

# WSM

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**WORKSHOP MANUAL**

**TRACTOR, FRONT LOADER,  
BACKHOE, ROTARY MOWER**

**BX23S-AU, LA340AU,  
BT603, RCK54D, RCK60D,  
RCK54, RCK60B**

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**Kubota**

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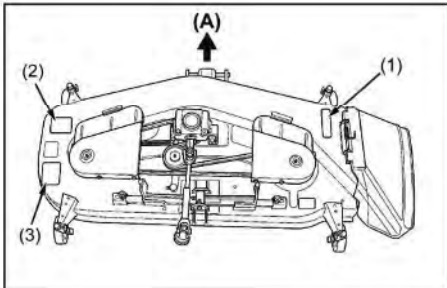
# 1. INFORMATION

## 1. INFORMATION

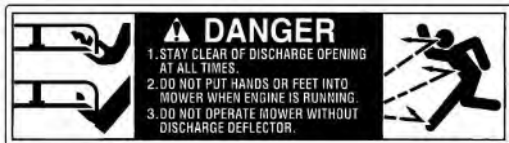
## 2. Safety labels for mower

The safety labels are installed on the mower. If a label becomes damaged, illegible or is not on the mower, replace it. The label part number is listed in the parts list.

[RCK60B-23BX, RCK54-23BX]



(1) Part No. K5112-7311-1



1BDACADAP003E

(3) Part No. K5763-4715-1



1BDACADAP002E

(2) Part No. K5112-7312-1



1BDACADAP004E

2VKDY00022A01enUS

(A) Forward

### 3. Loader specifications

#### 3.1 Loader specifications

Loader model		LA340AU*1	LA340
Tractor model		BX23S-AU	
Boom cylinder	Bore	40 mm (1.6 in.)	
	Stroke	326 mm (12.8 in.)	
Bucket cylinder	Bore	65 mm (2.6 in.)	
	Stroke	196 mm (7.72 in.)	
Control valve		One detent float position, single bucket dump, power beyond circuit	
Rated flow		14 L/m (3.7 GPM)	
Maximum pressure		12.8 MPa (131 kg/cm <sup>2</sup> ) [1860 psi]	
Net weight (approximate)		180 kg (397 lbs)	161 kg (355 lbs)

\*1 Spill guard model



## 1.2 Overview of biodiesel fuel (BDF)

### B0-B20 biodiesel fuels (BDF)

You can use mixed diesel fuels containing 20% or less biodiesel under the following conditions.

#### ■ IMPORTANT

- **Concentrations greater than B5 (5%) are not approved for common rail engines and engines with aftertreatment device. Using concentrations greater than B5 (5%) can cause damage and reduce engine life.**
- **Refuel and use the fuel with caution in order to avoid contact with the fuel and spillage that could create a potential environmental or fire hazard. Wear appropriate protective equipment when refueling.**

#### Applicable BDF

- You can use blended diesel fuels containing 6% through 20% BDF (B6-B20) which comply with American society for testing and materials (ASTM) D7467 standard, as revised, without adversely affecting the performance and durability of the engine and the components of the fuel system.
- Any mineral-oil-diesel-fuel, if used, must conform to ASTM D975 (or the European EN590) Standard, as revised. B100 fuel used to generate biodiesel-blended-fuels must meet ASTM D6751 (or EN14214) Standard, as revised. The final blended fuel B20 must conform to ASTM D7467 standard, as revised. Straight-vegetable-oil is not allowed in any blended fuel.
- Allowable blended fuel is mineral-oil-diesel-fuel blended with B100 (for example 100% BDF). The blended fuel ratio shall be less than 20% B100 and 80% or more diesel fuel. Purchase the B100 source used for biodiesel blends from an accredited BQ-9000 marketer or producer. You can find more information about qualified marketer(s) and producer(s) at <http://www.bq-9000.org>.

#### Product warranty, emission, and other precautions

- The engine-emission-control-system was certified according to current regulations based on the use of non-BDF. When using BDF, the owner is advised to check applicable local and federal emission regulations, and comply with all of them.
- BDF may cause restricted or clogged fuel filters during cold weather conditions, resulting in the engine not operating properly.
- BDF encourages the growth of microorganisms which may cause degradation of the fuel. Degradation of the fuel may cause corrosion of the fuel line or reduce the fuel filter flow earlier than expected.
- BDF inherently absorbs moisture which may cause degradation of the fuel earlier than expected. To avoid absorbing moisture of BDF, drain the water separator and the fuel-filter-port often.
- Do not use biodiesel whose concentrations higher than 20% (for example, greater than B20). Higher concentrated biodiesel will affect engine performance and fuel consumption, and degradation of the fuel system components may occur.
- Do not readjust the engine-fuel-control-system because readjusting it will violate the emission-control-levels for which the equipment was approved.
- Compared with soybean-based and rapeseed-based feedstock, palm-oil-based feedstock has a thicker consistency (for example, higher viscosity) at lower temperatures. Consequently, palm-oil-based feedstock may reduce performance of the fuel filter, particularly during cold weather conditions.
- The Kubota warranty, as specified in the Owner's Warranty Information Guide, only covers flaws in product materials and workmanship. Accordingly, the Kubota warranty does not cover any problems that may arise due to the use of poor quality fuels that fail to meet the preceding requirements, whether biodiesel or mineral-oil-based.

#### Routine using

- Avoid spilling BDF onto painted surfaces because this may damage the finish. If the fuel is spilled, immediately wipe clean and flush with soapy water to avoid permanent damage.
- When using BDF, you are advised to keep a full tank of the fuel, especially overnight and during short term storage, to reduce condensation within the tank. Be sure to tighten the fuel cap after refueling to prevent moisture build up within the tank. Water in the biodiesel mixture will damage the fuel filters and may damage the engine components.

#### Maintenance requirements when using BDF B0 through B5

Extended oil-change-intervals may result in premature wear or engine damage.

#### Maintenance requirements when using BDF B6 through B20

The maintenance interval for fuel related parts changes.

## 2. Mower service intervals

To keep the mower working in good condition as well as to avoid any accident and trouble, do periodic inspection and maintenance. Check the following points before use.

No.	Item	Service interval					Reference page
		Daily check	Every 50 hrs	Every 150 hrs	Every 1 year	Every 4 years	
1	Oil leakage check	○					—
2	Make sure blade bolts are tight.	○					2-43
3	Blade wear check	○					2-44
4	Belt wear check	○					2-44
5	All hardware check	○					—
6	Make sure that all pins are in place.	○					—
7	Mower deck cleaning	○					—
8	Greasing • Universal joint • Three spindle shafts • Belt tension pulley • Belt tension pivot • Front and rear anti-scalp rollers • Frame link	○					2-45 2-45 2-46
9	Gear box oil check	○					2-44
10	Gear box oil change		⊙	○			2-46
11	Gear box oil seal check				○ <sup>*1</sup>		2-47
12	Gear box oil seal replace					○	2-47

**IMPORTANT**

- The jobs indicated by ⊙ must be done after the first 50 hours of operation.

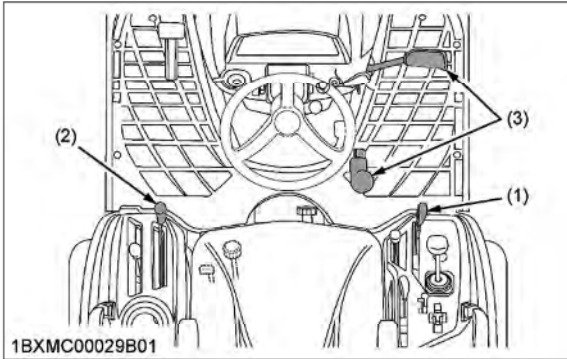
\*1 Replace the gear box oil seal if any deterioration (crack, hardening, scar, or deformation) or damage occurred.

**[Test 2] Switches for the operator's seat and the PTO clutch lever**

1. Start the engine.
2. Engage the PTO clutch lever.
3. Stand up.

Do not get off the machine.

The engine must stop after approximately one second.



- (1) Range gear shift lever (Hi-Lo)      (2) PTO clutch lever  
 (3) Speed control pedal

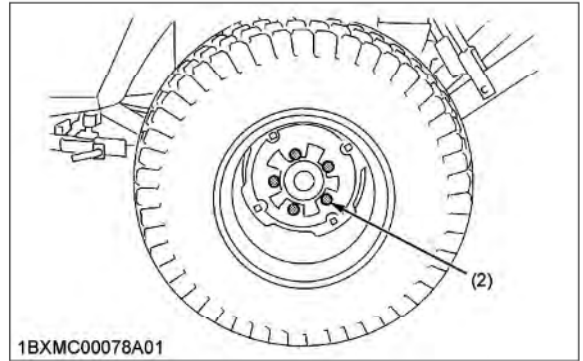
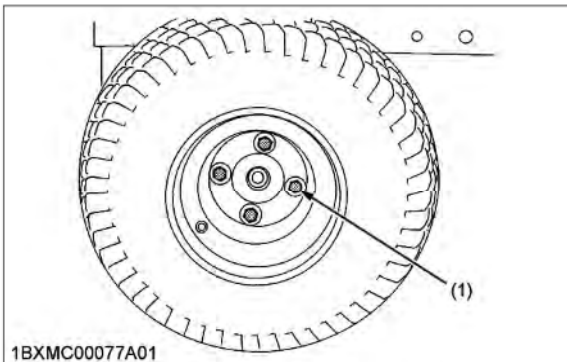
**1.4.4 Checking wheel bolt torque**

**⚠ WARNING**

To avoid serious injury or death:

- Never operate the tractor with a loose rim, wheel, or axle.
- Any time bolts are loosened, retighten to the specified torque.
- Check all bolts frequently and keep them tight.

1. Check the wheel bolts regularly especially when new.
2. If they are loose, tighten them as follows.

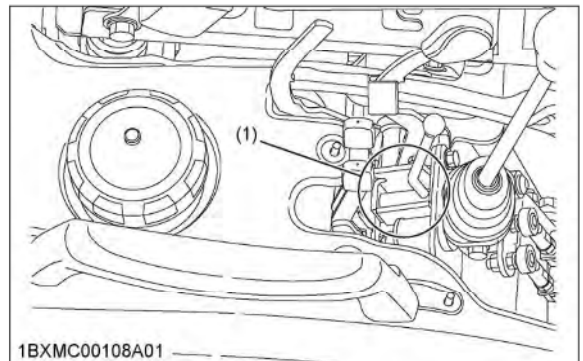


- (1) Front wheel bolt      (2) Rear wheel bolt

Tightening torque	Front wheel bolt	149.2 to 179.0 N·m 15.2 to 18.3 kgf·m 110 to 132 lbf·ft
	Rear wheel bolt	108.5 to 130.2 N·m 11.1 to 13.3 kgf·m 80 to 96 lbf·ft

**1.4.5 Cleaning lock lever shaft**

1. Before you use the lock lever, clean the lever movable area (1).



- (1) Lever movable area

**1.5 Check points of every 100 hours**

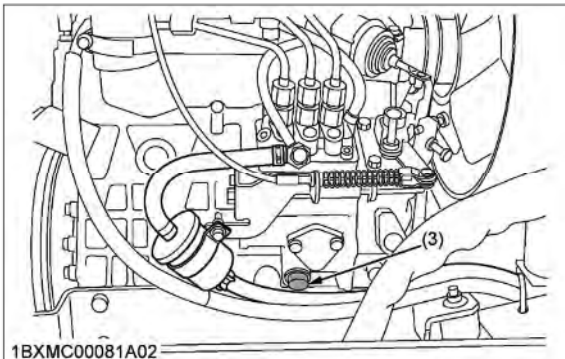
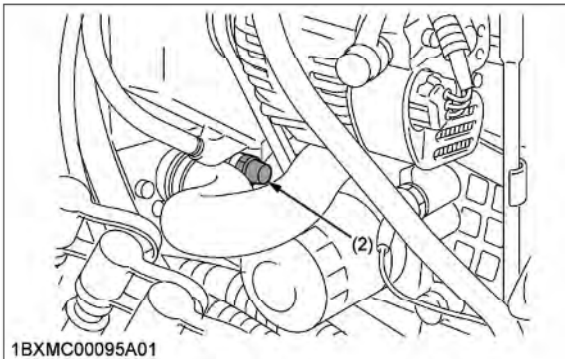
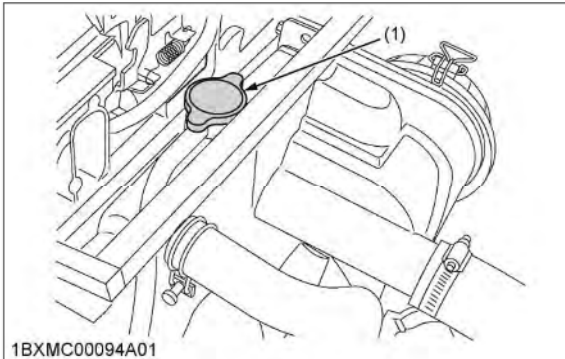
**1.5.1 Checking battery condition**

**⚠ DANGER**

To avoid the possibility of battery explosion: For the refillable type battery, follow the instructions below.

- Do not use or charge the refillable type battery if the fluid level is below the [LOWER] (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion.

9. Start and operate the engine for a few minutes.
10. Stop the engine and let it cool.
11. Check the coolant level of the recovery tank and add the coolant if necessary.



- (1) Radiator cap  
 (2) Radiator drain plug  
 (3) Engine drain plug

— RELATED PAGE —

[LUBRICANTS, FUEL AND COOLANT on page 2-7](#)

### 1.11.2 Antifreeze



#### WARNING

To avoid serious injury or death:

- When using the antifreeze, put on some protection such as rubber gloves. The antifreeze contains poison.
- If someone drank antifreeze, seek immediate medical help. Do not make a person throw up unless told to throw up by poison-control-center or a health care professional. Use standard first aid and CPR for signs of shock or cardiac arrest. Call your local poison control center or your local emergency number for further assistance.
- When the antifreeze comes in contact with the skin or clothing, wash it off immediately.
- Do not mix different types of the antifreeze. The mixture can produce chemical reaction causing harmful substances.
- The antifreeze is extremely flammable and explosive under certain conditions. Keep fire and children away from the antifreeze.
- When draining fluids from the engine, place some container underneath the engine body.
- Do not pour waste onto the ground, down a drain, or into any water source.
- Also, follow the relevant environmental protection regulations when disposing of the antifreeze.

Always use a 50/50 mix of long-life coolant and clean soft water in KUBOTA engines.

#### NOTE

- The following data represent industry standards that necessitate a minimum glycol content in the concentrated antifreeze.
- Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
- Before using LLC-mixed cooling water, fill the radiator with fresh water and empty it again. Repeat this procedure two times or three times to clean up the inside.
- Mixing the LLC

Premix	50% LLC with 50% clean soft water.
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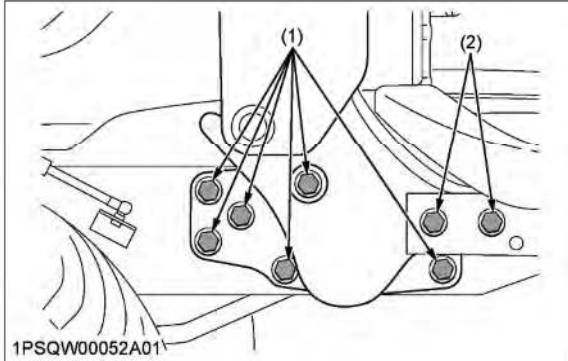
- When mixing, stir it up well, and then fill into the radiator.
- Adding the LLC.
  - Add only water if the mixture reduces in amount by evaporation.
  - If there is a mixture leak, add the LLC of the same manufacturer and type in the same mixture percentage.

#### IMPORTANT

- Never add any long-life coolant of different manufacturer. Different brands may have different additive components,

- Check the bolts and nuts of the main frame regularly especially when they are new. If the bolts and nuts of the main frame are loose, tighten them as follows.

1. Check the torque of bolts and nuts.



(1) Bolt and nut of the main frame (2) Bolt and nut of the main frame

Tightening torque	Bolt and nut (1)	147 N · m 15.0 kgf · m 108 lbf · ft
	Bolt and nut (2)	203 N · m 20.7 kgf · m 150 lbf · ft

## 4. Backhoe

### 4.1 Check points of daily or each use

#### 4.1.1 Checking transmission fluid level

##### **WARNING**

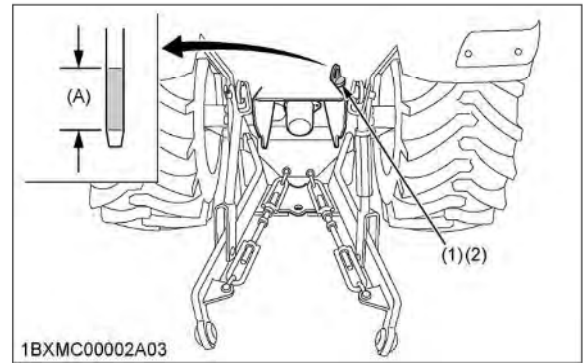
To avoid serious injury or death:

- Park the tractor on a firm, flat, and level surface, lower the implement to the ground, and stop the engine.

##### **IMPORTANT**

- If the transmission fluid level is low, do not operate the engine.

- To check the transmission fluid level, check the dipstick as the following procedure.
  - Draw out the dipstick.
  - Wipe the dipstick clean.
  - Replace the dipstick.
  - Draw the dipstick out again.
- Check to see that the transmission fluid level lies between the two notches.
- If the transmission fluid level is too low, add new fluid to the prescribed level at the oil inlet.



(1) Oil inlet (A) Transmission fluid level is acceptable within this range.  
(2) Dipstick

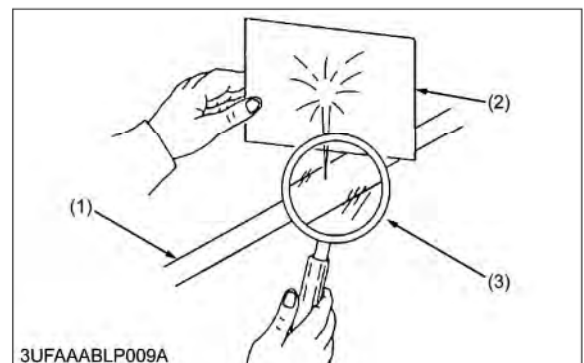
— RELATED PAGE —  
[LUBRICANTS, FUEL AND COOLANT on page 2-7](#)

#### 4.1.2 Checking hydraulic hoses

##### **WARNING**

To avoid serious injury or death:

- Escaping the hydraulic fluid under pressure can obtain sufficient force to penetrate skin, causing serious personal injury.
- Before disconnecting lines, be sure to relieve all pressure. Before applying pressure to the loader system, be sure that all connections are tight and that lines, tubes, and hoses are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than your hands, to search for suspected leaks.
- If you are injured by escaping fluid, see a doctor at once. Serious infection or allergic reaction will develop if proper medical treatment is not administered immediately.



(1) Hydraulic hose (2) Cardboard (3) Magnifying glass

**Implement weight list**

Implement		Remarks	BX23S
Backhoe* <sup>1</sup>		Max. digging depth	1840 mm (6 ft)
		Max. weight	w/o bucket 266 kg (586 lbs)
Front-end loader* <sup>2</sup>		Max. lifting capacity (Bucket pivot pin, max. height)* <sup>3</sup>	335 kg (739 lbs)
		Max. width	122 cm (48 in.)
		Sub frame	Necessary
Mower	Mid-mount	Max. cutting width	152 cm (60 in.)
		Max. weight	134 kg (295 lbs)
	Rotary-Cutter (1 blade)	Max. cutting width	122 cm (48 in.)
		Max. weight	181 kg (400 lbs)
	Rear-mount (2 or 3 blade)	Max. cutting width	152 cm (60 in.)
		Max. weight	262 kg (577 lbs)
Flail-mower	Max. cutting width	107 cm (42 in.)	
Sickle bar	Max. cutting width	122 cm (48 in.)	
Rotary tiller		Max. tilling width	127 cm (50 in.)
		Max. weight	197 kg (435 lbs)
Bottom plow		Max. size	14 × 1 in.
Disc plow		Max. size	22 × 1 in.
Cultivator		Max. size	122 cm (48 in.) 1 Row
Disc harrow		Max. harrowing width	122 cm (48 in.)
		Max. weight	249 kg (549 lbs)
Sprayer		Max. tank capacity	150 L (40 U.S.gals.)
Front blade		Max. cutting width	152 cm (60 in.)
		Sub frame	Necessary
Rear blade		Max. cutting width	152 cm (60 in.)
		Max. weight	112 kg (248 lbs)
Box blade		Max. cutting width	152 cm (60 in.)
		Max. weight	170 kg (375 lbs)
Snow blower (Front)		Max. working width	127 cm (50 in.)
		Max. weight	160 kg (353 lbs)
		Sub frame	Necessary
Post hole digger		Digging depth	114 cm (45 in.)
Rotary broom		Cleaning width	119 cm (47 in.)
Trailer		Max. load capacity	800 kg (1765 lbs)* <sup>4</sup>
		Max. weight	1100 kg (2425 lbs)

\*1 KUBOTA provides BT603 backhoe for BX23S. No other backhoe installed by 3-point hitch is permitted for BX23S.

\*2 KUBOTA provides LA340 and LA340S Front-end Loader for BX23S.

\*3 The value contains the weight of KUBOTA standard bucket.

\*4 Reduce speed and trailer loads when operating in slippery conditions or when operating on slopes and using front wheel drive.

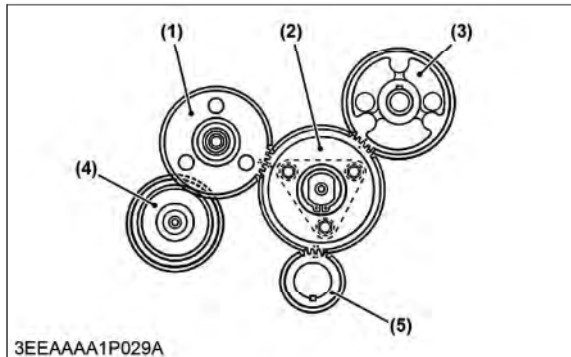
J	50.8 mm (2.00 in.)
K	40 mm (1.57 in.)
L	38.1 mm (1.50 in.)
M	1.9 mm (0.07 in.)
N	4.8 mm (0.19 in.)
O	200 mm (7.87 in.)
P	φ9 mm (φ0.35 in.), 3 holes
Q	25 mm (0.98 in.)
R	39.5 to 40.5 mm (1.56 to 1.59 in.)
S	140 mm (5.51 in.)
T	260 mm (10.24 in.)
U	99.5 to 100.5 mm (3.92 to 3.95 in.)
V	45 mm (1.77 in.)

### 3. ENGINE

The flywheel periphery is inscribed with the marks showing fuel injection timing angle lines and top dead center mark [TC]. The flywheel (2) mounted on the rear of the crankshaft (1) is a stabilizer for the whole engine.

#### 1.11 Function of timing gears

The timing gears correctly control fuel injection to the cylinders and valve timing.



- |                         |                   |
|-------------------------|-------------------|
| (1) Injection pump gear | (4) Governor gear |
| (2) Idle gear           | (5) Crank gear    |
| (3) Cam gear            |                   |

The timing gears transmit torque from the crankshaft to the oil pump and injection pump and, at the same time, correctly control fuel injection to the cylinders and valve timing. Each gear has a mating mark inscribed on it for correct and easy assembly and is spherical with teeth set obliquely to the axis of rotation to rotate smoothly and reduce noise. The crankshaft is the hub around which other parts of the engine can be timed and driven. This is done by the meshing of gears as shown in the figure.



3. ENGINE

## 4. Checking and adjusting

### 4.1 Engine body

#### 4.1.1 Checking compression pressure

■ **NOTE**

- Check the compression pressure with the specified valve clearance.
- Always use a fully charged battery for performing this test.
- Variances in cylinder compression values should be under 10%.



1. Operate the engine until it is warmed up.
2. Stop the engine.
3. Remove the air cleaner, the muffler and all glow plugs (or nozzles).
4. Set a compression tester with the adapter to the glow plug hole (or nozzle hole).

**Nozzle hole:**

Adapter H (07909-31231)

**Glow plug hole:**

Adapter L (07909-31301)

5. Disconnect the connector of engine stop solenoid and keep the engine stop position (non-injection). Then, operate the engine with the starter and measure the compression pressure.
6. Repeat steps 4 and 5 for each cylinder.
7. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the glow plug hole (or nozzle hole) and measure the compression pressure again.

Compression pressure	Factory specification	3.53 to 4.02 MPa 36.0 to 41.0 kgf/cm <sup>2</sup> 512 to 583 psi
	Allowable limit	2.55 MPa 26.0 kgf/cm <sup>2</sup> 370 psi

8. If the compression pressure is still less than the allowable limit, check the top clearance, valve clearance and cylinder head.
9. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

#### 4.1.2 Checking valve clearance

■ **IMPORTANT**

- Valve clearance must be checked and adjusted when engine is cold.

■ **NOTE**

- The sequence of cylinder numbers is given as No. 1, No. 2 and No. 3 starting from the gear case side.
- After adjusting the valve clearance, secure the adjusting screw with the lock nut.

3. ENGINE

3. Disconnect the ground cables (7), (8), (9), and (10).



- (7) Ground cable (Starter to frame)
- (8) Ground cable (Harness to frame)
- (9) Ground cable (Battery to L.H. engine support)
- (10) Ground cable (Wire harness to R.H. engine support)
- (11) Nut

**(When reassembling)**

Tightening torque	Engine mounting nut	24 to 27 N · m 2.4 to 2.8 kgf · m 18 to 20 lbf · ft
-------------------	---------------------	---

**5.1.5 Disconnecting fuel hoses**

1. Disconnect fuel return hose (1) and fuel supply hose (2) from engine.

2. Disconnect fuel filter (3) from engine.



- (1) Fuel return hose
- (2) Fuel supply hose
- (3) Fuel filter

**5.1.6 Disconnecting accelerator wire**

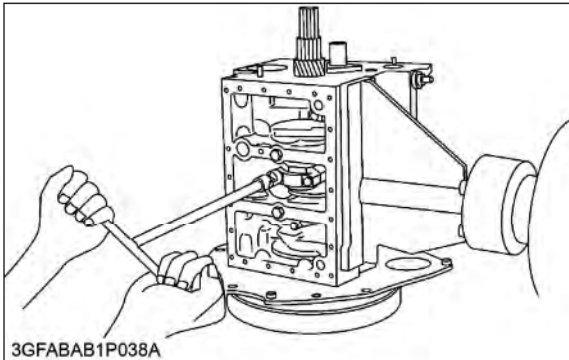
1. Disconnect accelerator wire (2) from speed control lever (1).



- (1) Speed control lever
- (2) Accelerator wire

### 5.2.3 Piston and connecting rod

#### 5.2.3.1 Removing connecting rod



1. Remove the connecting rod cap.

**(When reassembling)**

- Align the marks (a) with each other. (Face the marks toward the injection pump.)

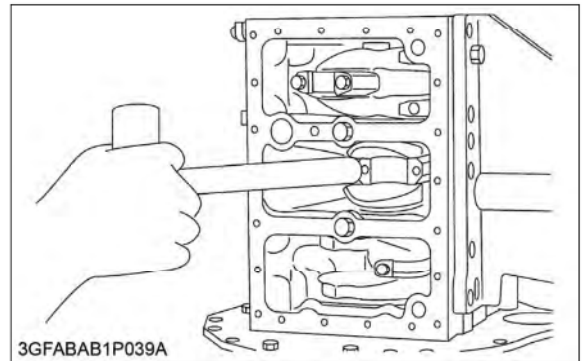


(a) Mark

- Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque.  
If the connecting rod screw does not screw in smoothly, clean the threads.  
If the connecting rod screw is still hard to screw in, replace it.

Tightening torque	Connecting rod screw	27 to 30 N·m 2.7 to 3.1 kgf·m 20 to 22 lbf·ft
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#### 5.2.3.2 Removing pistons

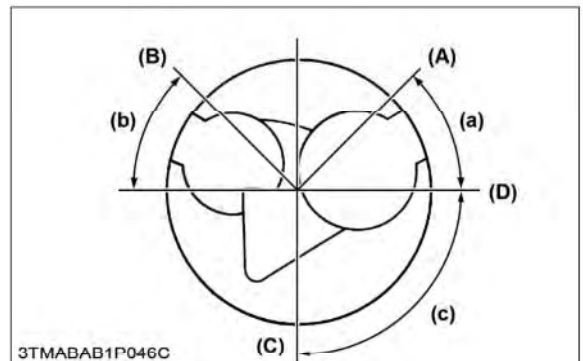


1. Turn the flywheel and bring the piston to top dead center.
2. Draw out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.
3. Draw out the other piston in the same method as above.

**(When reassembling)**

**■ IMPORTANT**

- Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark [1] on the No. 1 piston.
- When installing the piston into the cylinder, place the gaps of all the piston rings as shown in the figure.



- (A) Top ring gap
- (B) Second ring gap
- (C) Oil ring gap
- (D) Piston pin hole
- (a) 0.79 rad (45°)
- (b) 0.79 rad (45°)
- (c) 1.6 rad (90°)

- Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section may be scratched, causing trouble inside the cylinder.

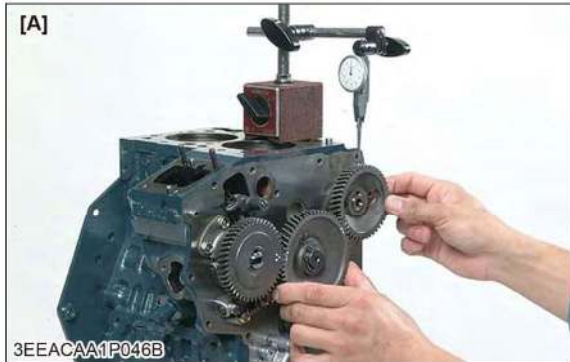
### 3. ENGINE

- If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil clearance between tappet and tappet guide bore	Factory specification	0.016 to 0.052 mm 0.00063 to 0.0020 in.
	Allowable limit	0.10 mm 0.0039 in.

## 6.2 Timing gears, camshaft and governor gear

### 6.2.1 Checking timing gear backlash



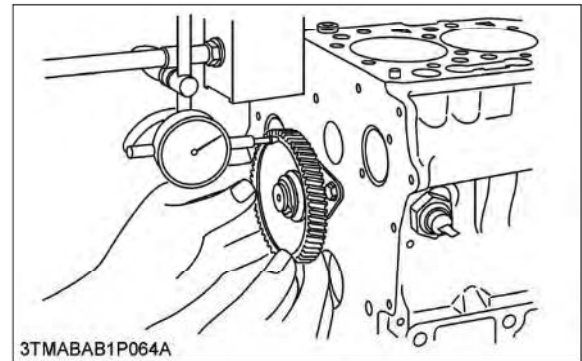
[A] D902-E4

- Set a dial indicator (lever type) with its tip on the gear tooth.
- Move the gear to measure the backlash, holding its mating gear.
- If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.

Backlash between idle gear and crank gear	Factory specification	0.0430 to 0.124 mm 0.00170 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.
Backlash between idle gear and cam gear	Factory specification	0.0470 to 0.123 mm 0.00185 to 0.00484 in.
	Allowable limit	0.15 mm 0.0059 in.
Backlash between idle gear and injection pump gear	Factory specification	0.0460 to 0.124 mm 0.00182 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.
Backlash between oil pump drive gear and crank gear	Factory specification	0.0410 to 0.123 mm 0.00162 to 0.00484 in.
	Allowable limit	0.15 mm 0.0059 in.

- If the oil clearance is proper, replace the gear.

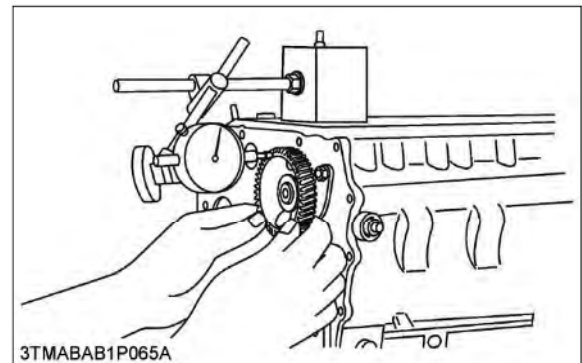
### 6.2.2 Checking idle gear 1 side clearance



- Set a dial indicator with its tip on the idle gear.
- Measure the side clearance by moving the idle gear to the front and rear.
- If the measurement exceeds the allowable limit, replace the idle gear collar.

Idle gear 1 side clearance	Factory specification	0.20 to 0.51 mm 0.0079 to 0.020 in.
	Allowable limit	0.80 mm 0.031 in.

### 6.2.3 Checking camshaft side clearance



- Set a dial indicator with its tip on the camshaft.
- Measure the side clearance by moving the cam gear to the front to rear.
- If the measurement exceeds the allowable limit, replace the camshaft stopper.

Camshaft side clearance	Factory specification	0.15 to 0.31 mm 0.0059 to 0.012 in.
	Allowable limit	0.50 mm 0.020 in.

### 3. ENGINE

1. Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge.



2. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Rotor lobe clearance	Factory specification	0.030 to 0.14 mm 0.0012 to 0.0055 in.
----------------------	-----------------------	--

#### 6.6.2 Checking clearance between outer rotor and pump body

##### Tools required

- Feeler gauge

1. Measure the clearance between the outer rotor and the pump body with a feeler gauge.



2. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

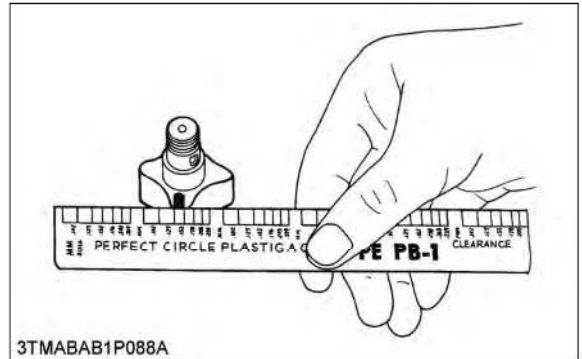
Clearance between outer rotor and pump body	Factory specification	0.070 to 0.15 mm 0.0028 to 0.0059 in.
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#### 6.6.3 Checking clearance between rotor and cover

##### Tools required

- Plastigauge

1. Put a strip of plastigauge onto the rotor face with grease.



2. Install the cover and tighten the screws.
3. Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.
4. If the clearance exceeds the factory specifications, replace oil pump rotor assembly.

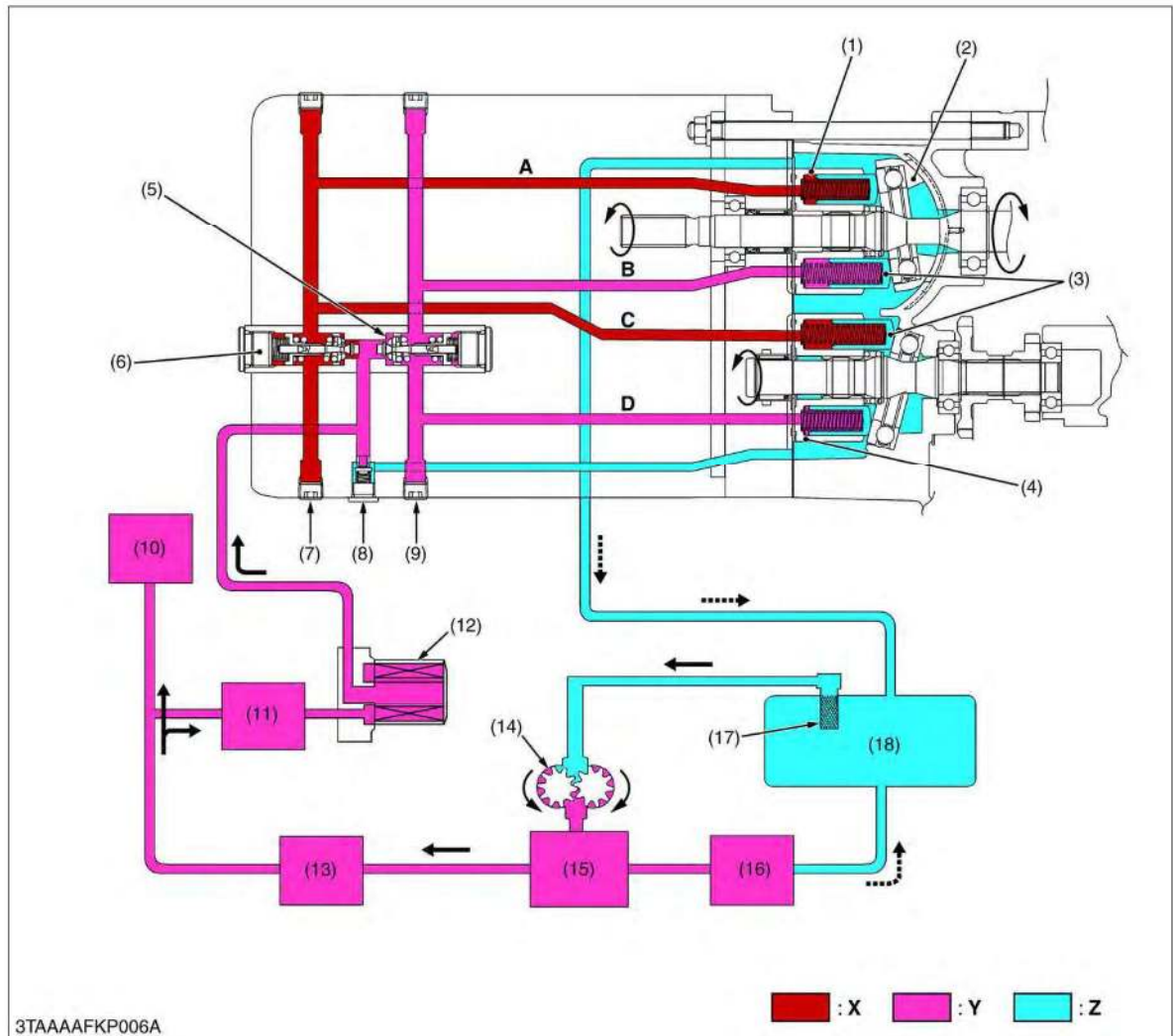
Clearance between rotor and cover	Factory specification	0.0750 to 0.135 mm 0.00296 to 0.00531 in.
-----------------------------------	-----------------------	--

### 2.1.2.4 Relief (reverse position)

When the speed control pedal is in reverse, the variable swashplate is tilted as shown in figure. As the pump cylinder block rotates with the input shaft, oil is forced out of pump port A at high pressure. As pressure oil enters motor port C, the pistons, which align with port C, are pushed against the swashplate and slide down the inclined surface. Since the oil pressure in the check and high pressure relief valve (reverse) increases, the high oil pressure opens the check and high pressure relief valve (reverse) and the flows through the charge relief valve to the transmission case.

Then the output shaft rotates with the motor cylinder block. This drives the machine rearward and the angle of pump swashplate determines the output shaft speed.

As the motor cylinder block continues to rotate, oil is forced out of motor port D at low pressure and returns to the pump.



- |  |  |  |                  |
|--|--|--|------------------|
| (1) Cylinder block (Pump)                          | (7) High pressure relief port plug (Forward) | (13) Power steering controller                     | B: B port        |
| (2) Swashplate                                     | (8) Charge relief valve                      | (14) Hydraulic pump                                | C: C port        |
| (3) Piston   | (9) High pressure relief port plug (Reverse) | (15) Flow priority valve (Hydraulic control valve) | D: D port        |
| (4) Cylinder block (Motor)                         | (10) PTO clutch valve                        | (16) Position control valve                        | X: High pressure |
| (5) Check and high pressure relief valve (Forward) | (11) PTO relief valve                        | (17) Oil strainer                                  | Y: Low pressure  |
| (6) Check and high pressure relief valve (Reverse) | (12) Oil filter cartridge                    | (18) Transmission case                             | Z: Free oil      |
|  |  | A: A port  |                  |

### 3. PTO system

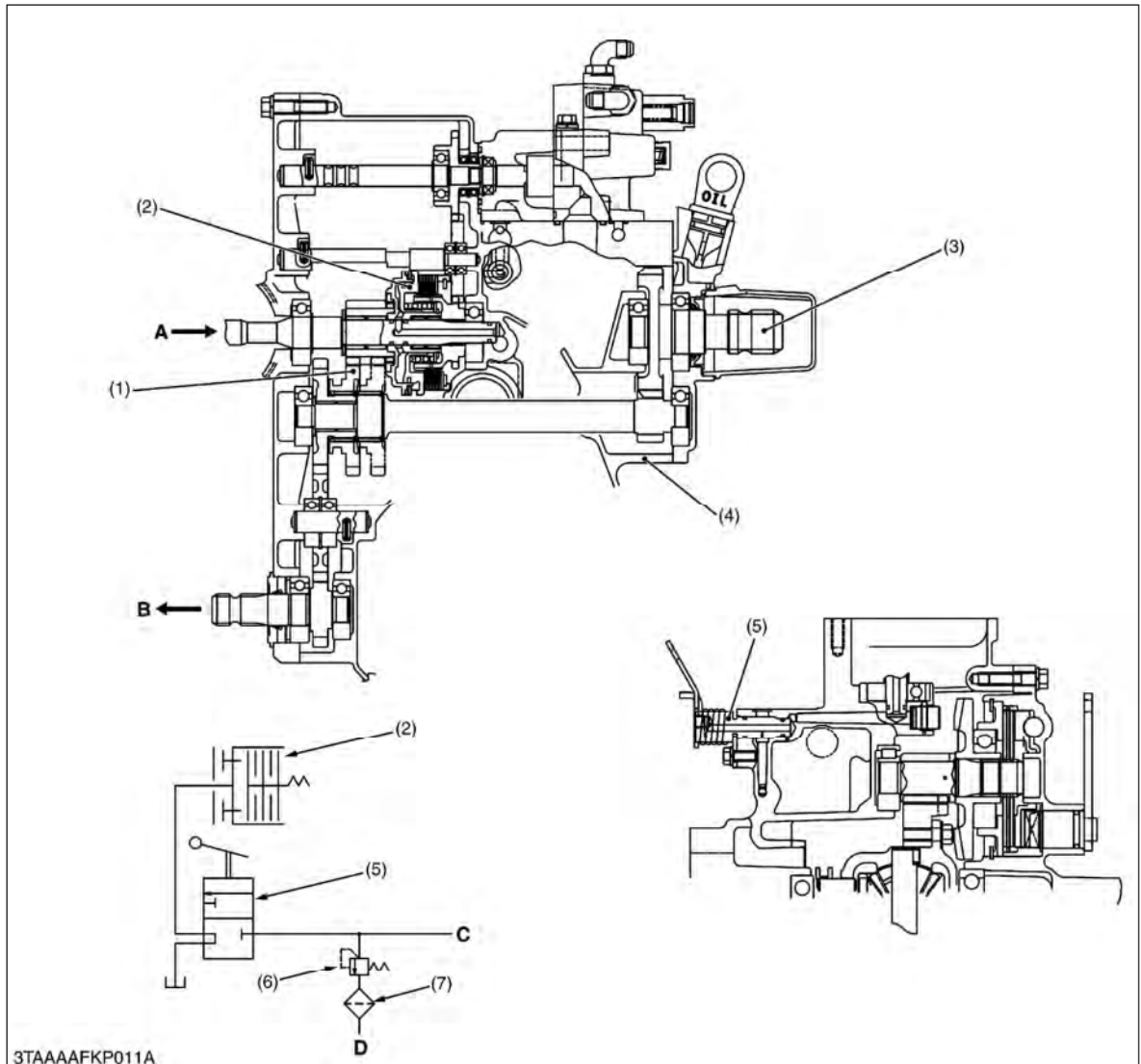
#### 3.1 Structure of PTO system

The BX 80 series equipped with hydraulic independent PTO clutch (wet multi-plates type). Therefore, the engine power engages or disengages to the PTO shafts without stopping the tractor movement.

The PTO clutch pack (2) has four clutch discs, four drive plates, pressure plate, clutch piston and so on.

The clutch piston is actuated by hydraulic oil flow from the power steering controller.

The PTO clutch valve (5) controls the hydraulic oil flow from power steering controller to the PTO clutch pack (2) by operating the PTO clutch lever through the linkage.

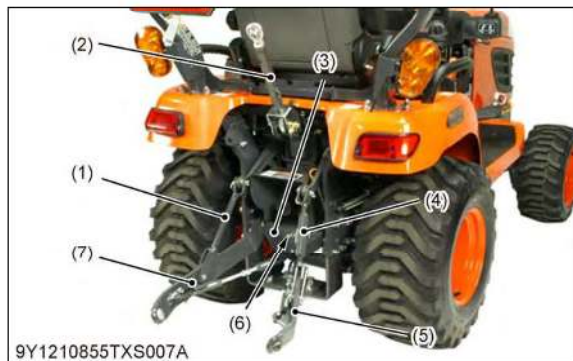


- |                     |                             |                          |                                   |
|---------------------|-----------------------------|--------------------------|-----------------------------------|
| (1) PTO select gear | (4) Transmission case       | (7) Oil filter cartridge | C: From power steering controller |
| (2) PTO clutch pack | (5) PTO clutch valve        | A: From HST pump shaft   | D: To hydrostatic transmission    |
| (3) Rear PTO shaft  | (6) PTO clutch relief valve | B: To mid-PTO            |                                   |

## 2. Servicing specifications for transaxle

Item		Factory specifications	Allowable limit
Charge relief valve [oil temperature at 50 °C (122 °F)]	Setting pressure	0.55 to 0.75 MPa 5.6 to 7.7 kgf/cm <sup>2</sup> 80 to 100 psi	—
High pressure relief valve (forward and reverse) [oil temperature at 50 °C (122 °F)]	Setting pressure	20.1 to 21.1 MPa 205 to 215 kgf/cm <sup>2</sup> 2920 to 3060 psi	—
PTO clutch	Operating pressure	1.0 to 1.3 MPa 11 to 13 kgf/cm <sup>2</sup> 150 to 180 psi	—
PTO clutch disk	Thickness	1.50 to 1.70 mm 0.0591 to 0.0669 in.	1.35 mm 0.0531 in.
Separate plate	Thickness	0.9450 to 1.055 mm 0.03721 to 0.04153 in.	0.80 mm 0.031 in.
Back plate	Thickness	1.9 to 2.1 mm 0.075 to 0.082 in.	1.85 mm 0.0728 in.
Clutch piston	Flatness	—	0.15 mm 0.0059 in.
Pressure plate and steel plate	Flatness	—	0.20 mm 0.0079 in.
Clutch spring	Free length	38.5 mm 1.52 in.	34.5 mm 1.36 in.
PTO brake disk	Thickness	2.90 to 3.10 mm 0.115 to 0.122 in.	2.70 mm 0.11 in.
PTO brake plate	Thickness	1.9 to 2.1 mm 0.075 to 0.082 in.	1.85 mm 0.0728 in.
Differential case to differential side gear	Clearance	0.0500 to 0.151 mm 0.00197 to 0.00594 in.	0.30 mm 0.012 in.
• Differential case	I.D.	38.000 to 38.062 mm 1.4961 to 1.4985 in.	—
• Differential side gear	O.D.	37.911 to 37.950 mm 1.4926 to 1.4940 in.	—
Differential pinion shaft to differential pinion	Clearance	0.0800 to 0.122 mm 0.00315 to 0.00480 in.	0.30 mm 0.012 in.
• Differential pinion	I.D.	20.060 to 20.081 mm 0.78977 to 0.79059 in.	—
• Differential pinion shaft	O.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	—
Differential pinion to differential side gear	Backlash	0.15 to 0.30 mm 0.0059 to 0.011 in.	0.40 mm 0.016 in.
Spiral bevel pinion shaft to spiral bevel gear	Backlash	0.10 to 0.30 mm 0.0040 to 0.011 in.	—
Actuator and bearing holder	Flatness	—	0.30 mm 0.012 in.
Cam plate and ball	Height	22.89 to 22.99 mm 0.9012 to 0.9051 in.	22.40 mm 0.8819 in.
Brake disk	Thickness	3.30 to 3.50 mm 0.130 to 0.137 in.	3.0 mm 0.12 in.
Friction plate	Thickness	1.92 to 2.08 mm 0.0756 to 0.0818 in.	1.52 mm 0.0598 in.

- Remove the stopper pin (6) and remove the check chain plate (3).



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- |                       |                     |
|-----------------------|---------------------|
| (1) Lift rod L.H.     | (5) Lower link R.H. |
| (2) Top link          | (6) Stopper pin     |
| (3) Check chain plate | (7) Lower link L.H. |
| (4) Lift rod R.H.     |                     |

- Move the bushes (8) to inside.
- Move the shaft (9) to right side and remove the lower link as a unit.



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- |          |           |
|----------|-----------|
| (8) Bush | (9) Shaft |
|----------|-----------|

### 5.1.4 Removing ROPS

- Disconnect the R.H and L.H. hazard lamp/turn signals (3), (4) from the wire harness.
- Remove the upper ROPS (1).



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- |                                  |                     |
|----------------------------------|---------------------|
| (1) Upper ROPS                   | (5) L.H. lower ROPS |
| (2) R.H. lower ROPS              | (6) Bolt            |
| (3) R.H. hazard lamp/turn signal |                     |
| (4) L.H. hazard lamp/turn signal |                     |

- Remove the ROPS mounting bolts (6).
- Remove the R.H. and L.H. lower ROPS (2), (5).

#### (When reassembling)

Tightening torque	ROPS mounting bolt	48.0 to 55.9 N·m 4.90 to 5.70 kgf·m 35.5 to 41.2 lbf·ft
-------------------	--------------------	---

### 5.1.5 Removing seat

- Disconnect the seat switch connectors.
- Remove the snap pins (2) to remove the seat (1).



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- |          |              |
|----------|--------------|
| (1) Seat | (2) Snap pin |
|----------|--------------|

### 5.1.6 Removing step

- Disconnect the upper cruise control rod (1) from the lower cruise control rod.

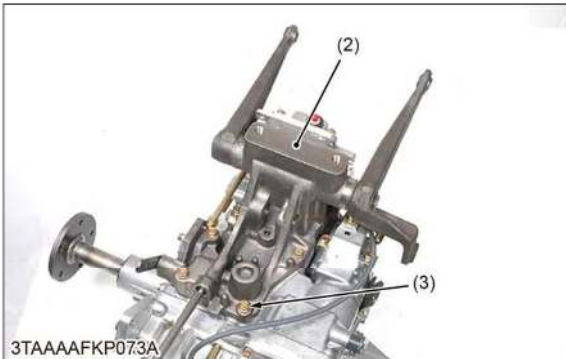
5. Remove the neutral adjuster (5) and the neutral arm (3).
6. Remove the trunnion arm (6).

**(When reassembling)**

- Adjust the HST neutral position. Refer to "Checking and adjusting" section.

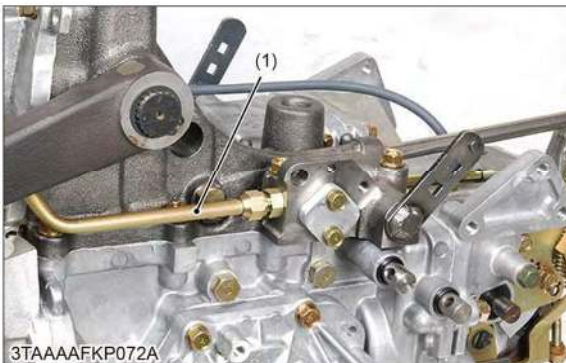
### 5.3 Hydraulic cylinder

#### 5.3.1 Removing hydraulic cylinder



(2) Hydraulic cylinder (3) Bolt

1. Disconnect the delivery pipe (1).



(1) Delivery pipe

2. Remove the hydraulic cylinder mounting bolts (3).
3. Remove the hydraulic cylinder (2).

**(When reassembling)**

- Apply liquid gasket (Three Bond 1208D or equivalent) to the joint surface of the transaxle case to the hydraulic cylinder.

Tightening torque	Hydraulic cylinder mounting bolt	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
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### 5.4 Transaxle shafts

#### 5.4.1 Removing transaxle case front cover

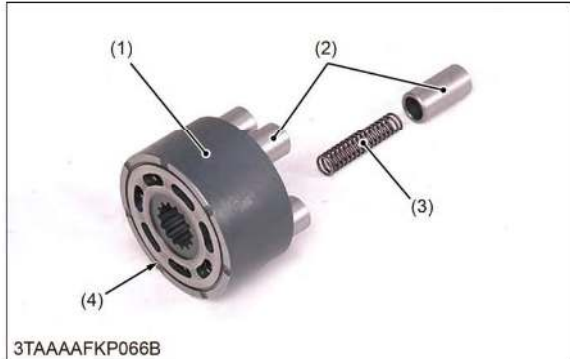
**NOTE**

- Before removing the transaxle case front cover (4), remove the 4WD detent bolt (1), the detent spring (2) and the detent ball (3) from the transaxle case front cover (4).
- Remove the circlip (5) from the HST pump shaft (PTO shaft) (6) and the HST motor shaft securely.

### 6.1.4 Checking cylinder block assembly

**■ IMPORTANT**

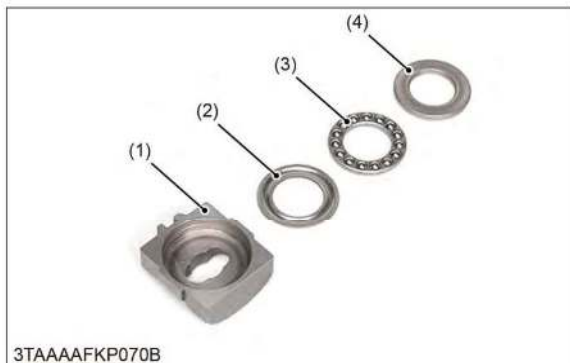
- Do not interchange the pistons between the pump cylinder block and the motor cylinder block. Pistons and cylinder blocks are matched.



- |                    |                   |
|--------------------|-------------------|
| (1) Cylinder block | (3) Spring        |
| (2) Piston         | (4) Polished face |

1. Check the cylinder blocks (1) and the pistons (2) for scratches and wear.
2. If there are scratch or worn, replace the cylinder block assembly.
3. Check the pistons for their free movement in the cylinder block bores.
4. If the piston or the cylinder block is scored, replace the cylinder block assembly.
5. Check the polished face (4) of the cylinder block for scoring. If it is scored, replace the cylinder block assembly.

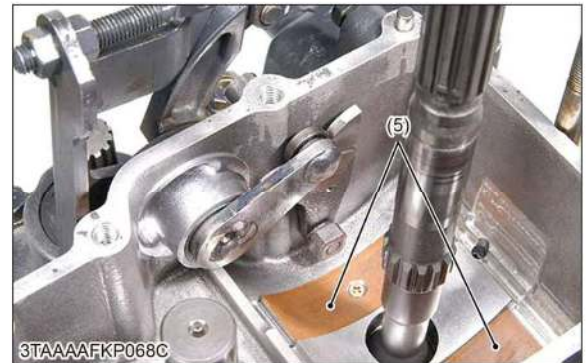
### 6.1.5 Checking thrust washer, thrust roller bearing, thrust plate and cradle bearing



- |                   |                    |
|-------------------|--------------------|
| (1) Swashplate    | (3) Thrust bearing |
| (2) Thrust washer | (4) Thrust plate   |

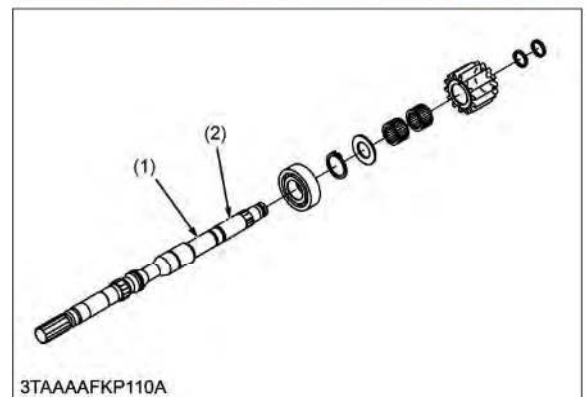
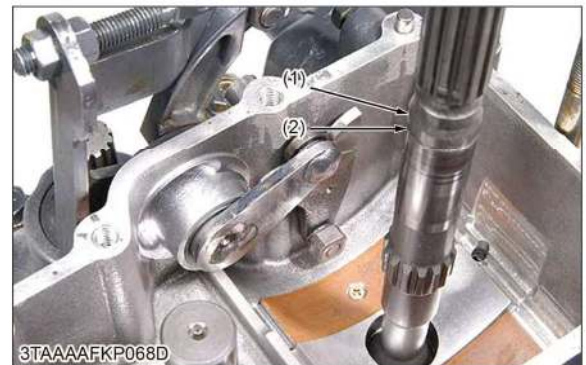
1. Check the thrust bearing (3) for scratches and excessive wear.
2. If it is worn, replace it.

3. Check the thrust plate (4) for scratches and excessive wear. If it is worn or scored, replace it.
4. Check the cradle bearing (5) for excessive wear. If it is worn, replace it.



(5) Cradle bearing

### 6.1.6 Checking pump shaft (PTO clutch shaft)



- |                  |                     |
|------------------|---------------------|
| (1) Seal surface | (2) Bearing surface |
|------------------|---------------------|

1. Check the seal surface (1) and the bearing surface (2).
2. If the pump shaft is rough or grooved, replace it.

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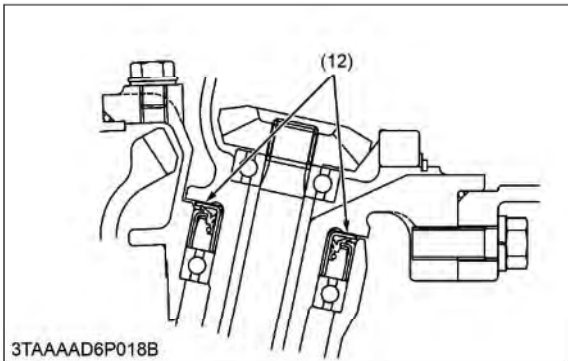


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5. FRONT AXLE



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(12) Oil seal

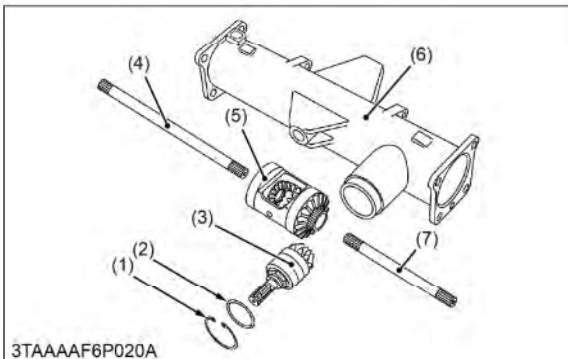
- Install the adjusting shims (2) to their original position.



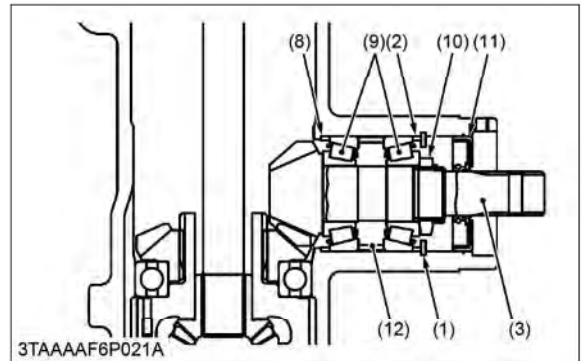
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(2) Shim

5.2.6 Removing bevel pinion shaft and differential gear assembly



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- |                                  |                                  |
|----------------------------------|----------------------------------|
| (1) Internal circlip             | (7) Differential yoke shaft R.H. |
| (2) Adjusting collar             | (8) Adjusting collar             |
| (3) Bevel pinion shaft           | (9) Taper roller bearing         |
| (4) Differential yoke shaft L.H. | (10) Lock nut                    |
| (5) Differential gear assembly   | (11) Oil seal                    |
| (6) Front axle case              | (12) Collar                      |

1. Remove the differential yoke shaft (4), (7).
2. Remove the oil seal (11).
3. Remove the internal circlip (1).
4. Pull out the bevel pinion shaft (3).
5. Remove the differential gear assembly (5), from right side of front axle case (6).
6. Remove the stake of lock nut (10), and then remove the lock nut (10).
7. Remove the taper roller bearing (9).

(When reassembling)

- Apply gear oil to the taper roller bearings (9) and install them correctly, noting their direction.
- Replace the lock nut (10) and oil seal (11) with new ones.
- After tightening the lock nut (10) to the specified torque, stake it firmly.
- Install the adjusting collars (2), (8) to their original position.

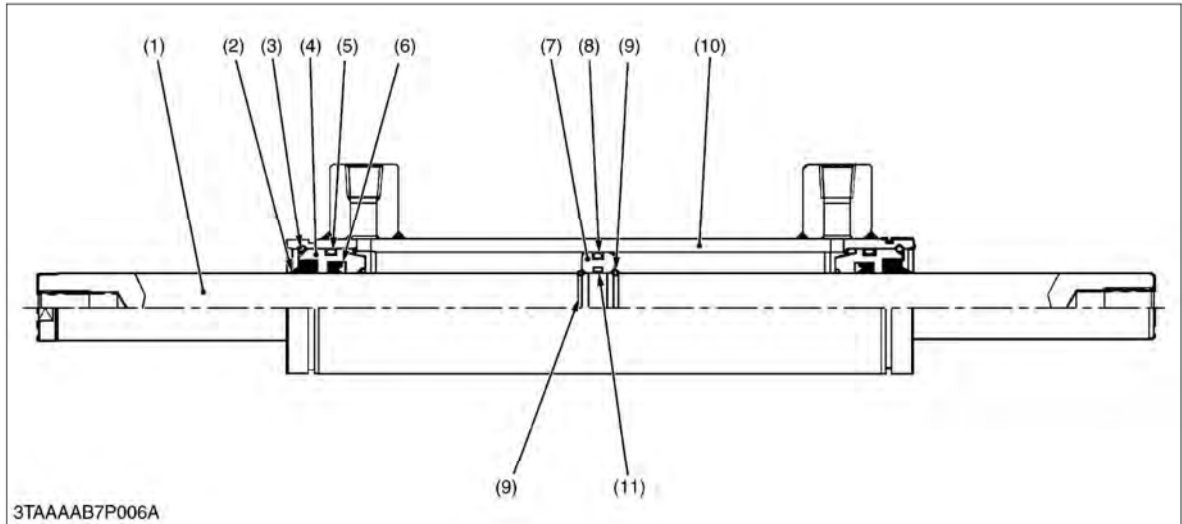
5.2.7 Removing differential gear

■ NOTE

- Arrange the parts to know their original position.

## 4. Steering cylinder

### 4.1 Structure of steering cylinder



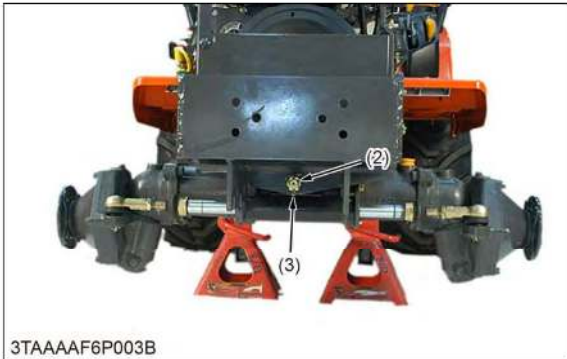
- |                      |               |                      |                    |
|----------------------|---------------|----------------------|--------------------|
| (1) Rod              | (4) Guide     | (7) Center piston    | (10) Cylinder tube |
| (2) Wiper seal       | (5) O-ring    | (8) Piston O-ring    | (11) Rod O-ring    |
| (3) Internal circlip | (6) Seal ring | (9) External circlip |                    |

The steering cylinder is single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods.

The tie-rods connected to both knuckle arm guarantees equal steering movement to both front wheels.

The steering cylinder provides force in both directions. Depending upon direction the steering wheel is turned pressure oil enters at one end of the cylinder to extend, or the other end to retract it, thereby turning front wheel of the tractor.

4. Remove the slotted nut (2) of center pin and separate the front axle from the frame.



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- (2) Slotted nut (Adjusting nut for front axle rocking force) (3) Cotter pin

5. Disconnect the power steering hoses (4).



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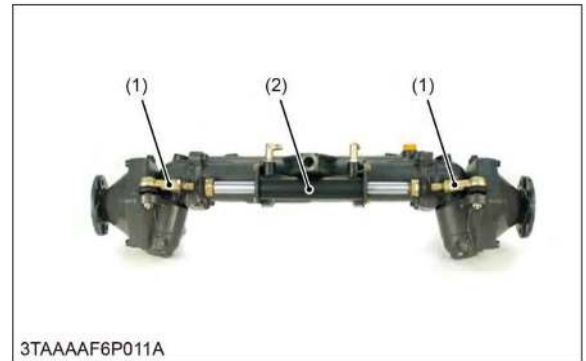
- (4) Power steering hose

**(When reassembling)**

- After mounting the front axle assembly to the frame, be sure to adjust the front axle rocking force.
- When installing the cotter pin, be sure to split the cotter pin like an anchor.

Tightening torque	Power steering hose	24 to 27 N · m 2.4 to 2.8 kgf · m 18 to 20 lbf · ft
-------------------	---------------------	---

**5.3.3 Removing power steering cylinder**



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- (1) Tie-rod (2) Power steering cylinder

1. Remove the cotter pin and remove the slotted nut for tie-rod (1).
2. Remove the power steering cylinder mounting screws and remove the power steering cylinder (2) with tie-rod.

**(When reassembling)**

**NOTE**

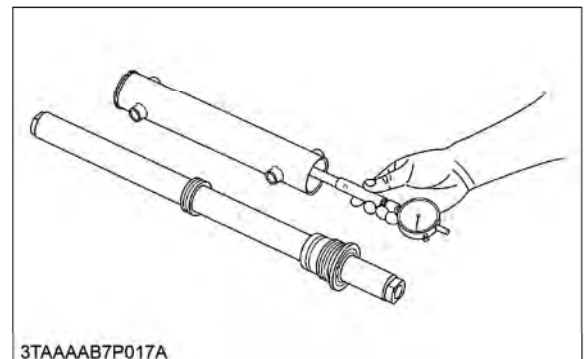
- Tighten the slotted nut. If the slot and pin hole do not meet, tighten the nut until they do meet, and install the cotter pin.
- Be sure to split the cotter pin like an anchor.

Tightening torque	Tie-rod slotted nut	18 to 34 N · m 1.8 to 3.5 kgf · m 13 to 25 lbf · ft
	Power steering cylinder mounting screw	48 to 55 N · m 4.9 to 5.7 kgf · m 36 to 41 lbf · ft

**6. Servicing**

**6.1 Checking steering cylinder I.D.**

1. Measure the steering cylinder I.D. with a cylinder gauge.



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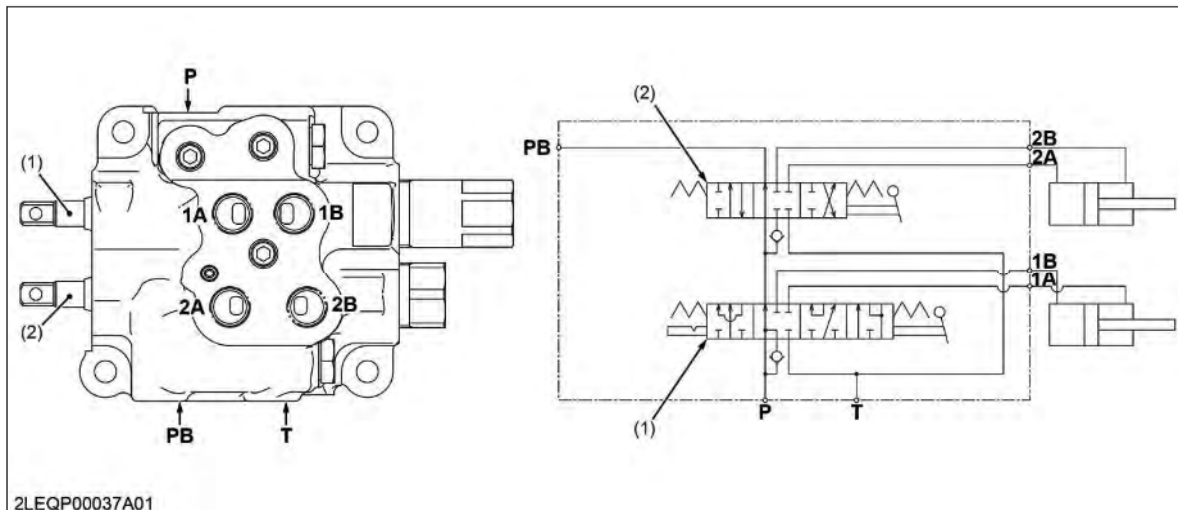
## 5. Flow priority valve

### 5.1 Outline of flow priority valve

This flow priority valve is located to the left side of the transmission.

The flow priority valve is a flow divider that divides a single hydraulic source (hydraulic pump) into two circuits and actuates them simultaneously.

## 10.1.2 Structure of front loader control valve



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- |                          |             |                       |
|--------------------------|-------------|-----------------------|
| (1) Boom control valve   | 1B: 1B port | P: Pump port          |
| (2) Bucket control valve | 2A: 2A port | PB: Power beyond port |
| 1A: 1A port              | 2B: 2B port | T: Tank port          |

The control valve assembly consists of one casting block and four major sections.

**(1) Boom control section**

The boom control valve is of 4-position, 6-connection, detent, spring center type, consisting of a mono block valve housing, spool, load check valve, etc. This valve has A1 and B1 ports and controls oil flow to the boom cylinder.

**(2) Bucket control section**

The bucket control valve is of 3-position, 6-connection, no detent, spring center type, consisting of a mono block valve housing, spool, load check valve, etc. This valve has A2 and B2 ports and controls oil flow to the bucket cylinder.

**Inlet (P port) and outlet (T port) section**

This section has P and T ports.

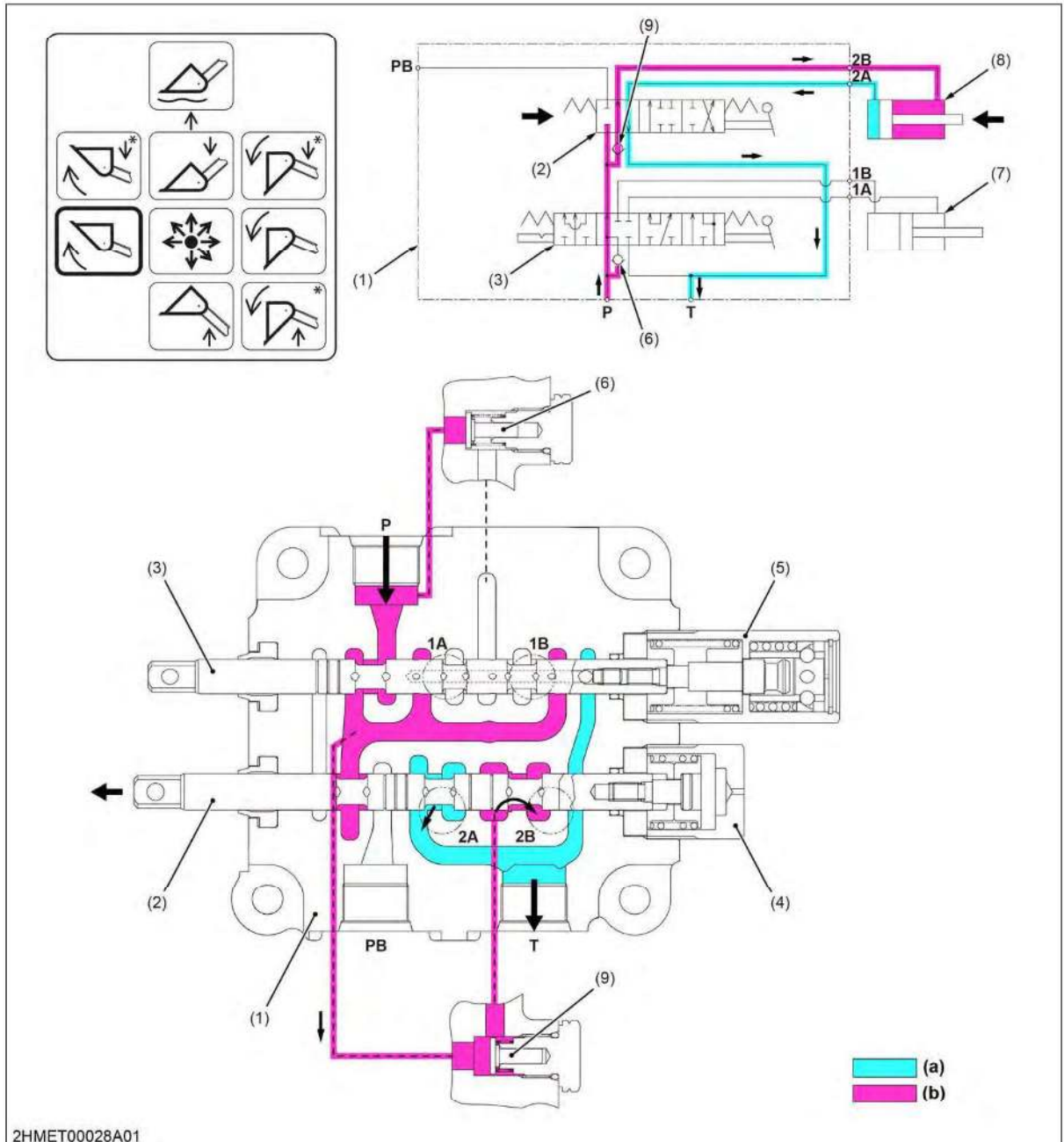
The P port is connected to the outlet port of hydraulic block by the hydraulic pipe.

The T port is connected to the tank port of hydraulic block by the hydraulic pipe.

**Power beyond (PB port)**

This section has PB port which is connected to the inlet port of hydraulic block by the hydraulic hose, and feeds oil to the three point hydraulic control valve.

Roll-back



2HMET00028A01

- |                                  |                     |                                 |                               |
|----------------------------------|---------------------|---------------------------------|-------------------------------|
| (1) Front loader control valve   | (6) Check valve     | 1B: 1B port                     | T: To tank, transmission case |
| (2) Bucket spool valve           | (7) Boom cylinder   | 2A: 2A port                     | a: Low pressure               |
| (3) Boom spool valve             | (8) Bucket cylinder | 2B: 2B port                     | b: High pressure              |
| (4) Detent plug (Bucket control) | (9) Check valve     | P: From hydraulic pump          |                               |
| (5) Detent plug (Boom control)   | 1A: 1A port         | PB: To 3-point hydraulic system |                               |

7. HYDRAULIC SYSTEM

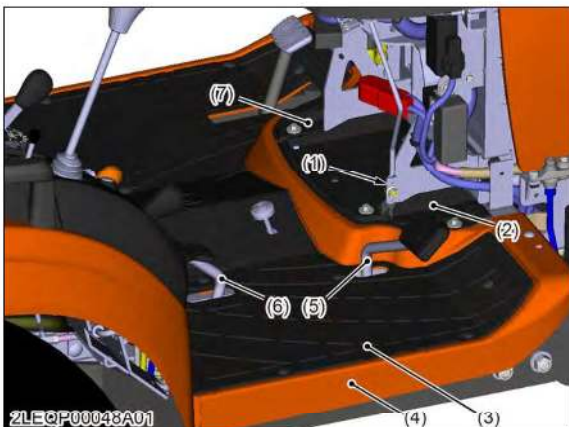
2. Remove the snap pins (2) to remove the seat (1).



(1) Seat (2) Snap pin

5.1.5 Removing step

1. Disconnect the upper cruise control rod (1) from the lower cruise control rod.
2. Remove the R.H. and L.H. side covers (2), (7).



(1) Upper cruise control rod (5) Forward HST pedal  
 (2) R.H. side cover (6) Reverse HST pedal  
 (3) Step mat (7) L.H. side cover  
 (4) Step

3. Remove the step mat (3).
4. Remove the forward and reverse HST pedals (5), (6).
5. Remove the step (4).

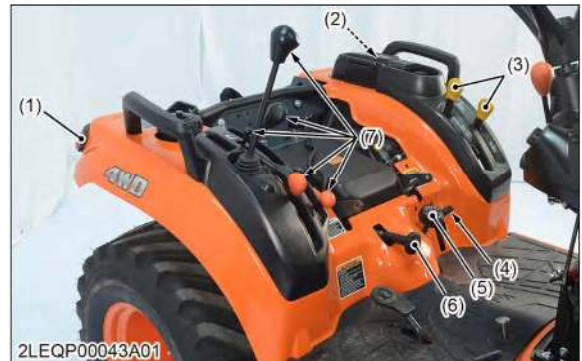
5.1.6 Removing fender

1. Disconnect the L.H. and R.H. tail lamps (3), (7) from the wire harness.
2. Disconnect the 12 V outlet (2) from the wire harness.

NOTE

- 12 V outlet connector is near the L.H. tail lamp connector.

3. Remove the L.H. lever grips (3).



(1) Tail lamp (6) Lowering speed adjusting knob  
 (2) 12 V outlet (7) R.H. lever grip  
 (3) L.H. lever grip (4) Differential lock pedal cover  
 (5) Cutting height adjusting dial knob

4. Remove the differential lock pedal cover (4), cutting height adjusting dial knob (5), and lower speed adjusting knob (6).
5. Remove the R.H. lever grips (7).
6. Remove the R.H. lever guide (8) and R.H. handrail (10).
7. Remove the L.H. lever guide stay nut.



(8) R.H. lever guide (10) R.H. handrail  
 (9) Fender

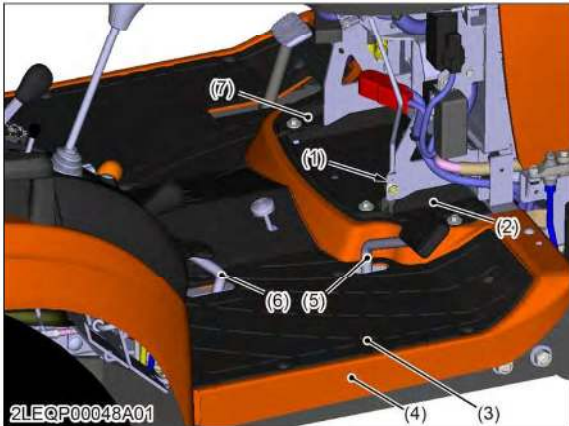
8. Remove the fender (9).

5.1.7 Removing fuel tank

1. Remove the and R.H. lever guide stay (1).
2. Drain the fuel from the fuel tank.

7. HYDRAULIC SYSTEM

- Remove the R.H. and L.H. side covers (2), (7).



- |                              |                       |
|------------------------------|-----------------------|
| (1) Upper cruise control rod | (5) Forward HST pedal |
| (2) R.H. side cover          | (6) Reverse HST pedal |
| (3) Step mat                 | (7) L.H. side cover   |
| (4) Step                     |                       |

- Remove the step mat (3).
- Remove the forward and reverse HST pedals (5), (6).
- Remove the step (4).

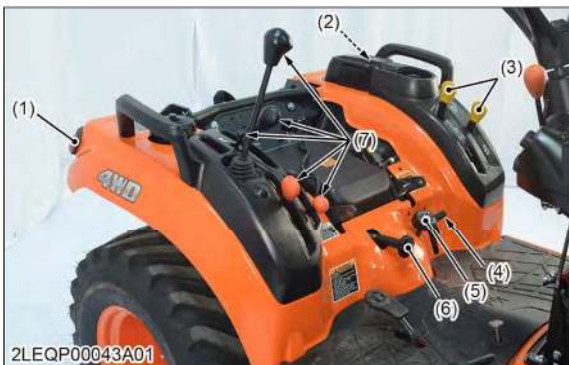
5.5.5 Removing fender

- Disconnect the L.H. and R.H. tail lamps (3), (7) from the wire harness.
- Disconnect the 12 V outlet (2) from the wire harness.

NOTE

- 12 V outlet connector is near the L.H. tail lamp connector.

- Remove the L.H. lever grips (3).



- |  |                                   |
|--|-----------------------------------|
| (1) Tail lamp                          | (6) Lowering speed adjusting knob |
| (2) 12 V outlet                        | (7) R.H. lever grip               |
| (3) L.H. lever grip                    |                                   |
| (4) Differential lock pedal cover      |                                   |
| (5) Cutting height adjusting dial knob |                                   |

- Remove the differential lock pedal cover (4), cutting height adjusting dial knob (5), and lower speed adjusting knob (6).
- Remove the R.H. lever grips (7).
- Remove the R.H. lever guide (8) and R.H. handrail (10).
- Remove the L.H. lever guide stay nut.

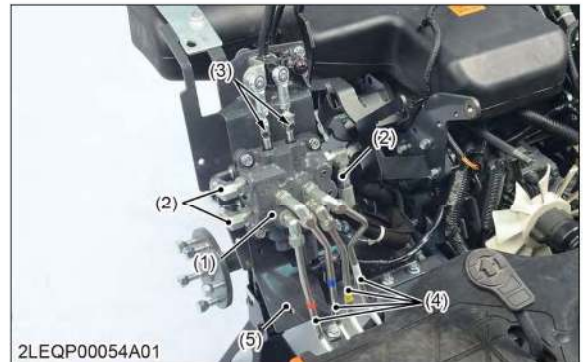


- |                      |                    |
|----------------------|--------------------|
| (8) R.H. lever guide | (10) R.H. handrail |
| (9) Fender           |                    |

- Remove the fender (9).

5.5.6 Removing control valve

- Disconnect the hydraulic hoses (2).
- Disconnect hydraulic pipes (4).



- |                    |                    |
|--------------------|--------------------|
| (1) Control valve  | (4) Hydraulic pipe |
| (2) Hydraulic hose | (5) Valve stay     |
| (3) Rod            |                    |

- Disconnect the rods (3).
- Remove the control valve (1) from the valve stay (5).

(When reassembling)

IMPORTANT

- After reassembling a valve, check for oil leakage by starting up engine.

### 3. Tightening torques for mower

Item	N · m	kgf · m	lbf · ft
Stay link nut (RCK54D-26BX and RCK60D-26BX)	43.3 to 50.3	4.4 to 5.1	32 to 37
Front link lock nut (RCK54D-26BX and RCK60D-26BX)	60 to 70	6.2 to 7.1	45 to 51
Gear box bracket mounting bolt and nut	78 to 90	7.9 to 9.2	58 to 66
Gear box mounting screw	78 to 90	7.9 to 9.2	58 to 66
Mower blade screw	103 to 117	10.5 to 12.0	76.0 to 86.7
Center pulley holder bolt and nut	78 to 90	7.9 to 9.2	58 to 66
Outer pulley mounting nut	197 to 225	20.0 to 23.0	145 to 166
Pulley boss mounting nut	24 to 27	2.4 to 2.8	18 to 20
Outer pulley holder mounting bolt and nut	78 to 90	7.9 to 9.2	58 to 66

---

RELATED PAGE

[TIGHTENING TORQUES on page 2-13](#)

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- Turn the cutting height control dial to **2.0** and adjust the anti-scalp roller's height to factory specified clearance between the rollers and the ground.

Clearance between rollers and ground	Factory specification	6.0 to 13 mm 0.25 to 0.50 in.
--------------------------------------	-----------------------	----------------------------------

- Align the ends of the right side blade towards the front and rear of the machine. Turn blade by hand in either direction.
- Adjust (L1) of the front links with lock nuts (2), (3) so that (A) is within factory specification ((A) = (Y) - (X)).

Difference (Y) - (X) ((Y) ≥ (X)) between front tip and rear tip of blade	Factory specification	0.0 to 5.0 mm 0.0 to 0.20 in.
--	-----------------------	----------------------------------

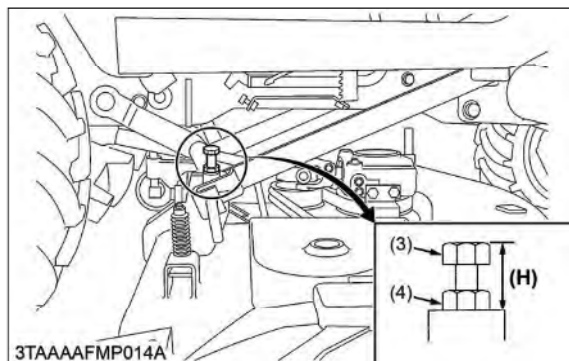
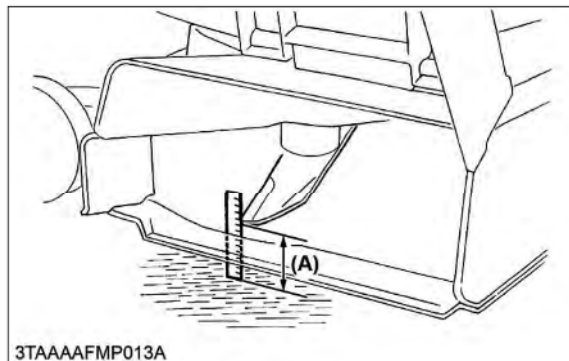
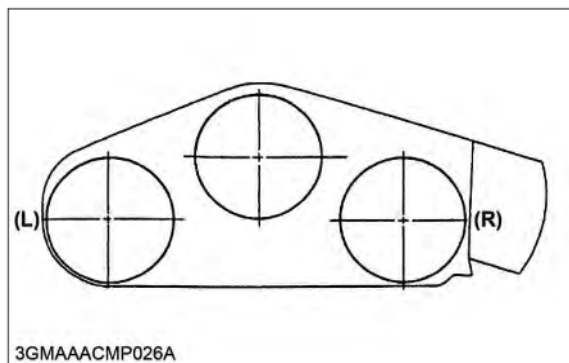
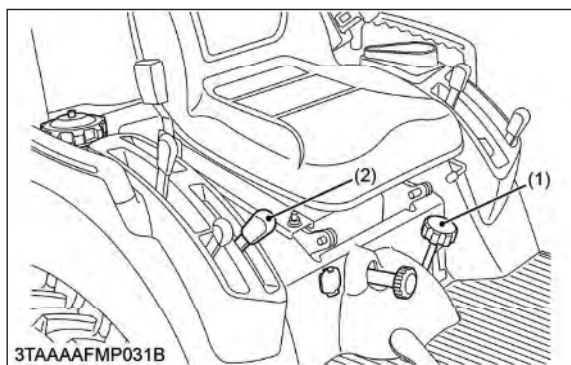
- To adjust (L1), loosen lock nuts (2) then turn lock nuts (3). Rotate both lock nuts (3) at the same time to set L.H. and R.H. (L2) in even length.
- Tighten lock nuts securely.

Tightening torque	Front link lock nut	60 to 70 N·m 6.2 to 7.1 kgf·m 45 to 51 lbf·ft
-------------------	---------------------	---

### 6.1.4 Adjusting left and right cutting height

**IMPORTANT**

- Park the machine on a firm, flat and level surface and set the parking brake.
- Before adjusting mower deck, make sure the tire pressure is correct.



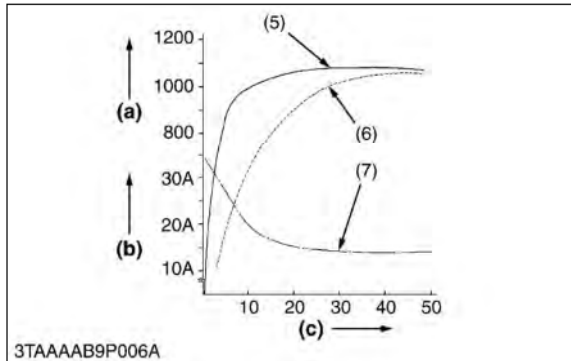
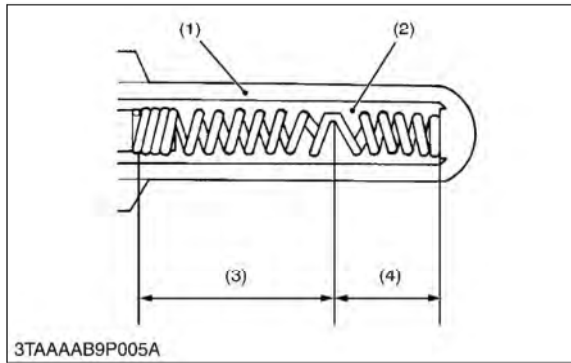
- |                                      |                                      |
|--------------------------------------|--------------------------------------|
| (1) Cutting height control dial      | (L) Left blade measurement position  |
| (2) Hydraulic control lever          | (R) Right blade measurement position |
| (3) Cutting height fine turning bolt | (A) Blade height                     |
| (4) Lock nut                         |                                      |

- Operate the hydraulic control lever (2) rearward to raise the mower deck to the highest position.
- Stop the engine and remove the key.
- Turn the cutting height control dial to the desired height.
- Set the anti-scalp roller's height to keep clearance between rollers and the ground inside specification shown below.

Clearance between rollers and ground	Specification	6 to 13 mm 0.2 to 0.5 in.
--------------------------------------	---------------	------------------------------

# **9. ELECTRICAL SYSTEM**

### 4.4 Function of glow plug



- (1) Sheath tube
- (2) Insulation powder
- (3) Heater also functioning as a resistor
- (4) Heater
- (5) Super glow plug
- (6) Conventional quick-heating type glow plug
- (7) Glow plug current
- (a) Glow plug temperature (°C)
- (b) Current (A)
- (c) Time (Sec.)

This plug is a two-material type quick glow system (QGS) for quick temperature rise, and has self-controlling function as well as excellent durability. The heater (4) connected in series to the heater (3), which also functions as the resistor, is incorporated in the sheath tube (1) of the super glow plug (5). The resistance of this heater (3) cum resistor is small when the temperature is low, while the resistance becomes large when the temperature rises. Therefore, because sufficient current is flown to the heater (4) during the initial period of energization, the temperature rises quickly and the resistance grows with the rise in the temperature of the resistor, the flowing current is reduced to prevent the heater (4) from being heated. The ignition point is in the area of 2 to 3 mm (0.079 to 0.118 in.) from the tip of the plug in order to reduce its projection into the combustion chamber.

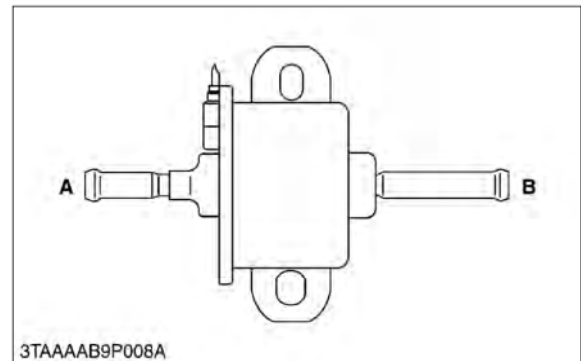
### 4.5 Function of safety switch

The safety switch is electrically closed in normal condition (normally closed type). The switch operates as sensor detecting and transmitting the position of

HST pedal, PTO lever, independent PTO lever, and seat to engine stop solenoid.

Type of switch	Safety switch name	Number of switch contact
Normal open type	Seat switch	1
	Seat turnover switch	1
	PTO shift lever switch	1
	Independent PTO lever switch (Rear PTO switch)	2
	HST pedal neutral switch	2

### 4.6 Function of fuel pump



A: Inlet B: Outlet

An electromagnetic fuel pump uses a transistor that causes the pump to start pumping fuel when the main switch is turned to the on position. Therefore, fuel is supplied to the fuel injection pump regardless of engine speed. This pump is driven by the battery. It can therefore be operated even with the engine being stopped.

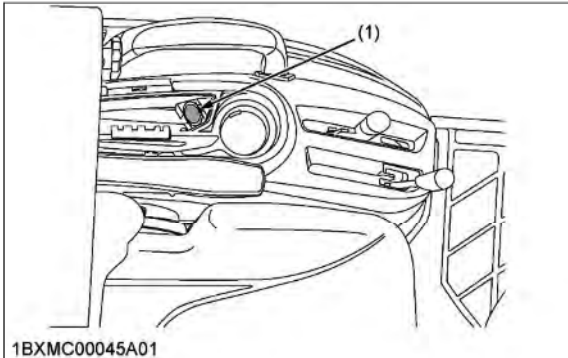
## 9.2 Function of DC outlet

### ■ IMPORTANT

- Do not use as cigarette lighter.
- Do not use when wet.

This machine is equipped with a DC outlet. It is located inside of the L.H. lever guide compartment.

The capacity of the outlet is 12 V / 120 W. Electrical device's such as an auxiliary light, mobile phone battery charger, or other 12 V components can be used with the outlet.



(1) DC outlet

9. ELECTRICAL SYSTEM

2. When the electrolyte temperature differs from that at which the hydrometer was calibrated, correct the specific gravity reading following the formula mentioned in (Reference).

**(Reference)**

- Specific gravity slightly varies with temperature. To be exact, the specific gravity decreases by 0.0007 with an increase of 1 °C (0.0004 with an increase of 1 °F) in temperature, and increases by 0.0007 with a decrease of 1 °C (0.0004 with a decrease of 1 °F).

Therefore, using 20 °C (68 °F) as a reference, the specific gravity reading must be corrected by the following formula:

- Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature -20 °C)
- Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature -68 °F)

Specific gravity	State of charge
1.260 Sp. Gr.	100% charged
1.230 Sp. Gr.	75% charged
1.200 Sp. Gr.	50% charged
1.170 Sp. Gr.	25% charged
1.140 Sp. Gr.	Very little useful capacity
1.110 Sp. Gr.	Discharged

At an electrolyte temperature of 20 °C (68 °F)

3. If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.
4. If the specific gravity differs between any two cells by more than 0.05, replace the battery.

**4.2 Main switch**

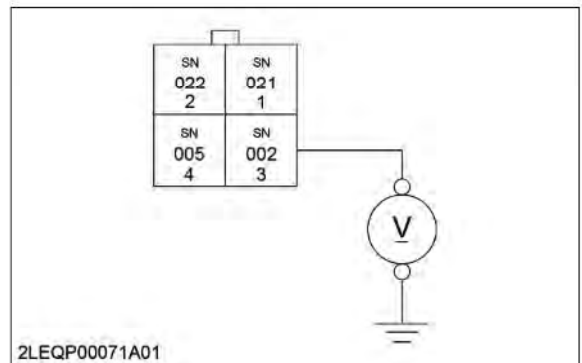
**4.2.1 Checking main switch connector voltage**

1. Remove the under cover panel.
2. Disconnect the 4P connector and remove the main switch (1).



(1) Main switch

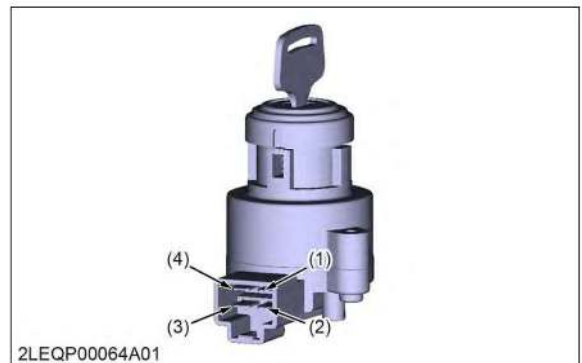
3. Measure the voltage with a voltmeter across the 4P connector 3 terminal and the chassis.



4. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is damaged.

Voltage	Connector 3 terminal - Chassis	Approx. battery voltage
---------	--------------------------------	-------------------------

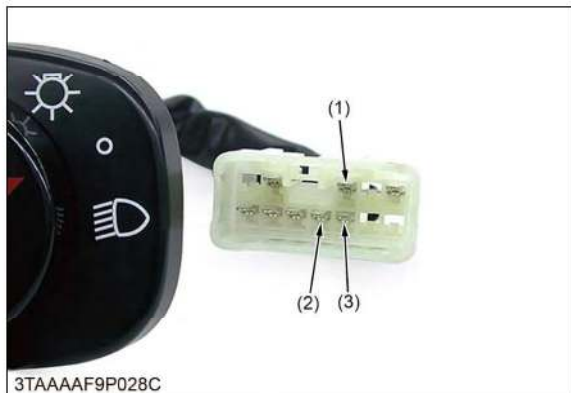
**4.2.2 Checking main switch continuity at off position**



- (1) B terminal
- (2) ST terminal
- (3) ACC terminal
- (4) G terminal

1. Set the main switch to the off position.

**4.11.5 Checking turn signal light switch continuity when setting switch knob at off position**

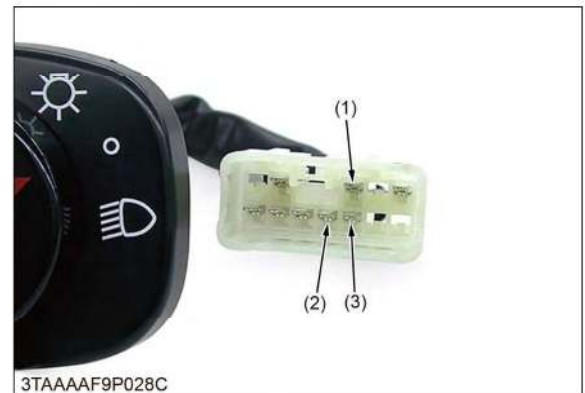


- (1) Green lead
  - (2) Red / white lead
  - (3) Green / white lead
- (A) Turn signal light switch off position

1. Set the turn signal switch knob to the off position.
2. Measure the resistance with an ohmmeter across the green lead (1) and red / white lead (2), and across to the green lead (1) and green / white lead (3).
3. If infinity is not indicated, the combination switch is damaged.

Resistance (Switch knob at off position)	Green lead (1) - Red / white lead (2)	Infinity
	Green lead (1) - Green / white lead (3)	

**4.11.6 Checking turn signal light switch continuity when setting switch knob at right position**



- (1) Green lead
  - (2) Red / white lead
  - (3) Green / white lead
- (A) Turn signal light switch right position

1. Set the turn signal switch knob to the right position.
2. Measure the resistance with an ohmmeter across the green lead (1) and red / white lead (2), and across to the green lead (1) and green / white lead (3).
3. If 0 Ω is not indicated, the combination switch is damaged.

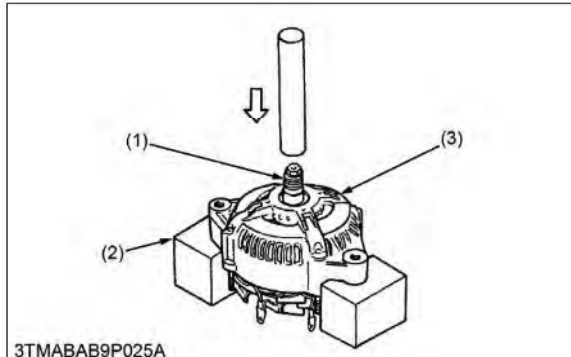
Resistance (Switch knob at right position)	Green lead (1) - Red / white lead (2)	0 Ω
	Green lead (1) - Green / white lead (3)	Infinity

### 5.2.7 Removing rotor

**IMPORTANT**

- Be careful not to drop the rotor and damage the slip ring or fan, etc.

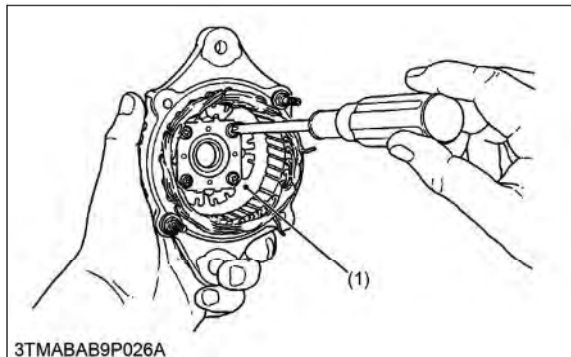
1. Press out the rotor (1) from drive end frame (3).



- (1) Rotor  
(2) Block  
(3) Drive end frame

### 5.2.8 Removing retainer plate

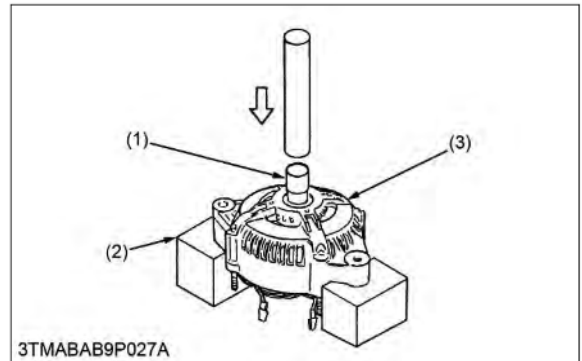
1. Remove the four screws holding the retainer plate, and remove the retainer plate (1).



- (1) Retainer plate

### 5.2.9 Removing bearing on drive end side

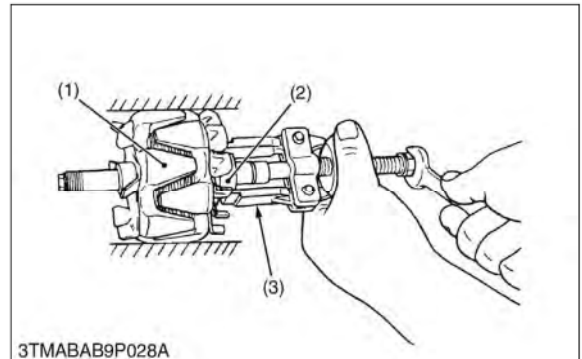
1. Press out the bearing from drive end frame (3) with a press and jig (1).



- (1) Jig  
(2) Block  
(3) Drive end frame

### 5.2.10 Removing bearing at slip ring side

1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

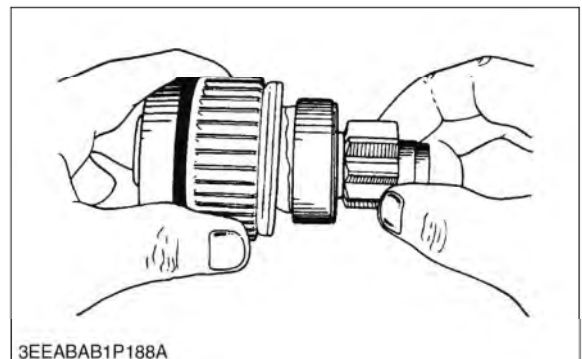


- (1) Rotor  
(2) Bearing  
(3) Puller

## 6. Servicing

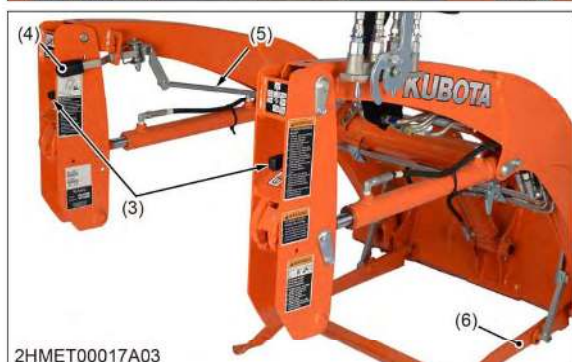
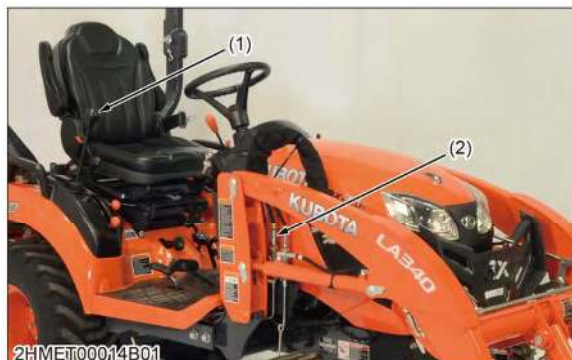
### 6.1 Starter

#### 6.1.1 Checking overrunning clutch



## 4. One touch front loader

### 4.1 Outline of one touch front loader



- |                                |                 |
|--------------------------------|-----------------|
| (1) Front loader control lever | (4) Stand lever |
| (2) Quick coupler              | (5) Stand rod   |
| (3) Mounting lever             | (6) Stand       |

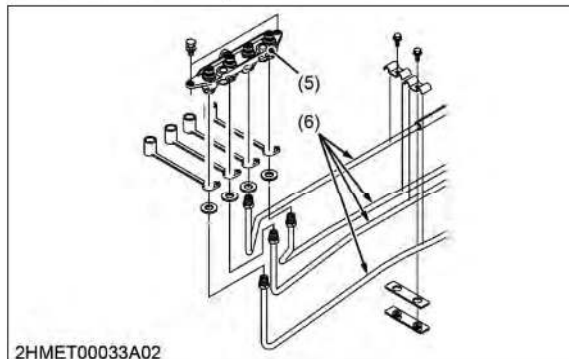
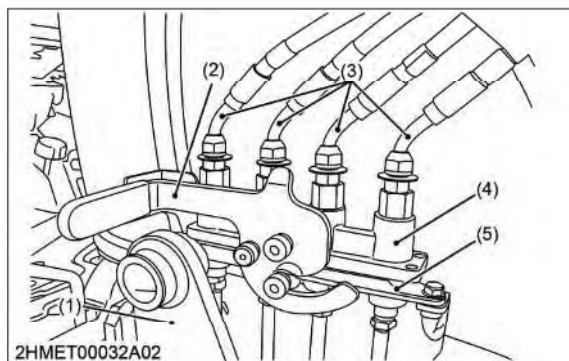
The one touch front loader allows the operator to attach and disconnect the front loader quickly and safely without exiting the tractor. The main component parts include the front loader control lever (1), quick coupler (2), mounting lever (3), stand lever (4), stand rod (5), and stand (6).

## 5. One lever quick touch 4 lines coupler

### 5.1 Structure of one lever quick touch 4 lines coupler

The quick touch coupler allows to attach and remove the quick coupler. The quick coupler is divided to the upper part and the lower part. The upper part consists of the quick coupler lever (2) and the mobile quick coupler (4) with four hydraulic hoses (3).

The lower part consists of the quick coupler base (5) with four hydraulic pipes (6). It is installed to the loader main frame (1). Non-spill structure is adopted in the couplers on the quick coupler base to protect the oil leakage from the hydraulic oil line.



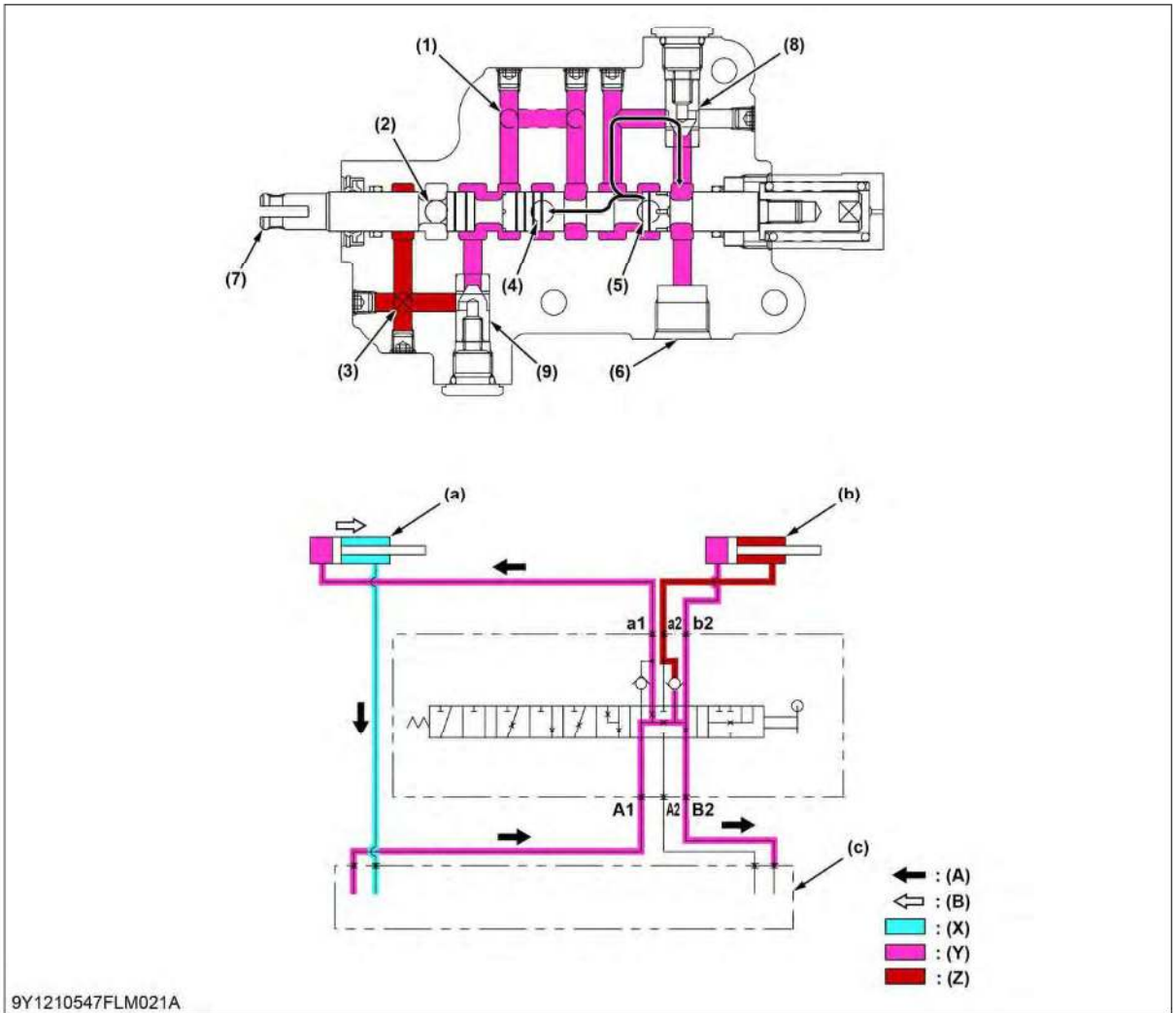
- |                         |                          |
|-------------------------|--------------------------|
| (1) Loader main frame   | (4) Mobile quick coupler |
| (2) Quick coupler lever | (5) Quick coupler base   |
| (3) Hydraulic hoses     | (6) Hydraulic pipe       |

## 6. Auto lock attachment and detachment

### 6.1 Outline of auto lock attachment and detachment

The side frame (5) is mounted on the main frame (1). The side frame (5) can be locked or freed by controlling the mounting lever (3) on the lever guide (4). When the bucket is lifted up, the side frame (5) and the main frame (1) are locked. When the front wheels are lifted up by lowering the bucket to the ground, the operator can control the mounting lever (3) easily and release the hook (2) mounted on the main frame by hand.

8.4.2.4 Spool 4 to 7 mm from neutral position



- |             |                   |                        |                     |
|-------------|-------------------|------------------------|---------------------|
| (1) b2 port | (6) a1 port       | (b) Bucket cylinder    | (Y) Middle pressure |
| (2) A2 port | (7) Spool         | (c) Control valve      | (Z) High pressure   |
| (3) a2 port | (8) Check A       | (A) Hydraulic oil flow |                     |
| (4) B2 port | (9) Check B       | (B) Cylinder movement  |                     |
| (5) A1 port | (a) Boom cylinder | (X) Low pressure       |                     |

The above figure shows an oil pressure circuit chart. The control valve (c) is in boom up and bucket.

**Roll-back**

In this state, hydraulic oil flows between A1 port (5) and a1 port (6) through the orifice.

**(Boom up condition)**

In this state, hydraulic oil flows from A1 port (5) to a1 port (6) through the orifice.

**(Boom down condition)**

In this state, hydraulic oil flows from between a1 port (6) to A1 port (5) through the check valve.

**(Bucket roll-back condition)**

Hydraulic oil passage from A2 port (2) completely closes.  
Bucket cannot move to roll-back.

**(Bucket dump condition)**

Hydraulic oil flows from B2 port (4) to b2 port (1).

## 2. Tightening torques for front loader

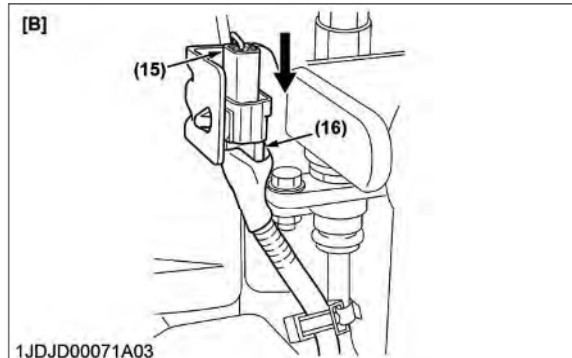
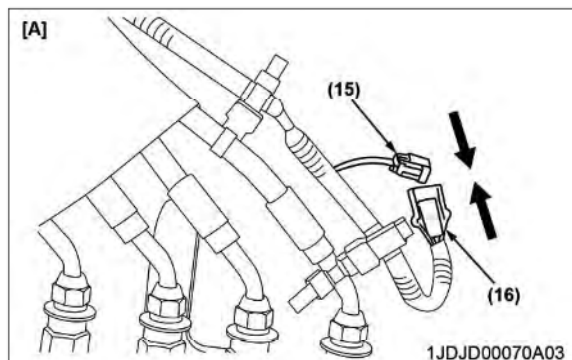
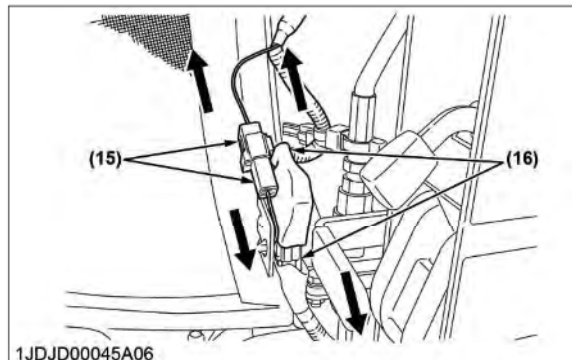
Tightening torques of screws, bolts and nuts on the table below are especially specified.

Item	N · m	kgf · m	lbf · ft
Boom cylinder piston mounting nut	150 to 180	15.3 to 18.3	111 to 132
Bucket cylinder piston mounting nut	350 to 400	35.7 to 40.7	259 to 295
Main frame mounting bolt (M14)	115	11.7	85

RELATED PAGE

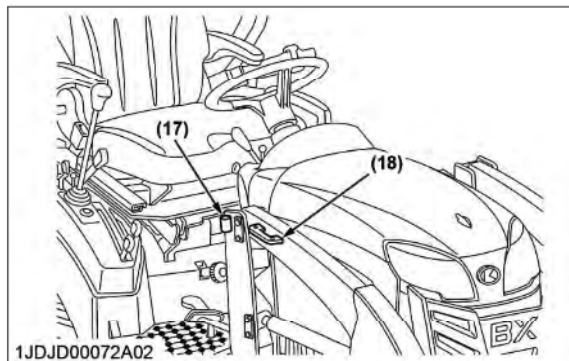
[TIGHTENING TORQUES on page 2-13](#)

13. When the third function kit is mounted, remove the connector. Connect the caps to the connectors of mobile side and tractor side.



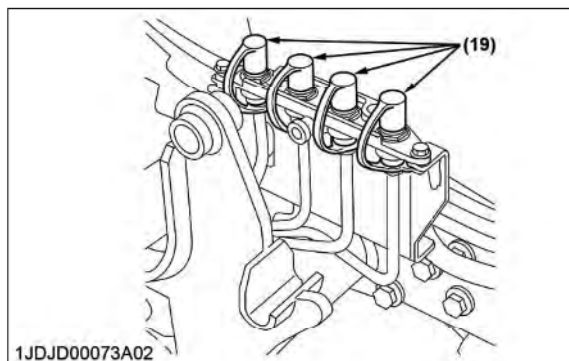
(15) Cap  
 (16) Connector  
 [A] Mobile side  
 [B] Tractor side

14. Put the mobile part on the coupler stay (17). Put the mobile part on the coupler stay (18) for cab model.



(17) Coupler stay (18) Coupler stay for cab model

15. Place the protective caps and plugs on the ends of the quick coupler.



(19) Protective caps

16. Fasten the seat belt and slowly back the tractor away from the loader.

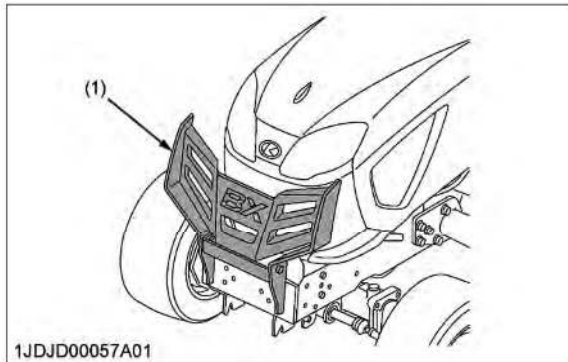
### 4.1.2 Installing loader

**⚠ WARNING**  
 To avoid personal injury or death:

- When starting the engine and operating the hydraulic control valve, always sit in the operator's seat.

### 4.3.2 Removing front guard

1. Remove the front guard (1).

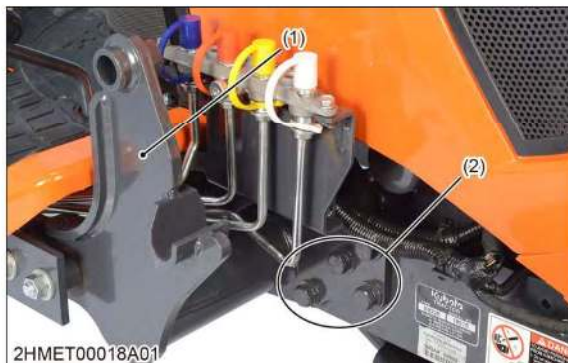


1JJD00057A01

(1) Front guard

### 4.3.3 Removing main frames

1. Remove the main frame mounting bolts and nuts (2) from the tractor body.
2. Remove the main frame (1).



2HMET00018A01

(1) Main frame (2) Main frame mounting bolt

(When reassembling)

**■ IMPORTANT**

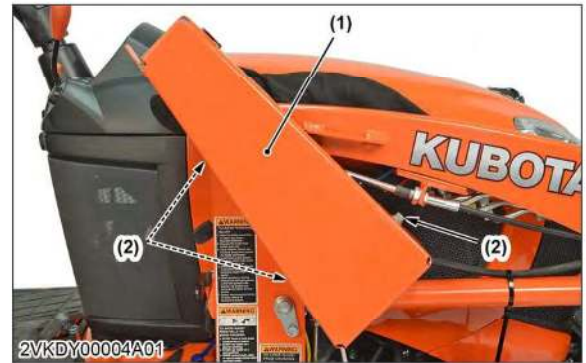
- Be careful not to pinch the wire harness when assembling the main frame.
- Tighten to the specified tightening torque.

Tightening torque	Main frame mounting bolt (M14)	115 N · m 11.7 kgf · m 85 lbf · ft
-------------------	--------------------------------	--

## 4.4 Spill guard valve

### 4.4.1 Removing spill guard valve

1. Remove cover (1) by loosening bolts (2).



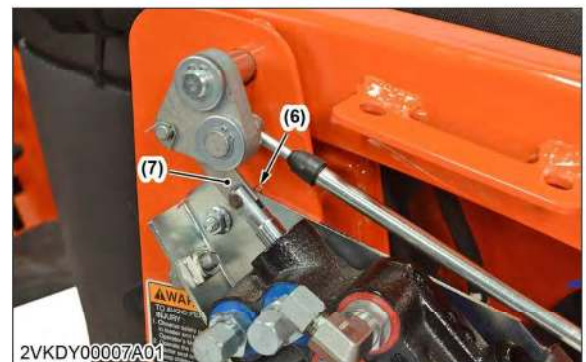
(1) Cover (2) Bolt

2. Disconnect and remove the hydraulic hoses (3) and drain the hydraulic fluid into bucket.



(3) Hydraulic hoses (5) Spill guard bracket  
(4) Spill guard

3. Remove the bracket pin clip (6) linked to the spill guard linkage bracket (7).



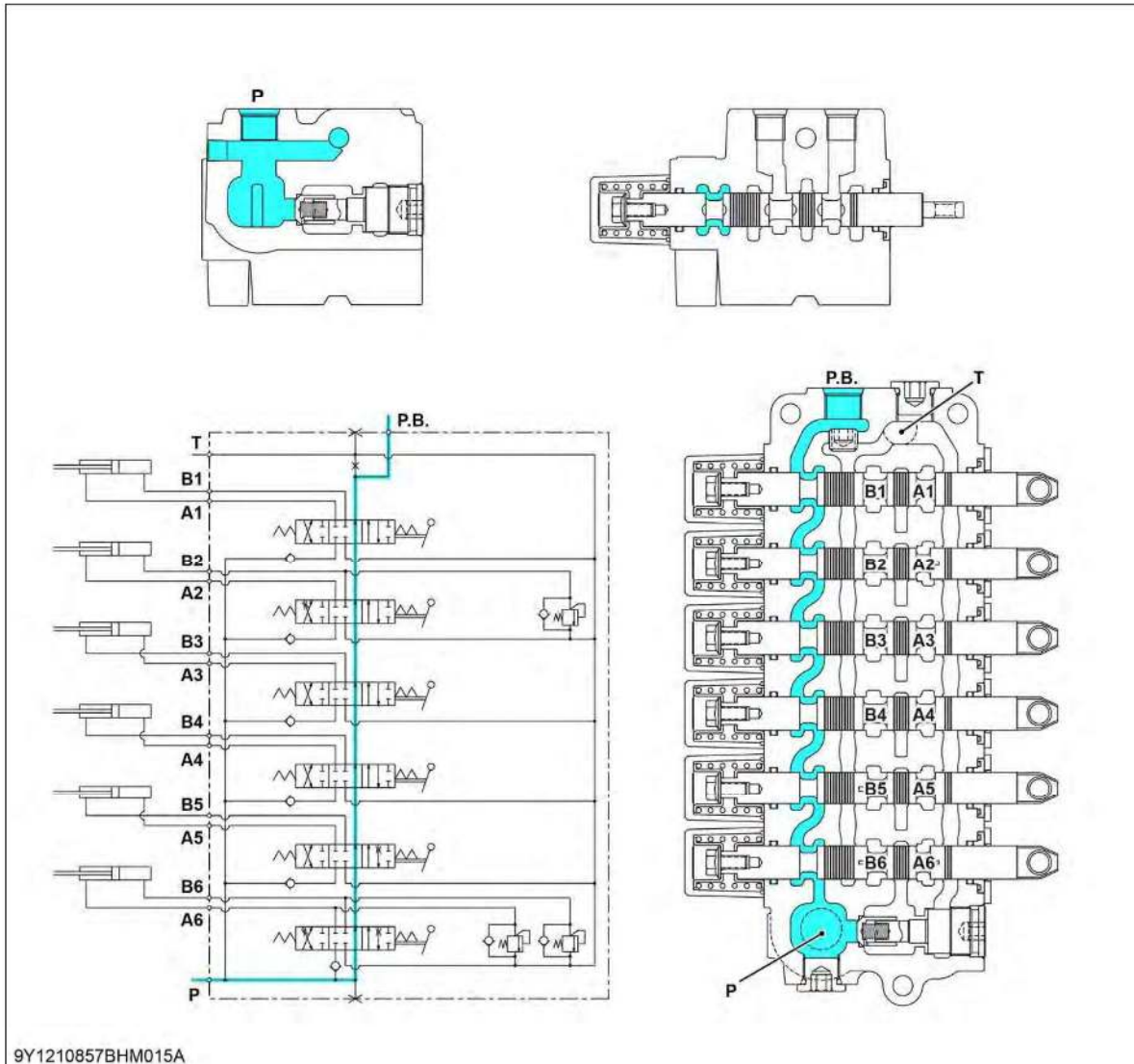
(6) Pin clip (7) Spill guard linkage bracket

4. Remove the spill guard bracket nuts (8).

## 2.2 Function of backhoe control valve

### 2.2.1 Backhoe control valve in neutral position

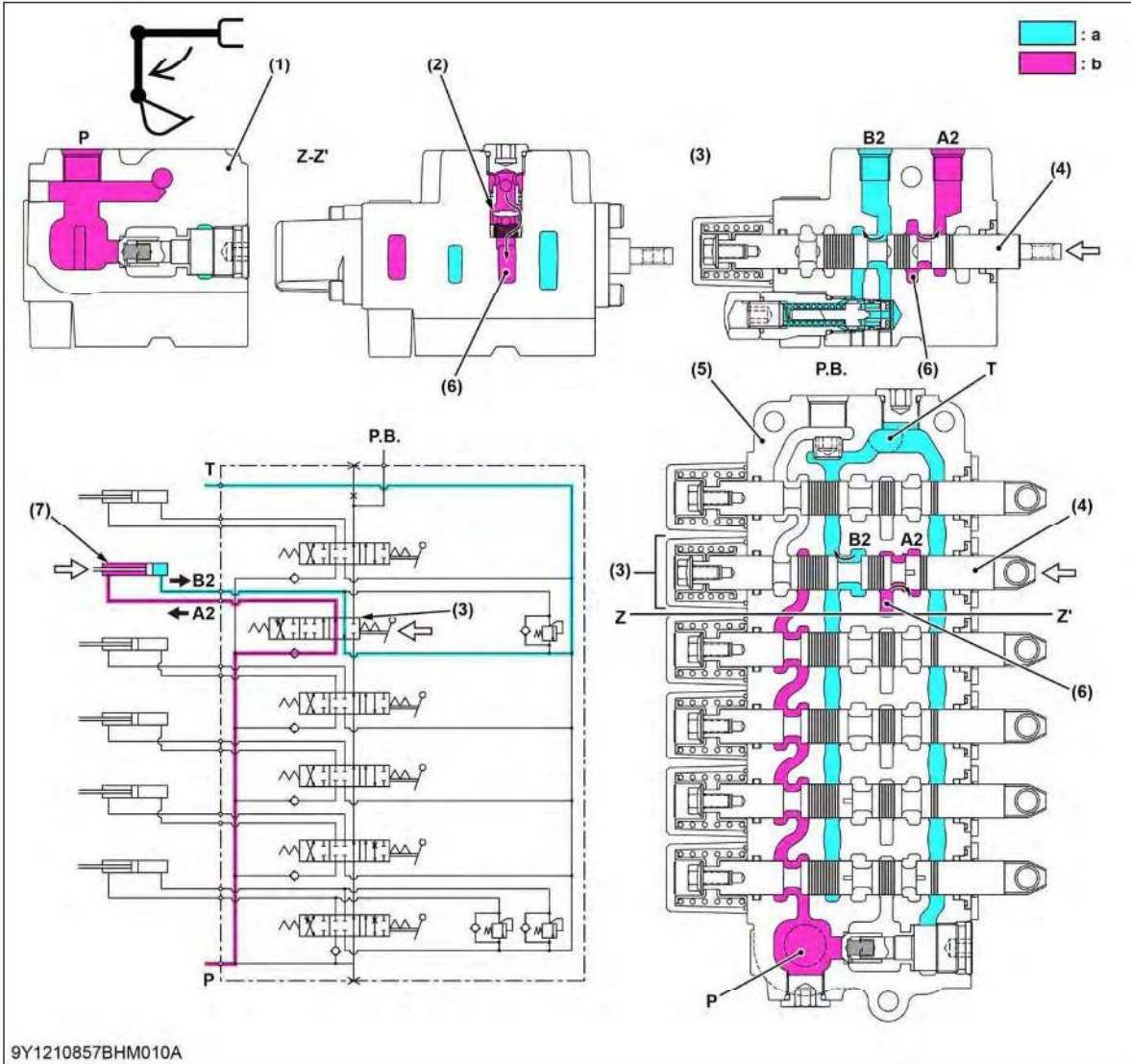
1. Pressure-fed oil from the hydraulic pumps is delivered into the P port in the outlet section (8).
2. As the load check valves (9) are kept closed in the neutral position, oil flows along the notched section of the spools (10) to the P.B. port through the neutral passage (11).
3. Oil is then fed to the front loader valve or transaxle case and pipe from the P.B. port.



- |                                   |                      |             |                         |
|-----------------------------------|----------------------|-------------|-------------------------|
| (1) Inlet section                 | (8) Outlet section   | A4: A4 port | B5: B5 port             |
| (2) Bucket control valve          | (9) Load check valve | A5: A5 port | B6: B6 Port             |
| (3) Dipperstick control valve     | (10) Spool           | A6: A6 port | P: Pump port            |
| (4) Stabilizer R.H. control valve | (11) Neutral passage | B1: B1 port | T: Tank port            |
| (5) Stabilizer L.H. control valve | A1: A1 port          | B2: B2 port | P.B.: Power beyond port |
| (6) Boom control valve            | A2: A2 port          | B3: B3 port | a: Low pressure         |
| (7) Swing control valve           | A3: A3 port          | B4: B4 port |                         |

2.2.11 Backhoe control valve in dipperstick extend position

1. When the dipperstick and bucket lever is pushed to the forward to set to the extend position, the spool (4) of the dipperstick control valve moves to the right, which forms oil passage between bridge passage (6) and A2 port, and between B2 port and T port.
2. The pressure-fed oil from the P port opens the load check valve (2) and flows to A2 port to retract the dipperstick cylinder.
3. Return oil from the dipperstick cylinder returns to the transmission case through the B2 port, low pressure passage and T port.



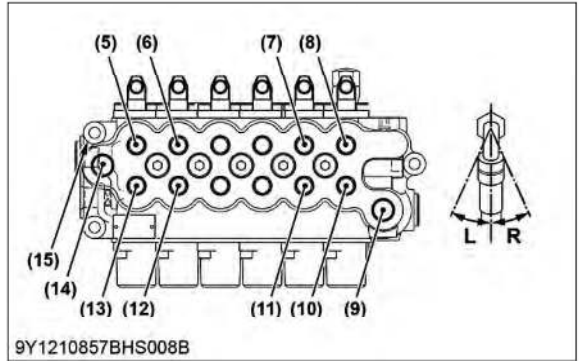
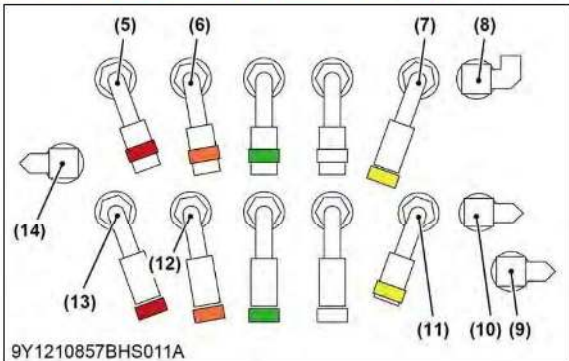
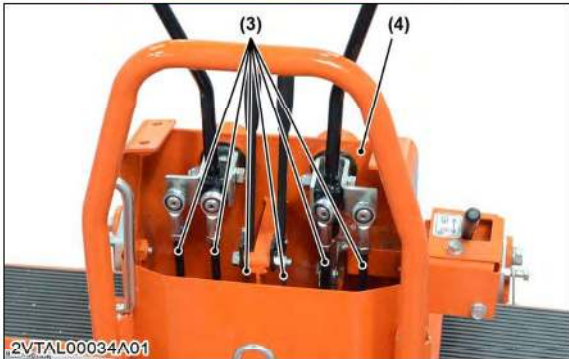
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- |                         |                          |   |                         |
|-------------------------|--------------------------|---|-------------------------|
| (1) Inlet section       | (5) Outlet section       | A2: A2 port (to dipperstick cylinder)   | T: Tank port            |
| (2) Check valve         | (6) Bridge passage       | B2: B2 port (from dipperstick cylinder) | P.B.: Power beyond port |
| (3) Dipperstick section | (7) Dipperstick cylinder |   | a: Low pressure         |
| (4) Spool               |                          |   | b: High pressure        |
|                         |                          | P: Pump port                            |                         |

**11. BACKHOE**

<b>Item</b>		<b>Factory specification</b>	<b>Allowable limit</b>
Thrust washer	Thickness	2.66 mm 0.1046 in.	1.8 mm 0.0709 in.
Piston rod	Bend	—	0.25 mm 0.0098 in.

5.3.7 Removing lever support and control valve



- |  |  |
|--|--|
| (1) Valve cover (Top)                          | (10) B6 port (Bottom side of swing cylinder)       |
| (2) Valve cover (Front)                        | (11) B5 port (Rod side of swing cylinder)          |
| (3) Control lever rod                          | (12) B2 port (Bottom side of dipperstick cylinder) |
| (4) Lever support                              | (13) B1 port (Bottom side of bucket cylinder)      |
| (5) A1 port (Rod side of bucket cylinder)      | (14) T port (Tank)                                 |
| (6) A2 port (Rod side of dipperstick cylinder) | (15) Control valve                                 |
| (7) A5 port (Bottom side of boom cylinder)     | L: Installation angle                              |
| (8) A6 port (Bottom side of swing cylinder)    | R: Installation angle                              |
| (9) P port (Pump)                              |  |

1. Remove the valve covers (1), (2).
2. Disconnect the control lever rods (3) of valve side.
3. Remove the lever support (4) with control levers.
4. Disconnect the hydraulic hoses.
5. Remove the control valve (15).

(When reassembling)

NOTE

- P port is short hose without sleeve.
- T port is long hose with sleeve.
- Connect the hydraulic hoses at their original portions and be sure to connect the hose angle as indicated table below.

Port	Angle of bent tube
T	L: 1.57 rad (90°)
A6, B6, P	R: 1.57 rad (90°)
A1, B1	R: 0.35 rad (20°)
A2, B2	R: 0.17 rad (10°)
A5, B5	L: 0.35 rad (20°)

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