

PTO SECTION

Symptom	Probable Cause	Solution	Reference Page
PTO Clutch Slip	Operating pressure is low	Check	2-S11
	PTO clutch valve malfunctioning	Repair or replace	2-S21
	Clutch disc or drive plate excessively worn	Replace	2-S27
PTO Shaft Does Not Rotate	PTO clutch malfunctioning	Repair or replace	2-S27
PTO Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Replenish or change	2-S14
	Regulator valve malfunctioning	Check or replace	2-S21
PTO Clutch Drags	Brake plate excessively worn	Replace	2-S27
	Clutch spring weaken or broken	Replace	2-S27
	Deformation of pressure plate or steel plate	Replace	2-S27

PARKING BRAKE SECTION

Symptom	Probable Cause	Solution	Reference Page
Brake Drags	Brake spring play too small	Adjust	G-30
	Brake return spring weaken or broken	Replace	–
Poor Braking Force	Brake spring play excessive	Adjust	G-30
	Brake disc worn	Replace	2-S36

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Regulator Valve (HST Charge Relief Valve)	Setting pressure [at engine speed 3200 min ⁻¹ (rpm)]	0.75 to 0.95 MPa 7.7 to 9.6 kgf/cm ² 110 to 130 psi	—
PTO Clutch	Operating pressure [at engine speed 1800 min ⁻¹ (rpm)]	0.65 to 0.75 MPa 6.7 to 7.6 kgf/cm ² 95 to 100 psi	—
Check and High Pressure Relief Valve	Relief valve setting pressure [at engine speed 1800 min ⁻¹ (rpm)]	20.0 to 22.0 MPa 204 to 224 kgf/cm ² 2900 to 3190 psi	
Maximum Speed • At Maximum Engine rpm	Wheel rotation	133 to 135 min ⁻¹ (rpm)	—
Motion Control Lever Alignment	Gap	0 to 2 mm 0 to 0.08 in.	—
	Space	10 to 20 mm 0.4 to 0.8 in.	—
15T Bevel Gear to 21T Bevel Gear	Backlash	0.25 to 0.30 mm 0.0099 to 0.011 in.	—

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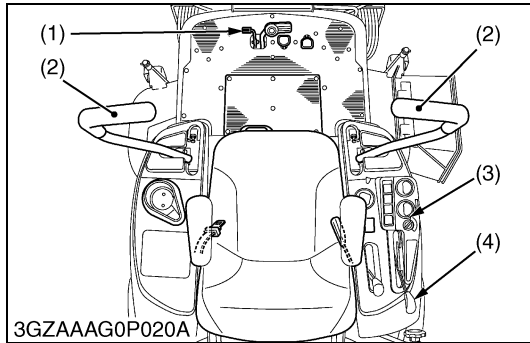
3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-11.)

Item	N·m	kgf·m	lbf·ft
Motion control lever mounting bolt and nut	18 to 20	1.8 to 2.1	13 to 15
Hydrostatic transmission mounting screw (M10, 7T, Aluminum)	40 to 44	4.0 to 4.5	29 to 32
Universal joint mounting screw	26.5 to 28.4	2.7 to 2.9	19.6 to 20.9
Rear axle gear case mounting screw (M12, 7T)	78 to 90	7.9 to 9.2	58 to 66
Rear axle gear case mounting screw (M10, 7T, Aluminum)	40 to 44	4.0 to 4.5	29 to 32
Hydraulic pump mounting screw	40 to 44	4.0 to 4.5	29 to 32
Center case rear cover mounting screw	40 to 44	4.0 to 4.5	29 to 32
Center section mounting hex. socket head screw	40 to 44	4.0 to 4.5	29 to 32
Check and high pressure relief valve plug	30 to 44	3.0 to 4.5	22 to 32
Engine mounting nut	24 to 27	2.4 to 2.8	18 to 20
ROPS mounting screw (M10, 7T)	48 to 55	4.9 to 5.7	36 to 41
Rear wheel mounting screw	108.5 to 130.2	11.1 to 13.3	80 to 96
Center case front cover mounting screw (M10, 7T, Aluminum)	40 to 44	4.0 to 4.5	29 to 32
Hydrostatic transmission and rear axle gear case assembly mounting screw (M10, 7T, Aluminum)	40 to 44	4.0 to 4.5	29 to 32
ROPS connecting plate mounting screw (M8, 7T)	24 to 27	2.4 to 2.8	18 to 20
ROPS connecting plate under mounting screw (M10, 7T)	48 to 55	4.9 to 5.7	36 to 41

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4. CHECKING AND ADJUSTING



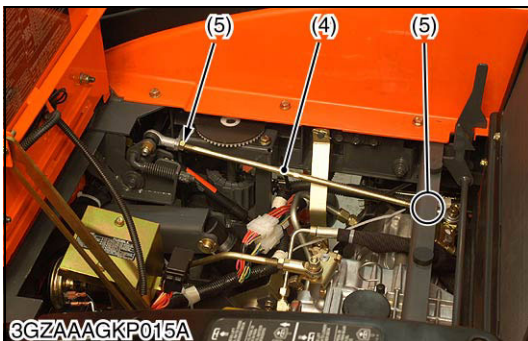
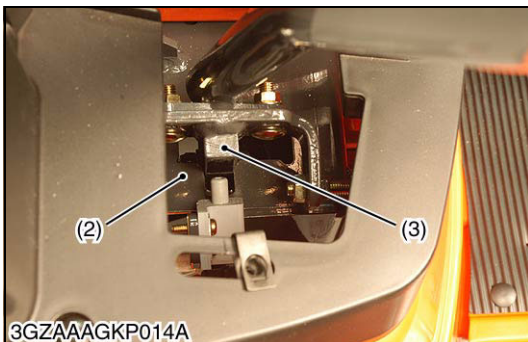
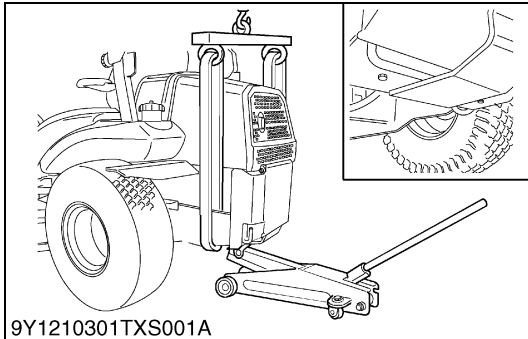
Checking Neutral

1. Park machine safely.
2. Set the motion control levers (2) in the **"NEUTRAL"** position.
3. Move the PTO lever (4) to **"OFF"** position and apply the parking brake (1).
4. With the operator on the seat, start the engine (3).
5. Move the throttle lever to **Max. speed** position.
6. Release the parking brake.
7. Check the drive wheels, the wheels should not move.
8. If movements is noted, perform adjustment as follows.

- (1) Parking Brake Lock Pedal
(2) Motion Control Lever

- (3) Main Switch
(4) PTO Lever

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Adjusting Neutral

⚠ CAUTION

To avoid personal injury:

- Park the machine on a hard and level surface.
- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- Lift up and secure with jack stands or blocking the rear of the machine, do not run the machine while adjusting.
- Do not adjust only one of the following adjustment; exclude "MOTION CONTROL LEVER POSITION".

They are relative each other.

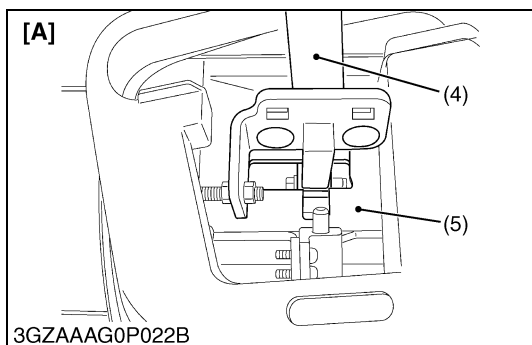
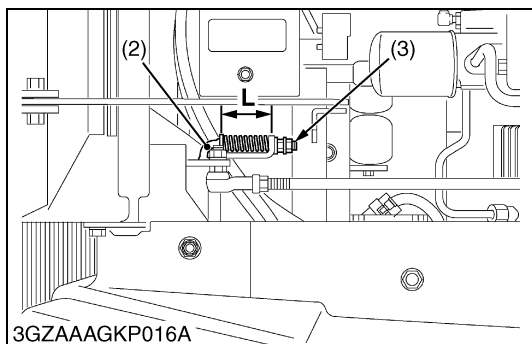
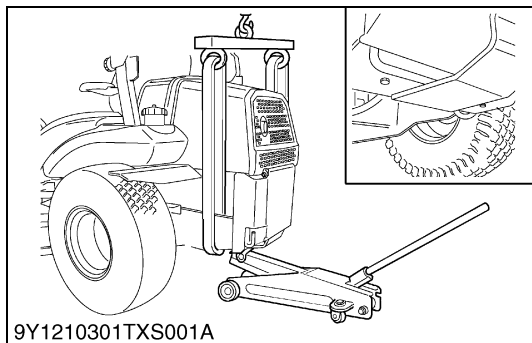
1. Turn key switch to "OFF" position.
2. Apply the parking brake.
3. Set the motion control levers (3) to "Neutral lock" position.
4. Raise and latch the seat assembly.
5. Remove the connector from the seat safety switch, then **temporarily** install a jumper wire across the terminals in the connector of the wiring harness.
6. Raise the rear of machine and block up so that rear wheel can rotate freely.
7. Remove the motion control lever cover (1).
8. Loosen the lock nuts (5) from the ball joints on the two speed control rods (4).
9. Start the engine.
10. Move the throttle lever to **Max. speed** position.
11. Release the parking brake.
12. Turn the speed control rod (4) to extend the rod length and rotate the rear wheel backward. Then, turn the speed control rod (4) in reverse direction and find a position where the rear wheel stops rotating.
13. Then, turn the speed control rod (4) to shorten the rod length and rotate the rear wheel forward. Then, turn the speed control rod (4) in reverse direction and find a position where the rear wheel stops rotating.
14. After taking steps 12 and 13 above, fix the speed control rod (4) length at the midpoint between the two position. Adjust a speed control rod (4) length to be the center of the HST neutral range.
15. Shut off the machine. Remove jumper wire from wire harness connector and plug connector or into seat safety switch.

■ IMPORTANT

- The right and left motion control lever (3) can be adjusted independently.

- | | |
|--------------------------------|-----------------------|
| (1) Motion Control Lever Cover | (4) Speed Control Rod |
| (2) Guide Plate | (5) Lock Nut |
| (3) Motion Control Lever | |

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Checking Motion Control Lever Neutral Position



CAUTION

To avoid personal injury:

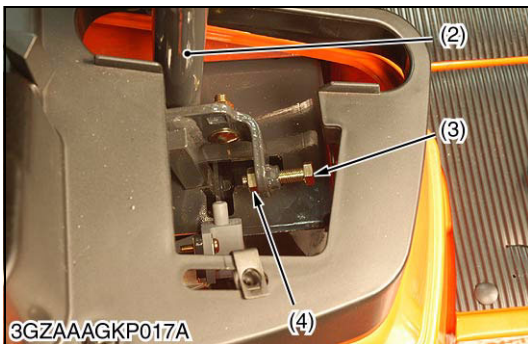
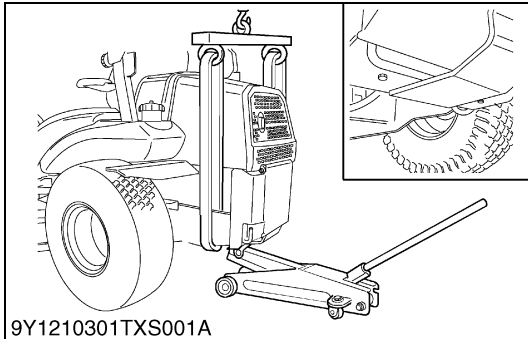
- Park the machine on a hard and level surface.
- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- Lift up and secure with jack stands or blocking the rear of the machine, do not run the machine while adjusting.
- Do not adjust only one of the following adjustment; **exclude "MOTION CONTROL LEVER POSITION". They are relative each other.**

1. Turn key switch to **OFF** position
2. Apply the parking brake.
3. Set the motion control lever (4) to **"Neutral lock"** position and remove the motion control lever cover (1).
4. Raise and latch the seat assembly.
5. Remove the connector from the seat safety switch, then **temporarily** install a jumper wire across the terminals in the connector of the wiring harness.
6. Raise the rear of machine and block up so that rear wheel can rotate freely.
7. Start the engine, and run at maximum speed.
8. Pull the motion control lever (4) to the reverse maximum position and release the motion control lever.
9. Measure the rear wheel rotation.
10. Loosen the lock nut (3) and adjust the speed control bolt length (2) so that the rear wheel rotation would stop.
11. Tighten the lock nut (3).
12. Check the rear wheel rotation again.
If it is not correct, adjust again.
13. Adjust the other side equally.
14. After adjustment, be sure to stop the engine immediately.

- (1) Motion Control Lever Cover
- (2) Speed Control Bolt
- (3) Lock Nut
- (4) Motion Control Lever
- (5) Guide Plate

[A] "Neutral" Position (Hands Off)
L: 50 mm (2.0 in.)

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Adjusting Maximum Speed



CAUTION

To avoid personal injury:

- Park the machine on a hard and level surface.
- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- Lift up and secure with jack stands or blocking the rear of the machine, do not run the machine while adjusting.
- Do not adjust only one of the following adjustment; exclude "MOTION CONTROL LEVER POSITION".

They are relative each other.

1. Turn key switch to "OFF" position.
2. Apply the parking brake.
3. Set the motion control lever (2) to "Neutral lock" position.
4. Raise and latch the seat assembly.
5. Remove the connector from the seat safety switch, then **temporarily** install a jumper wire across the terminals in the connector of the wiring harness.
6. Remove the motion control lever cover (1).
7. Raise the rear of machine and block up so that rear wheel can rotate freely.
8. Start the engine.
9. Move the throttle lever to **Max. speed** position.
10. Push the motion control lever (2) to the front until the speed set bolt (3) comes into contact with the stopper plate.

NOTE

- At this time, the speed set bolt (3) touches the stopper plate.

11. Measure the rotations of rear wheel.
12. If the measurement is not within the factory specifications, loosen the lock nut (4) and adjust the length of speed set bolt (3).

Max. speed: Wheel rotation	Factory specification	133 to 135 min ⁻¹ (rpm) at max. engine speed
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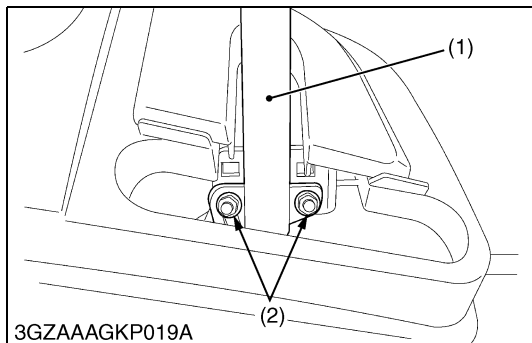
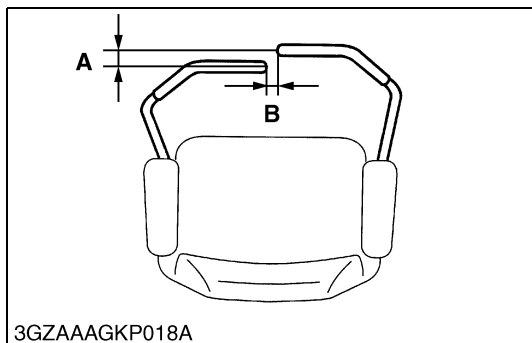
NOTE

- The right and left speed set bolt can be adjusted independently.

- (1) Motion Control Lever Cover
(2) Motion Control Lever

- (3) Speed Set Bolt
(4) Lock Nut

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Checking Motion Control Lever Alignment

CAUTION

- When checking, park the tractor on flat ground, apply the parking brake.
- Check the gap "A" and space "B" between the motion control levers, at the maximum forward position. If positions of the motion control levers are unequal, an adjustment is necessary.

When adjusting alignment

- Stop the engine and apply the parking brake.
 - Loosen the nut and remove the motion control lever (1).
- **Lever position (High or Low)**
- Remove the screw (2) and select the motion control lever position, high or low.
 - Tighten the screw (2) and install the motion control lever (1).
- **Lever alignment (Right and Left)**
- Loosen the screws (2).
 - Slide both motion control levers forward or rearward to desired position within tab slots until levers are aligned.
 - Tighten the screws (2).

Gap "A"	Factory specification	0 to 2 mm 0 to 0.08 in.
Space "B"	Factory specification	10 to 20 mm 0.4 to 0.8 in.

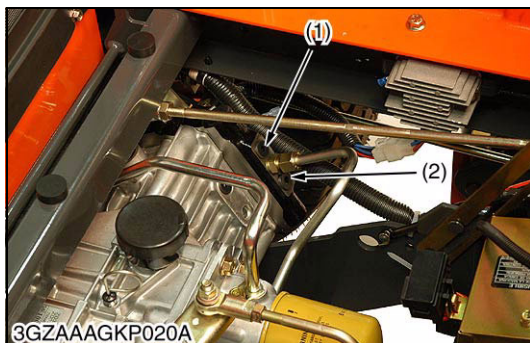
■ NOTE

- If the ends of the levers strike against each other while in the "NEUTRAL" position, move the levers outward to the "NEUTRAL LOCK" position and carefully bend them outward.

Move them back to the "NEUTRAL" position and check for the recommended space.

- | | |
|---|-----------------|
| (1) Motion Control Lever | A: Gap |
| (2) Motion Control Lever Mounting Screw | B: Space |

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Checking Hydrostatic Transmission



CAUTION

- When checking, park the machine on flat ground, apply the parking brake.
 - Sit on operator's seat for checking.
1. After warming up the machine, apply the parking brake and set the stop wood (chock) to the rear wheels.
 2. Remove the plug (1) from the HST and set the HST adaptor. Then install the pressure gauge.
 3. The safety switch for parking brake is **temporarily** turned on, and the state which can be checked is made.
(For example) Remove the connector from parking brake switch, then temporarily install a jumper wire across the terminals in the connector of the wiring harness.
 4. Start the engine.
 5. Move the throttle lever to engine speed at 1800 min⁻¹ (rpm)
 6. Grasp the motion control levers and move them inward from "NEUTRAL LOCK" position to "NEUTRAL" position and then slowly push forward. And measure the pressure of HST.
 7. At this time, if pressure rise to 19.5 MPa (199 kgf/cm², 2830 psi), it is assumed OK.
 8. If the operation pressure does not rise to 17.0 MPa (173 kgf/cm², 2470 psi), repair or replace the HST.

(Reference)

Check and high pressure relief valve pressure	Factory specification	20.0 to 22.0 MPa 204 to 224 kgf/cm ² 2900 to 3190 psi
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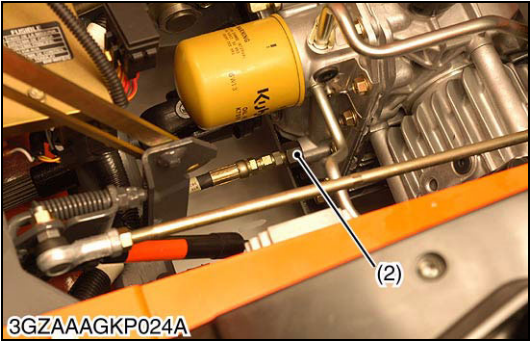
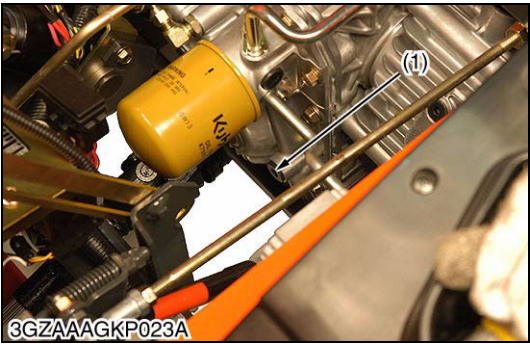
■ IMPORTANT

- When the check and high pressure relief valve pressure is measured, the thing is that the relief valve is not operated continuously for 5 seconds or more. Otherwise, HST might break.
- The length in the plug (1), (2) threaded portion is approx. 10 mm (0.39 in.). The length in the threaded portion of the adaptor used during pressure measurement should also be within 10 mm (0.39 in.).

(1) Plug, 1/4 Straight Thread
(Forward Side)

(2) Plug, 1/4 Straight Thread
(Reverse Side)

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PTO Clutch Operating Pressure
(Hydrostatic Transmission Charge Pressure)

CAUTION

- **When checking, park the tractor on flat ground, apply the parking brake.**
1. Remove the plug (1), then install the adaptor (2) cable and pressure gauge.
 2. Start the engine and set speed at 1800 min⁻¹ (rpm).
 3. At this time, read the pressure gauge.
 4. If the pressure is not within the factory specifications, check the regulator valve and related hydraulic components.

PTO clutch operating pressure	Factory specification	0.65 to 0.75 MPa 6.7 to 7.6 kgf/cm ² 95 to 100 psi
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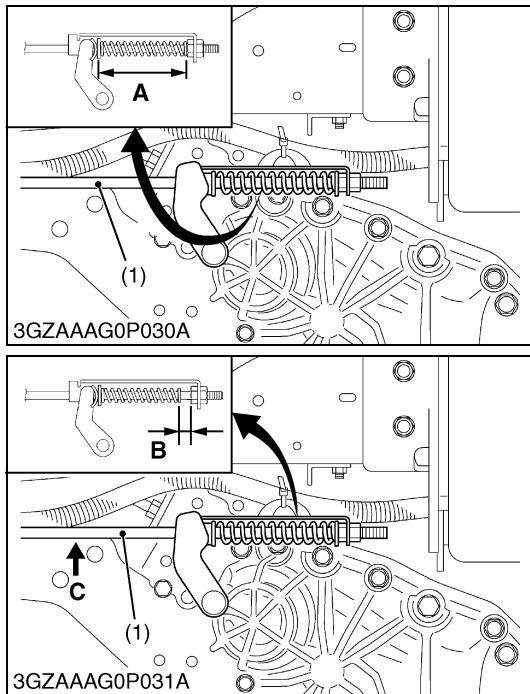
Condition

- Engine speed
1800 min⁻¹ (rpm)
- Oil temperature
45 to 55 °C (113 to 131 °F)

(1) Plug, 3/8 Straight Thread

(2) Adaptor

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Checking and Adjusting Parking Brake

⚠ CAUTION

To avoid personal injury:

- Park the machine on a hard and level surface.
- Stop the engine and chock the wheels before checking or adjusting.

■ IMPORTANT

- Wrong adjustment may cause machine damage.

■ Check brake spring

1. Place the motion control levers to "NEUTRAL LOCK" position.
2. Be sure to chock the rear wheels.
3. Apply the parking brake to the lock position.
4. Check the length of the brake springs on both sides.
5. Release the parking brake completely.
6. Hold the brake rod (1) lightly.
7. Check the brake spring play.
8. If these dimensions are not correct, adjust them.

Proper brake spring length "A" with the brake applied to the lock position	Factory specification	115 to 117 mm 4.53 to 4.61 in.
Proper brake spring play "B"	Factory specification	The spring must have play Reference: 0.5 to 1.0 mm 0.02 to 0.04 in.

■ Adjustment of brake spring play

1. Place the motion control lever to the "NEUTRAL LOCK" position
2. Be sure to chock the rear wheels.
3. Release the parking brake completely.
4. Loosen the lock nuts.
5. Hold the brake rod (1) by hand.
6. Tighten the nut to the correct space between the end of the spring and the nut.
7. Lock the nuts.
8. Adjust the other side spring to the same dimension.

■ Adjustment of brake spring length

1. Place the motion control lever to the "NEUTRAL LOCK" position
2. Apply the parking brake to the lock position.
3. Loosen the lock nuts.
4. Adjust the spring length to the recommendation.
5. Lock the nuts.
6. Check the brake spring play to the recommendation. If there is no play, adjust the brake spring play again.
7. Adjust the other side spring to the same dimension.

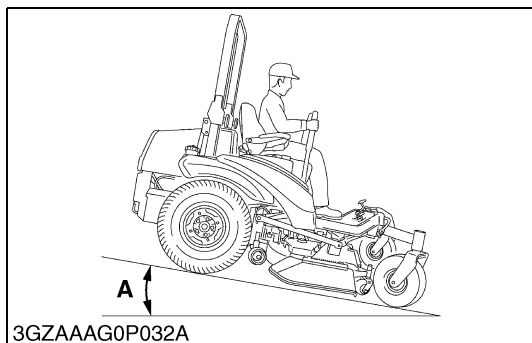
(1) Brake Rod

A: Parking Brake Spring Length

B: Parking Brake Spring Play

C: Hold the Brake Rod

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Checking Parking Brake on the Slope

1. Place the machine on a 17 ° ramp "A".
2. Apply the parking brake.
3. Place the motion control levers in **"NEUTRAL LOCK"** position and shut off the engine.
4. Check that the machine does not move.

■ NOTE

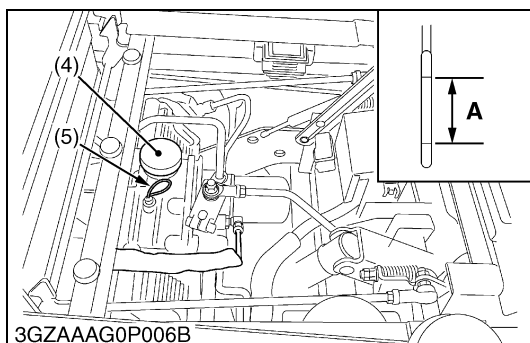
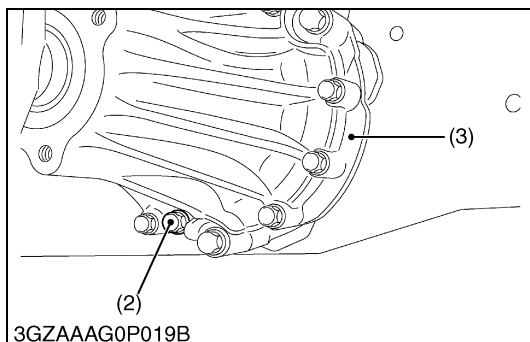
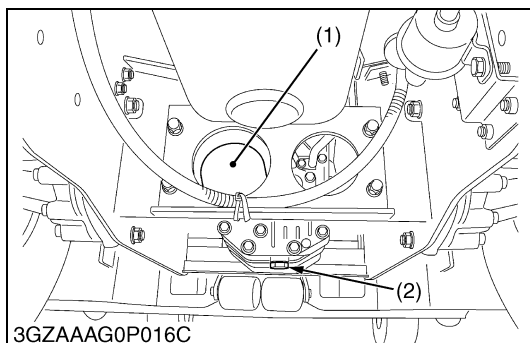
- **For parking brake test purposes, only use 17 ° ramp "A".**

A: 17 ° Ramp

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5. DISASSEMBLING AND ASSEMBLING

[1] SEPARATING TRANSAXLE ASSEMBLY



Draining Transmission Fluid



CAUTION

To avoid personal injury:

- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow transmission case to cool down sufficiently; oil can be hot and may cause burns.

The fluid in the transmission case is also used for the hydrostatic drive system.

1. To drain the transmission oil, place oil pan underneath the transmission case and the rear axle gear case (RH and LH) and remove the drain plug at the bottom of the transmission case and the rear axle gear case (RH and LH).
2. After draining, reinstall the drain plugs.
3. Fill with new fluid from filling port after removing the filling plug (4) up the upper notch on the dipstick.

■ IMPORTANT

- If takes time to pour the oil from the transmission case to reach the rear axle case (RH and LH) pour the regulated amount of oil slowly.
- 4. After running the engine for a few minutes, stop it and check the oil level again; add oil to the prescribed level.

■ IMPORTANT

- Operate only at low RPM's immediately after changing the transmission fluid and filter cartridge. Keep the engine at medium speed for a few minutes to insure proper lubrication of all parts so there is no damage to transmission.
- Use only multi-grade transmission oil. Use of other oils may damage the transmission of hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)
- Do not mix different brands oil together.

Transmission fluid capacity	12.1 L 12.8 U.S.qts 10.6 Imp.qts
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- (1) Hydraulic Oil Filter
- (2) Drain Plug
- (3) Rear Axle Gear Case LH
- (4) Oil Plug and Breather Cup
- (5) Dipstick

A: Oil level acceptable within this range

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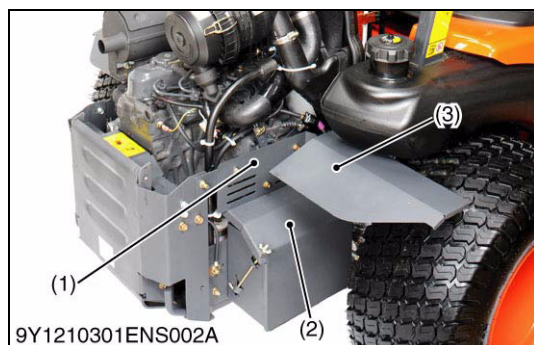
Bonnet

1. Remove the snap pin and bonnet mounting screw, then remove the bonnet (1).

- (1) Bonnet

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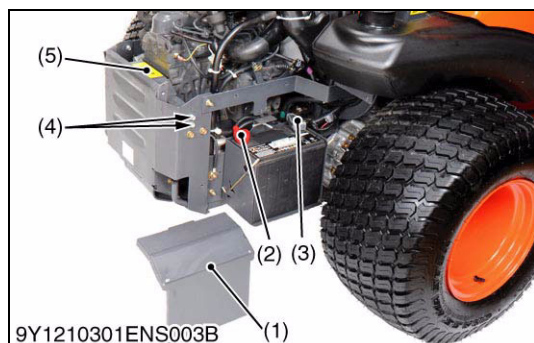
Battery Cover

1. Remove the side covers L, R (1) and the rear fenders L, R (3).
2. Remove the battery cover (2).

(1) Side cover
(2) Battery cover

(3) Rear Fender

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Battery and Flywheel Cover



CAUTION

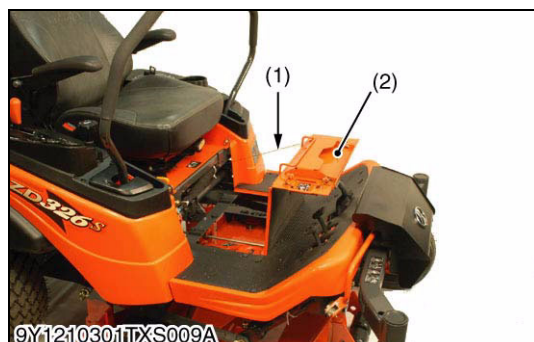
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (3) from the battery.
2. Disconnect the positive cable (2) from the battery.
3. Remove the bolts (4) and flywheel cover (5).

(1) Battery Cover
(2) Positive Cable
(3) Negative Cable

(4) Bolt
(5) Flywheel Cover

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Step Center and Step

1. Remove the clevis pin and remove the cable (1).
2. Remove the clevis pins and remove the step center (2).
3. Remove the front cover (3).
4. Remove the step (4).

(1) Cable
(2) Step Center

(3) Front Cover
(4) Step

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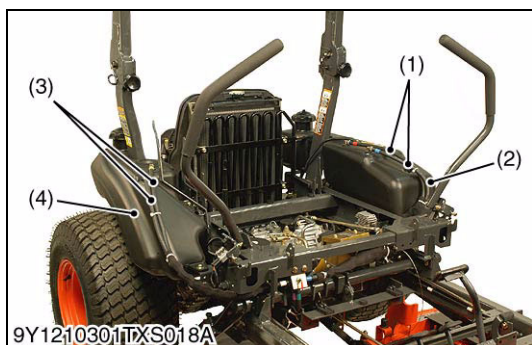
Seat Assembly and Fender

1. Raise the seat and disconnect the wiring connector for safety switch.
2. Remove the seat assembly (1) with seat base (2).
3. Remove the fender (LH) (3).
4. Disconnect the wiring connectors for gauges and remove the fender (RH) (4).

(1) Seat Assembly
(2) Seat Base

(3) Fender (LH)
(4) Fender (RH)

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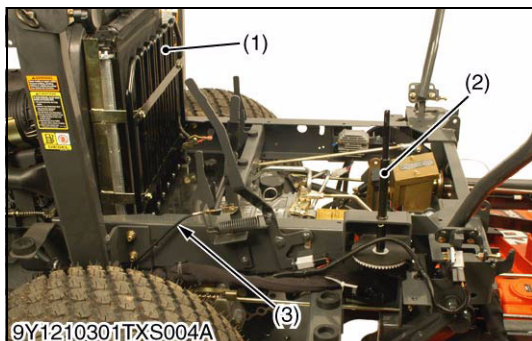
Fuel Tank

1. Disconnect the wiring connectors for fuel gauge and fuel hoses (1).
2. Remove the fuel tank (LH) (2).
3. Disconnect the fuel hoses (3), and remove the fuel tank (4).

- (1) Fuel Hose
(2) Fuel Tank (LH)

- (3) Fuel Hose
(4) Fuel Tank (RH)

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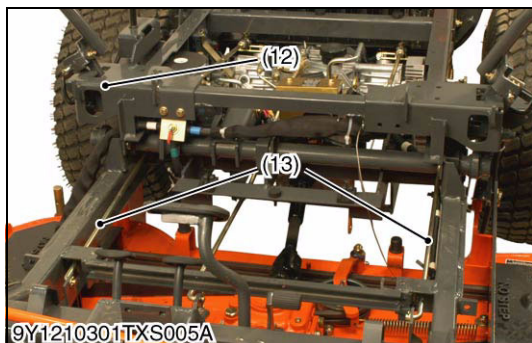
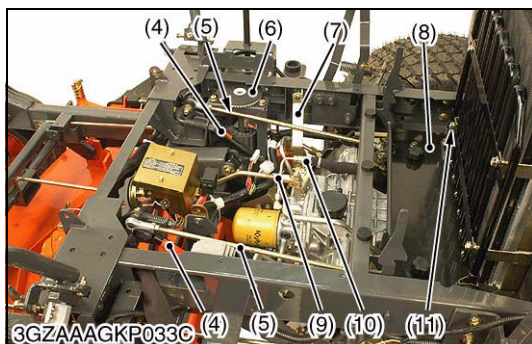
Upper Frame, Oil Cooler and Others

1. Remove the stopper (11) and remove the oil cooler (1).
2. Remove the throttle cable (3).
3. Remove the rod (2).
4. Disconnect the wiring connectors for safety switches and regulator.
5. Remove the speed control rods (5).
6. Remove the dampers (4).
7. Remove the cutting height adjusting gear with stay (6).
8. Remove the hydraulic lift link (7).
9. Remove the bonnet cover (8) and ROPS connecting plate.
10. Remove the hydraulic lift rod (9).
11. Disconnect the hydraulic hose (10).
12. Remove the upper frame (12).
13. Remove the parking brake rods (13).

(When reassembling)

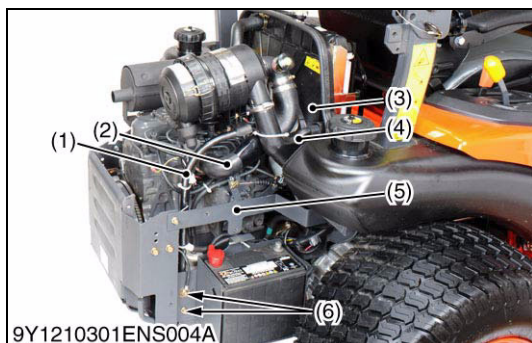
NOTE

- After assembling the parking brake rods, be sure check the parking brake spring length and play. If the measurement is not within the factory specifications, adjust the spring length and play. (See page 2-S12.)



- | | |
|---|----------------------------|
| (1) Oil Cooler | (7) Hydraulic Lift Link |
| (2) Rod | (8) Bonnet Cover |
| (3) Throttle Cable | (9) Hydraulic Lift Rod |
| (4) Damper | (10) Hydraulic Hose |
| (5) Speed Control Rod | (11) Stopper (Leaf Spring) |
| (6) Cutting Height Adjusting Gear with Stay | (12) Upper Frame |
| | (13) Parking Brake Rod |

9Y1210301TXS0040US0

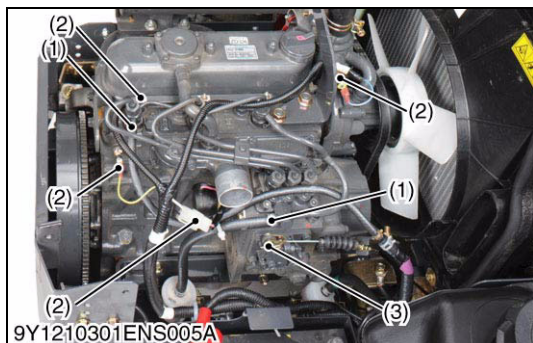


Air Cleaner

1. Remove the side cover stays L, R (5).
2. Remove the bolts (6) for air cleaner support (1).
3. Disconnect the inlet hose (2) from engine.
4. Pull out the intake pipe (4) from the shroud (3).
5. Remove the air cleaner.

- | | |
|-------------------------|---------------------|
| (1) Air Cleaner Support | (4) Intake Pipe |
| (2) Inlet Hose | (5) Side Cover Stay |
| (3) Shroud | (6) Bolts |

9Y1210301TXS0009US0



Electric Wiring and Fuel Hoses

1. Disconnect the wiring connectors (2) for engine stop solenoid, glow plug, coolant temperature sensor, and coolant temperature switch.
2. Disconnect the accelerator wire (3).
3. Disconnect the fuel hoses (1) from engine.

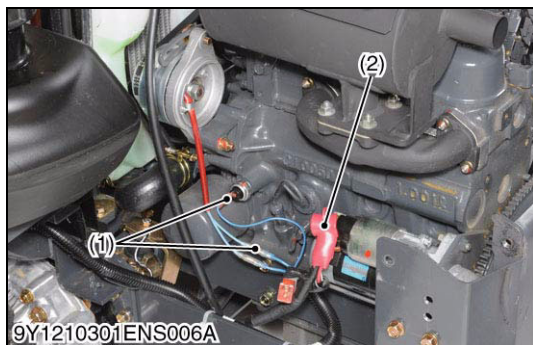
(When reassembling)

- When accelerator wire is installed, adjust the wiring length. The stop lever must hit both the idling speed adjusting bolt and the maximum speed adjusting bolt within the stroke of the accelerator lever.

(1) Fuel Hose
(2) Wiring Connectors

(3) Accelerator Wire (Throttle Cable)

9Y1210301TXS0010US0



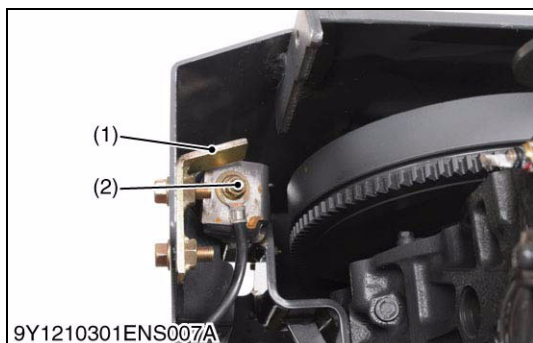
Electric Wiring

1. Disconnect the wiring connectors (1) for dynamo and engine oil pressure switch.
2. Remove the positive cable (2) from the starter motor.

(1) Wiring Connectors

(2) Positive Cable

9Y1210301TXS0011US0



Engine Stopper and Mounting Nuts

1. Remove the engine stoppers (1).
2. Remove the engine mounting nuts (2).
3. Remove the bolts (3) for shroud.

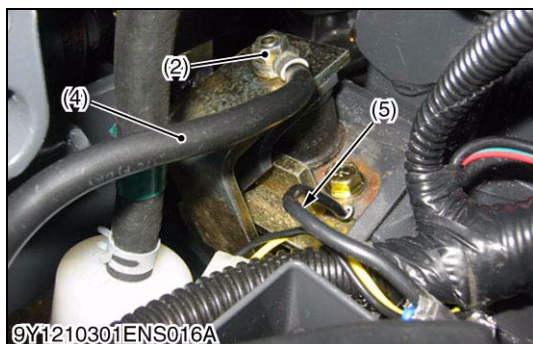
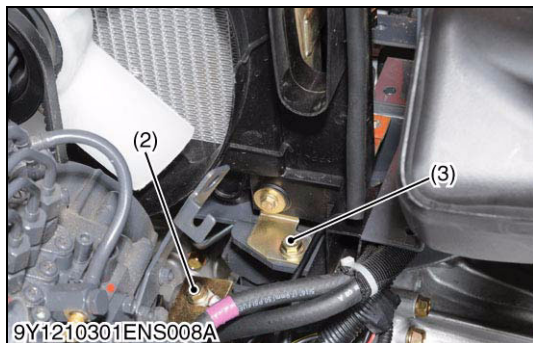
(When reassembling)

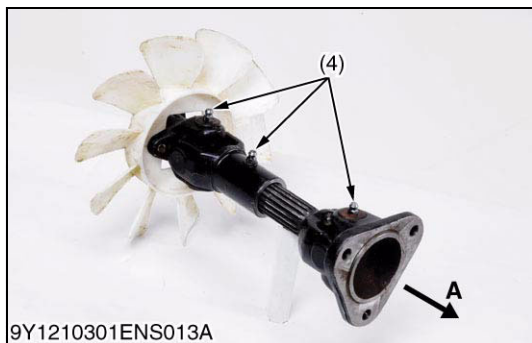
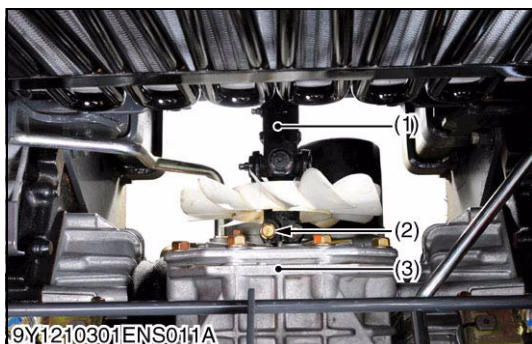
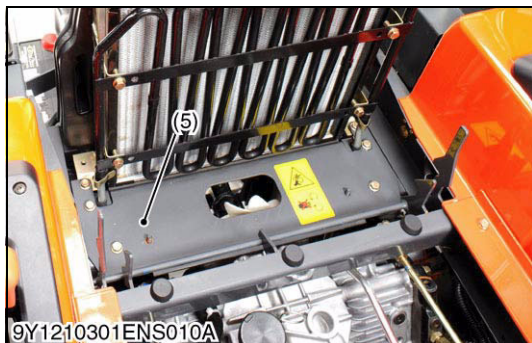
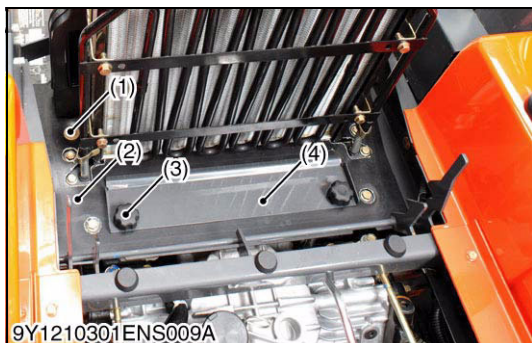
- To get a good contact of the ground, attach the ground wire (5) to the specified position (separate position from that of the battery negative cable (4)). (Right side front only)

(1) Engine Stopper
(2) Engine Mounting Nut
(3) Bolt

(4) Battery Negative Cable
(5) Ground Wire

9Y1210301ENS0029US0





Plate

1. Raise the seat.
2. Remove the knobs (3) and the plate (4).
3. Remove the 2 bolts (1) and the rubber sheet (2).
4. Remove the plate (5).

- | | |
|------------------|-----------|
| (1) Bolt | (4) Plate |
| (2) Rubber Sheet | (5) Plate |
| (3) Knob | |

9Y1210301TXS0013US0

Universal Joint

1. Remove the 2 bolts (2).
2. Lift up the engine and separate the universal joint (1) from transmission (3).

(When reassembling)

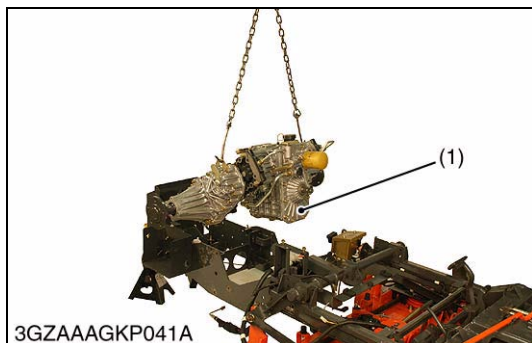
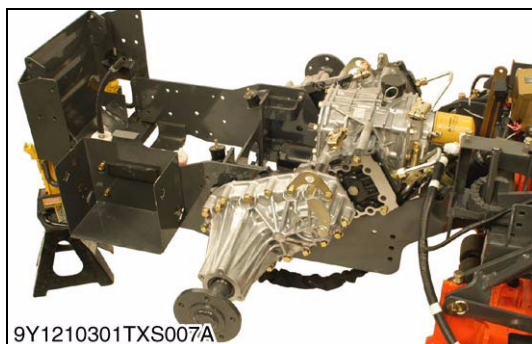
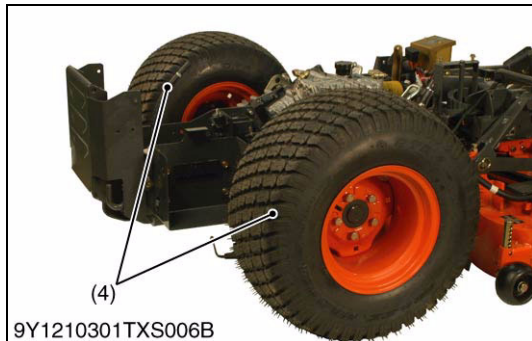
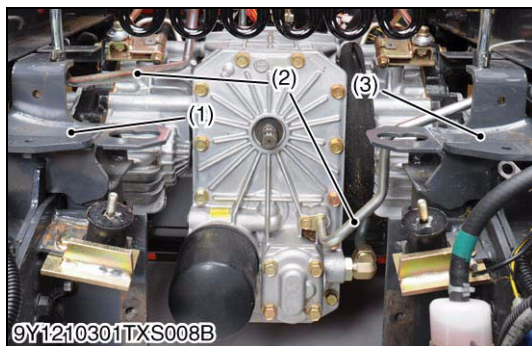
- Apply grease to the all splines on the drive shaft.
- Set the engine on the rubber cushion. Before fastening the engine mounting nuts, connect the universal joint.
- Make sure to align all the grease nipples. Only this one position meets the spline.

Tightening torque	Universal joint mounting screw	26.0 to 28.0 N·m 2.7 to 2.9 kgf·m 19.2 to 20.7 lbf·ft
	Engine mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

- (1) Universal Joint
- (2) Bolt
- (3) Transmission
- (4) Grease Nipple

A: Fixed to the fan drive pulley.

9Y1210301TXS0014US0



ROPS, Rear Wheel and Others

1. Remove the oil cooler pipes (2).
2. Remove the ROPS upper, and remove the ROPS lower (LH) (1) and ROPS lower (RH) (3).
3. Unscrew the rear wheel mounting.
4. Lift up and secure with jack stands or blocking the rear of the machine frame, and remove the rear wheels (4).

(When reassembling)

■ NOTE

- Remember to mount the cushion rubber on the oil cooler pipe.

Tightening torque	ROPS mounting screw (M10, 7T)	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Rear wheel mounting screw	108.5 to 130.2 N·m 11.1 to 13.3 kgf·m 80 to 96 lbf·ft

- (1) ROPS Lower (LH)
(2) Oil Cooler Pipe

- (3) ROPS Lower (RH)
(4) Rear Wheel

9Y1210301TXS0041US0

Separating Transaxle Assembly

1. Remove the rear axle gear case mounting screws.
2. Separate the transaxle assembly (1) from main frame.

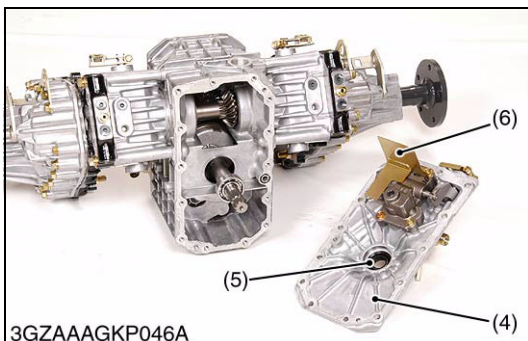
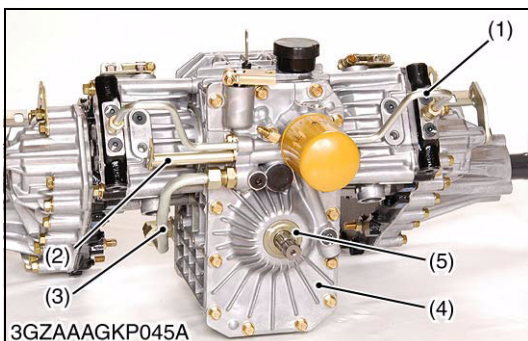
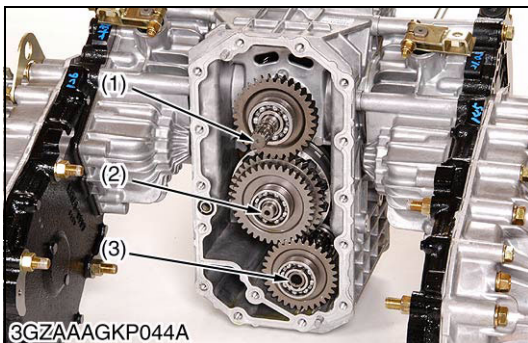
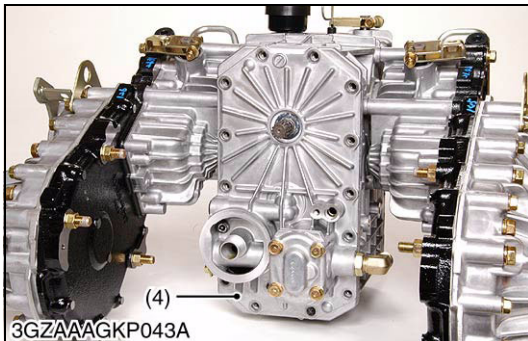
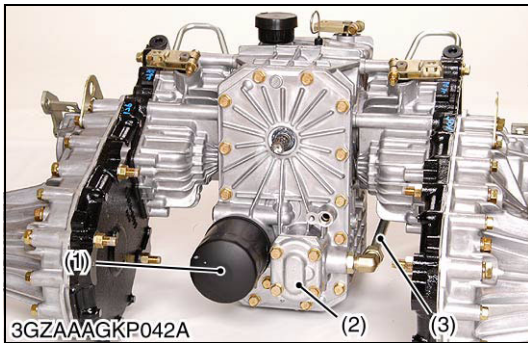
(When reassembling)

Tightening torque	Rear axle gear case mounting screw (M12)	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	--	---

- (1) Transaxle Assembly

9Y1210301TXS0042US0

[2] DISASSEMBLING TRANSAXLE CENTER CASE



Center Case Rear Cover

1. Remove the oil filter cartridge (1).
2. Remove the delivery pipe (3).
3. Remove the center case rear cover (4).

NOTE

- Remember to remove the hex. socket head screw hidden behind the filter cartridge (1)
- To remove the center case rear cover (4) mounted on the machine, also remove the hydraulic pump (2). This makes fitting the spline between pump shaft and the pump drive shaft easy.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the center case and center case rear cover.
- Take care not to damage the oil seal.

Tightening torque	Center case rear cover mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
-------------------	---------------------------------------	---

- (1) Oil Filter Cartridge
(2) Hydraulic Pump

- (3) Delivery Pipe
(4) Center Case Rear Cover

9Y1210301TXS0043US0

PTO Clutch Shaft Assembly and Pump Gear Shaft

1. Remove the input shaft assembly (1).
2. Remove the PTO clutch shaft assembly (2) and pump shaft assembly (3).

(When reassembling)

- Take care not to damage the PTO shaft oil seal.

- (1) Input Shaft Assembly
(2) PTO Clutch Shaft Assembly

- (3) Pump Shaft Assembly

9Y1210301TXS0044US0

Center Case Front Cover

NOTE

- To remove the center case front cover (4) mounted on the machine, remove the PTO shaft oil seal (5) first.

1. Remove the HST Pipe (1).
2. Remove the delivery pipe (3).
3. Remove the PTO clutch lever (2).
4. Remove the center case front cover (4).

(When reassembling)

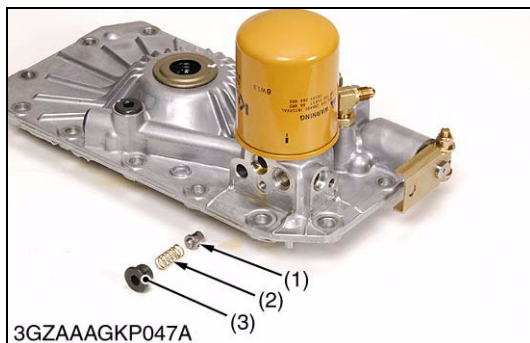
- Take care not to damage the oil seal (5).
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the center case and center case front cover (4).

Tightening torque	Center case front cover mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
-------------------	--	---

- (1) HST Pipe
(2) PTO Clutch Lever
(3) Delivery Pipe

- (4) Center Case Front Cover
(5) PTO Shaft Oil Seal
(6) Plate

9Y1210301TXS0045US0

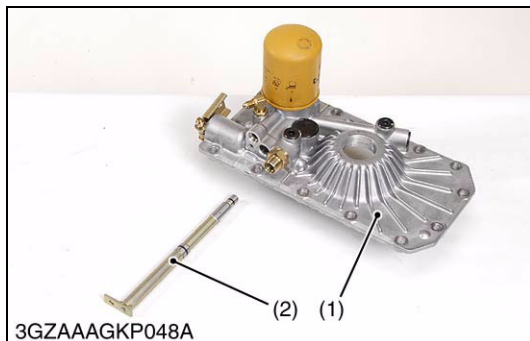


Regulator Valve (HST Charge Pressure Relief Valve)

1. Remove the plug (3).
2. Remove the spring (2) and poppet (1).

- (1) Poppet (3) Plug
(2) Spring

9Y1210301TXS0046US0

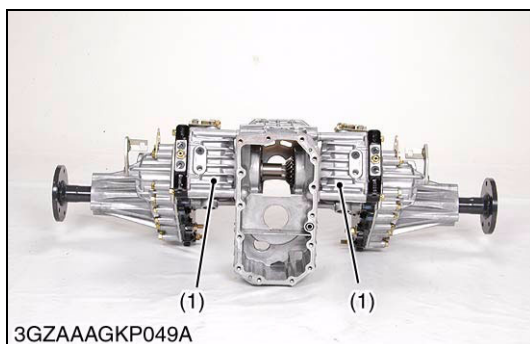


PTO Clutch Lever

1. Remove the lever stopper and remove the PTO clutch lever (2).
(When reassembling)
 - Take care not to damage the O-rings.

- (1) Center Case Front Cover (2) PTO Clutch Lever

9Y1210301TXS0047US0



Separating Hydrostatic Transmission and Rear Axle Gear Case Assembly

1. Remove the hydrostatic transmission and rear axle gear case assembly mounting screws.
2. Separate the hydrostatic transmission and rear axle gear case assembly (1).

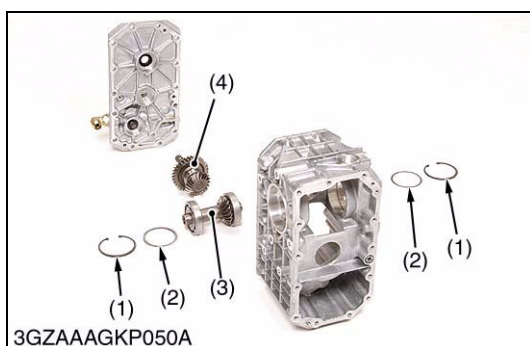
(When reassembling)

- Take care not to damage the O-ring.

Tightening torque	Hydrostatic transmission and rear axle gear case assembly mounting screw	40 to 44 N·m
		4.0 to 4.5 kgf·m
		29 to 32 lbf·ft

- (1) Hydrostatic Transmission and Rear Axle Gear Case Assembly

9Y1210301TXS0048US0



Input Shaft, Spiral Bevel Gear and Joint Shaft

1. Remove the input shaft and spiral bevel gear (4).
2. Remove the internal snap ring (1).

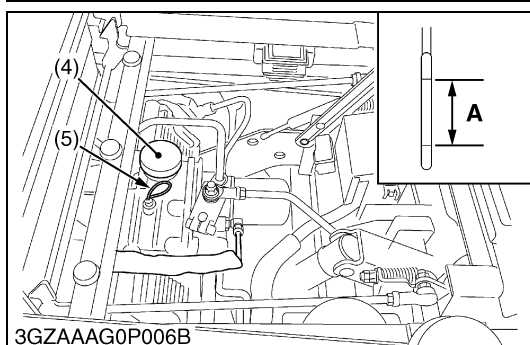
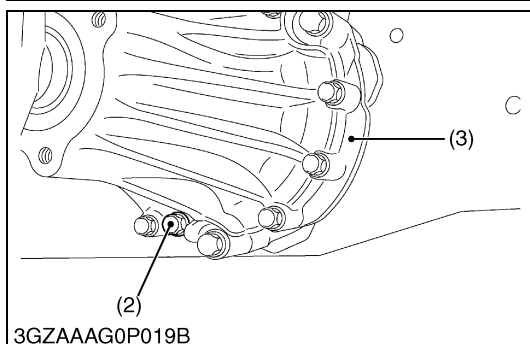
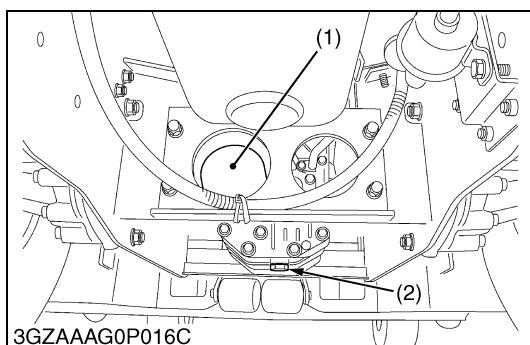
(When reassembling)

- Use same thickness of shims as before disassembling.

- (1) Internal Snap Ring (3) Joint Shaft Assembly
(2) Shim (4) Spiral Bevel Gear

9Y1210301TXS0049US0

[3] DISASSEMBLING PTO CLUTCH SHAFT ASSEMBLY



Draining Transmission Fluid



CAUTION

To avoid personal injury:

- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow transmission case to cool down sufficiently; oil can be hot and may cause burns.

The fluid in the transmission case is also used for the hydrostatic drive system.

1. To drain the transmission oil, place oil pan underneath the transmission case and the rear axle gear case (RH and LH) and remove the drain plug at the bottom of the transmission case and the rear axle gear case (RH and LH).
2. After draining, reinstall the drain plugs.
3. Fill with new fluid from filling port after removing the filling plug (4) up the upper notch on the dipstick.

■ IMPORTANT

- If takes time to pour the oil from the transmission case to reach the rear axle case (RH and LH) pour the regulated amount of oil slowly.

4. After running the engine for a few minutes, stop it and check the oil level again; add oil to the prescribed level.

■ IMPORTANT

- Operate only at low RPM's immediately after changing the transmission fluid and filter cartridge. Keep the engine at medium speed for a few minutes to insure proper lubrication of all parts so there is no damage to transmission.
- Use only multi-grade transmission oil. Use of other oils may damage the transmission of hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)
- Do not mix different brands oil together.

Transmission fluid capacity	12.1 L 12.8 U.S.qts 10.6 Imp.qts
-----------------------------	--

- (1) Hydraulic Oil Filter
- (2) Drain Plug
- (3) Rear Axle Gear Case LH
- (4) Oil Plug and Breather Cup
- (5) Dipstick

A: Oil level acceptable within this range

9Y1210301TXS0025US0

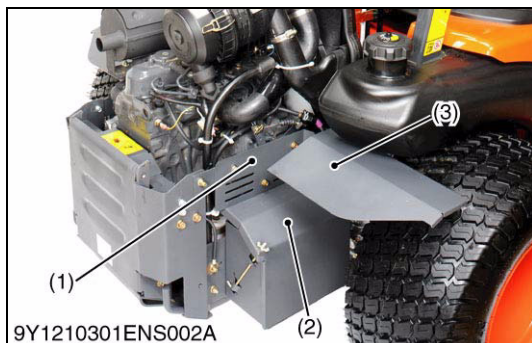
Bonnet

1. Remove the snap pin and bonnet mounting screw, then remove the bonnet (1).

- (1) Bonnet

9Y1210301TXS0015US0



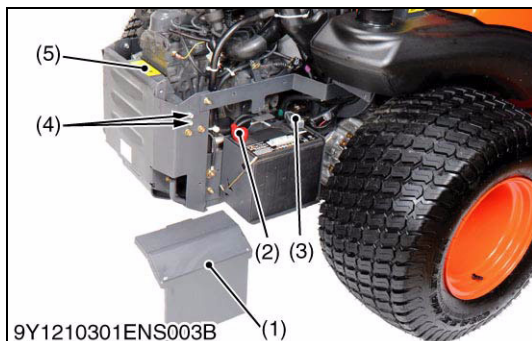


Battery Cover

1. Remove the side covers L, R (1) and the rear fenders L, R (3).
2. Remove the battery cover (2).

- | | |
|-------------------|-----------------|
| (1) Side cover | (3) Rear Fender |
| (2) Battery cover | |

9Y1210301TXS0016US0



Battery and Flywheel Cover



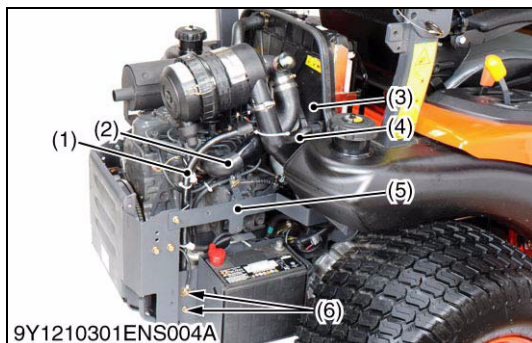
CAUTION

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (3) from the battery.
2. Disconnect the positive cable (2) from the battery.
3. Remove the bolts (4) and flywheel cover (5).

- | | |
|--------------------|--------------------|
| (1) Battery Cover | (4) Bolt |
| (2) Positive Cable | (5) Flywheel Cover |
| (3) Negative Cable | |

9Y1210301TXS0004US0

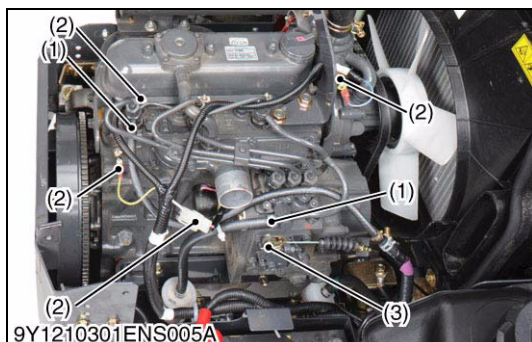


Air Cleaner

1. Remove the side cover stays L, R (5).
2. Remove the bolts (6) for air cleaner support (1).
3. Disconnect the inlet hose (2) from engine.
4. Pull out the intake pipe (4) from the shroud (3).
5. Remove the air cleaner.

- | | |
|-------------------------|---------------------|
| (1) Air Cleaner Support | (4) Intake Pipe |
| (2) Inlet Hose | (5) Side Cover Stay |
| (3) Shroud | (6) Bolts |

9Y1210301TXS0017US0



Electric Wiring and Fuel Hoses

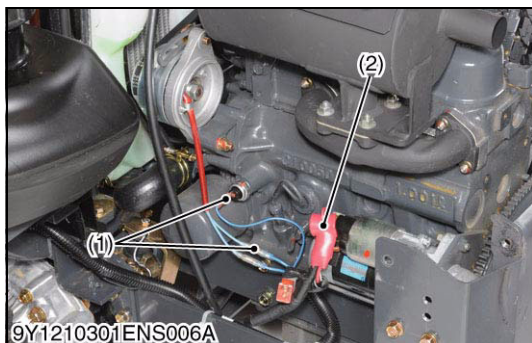
1. Disconnect the wiring connectors (2) for engine stop solenoid, glow plug, coolant temperature sensor, and coolant temperature switch.
2. Disconnect the accelerator wire (3).
3. Disconnect the fuel hoses (1) from engine.

(When reassembling)

- When accelerator wire is installed, adjust the wiring length. The stop lever must hit both the idling speed adjusting bolt and the maximum speed adjusting bolt within the stroke of the accelerator lever.

- | | |
|-----------------------|---------------------------------------|
| (1) Fuel Hose | (3) Accelerator Wire (Throttle Cable) |
| (2) Wiring Connectors | |

9Y1210301TXS0018US0



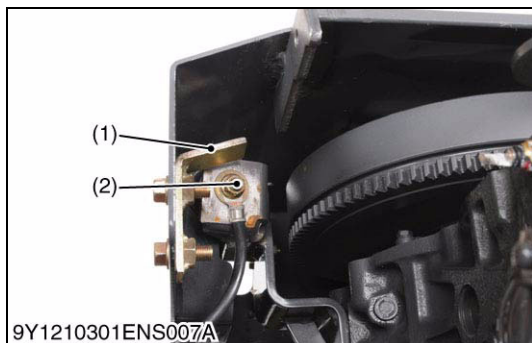
Electric Wiring

1. Disconnect the wiring connectors (1) for dynamo and engine oil pressure switch.
2. Remove the positive cable (2) from the starter motor.

(1) Wiring Connectors

(2) Positive Cable

9Y1210301TXS0019US0



Engine Stopper and Mounting Nuts

1. Remove the engine stoppers (1).
2. Remove the engine mounting nuts (2).
3. Remove the bolts (3) for shroud.

(When reassembling)

- To get a good contact of the ground, attach the ground wire (5) to the specified position (separate position from that of the battery negative cable (4)). (Right side front only)

(1) Engine Stopper

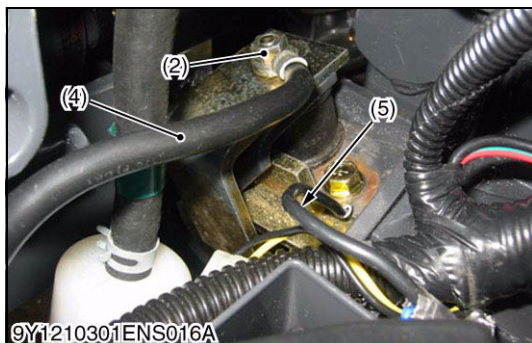
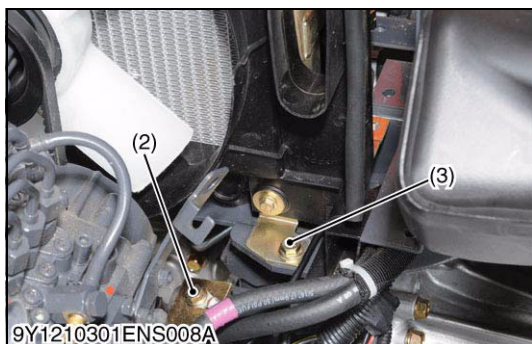
(4) Battery Negative Cable

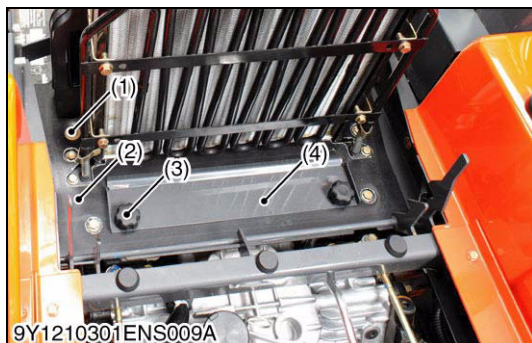
(2) Engine Mounting Nut

(5) Ground Wire

(3) Bolt

9Y1210301ENS0029US0



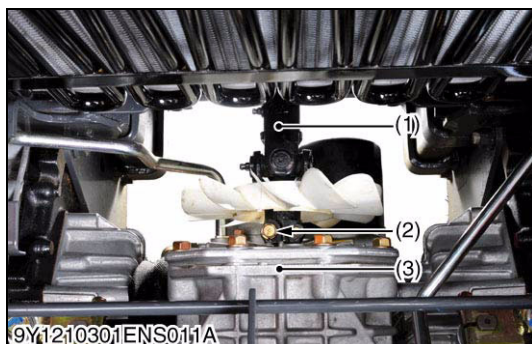
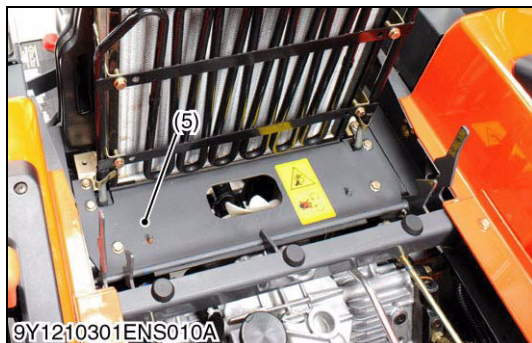


Plate

1. Raise the seat.
2. Remove the knobs (3) and the plate (4).
3. Remove the 2 bolts (1) and the rubber sheet (2).
4. Remove the plate (5).

- | | |
|------------------|-----------|
| (1) Bolt | (4) Plate |
| (2) Rubber Sheet | (5) Plate |
| (3) Knob | |

9Y1210301TXS0021US0



Universal Joint

1. Remove the 2 bolts (2).
2. Lift up the engine and separate the universal joint (1) from transmission (3).

(When reassembling)

- Apply grease to the all splines on the drive shaft.
- Set the engine on the rubber cushion. Before fastening the engine mounting nuts, connect the universal joint.
- Make sure to align all the grease nipples. Only this one position meets the spline.

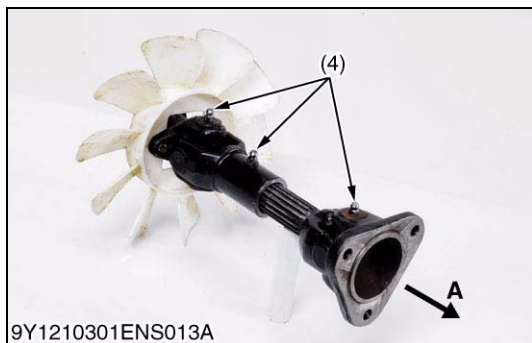


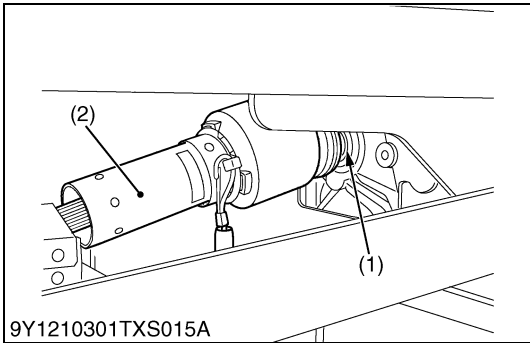
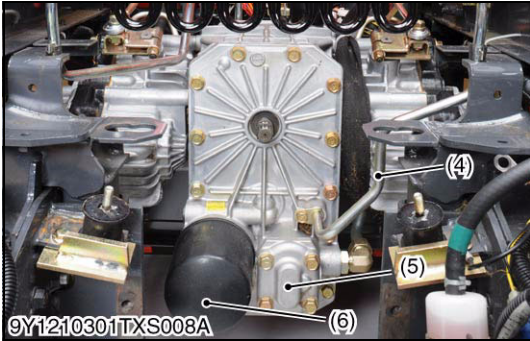
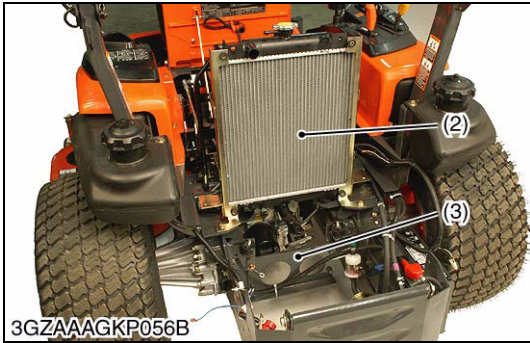
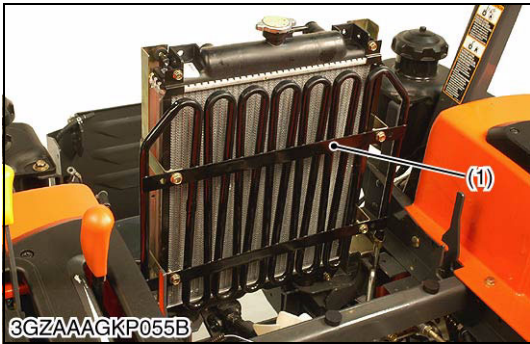
Tightening torque	Universal joint mounting screw	26.0 to 28.0 N·m 2.7 to 2.9 kgf·m 19.2 to 20.7 lbf·ft
	Engine mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

- (1) Universal Joint
- (2) Bolt
- (3) Transmission
- (4) Grease Nipple

A: Fixed to the fan drive pulley.

9Y1210301TXS0022US0





Oil Cooler, Radiator and Others

1. Remove the oil cooler (1).
2. Remove the radiator (2).
3. Remove the ROPS connecting plate under (3).
4. Remove the oil cooler pipe (4).
5. Remove the hydraulic pump assembly (5).
6. Remove the oil filter cartridge (6).

(When reassembling)

NOTE

- Remember to mount the cushion rubber on the oil cooler pipe.

Tightening torque	ROPS connecting plate mounting screw (M8)	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	ROPS connecting plate under mounting screw (M10)	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Hydraulic pump mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

- | | |
|----------------------------------|-----------------------------|
| (1) Oil Cooler | (4) Oil Cooler Pipe |
| (2) Radiator | (5) Hydraulic Pump Assembly |
| (3) ROPS Connecting Plate, Under | (6) Oil Filter Cartridge |

9Y1210301TXS0050US0

Universal Joint and PTO Shaft Oil Seal

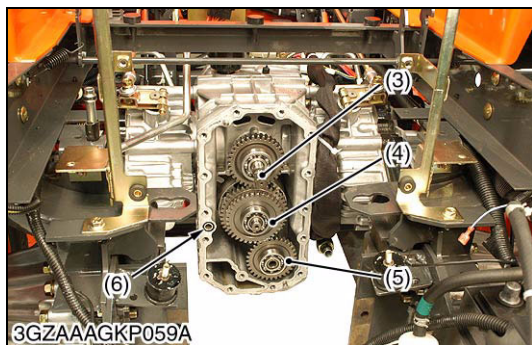
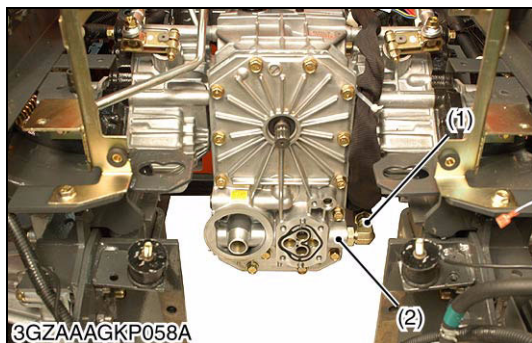
1. Disconnect the universal joint (2).
2. Remove the PTO shaft oil seal (1).

(When reassembling)

- Replace the PTO shaft oil seal with new one.

- | | |
|------------------------|---------------------|
| (1) PTO Shaft Oil Seal | (2) Universal Joint |
|------------------------|---------------------|

9Y1210301TXS0051US0



Center Case Rear Cover and PTO Clutch Shaft Assembly

1. Disconnect the delivery pipe (1).
2. Remove the center case rear cover (2).
3. Remove the pump shaft assembly (5).
4. Remove the PTO clutch shaft assembly (4).

NOTE

- At this point, the input shaft (3) must be pulled out to prevent interference between the PTO clutch case and the gear.
- Note that pulling out the input shaft (3) excessively may cause falling off of the bevel gear from the input shaft (3).

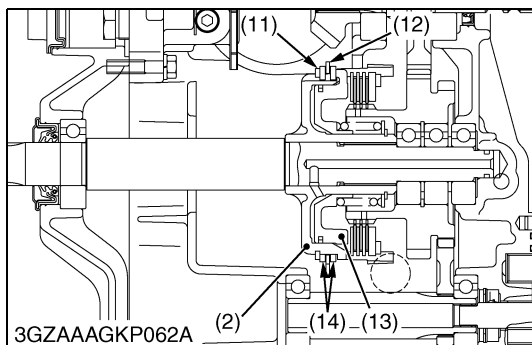
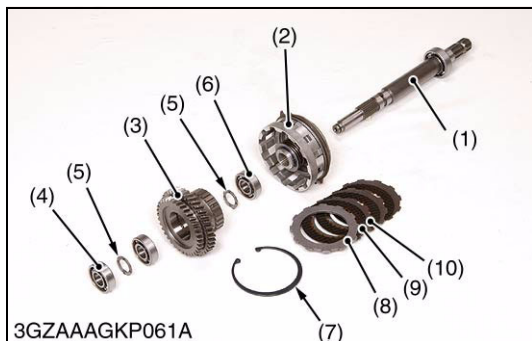
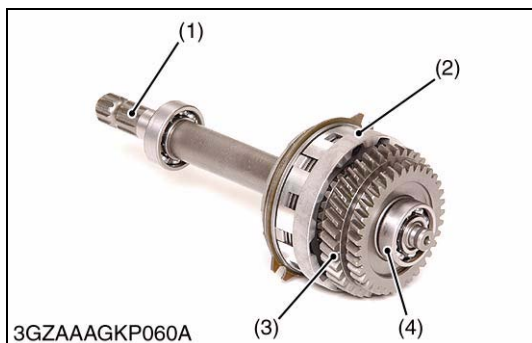
(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of center case and center case rear cover.

Tightening torque	Center case rear cover mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
-------------------	---------------------------------------	---

- | | |
|----------------------------|-------------------------------|
| (1) Delivery Pipe | (4) PTO Clutch Shaft Assembly |
| (2) Center Case Rear Cover | (5) Pump Shaft Assembly |
| (3) Input Shaft | (6) O-ring |

9Y1210301TXS0052US0



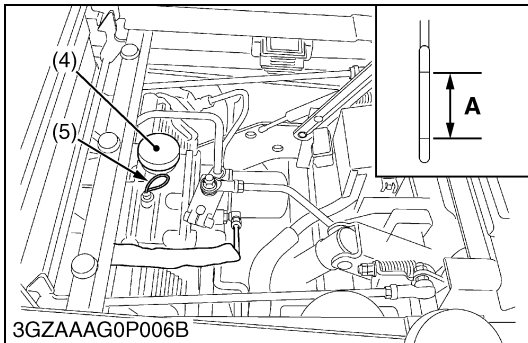
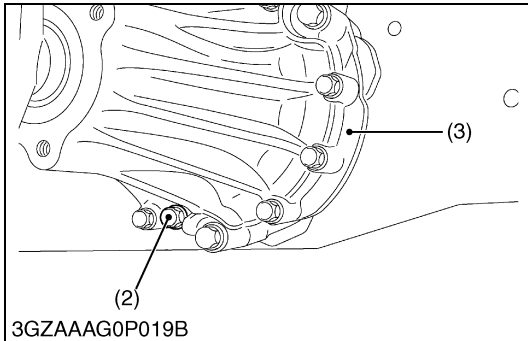
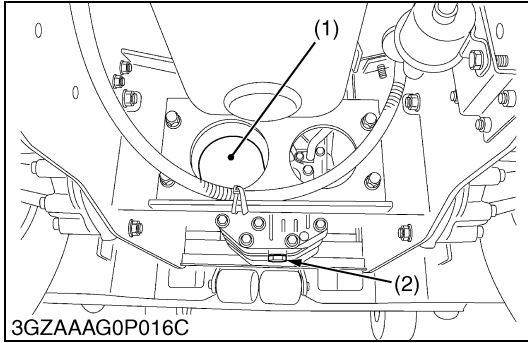
Disassembling PTO Clutch Assembly

1. Remove the bearing (4) and clutch gear (3) with bearing.
2. Remove the internal snap ring (7), pressure plate (8), clutch disk (9) and clutch plate (10).
3. Remove the bearing (6) PTO clutch case (2) from the PTO shaft (1).

- | | |
|------------------------|-------------------------|
| (1) PTO Shaft | (8) Pressure Plate |
| (2) PTO Clutch Case | (9) Clutch Disk |
| (3) Clutch Gear | (10) Clutch Plate |
| (4) Bearing | (11) External Snap Ring |
| (5) Collar | (12) Brake Disk |
| (6) Bearing | (13) Piston |
| (7) Internal Snap Ring | (14) Brake Plate |

9Y1210301TXS0053US0

[4] DISASSEMBLING HYDROSTATIC TRANSMISSION AND REAR AXLE GEAR CASE ASSEMBLY



Draining Transmission Fluid



CAUTION

To avoid personal injury:

- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow transmission case to cool down sufficiently; oil can be hot and may cause burns.

The fluid in the transmission case is also used for the hydrostatic drive system.

1. To drain the transmission oil, place oil pan underneath the transmission case and the rear axle gear case (RH and LH) and remove the drain plug at the bottom of the transmission case and the rear axle gear case (RH and LH).
2. After draining, reinstall the drain plugs.
3. Fill with new fluid from filling port after removing the filling plug (4) up the upper notch on the dipstick.

■ IMPORTANT

- If takes time to pour the oil from the transmission case to reach the rear axle case (RH and LH) pour the regulated amount of oil slowly.
- 4. After running the engine for a few minutes, stop it and check the oil level again; add oil to the prescribed level.

■ IMPORTANT

- Operate only at low RPM's immediately after changing the transmission fluid and filter cartridge.
Keep the engine at medium speed for a few minutes to insure proper lubrication of all parts so there is no damage to transmission.
- Use only multi-grade transmission oil. Use of other oils may damage the transmission of hydraulic system.
Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)
- Do not mix different brands oil together.

Transmission fluid capacity	12.1 L 12.8 U.S.qts 10.6 Imp.qts
-----------------------------	--

- (1) Hydraulic Oil Filter
- (2) Drain Plug
- (3) Rear Axle Gear Case LH
- (4) Oil Plug and Breather Cup
- (5) Dipstick

A: Oil level acceptable within this range

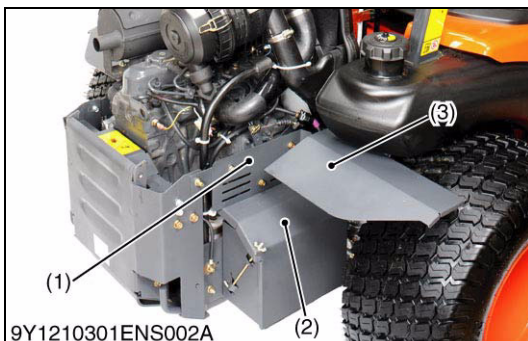
9Y1210301TXS0025US0

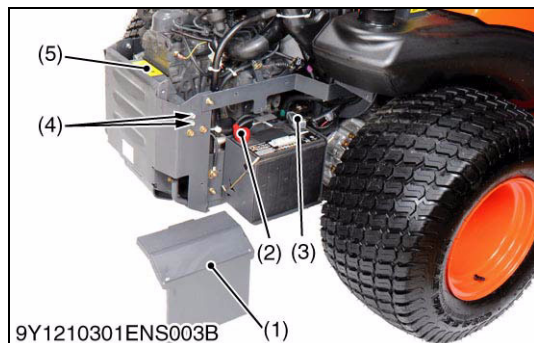
Battery Cover

1. Remove the side covers L, R (1) and the rear fenders L, R (3).
2. Remove the battery cover (2).

- (1) Side cover
- (2) Battery cover
- (3) Rear Fender

9Y1210301TXS0023US0





Battery and Flywheel Cover



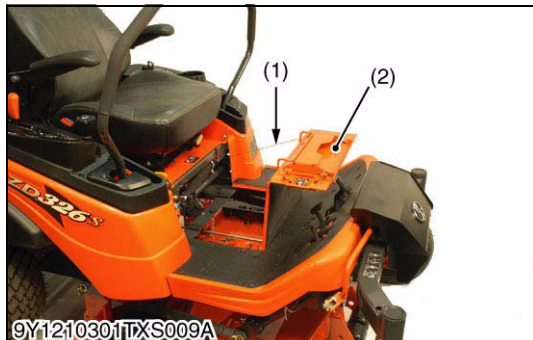
CAUTION

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (3) from the battery.
2. Disconnect the positive cable (2) from the battery.
3. Remove the bolts (4) and flywheel cover (5).

- | | |
|--------------------|--------------------|
| (1) Battery Cover | (4) Bolt |
| (2) Positive Cable | (5) Flywheel Cover |
| (3) Negative Cable | |

9Y1210301TXS0005US0

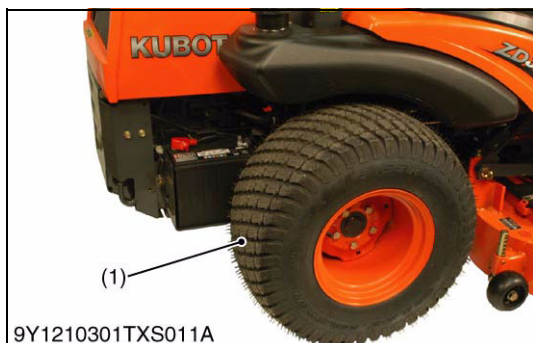


Step Center and Step

1. Remove the clevis pin and remove the cable (1).
2. Remove the clevis pins and remove the step center (2).
3. Remove the front cover (3).
4. Remove the step (4).

- | | |
|-----------------|-----------------|
| (1) Cable | (3) Front Cover |
| (2) Step Center | (4) Step |

9Y1210301TXS0054US0



Rear Wheel

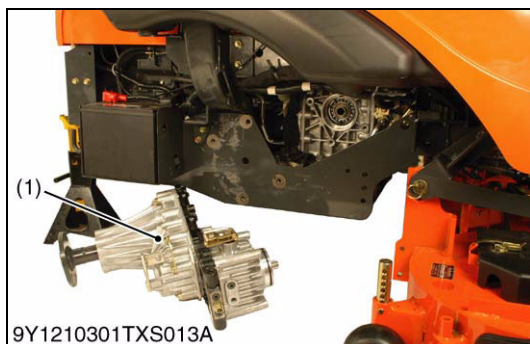
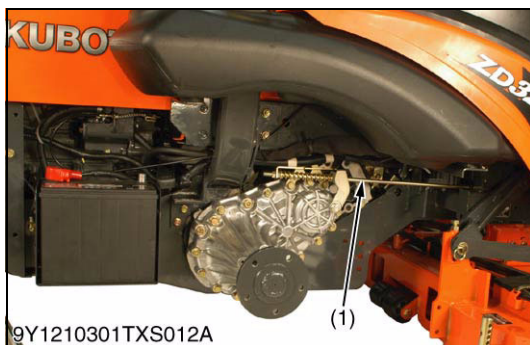
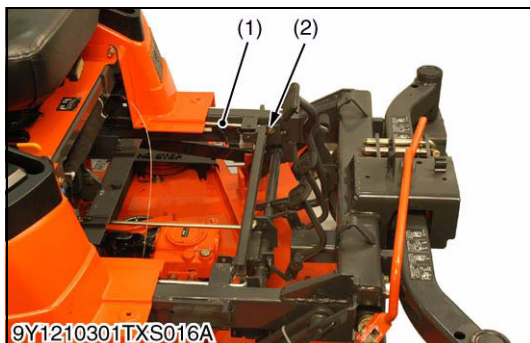
1. Lift up and secure with jack stands or blocking the rear of the machine frame, and remove the rear wheels (1).

(When reassembling)

Tightening torque	Rear wheel mounting screw	108.5 to 130.2 N·m 11.1 to 13.3 kgf·m 80 to 96 lbf·ft
-------------------	---------------------------	---

- (1) Rear Wheel

9Y1210301TXS0055US0



Parking Brake Rod

1. Remove the parking brake rods (1).
(When reassembling)

■ NOTE

- Replace the cotter pin (2) with new one.
- After assembling the parking brake rods, be sure check the parking brake spring length and play. If the measurement is not within the factory specifications, adjust the spring length and play. (See page 2-S12.)

(1) Parking Brake Rod

(2) Cotter Pin

9Y1210301TXS0056US0

Hydrostatic Transmission and Rear Axle Gear Case Assembly

■ NOTE

- The hydrostatic transmission and rear axle gear case assembly weighs approximately 35 kg (77 lbs). Take extra care in handling.

1. Loosen the delivery pipe.
2. Remove the hydrostatic transmission mounting screws.
3. Remove the rear axle gear case mounting screws.
4. Separate the hydrostatic transmission and rear axle gear case assembly (1) and the transmission center case.

(When reassembling)

- Take care not to damage the O-ring.
- Check the tightening torque on the removed case and other side. (Make sure the screw does not loose.)

Tightening torque	Hydrostatic transmission mounting screw (M10)	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Rear axle gear case mounting screw (M12)	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Hydrostatic Transmission and Rear Axle Gear Case Assembly

9Y1210301TXS0057US0



Rear Axle Gear Case

1. Remove the rear axle gear case (1).

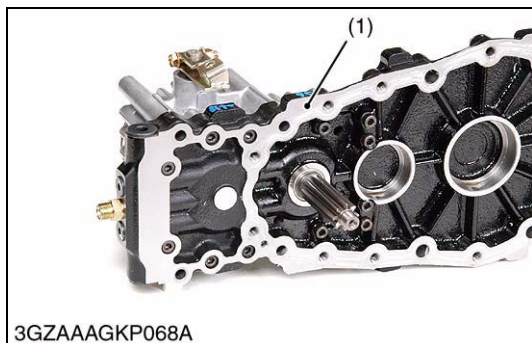
(When reassembling)

- Put in the motor shaft on the brake disc side by aligning the spline. Then mount the rear axle gear case assembly and HST.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle gear case and port block (center section).

Tightening torque	Rear axle gear case mounting screw	48 to 56 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
-------------------	------------------------------------	---

(1) Rear Axle Gear Case

9Y1210301TXS0058US0



Center Section (Port Block)

1. Separate the center section (1) and the hydrostatic transmission housing.

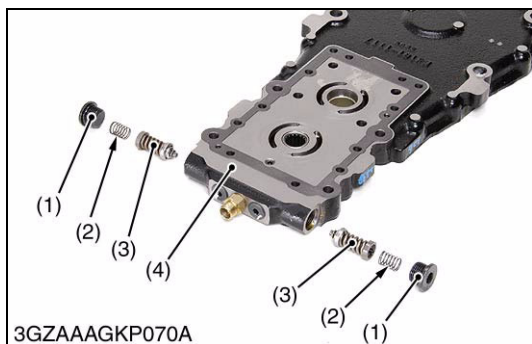
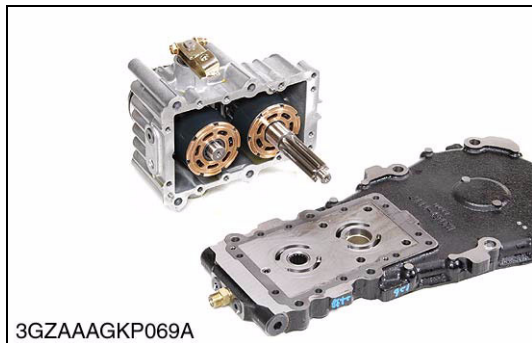
NOTE

- Take care not to damage the surface of cylinder blocks pistons and center section.

Tightening torque	Center section mounting hex. socket head screw	25 to 29 N·m 2.6 to 2.9 kgf·m 19 to 21 lbf·ft
-------------------	--	---

(1) Center Section

9Y1210301TXS0059US0



Check and High Pressure Relief Valve Assembly

1. Remove the plug (1) and draw out the spring (2) and check and high pressure relief valve assembly (3).

(When reassembling)

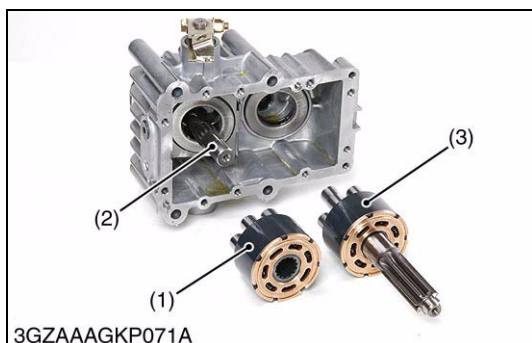
- Take care not to damage the O-ring on the plug.

Tightening torque	Check and high pressure relief valve plug	59 to 78 N·m 6.1 to 7.9 kgf·m 44 to 58 lbf·ft
-------------------	---	---

(1) Plug
(2) Spring

(3) Check and High Pressure Relief Valve Assembly
(4) Center Section

9Y1210301TXS0060US0



Cylinder Block Assembly and Thrust Ball Bearing

1. Lay the housing on its side.
2. Slide out the cylinder block assembly (pump) (1).
3. Slide out the cylinder block assembly (motor) (3).
4. Remove the thrust ball bearing (4).

NOTE

- Take care not to damage the surface of the cylinder blocks.

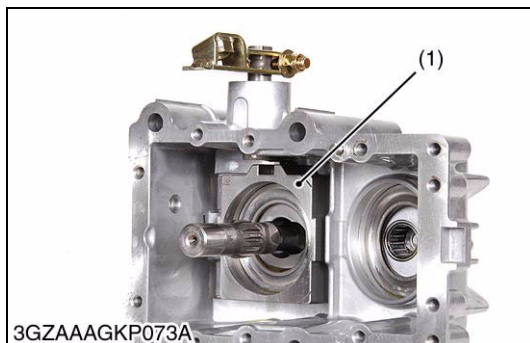
(When reassembling)

- Apply clean fluid to the surface of cylinder block.

(1) Cylinder Block Assembly (Pump) (2) Pump Shaft
(3) Cylinder Block Assembly (Motor) (4) Thrust Ball Bearing

9Y1210301TXS0061US0



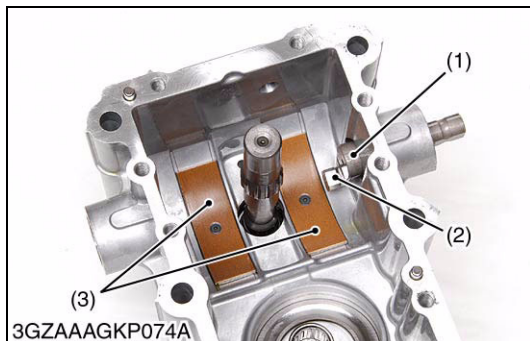


Swashplate

1. Remove the swashplate (1) from the housing.

(1) Swashplate

9Y1210301TXS0062US0



Slot Guide and Cradle Bearing

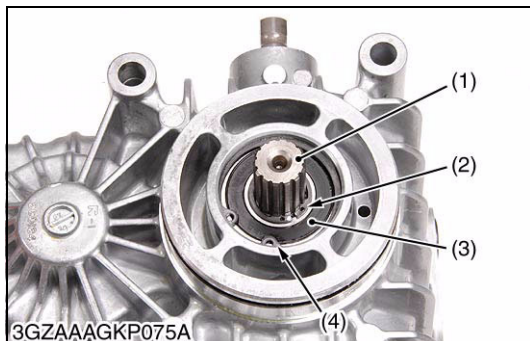
1. Remove the slot guide (2) from the trunnion arm (1).
2. Remove the cradle bearing (3) from the housing.

(1) Trunnion Arm

(3) Cradle Bearing

(2) Slot Guide

9Y1210301TXS0063US0



Pump Shaft

1. Remove the external snap ring (2).
2. Tap the pump shaft (1) with a plastic hammer slightly to side out it from the housing with the ball bearing (3).
3. Remove the internal snap ring (4) and bearing (3).

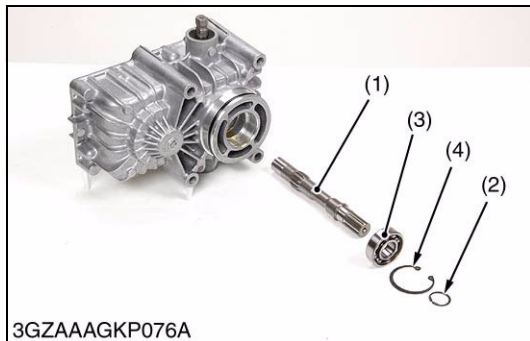
(1) Pump Shaft

(3) Ball Bearing

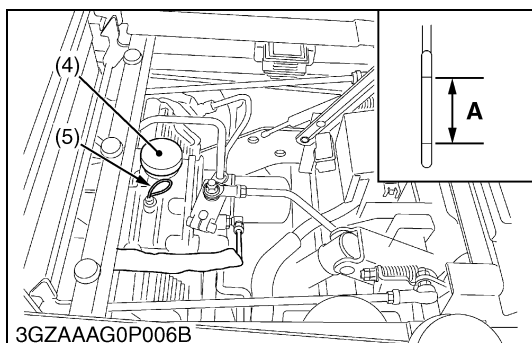
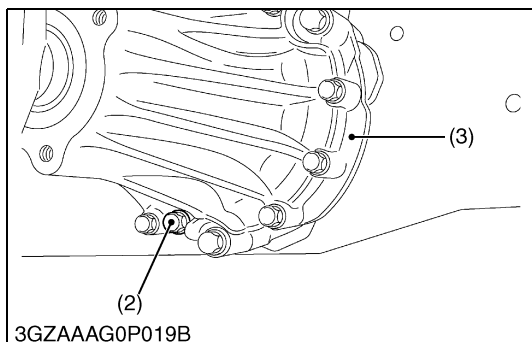
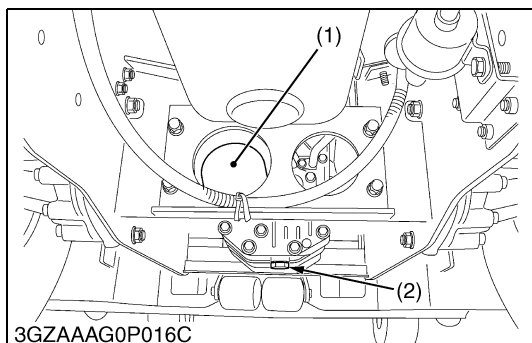
(2) External Snap Ring

(4) Internal Snap Ring

9Y1210301TXS0064US0



[5] DISASSEMBLING REAR AXLE GEAR CASE



Draining Transmission Fluid



To avoid personal injury:

- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow transmission case to cool down sufficiently; oil can be hot and may cause burns.

The fluid in the transmission case is also used for the hydrostatic drive system.

1. To drain the transmission oil, place oil pan underneath the transmission case and the rear axle gear case (RH and LH) and remove the drain plug at the bottom of the transmission case and the rear axle gear case (RH and LH).
2. After draining, reinstall the drain plugs.
3. Fill with new fluid from filling port after removing the filling plug (4) up the upper notch on the dipstick.

■ IMPORTANT

- If takes time to pour the oil from the transmission case to reach the rear axle case (RH and LH) pour the regulated amount of oil slowly.
- 4. After running the engine for a few minutes, stop it and check the oil level again; add oil to the prescribed level.

■ IMPORTANT

- Operate only at low RPM's immediately after changing the transmission fluid and filter cartridge. Keep the engine at medium speed for a few minutes to insure proper lubrication of all parts so there is no damage to transmission.
- Use only multi-grade transmission oil. Use of other oils may damage the transmission of hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)
- Do not mix different brands oil together.

Transmission fluid capacity	12.1 L 12.8 U.S.qts 10.6 Imp.qts
-----------------------------	--

- (1) Hydraulic Oil Filter
- (2) Drain Plug
- (3) Rear Axle Gear Case LH
- (4) Oil Plug and Breather Cup
- (5) Dipstick

A: Oil level acceptable within this range

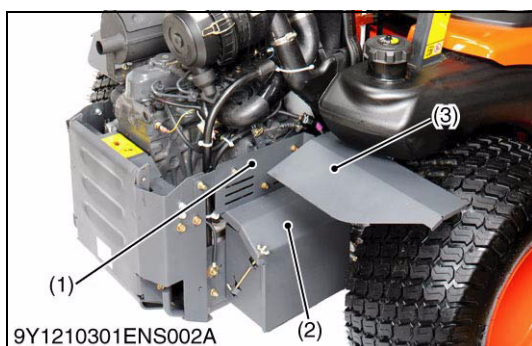
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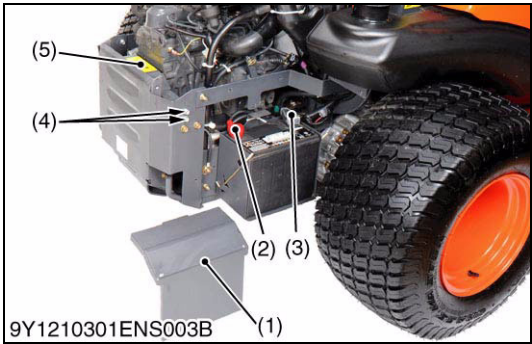
Battery Cover

1. Remove the side covers L, R (1) and the rear fenders L, R (3).
2. Remove the battery cover (2).

- (1) Side cover
- (2) Battery cover
- (3) Rear Fender

9Y1210301TXS0024US0





Battery and Flywheel Cover

CAUTION

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

- Disconnect the negative cable (3) from the battery.
- Disconnect the positive cable (2) from the battery.
- Remove the bolts (4) and flywheel cover (5).

- | | |
|--------------------|--------------------|
| (1) Battery Cover | (4) Bolt |
| (2) Positive Cable | (5) Flywheel Cover |
| (3) Negative Cable | |

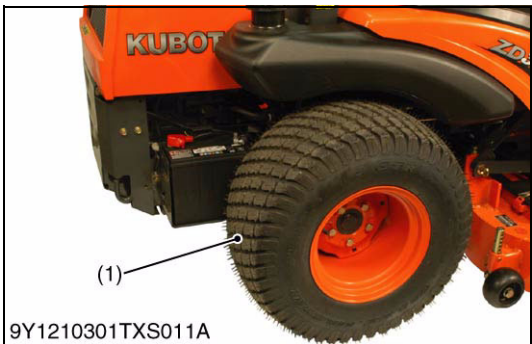
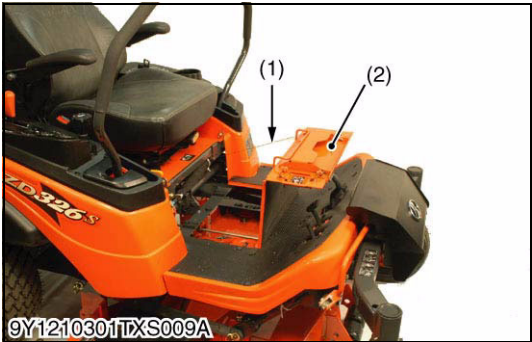
9Y1210301TXS0006US0

Step Center and Step

- Remove the clevis pin and remove the cable (1).
- Remove the clevis pins and remove the step center (2).
- Remove the front cover (3).
- Remove the step (4).

- | | |
|-----------------|-----------------|
| (1) Cable | (3) Front Cover |
| (2) Step Center | (4) Step |

9Y1210301TXS0065US0



Rear Wheel

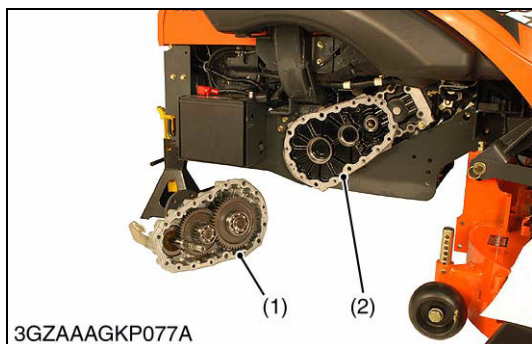
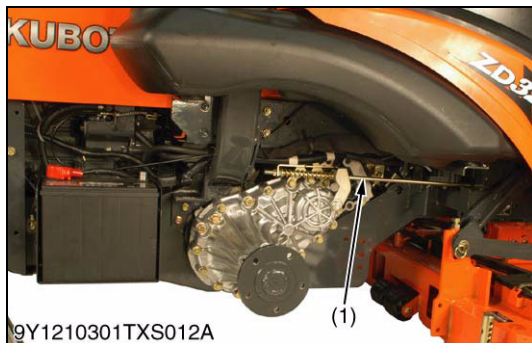
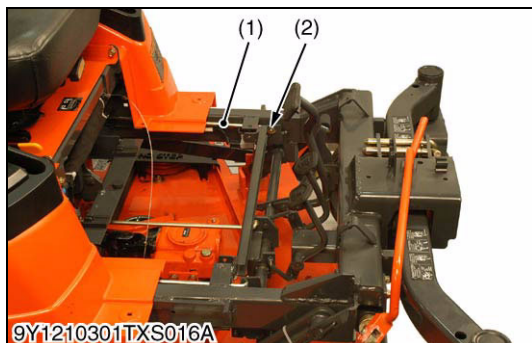
- Lift up and secure with jack stands or blocking the rear of the machine frame, and remove the rear wheels (1).

(When reassembling)

Tightening torque	Rear wheel mounting screw	108.5 to 130.2 N·m 11.1 to 13.3 kgf·m 80 to 96 lbf·ft
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- (1) Rear Wheel

9Y1210301TXS0066US0



Parking Brake Rod

1. Remove the parking brake rods (1).
(When reassembling)

■ NOTE

- Replace the cotter pin (2) with new one.
- After assembling the parking brake rods, be sure check the parking brake spring length and play. If the measurement is not within the factory specifications, adjust the spring length and play. (See page 2-S12.)

(1) Parking Brake Rod

(2) Cotter Pin

9Y1210301TXS0067US0

Removing Rear Axle Gear Case

1. Remove the rear axle gear case mounting screws.
2. Separate the rear axle gear case assembly (1) and center section (2).

(When reassembling)

- Apply to liquid gasket (Three Bond 1208D or equivalent) to the joint face of the rear axle gear case and center section.

■ NOTE

- If impulse or vibration is applied to the center section after the rear axle gear case assembly (1) was removed, the HST motor-side cylinder block (3) may possibly be deviated as shown in the photo.

If this cylinder block (3) should deviate up to the position shown in the photo, it will be unable to be returned to the original position.

At this time, the center section (2) must be separated for servicing or repair. When the rear axle gear case assembly (1) is removed, therefore, watchful care must be taken so as not to give any impulse and shocks to the center section (2).

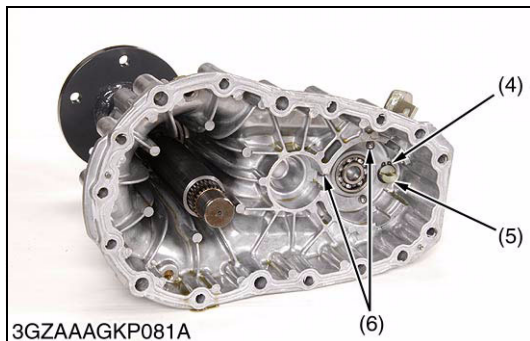
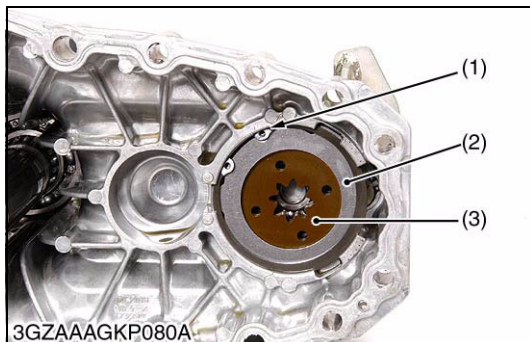
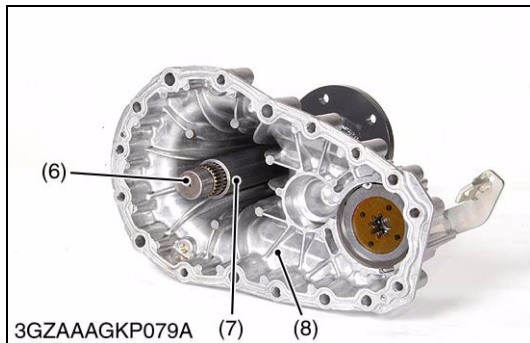
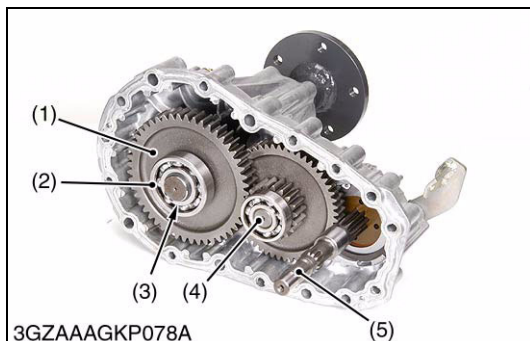
Tightening torque	Rear axle gear case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
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(1) Rear Axle Gear Case Assembly

(3) Cylinder Block (Motor)

(2) Center Section

9Y1210301TXS0068US0



Rear Axle

1. Remove the brake shaft (HST motor shaft) (5).
2. Remove the external snap ring (3) and remove the ball bearing (2) with puller.
3. Remove the final reduction gear (1) and gear shaft (4).
4. Remove the collar (7) and tap out the rear axle (6) from rear axle gear case (8).

(When reassembling)

- Do not damage oil seal.

- | | |
|--------------------------|-----------------------------------|
| (1) Final Reduction Gear | (5) Brake Shaft (HST Motor Shaft) |
| (2) Ball Bearing | (6) Rear Axle |
| (3) External Snap Ring | (7) Collar |
| (4) Gear Shaft | (8) Rear Axle Gear Case |

9Y1210301TXS0069US0

Parking Brake

1. Remove the internal snap ring (1), friction plates (2) and brake discs (3).
2. Remove the external snap ring (4), brake arm (5) and balls (6).

(When reassembling)

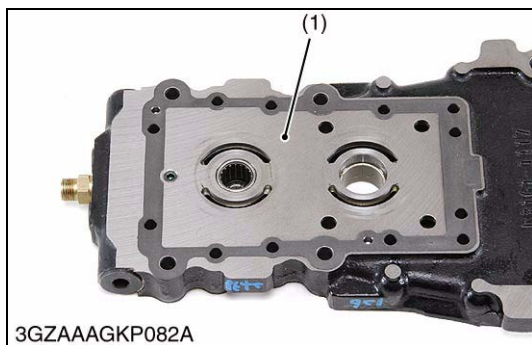
- Align splines of brake shaft and brake discs (3).
- Do not damage brake discs (3).
- Apply transmission fluid to brake discs (3).

- | | |
|------------------------|------------------------|
| (1) Internal Snap Ring | (4) External Snap Ring |
| (2) Friction Plate | (5) Brake Cam |
| (3) Brake Disc | (6) Ball |

9Y1210301TXS0070US0

6. SERVICING

[1] HYDROSTATIC TRANSMISSION

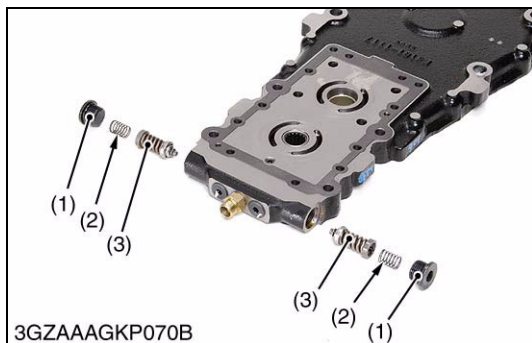


Center Section

1. Check the surface (1) of center section for scratches or wear. If deep scratch or excessive wear is found, replace the hydrostatic transmission assembly.

(1) Surface

9Y1210301TXS0071US0



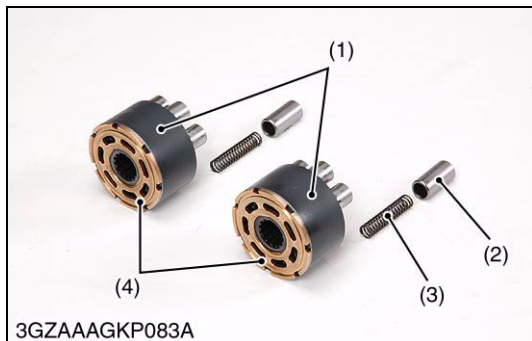
Check and High Pressure Relief Valve

1. Check the check and high pressure relief valve assembly (3) for scratches and damage.
2. Check the spring (2) for breakage and wear.
3. If anything unusual, replace the ball and spring.

(1) Plug
(2) Spring

(3) Check and High Pressure Relief
Valve Assembly

9Y1210301TXS0072US0



Cylinder Block Assembly

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

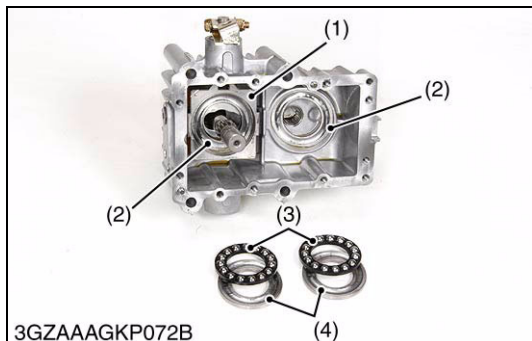
■ IMPORTANT

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

(1) Cylinder Block
(2) Piston

(3) Spring
(4) Polished Face

9Y1210301TXS0073US0



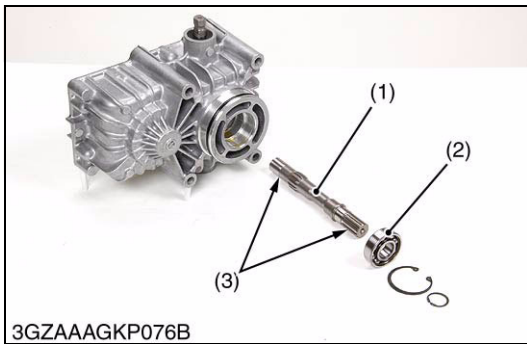
Thrust Washer, Thrust Ball Bearing and Thrust Plate

1. Check the thrust ball bearing (3) for scratches and excessive wear.
2. If worn, replace.
3. Check the thrust plate (4) for scratches and excessive wear.
4. If worn or scored, replace.

(1) Swashplate
(2) Thrust Washer

(3) Thrust Ball Bearing
(4) Thrust Plate

9Y1210301TXS0074US0



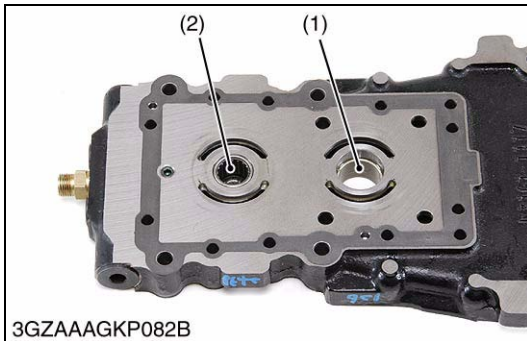
Pump Shaft

1. Check the bearing surface (3) and the ball bearing (2).
2. If the shaft is rough or grooved, replace it.
3. If the ball bearing is worn, replace it.

(1) Pump Shaft
(2) Ball Bearing

(3) Bearing Surface

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Bush and Needle Bearing

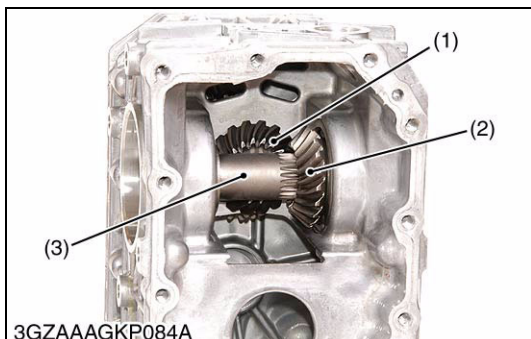
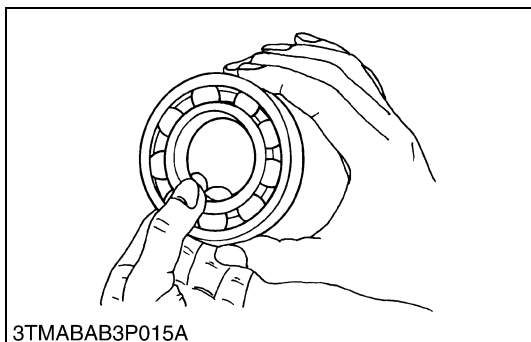
1. Check the bush (1) for wear.
2. If the bush is worn or damaged, replace it.
3. Check the needle bearing (2) for wear.
4. If the needle bearing is worn or damaged, replace it.

(1) Bush

(2) Needle Bearing

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[2] TRANSMISSION CASE



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 defect, replace it.

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Backlash and Tooth Contact between 15T Bevel Gear and 21T Bevel Gear

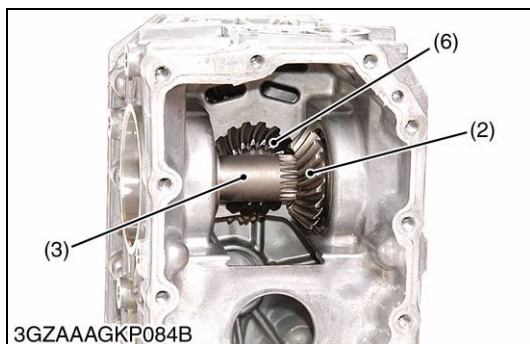
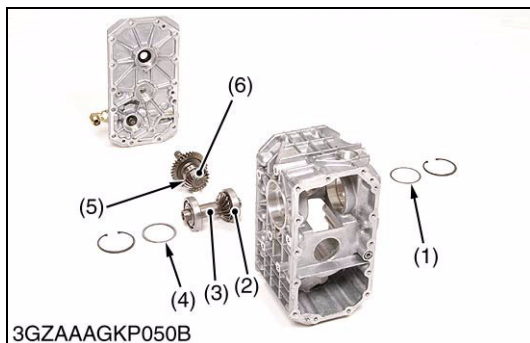
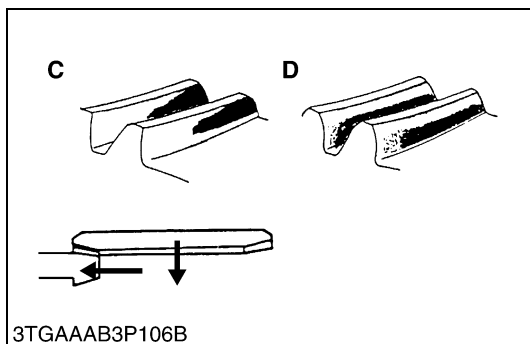
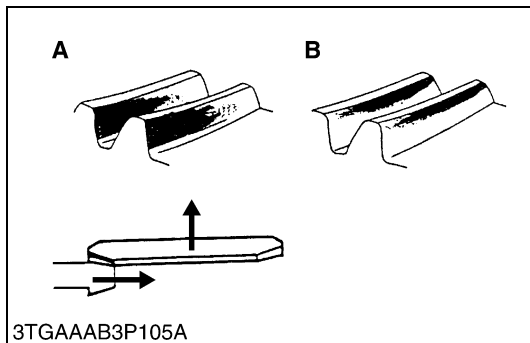
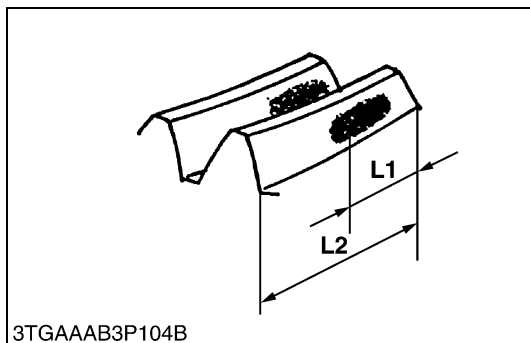
1. Measure the backlash between the 15T bevel gear (1) and 21T bevel gear (1).
2. When the backlash is too large, decrease the number of shims in the side of the spiral bevel gear, and insert the removed shims in the opposite side. When the backlash is too small, decrease the number of shims in the side of the differential case, and insert the removed shims in the opposite side.
3. Adjust the backlash properly by repeating the above procedure.
4. Apply red lead lightly over several teeth at three positions equally spaced on the hypoid ring gear.
5. Turn the 15T bevel gear by input shaft while pressing a wooden piece against the periphery of the bevel gear.
6. Check the tooth contact, if not proper, adjust according to the following instruction.

Backlash between 15T bevel gear and 21T bevel gear	Factory specification	0.25 to 0.30 mm 0.0099 to 0.011 in.
Tooth contact	Factory specification	More than 25 % read lead contact area on the gear tooth surface
The position of tooth contact point	Factory specification	The center of tooth contact at 3/10 of the entire width from the small end

(1) 15T Bevel Gear
(2) 21T Bevel Gear

(3) Joint Shaft

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Correcting Tooth Contact

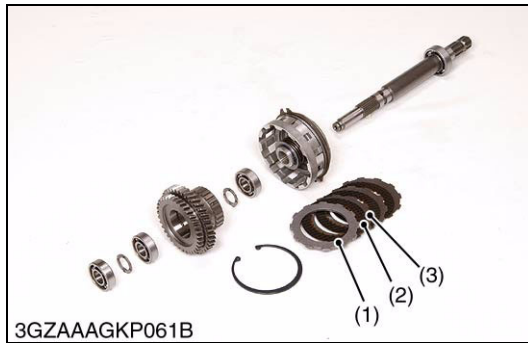
1. Proper contact
 - No adjustment.
2. Correcting of the heel contact and shallow contact
 - It is confirmed whether there is a shim (5).
 - The 15T bevel gear (6) can be moved to backward by doing to add the shim (5) when not is. (The shim is made the state as it is when there is a shim (5).)
 - And place the 21T bevel gear (2) side shim to the shim (1) to move the 21T bevel gear outside.
 - Repeat above until the proper tooth contact and backlash are achieved.
3. Correcting of the toe contact and deep contact
 - It is confirmed whether there is a shim (5).
 - The 15T bevel gear (6) can be moved to backward by removing the shim (5) if there is a shim. (The shim (5) is not put when there is no shim.)
 - And place the shim (1) side to the 19T bevel gear (2) side shim to move the 21T bevel gear inside.
 - Repeat above until the proper tooth contact and backlash are achieved.

- (1) Shim
(2) 21T Bevel Gear
(3) Joint Shaft
(4) Shim
(5) Shim
(6) 15T Bevel Gear

- L1: Tooth Contact**
L2: Tooth Bottom
A: Heel Contact
B: Shallow Contact
C: Toe Contact
D: Deep Contact

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[3] PTO CLUTCH



Checking PTO Clutch Discs

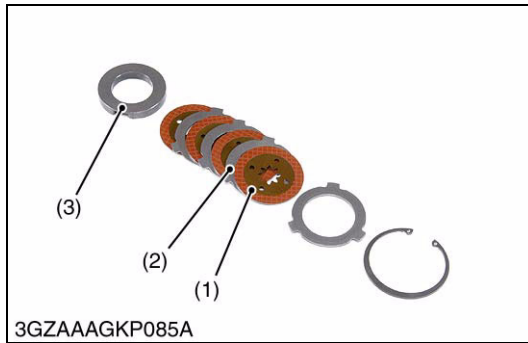
1. Check the surface of the pressure plate (1), PTO clutch discs (2) and PTO clutch plates (3).
2. If excessive wear is found, replace it to a new one.

(1) Pressure Plate
(2) PTO Clutch Disc

(3) PTO Clutch Plate

9Y1210301TXS0080US0

[4] BRAKE



Checking Brake Discs, Friction Plates and Actuator

1. Check the surface of the brake discs (2), friction plates (1) and actuator (3). If excessive wear is found, replace it to a new one.

(1) Friction Plate
(2) Brake Disc

(3) Actuator

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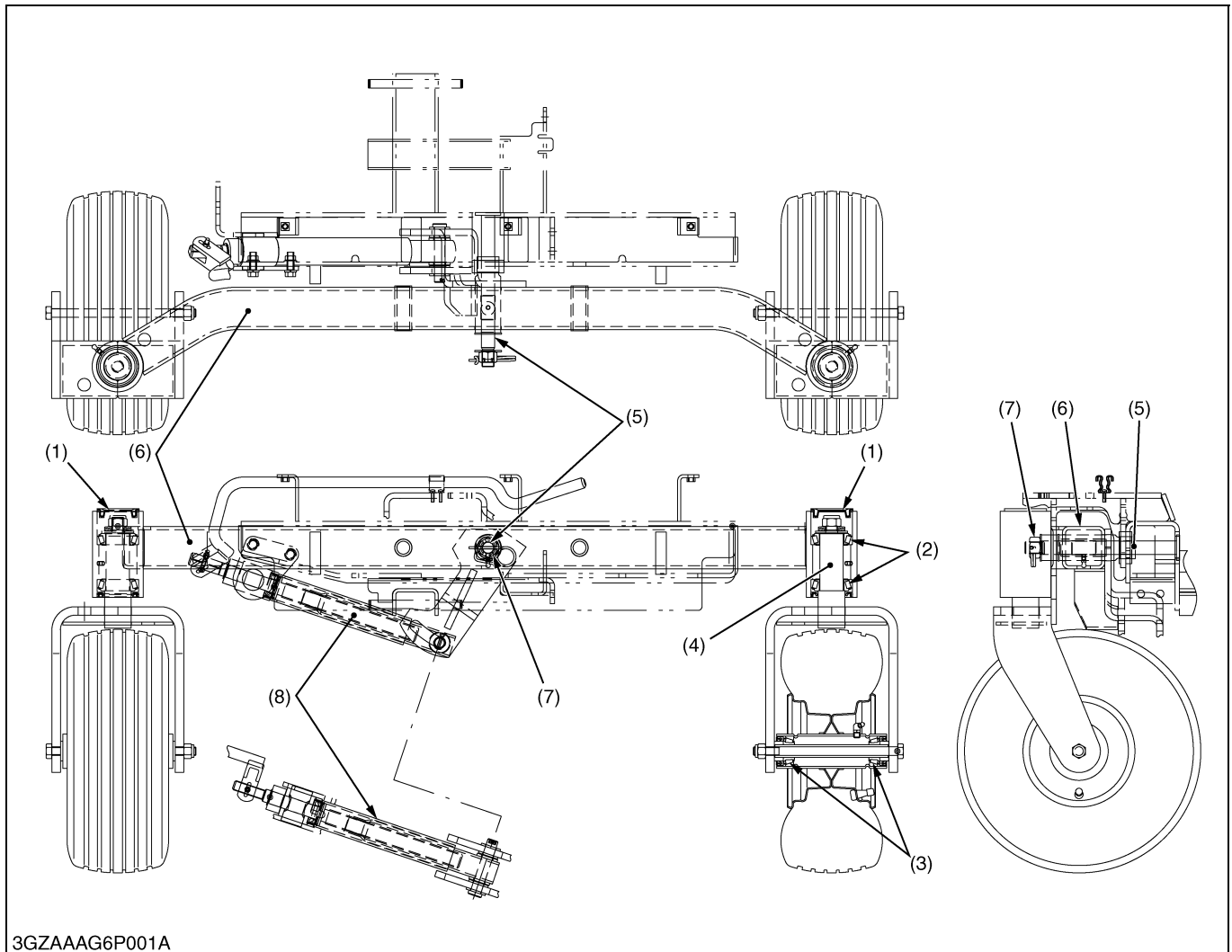
3 FRONT AXLE

MECHANISM

CONTENTS

1. STRUCTURE.....	3-M1
-------------------	------

1. STRUCTURE



3GZAAAG6P001A

- | | | | |
|--------------------------|--------------------------|----------------|----------------------|
| (1) Cap | (3) Taper Roller Bearing | (5) Center Pin | (7) Slotted Nut |
| (2) Taper Roller Bearing | (4) Wheel Bracket | (6) Front Axle | (8) Lift Up Adjuster |

The front axle is constructed as shown above. The shape of the front axle is relatively simple, and the front axle is supported at its center with the center pin (5), so that steering operation is stable even on uneven grounds in a grass field. And this time, the structure that the front axle can be fixed is adopted.

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SERVICING

CONTENTS

- 1. TROUBLESHOOTING.....3-S1
- 2. SERVICING SPECIFICATIONS3-S2
- 3. TIGHTENING TORQUES.....3-S3
- 4. CHECKING, DISASSEMBLING AND SERVICING3-S4
 - [1] CHECKING AND ADJUSTING.....3-S4
 - [2] DISASSEMBLING AND ASSEMBLING3-S5
 - (1) Separating Front Wheel and Wheel Bracket3-S5
 - (2) Separating Front Axle Assembly3-S6

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	Clearance between center pin and front axle excessive	Replace	3-S7
	Force of the lock nut which tighten the wheel bracket has become down	Adjust	3-S5
	Clearance between front axle and front axle support excessive	Adjust	3-S4

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Axle End Play	Clearance A	0 to 0.2 mm 0 to 0.008 in.	0.5 mm 0.02 in.

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3. TIGHTENING TORQUES

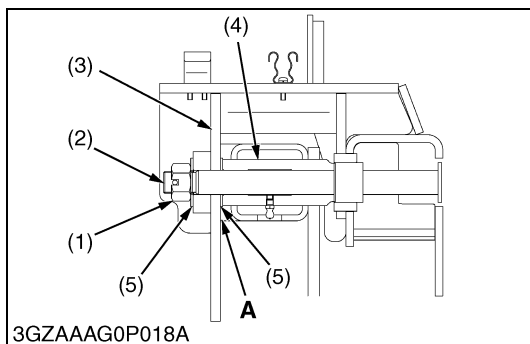
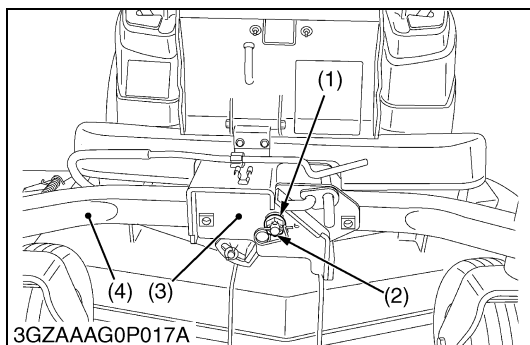
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-11.)

Item	N·m	kgf·m	lbf·ft
Wheel bolt and lock nut	20 to 25	2.1 to 2.5	15 to 18
Wheel bracket lock nut	45 to 55	4.6 to 5.6	34 to 40
Center pin lock nut (Slotted nut)	40 to 80	4.1 to 8.1	30 to 59
Connecting plate mounting screw	48 to 55	4.9 to 5.7	36 to 41

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



Adjusting Front Axle Pivot

1. Lift up and securely block the front of the machine.
2. Measure the clearance "A" between the front axle (4) and front axle support (3).
3. If the measurement exceeds the allowable limit, remove the set spring and adjust the end play by slotted nut (1).

(When reassembling)

Tightening torque	Center pin lock nut (Slotted nut)	40 to 80 N·m 4.1 to 8.1 kgf·m 30 to 59 lbf·ft
-------------------	--------------------------------------	---

■ NOTE

- When fastening the center pin (2), tighten the nut (1) so that the front axle may be oscillated smoothly by hand.

Front axle end play "A"	Factory specification	0 to 0.2 mm 0 to 0.008 in.
	Allowable limit	0.5 mm 0.02 in.

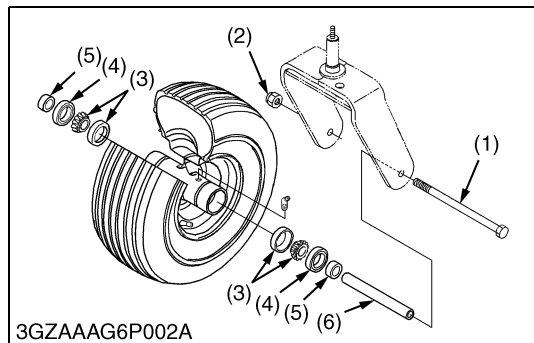
- (1) Slotted Nut
- (2) Center Pin
- (3) Front Axle Support
- (4) Front Axle
- (5) Plain Washer

A: Front Axle End Play

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[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Front Wheel and Wheel Bracket



Remove the Front Wheel

1. Inspect all parts for wear or damage. Replace the parts as needed.

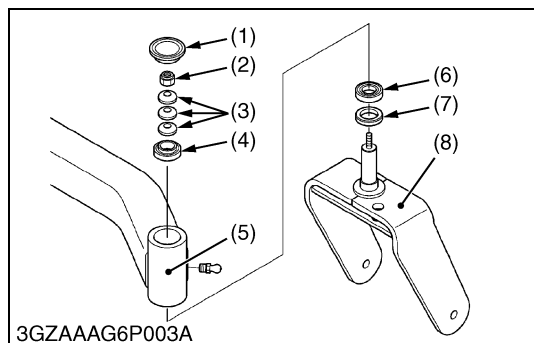
(When reassembling)

- Apply grease to grease fittings. (See page G-9.)

Tightening torque	Front wheel mounting bolt and locking nut	20 to 25 N·m 2.1 to 2.5 kgf·m 15 to 18 lbf·ft
-------------------	---	---

- | | |
|--------------------------|--------------|
| (1) Bolt | (4) Oil Seal |
| (2) Locking Nut | (5) Spacer |
| (3) Taper Roller Bearing | (6) Sleeve |

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Remove the Wheel Bracket

1. Remove the cap (1).
2. Remove the locking nut (2) and wheel bracket (8).
3. Inspect all parts for wear or damage. Replace the parts as needed.

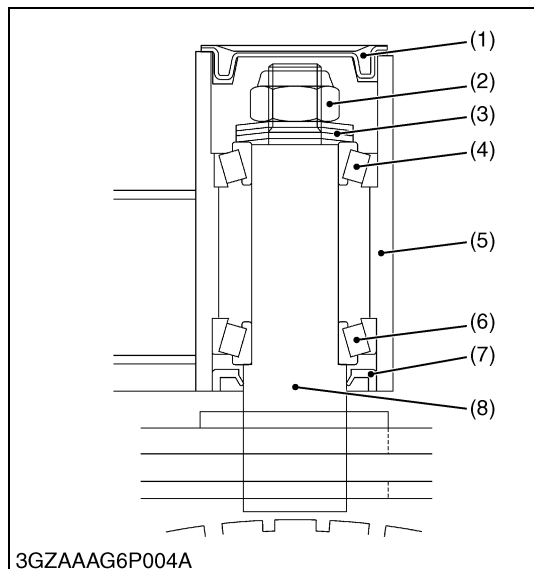
(When reassembling)

- Do not mistake the direction when reassembling the plate spring (3), taper roller bearing (4), (6) and oil seal (7).

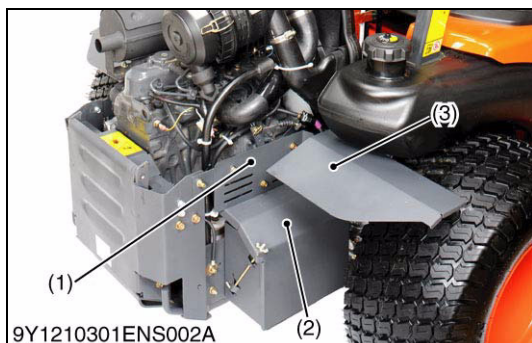
Tightening torque	Locking nut tightening torque	45 to 55 N·m 4.6 to 5.6 kgf·m 34 to 40 lbf·ft
-------------------	-------------------------------	---

- | | |
|--------------------------|--------------------------|
| (1) Cap | (5) Front Axle |
| (2) Locking Nut | (6) Taper Roller Bearing |
| (3) Plate Spring | (7) Oil Seal |
| (4) Taper Roller Bearing | (8) Bracket |

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(2) Separating Front Axle Assembly

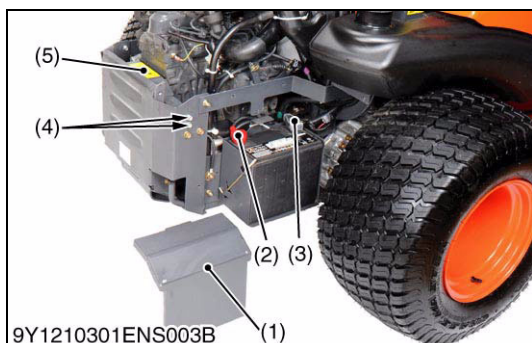


Battery Cover

1. Remove the side covers L, R (1) and the rear fenders L, R (3).
2. Remove the battery cover (2).

- | | |
|-------------------|-----------------|
| (1) Side Cover | (3) Rear Fender |
| (2) Battery Cover | |

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Battery and Flywheel Cover



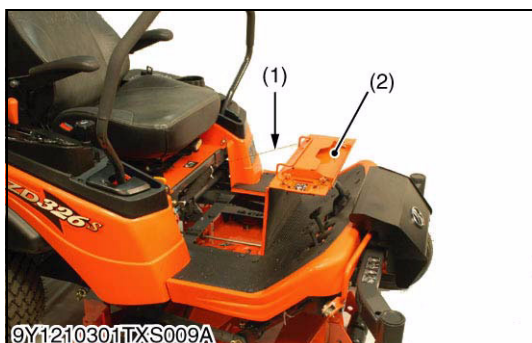
CAUTION

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (3) from the battery.
2. Disconnect the positive cable (2) from the battery.
3. Remove the bolts (4) and flywheel cover (5).

- | | |
|--------------------|--------------------|
| (1) Battery Cover | (4) Bolt |
| (2) Positive Cable | (5) Flywheel Cover |
| (3) Negative Cable | |

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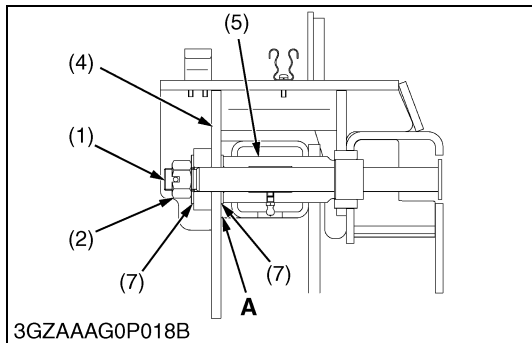
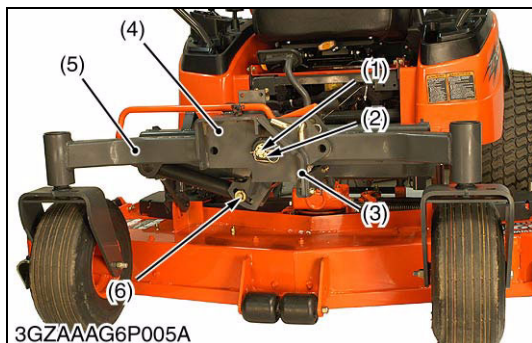
Step Center and Step

1. Remove the clevis pin and remove the cable (1).
2. Remove the clevis pins and remove the step center (2).
3. Remove the front cover (3).
4. Remove the step (4).

- | | |
|-----------------|-----------------|
| (1) Cable | (3) Front Cover |
| (2) Step Center | (4) Step |

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Separating Front Axle Assembly

1. Remove the set spring and slotted nut (2).
2. Remove the cotter pin and clevis pin (6).
3. Remove the connecting plate (3).
4. Lift up and secure with jack stands or blocking the front of machine frame.
5. Remove the center pin (1), and separate the front axle assembly (5).

(When reassembling)

■ NOTE

- Do not hit the center pin.
- After assembling the front axle assembly, be sure check the front axle end play "A". If the measurement is not within the factory specifications, adjust the front axle end play "A".

Tightening torque	Center pin lock nut (slotted nut)	40 to 80 N·m 4.1 to 8.1 kgf·m 30 to 59 lbf·ft
	Connecting plate mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft

Front Axle End Play	Factory specification	0 to 0.2 mm 0 to 0.008 in.
---------------------	-----------------------	-------------------------------

- | | |
|---------------------------------------|------------------|
| (1) Center Pin | (6) Clevis Pin |
| (2) Center Pin Lock Nut (Slotted Nut) | (7) Plain Washer |
| (3) Connecting Plate | |
| (4) Front Axle Support | |
| (5) Front Axle Assembly | |

A: Front Axle End Play

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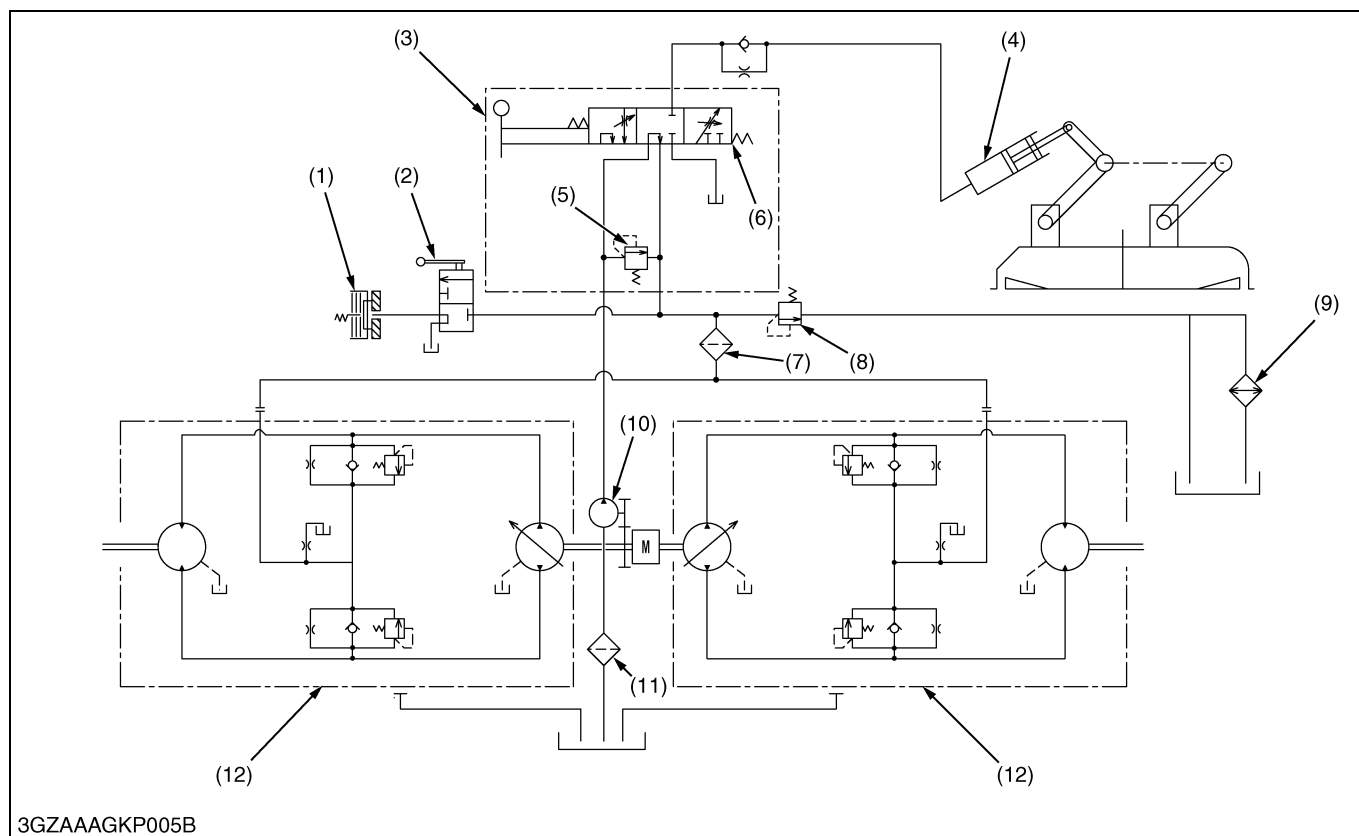
4 HYDRAULIC SYSTEM

MECHANISM

CONTENTS

1. HYDRAULIC CIRCUIT	4-M1
2. HYDRAULIC PUMP.....	4-M2
3. HYDRAULIC CONTROL VALVE.....	4-M3
[1] OPERATION	4-M4
4. LIFT CYLINDER	4-M6
5. MOWER LINKAGE	4-M7

1. HYDRAULIC CIRCUIT



- | | | | |
|--------------------------------------|------------------------|-------------------------|-------------------------------|
| (1) PTO Clutch | (4) Hydraulic Cylinder | (7) TM Oil Filter (HST) | (10) Hydraulic Pump |
| (2) PTO Clutch Valve | (5) Relief Valve | (8) Regulator Valve | (11) Hydraulic Oil Filter |
| (3) Hydraulic Control Valve Assembly | (6) Control Valve | (9) Oil Cooler | (12) Hydrostatic Transmission |

The hydraulic system of this machine consists of a hydraulic pump (10), control valve (6), hydraulic cylinder (4) and other components.

This system has the following functions.

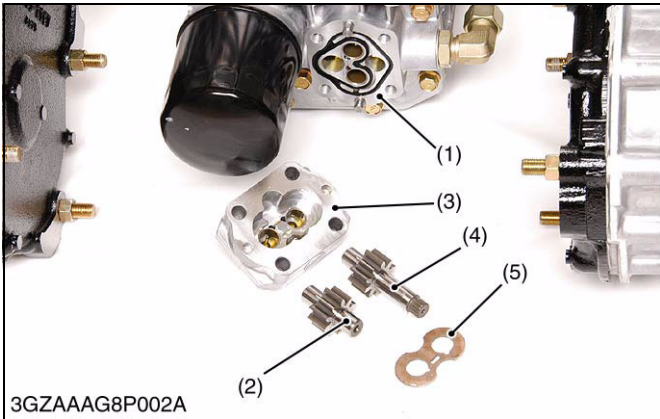
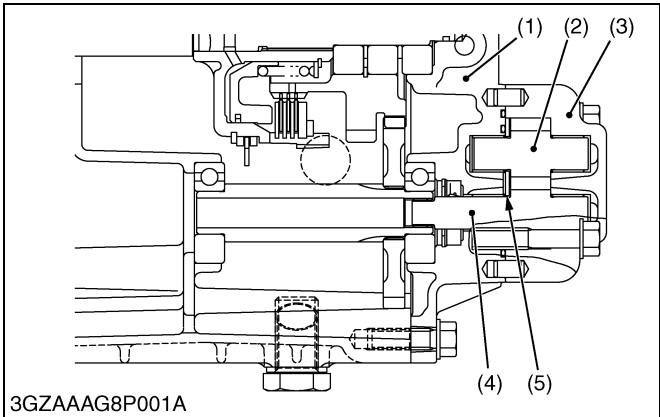
Hydraulic pump (10) supplies oil to hydraulic cylinder (4), PTO clutch (1) and HST (12).

Power from the input shaft (pump shaft) is distributed to right and left with the bevel gears and drives each hydrostatic transmission (12).

Moreover, oil from the hydraulic pump (10) is sent to the transmission center case through the control valve (6). On the other hand, oil is regulated by the regulator valve (8) to constant pressure and is sent to the hydrostatic transmission (12) and PTO clutch (1).

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2. HYDRAULIC PUMP



The hydraulic pump consists of the casing (1), cover (3), side plate (5), and two spur gears (drive gear (4) and driven gear (2)) that are in mesh.

Hydraulic pump is driven by the pump drive shaft in the transmission case.

Maximum displacement is as follows.

Displacement	Engine speed	Condition
21.0 L/min. 5.5 U.S.gals/min. 4.6 Imp.gals/min.	At 3200 min ⁻¹ (rpm)	at no load

- (1) Casing

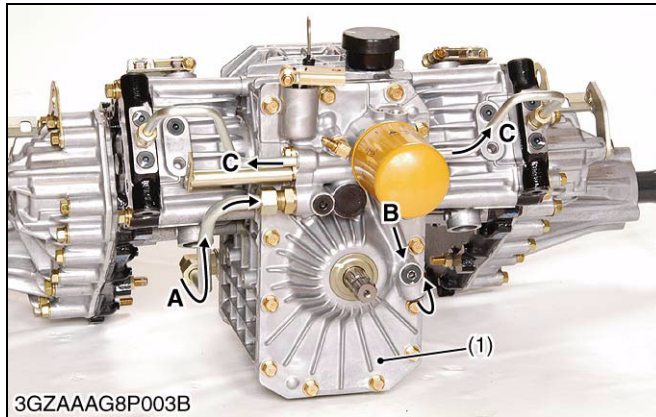
(2) Driven Gear

(3) Cover
- (4) Drive Gear

(5) Side Plate

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3. HYDRAULIC CONTROL VALVE



The hydraulic system consists of the transmission center case (oil tank), cushion oil filter, hydraulic pump, control valve, hydraulic cylinder and etc..

The new series product is provided with a built-in control valve (2) in the center cover (1).

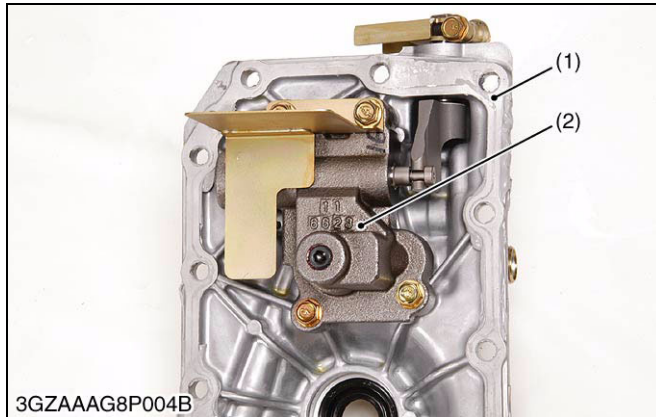
The oil flows through the oil filter, and then the oil is sent to the control valve by the pump.

After flowing through the control valve, the oil is sent to the PTO clutch and the HST charge circuit.

- (1) Center Cover
- (2) Control Valve

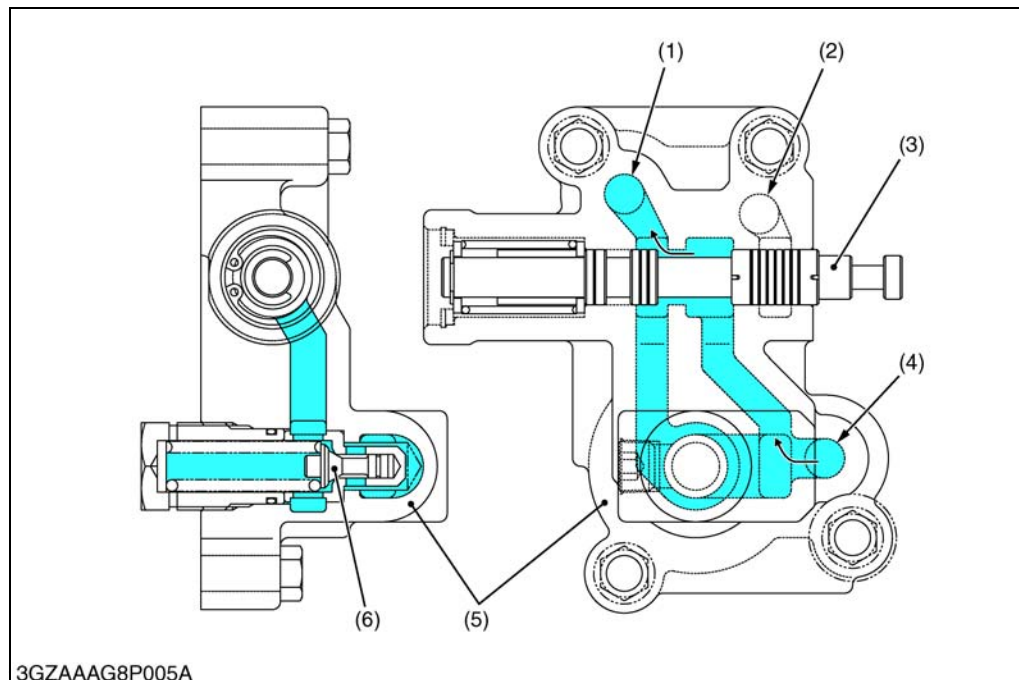
- A: From Hydraulic Pump**
- B: To PTO Clutch**
- C: To Hydrostatic Transmission**

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[1] OPERATION

Neutral

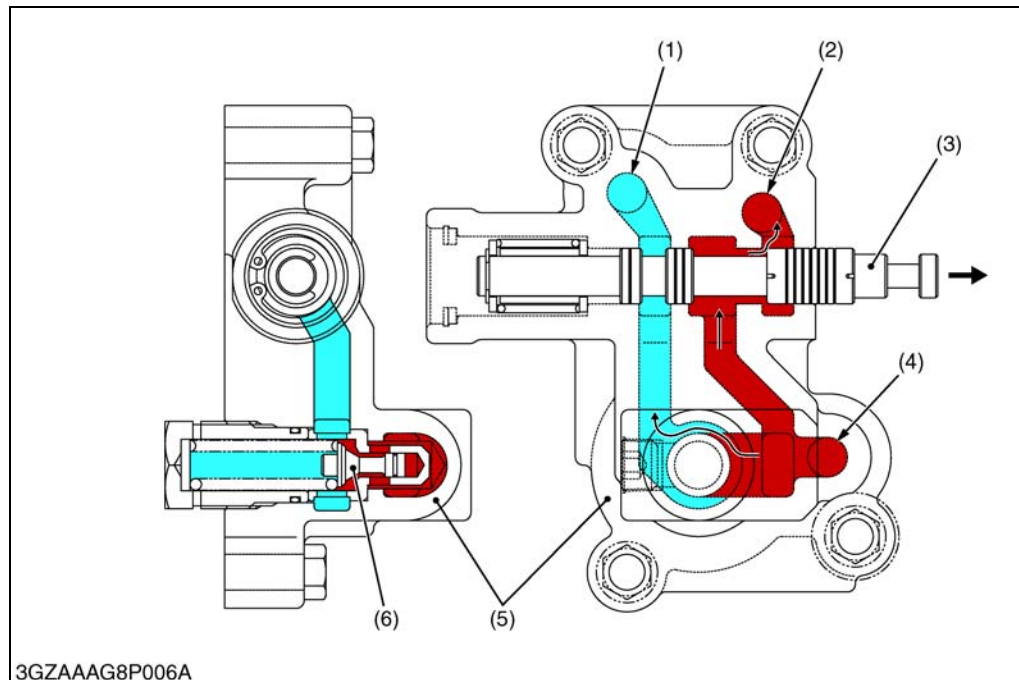


- (1) To PTO Clutch and Hydrostatic Transmission
- (2) **C** (Cylinder) Port
- (3) Spool
- (4) **P** (Pump) Port
- (5) Valve Body
- (6) Relief Valve

The oil sent from the pump passes through a gap between the spool (3) and the valve body (5), through the regulator valve, and then flows to the PTO valve and HST charge circuit. The oil sent to the mower-lifting cylinder is interrupted by the spool (3).

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Lift and Overloaded



- (1) To PTO Clutch and Hydrostatic Transmission
- (2) **C** (Cylinder) Port
- (3) Spool
- (4) **P** (Pump) Port
- (5) Valve Body
- (6) Relief Valve

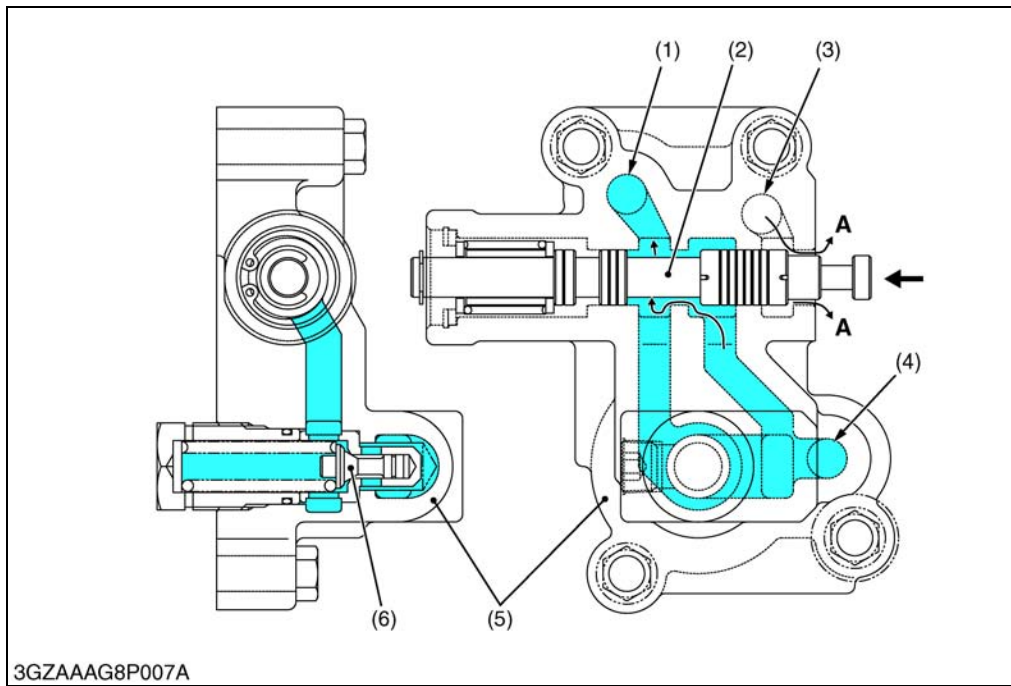
The oil from the pump flows through a hydraulic circuit, which is switched over by the spool (3), and is sent to the mower-lifting cylinder (2). When the mower is lifted, the relief valve (6) also operates. As a result, the oil passing through the relief valve (6) is always sent to the PTO valve and HST charge circuit.

(Reference)

- Relief valve setting pressure
5.5 to 7.0 MPa (56 to 71 kgf/cm², 800 to 1000 psi)
- Engine speed
1800 min⁻¹ (rpm)

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(EU)
KiSC issued 07, 2011 A

Down

- (1) To PTO Clutch and Hydrostatic Transmission
- (2) Spool
- (3) C (Cylinder) Port
- (4) P (Pump) Port
- (5) Valve Body
- (6) Relief Valve

A: Drain directly to the Transmission Center Case

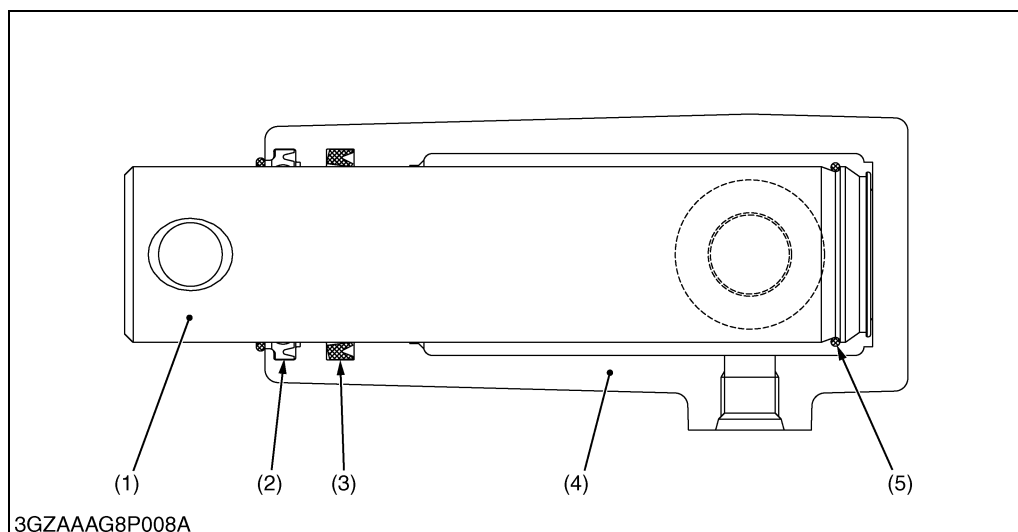
The oil sent from the pump passes through a gap between the spool (2) and the valve body (5), through the regulator valve, and then the oil flows to the PTO valve and HST charge circuit.

The mower-lifting cylinder circuit, which has been interrupted by the spool, is returned to the transmission center case by the pressed-in spool, and a new circuit is formed.

Then the oil in the mower-lifting cylinder is discharged to the transmission center case, and the mower goes down.

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4. LIFT CYLINDER

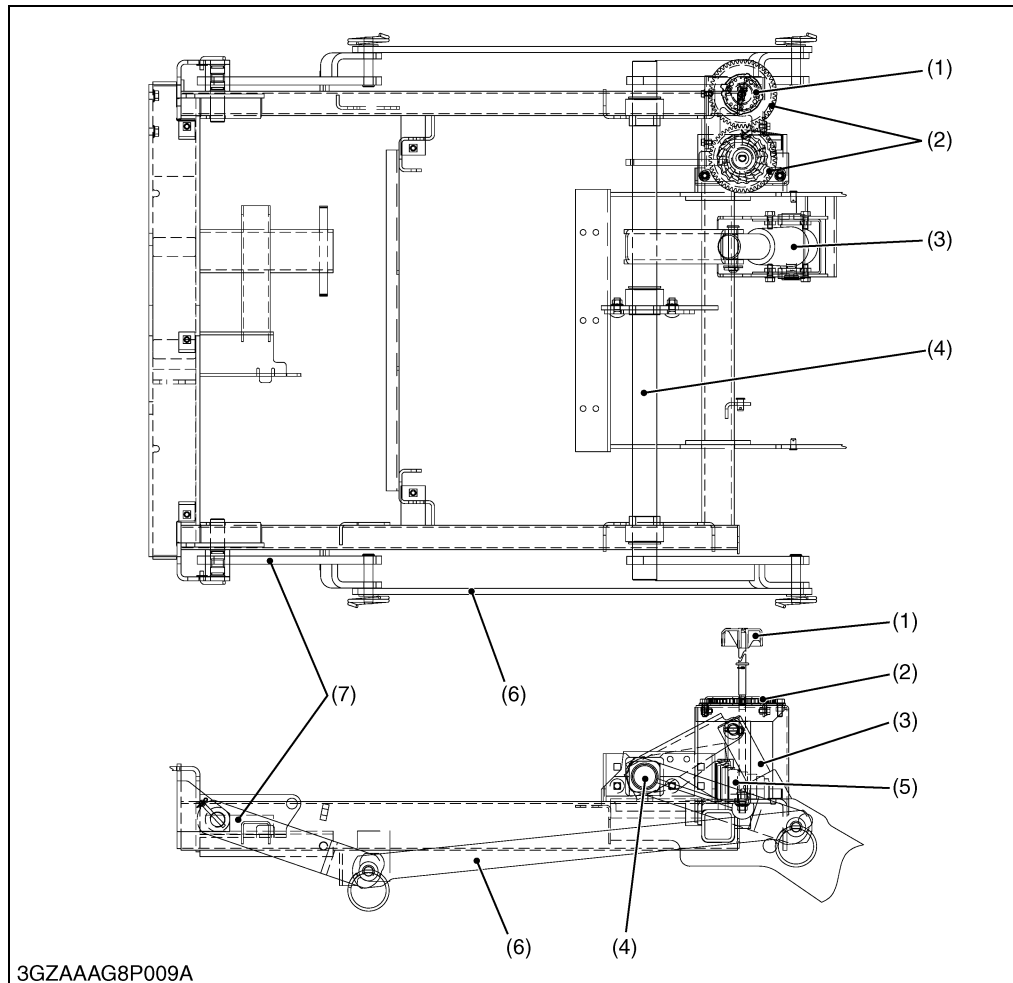


- (1) Piston Rod
- (2) Scraper
- (3) Packing
- (4) Cylinder
- (5) Snap Ring

The lift cylinder consists of the cylinder (4), piston rod (1) and other parts as shown in the figure above.
This cylinder is single acting type.

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5. MOWER LINKAGE



- (1) Cutting Height Adjusting Dial
- (2) Dial Cam Gear
- (3) Lift Cylinder
- (4) Lift Shaft
- (5) Adjusting Cam
- (6) Horizon Plate
- (7) Front Arm

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The lifting of mower is controlled by the hydraulic system on the machine.

Front arm (7) and lift shaft (4) are linked with horizon plate (6). When the position control lever is moved to **"LIFT"** position, the horizon plate (6) is risen by the oil pressure of hydraulic system.

Therefore, front arm (7) connected with the horizon plate (6) are lifted at the same time.

As this link system is a parallel linkage, the mower can be kept parallel at every position.

The cutting height adjusting dial (1) adjusts the cutting height of mower by rotating the adjusting cam (5).



CAUTION

- Never operate mower in transport position.

9Y1210301HYM0008US0

SERVICING

CONTENTS

1. TROUBLESHOOTING.....	4-S1
2. SERVICING SPECIFICATIONS	4-S2
3. TIGHTENING TORQUES	4-S3
4. CHECKING, DISASSEMBLING AND SERVICING	4-S4
[1] HYDRAULIC CONTROL VALVE, PUMP AND CYLINDER.....	4-S4
(1) Checking and Adjusting.....	4-S4
(2) Disassembling and Assembling the Hydraulic Control Valve	4-S5
(3) Disassembling and Assembling the Hydraulic Pump	4-S9
[2] LIFTING LINKAGE	4-S15
(1) Disassembling and Assembling.....	4-S15

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Mower Does Not Rise	Control valve malfunctioning	Repair or replace	4-S4, 4-S7
	Lift cylinder damaged	Replace	4-S15
	Relief valve spring damaged	Replace	4-S7
	Relief valve setting pressure too low	Adjust	4-S4
	Hydraulic pump defective	Replace	4-S9, 4-S13, 4-S14
	Oil filter clogged	Clean or replace	G-33
	Suction pipe loosened or broken	Repair or replace	–
	Insufficient transmission oil	Refill	G-9
Mower Does Not Lower	Control valve malfunctioning	Repair or replace	4-S4, 4-S7
Mower Drops by Its Weight	Lift cylinder worn or damaged	Replace	4-S15
	Control valve malfunctioning	Replace	4-S4, 4-S7

9Y1210301HYS0009US0

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Relief Valve (Control Valve)	Setting Pressure [at engine speed 1800 min ⁻¹ (rpm)]	5.5 to 7.0 MPa 56 to 71 kgf/cm ² 800 to 1000 psi	—

9Y1210301HYS0010US0

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-11.)

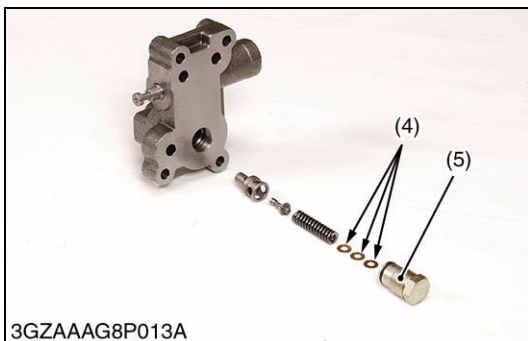
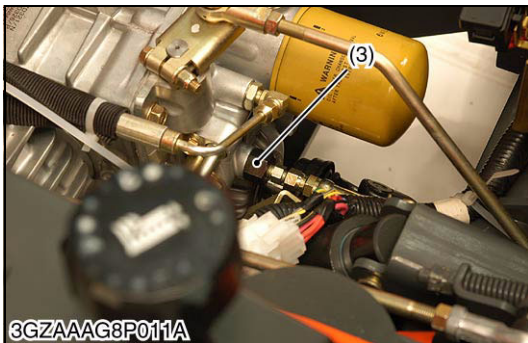
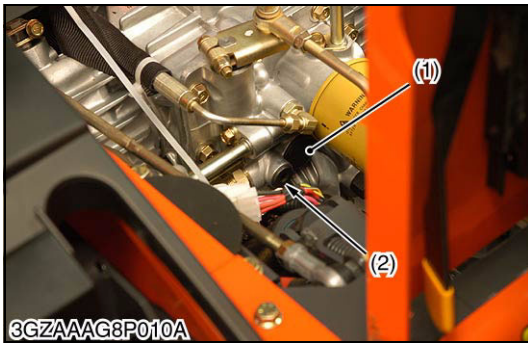
Item	N·m	kgf·m	lbf·ft
Center case front cover mounting screw	40 to 44	4.0 to 4.5	29 to 32
Hydraulic control valve mounting screw	18 to 20	1.8 to 2.1	13 to 15
Relief valve plug	49 to 68	5.0 to 7.0	37 to 50
ROPS connecting plate mounting screw (M8)	24 to 27	2.4 to 2.8	18 to 20
ROPS connecting plate, under mounting screw (M10)	48 to 55	4.9 to 5.7	36 to 41
Hydraulic pump mounting screw	40 to 44	4.0 to 4.5	29 to 32
Cover mounting screw	35 to 39	3.5 to 4.0	26 to 28
Universal joint mounting screw	26.5 to 28.4	2.7 to 2.9	19.6 to 20.9
Engine mounting nut	24 to 27	2.4 to 2.8	18 to 20

9Y1210301HYS0011US0

4. CHECKING, DISASSEMBLING AND SERVICING

[1] HYDRAULIC CONTROL VALVE, PUMP AND CYLINDER

(1) Checking and Adjusting



Relief Valve Setting Pressure

1. Remove the plug (2) from the front cover of transmission center case.
2. Install the adaptor (3/8 in., straight thread), cable and pressure gauge.
3. Start the engine and set at maximum speed.
4. Move the control pedal to "LIFT" position to operate the relief valve and read the gauge.
5. If the pressure is not within the factory specifications, adjust with the adjusting shims (4).

(Adjusting procedure)

- Remove the plug (1), and remove the plug (5) of relief valve. Then, adjust the thickness of shims.

Relief valve setting pressure	Factory specification	5.5 to 7.0 MPa 56 to 71 kgf/cm ² 800 to 1000 psi
-------------------------------	-----------------------	---

Condition

- Engine speed
1800 min⁻¹ (rpm)
- Oil temperature
45 to 55 °C (113 to 131 °F)

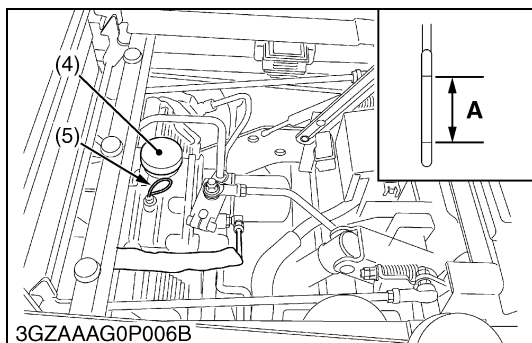
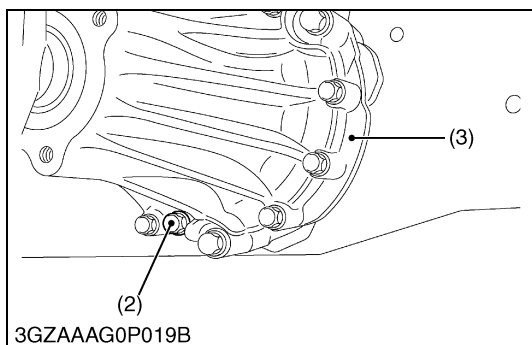
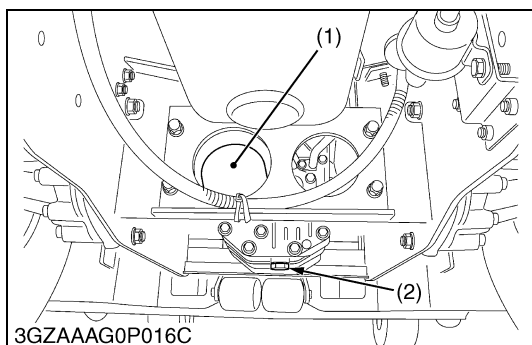
(Reference)

- Replace the hydraulic pump if pressure does not rise in 5 MPa (50 kgf/cm², 700 psi) or more.
- Thickness of shims (4):
0.2 mm (0.0079 in.)
0.3 mm (0.0118 in.)
0.8 mm (0.0315 in.)

- | | |
|-------------------------------------|----------|
| (1) Plug | (4) Shim |
| (2) Plug (3/8 in., straight thread) | (5) Plug |
| (3) Adaptor | |

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(2) Disassembling and Assembling the Hydraulic Control Valve



Draining Transmission Fluid



CAUTION

To avoid personal injury:

- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow transmission case to cool down sufficiently; oil can be hot and may cause burns.

The fluid in the transmission case is also used for the hydrostatic drive system.

1. To drain the transmission oil, place oil pan underneath the transmission case and the rear axle gear case (RH and LH) and remove the drain plug at the bottom of the transmission case and the rear axle gear case (RH and LH).
2. After draining, reinstall the drain plugs.
3. Fill with new fluid from filling port after removing the filling plug (4) up the upper notch on the dipstick.

■ IMPORTANT

- If takes time to pour the oil from the transmission case to reach the rear axle case (RH and LH) pour the regulated amount of oil slowly.

4. After running the engine for a few minutes, stop it and check the oil level again; add oil to the prescribed level.

■ IMPORTANT

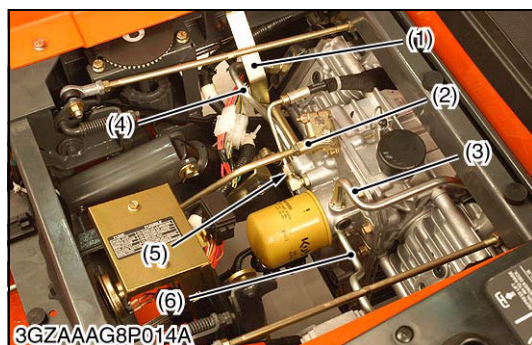
- Operate only at low RPM's immediately after changing the transmission fluid and filter cartridge. Keep the engine at medium speed for a few minutes to insure proper lubrication of all parts so there is no damage to transmission.
- Use only multi-grade transmission oil. Use of other oils may damage the transmission of hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)
- Do not mix different brands oil together.

Transmission fluid capacity	12.1 L 12.8 U.S.qts 10.6 Imp.qts
-----------------------------	--

- (1) Hydraulic Oil Filter
- (2) Drain Plug
- (3) Rear Axle Gear Case LH
- (4) Oil Plug and Breather Cup
- (5) Dipstick

A: Oil level acceptable within this range

9Y1210301TXS0025US0



PTO Clutch Link, Cylinder Hose, Oil Cooler Pipe and HST Charge Pipes

1. Remove the seat and seat base assembly.
2. Remove the PTO clutch link (1).
3. Remove the lift rod (2).
4. Disconnect the oil cooler pipe (3).
5. Remove the HST pipes (4), (6).
6. Disconnect the delivery pipe (5).

(When reassembling)

- Take care not to damage O-ring on the pipes.

- | | |
|---------------------|-------------------|
| (1) PTO Clutch Link | (4) HST Pipe |
| (2) Lift Rod | (5) Delivery Pipe |
| (3) Oil Cooler Pipe | (6) HST Pipe |

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PTO Clutch Lever, Delivery Pipe, Pipe Fitting, Universal Joint and PTO Shaft Oil Seal

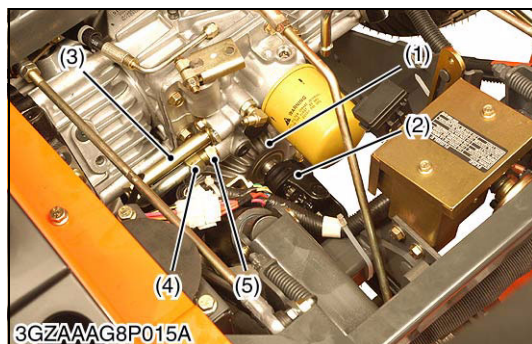
1. Disconnect the universal joint (2).
2. Remove the PTO shaft oil seal (1).
3. Remove the PTO clutch lever stopper, and remove the PTO clutch lever (3).
4. Remove the delivery pipe (4) and pipe fitting (5).

(When reassembling)

- Replace the PTO shaft oil seal (1) with new one.

- | | |
|------------------------|-------------------|
| (1) PTO Shaft Oil Seal | (4) Delivery Pipe |
| (2) Universal Joint | (5) Pipe Fitting |
| (3) PTO Clutch Lever | |

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Center Case Front Cover Assembly

1. Wrap the tape (1) around the PTO shaft to prevent it from damaging internally of the center case front cover.
2. Remove the center case front cover mounting screw, and separate the center case and center case front cover.
3. Remove the plate (2) from hydraulic control valve (3).
4. Remove the center case front cover assembly (4).

(When reassembling)

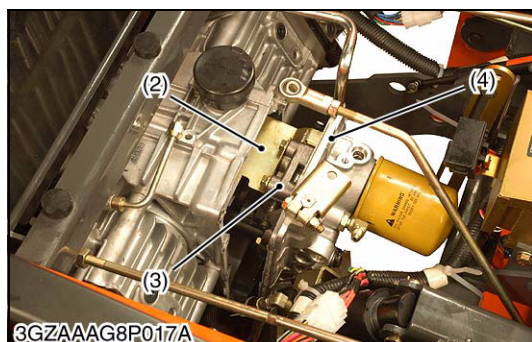
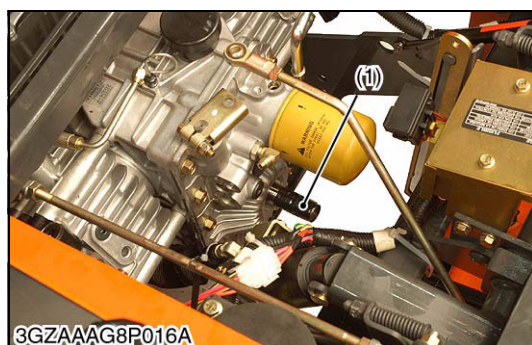
■ NOTE

- Assemble the plate (2) as shown in the photo. If the plate (2) is mounted onto the valve first, the front cover (4) cannot be mounted onto the transmission center case.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of center case and center case front cover.

Tightening torque	Center case front cover mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
-------------------	--	---

- | | |
|-----------|-----------------------------|
| (1) Tape | (3) Hydraulic Control Valve |
| (2) Plate | (4) Front Cover Assembly |

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Lift Shaft and Arm

1. Remove the lift arm (1).
2. Remove the oil seal (3).
3. Remove the internal snap ring (4).
4. Remove the lift shaft (5) with ball bearings and remove the arm (2).

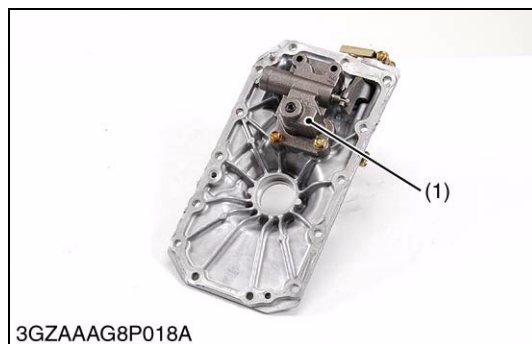
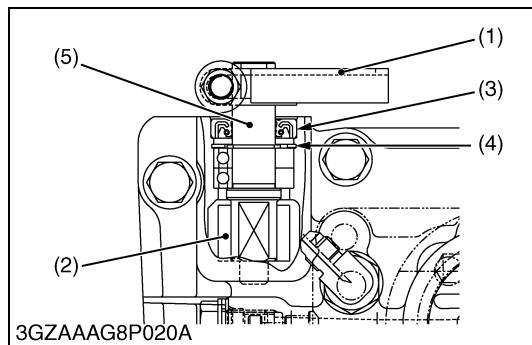
(When reassembling)

- Replace the oil seal (3) with new one.

- (1) Lift Arm
(2) Arm
(3) Oil Seal

- (4) Internal Snap Ring
(5) Lift Shaft

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Removing Hydraulic Control Valve

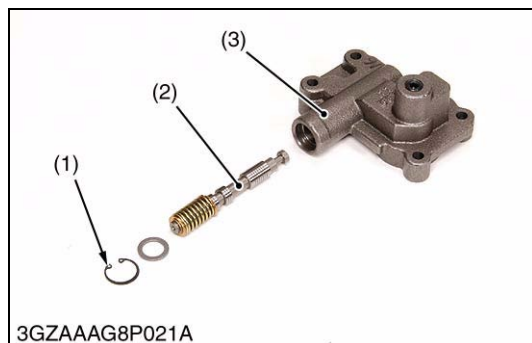
1. Remove the hydraulic control valve (1).

(When reassembling)

Tightening torque	Hydraulic control valve mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
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- (1) Hydraulic Control Valve

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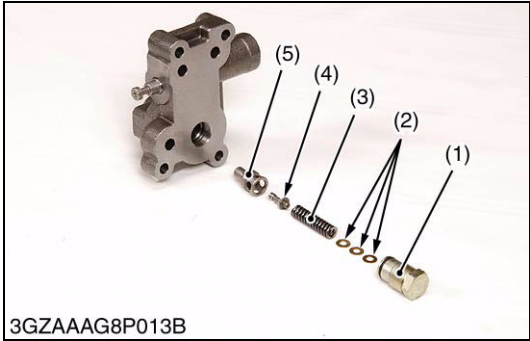
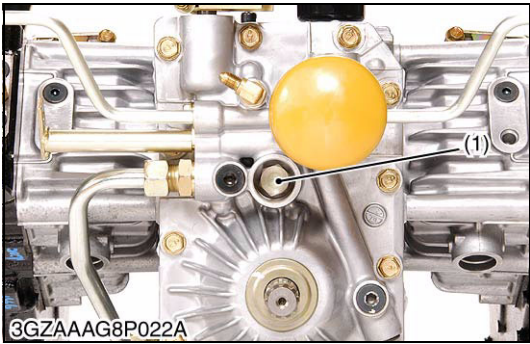


Spool

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

- (1) Internal Snap Ring
(2) Spool
(3) Valve Body

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Relief Valve

1. Remove the plug (1), and remove the shims (2), spring (3), poppet (4) and valve seat (5).

(When reassembling)

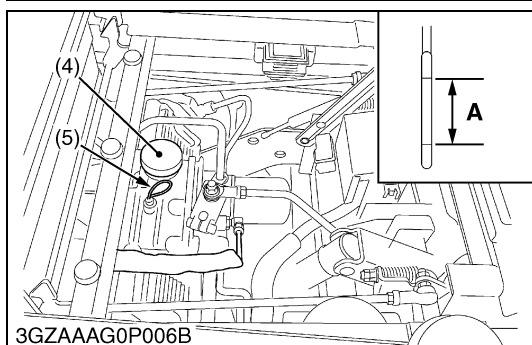
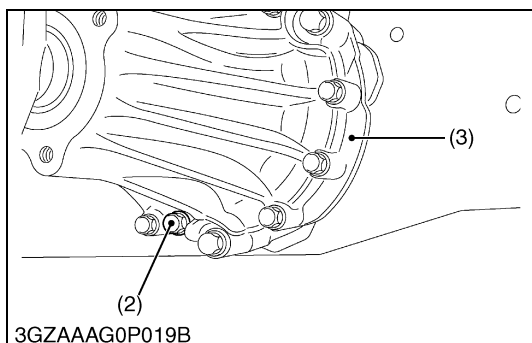
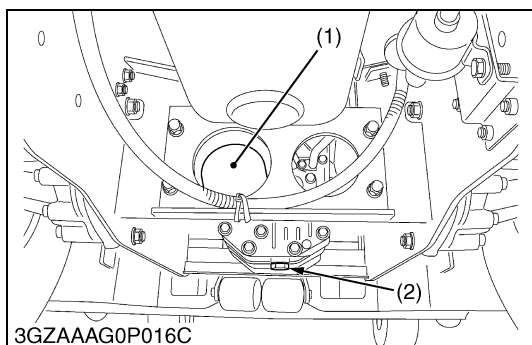
- Take care not to damage the O-ring on plug.

Tightening torque	Relief valve plug	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft
-------------------	-------------------	---

- | | |
|------------|----------------|
| (1) Plug | (4) Poppet |
| (2) Shim | (5) Valve Seat |
| (3) Spring | |

9Y1210301HYS0019US0

(3) Disassembling and Assembling the Hydraulic Pump



Draining Transmission Fluid



CAUTION

To avoid personal injury:

- Be sure to stop the engine and remove the key before changing or checking the oil.
- Allow transmission case to cool down sufficiently; oil can be hot and may cause burns.

The fluid in the transmission case is also used for the hydrostatic drive system.

1. To drain the transmission oil, place oil pan underneath the transmission case and the rear axle gear case (RH and LH) and remove the drain plug at the bottom of the transmission case and the rear axle gear case (RH and LH).
2. After draining, reinstall the drain plugs.
3. Fill with new fluid from filling port after removing the filling plug (4) up the upper notch on the dipstick.

IMPORTANT

- If takes time to pour the oil from the transmission case to reach the rear axle case (RH and LH) pour the regulated amount of oil slowly.

4. After running the engine for a few minutes, stop it and check the oil level again; add oil to the prescribed level.

IMPORTANT

- Operate only at low RPM's immediately after changing the transmission fluid and filter cartridge. Keep the engine at medium speed for a few minutes to insure proper lubrication of all parts so there is no damage to transmission.
- Use only multi-grade transmission oil. Use of other oils may damage the transmission of hydraulic system. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-9.)
- Do not mix different brands oil together.

Transmission fluid capacity	12.1 L 12.8 U.S.qts 10.6 Imp.qts
-----------------------------	--

- (1) Hydraulic Oil Filter
- (2) Drain Plug
- (3) Rear Axle Gear Case LH
- (4) Oil Plug and Breather Cup
- (5) Dipstick

A: Oil level acceptable within this range

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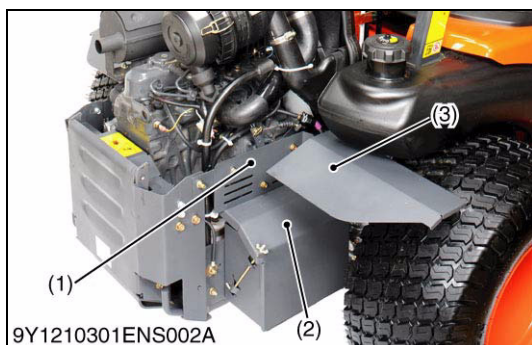
Bonnet

1. Remove the snap pin and bonnet mounting screw, then remove the bonnet (1).

- (1) Bonnet

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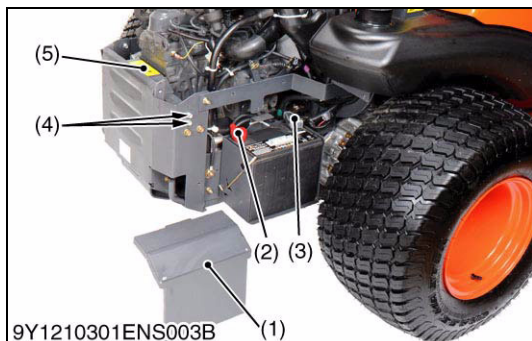


Battery Cover

1. Remove the side covers L, R (1) and the rear fenders L, R (3).
2. Remove the battery cover (2).

- | | |
|-------------------|-----------------|
| (1) Side cover | (3) Rear Fender |
| (2) Battery cover | |

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Battery and Flywheel Cover



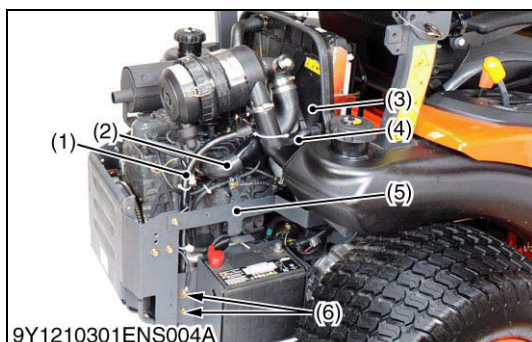
CAUTION

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (3) from the battery.
2. Disconnect the positive cable (2) from the battery.
3. Remove the bolts (4) and flywheel cover (5).

- | | |
|--------------------|--------------------|
| (1) Battery Cover | (4) Bolt |
| (2) Positive Cable | (5) Flywheel Cover |
| (3) Negative Cable | |

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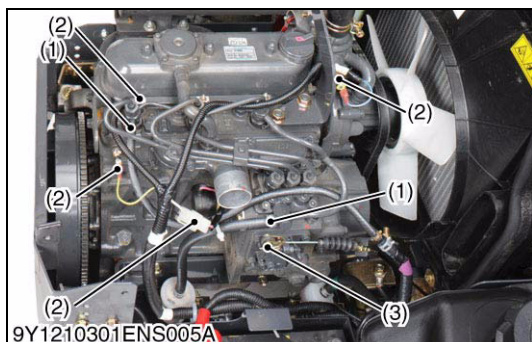


Air Cleaner

1. Remove the side cover stays L, R (5).
2. Remove the bolts (6) for air cleaner support (1).
3. Disconnect the inlet hose (2) from engine.
4. Pull out the intake pipe (4) from the shroud (3).
5. Remove the air cleaner.

- | | |
|-------------------------|---------------------|
| (1) Air Cleaner Support | (4) Intake Pipe |
| (2) Inlet Hose | (5) Side Cover Stay |
| (3) Shroud | (6) Bolts |

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Electric Wiring and Fuel Hoses

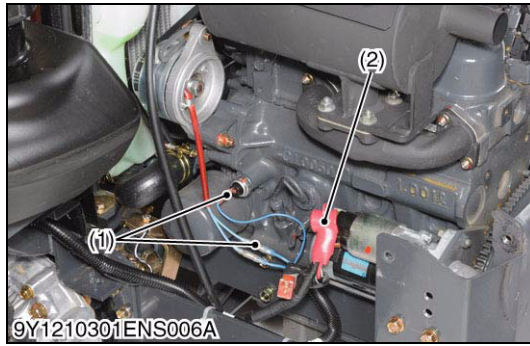
1. Disconnect the wiring connectors (2) for engine stop solenoid, glow plug, coolant temperature sensor, and coolant temperature switch.
2. Disconnect the accelerator wire (3).
3. Disconnect the fuel hoses (1) from engine.

(When reassembling)

- When accelerator wire is installed, adjust the wiring length. The stop lever must hit both the idling speed adjusting bolt and the maximum speed adjusting bolt within the stroke of the accelerator lever.

- | | |
|-----------------------|---------------------------------------|
| (1) Fuel Hose | (3) Accelerator Wire (Throttle Cable) |
| (2) Wiring Connectors | |

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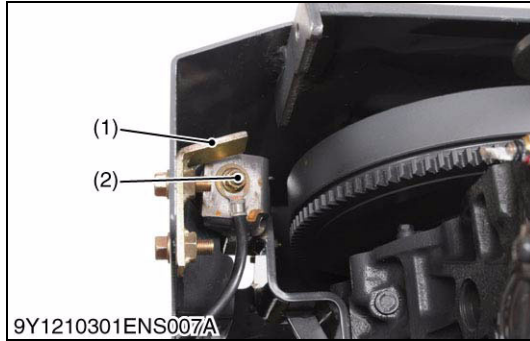
Electric Wiring

1. Disconnect the wiring connectors (1) for dynamo and engine oil pressure switch.
2. Remove the positive cable (2) from the starter motor.

(1) Wiring Connectors

(2) Positive Cable

9Y1210301HYS0005US0



Engine Stopper and Mounting Nuts

1. Remove the engine stoppers (1).
2. Remove the engine mounting nuts (2).
3. Remove the bolts (3) for shroud.

(When reassembling)

- To get a good contact of the ground, attach the ground wire (5) to the specified position (separate position from that of the battery negative cable (4)). (Right side front only)

(1) Engine Stopper

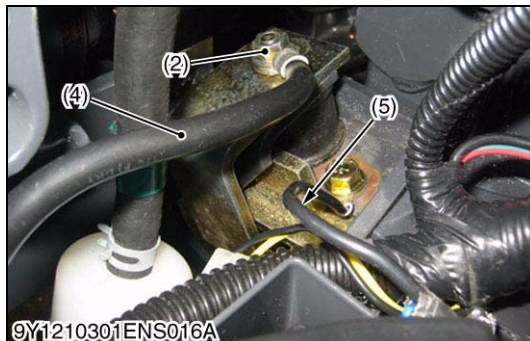
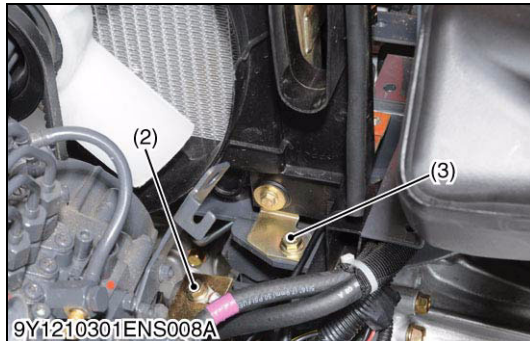
(4) Battery Negative Cable

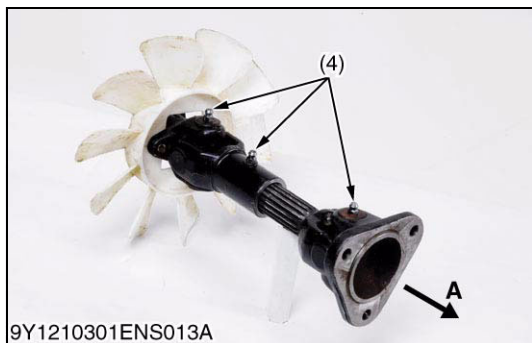
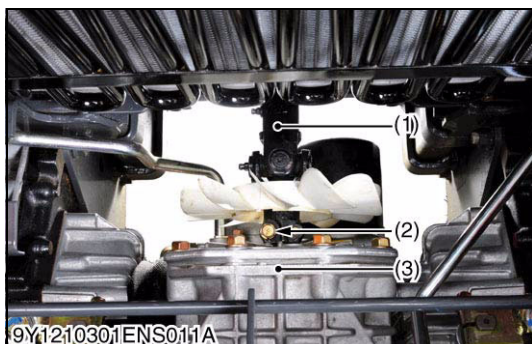
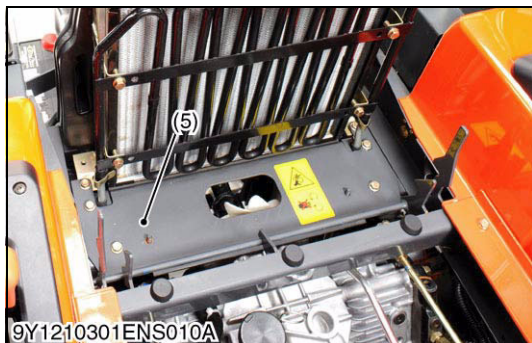
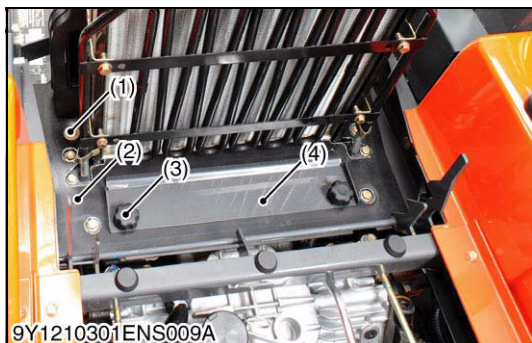
(2) Engine Mounting Nut

(5) Ground Wire

(3) Bolt

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Plate

1. Raise the seat.
2. Remove the knobs (3) and the plate (4).
3. Remove the 2 bolts (1) and the rubber sheet (2).
4. Remove the plate (5).

- | | |
|------------------|-----------|
| (1) Bolt | (4) Plate |
| (2) Rubber Sheet | (5) Plate |
| (3) Knob | |

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Universal Joint

1. Remove the 2 bolts (2).
2. Lift up the engine and separate the universal joint (1) from transmission (3).

(When reassembling)

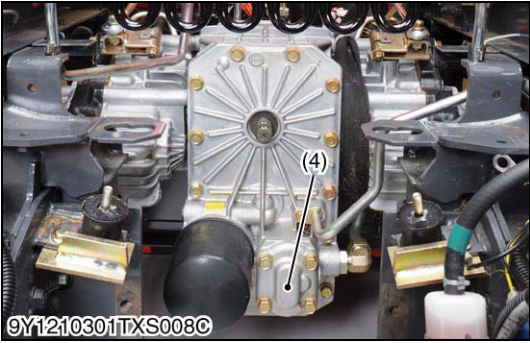
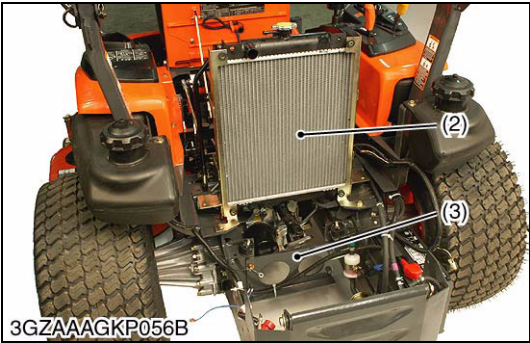
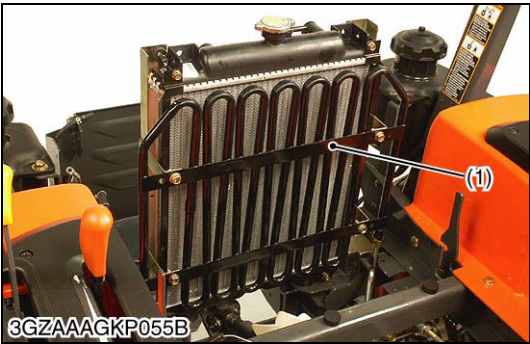
- Apply grease to the all splines on the drive shaft.
- Set the engine on the rubber cushion. Before fastening the engine mounting nuts, connect the universal joint.
- Make sure to align all the grease nipples. Only this one position meets the spline.

Tightening torque	Universal joint mounting screw	26.0 to 28.0 N·m 2.7 to 2.9 kgf·m 19.2 to 20.7 lbf·ft
	Engine mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

- (1) Universal Joint
- (2) Bolt
- (3) Transmission
- (4) Grease Nipple

A: Fixed to the fan drive pulley.

9Y1210301HYS0008US0



Oil Cooler, Radiator and Removing Hydraulic Pump

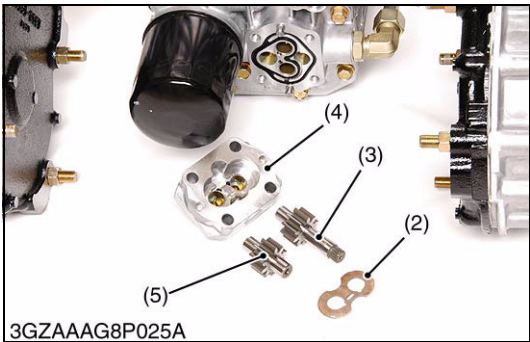
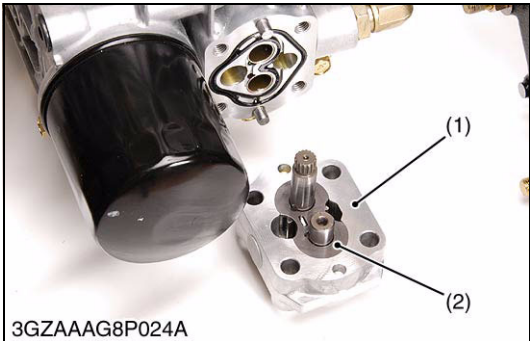
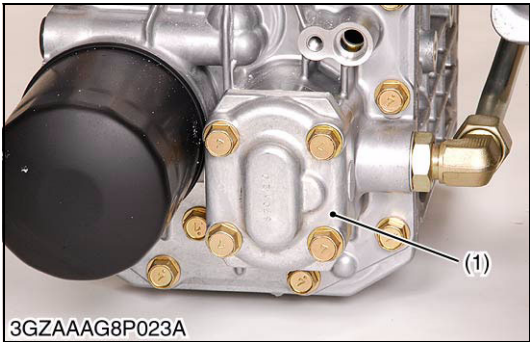
- 1. Remove the oil cooler (1).
- 2. Remove the radiator (2).
- 3. Remove the ROPS connecting plate, under (3).
- 4. Remove the hydraulic pump (4).

(When reassembling)

Tightening torque	ROPS connecting plate mounting screw (M8)	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	ROPS connecting plate, under mounting screw (M10)	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Hydraulic pump mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

- (1) Oil Cooler
- (2) Radiator
- (3) ROPS Connecting Plate, Under
- (4) Hydraulic Pump

9Y1210301HYS0020US0



Hydraulic Pump

1. Remove the hydraulic pump assembly (1).
2. Remove the side plate (2).
3. Remove the drive gear (3) and the driven gear (5) from the casing (4).

(When reassembling)

- Take care not to damage the O-ring.
- Align the holes of the cover and casing.
- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

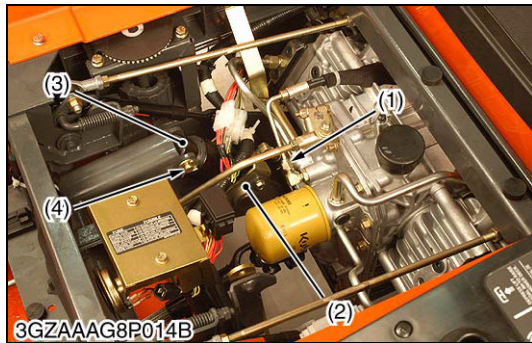
Tightening torque	Cover mounting screw	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
-------------------	----------------------	---

- | | |
|-----------------------------|-----------------|
| (1) Hydraulic Pump Assembly | (4) Casing |
| (2) Side Plate | (5) Driven Gear |
| (3) Drive Gear | |

9Y1210301HYS0021US0

[2] LIFTING LINKAGE

(1) Disassembling and Assembling



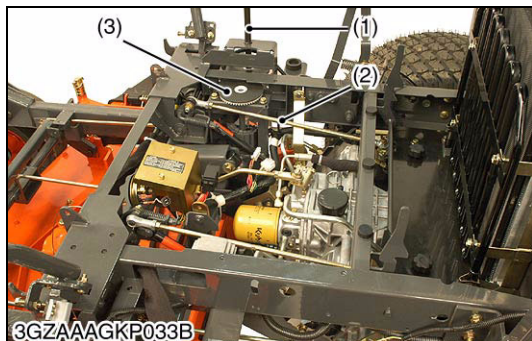
Removing Lift Cylinder

1. Disconnect the cylinder hose (1).
2. Remove the clevis pin (4).
3. Remove the cylinder bracket (2), and remove the bushings.
4. Remove the lift cylinder (3) with cylinder hose (1).

(1) Cylinder Hose
(2) Cylinder Bracket

(3) Lift Cylinder
(4) Clevis Pin

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Dial Cam Gear

1. Remove the cam rod (1).
2. Remove the dial cam gear assembly (2).
3. Remove the gear cover (3).
4. Remove the dial cam gears (4).

(When reassembling)

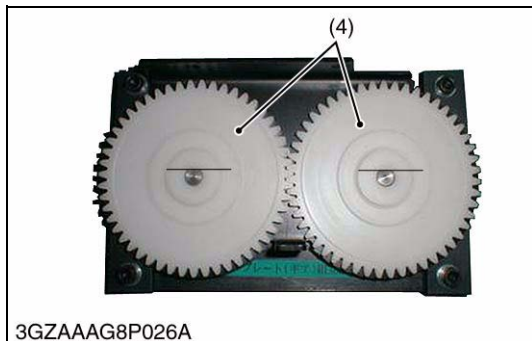
■ NOTE

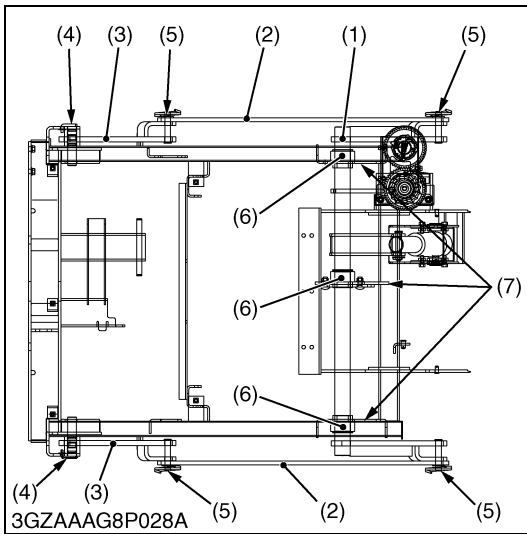
- When assembling the dial cam gear, align the gear notch as shown in photo.

(1) Cam Rod
(2) Cam Gear Assembly

(3) Gear Cover
(4) Dial Cam Gear

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Mower Linkage

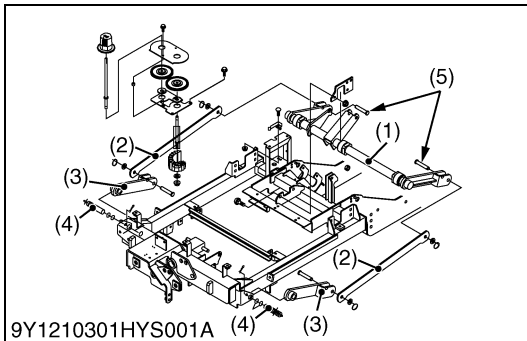
1. Remove the clevis pins (5) and horizon plate (2).
2. Remove the front pin (4) and front arm (3).
3. Remove the clevis pin, and disconnect the lift shaft (1) and lift cylinder.
4. Remove the plates (7) and lift shaft (1) with bushings (6).

(When reassembling)

- Apply grease to front pins (4).

- | | |
|-------------------|----------------|
| (1) Lift Shaft | (5) Clevis Pin |
| (2) Horizon Plate | (6) Bushing |
| (3) Front Arm | (7) Plate |
| (4) Front Pin | |

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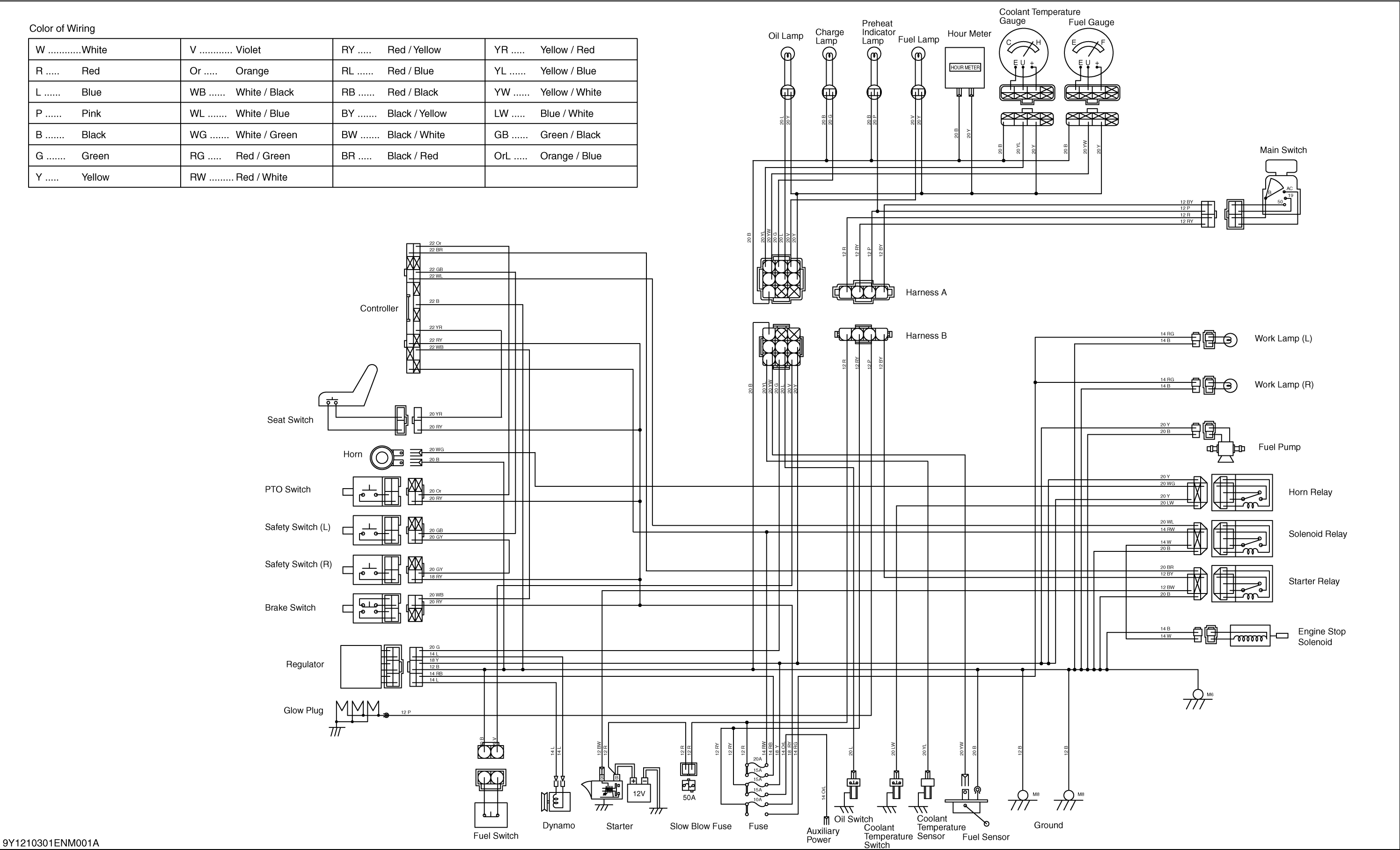
5 ELECTRICAL SYSTEM

MECHANISM

CONTENTS

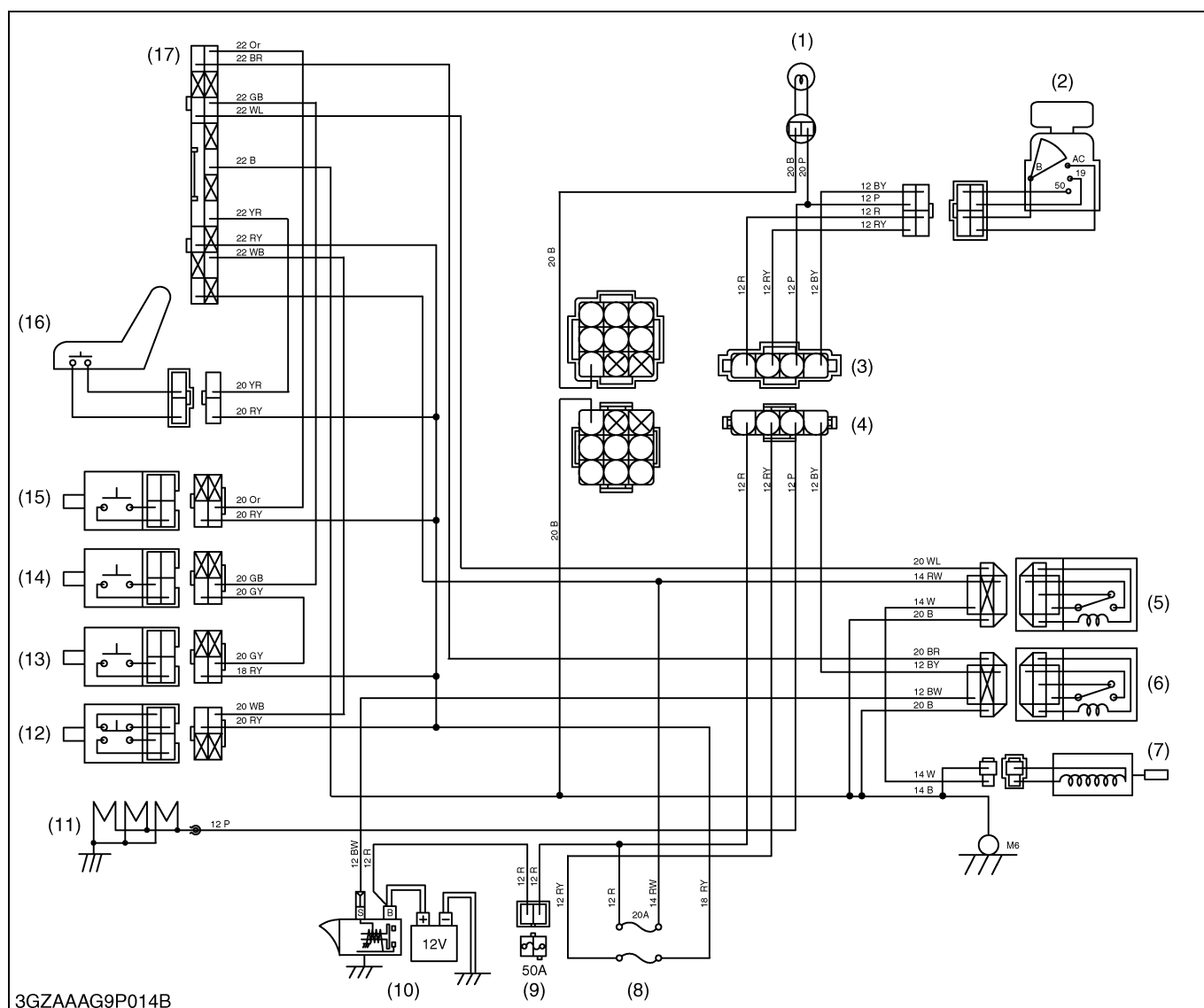
1. WIRING DIAGRAM.....	5-M1
2. STARTING SYSTEM.....	5-M2
[1] RELAY	5-M3
[2] STARTER	5-M4
[3] GLOW PLUG	5-M5
[4] SAFETY SWITCH	5-M5
[5] FUEL PUMP	5-M6
[6] ENGINE STOP SOLENOID	5-M6
3. CHARGING SYSTEM.....	5-M7
[1] AC DYNAMO	5-M8
[2] REGULATOR	5-M8
[3] EASY CHECKER™	5-M9
4. GAUGES	5-M10
[1] FUEL QUANTITY	5-M11
[2] COOLANT TEMPERATURE	5-M11

1. WIRING DIAGRAM



9Y1210301ENM001A

2. STARTING SYSTEM



- | | | | |
|----------------------------|--------------------------|-------------------------|-------------------------|
| (1) Preheat Indicator Lamp | (6) Starter Relay | (10) Starter | (14) Safety Switch (LH) |
| (2) Main Switch | (7) Engine Stop Solenoid | (11) Glow Plug | (15) PTO Switch |
| (3) Harness A | (8) Fuse | (12) Brake Switch | (16) Seat Switch |
| (4) Harness B | (9) Slow Blow Fuse | (13) Safety Switch (RH) | (17) Controller |
| (5) Solenoid Relay | | | |

When the main switch (2) is turned to the **PREHEAT** position, the terminal **B** is connected to the terminals **19** and **AC**. The glow plugs (11) become red-hot, and the preheat indicator lamp (1) also lights on while preheating.

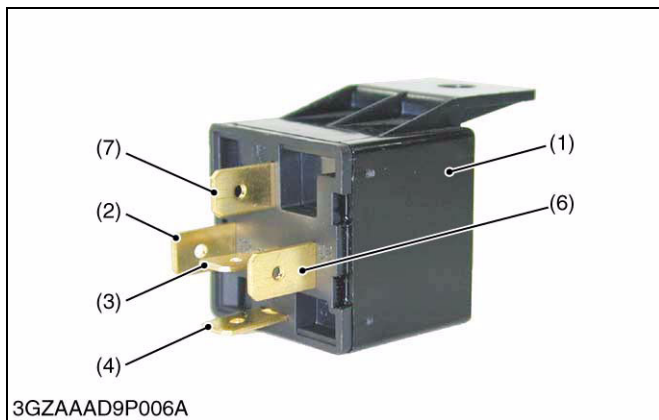
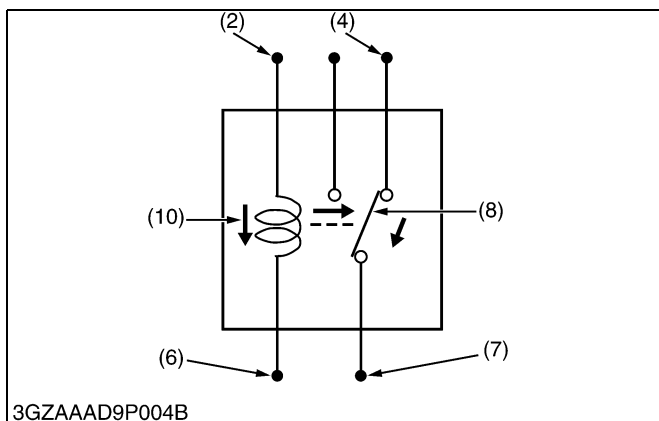
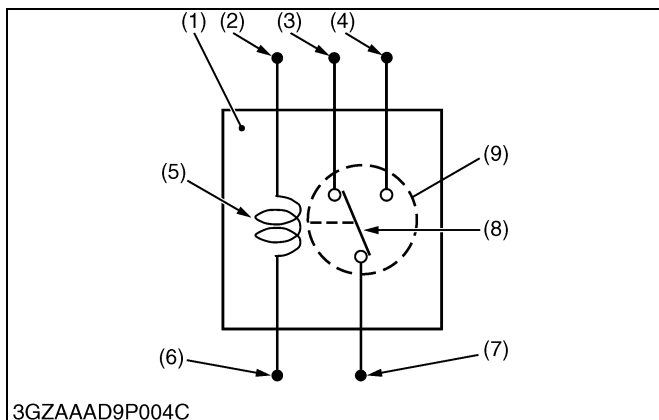
When the main switch is then turned to the **START** position with the safety switches on, the terminal **B** is connected to the terminals **50** and **AC**. Consequently, battery current flows to the starter motor and start the engine.

The main switch automatically returns to the **ON** position, the terminal **B** is connected only to the terminal **AC**, thereby causing the starting circuit to be opened, stopping the starter motor.

When the main switch turned from the **ON** position to the **OFF** position, the engine stop solenoid (7) moves the fuel injection pump control rack to the **"No Fuel Injection"** position and stop the engine.

9Y1210301ELM0002US0

[1] RELAY



Solenoid Relay, Starter Relay, Horn Relay

Relay (1) basically consists of a relay winding (5) and mechanical contact points (9).

A current flowing from switch to relay winding (5) causes **"ON (Close)"** or **"OFF (Open)"** of mechanical contact points (9).

When a current is applied to the winding (energized) (10), a magnetic field pushes the contact lever (8) and normally open terminal is connected.

A function of relay (1) is to control a current in a circuit from a distant place (switch location place).

Another function of relay (1) is to control a large current by a small current.

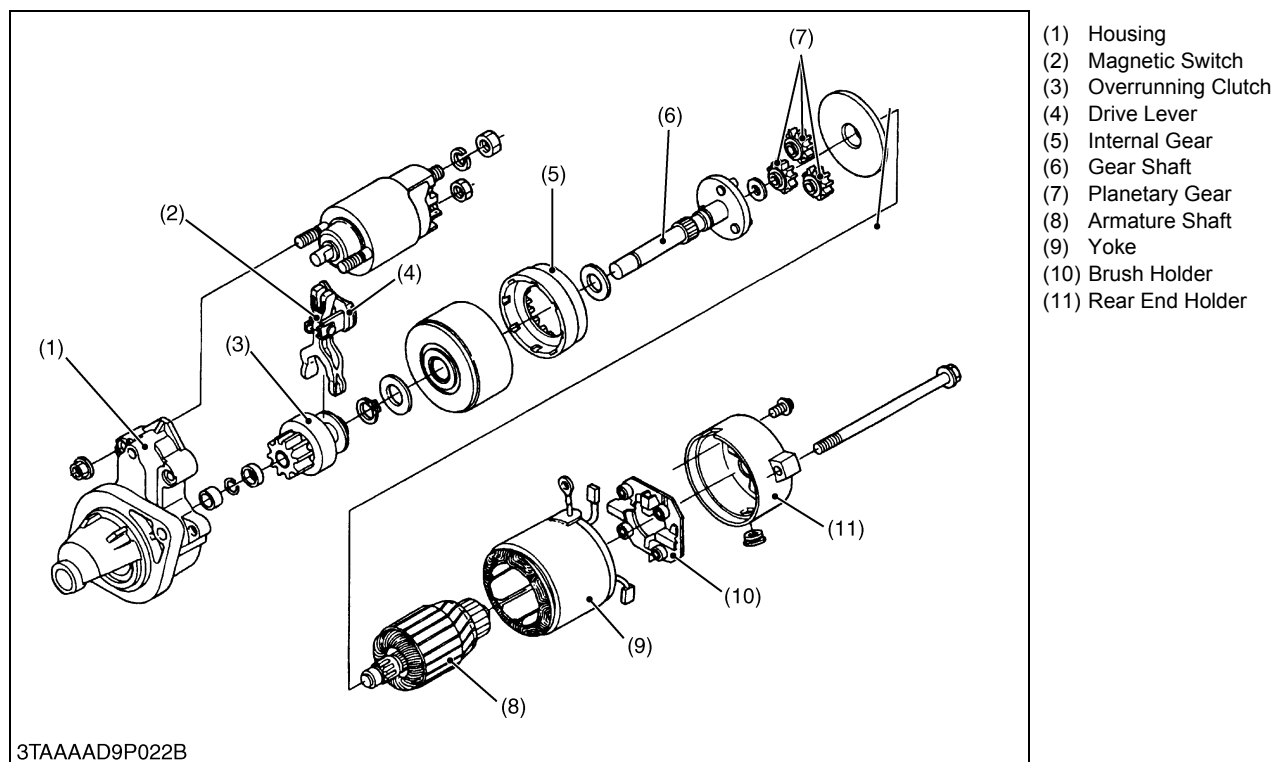
Function of each relay are as follows.

- Relay 1: Relay to horn (overheat alarm relay)
- Relay 2: Relay to start engine (starter relay)
- Relay 3: Relay to stop engine (solenoid relay)

- | | |
|-------------------|-------------------------------|
| (1) Relay | (6) 86 Terminal |
| (2) 85 Terminal | (7) 30 Terminal |
| (3) 87a Terminal | (8) Contact Lever |
| (4) 87 Terminal | (9) Mechanical Contact Points |
| (5) Relay Winding | (10) Winding (Energized) |

9Y1210301ELM0003US0

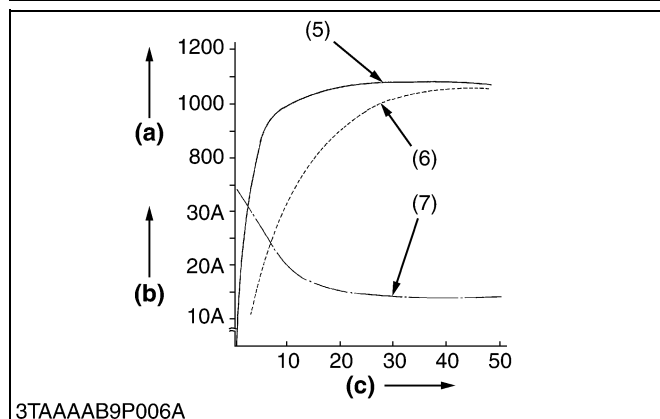
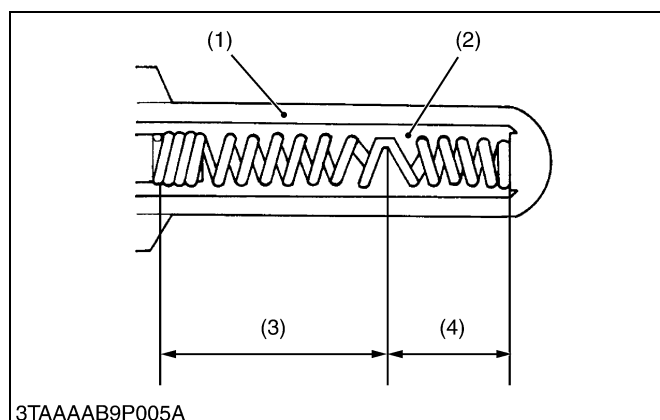
[2] STARTER



The reduction system uses planetary gears, and the speed of gear shaft (6) reduces to approximately one fifth of the armature shaft (8).

9Y1210301ELM0004US0

[3] GLOW PLUG



This plug is a two-material type QGS (Quick Glow System) 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.

The resistance of this heater (3) cum resistor is small when the temperature is low, while the resistance becomes large when the temperature rises.

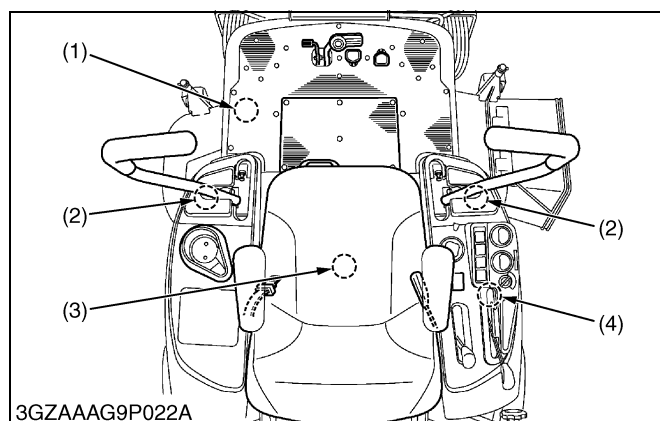
Therefore, because sufficient current is flown to the heater (4) during the initial period of energization, the temperature rises quickly and the resistance grows with the rise in the temperature of the resistor, the flowing current reduces to prevent the heater (4) from being heated.

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.

- | | |
|---|--------------------------------|
| (1) Sheath Tube | (a) Glow Plug Temperature (°C) |
| (2) Insulation Powder | (b) Current (A) |
| (3) Heater also functioning as a Resistor | (c) Time (Sec.) |
| (4) Heater | |
| (5) Super Glow Plug | |
| (6) Conventional Quick-heating type Glow Plug | |
| (7) Glow Plug Current | |

9Y1210301ELM0005US0

[4] SAFETY SWITCH



Switches are located at the motion control levers, at the parking brake pedal, at the PTO lever and under the operator's seat.

A function of switch is to control current from main switch to relay.

Switches are changed to **"CLOSE"** or **"OPEN"** electrically by changing the motion control levers, or sitting on the operator's seat or engaging the parking brake.

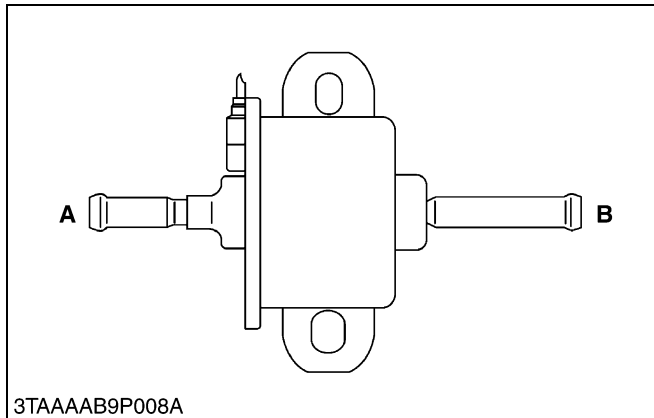
By selecting either normally open or normally closed contact, the switch function is determined.

Safety switch	Type
Seat switch	Normally open
PTO lever switch	Normally open
Parking brake switch	Normally close
Motion control lever (LH) switch	Normally open
Motion control lever (RH) switch	Normally open

- | | |
|---------------------------------|----------------------|
| (1) Parking Brake Switch | (3) Seat Switch |
| (2) Motion Control Lever Switch | (4) PTO Lever Switch |

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[5] FUEL PUMP



An electro magnetic fuel pump uses a transistor that causes the pump to start pumping fuel when the main switch is turned to the **"ON"** position.

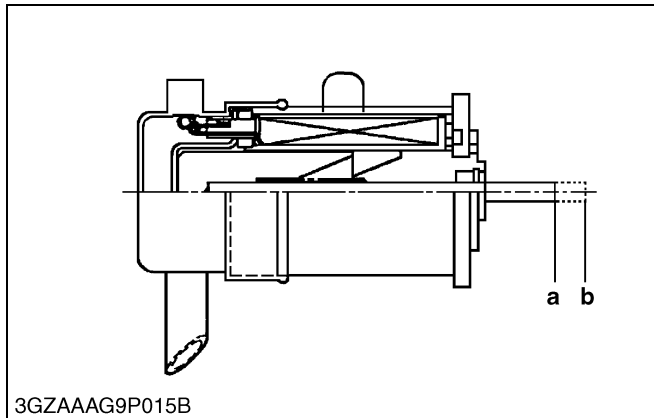
Therefore, fuel is supplied to the fuel injection pump regardless of engine speed. This pump is driven by the battery. It can therefore be operated even with the engine being stopped.

A: Inlet

B: Outlet

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[6] ENGINE STOP SOLENOID



Controller is provided to actuate the engine stop solenoid approx. 10 seconds to stop after the main switch is turned from **ON** position to **OFF** position.

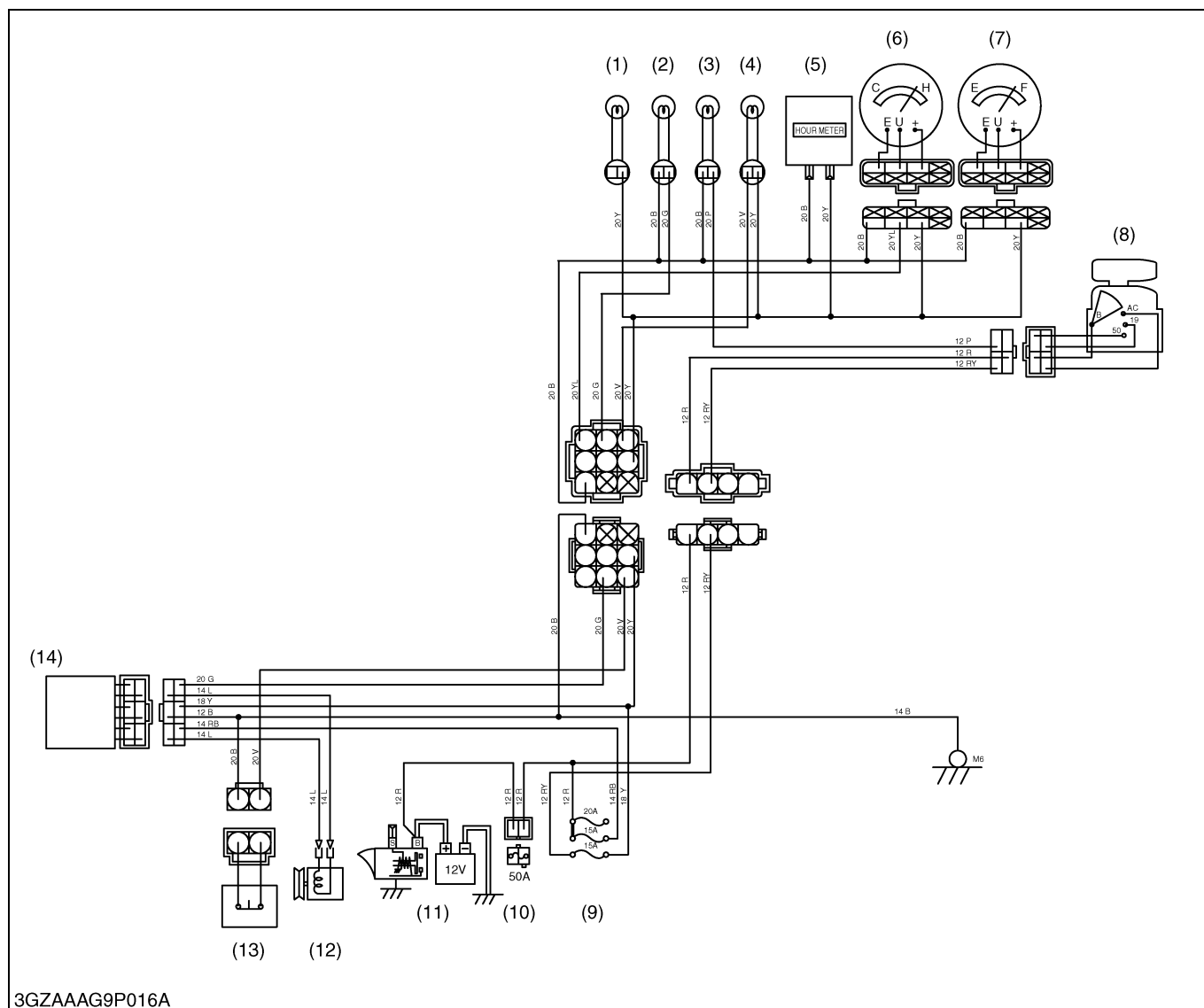
Flowing of the battery current into the coil while the controller's timer works attracts the plunger to actuate the stop lever or control rack of the injection pump. When the battery current stops, the plunger is returned to the original position by the spring.

a: ON

b: OFF

9Y1210301ELM0008US0

3. CHARGING SYSTEM



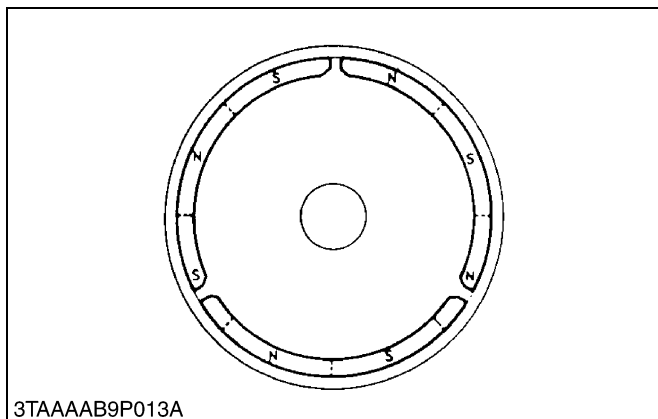
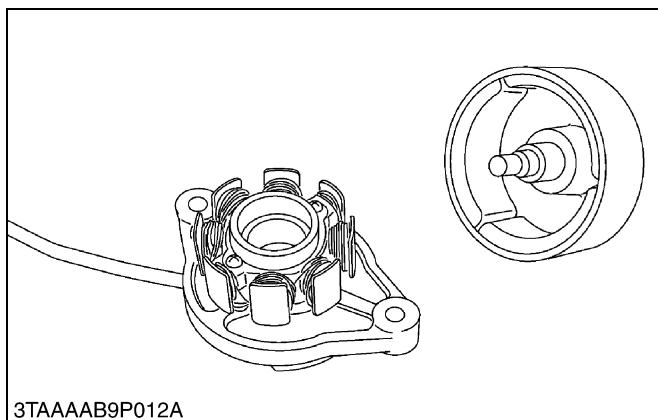
- | | | | |
|-----------------|-------------------------------|---------------------|------------------|
| (1) Oil Lamp | (5) Hour Meter | (9) Fuse | (12) AC Dynamo |
| (2) Charge Lamp | (6) Coolant Temperature Gauge | (10) Slow Blow Fuse | (13) Fuel Switch |
| (3) Glow Lamp | (7) Fuel Gauge | (11) Starter | (14) Regulator |
| (4) Fuel Lamp | (8) Main Switch | | |

The charging system supplies electric power for various electrical devices and also charges the battery while the engine runs.

It consists of a AC dynamo (12) and a regulator (14).

9Y1210301ELM0009US0

[1] AC DYNAMO

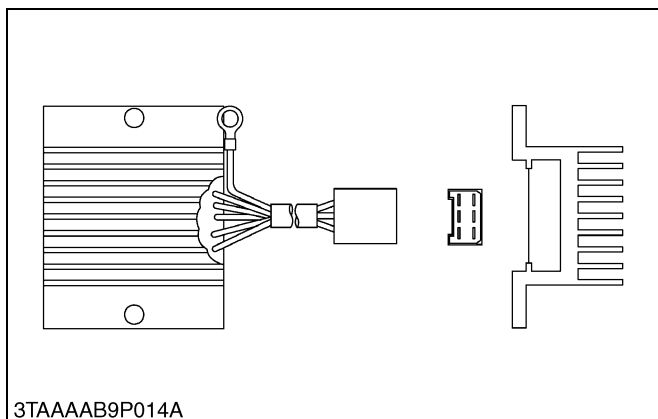


The dynamo is an 8-8 pole rotating magnet type generator. It is simple in construction, consisting of a stator and rotor. The rotor is made up of eight permanent magnet pole pieces assembled on a shaft and rotates on the center of the stator around which eight electromagnetic coils are provided for.

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

9Y1210301ELM0010US0

[2] REGULATOR



The regulator performs rectification and voltage regulation.

The regulator converts AC into DC which flows through the power consuming circuits and the battery, and also charges the battery.

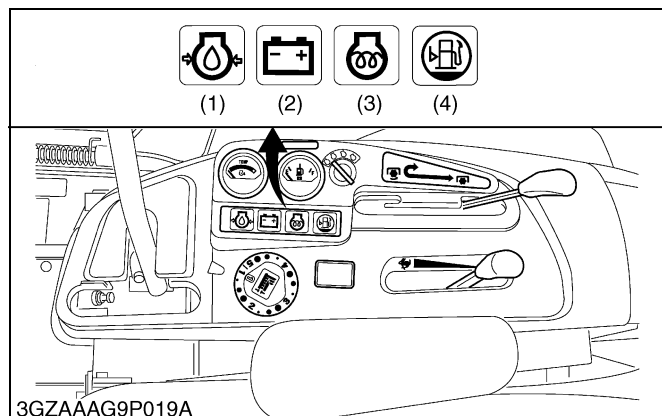
If however, the battery voltage exceeds a certain level, the DC current is cut off from the charging circuit to prevent overcharging.

9Y1210301ELM0011US0

[3] EASY CHECKER™

To check the conditions of tractor easily before and during operation, easy checker™ combination of lamps on the easy checker™ board is provided.

9Y1210301ELM0012US0



3GZAAAG9P019A

Indication Items

(1) Oil Pressure Lamp

When the engine oil pressure is low, this lamp illuminates.

(2) Charge Lamp

When the charging system is not functioning properly, this lamp illuminates.

(3) Pre-heat Indicator Lamp

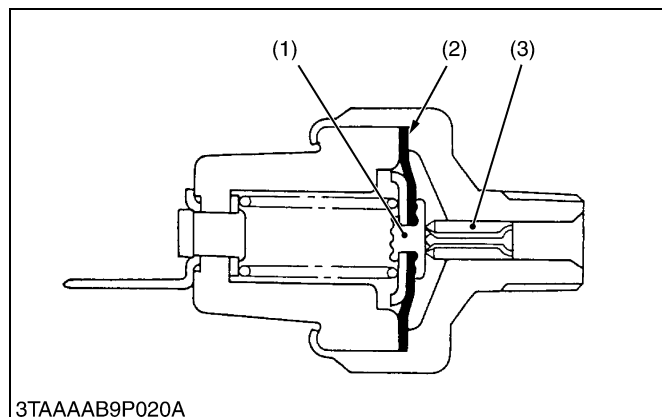
When the key switch is in the "Pre-heat" position, the pre-heat indicator lamp illuminates.

(4) Fuel Lamp

When the fuel in the RH tank goes below the prescribed level, the fuel level warning lamp illuminates.

- | | |
|-----------------------|-----------------------------|
| (1) Oil Pressure Lamp | (3) Pre-heat Indicator Lamp |
| (2) Charge Lamp | (4) Fuel Lamp |

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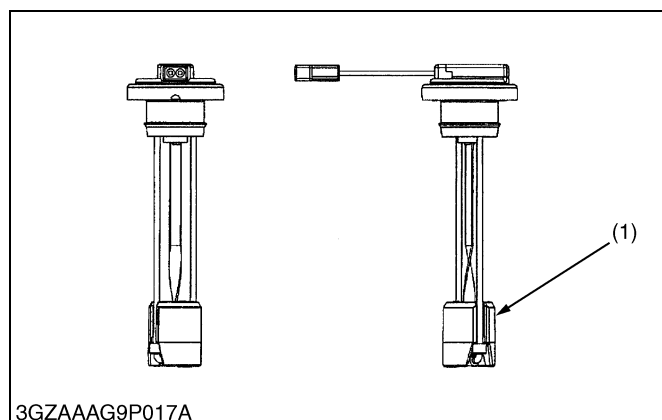
3TAAAB9P020A

Oil Pressure Switch

While oil pressure is high and the force applied to the diaphragm (2) is larger than the spring tension, the terminal contact (1) is open separated from the body contact (3). If the pressure drops below approx. 49 kPa (0.5 kgf/cm², 7.1 psi), the contact closes.

- | | |
|----------------------|------------------|
| (1) Terminal Contact | (3) Body Contact |
| (2) Diaphragm | |

9Y1210301ELM0014US0



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Fuel (Lamp) Switch

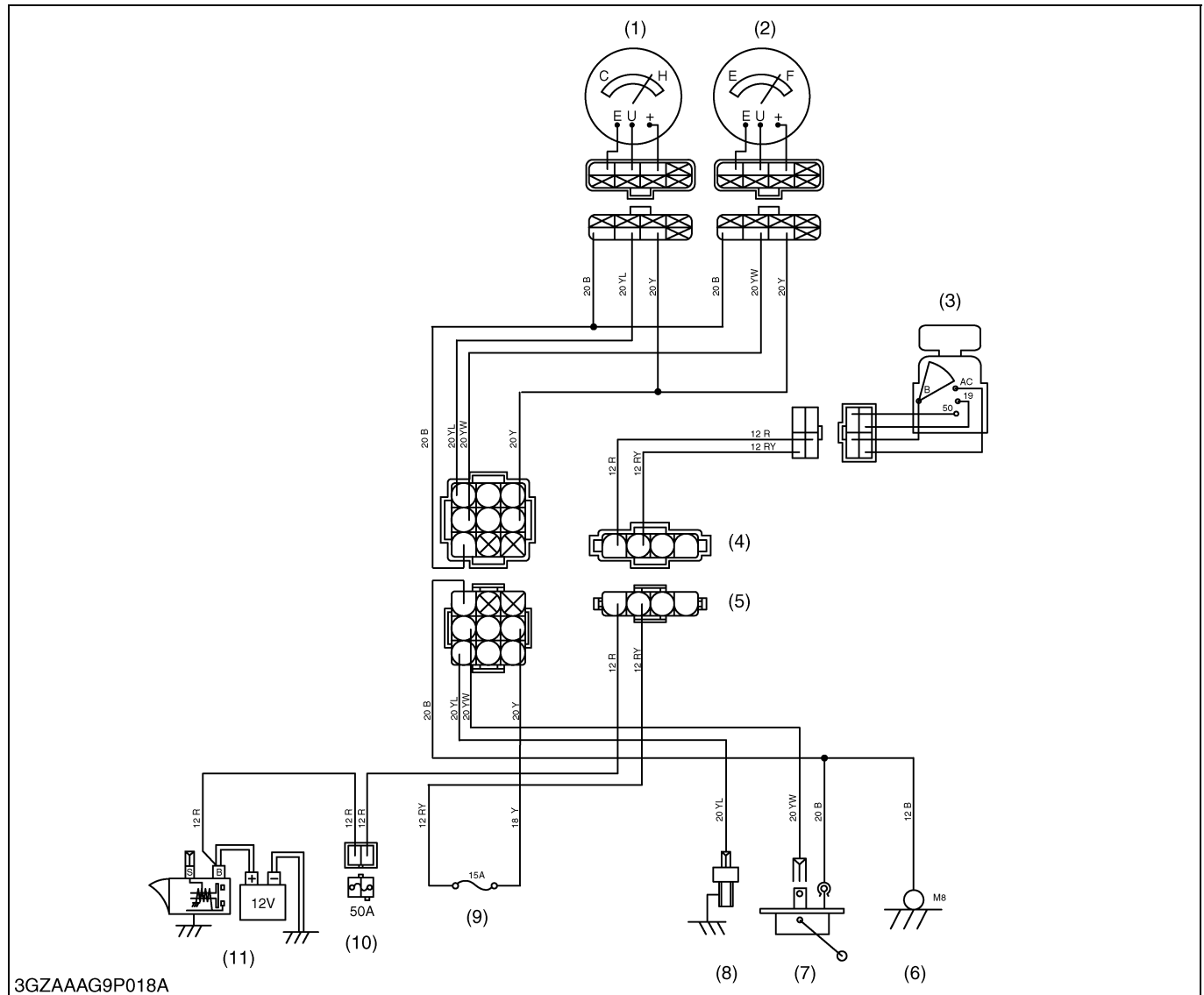
The switch is close when falling more than the prescribed level with the float (1).

When the amount of the remainder in the RH fuel tank becomes 9.0 L (2.38 U.S.gals, 1.98 Imp.gals) or less, the switch is turned on.

- (1) Float

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4. GAUGES

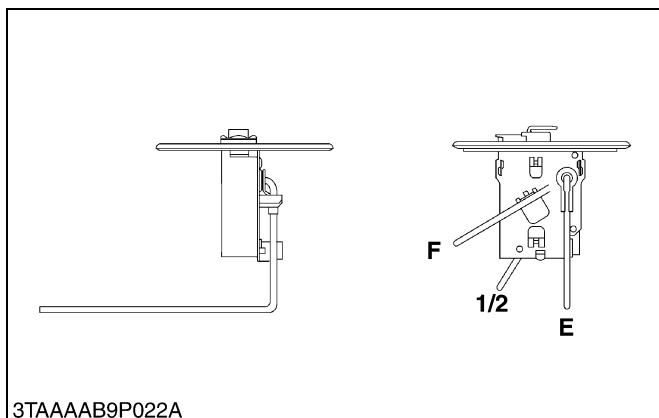


- | | | | |
|-------------------------------|---------------|--------------------------------|---------------------|
| (1) Coolant Temperature Gauge | (4) Harness A | (7) Fuel Sensor | (10) Slow Blow Fuse |
| (2) Fuel Gauge | (5) Harness B | (8) Coolant Temperature Sensor | (11) Starter |
| (3) Main Switch | (6) Ground | (9) Fuse | |

The fuel quantity and coolant temperature are indicated by the ammeters. The ammeters indicate each amperage flowing through the fuel level sensor for the fuel quantity detection and through the coolant temperature sensor for the coolant temperature detection.

9Y1210301ELM0016US0

[1] FUEL QUANTITY



Fuel Level Sensor

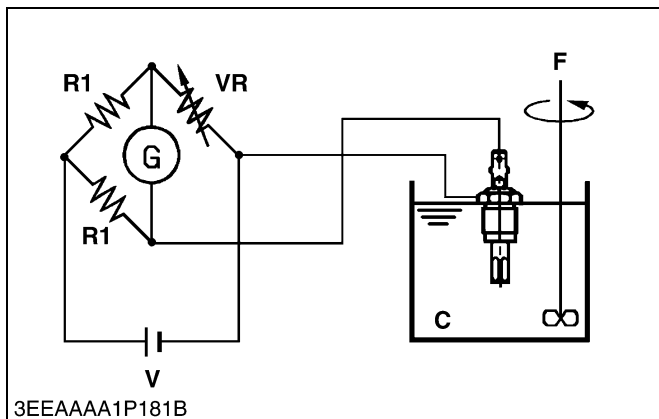
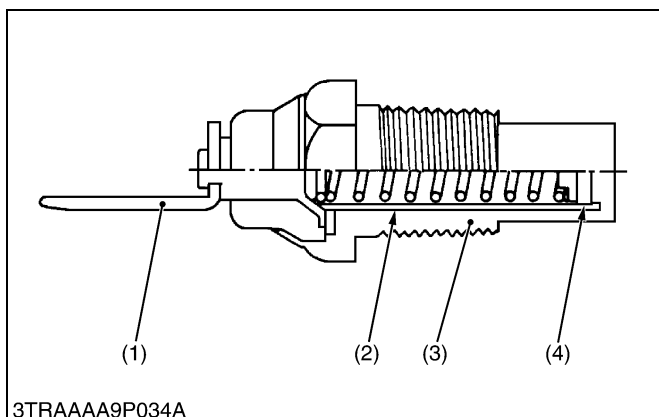
The remaining fuel quantity is detected by the fuel level sensor installed in the fuel tank and indicated on the fuel gauge. For detection, a float and a resistor are used.

As the float lowers, the resistance of the variable resistor varies. The relation between the amount of fuel and the resistance is as follows.

F	1/2	E (Remaining fuel of approx. 5.0 L, 1.32 U.S.gal., 1.10 Imp.gal.)
1 to 5 Ω	28.5 to 36.5 Ω	103 to 117 Ω

9Y1210301ELM0017US0

[2] COOLANT TEMPERATURE



Coolant Temperature Sensor

The coolant temperature sensor is installed to the cylinder head of engine, and its tip is in touch with the coolant. It contains a thermistor (4) whose electrical resistance decreases as the temperature increases.

Current varies with changes in the coolant temperature, and the increases or decreases in the current move the pointer of gauge.

Characteristics of Thermistor		
Temperature	Resistance of VR : ★	Condition
50 °C (122 °F)	153.9 Ω	(A)
80 °C (176 °F)	51.9 Ω	
100 °C (212 °F)	27.4 Ω	
120 °C (248 °F)	16.1 Ω	

★ When galvanometer shows 0 (Zero).

Condition	Setting Value
(A)	R1: 54.945 to 55.055 Ω V: DC 6.9 to 7.1 V

- (1) Terminal
- (2) Insulator
- (3) Body
- (4) Thermistor

C: Coolant or Silicon Oil
G: Galvanometer
VR: Variable Resistor
F: Flow Velocity
(0.14 to 0.15 m/s)

9Y1210301ELM0018US0

Coolant Temperature Switch

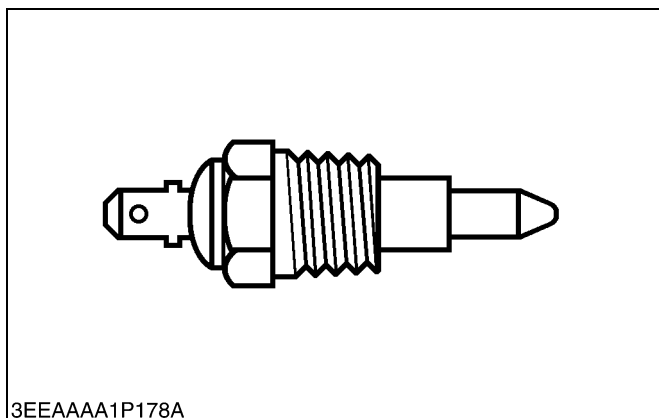
The coolant temperature switch is installed to the water flange of engine, and its tip is in touch with the coolant.

The overheat alarm activates when the coolant temperature goes up more than the specified value.

When the coolant temperature falls below the specified value, the overheat alarm stops.

Characteristics of Coolant Temperature Switch		
Type	Operation Temperature	
	Horn operates	Horn stops
Normally open	120 to 126 °C (248 to 258 °F)	116 °C (241 °F)

9Y1210301ELM0019US0



SERVICING

CONTENTS

1. TROUBLESHOOTING.....	5-S1
2. SERVICING SPECIFICATIONS	5-S3
3. TIGHTENING TORQUES.....	5-S4
4. CHECKING, DISASSEMBLING AND SERVICING	5-S5
[1] CHECKING.....	5-S5
(1) Battery	5-S5
(2) Safety Switches	5-S7
(3) Main Switch	5-S8
(4) Starter.....	5-S9
(5) Glow Plug	5-S10
(6) Safety Switch.....	5-S10
(7) Fuel Pump	5-S11
(8) Engine Stop Solenoid	5-S11
(9) Charging System	5-S12
(10)Lighting System.....	5-S13
(11)Sensors for Gauges	5-S14
(12)Cooling System and Gauges	5-S15
[2] DISASSEMBLING AND ASSEMBLING	5-S18
(1) Starting System (Starter).....	5-S18
(2) Charging System (Dynamo)	5-S18
[3] SERVICING.....	5-S19
(1) Starting System	5-S19
(2) Charging System	5-S21

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	Battery discharged or defective	Recharge or replace	G-27
	Battery positive cable disconnected or improperly connected	Repair or replace	5-S5
	Battery negative cable disconnected or improperly connected	Repair or replace	5-S5
	Slow blow fuse blown	Replace	G-39
Fuse Blown Frequently	Short-circuited	Repair or replace	G-39

BATTERY

Symptom	Probable Cause	Solution	Reference Page
Battery Discharges Too Quickly	Battery defective	Replace	G-27
	Dynamo defective	Replace	5-S12, 5-S18
	Regulator defective	Replace	5-S12
	Wiring harness disconnected or improperly connected (between battery positive terminal and regulator B terminal)	Repair or replace	–
	Cooling fan belt slipping	Adjust tension	G-29

STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Operate	Battery discharged or defective	Recharge or replace	G-27
	Slow blow fuse blown	Replace	G-39
	Safety switch defective	Replace	G-23, 5-S7, 5-S10
	Wiring harness disconnected or improperly connected (between main switch 50 terminal and safety switches, between safety switches and starter motor, between battery positive terminal and starter motor)	Repair or replace	5-M1
	Starter motor defective	Repair or replace	5-S9, 5-S18
	Main switch defective	Replace	5-S8
Engine Does Not Stop When Main Switch Is Turned OFF	Fuse blown (20 A)	Replace	G-39
	Wiring harness disconnected or improperly connected (between main switch AC terminal and engine stop solenoid)	Repair or replace	5-M1
	Engine stop solenoid defective	Replace	5-S11
	Controller defective	Replace	5-M2
Engine Does Not Start	Engine stop solenoid defective	Replace	5-S11
	Controller defective	Replace	5-M2

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light When Main Switch Is Turned ON	Fuse blown (15 A)	Replace	G-39
	Wiring harness disconnected or improperly connected (between main switch AC terminal and panel board, between panel board and dynamo)	Repair or replace	5-M1
	Dynamo defective	Repair or replace	5-S12, 5-S18
	Regulator defective	Replace	5-S12
Charging Lamp Does Not Go Off When Engine Is Running	Wiring harness disconnected or improperly connected (between main switch B terminal and dynamo, between panel board and dynamo)	Repair or replace	5-M1
	Dynamo defective	Repair or replace	5-S12, 5-S18
	Regulator defective	Replace	5-S12

SENSORS AND GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	Fuel gauge defective	Replace	5-M11, 5-S16
	Fuel level sensor defective	Replace	5-M11, 5-S14
	Wiring harness disconnected or improperly connected (between fuel gauge and fuel level sensor)	Repair or replace	5-M1
Coolant Temperature Gauge Does Not Function	Coolant temperature gauge defective	Replace	5-M10, 5-M11
	Coolant temperature sensor defective	Replace	5-M10, 5-M11, 5-S15, 5-S16
	Wiring harness disconnected or improperly connected (between coolant temperature gauge and coolant temperature sensor)	Repair or replace	5-M1

9Y1210301ELS0001US0

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Battery	Voltage	More than 12 V	—
	Potential Difference	Less than 0.1 V	—
Glow Plug	Resistance	Approx. 0.9 Ω	—
Starter • Commutator • Mica • Brush	O.D.	30.0 mm 1.181 in.	29.0 mm 1.142 in.
	Difference of O.D.'s	Less than 0.02 mm 0.0008 in.	0.05 mm 0.0020 in.
	Undercut	0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.20 mm 0.0079 in.
	Length	14.0 mm 0.551 in.	9.0 mm 0.354 in.
AC Dynamo	Charging Current / Dynamo Speed	4 to 15 A / 5200 rpm	—
	Charging Voltage / Dynamo Speed	4 to 15 A / 5200 rpm	—

9Y1210301ELS0002US0

3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-10.)

Item	N·m	kgf·m	lbf·ft
Starter (B terminal nut)	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7
AC dynamo (Stator nut)	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5

9Y1210301ELS0003US0

4. CHECKING, DISASSEMBLING AND SERVICING



CAUTION

- To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.
- Never remove the battery cap while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately.
- Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.

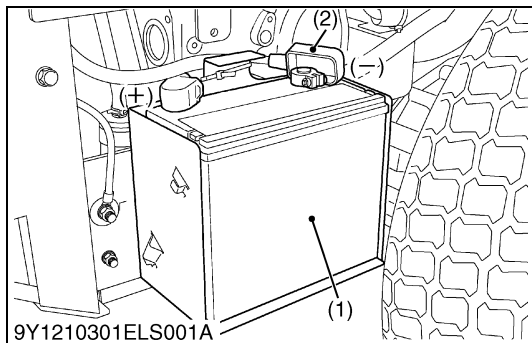
■ **IMPORTANT**

- If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.

9Y1210301ELS0004US0

[1] CHECKING

(1) Battery



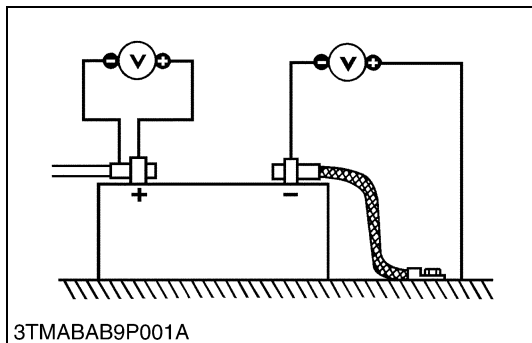
Battery Voltage

1. Stop the engine and turn the main switch off.
2. Connect the COM (–) lead of the voltmeter to the battery's negative terminal post and the (+) lead to the positive terminal post, and measure the battery voltage.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Battery voltage	Factory specification	More than 12 V
-----------------	-----------------------	----------------

- | | |
|------------------|-----------------------|
| (1) Battery | (+) Positive Terminal |
| (2) Ground Cable | (-) Negative Terminal |

9Y1210301ELS0005US0

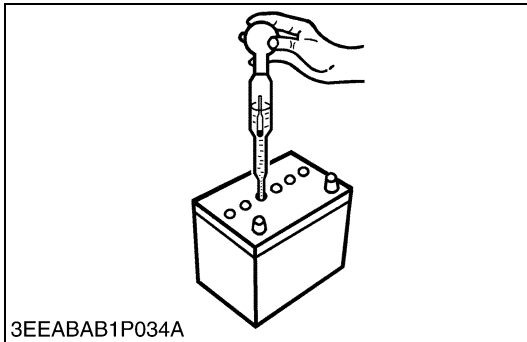


Battery Terminal Connection

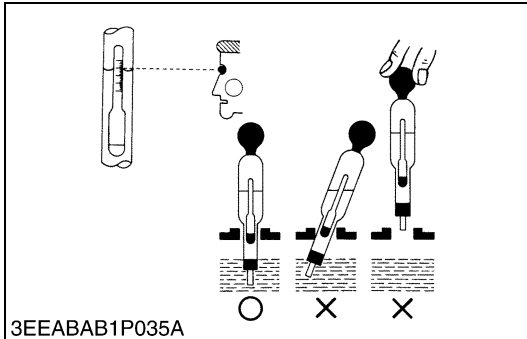
1. Turn the main switch on, and turn on the head light.
2. Measure the voltage with a voltmeter across the battery's positive terminal post and the cable terminal, and the voltage across the battery's negative terminal post and the chassis.
3. If the measurement exceeds the factory specification, clean the battery terminal posts and cable clamps, and tighten them firmly.

Potential difference	Factory specification	Less than 0.1 V
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9Y1210301ELS0006US0



3EEABAB1P034A



3EEABAB1P035A

Battery Specific Gravity

1. Check the specific gravity of the electrolyte in each cell with a hydrometer.
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)**.
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.

NOTE

- Hold the hydrometer tube vertical without removing it from the electrolyte.
- Do not suck too much electrolyte into the tube.
- Allow the float to move freely and hold the hydrometer at eye level.
- The hydrometer reading must be taken at the highest electrolyte level.

(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 decreases 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:

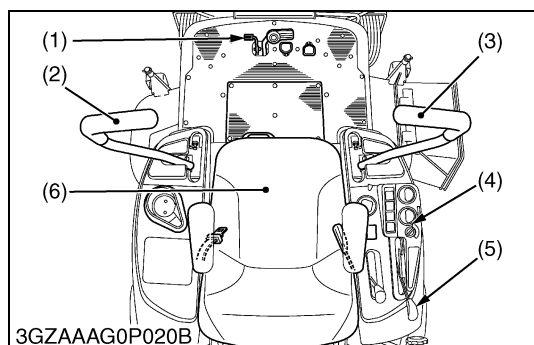
- Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature – 20 °C)
- Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature – 68 °F)

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)

9Y1210301ELS0007US0

(2) Safety Switches



Method of Inspecting Each Control

A defective location can be judged by checking function of each safety switch one by one as shown in the table below.

(Reference)

- Type of Safety Switch
 - Parking Brake Lever: Normal Close
 - Motion Control Lever: Normal Open
 - PTO Lever: Normal Open
 - Operator Seat: Normal Open

- | | |
|-------------------------------|-------------------|
| (1) Parking Brake Lock Pedal | (4) Main Switch |
| (2) Motion Control Lever (LH) | (5) PTO Lever |
| (3) Motion Control Lever (RH) | (6) Operator Seat |

9Y1210301ELS0008US0

Combination	State of set such as operation levers					Control operation	
	Motion control lever (LH)	Motion control lever (RH)	PTO lever	Parking brake pedal	Operator seat	Automatic engine stop	Engine start (Right or wrong)
1	Parking position (Neutral lock)	Parking position (Neutral lock)	Off position	Lock position	On the seat	Keep running**	Possible
2					Leave the seat*		Impossible
3				Release position*	On the seat		
4		On position*	Lock position				
5		Operating position*		Off position			
6	Operating position*	Parking position					

* In this part, the safety switch is a position of off. And it is a checked place.

** In this part, the voltage of the terminal of the engine stop solenoid is 0 V.

9Y1210301ELS0009US0

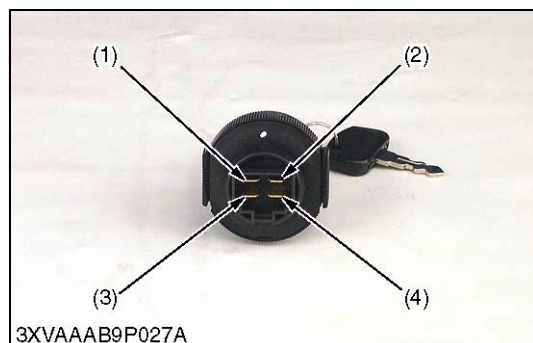
■ How to read meaning from table above.

- If the engine starts in combination 2 when leaving the seat, the seat safety switch is bad.
- If the engine starts with the parking brake released at combination 3, the parking brake safety switch is bad.
- If the engine starts in combination 4 when the PTO lever is **ON** position, the PTO lever switch is bad.
- If the engine starts in combinations 5 and 6 when the motion control lever is a **Operating** position, the motion control lever safety switch is bad.

■ If the engine does not start in combination 1, Do the continuity test of each switch.

9Y1210301ELS0010US0

(3) Main Switch



Main Switch Continuity

1) Main Switch Key at OFF Position

1. Set the main switch **OFF** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **ACC** terminal, **B** terminal and **ST** terminal, **B** terminal and **G** terminal.
3. If infinity is not indicated, the contacts of the main switch are faulty.

Resistance	B terminal – ACC terminal	Infinity
	B terminal – ST terminal	
	B terminal – G terminal	

2) Main Switch Key at ON Position

1. Set the main switch **ON** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **ACC** terminal.
3. If 0 ohm is not indicated, the **B – ACC** contact of the main switch are faulty.

Resistance	B terminal – ACC terminal	0 Ω
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3) Main Switch Key at PREHEAT Position

1. Set and hold the main switch key at the **PREHEAT** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **G** terminal, and measure the resistance across the **B** terminal and the **ACC** terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	B terminal – G terminal	0 Ω
	B terminal – ACC terminal	

4) Main Switch Key at START Position

1. Set and hold the main switch key at the **START** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **G** terminal, across the **B** terminal and the **ST** terminal, and across the **B** terminal and the **ACC** terminal.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

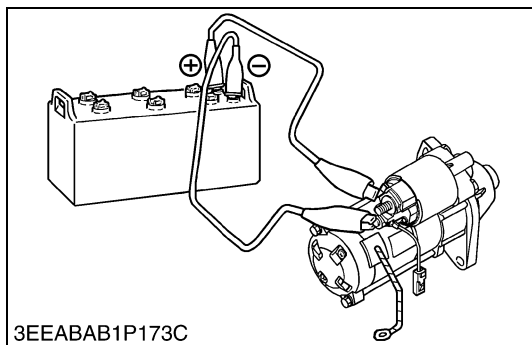
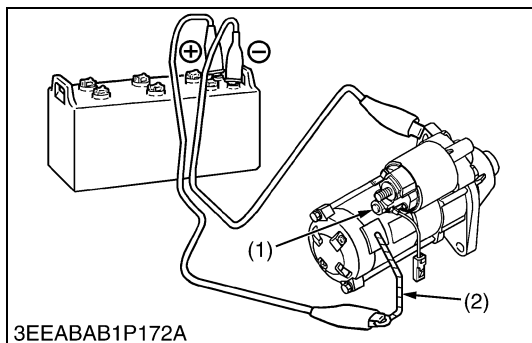
Resistance	B terminal – G terminal	0 Ω
	B terminal – ST terminal	
	B terminal – ACC terminal	

- (1) **G** Terminal
(2) **ACC** Terminal

- (3) **ST** Terminal
(4) **B** Terminal

9Y1210301ELS0011US0

(4) Starter



Motor Test



CAUTION

- **Secure the starter to prevent it from jumping up and down while testing the motor.**

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (2) from the starter **C** terminal (1).
5. Connect a jumper lead from the connecting lead (2) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter motor housing and the battery negative terminal post
7. If the motor does not run, check the motor.

(1) **C** Terminal

(2) Connecting Lead

9Y1210301ELS0012US0

Magnet Switch Test (Pull-in, Holding Coils)

NOTE

- **Each test should be carried out for a start time (3 to 5 seconds), and at half of the rated voltage (6V)**

1) Checking Pull-in Coil

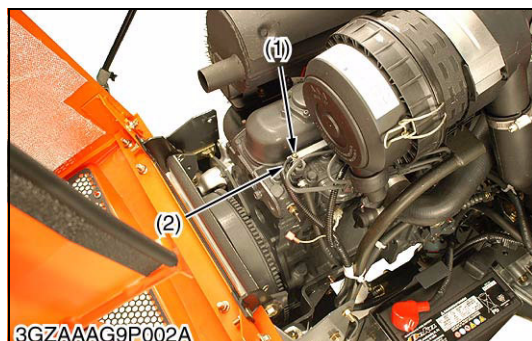
1. Connect jumper lead from the battery's negative terminal post to the **C** terminal.
2. The plunger should be attached strongly when a jumper lead is connected from the battery positive terminal to the **S** terminal.

2) Checking Holding Coil

1. Connect jumper leads from the battery's negative terminal post to the body and the battery's positive terminal post to the **S** terminal.
2. Push the plunger in by hand and release it. Then, the plunger should remain being attracted.

9Y1210301ELS0013US0

(5) Glow Plug



Lead Terminal Voltage

1. Disconnect the wiring lead (1) from the glow plug (2) after turning the main switch off.
2. Turn the main switch key to the **"PREHEAT"** position, and measure the voltage between the lead terminal and the chassis.
3. Turn the main switch key to the **"START"** position, and measure the voltage with a voltmeter between the lead terminal and the chassis.
4. If the voltage at either position differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage (Lead terminal - Chassis)	Main switch key at "PREHEAT"	Approx. battery voltage
	Main switch key at "START"	Approx. battery voltage

(1) Wiring Lead (Positive)

(2) Glow Plug

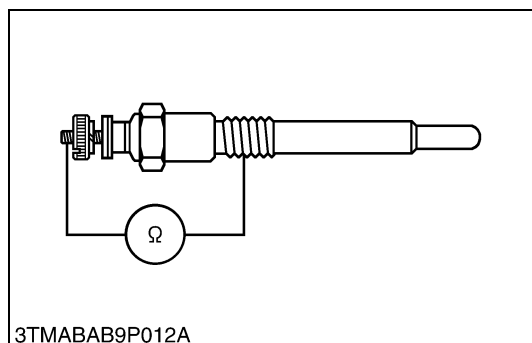
9Y1210301ELS0014US0

Glow Plug Continuity

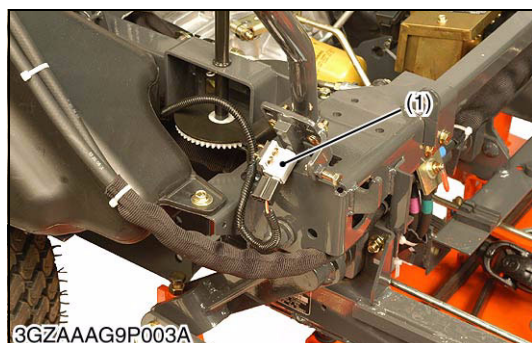
1. Disconnect the lead from the glow plugs.
2. Measure the resistance with an ohmmeter between the glow plug terminal and the chassis.
3. If 0 ohm is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. If the factory specification is not indicated, the glow plug is faulty.

Glow plug resistance	Factory specification	Approx. 0.9 Ω
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9Y1210301ELS0015US0



(6) Safety Switch



Safety Switch Continuity

1. Remove the safety switch leads.
2. Connect the circuit tester to the safety switch leads.
3. Measure the resistance between leads.
4. If the safety switch is defective, replace it.

Resistance (Across switch terminal) • Motion control lever • PTO lever • Operator seat	When switch push is pushed	0 Ω
	When switch push is released	Infinity

Resistance (Across switch terminal) • Parking brake pedal	When actuator is pushed	Infinity
	When actuator is released	0 Ω

(1) Safety Switch

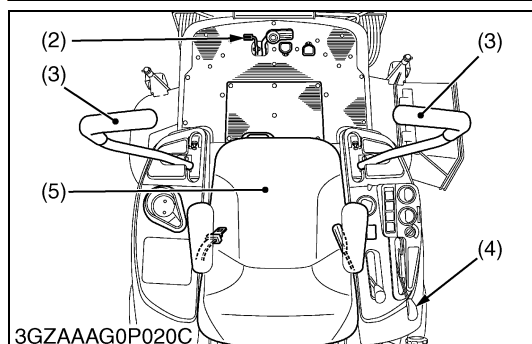
(4) PTO Lever

(2) Parking Brake Lock Pedal

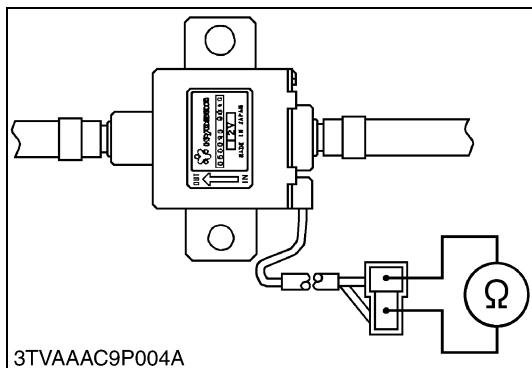
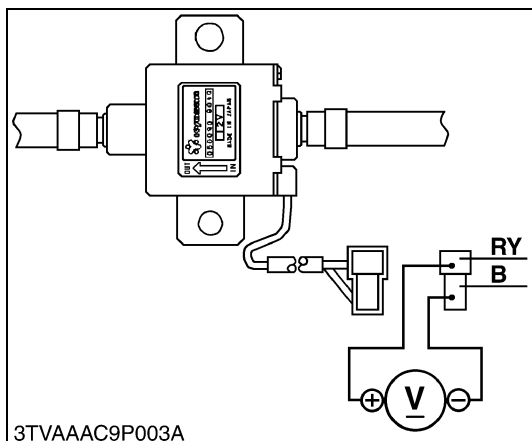
(5) Operator Seat

(3) Motion Control Lever

9Y1210301ELS0016US0



(7) Fuel Pump



Connector Voltage

1. Disconnect the **2P** connector from the fuel pump.
2. Turn the main switch key to the **"ON"** position, and measure the voltage with a voltmeter between the connector terminals.
3. If the voltage differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage	Between connector terminals	Approx. battery voltage
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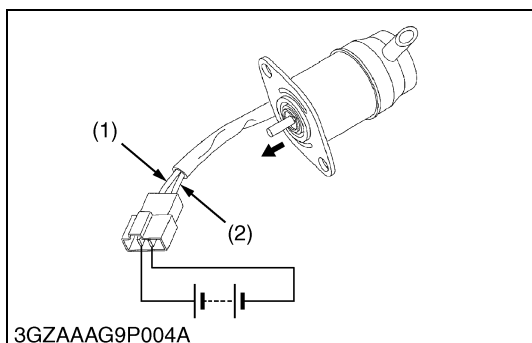
9Y1210301ELS0017US0

Fuel Pump Continuity

1. Disconnect the **2P** connector from the fuel pump.
2. Check the continuity between the connector terminals with an ohmmeter.
3. If it does not conduct, the fuel pump is faulty.

9Y1210301ELS0018US0

(8) Engine Stop Solenoid



Engine Stop Solenoid Test

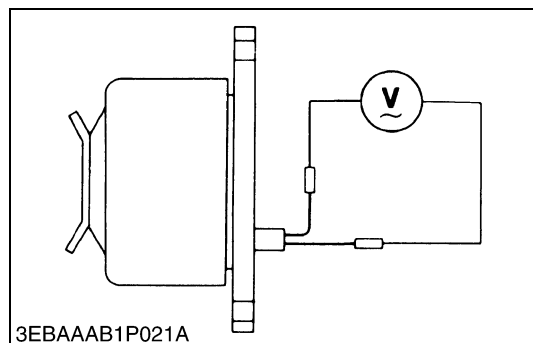
1. Disconnect the connector from the engine stop solenoid.
2. Remove the engine stop solenoid from the engine.
3. Connect the jumper leads from the battery positive terminal to the connector, and from the battery negative terminal to the engine stop solenoid body.
4. If the solenoid plunger is not attracted, the engine stop solenoid is faulty.

(1) White

(2) Black

9Y1210301ELS0019US0

(9) Charging System

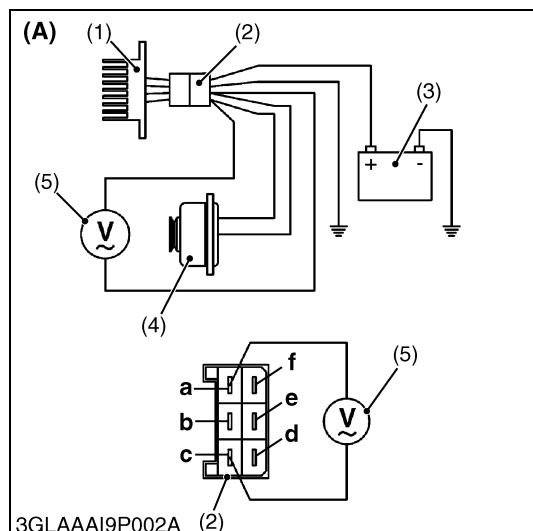


No-load Dynamo Output

1. Disconnect the lead wires from the dynamo.
2. Start the engine and operate the dynamo at the rated speed.
3. Measure the output voltage with a volt meter.
4. If the measurement is not within the specified values, replace the dynamo.

No-load output	Factory specification	AC 20 V or more
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9Y1210301ELS0020US0



Regulation Voltage



CAUTION

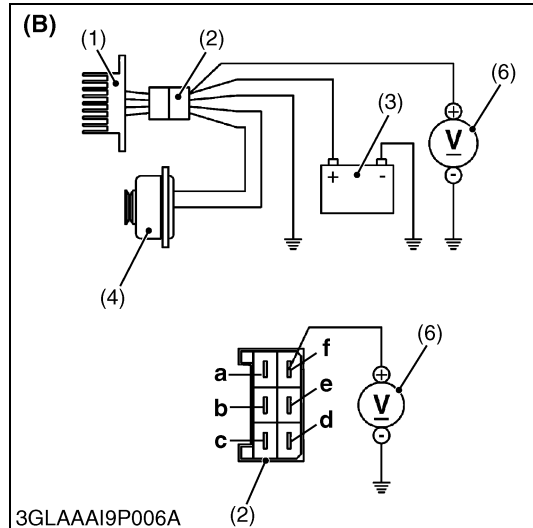
- To avoid personal injury, do not touch the rotating or hot parts while the engine is running.

NOTE

- Before performing this checking, make sure that the no-load dynamo output is proper.
- Complete the charging circuit with fully charged battery.

1. Run the engine at the rated speed.
2. Keeping the coupler (2) of regulator being connected, measure the voltage with a volt meter (5) across the terminal blue "a" and terminal blue "c". (Refer to figure (A).)
3. If the measurement is not within the specified value, replace the wire harness between the dynamo (4) and regulator (1).
4. If the measurement is within the specified value, measure the voltage with a volt meter (6) across the terminal red "f" and chassis. (Refer to figure (B).)
5. If the measurement is not within specified value, replace the regulator (1).

Voltage	Terminal blue "a" – Terminal blue "c"	AC 20 V or more
	Terminal red "f" – Chassis	DC 14 to 15 V

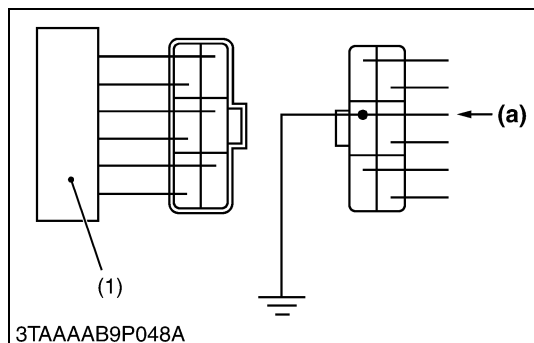


- (1) Regulator
- (2) Coupler
- (3) Battery
- (4) Dynamo
- (5) Volt Meter (AC)
- (6) Volt Meter (DC)

- a: Terminal Blue
- b: Terminal Black
- c: Terminal Blue
- d: Terminal Green
- e: Terminal Yellow
- f: Terminal Red

9Y1210301ELS0021US0

(10) Lighting System



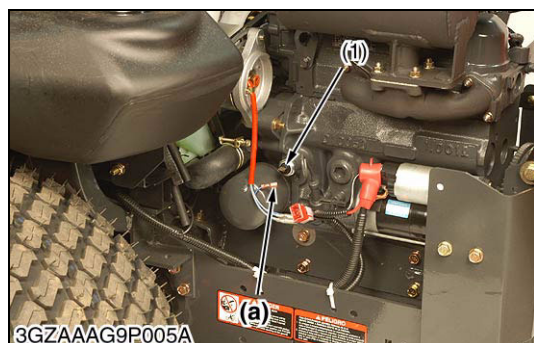
Charge Lamp (Charging Circuit)

1. Remove the under panel.
2. Disconnect the **6P** connector from the regulator after turning the main switch **OFF**.
3. Turn the main switch **ON** and connect a jumper lead from the wiring harness connector terminal (Black) to the chassis.
4. If the charge lamp does not light, the wiring harness or fuse is faulty.

(1) Regulator

(a) From Charge Lamp

9Y1210301ELS0022US0



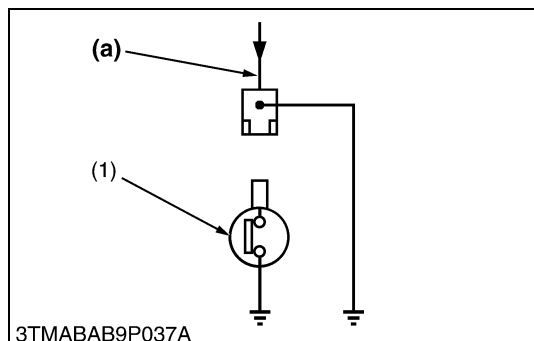
Engine Oil Pressure Lamp

1. Disconnect the lead from the engine oil pressure switch after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from the lead to the chassis.
3. If the engine oil pressure indicator lamp does not light, the wiring harness is faulty.

(1) Engine Oil Pressure Switch

(a) From Oil Pressure Lamp

9Y1210301ELS0023US0



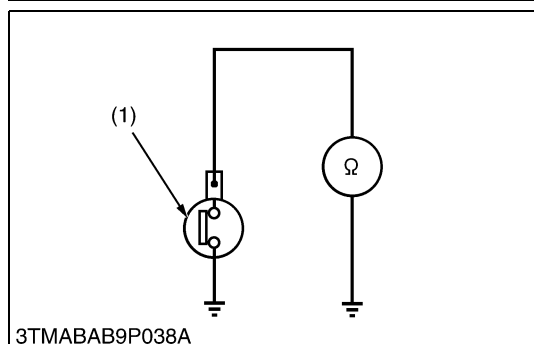
Engine Oil Pressure Switch Continuity

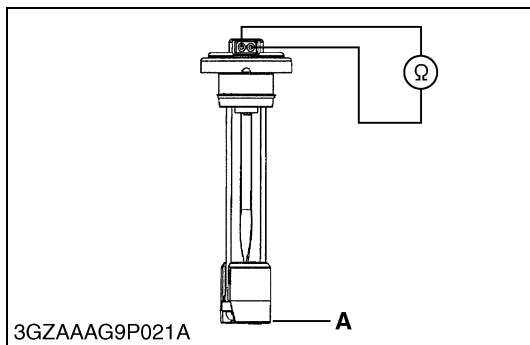
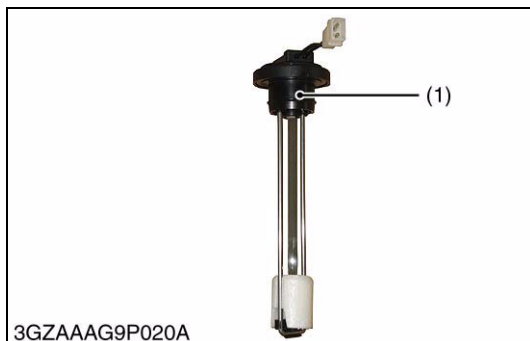
1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 4.9 kPa (0.5 kgf/cm², 7 psi), the switch is faulty.

Resistance (Switch terminal – Chassis)	In normal state	0 Ω
	At pressure over approx. 4.9 kPa (0.5 kgf/cm ² , 7 psi)	Infinity

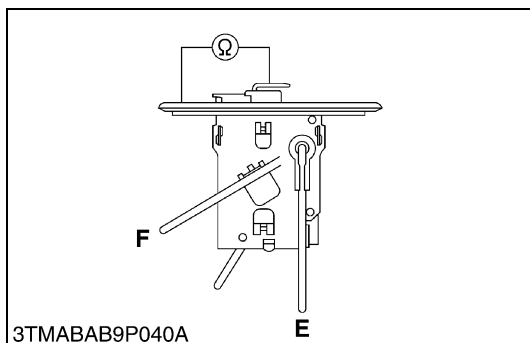
(1) Engine Oil Pressure Switch

9Y1210301ELS0024US0





(11) Sensors for Gauges



Fuel Lamp (Fuel Switch)

1) Switch Continuity

1. Remove the fuel switch from the RH fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminals.
3. If the reference values are not indicated, the sensor is faulty.

Resistance	Reference value	Float at not lower-most position	Infinity
		Float at lower-most position	Approx. 5 Ω

(1) Fuel Level Sensor

A: Lower-most Position

9Y1210301ELS0025US0

Fuel Level Sensor

1) Sensor Continuity

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the sensor terminal and its body.
3. If the reference values are not indicated, the sensor is faulty.

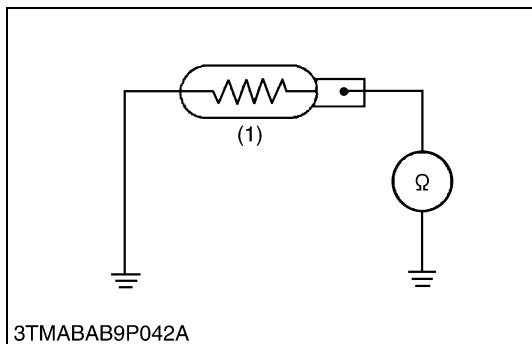
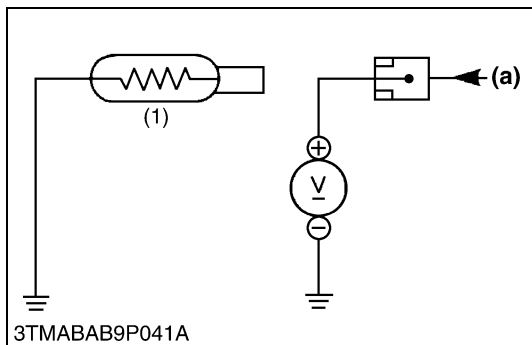
Resistance (Sensor terminal – its body)	Reference value	Float at upper-most position	1 to 5 Ω
		Float at lower-most position	103 to 117 Ω

(1) Fuel Level Sensor

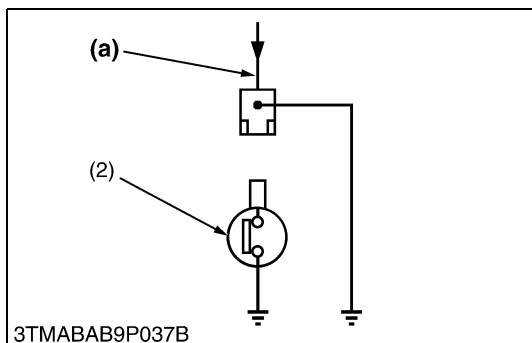
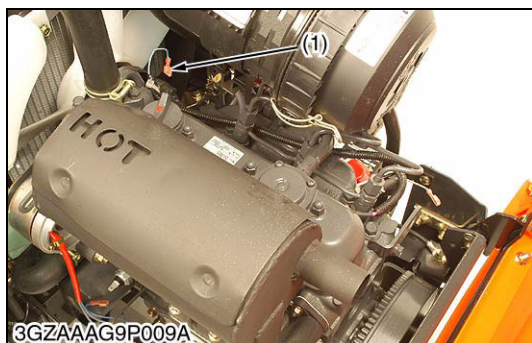
E: Empty

F: Full

9Y1210301ELS0026US0



(12) Cooling System and Gauges



Coolant Temperature Sensor

1) Lead Terminal Voltage

1. Disconnect the lead from the coolant temperature sensor (1) after turning the main switch **OFF**.
2. Turn the main switch **ON** and measure the voltage with a voltmeter across the lead terminal and the chassis. If the voltage differs from the battery voltage, the wiring harness, fuse or coolant temperature gauge is faulty.

Voltage	Lead terminal – Chassis	Approx. battery voltage
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2) Sensor Continuity

1. Measure the resistances with an ohmmeter across the sensor terminal and the chassis.
2. If the reference value is not indicated, the sensor is faulty.

Resistance (Sensor terminal – Chassis)	Reference value	Approx. 16.1 Ω at 120 °C (248 °F) Approx. 27.4 Ω at 100 °C (212 °F) Approx. 51.9 Ω at 80 °C (176 °F) Approx. 153.9 Ω at 50 °C (122 °F)
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(1) Coolant Temperature Sensor

(a) From Temperature Gauge

9Y1210301ELS0027US0

Horn Wiring Harness

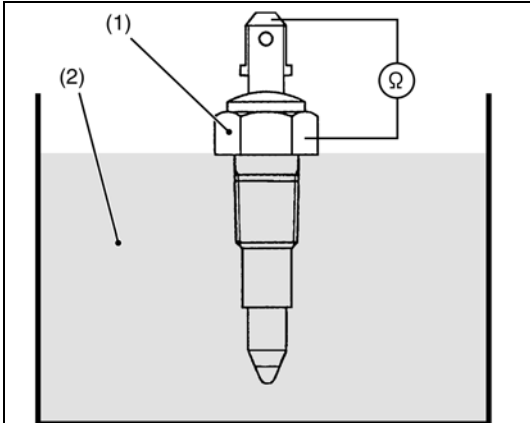
1. Disconnect the wiring lead (1) from the coolant temperature switch (2) after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from lead to the chassis.
3. If the horn does not operate, wiring harness or relay is faulty.

(1) Wiring Lead

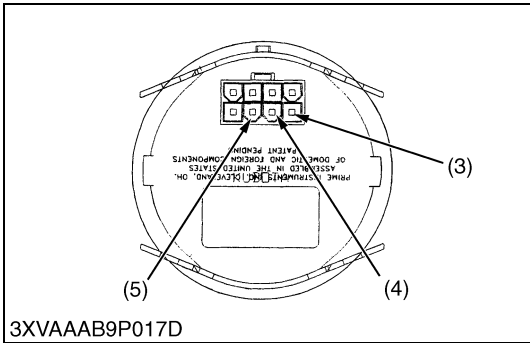
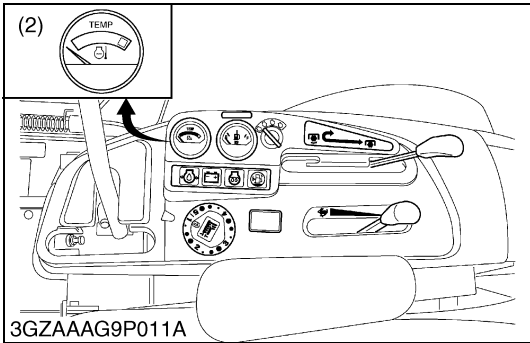
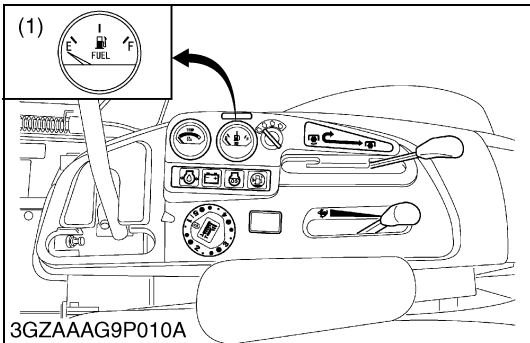
(a) From Fan Motor Relay

(2) Coolant Temperature Switch

9Y1210301ELS0028US0



3XVAAAB9P014A



Coolant Temperature Switch

1. Measure the resistance with an ohmmeter across the switch terminal and the switch body.
2. If 0 ohm is not indicated in the coolant temperature at 194 °C (201 °F) or more, the sensor is faulty.
3. If infinity is not indicated in the coolant temperature at lower than 90 °C (194 °F), the sensor is faulty.

Resistance (Switch terminal – Switch body)	At coolant temperature lower than 116 °C (241 °F)	Infinity
	At coolant temperature more than 120 to 126 °C (248 to 258 °F)	0 Ω

- (1) Coolant Temperature Switch (2) Coolant

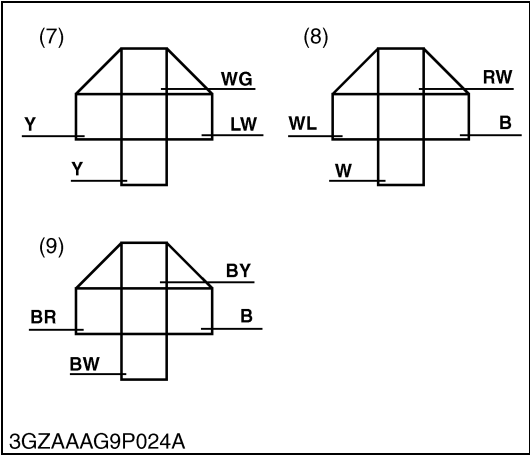
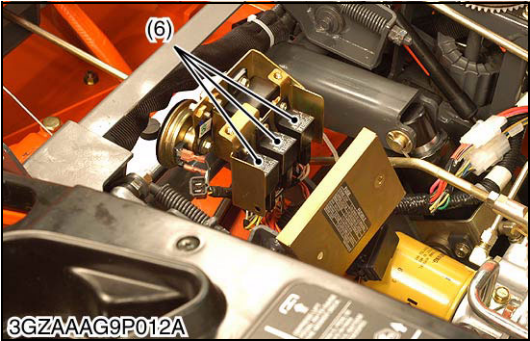
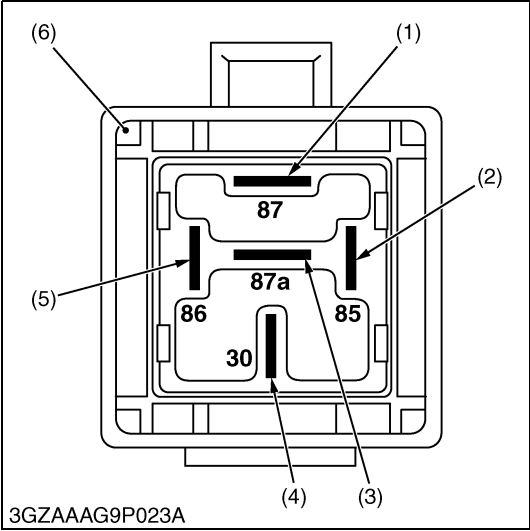
9Y1210301ELS0029US0

Fuel Gauge and Coolant Temperature Gauge Operation

1. Remove the fender cover.
2. Turn the main switch to **ON** position. Measure the voltage with a voltmeter across the **I** terminal (5) and **GND** terminal (3) of the gauge.
3. If approx. battery voltage is indicated, the ignition and ground lead connections are good.
4. Turn the main switch to **OFF** position. Connect a jumper lead between **S** terminal (4) and **GND** terminal (3) of the gauge.
5. Turn the main switch to **ON** position. If the gauge resisters a full scale reading under those conditions, the gauge is good. If less than full scale reading is indicated, the gauge is defective and should be replaced.

- (1) Fuel Gauge (4) **S** Terminal
(2) Temperature Gauge (5) **I** Terminal
(3) **GND** Terminal

9Y1210301ELS0030US0



Relay (Horn, Solenoid and Starter)

1. Disconnect the connector from relay (6) after turning the main switch off.
2. Remove the relay from bracket.
3. Measure the resistance with an ohmmeter across the terminal **85** (2) to terminal **86** (5), terminal **87** (1) to terminal **87a** (3) and terminal **87** (1) to terminal **30** (4).
4. If resistance differs from the factory specifications, the relay is faulty.

Resistance	Terminal 85 (2) – Terminal 86 (5)	Approx. 90 Ω
	Terminal 87 (1) – Terminal 87a (3)	0 Ω
	Terminal 87 (1) – Terminal 30 (4)	Infinity

- (1) Terminal **87**

(2) Terminal **85**

(3) Terminal **87a**

(4) Terminal **30**

(5) Terminal **86**
- (6) Relay (Horn, Solenoid and Starter)

(7) Horn Relay Connector

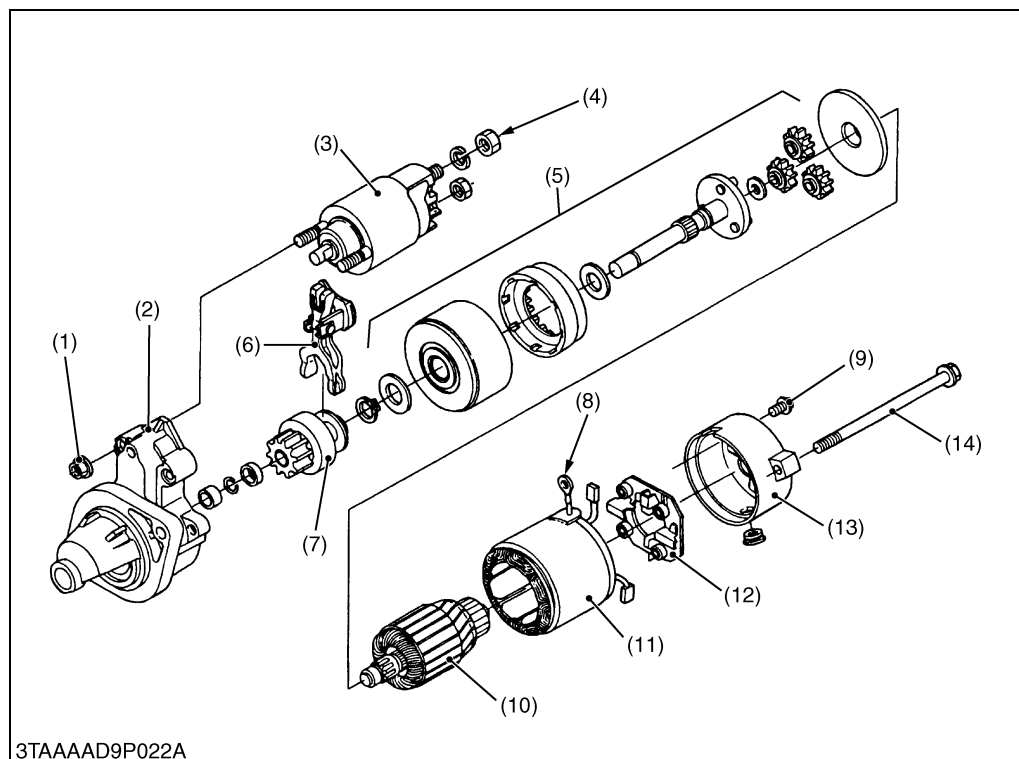
(8) Solenoid Relay Connector

(9) Starter Relay Connector

9Y1210301ELS0031US0

[2] DISASSEMBLING AND ASSEMBLING

(1) Starting System (Starter)



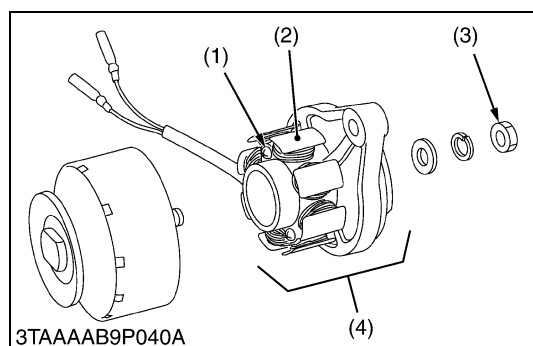
- (1) Magnetic Switch Mounting Nut
- (2) Housing
- (3) Magnetic Switch
- (4) C Terminal Nut
- (5) Shaft Assembly
- (6) Drive Lever
- (7) Overrunning Clutch
- (8) Connecting Lead
- (9) Mounting Screw
- (10) Armature
- (11) Yoke
- (12) Brush Holder
- (13) Rear End Holder
- (14) Through Bolt

3TAAAD9P022A

1. Unscrew the C terminal nut (4), and disconnect the connecting lead (8).
2. Unscrew the magnetic switch mounting nuts (1), and remove the magnetic switch (3) from the housing (2).
3. Unscrew the through bolts (14) and mounting screw (9), and remove the rear end frame (13).
4. Remove the brush from the brush holder while holding the spring up.
5. Remove the brush holder (12).
6. Draw out the armature (10) and yoke (11) from the housing.
7. Draw out the shaft assembly (5) with the drive lever (6) and overrunning clutch (7) from the housing.

9Y1210301ELS0032US0

(2) Charging System (Dynamo)



3TAAAB9P040A

Stator

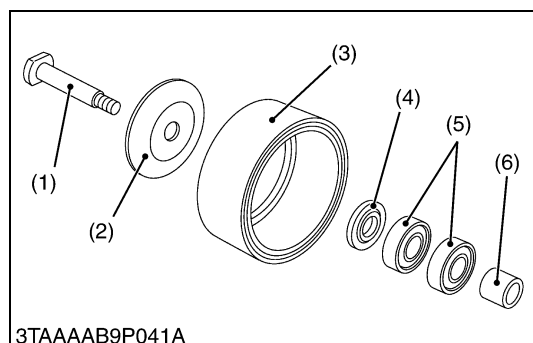
1. Remove the nut (3) and separate the stator comp. (4).
2. Unscrew the screws (1) and remove the stator (2).

(When reassembling)

Tightening torque	Nut	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 lbf·ft
-------------------	-----	---

- (1) Screw
- (2) Stator
- (3) Nut
- (4) Stator Comp

9Y1210301ELS0033US0



3TAAAB9P041A

Rotor

1. Tap out the shaft (1) from the rotor (3).

(When reassembling)

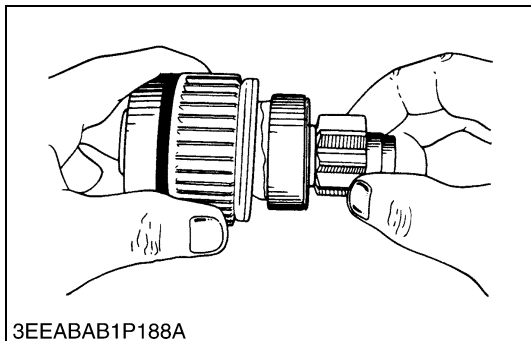
- Take care the direction of the collar (4), the flat side should face to the pulley (2) side.

- (1) Shaft
- (2) Pulley
- (3) Rotor
- (4) Collar
- (5) Bearings
- (6) Collar

9Y1210301ELS0034US0

[3] SERVICING

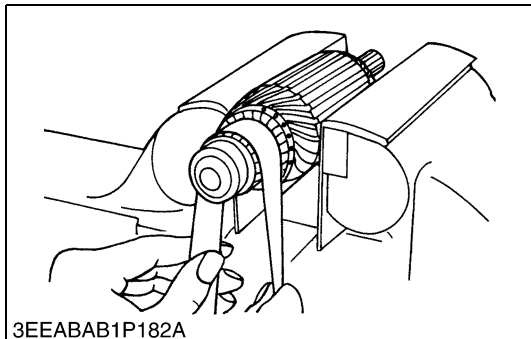
(1) Starting System



Overrunning Clutch

1. Inspect the pinion for wear or damage.
2. If there is any defect, replace the overrunning clutch assembly.
3. Check that the pinion turns freely and smoothly in the overrunning direction and does not slip in the cranking direction.
4. If the pinion slips or does not rotate in the both directions, replace the overrunning clutch assembly.

9Y1210301ELS0035US0



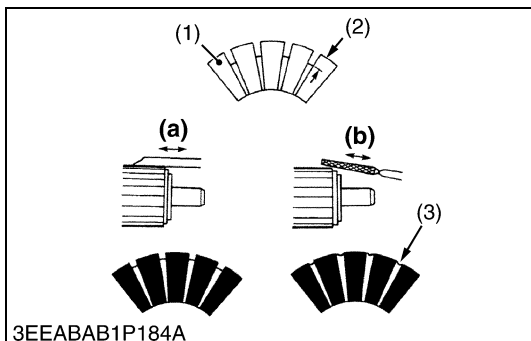
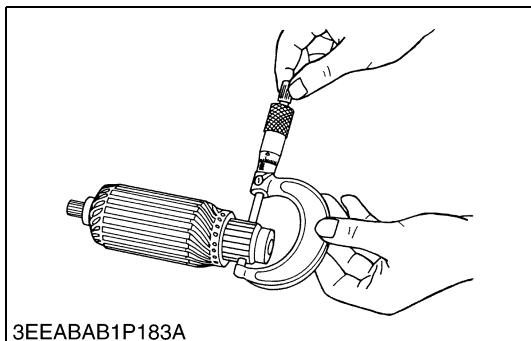
Commutator and Mica

1. Check the contact face of the commutator for wear, and grind the commutator with emery paper if it is slightly worn.
2. Measure the commutator O.D. with an outside micrometer at several points.
3. If the minimum O.D. is less than the allowable limit, replace the armature.
4. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
5. Measure the mica undercut.
6. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D.	Factory specification	30.0 mm 1.181 in.
	Allowable limit	29.0 mm 1.142 in.

Difference of O.D.'s	Factory specification	Less than 0.02 mm Less than 0.0008 in.
	Allowable limit	0.05 mm 0.0020 in.

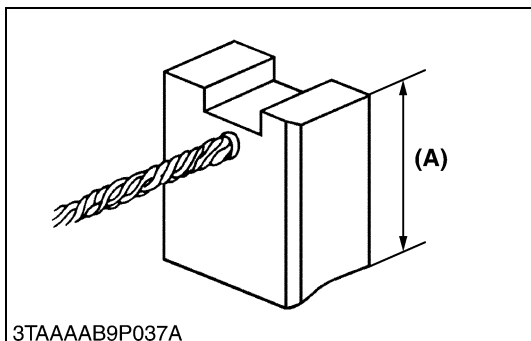
Mica undercut	Factory specification	0.50 to 0.80 mm 0.0197 to 0.0315 in.
	Allowable limit	0.20 mm 0.0079 in.



- (1) Segment
(2) Undercut
(3) Mica

- (a) Correct
(b) Incorrect

9Y1210301ELS0036US0

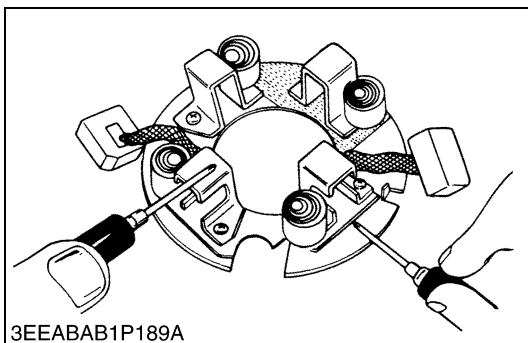


Brush Wear

1. If the contact face of the brush is dirty or dusty, clean it with emery paper.
2. Measure the brush length (A) with vernier calipers.
3. If the length is less than the allowable limit, replace the yoke assembly and brush holder.

Brush length (A)	Factory specification	14.0 mm 0.551 in.
	Allowable limit	9.0 mm 0.354 in.

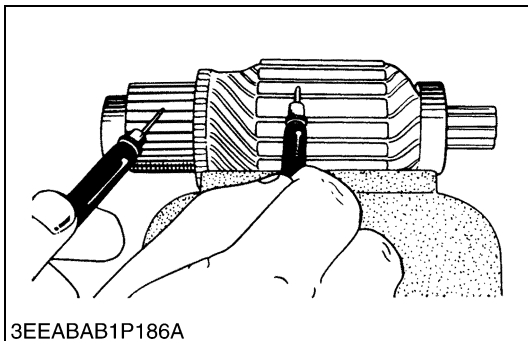
9Y1210301ELS0037US0



Brush Holder

1. Check the continuity across the brush holder and the holder support with an ohmmeter.
2. If it conducts, replace the brush holder.

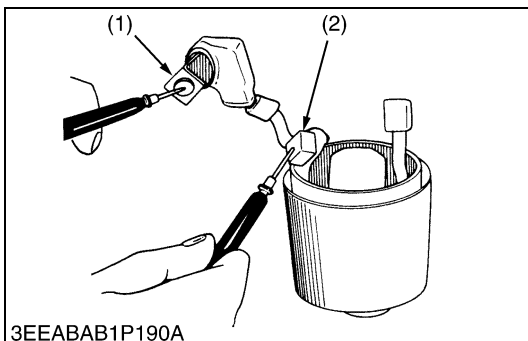
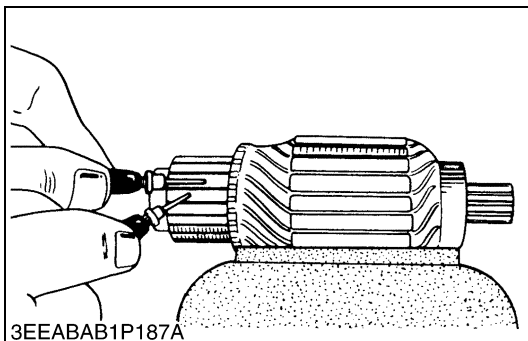
9Y1210301ELS0038US0



Armature Coil

1. Check the continuity across the commutator and armature coil core with an ohmmeter.
2. If it conducts, replace the armature.
3. Check the continuity across the segments of the commutator with an ohmmeter.
4. If it does not conduct, replace the armature.

9Y1210301ELS0039US0



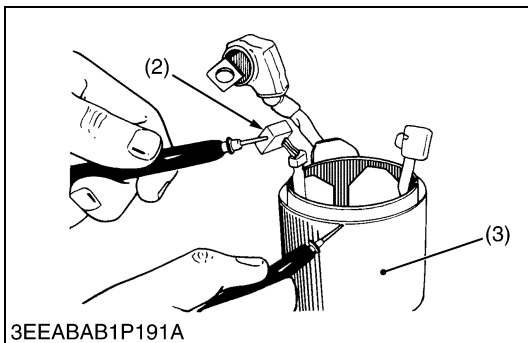
Field Coil

1. Check the continuity across the lead (1) and brush (2) with an ohmmeter.
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter.
4. If it conducts, replace the yoke assembly.

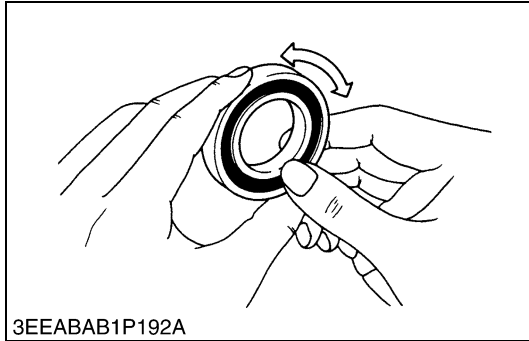
(1) Lead
(2) Brush

(3) Yoke

9Y1210301ELS0040US0



(2) Charging System



Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

9Y1210301ELS0041US0

6 MOWER

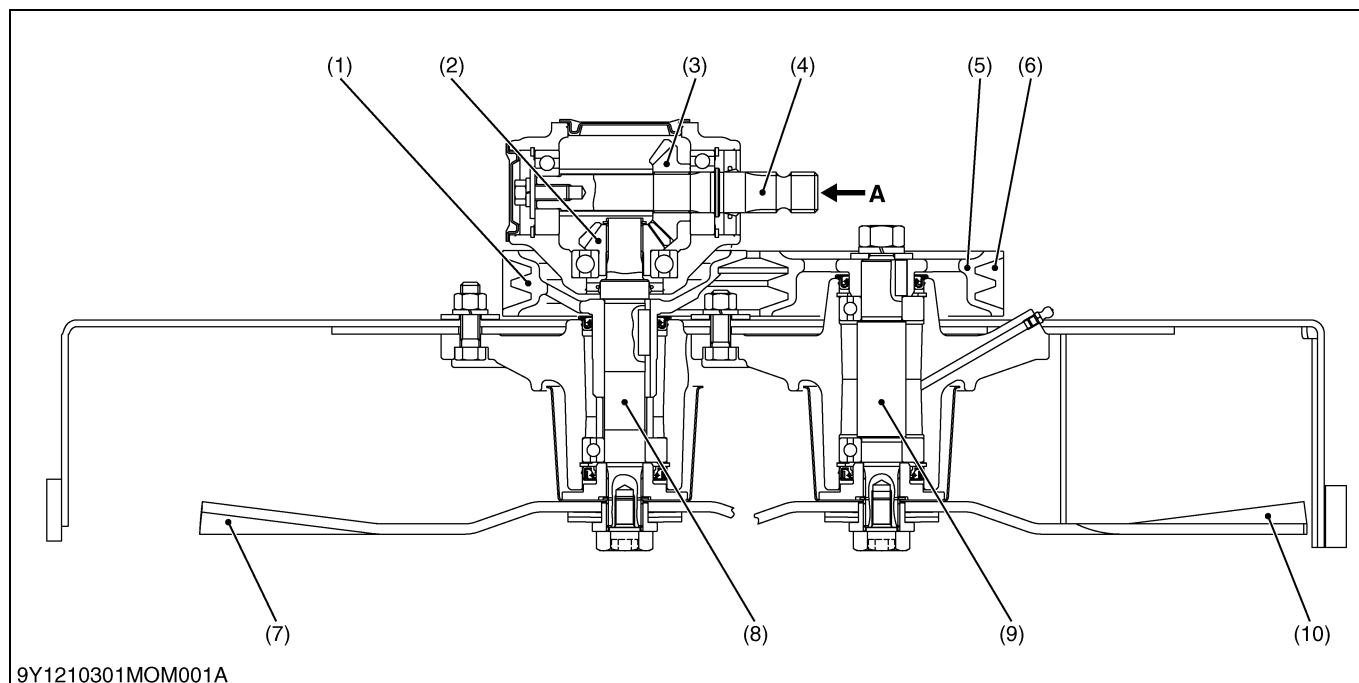
MECHANISM

CONTENTS

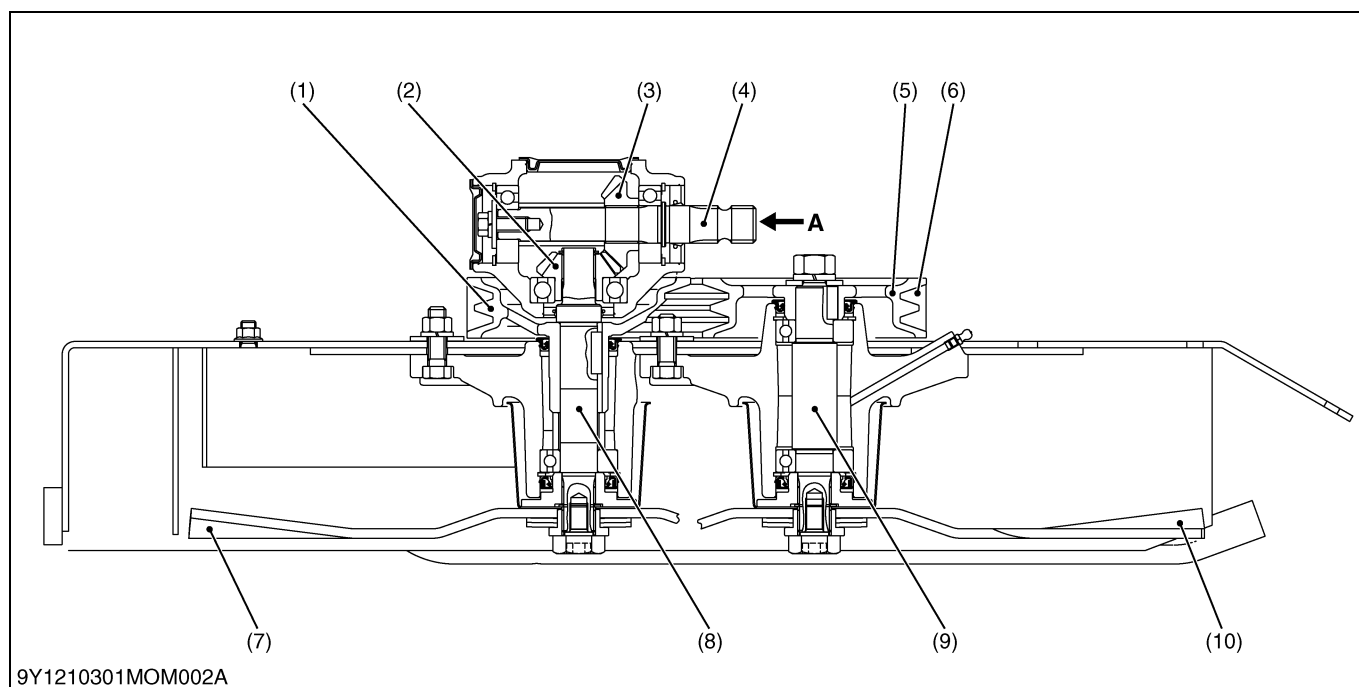
1. POWER TRANSMISSION.....	6-M1
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1. POWER TRANSMISSION

[RCK60P-326Z-EU]



[RCK60R-326Z-EU]



- | | | | |
|--------------------|------------------|----------------------|--------------------------|
| (1) Center Pulley | (4) Pinion Shaft | (7) Center Blade | (10) Outer Blade |
| (2) 17T Bevel Gear | (5) Outer Pulley | (8) Bevel Gear Shaft | |
| (3) 18T Bevel Gear | (6) Mower Belt | (9) Blade Shaft | A: From PTO Shaft |

The power is transmitted from mid-PTO to blades as follows.

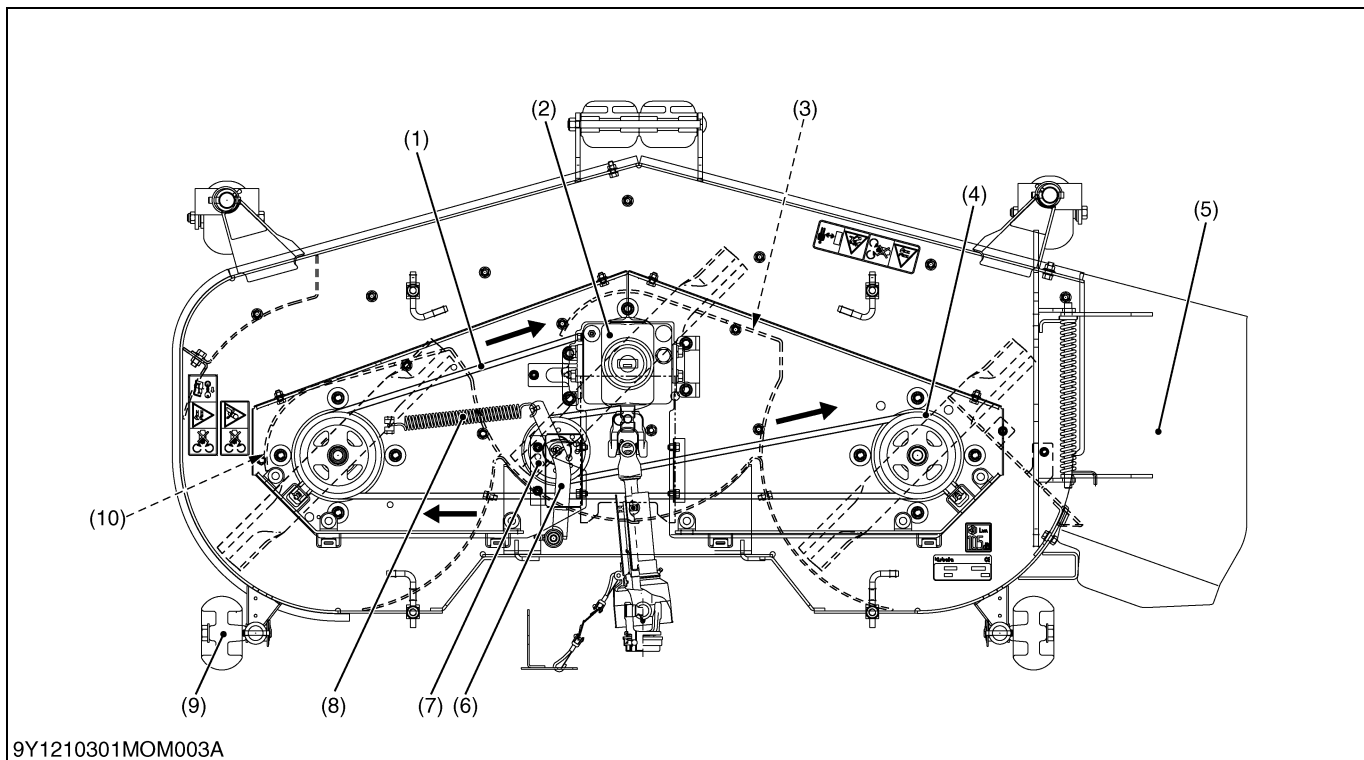
■ Center Blade

From PTO Shaft "A" → Pinion Shaft (4) → Bevel Gear (3) → Bevel Gear (2) → Bevel Gear Shaft (8) → Center Blade (7)

■ Outer Blade

From PTO Shaft "A" → Pinion Shaft (4) → Bevel Gear (3) → Bevel Gear (2) → Bevel Gear Shaft (8) → Center Pulley (1) → Mower Belt (6) → Outer Pulley (5) → Blade Shaft (9) → Outer Blade (10)

9Y1210301MOM0001US0

[RCK60P-326Z-EU]

9Y1210301MOM003A

- | | | | |
|------------------|---------------------|--------------------|-----------------------|
| (1) Mower Belt | (4) Pulley | (7) Tension Pulley | (9) Anti-Scalp Roller |
| (2) Gear Box | (5) Discharge Cover | (8) Tension Spring | (10) Baffle Plate |
| (3) Baffle Plate | (6) Tension Arm | | |

The method of power transmission is the same between the side discharge type and rear discharge type.

The mower belt(1) and all blades turn clockwise. There are baffle plates(3)(10) in the mower deck. They make discharge channels of cut grass according to the discharge directions.

9Y1210301MOM0002US0

SERVICING

CONTENTS

1. TROUBLESHOOTING.....	6-S1
2. SERVICING SPECIFICATIONS	6-S2
3. TIGHTENING TORQUES.....	6-S3
4. CHECKING, DISASSEMBLING AND ASSEMBLING	6-S4
[1] CHECKING AND ADJUSTING.....	6-S4
[2] DISASSEMBLING AND ASSEMBLING	6-S7
(1) Dismounting Mower.....	6-S7
(2) Disassembling and Assembling.....	6-S10

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Blade Does Not Turn	PTO system malfunctioning	Check transmission	2-S1
	Broken mower belt	Replace mower belt	6-S12
Blade Speed Is Slow	Loosen mower belt	Replace mower belt or tension spring	6-S12
	Clogged grass	Remove grass	—
	Flattened out or worn cup washer	Replace cup washer	6-S11
	Engine rpm too low	Mow at full throttle, check and reset engine rpm	
Cutting Is Poor	Worn or bent mower blade	Sharpen or replace mower blade	G-40, 6-S11
	Loosen mower blade screw	Retighten mower blade screw	6-S11
	Cutting height improper	Adjust cutting height	6-S4 to 6-S6
	Ground speed too fast	Slow-down	—
	Low wheel inflation	Add air to correct	G-17
	Anti-scalp rollers not adjusted correctly	Adjust anti-scalp rollers	6-S4
Mower Is Not Lifted	Broken linkage system	Replace linkage system	4-M7
	Trouble of hydraulic system	Check hydraulic system	4-S1

9Y1210301MOS0001US0

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Pinion Shaft (without Mower Belt)	Turning Force	Less than 117.7 N 12.0 kgf 26.5 lbf	—
	Turning Torque	Less than 1.47 N·m 0.15 kgf·m 1.08 lbf·ft	—
Bevel Gears in Gear Box	Backlash	0.1 to 0.2 mm 0.0039 to 0.0078 in.	0.4 mm 0.157 in.
Front Tip of Blade to Rear Tip of Blade	Difference	0 to 6.0 mm 0 to 0.24 in.	—
Left Tip of Blade to Right Tip of Blade	Difference	Less than 3 mm 0.1 in.	—

9Y1210301MOS0002US0

3. TIGHTENING TORQUES

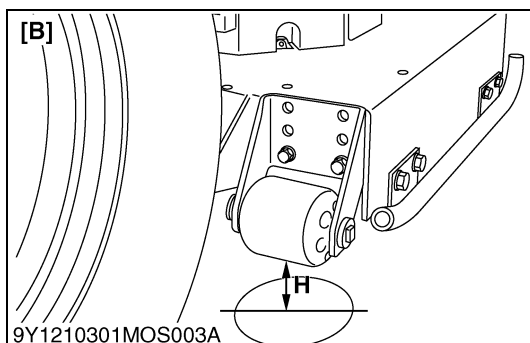
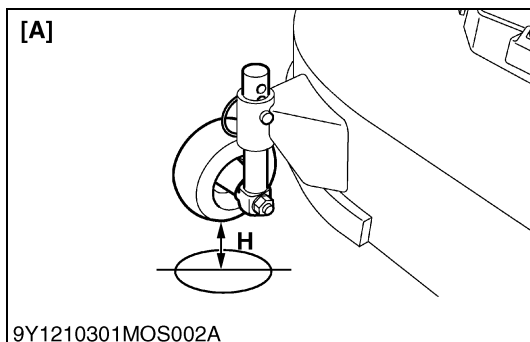
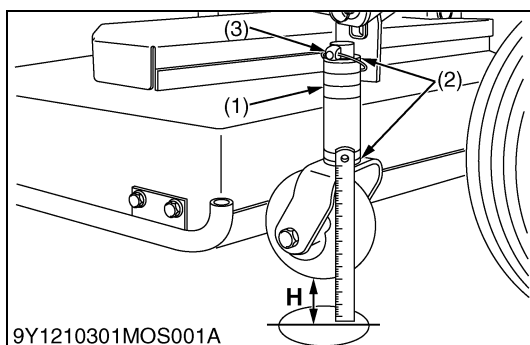
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-11.)

Item	N·m	kgf·m	lbf·ft
Mower blade screw	98.1 to 117	10.0 to 12.0	72.4 to 86.7
Gear box mounting screw (Standard type / Reamer type)	79 to 90	8.0 to 9.2	58 to 66
Center pulley holder screw (Standard type / Reamer type)	79 to 90	8.0 to 9.2	58 to 66
Outer pulley mounting nut	167 to 186	17.0 to 19.0	123 to 137
Pulley holder mounting screw	78 to 90	7.9 to 9.2	58 to 66

9Y1210301MOS0003US0

4. CHECKING, DISASSEMBLING AND ASSEMBLING

[1] CHECKING AND ADJUSTING



Adjusting Anti-scalp Rollers



CAUTION

To avoid personal injury ;

- Park the machine on a firm and level surface.
- Apply the parking brake.
- Stop the engine and remove the key.
- Wait for all moving parts to stop.

■ IMPORTANT

- The flattest cut can be achieved by adjusting the anti-scalp rollers to be off the ground.
- Check anti-scalp roller adjustments each time the mower deck cutting height is changed.
- It is recommended that all the anti-scalp rollers be kept off the ground to minimize scuffing.

1. Check the machine wheel pressure.
Inflate wheels to the correct pressure. (See table below.)

	Inflation Pressure
Front wheel	160 kPa, 1.6 kgf/cm ² , 23 psi
Rear wheel	120 kPa, 1.2 kgf/cm ² , 17 psi

2. Start the engine.
3. Raise up the mower deck to the transport position.
(Also the top end of the lift.)
4. Turn the cutting height control dial to adjust height.
5. Lower the mower deck.

■ Front side anti-scalp roller

6. Adjust the height "H" of the front side anti-scalp roller by adding or removing the collar (1) to approximately 19 mm (0.75 in.) between rollers and ground. Adjust both side rollers to the same height.
7. Install the roller with attaching hardware.

■ Rear side anti-scalp roller

8. Adjust height "H" of the rear side anti-scalp roller to one of hole positions to approximately 19 mm (0.75 in.) between rollers and ground. Adjust both side rollers to the same height.
9. Install the roller with attaching hardware.

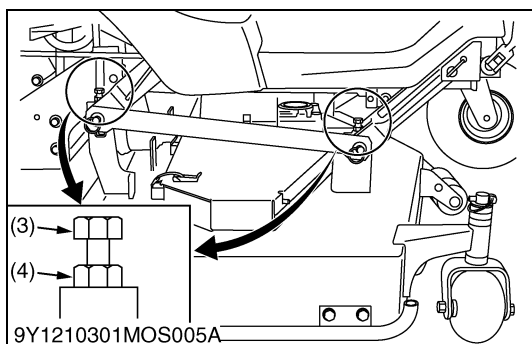
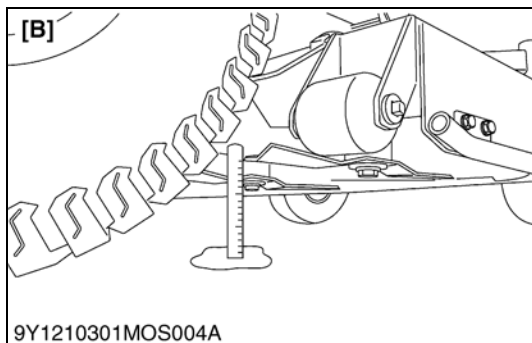
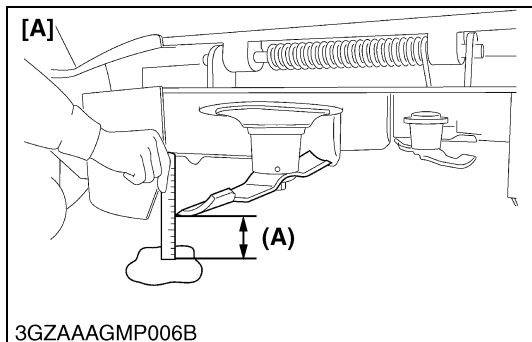
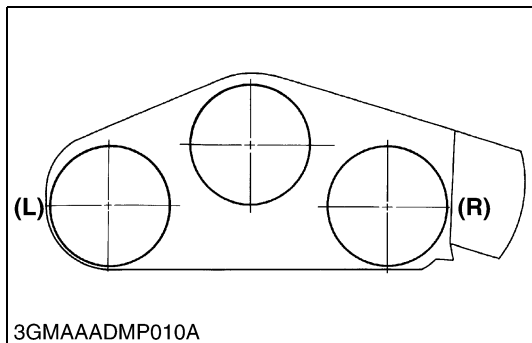
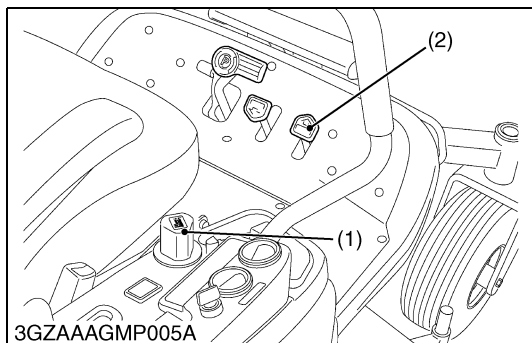
- (1) Collar
(2) Washer
(3) Set Pin

[A] RCK60P-326Z-EU

[B] RCK60R-326Z-EU

H: Height

9Y1210301MOS0004US0



Leveling Mower Deck (Side to Side)

CAUTION

To avoid personal injury ;

- Park the machine on a firm and level surface.
 - Apply the parking brake.
 - Disengage PTO (OFF).
 - Stop the engine, remove the key.
 - Remove the mower u-joint while checking or adjusting the level of the mower deck.
1. Tire pressure must be correct.
 2. Raise up the mower deck to the transport position. (Also the top end).
 3. Turn the cutting height set dial (1) to the 3 in. cutting height position.
 4. Place 51 mm (2 in.) height wood blocks under each side of the mower deck for safety.
Anti-scalp rollers must not rest on the wood block.
 5. Lower the mower deck.
 6. Position mower blade in the Side-to-Side position.
 7. Loosen the lock nuts (4) of the right side of the machine.
 8. Adjust the cutting height fine tuning bolts (3) to set 76 mm (3 in.) blade height (A).
Front and rear side bolts must be adjusted.
 9. Lock the lock nuts (4).
 10. Adjust the left side equally.
 11. **At the measurement positions (L) and (R),** measure the blade height (A) from the ground surface and calculate the difference.
 12. If the difference between left tip and right tip of blade is not within the factory specification, adjust the length of cutting height fine tuning bolt (3).

Difference (L) - (R) between left tip and right tip of blade	Factory specification	Less than 3 mm 0.1 in.
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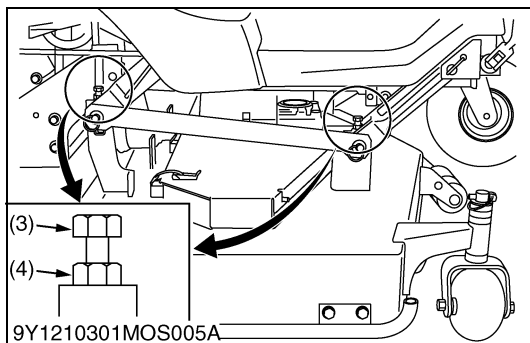
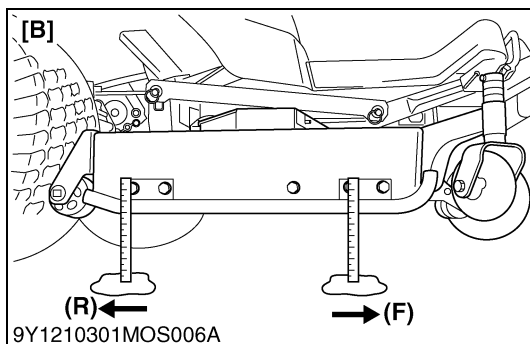
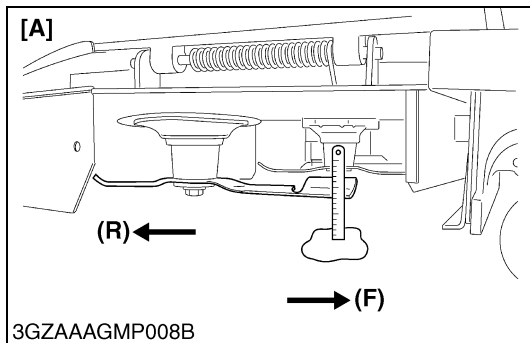
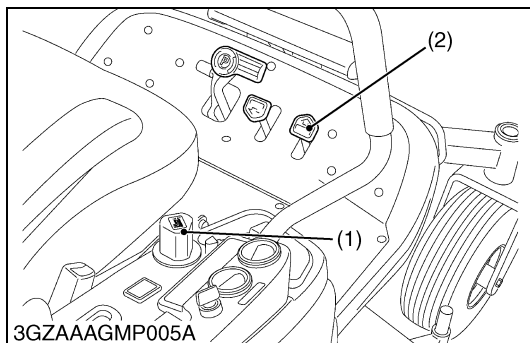
- (1) Cutting Height Control Dial
(2) Hydraulic Lift Control Pedal
(3) Cutting Height Fine Tuning Bolt
(4) Lock Nut

- (L) Left Blade Measurement Position
(R) Right Blade Measurement Position
(A) Blade Height

[A] RCK60P-326Z-EU

[B] RCK60R-326Z-EU

9Y1210301MOS0005US0



Leveling Mower Deck (Front to Rear)



CAUTION

To avoid personal injury:

- Park the machine on a firm and level surface.
- Engage the parking brake.
- Disengage PTO.
- Stop the engine, remove the key.
- Remove the mower u-joint while checking or adjusting the level of the mower deck.

1. Tire pressure must be correct.
2. Raise up the mower deck to the transport position. (Also the top end).
3. Turn the cutting height set dial (1) to the 3 in. cutting height position.
4. Place 51 mm (2 in.) height wood blocks under each side of the mower deck for safety. Anti-scalp rollers must not rest on the wood block.
5. Lower the mower deck.
6. Loosen the lock nuts (4) of the front side of the machine.
7. Adjust the cutting height fine tuning bolts (3) to set 76 mm (3 in.) blade height. Both front side bolts (3) must be adjusted.
8. Lock the lock nuts (4).
9. Adjust the other side equally.
10. Measure the heights of blade (F) and (R) from the ground surface and calculate the difference.
11. If the difference between front tip and rear tip of blade is not within the factory specification, adjust the length of cutting height fine tuning bolt (3) with lock nut (4). The height of rear blade tip (R) should be bigger than the front.

Difference (R) – (F)
(R) ≥ (F) between front
tip and rear tip of blade

Factory specification

0 to 6.0 mm
0 to 0.24 in.

- (1) Cutting Height Control Dial
- (2) Hydraulic Lift Control Pedal
- (3) Cutting Height Fine Tuning Bolt
- (4) Lock Nut

(F) Height of Blade Tip (Front)
(R) Height of Blade Tip (Rear)

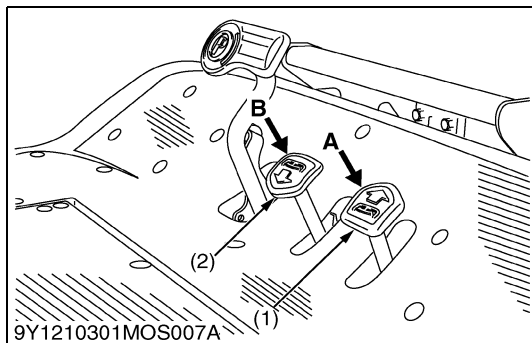
[A] RCK60P-326Z-EU

[B] RCK60R-326Z-EU

9Y1210301MOS0006US0

[2] DISASSEMBLING AND ASSEMBLING

(1) Dismounting Mower



Raising Mower



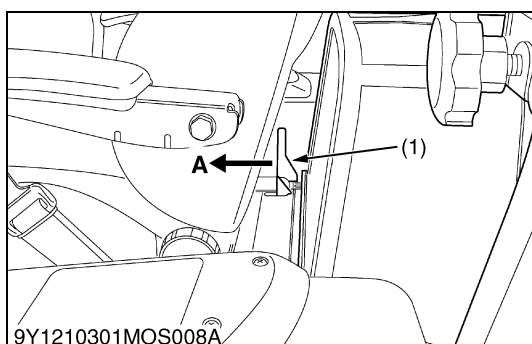
CAUTION

To avoid personal injury:

- Park the machine on a firm and level surface.
 - Apply the parking brake.
 - Stop the engine, remove the key.
1. To raise the mower to the full up position, start the engine, depress the hydraulic lift control pedal (UP) (1).
 2. Stop engine.

- | | |
|---|----------------|
| (1) Hydraulic Lift Control Pedal (UP) | A: UP |
| (2) Hydraulic Lift Control Pedal (DOWN) | B: DOWN |

9Y1210301MOS0007US0



Raising Seat



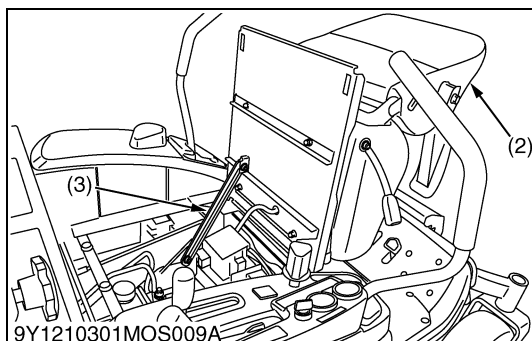
CAUTION

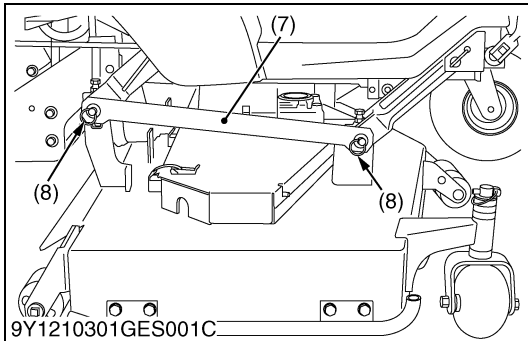
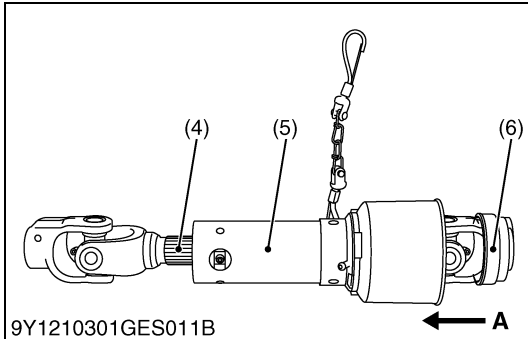
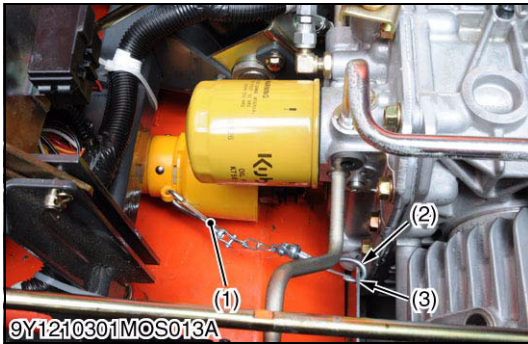
To avoid personal injury:

- Fully raise the operator's seat.
(To the locked position)
Do not keep the seat halfway.
1. Seat must be all the way back before raising.
 2. Pull the latch lever (1) on the seat panel frontward.
 3. Raise the operator's seat to the "LOCK" position.

- | | |
|----------------------|------------------|
| (1) Latch Lever | A: "PULL" |
| (2) Operator's Seat | |
| (3) Seat Support Rod | |

9Y1210301MOS0008US0





Uninstalling Universal Joint

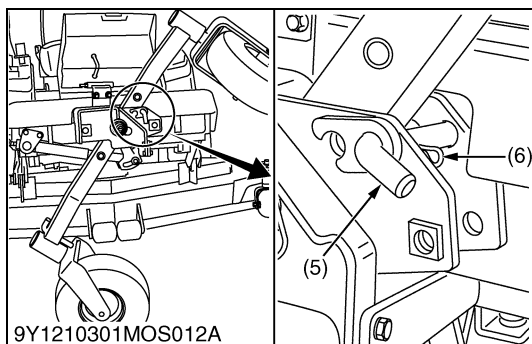
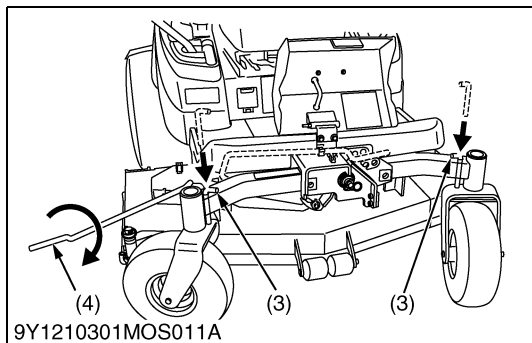
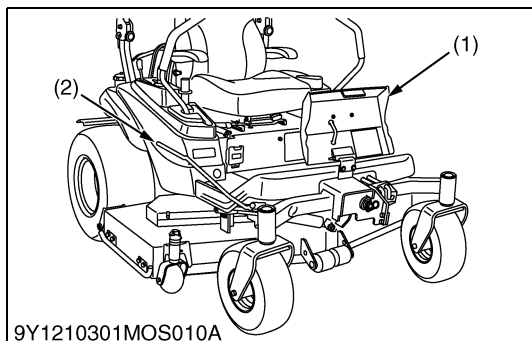
1. Unhook the chain (1) from the hole (3) of the stay.
2. Push the coupler (6) of the universal joint (4).
3. Remove the universal joint from PTO shaft.
4. Place 50 mm (2 in.) wood block under each side of the mower deck.
5. Lower the mower.
6. Remove clevis pins from lift links LH, RH (7).
7. Remove lift links LH, RH (7).

- (1) Chain
- (2) Hook
- (3) Hole
- (4) Universal Joint
- (5) Coupler

- (6) Universal Joint Cover
- (7) Lift Link
- (8) Clevis Pin, Plain Washer, Snap Ring

A: "PUSH"

9Y1210301MOS0009US0



Tilting up Machine

WARNING

To avoid personal injury or death:

- Park the machine on a firm and level surface.
- Set the mower deck height to 5 inch.
- Stop the engine, remove the key and engage the parking brake.
- Be sure to chock the wheels.
- Lock the raised axle with an L-pin and hairpin cotter before working under the machine.

1. Lower the forward right anti-scalp roller to the lowest position.
2. Fully open the front cover (1).
3. Unfold the tilt lever (2).
4. Keep the front cover open.
5. Remove two L-pins (3).
6. Insert L-pins to both sides of the front axle to position the front wheels. See picture.
7. Turn the tilt lever (4) clockwise to raise the axle to the stop.
8. Remove the L-pin of the raised wheel and insert it to the outside hole of the frame.
9. Insert the hairpin cotter (6).
10. Slide out the mower deck from the machine.

■ Return to the normal position.

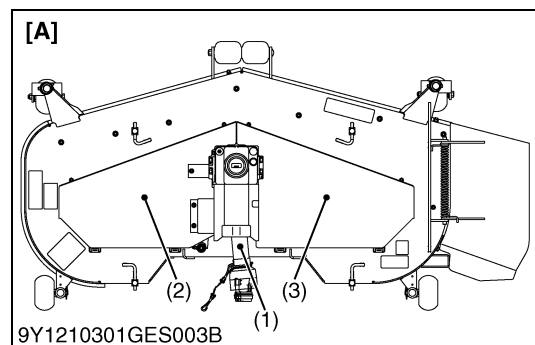
Reverse the above steps.

- (1) Front Cover
- (2) Tilt Lever
- (3) L-Pin

- (4) Tilt Lever
- (5) L-Pin
- (6) Hairpin Cotter

9Y1210301MOS0010US0

(2) Disassembling and Assembling



Universal Joint and Belt Covers

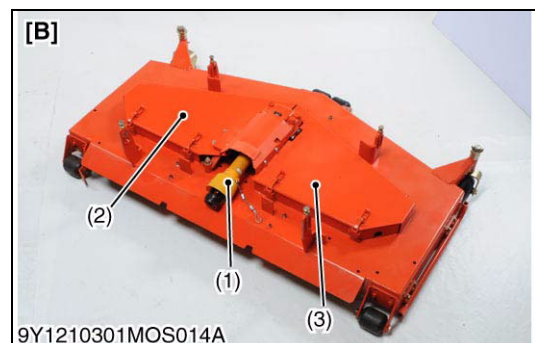
1. Remove the universal joint (1).
2. Remove the left and right belt covers (2), (3).

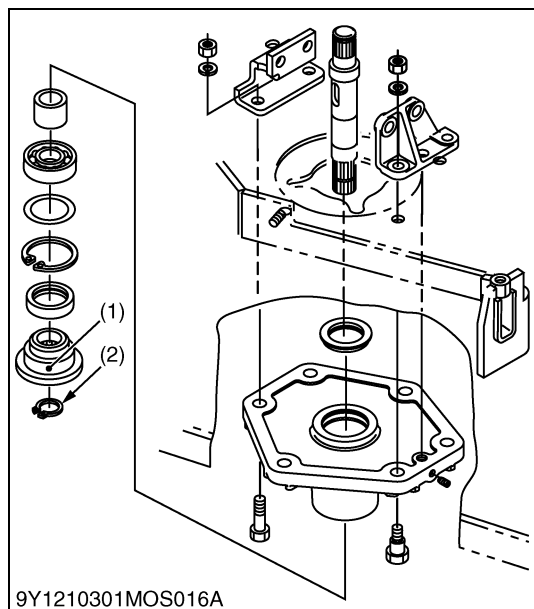
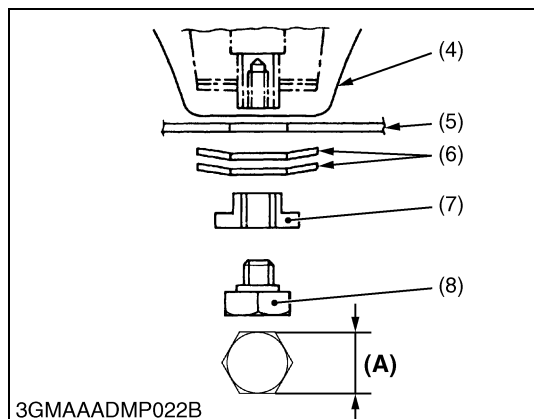
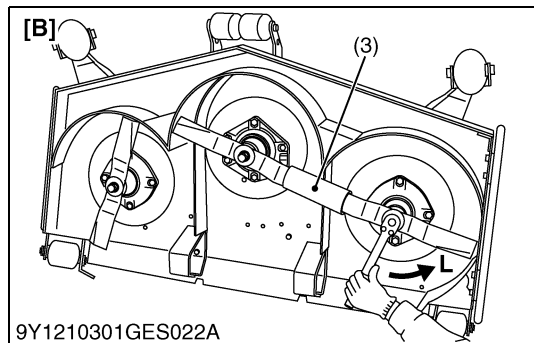
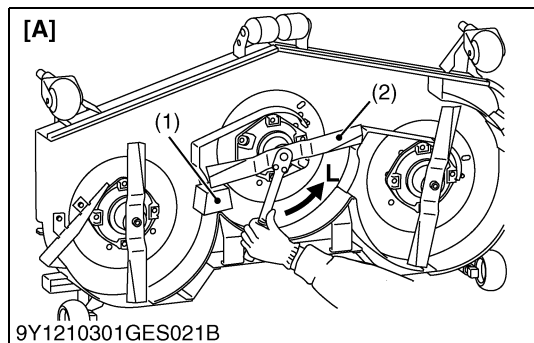
- (1) Universal Joint
 (2) Belt Cover (Left)
 (3) Belt Cover (Right)

[A] RCK60P-326Z-EU

[B] RCK60R-326Z-EU

9Y1210301MOS0011US0





Mower Blades (Center Blade and Outer Blades)

1. Turn over the mower.
2. **[RCK60P]**
Wedge a block of wood (1) between the blade (2) and mower housing or use a box wrench over the pulley nut to prevent the spindle from rotating while removing the blade screws.

[RCK60R]

Set the pipe (3) between the blade and the next blade or use a box wrench over the pulley nut to prevent the spindle from rotating while removing the blade screws.

3. Loosen the blade screws as illustrated.

■ IMPORTANT

- Use the proper metric size box or socket wrench to tighten or loosen the blade screws.

4. Remove the blade screw (8), the spline boss (7), two cup washers (6), mower blade (5) and dust cover (4).

(When reassembling)

- Be sure to assemble the two cup washers (6) between the mower blade and spline boss.

■ IMPORTANT

- Make sure the cup washer is not flattened out or worn, causing blade to slip easily.

Replace two cup washers if either is damaged.

Tightening torque	Mower blade screw	98.1 to 117 N·m 10.0 to 12.0 kgf·m 72.4 to 86.7 lbf·ft
-------------------	-------------------	--

- (1) Wood Block
- (2) Blade
- (3) Pipe
- (4) Dust Cover
- (5) Mower Blade
- (6) Cup Washer
- (7) Spline Boss
- (8) Blade Screw

L: Loosen

[A] RCK60P-326Z-EU

[B] RCK60R-326Z-EU

(A) 30mm (1-3/16 in.)

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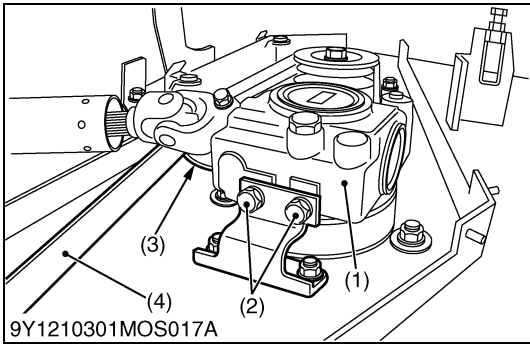
Blade Boss

1. Remove the external snap ring (2).
2. Remove the blade boss (1).

- (1) Blade Boss

- (2) External Snap Ring

9Y1210301MOS0013US0



Gear Box and Mower Belt Replacing

- 1. Remove the mower deck from the machine.
- 2. Remove the left and right hand shield from the mower deck.
- 3. Clean around the gear box (1).
- 4. Remove the mower belt (4) from the tension pulley (3).
- 5. Remove the right hand bracket which mounts the gear box to the mower deck and slip the belt over the top of the gear box.
- 6. To install a new belt, reverse the above procedure.

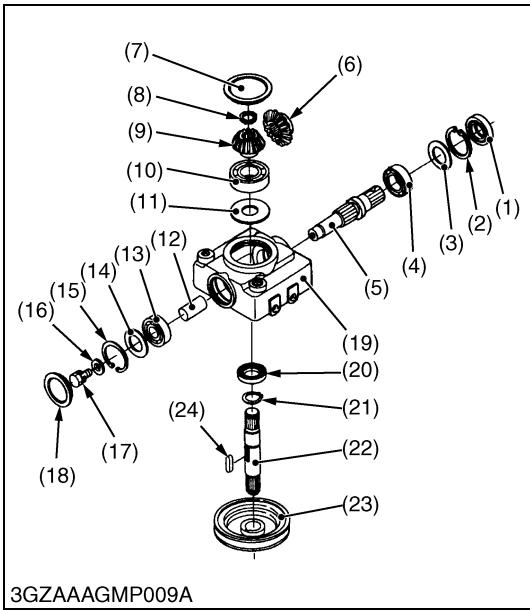
(When reassembling)

- Install the reamer screws at their original positions as shown in the figure.

Tightening torque	Gear box mounting screw	79 to 90 N·m 8.0 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	-------------------------	---

- (1) Gear Box
- (2) Gear Box Mounting Screw
- (3) Tension Pulley
- (4) Mower Belt

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Disassembling Gear Box

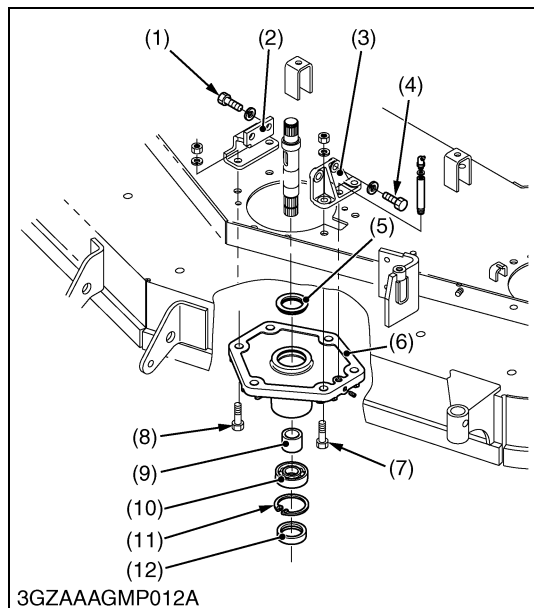
- 1. Unscrew the drain plug, and drain the gear box oil.
- 2. Remove the center pulley (23) with a puller, and remove the feather key (24) on the bevel gear shaft.
- 3. Remove the gear box caps (7), (18).
- 4. Remove the oil seal (1), external snap ring (2) and shim (3).
- 5. Remove the screw (17), washer (16) and tap out the pinion shaft (5) with ball bearing (4).
- 6. Remove the bevel gear (6) and pinion shaft collar (12).
- 7. Remove the internal snap ring (15) and shims (14).
- 8. Remove the ball bearing (13).
- 9. Remove the external snap ring (8), and draw out the bevel gear shaft (22).
- 10. Remove the bevel gear (9) with ball bearing (10).

(When reassembling)

- Replace the oil seals (1), (20) and gear box caps (7), (18) with new ones
- Check the backlash and turning torque.
- If not proper, adjust with the shims (3), (11) and (14). (See page 6-S11, 6-S12.)

- (1) Oil Seal
- (2) Internal Snap Ring
- (3) Shim
- (4) Ball Bearing
- (5) Pinion Shaft
- (6) 18T Bevel Gear
- (7) Gear Box Cap
- (8) External Snap Ring
- (9) 17T Bevel Gear
- (10) Ball Bearing
- (11) Shim
- (12) Pinion Shaft Collar
- (13) Ball Bearing
- (14) Shim
- (15) Internal Snap Ring
- (16) Washer
- (17) Screw
- (18) Gear Box Cap
- (19) Gear Box
- (20) Oil Seal
- (21) External Snap Ring
- (22) Bevel Gear Shaft
- (23) Center Pulley
- (24) Feather Key

9Y1210301MOS0015US0



Center Pulley Holder

1. Unscrew the center pulley holder screws (8) and reamer screws (7).
2. Remove the upper oil seal (5) and lower oil seal (12).
3. Remove the internal snap ring (11) and ball bearing (10).

(When reassembling)

- Replace the oil seals (5), (12) with new ones.
- Install the reamer screws (10) at their original positions as shown in the figure.

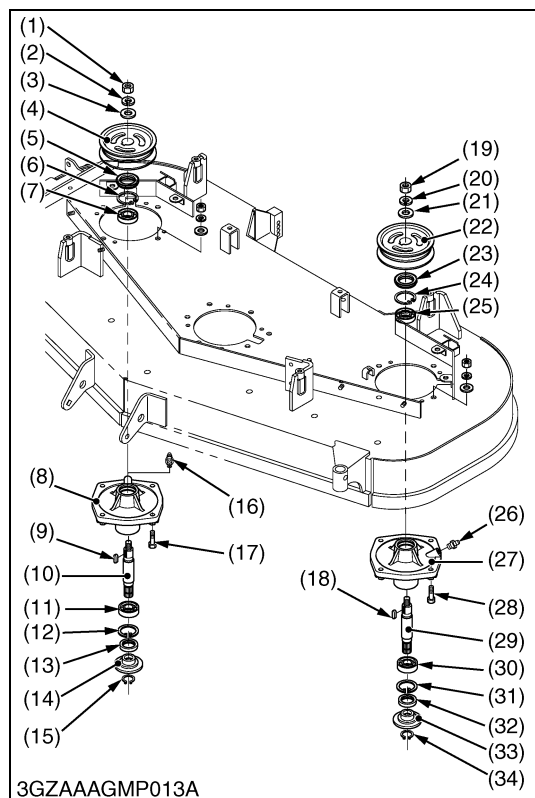
■ NOTE

- When reassembling the center pulley holder (6), gear box and gear box stays (2), (3), screw the all screws by hand temporary.
- Tighten the screws in the order as below, to prevent the incline the gear box.
- Tighten the reamer screws (4) to the gear box first, then tighten the reamer screws (7) to the center pulley holder (6) with specified torque.
- Tighten the gear box screws (1) to the gear box, then tighten the center pulley holder screws (8) with specified torque.
- See page 6-S12 for tightening torque of gear box screw.

Tightening torque	Center pulley holder screw (Standard type / Reamer type)	79 to 90 N·m 8.0 to 9.2 kgf·m 58 to 66 lbf·ft
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- | | |
|---------------------------|---------------------------------------|
| (1) Gear Box Screw | (7) Center Pulley Holder Reamer Screw |
| (2) Gear Box Stay RH | (8) Center Pulley Holder Screw |
| (3) Gear Box Stay LH | (9) Collar |
| (4) Gear Box Reamer Screw | (10) Ball Bearing |
| (5) Oil Seal | (11) Internal Snap Ring |
| (6) Center Pulley Holder | (12) Oil Seal |

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Outer Pulley and Blade Shaft

1. Unscrew the outer pulley mounting nut (19), and remove the outer pulley (22) and feather key (18).
2. Unscrew the pulley holder mounting screws (28), and separate the left pulley holder (27) from the mower deck.
3. Remove the external snap ring (34) on the left blade shaft (29).
4. Remove the spline boss (33) and oil seal (32).
5. Remove the internal snap ring (31) and tap out the left blade shaft (29) with the ball bearings (25), (30), taking care not to damage the grease nipple (26).
6. Remove the oil seal (23) and internal snap ring (24).
7. Remove the ball bearings (25), (30) from the blade shaft (29).
8. Remove the right pulley holder (8) and blade shaft (10) as above.

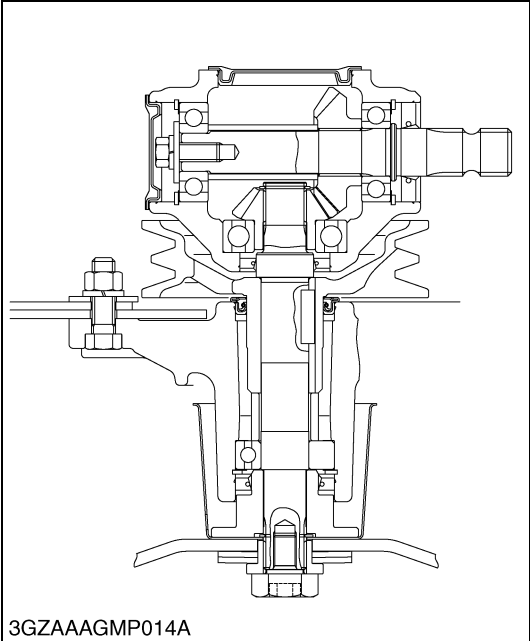
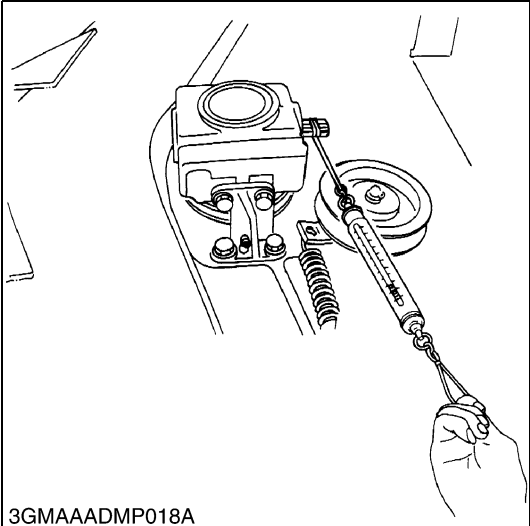
(When reassembling)

- Replace the oil seals (32), (23), (13) and (5) with new ones.

Tightening torque	Outer pulley mounting nut	167 to 186 N·m 17.0 to 19.0 kgf·m 123 to 137 lbf·ft
	Pulley holder mounting screw	78 to 90 N·m 8.0 to 9.2 kgf·m 58 to 66 lbf·ft

- | | |
|-----------------------------------|-----------------------------------|
| (1) Outer Pulley Mounting Nut | (18) Feather Key |
| (2) Spring Washer | (19) Outer Pulley Mounting Nut |
| (3) Plain Washer | (20) Spring Washer |
| (4) Outer Pulley (Right) | (21) Plain Washer |
| (5) Oil Seal | (22) Outer Pulley (Left) |
| (6) Internal Snap Ring | (23) Oil Seal |
| (7) Ball Bearing | (24) Internal Snap Ring |
| (8) Pulley Holder (Right) | (25) Ball Bearing |
| (9) Feather Key | (26) Grease Nipple |
| (10) Blade Shaft (Right) | (27) Pulley Holder (Left) |
| (11) Ball Bearing | (28) Pulley Holder Mounting Screw |
| (12) Internal Snap Ring | (29) Blade Shaft (Left) |
| (13) Oil Seal | (30) Ball Bearing |
| (14) Spline Boss | (31) Internal Snap Ring |
| (15) External Snap Ring | (32) Oil Seal |
| (16) Grease Nipple | (33) Spline Boss |
| (17) Pulley Holder Mounting Screw | (34) External Snap Ring |

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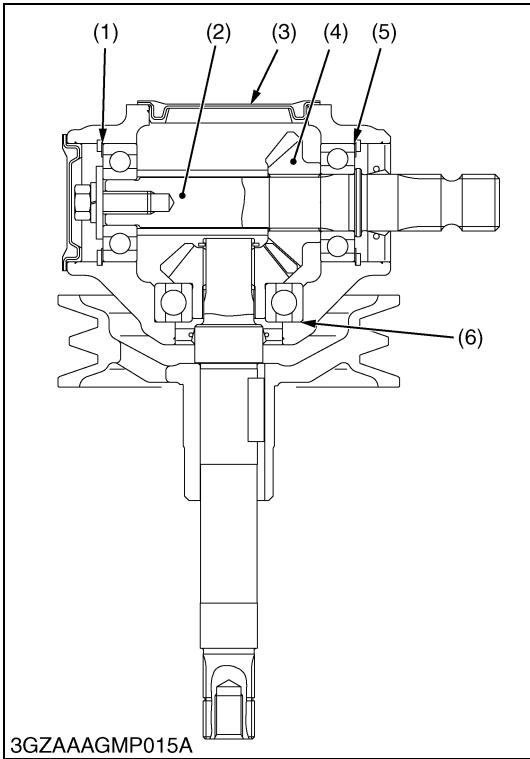
Turning Torque of Pinion Shaft

- 1. Remove the mower belt, and reassemble the gear box to the mower deck.
- 2. Wind a string around the pinion shaft and set a spring balance (or push-pull gauge) to the tip of the string, and then slowly pull the spring balance horizontally to measure the turning force.
- 3. If the measurement exceeds the factory specification, check the bearings and gears.

Turning force	Factory specification	Less than 117.7 N 12.0 kgf 26.5 lbf
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Turning torque	Factory specification	Less than 1.47 N·m 0.15 kgf·m 1.08 lbf·ft
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Backlash between Bevel Gears

- 1. Remove the gear box cap (3).
- 2. Place fuses the bevel gear (4) on the pinion shaft (2).
- 3. Turn the pinion shaft (2).
- 4. Take out the fuses, and measure the thickness of fuses with an outside micrometer. (Backlash equal thickness of fuse)
- 5. If the backlash exceeds the allowable limit, adjust with shims (1), (5), (6).

Backlash between bevel gears	Factory specification	0.13 to 0.25 mm 0.0051 to 0.0098 in.
	Allowable limit	0.40 mm 0.0157 in.

(Reference)

- Thickness of adjusting shims (1), (4)
0.2 mm (0.008 in.)
0.3 mm (0.012 in.)
- Thickness of adjusting shims (6)
0.1 mm (0.004 in.)
0.2 mm (0.008 in.)

- (1) Shim

(2) Pinion Shaft

(3) Gear Box Cap
- (4) Bevel Gear

(5) Shim

(6) Shim

9Y1210301MOS0019US0

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