

WSM

WORKSHOP MANUAL

GR2100EC

Kubota

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of KUBOTA GR2100EC. It is divided into three parts, "General", "Mechanism" and "Servicing".

■ General

Information on the product identification, the general precautions, maintenance check list, check and maintenance and special tools are described.

■ Mechanism

Information on the construction and function are included. This part should be understood before proceeding with troubleshooting, disassembling and servicing.

■ Servicing

Information on the troubleshooting, servicing specification lists, tightening torque, checking and adjusting, disassembling and assembling, and servicing which cover procedures, precautions, factory specifications and allowable limits.

All information illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

The right is reserved to make changes in all information at any time without notice.

Due to covering many models of this manual, information or picture being used have not been specified as one model.

April 2005

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SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol" is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.



DANGER

- Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

- Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

- Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

IMPORTANT

- Indicates that equipment or property damage could result if instructions are not followed.

NOTE

- Gives helpful information.

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BEFORE SERVICING AND REPAIRING

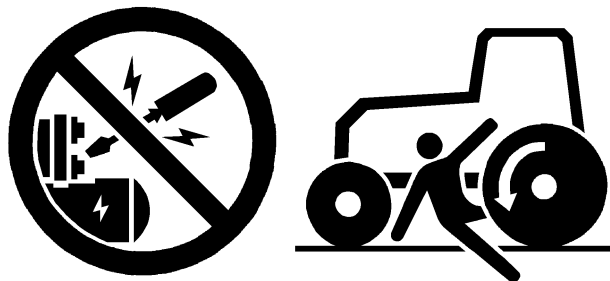
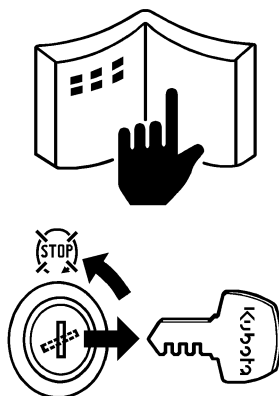
- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a firm and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, and remove the key
- Disconnect the battery negative cable
- Hang a **"DO NOT OPERATE"** tag in operator station.

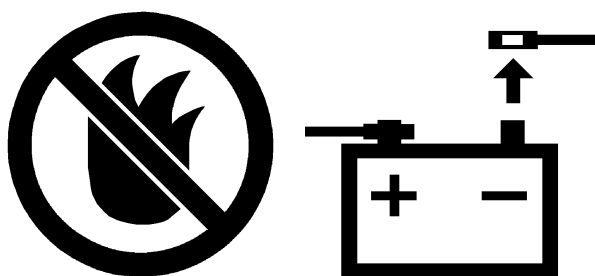
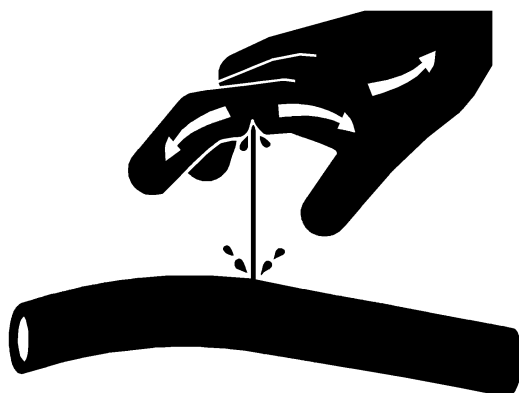
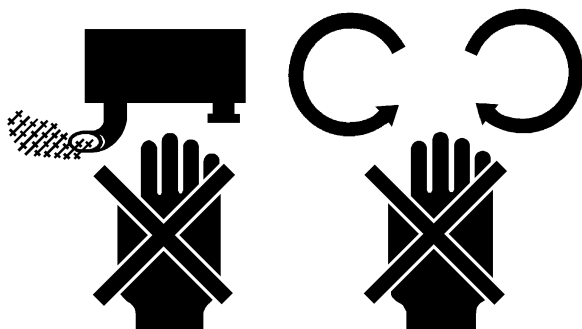
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SAFETY STARTING

- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine while standing on ground. Start the engine only from operator's seat.

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SAFETY WORKING

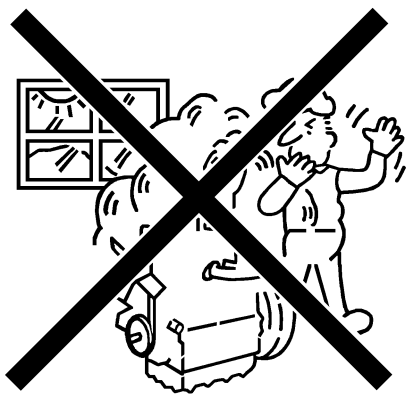
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.

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AVOID FIRES

- Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
- To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
- Make sure that no fuel has been spilled on the engine.

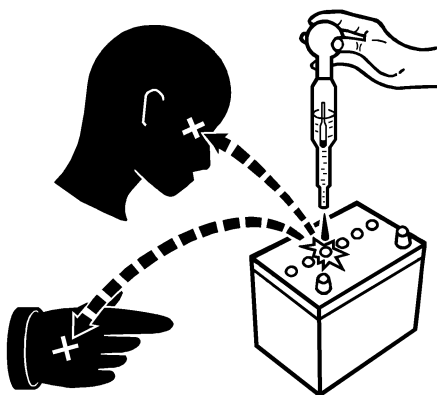
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VENTILATE WORK AREA

- If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

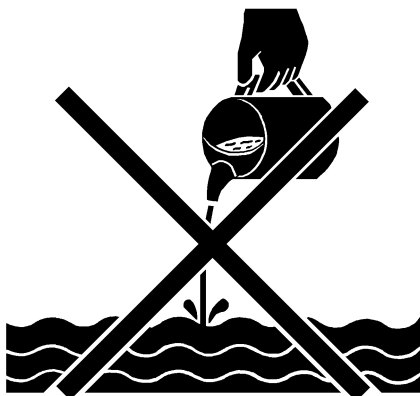
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PREVENT ACID BURNS

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, clothing and cause blindness if splashed into eyes. Keep electrolyte away from eyes, hands and clothing. If you spill electrolyte on yourself, flush with water, and get medical attention immediately.

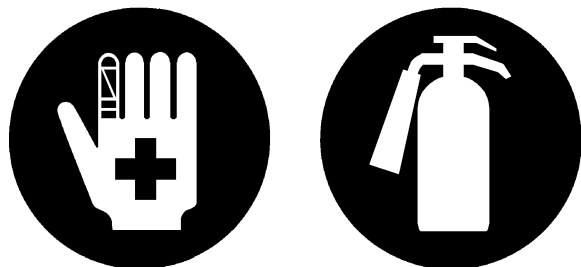
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DISPOSE OF FLUIDS PROPERLY

- Do not pour fluids into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, electrolyte and other harmful waste.

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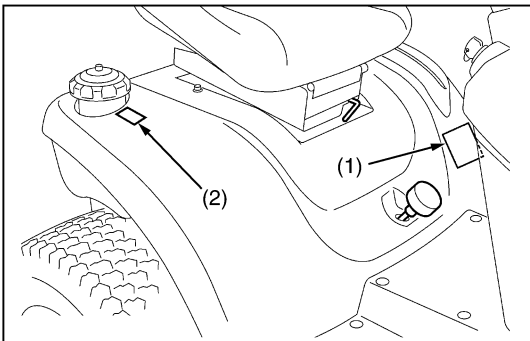
PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

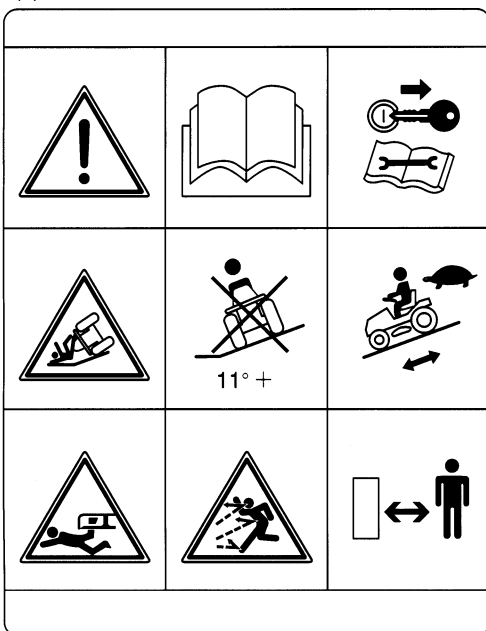
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SAFETY DECALS

The following safety decals are installed on the machine. If a decal becomes damaged, illegible or is not on the machine, replace it. The decal part number is listed in the parts list.



(1) Part No. K1213-6581-1



1BDAHAAAP0260

(2) Part No. K2110-6585-1

Diesel fuel only No fire



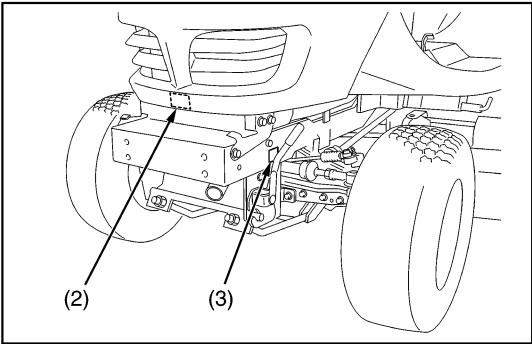
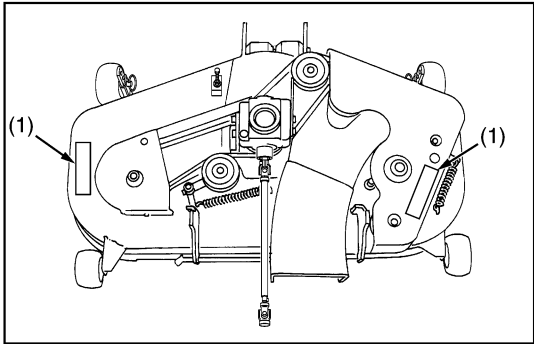
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TO AVOID INJURY OR DEATH:

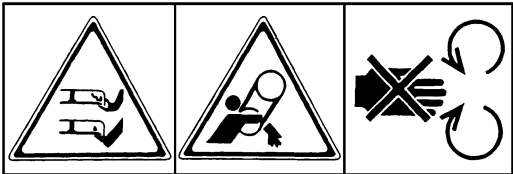
- Read and understand Operator's Manual.
- Stop the engine and remove key before servicing.
- DO NOT operate where machine could slip or tip.
- Mow up and down slopes, not across.
- DO NOT allow any bystanders or children around or near machine at any time when the engine is running.

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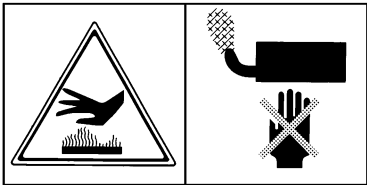
(1) Part No. K5410-7311-1



ROTATING BLADES HAZARDOUS:

- DO NOT put hands or feet into mower when engine is running.
- Keep all shields and guards in place.

(2) Part No. K2561-6542-1
Do not touch hot surface like muffler, etc.



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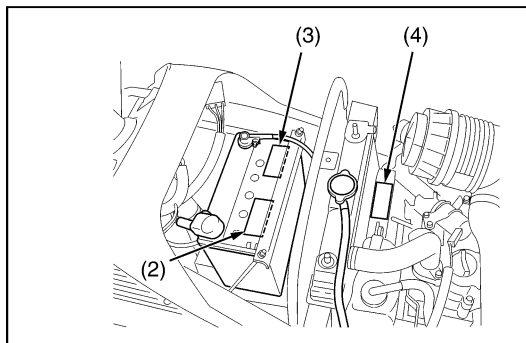
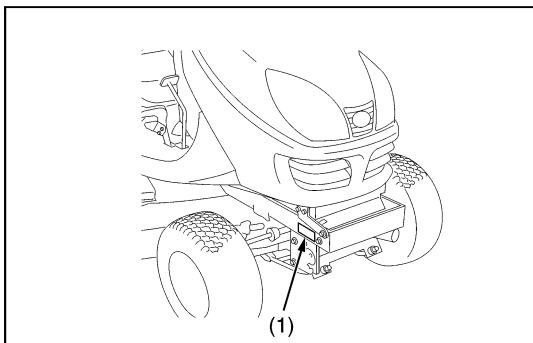
(3) Part No. K2110-6573-1
HOT SURFACE
DO NOT TOUCH



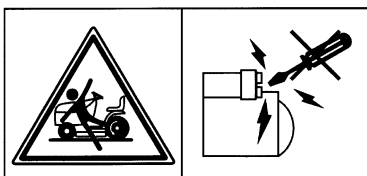
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(1) Part No. K1213-6583-1



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TO AVOID MACHINE RUNAWAY:

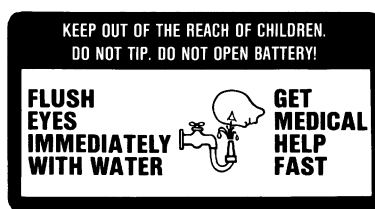
- DO NOT start engine by shorting across starter terminals or bypassing the safety start switch.

(2) Part No. K1211-6115-1



1BDAHADAP0240

(3) Part No. K1211-6116-1



1BDAHADAP0250

(4) Part No. 6C090-4958-2
Stay clear of engine fan and fan belt.

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CARE OF DANGER, WARNING AND CAUTION LABELS

1. Keep danger, warning and caution labels clean and free from obstructing material.
2. Clean danger, warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing danger, warning and caution labels with new labels.
4. If a component with danger, warning or caution label (s) affixed is replaced with new part, make sure new label (s) is (are) attached in the same location (s) as the replaced component.
5. Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

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SPECIFICATIONS

Model			GR2100EC
Engine	Maker		KUBOTA
	Model		D782-E2-GX
	Type		Indirect injection. Vertical, water-cooled, 4-cycle diesel
	Number of cylinders		3
	Bore and stroke		67 x 73.6 mm (2.64 x 2.90 in.)
	Total displacement		778 cm ³ (47.46 cu.in.)
	Engine gross power (DIN)		15.6 kW (20.9 HP)
	Rated revolution		50 r/s [3000 min ⁻¹ (rpm)]
	Battery		51R (12 V, 450CCA)
	Starting system		Cell starter (with glow plug)
	Lubrication system		Forced lubrication by trochoidal pump
	Cooling system		Pressurized radiator, forced circulation with water pump
	Fuel		Diesel fuel No.2-D [above -10 °C(14 °F)], Diesel fuel No.1-D [below -10 °C (14 °F)]
	Capacities	Fuel tank	
Engine crankcase (with filter)		2.8 L (2.96 U.S.qts., 2.46 Imp.qts.)	
Engine coolant (with recovery tank)		2.35 L (2.48 U.S.qts., 2.07 Imp.qts.)	
Transmission case		3.3 L (0.87 U.S.gals., 0.73 Imp.gals.)	
Front axle case		1.9 L (0.50 U.S.gals., 0.42 Imp.gals.)	
Dimensions	Overall length (with grass catcher)		2540 mm (100.0 in.)
	Overall width		1280 mm (50.4 in.)
	Overall height		1230 mm (48.4 in.)
	Wheel base		1280 mm (50.4 in.)
	Tread	Front	825 mm (32.5 in.)
		Rear	800 mm (31.5 in.)
Weight (without mower and grass catcher)			360 kg (794 lbs)
Traveling system	Tires	Front	16 x 7.50 - 8, 4PR
		Rear	23 x 10.50 - 12, 4PR
	Steering		Full hydraulic power steering (Glide Steer)
	Transmission		Hydrostatic transmission
	Brake		Internal expanding brake
	Traveling speed	Forward	0.0 to 10.0 km/h (0.0 to 6.2 mph)
		Reverse	0.0 to 5.0 km/h (0.0 to 3.1 mph)
PTO system	Clutch		Mechanical wet multi discs
	PTO brake		Wet multi discs

NOTE: *Manufacture's estimate

The company reserves the right to change the specifications without notice.

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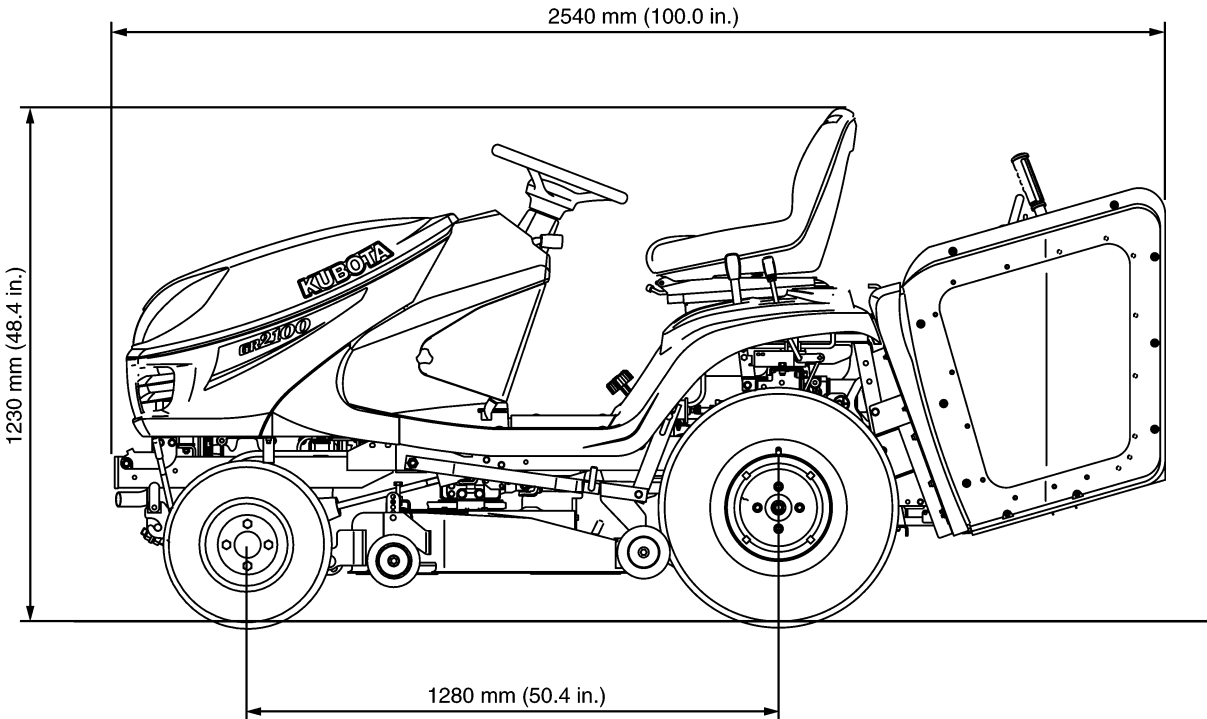
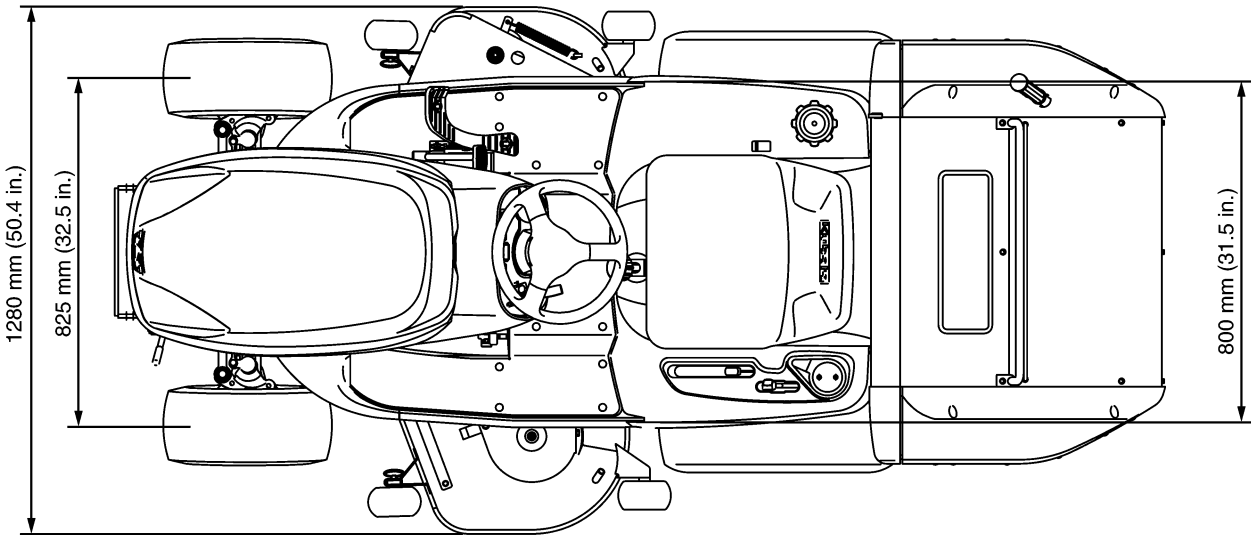
Model		RCK48GR
Mower	Cutting width	1219 mm (48.0 in.)
	Cutting height	25 to 102 mm (1 to 4 in.)
	Adjustment of cutting height	Dial gauge
	Mounting method	Quick joint, Parallel linkage
	Weight (Approx.)	80 kg (176 lbs)
	Dimensions	Total length
		871 mm (34.3 in.)
		Total width
		1270 mm (50.0 in.)
		Total height
		305 mm (12.0 in.)
	Discharge direction	Rear
	Gear box oil	0.40 L (0.42 U.S.qts, 0.35 Imp.qts)
Model		GCK450GR
Grass catcher	Container capacity	450 L (118.9 U.S.gals, 99.0 Imp.gals)
	Weight (Approx.)	50 kg (110 lbs)

NOTE: *Manufacture's estimate

The company reserves the right to change the specifications without notice.

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DIMENSIONS



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G GENERAL

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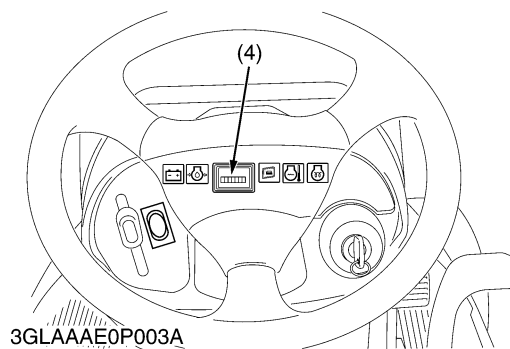
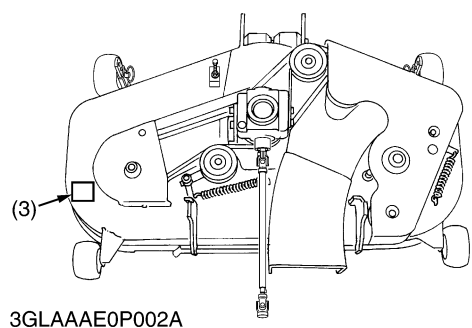
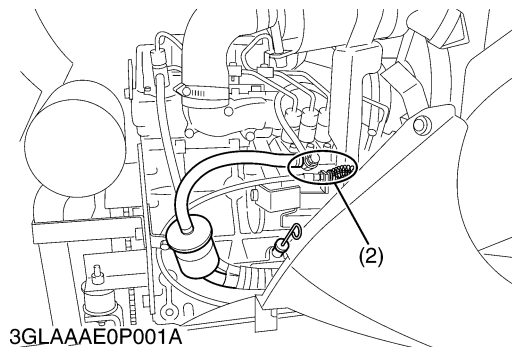
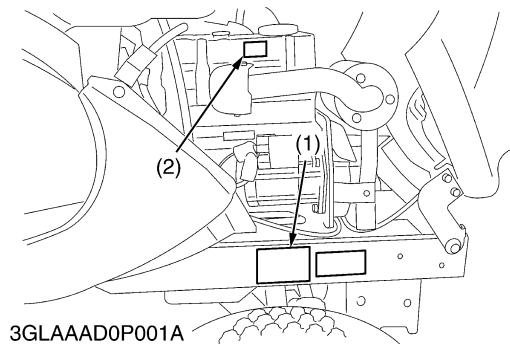
1. IDENTIFICATION

When contacting your local KUBOTA distributor, always specify engine serial number (2), machine serial number (1), mower serial number (3) and hour meter reading.

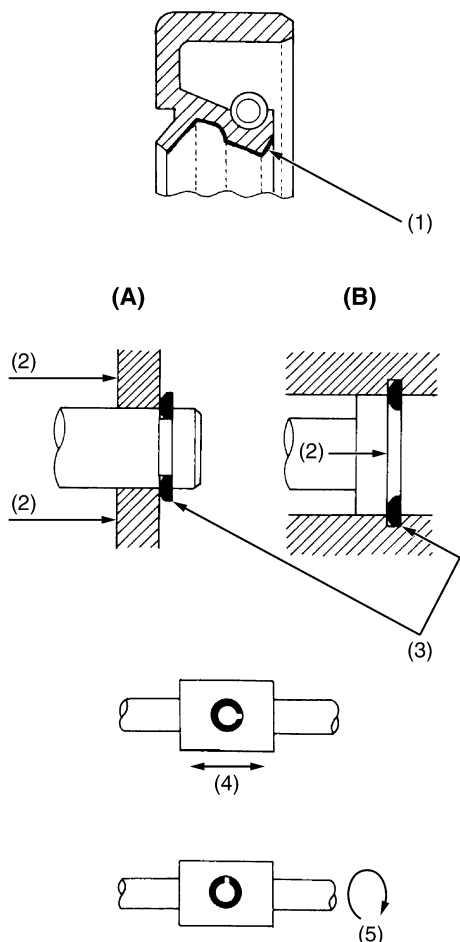
- (1) Machine Serial Number
- (2) Engine Serial Number

- (3) Mower Serial Number
- (4) Hour Meter

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2. GENERAL PRECAUTIONS



- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently used should be made according to the drawings provided.
- Before disassembling or servicing electrical wires, always disconnect the ground cable from the battery first.
- Remove oil and dirt from parts before measuring.
- Use only KUBOTA genuine parts for parts replacement to maintain machine performance and to assure safety.
- Gaskets and O-rings must be replaced during reassembly. Apply grease to new O-rings or oil seals before assembling. See the figure left side.
- When reassembling external snap rings or internal snap rings, they must be positioned so that sharp edge faces against the direction from which a force is applied. See the figure left side.
- When inserting spring pins, their splits must face the direction from which a force is applied. See the figure left side.
- To prevent damage to the hydraulic system, use only specified fluid or equivalent.

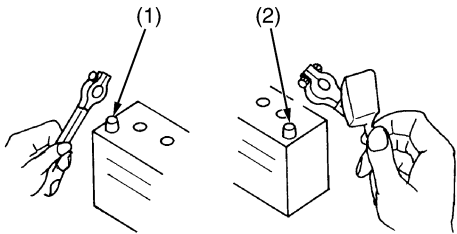
- (1) Grease
- (2) Force
- (3) Sharp Edge
- (4) Axial Force
- (5) Rotating Movement

- (A) External Snap Ring
- (B) Internal Snap Ring

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3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



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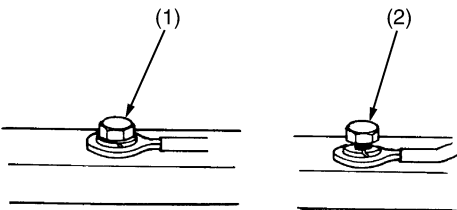
To ensure safety and prevent damage to the machine and surrounding equipment, heed the following precautions in handling electrical parts and wiring.

- **IMPORTANT**
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
 - Do not attempt to modify or remodel any electrical parts and wiring.
 - When removing the battery cables, disconnect the negative cable first. When installing the battery cables, connect the positive cable first.

(1) Negative Terminal (2) Positive Terminal

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[1] WIRING

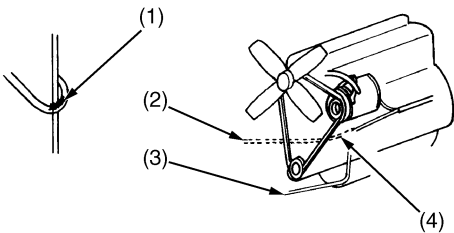


- Securely tighten wiring terminals.

(1) Correct (Securely Tighten) (2) Incorrect (Loosening Leads to Faulty Contact)

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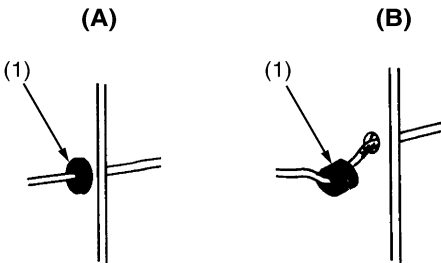


- Do not let wiring contact dangerous part.

(1) Dangerous Part (2) Wiring (Incorrect) (3) Wiring (Correct) (4) Dangerous Part

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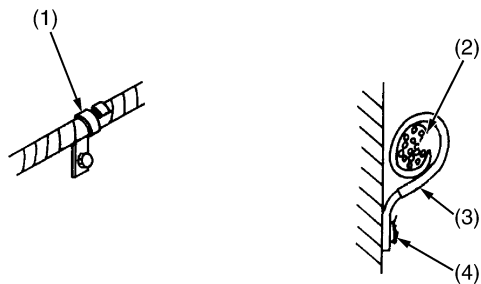


- Securely insert grommet.

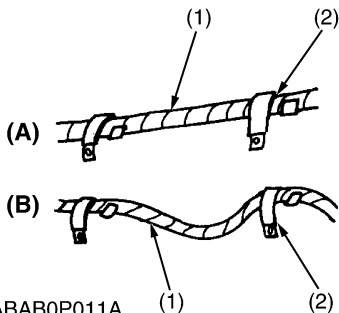
(1) Grommet (A) Correct (B) Incorrect

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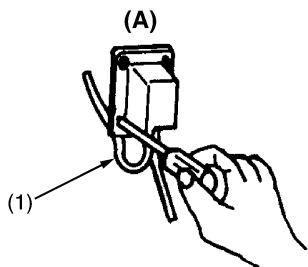
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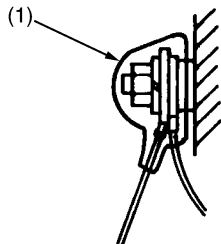
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3TMABAB0P011A



3TMABAB0P012A



3TMABAB0P013A

● Securely clamp, being careful not to damage wiring.

- (1) Clamp
*Wind Clamp Spirally
- (2) Wire Harness
- (3) Clamp
- (4) Welding Dent

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● Clamp wiring so that there is no twist, unnecessary sag, or excessive tension, except for movable part, where sag be required.

- (1) Wiring
(2) Clamp
- (A) Correct
(B) Incorrect

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● In installing a part, take care not to get wiring caught by it.

- (1) Wiring
(A) Incorrect

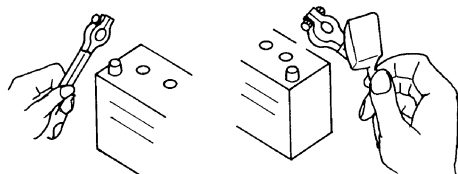
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● After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover
*Securely Install Cover

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[2] BATTERY



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- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting cables to battery terminal posts, apply high temperature grease to them and securely install terminal covers on them.
- Do not allow dirt and dust to collect on battery.

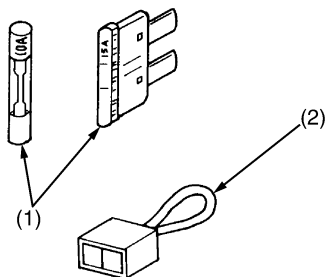


CAUTION

- Take care not to let battery liquid spill on your skin and clothes. If contaminated, wash it off with water immediately.
- Before recharging the battery, remove it from the machine.
- Before recharging, remove cell caps.
- Do recharging in a well-ventilated place where there is no open flame nearby, as hydrogen gas and oxygen are formed.

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[3] FUSE



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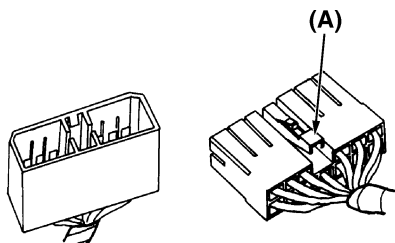
- Use fuses with specified capacity.
Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of reserve power supply is exceeded.

(1) Fuse

(2) Fusible Link

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[4] CONNECTOR

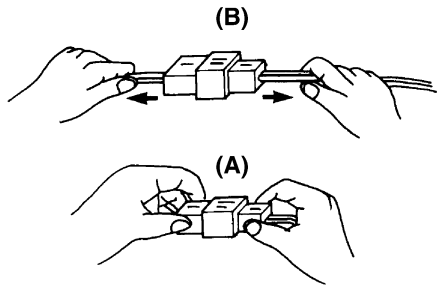


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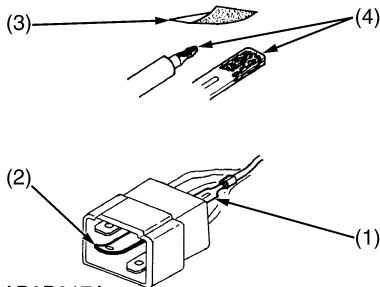
- For connector with lock, push lock to separate.

(A) Push

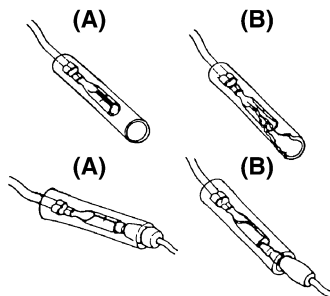
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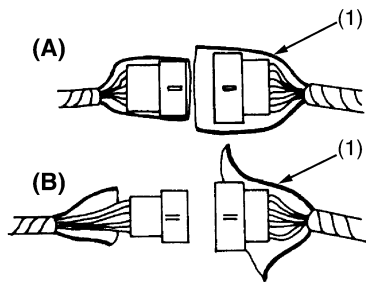
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3TMABAB0P017A



3TMABAB0P018A



3TMABAB0P019A

- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

0000000624E

- Use sandpaper to remove rust from terminals.
- Repair deformed terminal. Make certain there is no terminal being exposed or displaced.

(1) Exposed Terminal

(3) Sandpaper

(2) Deformed Terminal

(4) Rust

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- Make certain that there is no female connector being too open.

(A) Correct

(B) Incorrect

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- Make certain plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct

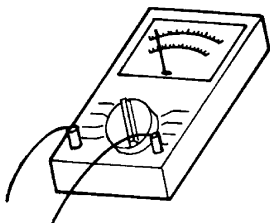
(B) Incorrect

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[5] HANDLING OF CIRCUIT TESTER

- Use tester correctly following manual provided with tester.
- Check for polarity and range.

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4. LUBRICANTS, FUEL AND COOLANT

No.	Place	Capacity	Lubricants, fuel and coolant	
1	Fuel tank	18 L 4.8 U.S.gals. 4.0 Imp.gals.	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below -10 °C (14 °F)	
2	Cooling system with recovery tank	2.35 L 2.48 U.S.qts. 2.07 Imp.qts.	Fresh clean water with anti-freeze	
3	Engine crankcase	2.8 L 2.96 U.S.qts. 2.46 Imp.qts.	Engine oil: API service CD, CE or CF Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40 0 to 25 °C (32 to 77 °F) : SAE20, 10W-30 or 10W-40 Above 25 °C (77 °F) : SAE30, 10W-30 or 10W-40	
4	Transmission case	3.3 L 0.87 U.S.gals. 0.73 Imp.gals.	KUBOTA UDT or SUPER UDT fluid*	
5	Front axle case	1.9 L 0.50 U.S.gals. 0.42 Imp.gals.		
6	Mower gear box	0.40 L 0.42 U.S.qts. 0.35 Imp.qts.	SAE90 gear oil (API service classification : more than GL-3)	
Greasing				
No.	Place	No. of greasing points	Capacity	Type of grease
7	Engine transmission universal joint	1	Until grease overflows	SAE multi-purpose type grease
8	King pin	2		
9	Center pin	2		
10	Glide Steer bolt	2		
11	Glise Steer rear arm	2		
12	Speed control pedal shaft	—	Moderate amount	Engine oil
13	Mower link	—		
14	Seat adjuster	—		
15	Cable	—		
16	PTO lever	—		
17	Hydraulic lift lever	—		
18	Grass catcher hinge	—		
	[Mower]			
19	Spindle shafts	3	Until grease overflows	SAE multi-purpose type grease
20	Tension arm	2		
21	Mower universal joint	1	Moderate amount	Engine oil

*KUBOTA original transmission hydraulic fluid.

5. TIGHTENING TORQUES

[1] GENERAL USE SCREWS, BOLT AND NUTS

Screws, bolt and nuts whose tightening torque are not specified in this Workshop Manual should be tightened according to the table below.

Indication on top of bolt	 No-grade or 4T						 7T						 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6 (6 mm, 0.24 in.)	7.85 to 9.31	0.80 to 0.95	5.79 to 6.87	7.85 to 8.82	0.80 to 0.90	5.79 to 6.50	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31	7.85 to 8.82	0.80 to 0.90	5.79 to 6.50	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8 (8 mm, 0.31 in.)	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1	16.7 to 19.6	1.7 to 2.0	12.3 to 14.4	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1	29.5 to 34.3	3.0 to 3.5	21.7 to 25.3
M10 (10 mm, 0.39 in.)	39.3 to 45.1	4.0 to 4.6	29.0 to 33.2	31.4 to 34.3	3.2 to 3.5	23.2 to 25.3	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5	60.9 to 70.6	6.2 to 7.2	44.9 to 52.0
M12 (12 mm, 0.47 in.)	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	—	—	—	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	103 to 117	10.5 to 12.0	76.0 to 86.7
M14 (14 mm, 0.55 in.)	108 to 125	11.0 to 12.8	79.6 to 92.5	—	—	—	124 to 147	12.6 to 15.0	91.2 to 108	—	—	—	167 to 196	17.0 to 20.0	123 to 144
M16 (16 mm, 0.63 in.)	167 to 191	17.0 to 19.5	123 to 141	—	—	—	197 to 225	20.0 to 23.0	145 to 166	—	—	—	260 to 304	26.5 to 31.0	192 to 224
M18 (18 mm, 0.71 in.)	246 to 284	25.0 to 29.0	181 to 209	—	—	—	275 to 318	28.0 to 32.5	203 to 235	—	—	—	344 to 402	35.0 to 41.0	254 to 296
M20 (20 mm, 0.79 in.)	334 to 392	34.0 to 40.0	246 to 289	—	—	—	368 to 431	37.5 to 44.0	272 to 318	—	—	—	491 to 568	50.0 to 58.0	362 to 419

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[2] METRIC SCREWS, BOLTS AND NUTS

Grade	Property class 8.8 			Property class 10.9 		
Unit Nominal Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M8	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
M10	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
M12	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5	103.0 to 117.0	10.5 to 12.0	76.0 to 86.8
M14	124.0 to 147.0	12.6 to 15.0	91.2 to 108.0	167.0 to 196.0	17.0 to 20.0	123.0 to 144.0
M16	196.0 to 225.0	20.0 to 23.0	145.0 to 166.0	260.0 to 303.0	26.5 to 31.0	192.0 to 224.0

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[3] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS

Grade	SAE GR.5 			SAE GR.8 		
Unit Norminal Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
5/16	23.1 to 27.8	2.35 to 2.84	17.0 to 20.5	32.5 to 39.3	3.31 to 4.01	24.0 to 29.0
3/8	47.5 to 57.0	4.84 to 5.82	35.0 to 42.0	61.0 to 73.2	6.22 to 7.47	45.0 to 54.0
1/2	108.5 to 130.2	11.07 to 13.29	80.0 to 96.0	149.2 to 179.0	15.22 to 18.27	110.0 to 132.0
9/16	149.2 to 179.0	15.22 to 18.27	110.0 to 132.0	217.0 to 260.4	22.14 to 26.57	160.0 to 192.0
5/8	203.4 to 244.1	20.75 to 24.91	150.0 to 180.0	298.3 to 358.0	30.44 to 36.53	220.0 to 264.0

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[4] PLUGS

Shape	Size	Material of opponent part					
		Ordinariness			Aluminum		
		N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
Tapered screw 	R1/8	12.7 to 21.6	1.3 to 2.2	9.4 to 15.9	12.7 to 19.6	1.3 to 2.0	9.4 to 15.4
	R1/4	24.5 to 44.1	2.5 to 4.5	18.1 to 32.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.4
	R3/8	49.0 to 88.3	5.0 to 9.0	36.2 to 65.1	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
	R1/2	58.8 to 107.9	6.0 to 11.0	43.4 to 79.6	58.8 to 78.5	6.0 to 8.0	43.4 to 57.9
Straight screw 	G1/4	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3	—	—	—
	G3/8	61.8 to 82.4	6.3 to 8.4	45.6 to 60.8	—	—	—
	G1/2	49.0 to 88.3	5.0 to 9.0	36.2 to 65.1	—	—	—

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6. MAINTENANCE CHECK LIST

■ IMPORTANT

- The jobs indicated by ★ must be done initially.
- *1 : This maintenance should be done daily more often in dusty conditions than in normal conditions.
Suggested cleaning interval is every 100 hours in normal conditions.

No.	Period Item		Indication on hour meter (Hr)												After since	Im- por- tant	Ref- er- ence page
			50	100	150	200	250	300	350	400	450	500	550	600			
1	Engine oil	Change	★	☆		☆		☆		☆		☆		☆	every 100 hr		G-26
2	Engine oil filter	Replace	★			☆				☆				☆	every 200 hr		G-29
3	Transmission and Front axle cases fluid	Change				★				☆				☆	every 200 hr		G-30, G-32
4	Transmission oil filter	Replace	★			☆				☆				☆	every 200 hr		G-31
5	Transmission strainer	Clean				★				☆				☆	every 200 hr		G-31
6	Front axle pivot	Adjust		★		☆				☆				☆	every 200 hr		G-34
7	Safety device	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 hr		G-19
8	Oiling	-	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 hr		G-22
9	Greasing	-	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 hr		G-21
10	Mower gear box oil	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 hr		G-20
		Change	☆		☆			☆			☆			☆	every 150 hr		G-28
11	Air cleaner element	Clean	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 hr	*1	G-20
		Replace													every 1 year		G-35
12	Battery condition	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 hr		G-24
13	Brake	Adjust		☆		☆		☆		☆		☆		☆	every 100 hr		G-27
14	Fan drive belt tension	Adjust		☆		☆		☆		☆		☆		☆	every 100 hr		G-28
15	Fuel filter element	Check		☆		☆		☆		☆		☆		☆	every 100 hr		G-27
		Replace								☆					every 400 hr		G-34

No.	Item	Period	Indication on hour meter (Hr)												After since	Im- por- tant	Ref- er- ence page
			50	100	150	200	250	300	350	400	450	500	550	600			
16	Fuel line	Check		☆		☆		☆		☆		☆		☆	every 100 hr		G-27
		Replace													every 2 years		G-38
17	Hydraulic hose	Check				☆				☆				☆	every 200 hr		G-33
		Replace													every 2 years		G-33
18	Radiator hose and clamp	Check				☆				☆				☆	every 200 hr		G-31
		Replace													every 2 years		G-38
19	Radiator core	Check				☆				☆				☆	every 200 hr		G-35
20	Radiator	Clean													every 1 year		G-35
21	Coolant	Change													every 1 year		G-35
22	Mower gear box oil seal	Replace													every 2 years		G-38
23	Fuel system	Bleed													Ser- vice as re- quired		G-41
24	Fuse	Replace															G-38
25	Blade	Replace															G-40
26	Mower belt	Replace															G-41

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7. CHECK AND MAINTENANCE



CAUTION

- Be sure to check and service the machine on a flat place with engine shut off, the parking brake on and chock the wheels.

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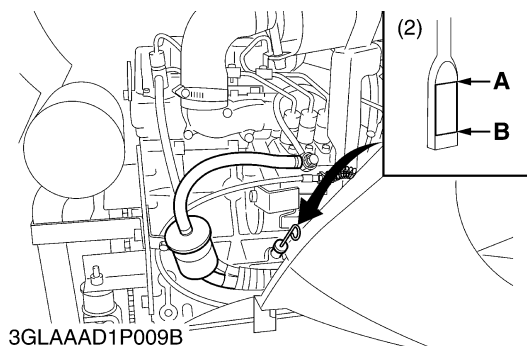
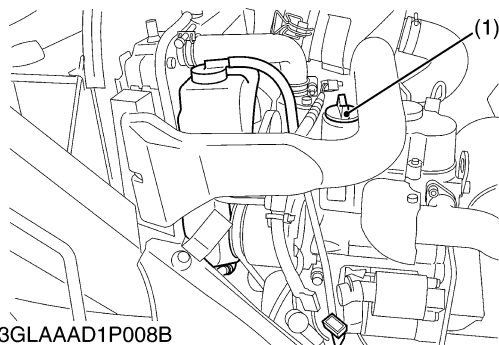
[1] DAILY CHECK

To prevent trouble from occurring, it is important to know the condition of the machine. Check the following items before starting.

Checking

- Check areas where previous trouble was experienced.
- Walk around the machine.
 1. Tire pressure, wear and damage
 2. Oil and water leak
 3. Engine oil level
 4. Transmission fluid level
 5. Coolant level in the recovery tank
 6. Damage of machine body, tightness of all bolts and nuts
 7. Radiator screen
 8. Panel screen
 9. Brake play
 10. Fuel level
 11. Check air cleaner element
- Mower
 1. Oil leak
 2. Make sure blade cap screws are tight.
 3. Blades for wear or damage.
 4. Check all hardware.
 5. Make sure all pins are in place.
 6. Mower deck cleaning
 7. Greasing
- While sitting in the operator's seat,
 1. Speed control pedal and brake pedal
 2. Brake
- Turning the key switch "ON"
 1. Performance of the easy checker light.
- Starting the engine
 1. Color of the exhaust fumes
 2. Safety start switch, seat safety control and another safety devices.
 3. Check for abnormal noise and vibration.
- Others
 1. Check the areas where previous troubles were experienced.

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Checking Engine Oil Level



CAUTION

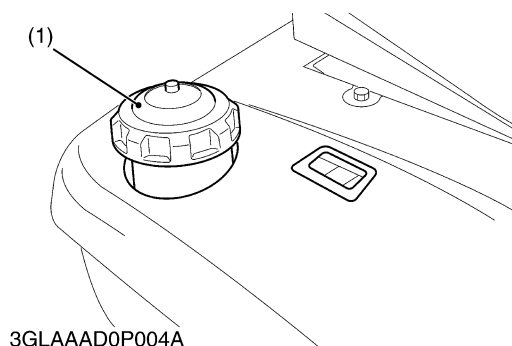
- **Always stop the engine and remove the key before checking oil.**

1. Check engine oil before starting and 5 minutes or more after the engine has stopped.
2. Wipe dipstick (2) area clean.
3. To check the oil level, remove the dipstick (2), wipe it clean, reinsert it, and draw it out again. Check to see that the oil level is between the two notches.
4. Add new oil to the prescribed level at the oil inlet (1) if necessary.
5. When using a different brand or viscosity oil from the previous one, remove all of the old oil and oil filter. Never mix two different types of oil.
6. Use the proper Engine Oil SAE according to the ambient temperatures. (See page G-8.)

- (1) Engine Oil Inlet
(2) Oil Level Dipstick

- A : Upper Level**
B : Lower Level

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Checking Amount of Fuel and Refueling



CAUTION

- **Handle fuel carefully. If the engine is running, do not fill the fuel tank. If engine is hot, let engine cool several minutes before adding fuel.**

Do not smoke while filling the fuel tank or servicing the fuel system. Fill fuel tank only to bottom of filler neck.

Check the fuel level. Take care that the fuel tank does not become empty.

Fuel tank capacity	18 L 4.8 U.S.gals. 4.0 Imp.gals.
--------------------	--

■ IMPORTANT

- **Use Diesel Fuel Only.**

1. Use No.2-D diesel fuel.
2. Use No.1-D diesel fuel if the temperature is below -10 °C (14 °F).
3. Always use a strainer when refueling to prevent fuel injection pump contamination.

■ NOTE

- **No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service.**

(SAE J313 JUN87)

Grade of Diesel Fuel Oil according to ASTM D975

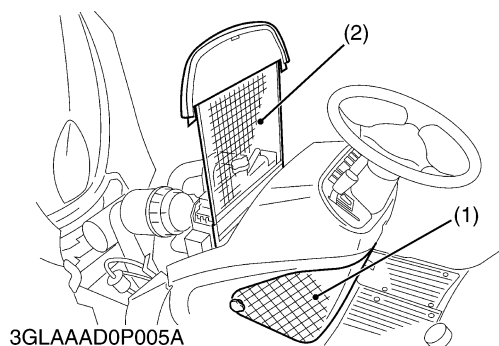
Flash point °C	Water and Sediment, volume %	Carbon Residue on, 10 percent Residuum %	Ash, weight %
Min	Max	Max	Max
52	0.05	0.35	0.01

Distillation Temperatures °C 90% Point		Kinematics Viscosity cSt or mm ² /S at 40 °C		Saybolt Viscosity, SUS at 100 °F	
Min	Max	Min	Max	Min	Max
282	338	1.9	4.1	32.6	40.1

Sulfur, weight	Copper strip Corrosion	Cetane Number
Max	Max	Min
0.50	No.3	40

(1) Fuel Cap

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Checking and Cleaning Radiator to Prevent Overheating



CAUTION

- **Be sure to stop the engine and remove the key before cleaning.**

Daily or after every 5 hours of operation, check to be sure the radiator screen (2) and radiator core are clean. Dirt or chaff on the radiator screen (2) or radiator core decrease cooling performance.

1. Remove the radiator screen (2) and panel screen (1) and remove all foreign material.
2. Remove the dust from between the fins and the tube.
3. Tighten the fan drive belt as necessary. For this, refer to "CHECK POINT EVERY 100 HOURS".
4. If scale forms in the tube, clean with the scale inhibitor or its equivalent.
5. Each time the panel screen (1) is covered with grass during operation, rub it off the screen with hand. Check the radiator screen (2) from time to time if grass accumulates.
6. If the dust or chaff has accumulated inside of the panel, remove the radiator screen (2) and clean inside completely. After cleaning, reinstall the radiator screen (2) properly.

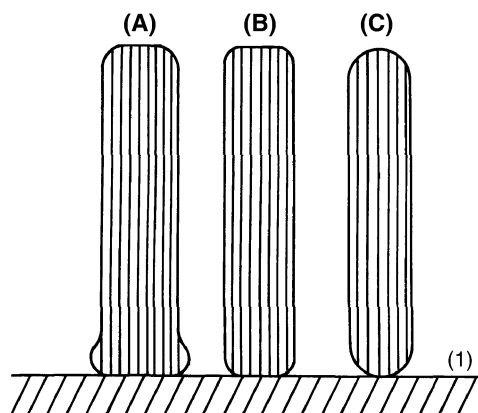
NOTE

- **When assembling the panel screen (1), be sure to fit it to panel with no clearance at the bottom.**

(1) Panel Screen

(2) Radiator Screen

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Checking Tire Pressure



WARNING

- Do not attempt to mount a tire on a rim. This should be done by a qualified person with the proper equipment.
- Always maintain the correct tire pressure.
Do not inflate tires above the recommended pressure.
- Inflation pressure in front tires rises quickly when using compressed air.



CAUTION

- Never operate machine with a loose rim, wheel or axle.
- Whenever bolts are loosened, retighten to specified torque.
- Check all bolts frequently and keep them tightened.

■ Inflation Pressure

Though the inflation pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Thus, check it every day and inflate as necessary.

	Tire Sizes	Recommended Inflation Pressure
Front	16 x 7.50-8, 4PR	200 kPa (2.0 kgf/cm ² , 29 psi)
Rear	23 x 10.50-12, 4PR	140 kPa (1.4 kgf/cm ² , 20 psi)

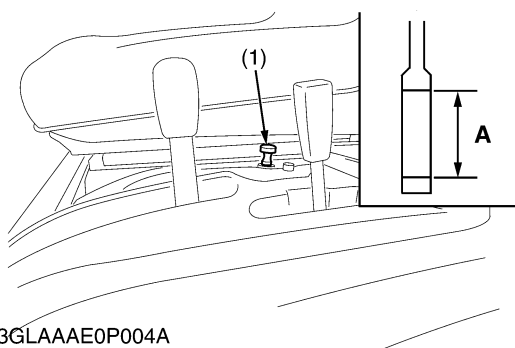
(1) Ground

(A) Insufficient

(B) Normal

(C) Excessive

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Checking Transmission Fluid Level

1. Park the machine on a flat surface, lower the implement to the ground and shut off engine and remove the key.
2. Raise the operator's seat.
3. To check the oil level, draw out the dipstick (1), wipe it clean, reinsert it, and draw it out again. Check to see that the oil level lies between the two notches. If the level is too low, add new oil to the prescribed level at the oil inlet. (See page G-8.)

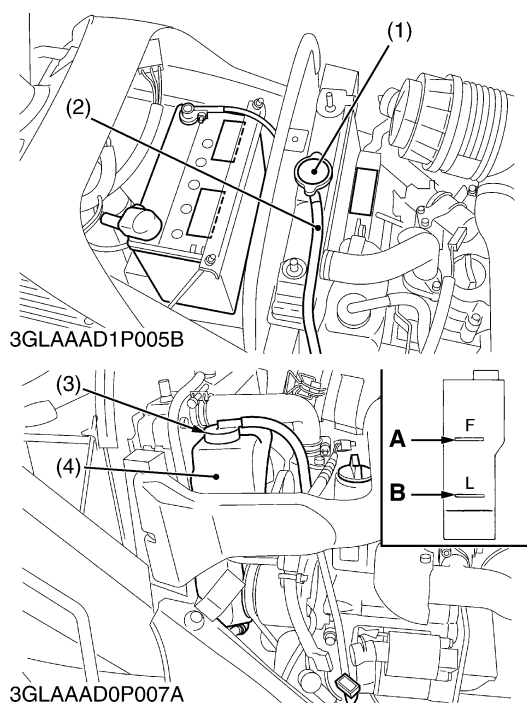
■ IMPORTANT

- If oil level is low, do not run engine.

(1) Oil Level Dipstick

A : Oil level is acceptable within this range.

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Checking Coolant Level

⚠ CAUTION

- Do not remove the radiator cap when the engine is hot. Loosen cap slightly, to the stop, to relieve any excess pressure before removing cap completely.

Check the coolant level daily both the radiator and the recovery tank (4) before starting engine.

1. Remove the radiator cap (1) and check to see that the coolant level is just below the fill port.
2. Check to see that the coolant level is between the "FULL" and "LOW" marks of recovery tank (4).
3. When the coolant level drops due to evaporation, add water only up to just below the fill port of the radiator and the full level of the recovery tank (4).

In case of leakage, add coolant and water in the specified mixing ratio up to the full level. (See page G-35.)

■ IMPORTANT

- If the radiator cap has to be removed, follow the caution above and securely retighten the cap.
- Use clean, distilled coolant and water to fill the radiator and recovery tank.

- | | |
|-----------------------|----------|
| (1) Radiator Cap | A : FULL |
| (2) Overflow Pipe | B : LOW |
| (3) Recovery Tank Cap | |
| (4) Recovery Tank | |

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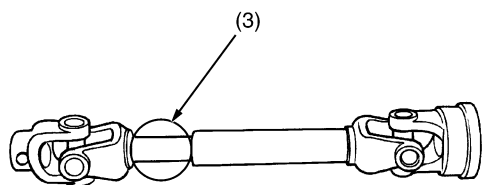
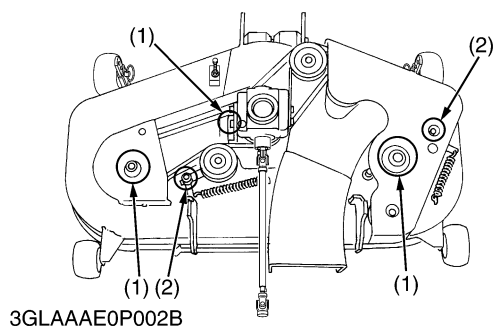
Greasing

⚠ CAUTION

- Be sure to stop the engine and remove the key before greasing.

- | | |
|-------------------|--|
| (1) Spindle Shaft | (3) Mower Universal Joint (Apply grease on the spline shaft) |
| (2) Tension Arm | |

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[2] CHECK POINTS OF EVERY 50 HOURS

Checking Safety Device



CAUTION

- Do not allow anyone near the machine while testing.
- If the machine does not pass one of the following tests, do not operate the machine.

1. Check the following tests before operating the mower. Sit on the operator's seat for all tests.

■ **Safety Start Control 1**

1. Depress the brake pedal fully.
2. Engage the PTO lever.
3. Turn the key switch to the "**START**" position.
4. The engine should not crank.

■ **Safety Start Control 2**

1. Disengage the PTO lever.
2. Release the brake pedal.
3. Turn the key to the "**START**" position.
4. The engine should not crank.

■ **Seat Safety Control 1**

1. Run the engine at half throttle.
2. Engage the PTO lever.
3. Stand up. (Do not get off the machine.)
4. Engine should shut off.

■ **Seat Safety Control 2**

1. Run the engine at half throttle.
2. Disengage the PTO lever.
3. Release the brake pedal.
4. Stand up. (Do not get off the machine.)
5. Engine should shut off.

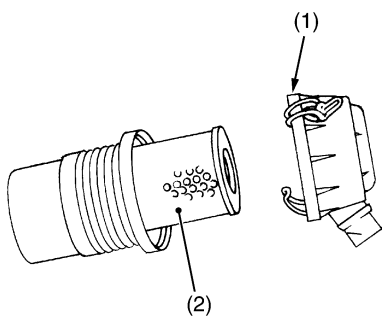
■ **PTO Safety Control 1**

1. Dismount the grass container from the platform.
2. Run the engine at half throttle.
3. Engage the PTO lever.
4. Engine should shut off.

■ **PTO Safety Control 2**

1. Run the engine at half throttle.
2. Engage the PTO lever.
3. Dump the grass from grass container.
4. Engine should shut off.

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3GLAAD0P008A

Cleaning Air Cleaner Element

1. The air cleaner uses a dry element, never apply oil.
2. Do not touch the filter element except where cleaning is required. To clean the element, use clean and dry compressed air on the inside of the element. Air pressure should not exceed 205 kPa (2.1 kgf/cm², 30 psi).

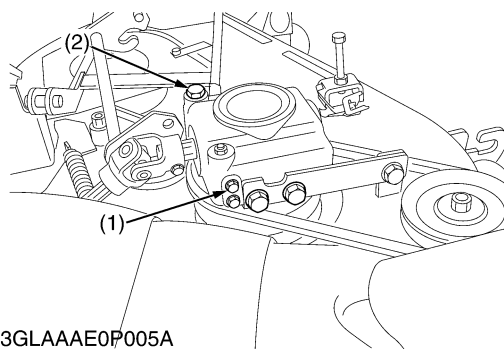
■ NOTE

- Operating in dusty conditions requires more frequent maintenance.
- Align the arrow marks when reinstalling the air cleaner cover.

(1) Air Cleaner Cover

(2) Air Cleaner Element

000001434E



3GLAAE0P005A

Checking Mower Gear Box Oil Level



CAUTION

- Always stop the engine and remove the key before checking oil.
1. Park the machine on a flat surface and lower the mower to the ground.
To check the oil level, loosen check plug (1) bolt and check to see that the oil level is just below the oil check plug (1) port.
If the level is too low, add new oil to the prescribed level at the oil filling plug (2). (See page G-8.)

(1) Check Plug

(2) Oil Filling Plug

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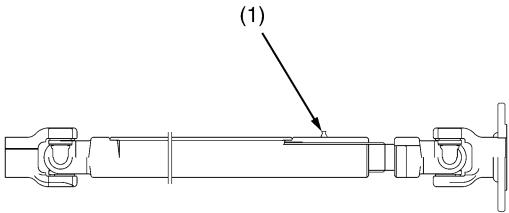
Lubricating All Grease Nipple

1. Apply a grease to the following locations as figures.



CAUTION

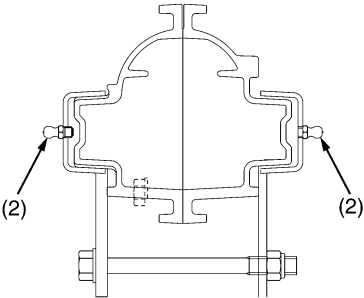
- Be sure to stop the engine and remove the key before greasing.



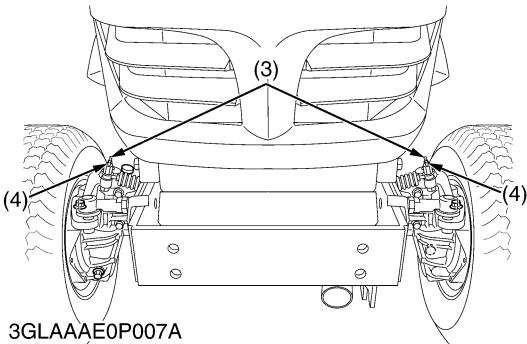
3GLAAD0P010A

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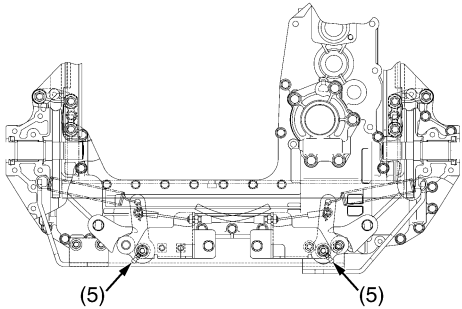
- | | |
|--|--------------------------|
| (1) Engine Transmission
Universal Joint | (3) King Pin Support |
| (2) Center Pin | (4) Glide Steer Bolt |
| | (5) Glide Steer Rear Arm |



3GLAAAE0P006A



3GLAAAE0P007A



3GLAAAE0P008A

Oiling

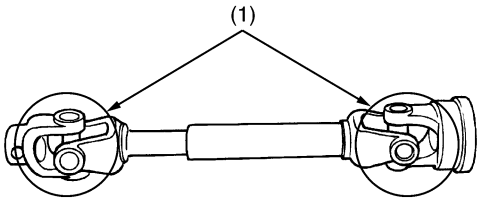
1. Apply oil to the following location as figures.



CAUTION

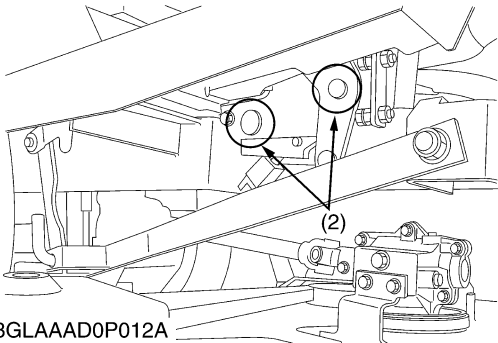
● Be sure to stop the engine and remove the key before oiling.

- | | |
|------------------------------|--------------------|
| (1) Mower Universal Joint | (4) Seat Adjuster |
| (2) Speed Control Shaft (RH) | (5) Throttle Cable |
| (3) Speed Control Shaft (LH) | |

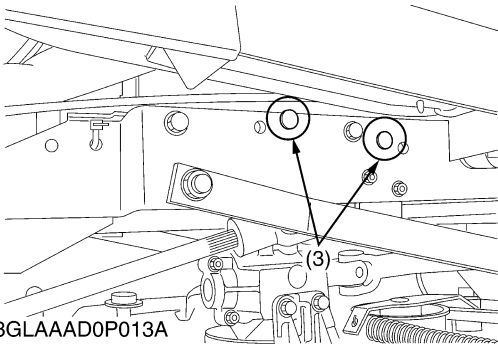


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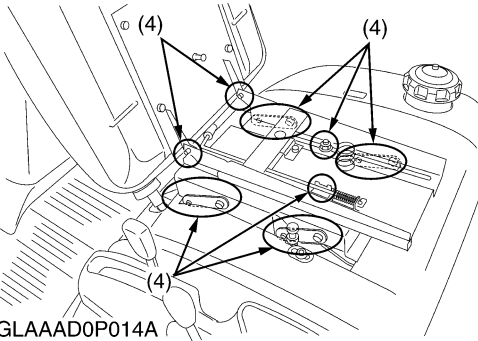
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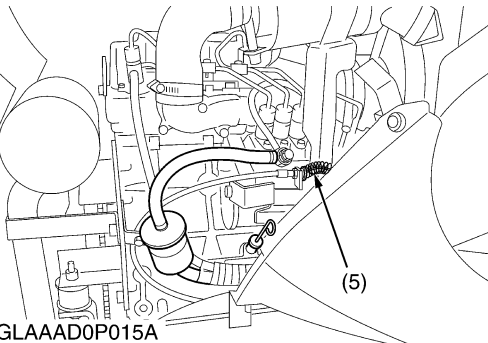
3GLAAD0P012A



3GLAAD0P013A



3GLAAD0P014A



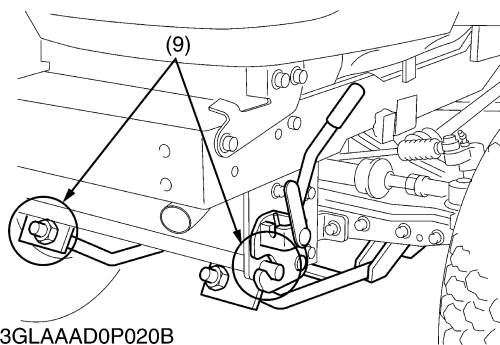
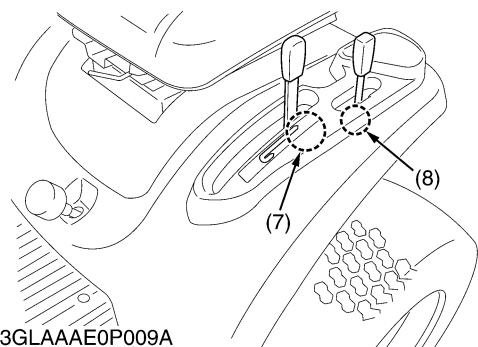
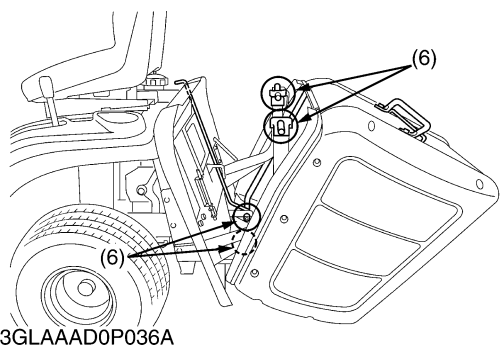
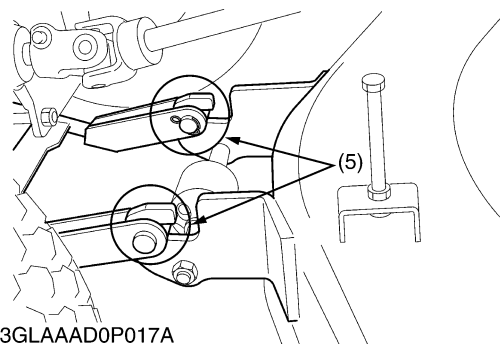
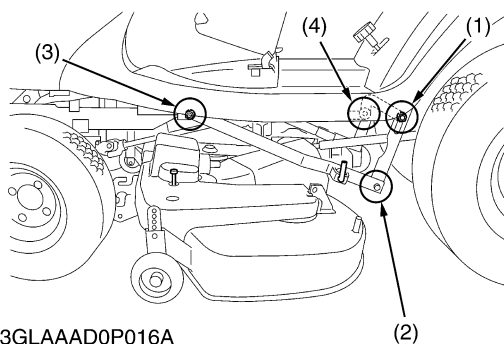
3GLAAD0P015A

Oiling (Continued)

1. Apply oil to the following location as figures.

**CAUTION**

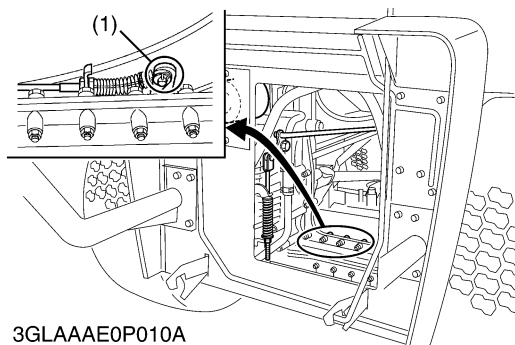
● Be sure to stop the engine and remove the key before oiling.



- (1) Around Hole of Mower Link
- (2) Around Pin
- (3) Pivot of Mower Link
- (4) Pivot of Lift Arm
- (5) Front Link

- (6) Hinge
- (7) PTO Lever (Fulcrum)
- (8) Hydraulic Lift Lever (Fulcrum)
- (9) Link Fulcrum

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Oiling (Continued)

1. Apply oil to the following location as figures.

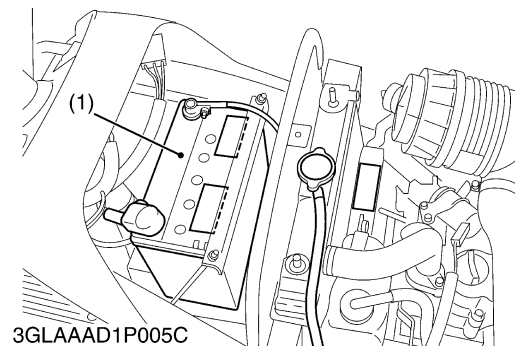


CAUTION

- Be sure to stop the engine and remove the key before oiling.

(1) Glide Steer Wire

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Checking Battery Condition



DANGER

- To avoid the possibility of battery explosion:
For the refillable type battery, follow the instructions below.
- Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.

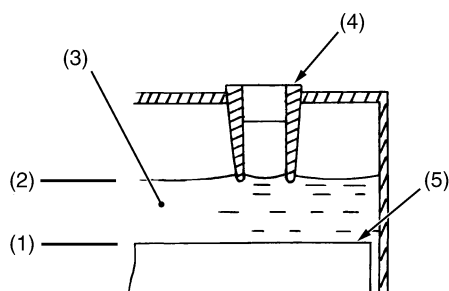


CAUTION

- Never remove the vent plugs while the engine is running.
 - Keep electrolyte away from eyes, hands and clothes. If you are splattered with it, wash it away completely with water immediately and get medical attention.
 - Wear eye protection and rubber gloves when working around battery.
1. Mishandling the battery shortens the service life and adds to maintenance costs.
 2. The original battery is maintenance free type battery, but need some servicing. If the battery is weak, the engine is difficult to start and the lights become dim. It is important to check the battery periodically.

(1) Battery

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■ Battery Charging



DANGER

- When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.



CAUTION

- When charging the battery, ensure the vent caps are securely in place (if equipped).
- When disconnecting the cable from the battery, start with the negative terminal first.
When connecting the cable to the battery, start with the positive terminal first.
- Never check battery charge by placing a metal object across the posts.

Use a voltmeter or hydrometer

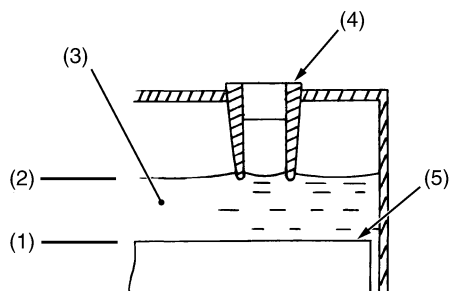
(For accessible maintainable type batteries with removable vent caps.)

1. Make sure each electrolyte (3) level is to the bottom of vent wells (4), if necessary add distilled water in a well-ventilated area.
2. The water in the electrolyte (3) evaporates during recharging. Liquid shortage damages the battery. Excessive liquid spills over and damages the machine.
3. To slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
4. A boost charge is only for emergencies. It will partially charges the battery at a high rate and in a short time.
When using a boost-charged battery, it is necessary to recharge the battery as early as possible.
Failure to do this will shorten the battery's service life.
5. When the specific gravity of electrolyte (3) become between 1.27 and 1.29 charge has completed.
6. When exchanging an old battery into new one, use battery of equal specification shown in "SPECIFICATIONS".

- (1) Lowest Level
(2) Highest Level
(3) Electrolyte

- (4) Vent Well
(5) Separator

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■ Battery Charging (Continued)

(For non-accessible maintenance-free type batteries.)

Maintenance-free, non-accessible batteries are designed to eliminate the need to add water. Yet the volume of electrolyte (3) above plates may eventually become depleted due to abnormal conditions such as high heat or improper regulator setting. Use a voltmeter to check the state of charge. (See reference chart below to determine if charging is necessary.)

Battery voltage	Reference state of charge
12.6	100 % (Full charge)
12.4	75 %
12.2	50 %
12.0	25 %
11.8	0 %

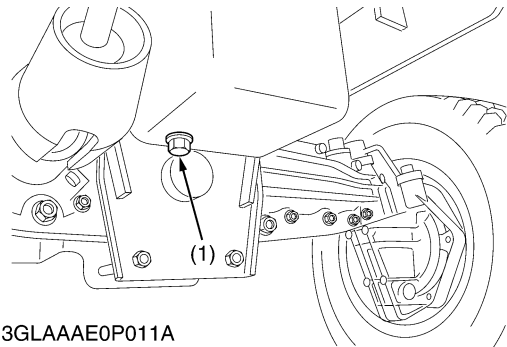
■ Direction for Storage

1. When storing the machine for long periods of time, remove the battery from machine, adjust the electrolyte (3) to the proper level and store in a dry place out of direct sunlight.
2. The battery self-discharges while it is stored.
Recharge it once every three months in hot seasons and once every six months in cold seasons.

- | | |
|-------------------|---------------|
| (1) Lowest Level | (4) Vent Well |
| (2) Highest Level | (5) Separator |
| (3) Electrolyte | |

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[3] CHECK POINTS OF EVERY 100 HOURS



3GLAAE0P011A

Changing Engine Oil



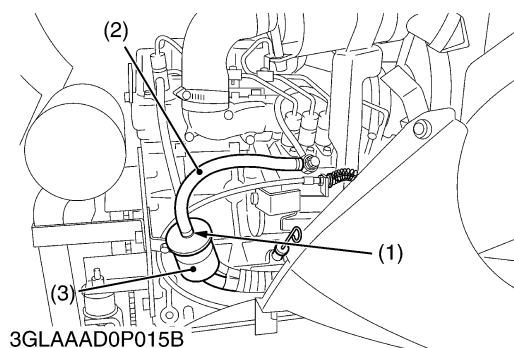
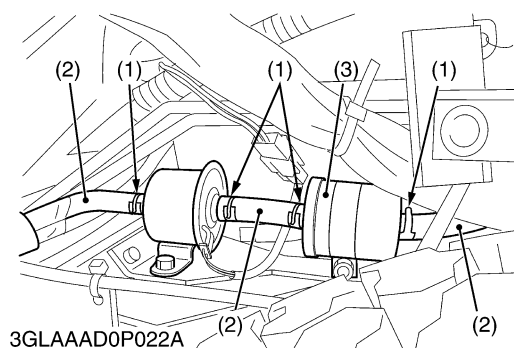
CAUTION

- Be sure to stop the engine and remove the key before changing the oil.
 - Allow engine to cool down sufficiently; oil can be hot and may cause burns.
1. To change the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely. The used oil can be drained out more easily if the engine is warm.
 2. Fill with the new oil up to the upper notch on the dipstick.
 3. To check the oil level. Remove the dipstick, wipe it clean, insert it and draw it out again. Check to see the oil level is between the two marks.

Engine oil capacity	2.8 L 2.96 U.S.qts 2.46 Imp.qts
---------------------	---------------------------------------

- (1) Drain Plug

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Checking Fuel Line and Fuel Filter



CAUTION

- **Be sure to stop the engine and remove the key when attempting to make the following checks and changes.**
- **Never fail to check the fuel lines periodically. The fuel lines are subject to wear and aging. Fuel may leak out onto the running engine, causing a fire.**

The fuel line connections should be checked annually or every 100 service hours, whichever comes first.

1. The fuel line (2) is made of rubber and ages regardless of service period.
2. If the fuel line (2) and clamps (1) are found to be damaged or deteriorated, replace them.
3. Check fuel filter (3), if it is clogged by debris or contaminated with water, replace it.

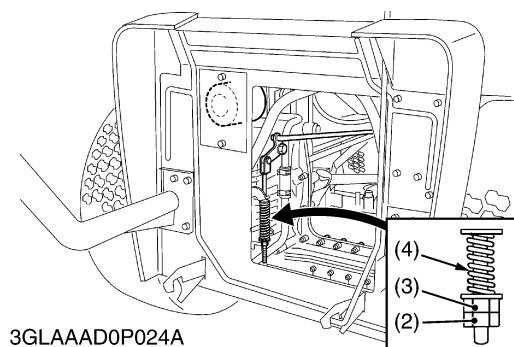
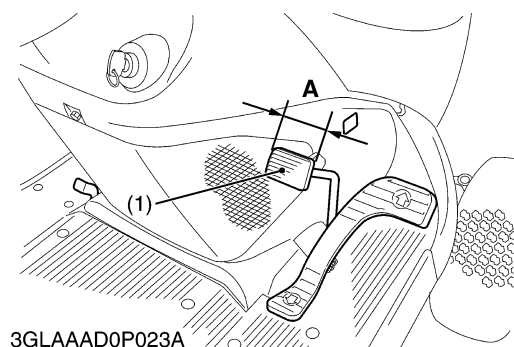
■ IMPORTANT

- When the fuel line is disconnected for maintenance or repair, close both ends of the fuel line with a piece of clean cloth or paper to prevent dust and dirt from entering. In addition, particular care must be taken not to admit dust and dirt into the fuel pump. Entrance of even a small amount of dust or dirt causes premature wear and malfunction of the fuel pump and injector components.

- (1) Pipe Clamp
- (2) Fuel Line

- ### (3) Fuel Filter

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Checking Brake



CAUTION

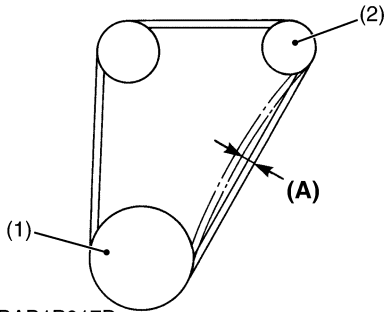
- **When making adjustments, park the machine on a flat area, block wheels, stop the engine and remove the key.**
1. Correct play ranges from 15 to 25 mm (0.59 to 0.98 in.). If it is not correct, loosen the lock nut (2) and turn the nut (3) in the desired direction until the proper play is achieved. After adjustment, retighten lock nut securely.

Play (A)	Factory spec.	15 to 25 mm 0.59 to 0.98 in.
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- (1) Brake Pedal
- (2) Lock Nut

- (3) Nut
(4) Spring

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Checking Fan Drive Belt Tension

CAUTION

● Be sure to stop the engine and remove the key before checking belt tension.

1. Measure the deflection (A), depressing the belt halfway between the fan drive pulley (1) and dynamo pulley (2) at specified force (98 N, 10 kgf, 22 lbs).
2. If the measurement is not within the factory specifications, loosen the dynamo mounting screws and relocate the dynamo to adjust.

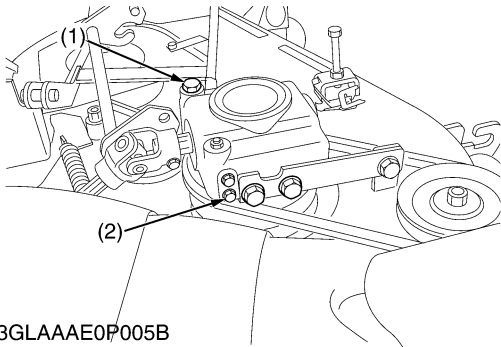
Deflection (A)	Factory spec.	7 to 9 mm 0.28 to 0.35 in.
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(1) Fan Drive Pulley

(2) Dynamo Pulley

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[4] CHECK POINTS OF EVERY 150 HOURS



3GLAAAE0P005B

Changing Mower Gear Box Oil

CAUTION

● Be sure to stop the engine and remove the key before changing the oil.

1. To drain the used oil, remove the oil filler plug (1) at the mower gear box, tilt the mower deck and drain the oil completely into the oil pan.
2. Fill with the new oil.
(See page G-8.)
3. After filling, reinstall the oil filler plug (1).

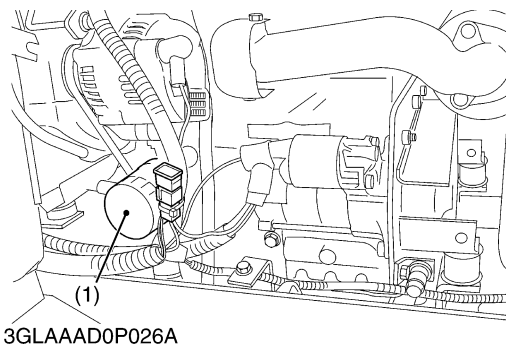
Mower gear box oil capacity	0.40 L 0.42 U.S.qts. 0.35 Imp.qts.
-----------------------------	--

(1) Oil Filler Plug

(2) Drain Plug

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[5] CHECK POINTS OF EVERY 200 HOURS



Replacing Engine Oil Filter Cartridge



CAUTION

- Be sure to stop the engine and remove the key before changing the oil filter cartridge.
- Allow engine to cool down sufficiently, oil can be hot and may cause burns.

1. The oil filter cartridge (1) must be changed every 200 service hours.
2. Apply a slight coat of oil onto the rubber gasket of new cartridge.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the cartridge has been replaced, the engine oil level normally lowers a little. Add engine oil to proper level. Check for oil leaks around filter gasket.

IMPORTANT

- To prevent serious damage to the engine, element of recommended type must be used. Use only a genuine KUBOTA filter or its equivalent.

(1) Engine Oil Filter Cartridge

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Changing Transmission Fluid

CAUTION

- 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 remove the suction pipe (1) at the bottom of the transmission case.
2. After draining, disassemble and clean the strainer (5) and change the oil filter cartridge (6). After reassembling, fill with UDT or SUPER UDT hydrostatic transmission fluid, or its equivalent.
3. Remove the oil plug and fill with the new oil.
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 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 that there is no damage to transmission.

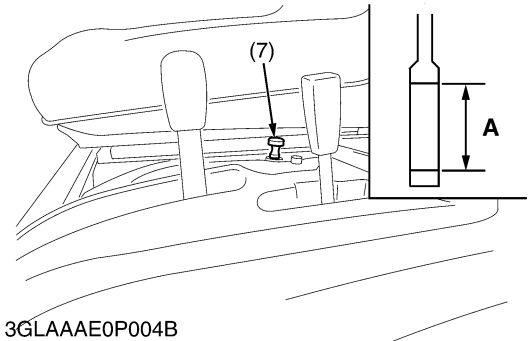
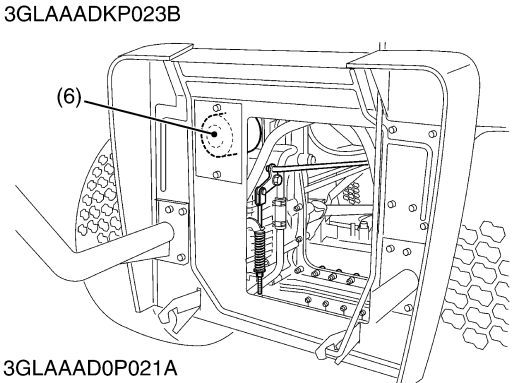
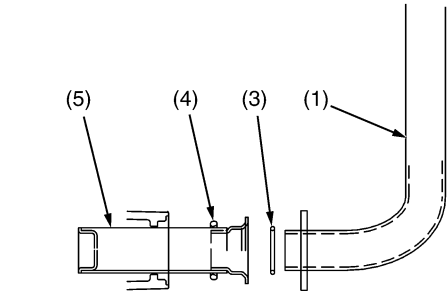
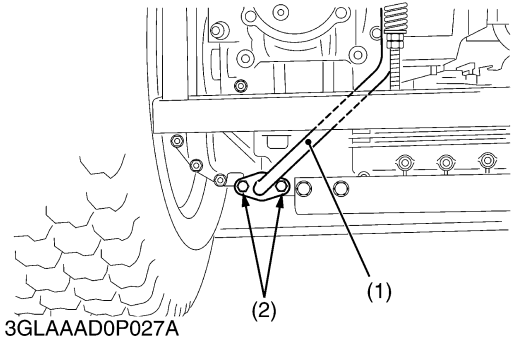
Transmission fluid capacity	3.3 L 0.87 U.S.gals 0.73 Imp.gals
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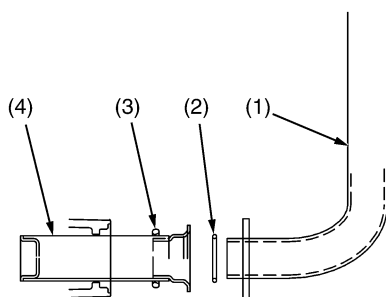
- (1) Suction Pipe
- (2) Bolt
- (3) O-ring (Small)
- (4) O-ring (Large)
- (5) Strainer

- (6) Transmission Oil Filter Cartridge
- (7) Dipstick

A : Oil level is acceptable within this range

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Cleaning Transmission Strainer

When changing the transmission fluid, disassemble and rinse the strainer with nonflammable solvent to completely clean off filings.

Check O-rings (2), (3), replace if damaged, cracked or hardened.

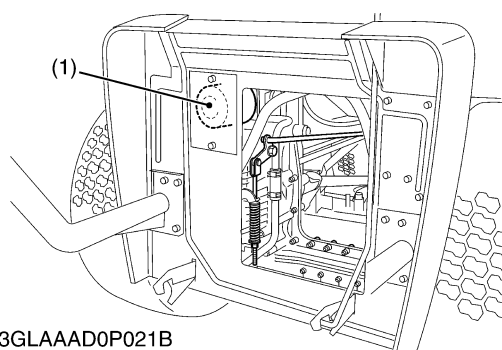
When reassembling be careful not to damage the parts.

■ NOTE

- Since the fine filings in the oil can damage the precision component parts of the hydraulic system, the end of the suction line is provided with an oil strainer.

- | | |
|--------------------|--------------------|
| (1) Suction Pipe | (3) O-ring (Large) |
| (2) O-ring (Small) | (4) Strainer |

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CAUTION

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

1. The transmission oil filter cartridge (1) must be changed every 300 service hours.
2. Remove the grass container and clean the area indicated.
3. Remove the oil filter cartridge (1) with the filter wrench.
4. Lightly tighten the screw (2) by using a screwdriver.
5. Apply a slight coat of oil onto the cartridge gasket.
6. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
7. Assemble the cover and mount the grass container.
8. After the new cartridge has been replaced, the transmission fluid level normally lowers a little. Add fluid to proper level. Check for oil leaks around filter gasket.

■ IMPORTANT

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

- | | |
|---------------------------------------|-----------|
| (1) Transmission Oil Filter Cartridge | (2) Screw |
|---------------------------------------|-----------|

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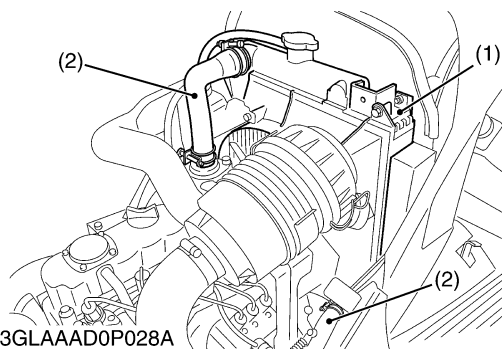
Checking Radiator Hose and Hose Clamp

Check to see if radiator hoses are properly fixed every 200 hours of operation or six months, whichever comes first.

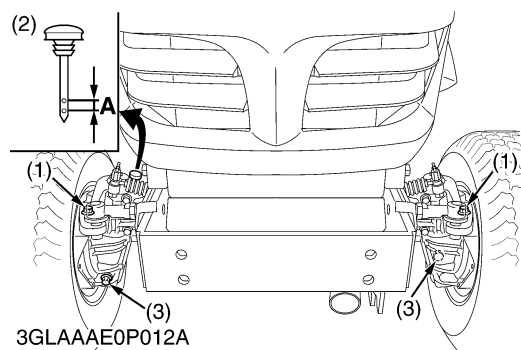
1. If hose clamps are loose or water leaks, tighten bands securely.
2. Replace hoses (2) and tighten hose clamps securely, if radiator hoses (2) are swollen, hardened or cracked.

- | | |
|-------------------|-------------------|
| (1) Radiator Core | (2) Radiator Hose |
|-------------------|-------------------|

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Changing Front Axle Case Oil

1. Park the machine on a firm, flat and level surface.
2. To drain the used oil, remove the right and left drain plugs (3) and filling plug (2) at the front axle case and drain the oil completely into the oil pan.
3. After draining, reinstall the drain plugs (3).
4. Remove the right or left breather plugs (1).
5. Fill with the new oil up to the upper notch on the dipstick (2).

■ **IMPORTANT**

- **After ten minutes, check the oil level again: add oil to prescribed level.**

6. After filling reinstall the filling plug (2) and breather plugs (1).

Front axle case fluid capacity	1.9 L
	0.50 U.S.gals
	0.42 Imp.gals

- (1) Breather Plug
- (2) Filling Plug with Dipstick
- (3) Drain Plug

A : Oil level is acceptable within this range

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Checking Hydraulic Hose**CAUTION**

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

Check to see if hydraulic hoses are properly fixed every 200 hours of operation.

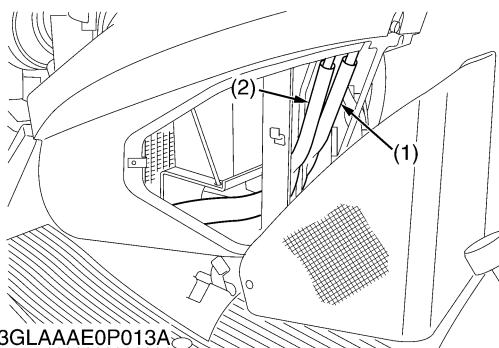
1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

(1) Power Steering Hose RH

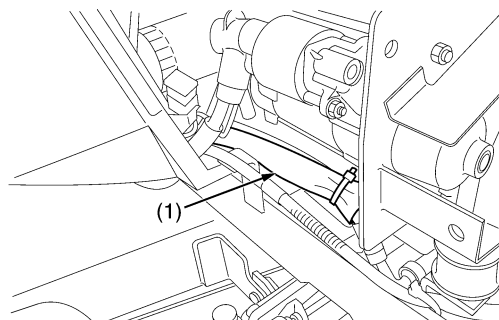
(3) Mower Lift Cylinder Hose

(2) Power Steering Hose LH

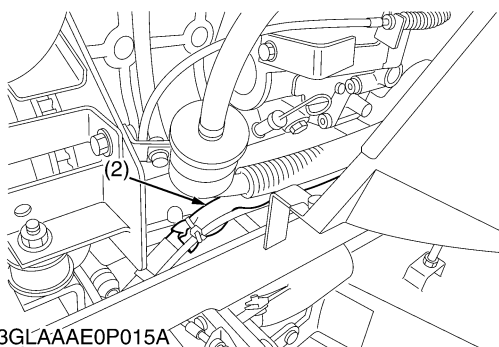
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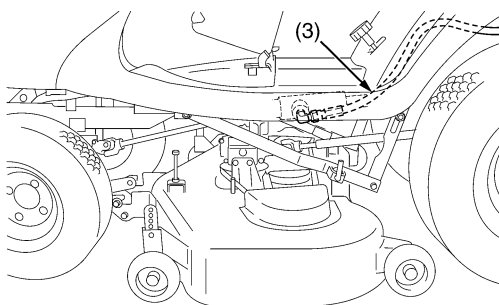
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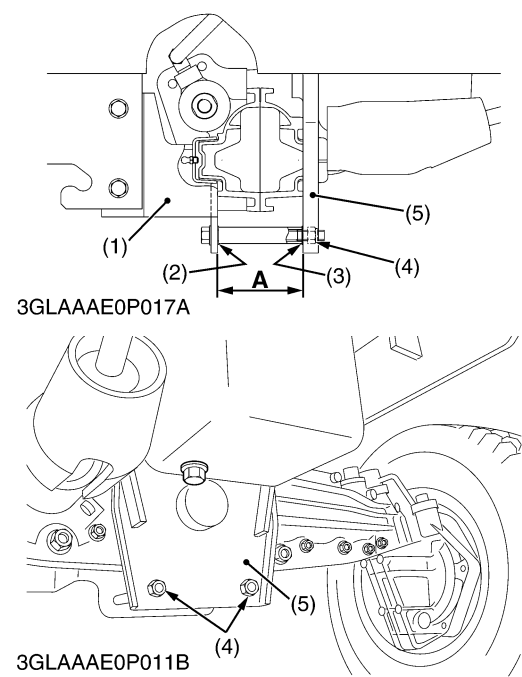
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Adjusting Front Axle Pivot

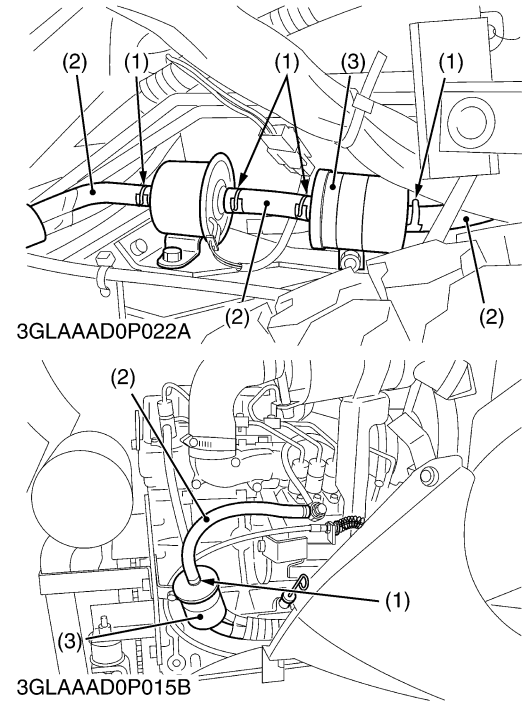
1. Jack up the front of machine.
2. Measurement the clearance between the front axle bracket (1) and frame (5).
3. If the measurement exceeds the factory specification, adjust the front axle bracket mounting screw and nut (4).
4. If the vibration in the front wheel does not stop after adjustment, remove one shim (2) (3) and tighten the front axle bracket mounting screw and nut (4) with a specified torque.

Clearance between front axle bracket and frame "A"	Factory spec.	81 to 83 mm 3.19 to 3.26 in.
Tightening torque	Front axle bracket mounting screw and nut	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs

- (1) Front Axle Bracket
(2) Shim
(3) Shim
(4) Front Axle Bracket Mounting Nut
(5) Frame
A : Clearance

0000010064E

[6] CHECK POINT OF EVERY 400 HOURS



Replacing Fuel Filter

1. Disconnect the fuel hoses and loosen the filter band to replace the fuel filter (3).

■ **NOTE**

- If the fuel line is removed, be sure to properly bleed the fuel system. (See page G-41.)

- (1) Pipe Clamps
(2) Fuel Line
(3) Fuel Filter

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[7] CHECK POINTS OF EVERY 1 YEAR

Replacing Air Cleaner Element

- 1. Change the element once a year.

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Flushing Cooling System and Changing Coolant



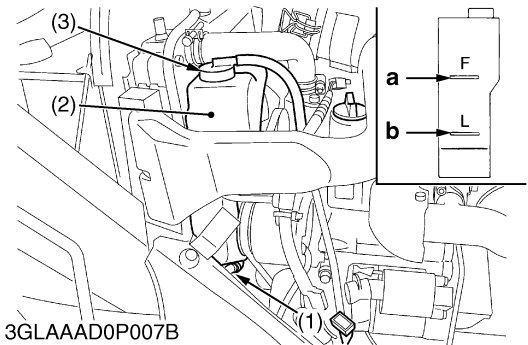
CAUTION

- Do not remove the radiator cap when the engine is hot. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.

- 1. Stop the engine and let cool down.
- 2. To drain the coolant, remove the clamp and the hose, and remove the radiator cap. The radiator cap must be removed to completely drain the coolant.
- 3. After all coolant is drained, install the hose with the clamp.
- 4. Fill with clean water and cooling system cleaner.
- 5. Follow directions of the cleaner instruction.
- 6. After flushing, fill with clean water and anti-freeze until the coolant level is just below the fill port on the radiator. Install the radiator cap securely.
- 7. Fill with coolant up to "FULL" mark on the recovery tank.
- 8. Start and operate the engine for a few minutes.
- 9. Stop the engine and let cool. Check coolant level of recovery tank (2) and add coolant if necessary.

IMPORTANT

- Do not start engine without coolant.
- Use clean, fresh water and anti-freeze to fill the radiator and recovery tank.
- When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.
- Securely tighten radiator cap. If the cap is loose or improperly fitted, water may leak out and the engine could overheat.
- Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8.)



3GLAAAD0P007B

Coolant capacity (with recovery tank)	2.35 L
	2.48 U.S.qts.
	2.07 Imp.qts.

- (1) Clamp

A: FULL
- (2) Recovery Tank

B: LOW
- (3) Recovery Tank Cap

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Flushing Cooling System and Changing Coolant (Continued)■ **Anti-Freeze****CAUTION**

- When using anti-freeze, put on some protection such as rubber gloves (Anti-freeze contains poison.).
- If should drink anti-freeze, throw up at once and take medical attention.
- When anti-freeze comes in contact with the skin or clothing, wash it off immediately.
- Do not mix different types of anti-freeze. The mixture can produce chemical reaction causing harmful substances.
- Anti-freeze is extremely flammable and explosive under certain conditions. Keep fire and children away from anti-freeze.
- When draining fluids from the engine, place some container underneath the engine body.
- Do not pour waste onto the grounds, down a drain, or into any water source.
- Also, observe the relevant environmental protection regulations when disposing of anti-freeze.

If it freezes, coolant can damage the cylinders and radiator. If the ambient temperature falls below 0 °C or before a long-term storage, let out coolant completely, or mix fresh water with long-life coolant and fill the radiator and reserve tank with the mixture.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed coolant, fill the radiator with fresh water and empty it again. Repeat this procedure 2 or 3 times to clean up the inside.
3. Mixing the LLC
Put the LLC in coolant in the percentage (%) for a target temperature. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and anti-freeze differs according to the make of the anti-freeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.

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Flushing Cooling System and Changing Coolant (Continued)**■ IMPORTANT**

- **When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50%.**

Vol % Anti-freeze	Freezing Point	Boiling Point*
	°C (°F)	°C (°F)
40	-24 (-12)	106 (222)
50	-37 (-34)	108 (115)

*At 0.1013 MPa (760 mmHg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

1. Adding the LLC

(1) Add only water if the mixture reduces in amount by evaporation.

(2) If there is a mixture leak, add the LLC the same manufacture and type in the same mixture percentage.

*Never add any long-life coolant of different manufacture. (Different brands may have different additive components, and the engine may fail to perform as specified.)

2. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anti-corrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.

3. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

■ NOTE

- **The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.**
- **When the coolant level drops due to evaporation, add water only to keep the anti-freeze mixing ratio less than 50%. In case of leakage, add anti-freeze and water in the specified mixing ratio before filling in to the radiator.**

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[8] CHECK POINTS OF EVERY 2 YEARS

Replacing Fuel Lines

- 1. Replace the fuel line.
Refer to "Checking Fuel Lines and Fuel Filter". (See page G-27.)

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Replacing Radiator Hose

- 1. Replace hoses and clap bands every 2 years or earlier if checked and found that hoses are swollen, hardened or cracked.

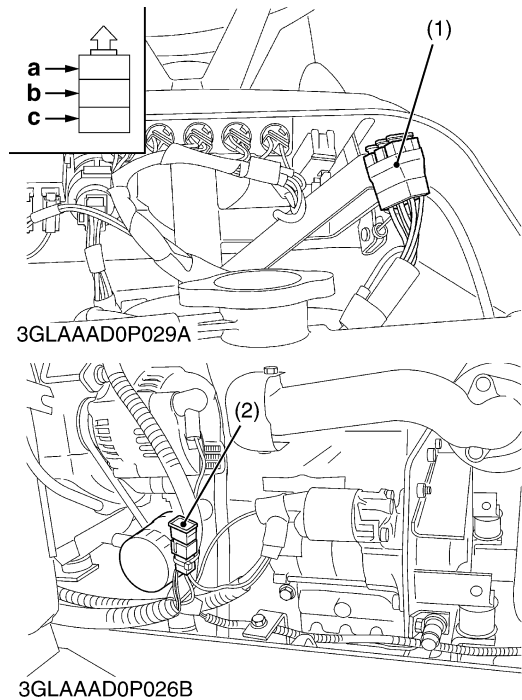
0000009581E

Replacing Mower Gear Box Oil Seals

- 1. Replace the mower gear box oil seals.
Refer to "Disassembling Gear Box".
(See page 8-S10.)

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[9] OTHERS



Replacing Fuses

- 1. Open the hood.
- 2. Remove the blown fuse.
- 3. Place a new 3 A or 10 A or 15 A or 30 A or 40 A fuse in position.

■ IMPORTANT

- Never "jump" the fuse with wire or foil, or install a larger capacity fuse than is recommended.

■ Protected circuit

Fuse No. (ID Label)		Capacity (A)	Protected circuit
(1)	E/G STOP (a)	15	Engine stop timer relay
	IG/M (b)	10	Fuel pump, head light, etc.
	OPC (c)	3	OPC
(2)	—	Slow blow fuse 40	Check circuit against wrong battery connection

(1) Fuse Location

(2) Slow Blow Fuse

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Replacing Bulbs**(A) Replacement of the head light bulb**

1. Open the hood.
2. Turn bulb socket to remove socket from head light housing.
3. Push bulb down and turn one quarter turn to remove bulb from the socket.
4. Install new bulb to the socket.
5. Install the socket in housing.
6. Close the hood.

Head light bulb	12V - 24 W
-----------------	------------

(B) Replacement of the indicator light bulb

1. Open the hood.
2. Turn bad bulb socket to the left. And remove it.
3. Pull bulb from the socket.
4. Push new bulb into the socket.
5. Install the socket.
6. Close the hood.

Indicator light bulb	14.0 rated voltage / 0.27 AMP/2 MSCP
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0000009584E

Checking and Replacing Mower Blade

CAUTION

- Be sure to stop the engine and remove the key.
- Blades may be sharp. When you handle blades, wear heavy gloves or wrap end of blade with a rag.

■ Checking Blade

1. The blade cutting edges should be kept sharp at all times. Sharpen the cutting edges, if they resemble blade (b). Replace the blades if they appear similar to blade (c).

■ Replacing Blade

1. Remove the mower deck from the machine and turn it over to expose the blades (4).
2. Wedge a block of wood (1) between the blade (4) and mower housing as illustrated.
3. The blade bolt (2) has right hand threads, turn counterclockwise to loosen.
The blade bolt (2) has left hand threads, turn clockwise to loosen.

■ NOTE

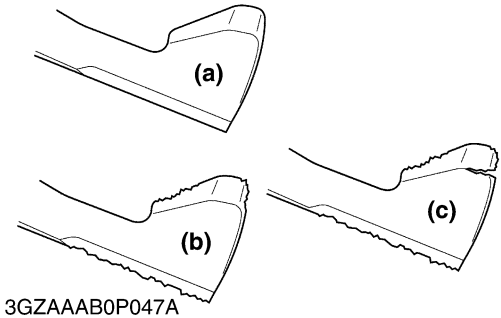
- Use the proper size box or socket wrench to tighten or loosen the blade mounting bolt.
4. To sharpen the blades yourself, clamp the blade securely in a vise.
Use a large mill file and file along the original bevel until sharp.
 5. To check the blade for balance, place a small rod through the centre hole. If the blade is not balanced, file the heavy side of the blade until balance is achieved.
 6. To attach blades (4), be sure to install the spring plate (5) between the blade (4) and bolt (2) head.

Tightening torque	Blade mounting bolt	88.0 to 117.6 N·m 8.98 to 11.99 kgf·m 65.0 to 86.7 ft·lbs
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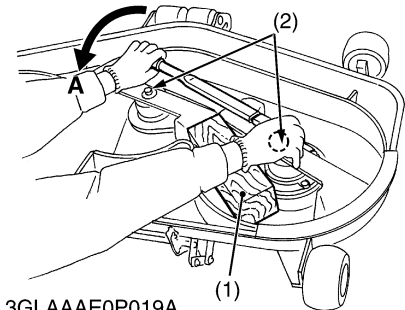
- (1) Block
- (2) Blade Bolt
- (3) Spindle Holder
- (4) Blade
- (5) Spring Plate
- (6) Cover

- (a) New Blade
- (b) Worn Blade
- (c) Cracked Blade

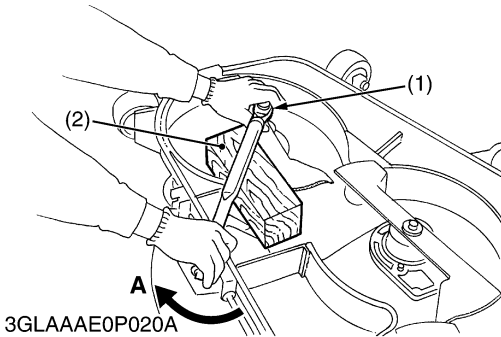
A : Loosen



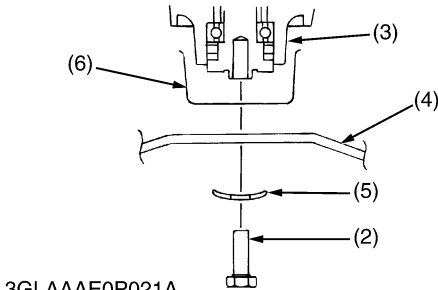
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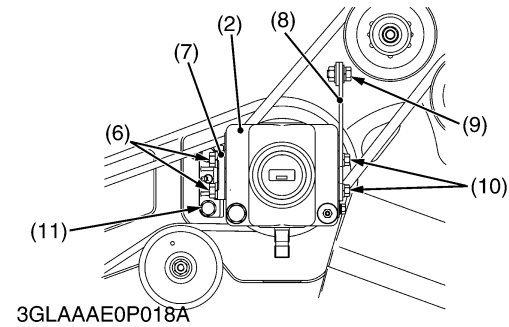
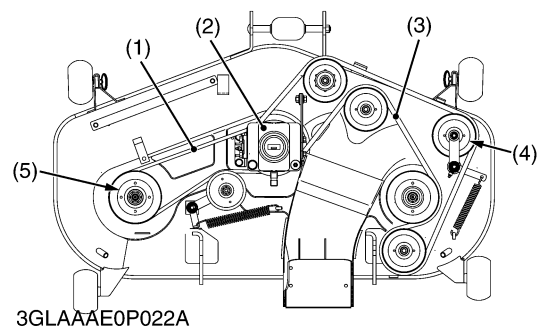


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Replacing Mower Belt

1. Remove the left and right belt covers from the mower deck.
2. Disconnect the universal joint from the gear box (2).
3. Clean around the gear box (2).
4. Remove the mower belt RH (3) from the tension pulley (4).
5. Remove the mower belt LH (1) from the left side blade pulley (5).
6. Remove the gear box stays (7) (8).
7. Remove the mower belts (1) (3) from the center blade pulley.

Tightening torque	Gear box mounting screw LH (Reamer)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Gear box mounting screw RH	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Gear box stay mounting screw LH (Reamer)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Gear box stay mounting screw RH	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs

- | | |
|---|---|
| (1) Mower Belt LH | (7) Gear Box Stay LH |
| (2) Gear Box | (8) Gear Box Stay RH |
| (3) Mower Belt RH | (9) Gear Box Stay Mounting Screw RH |
| (4) Tension Pulley | (10) Gear Box Mounting Screw RH |
| (5) Left Side Blade Pulley | (11) Gear Box Stay Mounting Screw LH (Reamer) |
| (6) Gear Box Mounting Screw LH (Reamer) | |

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Bleeding Fuel System

Air must be removed:

1. When the fuel filter or lines are removed.
2. When tank is completely empty.
3. After the machine has not been used for a long period of time.

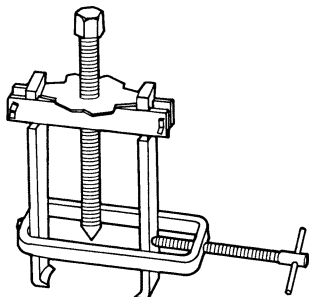
Bleeding procedure is as follows:

1. Fill the fuel tank with fuel.
2. Start the engine and run for about 30 seconds, and then stop the engine.

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8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE

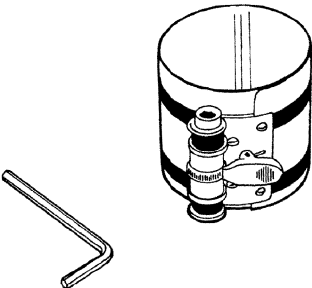


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Special Use Puller Set

Code No : 07916-09032
Application : Use exclusively for pulling out bearing, gears and other parts with ease.

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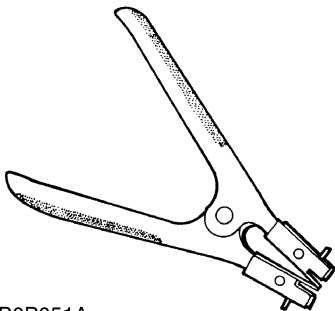


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Piston Ring Compressor

Code No : 07909-32111
Application : Use exclusively for pushing in the piston with piston rings into the cylinder.

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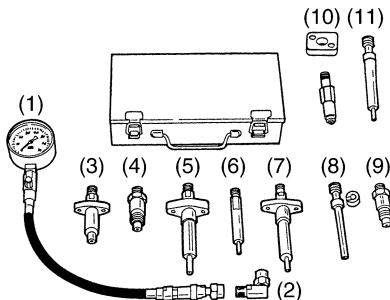


3TMABAB0P051A

Piston Ring Tool

Code No : 07909-32121
Application : Use exclusively for removing or installing the piston ring with ease.

0000000679E



3TMABAB0P052A

Diesel Engine Compression Tester

Code No : 07909-30208 (Assembly) 07909-31251 (G)
07909-30934 (A to F) 07909-31271 (I)
07909-31211 (E and F) 07909-31281 (J)
07909-31231 (H)
Application : Use to measure diesel engine compression and diagnostics of need for major overhaul.

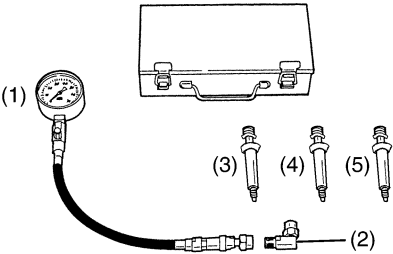
- | | |
|---------------|----------------|
| (1) Gauge | (7) Adaptor F |
| (2) L Joint | (8) Adaptor G |
| (3) Adaptor A | (9) Adaptor H |
| (4) Adaptor B | (10) Adaptor I |
| (5) Adaptor C | (11) Adaptor J |
| (6) Adaptor E | |

0000000680E

Diesel Engine Compression Tester (for Glow Plug)

Code No : 07909-39081 (Assembly) 07909-31301 (L)
07909-31291 (K) 07909-31311 (M)

Application : Use to measure diesel engine compression and
diagnostics of need for major overhaul.



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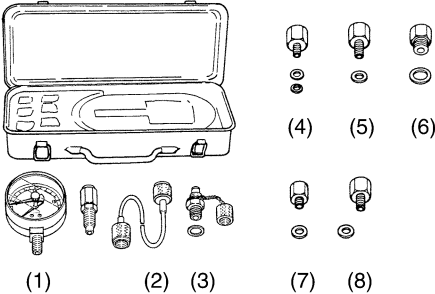
- | | |
|---------------|---------------|
| (1) Gauge | (4) Adaptor L |
| (2) L Joint | (5) Adaptor M |
| (3) Adaptor K | |

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Oil Pressure Tester

Code No : 07916-32032

Application : Use to measure lubricating oil pressure.



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- | | |
|--------------------|---------------|
| (1) Gauge | (5) Adaptor 2 |
| (2) Cable | (6) Adaptor 3 |
| (3) Threaded Joint | (7) Adaptor 4 |
| (4) Adaptor 1 | (8) Adaptor 5 |

0000000681E

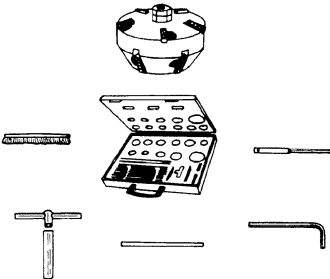
Valve Seat Cutter

Code No : 07909-33102

Application : Use to reseal valves.

Angle : 0.785 rad (45°)
0.262 rad (15°)

Diameter :	28.6 mm (1.126 in.)	38.0 mm (1.496 in.)
	31.6 mm (1.244 in.)	41.3 mm (1.626 in.)
	35.0 mm (1.378 in.)	50.8 mm (2.000 in.)



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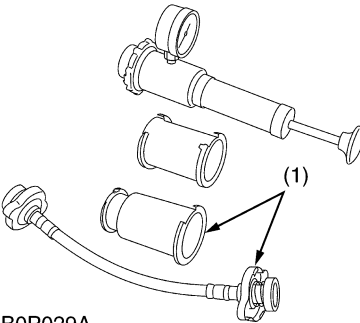
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Radiator Tester

Code No : 07909-31551

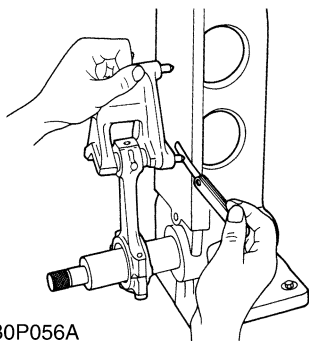
Application : Use to check of radiator cap pressure, and leaks
from cooling system.

Remarks : Adaptor (1) BANZAI Code No. RCT-2A-30S.



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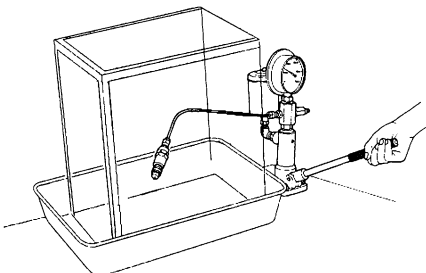
Connecting Rod Alignment Tool

Code No : 07909-31661

Application : Use to check the connecting rod alignment.

Applicable : Connecting rod big end I.D.
range 30 to 75 mm (1.18 to 2.95 in.) dia.
Connecting rod length
65 to 300 mm (2.56 to 11.81 in.)

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3TLABAB1P041A

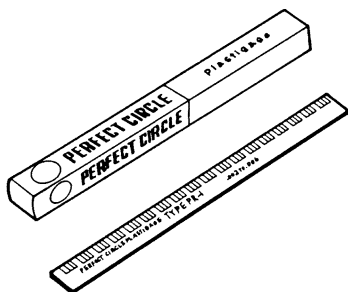
Nozzle Tester

Code No : 07909-31361

Application : Use to check the fuel injection pressure and spray pattern of nozzle.

Measuring : 0 to 50 MPa
range (0 to 500 kgf/cm², 0 to 7000 psi)

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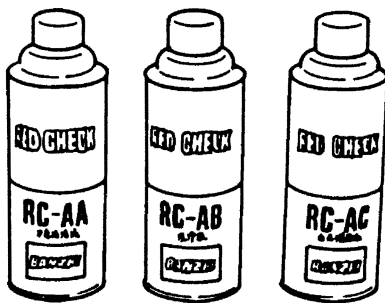
Plastigage

Code No : 07909-30241

Application : Use to check the oil clearance between crankshaft and bearing, etc..

Measuring : Green.....0.025 to 0.076 mm (0.001 to 0.003 in.)
range Red.....0.051 to 0.152 mm (0.002 to 0.006 in.)
Blue.....0.102 to 0.229 mm (0.004 to 0.009 in.)

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Red Check

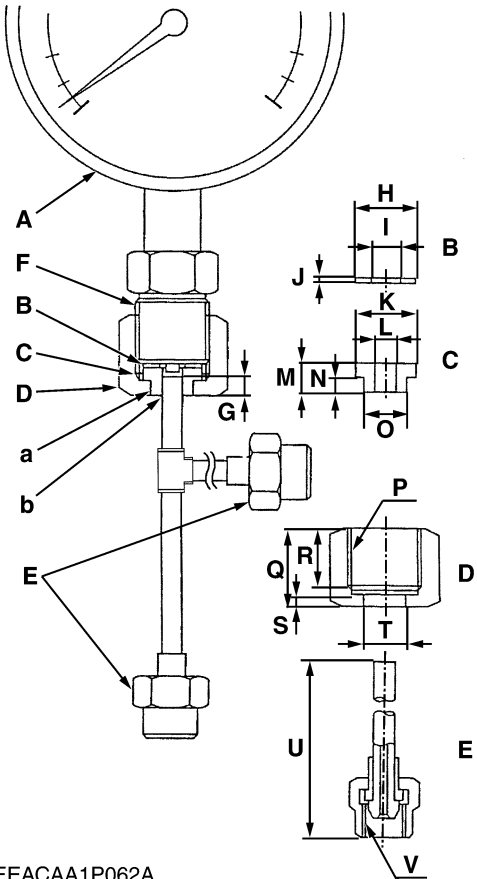
Code No : 07909-31371

Application : Use to check cracks on cylinder head, cylinder block, etc..

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Injection Pump Pressure Tester

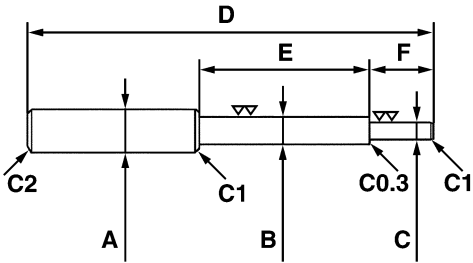
Application : Use to check fuel tightness of injection pumps.



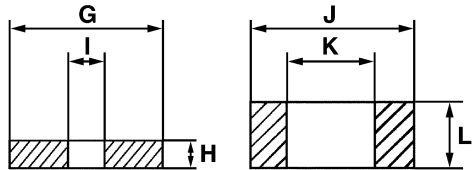
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A	Pressure gauge full scale : More than 29.4 MPa (300 kgf/cm ² , 4267 psi)
B	Copper gasket
C	Flange (Material : Steel)
D	Hex. nut 27 mm (1.06 in.) across the plat
E	Retaining nut
F	PF 1/2
G	5 mm (0.20 in.)
H	17 mm dia. (0.67 in.dia.)
I	8 mm dia. (0.31 in.dia.)
J	1.0 mm (0.039 in.)
K	17 mm dia. (0.67 in.dia.)
L	6.10 to 6.20 mm dia. (0.2402 to 0.2441 in.dia.)
M	8 mm (0.31 in.)
N	4 mm (0.16 in.)
O	11.97 to11.99 mm dia. (0.4713 to 0.4721 in.dia.)
P	PF 1/2
Q	23 mm (0.91 in.)
R	17 mm (0.67 in.)
S	4 mm (0.16 in.)
T	12.00 to 12.02 mm dia. (0.4724 to 0.4732 in.dia.)
U	100 mm (3.94 in.)
V	M12 x P1.5
a	Adhesive application
b	Fillet welding on the enter circumference

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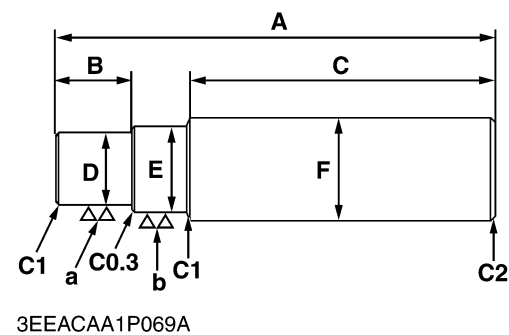
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Valve Guide Replacing Tool

Application : Use to press out and press fit the valve guide.

A	20 mm dia. (0.79 in. dia.)
B	9.96 to 9.98 mm dia. (0.3921 to 0.3929 in. dia.)
C	5.5 to 5.7 mm dia. (0.2165 to 0.2244 in. dia.)
D	220 mm (8.66 in.)
E	80 mm (3.15 in.)
F	40 mm (1.58 in.)
G	25 mm dia. (0.98 in. dia.)
H	5 mm (0.197 in.)
I	6.0 to 6.1 mm dia. (0.236 to 0.240 in. dia.)
J	18 mm dia. (0.71 in. dia.)
K	10.6 to 10.7 mm dia. (0.417 to 0.421 in. dia.)
L	6.9 to 7.1 mm dia. (0.272 to 0.280 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)

0000000816E



Bushing Replacing Tools

Application : Use to press out and to press fit the bushing.

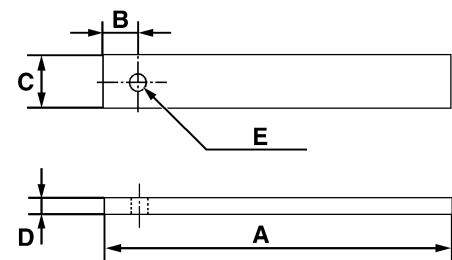
1. For small end bushing

A	145 mm (5.71 in.)
B	20 mm (0.79 in.)
C	100 mm (3.94 in.)
D	19.90 to 19.95 mm dia. (0.7835 to 0.7854 in. dia.)
E	21.90 to 21.95 mm dia. (0.8622 to 0.8642 in. dia.)
F	25 mm dia. (0.98 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)
a	6.3 μm (248 μin.)
b	6.3 μm (248 μin.)

2. For idle gear bushing

A	150 mm (5.91 in.)
B	23 mm (0.91 in.)
C	100 mm (3.94 in.)
D	19.90 to 19.95 mm dia. (0.7835 to 0.7854 in. dia.)
E	21.90 to 21.95 mm dia. (0.8622 to 0.8642 in. dia.)
F	25 mm dia. (0.98 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)
a	6.3 μm (248 μin.)
b	6.3 μm (248 μin.)

0000003194E



3TMABAB0P067B

Flywheel Stopper

Application : Use to loosen and tighten the flywheel screw.

A	200 mm (7.87 in.)
B	30 mm (1.18 in.)
C	20 mm (0.79 in.)
D	15 mm (0.59 in.)
E	8 mm (0.31 in.)
F	10 mm dia. (0.39 in. dia.)

0000000818E

Crankshaft Bearing 1 Replacing Tool

Application : Use to press out and press fit the crankshaft bearing 1.

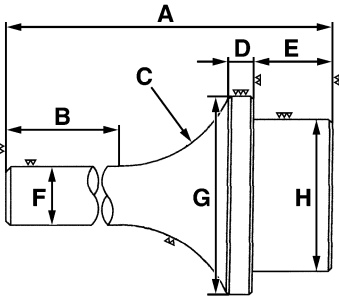
[Press Out]

A	135 mm (5.31 in.)
B	72 mm (2.83 in.)
C	40 mm radius (1.57 in. radius)
D	10 mm (0.39 in.)
E	22 mm (0.87 in.)
F	20 mm dia. (0.79 in. dia.)
G	47.90 to 47.95 mm dia. (1.8858 to 1.8878 in. dia.)
H	43.90 to 43.95 mm dia. (1.7283 to 1.7303 in. dia.)

[Press Fit]

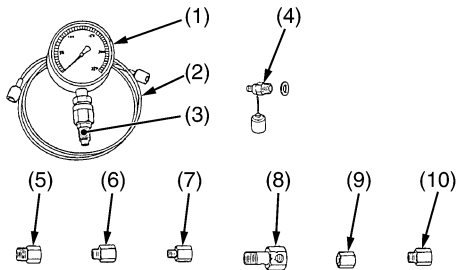
A	130 mm (5.12 in.)
B	72 mm (2.83 in.)
C	40 mm radius (1.57 in. radius)
D	9 mm (0.35 in.)
E	24 mm (0.95 in.)
F	20 mm dia. (0.79 in. dia.)
G	68 mm dia. (2.68 in. dia.)
H	39.90 to 39.95 mm dia. (1.5709 to 1.5728 in. dia.)

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3GFABAB0P041A

[2] SPECIAL TOOLS FOR TRACTOR



3TMABAB0P077A

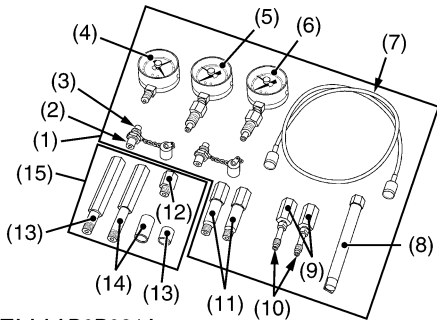
Relief Valve Pressure Tester

Code No : 07916-50045

Application : This allows easy measurement of relief set pressure.

- | | |
|--|---------------------------------------|
| (1) Gauge (07916-50322) | (6) Adaptor C (PS3/8) (07916-50371) |
| (2) Cable (07916-50331) | (7) Adaptor D (PT1/8) (07916-50381) |
| (3) Threaded Joint (07916-50401) | (8) Adaptor E (PS3/8) (07916-50392) |
| (4) Threaded Joint (07916-50341) | (9) Adaptor F (PF1/2) (07916-62601) |
| (5) Adaptor B (M18 x P1.5) (07916-50361) | (10) Adaptor 58 (PT1/4) (07916-52391) |

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3TAAAB0P031A

Hydrostatic Transmission Tester and HST Adaptor Set

Code No : 07916-52040 (Hydrostatic Transmission Tester)
07916-53072 (HST Adaptor Set)

Application : This allows easy measurement of hydrostatic transmission pressure.

- | | |
|--|--|
| (1) Hydrostatic Transmission Tester (07916-52040) | (8) Valve Seat Driver (07916-60841) |
| (2) Gasket (04714-00200) | (9) Connector 1 (07916-60811) |
| (3) Connector 3 (07916-51331) | (10) Connector 2 (07916-60821) |
| (4) Vacuum Gauge (07916-51331) | (11) Long Connector (07916-60831) |
| (5) Pressure Gauge (Low Pressure) (07916-51301) | (12) Adaptor 1 (07916-52621) |
| (6) Pressure Gauge (High Pressure) (in Relief Valve Set Pressure Tester) (07916-50321) | (13) Adaptor 2 with Collar (07916-52632) |
| (7) HN Tube (in Relief Valve Set Pressure Tester) (07916-50331) | (14) Adaptor 3 with Collar (07916-52642) |
| | (15) HST Adaptor Set (07916-53072) |

0000000820E

9. TIRES

[1] TIRE PRESSURE

 CAUTION

- Do not attempt to mount a tire on a rim. This should be done by a qualified person with the proper equipment.
- Always maintain the correct tire pressure.
Do not inflate tires above the recommended pressure as shown below.

■ IMPORTANT

- Do not use tires larger than specified.

	Tire sizes	Inflation pressure
Front	16 x 7.50-8, 4PR	200 kPa (2.0 kgf/cm ² , 29 psi)
Rear	23 x 10.50-12, 4PR	140 kPa (1.4 kgf/cm ² , 20 psi)

Though the tire pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Thus, check it everyday and inflate as necessary.

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[2] TREAD

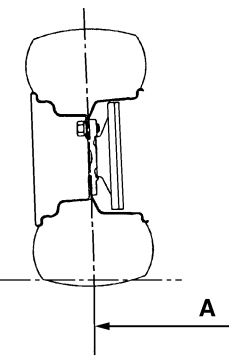
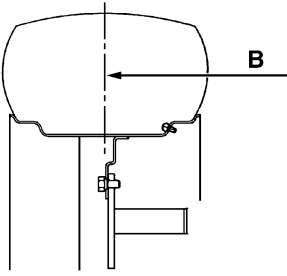
The tread can not be adjusted.

■ IMPORTANT

- Do not turn discs to obtain wider tread.
- Always attach tires as shown in the drawing.
- If not attached as illustrated, transmission parts may be damaged.

■ NOTE

- Use the tapered bolts for wheels with beveled or tapered holes.

Front	Rear
16 x 7.50 - 8, 4PR	23 x 10.50 - 12, 4PR
 3TAAAB0P032A	 3TAAAB0P033A

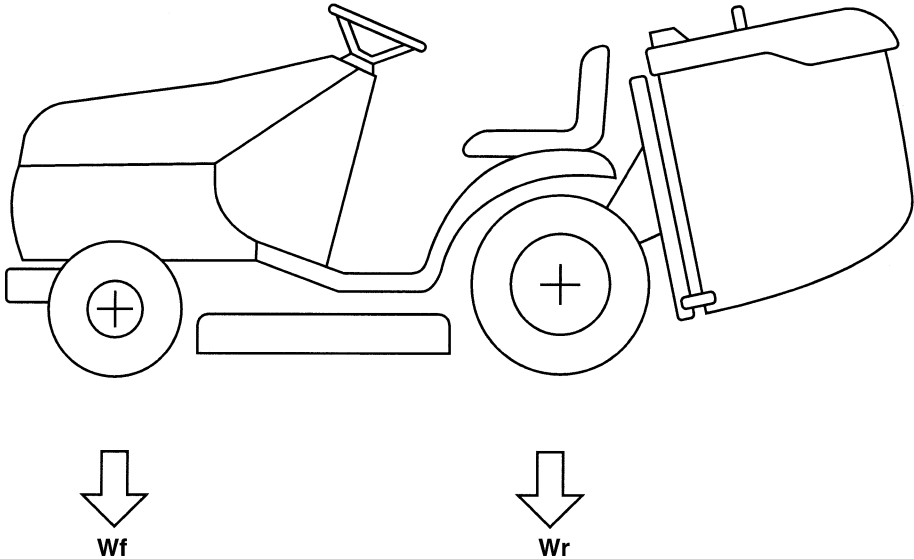
A: 825 mm (32.5 in.)

B: 800 mm (31.5 in.)

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10.IMPLEMENT LIMITATIONS

The KUBOTA Machine has been thoroughly tested for proper performance with implements sold or approved by KUBOTA. Use of implements which are not sold or approved by KUBOTA and which exceed the maximum specifications listed below, or which are otherwise unfit for use with the KUBOTA Machine may result in malfunctions or failures of the machine, damage to other property and injury to the operator or others. [Any malfunctions or failures of the machine resulting from use with improper implements are not covered by the warranty.]

Maximum axle loading weight		
Front axle Wf	Rear axle Wr	Total gross weight
300 kg (661 lbs)	500 kg (1102 lbs)	700 kg (1543 lbs)
 3GLAAAD0P018A		

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1 ENGINE

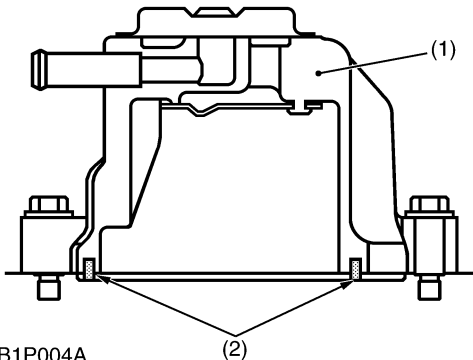
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1. ENGINE BODY	1-M1
[1] HALF-FLOATING HEAD COVER	1-M1
[2] CLOSED BREATHER	1-M1
2. LUBRICATING SYSTEM	1-M2
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1. ENGINE BODY

[1] HALF-FLOATING HEAD COVER

The rubber packing is fitting in to maintain the head cover 0.5 mm (0.02 in.) or so off the cylinder head. This arrangement helps reduce noise coming from the cylinder head.



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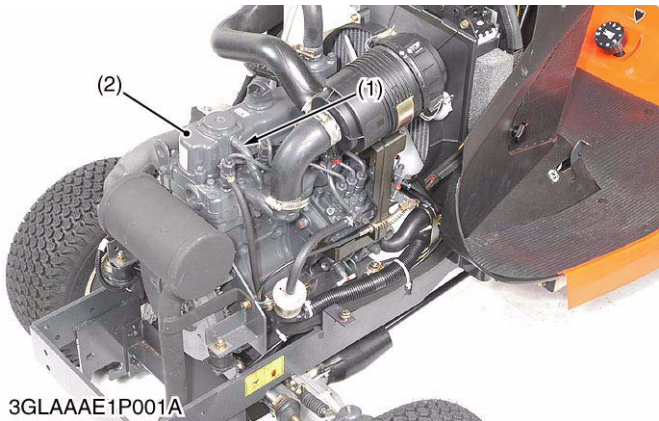
- (1) Cylinder Head Cover (2) Rubber Packing

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[2] CLOSED BREATHER

Closed breather system has been adopted to prevent the release of blowby gas into the atmosphere.

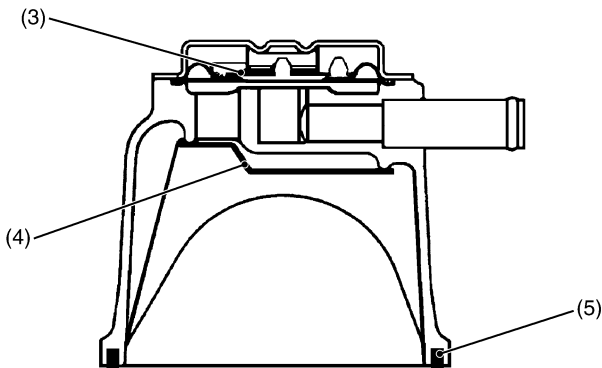
After its oil content is filtered by oil shield (4), the blowby gas is fed back to the intake manifold through breather valve (3) to be used for re-combustion.



3GLAAAE1P001A

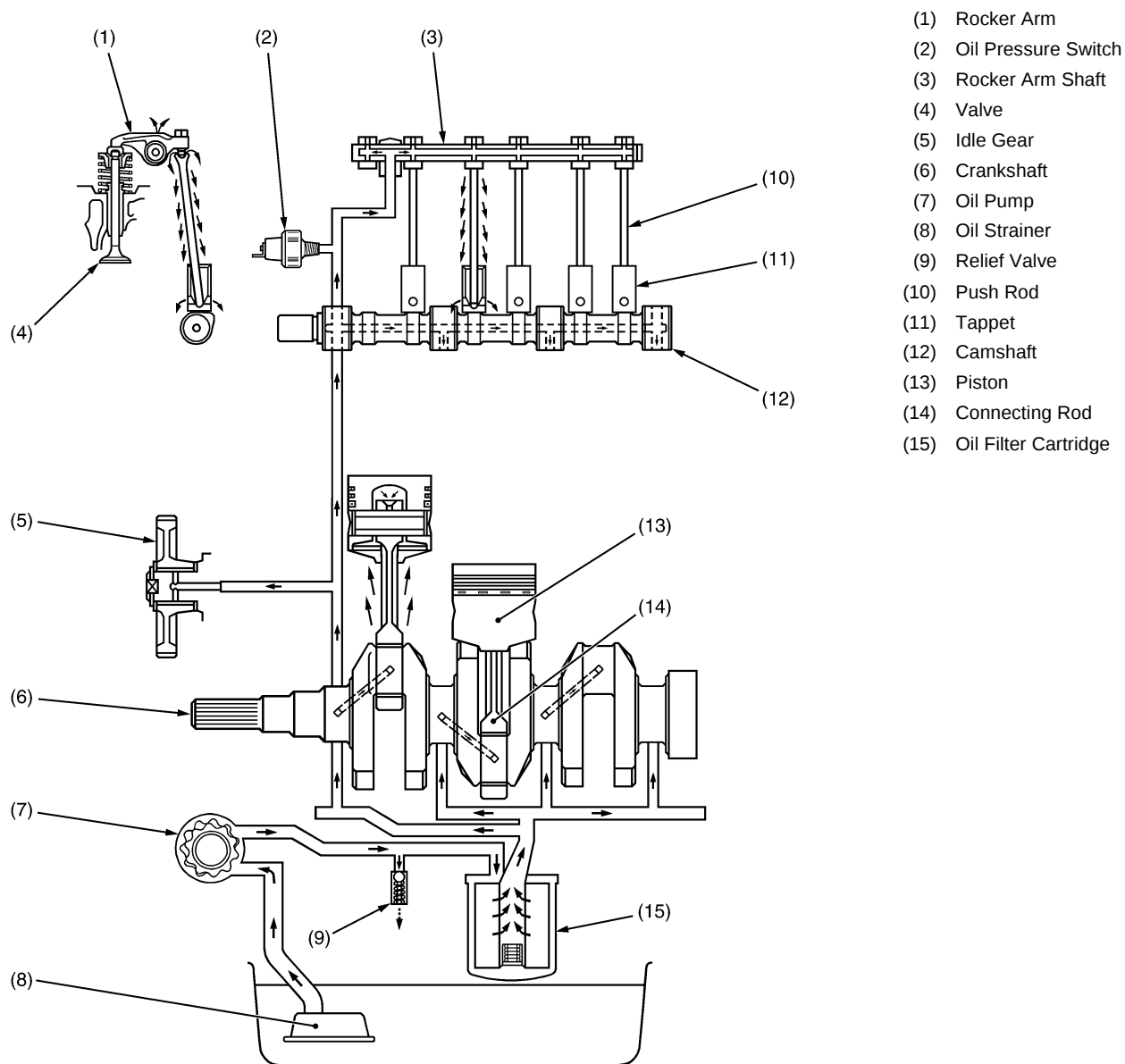
- (1) Breather Hose (4) Oil Shield
(2) Cylinder Head Cover (5) Rubber Packing
(3) Breather Valve

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2. LUBRICATING SYSTEM



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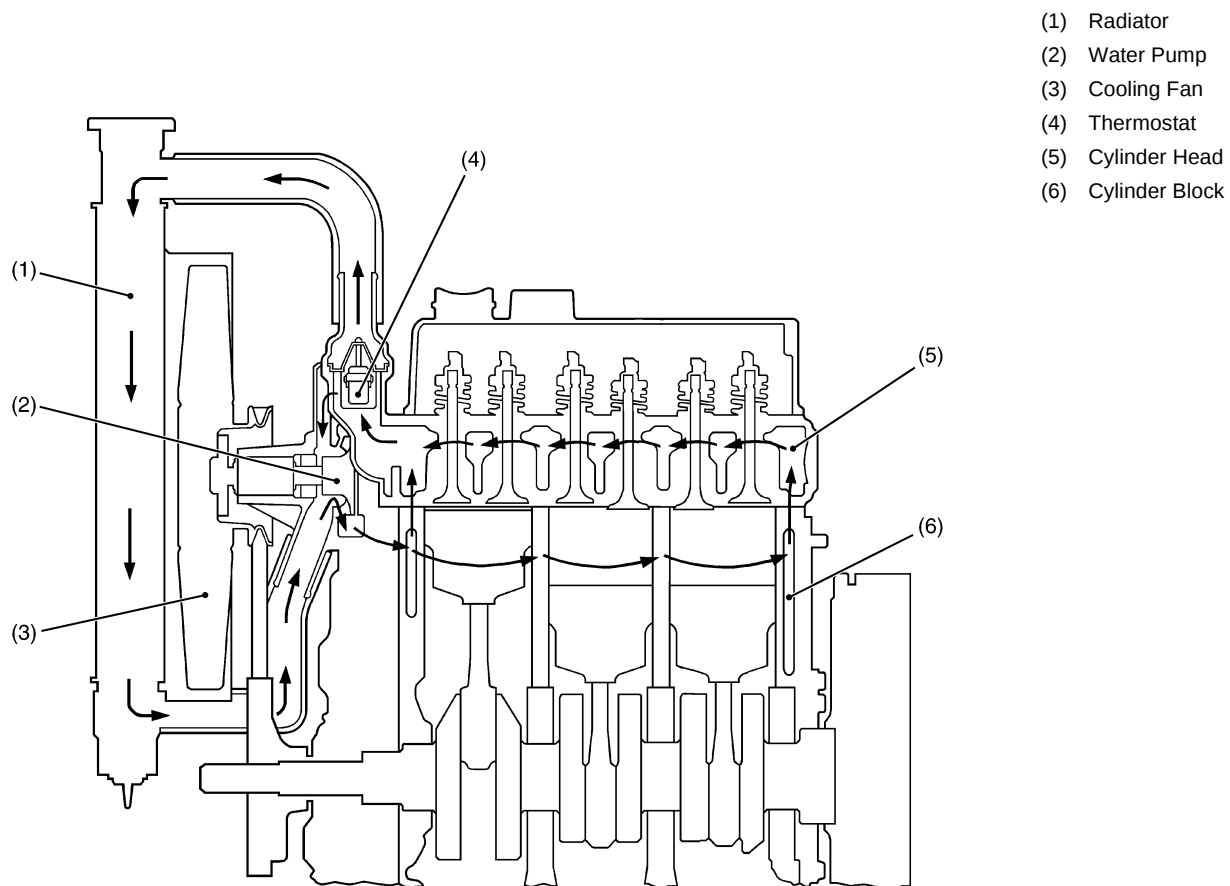
This engine's lubricating system consists of oil strainer (8), oil pump (7), relief valve (9), oil filter cartridge (15) and oil pressure switch (2).

The oil pump sucks lubricating oil from the oil pan through the oil strainer and the oil flows down to the filter cartridge, where it is further filtered. Then the oil is forced to crankshaft (6), connecting rods (14), idle gear (5), camshaft (12) and rocker arm shaft (3) to lubricate each part.

Some part of oil, splashed by the crankshaft or leaking and dropping from gaps of each part, lubricates these parts: piston (13), cylinders, small ends or connecting rods, tappets (11), push rods (10), inlet and exhaust valves (4) and timing gears.

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3. COOLING SYSTEM



3TAAAE1P003A

The cooling system consists of a radiator (1), a centrifugal water pump (2), a cooling fan (3) and a thermostat (4).

The coolant is cooled through the radiator core, and the cooling fan (3) set behind the radiator (1) pushes cooling air through the radiator core to improve cooling.

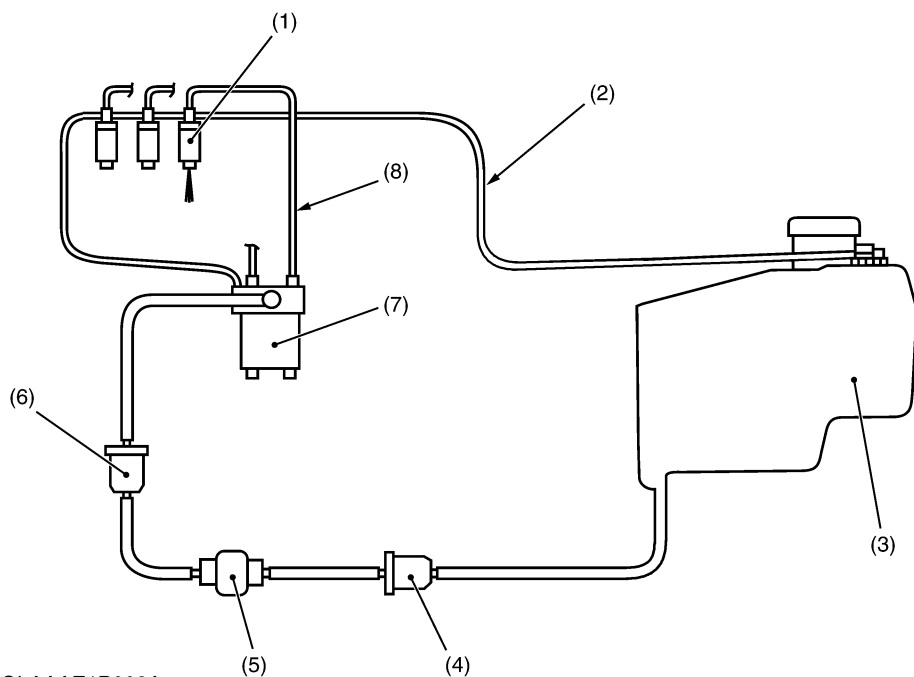
The water pump receives water from the radiator or from the cylinder head and force it into the cylinder block.

The thermostat opens or closes according to the water temperature. When the water temperature is high, the thermostat opens to allow the water to flow from the cylinder head to the radiator. When the water temperature is low, the thermostat close to flow the water only to the water pump.

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4. FUEL SYSTEM

[1] FUEL LINE



- (1) Injection Nozzle
- (2) Fuel Overflow Pipe
- (3) Fuel Tank
- (4) Fuel Filter
- (5) Fuel Feed Pump
- (6) Fuel Filter
- (7) Injection Pump
- (8) Injection Pipe

3GLAAAE1P002A

Fuel from the fuel tank (3) passes through the fuel filter (4), and then enters the injection pump (7) after impurities such as dirt, water, etc. are removed.

The fuel pressurized by the injection pump to the opening pressure (13.73 to 14.71 MPa, 140 to 150 kgf/cm², 1990 to 2133 psi), of the injection nozzle (1) is injected into the combustion chamber.

Part of the fuel fed to the injection nozzle (1) lubricates the moving parts of the needle valve inside the nozzle, then returns to the fuel tank through the fuel overflow pipe (2) from the upper part of the nozzle holder.

0000000939E

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(4) Crankshaft	1-S51
(5) Cylinder	1-S55
(6) Oil Pump	1-S56

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	● No fuel	Replenish fuel	G-8
	● Air in the fuel system	Bleed	G-41
	● Water in the fuel system	Change fuel and repair or replace fuel system	G-27, 38
	● Fuel pipe clogged	Clean	G-27
	● Fuel filter clogged	Change	G-27, 34
	● Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-8
	● Fuel with low cetane number	Use specified fuel	G-8
	● Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S24
	● Incorrect injection timing	Adjust	1-S16
	● Fuel camshaft worn	Replace	—
	● Injection nozzle clogged	Repair or replace	1-S38
	● Injection pump malfunctioning	Replace	1-S28
	● Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	—
	● Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S10
	● Improper valve timing	Correct or replace timing gear	1-S30
	● Piston ring and cylinder worn	Replace	1-S49, 55
	● Excessive valve clearance	Adjust	1-S12
(Starter Does Not Run)	● Battery discharged	Charge	G-25
	● Starter malfunctioning	Repair or replace	7-S18
	● Main switch malfunctioning	Replace	7-S6, 7
	● PTO switch defective	Replace	7-S10
	● Brake switch defective	Replace	7-S10
	● Seat switch defective	Replace	7-S11
	● Slow blow fuse blown	Replace	G-38
	● Wiring disconnected	Connect	—

Symptom	Probable Cause	Solution	Reference Page
Engine Revolution Is Not Smooth	● Fuel filter clogged or dirty	Replace	G-27, 34
	● Air cleaner clogged	Clean or replace	G-20, 35
	● Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S24
	● Injection pump malfunctioning	Replace	1-S28
	● Incorrect nozzle injection pressure	Adjust	1-S19
	● Injection nozzle stuck or clogged	Repair or replace	1-S38
	● Governor malfunctioning	Repair	—
Either White or Blue Exhaust Gas Is Observed	● Excessive engine oil	Reduce to specified level	G-8, 14
	● Piston ring and cylinder worn or stuck	Repair or replace	1-S49, 55
	● Incorrect injection timing	Adjust	1-S16
	● Deficient compression	Adjust top clearance	1-S11
Either Black or Dark Gray Exhaust Gas Is Observed	● Overload	Reduce the load	—
	● Low grade fuel used	Use specified fuel	G-8
	● Fuel filter clogged	Replace	G-38
	● Air cleaner clogged	Clean or replace	G-20, 35
	● Deficient nozzle injection	Repair or replace nozzle	1-S38
Deficient Output	● Incorrect injection timing	Adjust	1-S16
	● Engine's moving parts seem to be seizing	Repair or replace	—
	● Uneven fuel injection	Replace injection pump	1-S28
	● Deficient nozzle injection	Repair or replace nozzle	1-S38
	● Compression leak	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S10
Excessive Lubricant Oil Consumption	● Piston ring's gap facing the same direction	Shift ring gap direction	1-S32
	● Oil ring worn or stuck	Replace	1-S33
	● Piston ring groove worn	Replace piston	1-S33
	● Valve stem and valve guide worn	Replace	1-S27, 40
	● Oil leaking due to defective seals or packing	Replace	—
Fuel Mixed into Lubricant Oil	● Injection pump's plunger worn	Replace injection pump	1-S28
	● Deficient nozzle injection	Repair or replace nozzle	1-S38
	● Injection pump broken	Replace	1-S28

Symptom	Probable Cause	Solution	Reference Page
Water Mixed into Lubricant Oil	● Head gasket defective	Replace	1-S26
	● Cylinder block or cylinder head flawed	Replace	—
Low Oil Pressure	● Engine oil insufficient	Replenish	G-8, 14
	● Oil strainer clogged	Clean	—
	● Oil filter clogged	Replace	G-29
	● Relief valve stuck with dirt	Clean	—
	● Relief valve spring weaken or broken	Replace	—
	● Excessive oil clearance of crankshaft bearing	Replace	1-S53, 54
	● Excessive oil clearance of crankpin bearing	Replace	1-S52
	● Excessive oil clearance of rocker arm	Replace	1-S43
	● Oil passage clogged	Clean	—
	● Different type of oil	Use specified type of oil	G-8
	● Oil pump defective	Repair or replace	1-S31
High Oil Pressure	● Different type of oil	Use specified type of oil	G-8
	● Relief valve defective	Replace	—
Engine Overheated	● Engine oil insufficient	Replenish	G-8
	● Fan belt broken or tensioned improperly	Replace or adjust	G-28, 1-S13
	● Coolant insufficient	Replenish	G-8
	● Radiator net and radiator fin clogged with dust	Clean	—
	● Inside of radiator corroded	Clean or replace	G-35
	● Coolant flow route corroded	Clean or replace	G-31
	● Radiator cap defective	Replace	1-S15
	● Radiator hose damaged	Replace	G-31
	● Overload running	Reduce the load	—
	● Head gasket defective	Replace	1-S26
	● Incorrect injection timing	Adjust	1-S16
	● Unsuitable fuel used	Use specified fuel	G-8

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2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Compression Pressure	—	2.84 to 3.24 MPa 29.0 to 33.0 kgf/cm ² 412 to 469 psi	2.26 MPa 23.0 kgf/cm ² 327 psi
	Variance Among Cylinder	—	10 % or less
Top Clearance		0.50 to 0.70 mm 0.0197 to 0.0276 in.	—
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	—
Cylinder Head Surface	Flatness	—	0.05 mm 0.0020 in.
Valve Recessing (Intake and Exhaust)		-0.10 to 0.10 mm -0.0039 to 0.0039 in.	0.30 mm 0.0118 in.
Valve Stem to Valve Guide	Clearance	0.030 to 0.057 mm 0.00118 to 0.00224 in.	0.10 mm 0.0039 in.
	Valve Stem (O.D.)	5.968 to 5.980 mm 0.23496 to 0.23543 in.	—
	Valve Guide (I.D.)	6.010 to 6.025 mm 0.23661 to 0.23720 in.	—
Valve Seat	Width	2.12 mm 0.0835 in.	—
	Angle	0.785 rad 45 °	—
Valve Face	Angle	0.785 rad 45 °	—
Valve Spring	Free Length	31.3 to 31.8 mm 1.232 to 1.252 in.	28.4 mm 1.118 in.
	Tilt	—	1.2 mm 0.047 in.
	Setting Load	64.7 N 6.6 kgf 14.6 lbs	54.9 N 5.6 kgf 12.3 lbs
	Setting Length	27.0 mm 1.063 in.	—
Rocker Arm to Rocker Arm Shaft	Oil Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.15 mm 0.0059 in.
	Rocker Arm Shaft (O.D.)	10.473 to 10.484 mm 0.41232 to 0.41276 in.	—
	Rocker Arm (I.D.)	10.500 to 10.518 mm 0.41339 to 0.41410 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.

Item		Factory Specification	Allowable Limit
Tappet to Tappet Guide	Clearance	0.016 to 0.052 mm 0.00063 to 0.00205 in.	0.10 mm 0.0039 in.
	Tappet (O.D.)	17.966 to 17.984 mm 0.70732 to 0.70803 in.	—
	Tappet Guide Bore (I.D.)	18.000 to 18.018 mm 0.70866 to 0.70937 in.	—
Timing Gear	Idle Gear to Crank Gear (Backlash)	0.043 to 0.124 mm 0.00169 to 0.00488 in.	0.15 mm 0.0059 in.
	Idle Gear to Cam Gear (Backlash)	0.047 to 0.123 mm 0.00185 to 0.00484 in.	0.15 mm 0.0059 in.
	Idle Gear to Injection Pump Gear (Backlash)	0.046 to 0.124 mm 0.00185 to 0.00488 in.	0.15 mm 0.0059 in.
	Oil Pump Drive Gear to Crank Gear (Backlash)	0.041 to 0.123 mm 0.00161 to 0.00484 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.20 to 0.51 mm 0.0079 to 0.0201 in.	0.80 mm 0.0315 in.
Camshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	—	0.01 mm 0.0004 in.
	Cam Height (Intake and Exhaust)	26.88 mm 1.0583 in.	26.83 mm 1.0563 in.
Camshaft Journal to Cylinder Block Bore	Oil Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.15 mm 0.0059 in.
	Camshaft Journal (O.D.)	32.934 to 32.950 mm 1.29661 to 1.29724 in.	—
	Cylinder Block Bore (I.D.)	33.000 to 33.025 mm 1.29921 to 1.30020 in.	—
Idle Gear Shaft to Idle Gear Bushing	Oil Clearance	0.020 to 0.084 mm 0.00079 to 0.00331 in.	0.10 mm 0.0039 in.
	Idle Gear Shaft (O.D.)	19.967 to 19.980 mm 0.78610 to 0.78661 in.	—
	Idle Gear Bushing (I.D.)	20.000 to 20.051 mm 0.78740 to 0.78941 in.	—
Piston Pin Bore	I.D.	20.000 to 20.013 mm 0.78740 to 0.78791 in.	20.05 mm 0.7894 in.

Item		Factory Specification	Allowable Limit
Piston Pin to Small End Bushing	Oil Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.10 mm 0.0039 in.
	Piston Pin (O.D.)	20.002 to 20.011 mm 0.78748 to 0.078783 in.	—
	Small End Bushing (I.D.)	20.025 to 20.040 mm 0.78839 to 0.78897 in.	—
Piston Pin to Small End Bushing (Spare Parts)	Oil Clearance	0.015 to 0.075 mm 0.00059 to 0.00295 in.	0.15 mm 0.0059 in.
	Small End Bushing (I.D.)	20.026 to 20.077 mm 0.78845 to 0.79043 in.	—
Piston Ring Gap	Top Ring	0.15 to 0.30 mm 0.0059 to 0.0118 in.	1.20 mm 0.0472 in.
	Second Ring	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.20 mm 0.0472 in.
	Oil Ring	0.15 to 0.30 mm 0.0059 to 0.0118 in.	1.20 mm 0.0472 in.
Piston Pin to Piston Ring Groove	Second Ring (Clearance)	0.090 to 0.120 mm 0.00354 to 0.00472 in.	0.15 mm 0.0059 in.
	Oil Ring (Clearance)	0.04 to 0.08 mm 0.0016 to 0.0031 in.	0.15 mm 0.0059 in.
Connecting Rod	Alignment	—	0.05 mm 0.0020 in.
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	—	0.02 mm 0.0008 in.
Crankpin to Crankpin Bearing	Oil Clearance	0.020 to 0.051 mm 0.00079 to 0.00201 in.	0.15 mm 0.0059 in.
	Crankpin (O.D.)	33.959 to 33.975 mm 1.33697 to 1.33760 in.	—
	Crankpin Bearing (I.D.)	33.995 to 34.010 mm 1.33893 to 1.33898 in.	—
Crankshaft Journal to Crankshaft Bearing 1	Oil Clearance	0.034 to 0.106 mm 0.00134 to 0.00417 in.	0.20 mm 0.0079 in.
	Crankshaft Journal (O.D.)	39.934 to 39.950 mm 1.57221 to 1.57284 in.	—
	Crankshaft Bearing 1 (I.D.)	39.984 to 40.040 mm 1.57417 to 1.57638 in.	—
Crankshaft Journal to Crankshaft Bearing 2 (Flywheel Side)	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
	Crankshaft Journal (O.D.)	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
	Crankshaft Bearing 2 (I.D.)	43.978 to 43.993 mm 1.73142 to 1.73201 in.	—

Item		Factory Specification	Allowable Limit
Crankshaft Journal to Crankshaft Bearing 3 (Intermediate)	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
	Crankshaft Journal (O.D.)	39.934 to 39.950 mm 1.57221 to 1.57284 in.	—
	Crankshaft Bearing 3 (I.D.)	39.978 to 39.993 mm 1.57394 to 1.57453 in.	—
Cylinder Liner	I.D.	67.000 to 67.019 mm 2.63779 to 2.63854 in.	67.169 mm 2.6445 in.
Cylinder Liner (Oversize)	I.D.	67.250 to 67.269 mm 2.64764 to 2.64839 in.	67.419 mm 2.65429 in.

0000010075E

LUBRICATING SYSTEM

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	More than 49 MPa 0.5 kgf/cm ² 7 psi	—
	At Rated Speed	196 to 441 MPa 2.0 to 4.5 kgf/cm ² 28 to 64 psi	147 MPa 1.5 kgf/cm ² 21 psi
Oil Pump	Inter Rotor to Outer Rotor (Clearance)	0.03 to 0.14 mm 0.0012 to 0.0055 in.	—
	Outer Rotor to Pump Body (O.D.)	0.07 to 0.15 mm 0.0028 to 0.0059 in.	—
	Inter Rotor to Cover (I.D.)	0.075 to 0.135 mm 0.00295 to 0.00531 in.	—

0000004340E

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7 to 9 mm / 98 N 0.28 to 0.35 in. / 98N (10 kgf, 22 lbs)	—
Thermostat	Valve Opening Temperature (At Beginning)	69.5 to 72.5 °C 157.1 to 162.5 °F	—
	Valve Opening Temperature (Opened Completely)	85 °C 185 °F	—
Radiator Cap	Pressure Falling Time	10 seconds or more 88 → 59 kPa 0.9 → 0.6 kgf/cm ² 13 → 9 psi	—
Radiator	Water Leakage Test Pressure	No leak at specified pressure 157 kPa 1.6 kgf/cm ² 23 psi	—

0000010076E

FUEL SYSTEM

Item		Factory Specification	Allowable Limit
Injection Pump	Injection Timing	0.28 to 0.31 rad (16 to 18 °) before T.D.C.	—
Pump Element	Fuel Tightness	—	13.7 MPa 140 kgf/cm ² 1991 psi
Delivery Valve	Fuel Tightness	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm ² 1991 → 1849 psi	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm ² 1991 → 1849 psi
Fuel Injection Nozzle	Injection Pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2134 psi	—
	Valve Seat Tightness	When the pressure is 12.75 MPa (130 kgf/cm ² , 1849 psi), the valve seat must be fuel tightness	—

0000010077E

3. TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts : See page G-9.)

Item	Size x Pitch	N·m	kgf·m	ft-lbs
Front coupling mounting screw	M8 x 1.25	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Engine mounting nut	M8 x 1.25	23.5	2.4	17.4
Air cleaner stay screw	M8 x 1.25	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Engine support screw	M10 x 1.25	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
*Cylinder head cover screw	M6 x 1.0	6.86 to 11.3	0.7 to 1.15	5.1 to 8.3
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe retaining nut	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Glow plug	M8 x 1.0	7.85 to 14.7	0.8 to 1.5	5.8 to 10.8
*Rocker arm bracket screw	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Cylinder head screw	M8 x 1.25	37.3 to 42.2	3.8 to 4.3	27.5 to 31.1
*Fan drive pulley screw	M12 x 1.5	98.0 to 107.8	10.0 to 11.0	72.3 to 79.5
*Idle gear shaft mounting screw	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Connecting rod screw	M7 x 0.75	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Flywheel screw	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
Bearing case cover mounting screw	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Main bearing case screw 2	M7 x 1.0	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Main bearing case screw 1	M6 x 1.0	12.7 to 15.7	1.3 to 1.6	9.4 to 11.6
Nozzle holder		34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Oil pressure switch	PT1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5

■ NOTE

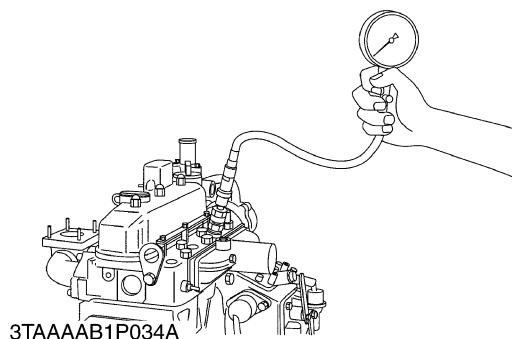
- In removing and applying the screws and nuts marked with "*", a pneumatic wrench or similar pneumatic tool, if employed, must be used with enough care not to get them seized.
- For "*" marked screws and nuts on the table, apply engine oil to their threads and seats before tightening.
- The letter "M" in Size x Pitch means that the screw or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.

0000010830E

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

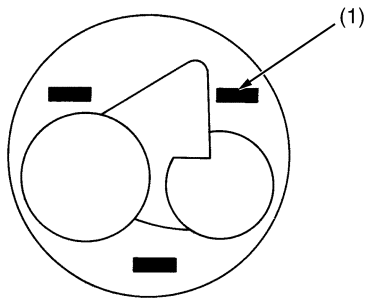
1. Run the engine until it is warmed up.
2. Stop the engine.
3. Disconnect the **2P** connector from the fuel pump.
4. Remove the air cleaner, the muffler and all injection nozzles.
5. Disconnect the accelerator wire.
6. Engage the parking brake.
7. Set a compression tester (Code No. 07909-30208) with the adaptor (Adaptor **H**, Code No. 07909-31231) to the nozzle hole.
8. While cranking the engine with the starter, measure the compression pressure.
9. Repeat steps 7 and 8 for each cylinder.
10. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.
11. If the compression pressure is still less than the allowable limit, check the top clearance, valve clearance and cylinder head.
12. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

■ NOTE

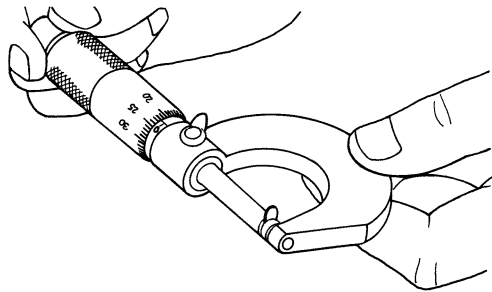
- Check the compression pressure with the specified valve clearance.
- Always use a fully charged battery for performing this test.
- Variances in cylinder compression values should be under 10 %.

Compression pressure	Factory spec.	2.84 to 3.24 MPa 29.0 to 33.0 kgf/cm ² 412 to 469 psi
	Allowable limit	2.26 MPa 23.0 kgf/cm ² 327psi

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Top Clearance

1. Remove the cylinder head. (Do not attempt to remove the cylinder head gasket.).
2. Move the piston up, and stick a strip of fuse [1.5 mm dia. (0.059 in. dia.), 5 to 7 mm long (0.197 to 0.276 in. long)] on the piston head at three positions with grease so as to avoid the intake and exhaust valves and the combustion chamber ports.
3. Lower the piston, and install the cylinder head and tighten the cylinder head screws to the specified torque.
4. Turn the flywheel until the piston exceeds its top dead center.
5. Remove the cylinder head, and measure the thickness of the squeezed fuses.
6. If the measurement is not within the factory specifications, check the oil clearance between the crankpin and crankpin bearing and between the piston pin and small end bushing.

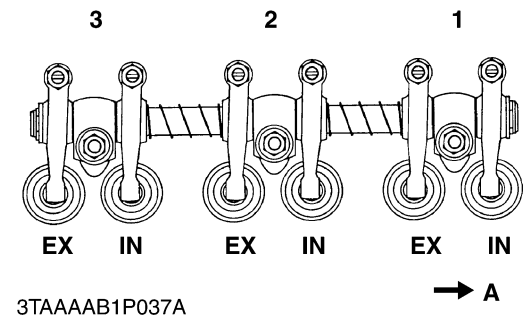
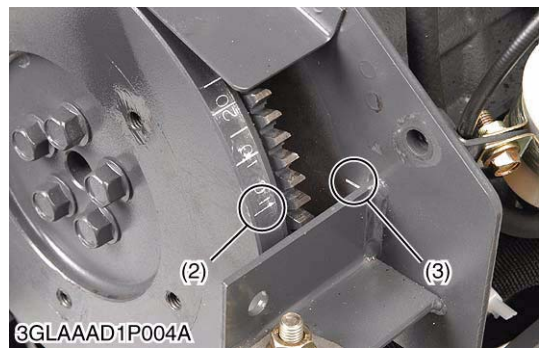
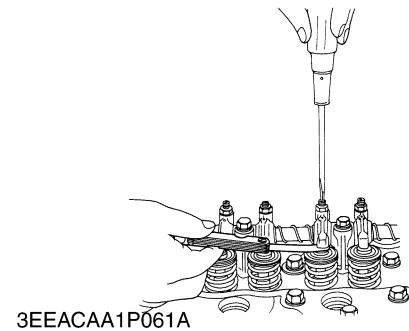
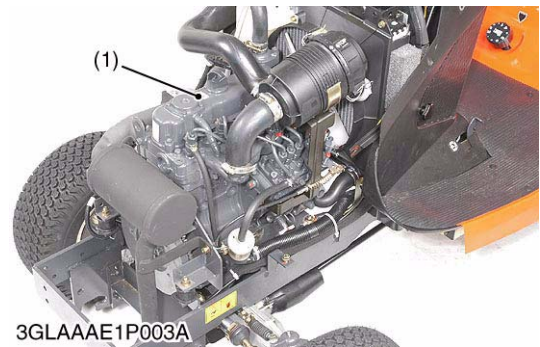
■ **NOTE**

- **After checking the top clearance, be sure to assemble the cylinder head with a new cylinder head gasket.**

Top clearance	Factory spec.	0.50 to 0.70 mm 0.0197 to 0.0276 in.
Tightening torque	Cylinder head screw	37.3 to 42.2 N·m 3.8 to 4.3 kgf·m 27.5 to 31.1 ft-lbs

(1) Fuse

0000000844E



Checking Valve Clearance

■ IMPORTANT

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

1. Remove the cylinder head cover (1) and the glow plugs.
2. Align the "1TC" mark (2) on the flywheel and alignment mark (3) on the rear end plate so that the No. 1 piston comes to the compression top dead center.
3. Check the following valve clearance marked with "★" using a thickness gauge.
4. If the clearance is not within the factory specifications, adjust with the adjusting screw.
5. Then turn the flywheel 6.28 rad (360 °), and align the "1TC" mark (2) on the flywheel and alignment mark (3) on the rear end plate so that the No.1 piston comes to the overlap position.
6. Check the following valve clearance marked with "☆" using a thickness gauge

Cylinder No.	No.1	No.2	No.3
Intake valve	★	☆	★
Exhaust valve	★	★	☆

★ : When No.1 piston is at the compression top dead center position.

☆ : When No.1 piston is at the overlap position.

7. If the clearance is not within the factory specifications, adjust with the adjusting screw.

Intake and exhaust valve clearance (Cold)	Factory spec.	0.145 to 0.185 mm 0.00571 to 0.00728 in.
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■ NOTE

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

(1) Cylinder Head Cover

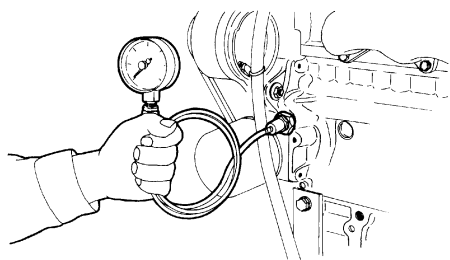
(2) "1TC" Mark

(3) Alignment Mark

A: Gear Case Side

0000010078E

(2) Lubricating System



3GFABAB1P056A

Engine Oil Pressure

1. Remove the engine oil pressure switch, and set an oil pressure tester (Code No.: 07916-32032).
2. Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.
3. If the oil pressure is less than the allowable limit, check the following.
 - Engine oil insufficient.
 - Oil pump defective
 - Oil strainer clogged
 - Oil filter cartridge clogged
 - Oil gallery clogged
 - Excessive oil clearance
 - Foreign matter in the relief valve

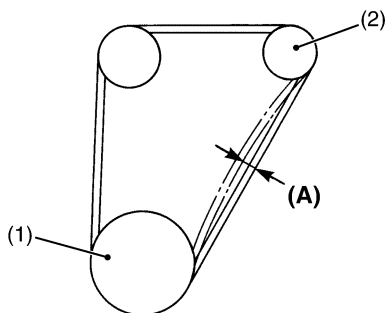
Engine oil pressure	At idle speed	Factory spec.	More than 49 kPa 0.5 kgf/cm ² 7 psi
	At rated speed	Factory spec.	196 to 441 kPa 2.0 to 4.5 kgf/cm ² 28 to 64 psi
		Allowable limit	147 kPa 1.5 kgf/cm ² 21 psi

(When reassembling)

- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

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(3) Cooling System



3EEABAB1P017D

Checking Fan Drive Belt Tension



CAUTION

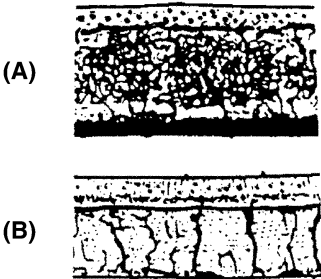
- Be sure to stop the engine and remove the key before checking belt tension.
1. Measure the deflection (A), depressing the belt halfway between the fan drive pulley (1) and dynamo pulley (2) at specified force (98 N, 10 kgf, 22 lbs).
 2. If the measurement is not within the factory specifications, loosen the dynamo mounting screws and relocate the dynamo to adjust.

Deflection (A)	Factory spec.	7 to 9 mm 0.28 to 0.35 in.
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(1) Fan Drive Pulley

(2) Dynamo Pulley

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3EEABAB1P019B

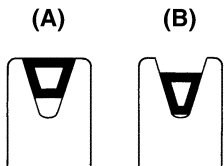
Fan Belt Damage and Wear

- 1. Check the fan belt for damage.
- 2. If the fan belt is damaged, replace it.
- 3. Check if the fan belt is worn and sunk in the pulley groove.
- 4. If the fan belt is nearly worn out and deeply sunk in the pulley groove, replace it.

(A) Good

(B) Bad

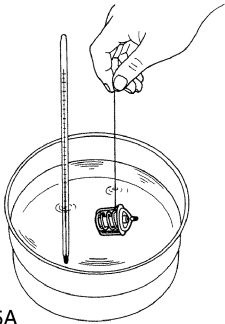
0000000920E



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Thermostat Valve Opening Temperature

- 1. Suspend the thermostat in the water by a string with its end inserted between the valve and seat.
- 2. Heating the water gradually, read the temperature when the valve opens and leaves the string.
- 3. Continue heating and read the temperature when the valve opens approx. 6 mm (0.236 in.).
- 4. If the measurement is not within the factory specifications, replace the thermostat.



3TBAAAF1P005A

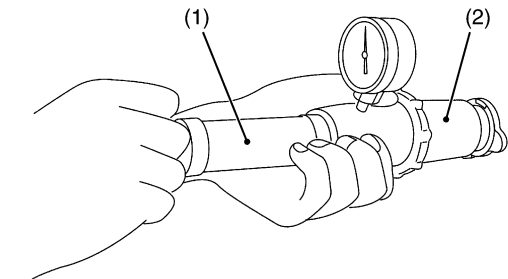
Thermostat's valve opening temperature	Factory spec.	69.5 to 72.5 °C 157.1 to 162.5 °F
Temperature at which thermostat completely opens	Factory spec.	85 °C 185 °F

0000010080E

 CAUTION

- When removing the radiator cap, wait at least ten minutes after the engine has stopped and cooled down. Otherwise, hot water may gush out, scalding nearby people.

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3TAAAB1P060A

Radiator Cap Air Leakage

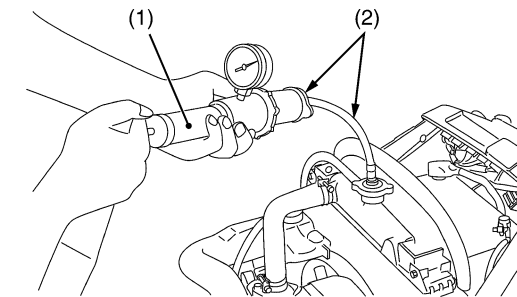
1. Set a radiator tester (1) and adaptor (2) (BANZAI Code No.: RCT-2A-30S) on the radiator cap.
2. Apply the specified pressure (88 kPa, 0.9 kgf/cm², 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm², 9 psi).
3. If the measurement is less than the factory specification, replace the radiator cap.

Pressure falling time	Factory spec.	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm ² from 13 to 9 psi)
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(1) Radiator Tester

(2) Adaptor

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3TAAAB1P061A

Radiator Water Leakage

1. Pour a specified amount of water into the radiator.
2. Set a radiator tester (1) (Code No. 07909-31551) and an adaptor (2) (BANZAI Code No.: RCT-2A-30S) and raise the water pressure to the specified pressure.
3. Check the radiator for water leaks.
4. For water leak from the pinhole, repair with the radiator cement. When water leak is excessive, replace the radiator.

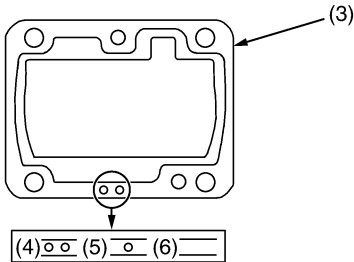
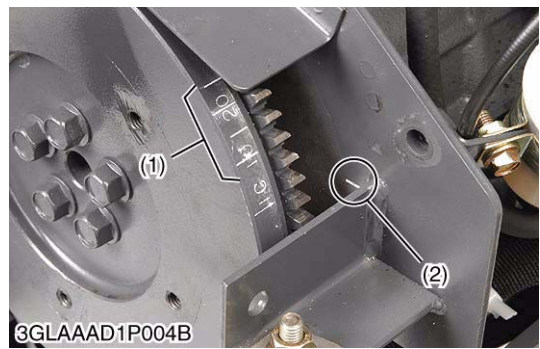
Radiator water leakage test pressure	Factory spec.	157 kPa 1.6 kgf/cm ² 23 psi
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(1) Radiator Tester

(2) Adaptor

0000000924E

(4) Fuel System



3TAAAAB1P062A

Injection Timing

1. Remove the injection pipes.
2. Remove the engine stop solenoid.
3. Turn the flywheel counterclockwise (facing the flywheel) until fuel flows from the delivery valve holder.
4. Continue to turn the flywheel slowly, and stop it as soon as the fuel level at the tip of the delivery valve holder begins to increase.
5. Check to see if the timing angle lines on the flywheel is aligned with the alignment mark (2).
6. If the injection timing is out of adjustment, readjust the timing with shims.

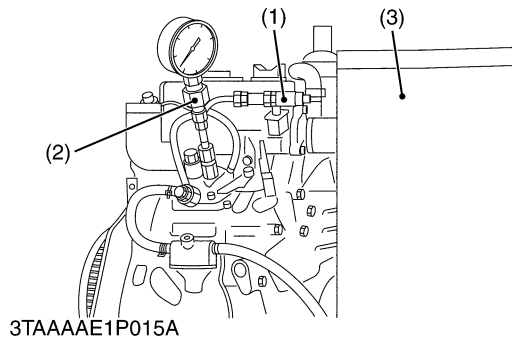
Injection timing	Factory spec.	0.28 to 0.31 rad. (16 to 18 °) before T.D.C.
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■ NOTE

- The sealant is applied to both sides of the shim (soft metal gasket shim). The liquid gasket is not required for assembling.
- Shims are available in thickness of 0.20 mm (0.0079 in.), 0.25 mm (0.0098 in.) and 0.30 mm (0.0118 in.). Combine these shims for adjustments.
- Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad. (0.5 °).
- In disassembling and replacing the injection pump, be sure to use the same number of new shims with the same thickness.
- Refer to figure below to check the thickness of the shims.

- | | |
|-----------------------------------|----------------------|
| (1) Timing Line | (4) Two-holes: |
| (2) Alignment Mark | 0.20 mm (0.0079 in.) |
| (3) Shim (Soft Metal Gasket Shim) | (5) One-holes: |
| | 0.25 mm (0.0098 in.) |
| | (6) Without hole: |
| | 0.30 mm (0.0118 in.) |

0000010081E



Fuel Tightness of Pump Element

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Install the injection pump pressure tester to the injection pump.
4. Install the injection nozzle (1) jetted with the proper injection pressure to the injection pump pressure tester (2). (Refer to the figure.)
5. Set the speed control lever to the maximum speed position.
6. Run the starter to increase the pressure.
7. If the pressure can not reach the allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

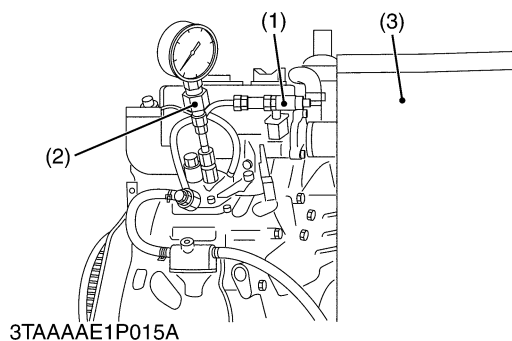
Fuel tightness of pump element	Allowable limit	13.7 MPa 140 kgf/cm ² 1991 psi
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■ NOTE

- **Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.**

- (1) Injection Nozzle
- (2) Injection Pump Pressure Tester
- (3) Protection Cover for Jetted Fuel

0000004218E



Fuel Tightness of Delivery Valve

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Set a pressure tester to the fuel injection pump.
4. Install the injection nozzle (1) jetted with the proper injection pressure to the injection pump pressure tester (2).
5. Run the starter to increase the pressure.
6. Stop the starter when the fuel jets from the injection nozzle.
After that, turn the flywheel by the hand and raise the pressure to approx. 13.73 MPa (140 kgf/cm², 1991 psi).
7. Now turn the flywheel back about half a turn (to keep the plunger free). Maintain the flywheel at this position and clock the time taken for the pressure to drop from 13.73 to 12.75 MPa (from 140 to 130 kgf/cm², from 1991 to 1849 psi).
8. Measure the time needed to decrease the pressure from 13.73 to 12.75 MPa (from 140 to 130 kgf/cm², from 1991 to 1849 psi).
9. If the measurement is less than allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

Fuel tightness of delivery valve	Factory spec.	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm ² 1991 → 1849 psi
	Allowable limit	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm ² 1991 → 1849 psi

NOTE

- Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.

- (1) Injection Nozzle (3) Protection Cover for Jetted Fuel
(2) Injection Pump Pressure Tester

0000001361E

 CAUTION

- Check the injection pressure and condition after confirming that there is nobody standing in the direction the fume goes.
- If the fume from the nozzle directly contacts the human body, cells may be destroyed and blood poisoning may be caused.

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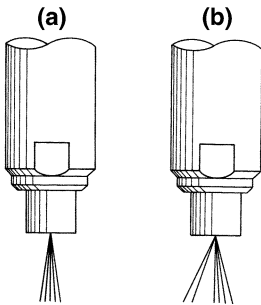
Nozzle Spraying Condition

1. Set the injection nozzle to a nozzle tester (Code No. 07909-31361), and check the nozzle spraying condition.
2. If the spraying condition is defective, replace the nozzle piece.

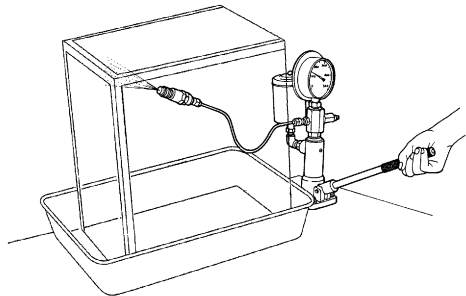
(a) Good

(b) Bad

0000004118E



3EEABAB1P037A



3TLABAB1P040A

Fuel Injection Pressure

1. Set the injection nozzle to a nozzle tester (Code No. 07909-31361).
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, replace the adjusting washer (1) in the nozzle holder to adjust it.

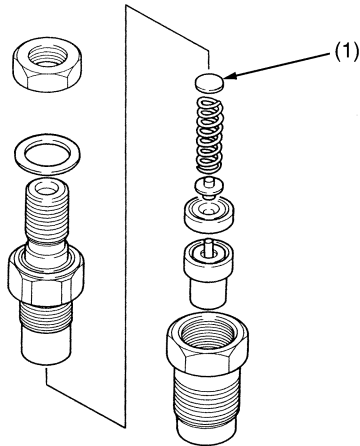
Fuel injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2134 psi
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(Reference)

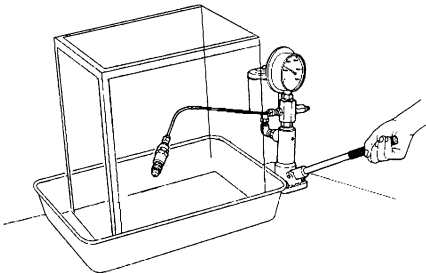
- Pressure variation with 0.01 mm (0.0004 in.) difference of adjusting washer thickness.
Approx. 235 kPa (2.3 kgf/cm², 34 psi)

(1) Adjusting Washer

0000000934E

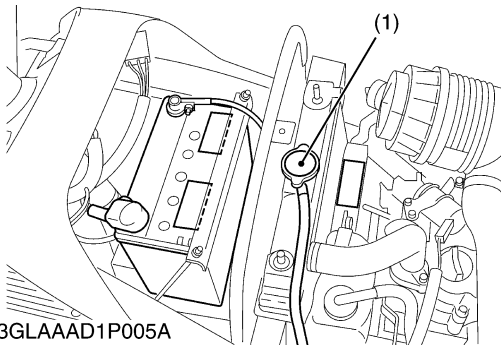


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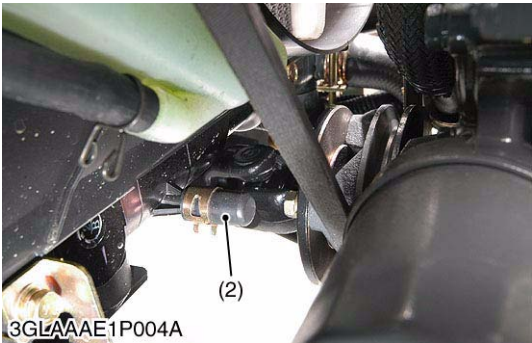


3TLABAB1P041A

[2] PREPARATION
(1) Separating Engine



3GLAAD1P005A



3GLAAAE1P004A

Valve Seat Tightness

1. Set the injection nozzle to a nozzle tester (Code No. 07909-31361).
2. Raise the fuel pressure, and keep at 12.75 MPa (130 kgf/cm², 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

Valve seat tightness	Factory spec.	No fuel leak at 12.75 MPa 130 kgf/cm ² 1849 psi
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0000000935E

Draining Coolant



CAUTION

- **Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**

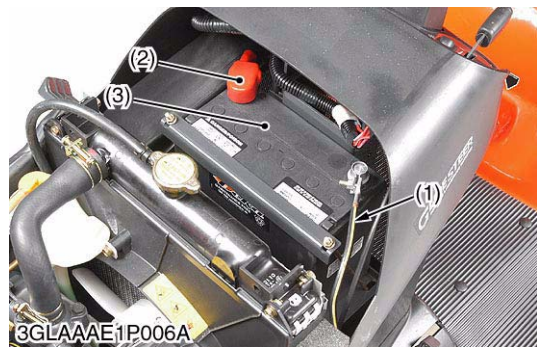
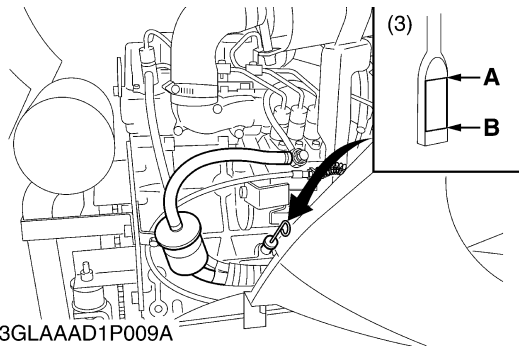
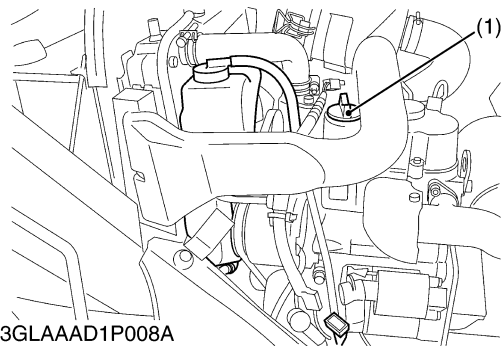
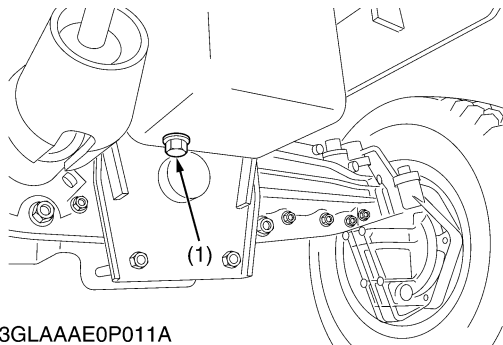
1. Open the radiator drain plug (2), and remove radiator cap (1) to completely drain the coolant.
2. After all coolant is drained, close the drain plug (2).

Coolant	Capacity (with recovery tank)	2.35 L 2.48 U.S.qts. 2.07 Imp.qts.
---------	-------------------------------	--

(1) Radiator Cap

(2) Drain Plug

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Draining Engine Oil

1. Start and warm up the engine for approx. 5 minutes
2. Place an oil pan underneath the engine.
3. Remove the drain plug (1) to drain oil.
4. After draining, screw in the drain plug (1).

(When refilling)

- Fill the engine oil up to the upper line on the dipstick (3).
- **IMPORTANT**
- **Never mix two different type of oil.**
 - **Use the proper SAE Engine Oil according to ambient temperature.**
- Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8.)**

Engine Oil	Capacity	2.8 L 2.96 U.S.qts. 2.46 Imp.qts.
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- (1) Drain Plug
(2) Oil Inlet
(3) Dipstick
- A : Upper Level**
B : Lower Level

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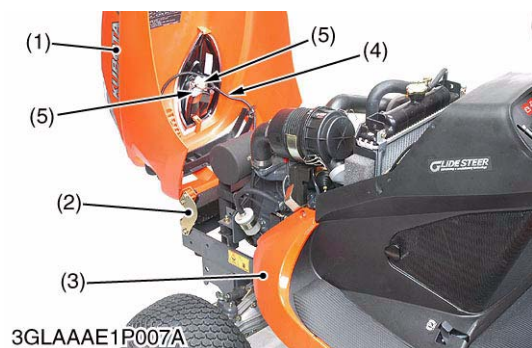
Battery

⚠ 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. Open the bonnet.
 2. Remove the radiator net.
 3. Disconnect the negative cable (1) from the battery.
 4. Disconnect the positive cable (2) from the battery and remove the battery (3).

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

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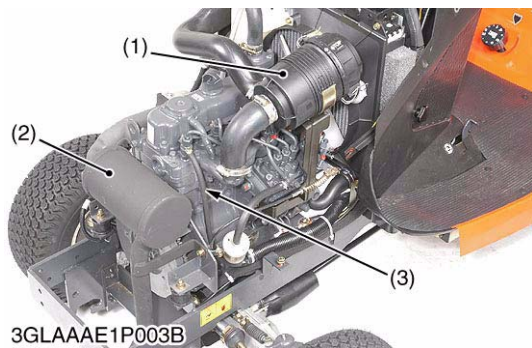


Bonnet and Side Bonnet

1. Disconnect the connectors (5) from the head light.
2. Remove the wire harness (4) from the bonnet.
3. Remove the bonnet (1) with bonnet bracket (2).
4. Remove the side bonnet (3).

- | | |
|--------------------|------------------|
| (1) Bonnet | (4) Wire Harness |
| (2) Bonnet Bracket | (5) Connector |
| (3) Side Bonnet | |

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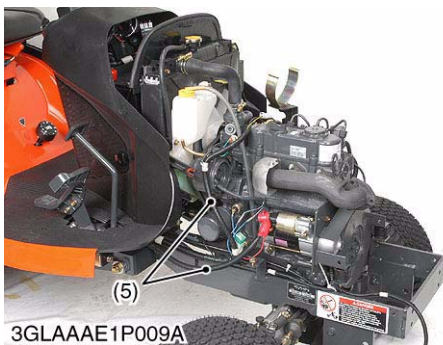
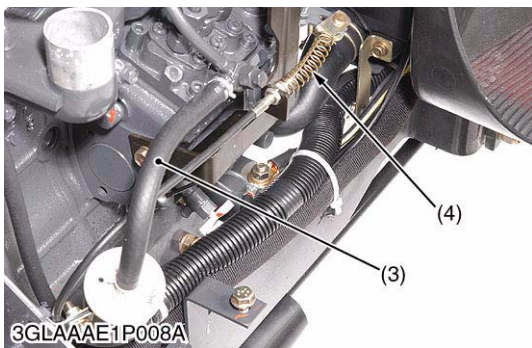


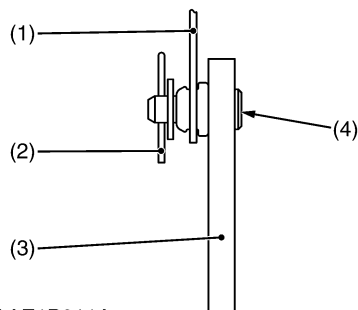
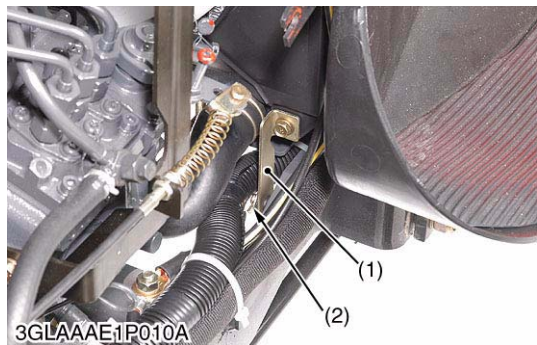
Air Cleaner, Muffler, Fuel Hose and Wire Harness

1. Remove the air cleaner (1) and muffler (2).
2. Disconnect the fuel hoses (3).
3. Disconnect the accelerator wire (4).
4. Disconnect the wire harness (5).

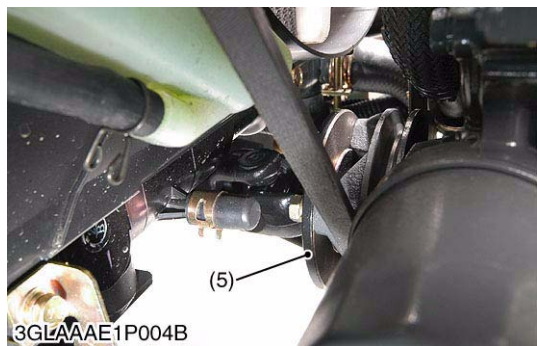
- | | |
|-----------------|----------------------|
| (1) Air Cleaner | (4) Accelerator Wire |
| (2) Muffler | (5) Wire Harness |
| (3) Fuel Hose | |

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Engine Assembly

- 1. Remove the radiator stopper snap pins (2).
- 2. Disconnect the front coupling (5).
- 3. Separate the engine assembly (6) with radiator from the frame (3).

(When reassembling)

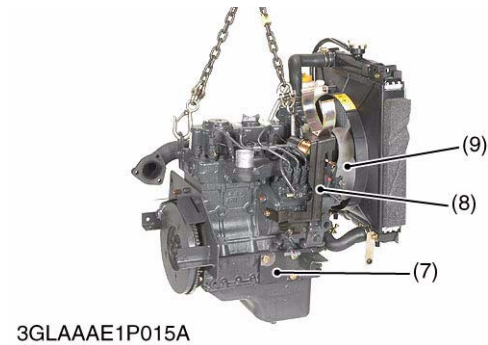
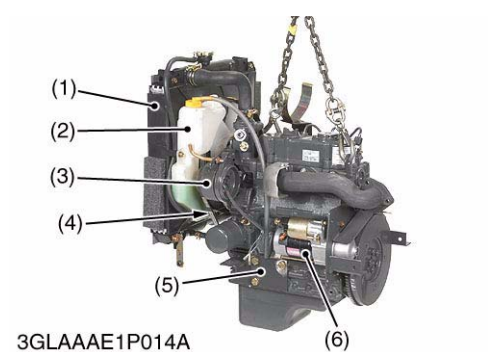
Tightening torque	Front coupling mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Engine mounting nut	23.5 N·m 2.4 kgf·m 17.4 ft-lbs

- (1) Radiator Stopper
- (2) Radiator Stopper Snap Pin
- (3) Frame
- (4) Joint Pin
- (5) Front Coupling
- (6) Engine Assembly

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[3] DISASSEMBLING AND ASSEMBLING

(1) Cylinder Head and Valves



Dynamo, Fan Belt and Radiator

1. Disconnect the radiator hoses and separate the radiator (1) with recovery tank (2) from engine assembly.
2. Remove the cooling fan (9) and fan pulley.
3. Remove the dynamo (3) and fan belt (4).
4. Remove the starter (6).
5. Disconnect the air cleaner stay (8) and engine stop solenoid.
6. Remove the wire bracket.
7. Remove the engine support LH (7) and RH (5).

(When reassembling)

- Check to see that there are no cracks on the belt surface.
- **IMPORTANT**
- **After reassembling the fan belt, be sure to adjust the fan belt tension.**

Tightening torque	Air cleaner stay screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft·lbs
	Engine support screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs

- | | |
|-----------------------|-----------------------|
| (1) Radiator | (6) Starter |
| (2) Recovery Tank | (7) Engine Support LH |
| (3) Dynamo | (8) Air Cleaner Stay |
| (4) Fan Belt | (9) Cooling Fan |
| (5) Engine Support RH | |

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Cylinder Head Cover

1. Remove the head cover screws (1).
2. Remove the cylinder head cover (2).

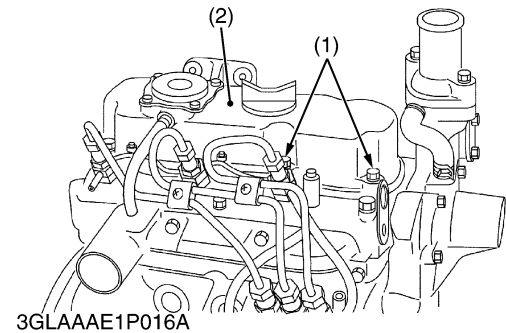
(When reassembling)

- Check to see if the cylinder head cover gasket is not defective.

Tightening torque	Cylinder head cover screw	6.86 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.3 ft·lbs
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- | | |
|-----------------------|-------------------------|
| (1) Head Cover Screws | (2) Cylinder Head Cover |
|-----------------------|-------------------------|

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Injection Pipes

1. Loosen the screw on the pipe clamp (1).
2. Detach the injection pipes (2).

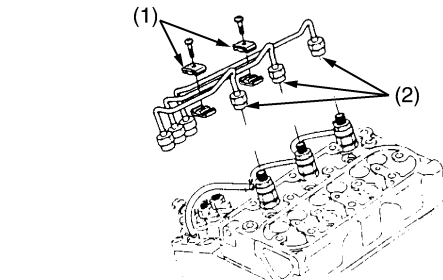
(When reassembling)

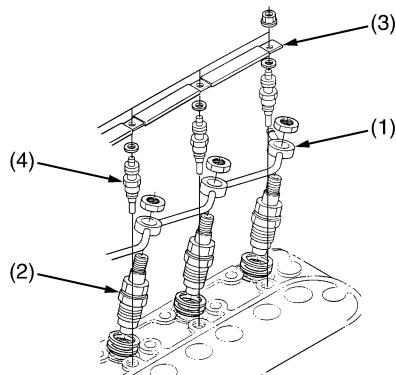
- Sent compressed air into the pipes to blow out dust. Then, reassemble the pipes in the reverse order.

Tightening torque	Injection pipe retaining nut	24.5 to 34.3 N·m 2.5 to 3.5 kgf·m 18.1 to 25.3 ft·lbs
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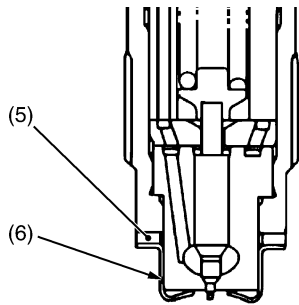
- | | |
|----------------|--------------------|
| (1) Pipe Clamp | (2) Injection Pipe |
|----------------|--------------------|

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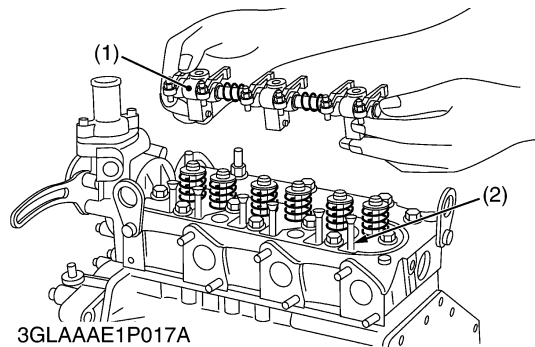




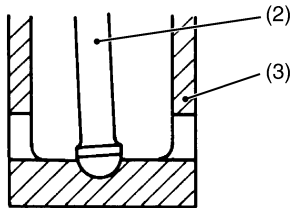
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3TAAAD1P026A



3GLAAAE1P017A



3EEABAB1P062A

Nozzle Holder Assembly and Glow Plugs

1. Remove the overflow pipe (1).
2. Remove the nozzle holder assemblies (2).
3. Remove the copper gasket (5) and the heat seal (6).
4. Remove the lead (3) from the glow plugs (4).
5. Remove the glow plugs (4).

(When reassembling)

- Replace the copper gasket and heat seal with new one.

Tightening torque	Overflow pipe retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	Glow plug	7.85 to 14.7 N·m 0.8 to 1.5 kgf·m 5.8 to 10.8 ft-lbs

- | | |
|----------------------------|-------------------|
| (1) Overflow Pipe | (4) Glow Plug |
| (2) Nozzle Holder Assembly | (5) Copper Gasket |
| (3) Lead | (6) Heat Seal |

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Rocker Arm and Push Rods

1. Remove the rocker arm bracket screws.
2. Detach the rocker arm assembly (1).
3. Remove the push rods (2).

(When reassembling)

- When putting the push rods (2) onto the tappets (3), check to see if their ends are properly engaged with the dimples.

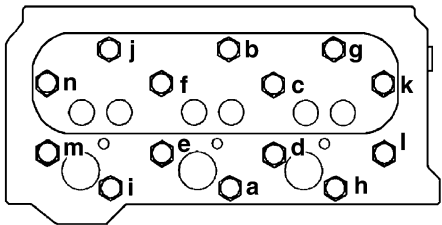
■ IMPORTANT

- After installing the rocker arm, be sure to adjust the valve clearance.

Tightening torque	Rocker arm bracket screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 ft-lbs
-------------------	--------------------------	--

- | | |
|-------------------------|------------|
| (1) Rocker Arm Assembly | (3) Tappet |
| (2) Push Rod | |

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Cylinder Head

- 1. Loosen the pipe clamp, and remove the water return pipe.
- 2. Remove the cylinder head screw in the order of (n) to (a).
- 3. Lift up the cylinder head to detach.
- 4. Remove the cylinder head gasket and O-ring (1).

(When reassembling)

- Replace the cylinder head gasket with a new one.
- Securely fit the O-ring (1) to the pipe pin.
- Tighten the cylinder head screws after applying sufficient oil.
- Tighten the cylinder head screws diagonal sequence starting from the centre.
- Tighten them uniformly, or the head may deform in the long run.
- Retighten the cylinder head screws after running the engine for 30 minutes.

Tightening torque	Cylinder head screw	37.3 to 42.2 N·m 3.8 to 4.3 kgf·m 27.5 to 31.1 ft-lbs
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- (1) O-ring
- (n) to (a): To Loosen
- (a) to (n): To Tighten

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Tappets

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

(When reassembling)

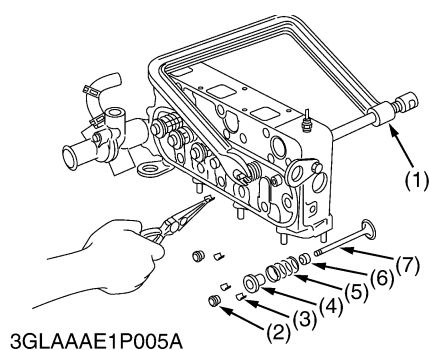
- Visually check the contact between tappets and cams for proper rotation. If defect is found, replace tappets.
- Before installing the tappets, apply engine oil thinly around them.

■ IMPORTANT

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

- (1) Tappet

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Valves

1. Remove the valve caps (2).
2. Remove the valve spring collet (3), pushing the valve spring retainer (4) by valve spring replacer (1).
3. Remove the valve spring retainer (4), valve spring (5) and valve stem seal (6).
4. Remove the valve (7).

(When reassembling)

- Wash the valve stem seal and valve guide hole, and apply engine oil sufficiently.
- After installing the valve spring collets, lightly tap the stem to assure proper fit with a plastic hammer.

■ IMPORTANT

- Do not change the combination of valve and valve guide.

- | | |
|---------------------------|---------------------|
| (1) Valve Spring Replacer | (5) Valve Spring |
| (2) Valve Cap | (6) Valve Stem Seal |
| (3) Valve Spring Collet | (7) Valve |
| (4) Valve Spring Retainer | |

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(2) Oil Pan, Timing Gears, Camshaft and Fuel Camshaft

Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws (5).
2. Remove the oil pan (4) by lightly tapping the rim of the pan with a wooden hammer.
3. Remove the oil strainer (3).

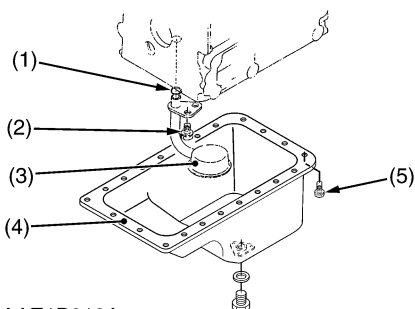
(When reassembling)

- After cleaning the oil strainer, check to see that the filter mesh is clean, and install it.
- Visually check the O-ring (1), apply engine oil, and install it.
- Securely fit the O-ring to the oil strainer.
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order from the center.
- Using the hole (6) numbered "3", install the oil strainer by mounting screw.

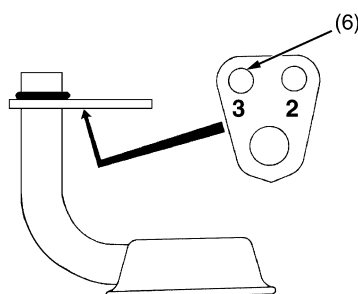
■ IMPORTANT

- Scrape off the old adhesive completely. Wipe the sealing surface clean. Now apply new adhesive 3 to 5 mm (0.12 to 0.20 in.) thick all over the contact surface. Apply the adhesive also on the center of the flange as well as on the inner wall of each bolt hole.
- Cut the nozzle of the "liquid gasket" (Three Bond 1207D or equivalent) container at its second notch. Apply "liquid gasket" about 5 mm (0.20 in.) thick. Within 20 minutes after the application of fluid sealant, reassemble the components. Wait then for about 30 minutes, and pour oil in the crankcase.

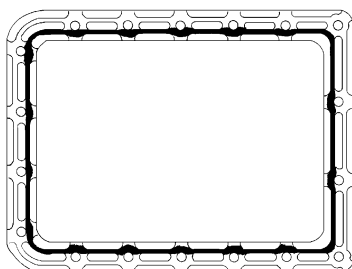
- | | |
|------------------|-----------------------------|
| (1) O-ring | (4) Oil Pan |
| (2) Screw | (5) Oil Pan Mounting Screws |
| (3) Oil Strainer | (6) Hole |



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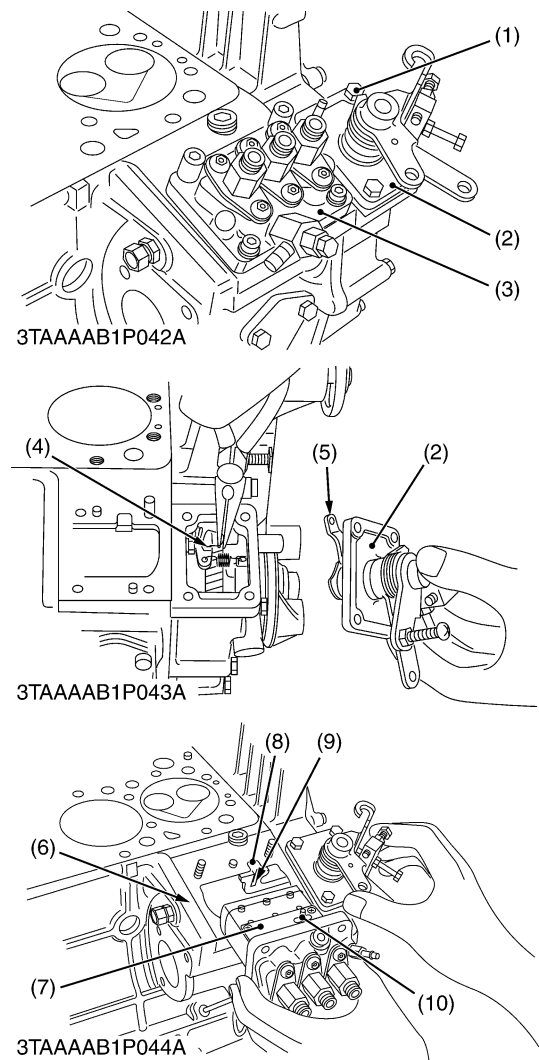


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Injection Pump and Speed Control Plate

1. Remove the socket head screws and nuts, and remove the injection pump (3).
2. Remove the screws and separate the speed control plate (2), taking care not to damage the governor spring (4).
3. Disconnect the governor spring (4) and remove the speed control plate (2).

(When reassembling)

- Hook the governor spring (4) to the governor lever (5) first and install the speed control plate (2).
- Be sure to place the copper washers underneath two screws (1). (Two screws (1) in the upper of the speed control plate (2).)
- Position the slot (9) on the fork lever just under the slot (8) on the crankcase.
- Insert the injection pump (3) so that the control rod (7) should be pushed by the idling adjusting spring (6) at its end and the pin (10) on the rod engages with the slot (9) on the fork lever (as shown in the figure).

NOTE

- The sealant is applied to both sides of the soft metal gasket shim. The liquid gasket is not required for assembling.
- Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad. (0.5 °)
- In disassembling and replacing, be sure to use the same number of new gasket shims with the same thickness.

- | | |
|-------------------------------|-----------------------------|
| (1) Screws and Copper Washers | (6) Idling Adjusting Spring |
| (2) Speed Control Plate | (7) Control Rod |
| (3) Injection Pump | (8) Slot (Crankcase Side) |
| (4) Governor Spring | (9) Slot (Fork Lever Side) |
| (5) Governor Lever | (10) Pin |

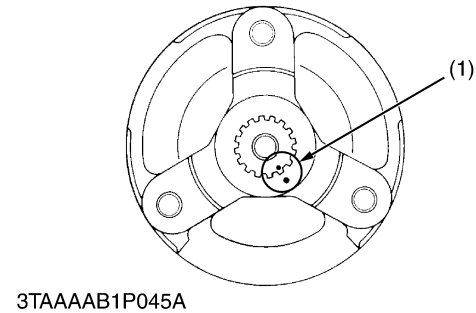
0000000858E

Fan Drive Pulley

1. Secure the flywheel to keep it from turning.
2. Remove the fan drive pulley screw.
3. Draw out the fan drive pulley with a puller.

(When reassembling)

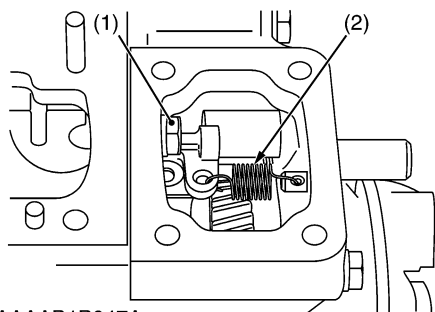
- Install the pulley to the crankshaft, aligning the mark (1) on them.
- Apply engine oil to the fan drive pulley retaining screws. And tighten them.



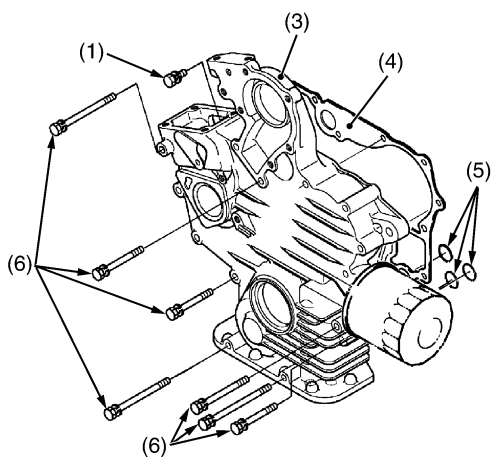
Tightening torque	Fan drive pulley screw	98.0 to 107.8 N·m 10.0 to 11.0 kgf·m 72.3 to 79.5 ft·lbs
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- (1) Alignment Mark

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Gear Case

1. Remove the screw (1) of inside the gear case and outside screws (6).
2. Disconnect the start spring (2) from the fork lever 1.
3. Remove the gear case (3).

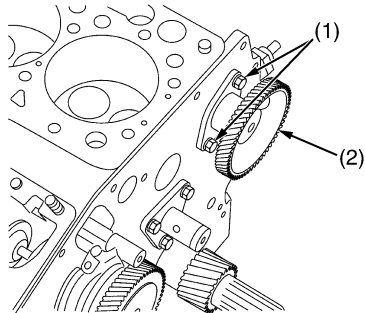
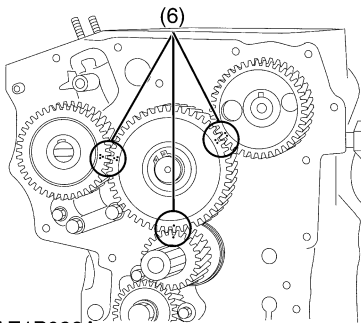
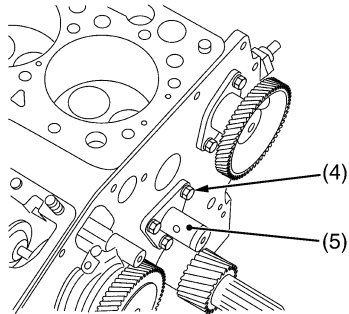
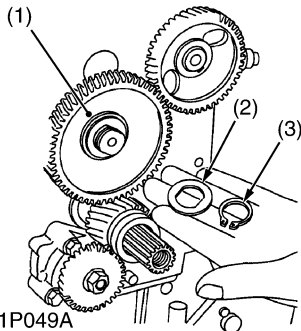
(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) to both sides of the gear case gasket (4).
- Be sure to set three O-rings (5) inside the gear case.

- (1) Screw (Inside)
 (2) Start Spring
 (3) Gear Case

- (4) Gear Case Gasket
 (5) O-rings
 (6) Screw

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Idle Gear

1. Remove the external snap ring (3), the collar (2) and the idle gear (1).
2. Remove the idle gear shaft mounting screws (4).
3. Remove the idle gear shaft (5).

(When reassembling)

- Apply engine oil to the idle gear shaft mounting screw (4). And tighten them.
- Install the idle gear, aligning the mark (6) on the gears referring to the photo.

Tightening torque	Idle gear shaft mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 ft·lbs
-------------------	--------------------------------	--

- | | |
|------------------------|------------------------------------|
| (1) Idle Gear | (4) Idle Gear Shaft Mounting Screw |
| (2) Idle Gear Collar | (5) Idle Gear Shaft |
| (3) External Snap Ring | (6) Alignment Mark |

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Camshaft

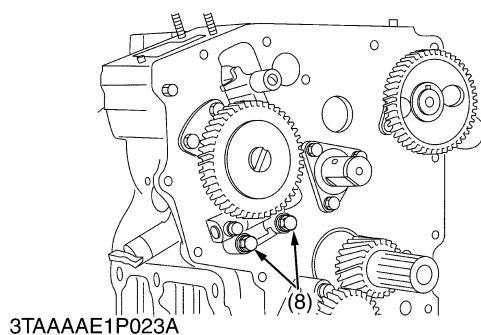
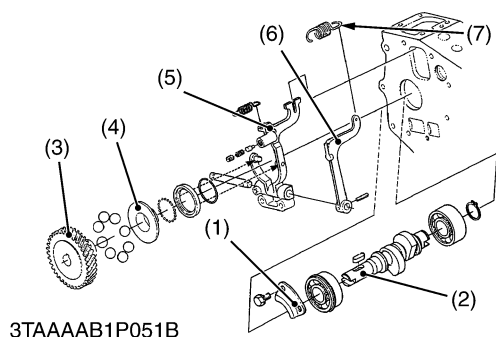
1. Remove the camshaft mounting screws (1) and draw out the camshaft with gear (2) on it.

(When reassembling)

- When install the camshaft, apply engine oil to the camshaft journals.
- Apply engine oil to the camshaft mounting screws. And tighten them.

- | | |
|-----------------------------|-------------------|
| (1) Camshaft Mounting Screw | (2) Camshaft Gear |
|-----------------------------|-------------------|

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Fuel Camshaft

1. Remove the retaining plate (1).
2. Remove the fork lever holder mounting screws (8), then draw out the injection pump gear (3) and fuel camshaft (2) with the governor fork assembly.

(When reassembling)

- Hook the governor spring (7) to the fork lever 2 (6) as shown in the figure before installing the fork lever assembly to the crankcase.

- | | |
|-------------------------|--------------------------------------|
| (1) Retaining Plate | (5) Fork Lever 1 |
| (2) Fuel Camshaft | (6) Fork Lever 2 |
| (3) Injection Pump Gear | (7) Governor Spring |
| (4) Governor Sleeve | (8) Fork Lever Holder Mounting Screw |

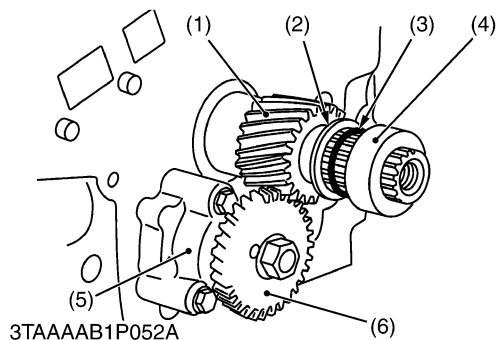
000001332E

Oil Pump and Crankshaft Gear

1. Remove the oil pump gear (6).
2. Remove the oil pump (5).
3. Remove the collar (4), O-ring (3) and crankshaft oil slinger (2).
4. Remove the crankshaft gear (1).

(When reassembling)

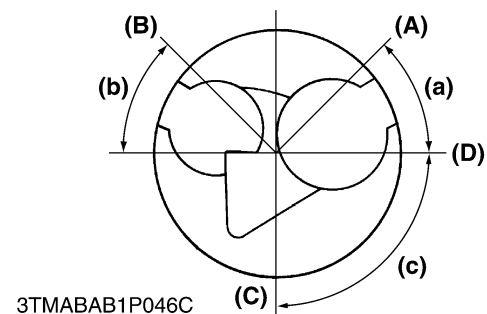
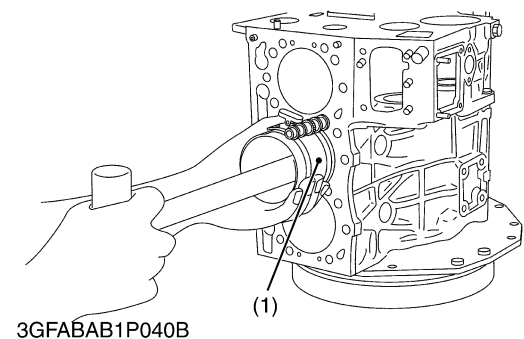
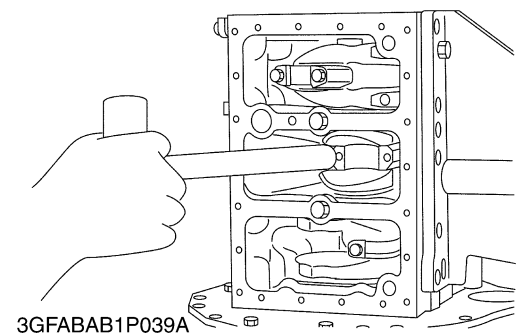
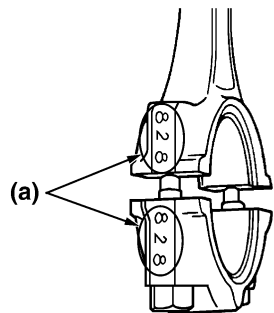
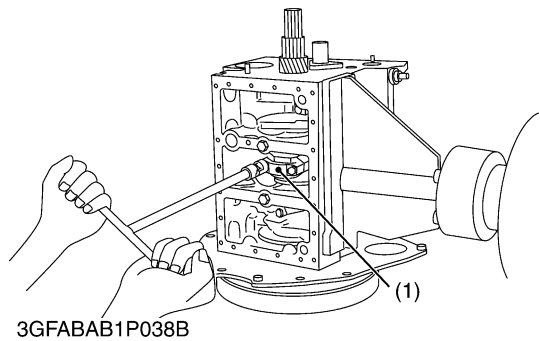
- Install the collar (4) after aligning the marks on the gears. (See the figure at "Idle Gear".)



- | | |
|----------------------------|-----------------------|
| (1) Crankshaft Gear | (4) Crankshaft Collar |
| (2) Crankshaft Oil Slinger | (5) Oil Pump |
| (3) O-ring | (6) Oil Pump Gear |

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(3) Pistons and Connecting Rods



Connecting Rods

1. Remove the connecting rod caps (1).

(When reassembling)

- Align the marks (a) with each other. (Face the marks toward the injection pump.).
- Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque.
If the connecting rod screw won't be screwed in smoothly, clean the threads.
If the connecting rod screw is still hard to screw in, replace it.

Tightening torque	Connecting rod screw	26.5 to 30.4 N·m 2.7 to 3.1 kgf·m 19.5 to 22.4 ft-lbs
-------------------	----------------------	---

(1) Connecting Rod Cap

(a) Mark

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Pistons

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

(When reassembling)

- Before inserting the piston into the cylinder, apply enough engine oil to the piston.
- When inserting the piston into the cylinder, face the mark on the connecting rod to the injection pump.

■ IMPORTANT

- Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No.1 piston.
- When installing the piston into the cylinder, place the gaps of all the piston rings as shown in the figure.
- Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section may be scratched, causing trouble inside the cylinder.

(1) Piston Ring Compressor

(a) 0.785 rad (45 °)

(A) Top Ring Gap

(b) 0.785 rad (45 °)

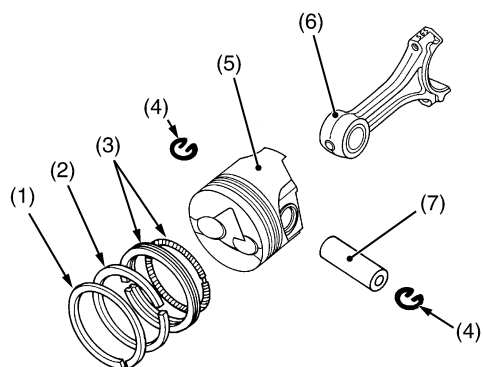
(B) Second Ring Gap

(c) 1.57 rad (90 °)

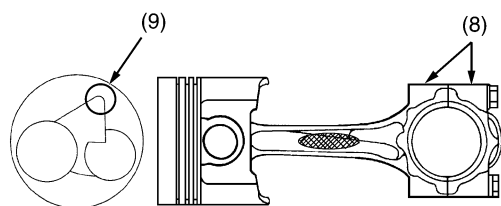
(C) Oil Ring Gap

(D) Piston Pin Hole

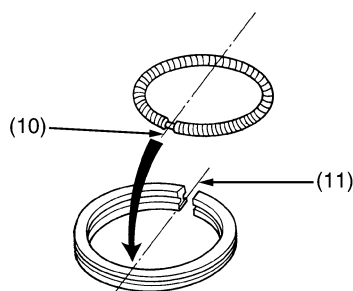
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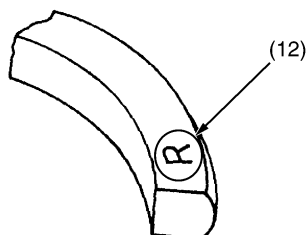
3TMABAB1P047A



3EEACAA1P089A



3EEABAB1P100A



3EEABAB1P101A

Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool (Code No. 07909-32121).
2. Remove the piston pin (7), and separate the connecting rod (6) from the piston (5).

(When reassembling)

- When installing the ring, assemble the rings so that the manufacturer's mark (12) near the gap faces the top of the piston.
- When installing the oil ring onto the piston, place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin.
- When installing the connecting rod to the piston, immerse the piston in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin to the piston.
- When installing the connecting rod to the piston, align the mark (8) on the connecting rod to the fan-shaped concave (9).

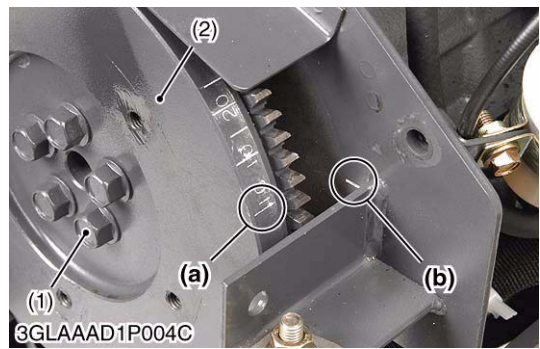
■ NOTE

- **Mark the same number on the connecting rod and the piston so as not to change the combination.**

- | | |
|--------------------------|--------------------------|
| (1) Top Ring | (9) Fan-Shaped Concave |
| (2) Second Ring | (10) Expander Joint |
| (3) Oil Ring | (11) Oil Ring Gap |
| (4) Piston Pin Snap Ring | (12) Manufacturer's Mark |
| (5) Piston | |
| (6) Connecting Rod | |
| (7) Piston Pin | |
| (8) Mark | |

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(4) Crankshaft



Flywheel

1. Secure the flywheel to keep it from turning using a flywheel stopper. (Refer to "SPECIAL TOOLS".)
2. Remove all flywheel screws (1) and then remove the flywheel (2).

(When reassembling)

- Set the No. 1 crankpin at the top dead center (T.D.C.).
- Align the "1TC" mark (a) on the outer surface of the flywheel horizontally with the alignment mark (b) on the rear end plate.
- Apply engine oil to the threads and the undercut surface of the flywheel screw and fit the screw.

Tightening torque	Flywheel screw	53.9 to 58.8 N·m 5.5 to 6.0 kgf·m 39.8 to 43.4 ft-lbs
-------------------	----------------	---

- | | |
|--------------------|--------------------|
| (1) Flywheel Screw | (a) 1TC Mark |
| (2) Flywheel | (b) Alignment Mark |

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Bearing Case Cover

1. Remove the bearing case cover mounting screws. First, remove inside screws (1) and then outside screws (2).
2. Remove the bearing case cover (6).

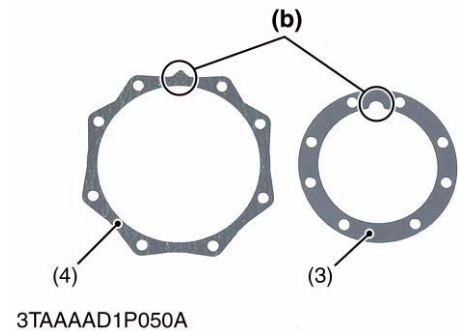
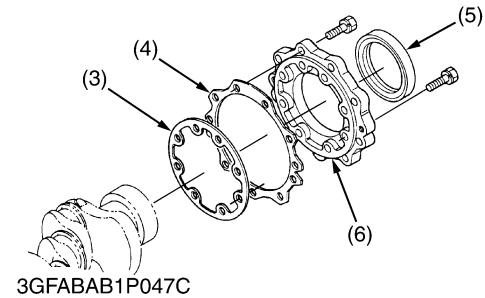
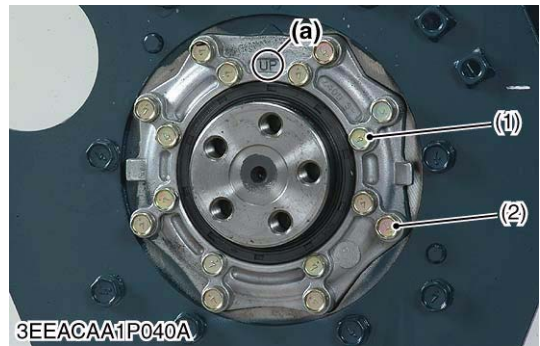
(When reassembling)

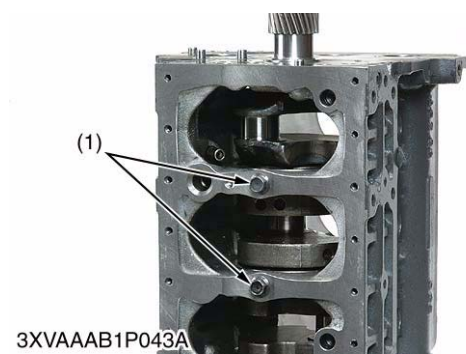
- Fit the bearing case gasket (3) and the bearing case cover gasket (4) with correct directions.
- Install the bearing case cover (6) to position the casting mark "UP" (a) on it upward.
- Apply engine oil to the oil seal (5) lip and take care that it is not rolled when installing.
- Tighten the bearing case cover mounting screws with even force on the diagonal line.

Tightening torque	Bearing case cover mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 ft-lbs
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- | | |
|---|------------------------|
| (1) Bearing Case Cover Mounting Screw (Inside) | (5) Oil Seal |
| (2) Bearing Case Cover Mounting Screw (Outside) | (6) Bearing Case Cover |
| (3) Bearing Case Gasket | (a) Top Mark "UP" |
| (4) Bearing Case Cover Gasket | (b) Upside |

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Crankshaft Assembly

1. Remove the main bearing case screw 2 (1).
2. Turn the crankshaft to set the crankpin of the third cylinder to the bottom dead center. Then draw out the crankshaft until the crankpin of the second cylinder comes to the center of the third cylinder.
3. Turn the crankshaft by 2.09 rad (120 °) counterclockwise to set the crankpin of second cylinder to the bottom dead center. Draw out the crankshaft until the crankpin of the first cylinder comes to the center of the third cylinder.
4. Repeat the above steps to draw out all the crankshaft.

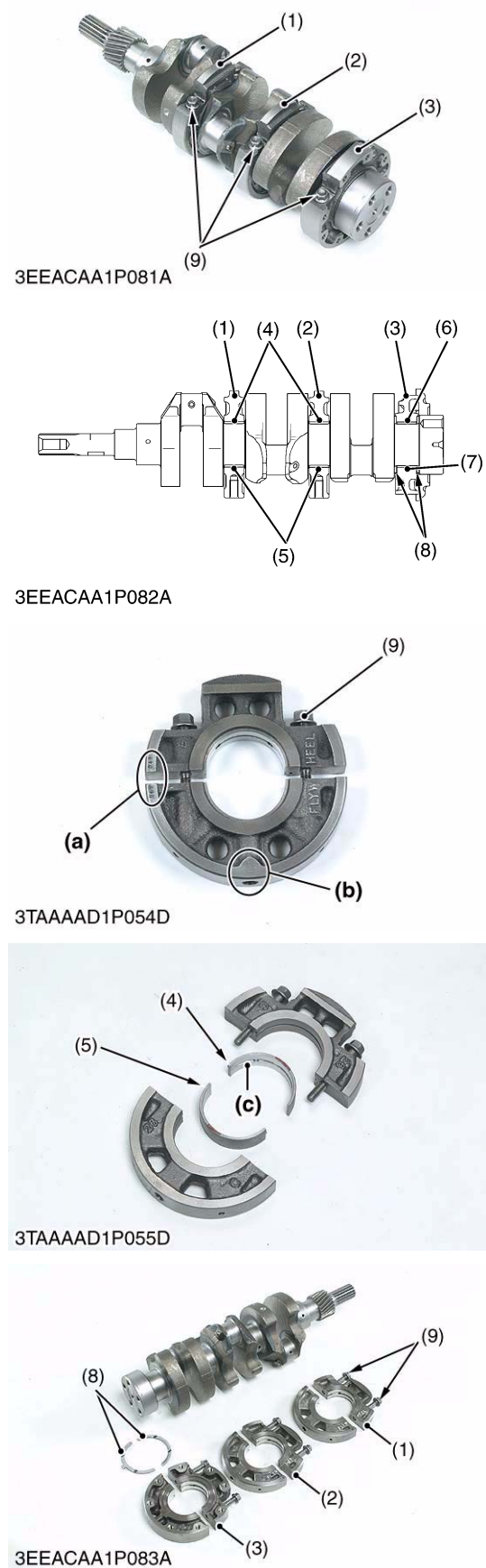
(When reassembling)

- Clean the oil passage of the crankshaft with compressed air.
- Install the crankshaft assembly, aligning the screw hole of main bearing case screw 2 with the screw hole of crankcase.
- When tightening the main bearing case screw 2 (1), apply oil to it and screw by hand before tightening the specific torque. If not smooth to screw by hand, align the screw holes between the crankcase and the main bearing case.

Tightening torque	Main bearing case screw 2	26.5 to 30.4 N·m 2.7 to 3.1 kgf·m 19.5 to 22.4 ft-lbs
-------------------	---------------------------	---

(1) Main Bearing Case Screw 2

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Main Bearing Case Assembly

1. Remove the two main bearing case screws 1 (9), and remove the main bearing case assembly 1 (1), being careful with crankshaft bearing 3 (4) (5).
2. Remove the main bearing case assembly 2 (2) and the main bearing case assembly (3) as above. Keep in mind, however, that the thrust bearing (8) is installed in the main bearing case assembly (3).

(When reassembling)

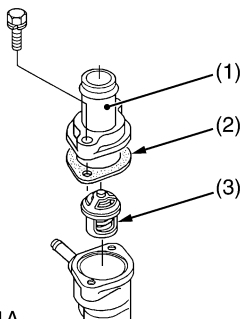
- Clean the oil passage in the main bearing cases.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in original positions. Since diameters of main bearing cases vary, install them in order to marking **(b)** from the gear case side. (Refer to the figure.)
- Be careful not to confuse the top and bottom of the crankshaft bearing 3 (4) (5). (Install the bearing with the oil groove **(c)** up.)
- Match the alignment numbers **(a)** on the main bearing case assembly 1.
- Do the same for the main bearing case assembly 2 (2) and the main bearing case assembly (3) too.
- When installing the main bearing case 1 and 2, face the mark "FLYWHEEL" to the flywheel.
- Install the thrust bearing (8) with its oil groove facing outward.
- Confirm that the main bearing case moves smoothly after tightening the main bearing case screw 1 to the specified torque.

Tightening torque	Main bearing case screw 1	12.7 to 15.7 N·m 1.3 to 1.6 kgf·m 9.4 to 11.6 ft·lbs
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- | | |
|----------------------------------|-----------------------------|
| (1) Main Bearing Case Assembly 1 | (a) Alignment Number |
| (2) Main Bearing Case Assembly 2 | (b) Marking (1 or 2) |
| (3) Main Bearing Case Assembly | (c) Oil Groove |
| (4) Crankshaft Bearing 3 | |
| (5) Crankshaft Bearing 3 (Lower) | |
| (6) Crankshaft Bearing 2 | |
| (7) Crankshaft Bearing 2 (Lower) | |
| (8) Thrust Bearing | |
| (9) Main Bearing Case Screw 1 | |

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(5) Waterpump



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Thermostat Assembly

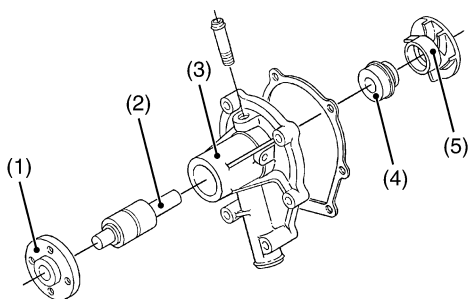
1. Remove the thermostat cover mounting screws, and remove the thermostat cover (1).
2. Remove the thermostat assembly (3).

(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the gasket (2).

- | | |
|-----------------------------|-------------------------|
| (1) Thermostat Cover | (3) Thermostat Assembly |
| (2) Thermostat Cover Gasket | |

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Water Pump Assembly

1. Loosen the dynamo mounting screws, and remove the fan belt.
2. Remove the fan and fan pulley.
3. Remove the water pump assembly from the gear case cover.
4. Remove the water pump flange (1).
5. Press out the water pump shaft (2) with the impeller (5) on it.
6. Remove the impeller from the water pump shaft.
7. Remove the mechanical seal (4).

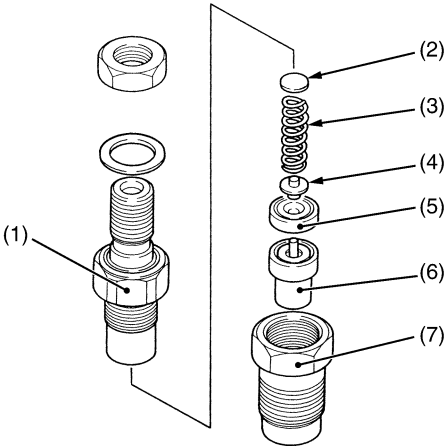
(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) to the both sides of gasket.
- Replace the mechanical seal with new one.

- | | |
|-----------------------|---------------------|
| (1) Water Pump Flange | (4) Mechanical Seal |
| (2) Water Pump Shaft | (5) Impeller |
| (3) Water Pump Body | |

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(6) Injection Nozzle



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Nozzle Holder

1. Secure the nozzle retaining nut (7) with a vise.
2. Remove the nozzle holder (1), and take out parts inside.

(When reassembling)

- Assemble the nozzle in clean fuel oil.
- Install the push rod (4), noting its direction.
- After assembling the nozzle, be sure to adjust the fuel injection pressure.

Tightening torque	Nozzle holder	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Overflow pipe retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

- | | |
|----------------------|--------------------------|
| (1) Nozzle Holder | (5) Distance Piece |
| (2) Adjusting Washer | (6) Nozzle Piece |
| (3) Nozzle Spring | (7) Nozzle Retaining Nut |
| (4) Push Rod | |

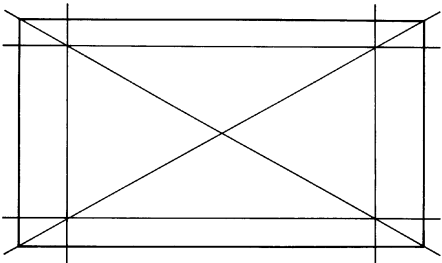
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[4] SERVICING

(1) Cylinder Head and Valve



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Cylinder Head Surface Flatness

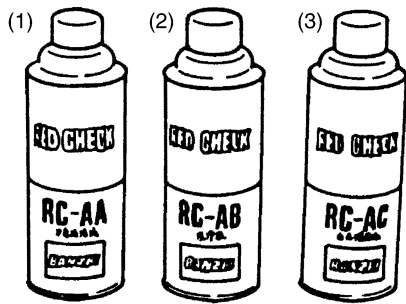
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides and two diagonal lines as shown in the figure.
3. Measure the clearance with a thickness gauge.
4. If the measurement exceeds the allowable limit, correct it with a surface grinder.

■ IMPORTANT

- Do not place the straightedge on the combustion chamber.
- Be sure to check the valve recessing after correcting.

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.
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Cylinder Head Flaw

1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with the detergent (2).
3. Spray the cylinder head surface with the red permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface with the detergent (2).
5. Spray the cylinder head surface with the white developer (3).
6. If flawed, it can be identified as red marks.

- (1) Red Permeative Liquid (3) White Developer
(2) Detergent

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Valve Recessing

1. Clean the cylinder head surface, valve face and valve seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
5. If it still exceeds the allowable limit after replacing the valve, replace the cylinder head.

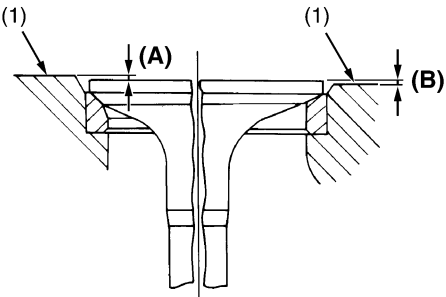
Valve recessing (Intake and Exhaust)	Factory spec.	0.10 (protrusion) to 0.10 (recessing) mm 0.0039 (protrusion) to 0.0039 (recessing) in.
	Allowable limit	0.30 (recessing) mm 0.0118 (recessing) in.

- (1) Cylinder Head Surface (A) Recessing
(B) Protrusion

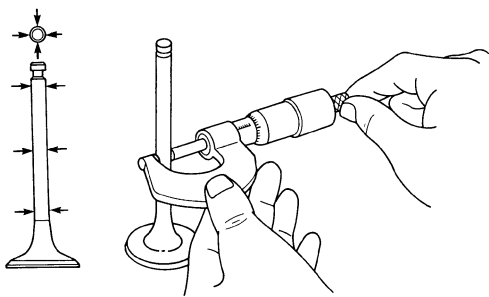
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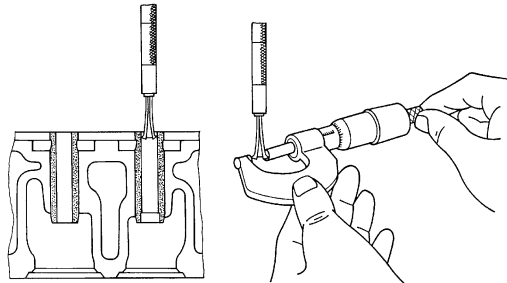
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Clearance between Valve Stem and Valve Guide

1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. with a small hole gauge, and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

Clearance between valve stem and valve guide	Factory spec.	0.030 to 0.057 mm 0.00118 to 0.00224 in.
	Allowable limit	0.10 mm 0.0039 in.

Valve stem O.D.	Factory spec.	5.968 to 5.980 mm 0.23496 to 0.23543 in.
Valve guide I.D.	Factory spec.	6.010 to 6.025 mm 0.23661 to 0.23720 in.

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Replacing Valve Guide

(When removing)

1. Press out the used valve guide using a valve guide replacing tool.

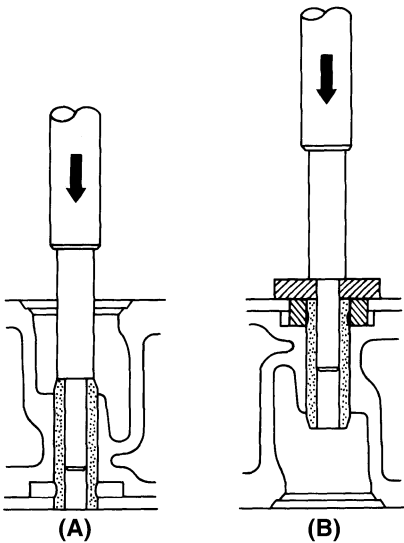
(When installing)

1. Clean a new valve guide and valve guide bore, and apply engine oil to them.
2. Press in a new valve guide using a valve guide replacing tool.
3. Ream precisely the I.D. of the valve guide to the specified dimension.

Valve guide I.D. (Intake and Exhaust)	Factory spec.	6.010 to 6.025 mm 0.23661 to 0.23720 in.
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■ **IMPORTANT**

- Do not hit the valve guide with a hammer during replacement.

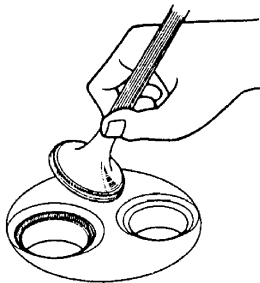


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(A) When removing

(B) When installing

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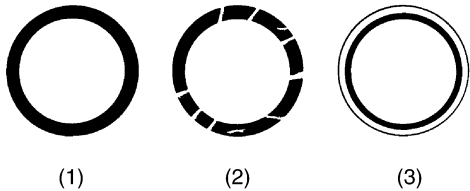
Valve Seating

1. Coat the valve face lightly with prussian blue and put the valve on its seat to check the contact.
2. If the valve does not seat all the way around the valve seat or the valve contact is less than 70 %, correct the valve seating as follows.
3. If the valve contact does not comply with the reference value, replace the valve or correct the contact of valve seating.

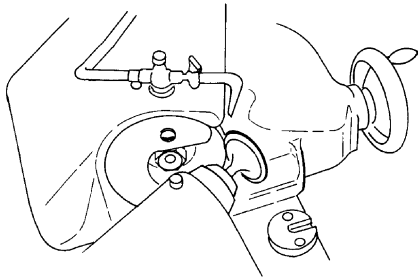
Valve seat width	Factory spec.	2.12 mm 0.0835 in.
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- (1) Correct (3) Incorrect
- (2) Incorrect

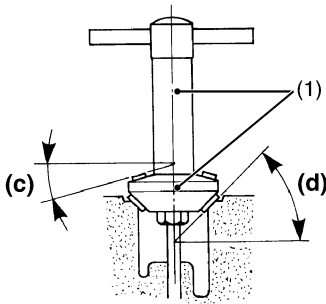
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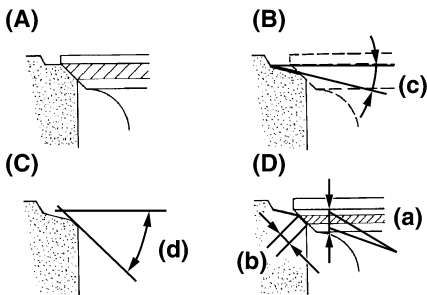
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3EEABAB1P119B



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Correcting Valve and Valve Seat

■ **NOTE**

- **Before correcting the valve and seat, check the valve stem and the I.D. of valve guide section, and repair them if necessary.**
- **After correcting the valve seat, be sure to check the valve recessing.**

1) Correcting Valve

1. Correct the valve with a valve refacer.

Valve face angle	Factory spec.	0.785 rad 45 °
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2) Correcting Valve Seat

1. Slightly correct the seat surface with a 0.785 rad (45 °) valve seat cutter (Code No. 07909-33102).
2. Fitting the valve, check the contact position of the valve face and seat surface with prussian blue. (Visual check) [If the valve has been used for a long period, the seat tends to come in contact with the upper side of the valve face.]
3. Grind the upper surface of the seat with a 0.262 rad (15 °) valve seat cutter until the valve seat touches to the center of the valve face (so that (a) equals (b) as shown in the figure)
4. Grind the seat with a 0.785 rad (45 °) valve seat cutter again, and visually recheck the contact between the valve and seat.
5. Repeat steps 3 and 4 until the correct contact is achieved.
6. Continue lapping until the seated rate becomes more than 70 % of the total contact area.

Valve seat angle	Factory spec.	0.785 rad 45 °
------------------	---------------	-------------------

- | | |
|--------------------------|--------------------------|
| (1) Valve Seat Cutter | (a) Identical Dimensions |
| (A) Check Contact | (b) Valve Seat Width |
| (B) Correct Seat Width | (c) 0.262 rad (15 °) |
| (C) Correct Seat Surface | (d) 0.785 rad (45 °) |
| (D) Check Contact | |

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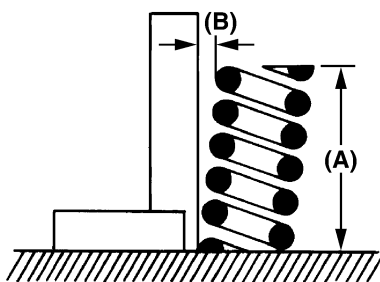
Valve Lapping

1. Apply compound evenly to the valve lapping surface.
2. Insert the valve into the valve guide. Lap the valve onto its seat with a valve flapper or screwdriver.
3. After lapping the valve, wash the compound away and apply oil, then repeat valve lapping with oil.
4. Apply prussian blue to the contact surface to check the seated rate. If it is less than 70 %, repeat valve lapping again.

■ **IMPORTANT**

- **When valve lapping is performed, be sure to check the valve recessing and adjust the valve clearance after assembling the valve.**

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Free Length and Tilt of Valve Spring

1. Measure the free length **(A)** of valve spring with vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Put the valve spring on a surface plate, place a square on the side of the valve spring.
3. Check to see if the entire side is in contact with the square. Rotate the valve spring and measure the maximum tilt **(B)**. If the measurement exceeds the allowable limit, replace it.
4. Check the entire surface of the valve spring for scratches. If there is any defect, replace it.

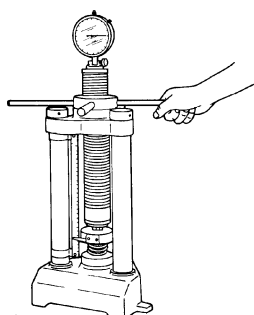
Free length (A)	Factory spec.	31.3 to 31.8 mm 1.232 to 1.252 in.
	Allowable limit	28.4 mm 1.118 in.
Tilt (B)	Allowable limit	1.2 mm 0.047 in.

(A) Free Length**(B) Tilt**

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Valve Spring Setting Load

1. Place the valve spring on a tester and compress it to the same length it is actually compressed in the engine.
2. Read the compression load on the gauge.
3. If the measurement is less than the allowable limit, replace it.



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Setting load / Setting length	Factory spec.	64.7 N / 27.0 mm 6.6 kgf / 27.0 mm 14.6 lbs / 1.063 in.
	Allowable limit	54.9 N / 27.0 mm 5.6 kgf / 27.0 mm 12.3 lbs / 1.063 in.

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Oil Clearance between Rocker Arm and Rocker Arm Shaft

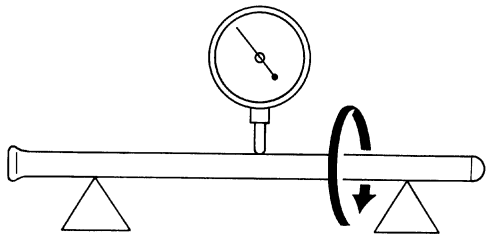
1. Measure the rocker arm shaft O.D. with an outside micrometer.
2. Measure the rocker arm I.D. with an inside micrometer, and then calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the rocker arm and measure the oil clearance again. If it still exceeds the allowable limit, replace also the rocker arm shaft.



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Oil clearance between rocker arm and rocker arm shaft	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.00177 in.
	Allowable limit	0.15 mm 0.0059 in.
Rocker arm shaft O.D.	Factory spec.	10.473 to 10.484 mm 0.41232 to 0.41276 in.
Rocker arm I.D.	Factory spec.	10.500 to 10.518 mm 0.41339 to 0.41410 in.

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Push Rod Alignment

- 1. Place the push rod on V blocks.
- 2. Measure the push rod alignment.
- 3. If the measurement exceeds the allowable limit, replace the push rod.

Push rod alignment	Allowable limit	0.25 mm 0.0098 in.
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Oil Clearance between Tappet and Tappet Guide Bore

- 1. Measure the tappet O.D. with an outside micrometer.
- 2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
- 3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil clearance between tappet and tappet guide bore	Factory spec.	0.016 to 0.052 mm 0.00063 to 0.00205 in.
	Allowable limit	0.10 mm 0.0039 in.



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Tappet O.D.	Factory spec.	17.966 to 17.984 mm 0.70732 to 0.70803 in.
Tappet guide bore I.D.	Factory spec.	18.000 to 18.018 mm 0.70866 to 0.70937 in.

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(2) Timing Gear, Camshaft and Fuel Camshaft



Timing Gear Backlash

1. Set a dial indicator (lever type) with its tip on the gear tooth.
2. Move the gear to measure the backlash, holding its mating gear.
3. If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.
4. If the oil clearance is not proper, replace the gear.

Backlash between idle gear and crank gear	Factory spec.	0.043 to 0.124 mm 0.00169 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and cam gear	Factory spec.	0.047 to 0.123 mm 0.00185 to 0.00484 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and injection pump gear	Factory spec.	0.046 to 0.124 mm 0.00185 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between oil pump drive gear and crank gear	Factory spec.	0.041 to 0.123 mm 0.00161 to 0.00484 in.
	Allowable limit	0.15 mm 0.0059 in.

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Idle Gear Side Clearance

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

Idle gear side clearance	Factory spec.	0.20 to 0.51 mm 0.0079 to 0.0201 in.
	Allowable limit	0.80 mm 0.0315 in.

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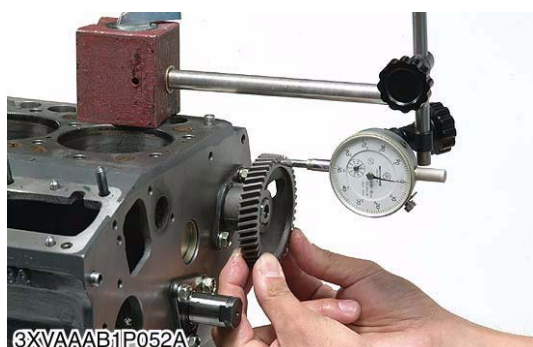


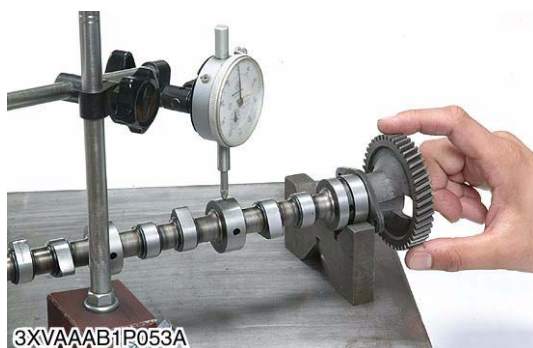
Camshaft Side Clearance

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

Camshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.50 mm 0.0197 in.

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Camshaft Alignment

1. Support the camshaft with V blocks on the surface plate at both end journals.
2. Set a dial indicator with its tip on the intermediate journal.
3. Measure the camshaft alignment.
4. If the measurement exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.0004 in.
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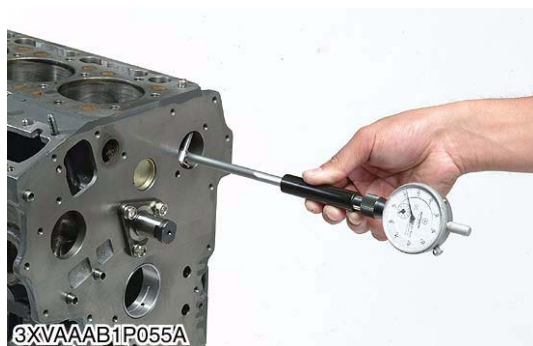


Cam Height

1. Measure the height of the cam at its highest point with an outside micrometer.
2. If the measurement is less than the allowable limit, replace the camshaft.

Cam height of intake and exhaust	Factory spec.	26.88 mm 1.0583 in.
	Allowable limit	26.83 mm 1.0563 in.

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Oil Clearance of Camshaft Journal

1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the camshaft.

Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.00197 to 0.00358 in.
	Allowable limit	0.15 mm 0.0059 in.



Camshaft journal O.D.	Factory spec.	32.934 to 32.950 mm 1.29661 to 1.29724 in.
Camshaft bearing I.D. (Cylinder block bore I.D.)	Factory spec.	33.000 to 33.025 mm 1.29921 to 1.30020 in.

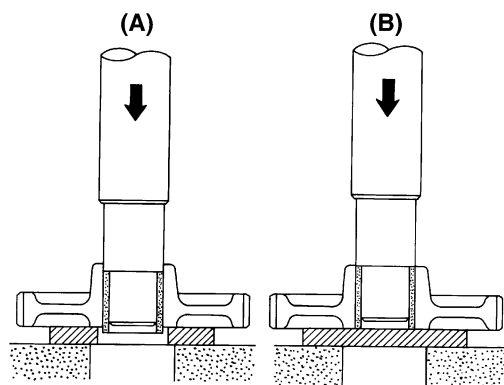
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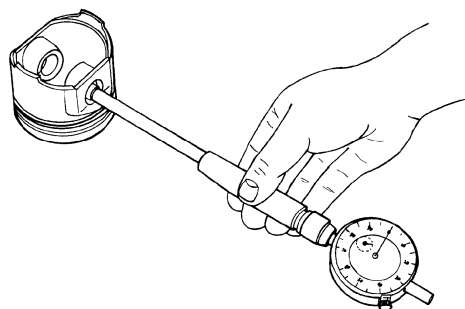


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(3) Piston and Connecting Rod



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Oil Clearance between Idle Gear Shaft and Idle Gear Bushing

1. Measure the idle gear shaft O.D. with an outside micrometer.
2. Measure the idle gear bushing I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing.
4. If it still exceeds the allowable limit, replace the idle gear shaft.

Oil clearance between idle gear shaft and idle gear bushing	Factory spec.	0.020 to 0.084 mm 0.00079 to 0.00331 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear shaft O.D.	Factory spec.	19.967 to 19.980 mm 0.78610 to 0.78661 in.
Idle gear bushing I.D.	Factory spec.	20.000 to 20.051 mm 0.78740 to 0.78941 in.

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Replacing Idle Gear Bushing

(When removing)

1. Press out the used idle gear bushing using an idle gear bushing replacing tool.

(When installing)

1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Press in a new bushing using an idle gear bushing replacing tool, until it is flush with the end of the idle gear.

(A) When removing

(B) When installing

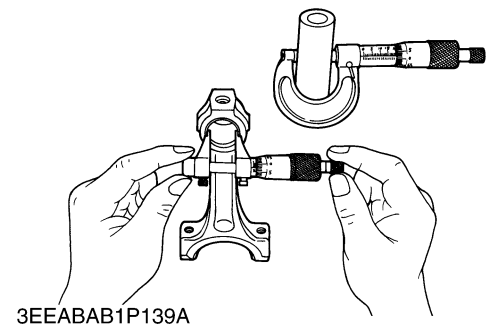
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Piston Pin Bore I.D.

1. Measure the piston pin bore I.D. in both the horizontal and vertical directions with a cylinder gauge.
2. If the measurement exceeds the allowable limit, replace the piston.

Piston pin bore I.D.	Factory spec.	20.000 to 20.013 mm 0.78740 to 0.78791 in.
	Allowable limit	20.05 mm 0.7894 in.

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Oil Clearance between Piston Pin and Small End Bushing

1. Measure the piston pin O.D. where it contacts the bushing with an outside micrometer.
2. Measure the small end bushing I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing. If it still exceeds the allowable limit, replace the piston pin.

Oil clearance between piston pin and small end bushing	Factory spec.	0.014 to 0.038 mm 0.00055 to 0.00150 in.
	Allowable limit	0.10 mm 0.0039 in.

Piston pin O.D.	Factory spec.	20.002 to 20.011 mm 0.78748 to 0.78783 in.
Small end bushing I.D.	Factory spec.	20.025 to 20.040 mm 0.78839 to 0.78897 in.

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Replacing Small End Bushing

(When removing)

1. Press out the used bushing using a small end bushing replacing tool.

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Insert a new bushing onto the tool and press-fit it with a press so that the seam (1) of bushing positions as shown in the figure, until it is flush with the connecting rod.
3. Drill a hole to the bushing with aligning the oil hole (2) of connecting rod. (Refer to the figure.)

■ **NOTE**

- Be sure to chamfer the oil hole circumference with an oil stone.

Oil clearance between piston pin and small end bushing (Spare parts)	Factory spec.	0.015 to 0.075 mm 0.00059 to 0.00295 in.
	Allowable limit	0.15 mm 0.0059 in.

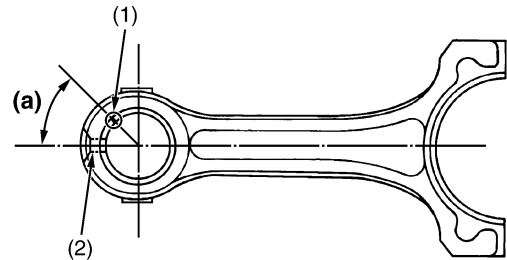
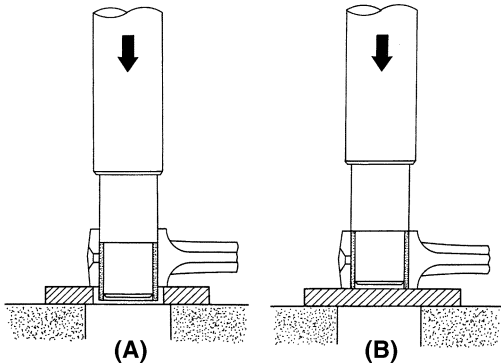
Small end bushing I.D. (Spare parts)	Factory spec.	20.026 to 20.077 mm 0.78845 to 0.79043 in.
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- (1) Seam
(2) Oil Hole

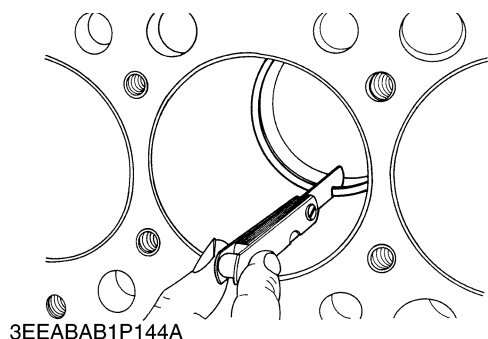
- (A) When removing**
(B) When installing
(a) 0.785 rad. (45 °)

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Piston Ring Gap

1. Insert the piston ring into the lower part of the cylinder (the least worn out part) with piston.
2. Measure the ring gap with a thickness gauge.
3. If the measurement exceeds the allowable limit, replace the piston ring.

Piston ring gap	Top ring	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
		Allowable limit	1.20 mm 0.0472 in.
	Second ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
		Allowable limit	1.20 mm 0.0472 in.
	Oil ring	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
		Allowable limit	1.20 mm 0.0472 in.

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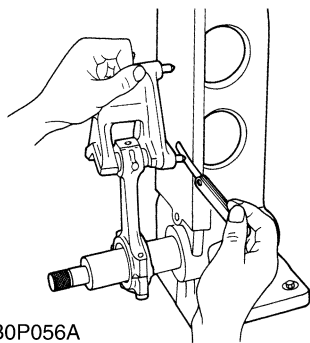
Clearance between Piston Ring and Piston Ring Groove

1. Clean the rings and the ring grooves, and install each ring in its groove.
2. Measure the clearance between the ring and the groove with a thickness gauge.
3. If the clearance exceeds the allowable limit, replace the piston ring.
4. If the clearance still exceeds the allowable limit with new ring, replace the piston.



Clearance between piston ring and piston ring groove	Second ring	Factory spec.	0.090 to 0.120 mm 0.00354 to 0.00472 in.
		Allowable limit	0.15 mm 0.0059 in.
	Oil ring	Factory spec.	0.04 to 0.08 mm 0.0016 to 0.0031 in.
		Allowable limit	0.15 mm 0.0059 in.

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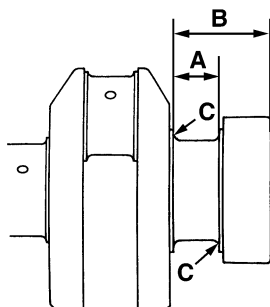
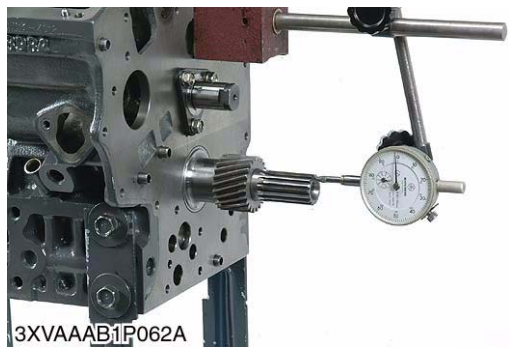
Connecting Rod Alignment

1. Remove the crankpin bearing, and install the connecting rod cap.
2. Install the piston pin in the connecting rod.
3. Install the connecting rod on the connecting rod alignment tool (Code No. 07909-31661).
4. Put a gauge over the piston pin, and move it against the face plate.
5. If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.
6. If the measurement exceeds the allowable limit, replace the connecting rod.

Space between gauge pin face plate	Allowable limit	0.05 mm 0.0020 in.
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(4) Crankshaft



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Crankshaft Side Clearance

1. Set a dial indicator with its tip on the end of the crankshaft.
2. Measure the side clearance by moving the crankshaft to the front and rear.
3. If the measurement exceeds the allowable limit, replace the thrust bearings.
4. If the same size bearing is useless because of the crankshaft journal wear, replace it with an oversize one referring to the table and figure.

Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.50 mm 0.0197 in.

(Reference)

● Oversize thrust bearing

Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	15261-23950	020 OS
	Thrust bearing 2 02	15261-23970	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	15261-23960	040 OS
	Thrust bearing 2 04	15261-23980	040 OS

● Oversize dimensions of crankshaft journal

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	23.40 to 23.45 mm 0.9134 to 0.9154 in.	23.80 to 23.85 mm 0.9213 to 0.9232 in.
Dimension B	46.1 to 46.3 mm 1.815 to 1.823 in.	46.3 to 46.5 mm 1.823 to 1.831 in.
Dimension C	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
(0.8-S) The crankshaft journal must be fine-finished to higher than ▽▽▽▽		

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Crankshaft Alignment

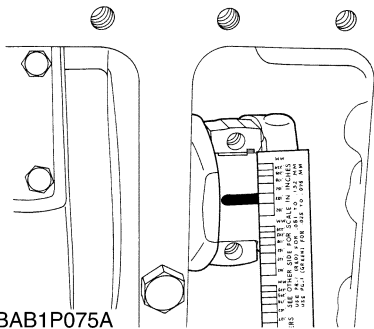
1. Support the crankshaft with V blocks on the surface plate at both end journals.
2. Set a dial indicator with its tip on the intermediate journal.
3. Measure the crankshaft alignment.
4. If the measurement exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.
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Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage (Code No.: 07909-30241) on the centre of the crankpin.
3. Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.
4. Measure the amount of the flattening with the scale, and get the oil clearance.
5. If the oil clearance exceeds the allowable limit, replace the crankpin bearing.
6. If the same size bearing is useless because of the crankpin wear, replace it with an undersize one referring to the table and figure.

■ NOTE

- Never insert the plastigage into the crankpin oil hole.
- Be sure not to move the crankshaft while the connecting rod screws are tightened.

Oil clearance between crankpin and crankpin bearing	Factory spec.	0.020 to 0.051 mm 0.00079 to 0.00201 in.
	Allowable limit	0.15 mm 0.0059 in.

Crankpin O.D.	Factory spec.	33.959 to 33.975 mm 1.33697 to 1.33760 in.
Crankpin bearing I.D.	Factory spec.	33.995 to 34.010 mm 1.33893 to 1.33898 in.

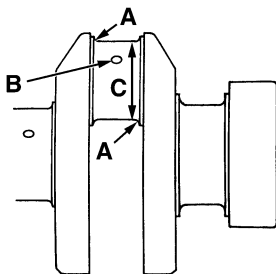
(Reference)

- Undersize crankpin bearing

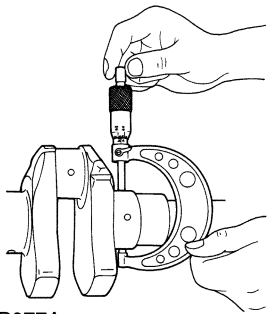
Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankpin bearing 02	15861-22970	020 US
0.4 mm 0.016 in.	Crankpin bearing 04	15861-22980	040 US

- Undersize dimensions of crankpin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius
Dimension B	4 mm dia. 0.16 in. dia.	4 mm dia. 0.16 in. dia.
Dimension C	33.759 to 33.775 mm dia. 1.32910 to 1.32973 in. dia.	33.559 to 33.575 mm dia. 1.32112 to 1.32185 in. dia.
(0.8-S) The crankpin must be fine-finished to higher than ▽▽▽▽		



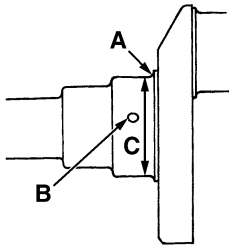
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Oil Clearance between Crankshaft Journal and Crankshaft Bearing 1

1. Measure the O.D. of the crankshaft front journal with an outside micrometer.
2. Measure the I.D. of the crankshaft bearing 1 with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the crankshaft bearing 1.
4. If the same size bearing is useless because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.

Oil clearance between crankshaft journal and crankshaft bearing 1	Factory spec.	0.034 to 0.106 mm 0.00134 to 0.00417 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D.	Factory spec.	39.934 to 39.950 mm 1.57221 to 1.57284 in.
Crankshaft bearing 1 I.D.	Factory spec.	39.984 to 40.040 mm 1.57417 to 1.57638 in.

(Reference)

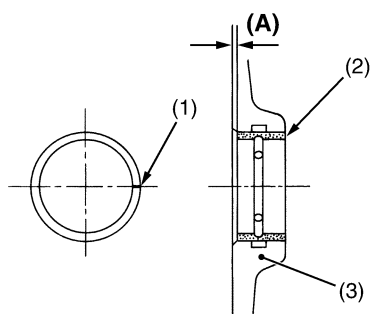
● Undersize crankshaft bearing 1

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 1 02	15861-23910	020 US
0.4 mm 0.016 in.	Crankshaft bearing 1 04	15861-23920	040 US

● Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
Dimension B	5 mm dia. 0.20 in. dia.	5 mm dia. 0.20 in. dia.
Dimension C	39.734 to 39.750 mm dia. 1.56433 to 1.56496 in. dia.	39.534 to 39.550 mm dia. 1.55646 to 1.55709 in. dia.
(0.8-S) The crankpin must be fine-finished to higher than ▽▽▽▽		

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Replacing Crankshaft Bearing 1

(When removing)

1. Press out the used crankshaft bearing 1 using a crankshaft bearing 1 replacing tool. (Refer to "SPECIAL TOOLS".)

(When installing)

1. Clean a new crankshaft bearing 1 and crankshaft journal bore, and apply engine oil to them.
2. Using a crankshaft bearing 1 replacing tool, press in a new bearing 1 (2) so that its seam (1) directs toward the exhaust manifold side. (See figure.)

Dimension (A)	Factory spec.	0.0 to 0.3 mm 0.0 to 0.0118 in.
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(1) Seam

(A) Dimension

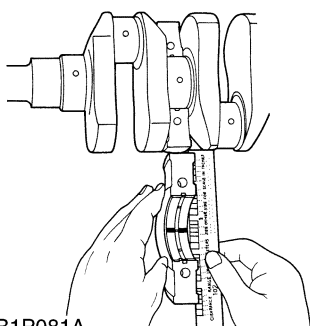
(2) Crankshaft Bearing 1

(3) Cylinder Block

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Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2 (Crankshaft Bearing 3)

1. Put a strip of plastigage (Code No. 07909-30241) on the center of the journal.
2. Install the bearing case and tighten the bearing case screws 1 to the specified torque, and remove the bearing case again.
3. Measure the amount of the flattening with the scale, and get the oil clearance.
4. If the oil clearance exceeds the allowable limit, replace the crankshaft bearing 2 (crankshaft bearing 3).
5. If the same size bearing is useless because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.



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NOTE

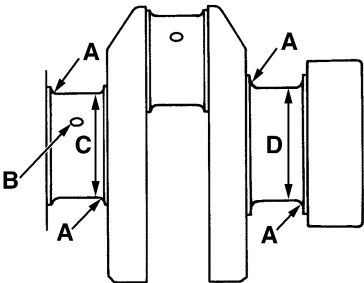
- Be sure not to move the crankshaft while the bearing case screws are tightened.

Oil clearance between crankshaft journal and crankshaft bearing 2 (Crankshaft bearing 3)	Factory spec.	0.028 to 0.059 mm 0.00110 to 0.00232 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D. (Flywheel side)	Factory spec.	43.934 to 43.950 mm 1.72968 to 1.73031 in.
Crankshaft bearing 2 I.D.	Factory spec.	43.978 to 43.993 mm 1.73142 to 1.73201 in.

Crankshaft journal O.D. (Intermediate)	Factory spec.	39.934 to 39.950 mm 1.57221 to 1.57284 in.
Crankshaft bearing 3 I.D.	Factory spec.	39.978 to 39.993 mm 1.57394 to 1.57453 in.

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Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2 (Crankshaft Bearing 3) (Continued)

(Reference)

- Undersize crankshaft bearing 2 and 3

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 2 02	15694-23930	020 US
	Crankshaft bearing 3 02	15861-23860	020 US
0.4 mm 0.016 in.	Crankshaft bearing 2 04	15694-23940	040 US
	Crankshaft bearing 3 04	15861-23871	040 US

- Undersize dimensions of crankshaft journal

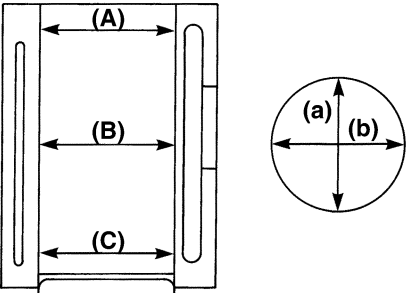
Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
Dimension B	3 mm dia. 0.12 in. dia.	3 mm dia. 0.12 in. dia.
Dimension C	39.734 to 39.750 mm dia. 1.56433 to 1.56496 in. dia.	39.534 to 39.550 mm dia. 1.55646 to 1.55709 in. dia.
Dimension D	43.734 to 43.750 mm dia. 1.72181 to 1.72244 in. dia.	43.534 to 43.550 mm dia. 1.71394 to 1.7147 in. dia.
(0.8-S) The crankpin must be fine-finished to higher than ▽▽▽▽		

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(5) Cylinder



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Cylinder Wear

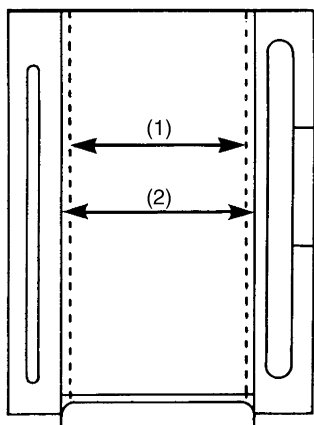
1. Measure the I.D. of the cylinder at the six positions (see figure) with a cylinder gauge to find the maximum and minimum I.D.'s.
2. Get the difference (Maximum wear) between the maximum and the minimum I.D.'s.
3. If the wear exceeds the allowable limit, bore and hone to the oversize dimension. (Refer to "Correcting Cylinder".)
4. Visually check the cylinder wall for scratches. If deep scratches are found, the cylinder should be bored. (Refer to "Correcting Cylinder".)

Cylinder I.D.	Factory spec.	67.000 to 67.019 mm 2.63779 to 2.63854 in.
	Allowable limit	67.169 mm 2.6445 in.

- (A) Top
(B) Middle
(C) Bottom (Skirt)

- (a) Right-angled to Piston Pin
(b) Piston Pin Direction

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3EEABAB1P156A

Correcting Cylinder

1. When the cylinder is worn beyond the allowable limit, bore and hone it to the specified dimension.

Cylinder I.D. [Oversize]	Factory spec.	67.250 to 67.269 mm 2.64764 to 2.64839 in.
	Allowable limit	67.419 mm 2.65429 in.
Finishing	Horn to 1.2 to 2.0 μ m Rmax. ▽▽▽▽ (0.000047 to 0.000079 in. Rmax.)	

2. Replace the piston and piston rings with oversize ones.

Oversize	Part Name	Code Number	Marking
0.25 mm 0.0098 in.	Piston	1E051-21900	025
	Piston ring assembly	16853-21090	025

NOTE

- When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.

- (1) Cylinder I.D. [Before Correction] (2) Cylinder I.D. [Oversize]

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(6) Oil Pump



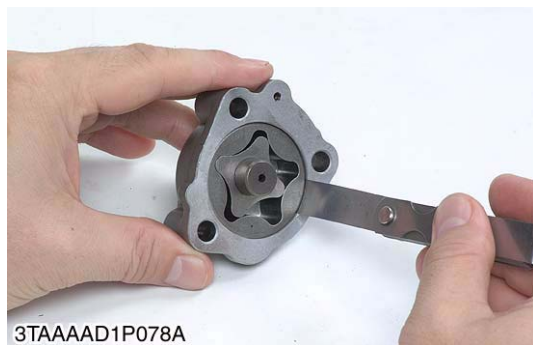
3TAAAD1P077A

Rotor Lobe Clearance

1. Measure the clearance between lobes of the inner rotor and the outer rotor with a thickness gauge.
2. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Rotor lobe clearance	Factory spec.	0.03 to 0.14 mm 0.0012 to 0.0055 in.
----------------------	---------------	---

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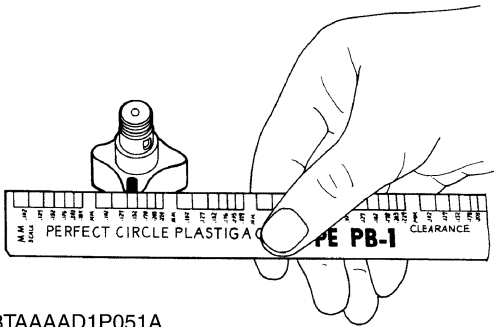
3TAAAD1P078A

Clearance between Outer Rotor and Pump Body

1. Measure the clearance between the outer rotor and the pump body with a thickness gauge.
2. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory spec.	0.07 to 0.15 mm 0.0028 to 0.0059 in.
---	---------------	---

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3TAAAD1P051A

Clearance between Rotor and Cover

1. Put a strip of plastigage (Code No. 07909-30241) onto the rotor face with grease.
2. Install the cover and tighten the screws.
3. Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.
4. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between rotor and cover	Factory spec.	0.075 to 0.135 mm 0.00295 to 0.00531 in.
-----------------------------------	---------------	---

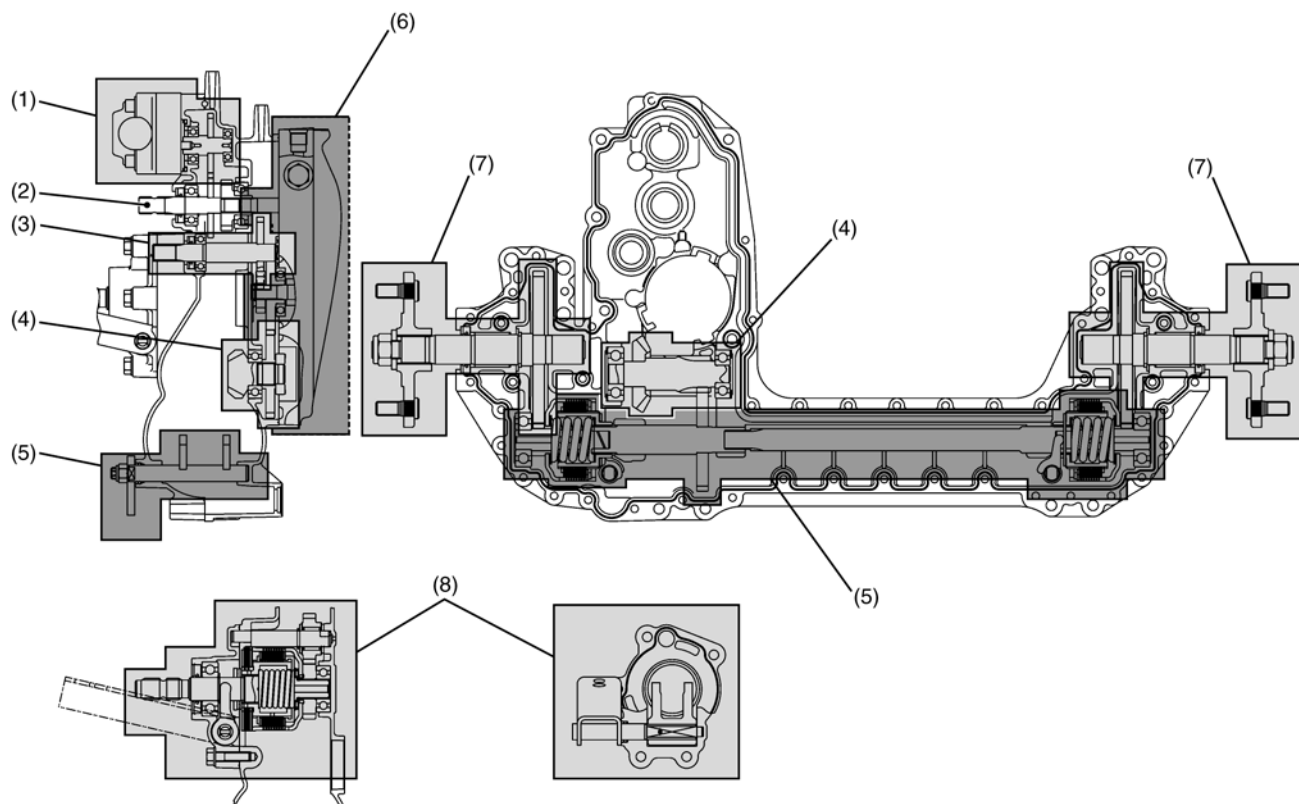
000000918E

2 TRANSAXLE

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1. STRUCTURE



3GLAAAEKP001A

- | | | | |
|----------------------------|-------------------------------|------------------------------|-----------------------|
| (1) Hydraulic Pump Section | (3) Front Wheel Drive Section | (5) Glide Steer Section | (7) Rear Axle Section |
| (2) Input Shaft | (4) Bevel Gear Section | (6) Hydrostatic Transmission | (8) Mower PTO Section |

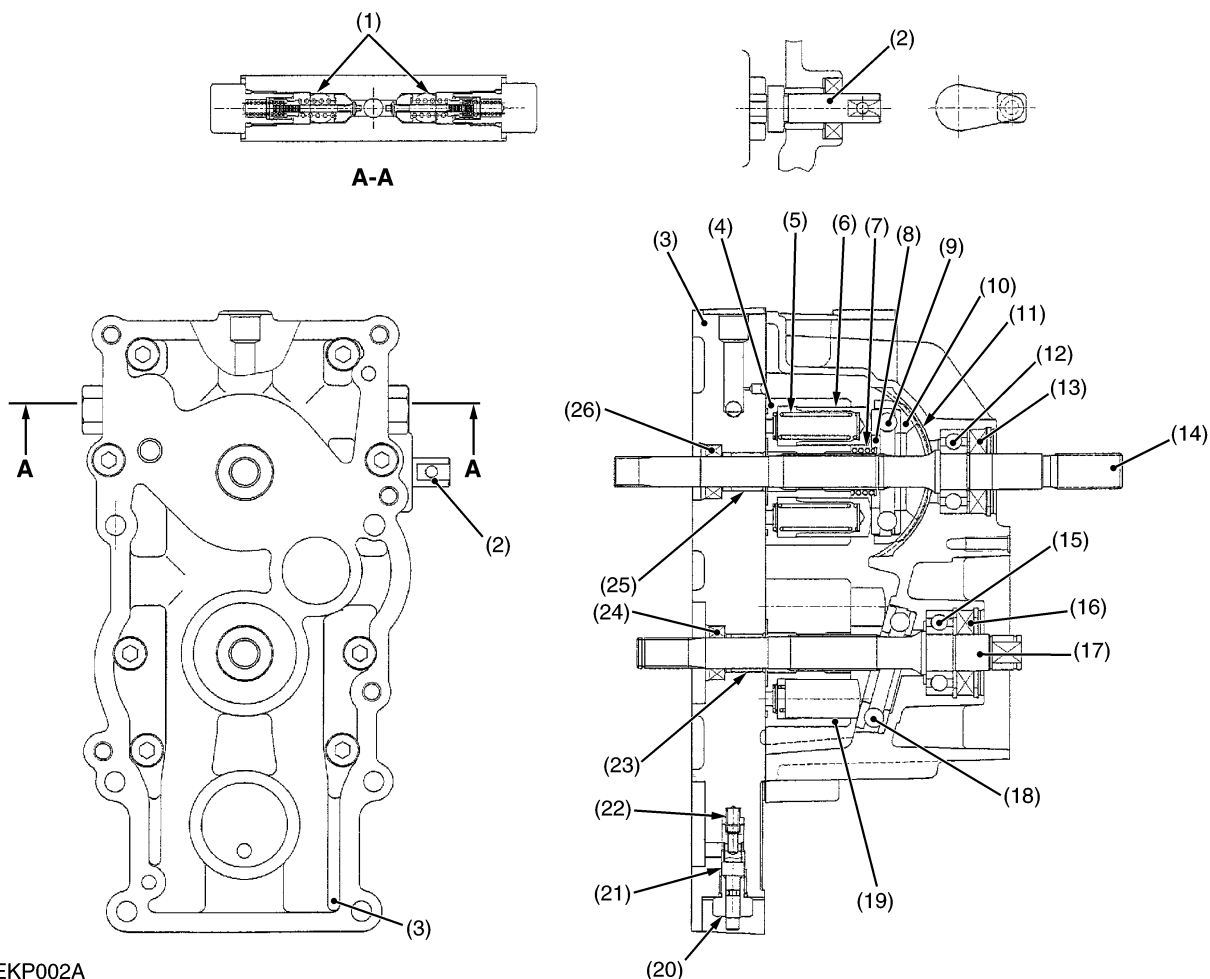
The transaxle of this machine is constructed as shown above. This machine is equipped with left and right clutches in transaxle.

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2. TRAVELLING SYSTEM

[1] HYDROSTATIC TRANSMISSION

(1) Structure



3GLAAAEKP002A

- | | | | |
|--|-----------------------------|-----------------------------|----------------------|
| (1) Check and High Pressure Relief Valve | (7) Spring (Cylinder Block) | (14) Pump Shaft | (21) By-pass Spool |
| (2) Trunnion Arm | (8) Washer | (15) Ball Bearing | (22) By-pass Spring |
| (3) Center Section | (9) Thrust Ball Bearing | (16) Oil Seal | (23) Journal Bearing |
| (4) Cylinder Block (Pump) | (10) Swashplate | (17) Motor Shaft | (24) Oil Seal |
| (5) Piston Spring | (11) Cradle Bearing | (18) Thrust Ball Bearing | (25) Journal Bearing |
| (6) Piston | (12) Ball Bearing | (19) Cylinder Block (Motor) | (26) Oil Seal |
| | (13) Oil Seal | (20) By-pass Plug | |

Hydrostatic Transmission (HST) consists of a variable displacement piston pump, a fixed displacement piston motor, two check and high pressure relief valves (1) and a by-pass valve.

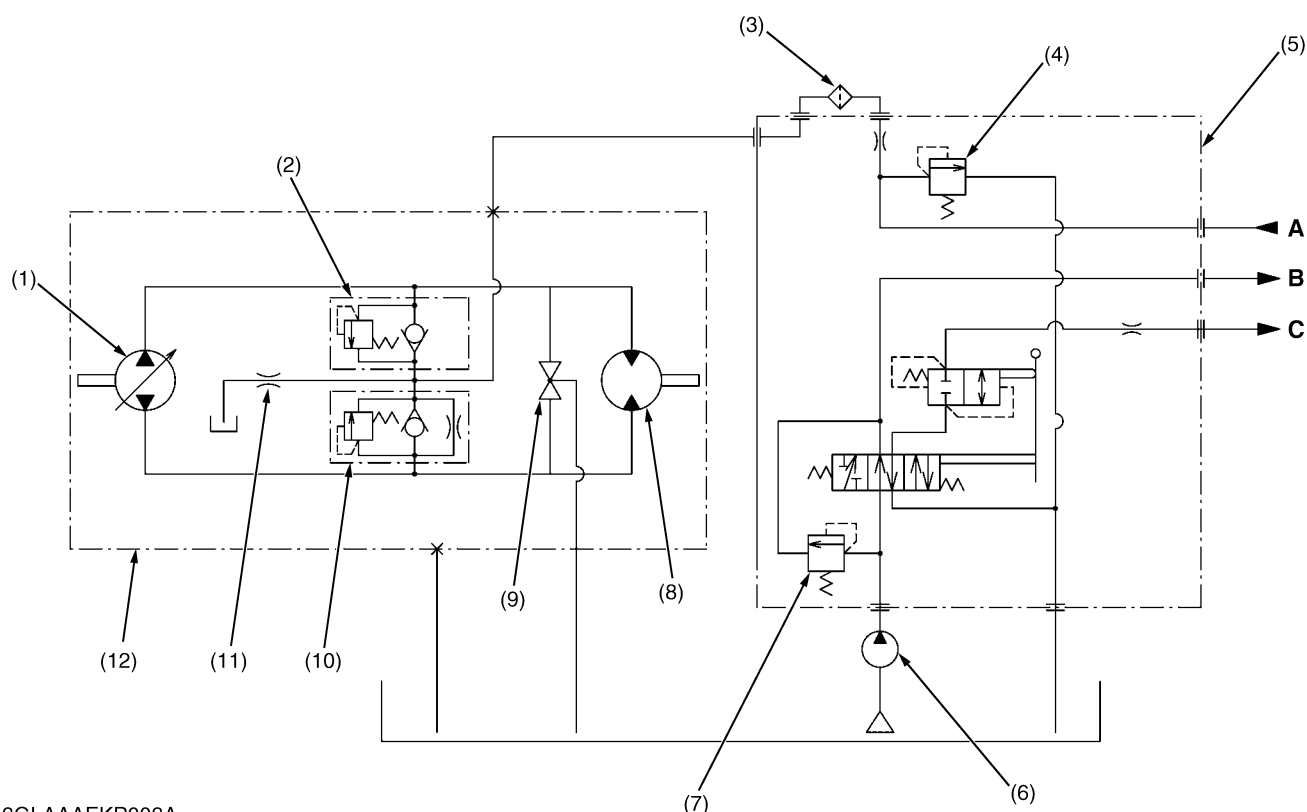
The pump and motor have five pistons (6) in their own cylinder block (4), (19).

The discharge rate of the HST is 10 cm³/rev. (0.61 cu.in./rev.).

With the speed change pedal connecting to the trunnion arm (2) in HST via a link mechanism, the speed change pedal permits simple operation of the machine, starting, stopping and increasing or decreasing speed.

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(2) Oil Flow



3GLAAAEKP003A

- | | | | |
|--|--------------------------------------|---|---|
| (1) Pump | (5) Hydraulic Control Valve Assembly | (9) By-pass Valve | A : From Power Steering Controller |
| (2) Check and High Pressure Relief Valve (Forward) | (6) Hydraulic Pump | (10) Check and High Pressure Relief Valve (Reverse) | B : To Power Steering Controller |
| (3) Filter Cartridge | (7) Main Relief Valve | (11) Lubricating Orifice | C : To Mower Lift Cylinder |
| (4) HST Relief Valve | (8) Motor | (12) Hydrostatic Transmission | |

The closed oil-hydraulic loop connects between the pump (1) and the motor (8) in HST.

Oil from the hydraulic pump (1) flows through the hydraulic control valve assembly (5) to the power steering controller. Then the oil flows back from the power steering controller to the hydraulic control valve assembly (5), and further flows through the filter cartridge (3).

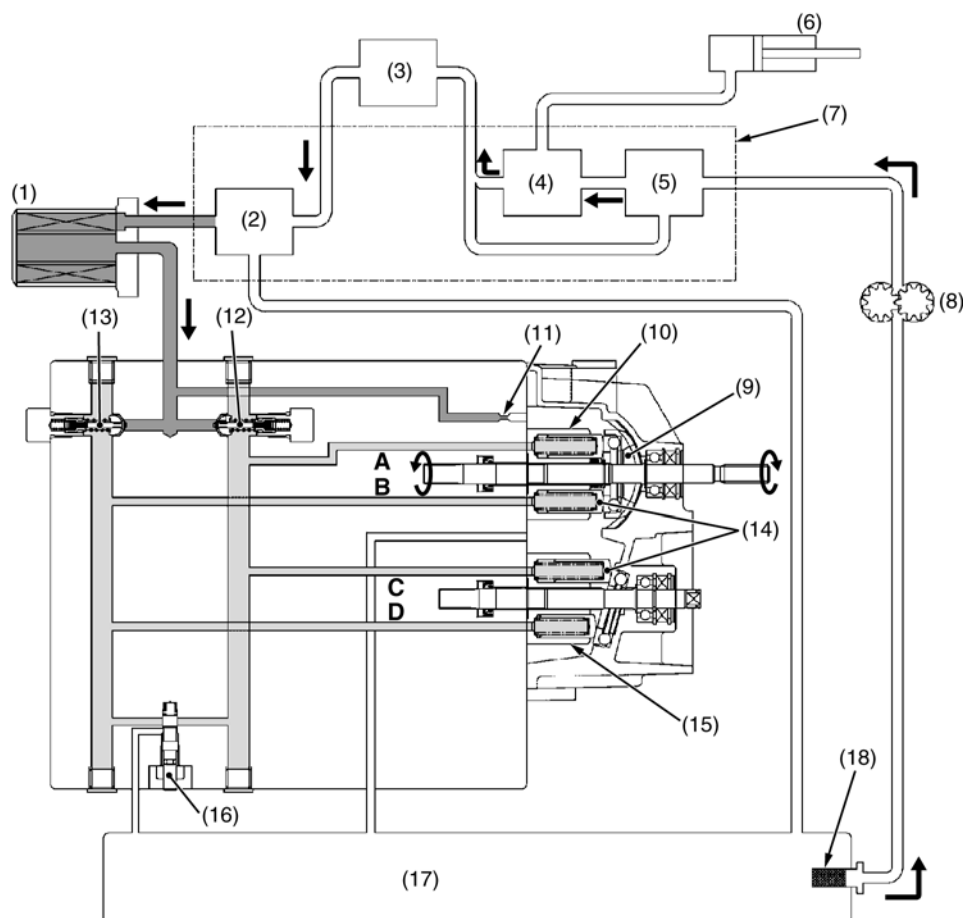
The HST relief valve (4) provides the functionality of a charge relief valve. Therefore, the oil passed through the filter cartridge is routed to HST as charge oil.

Overflow oil from the HST housing flows back to the transaxle.

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(3) Operation

■ Neutral



3GLAAEKP004A

High Pressure Charge Pressure Low Pressure

- | | | | |
|-------------------------------|--------------------------------------|---|-----------------------------|
| (1) Filter Cartridge | (7) Hydraulic Control Valve Assembly | (11) Lubricating Orifice | (14) Piston |
| (2) HST Relief Valve | (8) Hydraulic Pump | (12) Check and High Pressure Relief Valve (Reverse) | (15) Cylinder Block (Mower) |
| (3) Power Steering Controller | (9) Swashplate | (13) Check and High Pressure Relief Valve (Forward) | (16) By-pass Valve |
| (4) Control Valve | (10) Cylinder Block (Pump) | | (17) Transaxle Case |
| (5) Main Relief Valve | | | (18) Oil Strainer |
| (6) Mower Lift Cylinder | | | |

Engine revolution rotates the pump shaft via the universal joint.

Being engaged with each other, the pump shaft and the cylinder block (10) in the pump rotate together.

With the speed change pedal in the neutral position, the swashplate (9) in the pump is at right angles to the pump pistons.

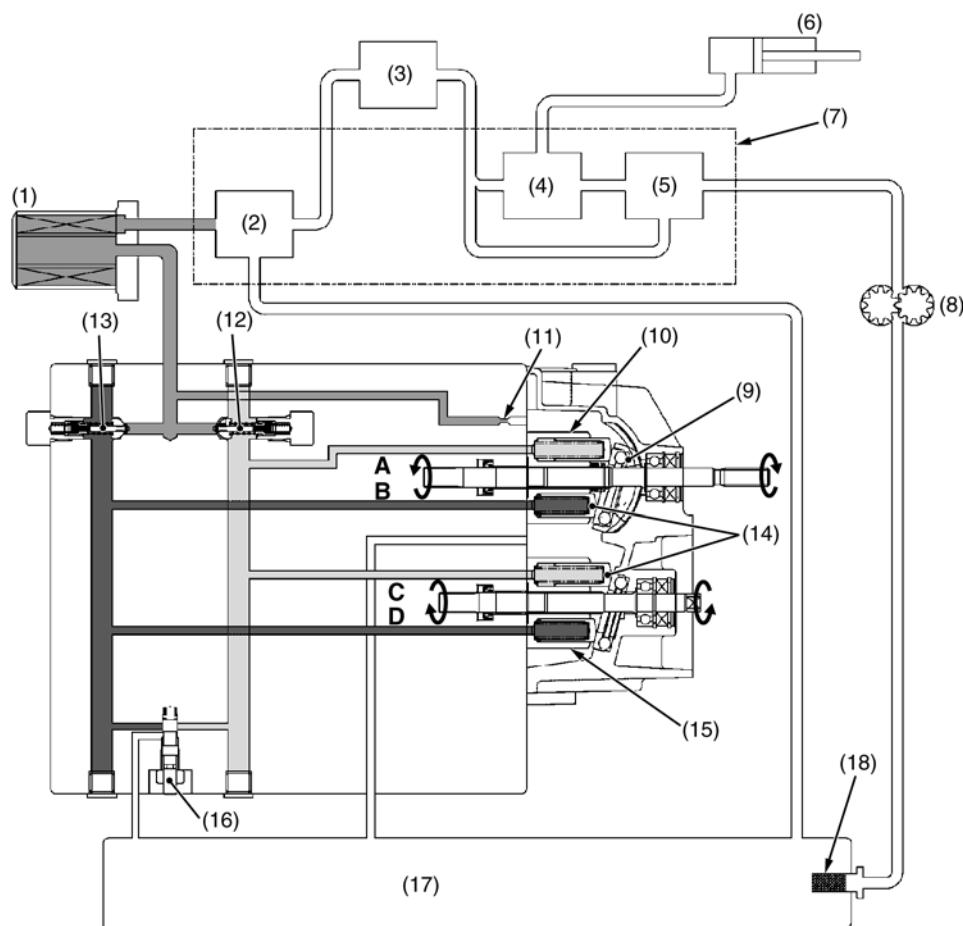
The pump pistons rotate with the pump cylinder block (10) without reciprocating motion.

At this time, since the pump pistons do not generate pressure, no pressure is transmitted to the motor pistons, thus causing neither rotation of the motor cylinder block (15) nor that of the motor shaft engaged with it.

Thus the machine is stationary.

0000010099E

■ Forward



3GLAAAEKP005A

High Pressure
 Charge Pressure
 Low Pressure

- | | | | |
|-------------------------------|--------------------------------------|---|-----------------------------|
| (1) Filter Cartridge | (7) Hydraulic Control Valve Assembly | (11) Lubricating Orifice | (14) Piston |
| (2) HST Relief Valve | (8) Hydraulic Pump | (12) Check and High Pressure Relief Valve (Reverse) | (15) Cylinder Block (Mower) |
| (3) Power Steering Controller | (9) Swashplate | (13) Check and High Pressure Relief Valve (Forward) | (16) By-pass Valve |
| (4) Control Valve | (10) Cylinder Block (Pump) | | (17) Transaxle Case |
| (5) Main Relief Valve | | | (18) Oil Strainer |
| (6) Mower Lift Cylinder | | | |

Stepping on the speed change pedal to the forward position inclines the HST trunnion arm, causing the pump swashplate (9) to incline as shown in the figure.

The pump pistons rotate with the pump cylinder block (10) while reciprocating.

At this time, the pump pistons generate pressure by reciprocating motion. The pressure generated is transmitted to the motor pistons (Port **B** - Port **D**).

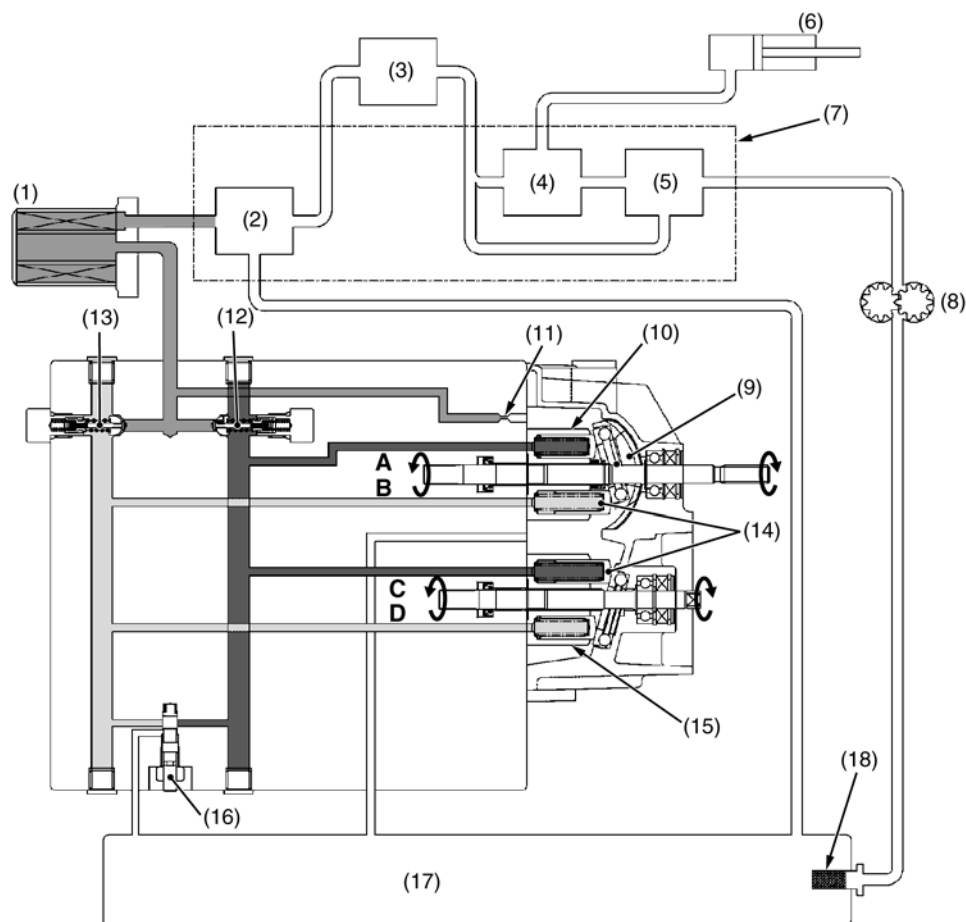
Pressure from the port **D** thrusts the motor pistons to the surface of the inclined thrust ball bearing, causing them to slide on the inclined surface.

This causes the motor cylinder block (15) and the motor shaft engaged with it to rotate.

This causes the machine to move forward. The inclination of the pump swashplate (9) determines the motor shaft speed.

0000010100E

■ Reverse



3GLAAAEKP006A

High Pressure Charge Pressure Low Pressure

- | | | | |
|-------------------------------|--------------------------------------|---|-----------------------------|
| (1) Filter Cartridge | (7) Hydraulic Control Valve Assembly | (11) Lubricating Orifice | (14) Piston |
| (2) HST Relief Valve | (8) Hydraulic Pump | (12) Check and High Pressure Relief Valve (Reverse) | (15) Cylinder Block (Mower) |
| (3) Power Steering Controller | (9) Swashplate | (13) Check and High Pressure Relief Valve (Forward) | (16) By-pass Valve |
| (4) Control Valve | (10) Cylinder Block (Pump) | | (17) Transaxle Case |
| (5) Main Relief Valve | | | (18) Oil Strainer |
| (6) Mower Lift Cylinder | | | |

Stepping on the speed change pedal to the reverse position inclines the HST trunnion arm in the direction opposite to that at moving forward, causing the pump swashplate (9) to incline as shown in the figure.

The pump pistons rotate with the pump cylinder block (10) while reciprocating.

At this time, the pump pistons generate pressure by reciprocating motion. The pressure generated is transmitted to the motor pistons (Port **A** - Port **C**).

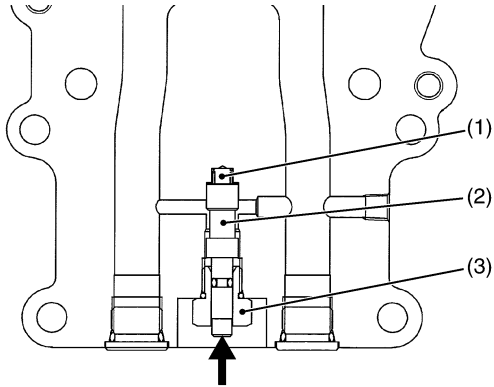
Pressure from the port **C** thrusts the motor pistons to the surface of the inclined thrust ball bearing, causing them to slide on the inclined surface.

This causes the motor cylinder block (15) and the motor shaft engaged with it to rotate.

This causes the machine to move reverse. The inclination of the pump swashplate (9) determines the motor shaft speed.

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(4) By-pass Valve



3GLAAADKP008A

Normally, when the engine is stopped, the pump shaft and pump cylinder block engaged with it do not rotate. Thus, the motor shaft does not rotate.

However, pressing the by-pass valve in the center section permits moving the machine with human power while the engine is stopped. The following paragraphs describe this mechanism:

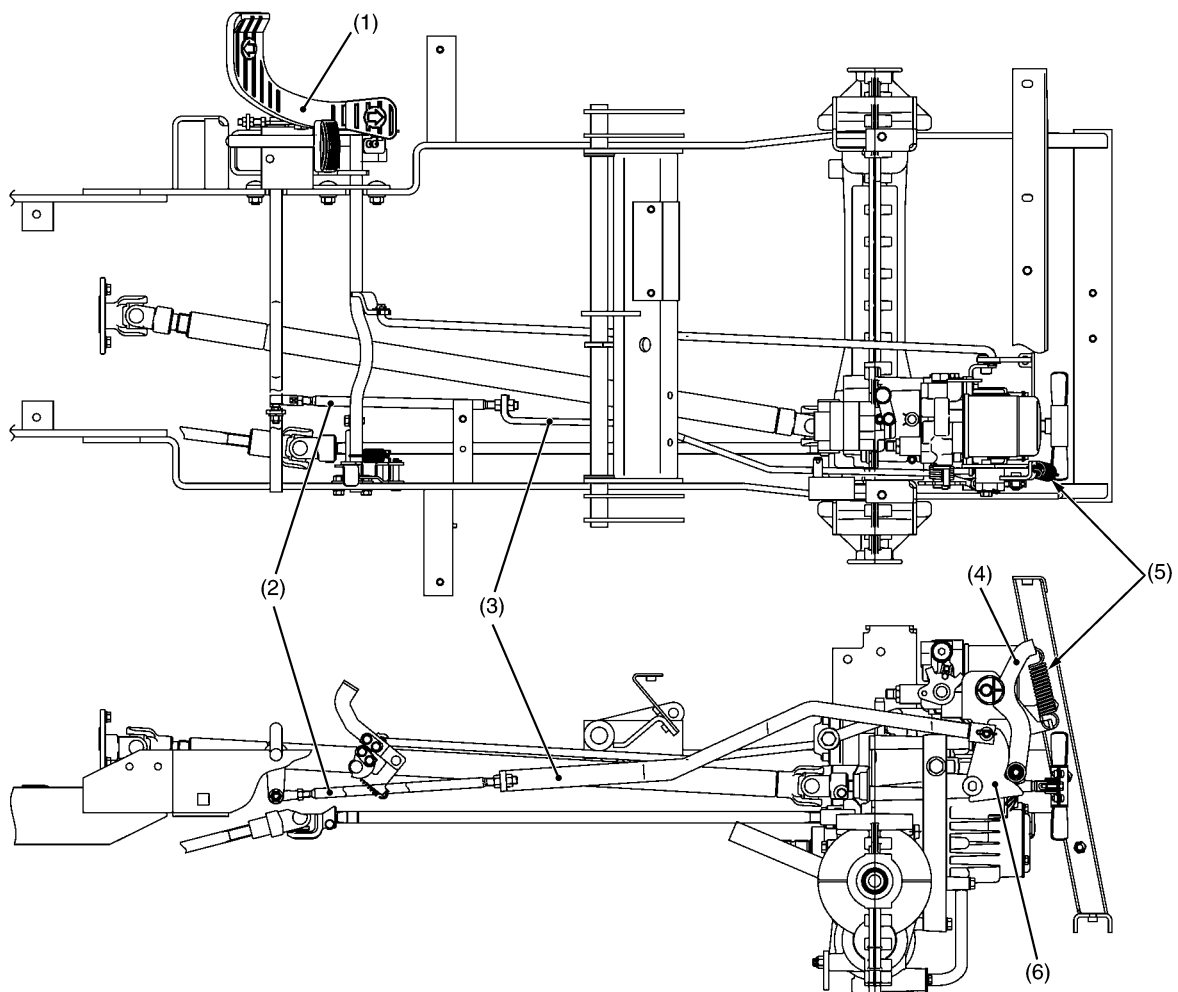
Pressing the by-pass valve connects the forward and reverse loops in the center section. This allows oil to flow between the forward and reverse loops through the by-pass valve to rotate only the motor cylinder block.

This means that pressing the by-pass valve while the engine is stopped, that is, while the pump shaft is not rotating, permits rotating the motor shaft engaged with the motor cylinder block.

- | | |
|--------------------|------------------|
| (1) By-pass Spring | (3) By-pass Plug |
| (2) By-pass Spool | |

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(5) Control Linkage



3GLAAAEKP007A

- | | | | |
|------------------------|------------------------|--------------------|-----------------------|
| (1) Speed Change Pedal | (3) Speed Change Plate | (5) Neutral Spring | (6) Speed Control Arm |
| (2) Speed Change Rod | (4) Neutral Arm | | |

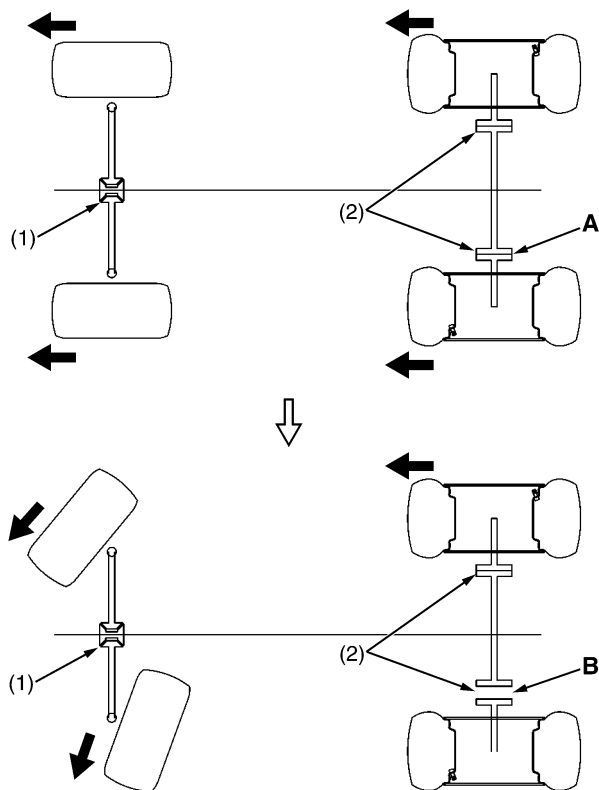
The speed change pedal (1) and the trunnion arm of variable swashplate are linked with the speed change rod (2), speed change plate (3) and the speed control arm (6). As the front of the pedal is depressed, the swashplate rotates and forward travelling speed increases. Depressing the rear end increases reverse speed.

The speed control arm (6) is returned to neutral position by the neutral arm (4) and the tension of neutral spring (5). At the same time, the swashplate is returned to neutral, when the pedal is released.

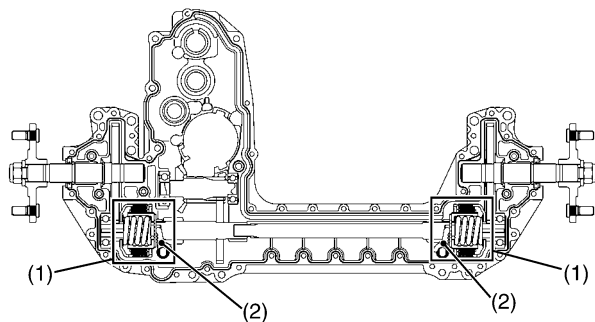
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[2] GLIDE STEER SECTION

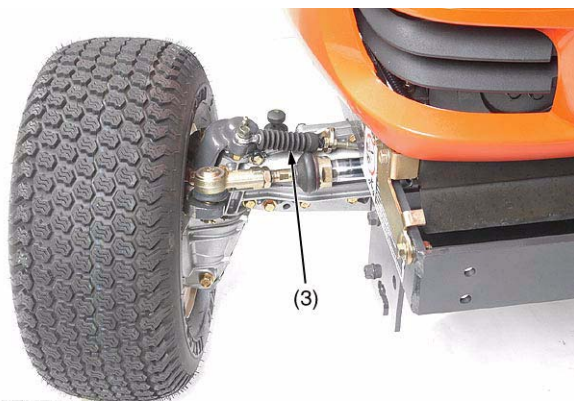
(1) General



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3GLAAAEKP009A



3GLAAAEKP010A

This machine is equipped with the Glide Steer system.

On turning, the Glide Steer system provides a mechanism that allows a turf-friendly minimum turn by driving the front wheels and the rear wheel on the outside of the turn at the same time.

- | | |
|-------------------------------|----------------------|
| (1) Differential Gear (Front) | A : Engage |
| (2) Steering Clutch | B : Disengage |

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This machine has left and right steering clutches (1) in the rear transaxle.

The clutch lever (2) is connected to the king pin support on the front axle with the wire (3). When turning left or right, the wire connecting to the king pin support on the front axle disengages only the steering clutch of the turn side. This shuts off driving power to the rear wheel on the inside of the turn.

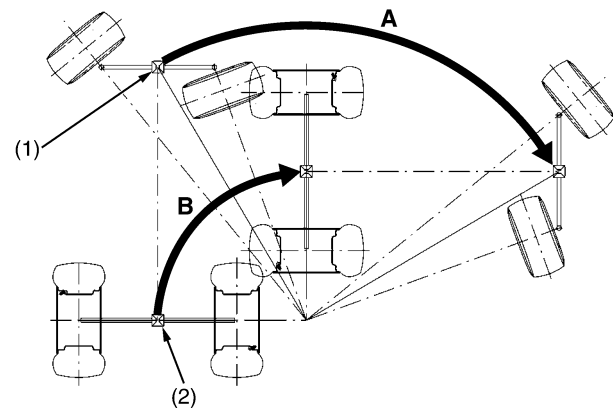
On the other hand, the rear wheel on the outside of the turn has driving power.

- | | |
|---------------------|----------|
| (1) Steering Clutch | (3) Wire |
| (2) Clutch Lever | |

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The following paragraphs describe how the machines equipped with normal 4WD and the Glide Steer turn.

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■ For Normal 4WD

The machine with four wheels has a wheel base.

Because of this, turning the machine creates a difference in the length of tracks made by the differential gears in the front axle and in the rear axle.

Assuming that the average speeds of the right and left front wheels and of the right and left rear wheels are equal to those of the differential gears in the front axle and in the rear axle, respectively.

Also assuming that the speeds of the differential gears in the front axle and in the rear axle are the same, the right and left rear wheels will free-spin by the difference in the length of tracks, causing damage to turf.

A large steering angle of the front axle results in a shorter turning radius of the machine. But a larger steering angle makes an even larger difference in the length of tracks made by differential gears in the front axle and in the rear axle.

Therefore, on a minimum turn, the right and left rear wheels will have more free-spins, causing greater damage to turf.

- (1) Differential Gear (Front)

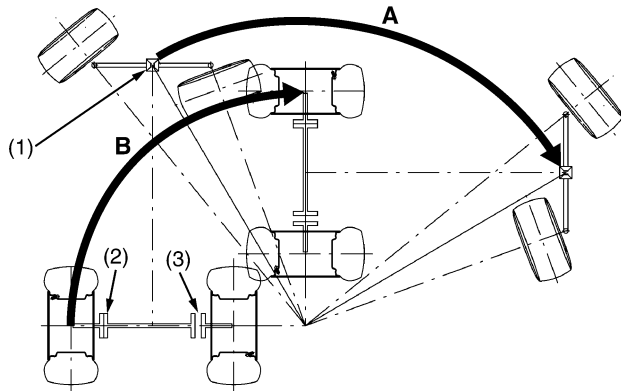
(2) Differential Gear (Rear)
- A : Track made by

Differential Gear (Front)

B : Track made by

Differential Gear (Rear)

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■ For Glide Steer System

In the Glide Steer system, driving power is transmitted only to the right and left front wheels and the rear wheel on the outside of the turn. The rear wheel on the inside of the turn does not receive driving power.

Assuming that the speeds of the differential gear in the front axle and of the rear wheel on the outside of the turn are the same.

At this time, even with a larger steering angle of the front axle, the difference in the length of tracks made by the differential gear in the front axle and the rear wheel on the outside of the turn is smaller than 4WD.

Therefore, on a minimum turn, the right and left rear wheels will have fewer free-spins, thus providing a turn-friendly mechanism.

- (1) Differential Gear (Front)

(2) Steering Clutch (Engaged)

(3) Steering Clutch (Disengaged)
- A : Track made by

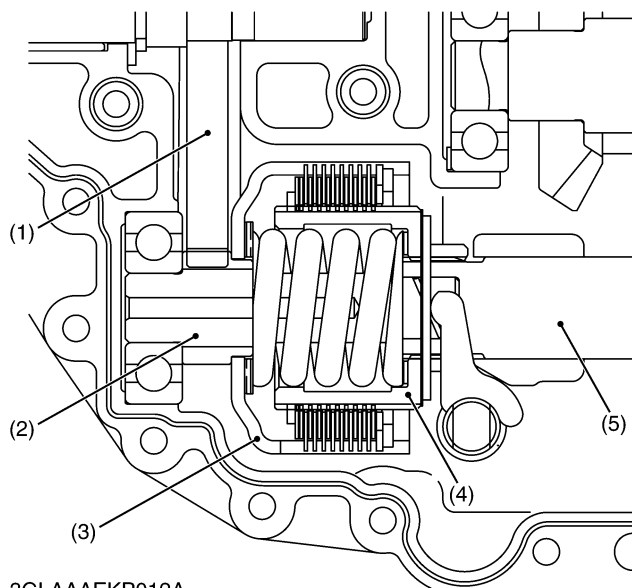
Differential Gear (Front)

B : Track made by

Rear Wheel on Outside of Turn

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(2) Operation



■ On Going Straight

On going straight, the right and left steering clutches in transaxle are engaged to transmit driving power to the right and left rear wheels. At this time, all four wheels drive the machine.

Spring tension pushes the spline boss (4) in the steering clutch toward the inside of the machine, which eliminates the clearance between clutch disc and friction plate, causing friction necessary to transmit driving power.

The spline boss (4) is engaged with 42T gear shaft (5) (for right wheels, with right drive shaft). The clutch case (3) is engaged with the 11T gear shaft (2).

Driving power is transmitted to the 42T gear shaft (5). Then the driving power is transmitted to the right and left rear wheels as follows.

● Rear wheel (LH) :

42T gear shaft (5) → Spline boss (4) → Clutch case (3) → 11T gear shaft (2) → 65T gear shaft (1) → Rear wheel (LH)

● Rear wheel (RH) :

42T gear shaft (5) → Right drive shaft → Spline boss → Clutch case → 11T gear shaft → 65T gear shaft → Rear wheel (RH)

- | | |
|--------------------|--------------------|
| (1) 65T Gear Shaft | (4) Spline Boss |
| (2) 11T Gear Shaft | (5) 42T Gear Shaft |
| (3) Clutch Case | |

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■ On Turning Right or Left

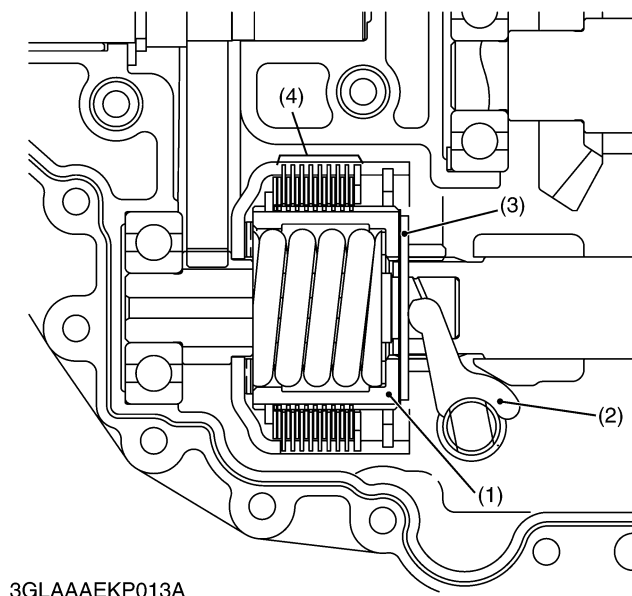
On turning right or left, the steering clutch on the inner side of the turn is disengaged. No driving power is transmitted to the rear wheels on the inside of the turn. At this time, right and left front wheels and the rear wheel on the outside of the turn drive the machine.

When the front wheels are turned by steering wheel rotation, the king pin support in the direction of turn pulls the wire, and then the wire rotates the clutch lever (2). The clutch lever (2) pushed the spline boss (1) via the clutch collar (3). This creates clearance between clutch disc and friction plate (4), causing no friction, thus shutting off driving power.

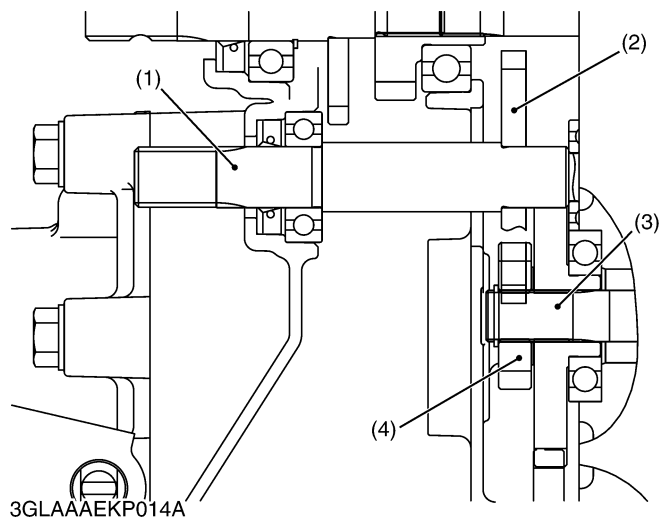
The steering clutch becomes disengaged when the steering wheel rotates to reach a front axle steering angle from 0.17 to 0.44 rad (10 to 25 degree).

- | | |
|------------------|------------------------------------|
| (1) Spline Boss | (3) Clutch Collar |
| (2) Clutch Lever | (4) Clutch Disc and Friction Plate |

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[3] FRONT WHEEL DRIVE SECTION



This machine always has the front axle driven.
Driving power is transmitted to the front axle as follows :

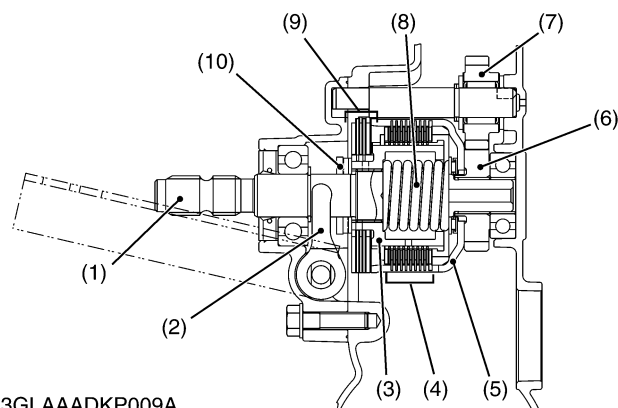
Motor shaft (3) → 15T gear (4) → 29T gear (2) →
Front wheel drive shaft (1)

- | | |
|-----------------------------|-----------------|
| (1) Front Wheel Drive Shaft | (3) Motor Shaft |
| (2) 29T Gear | (4) 15T Gear |

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3. MOWER PTO SYSTEM

[1] MOWER PTO CLUTCH



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The mower PTO clutch is equipped with mechanical independent clutches of wet multi-plates type.

The PTO shaft (1) is engaged with the spline boss (3).

The clutch case (5) is engaged with the 24T gear (6).

Normally, spring (8) tension pushes the spline boss (3) in the PTO clutch toward the front side of the machine, which creates clearance between clutch disc and friction plate (4), causing no friction.

Thus, no driving power is transmitted between spline boss (3) and clutch case (5), that is, no driving power is transmitted to the PTO shaft (1).

- | | |
|------------------------------------|-----------------------------------|
| (1) PTO Shaft | (6) 24T Gear |
| (2) Clutch Lever | (7) 19T-2 Gear |
| (3) Spline Boss | (8) Spring |
| (4) Clutch Disc and Friction Plate | (9) Brake Disc and Friction Plate |
| (5) Clutch Case | (10) Thrust Collar |

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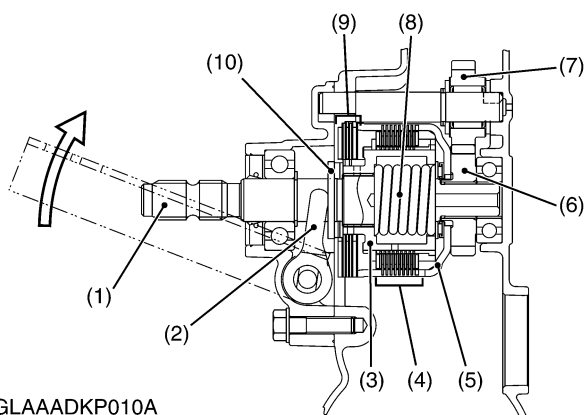
■ PTO "Engaged"

When the PTO lever is set at the **"Engaged"** position, the clutch lever (2) connected to the PTO lever via a link mechanism rotates to the rear side of the machine.

The clutch lever pushes the spline boss (3) toward the rear side of the machine via the thrust collar (10), which eliminates the clearance between the clutch disc and friction plate (4), causing friction necessary to transmit driving power.

This allows driving power to be transmitted as follows:

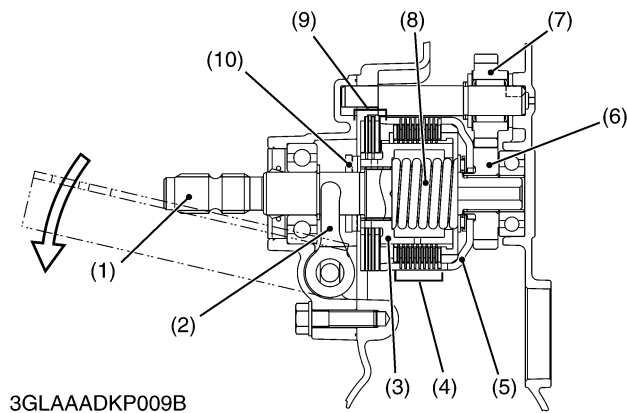
19T-2 Gear (7) → 24T Gear (6) → Clutch Case (5) → Spline Boss (3) → PTO Shaft (1)



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- | | |
|------------------------------------|-----------------------------------|
| (1) PTO Shaft | (6) 24T Gear |
| (2) Clutch Lever | (7) 19T-2 Gear |
| (3) Spline Boss | (8) Spring |
| (4) Clutch Disc and Friction Plate | (9) Brake Disc and Friction Plate |
| (5) Clutch Case | (10) Thrust Collar |

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3GLAAADKP009B

■ PTO "Disengaged"

When the PTO lever is set at the **"Disengaged"** position, the clutch lever (2) connected to the PTO lever via a link mechanism rotates to the front side of the machine.

Spring (8) tension pushes the spline boss (3) toward the front side of the machine, which creates clearance between the clutch disc and friction plate (4), causing no friction.

This eliminates the clearance between brake discs and friction plate (9), causing friction.

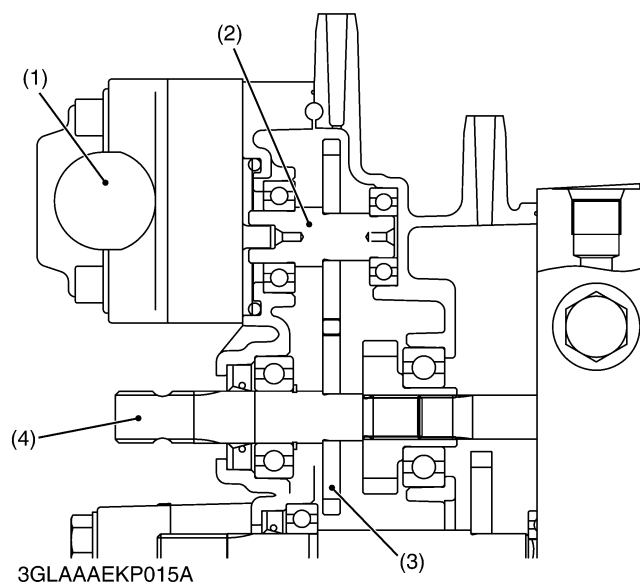
Driving power to the PTO shaft (1) is thus shut off and brake engages to prevent the PTO shaft (1) from free-spinning.

- | | |
|------------------------------------|-----------------------------------|
| (1) PTO Shaft | (6) 24T Gear |
| (2) Clutch Lever | (7) 19T-2 Gear |
| (3) Spline Boss | (8) Spring |
| (4) Clutch Disc and Friction Plate | (9) Brake Disc and Friction Plate |
| (5) Clutch Case | (10) Thrust Collar |

000009205E

4. OTHERS

[1] HYDRAULIC PUMP SECTION



The hydraulic pump (1) is mounted on the transaxle case.

The power to drive the hydraulic pump (1) is transmitted as follows :

Input shaft (4) → 25T gear (3) on input shaft → Hydraulic pump gear shaft (2)

- | | |
|-------------------------------|-----------------|
| (1) Hydraulic Pump | (3) 25T Gear |
| (2) Hydraulic Pump Gear Shaft | (4) Input Shaft |

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(1) Hydrostatic Transmission	2-S27
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1. TROUBLESHOOTING

Symptom	Probable Cause		Solution	Reference Page
System Will Not Operate in Either Direction	● Oil level is low		Fill oil to proper level	G-8, 2-S11
	● Control linkage defective (Speed change pedal to speed control arm)		Repair control linkage	2-S7, 15
	● Charge pressure is too low	● Oil filter cartridge clogged	Replace oil filter cartridge	G-31
		● HST relief valve defective	Replace HST relief valve	6-S11
		● Hydraulic pump defective	Replace hydraulic pump	6-S8
	● Check and high pressure relief valve defective		Replace check and high pressure relief valve	2-S20
	● By-pass valve defective		Replace by-pass valve	2-S20
Vibration and Noise	● Oil level is low		Fill oil to proper level	G-8, 2-S11
	● Control linkage defective (Speed change pedal to speed control arm)		Repair control linkage	2-S7, 15
	● Charge pressure is too low	● Oil filter cartridge clogged	Replace oil filter cartridge	G-31
		● HST relief valve defective	Replace HST relief valve	6-S11
		● Hydraulic pump defective	Replace hydraulic pump	6-S8
	● Check and high pressure relief valve defective		Replace check and high pressure relief valve	2-S20
	● By-pass valve defective		Replace by-pass valve	2-S20
Vibration and Noise	● HST component parts defective		Replace HST assembly	2-S18

Less of Power	● Oil level is low		Fill oil to proper level	G-8, 2-S11
	● Control linkage defective (Speed change pedal to speed control arm)		Repair control linkage	2-S7, 15
	● Charge pressure is too low	● Oil filter cartridge clogged	Replace oil filter cartridge	G-31
		● HST relief valve defective	Replace HST relief valve	6-S11
		● Hydraulic pump defective	Replace hydraulic pump	6-S8
	● Check and high pressure relief valve defective		Replace check and high pressure relief valve	2-S20
	● By-pass valve defective		Replace by-pass valve	2-S20
Oil Heat Over	● Oil level is low		Fill oil to proper level	G-8, 2-S11
	● Excessive machine load		Reduce machine load	—
	● Charge pressure is too low	● Oil filter cartridge clogged	Replace oil filter cartridge	G-31
		● HST relief valve defective	Replace HST relief valve	6-S11
		● Hydraulic pump defective	Replace hydraulic pump	6-S8
	● Control linkage defective (Speed change pedal to speed control arm)		Repair control linkage	2-S7, 15
	● Improper adjustment of neutral arm holder shaft		Adjust	2-S6
System Operates in One Direction Only	● Control linkage defective (Speed change pedal to speed control arm)		Repair control linkage	2-S7, 15
	● Check and high pressure relief valve defective		Replace check and high pressure relief valve	2-S20

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BEVEL GEAR SECTION

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	● Improper backlash between 11T bevel gear and 17T-13T gear shaft	Adjust	2-S32
	● Bearing worn	Replace	—
	● Insufficient or improper type of transmission fluid used	Replenish or change	G-8, 2-S11
Noise while Turning	● Bearing worn	Replace	—

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GLIDE STEER SECTION

Symptom	Probable Cause	Solution	Reference Page
The Driving Power is not Transmitted to Rear Wheel at the Time of Going Straight	● Steering clutch disc worn	Replace	2-S27, 31
	● Friction plate worn	Replace	2-S27, 32
	● Clutch spring weaken or broken	Replace	2-S27
	● Improper adjustment of wire	Adjust	2-S16, 4-S5
The Driving Power to Rear Wheel on inside of Turn is not Shut Off at the Time of Turning	● Steering clutch disc and friction plate are agglutinated	Replace	2-S27
	● Improper adjustment of wire	Adjust	2-S16, 4-S5
	● Wire broken	Replace	2-S16, 4-S7

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MOWER PTO SECTION

Symptom	Probable Cause	Solution	Reference Page
PTO Clutch Slip	● Improper length of PTO rod spring	Adjust	2-S13
	● PTO rod spring weaken or broken	Replace	2-S13
	● Clutch disc or friction plate excessively worn	Replace	2-S23, 30
PTO Shaft Does Not Rotate	● PTO clutch malfunctioning	Repair or replace	2-S22, 23
	● Bearing broken	Replace	2-S22
PTO Clutch Drags	● Brake plate excessive worn	Replace	2-S23, 31
	● Clutch spring weaken or broken	Replace	2-S23, 30
	● Deformation of plate	Replace	2-S23

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2. SERVIVING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
HST Relief Valve (Oil temperature at 50 °C, 122 °F)	Setting Pressure	0.9 to 1.1 MPa 9.2 to 11.2 kgf/cm ² 130.6 to 159.5 psi	—
High relief pressure	Setting Pressure	18.5 to 22.2 MPa 189 to 226 kgf/cm ² 2684 to 3263 psi	—
PTO Clutch Disc	Thickness	1.3 to 1.5 mm 0.051 to 0.059 in.	1.2 mm 0.047 in.
Pressure Plate	Thickness	1.55 to 1.65 mm 0.061 to 0.065 in.	1.50 mm 0.059 in.
Friction Plate 1	Thickness	1.55 to 1.65 mm 0.061 to 0.065 in.	1.50 mm 0.059 in.
Friction Plate 2	Thickness	0.75 to 0.85 mm 0.030 to 0.034 in.	0.70 mm 0.028 in.
Clutch Spring	Free Length	45 mm 1.77 in.	42 mm 1.65 in.
PTO brake disc 1	Thickness	2.85 to 3.05 mm 0.11 to 0.12 in.	2.75 mm 0.108 in.
PTO Brake Disc	Thickness	3.3 to 3.5 mm 0.13 to 0.14 in.	3.0 mm 0.118 in.
Brake Friction Plate 1	Thickness	1.75 to 1.85 mm 0.069 to 0.073 in.	1.60 mm 0.063 in.
Brake Friction Plate 2	Thickness	0.95 to 1.05 mm 0.037 to 0.041 in.	0.80 mm 0.031 in.
Clutch spline plate	Thickness	0.75 to 0.85 mm 0.030 to 0.033 in.	0.70 mm 0.028 in.
Steering clutch disc	Thickness	1.3 to 1.5 mm 0.051 to 0.059 in.	1.2 mm 0.047 in.
Friction plate	Thickness	0.75 to 0.85 mm 0.030 to 0.033 in.	0.70 mm 0.028 in.
Clutch plate	Thickness	1.55 to 1.65 mm 0.061 to 0.065 in.	1.50 mm 0.059 in.
11T Bevel Gear Shaft to 17T-13T Gear Shaft	Backlash	0.10 to 0.30 mm 0.0039 to 0.0012 in.	—

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3. TIGHTENING TORQUES

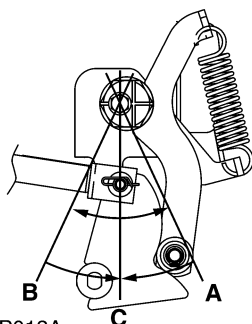
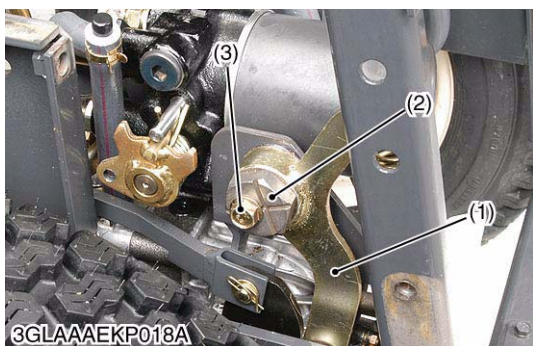
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-9)

Item	N·m	kgf·m	ft-lbs
Brake plate mounting screw	35 to 40	3.47 to 4.07	25.1 to 29.5
Universal joint mounting screw	9.8 to 11.3	1.00 to 1.15	7.23 to 8.33
Power steering pipe mounting nut	20.0 to 25.0	2.04 to 2.54	14.76 to 18.43
Rear wheel mounting nut	77.5 to 90.2	7.91 to 9.19	57.2 to 66.5
Transaxle mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Hydrostatic transmission mounting screw	23.5 to 27.5	2.4 to 2.8	17.3 to 20.3
Hydrostatic transmission mounting screw 2	17.7 to 20.6	1.8 to 2.1	13.1 to 15.2
Center section mounting hex. socket head screw	17.7 to 20.6	1.8 to 2.1	13.1 to 15.2
By-pass valve plug	15.0	1.53	11.1
Check valve plug	30.0	3.06	22.1
Hydraulic pump mounting screw	17.7 to 20.6	1.8 to 2.1	13.1 to 15.2
PTO clutch assembly mounting screw	17.7 to 20.6	1.8 to 2.1	13.1 to 15.2
Transaxle case screw	7.8 to 8.8	0.8 to 0.9	5.8 to 6.5

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



Adjustment of HST Neutral Position

1. Lift up the front and rear of the machine, and support it with disassembling jacks.
 2. Remove the left rear wheel.
 3. Start the engine, and set at approx. 1500 to 3000 min⁻¹ (rpm).
 4. Loosen the holder shaft mounting screw (3).
 5. Rotate the holder shaft (2) counterclockwise so that the rear wheels turn forward.
 6. Then rotate it clockwise until the rear wheels stop completely.
 7. Put a mark on the neutral arm (1). (Position **B**)
 8. Rotate the holder shaft (2) clockwise so that the rear wheels turn in reverse.
 9. Then rotate it counterclockwise until the rear wheels stop completely.
 10. Put a mark on the neutral arm (1). (Position **A**)
 11. Set the holder shaft (2) where it is right in the center between position **A** and **B** and tighten the holder shaft mounting screw (3) firmly.
- This means the hydrostatic transaxle is fully in neutral. (Position **C**)



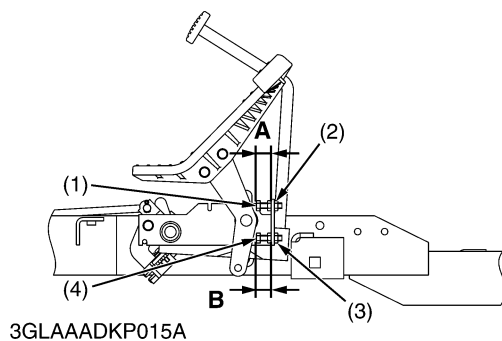
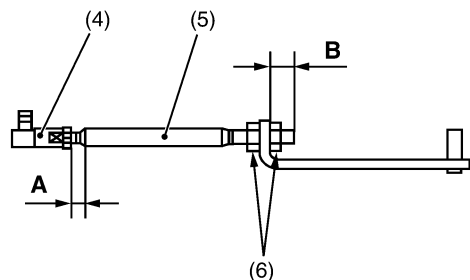
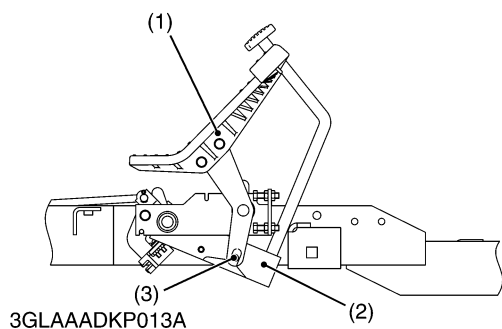
WARNING

- Use buddy system in adjusting the neutral position.
- One of you should sit on the operator's seat, adjust the engine rpm and step on the speed change pedal. The other should adjust the neutral position.

- (1) Neutral Arm
(2) Holder Shaft

- (3) Holder Shaft Mounting Screw

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Speed Change Pedal Restriction

■ NOTE

- This adjustment should be performed after completing the adjustment of neutral.

1. Set the speed change pedal (1) to "NEUTRAL" position, and apply the parking brake.
2. Check that the pin (3) of speed change pedal lock with the brake pedal arm (2).
3. If it is improper, adjust the length (A) with the rod end (4) on speed change rod.
4. Then adjust the length (B) with adjusting nut (6) on speed change rod (5).

(Reference)

- Length A : 5 mm (0.2 in.)
- Length B : 17 to 23 mm (0.67 to 0.91 in.)

- | | |
|------------------------|----------------------|
| (1) Speed Change Pedal | (4) Rod End |
| (2) Brake Pedal Arm | (5) Speed Change Rod |
| (3) Pin | (6) Adjusting Nut |

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Adjusting Maximum Speed

■ NOTE

- This adjustment should be performed after completing the adjustment of neutral.

[Forward]

1. Loose the lock nut (2) of adjusting screw.
2. Adjust the length (A) with the adjusting screw (1).

(Reference)

- Length (A) : 10 to 12 mm (0.40 to 0.47 in.)
- Traveling speed : 9.0 to 10.0 km/h (5.6 to 6.2 mph)

[Reverse]

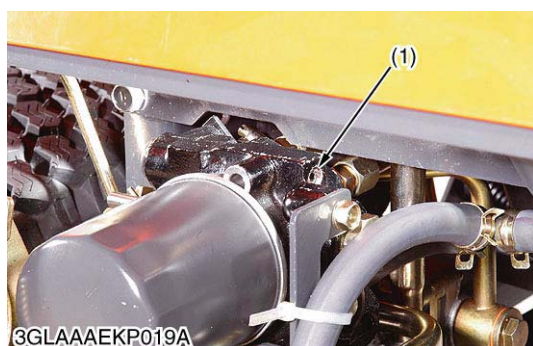
1. Loose the lock nut (3) of adjusting screw.
2. Adjust the length (B) with the adjusting screw (4).

(Reference)

- Length (B) : 12 to 15 mm (0.47 to 0.59 in.)
- Traveling speed : 4.0 to 5.0 km/h (2.5 to 3.1 mph)

- | | |
|---------------------|---------------------|
| (1) Adjusting Screw | (3) Lock Nut |
| (2) Lock Nut | (4) Adjusting Screw |

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HST Relief Pressure

⚠ CAUTION

- When checking, park the machine on level ground, apply the parking brake.
 - This checking should be performed after completing the adjustment of neutral.
1. Remove the plug (Rc 1/8) (1) from the hydraulic control valve assembly.
 2. Install the adaptor, thread joint, cable and pressure gauge.
 3. Start the engine and run engine speed at maximum speed.
 4. Read the pressure gauge to measure the HST relief pressure.
 5. If the measurement is not within the factory specification, check the HST relief valve and related hydraulic components.

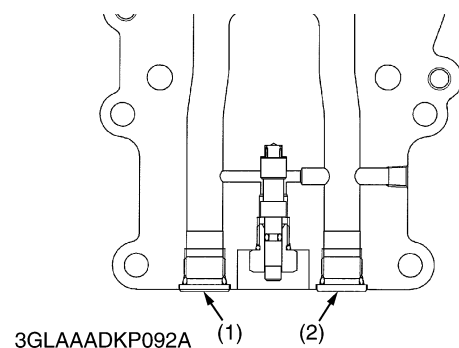
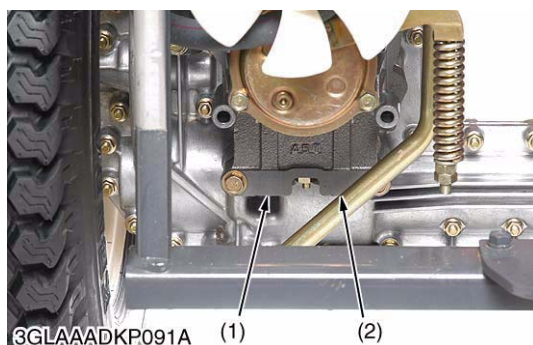
HST relief pressure	Factory spec.	0.9 to 1.1 MPa 9.2 to 11.2 kgf/cm ² 130.6 to 159.5 psi
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Condition

- Engine Speed : Maximum
- Oil Temperature : 50 °C (122 °F)

(1) Plug

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HST High Relief Pressure

⚠ CAUTION

- When checking, park the machine on level ground, apply the parking brake.
1. Remove the hexagon socket head plug (9/16-18 UNF) from **P1** (1) or **P2** (2), then install the adaptor, cable and pressure gauge.
 2. Start the engine and run it at maximum speed.
 3. Depress the speed change pedal to **forward** or **reverse**, and read the pressure gauge to measure the high relief pressure.
 4. If the measurement is not same as factory specification, check the high pressure relief valve and related hydraulic components.

HST High relief pressure	Factory spec. (Oil temperature at 50 °C, 122 °F)	18.5 to 22.2 MPa 189 to 226 kgf/cm ² , 2684 to 3263 psi
--------------------------	--	--

■ IMPORTANT

- Measure quickly so that the high pressure relief valve may not be in operation more than 10 seconds.

■ NOTE

- When reinstall the hexagon socket head plug, take care not to damage the O-ring.

(1) **P1** Port (Reverse)

(2) **P2** Port (Forward)

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[2] PREPARATION

(1) Separating Transaxle

Dismounting Mower

1. See page 8-S6. ("Mower" Section)

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Dismounting the Container



CAUTION

- **Park the machine on a firm and level ground.**
- **Stop the engine, and remove the key.**

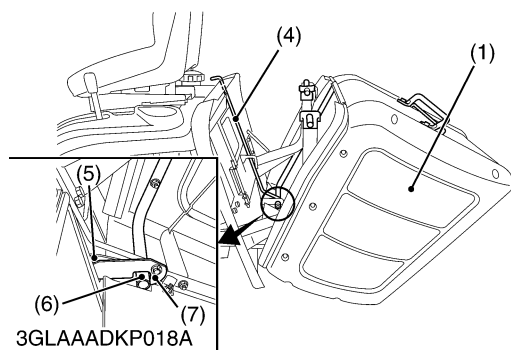
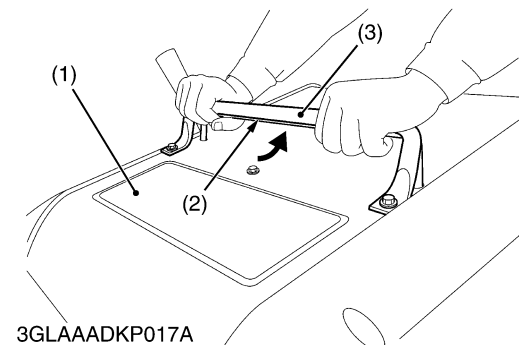
1. Grip the grass container lock handle (2) with the handle (3). Ground the grass container (1) as shown in the figure.
2. Pull the grass container lock rod (4) and hold it to hook the stopper pin.
3. Dismount the grass container (1).

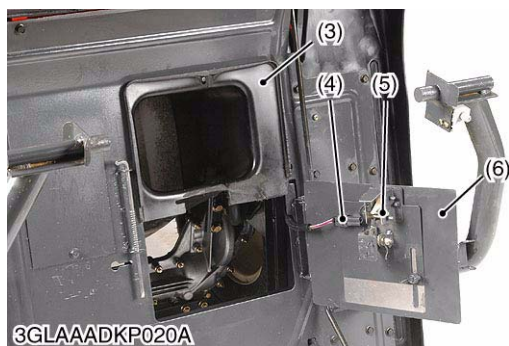
(When reassembling)

- Pull the grass container lock rod (4) and hold it to hook the stopper.
- Put the container pipe frame (6) on the stay (5).
- Release the grass container lock rod (4) so that the lock arm (7) holds the container pipe frame (6).
- Grip the grass container lock handle (2) with the handle (3). And turn the container (1) around the container pipe frame (6) that held by the lock arm (7).
- Release the grass container lock handle (2).

- | | |
|---------------------------------|--------------------------|
| (1) Grass Container | (5) Stay |
| (2) Grass Container Lock Handle | (6) Container Pipe Frame |
| (3) Handle | (7) Lock Arm |
| (4) Grass Container Lock Rod | |

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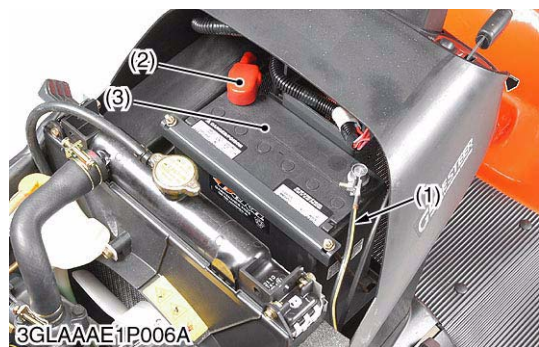
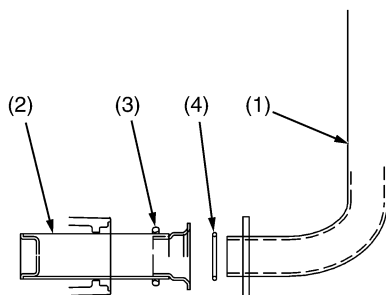
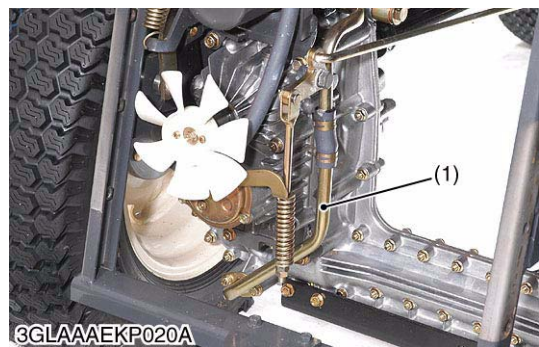


Container Base

1. Disconnect the couplers (1) from the relays.
2. Disconnect the connectors (2).
3. Open the switch cover (6). And disconnect the connector (4) from the grass container full switch (5).
4. Remove the discharge duct (3).
5. Remove the container base (7).

- | | |
|--------------------|---------------------------------|
| (1) Coupler | (5) Grass Container Full Switch |
| (2) Connector | (6) Switch Cover |
| (3) Discharge Duct | (7) Container Base |
| (4) Connector | |

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Draining Transmission Fluid

1. Place an oil pan under the transaxle.
2. Remove the suction pipe (1) at the bottom of the transaxle.
3. Remove the strainer (2) to completely drain the transmission fluid.
4. After draining, clean the strainer (2) and reinstall the strainer (2) and suction pipe (1).

(When refilling)

- Remove the filling plug with the dipstick (5).
- Fill new oil from the filling port up to the upper notch on dipstick.
- After running the engine for few minutes, stop the engine and check the oil level again, if low, add oil to prescribed level.

■ IMPORTANT

- **Use only the KUBOTA UDT or SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system.**
Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8).
- **Never work the machine immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevents damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid	Capacity	3.3 L 0.87 U.S.gals 0.73 Imp.gals
--------------------	----------	---

- | | |
|------------------|--------------------------------|
| (1) Suction Pipe | (4) O-ring |
| (2) Strainer | (5) Filling Plug with Dipstick |
| (3) O-ring | |

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Battery



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. Open the bonnet.
2. Remove the radiator net.
3. Disconnect the negative cable (1) from the battery.
4. Disconnect the positive cable (2) from the battery and remove the battery (3).

- | | |
|--------------------|-------------|
| (1) Negative Cable | (3) Battery |
| (2) Positive Cable | |

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Seat

1. Remove the snap pin (2).
2. Remove the seat (1) .

(1) Seat

(2) Snap Pin

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Fender

1. Remove the speed change pedal (5).
2. Peel the step sheet (4) halfway.
3. Remove the fuel cap (1).
4. Remove the fender (2).

(1) Fuel Cap

(4) Step Sheet

(2) Fender

(5) Speed Change Pedal

(3) Fender Mounting Screw

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Seat Base

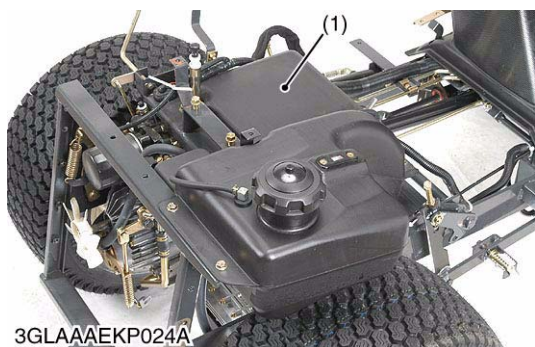
1. Loosen the seat base mounting screws 1 (1).
2. Remove the seat base mounting screws 2 (3).
3. Slide the seat base (2) and remove it.

(1) Seat Base Mounting Screw 1

(3) Seat Base Mounting Screw 2

(2) Seat Base

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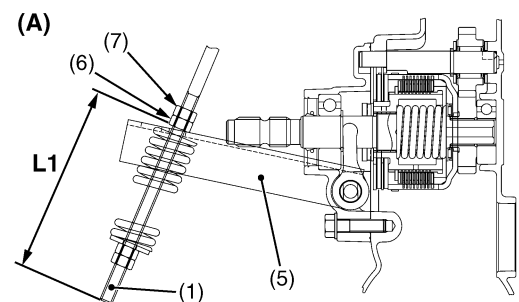
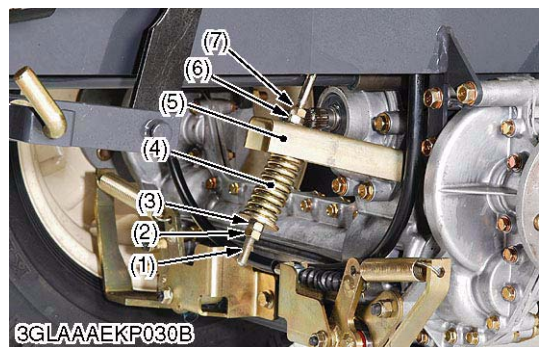


Fuel Tank

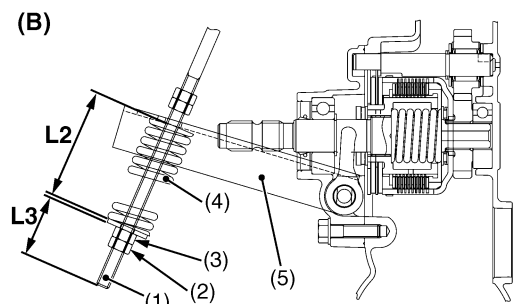
1. Drain the fuel.
2. Disconnect the fuel hoses.
3. Remove the fuel tank (1).

(1) Fuel Tank

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3GLAAADKP094A



3GLAAADKP095A

PTO Rod Spring

1. Remove the two nuts (2) (3) and spring (4).

(When reassembling)

1. Assemble a fuel tank, a seat base and a fender.
2. Setting the PTO lever at "**Disengaged**" position and lifting the PTO arm (5) slightly by hands directly, the upper side of PTO arm (5) and lower nut (6) on the upper side of PTO rod (1) make contact, and there is no play between them. Keeping this position, be sure to tighten the two nuts (6) (7) on the upper side of this PTO rod (1).
3. Assembly temporarily the spring (4) and two nuts (2) (3) to the PTO rod (1). After this, set the PTO lever at "**Engaged**" position, and then be sure to tighten two nuts (2) (3) on the lower side of PTO rod (1) so that the spring length (L2) reaches the specified value.

(When reassembling)

■ IMPORTANT

- After completing above assembling / adjustment, repeat the motion several times to set the PTO lever at "Disengaged" and "Engaged" position. Then, finally set the PTO lever at "Engaged" position. Be sure to check that the upper side of PTO arm (5) and the lower sides of two nuts (6) (7) on the upper side of PTO rod (1) are making no contact.

Spring length (L2)	Factory spec.	68 mm 2.68 in.
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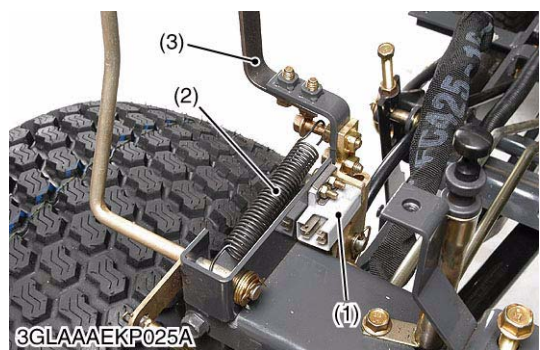
(Reference)

- Length (L1) : 115 to 118 mm (4.53 to 4.64 in.)
- Length (L3) : 38 to 40 mm (1.50 to 1.57 in.)

- | | |
|-------------|---------|
| (1) PTO Rod | (6) Nut |
| (2) Nut | (7) Nut |
| (3) Nut | |
| (4) Spring | |
| (5) PTO Arm | |

A : "Disengaged" Position
B : "Engaged" Position

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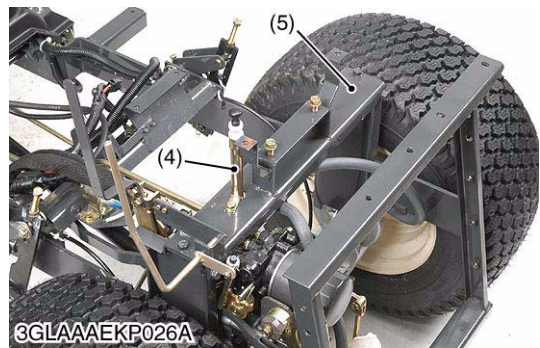


Beam

1. Disconnect the connector from the PTO switch (1).
2. Remove the spring (2) from the PTO lever (3).
3. Remove the PTO rod
4. Remove the filling pipe (4).
5. Remove the beam (5).

- | | |
|----------------|------------------|
| (1) PTO Switch | (4) Filling Pipe |
| (2) Spring | (5) Beam |
| (3) PTO Lever | |

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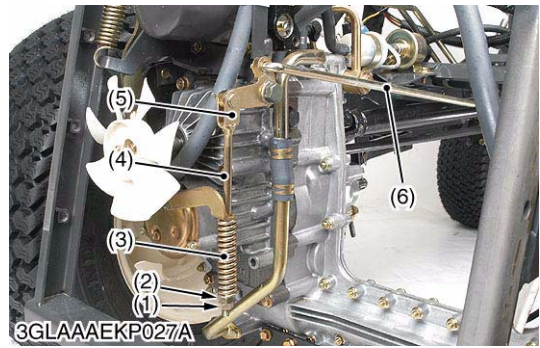
Brake Rod

1. Disconnect the brake rod 1 (6).
2. Remove the lock nut (1), plain washers (2) and brake spring (3).
3. Remove the brake plate (5).
4. Remove the brake rod 2 (4) and brake rod 1 (6).

(When reassembling)

■ IMPORTANT

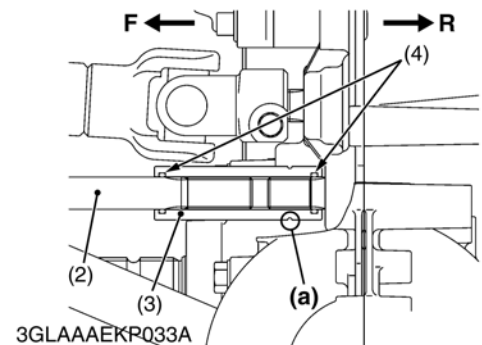
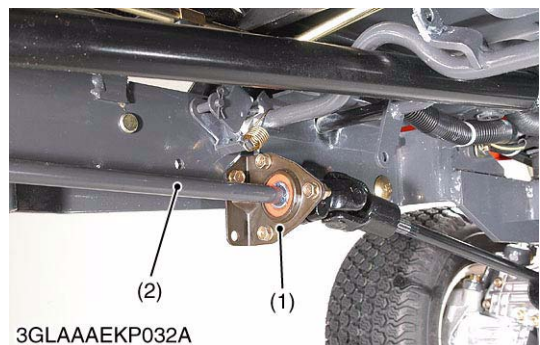
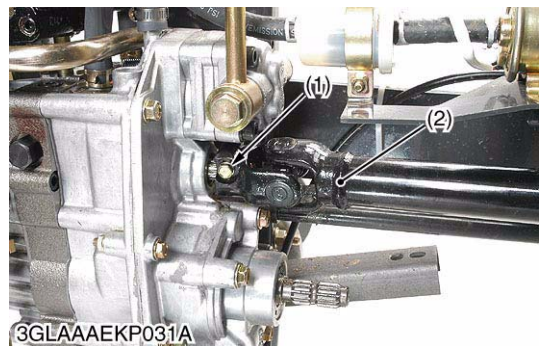
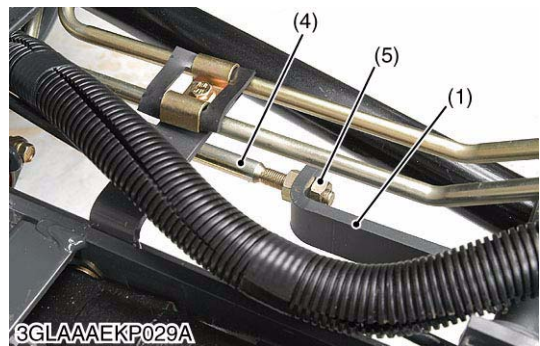
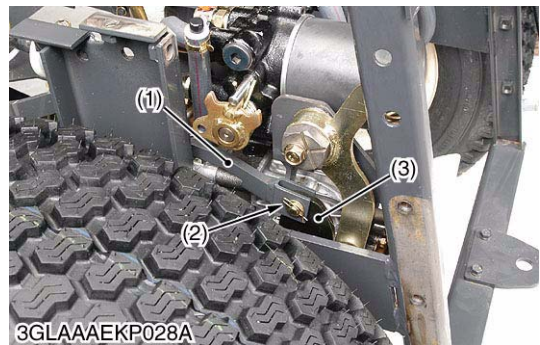
- After assembling the brake rod 1, 2 (4), (6) and brake spring (3), be sure to adjust the brake pedal free travel (see page 3-S4).



Tightening torque	Brake plate mounting screw	35 to 40 N·m 3.47 to 4.07 kgf·m 25.1 to 29.5 ft·lbs
-------------------	----------------------------	---

- | | |
|------------------|-----------------|
| (1) Lock Nut | (4) Brake Rod 2 |
| (2) Plain Washer | (5) Brake Plate |
| (3) Brake Spring | (6) Brake Rod 1 |

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Speed Control Plate

1. Remove the rue ring pin (2), and disconnect the speed change plate (1) and speed control arm (3).
2. Separate the speed change plate (1) and speed change rod (4).

■ **IMPORTANT**

- After assembling the speed change plate (1) and speed change rod (4), be sure to adjust the speed change pedal restriction (see page 2-S7).

- | | |
|------------------------|----------------------|
| (1) Speed Change Plate | (4) Speed Change Rod |
| (2) Rue Ring Pin | (5) Lock Nut |
| (3) Speed Control Arm | |

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Universal Joint

1. Remove the universal joint mounting screw (1).
2. Disconnect the universal joint (2).

(When reassembling)

- Apply grease to the splines of the universal joint.

Tightening torque	Universal joint mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.23 to 8.33 ft-lbs
-------------------	--------------------------------	--

- | | |
|------------------------------------|---------------------|
| (1) Universal Joint Mounting Screw | (2) Universal Joint |
|------------------------------------|---------------------|

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Front Wheel Drive Shaft

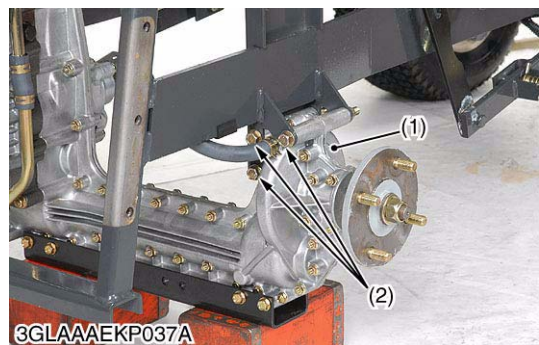
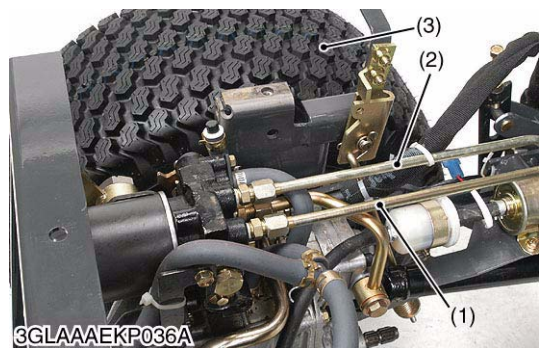
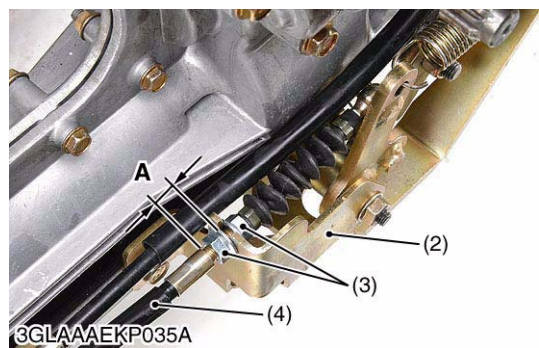
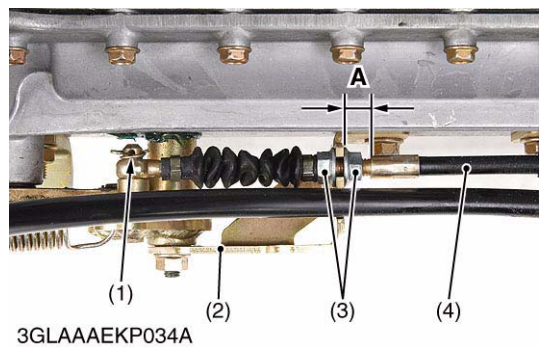
1. Remove the bearing holder (1).
2. Disconnect the front wheel drive shaft (2) and spline boss (3) from transaxle.

(When reassembling)

- Install the spline boss (3) a shown in figure.

- | | |
|-----------------------------|-------------------|
| (1) Bearing Holder | a : Groove |
| (2) Front Wheel Drive Shaft | F : Front |
| (3) Spline Boss | R : Rear |
| (4) O-ring | |

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Glide Steer Wire

1. Remove the rue ring pin (1).
2. Loose the adjusting nut (3).
3. Disconnect the Glide Steer wire (4) and wire stay (2).

(When reassembling)

- Adjust the length "A" with adjusting nut (3) on the Glide Steer wire (4).

(Reference)

- Length "A" : 10 to 12 mm (0.40 to 0.47 in.).

- | | |
|------------------|----------------------|
| (1) Rue Ring Pin | (3) Adjusting Nut |
| (2) Wire Stay | (4) Glide Steer Wire |

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Power Steering Pipe and Rear Wheel

1. Disconnect the power steering pipes (1) (2).
2. Remove the rear wheel (3).

(When reassembling)

Tightening torque	Power steering pipe	20.0 to 25.0 N·m 2.04 to 2.54 kgf·m 14.76 to 18.43 ft-lbs
	Rear wheel mounting nut	77.5 to 90.2 N·m 7.91 to 9.19 kgf·m 57.2 to 66.5 ft-lbs

- | | |
|---|----------------|
| (1) Power Steering Pipe
(To Power Steering Controller) | (3) Rear Wheel |
| (2) Power Steering Pipe
(From Power Steering Controller) | |

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Separating Transmission

1. Remove the transaxle mounting screws (2).
2. Separate the transaxle (1) from the frame.

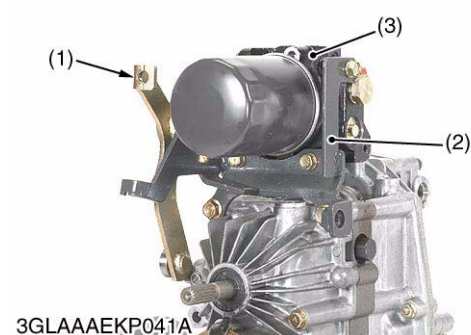
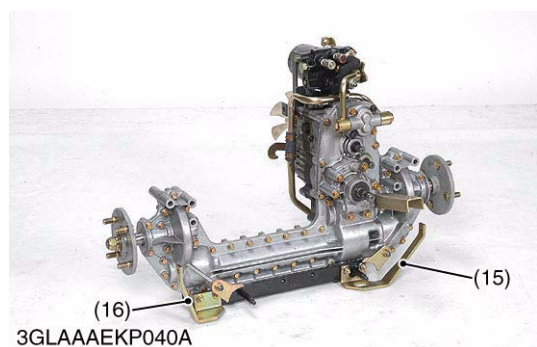
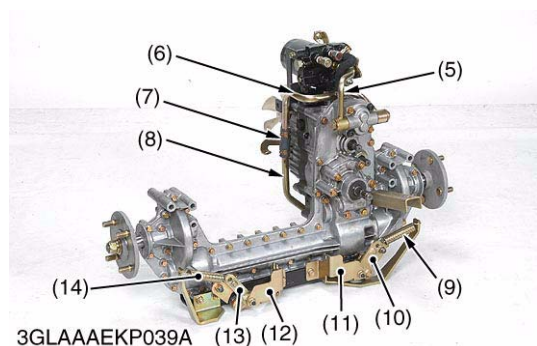
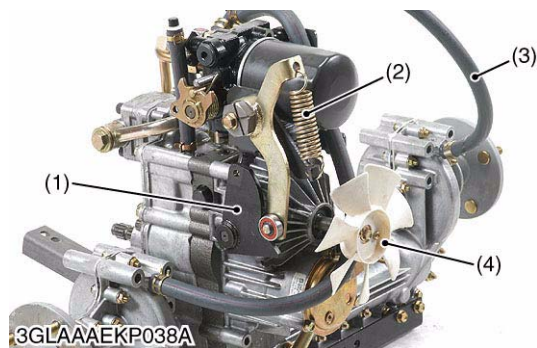
(When reassembling)

Tightening torque	Transaxle mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
-------------------	--------------------------	---

- | | |
|---------------|------------------------------|
| (1) Transaxle | (2) Transaxle Mounting Screw |
|---------------|------------------------------|

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(2) Separating Hydrostatic Transmission



Speed Control Arm, Neutral Spring, Cooling Fan and Others

1. Remove the neutral spring (2).
2. Remove the speed control arm (1).
3. Remove the cooling fan (4).
4. Remove the breather hoses (3).
5. Remove the control valve pipe (5).
6. Remove the suction pipe 1, 2 (6), (8) and hose (7).
7. Remove the return springs (9) (14), wire stays (11) (12) and Glide Steer levers (10) (13).
8. Remove the spring stays (15) (16).

- | | |
|------------------------|------------------------|
| (1) Speed Control Arm | (9) Return Spring |
| (2) Neutral Spring | (10) Glide Steer Lever |
| (3) Breather Hose | (11) Wire Stay |
| (4) Cooling Fan | (12) Wire Stay |
| (5) Control Valve Pipe | (13) Glide Steer Lever |
| (6) Suction Pipe 1 | (14) Return Spring |
| (7) Hose | (15) Spring Stay |
| (8) Suction Pipe 2 | (16) Spring Stay |

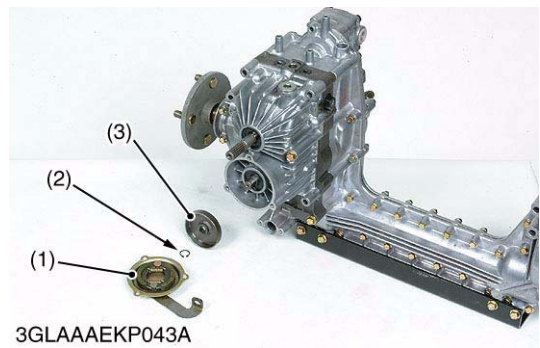
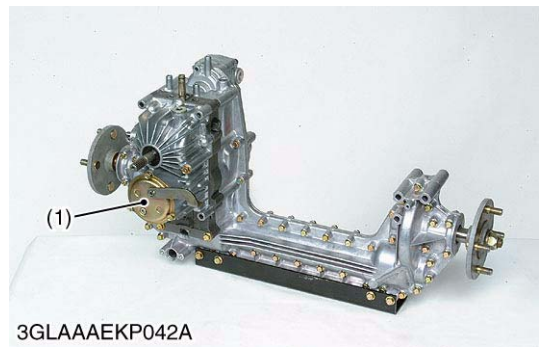
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Neutral Arm Holder and Filter Bracket

1. Remove the neutral arm holder (2) with neutral arm (1).
2. Remove the hydraulic control valve assembly (3) with filter cartridge.

- | | |
|------------------------|--------------------------------------|
| (1) Neutral Arm | (3) Hydraulic Control Valve Assembly |
| (2) Neutral Arm Holder | |

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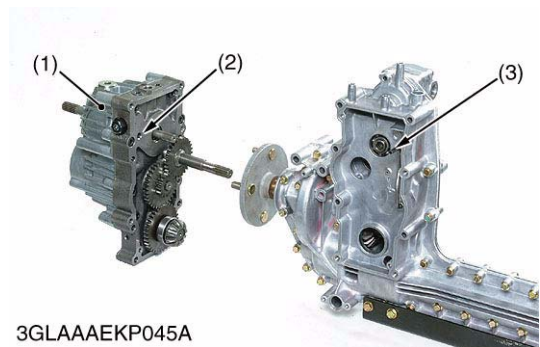
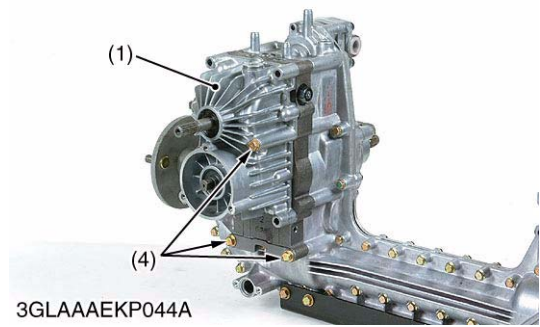


Brake Assembly

1. Remove the brake assembly (1).
2. Remove the external snap ring (2). And pull out the brake drum (3).

- (1) Brake Assembly (3) Brake Drum
(2) External Snap Ring

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Hydrostatic Transmission Assembly

1. Remove the hydrostatic transmission assembly (1).

■ NOTE

- When reassembling the hydrostatic transmission assembly, insert the drain pipe (3) in the hole (2) surely so as not to drop out it.

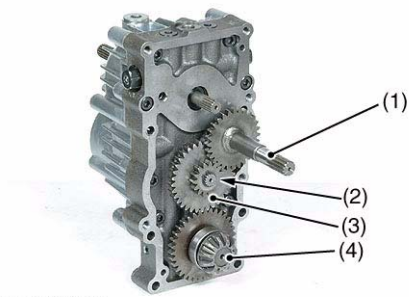
Tightening torque	Hydrostatic transmission mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs
	Hydrostatic transmission mounting screw 2	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.1 to 15.2 ft-lbs

- (1) Hydrostatic Transmission Assembly (3) Drain Pipe
(2) Hole (4) Hydrostatic Transmission Mounting Screw 2

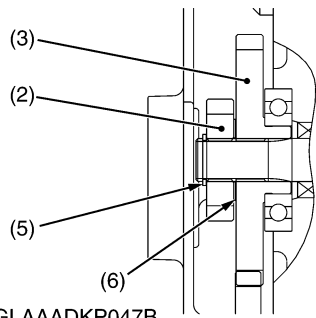
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[3] DISASSEMBLING AND ASSEMBLING

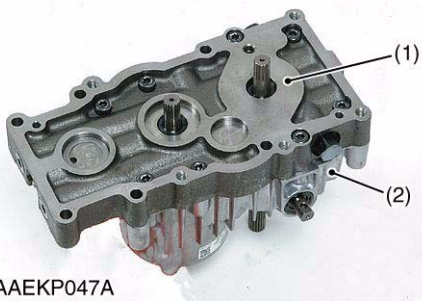
(1) Hydrostatic Transmission



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15T Gear, 34T Gear and Bevel Gear Shaft

1. Remove the front drive shaft (1)
2. Remove the external snap ring (5). And pull out the 15T gear (2) and 34T gear (3).
3. Remove the bevel gear shaft (4).

- | | |
|-----------------------|------------------------|
| (1) Front Drive Shaft | (4) Bevel Gear Shaft |
| (2) 15T Gear | (5) External Snap Ring |
| (3) 34T Gear | (6) Shim |

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Center Section

1. Remove the center section mounting hex. socket head screws.
2. Tap the center section (1) with soft hammer and separate the center section (1) from the HST housing (2).

(When reassembling)

- Cover the splines of each shaft with thin tape to protect the sealing lip of the oil seals.
- Place a new gasket on the HST 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	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.1 to 15.2 ft-lbs
-------------------	--	---

- | | |
|--------------------|-----------------|
| (1) Center Section | (2) HST Housing |
|--------------------|-----------------|

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By-pass Valve

- 1. Remove the plug (4) and draw out the the by-pass spool (2) and spring (1).

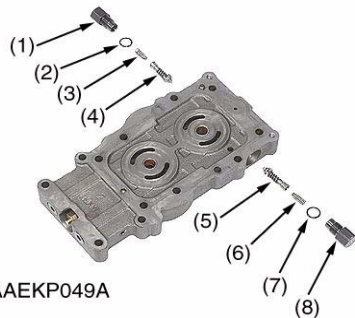
(When reassembling)

- Take care not to damage the O-ring (3) on the plug (4).

Tightening torque	By-pass valve plug	15.0 N·m 1.53 kgf·m 11.1 ft·lbs
-------------------	--------------------	---------------------------------------

- (1) Spring
- (2) By-pass Spool
- (3) O-ring
- (4) Plug

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Check and High Pressure Relief Valve

- 1. Remove the plugs (1), (8).
- 2. Draw out the springs (3), (6).
- 3. Draw out the check and high pressure relief valves (4) (5).

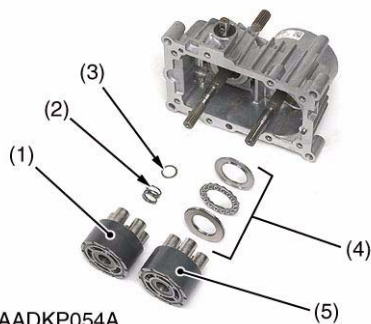
(When reassembling)

- Take care not to damage the O-rings (2), (7) on the plugs (1), (8).

Tightening torque	Check and high pressure relief valve plug	30.0 N·m 3.06 kgf·m 22.1 ft·lbs
-------------------	---	---------------------------------------

- (1) Plug
- (2) O-ring
- (3) Spring
- (4) Check and High Pressure Relief Valve (Reverse)
- (5) Check and High Pressure Relief Valve (Forward)
- (6) Spring
- (7) O-ring
- (8) Plug

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Cylinder Block Assembly and Thrust Ball Bearing

- 1. Remove the cylinder block assembly (pump side) (1), spring (2) and washer (3).
- 2. Remove the cylinder block assembly (motor side) (5).
- 3. Remove the thrust ball bearing (4).

(When reassembling)

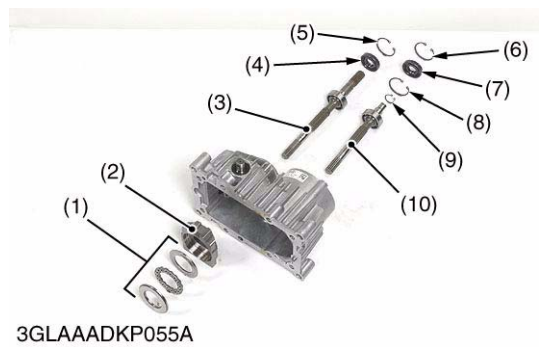
- Apply clean transmission oil to thrust ball bearing, cylinder block and piston.

NOTE

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

- (1) Cylinder Block Assembly (Pump Side)
- (2) Spring
- (3) Washer
- (4) Thrust Ball Bearing
- (5) Cylinder Block Assembly (Motor Side)

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Swashplate, Pump Shaft and Motor Shaft

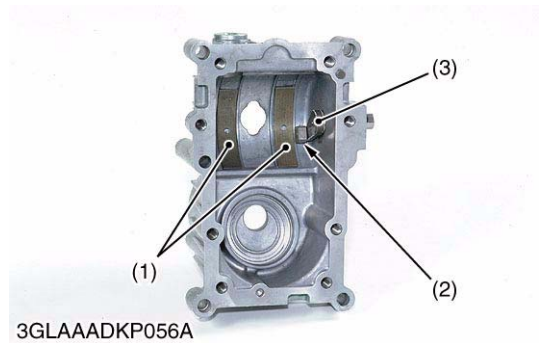
1. Remove the swashplate (2) and thrust ball bearing (1) from the HST housing.
2. Remove the internal snap ring (5), and tap out the pump shaft (3) and oil seal (4).
3. Remove the internal snap ring (6) and the oil seal (7).
4. Remove the internal snap ring (8), and tap out the motor shaft (10).

■ **NOTE**

- When removing the oil seal (7), take care not to damage the HST housing.
- (When reassembling)**
- Apply clean transmission oil to thrust ball bearing (1).

- | | |
|-------------------------|------------------------|
| (1) Thrust Ball Bearing | (6) Internal Snap Ring |
| (2) Swashplate | (7) Oil Seal |
| (3) Pump Shaft | (8) Internal Snap Ring |
| (4) Oil Seal | (9) External Snap Ring |
| (5) Internal Snap Ring | (10) Motor Shaft |

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Cradle Bearing, Slot Guide and Trunnion Arm

1. Remove the slot guide (2) and trunnion arm (3).
2. Remove the cradle bearings (1) from the HST housing.

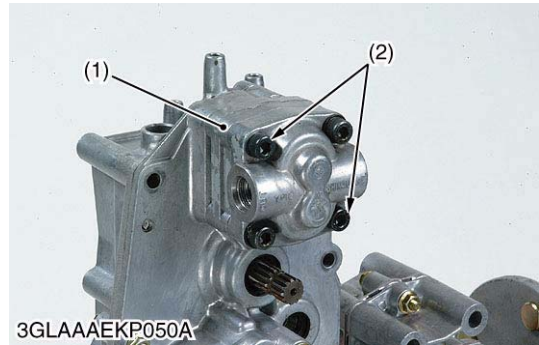
(When reassembling)

- Apply clean transmission oil to the cradle bearings (1) and trunnion arm.
- Fasten down the cradle bearing to the HST housing.

- | | |
|--------------------|------------------|
| (1) Cradle Bearing | (3) Trunnion Arm |
| (2) Slot Guide | |

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(2) Transaxle Case



Hydraulic Pump

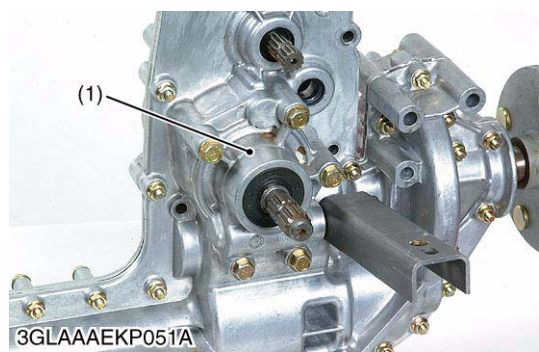
1. Unscrew the hydraulic pump mounting screws (2).
2. Remove the hydraulic pump (1).

(When reassembling)

Tightening torque	Hydraulic pump mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.1 to 15.2 ft-lbs
-------------------	-------------------------------	---

- | | |
|--------------------|-----------------------------------|
| (1) Hydraulic Pump | (2) Hydraulic Pump Mounting Screw |
|--------------------|-----------------------------------|

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PTO Clutch Assembly

1. Remove the PTO clutch assembly (1) and the ball bearing (2) from the transaxle case.

(When reassembling)

- Install the ball bearing (2) with the sealed face inside.
- Align the tangs (4) of PTO brake friction plate with the slots (3) of transaxle case.

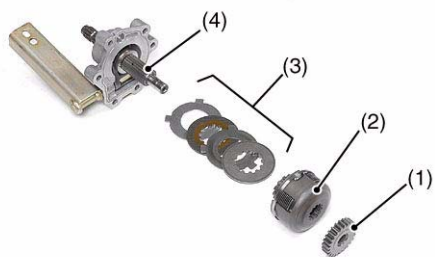
Tightening torque	PTO clutch assembly mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.1 to 15.2 ft-lbs
-------------------	------------------------------------	---

- (1) PTO Clutch Assembly (3) Slot
(2) Ball Bearing (4) Tang

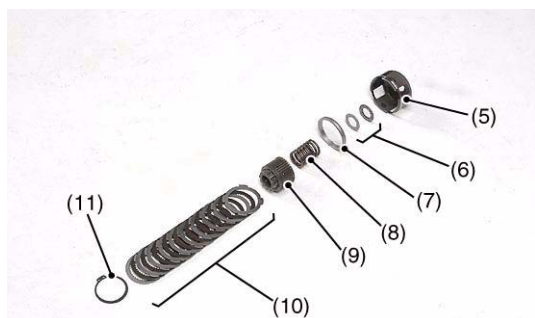
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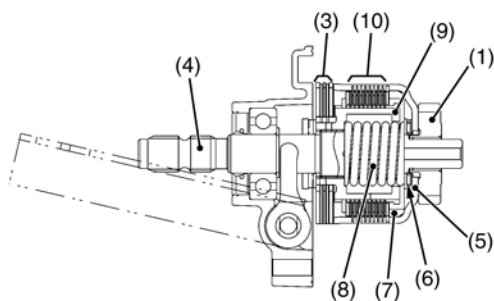
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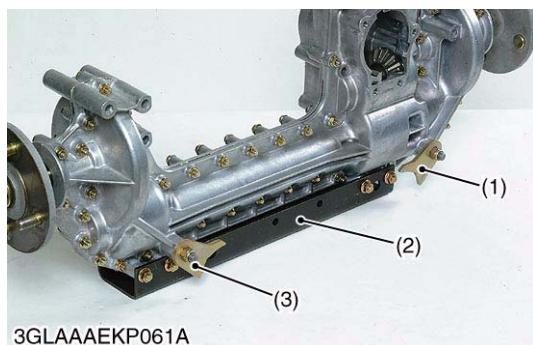
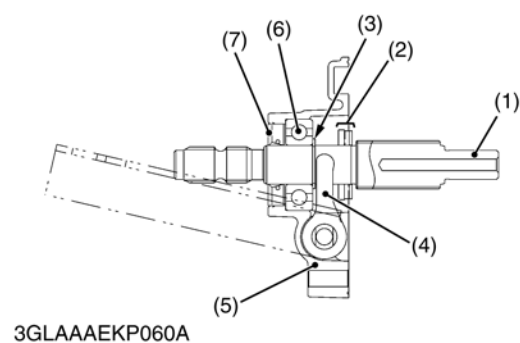
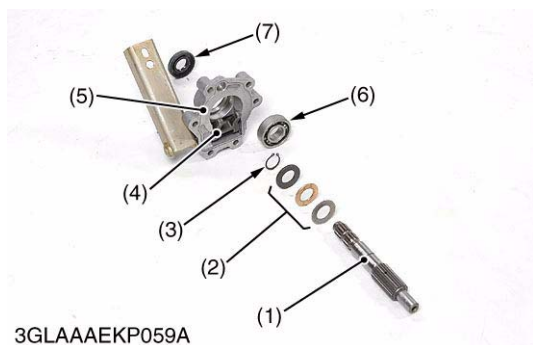
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Disassembling PTO Clutch Assembly

1. Remove the 24T gear (1), clutch (2), brake disc and friction plate (3) from PTO shaft (4).
2. While pressing the clutch (2), turn the clutch case (5) clockwise. Then, separate the clutch case (5) and the spline boss (9) with clutch disc and friction plate (10).
3. Then remove the thrust needle bearing (6), collar (7) and spring (8).
4. Remove the external snap ring (11), clutch disc and friction plate (10) from the spline boss.

- | | |
|-----------------------------------|-------------------------------------|
| (1) 24T Gear | (7) Collar |
| (2) Clutch | (8) Spring |
| (3) Brake Disc and Friction Plate | (9) Spline Boss |
| (4) PTO Shaft | (10) Clutch Disc and Friction Plate |
| (5) Clutch Case | (11) External Snap Ring |
| (6) Thrust Needle Bearing | |

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Disassembling PTO Clutch Assembly (Continued)

1. Pull out the PTO shaft (1) from PTO clutch cover (5) until external snap ring (3) touches clutch lever (4).
2. Tap out the PTO shaft (1) while opening the external snap ring (3) with external snap ring pliers.
3. Remove the thrust collar (2) from PTO shaft (1).
4. Remove the ball bearing (6) and oil seal (7) from the PTO clutch cover (5).

- | | |
|------------------------|----------------------|
| (1) PTO Shaft | (5) PTO Clutch Cover |
| (2) Thrust Collar | (6) Ball Bearing |
| (3) External Snap Ring | (7) Oil Seal |
| (4) Clutch Lever | |

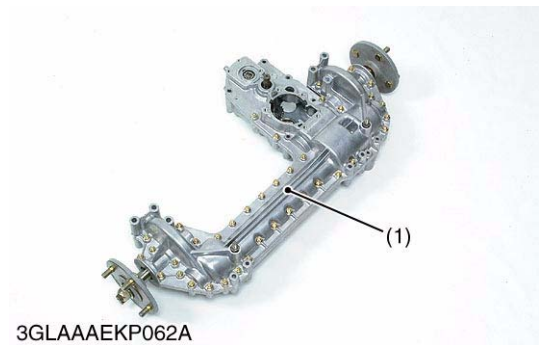
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Beam and Wire Lever

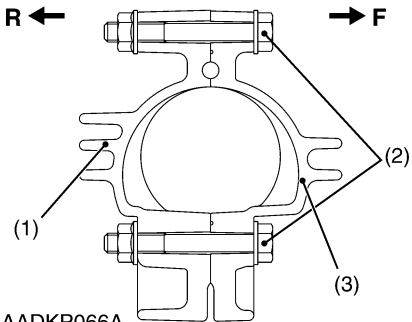
1. Remove the wire levers (1) (3) and beam (2) from the transaxle case.

- | | |
|----------------|----------------|
| (1) Wire Lever | (3) Wire Lever |
| (2) Beam | |

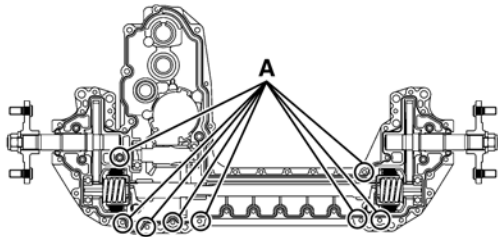
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Transaxle Case

1. Remove the transaxle case screws (2).
2. Separate the rear side of transaxle case (1).
(When reassembling)
 - Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the transaxle case.

■ NOTE

- Install the transaxle case screws (2) in the direction shown in figure.
- Tighten all screws by your hand. Then, tighten the screws located at the circled positions first with tightening torques. Next, tighten the remaining screws with tightening torque.

Tightening torque	Transaxle case screw	7.8 to 8.8 N·m 0.8 to 0.9 kgf·m 5.8 to 6.5 ft·lbs
-------------------	----------------------	---

- (1) Transaxle Case (Rear Side) **F : Front Side**
(2) Transaxle Case Screw **R : Rear Side**
(3) Transaxle Case (Front Side) **A : Screws Which Tightened First with Tightening Torque**

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Pump Drive Gear, Input Shaft, 19T-2 Gear and 17T-13T Gear Shaft

1. Remove the pump drive gear (1) and input shaft (2).
2. Remove the intermediate shaft (3) and 19T-2 gear (4) with collars (7) and needle bearing (8).
3. Remove the 17T-13T gear shaft (5).

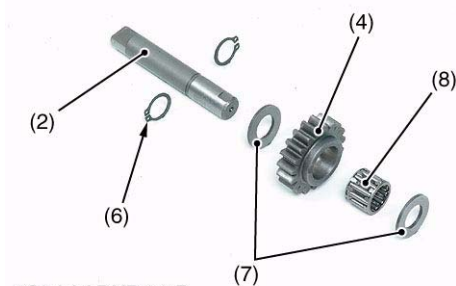
NOTE

- Install the two external snap rings (6) on intermediate shaft (3) by shifting each mating portion by 180 degrees.

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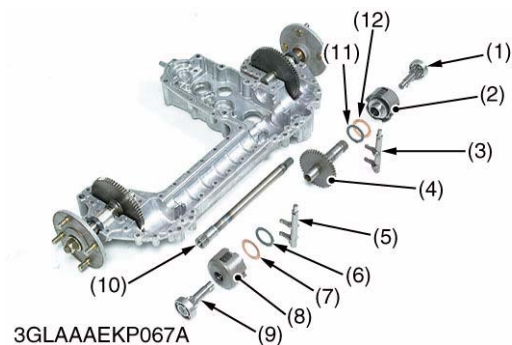
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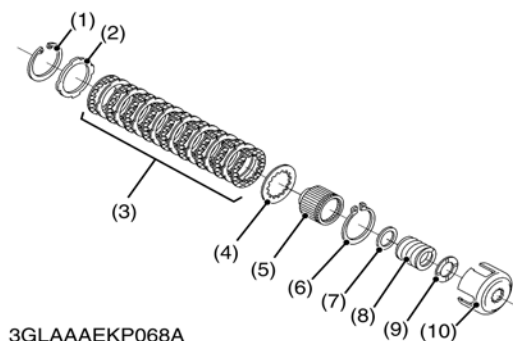
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Steering Clutch, Clutch Lever, 11T Gear Shaft, 42T Gear Shaft and Drive Shaft

1. Remove the steering clutches (2) (8), clutch levers (3) (5), 11T gear shafts (1) (9), 42T gear shaft (4) and drive shaft (10) from transaxle case.

- | | |
|--------------------------|--------------------------|
| (1) 11T Gear Shaft (LH) | (7) Spacer |
| (2) Steering Clutch (LH) | (8) Steering Clutch (RH) |
| (3) Clutch Lever (LH) | (9) 11T Gear Shaft (RH) |
| (4) 42T Gear Shaft | (10) Drive Shaft |
| (5) Clutch Lever (RH) | (11) Thrust Collar |
| (6) Thrust Collar | (12) Spacer |

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Disassembling Steering Clutch

1. Remove the internal snap ring (1).
2. Remove the clutch plate (2) and spline boss (5) with clutch disc and friction plate (3) from the steering clutch case (10).
3. Remove the spacer (7), spring (8) and clutch collar (9).
4. Remove the clutch disc and the friction plate (3), clutch spline (4) and external snap ring (6) from spline boss (5).

- | | |
|------------------------------------|---------------------------|
| (1) Internal Snap Ring | (6) External Snap Ring |
| (2) Clutch Plate | (7) Spacer |
| (3) Clutch Disc and Friction Plate | (8) Spring |
| (4) Clutch Spline Plate | (9) Clutch Collar |
| (5) Spline Boss | (10) Steering Clutch Case |

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Rear Axle

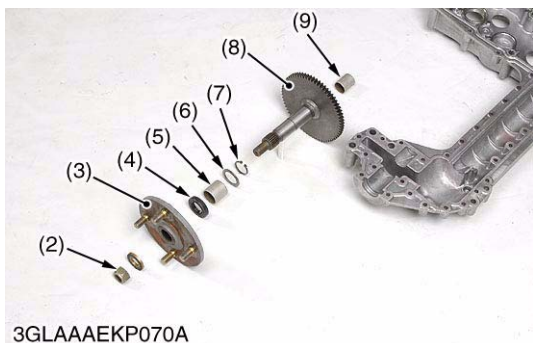
1. Remove the rear axle (1) from transaxle case.
2. Remove the bush (9) from 67T gear shaft (8).
3. Unscrew the lock nut (2), and remove the rear wheel hub (3).
4. Remove the oil seal (4), bush (5) collar (6) and external snap ring (7) from 67T gear shaft (8).

- | | |
|--------------------|------------------------|
| (1) Rear Axle | (6) Collar |
| (2) Lock Nut | (7) External Snap Ring |
| (3) Rear Wheel Hub | (8) 67T Gear Shaft |
| (4) Oil Seal | (9) Bush |
| (5) Bush | |

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[4] SERVICING

(1) Hydrostatic Transmission



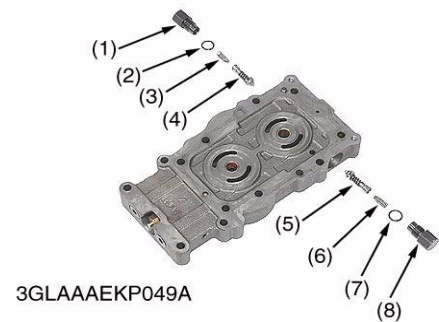
3GLAAAEKP071A

Center Section

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

- | |
|-------------|
| (1) Surface |
|-------------|

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Check and High Pressure Relief Valve

1. Check the check and high pressure relief valves (4) (5) for scratches and damage.
2. Check the springs (3) (6) for breakage and wear.
3. If anything unusual, replace the check and high pressure relief valve assembly.

- | | |
|--|--|
| (1) Plug | (5) Check and High Pressure Relief Valve (Forward) |
| (2) O-ring | (6) Spring |
| (3) Spring | (7) O-ring |
| (4) Check and High Pressure Relief Valve (Reverse) | (8) Plug |

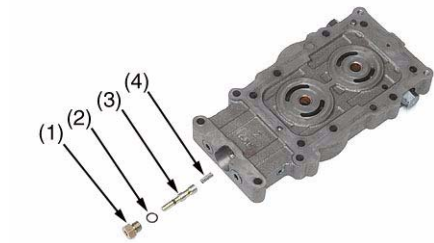
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By-pass Valve

1. Check the by-pass spool (3) and spring (4).
2. If defects are found, replace them.

- | | |
|------------|-------------------|
| (1) Plug | (3) By-pass Spool |
| (2) O-ring | (4) Spring |

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Cylinder Block Assembly

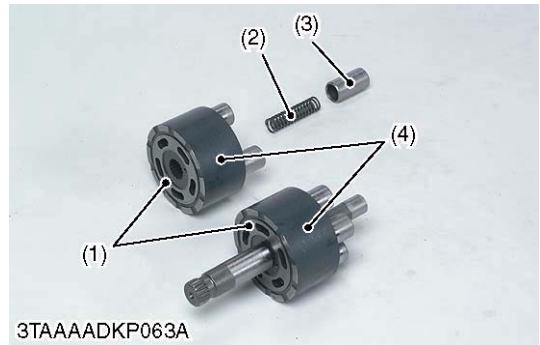
1. Check the cylinder blocks (4) and pistons (3) for scratches and wear.
2. If scratch or worn, replace the cylinder block assembly.
3. Check that the piston (3) and spring (2) are in each cylinder bore.
4. Check the pistons for their free movement in the cylinder block bores.
5. If the piston or the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

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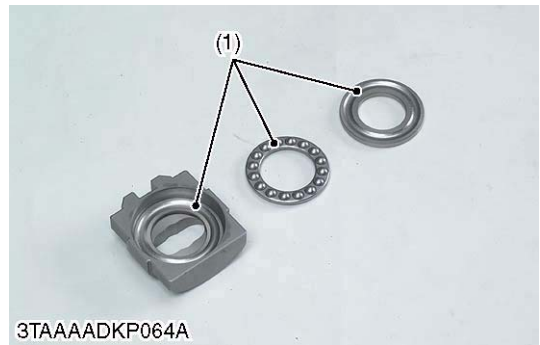
3TAAADKP063A

Thrust Ball Bearing

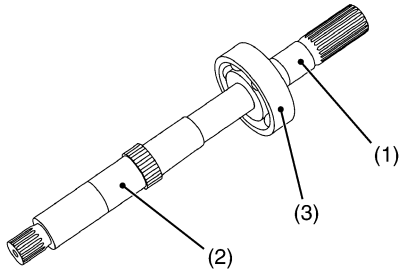
1. Check the thrust ball bearing (1) for scratches and excessive wear.
2. If the thrust ball bearing (1) is worn, replace it.

- | |
|-------------------------|
| (1) Thrust Ball Bearing |
|-------------------------|

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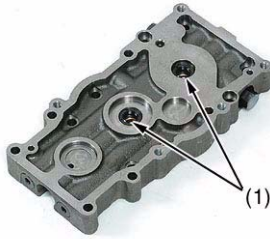
Pump Shaft

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

(1) Seal Surface
(2) Bearing Surface

(3) Ball Bearing

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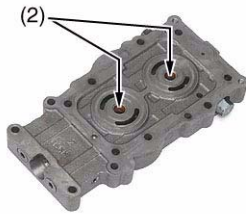
Bushing and Oil Seal

1. Check the oil seals (1) for damage.
2. Check the bushings (2) for wear.
3. If the oil seals and bushings are worn or damaged, replace them.

(1) Oil Seal

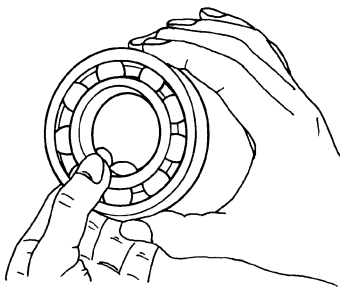
(2) Bushing

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(2) Transaxle Case



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Checking Bearing

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

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PTO Clutch Disc Wear

1. Measure the thickness of PTO clutch disc with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of PTO clutch disc	Factory spec.	1.3 to 1.5 mm 0.051 to 0.059 in.
	Allowable limit	1.2 mm 0.047 in.

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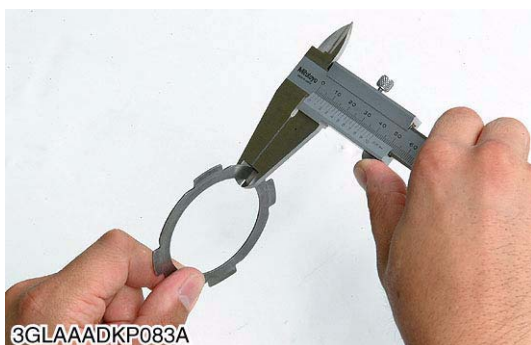


Pressure Plate and Friction Plate Wear

1. Measure the thickness of pressure plate and friction plate 1, 2 with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of pressure plate	Factory spec.	1.55 to 1.65 mm 0.061 to 0.065 in.
	Allowable limit	1.50 mm 0.059 in.

Thickness of friction plate 1	Factory spec.	1.55 to 1.65 mm 0.061 to 0.065 in.
	Allowable limit	1.50 mm 0.059 in.



Thickness of friction plate 2	Factory spec.	0.75 to 0.85 mm 0.030 to 0.034 in.
	Allowable limit	0.70 mm 0.028 in.

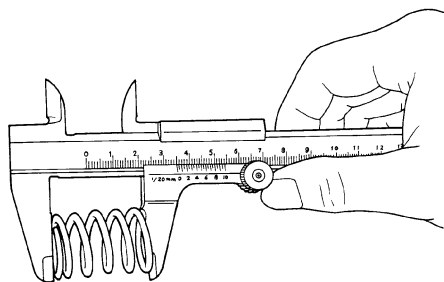
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Clutch Spring Free Length

1. Measure the free length of spring with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Clutch spring free length	Factory spec.	45 mm 1.77 in.
	Allowable limit	42 mm 1.65 in.

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PTO Brake Disc Wear

1. Measure the thickness of PTO brake disc with a vernier caliper.
2. If the thickness is less than the allowable limit, replace it.

PTO brake disc 1 thickness	Factory spec.	2.85 to 3.05 mm 0.11 to 0.12 in.
	Allowable limit	2.75 mm 0.108 in.

PTO brake disc thickness	Factory spec.	3.3 to 3.5 mm 0.13 to 0.14 in.
	Allowable limit	3.00 mm 0.118 in.

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Friction Plate Wear

1. Measure the thickness of brake friction plate 1, 2 with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of brake friction plate 1	Factory spec.	1.75 to 1.85 mm 0.069 to 0.073 in.
	Allowable limit	1.60 mm 0.063 in.

Thickness of brake friction plate 2	Factory spec.	0.95 to 1.05 mm 0.037 to 0.041 in.
	Allowable limit	0.80 mm 0.031 in.

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Clutch Spline Plate Wear

1. Measure the thickness of clutch spline plate with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of clutch spline plate	Factory spec.	0.75 to 0.85 mm 0.030 to 0.033 in.
	Allowable limit	0.70 mm 0.028 in.

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Steering Clutch Disc Wear

1. Measure the thickness of steering clutch disc with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

Thickness of steering clutch disc	Factory spec.	1.3 to 1.5 mm 0.051 to 0.059 in.
	Allowable limit	1.2 mm 0.047 in.

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Friction Plate and Clutch Plate

- 1. Measure the thickness of friction plate and clutch plate with vernier calipers.
- 2. If the thickness is less than the allowable limit, replace it.

Thickness of friction plate	Factory spec.	0.75 to 0.85 mm 0.030 to 0.033 in.
	Allowable limit	0.70 mm 0.028 in.

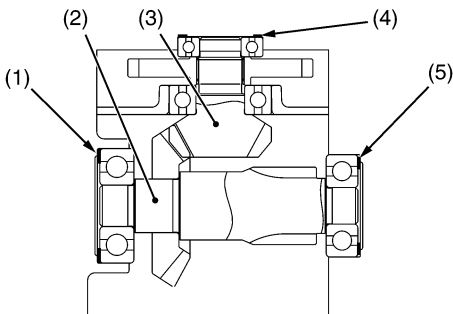
Thickness of clutch plate	Factory spec.	1.55 to 1.65 mm 0.061 to 0.065 in.
	Allowable limit	1.50 mm 0.059 in.

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Backlash between 11T Bevel Gear Shaft and 17T-13T Gear Shaft

- 1. Stick a strip of fuse the three spots on the 11T bevel gear shaft (3) with grease.
- 2. Reassemble the hydrostatic transmission and transaxle case.
- 3. Fix the transaxle case, and push the by-pass valve.
- 4. Turn the motor shaft.
- 5. Remove the 11T bevel gear shaft (3), and measure the thickness of the fuses with an outside micrometer.

Backlash between 11T bevel gear shaft and 17T-13T gear shaft	Factory spec.	0.10 to 0.30 mm 0.0039 to 0.012 in.
--	---------------	--



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(Reference)

- Thickness of adjusting shims
 - For 11T bevel gear shaft (4) : 0.2 mm (0.008 in.)
0.3 mm (0.012 in.)
0.5 mm (0.020 in.)
 - For 17T-13T gear shaft (LH) (1) : 0.2 mm (0.008 in.)
0.3 mm (0.012 in.)
0.5 mm (0.020 in.)
 - For 17T-13T gear shaft (RH) (5) : 0.2 mm (0.008 in.)
0.3 mm (0.012 in.)
0.5 mm (0.020 in.)
- Tooth contact : More than 35 %
 - (1) Shim (for 17T-13T Gear Shaft (LH))
 - (2) 17T-13T Gear Shaft
 - (3) 11T Bevel Gear Shaft
 - (4) Shim (for 11T Bevel Gear Shaft)
 - (5) Shim (for 17T-13T Gear Shaft (RH))

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3 BRAKES

CONTENTS

1. TROUBLESHOOTING.....	3-S1
2. SERVICING SPECIFICATIONS.....	3-S2
3. TIGHTENING TORQUES.....	3-S3
4. CHECKING, DISASSEMBLING AND SERVICING	3-S4
[1] CHECKING AND ADJUSTING	3-S4
[2] DISASSEMBLING AND ASSEMBLING.....	3-S4
(1) Pedal System Component.....	3-S4
(2) Brake Assembly.....	3-S8

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Insufficient Braking Force	● Brake pedal free travel excessive	Adjust	3-S4
	● Brake shoe worn	Replace	3-S8
	● Brake drum worn	Replace	3-S8
	● Grease or oil on brake shoe	Replace	3-S8
Brake Drags	● Brake pedal free travel too small	Adjust	3-S4
	● Brake spring weaken or broken	Replace	3-S8
Heavy Brakes	● Brake pedal rusted	Repair or replace	3-S8
	● Brake cam lever rusted	Replace	3-S8

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	15 to 25 mm 0.59 to 0.98 in.	—

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3. TIGHTENING TORQUES

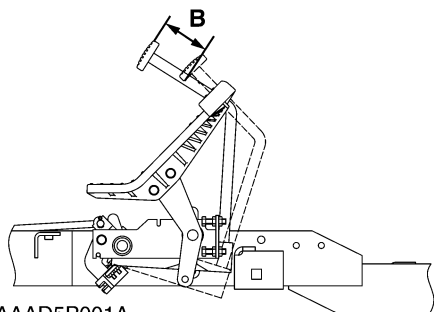
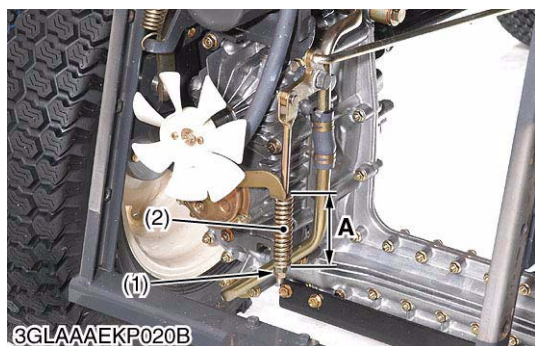
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-9)

Item	N·m	kgf·m	ft-lbs
Steering wheel mounting nut	20 to 25	2.0 to 2.5	14.8 to 18.4
Power steering hose mounting nut	24.0 to 28.0	2.45 to 2.85	17.71 to 20.65
Steering support mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Pedal system component mounting nut	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



Brake Pedal Free Travel



CAUTION

- Stop the engine, remove the key, and chock the wheels before checking brake pedal.

1. Release the parking brake.
2. Loosen the lock nut (1).
3. Adjust the brake spring (2) length (**A**) so that the brake pedal free travel (**B**) is from 15 to 25 mm (0.59 to 0.98 in.).
4. Retighten the lock nut (1).

Brake pedal free travel (B)	Factory spec.	15 to 25 mm 0.59 to 0.98 in.
--------------------------------	---------------	---------------------------------

(Reference)

- Brake spring length (**A**) : 73 to 74 mm (2.87 to 2.91 in.)

(1) Lock Nut

(2) Brake Spring

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[2] DISASSEMBLING AND ASSEMBLING

(1) Pedal System Component

Dismounting Mower

1. See page 8-S6. ("Mower" Section)

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Dismounting Container

1. See page 2-S9. ("Transaxle" Section)

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Battery



CAUTION

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

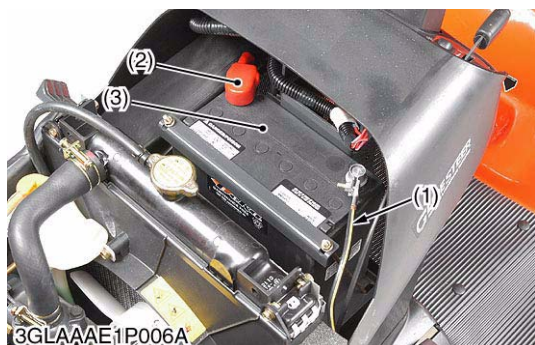
1. Open the bonnet.
2. Remove the radiator net.
3. Disconnect the negative cable (1) from the battery.
4. Disconnect the positive cable (2) from the battery and remove the battery (3).

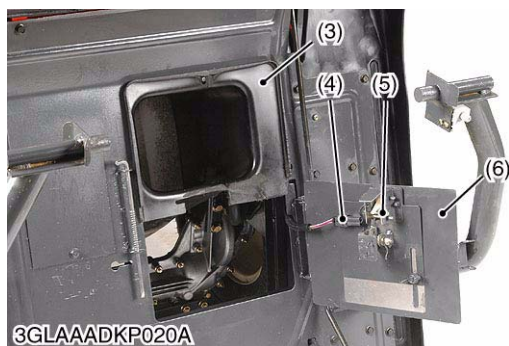
(1) Negative Cable

(3) Battery

(2) Positive Cable

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Container Base

1. Disconnect the couplers (1) from the relays.
2. Disconnect the connectors (2).
3. Open the switch cover (6). And disconnect the connector (4) from the grass container full switch (5).
4. Remove the discharge duct (3).
5. Remove the container base (7).

- | | |
|--------------------|---------------------------------|
| (1) Coupler | (5) Grass Container Full Switch |
| (2) Connector | (6) Switch Cover |
| (3) Discharge Duct | (7) Container Base |
| (4) Connector | |

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Seat

1. Remove the snap pin (2).
2. Remove the seat (1).

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

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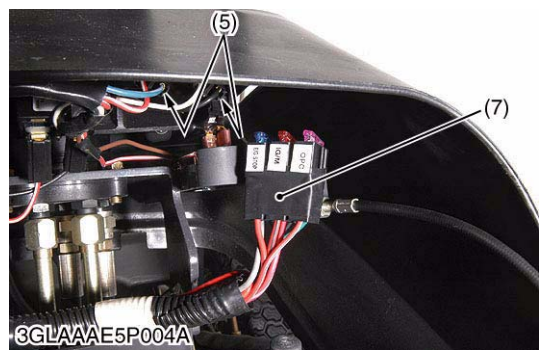


Fender

1. Remove the speed change pedal (5).
2. Peel the step sheet (4) halfway.
3. Remove the fuel cap (1).
4. Remove the fender (2).

- | | |
|---------------------------|------------------------|
| (1) Fuel Cap | (4) Step Sheet |
| (2) Fender | (5) Speed Change Pedal |
| (3) Fender Mounting Screw | |

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Steering Wheel, Side Bonnet and Panel

1. Remove the steering wheel (1).
2. Remove the side bonnet (3).
3. Remove the accelerator lever grip.
4. Disconnect the connectors for hour meter, main switch (4) and light switch.
5. Remove the indicator lamps (5).
6. Remove the fuse box (6) from the steering support.
7. Remove the panel (2).

(When reassembling)

Tightening torque	Steering wheel mounting nut	20 to 25 N·m 2.0 to 2.5 kgf·m 14.8 to 18.4 ft·lbs
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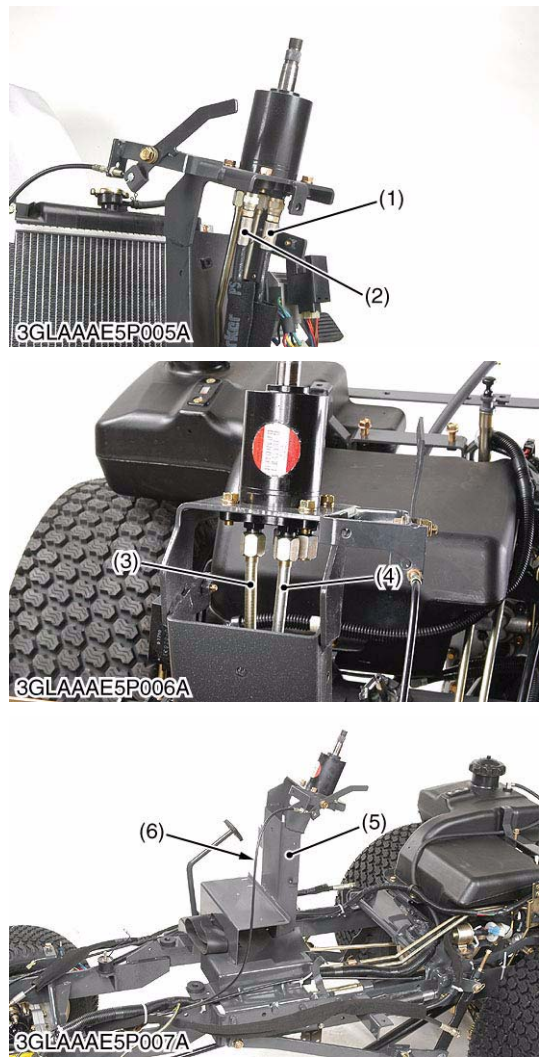
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|--------------------|--------------------|
| (1) Steering Wheel | (4) Main Switch |
| (2) Panel | (5) Indicator Lamp |
| (3) Side Bonnet | (6) Fuse Box |

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Separating Engine

1. See page 1-S20. ("Engine" Section)

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Steering Support Assembly

1. Disconnect the power steering hose (1) (2) (3) (4).
2. Disconnect the connectors for the timer relay, regulator and buzzer unit.
3. Disconnect the accelerator wire (6).
4. Separate the steering support assembly (5).

(When reassembling)

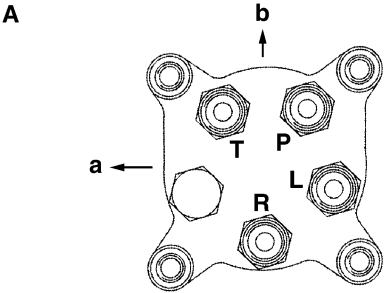
- Be sure to connect the power steering hose to their original position, and tighten them to the specified torque.

Tightening torque	Power steering hose mounting nut	24.0 to 28.0 N·m 2.45 to 2.85 kgf·m 17.71 to 20.65 ft·lbs
	Steering support mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft·lbs

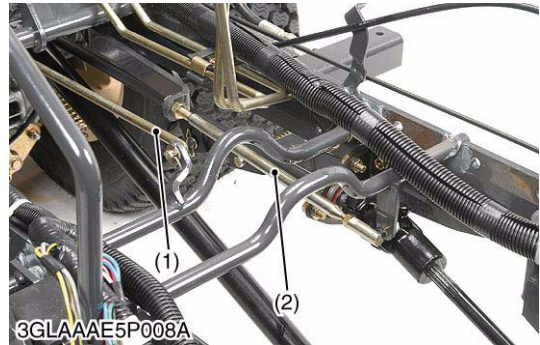
- (1) Cylinder Hose LH
(2) Cylinder Hose RH
(3) Return Hose
(4) Delivery Hose
(5) Steering Support
(6) Accelerator Wire

A : Bottom View
P : Pump Port
(Connected to Delivery Hose)
T : Tank Port
(Connected to Return Hose)
L : L Port
(Connected to Cylinder RH)
R : R Port
(Connected to Cylinder LH)
a : Right from Operator
b : Front

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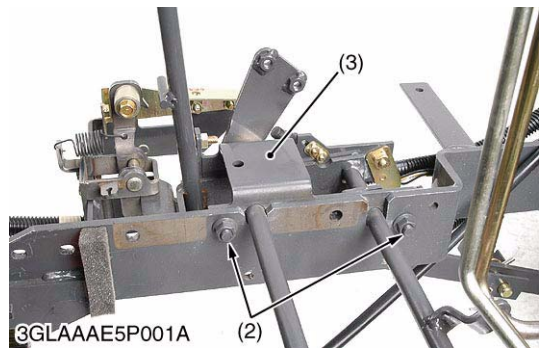
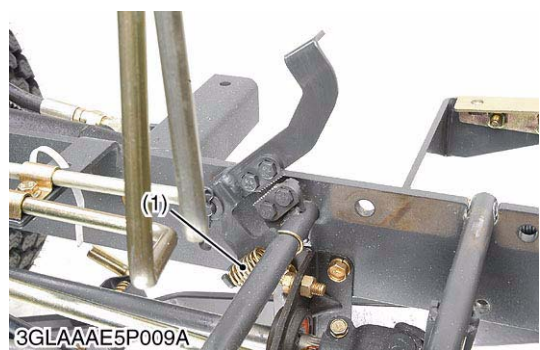


Brake Rod and Speed Change Rod

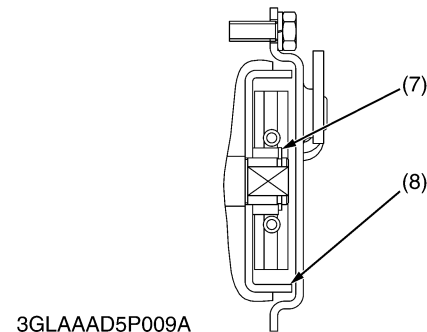
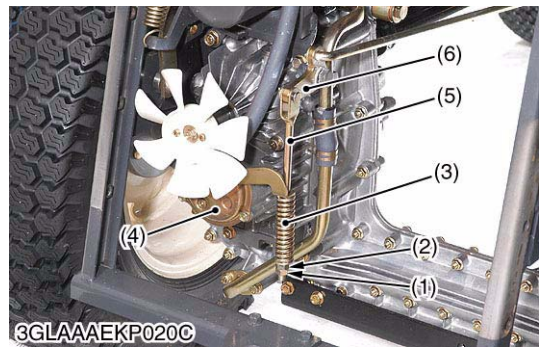
1. Disconnect the brake rod 1 (1) from the pedal system component.
2. Disconnect the speed change rod (2) from the pedal system component.

- (1) Brake Rod 1 (2) Speed Change Rod

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(2) Brake Assembly



Pedal System Component

1. Remove the parking lock spring (1).
2. Remove the pedal system component mounting nuts (2).
3. Separate the pedal system component (3) from frame.

(When reassembling)

Tightening torque	Pedal system component mounting nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
-------------------	-------------------------------------	---

- (1) Parking Lock Spring (3) Pedal System Component
(2) Pedal System Component Mounting Nut

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Brake Assembly

1. Remove the lock nut (1), plain washers (2) and brake spring (3).
2. Remove the brake plate (6).
3. Remove the brake rod 2 (5).
4. Remove the brake assembly (4).
5. Remove the external snap ring (7).
6. Pull out the brake drum (8).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the brake assembly.

NOTE

- After assembling the brake assembly, be sure to adjust the brake pedal free travel (see page 3-S4).

- (1) Lock Nut (5) Brake Rod 2
(2) Plain Washer (6) Brake Plate
(3) Brake Spring (7) External Snap Ring
(4) Brake Assembly (8) Brake Drum

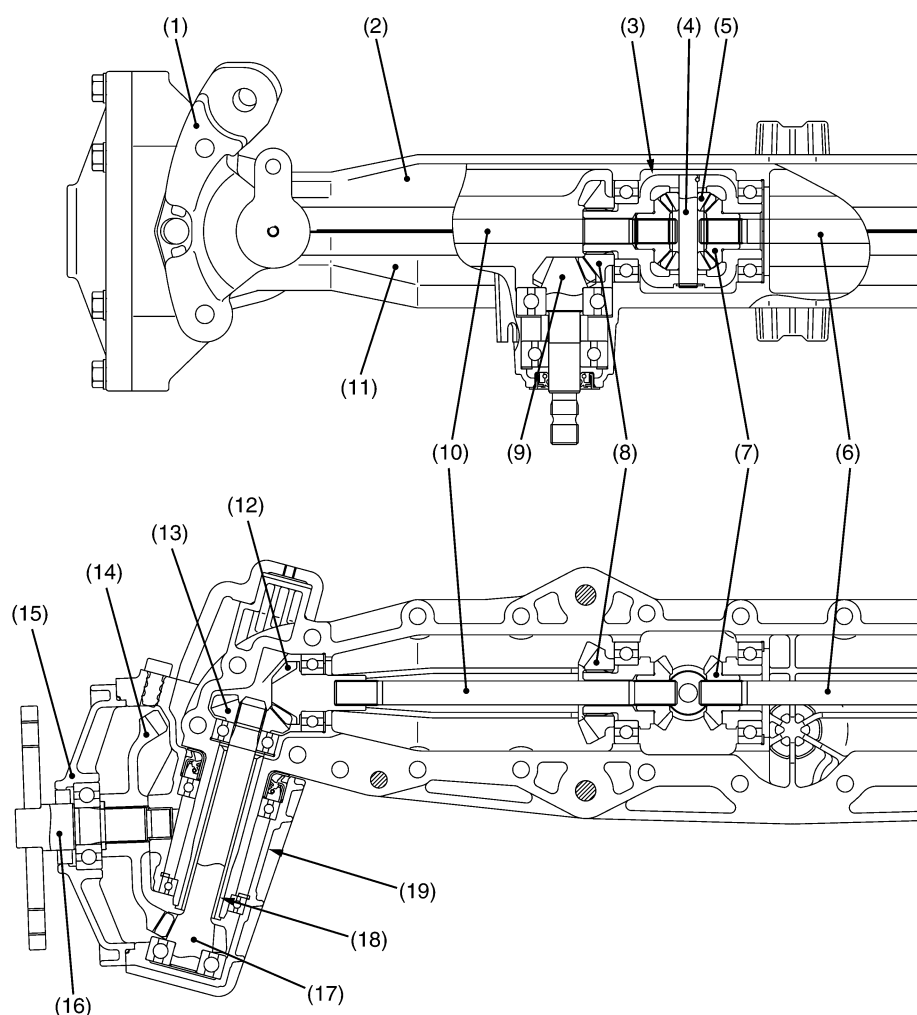
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4 FRONT AXLE

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1. STRUCTURE.....	4-M1
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1. STRUCTURE



- (1) King Pin Support
- (2) Front Axle Case (Front Side)
- (3) Differential Gear Assembly
- (4) Differential Pinion Shaft
- (5) Differential Pinion Gear
- (6) Differential Yoke Shaft, RH
- (7) Differential Side Gear
- (8) Bevel Gear
- (9) Bevel Pinion Shaft
- (10) Differential Yoke Shaft, LH
- (11) Front Axle Case (Rear Side)
- (12) 10T Bevel Gear
- (13) 15T Bevel Gear
- (14) 35T Bevel Gear
- (15) Front Gear Case Cover
- (16) Front Axle Shaft
- (17) Bevel Gear Shaft
- (18) Pipe
- (19) Front Gear Case

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The front axle of this machine is constructed as shown above. Power is transmitted from the transmission through the propeller shaft to the bevel pinion shaft (9), then to the bevel gear (8) and to the differential side gear (7).

The power through the differential side gear is transmitted to the differential yoke shaft (6), (10), and to the bevel gear shaft (17) through the 10T bevel gear (12) and 15T bevel gear (13).

The revolution is greatly reduced by the bevel gear shaft (17) and 35T bevel gear (14), then the power is transmitted to the front axle shaft (16).

The differential system allows each wheel to rotate at a different speed to make turning easier.

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(1) Front Axle Assembly.....	4-S9
[4] SERVICING.....	4-S12

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	● Tire pressure uneven	Adjust	G-49
	● Improper toe-in adjustment (improper alignment)	Adjust	4-S4
	● Tie-rod end loose	Tighten	4-S9
	● Air sucked in power steering circuit	Bleed	—
Front Wheels Can Not Be Driven	● Front wheel driving gears in front axle gear case broken	Replace	4-S9
	● Universal joint broken	Replace	4-S7
	● Front wheel drive gears in transmission broken	Replace	2-S26
	● Front differential gear broken	Replace	4-S11, 12
Noised	● Gear backlash excessive	Adjust or replace	4-S13 to 15
	● Oil insufficient	Replenish	4-S6
	● Bearings damaged or broken	Replace	—
	● Gears damaged or broken	Replace	—

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	0 to 5 mm 0.00 to 0.20 in.	—
Differential Gear Case to Differential Side Gear	Clearance	0.040 to 0.082 mm 0.00157 to 0.00323 in.	0.17 mm 0.0067 in.
	Differential Gear Case (I.D.)	19.500 to 19.521 mm 0.76772 to 0.76854 in.	—
	Differential Side Gear (O.D.)	19.439 to 19.460 mm 0.76532 to 0.76614 in.	—
Differential Pinion Shaft to Differential Pinion	Clearance	0.025 to 0.055 mm 0.00098 to 0.00217 in.	0.25 mm 0.0096 in.
	Differential Pinion Shaft (O.D.)	9.960 to 9.975 mm 0.39212 to 0.39272 in.	—
	Differential Pinion (I.D.)	10.000 to 10.015 mm 0.39370 to 0.39429 in.	—
Differential Pinion Gear to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	—
Bevel Pinion Shaft to Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	—
10T Bevel Gear to 15T Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	—

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3. TIGHTENING TORQUES

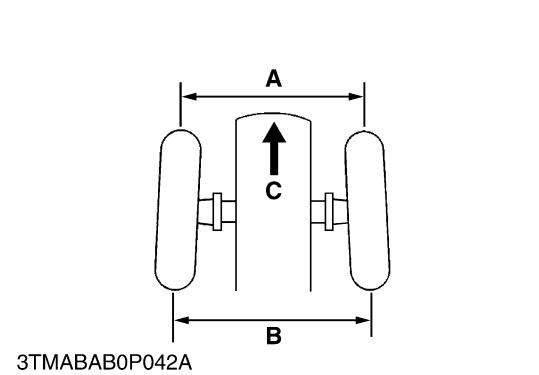
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-9.)

Item	N·m	kgf·m	ft-lbs
Power steering cylinder hose	24.0 to 28.0	2.45 to 2.85	17.71 to 20.65
Front wheel mounting screw	108.5 to 130.2	11.07 to 13.29	80 to 96
Front axle bracket mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Tie-rod slotted nut	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3
King pin support mounting nut	19.6 to 25.5	2.0 to 2.6	14.4 to 18.8
Front gear case cover mounting screw	17.7 to 20.6	1.8 to 2.1	13.0 to 15.1
Front axle case screw	9.8 to 11.3	1.00 to 1.15	7.23 to 8.33

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4. CHECKING, DISASSEMBLING AND SERVICING

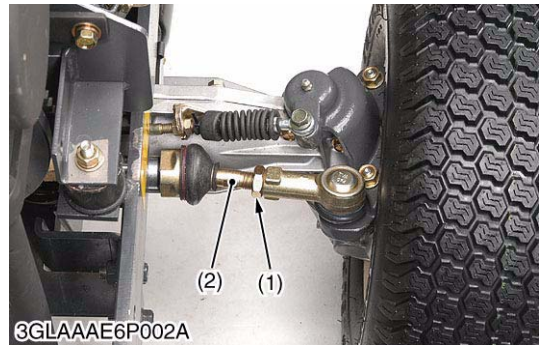
[1] CHECKING AND ADJUSTING



- Toe-in
1. Inflate the tires to the specified pressure.
 2. Turn the front wheels straight ahead.
 3. Measure the toe-in (**B-A**).
 4. If the measurement is not within the factory specifications, adjust the tie-rod length.

Toe-in (B-A)	Factory spec.	0 to 5 mm 0.00 to 0.20 in.
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- (A) Wheel to Wheel Distance at Front
- (B) Wheel to Wheel Distance at Rear
- (C) Front

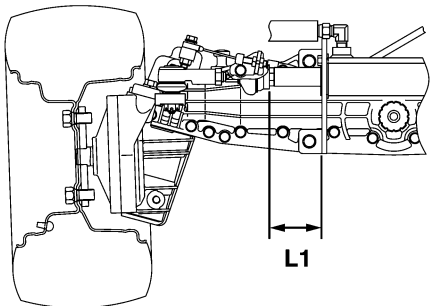


- Toe-in Adjusting
1. Loosen the lock nuts (1).
 2. Turn the tie-rod (2) until to be factory specification.
 3. Tighten the lock nuts (1).

- (1) Lock Nut
- (2) Tie-rod

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3GLAAAE6P004A

Adjusting Glide Steer

CAUTION

- Park the machine on level ground, apply the parking brake.
- Stop the engine and remove the key.

NOTE

- This adjustment should be performed after completing the adjustment of toe-in.
1. Lift up the machine while kept parallel, and support it with disassembling jacks.
 2. To fix the front axle, wedge the wooden blocks between the frame and the front axle.
 3. Turn the front wheels straight ahead position.
 4. Confirm that the left and right rear wheels do not rotate manually.
 5. Turn the steering wheel to left or right.
 6. When the rear wheel on the side to which the steering wheel is turned is rotated manually, measure the length (**L1**) of the steering cylinder tube.
 7. If the measurement is not within the factory specifications, adjust the length (**L2**) of Glide Steer wire boot.

NOTE

- Do not turn the steering wheel either from the left end or the right end.

Length of the steering cylinder tube (L1)	Factory spec.	79.6 to 94.0 mm 3.13 to 3.70 in.
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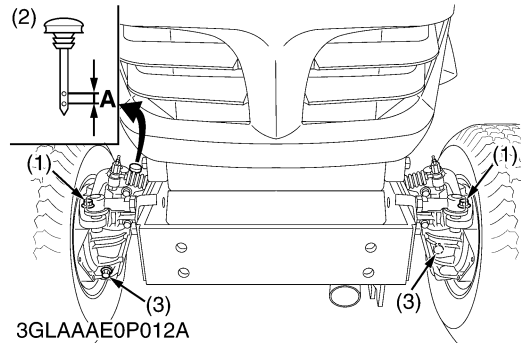
**L1 : Length of the Steering
Cylinder Tube**

**L2 : Length of Glide Steer
wire boot**

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[2] PREPARATION

(1) Separating Front Axle Assembly



Dismounting Mower

1. See page 8-S6. ("Mower" section)

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Draining Front Axle Case Oil

1. Place the oil pans underneath the front axle case.
2. Remove the both right and left hand side drain plugs (3) and filling plug with dipstick (2) to drain the oil.
3. After draining, reinstall the drain plugs (3).

(When re-filling)

- When re-filling, remove the right and left breather plugs (1).
- Fill the oil up to the upper line on the filling plug with dipstick (2).

■ IMPORTANT

- After ten minutes, check the oil level again, add oil to prescribed level.
- Use KUBOTA UDT or SUPER UDT fluid. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8).

Front axle case fluid capacity	1.9 L 0.50 U.S.gals 0.42 Imp.gals
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- (1) Breather Plug
(2) Filling Plug with Dipstick
(3) Drain Plug

A : Oil level is acceptable within this range

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Battery



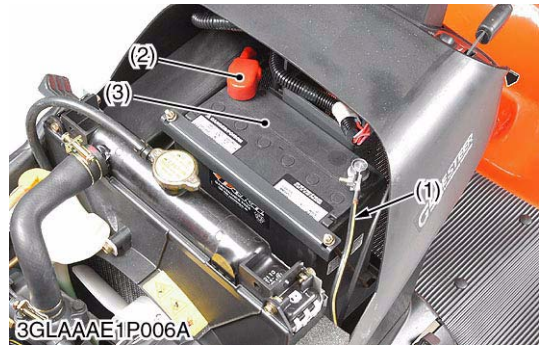
CAUTION

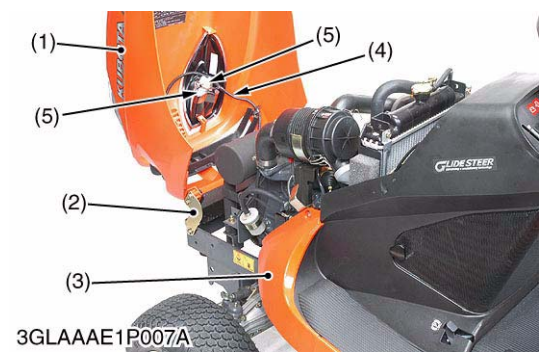
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Open the bonnet.
2. Remove the radiator net.
3. Disconnect the negative cable (1) from the battery.
4. Disconnect the positive cable (2) from the battery and remove the battery (3).

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

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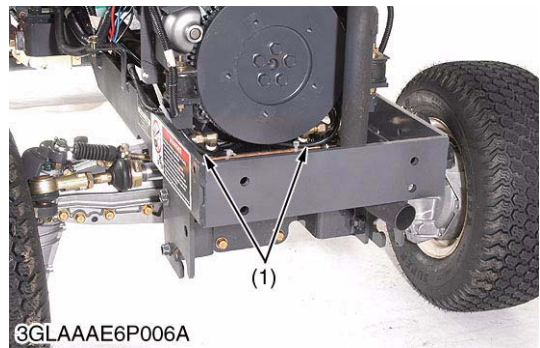


Bonnet and Side Bonnet

- 1. Disconnect the connectors (5) from the head light.
- 2. Remove the wire harness (4) from the bonnet.
- 3. Remove the bonnet (1) with bonnet bracket (2).
- 4. Remove the side bonnet (3).

- (1) Bonnet
- (2) Bonnet Bracket
- (3) Side Bonnet
- (4) Wire Harness
- (5) Connector

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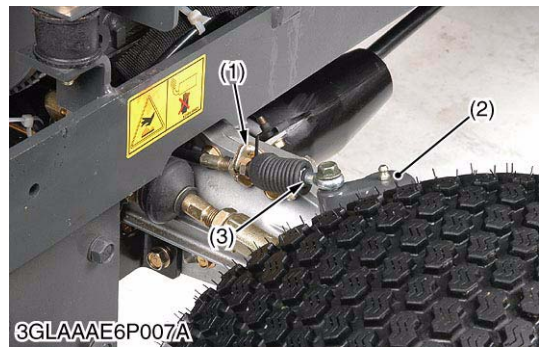
Power Steering Hose

- 1. Disconnect the power steering cylinder hoses (1).
- (When reassembling)**

Tightening torque	Power steering cylinder hose	24.0 to 28.0 N·m 2.45 to 2.85 kgf·m 17.71 to 20.65 ft-lbs
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- (1) Power Steering Cylinder Hose

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Glide Steer Wire

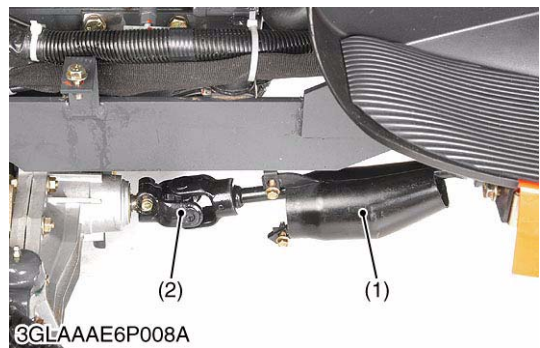
- 1. Turn the steering wheel to left or right.
- 2. Disconnect the Glide Steer wire (3) on the opposite side to which the steering wheel is turned from the king pin support (2).
- 3. Remove the Glide Steer wire (3) from the wire holder (1).

(When reassembling)

- Adjust the Glide Steer. (See page 4-S5.)

- (1) Wire Holder
- (2) King Pin Support
- (3) Glide Steer Wire

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Front Wheel and Joint Cover

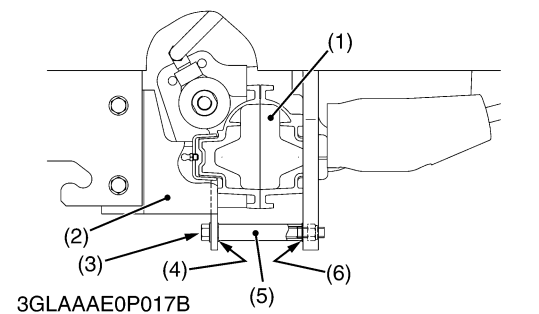
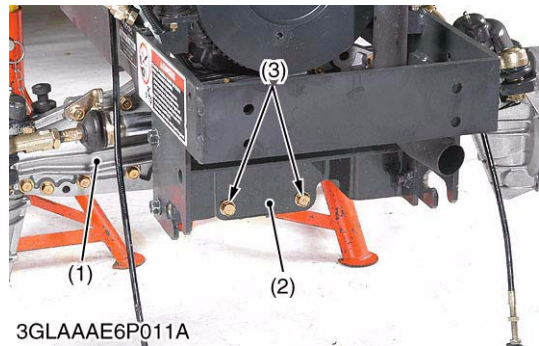
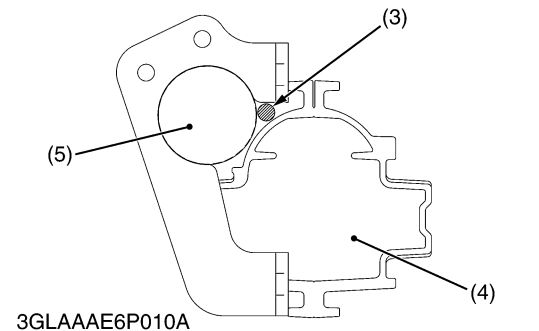
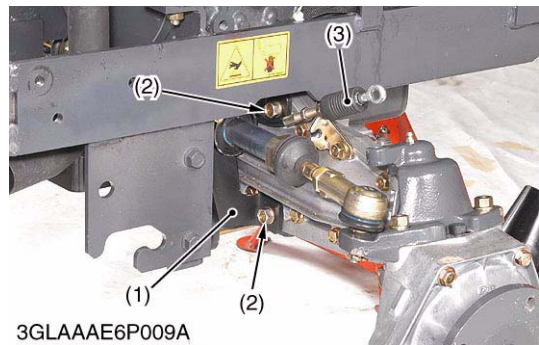
- 1. Lift up the front side of machine and place the disassembling stand under the front axle frame.
- 2. Remove the front wheels.
- 3. Remove the joint cover mounting screws and slide the joint cover (1).

(When reassembling)

Tightening torque	Front wheel mounting screw	108.5 to 130.2 N·m 11.07 to 13.29 kgf·m 80 to 96 ft-lbs
-------------------	----------------------------	---

- (1) Joint Cover
- (2) Universal Joint

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Power Steering Cylinder Holder

- 1. Unscrew the power steering cylinder holder mounting screws (2).
- 2. Remove the power steering cylinder holder (1).

(When reassembling)

- Reinstall the Glide Steer wire (3) as shown in the figure.

- | | |
|---|-----------------------------|
| (1) Power Steering Cylinder Holder | (3) Glider Steer Wire |
| (2) Power Steering Cylinder Holder Mounting Screw | (4) Front Axle Assembly |
| | (5) Power Steering Cylinder |

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Front Axle Assembly

- 1. Support the front axle assembly (1) so as not to drop out.
- 2. Remove the front axle bracket (2).
- 3. Separate the front axle assembly (1) from the frame.

(When reassembling)

- Apply the grease to center pin of front axle assembly.
- Reinstall the shims (4), (6) and collar (5) on the front axle bracket retaining screw (3) as shown in the figure.

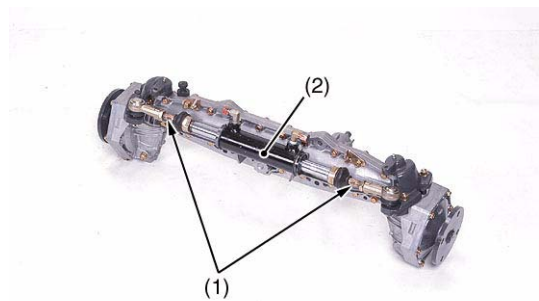
Tightening torque	Front axle bracket Mounting Screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
-------------------	-----------------------------------	---

- | | |
|--|------------|
| (1) Front Axle Assembly | (4) Shim |
| (2) Front Axle Bracket | (5) Collar |
| (3) Front Axle Bracket Retaining Screw | (6) Shim |

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[3] DISASSEMBLING AND ASSEMBLING

(1) Front Axle Assembly



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Power Steering Cylinder

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

(When reassembling)

NOTE

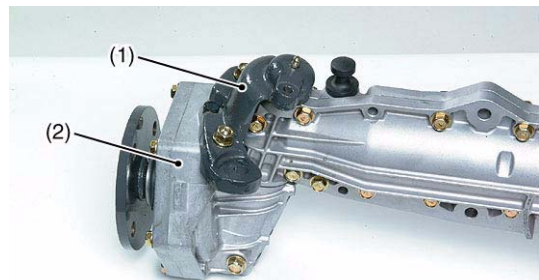
- Tighten the slotted nut to 17.7 N·m (1.8 kgf·m, 13 ft-lbs). If the slot and pin hole do not meet, tighten the nut until they do meet, and install the cotter pin.
- Be sure to split the cotter pin like an anchor.

Tightening torque	Tie-rod slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
-------------------	---------------------	---

(1) Tie-rod

(2) Power Steering Cylinder

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Front Gear Case Assembly

- 1. Remove the king pin support (1).
- 2. Remove the front gear case assembly (2).

(When reassembling)

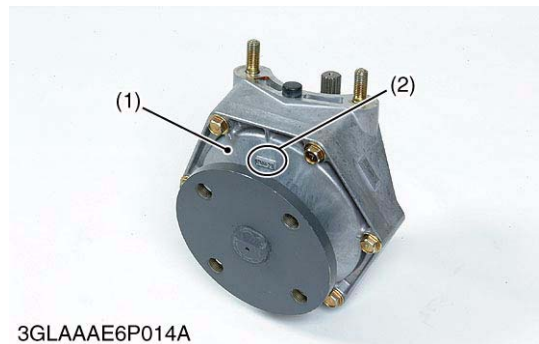
- Do not interchange left and right front gear case assemblies.

Tightening torque	King pin support mounting nut	19.6 to 25.5 N·m 2.0 to 2.6 kgf·m 14.4 to 18.8 ft-lbs
-------------------	-------------------------------	---

(1) King Pin Support

(2) Front Gear Case

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Front Gear Case Cover

- 1. Remove the front gear case cover (1) with bevel gear (3).

(When reassembling)

- Take care not to damage the O-ring (4).
- Install the front gear case cover (1) to position the square mark (2) on it upward.

Tightening torque	Front gear case cover mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.1 ft-lbs
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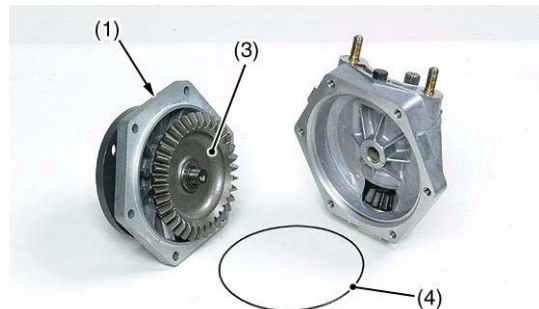
(1) Front Case Cover

(3) Bevel Gear

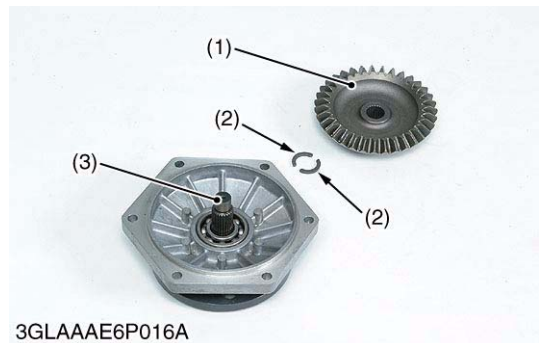
(2) Square Mark

(4) O-ring

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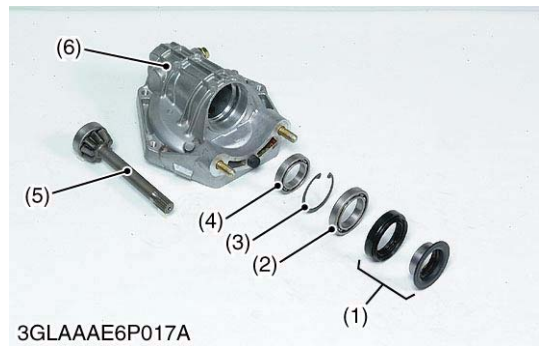


35T Bevel Gear and Front Axle

1. Remove the 35T bevel gear (1).
2. Remove the collar (2).
3. Tap out the front axle shaft (3).

- (1) 35T Bevel Gear (3) Front Axle Shaft
(2) Collar

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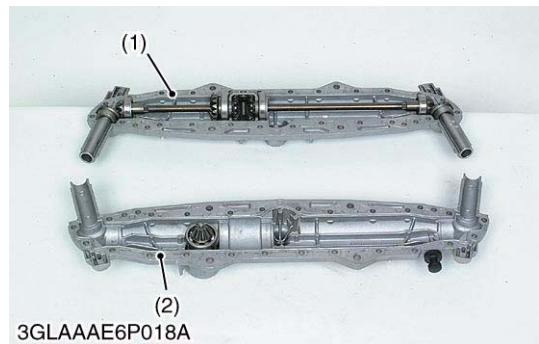


Front Gear Case

1. Remove the oil seal (1) and the ball bearing (2).
2. Remove the internal snap ring (3).
3. Remove the ball bearing (4).
4. Remove the bevel gear shaft (5) with ball bearing.

- (1) Oil Seal (4) Ball Bearing
(2) Ball Bearing (5) Bevel Gear Shaft
(3) Internal Snap Ring (6) Front Gear Case

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Front Axle Case

1. Separate the front axle case to front side (1) and rear side (2).

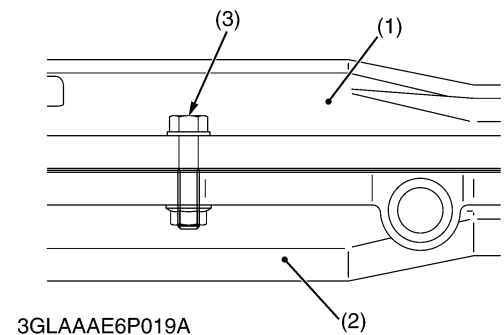
(When reassembling)

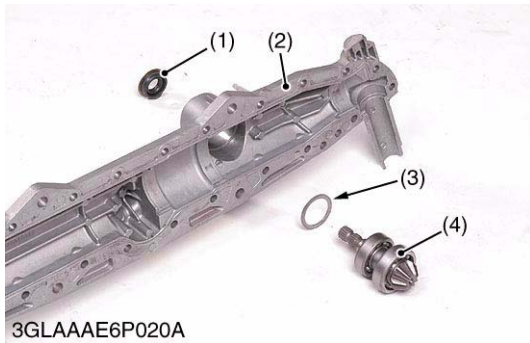
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the front axle case.
- Install the front axle case screw (3), noting its direction as shown in the figure.
- Tentatively tighten the front axle case screws (3) at intervals of every other one to join the front-side and rear-side front axle cases (1), (2). Then tighten all front axle case screws (3) with a specified tightening torque.

Tightening torque	Front axle case screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.23 to 8.33 ft-lbs
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- (1) Front Axle Case (Front Side) (3) Front Axle Case Screw
(2) Front Axle Case (Rear Side)

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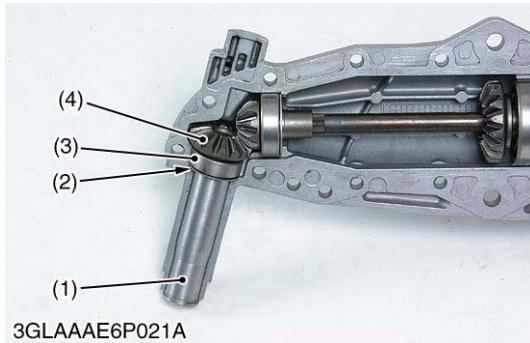


Bevel Pinion Shaft

1. Remove the bevel pinion shaft (4) from the rear side of front axle case (2).
2. Remove the oil seal (1).

- | | |
|---------------------------------|------------------------|
| (1) Oil Seal | (3) Shim |
| (2) Front Axle Case (Real Side) | (4) Bevel Pinion Shaft |

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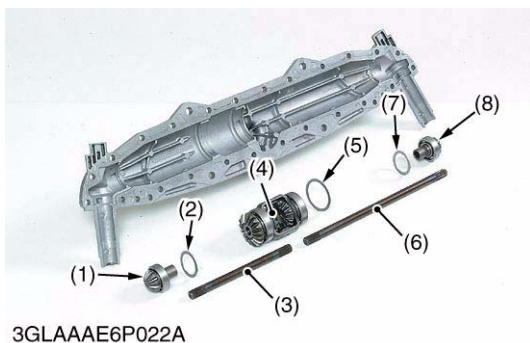


15T Bevel Gear

1. Remove the pipe (1).
2. Remove the ball bearing (3) and 15T bevel gear (4).

- | | |
|----------|--------------------|
| (1) Pipe | (3) Ball Bearing |
| (2) Shim | (4) 15T Bevel Gear |

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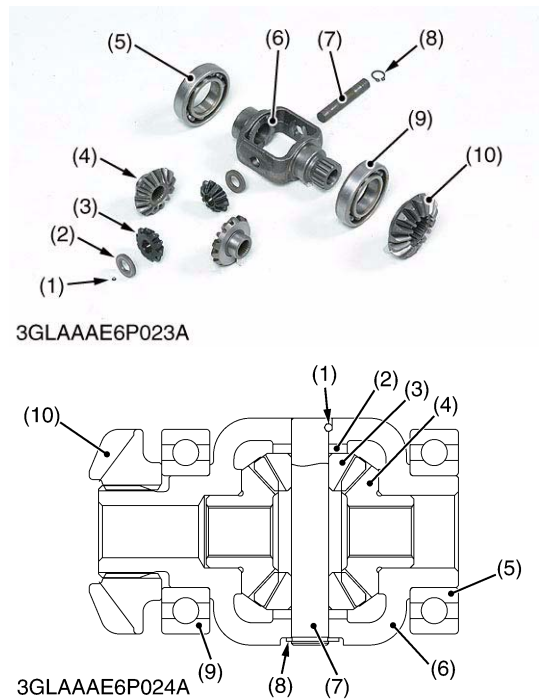


10T Bevel Gear and Differential Gear Assembly

1. Remove the 10T bevel gears (1), (8) with bearing.
2. Remove the differential yoke shafts (3), (6).
3. Remove the differential gear assembly (4).

- | | |
|----------------------------------|----------------------------------|
| (1) 10T Bevel Gear (LH) | (5) Shim |
| (2) Shim | (6) Differential Yoke Shaft (RH) |
| (3) Differential Yoke Shaft (LH) | (7) Shim |
| (4) Differential Gear Assembly | (8) 10T Bevel Gear (RH) |

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[4] SERVICING



Differential Gear Assembly

- 1. Remove the bevel gear (10).
- 2. Remove the bearings (5), (9) with the puller.
- 3. Remove the external snap ring (8).
- 4. Remove the differential pinion shaft (7).
- 5. Remove the differential pinion gears (3), differential side gears (4) and shims (2).

NOTE

- Arrange the parts to know their original position. (When reassembling)
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of differential pinion gears (3), differential side gears (4) and shims (2).
- Install the steel ball (1) in a specified position of the differential gear case (6) as shown in the figure.

- | | |
|------------------------------|-------------------------------|
| (1) Steel Ball | (6) Differential Gear Case |
| (2) Shim | (7) Differential Pinion Shaft |
| (3) Differential Pinion Gear | (8) External Snap Ring |
| (4) Differential Side Gear | (9) Bearing |
| (5) Bearing | (10) Bevel Gear |

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Clearance between Differential Gear Case and Differential Side Gear

- 1. Measure the differential side gear boss O.D..
- 2. Measure the differential case bore I.D., and calculate the clearance.
- 3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential gear case and differential side gear	Factory spec.	0.040 to 0.082 mm 0.00157 to 0.00323 in.
	Allowable limit	0.17 mm 0.0067 in.
Differential gear case bore I.D.	Factory spec.	19.500 to 19.521 mm 0.76772 to 0.76854 in.
Differential side gear O.D.	Factory spec.	19.439 to 19.460 mm 0.76532 to 0.76614 in.

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Clearance between Differential Pinion Shaft and Differential Pinion Gear

1. Measure the differential pinion shaft O.D..
2. Measure the differential pinion gear I.D., and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential pinion shaft and differential pinion gear	Factory spec.	0.025 to 0.055 mm 0.00098 to 0.00217 in.
	Allowable limit	0.25 mm 0.0096 in.

Differential pinion shaft O.D.	Factory spec.	9.960 to 9.975 mm 0.39212 to 0.39272 in.
Differential pinion gear I.D.	Factory spec.	10.000 to 10.015 mm 0.39370 to 0.39429 in.

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Backlash between Differential Pinion Gear and Differential Side Gear

1. Set a dial gauge (lever type) on a tooth of the differential pinion gear.
2. Fix the differential side gear, and move the differential pinion gear to measure the backlash.
3. If the measurement exceeds the factory specifications, adjust with the differential pinion gears shims.

Backlash between differential pinion gear and differential side gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
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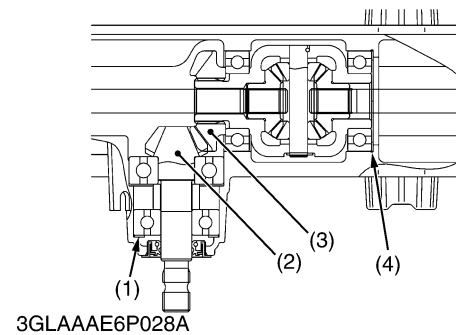


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(Reference)

- Thickness of adjusting shims:
For pinion gear: 2.3 mm (0.091 in.), 2.5 mm (0.098 in.)
2.7 mm (0.106 in.), 2.9 mm (0.114 in.)

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Backlash between Bevel Pinion Shaft and Bevel Gear

- 1. Stick a strip of fuse to three spots on the bevel gear (3) with grease.
- 2. Fix the front side and rear side of front axle case.
- 3. Turn the bevel pinion shaft.
- 4. Separate the front axle case to front side and rear side.
- 5. Remove the bevel gear (3), and measure the thickness of the fuses with an outside micrometer.
- 6. If the backlash is not within the factory specifications, adjust with shims (1), (4).

Backlash between bevel pinion shaft and bevel gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
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(Reference)

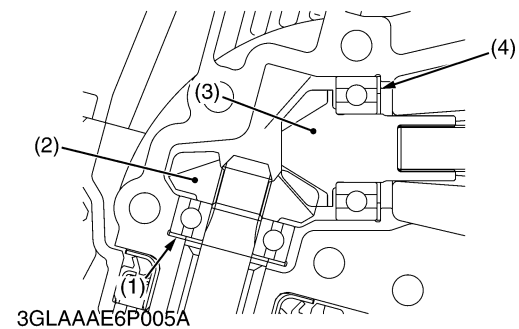
- Thickness of adjusting shims:
For Bevel pinion shaft (1):
0.5 mm (0.020 in.), 0.8 mm (0.031 in.)
1.0 mm (0.039 in.), 1.2 mm (0.047 in.)
1.4 mm (0.055 in.)
For Bevel gear (4): 0.6 mm (0.024 in.), 0.8 mm (0.031 in.)
1.2 mm (0.039 in.), 1.2 mm (0.047 in.)
1.4 mm (0.055 in.)

- (1) Shim

(2) Bevel Pinion Shaft
- (3) Bevel Gear

(4) Shim

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Backlash between 10T Bevel Gear and 15T Bevel Gear

1. Stick a strip of fuse to three spots on the 15T bevel gear (2) with grease.
2. Fix the front side and rear side of front axle case.
3. Install the front gear case in front axle case.
4. Turn the axle.
5. Remove the front gear case, and separate the front axle case to front side and rear side.
6. Remove the 15T bevel gear (2), and measure the thickness of the fuses with an outside micrometer.
7. If the backlash is not within the factory specifications, adjust with shims (1), (4).

Backlash between 10T bevel gear and 15T bevel gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
--	---------------	-------------------------------------

(Reference)

- Thickness of adjusting shims:
 For 15T Bevel gear (1): 0.6 mm (0.024 in.), 0.8 mm (0.031 in.)
 1.0 mm (0.039 in.), 1.2 mm (0.047 in.)
 1.4 mm (0.055 in.)
 For 10T Bevel gear (4): 0.6 mm (0.024 in.), 0.8 mm (0.031 in.)
 1.0 mm (0.039 in.), 1.2 mm (0.047 in.)
 1.4 mm (0.055 in.)

- | | |
|--------------------|--------------------|
| (1) Shim | (3) 10T Bevel Gear |
| (2) 15T Bevel Gear | (4) Shim |

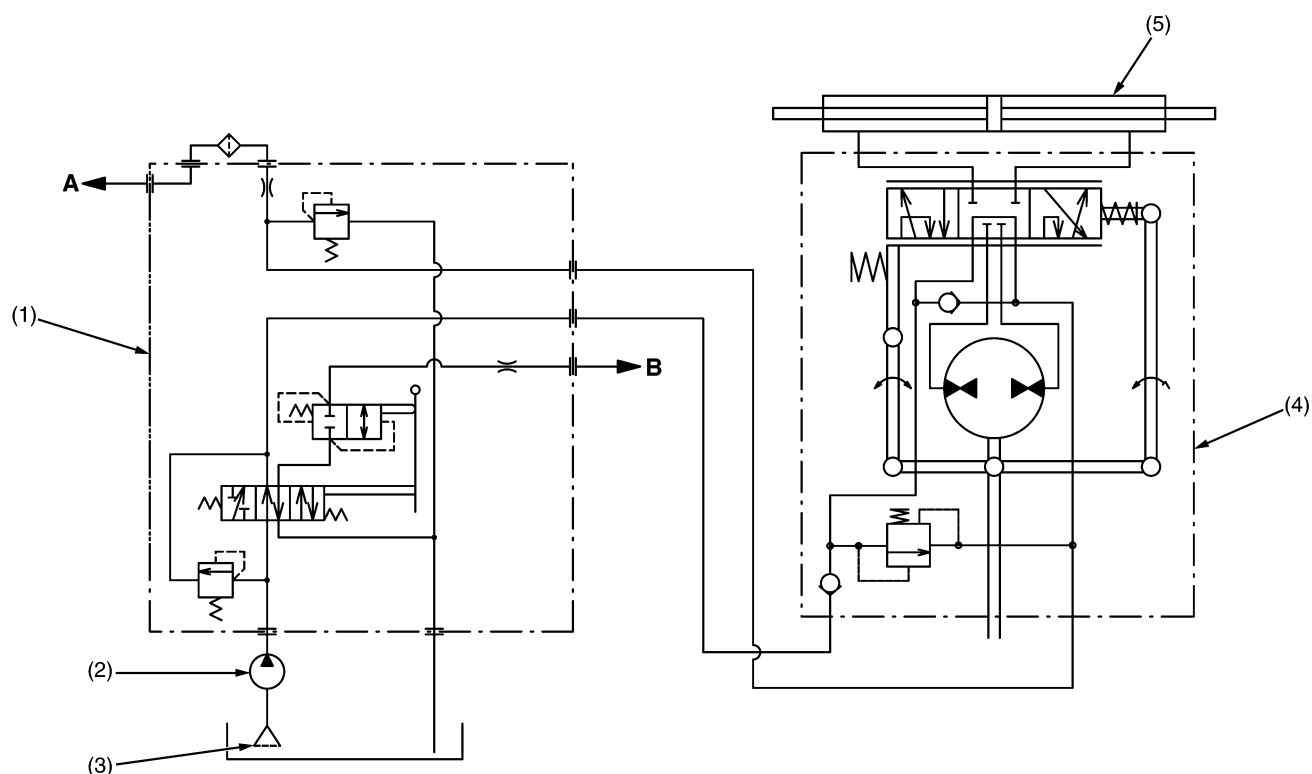
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5 STEERING

CONTENTS

1. HYDRAULIC CIRCUIT	5-M1
2. STEERING CONTROLLER.....	5-M2
3. STEERING CYLINDER	5-M4

1. HYDRAULIC CIRCUIT



3GLAAAE7P001A

(1) Hydraulic Control Valve
Assembly

(2) Hydraulic Pump

(3) Oil Strainer

(4) Steering Controller

(5) Steering Cylinder

A : To HST

B : To Mower Lift Cylinder

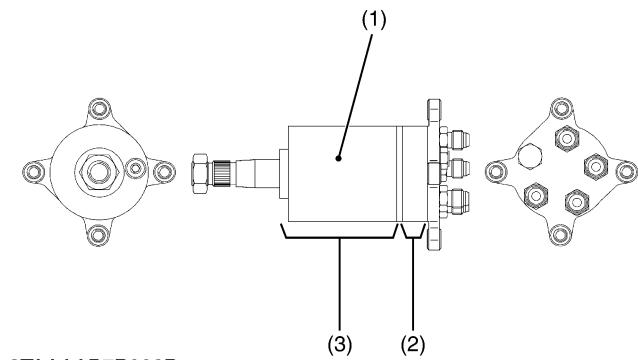
This machine is provided with a full hydrostatic power steering.

In the full hydrostatic power steering, the steering controller (4) is connected to the steering cylinder (5) with only the hydraulic piping. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc. Therefore, it is simple in construction. This steering system consists of the oil strainer (3), hydraulic pump (2), hydraulic control valve assembly (1), steering controller (4), steering cylinder (5), etc..

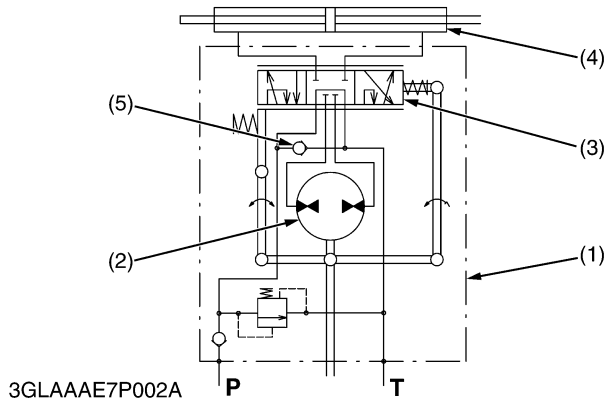
The oil is supplied to the steering controller (4) through the hydraulic control valve assembly (1) by the hydraulic pump (2). With the steering wheel at neutral, the oil returns through the steering controller (4) to the hydraulic control valve assembly (1). Turn the steering wheel, and just a required amount of oil is sent to the steering cylinder (5). The oil at the side opposite to the cylinder flows back to the hydraulic control valve assembly (1).

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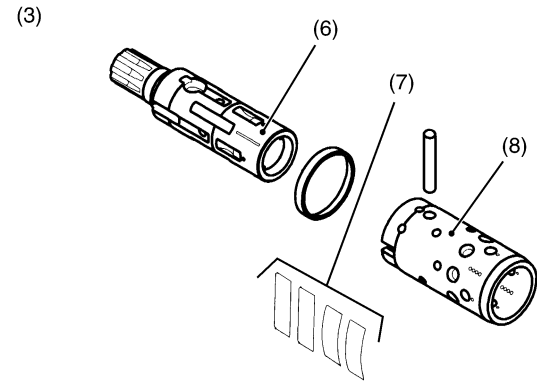
2. STEERING CONTROLLER



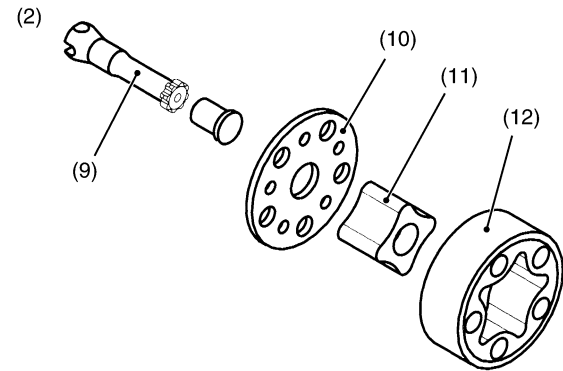
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3TAAAAB7P004C



3TAAAAB7P005C

The steering controller consists of a control valve (3) and a metering device (2).

■ Control Valve

The control valve is a rotating spool type.

When the steering wheel is not turned, the position of the spool (6) and sleeve (8) is kept neutral by the centering spring (7). This causes the forming of a "Neutral" oil circuit.

When the steering wheel is turned either clockwise or counterclockwise, the position of the spool and sleeve changes in relation to the centering spring. This allows the forming of a "Right Turning" or "Left Turning" oil circuit. At the same time, the gear pump (Metering device) rotates with the spool and sends the oil to the cylinder corresponding to the rotation of the steering wheel.

■ Metering Device

An oil, sent from the hydraulic pump to the steering cylinder, passes through the metering device (2).

Namely, when the rotor is driven, two chambers suck in oil due to volumetric change in the pup chambers formed between the rotor (11) and the stator (12), while oil is discharged from other two chambers. On the other hand, rotation of the steering wheel is directly transmitted to the rotor through the spool (6), drive shaft (9), etc.

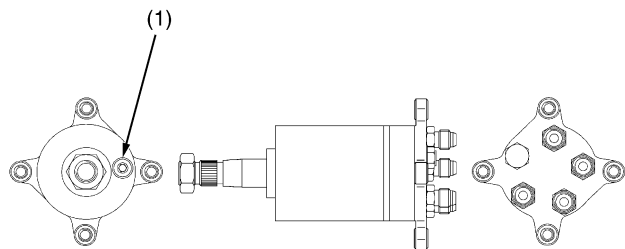
Accordingly, the metering device serves to supply the steering cylinder with oil, amount of which corresponds to the rotation of the steering wheel. The wheels are thus turned by the angle corresponding to the rotation of the steering wheel.

When the engine stops or the hydraulic pump malfunctions, the metering device functions as a manual trochoid pump, which makes manual steering possible.

- | | |
|-------------------------|------------------------|
| (1) Steering Controller | (10) Distributor Plate |
| (2) Metering Device | (11) Rotor |
| (3) Control Valve | (12) Stator |
| (4) Steering Cylinder | |
| (5) Check Valve | |
| (6) Spool | |
| (7) Centering Spring | |
| (8) Sleeve | |
| (9) Drive Shaft | |

P : P Port (From Hydraulic Control Valve Assembly)
T : T Port (To Hydraulic Control Valve Assembly)

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■ Relief Valve

The relief valve (1) is located in the steering controller. It controls the maximum pressure of the power steering system.

Its setting pressure is as follows.

8.3 to 8.8 MPa

84.6 to 89.7 kgf/cm²

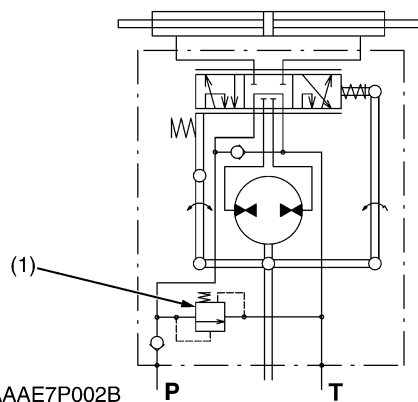
1204 to 1276 psi

(1) Relief Valve

P : P Port
(From Hydraulic Control Valve Assembly)

T : T Port
(To Hydraulic Control Valve Assembly)

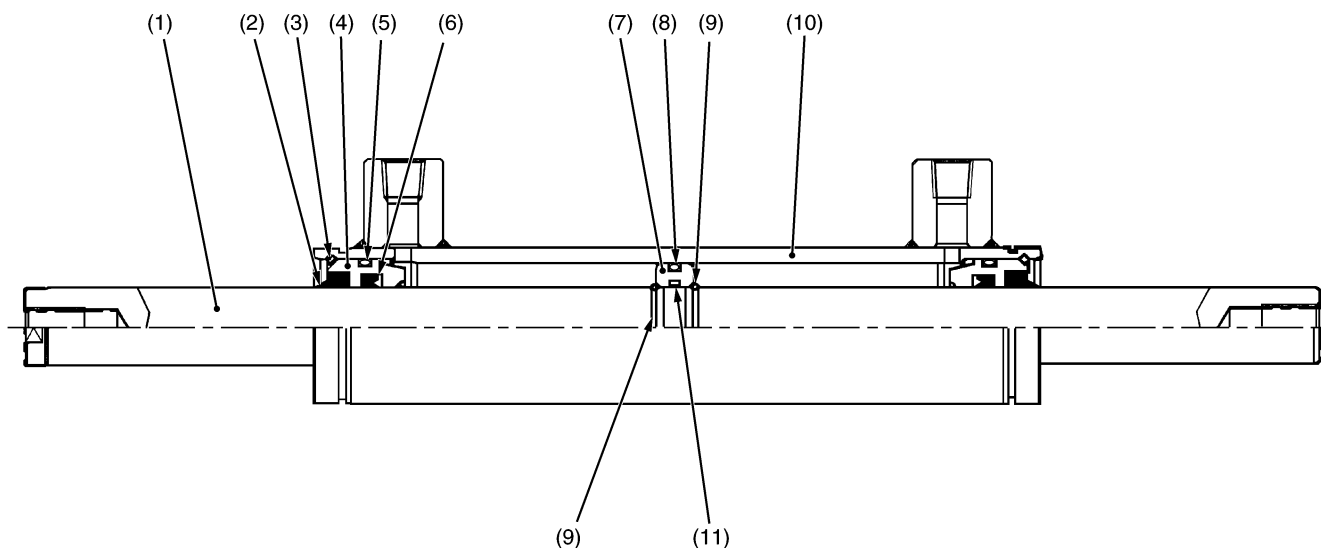
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3. STEERING CYLINDER



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- | | | | |
|------------------------|---------------|------------------------|--------------------|
| (1) Rod | (4) Guide | (7) Center Piston | (10) Cylinder Tube |
| (2) Wiper Ring | (5) O-ring | (8) Piston O-ring | (11) Rod O-ring |
| (3) Internal Snap Ring | (6) Seal Ring | (9) External Snap Ring | |

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

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

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

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1. TROUBLESHOOTING.....	5-S1
2. SERVICING SPECIFICATIONS.....	5-S2
3. TIGHTENING TORQUES.....	5-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	5-S4
[1] CHECKING AND ADJUSTING.....	5-S4
[2] PREPARATION.....	5-S5
(1) Separating Power Steering Controller.....	5-S5
(2) Separating Power Steering Cylinder.....	5-S8
[3] DISASSEMBLING AND ASSEMBLING.....	5-S11
(1) Power Steering Cylinder.....	5-S11

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Cannot Be Steered	● Steering controller malfunctioning	Replace	5-S8
	● Hose broken	Replace	5-S8
Hard Steering	● Power steering oil improper	Change with specified oil	G-8, 30
	● Hydraulic pump malfunctioning	Replace	6-S8
	● Steering controller malfunctioning	Replace	5-S8
Steering Force Fluctuates	● Steering controller malfunctioning	Replace	5-S8
	● Air sucked in pump due to lack of oil	Replenish	G-8, 17
	● Air sucked in pump from suction circuit	Repair	6-S6, 8
Steering Wheel Turns Spontaneously When Released	● Steering controller malfunctioning	Replace	5-S8
Front Wheels Wander to Right and Left	● Steering controller malfunctioning	Replace	5-S8
	● Air sucked in pump due to lack of oil	Replenish	G-8, 17
	● Air sucked in pump from suction circuit	Repair	6-S6, 8
	● Insufficient bleeding	Bleed	—
	● Cylinder malfunctioning	Replace	5-S11
	● Improper toe-in adjustment	Adjust	4-S4
	● Tire pressure uneven	Inflate	G-49
Wheels Are Turned to a Direction Opposite to Steering Direction	● Cylinder hoses connected in reverse	Repair	5-S8
Steering Wheel Turns Idle in Manual Steering	● Insufficient bleeding	Bleed	—
	● Air sucked in due to lack of oil	Replenish	G-8, 17
Noise	● Air sucked in pump due to lack of oil	Replenish	G-8, 17
	● Air sucked in pump from suction circuit	Repair	6-S6, 8
Oil Temperature Increases Rapidly	● Steering controller (relief valve) malfunctioning	Replace	5-S8

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Steering Wheel	Play	30 to 70 mm 0.79 to 1.18 in.	—

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POWER STEERING BODY

Item		Factory Specification	Allowable Limit
Relief Valve	Operating Pressure	8.3 to 8.8 MPa 84.6 to 89.7 kgf/cm ² 1204 to 1276 psi	—

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3. TIGHTENING TORQUES

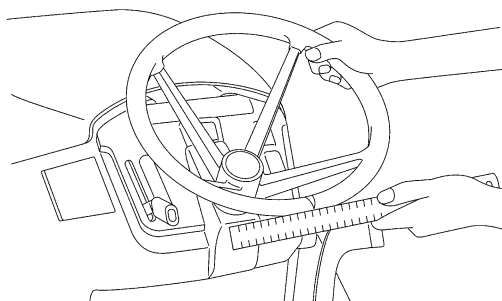
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-9)

Item	N·m	kgf·m	ft-lbs
Steering wheel mounting nut	20 to 25	2.0 to 2.5	14.8 to 18.4
Power steering hose mounting nut	24.0 to 28.0	2.45 to 2.85	17.71 to 20.65
Power steering cylinder hose nut	24.0 to 28.0	2.45 to 2.85	17.71 to 20.65
Front wheel mounting screw	108.5 to 130.2	11.07 to 13.29	80 to 96
Front axle bracket mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Tie-rod slotted nut	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3
Tie-rod screw	74 to 84	7.5 to 8.6	54.6 to 61.9

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



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Steering Wheel Play

1. Turn the front wheels straight ahead.
2. Rotate the steering wheel lightly by hand, and measure the play.
3. If the measurement exceeds the factory specifications, replace the steering shaft and sector gear.

Steering wheel play	Factory spec.	30 to 70 mm 0.79 to 1.18 in.
---------------------	---------------	---------------------------------

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Relief Valve Operating Pressure



CAUTION

- When checking, park the machine on level ground, apply the parking brake.

1. Disconnect the power steering hose (1) L (or R) from steering controller, and set a pressure gauge.
2. Start the engine and set at maximum speed.
3. Fully turn the steering wheel to the left (or right) to check the feeling which the steering wheel lightly locks. Read the relief valve operating pressure when the steering wheel to the above-mentioned lock position.

NOTE

- After set a pressure gauge, be sure to bleed air.
- Note that the pressure value changes by the pump action of the power steering controller when the steering operation is continued after the steering wheel is lightly locked and accurate relief valve pressure cannot be measured.

(Reference)

- Hose and adaptor size: 9/16-18 UNF.

Relief valve operating pressure	Factory spec.	8.3 to 8.8 MPa 84.6 to 89.7 kgf/cm ² 1204 to 1276 psi
---------------------------------	---------------	--

(1) Power Steering Hose

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[2] PREPARATION

(1) Separating Power Steering Controller

Dismounting Mower

1. See page 8-S6. ("Mower" Section)

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Dismounting Container

1. See page 2-S9. ("Transaxle" Section)

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Battery



CAUTION

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

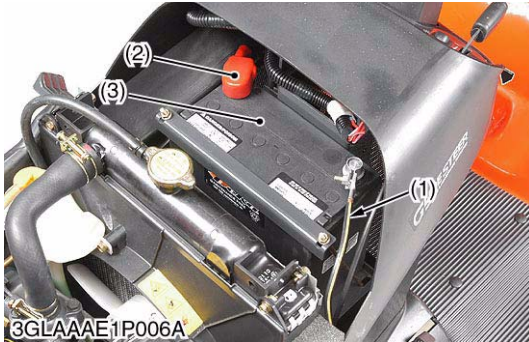
1. Open the bonnet.
2. Remove the radiator net.
3. Disconnect the negative cable (1) from the battery.
4. Disconnect the positive cable (2) from the battery and remove the battery (3).

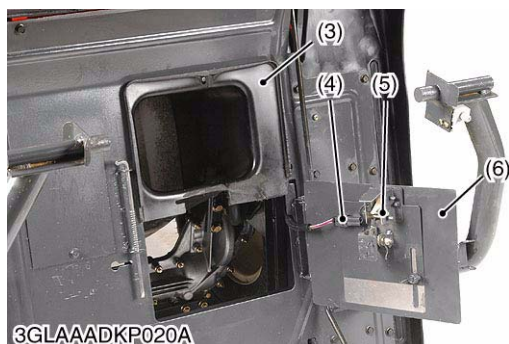
(1) Negative Cable

(3) Battery

(2) Positive Cable

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Container Base

1. Disconnect the couplers (1) from the relays.
2. Disconnect the connectors (2).
3. Open the switch cover (6). And disconnect the connector (4) from the grass container full switch (5).
4. Remove the discharge duct (3).
5. Remove the container base (7).

- | | |
|--------------------|---------------------------------|
| (1) Coupler | (5) Grass Container Full Switch |
| (2) Connector | (6) Switch Cover |
| (3) Discharge Duct | (7) Container Base |
| (4) Connector | |

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Seat

1. Remove the snap pin (2).
2. Remove the seat (1).

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

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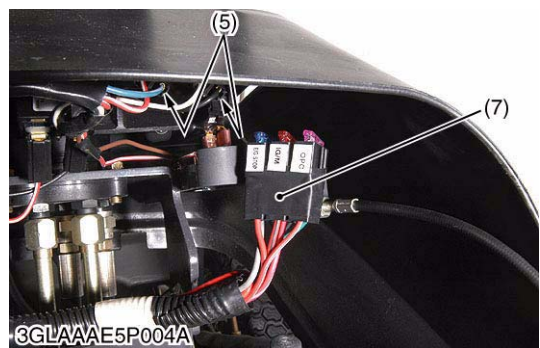


Fender

1. Remove the speed change pedal (5).
2. Peel the step sheet (4) halfway.
3. Remove the fuel cap (1).
4. Remove the fender (2).

- | | |
|---------------------------|------------------------|
| (1) Fuel Cap | (4) Step Sheet |
| (2) Fender | (5) Speed Change Pedal |
| (3) Fender Mounting Screw | |

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Steering Wheel, Side Bonnet and Panel

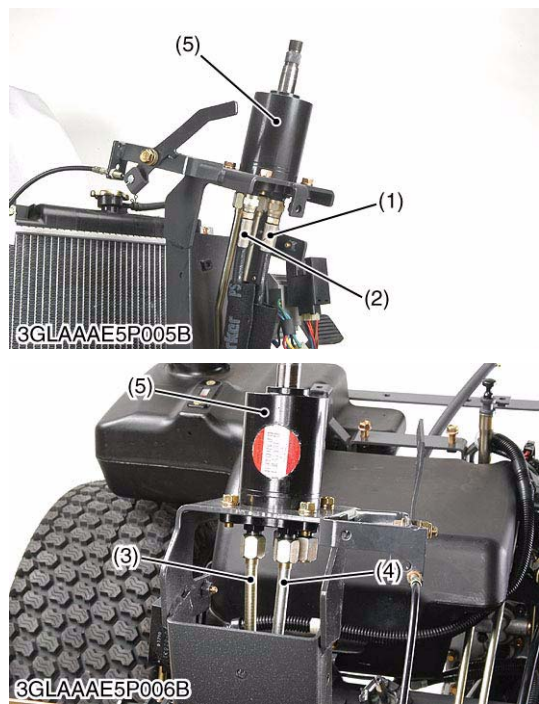
1. Remove the steering wheel (1).
2. Remove the side bonnet (3).
3. Remove the accelerator lever grip.
4. Disconnect the connectors for hour meter, main switch (4) and light switch.
5. Remove the indicator lamps (5).
6. Remove the fuse box (6) from the steering support.
7. Remove the panel (2).

(When reassembling)

Tightening torque	Steering wheel mounting nut	20 to 25 N·m 2.0 to 2.5 kgf·m 14.8 to 18.4 ft-lbs
-------------------	-----------------------------	---

- | | |
|--------------------|--------------------|
| (1) Steering Wheel | (4) Main Switch |
| (2) Panel | (5) Indicator Lamp |
| (3) Side Bonnet | (6) Fuse Box |

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Steering Controller

1. Disconnect the power steering hoses (1), (2), (3), (4).
2. Remove the steering controller mounting screws and remove the steering controller (5).

(When reassembling)

- Be sure to connect the power steering hoses to their original position, and tighten them to the specified torque.

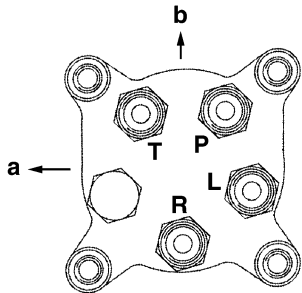
Tightening torque	Power steering hose mounting nut	24.0 to 28.0 N·m 2.45 to 2.85 kgf·m 17.71 to 20.65 ft·lbs
-------------------	----------------------------------	---

- (1) Cylinder Hose LH
(2) Cylinder Hose RH
(3) Return Hose
(4) Delivery Hose
(5) Steering Controller

- A: Bottom View**
P: Pump Port
(Connect to Delivery Hose)
T: Tank Port
(Connect to Return Hose)
L: L Port
(Connect to Cylinder RH)
R: R Port
(Connect to Cylinder LH)
a: Right from Operator
b: Front

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A



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(2) Separating Power Steering Cylinder

Dismounting Mower

1. See page 8-S6. ("Mower" Section)

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Battery

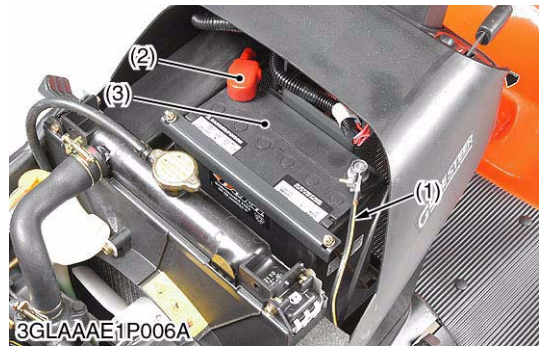
CAUTION

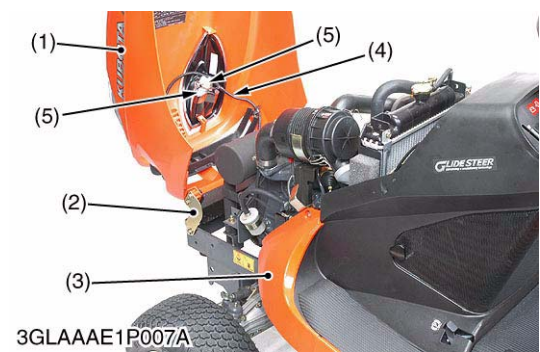
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Open the bonnet.
2. Remove the radiator net.
3. Disconnect the negative cable (1) from the battery.
4. Disconnect the positive cable (2) from the battery and remove the battery (3).

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

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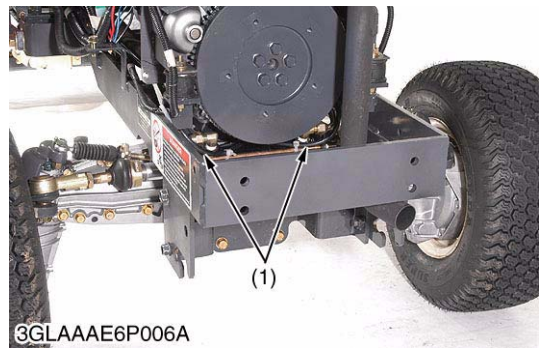


Bonnet and Side Bonnet

- 1. Disconnect the connectors (5) from the head light.
- 2. Remove the wire harness (4) from the bonnet.
- 3. Remove the bonnet (1) with bonnet bracket (2).
- 4. Remove the side bonnet (3).

- (1) Bonnet
- (2) Bonnet Bracket
- (3) Side Bonnet
- (4) Wire Harness
- (5) Connector

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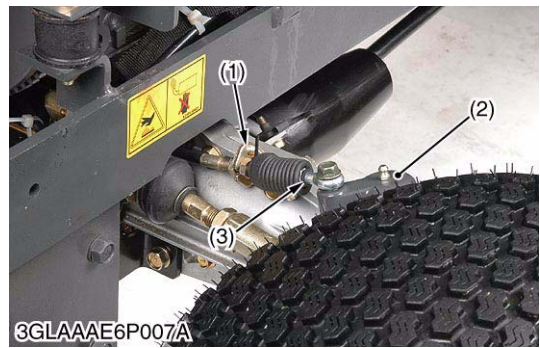
Power Steering Hose

- 1. Disconnect the power steering cylinder hoses (1).
- (When reassembling)**

Tightening torque	Power steering cylinder hose	24.0 to 28.0 N·m 2.45 to 2.85 kgf·m 17.71 to 20.65 ft-lbs
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- (1) Power Steering Cylinder Hose

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Glide Steer Wire

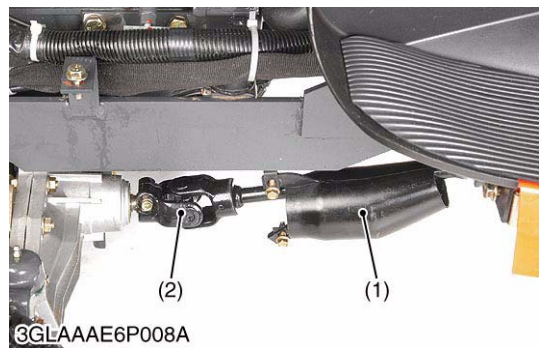
- 1. Turn the steering wheel to left or right.
- 2. Disconnect the Glide Steer wire (3) on the opposite side to which the steering wheel is turned from the king pin support (2).
- 3. Remove the Glide Steer wire (3) from the wire holder (1).

(When reassembling)

- Adjust the Glide Steer. (See page 4-S5.)

- (1) Wire Holder
- (2) King Pin Support
- (3) Glide Steer Wire

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Front Wheel and Joint Cover

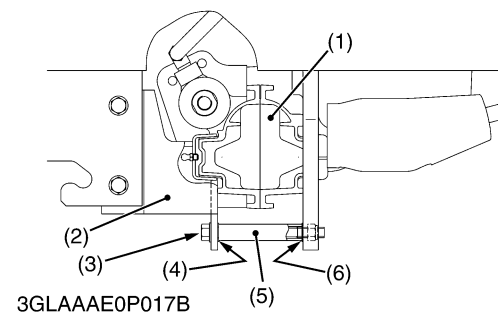
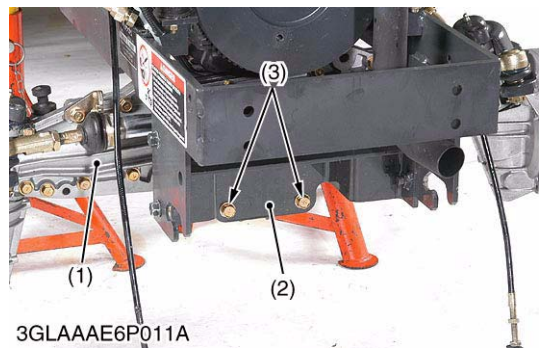
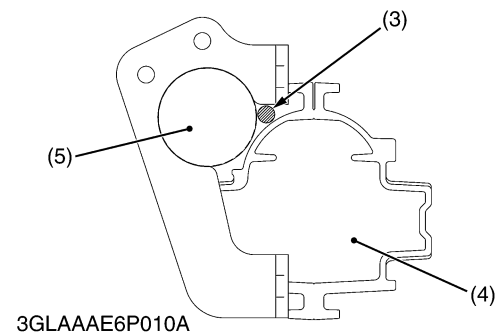
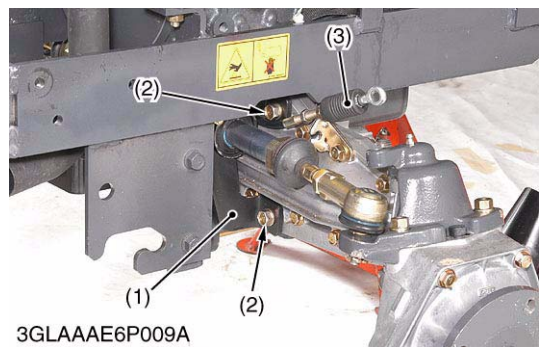
- 1. Lift up the front side of machine and place the disassembling stand under the front axle frame.
- 2. Remove the front wheels.
- 3. Remove the joint cover mounting screws and slide the joint cover (1).

(When reassembling)

Tightening torque	Front wheel mounting screw	108.5 to 130.2 N·m 11.07 to 13.29 kgf·m 80 to 96 ft-lbs
-------------------	----------------------------	---

- (1) Joint Cover
- (2) Universal Joint

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Power Steering Cylinder Holder

1. Unscrew the power steering cylinder holder mounting screws (2).
2. Remove the power steering cylinder holder (1).

(When reassembling)

- Reinstall the Glide Steer wire (3) as shown in the figure.

- | | |
|---|-----------------------------|
| (1) Power Steering Cylinder Holder | (3) Glider Steer Wire |
| (2) Power Steering Cylinder Holder Mounting Screw | (4) Front Axle Assembly |
| | (5) Power Steering Cylinder |

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Front Axle Assembly

1. Support the front axle assembly (1) so as not to drop out.
2. Remove the front axle bracket (2).
3. Separate the front axle assembly (1) from the frame.

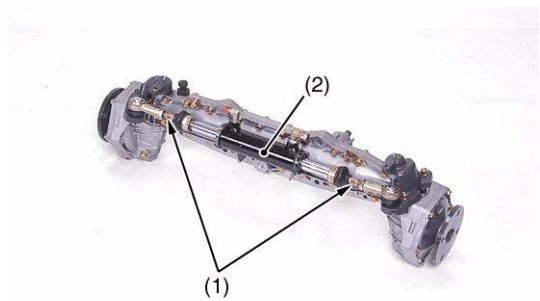
(When reassembling)

- Apply the grease to center pin of front axle assembly.
- Reinstall the shims (4), (6) and collar (5) on the front axle bracket retaining screw (3) as shown in the figure.

Tightening torque	Front axle bracket Mounting Screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
-------------------	-----------------------------------	---

- | | |
|--|------------|
| (1) Front Axle Assembly | (4) Shim |
| (2) Front Axle Bracket | (5) Collar |
| (3) Front Axle Bracket Retaining Screw | (6) Shim |

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Power Steering Cylinder

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

(When reassembling)

■ **NOTE**

- **Tighten the slotted nut to 17.7 N·m (1.8 kgf·m, 13 ft-lbs). If the slot and pin hole do not meet, tighten the nut until they do meet, and install the cotter pin.**
- **Be sure to split the cotter pin like an anchor.**

Tightening torque	Tie-rod slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 ft-lbs
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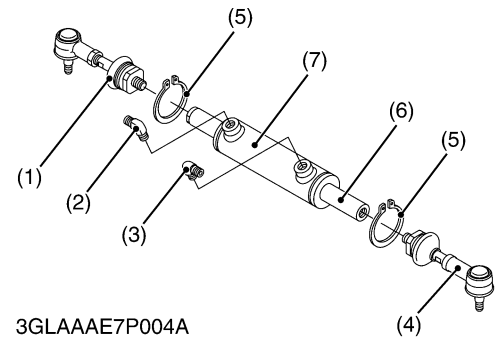
(1) Tie-rod

(2) Power Steering Cylinder

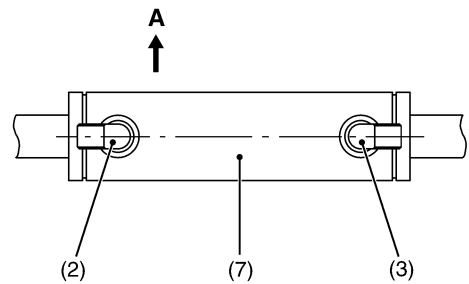
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[3] DISASSEMBLING AND ASSEMBLING

(1) Power Steering Cylinder



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Power Steering Cylinder and Tie-rod

1. Remove the cylinder hose adaptors (2), (3).
2. Remove the tie-rods (1), (4) from piston rod (6).
3. Remove the external snap rings (5).

(When reassembling)

- Be sure to install the hose adaptors (2), (3) as shown figure left.
- After reassembling the tie-rod, be sure to adjust the toe-in. (Refer to 4-S4.)
- Apply liquid lock to the thread of piston rod (6).

Tightening torque	Tie-rod screw	74 to 84 N·m 7.5 to 8.6 kgf·m 54.6 to 61.9 ft-lbs
-------------------	---------------	---

(1) Tie-rod RH

(6) Piston Rod

(2) Hose Adaptor RH

(7) Cylinder

(3) Hose Adaptor LH

(4) Tie-rod LH

A : Front

(5) External Snap Ring

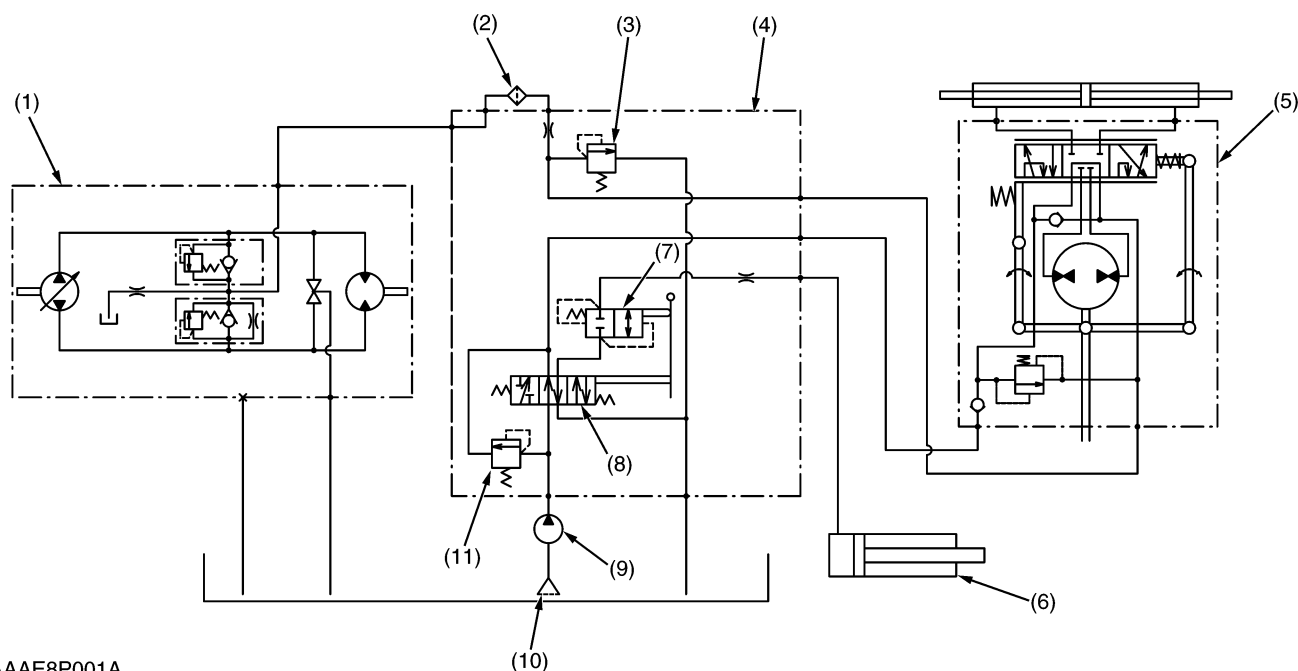
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6 HYDRAULIC SYSTEM

CONTENTS

1. HYDRAULIC CIRCUIT	6-M1
2. HYDRAULIC PUMP.....	6-M2
3. HYDRAULIC CONTROL VALVE.....	6-M3
[1] MOWER LIFT CIRCUIT.....	6-M4
[2] HST RELIEF VALVE.....	6-M8
4. MOWER LIFT CYLINDER.....	6-M9
5. MOWER LINKAGE	6-M10

1. HYDRAULIC CIRCUIT



3GLAAAE8P001A

- | | | | |
|------------------------------|--------------------------------------|--------------------|------------------------|
| (1) Hydrostatic Transmission | (4) Hydraulic Control Valve Assembly | (7) Check Valve | (10) Oil Strainer |
| (2) Oil Filter Cartridge | | (8) Control Valve | (11) Main Relief Valve |
| (3) HST Relief Valve | (5) Steering Controller | (9) Hydraulic Pump | |
| | (6) Mower Lift Cylinder | | |

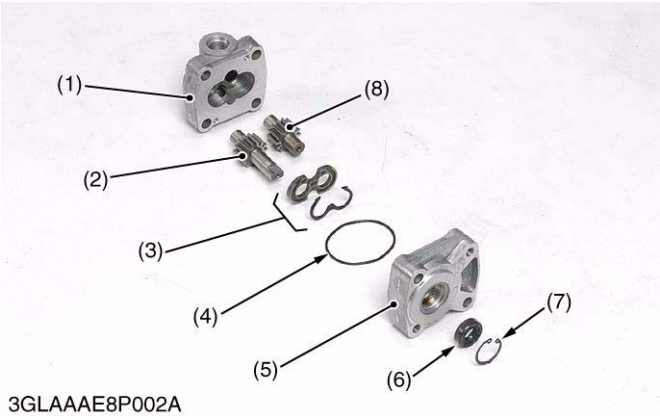
The hydraulic system of this machine is composed of a hydraulic pump (9), hydraulic control valve assembly (4), mower lift cylinder (6) and other components.

This system has the following functions.

1. The oil is supplied by the hydraulic pump (9) which is driven by pump drive shaft in the transaxle case. As the pump drive shaft is engaged with the input shaft which connected to the propeller shaft, the hydraulic pump (9) starts running when engine is started.
2. The hydraulic pump forces out the oil to the hydraulic control valve assembly (4), steering controller (5) and hydrostatic transmission (1).

0000010225E

2. HYDRAULIC PUMP



The hydraulic pump is composed of the casing (1), cover (5), side plate (3), drive gear (2) and driven gear (8).

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

Maximum displacement is as follows.

Displacement	Engine speed	Condition
10.4 L/min. 2.75 U.S.gal/min. 2.29 Imp.gal/min.	At 3000 min ⁻¹ (rpm)	at no load

- (1) Casing

(2) Drive Gear

(3) Side Plate

(4) O-ring
- (5) Cover

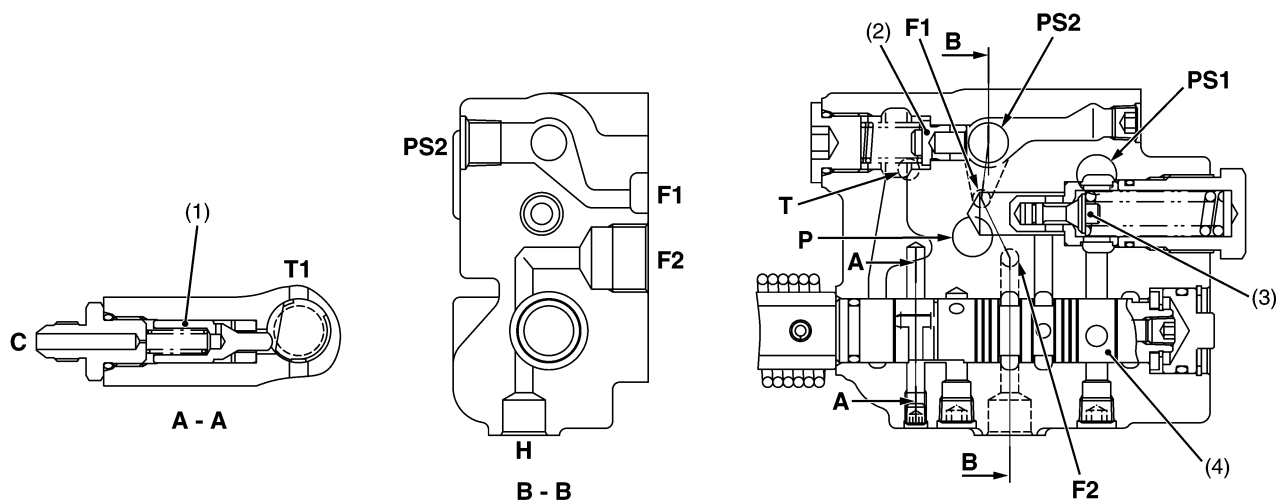
(6) Oil Seal

(7) Internal Snap Ring

(8) Driven Gear

0000010228E

3. HYDRAULIC CONTROL VALVE



3GLAAAE8P003A

(1) Check Valve	P : Pump Port	PS1: Power Steering Port	F1 : Filter Port
(2) HST Relief Valve	T : Tank Port	(To Power Steering	(To Filter Cartridge)
(3) Main Relief Valve	(To Transaxle Case)	Controller)	F2 : Filter Port
(4) Spool (for Control Valve)	T1 : Tank Port (To T Port)	PS2: Power Steering Port	(From Filter Cartridge)
	C : Cylinder Port	(From Power Steering	H : HST Port (To HST)
		Controller)	

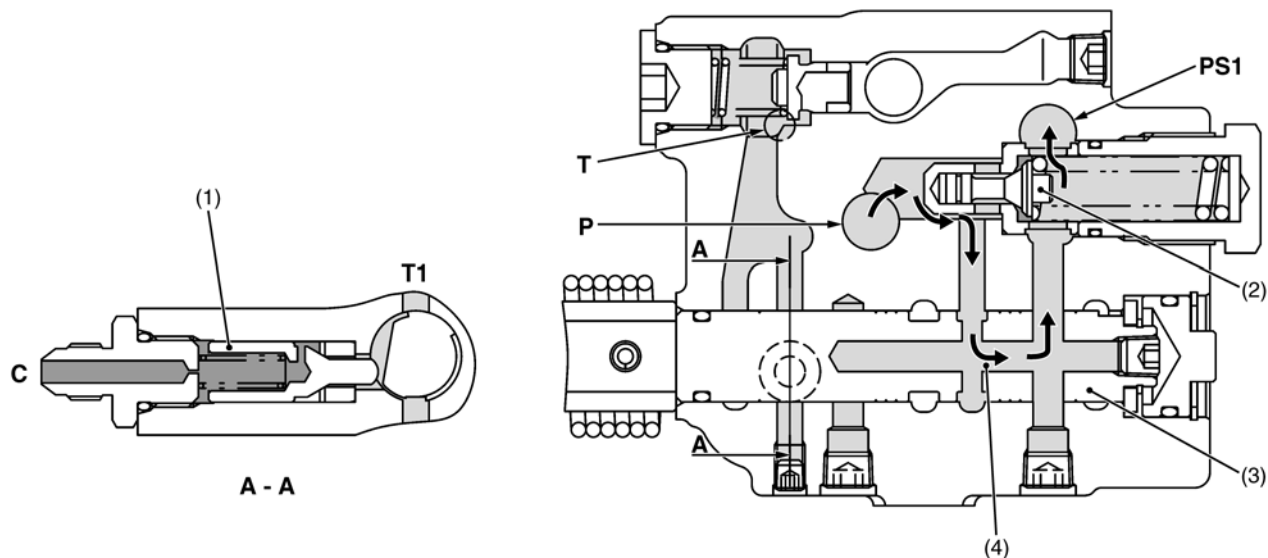
Hydraulic control valve assembly is composed of control valve, main relief valve (3), HST relief valve (2) and check valve (1).

The oil from hydraulic pump is faced into control valve. The spool (4) is rotated by hydraulic lift lever via a link mechanism and oil from hydraulic pump is changed flow direction by the spool (4).

0000010230E

[1] MOWER LIFT CIRCUIT

■ Neutral



3GLAAAE8P004A

- (1) Check Valve
- (2) Main Relief Valve
- (3) Spool
- (4) Passage

P : Pump Port
T : Tank Port
(To Transaxle Case)

T1 : Tank Port (To T Port)
C : Cylinder Port

PS1: Power Steering Port
(To Power Steering Controller)

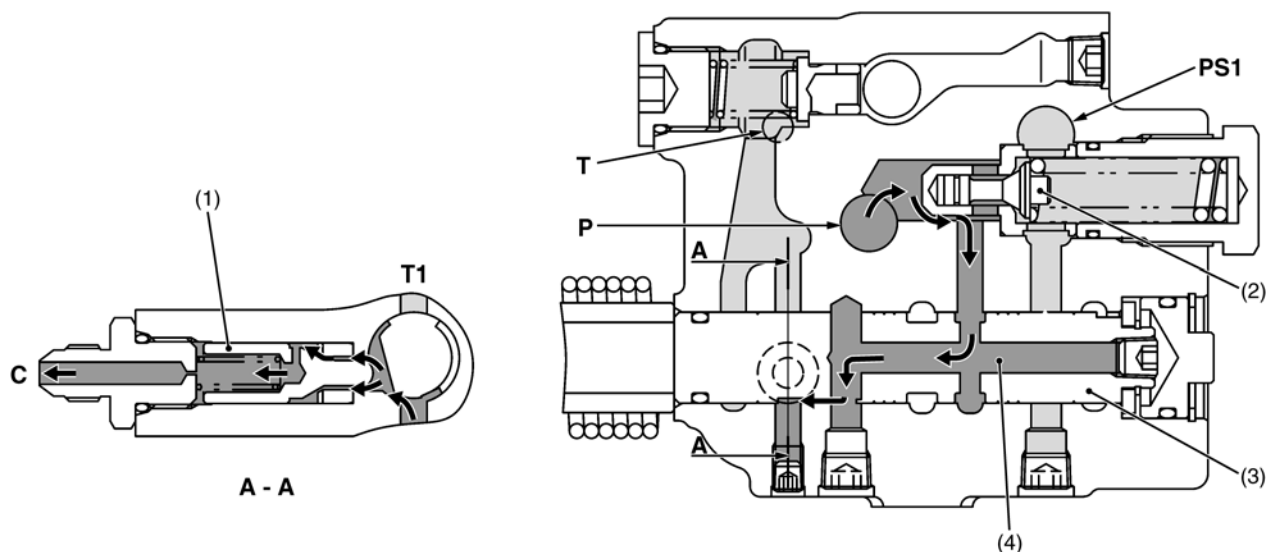
The oil is forced into the hydraulic control valve assembly through **P** port.

When the hydraulic lift lever is set to the "**NEUTRAL**" position, the spool (3) keeps still its original position. The oil flows through passage (4) in spool to **PS1** port, then flows to power steering controller.

Since the oil does not flow through passage (4) in spool to check valve (1), **C** port is closed by check valve (1). Therefore, the oil in mower lift cylinder does not flow out through **C** port and the mower maintains its position.

0000010235E

■ Lift



3GLAAAE8P005A

- (1) Check Valve
- (2) Main Relief Valve
- (3) Spool
- (4) Passage

P : Pump Port
T : Tank Port
(To Transaxle Case)

T1 : Tank Port (To T Port)
C : Cylinder Port

PS1: Power Steering Port
(To Power Steering Controller)

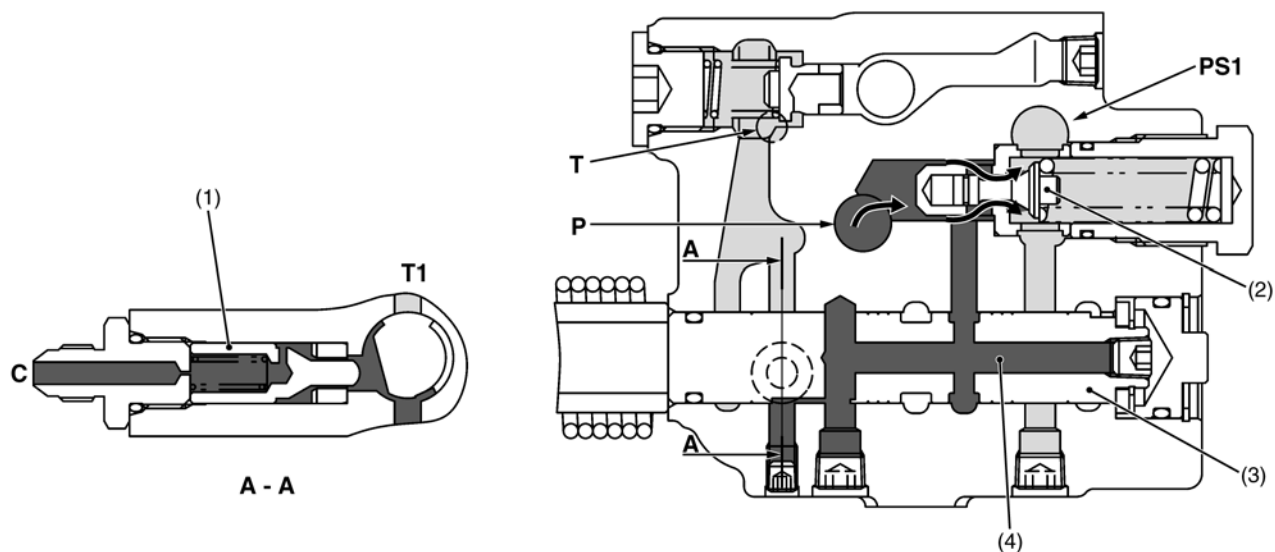
When the hydraulic lift lever is set to the "**LIFT**" position, the spool (3) is rotated counter clockwise in view of left side of the machine.

The oil flows through passage (4) in spool to check valve (1), and opens the check valve (1). The oil flows through **C** port to mower lift cylinder. Therefore, the mower is lifted.

While the hydraulic lift lever is set to the "**LIFT**" position, the oil does not flow through passage (4) in spool to **PS1** port.

0000010238E

Overload



3GLAAAE8P006A

- (1) Check Valve
- (2) Main Relief Valve
- (3) Spool
- (4) Passage

P : Pump Port
T : Tank Port
(To Transaxle Case)

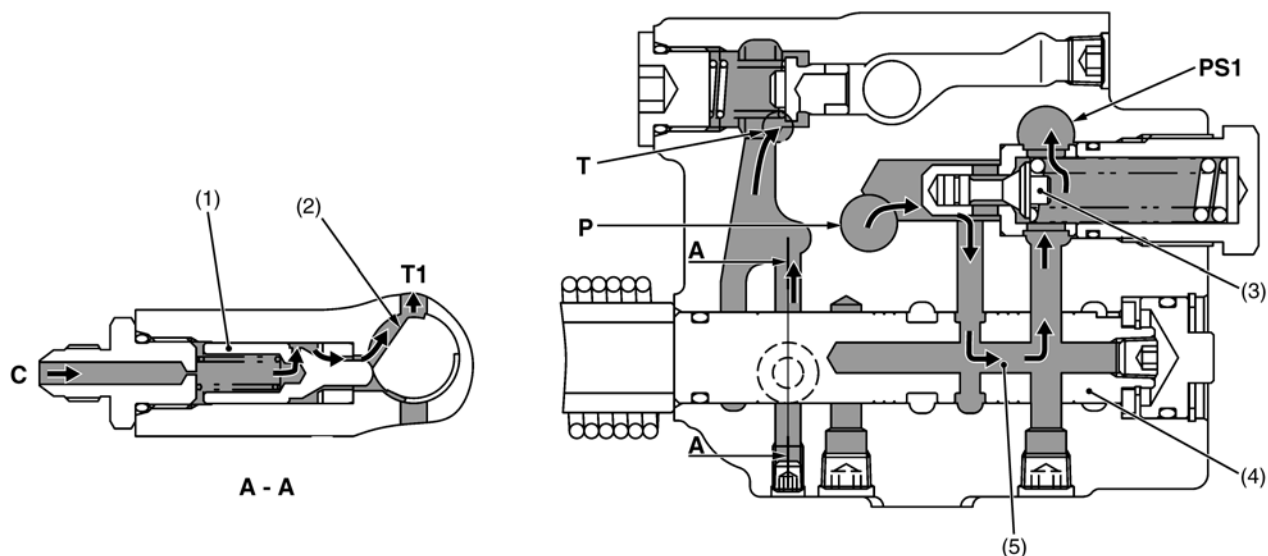
T1 : Tank Port (To T Port)
C : Cylinder Port

PS1: Power Steering Port
(To Power Steering Controller)

If the pressure between **P** port and **C** port exceeds the main relief valve setting pressure (9.5 to 11.0 MPa, 97 to 112 kgf/cm², 1378 to 1595 psi) while the hydraulic lift lever is set to "**LIFT**" position, the main relief valve (2) opens. Then, the oil flows out through the main relief valve (2) to **PS1** port, preventing any further rise in pressure.

0000010239E

■ Down



3GLAAAE8P007A

- (1) Check Valve
- (2) Flat Face
- (3) Main Relief Valve
- (4) Spool
- (5) Passage

P : Pump Port
T : Tank Port
(To Transaxle Case)

T1 : Tank Port (To T Port)
C : Cylinder Port

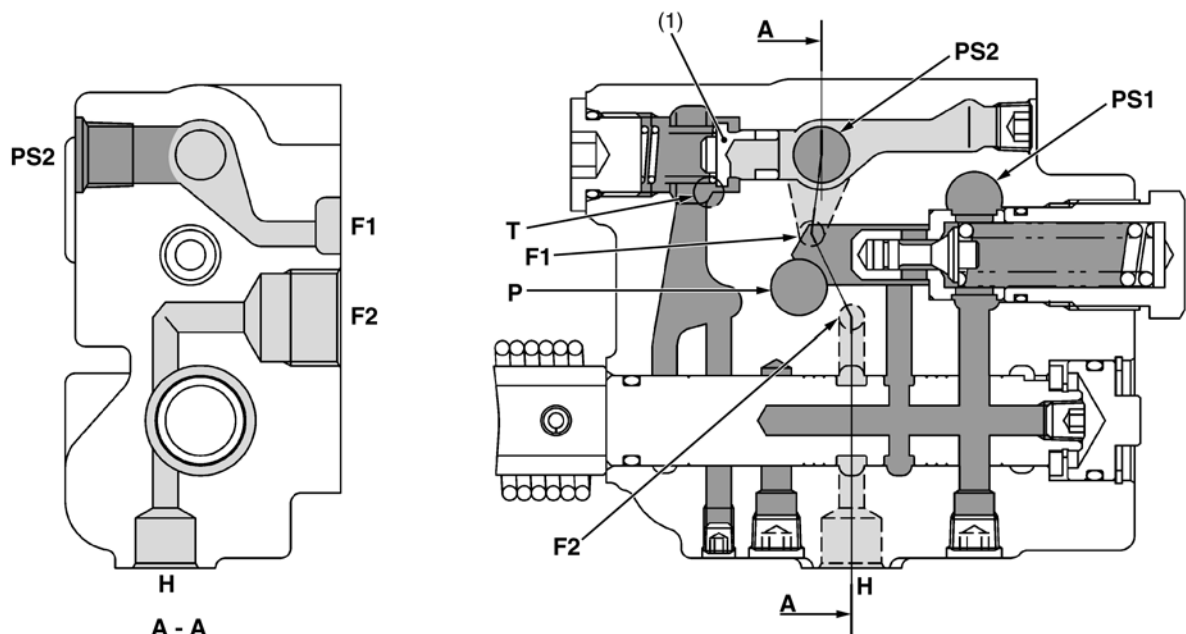
PS1: Power Steering Port
(To Power Steering Controller)

When the hydraulic lift lever is set to "**DOWN**" position, the spool (4) is rotated clockwise in view of left side of the machine.

The oil does not flow through passage in spool (4) to check valve (1). However, the check valve (1) is pushed by flat face (2) of spool and opened. The oil in mower lift cylinder is forced out through **C** port to **T** port by the weight of the mower, causing the mower to lower. The oil forced out returns the transaxle case.

0000010242E

[2] HST RELIEF VALVE



3GLAAAE8P008A

(1) HST Relief Valve

- | | | |
|---|--|--|
| P : Pump Port | PS1: Power Steering Port
(To Power Steering
Controller) | F1 : Filter Port
(To Filter Cartridge) |
| T : Tank Port
(To Transaxle Case) | PS2: Power Steering Port
(From Power Steering
Controller) | F2 : Filter Port
(From Filter Cartridge) |
| | | H : HST Port (To HST) |

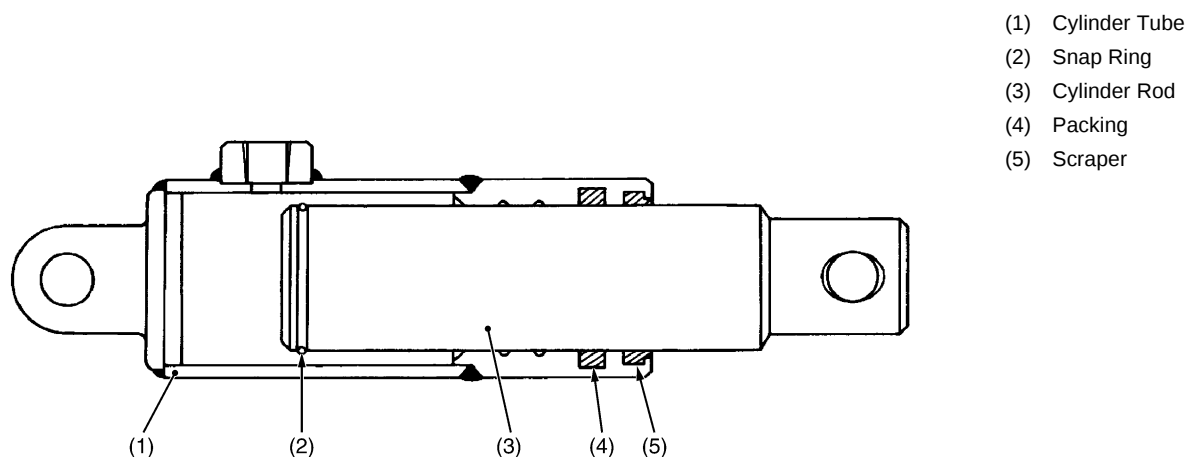
The oil flows through **PS1** port to the power steering controller, and then returns to the hydraulic control valve through **PS2** port. The oil in **PS2** port is regulated the setting pressure (0.9 to 1.1 MPa, 9.2 to 11.2 kgf/cm², 130.6 to 159.5 psi) by HST relief valve (1). Then, the oil flows through **F1** port to the filter cartridge. The oil passes through the filter cartridge, and is supplied through **H** port as the charge oil to HST.

Therefore, the HST relief valve (1) provides the functionality of a charge relief valve.

The oil that is relieved by HST relief valve (1) passes in the valve poppet, and flows through **T** port to the transaxle case.

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4. MOWER LIFT CYLINDER

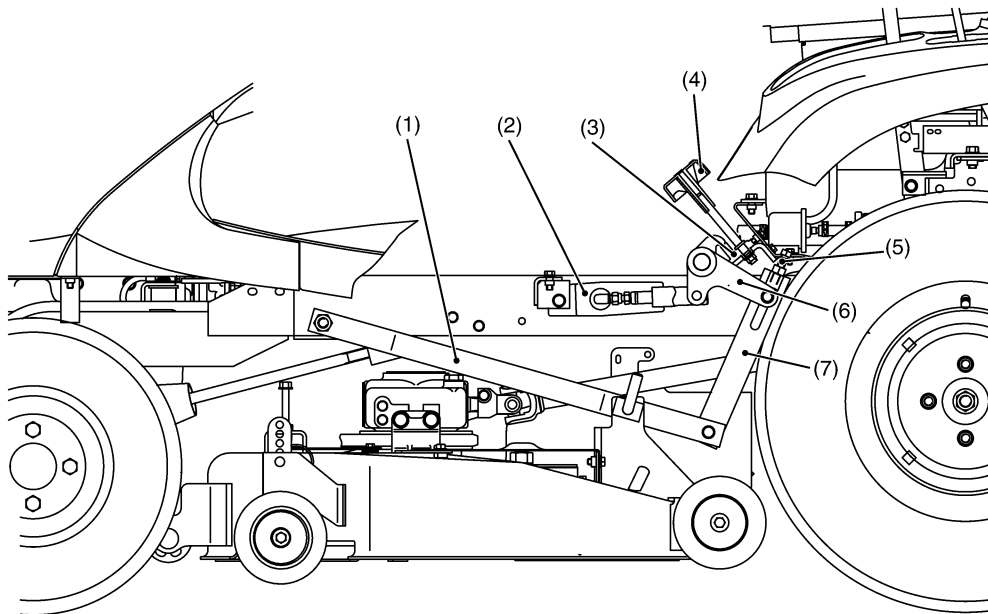


3GZAAAB8P018B

The mower lift cylinder consists of cylinder tube (1), cylinder rod (3) and other parts as shown in the figure above. This cylinder is single acting type.

0000010245E

5. MOWER LINKAGE



- (1) Rear Link
- (2) Mower Lift Cylinder
- (3) Adjusting Cam
- (4) Cutting Height Adjusting Dial
- (5) Cutting Height Fine Turning Bolt
- (6) Lift Link Shaft
- (7) Lift Link

3GLAAAE8P009A

The rear link (1) and lift link shaft (6) are linked with the lift link (7).

As the hydraulic lift lever is set to the "**LIFT**" position, the mower lift cylinder (2) is extended and the lift link shaft (6) is rotated to pull the lift link (7). As a result, mower is lifted.

The cutting height adjusting dial (4) adjusts the cutting height of mower by rotating the adjusting cam (3).

The level of mower deck is adjusted by adjusting the cutting height fine tuning bolt length (5).

0000010246E

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1. TROUBLESHOOTING.....	6-S1
2. SERVICING SPECIFICATIONS	6-S2
3. TIGHTENING TORQUES.....	6-S3
4. CHECKING, DISASSEMBLING AND SERVICING	6-S4
[1] CHECKING AND ADJUSTING	6-S4
[2] PREPARATION	6-S5
(1) Separating Hydraulic Control Valve and Hydraulic Pump	6-S5
(2) Mower Lift Cylinder	6-S9
[3] DISASSEMBLING AND ASSEMBLING.....	6-S11
(1) Hydraulic Control Valve Assembly	6-S11
(2) Mower Lift Linkage	6-S12

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Mower Does Not Rise	● Control valve malfunctioning	Repair or replace	6-S11
	● Lift cylinder damaged	Replace	6-S10
	● Main Relief valve spring damaged	Replace	6-S11
	● Main Relief valve setting pressure too low	Adjust	6-S4
	● Hydraulic pump defective	Replace	6-S8
	● Oil strainer clogged	Clean or replace	G-31
	● Insufficient transmission oil	Refill	G-8, 17
Mower Does Not Lower	● Control valve malfunctioning	Repair or replace	6-S11
Mower Drops by Its Weight	● Lift cylinder worn or damaged	Replace	6-S10
	● Control valve malfunctioning	Replace	6-S11

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Main Relief Valve	Setting Pressure	9.5 to 11.0 MPa 97 to 112 kgf/cm ² 1378 to 1595 psi	—

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3. TIGHTENING TORQUES

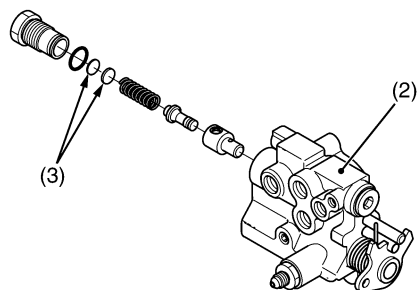
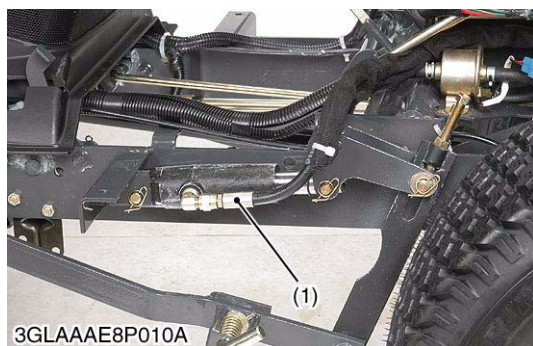
Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : See page G-9)

Item	N·m	kgf·m	ft-lbs
Bolt joint	24.5 to 34.3	2.50 to 3.49	18.1 to 25.2
Hydraulic pump mounting screw	17.7 to 20.6	1.8 to 2.1	13.1 to 15.2
Adaptor	20.0 to 25.0	2.04 to 2.54	14.8 to 18.4
Drain pipe mounting screw	5.0 to 7.0	0.51 to 0.71	3.69 to 5.16
Joint pipe	20.0 to 25.0	2.04 to 2.54	14.8 to 18.4

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



3GLAAAE8P011A

Main Relief Valve Setting Pressure

1. Remove the cylinder hose (1) form the mower lift cylinder.
2. Install the adaptor and pressure gauge.
3. Start the engine and set at maximum speed.
4. Move the hydraulic lift lever to the "**LIFT**" position to operate the main relief valve and read the gauge.
5. If the pressure is not within the factory specifications, adjust with the adjusting shims (3).

Main relief valve setting pressure	Factory spec.	9.5 to 11.0 MPa 97 to 112 kgf/cm ² 1378 to 1595 psi
------------------------------------	---------------	--

Condition

- Engine speed Maximum
- Oil temperature ... 45 to 55 °C
113 to 131 °F

(Reference)

- Thickness of shim : 0.1 mm (0.004 in.)
0.2 mm (0.008 in.)
0.4 mm (0.016 in.)

- (1) Cylinder Hose (3) Shim
(2) Hydraulic Control Valve
Assembly

0000010251E

[2] PREPARATION

(1) Separating Hydraulic Control Valve and Hydraulic Pump

Dismounting Container

1. See page 2-S9. ("Transaxle" Section)

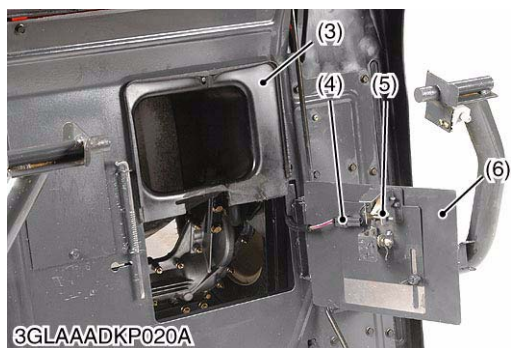
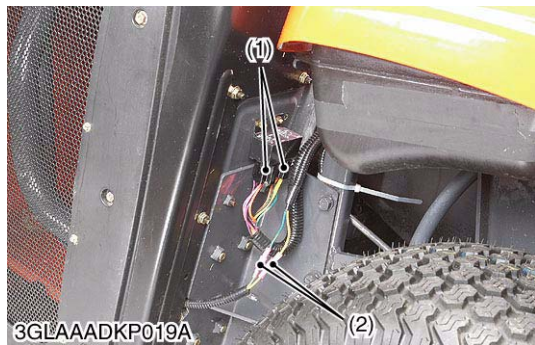
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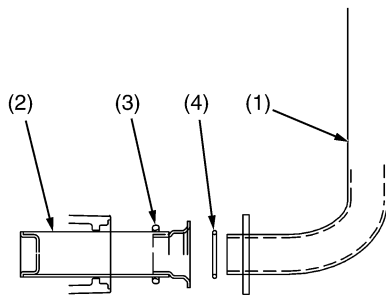
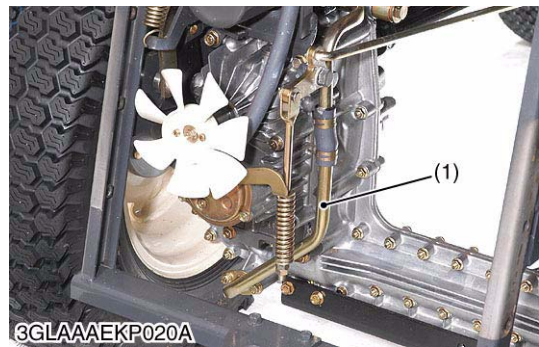
Container Base

1. Disconnect the couplers (1) from the relays.
2. Disconnect the connectors (2).
3. Open the switch cover (6). And disconnect the connector (4) from the grass container full switch (5).
4. Remove the discharge duct (3).
5. Remove the container base (7).

- | | |
|--------------------|---------------------------------|
| (1) Coupler | (5) Grass Container Full Switch |
| (2) Connector | (6) Switch Cover |
| (3) Discharge Duct | (7) Container Base |
| (4) Connector | |

0000009314E





Draining Transmission Fluid

1. Place an oil pan under the transaxle.
2. Remove the suction pipe (1) at the bottom of the transaxle.
3. Remove the strainer (2) to completely drain the transmission fluid.
4. After draining, clean the strainer (2) and reinstall the strainer (2) and suction pipe (1).

(When refilling)

- Remove the filling plug with the dipstick (5).
- Fill new oil from the filling port up to the upper notch on dipstick.
- After running the engine for few minutes, stop the engine and check the oil level again, if low, add oil to prescribed level.

■ IMPORTANT

- **Use only the KUBOTA UDT or SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system.**
Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8).
- **Never work the machine immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevents damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid	Capacity	3.3 L 0.87 U.S.gals 0.73 Imp.gals
--------------------	----------	---

- | | |
|------------------|--------------------------------|
| (1) Suction Pipe | (4) O-ring |
| (2) Strainer | (5) Filling Plug with Dipstick |
| (3) O-ring | |

0000010127E

Seat

1. Remove the snap pin (2).
2. Remove the seat (1) .

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

0000010128E

Fender

1. Remove the speed change pedal (5).
2. Peel the step sheet (4) halfway.
3. Remove the fuel cap (1).
4. Remove the fender (2).

- | | |
|---------------------------|------------------------|
| (1) Fuel Cap | (4) Step Sheet |
| (2) Fender | (5) Speed Change Pedal |
| (3) Fender Mounting Screw | |

0000009320E



Seat Base

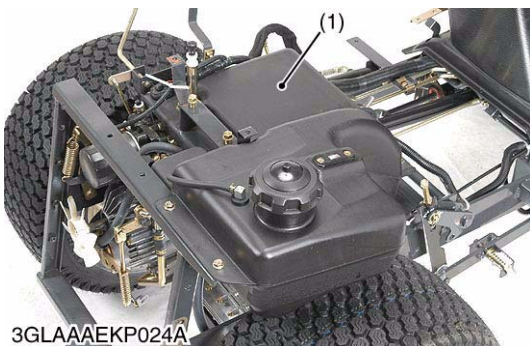
1. Loose the seat base mounting screws 1 (1).
2. Remove the seat base mounting screws 2 (3).
3. Slide the seat base (2) and remove it.

(1) Seat Base Mounting Screw 1

(3) Seat Base Mounting Screw 2

(2) Seat Base

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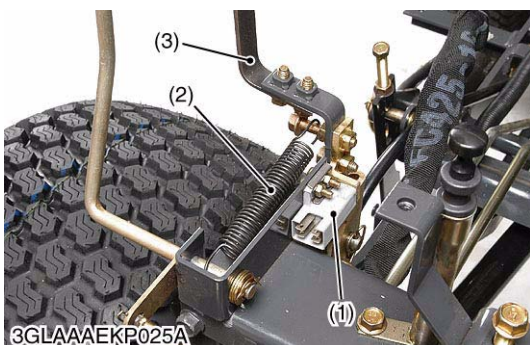


Fuel Tank

1. Drain the fuel.
2. Disconnect the fuel hoses.
3. Remove the fuel tank (1).

(1) Fuel Tank

0000009323E



Beam

1. Disconnect the connector from the PTO switch (1).
2. Remove the spring (2) from the PTO lever (3).
3. Remove the PTO rod
4. Remove the filling pipe (4).
5. Remove the beam (5).

(1) PTO Switch

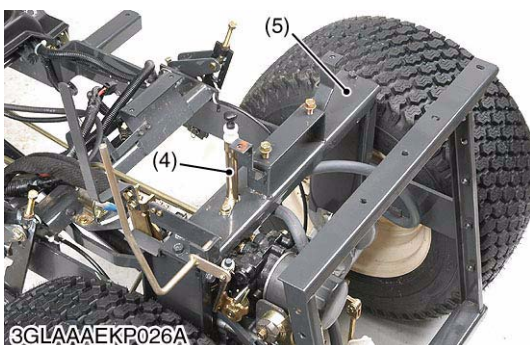
(4) Filling Pipe

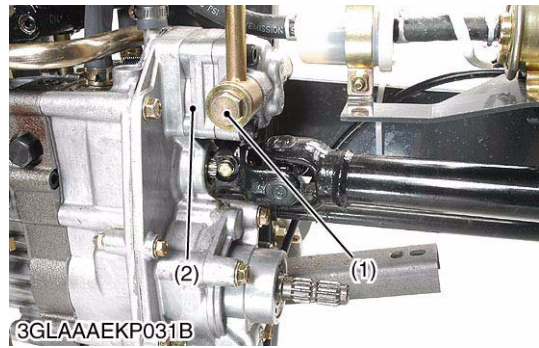
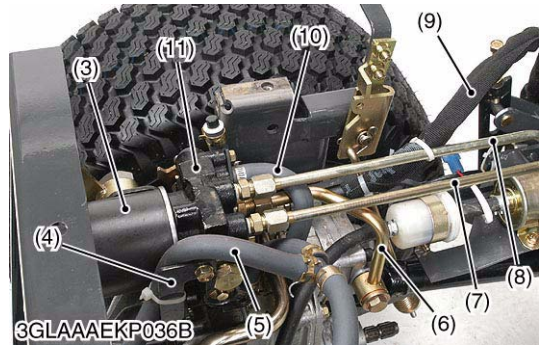
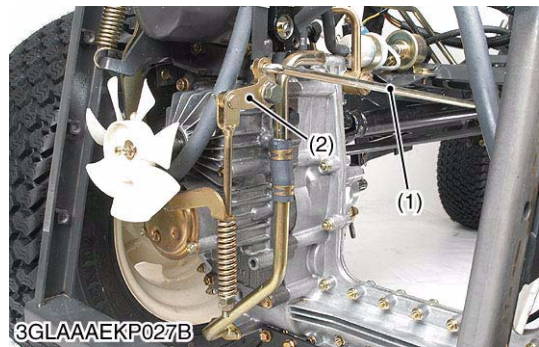
(2) Spring

(5) Beam

(3) PTO Lever

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Hydraulic Control Valve Assembly

- 1. Disconnect the brake rod 1 (1) and brake plate (2).
- 2. Remove the brake plate (2) from neutral arm holder.
- 3. Remove the filter cartridge (3), breather hose (5) and neutral arm holder (4).
- 4. Disconnect the power steering pipes (7) (8), drain hose (10).
- 5. Remove the control valve pipe (6).
- 6. Disconnect the cylinder hose (9).
- 7. Remove the hydraulic control valve assembly (11).

- (1) Brake Rod 1

(2) Brake Plate

(3) Filter cartridge

(4) Neutral Arm Holder

(5) Breather Hose

(6) Control Valve Pipe

(7) Power Steering Pipe
(To Power Steering Unit
Controller)
- (8) Power Steering Pipe
(From Power Steering Unit
Controller)

(9) Cylinder Hose

(10) Drain Hose

(11) Hydraulic Control Valve
Assembly

0000010253E

Hydraulic Pump

- 1. Unscrew the bolt joint (1).
- 2. Remove the hydraulic pump (2) with the suction pipe 2.
- 3. Remove the suction pipe 2 from the hydraulic pump.

Tightening torque	Bolt joint	24.5 to 34.3 N·m 2.50 to 3.49 kgf·m 18.1 to 25.2 ft-lbs
	Hydraulic pump mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.1 to 15.2 ft-lbs

- (1) Bolt Joint
- (2) Hydraulic Pump
- (for Control Valve Pipe)

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(2) Mower Lift Cylinder

Dismounting Container

1. See page 2-S9. ("Transaxle" Section)

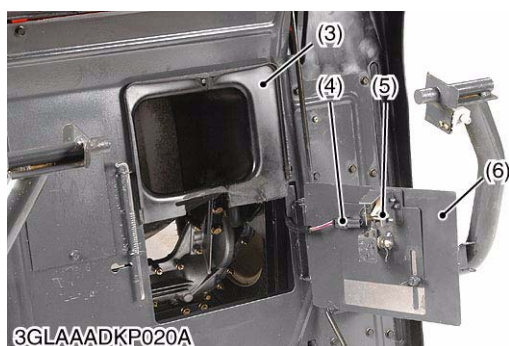
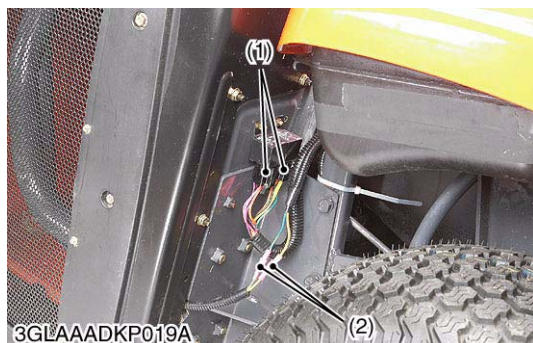
0000010177E

Container Base

1. Disconnect the couplers (1) from the relays.
2. Disconnect the connectors (2).
3. Open the switch cover (6). And disconnect the connector (4) from the grass container full switch (5).
4. Remove the discharge duct (3).
5. Remove the container base (7).

- | | |
|--------------------|---------------------------------|
| (1) Coupler | (5) Grass Container Full Switch |
| (2) Connector | (6) Switch Cover |
| (3) Discharge Duct | (7) Container Base |
| (4) Connector | |

0000009314E



Seat

1. Remove the snap pin (2).
2. Remove the seat (1).

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

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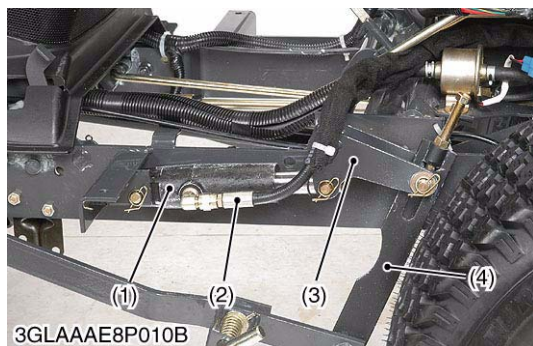


Fender

1. Remove the speed change pedal (5).
2. Peel the step sheet (4) halfway.
3. Remove the fuel cap (1).
4. Remove the fender (2).

- | | |
|---------------------------|------------------------|
| (1) Fuel Cap | (4) Step Sheet |
| (2) Fender | (5) Speed Change Pedal |
| (3) Fender Mounting Screw | |

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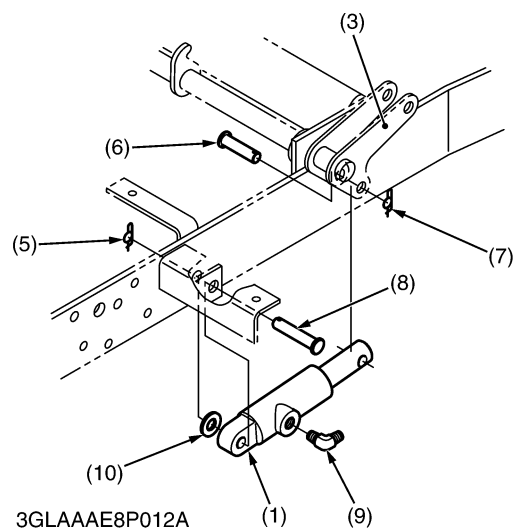


Mower Lift Cylinder

1. Disconnect the cylinder hose (2) from the mower lift cylinder (1).
2. Remove the both side of lift link (4) from the lift shaft (3).
3. Remove the clevis pins (6) (8), and remove the mower lift cylinder (1).

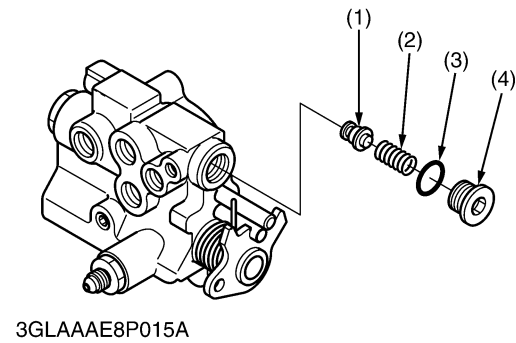
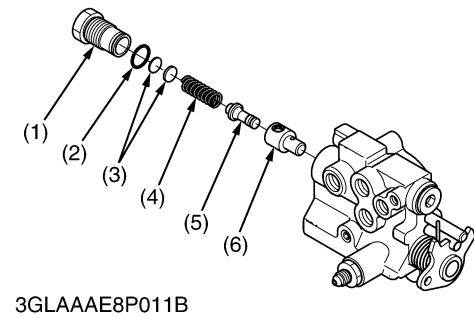
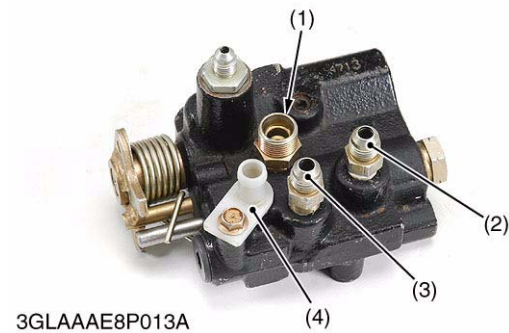
- | | |
|-------------------------|-------------------|
| (1) Mower Lift Cylinder | (6) Clevis Pin |
| (2) Cylinder Hose | (7) Rue Ring |
| (3) Lift Shaft | (8) Clevis Pin |
| (4) Lift Link | (9) Adaptor |
| (5) Rue Ring Pin | (10) Plain Washer |

0000010256E



[3] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Control Valve Assembly



Adaptor and Filter Joint

- 1. Remove the adaptors (2) (3).
- 2. Unscrew the drain pipe mounting screw, and remove the drain pipe (4).
- 3. Remove the joint pipe (1).
- 4. Remove the filter joint (5).

(When reassembling)

Tightening torque	Adaptor	20.0 to 25.0 N·m 2.04 to 2.54 kgf·m 14.8 to 18.4 ft-lbs
	Drain pipe mounting screw	5.0 to 7.0 N·m 0.51 to 0.71 kgf·m 3.69 to 5.16 ft-lbs
	Joint pipe	20.0 to 25.0 N·m 2.04 to 2.54 kgf·m 14.8 to 18.4 ft-lbs

- (1) Joint Pipe
- (2) Adaptor
- (3) Adaptor
- (4) Drain Pipe
- (5) Filter Joint

0000010257E

Main Relief valve

- 1. Remove the plug (1).
- 2. Draw out the shims (3), spring (4), poppet (5) and valve seat (6).

(When reassembling)

- Take care not to damage the O-ring (2).
- **IMPORTANT**
- **After reassembling the main relief valve, be sure to adjust the main relief valve setting pressure (see page 6-S4.).**

- (1) Plug
- (2) O-ring
- (3) Shim
- (4) Spring
- (5) Poppet
- (6) Valve Seat

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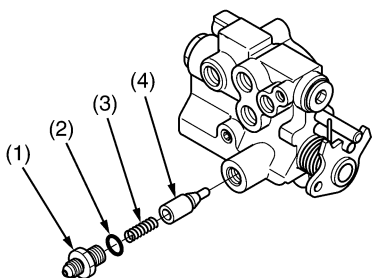
HST Relief Valve

- 1. Remove the plug (4).
- 2. Draw out the spring (2) and poppet (1).

(When reassembling)

- Take care not to damage the O-ring (3).
- (1) Poppet
- (2) Spring
- (3) O-ring
- (4) Plug

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Check Valve

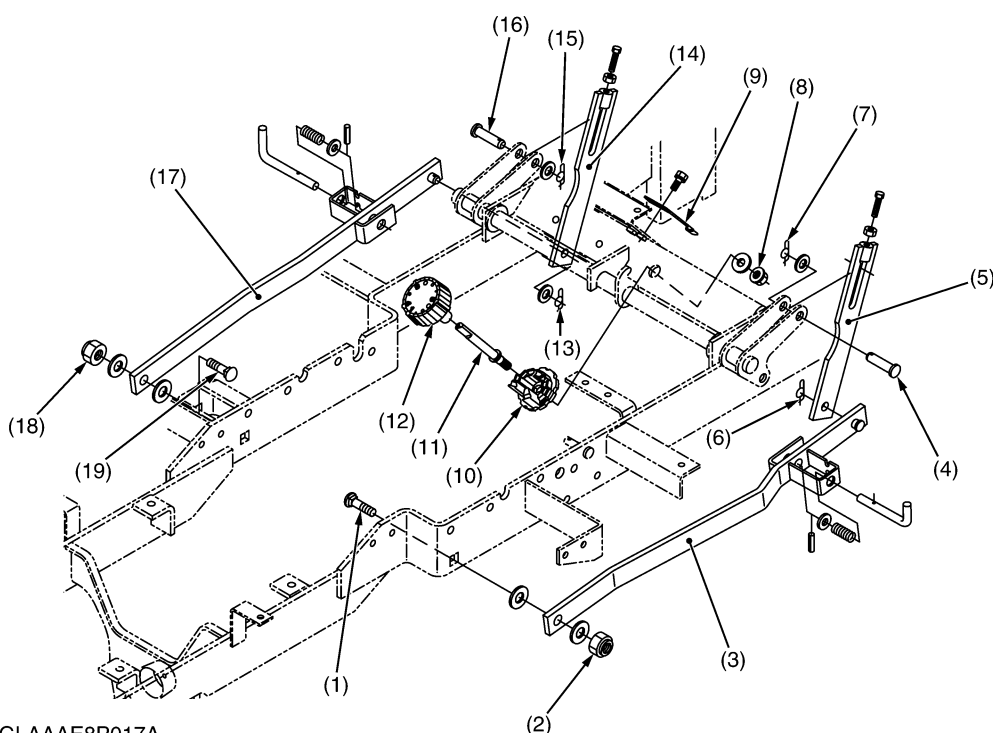
1. Remove the cylinder hose adaptor (1).
2. Draw out the spring (3) and poppet (4).

(When reassembling)

- Take care not to damage the O-ring (2).

- | | |
|---------------------------|------------|
| (1) Cylinder Hose Adaptor | (3) Spring |
| (2) O-ring | (4) Poppet |

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(2) Mower Lift Linkage

3GLAAAE8P017A

- | |
|---|
| (1) Screw |
| (2) Lock Nut |
| (3) Rear Link LH |
| (4) Clevis Pin |
| (5) Lift Link LH |
| (6) Rue Ring |
| (7) Rue Ring |
| (8) Lock Nut |
| (9) Plate Spring |
| (10) Adjusting Cam |
| (11) Cutting Height Adjusting Rod |
| (12) Cutting Height Adjusting Dial Knob |
| (13) Rue Ring |
| (14) Lift Link RH |
| (15) Rue Ring |
| (16) Clevis Pin |
| (17) Rear Link RH |
| (18) Lock Nut |
| (19) Screw |

1. Dismount the mower. (See page 8-S6.)
2. Remove the fender. (See page 2-S12.)
3. Remove the screws (1), (19) and lock nuts (2), (18), and pull out the rue rings (6), (13).
4. Remove the rear link LH (3) and RH (17).
5. Pull out the rue rings (7), (15) and remove the clevis pins (4), (16).
6. Remove the lift link LH (5) and RH (14).
7. Remove the cutting height adjusting dial knob (12).
8. Remove the plate spring (9).
9. Unscrew the lock nut (8), and remove the cutting height adjusting rod (11) and adjusting cam (10).

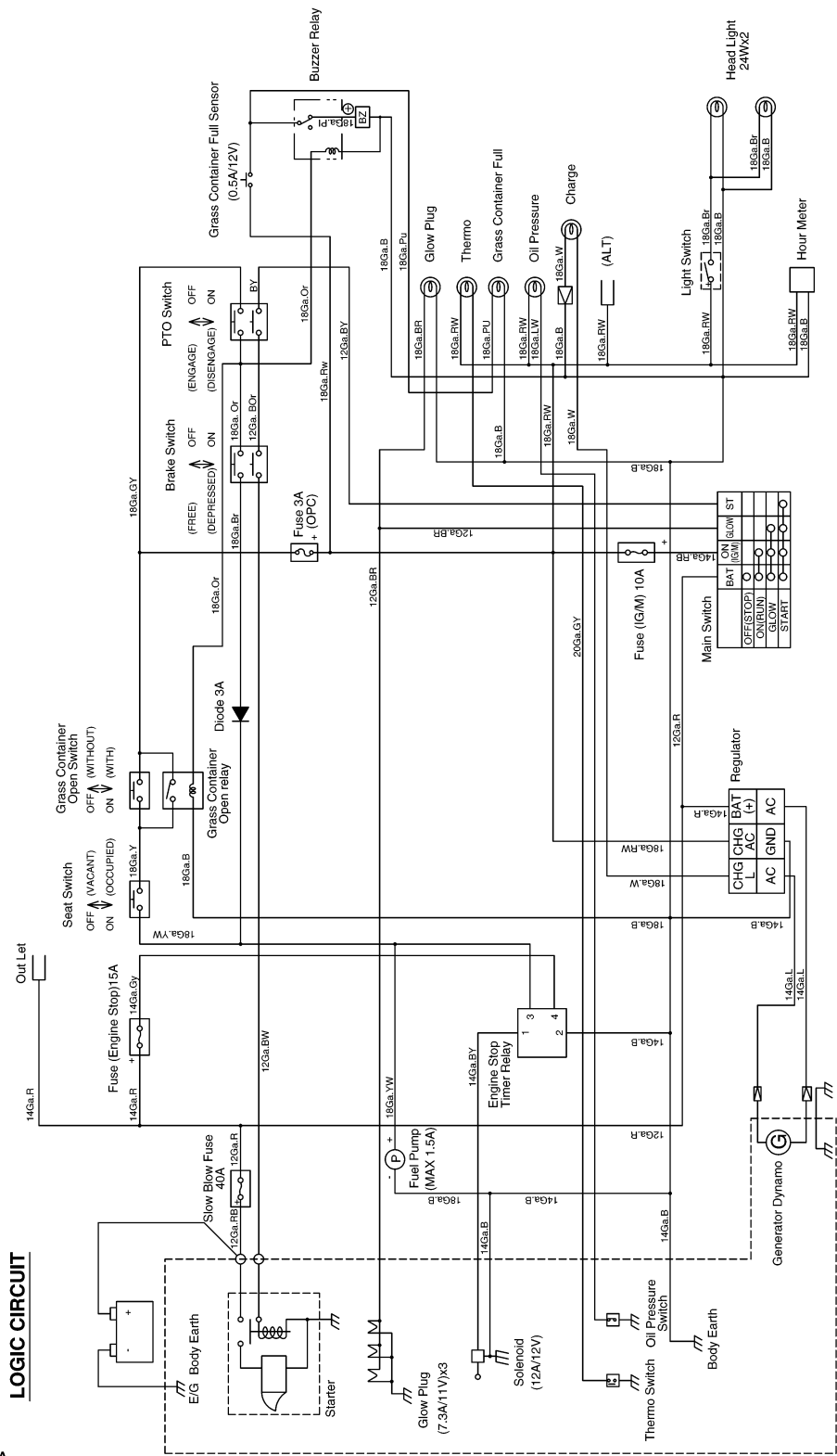
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7 ELECTRICAL SYSTEM

CONTENTS

1. WIRING DIAGRAM.....	7-M1
2. STARTING SYSTEM.....	7-M3
3. CHARGING SYSTEM.....	7-M4
4. LIGHTING SYSTEM.....	7-M5

1. WIRING DIAGRAM



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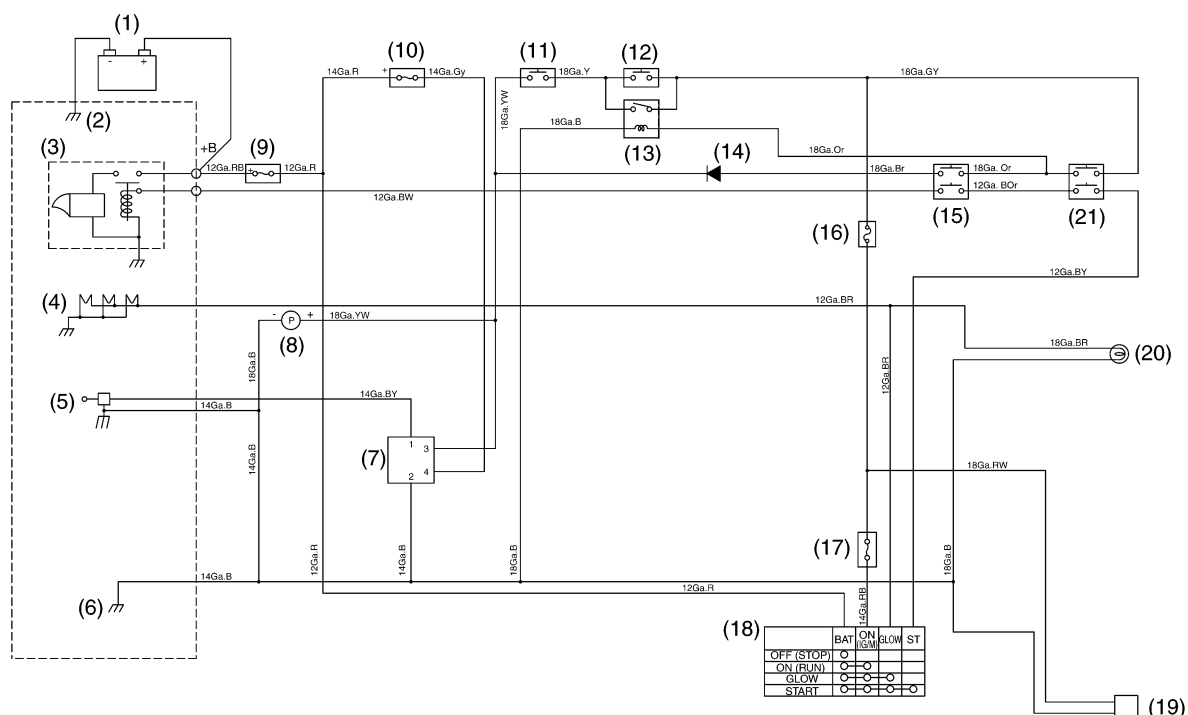
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Color of Wiring

W.....White	WR.....White / Red	BW.....Black / White
R.....Red	WY.....White / Yellow	BR.....Black / Red
L.....Blue	RB.....Red / Black	GW.....Green / White
P.....Pink	RW.....Red / White	YR.....Yellow / Red
B.....Black	RG.....Red / Green	YL.....Yellow / Blue
Br.....Brown	RY.....Red / Yellow	LW.....Blue / White
Sb.....Sky Blue		

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2. STARTING SYSTEM



3GLAAAE9P002A

- | | | | |
|--------------------------|----------------------------|---------------------------|---------------------|
| (1) Battery | (7) Engine Stop Time Relay | (12) Grass Container Open | (16) Fuse (3 A) |
| (2) Body Earth | (8) Fuel Feed Pump | Switch | (17) Fuse (10 A) |
| (3) Starter Motor | (9) Slow Blow Fuse (40 A) | (13) Grass Container Open | (18) Main Switch |
| (4) Glow Plug | (10) Fuse (15 A) | Relay | (19) Hour Meter |
| (5) Engine Stop Solenoid | (11) Seat Switch | (14) Diode (3 A) | (20) Glow Plug Lamp |
| (6) Body Earth | | (15) Brake Switch | (21) PTO Switch |

When the main switch is turned to the **PREHEAT** position, the terminal **BAT** is connected to the terminals **GLOW** and **ON**. The glow plugs become red-hot, and the glow plug (preheat indicator) lamp also lights on while preheating.

When the main switch is then turned to the **START** position with the brake switch on and PTO switch on, the terminal **BAT** is connected to the terminals **START** and **ON**. Consequently, battery current flows to the starter motor and start the engine.

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

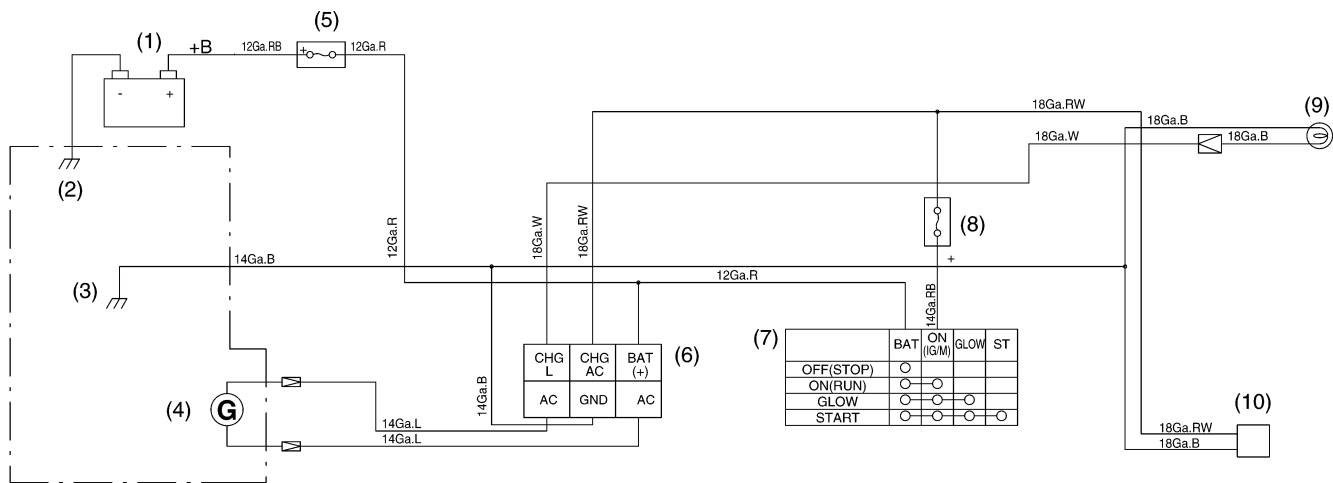
When the main switch turned from the **ON** position to the **OFF** position, the engine stop solenoid moves the fuel injection pump control rack to the "**No Fuel Injection**" position and stop the engine.

This machine equipped the operator presence control (OPC) system which automatically stops the engine when operator stands from the seat while shifting the PTO lever.

The engine of this machine also stops automatically when the grass container is opened or is dismantled while shifting the PTO lever.

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3. CHARGING SYSTEM



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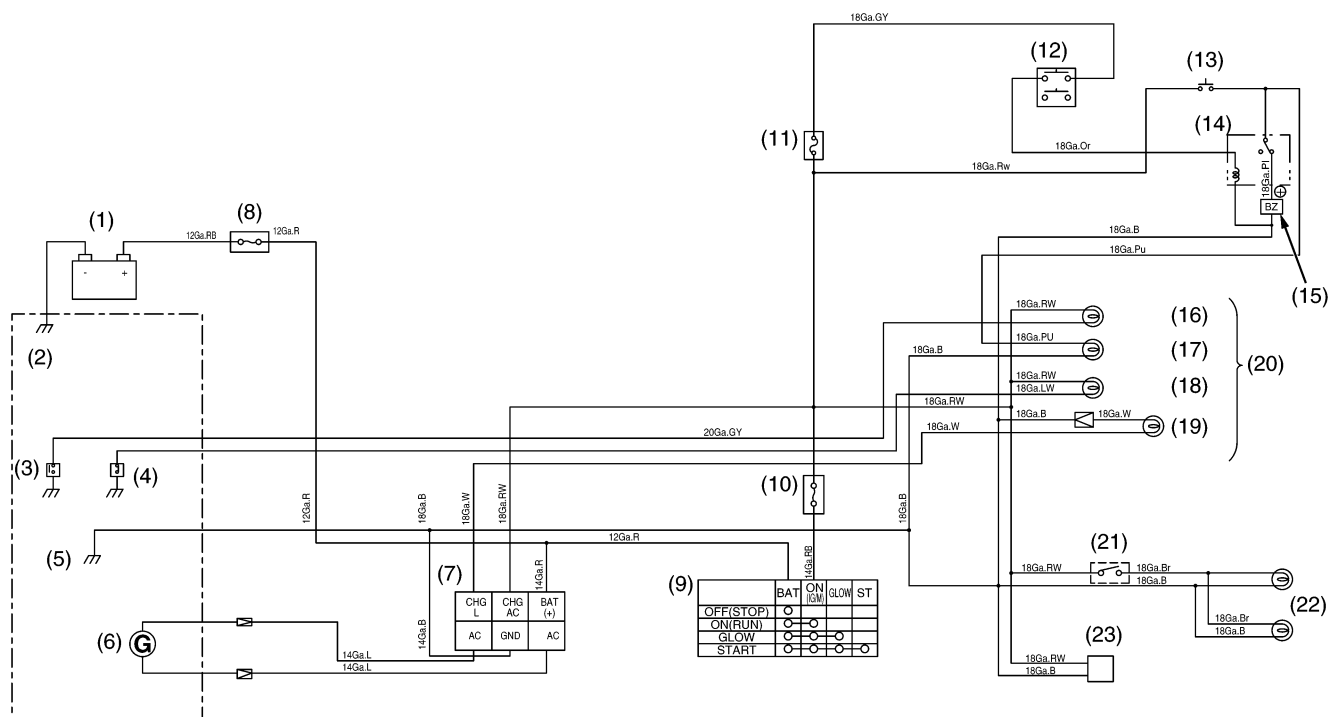
- | | | | |
|----------------|---------------------------|-----------------|-----------------|
| (1) Battery | (4) Dynamo | (7) Main Switch | (9) Charge Lamp |
| (2) Body Earth | (5) Slow Blow Fuse (40 A) | (8) Fuse (10 A) | (10) Hour Meter |
| (3) Body Earth | (6) Regulator | | |

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

It consists of a dynamo (4) and a regulator (6).

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4. LIGHTING SYSTEM



3GLAAD9P014A

- | | | | |
|-------------------|---------------------------|----------------------------------|------------------------|
| (1) Battery | (7) Regulator | (13) Grass Container Full Switch | (18) Oil Pressure Lamp |
| (2) Body Earth | (8) Slow Blow Fuse (40 A) | (14) Buzzer Relay | (19) Charge Lamp |
| (3) Thermo Switch | (9) Main Switch | (15) Buzzer | (20) Easy Checker |
| (4) Oil Switch | (10) Fuse (10 A) | (16) Thermo Lamp | (21) Head Light Switch |
| (5) Body Earth | (11) Fuse (3 A) | (17) Grass Container Full Lamp | (22) Head Light |
| (6) Dynamo | (12) PTO Switch | | (23) Hour Meter |

The lighting system consists of main switch, head light switch, head lights, etc..

The grass container full lamp in the easy checker lights when the grass container is filled while shifting the PTO lever. And the buzzer rings.

000009630E

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(1) Starter	7-S20
(2) Dynamo	7-S22

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	● Battery discharged or defective	Recharge or replace	G-25, 1-S21
	● Battery positive cable disconnected or improperly connected	Repair or replace	—
	● Battery negative cable disconnected or improperly connected	Repair or replace	—
	● Slow blow fuse blown (40 A)	Replace	G-38
Fuse Blown Frequently	● Short-circuited	Repair or replace	—

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BATTERY

Battery Discharges Too Quickly	● Battery defective	Replace	1-S21
	● Dynamo defective	Repair or replace	7-S19
	● Regulator defective	Replace	—
	● Wiring harness disconnected or improperly connected (between battery positive terminal and regulator B terminal)	Repair or replace	—
	● Cooling fan belt slipping	Adjust tension	G-28

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STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Operate	● Battery discharged or defective	Recharge or replace	G-25, 1-S21
	● Slow blow fuse blown (40 A)	Replace	G-38
	● Wiring harness disconnected or improperly connected (between main switch ST terminal and safety switches, between safety switches and starter motor, between battery positive terminal and starter motor)	Repair or replace	—
	● Starter motor defective	Repair or replace	7-S18
	● Main switch defective	Replace	7-S6
	● Seat switch defective	Replace	7-S11
	● Brake switch defective	Replace	7-S10
	● PTO switch defective	Replace	7-S10
	● Grass container open switch defective	Replace	7-S11
Engine Does Not Stop When Main Switch is Turned OFF	● Fuse blown (15 A)	Replace	G-38
	● Wiring harness disconnected or improperly connected (between main switch ACC terminal and engine stop solenoid)	Repair or replace	—
	● Engine stop solenoid defective	Replace	7-S12
	● Timer relay defective	Replace	7-S13
Engine Does Not Start	● Engine stop solenoid defective	Replace	7-S12
	● Timer relay defective	Replace	7-S13

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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-38
	● Bulb blown	Replace	G-39
	● Wiring harness disconnected or improperly connected (between main switch ACC terminal and regulator connector terminal (yellow), between regulator connector terminal (green) and charge lamp)	Repair or replace	—
	● Regulator defective	Replace	—
Charging Lamp Does Not Go Off When Engine is Running	● Dynamo defective	Repair or replace	7-S19
	● Regulator defective	Replace	—

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LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head Light Does Not Light	● Fuse blown (10 A)	Replace	G-38
	● Bulb blown	Replace	G-39
	● Wiring harness disconnected or improperly connected (between main switch ACC terminal and head light switch, between head light switch and head light)	Repair or replace	—
Glow Plug Lamp Does Not Light When Main Switch Is in Pre-heat Position	● Battery discharged or defective	Recharge or replace	G-25, 1-S21
	● Slow blow fuse blown (40 A)	Replace	G-38
	● Wiring harness disconnected or improperly connected (between main switch G terminal and glow plug lamp, between glow plug lamp and glow plugs)	Repair or replace	—
	● Main switch defective	Replace	7-S6
	● Bulb blown	Replace	G-39
Oil Pressure Lamp Lights Up When Engine Is Running	● Engine oil pressure too low	Repair engine	—
	● Engine oil insufficient	Replenish	G-8, 14
	● Oil pressure switch defective	Replace	7-S15
	● Short circuit between oil pressure switch lead and chassis	Repair	—
Oil Pressure Lamp Does Not Light When Main Switch Is Turned ON and Engine Is Not Running	● Fuse blown (10 A)	Replace	G-38
	● Bulb blown	Replace	G-39
	● Oil pressure switch defective	Replace	7-S15
	● Wiring harness disconnected or improperly connected (between main switch ACC terminal and oil pressure lamp, between oil pressure lamp and oil pressure switch)	Repair or replace	—
Thermo Lamp Does Not Light When Main Switch Is Turned ON and Engine Is Not Running	● Fuse blown (10 A)	Replace	G-38
	● Bulb blown	Replace	G-39
	● Thermo switch defective	Replace	7-S16
	● Wiring harness disconnected or improperly connected (between main switch ACC terminal and thermo lamp, between thermo lamp and thermo switch)	Repair or replace	—

0000010269E

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	—
Head Light Switch	Resistance OFF	Infinity	—
	Resistance ON	0 Ω	—
Starter	Commutator (O.D.)	28.0 mm 1.102 in.	27.0 mm 1.063 in.
	Commutator (Difference of O.D.)	Less than 0.05 mm 0.002 in.	0.4 mm 0.016 in.
	Mica (Undercut)	0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.20 mm 0.0079 in.
	Brush (Length)	16.0 mm 0.630 in.	10.5 mm 0.413 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-9)

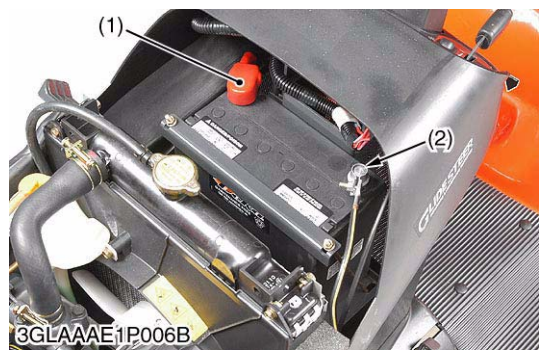
Item	N·m	kgf·m	ft-lbs
Starter (C terminal nut)	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7
Dynamo (stator nut)	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5

0000010270E

4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(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 (2) and the (+) lead to the positive terminal post (1), 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 spec.	More than 12 V
-----------------	---------------	----------------

(1) Positive Terminal Post (2) Negative Terminal Post

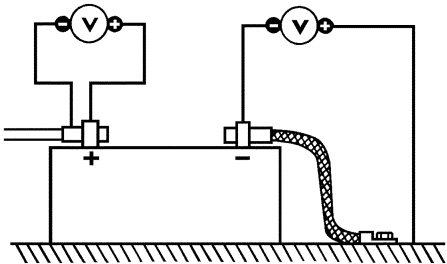
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Battery Terminal Connection

- 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 spec.	Less than 0.1 V
----------------------	---------------	-----------------

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3TMABAB9P001A

(2) Main Switch



Main Switch

- 1. Open the bonnet.
- 2. Disconnect the 4P connector and remove the main switch (1).
- 3. Perform the following checks.

(1) Main Switch

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Connector Voltage

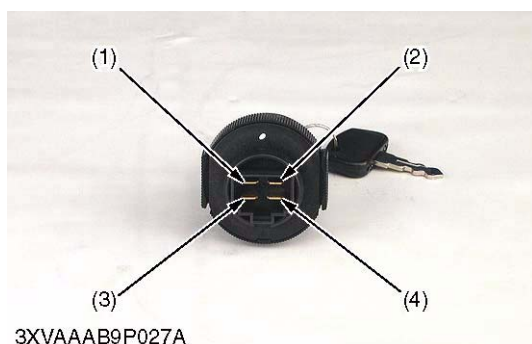
- 1. Measure the voltage with a voltmeter across the connector B (red) terminal and chassis.
- 2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector B (Red) terminal - chassis	Approx. battery voltage
---------	--------------------------------------	-------------------------

(1) Connector

0000007172E





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
------------	---	------------

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.

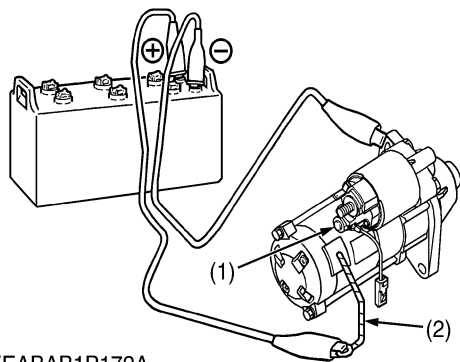
Resistance	B terminal - G terminal	0 Ω
	B terminal - ST terminal	
	B terminal - ACC terminal	

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

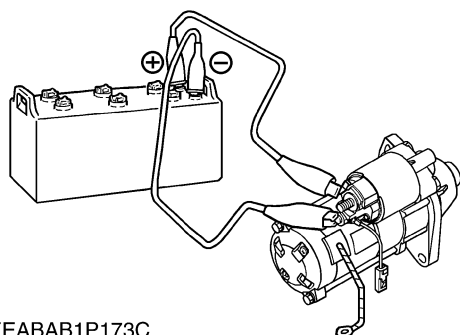
- (3) **ST** Terminal
(4) **B** Terminal

0000007173E

(3) Starter



3EEABAB1P172A



3EEABAB1P173C

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

0000005097E

Starter Magnet Switch Test (Pull-in, Holding Coils)

■ **NOTE**

- **Prepare a 6 V battery for the test, and each test should be carried out for 3 to 5 seconds.**

1) Checking Pull-in Coil

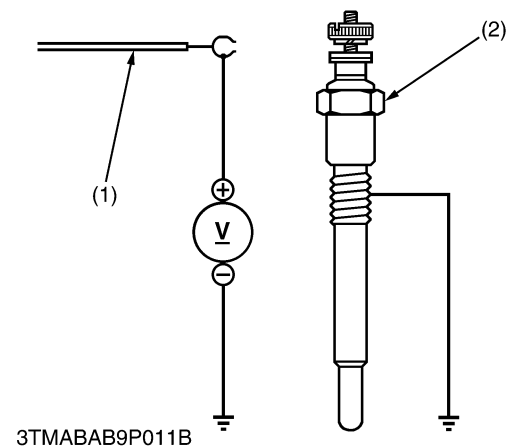
1. Connect jumper lead from the battery's negative terminal post to the **C** terminal.
2. The plunger should be attracted strongly when a jumper lead is connected from the battery positive terminal to the **S** terminal.

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.

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(4) 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

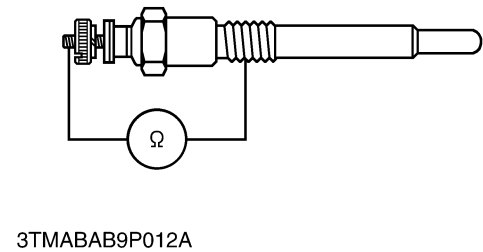
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Glow Plug Continuity

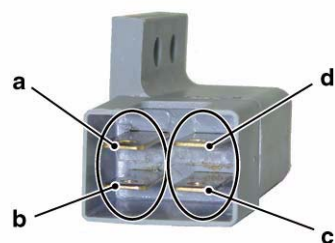
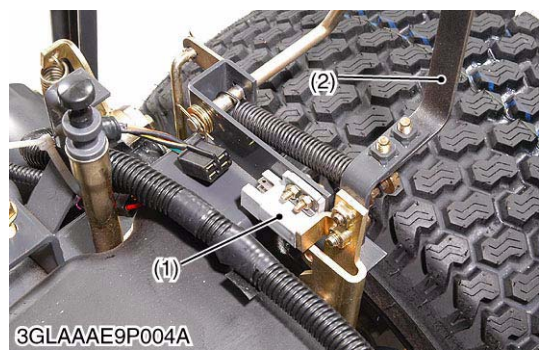
1. Disconnect the lead from the glow plugs.
2. Measure the resistance with an ohmmeter between the glow plug terminal and the chassis.
3. If 0 ohm is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. If the factory specification is not indicated, the glow plug is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

Glow plug resistance	Factory spec.	Approx. 0.9 Ω
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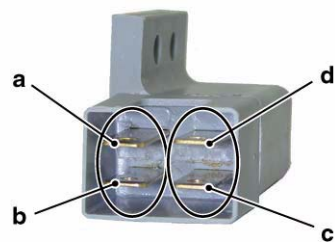
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(5) Safety Switch



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3GZAAAD9P008B

PTO Switch

- 1. Remove the battery.
- 2. Remove the fender.
- 3. Disconnect the connector from PTO switch (1).
- 4. Measure the resistance with an ohmmeter between the terminals.
- 5. If the PTO switch (1) is defective, replace it.

Resistance (between terminal a and b)	When plunger is pushed	0 Ω
	When plunger is released	Infinity
Resistance (between terminal c and d)	When plunger is pushed	0 Ω
	When plunger is released	Infinity

- (1) PTO Switch

a to d : Switch Terminal
- (2) PTO Lever

0000010271E

Brake Switch

- 1. Remove the battery.
- 2. Remove the fender.
- 3. Disconnect the connector from brake switch (1).
- 4. Measure the resistance with an ohmmeter between the terminals.
- 5. If the brake switch (1) is defective, replace it.

Resistance (between terminal a and b)	When plunger is pushed	0 Ω
	When plunger is released	Infinity
Resistance (between terminal c and d)	When plunger is pushed	0 Ω
	When plunger is released	Infinity

- (1) Brake Switch

a to d : Switch Terminal

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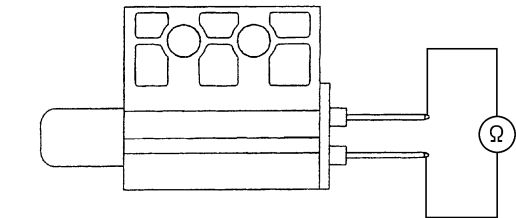
Grass Container Open Switch

- 1. Remove the battery.
- 2. Dismount the grass container.
- 3. Disconnect the safety switch (1) lead.
- 4. Measure the resistance with an ohmmeter between the safety switch terminals.
- 5. If the safety switch is defective, replace it.

Resistance (between switch terminals)	When plunger is pushed	0 Ω
	When plunger is released	Infinity

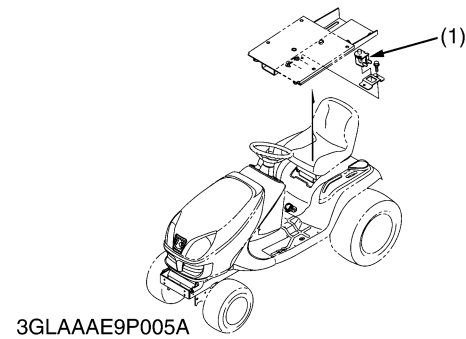
(1) Safety Switch for Grass Container

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(6) Operator Presence Control (OPC) Switch



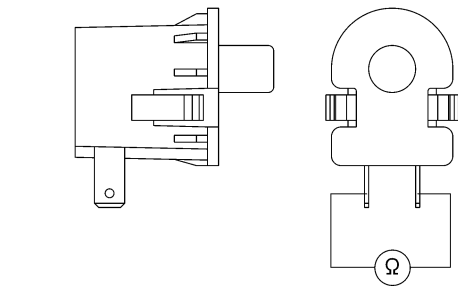
OPC Switch (Seat Switch)

- 1. Remove the battery.
- 2. Remove the OPC switch (1).
- 3. Measure the resistance with an ohmmeter between the OPC switch terminals.
- 4. If the OPC switch is defective, replace it.

Resistance (between switch terminals)	When plunger is pushed	0 Ω
	When plunger is released	Infinity

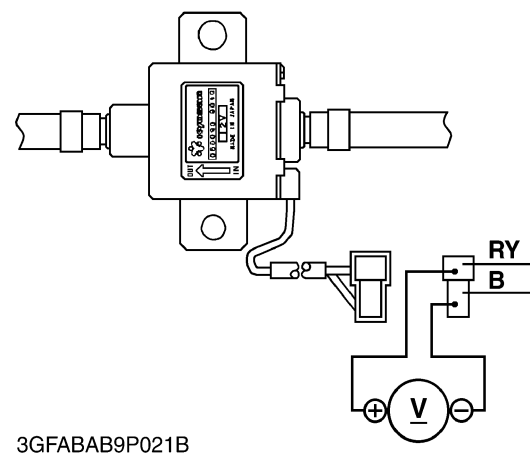
(1) OPC Switch (Seat Switch)

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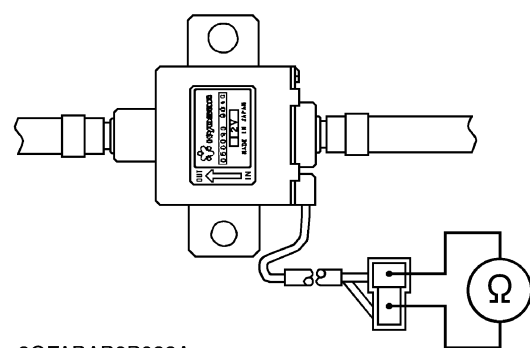


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(7) Fuel Pump



3GFABAB9P021B



3GFABAB9P022A

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
---------	-----------------------------	-------------------------

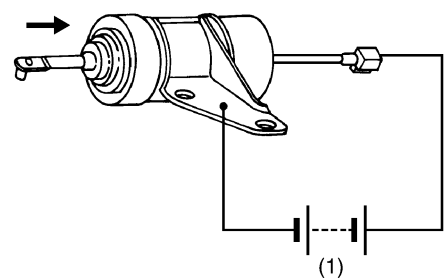
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Fuel Pump Continuity

- 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.

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(8) Engine Stop Solenoid



3TAAAB9P033A

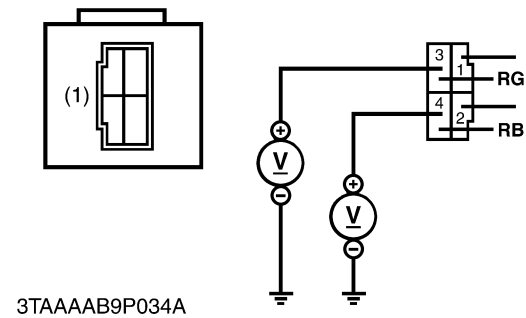
Engine Stop Solenoid Test

- 1. Disconnect the **1P** 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 **1P** 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) Battery (12 V)

0000001163E

(9) Time Relay



Timer Relay Connector Voltage

- 1. Disconnect the connector from the timer relay after turning the main switch off.
- 2. Measure the voltage with a voltmeter across the connector terminal 4 and chassis.
- 3. Turn the main switch on, and measure the voltage across the connector terminal 3 and chassis.
- 4. If these voltages differ from the battery voltage, the wiring harness or main switch is faulty.

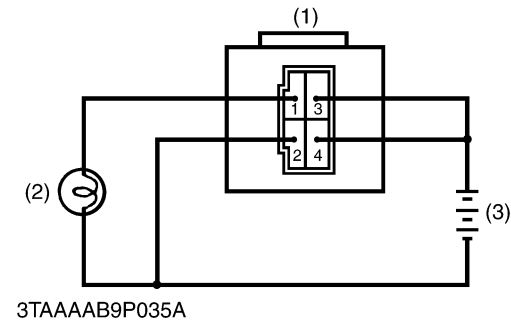
Voltage	Connector terminal 4 - chassis	Approx. battery voltage
	Connector terminal 3 - chassis	Approx. battery voltage

(1) Timer Relay

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Test of Timer Relay

- 1. Remove the timer relay from the machine.
- 2. Connect jumper leads across the battery positive terminal and the timer relay terminal 3, and across the battery positive terminal and the timer relay terminal 4.
- 3. Connect jumper leads across the battery negative terminal and the timer relay terminal 2, and across the battery negative terminal and the bulb terminal.
- 4. Connect jumper lead across the timer relay terminal 1 and the bulb terminal.
- 5. The bulb lights up when disconnecting a jumper lead from the terminal 3 and goes off 6 to 13 seconds late, the timer relay is proper.



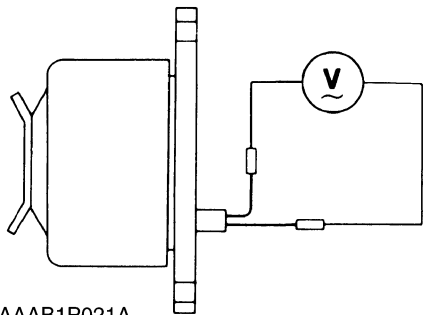
(1) Timer Relay

(3) Battery (12V)

(2) Load (Lamp)

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(10)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 spec.	AC 20 V or more
----------------	---------------	-----------------

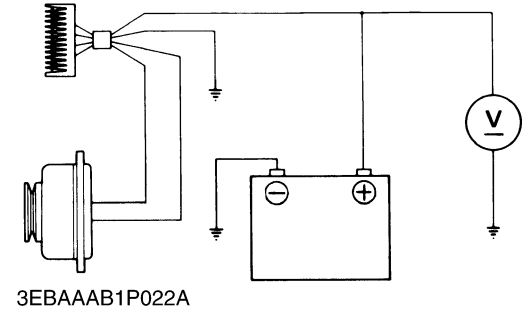
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Regulating Voltage

- 1. Complete the charging circuit with a fully charged battery and run the engine speed at the rated speed.
- 2. Measure the battery voltage with a volt meter.
- 3. If the measurement is not within the specified values, replace the regulator.

Regulating voltage	Factory spec.	14 to 15 V
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(11)Lighting System



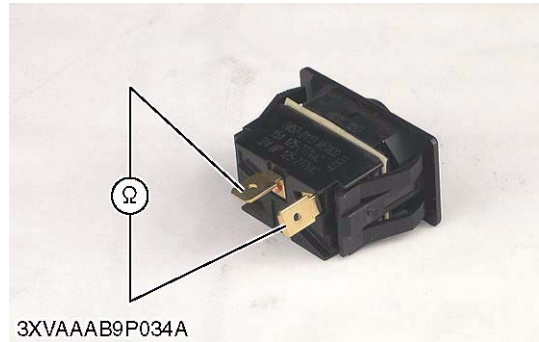
Head Light Switch Continuity

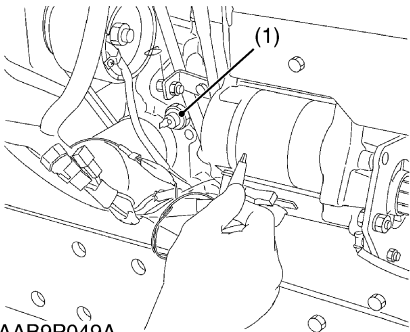
- 1. Disconnect the wiring leads from head light switch and remove it.
- 2. Measure the resistance with an ohmmeter across the head light switch terminals in each position.
- 3. If the resistance differs from the factory specifications, the head light switch is faulty.

Resistance	Factory spec.	OFF	Infinity
		ON	0 Ω

(1) Head Light Switch

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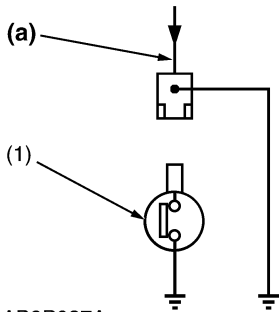


Engine Oil Pressure Lamp

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

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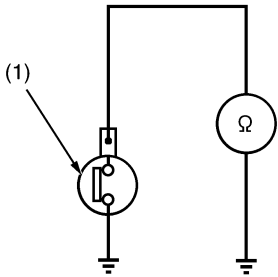
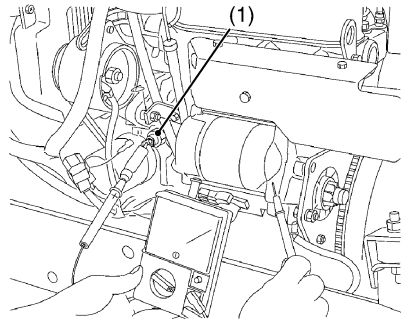
Engine Oil Pressure Switch Continuity

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.

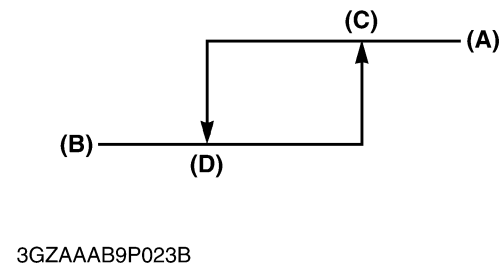
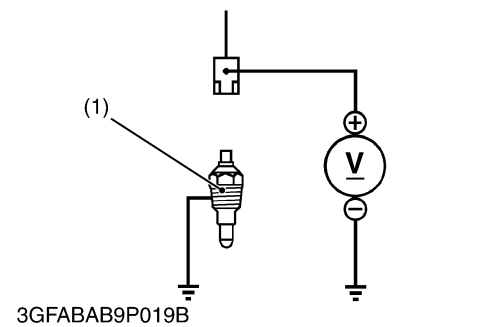
Resistance(Switch terminal -Chassis)	In normal state	0 Ω
	At pressure over approx. 4.9 kPa(0.5 kgf/cm ² , 7 psi)	Infinity

(1) Engine Oil Pressure Switch

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(12)Coolant Temperature Sensor



Coolant Temperature Sensor

- 1) Connector Voltage**
1. Disconnect the **1P** connector from the thermo switch (1).
 2. Turn the main switch key to the **"ON"** position, and measure the voltage with a voltmeter between the connector terminal and the chassis.
 3. If a certain voltage is not indicated, the wiring harness is faulty.

Voltage (Connector terminal - Chassis)	Factory spec.	A certain voltage is indicated
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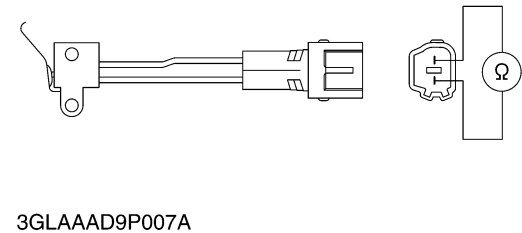
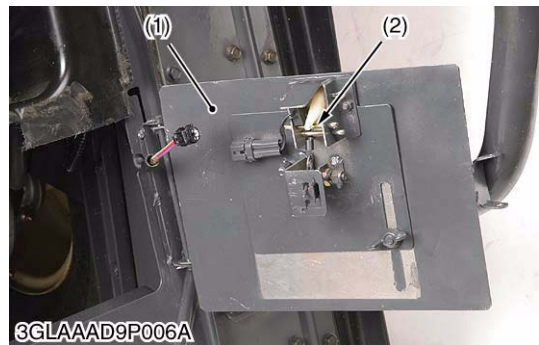
- 2) Thermo Switch Continuity**
1. Disconnect the **1P** connector, and remove the thermo switch.
 2. Using an ohmmeter, check for continuity between the switch terminal and the chassis.
 3. If infinity is indicated at temperature over factory specifications, the switch is faulty.

Working temperature	Factory spec.	120 to 126 °C 248.0 to 258.8 °F
---------------------	---------------	------------------------------------

- (1) Thermo Switch

(A) **ON**
(B) **OFF**
(C) **120 to 126 °C**
(248.0 to 258.8 °F)
(D) **116 °C (240.8 °F) or more**
- 000009486E

(13)Grass Container Full Switch



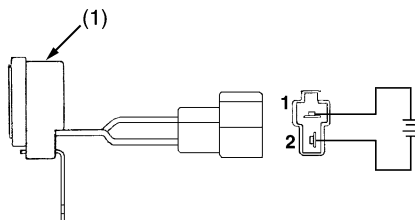
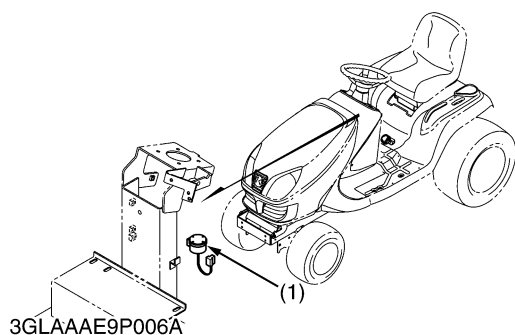
Grass Container Full Switch Continuity

1. Remove the battery.
2. Dismount the grass container.
3. Open the switch cover (1).
4. Disconnect the grass container full switch (2) lead.
5. measure the resistance with an ohmmeter between the grass container full switch terminals.
6. If the grass container full switch is defective, replace it.

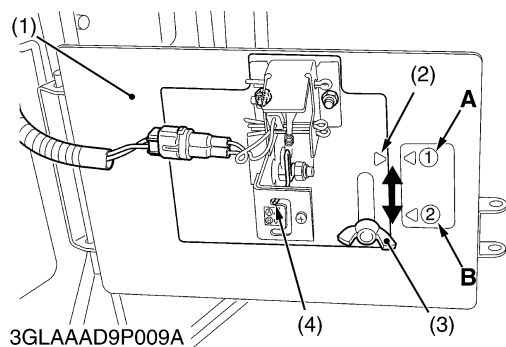
Resistance (between switch terminals)	When switch lever is pushed	0 Ω
	When switch lever is released	Infinity

- (1) Switch Cover

(2) Grass Container Full Switch
- 000009487E



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Buzzer

1. Remove the air intake net.
2. Disconnect the lead from buzzer (1).
3. Connect the jumper lead between the battery positive terminal and terminal **1** of connector.
4. Connect the jumper lead between the battery negative terminal and terminal **2** of connector.
5. If the buzzer does not whistle, replace it.

(1) Buzzer

1 : Terminal 1**2 : Terminal 2**

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Adjusting Grass Container Full Switch

■ NOTE

- **Before mowing, adjust the grass container full switch position according to the grass condition.**

1. Dismount the grass container (see page 2-S9).
2. Open the switch cover (1).
3. Loosen the wing nut (3) and align the position indicator (2) with switch position "A".
4. Set the position change lever (4) up.
5. Close the switch cover and remount the grass container, and start mowing.
6. If the discharge duct is plugged, align the position indicator (2) with switch position "B".
7. If the grass container is not filled much, set the position change lever (4) down.

(1) Switch Cover

A : Switch Position

(2) Position Indicator

B : Switch Position

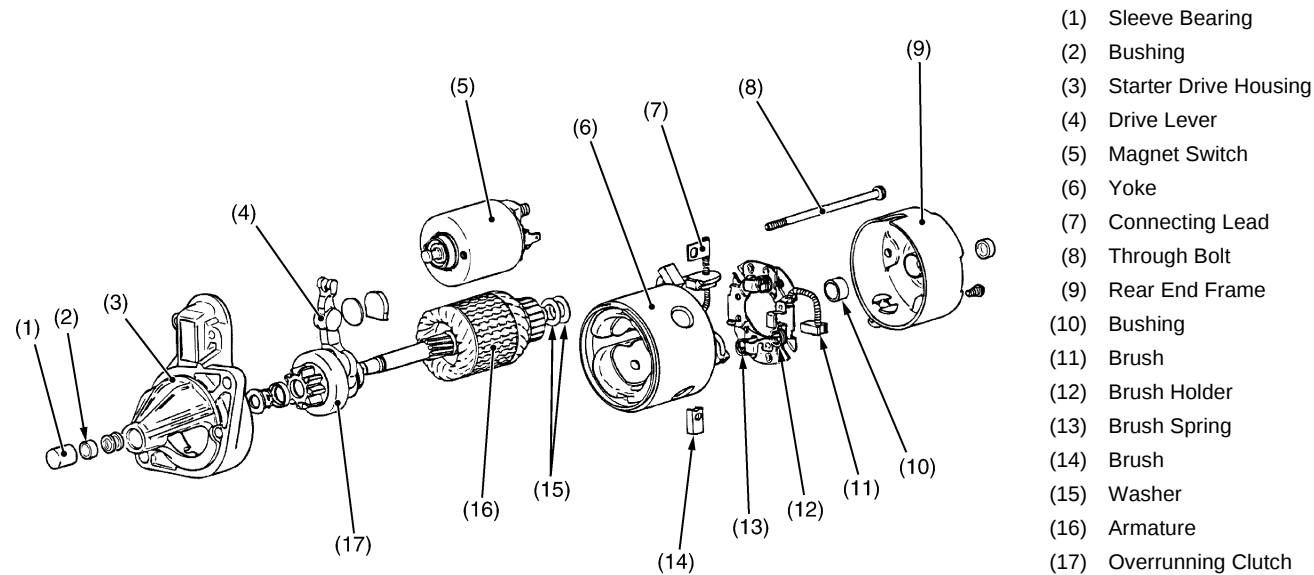
(3) Wing Nut

(4) Position Change Lever

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[2] DISASSEMBLING AND ASSEMBLING

(1) Starter



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1. Disconnect the connecting lead (7).
2. Remove the magnetic switch (5).
3. Remove the rear end frame (9).
4. Remove the brush (11) from brush holder (12).
5. Remove the brush holder (12).
6. Draw out the yoke (6) from the starter drive housing (3).
7. Draw out the armature (16) with the drive lever (4).

■ NOTE

- Do not damage to the brush and commutator.

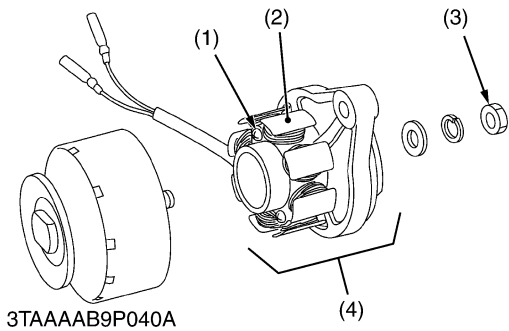
(When reassembling)

- Apply grease to spline teeth of the armature, bushing, pinion gear of the overrunning clutch and armature shaft.

Tightening torque	C Terminal Nut	5.9 to 11.8 N·m 0.6 to 1.2 kgf·m 4.3 to 8.7 ft-lbs
-------------------	----------------	--

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(2) Dynamo



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 ft-lbs
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- (1) Screw
- (2) Stator
- (3) Nut
- (4) Stator Comp.

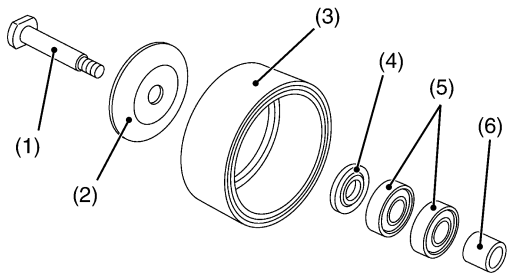
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Rotor

- 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

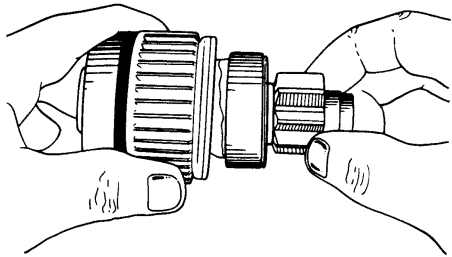


- (1) Shaft
- (2) Pulley
- (3) Rotor
- (4) Collar
- (5) Bearings
- (6) Collar

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[3] SERVICING

(1) Starter

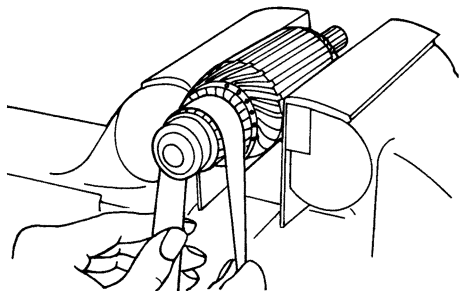


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Overrunning Clutch

- 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.

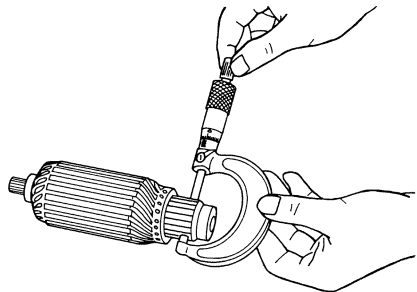
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Commutator and Mica

- 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.

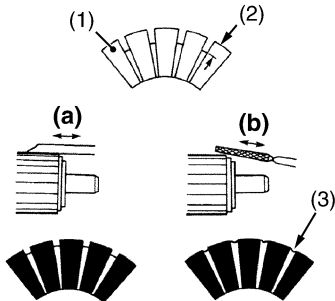


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Commutator O.D.	Factory spec.	28.0 mm 1.102 in.
	Allowable limit	27.0 mm 1.063 in.

Difference of O.D.'s	Factory spec.	Less than 0.05 mm 0.002 in.
	Allowable limit	0.4 mm 0.016 in.

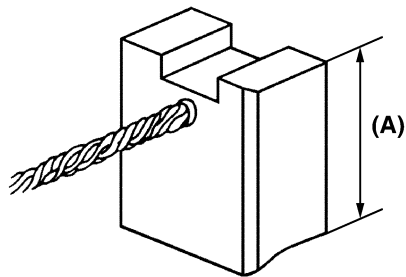
Mica undercut	Factory spec.	0.50 to 0.80 mm 0.0197 to 0.0315 in.
	Allowable limit	0.20 mm 0.0079 in.



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- (1) Segment
- (2) Undercut
- (3) Mica
- (a) Correct
- (b) incorrect

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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.

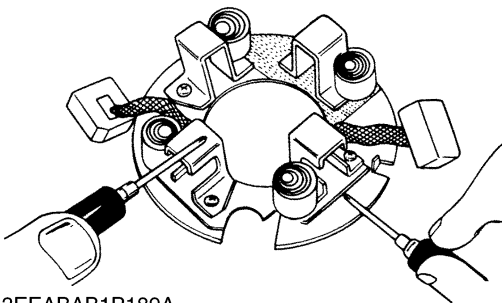
Brush length (A)	Factory spec.	16.0 mm 0.630 in.
	Allowable limit	10.5 mm 0.413 in.

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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.

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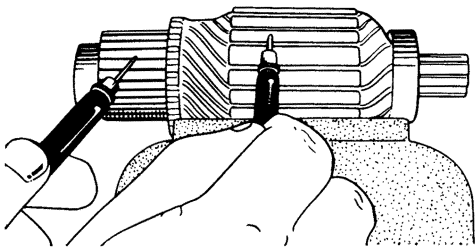


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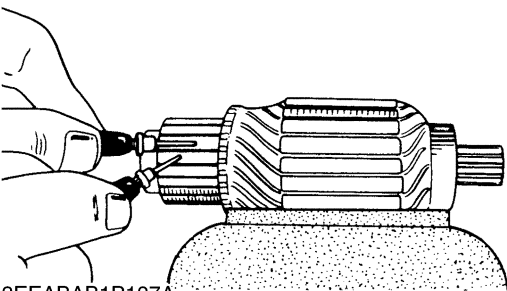
Armature Coil

- 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.

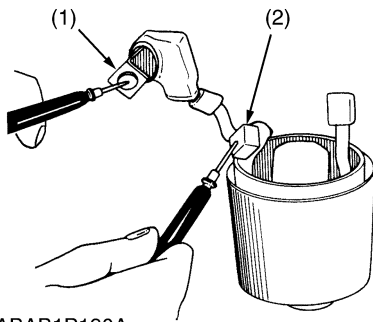
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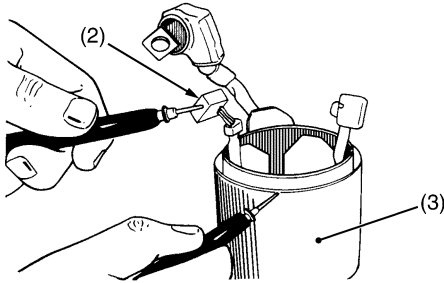
Field Coil

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

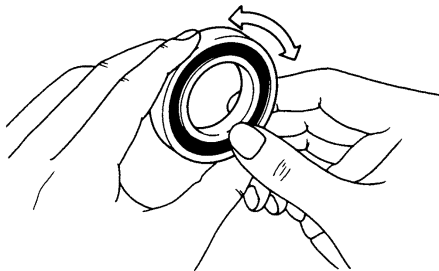
(3) Yoke

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(2) Dynamo



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Bearing

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

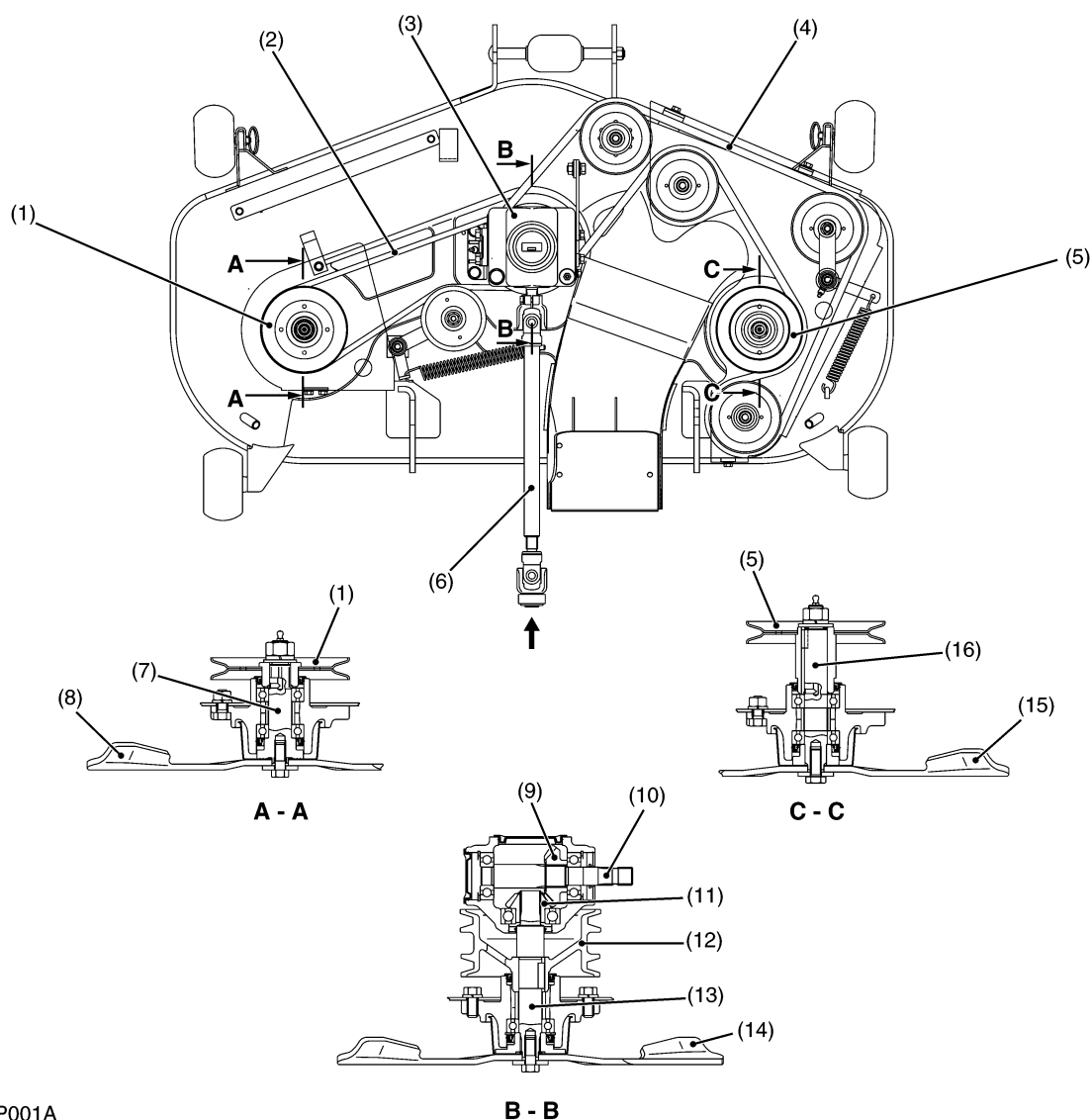
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8 MOWER

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2. LIFTING MECHANISM	8-M2

1. POWER TRANSMISSION



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- | | | | |
|-----------------------------|-----------------------------|--------------------------|-------------------------------|
| (1) Left Side Blade Pulley | (5) Right Side Blade Pulley | (9) 21T Spiral Gear | (13) Bevel Gear Shaft |
| (2) Mower Belt (Left Side) | (6) Universal Joint | (10) Input Shaft | (14) Center Blade |
| (3) Gear Box | (7) Blade Shaft (Left Side) | (11) 16T Spiral Gear | (15) Right Side Blade |
| (4) Mower Belt (Right Side) | (8) Left Side Blade | (12) Center Blade Pulley | (16) Blade Shaft (Right Side) |

The power is transmitted from transaxle case to blades as follows.

■ Center Blade

PTO Shaft → Universal Joint (6) → Input Shaft (10) → 21T Spiral Gear (9) → 16T Spiral Gear (11) → Bevel Gear Shaft (13) → Center Blade (14).

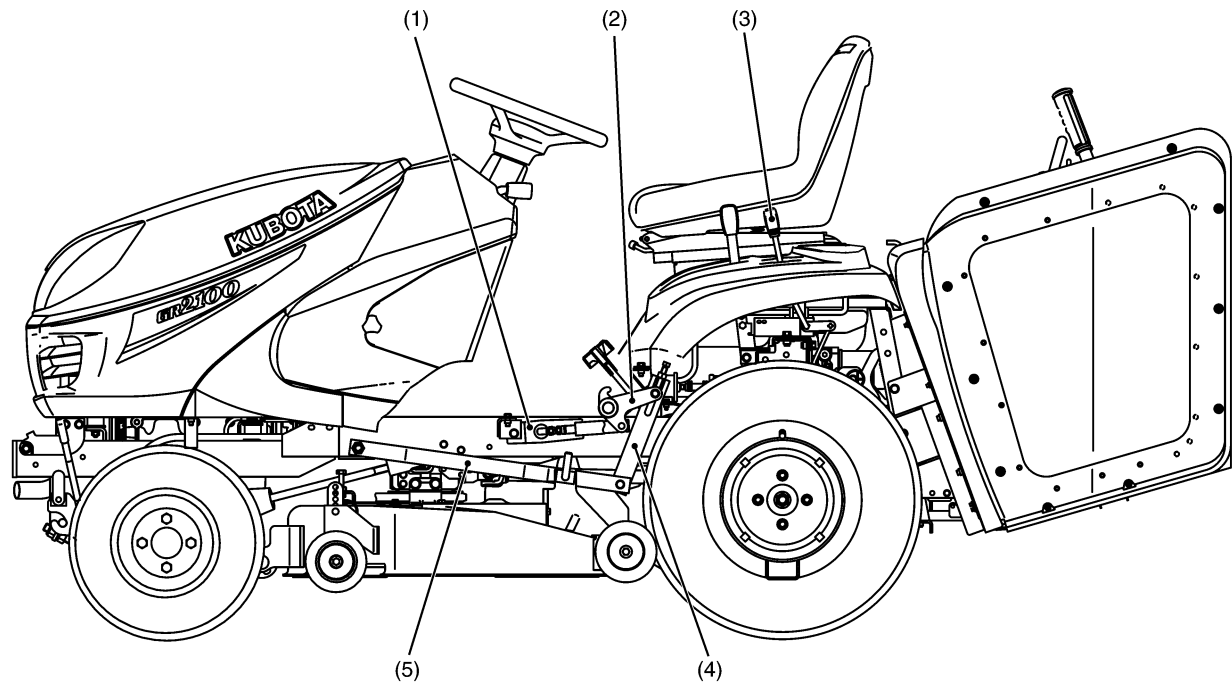
■ Left Side Blade

PTO Shaft → Universal Joint (6) → Input Shaft (10) → 21T Spiral Gear (9) → 16T Spiral Gear (11) → Bevel Gear Shaft (13) → Center Blade Pulley (12) → Mower Belt (Left Side) (2) → Left Side Blade Pulley (1) → Blade Shaft (Left Side) (7) → Left Side Blade (8).

■ Right Side Blade

PTO Shaft → Universal Joint (6) → Input Shaft (10) → 21T Spiral Gear (9) → 16T Spiral Gear (11) → Bevel Gear Shaft (13) → Center Blade Pulley (12) → Mower Belt (Right Side) (4) → Right Side Blade Pulley (5) → Blade Shaft (Right Side) (16) → Right Side Blade (15).

2. LIFTING MECHANISM



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- | | | | |
|---------------------|--------------------------|---------------|---------------|
| (1) Lift Cylinder | (3) Hydraulic Lift Lever | (4) Lift Link | (5) Rear Link |
| (2) Lift Link Shaft | | | |

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

For avoiding danger, the mower should be kept lifting when traveling. When the hydraulic lift lever (3) is moved to **"LIFT"** position, the lift links (4) are risen with lift link shaft (2) by the oil pressure of hydraulic system.

Therefore, rear links (5) are lifted at the same time.



CAUTION

- Never operate mower in transport position.

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1. TROUBLESHOOTING.....	8-S1
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(1) Gear Box	8-S14

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Blade Does Not Turn	● PTO system malfunctioning	Check transmission	—
	● Mower belt broken	Replace mower belt	8-S9
Blade Speed is Slow	● Mower belt loosen	Replace mower belt of tension spring	8-S9
	● Grass clogged	Remove grass	—
	● Cup washer flattened or worn	Replace cup washer	8-S8
	● Engine rpm too low	Mow at full throttle, check and reset engine rpm	—
Cutting is Poor	● Mower blade worn or bent	Sharpen or replace mower blade	G-40, 8-S8
	● Mower blade screw loosen	Retighten mower blade screw	8-S8
	● Cutting height improper	Adjust cutting height	8-S5
	● Ground speed too fast	Slow-down	—
	● Tire pressure uneven	Adjust	G-49
	● Anti-scalp rollers not adjusted correctly	Adjust anti-scalp rollers	8-S4
Mower is Not Lifted	● Linkage system broken	Replace linkage system	6-S12
	● Trouble of hydraulic system	Check hydraulic system	—

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Left Tip of Blade to Right Tip of Blade	Difference	Less than 3 mm 0.1181 in.	—
Front Tip of Blade to Rear Tip of Blade	Difference	Less than 5 mm 0.20 in.	—
21T Spiral Gear to 16T Spiral Gear	Backlash	0.13 to 0.25 mm 0.0051 to 0.0098 in.	0.40 mm 0.157 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-9)

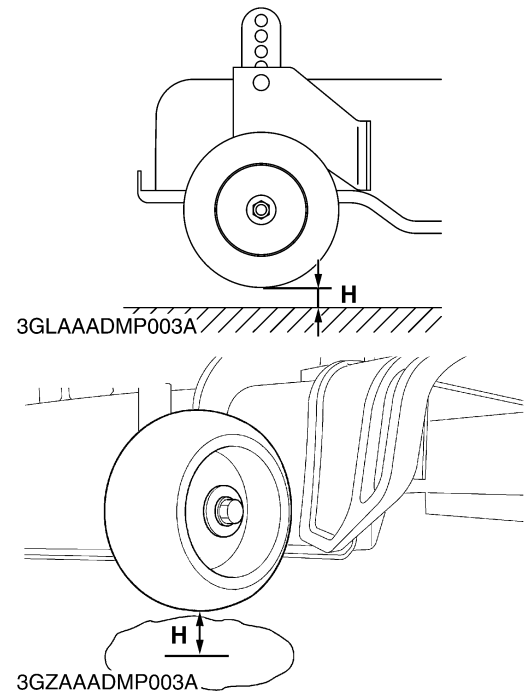
Item	N·m	kgf·m	ft-lbs
Mower blade screw	88.0 to 117.6	8.98 to 11.99	65.0 to 86.7
Gear box mounting screw LH (Reamer)	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Gear box mounting screw RH	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Gear box stay mounting screw LH (Reamer)	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Gear box stay mounting screw RH	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Center Blade pulley holder mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Pulley mounting nut (Right side)	88.0 to 117.6	8.98 to 11.99	65.0 to 86.7
Pulley mounting nut (Left side)	103 to 118	10.5 to 12.0	76.0 to 87.0
Pulley holder mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Tension pulley mounting screw and nut (Right side)	108.5 to 130	11.07 to 13.29	80.0 to 96.0
Tension pulley mounting screw and nut (Left side)	47.5 to 57.0	4.84 to 5.82	35.0 to 42.0
Tension arm mounting screw (Only left side) and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5

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4. CHECKING, DISASSEMBLING AND ASSEMBLING

[1] CHECKING AND ADJUSTING

(1) Adjusting Anti-Scalp Rollers



Adjusting Anti-scalp Rollers

■ IMPORTANT

- The flattest cut can be achieved by having the anti-scalp rollers adjusted 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	200 kPa, 2.0 kgf/cm ² , 29 psi
Rear wheel	140 kPa, 1.4 kgf/cm ² , 20 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 height **H** of the rear side anti-scalp roller to one of four positions 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.

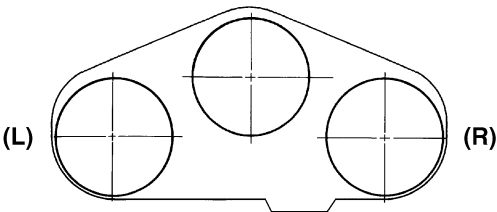
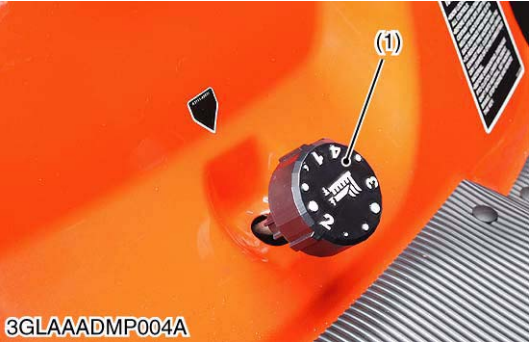
■ Rear side anti-scalp roller

8. Adjust height **H** of the front side anti-scalp roller to one of seven 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.

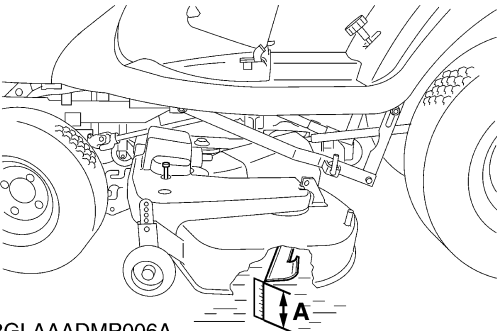
H : Height 19 mm (0.75 in.)

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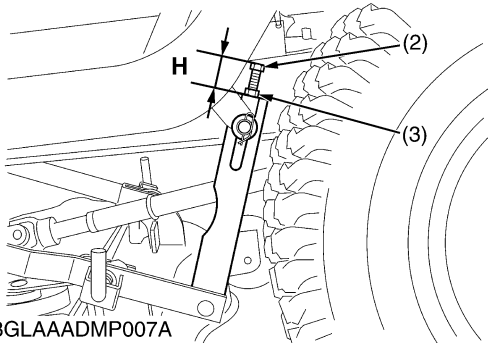
(2) Adjusting Left and Right Cutting Height



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Adjusting Left and Right Cutting Height

1. Park the machine on level surface.
2. Wheel pressure must be correct.
3. Raise up the mower deck to the transport position. (Also the top end.)
4. Turn the cutting height control dial (1) to the "3" position.
5. Place 51 mm (2 in.) height wood blocks under each side of the mower deck.
Anti-scalp rollers must not rest on the wood block.
6. Lower the mower deck.
7. Adjust the left side equally.
8. Measure the heights of blade **(L)** and **(R)** from the ground surface and calculate the difference.
9. 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 (2).

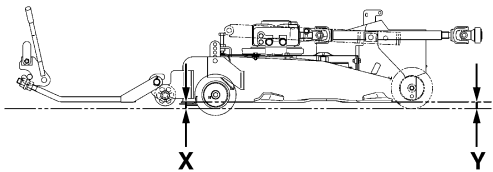
Difference (L) - (R) between left tip and right tip of blade	Factory spec.	Less than 3 mm 0.1181 in.
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(Reference)

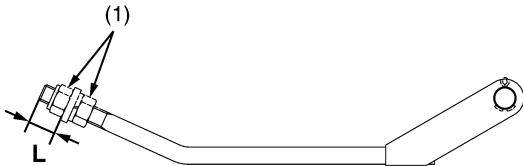
- Length of cutting height fine tuning bolt **(H)** :
46 to 54 mm (1.812 to 2.125 in.)

- | | |
|-------------------------------------|---|
| (1) Cutting Height Control Dial | (L) Left Blade Measurement Position |
| (2) Cutting Height Fine Tuning Bolt | (R) Right Blade Measurement Position |
| (3) Lock Nut | A : Blade Height |

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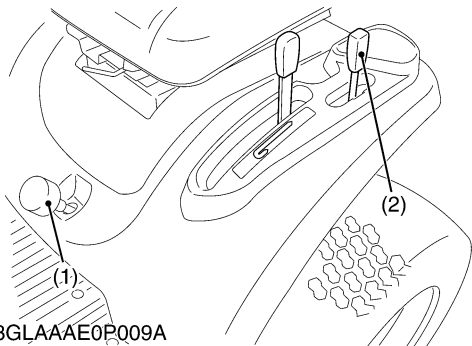


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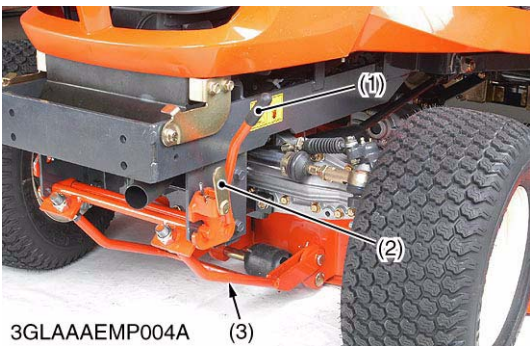


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[2] PREPARATION
(1) Dismounting Mower



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Adjusting Parallel Linkage

1. Park the machine on a level surface.
2. Wheel pressure must be correct.
3. Adjust the cutting height so that blade is level.
4. Position mower blade in the Front-to-Rear position.
5. Measure the height of blade **X** and **Y** from the ground surface and calculate the difference.
6. If the difference between front tip and rear tip of blade is not within the factory specification, adjust the length "**L**" of front link with lock nut (1).

Difference (X - Y) between front tip and rear tip of blade	Factory spec.	Less than 5 mm 0.20 in.
--	---------------	----------------------------

(Reference)

- **L** : 26 to 28 mm (1.0 to 1.1 in.)

(1) Lock Nut

X : Height of Blade Tip (Front)

Y : Height of Blade Tip (Rear)

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Cutting Height Adjusting Dial

1. Park the machine on level ground, and stop the engine.
2. Set the cutting height adjusting dial (1) to "**1**" position.
3. Set the front anti-scalp rollers at the top position.
4. Lower the mower deck on level ground by hydraulic lift lever (2).

(1) Cutting Height Adjusting Dial

(2) Hydraulic Lift Lever

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Front Link

1. Pull the lever fulcrum fixing pin (2) and turn it counterclockwise to lock.
2. Push down the link fixing lever (1).
3. Remove the front link (3) from the mower deck.

(When reassembling)

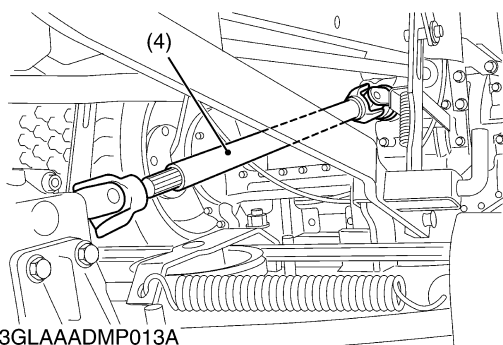
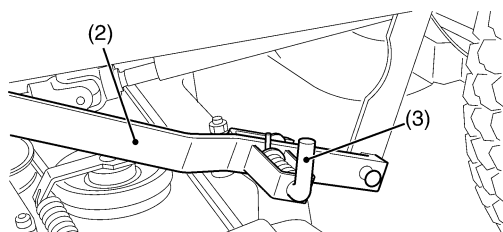
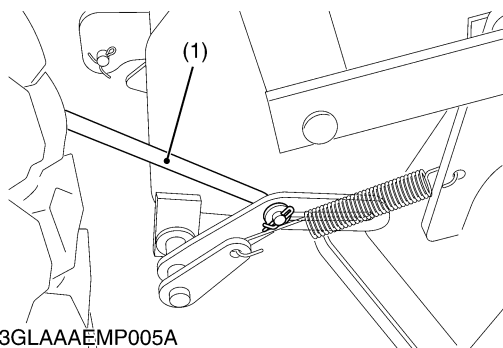
- When attach the front link, make sure the length of the front link.

(1) Link Fixing Lever

(3) Front Link

(2) Lever Fulcrum Fixing Pin

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Rear Link and Universal Joint

1. Disconnect the rotate plate rod (1).
2. Disconnect the rear link (2) from the mower deck, pulling the L-pins (3).
3. Disconnect the universal joint (4) from the PTO shaft.
4. Raise the mower lift lever and lock in the raised position.

(When reassembling)

- Apply grease to the spline of PTO shaft.
- Slide the universal joint back and front to make sure the universal joint is locked securely.
- When attach the rear links, make sure the length of the rear links.

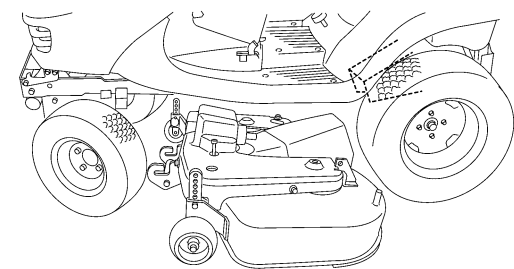
(1) Rotate Plate Rod

(3) L-pin

(2) Rear Link

(4) Universal Joint

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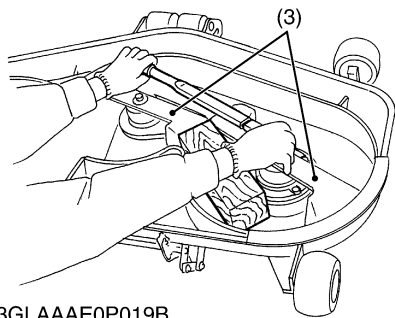
Dismounting Mower

1. Turn the front wheel to the right.
2. Pull out the mower deck to the left.

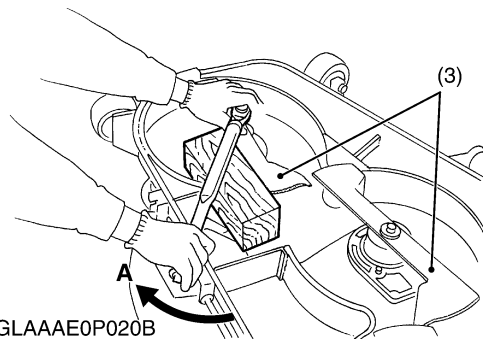
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[3] DISASSEMBLING AND ASSEMBLING

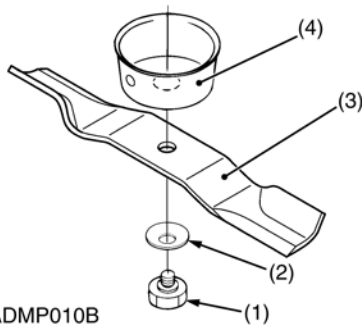
(1) Mower



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Mower Blades

1. Turn over the mower.
2. Unscrew the mower blade screw (1), and remove the plate spring (2), mower blade (3) and dust cover (4).

■ NOTE

- To remove the blade securely, wedge a block of wood between one blade and the mower deck in such position that it will hold the blade safely while loosening or tightening the blade screw.

(When reassembling)

- Be sure to assemble the plate spring (2) between the mower blade (3) and the mower blade screw (1).

■ IMPORTANT

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

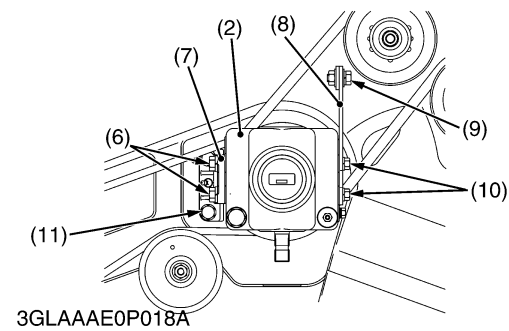
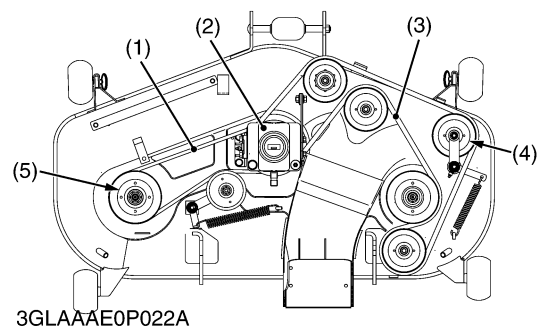
Replace two cup washers if either is damaged.

Tightening torque	Mower blade screw	88.0 to 117.6 N·m 8.98 to 11.99 kgf·m 65.0 to 86.7 ft·lbs
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- (1) Mower Blade Screw
(2) Plate Spring
(3) Mower Blade
(4) Dust Cover

A: Loosen

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Mower Belt

1. Remove the left and right belt covers from the mower deck.
2. Disconnect the universal joint from the gear box (2).
3. Clean around the gear box (2).
4. Remove the mower belt RH (3) from the tension pulley (4).
5. Remove the mower belt LH (1) from the left side blade pulley (5).
6. Remove the gear box stays (7), (8).
7. Remove the mower belts (1), (3) from the center blade pulley.

Tightening torque	Gear box mounting screw LH (reamer)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Gear box mounting screw RH	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Gear box stay mounting screw LH (reamer)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Gear box stay mounting screw RH	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs

- | | |
|---|---|
| (1) Mower Belt LH | (7) Gear Box Stay LH |
| (2) Gear Box | (8) Gear Box Stay RH |
| (3) Mower Belt RH | (9) Gear Box Stay Mounting Screw RH |
| (4) Tension Pulley | (10) Gear Box Mounting Screw RH |
| (5) Left Side Blade Pulley | (11) Gear Box Stay Mounting Screw LH (Reamer) |
| (6) Gear Box Mounting Screw LH (Reamer) | |

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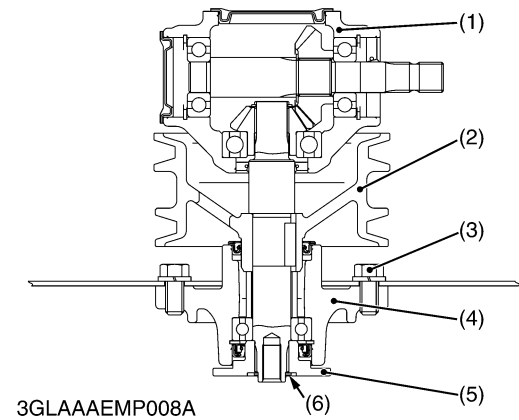
Gear Box

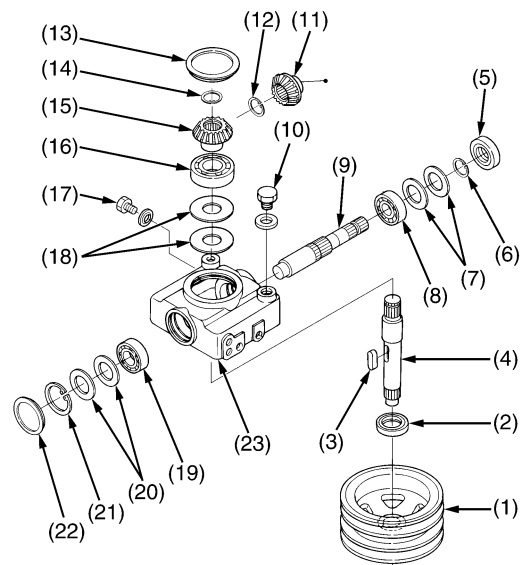
1. Remove the external snap ring (6).
2. Pull out the gear box (1) with the center blade pulley (2).
3. Remove the spline boss (5).
4. Unscrew the center blade pulley holder mounting screws (3).
5. Remove the pulley holder (4).

Tightening torque	Center blade pulley holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
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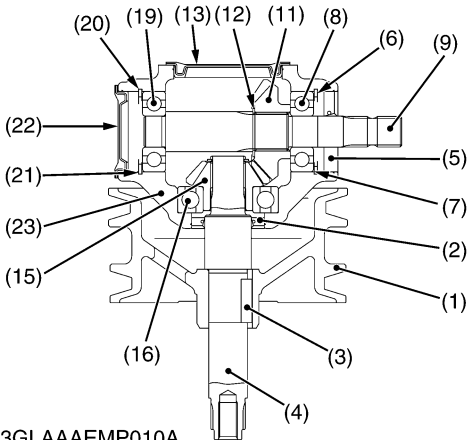
- | | |
|---|------------------------|
| (1) Gear Box | (4) Pulley Holder |
| (2) Center Blade PULley | (5) Spline Boss |
| (3) Center Blade Pulley Holder Mounting Screw | (6) External Snap Ring |

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Disassembling Mower Gear Box Assembly

1. Unscrew the drain plug (17), and drain gear case oil.
2. Remove the center blade pulley (1) with a puller, and remove the feather key (3) on the bevel gear shaft (4).
3. Remove the gear case caps (13), (22).
4. Remove the internal snap ring (21) and shims (20).
5. Tap out the input shaft (9) with the ball bearing (19), and external snap ring (12).
6. Remove the 21T spiral gear (11).
7. Remove the oil seal (5), internal snap ring (6), shims (7) and ball bearing (8).
8. Remove the external snap ring (14), and draw out the bevel gear shaft (4).
9. Remove the 16T spiral gear (15), ball bearing (16), shims (18) and oil seal (2).

(When reassembling)

- Replace the oil seals (2), (5) and gear case caps (13), (22) with new ones.
- Apply grease to the spline of input shaft and of bevel gear shaft.

■ IMPORTANT

- Use the specified gear box oil.
- Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8).

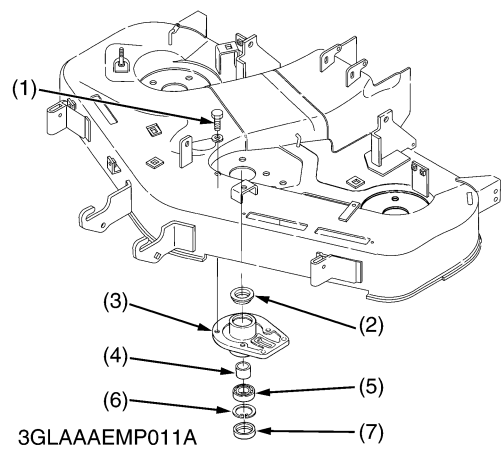
Mower gear case oil	Capacity	0.40 L 0.42 U.S.qts 0.35 Imp.qts
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■ NOTE

- While tapping out the input shaft (9) from the gear case (23), set the mating portion of external snap ring (12) on input shaft upward.

(1) Center Blade Pulley	(13) Case Cap
(2) Oil Seal	(14) External Snap Ring
(3) Feather Key	(15) 16T Spiral Gear
(4) Bevel Gear Shaft	(16) Ball Bearing
(5) Oil Seal	(17) Drain Plug
(6) Internal Snap Ring	(18) Shim
(7) Shim	(19) Ball Bearing
(8) Ball Bearing	(20) Shim
(9) Input Shaft	(21) Internal Snap Ring
(10) Plug	(22) Case Cap
(11) 21T Spiral Gear	(23) Gear Case
(12) External Snap Ring	

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Disassembling Center Blade Pulley Holder

1. Remove the center blade pulley holder mounting screws (1).
2. Separate the center blade pulley holder from the mower deck.
3. Remove the lower oil seal (7).
4. Remove the internal snap ring (6), ball bearing (5) and center collar (4).
5. Remove the upper oil seal (2).

(When reassembling)

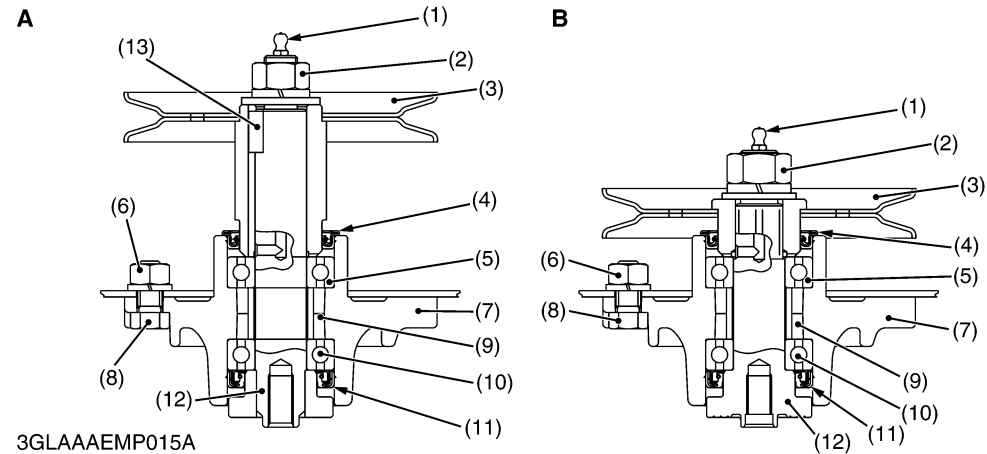
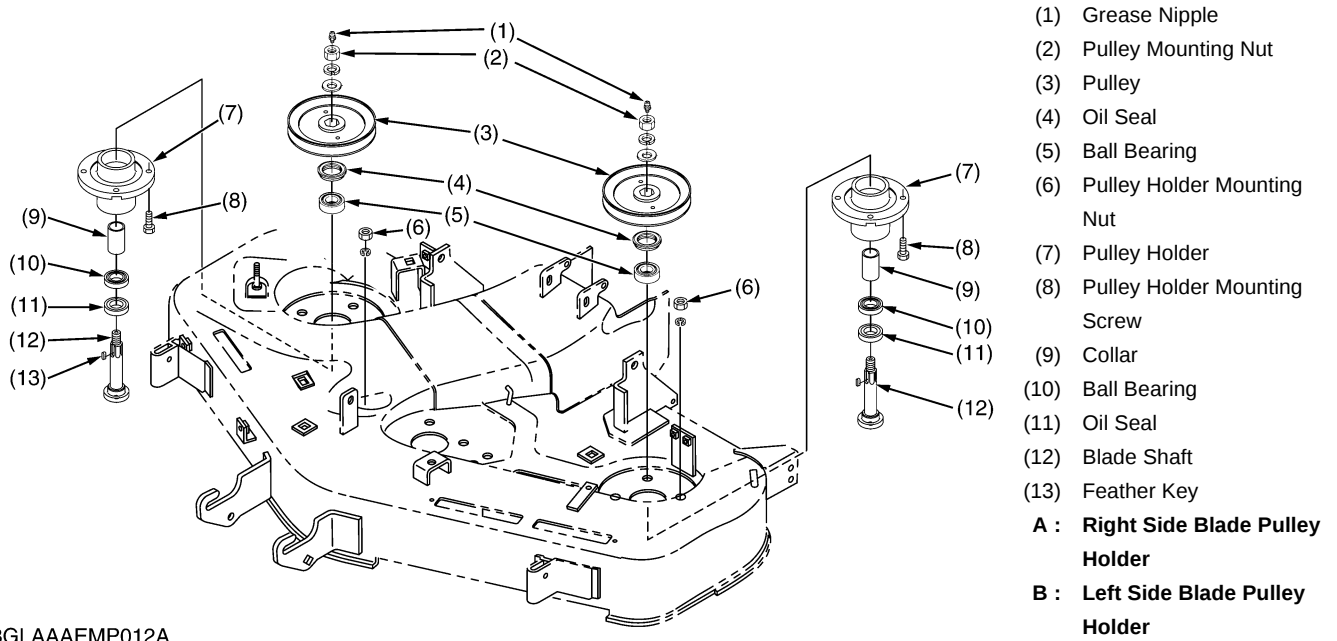
- Apply grease to the bearing and oil seal lips.
- Apply grease to the inside of center collar.
- Replace the oil seals with new ones.
- Be sure to pay attention to how to assemble lower oil seal.
- Apply liquid gasket (Three Bond 1208D or its equivalent) to the face of center pulley holder.

Tightening torque	Center blade pulley holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
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- | | |
|--|------------------------|
| (1) Center Blade Holder Mounting Screw | (5) Ball Bearing |
| (2) Upper Oil Seal | (6) Internal Snap Ring |
| (3) Center Blade Pulley Holder | (7) Lower Oil Seal |
| (4) Center Collar | |

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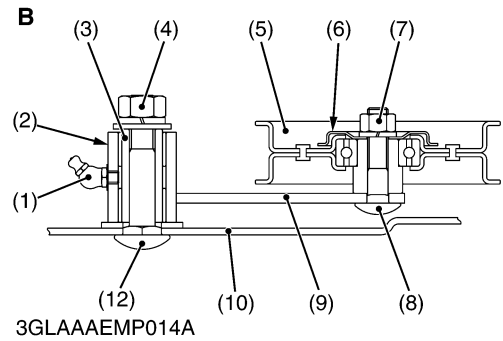
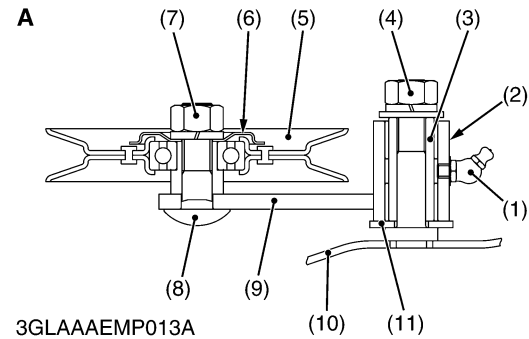
Disassembling Side Blade Pulley Holder



1. Remove the grease nipple (1).
2. Unscrew the pulley mounting nut (2), and remove the pulley (3) and feather key (13) (only right side).
3. Tap out the blade shaft (12).
4. Remove the pulley holder (7) from the mower deck.
5. Remove the oil seal (4), (11).
6. Remove the ball bearings (5), (10) and collar (9).

Tightening torque	Pulley mounting nut (Right side)	88.0 to 117.6 N·m 8.98 to 11.99 kgf·m 65.0 to 86.7 ft-lbs
	Pulley mounting nut (Left side)	103 to 118 N·m 10.5 to 12.0 kgf·m 76.0 to 87.0 ft-lbs
	Pulley holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs

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Disassembling Tension Pulley

1. Remove the spring from the tension arm (9).
2. Remove the tension arm mounting nut (4) and screw (12) (only left side).
3. Remove the tension arm assembly, tension collar (3) and plate (11) (only right side).
4. Remove the tension pulley mounting screw (8) and nut (7).
5. Remove the tension pulley (5) and the tension cover (6) from the tension arm (9).

(When reassembling)

- Apply grease to the tension collar (3).

Tightening torque	Tension pulley mounting screw and nut (Right side)	108.5 ti 130.2 N·m 11.07 to 13.29 kgf·m 80.0 to 96.0 ft-lbs
	Tension pulley mounting screw and nut (Left side)	47.5 to 57.0 N·m 4.84 to 5.82 kgf·m 35.0 to 42.0 ft-lbs
	Tension arm mounting screw (Only left side) and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs

- | | |
|-----------------------------------|--------------------------------------|
| (1) Grease Nipple | (9) Tension Arm |
| (2) Shim | (10) Mower Deck |
| (3) Tension Collar | (11) Plate |
| (4) Tension Arm Mounting Nut | (12) Tension Arm Screw |
| (5) Tension Pulley | |
| (6) Tension Cover | |
| (7) Tension Pulley Mounting Nut | A : Right Side Tension Pulley |
| (8) Tension Pulley Mounting Screw | B : Left Side Tension Pulley |

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EDITOR:

KUBOTA FARM & INDUSTRIAL MACHINERY SERVICE, LTD.

64, ISHIZU-KITAMACHI, SAKAI-KU, SAKAI-CITY, OSAKA, 590-0823, JAPAN

PHONE : (81)72-241-1129

FAX : (81)72-245-2484

E-mail : ksos-pub@kubota.co.jp
