

# WSM

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## WORKSHOP MANUAL **TRACTOR**

# L4400

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# Kubota

## TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of L4400. It is divided into three parts, "General", "Mechanism" and "Servicing" for each section.

### ■ General

Information on the tractor 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.

Refer to Diesel Engine / Tractor Mechanism Workshop Manual (Code No. 9Y021-01874 / 9Y021-18201) for the one which has not been described to this workshop manual.

### ■ 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.

December 2004

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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.



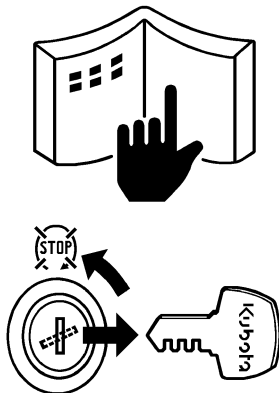
### IMPORTANT

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



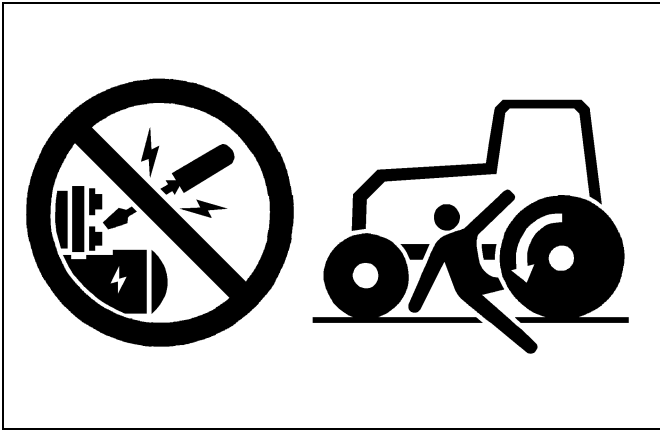
### NOTE

: Gives helpful information.



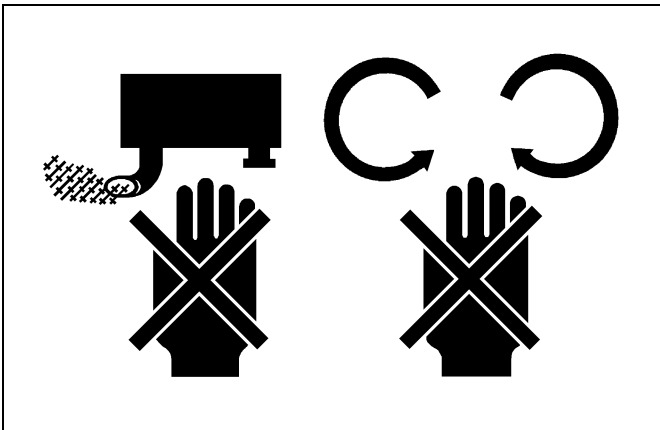
### BEFORE SERVICING AND REPAIRING

- 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.



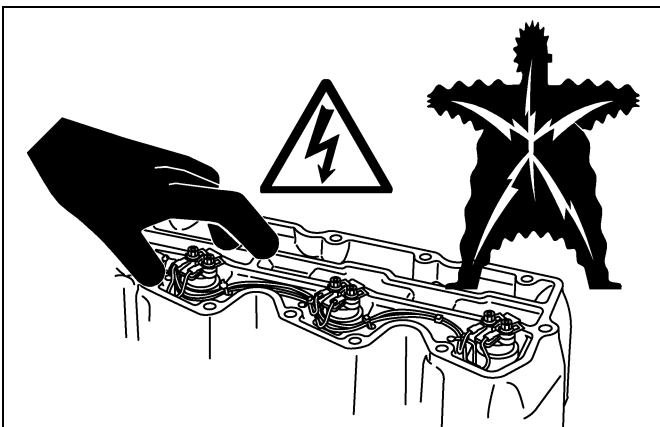
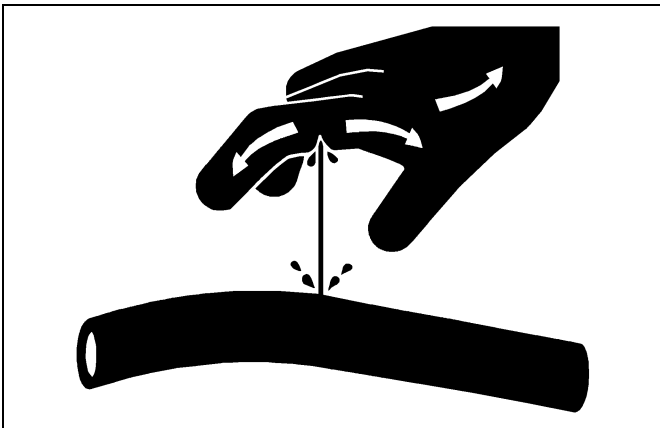
### SAFETY STARTING

- 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.

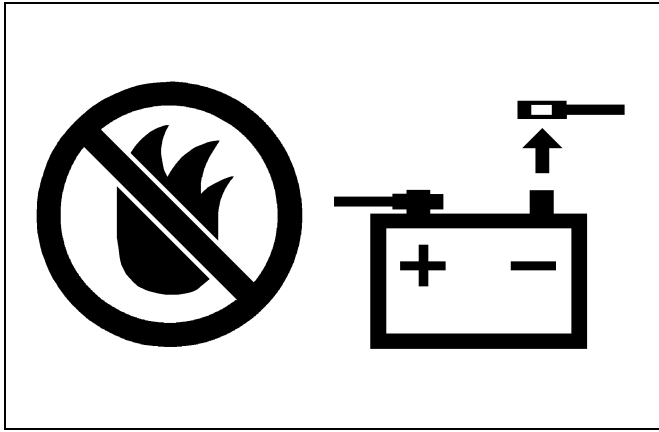


### SAFETY WORKING

- 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.
- Do not open high-pressure fuel system. High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt to repair fuel lines, sensors, or any other components between the high-pressure fuel pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU and injector. Pay sufficient caution to electric shock when performing work activities.







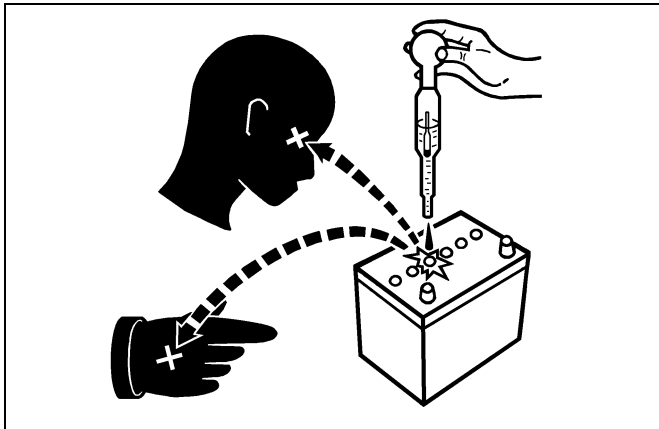
### AVOID FIRES

- 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.



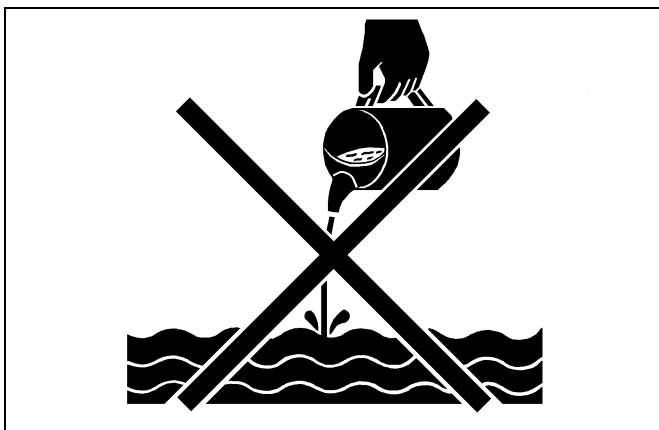
### VENTILATE WORK AREA

- 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.



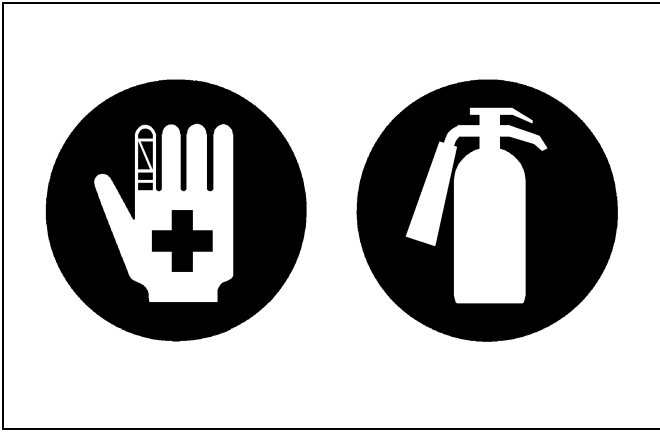
### PREVENT ACID BURNS

- 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.



### 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.

**PREPARE FOR EMERGENCIES**

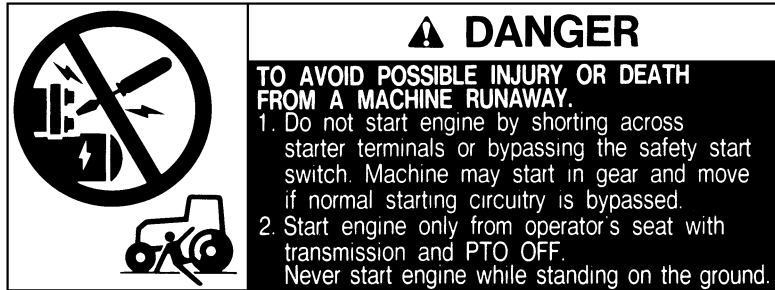
- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

## SAFETY DECALS

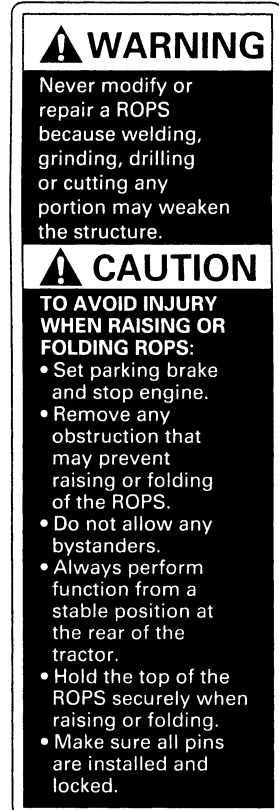
The following safety decals are installed on the machine.

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

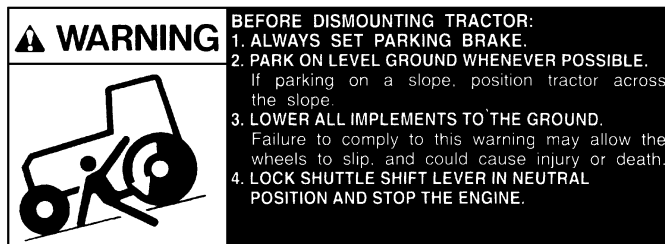
(1) Part No. TA040-4965-2



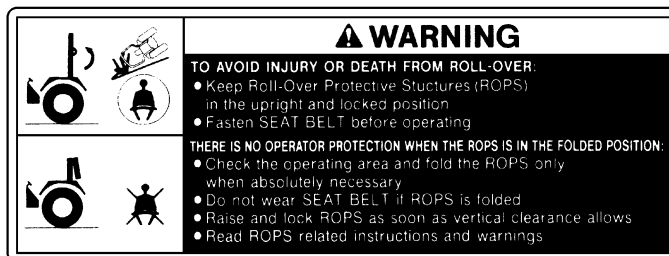
(5) Part No. 3A111-9554-1  
[Foldable ROPS type]



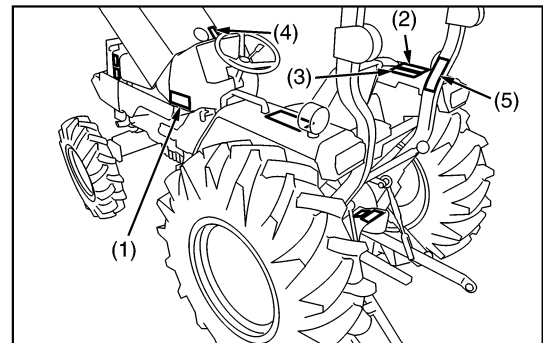
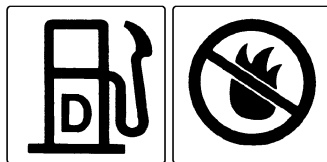
(2) Part No. TA140-4933-1



(3) Part No. TA240-9848-1 [Foldable ROPS type]



(4) Part No. TA040-4956-2  
Diesel fuel only. No fire



3TLAAACCP001A

(1) Part No. 35260-3491-4

**! CAUTION****TO AVOID PERSONAL INJURY:**

1. Read and understand the operator's manual before operation.
2. Before starting the engine, make sure that everyone is at a safe distance from the tractor and that the PTO is OFF.
3. Do not allow passengers on the tractor at any time.
4. Before allowing other people to use the tractor, have them read the operator's manual.
5. Check the tightness of all nuts and bolts regularly.
6. Keep all shields in place and stay away from all moving parts.
7. Lock the two brake pedals together before driving on the road.
8. Slow down for turns, or rough roads, or when applying individual brakes.
9. On public roads use SMV emblem and hazard lights, if required by local traffic and safety regulations.
10. Pull only from the drawbar.
11. Before dismounting, lower the implement to the ground, set the parking brake, stop the engine and remove the key.
12. Securely support tractor and implements before working underneath.

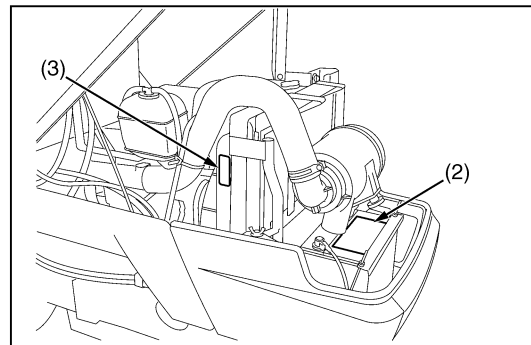
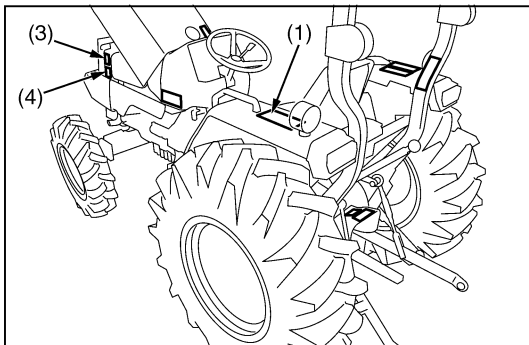
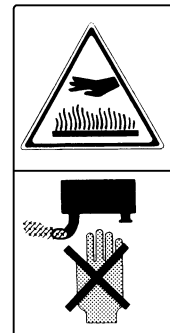
(3) Part No.  
32751-4958-1  
Stay clear of engine  
fan and fan belt.



(2) Part No. TD060-3012-2

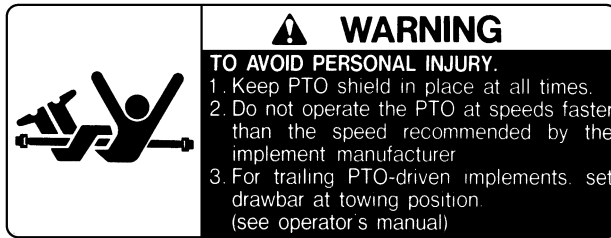
 <b>NX110-5MF 12V</b> AMP. HR (20HR) 55 RESERVE CAPACITY (MIN) 133 COLD CRANKING AMPS (-18°C) 582	<b>FLAMMABLES</b> <b>SHIELD EYES</b> <b>KEEP OUT OF THE REACH OF CHILDREN</b> <b>CAUTIONS OF SULFURIC ACID</b> <b>READ INSTRUCTION MANUAL CAREFULLY</b> <b>EXPLOSIVE</b>	<b>HYDROMETER</b> <b>OK</b> <b>CHARGE</b> <b>REPLACE</b> <b>BATTERY BATTERY</b> <b>DK 80059</b>
<p>• DUE TO HYDROGEN GAS GENERATED FROM BATTERY, HANDLING WITHOUT CARE CAN CAUSE FIRE AND EXPLOSION.</p> <p>• THIS 12V BATTERY IS ONLY FOR STARTING ENGINE. DO NOT APPLY THIS PRODUCT FOR OTHER USES.</p> <p>• CHARGE THIS BATTERY ONLY AT WELL VENTILATED PLACES, AND AVOID SHORTS OR SPARKS.</p> <p>• REFER TO THE INSTRUCTION MANUAL OF VEHICLE OR BATTERY BEFORE USING BOOSTER CABLE.</p> <p>• SULFURIC ACID MAY CAUSE BLINDNESS OR SEVERE BURN. IN CASE EYES, SKIN, CLOTHES OR ANY ARTICLES ARE STAINED WITH ACID, FLUSH OBJECTS IMMEDIATELY WITH WATER. IF ACID BEING SWALLOWED, DRINK PLENTY OF WATER PROMPTLY. IN CASE OF ACCIDENTAL CONTACT, CONSULT A DOCTOR IMMEDIATELY.</p> <p>• BATTERY FILLED WITH ACID (DO NOT TILT OR SPILL) • FLAMMABLE. DO NOT CHARGE NEAR FIRE OR SPARKS</p> <p>• DO NOT CHARGE RAPIDLY • DO NOT DISASSEMBLE THE BATTERY (SEALED TYPE)</p>		
<p><b>NX110-5MF</b> <b>80D26R</b></p> <p><b>FITTING DATE</b> (8) (1) (2) (3) (4) (5) (6) (7) (8) (9) YEAR</p> <p>(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) MONTH</p>		
<p><b>DANGER EXPLOSIVE GASES</b> Cigarettes, flames or sparks could cause battery to explode. Always shield eyes and face from battery. Do not charge or use booster cables or adjust post connections without proper instruction and training.</p> <p><b>POISON CAUSES SEVERE BURNS</b> Contains sulfuric acid. Avoid contact with skin, eyes or clothing. In event of accident flush with water and call a physician immediately.</p> <p><b>KEEP OUT OF REACH OF CHILDREN</b></p>		

(4) Part No.  
TD030-4958-1  
Do not touch hot  
surface like muffler,  
etc.



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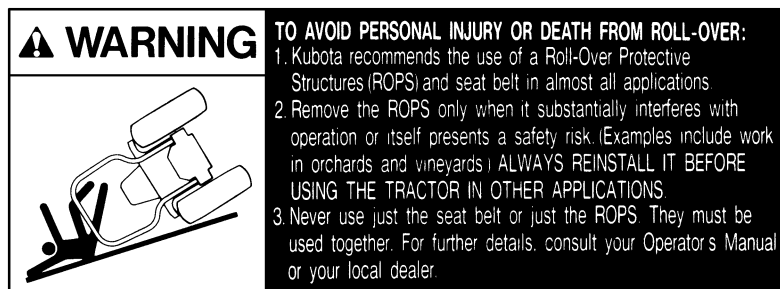
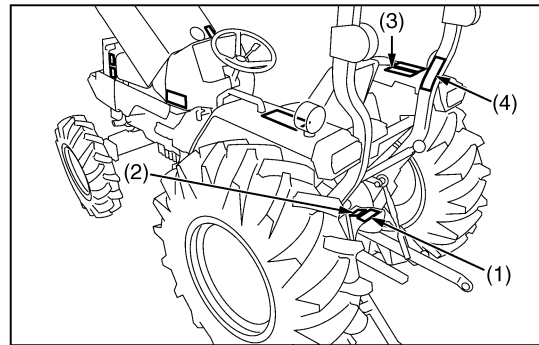
(1) Part No. TA040-4959-3



(2) Part No. TA040-4935-1



(3) Part No. TA040-4932-2 [Rigid ROPS type]

(4) Part No. 6C140-4746-1  
[Rigid ROPS type]**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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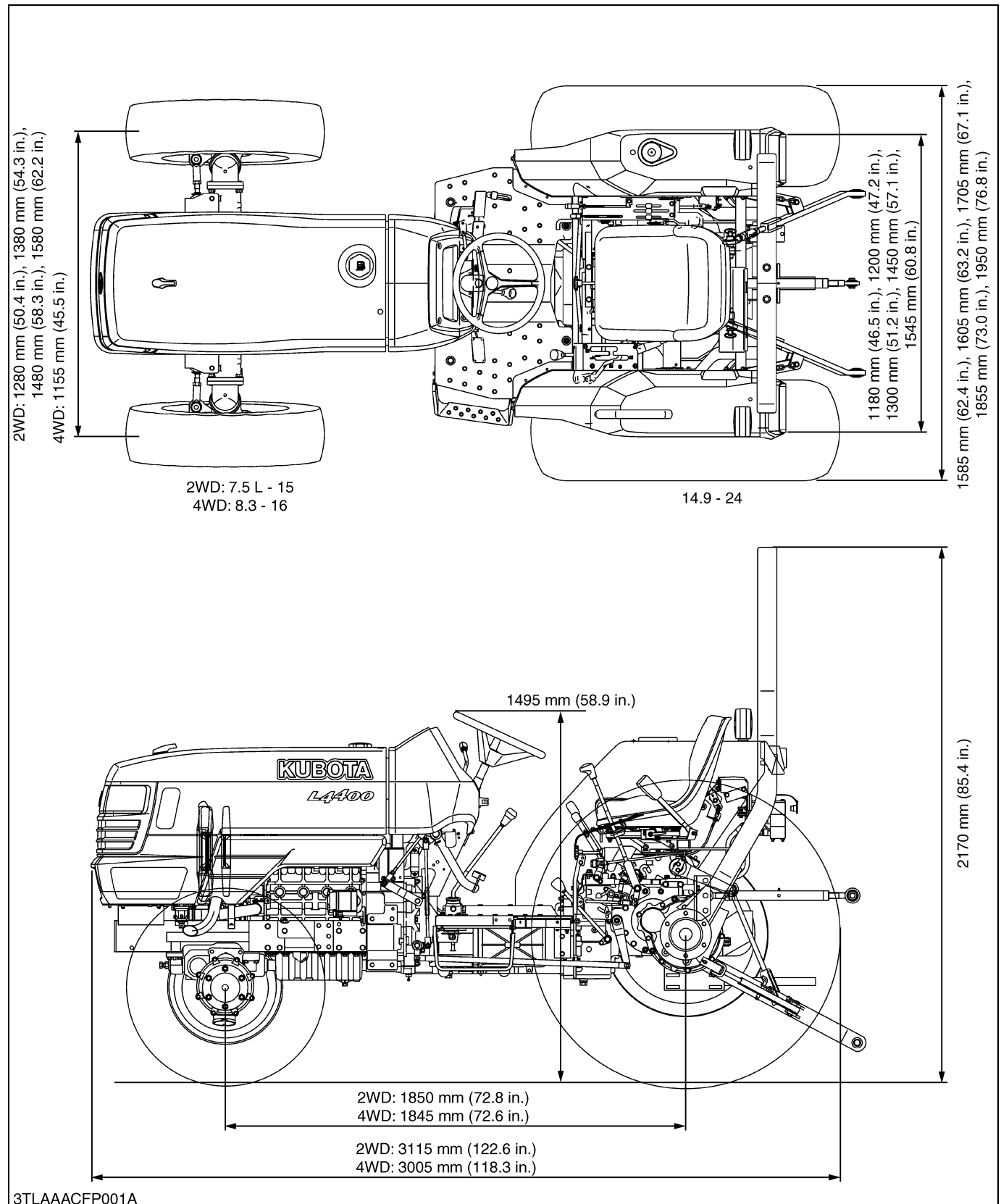
# SPECIFICATIONS

Model				L4400	
				2WD	4WD
PTO power		kW (HP) / rpm		28.0 (37.5) / 2600	
Engine	Maker		KUBOTA		
	Model		V2203-M-E2A		
	Type		Indirect injection, vertical, water-cooled 4 cycle diesel		
	Number of cylinders		4		
	Bore and stroke mm (in.)		87 X 92.4 (3.4 X 3.6)		
	Total displacement L (cu. in.)		2.197 (134.1)		
	Engine net power kW (HP) / rpm		32.1 (43.0) / 2600		
	Rated revolution rps (rpm)		43.4 (2600)		
	Maximum torque N·m (ft-lbs)		139.5 (102.9)		
	Battery		12 V. RC : 133 min., CCA : 582 A		
	Fuel		Diesel fuel No.1 [below -10 °C (14 °F)] Diesel fuel No.2 [below -10 °C (14 °F)]		
	Capacities	Fuel tank L (U.S.gals)		42 (11.1)	
Engine crankcase (with filter) L (U.S.qts)		7.6 (8.0)			
Engine coolant L (U.S.qts)		6.5 (6.9)			
Transmission case L (U.S.gals)		40 (10.6)			
Dimensions	Overall length (without 3P) mm (in.)		3115 (122.6)		3005 (118.3)
	Overall width (min. tread) mm (in.)		1585 (62.4)		
	Overall height (with ROPS) mm (in.)		2170 (85.4)		
	Overall height (Top of steering wheel) mm (in.)		1495 (58.9)		
	Wheel base mm (in.)		1850 (72.8)		1845 (72.6)
	Min. ground clearance mm (in.)		385 (15.2)		
	Tread	Front mm (in.)	1280 (50.4), 1380 (54.3), 1480 (58.3), 1580 (62.2)		1155 (45.5)
		Rear mm (in.)	1180 (46.5), 1200 (47.2), 1300 (51.2), 1450 (57.1), 1545 (60.8)		
Weight (with ROPS) kg (lbs)		1375 (3031)		1430 (3153)	
Clutch				Dry type single stage	
Traveling system	Tires	AG Front	7.5L - 15		8.3 - 16
		AG Rear	14.9 - 24		
	Indust (option) Front / Rear		10 - 16.5 / 17.5L - 24		
	Steering		Hydrostatic power steering		
	Transmission		Gear shift, 8 forward and 4 reverse		
	Brake		Mechanical, wet disk type		
	Min. turning radius (without brake) m (feet)		2.6 (8.5)		
Hydraulic unit	Hydraulic control system		Position control		
	Pump capacity (main) L /min (gal/min)		29.4 (7.8)		
	Pump capacity (PS) L /min (gal/min)		17.9 (4.7)		
	Three point hitch		Category I		
	Max. lift force	At lift points kg (lbs)	1300 (2870)		
		24 in. behind lift points kg (lbs)	1053 (2310)		
	System pressure MPa (kgf/cm <sup>2</sup> ) [psi]		17.7 (180) [2560]		
PTO	Rear PTO		SAE 1-3/8, 6 splines		
	PTO / Engine speed rpm		540 / 2475		

NOTE: \* Manufacture's estimate. The company reserves the right to change the specifications without notice.

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# DIMENSIONS



# **G GENERAL**

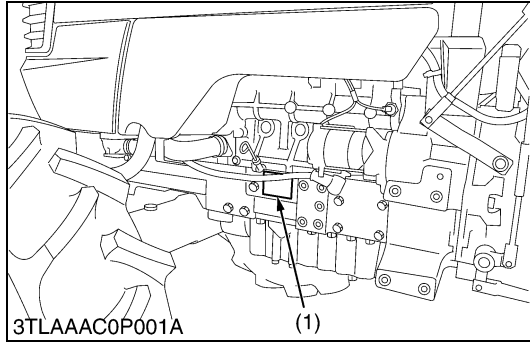


# GENERAL

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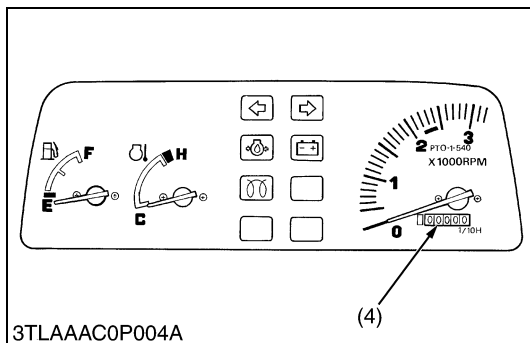
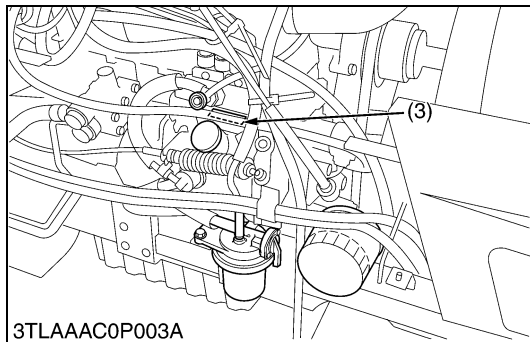
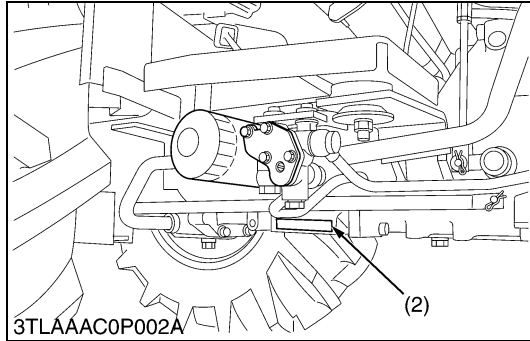
# 1. TRACTOR IDENTIFICATION



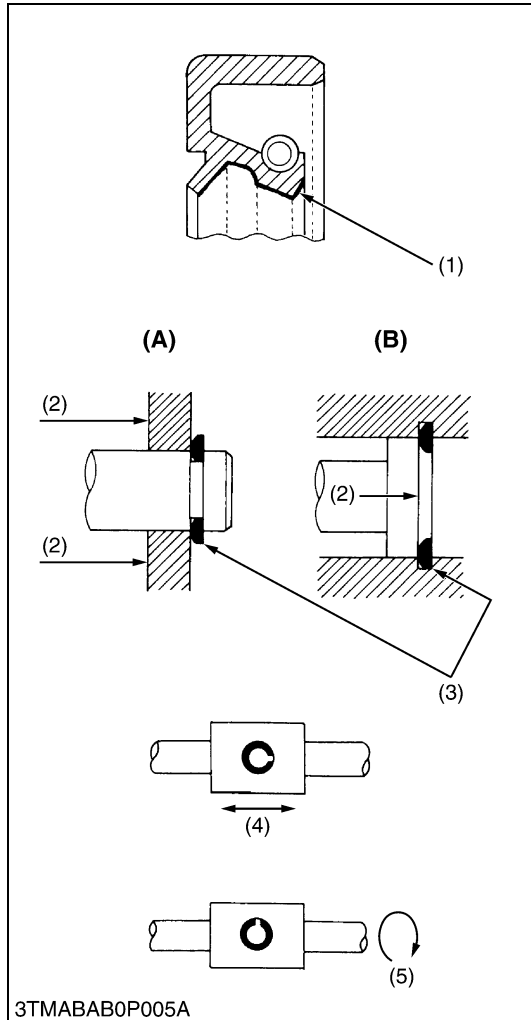
- (1) Tractor Identification Plate
- (2) Tractor Serial Number

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

W1010590



## 2. GENERAL PRECAUTIONS



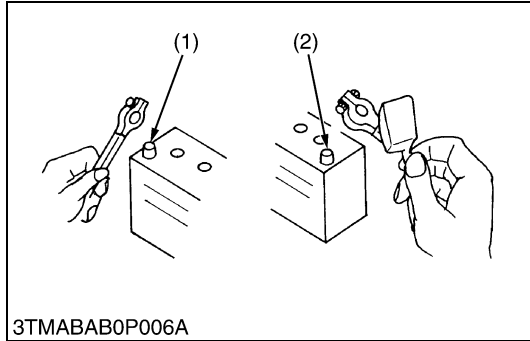
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently 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

W1010794

### 3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



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

#### ■ IMPORTANT

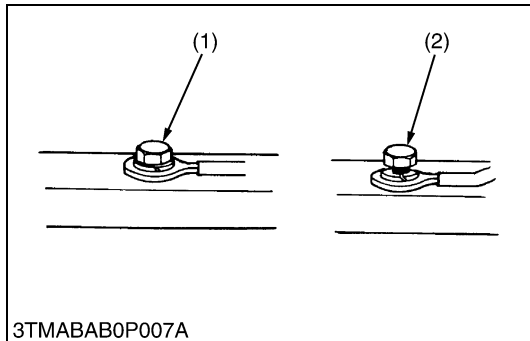
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
- Do not attempt to modify or remodel any electrical parts and wiring.
- When removing the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

(1) Negative Terminal

(2) Positive Terminal

W10111140

#### [1] WIRING

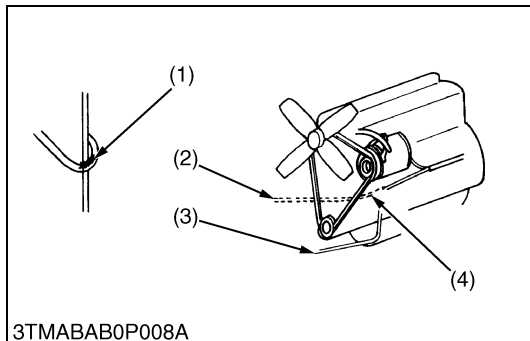


- Securely tighten wiring terminals.

(1) Correct  
(Securely Tighten)

(2) Incorrect  
(Loosening Leads to Faulty Contact)

W10112160

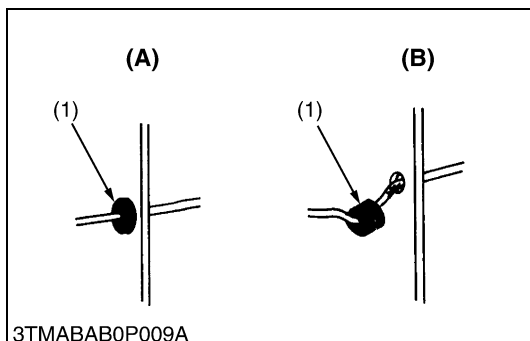


- Do not let wiring contact dangerous part.

(1) Dangerous Part  
(2) Wiring (Incorrect)

(3) Wiring (Correct)  
(4) Dangerous Part

W10113130

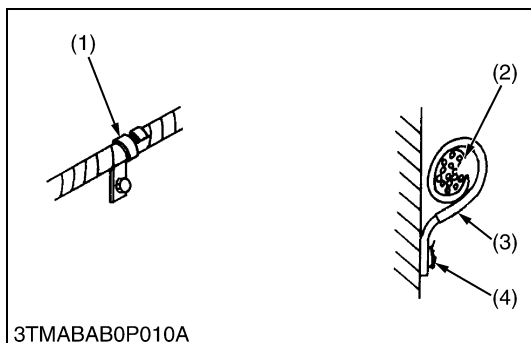


- Securely insert grommet.

(1) Grommet

(A) Correct  
(B) Incorrect

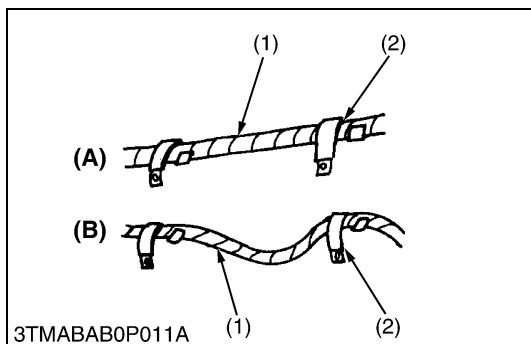
W10113880



- Securely clamp, being careful not to damage wiring.

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

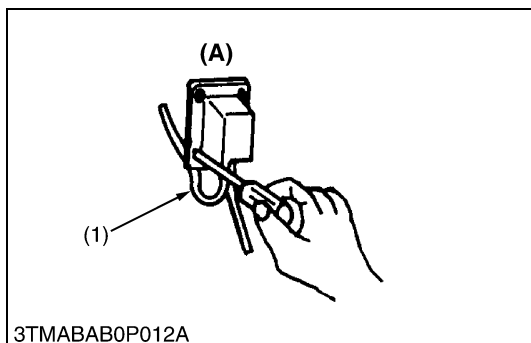
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- Clamp wiring so that there is no twist, unnecessary sag, or excessive tension, except for movable part, where sag be required.

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

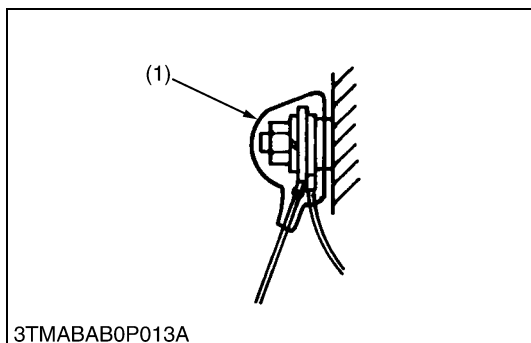
W10115870



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

- (1) Wiring  
(A) Incorrect

W10116700

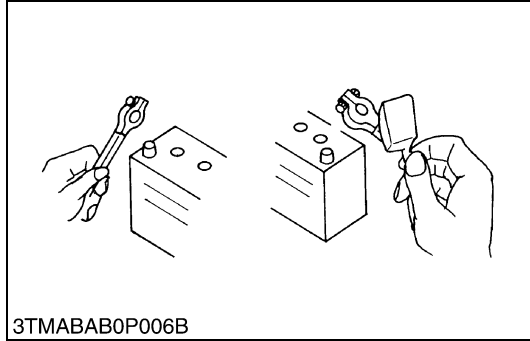


- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover  
• Securely Install Cover

W10117350

## [2] BATTERY



- 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.

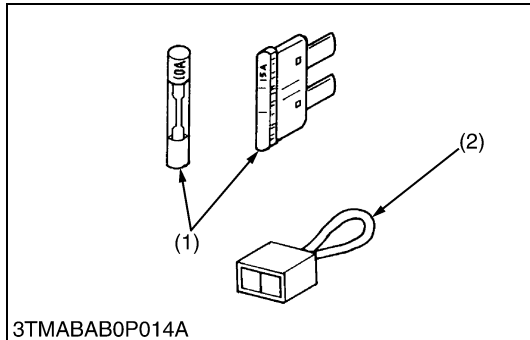


### CAUTION

- 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.

W10118160

## [3] FUSE



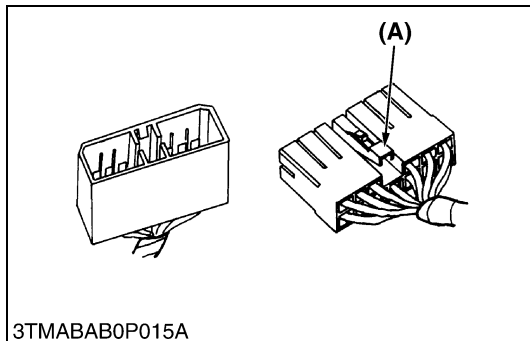
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Fusible Link

W10120920

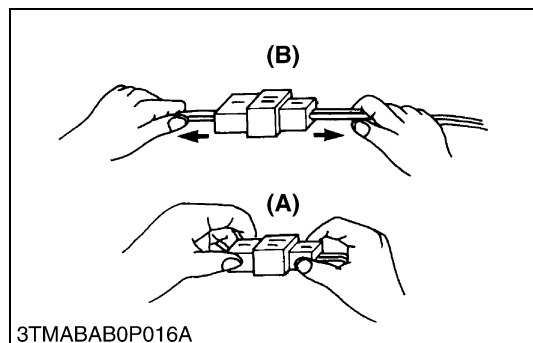
## [4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

W10122110

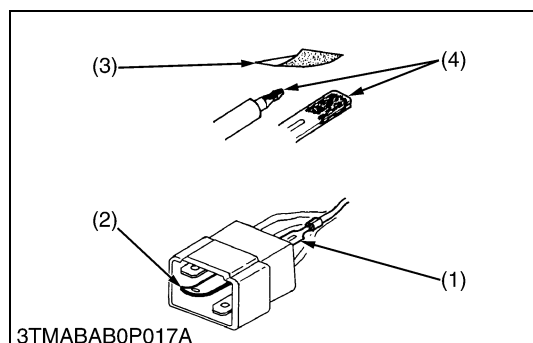


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

W10122720

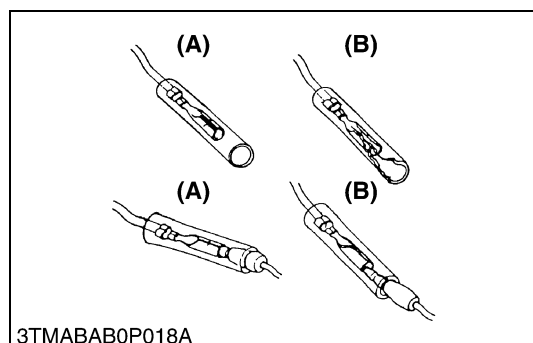


- Use sandpaper to remove rust from terminals.
- Repair deformed terminal. Make certain there is no terminal being exposed or displaced

(1) Exposed Terminal  
(2) Deformed Terminal

(3) Sandpaper  
(4) Rust

W10259430

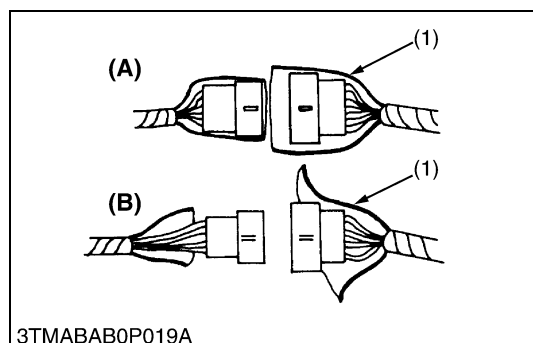


- Make certain that there is no female connector being too open.

(A) Correct

(B) Incorrect

W10263490



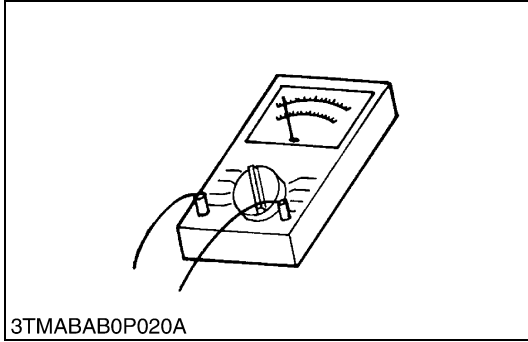
- Make certain plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct  
(B) Incorrect

W10264410

## [5] HANDLING OF CIRCUIT TESTER



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

W10267220



## 4. LUBRICANTS, FUEL AND COOLANT

	Place		Capacity	Lubricants, fuel and coolant	
			L4400		
1	Fuel		42 L 11.1 U.S.gals. 9.2 Imp.gals.	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below –10 °C (14 °F)	
2	Coolant		6.5 L 6.9 U.S.qts. 5.7 Imp.qts.	Fresh clean water with anti-freeze	
3	Engine crankcase (with filter)		7.6 L 8.0 U.S.qts. 6.7 Imp.qts.	Engine oil : API service Classification 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		40 L 10.6U.S.gals. 8.8 Imp.gals.	KUBOTA UDT or SUPER UDT fluid*	
5	Front axle case	4WD	6.5 L 6.9 U.S.qts. 1.4 Imp.qts.	KUBOTA UDT or SUPER UDT fluid* or SAE80 - 90 gear oil	
6	Greasing		No. of greasing points	Capacity	Type of grease
	Front wheel hub		2 [2WD only]	Until grease overflows	Multipurpose type grease
	Knuckle shaft		2 [2WD only]		
	Front axle support		2		
	Top link		1		
	Top link bracket		2 [with draft control (if equipped)]		
	Battery terminals		2		
	Lift rod		1		

\* KUBOTA original transmission hydraulic fluid.




### ■ NOTE

- Engine Oil:  
Oil used in the engine should have an American Petroleum Institute (API) service classification and Proper SAE Engine Oil according to the ambient temperatures as shown above:
- With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. **If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.**
- Lubricating oil recommended when a low-sulfur or high-sulfur fuel employed.

## 5. TIGHTENING TORQUES

### [1] GENERAL USE SCREWS, BOLTS 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
<b>M6</b> (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
<b>M8</b> (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
<b>M10</b> (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
<b>M12</b> (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
<b>M14</b> (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
<b>M16</b> (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
<b>M18</b> (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
<b>M20</b> (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

W1034542

## 6. MAINTENANCE

No.	Period		Indication on hour meter														After since	Refer- ence page		
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Engine oil	Change	★	☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-13		
2	Engine oil filter	Replace	★			☆				☆				☆			every 200Hr	G-14		
3	Hydraulic oil filter	Replace	★			☆				☆				☆			every 200Hr	G-15		
4	Transmission fluid	Change	★							☆							every 400Hr	G-14		
5	Front axle case oil (4WD)	Change	★							☆							every 400Hr	G-15		
6	Front axle pivot	Adjust												☆			every 600Hr	G-28		
7	Greasing	-	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50Hr	G-16, 17		
8	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50Hr	G-18		
9	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50Hr	G-19		
10	Battery condition	Check		☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-23		*4
11	Air cleaner element [Double element type] Primary element	Clean		☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-20	@	*1
		Replace															every 1 year	G-20		*2
12	Air cleaner element [Double element type] Secondary element	Replace															every 1 year	G-20		
13	Fuel filter element	Clean		☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-20		
		Replace								☆							every 400Hr	G-20		
14	Fan belt	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-21		
15	Clutch	Adjust	★	☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-16		
16	Brake	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-22		
17	Radiator hose and hose clamp	Check				☆				☆				☆			every 200Hr	G-25		
		Replace															every 2 years	G-25		

No.	Item	Period	Indication on hour meter														After since	Refer- ence page		
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
18	Power steering oil line	Check				☆				☆				☆			every 200Hr	G-25		
		Replace															every 2 years	G-25		
19	Fuel line	Check		☆		☆		☆		☆		☆		☆		☆	every 100Hr	G-21	@	
		Replace															every 2 years	G-21		*3
20	Toe-in	Adjust		☆		☆		☆		☆		☆		☆		☆	every 200Hr	G-27		
21	Intake air line	Check				☆				☆				☆			every 200Hr	G-26	@	
		Replace															every 800Hr	1-S11		*3
22	Greasing (2WD front wheel hub)	-								☆							every 400Hr	G-28		
23	Engine valve clearance	Adjust															every 800Hr	1-S13		
24	Fuel injection nozzle Injection pressure	Check															every 1500Hr	1-S19, S20	@	
25	Injection pump	Check															every 3000Hr	1-S19, S20	@	
26	Cooling system	Flush															every 2 years	G-29		
27	Coolant	Change															every 2 years	G-29		
28	Fuel system	Bleed																G-32		
29	Clutch housing water	Drain															Service as required	G-32		
30	Fuse	Replace																G-33		
31	Light bulb	Replace																G-33		

### ■ IMPORTANT

- The jobs indicated by ☆ must be done after the first 50 hours of operation.
- \*1 : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- \*2 : Every year or every 6 times of cleaning.
- \*3 : Replace only if necessary.
- \*4 : When the battery is used for less than 100 hours per year, check the battery condition by reading the indicator annually.
- The items insted above (@ marked) are registered as emission related critrical parts by KUBOTA in the U.S.EPA nonroad emission regulation.

W1067893

## 7. CHECK AND MAINTENANCE



### CAUTION

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

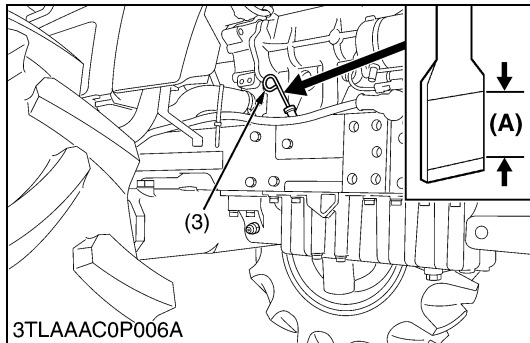
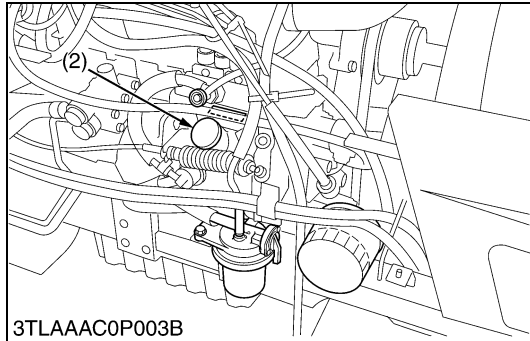
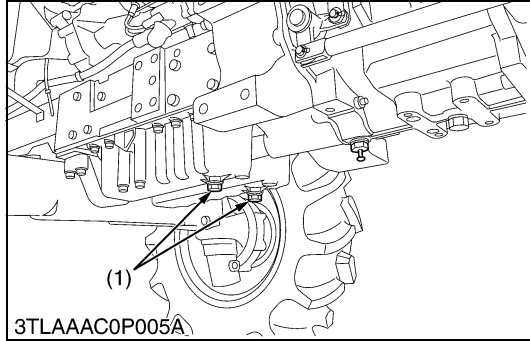
### [1] DAILY CHECK

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

#### Checking

- Check areas where previous trouble was experienced.
  - Walk around the tractor.
1. Check the tire pressure, and check for wear and damage.
  2. Check for oil and water leak.
  3. Check the engine oil level.
  4. Check the transmission fluid level.
  5. Check the coolant level.
  6. Check the condition of seat belt and ROPS attaching hardware.
  7. Check and clean the radiator screen and grill.
  8. Check the nuts of tires are tight.
  9. Care of danger, warning and caution labels.
  10. Clean around the exhaust manifold and the muffler of the engine.
    - While sitting in the operator's seat.
1. Check the brake pedals and clutch pedal.
  2. Check the parking brake.
  3. Check the steering wheel.
    - Turning the key switch.
1. Check the performance of the easy checker lights.
  2. Check the lights, turn signal lights, hazard lights and other light equipment. Clean if necessary.
  3. Check the performance of the meters and gauges.
    - Starting the engine.
1. Check to see that the lights on the easy checker go off.
  2. Check the color of the exhaust gas.
  3. Check the brakes for proper operation.

## [2] CHECK POINTS OF INITIAL 50 HOURS



### Changing Engine Oil

#### ⚠ CAUTION

- **Before changing oil, be sure to stop the engine.**
1. Start and warm up the engine for approx. 5 minutes.
  2. Place an oil pan underneath the engine.
  3. To drain the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely.
  4. Screw in the drain plug (1).
  5. Fill new oil up to upper hole on the dipstick (3).

#### ■ IMPORTANT

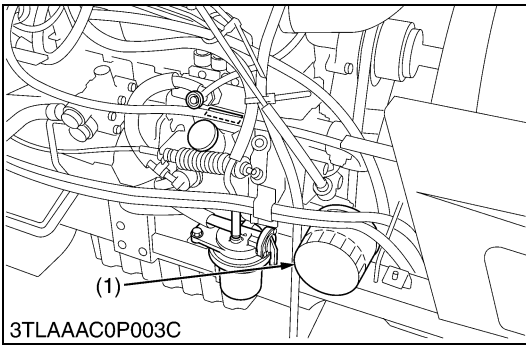
- **When using an oil of different manufacture or viscosity from the previous one, remove all of the old oil.**
- **Never mix two different types of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8).**

Engine oil	Capacity (with filter)	5.7 L 6.0 U.S.qts 5.0 Imp.qts
------------	------------------------	-------------------------------------

- (1) Drain Plug  
(2) Oil Inlet Plug  
(3) Dipstick

(A) Oil level is acceptable within this range.

W1014533



### Replacing Engine Oil Filter Cartridge

#### ⚠ CAUTION

- Be sure to stop the engine before changing oil filter cartridge (1).
- Allow engine to cool down sufficiently, oil can be hot and can burn.

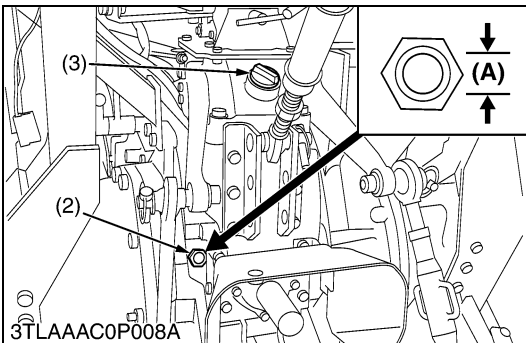
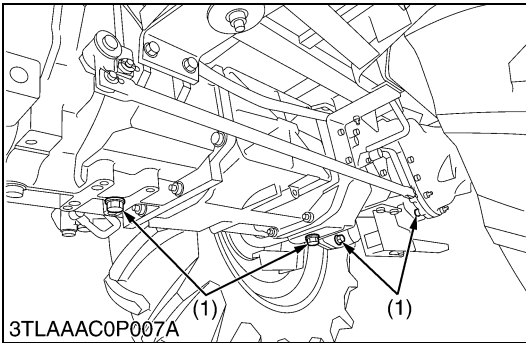
1. Remove the engine oil filter cartridge (1).
2. Put a film of clean engine oil on rubber seal of new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases a little. Make sure that the engine oil does not leak through the seal and be sure to check the oil level on the dipstick. Then, replenish the engine oil up to the prescribed level.

#### ■ IMPORTANT

- To prevent serious damage to the engine, replacement element must be highly efficient. Use only a KUBOTA genuine filter.

(1) Engine Oil Filter Cartridge

W1026738



### Changing Transmission Fluid

#### ⚠ CAUTION

- Be sure to stop the engine before checking and changing the transmission fluid.

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1) at the bottom of the transmission case.
3. Drain the transmission fluid.
4. After draining, screw in the drain plugs (1).
5. Fill with the new KUBOTA SUPER UDT fluid up to the upper line of the gauge (2).
6. After running the engine for a few minutes, stop it and check the fluid level again, if low, add fluid prescribed level (A).

#### ■ IMPORTANT

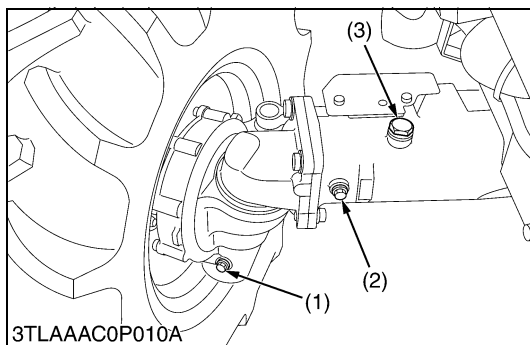
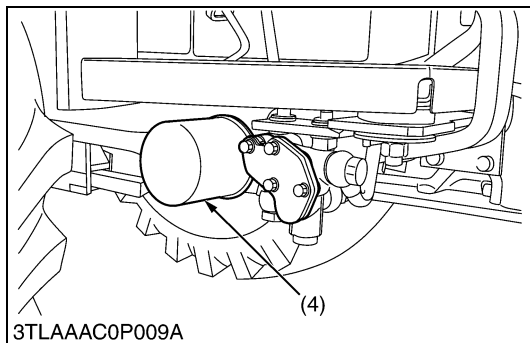
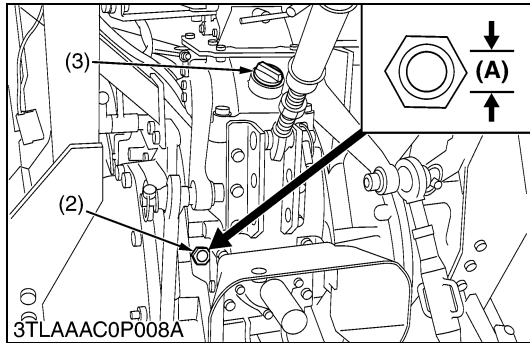
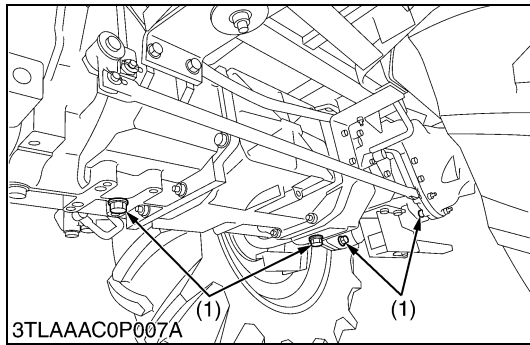
- Use only multi-grade transmission fluid. Use of other fluids may damage the transmission or hydraulic system.
- Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.)
- Never work the tractor immediately after changing the transmission fluid. Keeping the engine at medium speed for a few minutes to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

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.qts
--------------------	----------	-------------------------------------

- (1) Drain Plug  
(2) Gauge  
(3) Filling Plug

A : Oil level is acceptable within this range.

W1026893



### Replacing Hydraulic Oil Filter

#### ⚠ CAUTION

- Be sure to stop the engine before changing the oil filter.
- Allow engine to cool down sufficiently, oil can be hot and can burn.

1. Place an oil pan under the tractor.
2. Remove the drain plugs (1) at the bottom of the transmission case.
3. Drain the transmission fluid.
4. After draining, screw in the drain plugs.
5. Remove the oil filter cartridge (4) by using a filter wrench.
6. Make sure the mounting surface is clean.  
Put a film of clean transmission fluid on the rubber seal of the new filter.
7. Install the new filter cartridge.
8. Quickly tighten the filter until it contacts the mounting surface, then tighten it by hand an additional 1/2 turn only.
9. After the new filters have been replaced, fill oil up to the upper line on the gauge (2).
10. After running the engine for a few minutes, stop it and recheck the oil level, add oil to the prescribed level.
11. Make sure that the transmission fluid doesn't leak through the seal of the filter.

#### ■ IMPORTANT

- To prevent serious damage to the hydraulic system. Use only a genuine KUBOTA filter or its equivalents.

- (1) Drain Plug  
(2) Gauge  
(3) Filling Plug  
(4) Hydraulic Oil Filter

A : Oil level is acceptable within this range.

W1058427

### Changing Front Axle Case Oil [4WD]

1. Place the oil pans underneath the front axle case.
2. Remove the drain plug (1) both sides and filling port plug (3) to drain the oil.
3. After draining, reinstall the drain plug.
4. Remove the oil level check plug (2).
5. Fill with the new oil up to the check plug (2) port.
6. After filling, reinstall the check plug (2) and filling port plug.

#### ■ IMPORTANT

- Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.)

Front axle case oil	Capacity	6.5 L 6.9 U.S.qts 5.7 Imp.qts
---------------------	----------	-------------------------------------

- (1) Drain Plug  
(2) Check Plug

(3) Filling Port Plug

W1059460





### Adjusting Clutch Pedal Free Travel

1. Slightly depress the clutch pedal (5) and measure free travel on top of clutch pedal.
2. If the measurement is not within the factory specifications, loosen the lock nut (2), remove the cotter pin (3) and the clevis pin (4), then adjust the length of rod (1) within acceptable limits.
3. Retighten the lock nut, reinstall the clevis pin, the cotter pin and split the cotter pin.

Clutch pedal free travel on top of clutch pedal	Factory spec.	20 to 30 mm 0.8 to 1.2 in.
---	---------------	-------------------------------

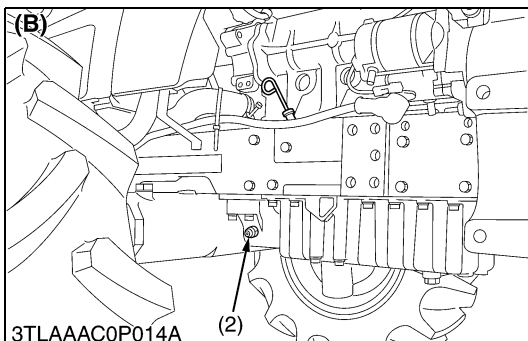
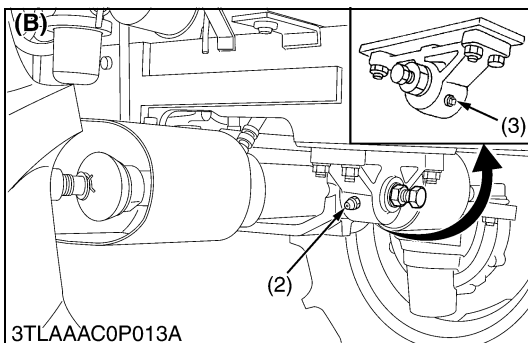
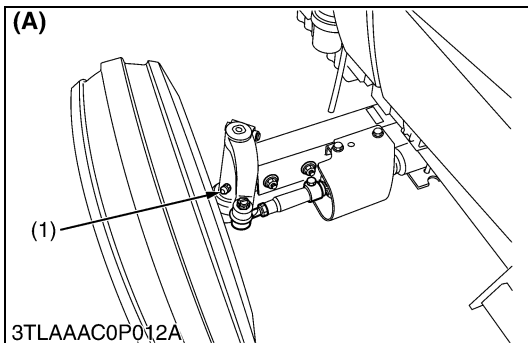
- (1) Clutch Pedal Rod  
(2) Lock Nut  
(3) Cotter Pin

- (4) Clevis Pin  
(5) Clutch Pedal

L : Clutch Pedal Free Travel

W1060392

## [3] CHECK POINTS OF EVERY 50 HOURS



### Greasing

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

#### ■ NOTE

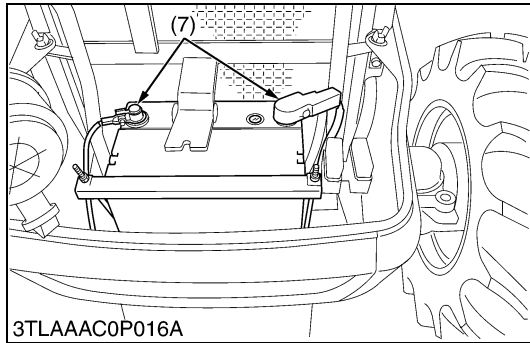
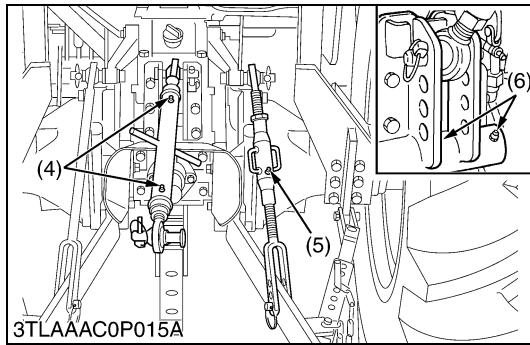
- Apply a small amount of multipurpose grease to the following points every 50 hours.  
If you operated the machine in extremely wet and muddy conditions, lubricate grease fittings more often.
- When applying a grease to the front axle support, remove the breather plug and apply a grease until grease overflows from breather plug. After greasing reinstall the plug.

- (1) Grease Fitting  
(Knuckle Shaft RH, LH)  
(2) Grease Fitting (Front Axle Support)

- (3) Breather Plug

(A) 2WD Type  
(B) 4WD Type

W1031719



### Greasing (Continued)

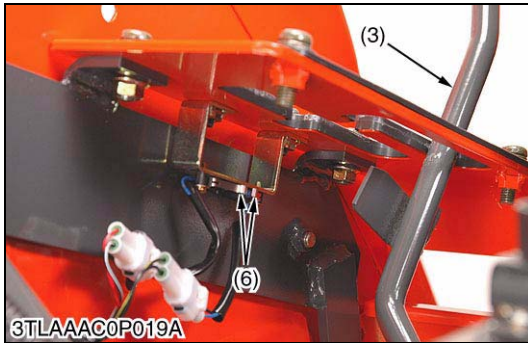
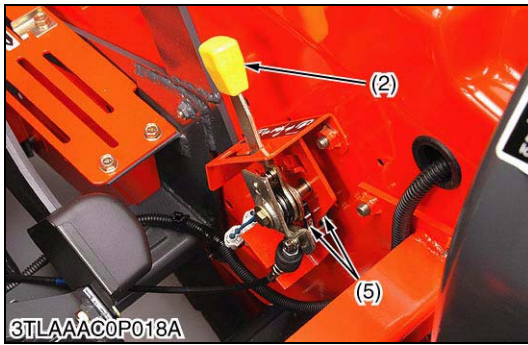
1. Apply a grease to the following position as figures.

#### ■ NOTE

- Apply a small amount of multipurpose grease to the following points every 50 hours.  
If you operated the machine in extremely wet and muddy conditions, lubricate grease fittings more often.

- |                                     |   |
|-------------------------------------|---|
| (4) Grease Fitting (Top Link)       | (6) Grease Fitting (Top Link with Draff Control, if Equipped) |
| (5) Grease Fitting (Lifting Rod RH) | (7) Battery Terminal  |

W1035698



### Checking Engine Start System with POC (Operator Presence Control System)

#### **! CAUTION**

- Do not allow anyone near the tractor while testing.
- If the tractor does not pass the test do not operate the tractor.

#### ■ Preparation before testing

1. Sit on operator's seat.
2. Set the parking brake and stop the engine.
3. Shift the main gear shift lever and the range gear shift lever (Lo-R, H) to "NEUTRAL" position.
4. Shift the PTO lever (PTO clutch control lever) to "OFF" position.

#### ■ Test 1: Switch for the PTO lever

1. Fully depress the clutch pedal.
2. Shift the PTO lever to "ON" position.
3. Turn the key to "START" position.
4. The engine must not crank.
5. If the engine cranks, check or replace the PTO safety switches.

#### ■ Test 2: Switch for the range gear shift lever

1. Fully depress the clutch pedal.
2. Shift the PTO lever to "OFF" position.
3. Shift the range gear shift lever to "Desired" position.
4. Turn the key to "START" position.
5. The engine must not crank.
6. If the engine cranks, check or replace the range gear shift safety switches.

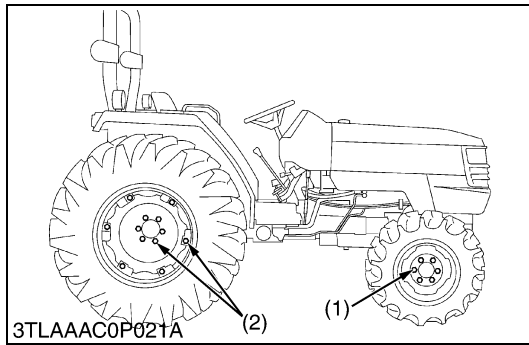
#### ■ Test 3: Switch for the operator's seat

1. Sit operator's seat.
2. Fully depress the clutch pedal.
3. Start the engine.
4. Engage the PTO gear shift lever.
5. Get up from the seat.
6. The engine must shut off after approximately 1 second.
7. If the engine does not shut off, check or replace the operator's seat safety switch

- (1) Clutch Pedal
- (2) PTO Lever
- (3) Range Gear Shift Lever
- (4) Operator's Seat

- (5) PTO Safety Switches
- (6) Range Gear Shift Safety Switches
- (7) Operator's Seat Safety Switches

W1031944



### Checking Wheel Mounting Screws and Nuts Tightening Torque

#### **⚠ CAUTION**

- Never operate tractor with a loose rim, wheel or axle.
  - Any time screws and nuts are loosened, retighten to specified torque.
  - Check all screws and nuts frequently and keep them tight.
1. Check the wheel mounting screws and nuts regularly especially when new. If there are loosened, tighten as follows.

Tightening torque	Front wheel mounting screw and nut or lug nut	137 N·m 14.0 kgf·m 100 ft-lbs
	Rear wheel mounting screw and nut	215 N·m 22.0 kgf·m 160 ft-lbs

(1) Front Wheel Mounting Screw and Nut or Lug Nut

(2) Rear Wheel Mounting Screw and Nut

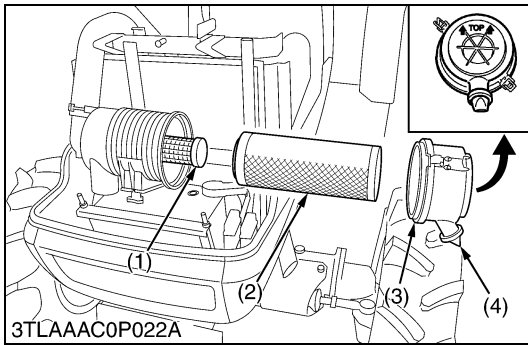
W1033386

## **[4] CHECK POINT OF EVERY 100 HOURS**

### Changing Engine Oil

1. See page G-13

W1033621



### Cleaning Air Cleaner Element

1. Remove the air cleaner cover (3) and primary element (2).
2. Clean the primary element :
  - When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm<sup>2</sup>, 30 psi)
  - When carbon or oil adheres to the element, soak the element in detergent for 15 minutes then wash it several times in water, rinse with clean water and dry it naturally. After element is fully dried, inspect inside of the element with a light and check if it is damaged or not
3. Replace the air cleaner primary element (2) :  
Once a year or after every sixth cleaning, whichever comes first.

#### ■ NOTE

- Check to see if the evacuator valve (3) is blocked with dust.

#### ■ IMPORTANT

- The air cleaner uses a dry element, never apply oil.
- Do not run the engine with filter element removed.
- Be sure to refit the dust cup with the arrow ↑ (on the rear of cover) upright. If the dust cup is improperly fitted, evacuator valve will not function and dust will adhere to the element.

#### ■ Evacuators Valves (4)

Open the evacuator valve once a week under ordinary conditions or daily when used in a dusty place to get rid of large particles of dust and dirt.

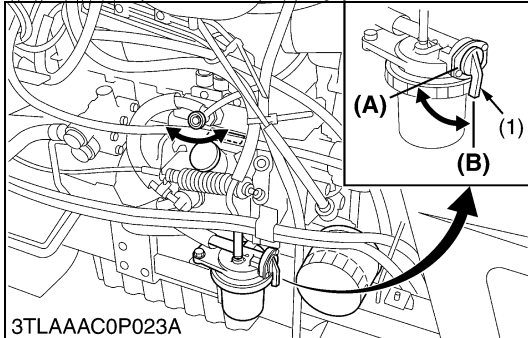
(1) Secondary Element

(2) Primary Valve

(3) Cover

(4) Evacuators Valve

W1033675



### Cleaning Fuel Filter

This job should not be done in the field, but in a clean place.

1. Close the fuel cock (1).
2. Unscrew the screw ring (6), remove the filter bowl (5), and rinse the inside with kerosene.
3. Take out the element and dip it in the kerosene to rinse.
4. After cleaning, reassemble the fuel filter, keeping out dust and dirt.
5. Bleed the fuel system. (See page G-32.)

(1) Fuel Filter Bowl

(2) O-ring

(3) Filter Element

(4) Spring

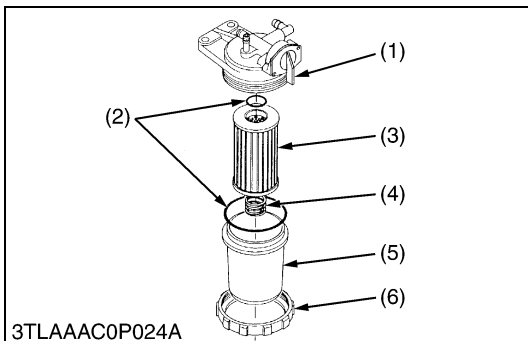
(5) Filter Bowl

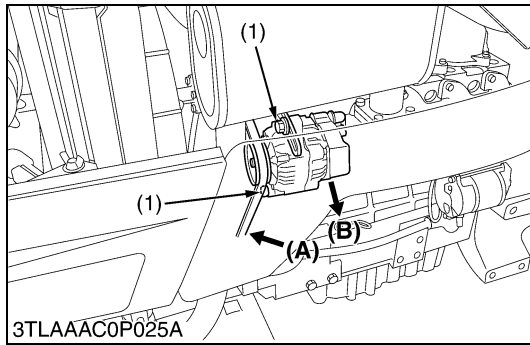
(6) Screw Ring

(A) "CLOSE"

(B) "OPEN"

W1034172





### Adjusting Fan Belt Tension

#### ⚠ CAUTION

- **Be sure to stop the engine before checking fan belt tension.**
1. Stop the engine and remove the key.
  2. Apply moderate thumb pressure to belt between pulleys.
  3. If tension is incorrect, loosen the alternator mounting bolts (2), and using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within the factory specifications.
  4. Replace fan belt if it is damaged.

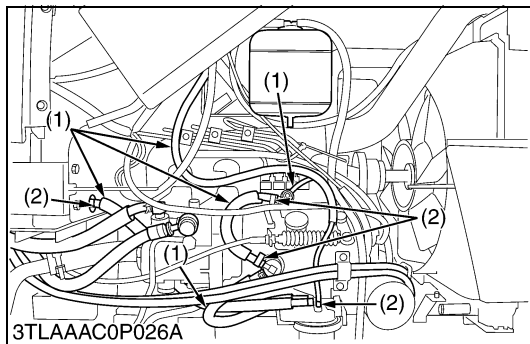
Fan belt tension	Factory spec.	A deflection of between 7 to 9 mm (0.28 to 0.34 in.) when the belt is pressed in the middle of the span
------------------	---------------	---

(1) Bolt

(A) To Check the Fan Belt Tension

(B) To Tighten the Fan Belt

W1034711



### Checking Fuel Line

#### ⚠ CAUTION

- **Stop the engine when checking or replacing the fuel line.**
  - **Remember to check the fuel line periodically. The fuel line is subject to wear and aging, fuel may leak out onto the running engine, causing a fire.**
1. Check to see that all line and hose clamps are tight and not damaged.
  2. If hoses and clamps are found worn or damaged, replace or repair them at once.

#### ■ NOTE

- **If the fuel line is removed, be sure to properly bleed the fuel system.**

Refer to "Bleeding Fuel System". (See page G-32.)

(1) Fuel Line

(2) Clamp Band

W1035367

### Adjusting Clutch Pedal Free Play

1. See page G-16.

W1035519





### Adjusting Brake Pedal Free Travel

#### **⚠ CAUTION**

- **Stop the engine and remove the key, then chock the wheel before checking brake pedals.**
1. Release the parking brake.
  2. Slightly depress the brake pedals and measure free travel (A) at top of pedal stroke.
  3. If the measurement is not within the factory specifications, loosen the lock nut (1) and turn the turnbuckle (2) to adjust it within the factory specifications.

Brake pedal free travel (A)	Factory spec.	15 to 20 mm (0.6 to 0.8 in.) on the pedal
-----------------------------	---------------	---

#### **■ IMPORTANT**

- **Keep the free travel in the right and left brake pedals equal.**

#### **■ NOTE**

- **The difference between the right and left pedal free travels must be less than 5 mm (0.20 in.).**
- **After adjusting brake pedal free travel, be sure to engage the parking brake lock fully and check to see that the brake pedals are securely locked.**

- (1) Lock Nut  
(2) Turnbuckle

A : Free Travel

W1035572



### Checking Battery Condition

#### ⚠ CAUTION

- 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 splashed with it, wash it away completely with water immediately and get medical attention.
- Wear eye protection and rubber gloves when working around battery.

#### ■ NOTE

- The factory-installed battery is of non-refillable type. If the indicator turns white, do not charge the battery but replace it with new one.

- Mishandling the battery shortens the service life and adds to maintenance costs.
- The original battery is maintenance free type battery, but needs some servicing.  
If the battery is weak, the engine is difficult to start and the lights will be dim. It is important to check the battery periodically.
- Check the battery condition by reading the indicator.  
State of indicator display :  
Green : Specific gravity of electrolyte and quality of electrolyte are both in good condition.  
Black : Need to charge the battery.  
White : battery needs to be replaced.  
Check the battery condition by reading the indicator.

State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs to charge the battery.
White	Battery needs to be replaced.

(1) Battery

(2) Indicator

W1035975





### Battery Charging



#### CAUTION

- 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.
- 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.

1. To slowly 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.
2. A boost charge is only for emergencies. It will partially charge 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.
3. The battery is charged if the indicator display turns green from black.
4. When exchanging an old battery into new one, use battery of equal specification shown in table 1.

**Table 1**

Battery Type	Volts (V)	Reserve Capacity (min.)	CCA (SAE)	Normal Charging Rate (A)
80D26R	12	133	582	6.5

CCA : Cold Cranking Ampere

#### ■ Direction for Storage

1. When storing the tractor for long periods of time, remove the battery from tractor, adjust the electrolyte 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) Battery

W1036354

## [5] CHECK POINTS OF EVERY 200 HOURS

### Replacing Engine Oil Filter Cartridge

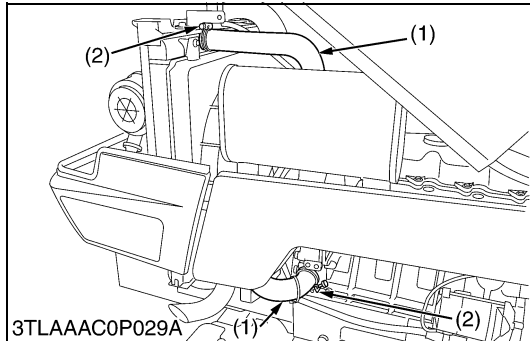
1. See page G-14.

W1037936

### Replacing Hydraulic Oil Filter

1. See page G-15.

W1039694



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

Replace hoses and hose clamps every 2 years or earlier if checked and found that hoses are swollen, hardened or cracked.

### ■ Precaution at Overheating

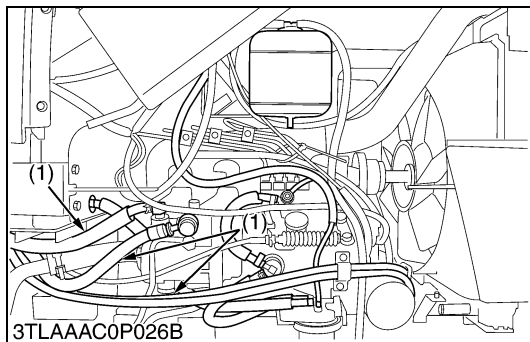
Take the following actions in the event the coolant temperature be nearly or more than the boiling point, this is called "**Overheating**".

1. Stop the machine operation in a safe place and keep the engine unloaded idling.
2. Don't stop the engine suddenly, but stop it after about 5 minutes of unloaded idling.
3. Keep yourself well away from the machine for further 10 minutes or while the steam blown out.
4. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see "**TROUBLESHOOTING**" section, and then start again the engine.

(1) Radiator Hose

(2) Clamp

W1037986

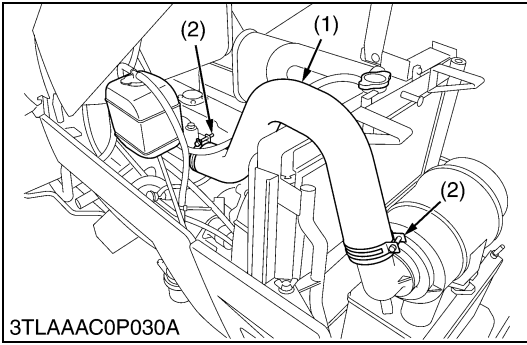


### Checking Power Steering Oil Line

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

(1) Power Steering Pressure Hose

W1038315

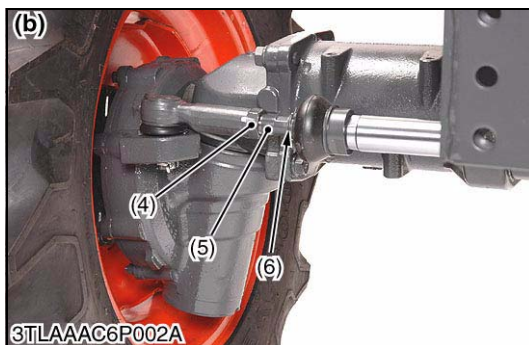
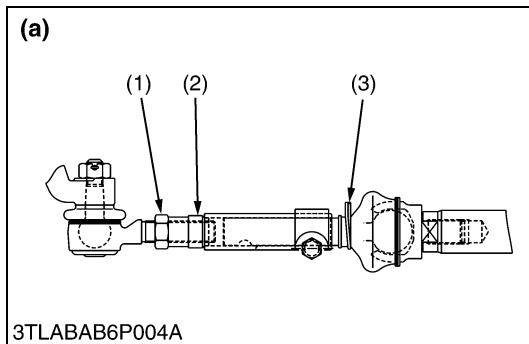
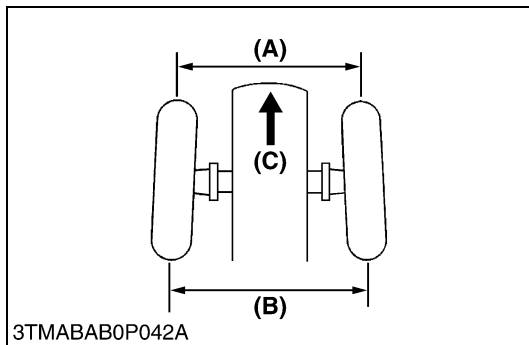
**Checking Intake Air Line**

1. Check to see that hoses 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) Hose

(2) Hose Clamp

W1039904



### Toe-in

1. Park the tractor on the flat place.
2. Inflate the tires to the specified pressure.
3. Turn steering wheel so front wheels are in the straight ahead position.
4. Lower the implement, lock the parking brake and stop the engine.
5. Measure distance between tire beads at front of tire, hub height.
6. Measure distance between tire beads at rear of tire, hub height.
7. Front distance should be 2 to 8 mm (0.079 to 0.315 in.) less than rear distance.
8. If the measurement is not within the factory specifications, adjust by changing the tie-rod length.

Toe-in ((B) - (A))	Factory spec.	2 to 8 mm 0.079 to 0.315 in.
--------------------	---------------	---------------------------------

### ■ Adjusting 2WD

1. Detach the snap ring (3).
2. Loosen the tie-rod lock nut (1).
3. Turn the outer tube (2) to adjust the tie-rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod lock nut (1) and rod mounting screw.
5. Attach the snap ring (3).

### 4WD

1. Detach the snap ring (6).
2. Loosen the tie-rod lock nut (4).
3. Turn the tie-rod joint (5) to adjust the rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod lock nut (2).
5. Attach the snap ring (6).

Tightening torque	Tie-rod lock nut	2WD	83.4 to 88.3 N·m 8.5 to 9.0 Kgf·m 61 to 65 ft-lbs
		4WD	166.7 to 196.1 N·m 17.0 to 20.0 Kgf·m 123 to 145 ft-lbs

### ■ IMPORTANT

- A right and left tie-rod joint is adjusted to the same length.

- (1) Tie-rod Lock Nut
- (2) Outer Tube
- (3) Snap Ring
- (4) Tie-rod Nut
- (5) Tie-rod Joint
- (6) Snap Ring

- (A) Wheel to Wheel Distance at Front
- (B) Wheel to Wheel Distance at Rear
- (C) Front
  - (a) 2WD
  - (b) 4WD

W1038470

## [6] CHECK POINTS OF EVERY 400 HOURS

### Changing Transmission Fluid

1. See page G-14.

W1039932

### Replacing Fuel Filter Element

1. See page G-20.

W1039982

### Changing Front Axle Case Oil [4WD]

1. See page G-15.

W1040876

### Greasing (2WD Front Wheel Hub)

Remove front wheel hub cover (1) and apply bearing grease to front wheel hub (both sides).

- (1) Front Wheel Hub Cover

W1040934



## [7] CHECK POINTS OF EVERY 600 HOURS

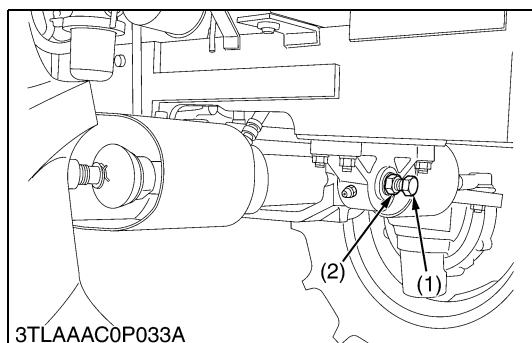
### Adjusting Front Axle Pivot

1. Loosen the lock nut (2), tighten the adjusting screw (1) all the way, and then loosen the adjusting screw (1) by 1/6 turn.
2. Retighten the lock nut (2).

- (1) Adjusting Screw

- (2) Lock Nut

W1040077



## [8] CHECK POINT OF EVERY 800 HOURS

### Checking Valve Clearance

1. See page 1-S13.

W1040181

## [9] CHECK POINT OF EVERY 1500 HOURS

### Checking Fuel Injection Nozzle Injection Pressure

1. See page 1-S19, S20.

W1042225

## [10] CHECK POINT OF EVERY 3000 HOURS

### Checking Injection Pump

1. See page 1-S18.

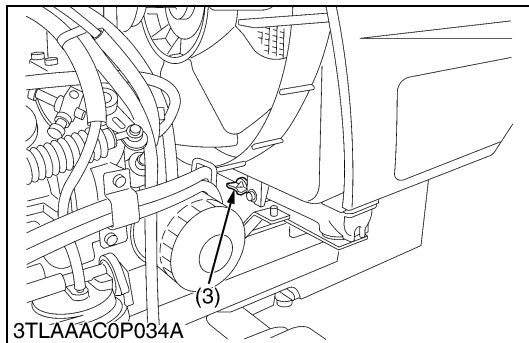
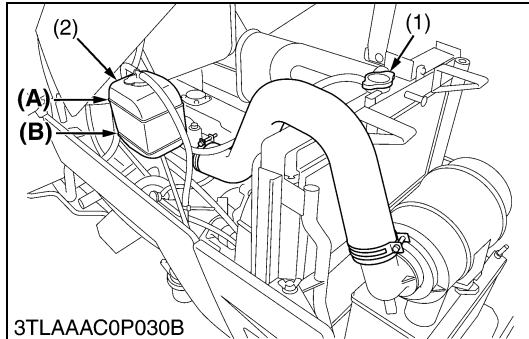
## [11] CHECK POINT OF EVERY 1 YEAR

### Replacing Air Cleaner Element

1. See page G-20.

W1040246

## [12] CHECK POINTS OF EVERY 2 YEARS



### Flush Cooling System and Changing Coolant



#### 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.
1. Stop the engine and let cool down.
  2. To drain the coolant, open the radiator drain plug (2) and remove radiator cap (1). The radiator cap (1) must be removed to completely drain the coolant.
  3. After all coolant is drained, close the drain plug (2).
  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 radiator cap. Install the radiator cap (1) securely.
  7. Fill with coolant up to the "FULL" mark of recovery tank.
  8. Start and operate the engine for a few minutes.
  9. Stop the engine. Check coolant level and add coolant if necessary.

#### ■ IMPORTANT

- Do not start engine without coolant.
- Use clean, fresh water and anti-freeze to fill the radiator. When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.
- Securely tighten radiator cap (1). If the cap is loose or improperly fitted, water may lead out and the engine could overheat.

Coolant Capacity (With recovery tank)	6.5 L
	6.9 U.S.qts
	5.7 Imp.qts

- (1) Radiator Cap
- (2) Recovery Tank
- (3) Drain Cock

A : "FULL"

B : "LOW"

**■ Anti-Freeze****CAUTION**

- When using antifreeze, put on some protection such as rubber gloves (Antifreeze contains poison.).
- If should drink antifreeze, throw up at once and take medical attention.
- When antifreeze comes in contact with the skin or clothing, wash it off immediately.
- Do not mix different types of Antifreeze.  
The mixture can produce chemical reaction causing harmful substances.
- Antifreeze is extremely flammable and explosive under certain conditions. Keep fire and children away from antifreeze.
- 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 antifreeze.

If it freezes, coolant can damage the cylinders and radiator. If the ambient temperature falls below 0 °C (32 °F) or before a long-term storage, let out cooling water 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 cooling water, 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 cooling water 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 antifreeze differs according to the make of the antifreeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.

### ■ IMPORTANT

- When the antifreeze is mixed with water, the antifreeze 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	226

\* At 1.013 x 1000000 Pa (760mmHg) pressure (atmospheric).

A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

#### 5. 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 of the same manufacturer and type in the same mixture percentage.

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

### ■ NOTE

- The above data represent industry standards that necessitate a minimum glycol content in the concentrates anti-freeze.
- When the coolant level drops due to evaporation, add water only. In case of leakage, add anti-freeze and water in the specified mixing ratio.
- Anti-freeze absorbs moisture. Keep unused anti-freeze in a tightly sealed container.
- Do not use radiator cleaning agents when anti-freeze has been added to the coolant. (Anti-freeze contains an anti-corrosive agent, which will react with the radiator cleaning agent forming sludge which will affect the engine parts.)

W1040304



**Replacing Fuel Hose**

1. Replace the fuel hoses and clamps.  
Refer to “**Checking Fuel Line**”. (See page G-21.)

W1041643

**Replacing Radiator Hose (Water Pipes)**

1. Replace the hoses and clamps.  
Refer to “**Checking Radiator Hose and Hose Clamp**”. (See page G-25.)

W1041698

**Replacing Air Hose**

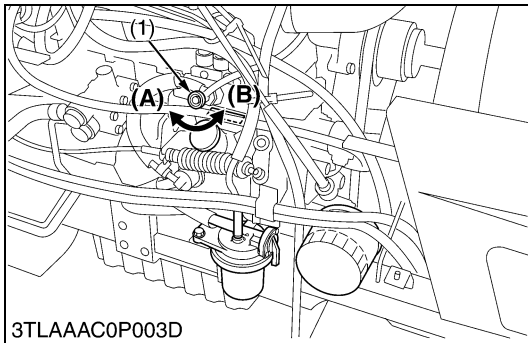
1. Replace the air hose and clamps.  
Refer to “**Checking Intake Air Line**”. (See page G-26.)

W1048307

**Replacing Power Steering Hose**

1. Replace the hoses and clamps. Refer “**Checking Power Steering Line**”

W1041752

**[13] OTHERS****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 tractor has not been used for a long period of time.

**CAUTION**

- **Do not bleed the fuel system when the engine is hot.**

Bleeding procedure is as follows :

1. Fill the fuel tank with fuel.
2. Open the air vent cock (1) on the fuel injection pump.
3. Close the air vent cock (1) after 30 seconds.

**■ IMPORTANT**

- **Always close the air vent cock (1) except for bleeding fuel lines.**

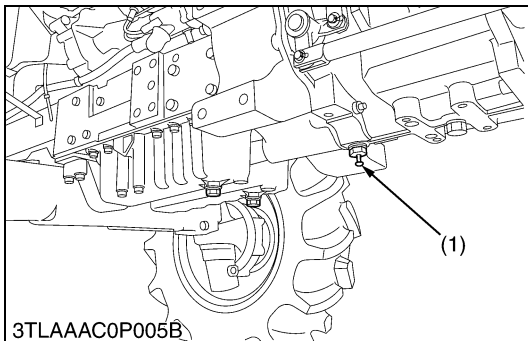
Otherwise, Engine runs irregularly or stalls frequently.

(1) Air Vent Plug

(A) CLOSE

(B) OPEN

W1041811

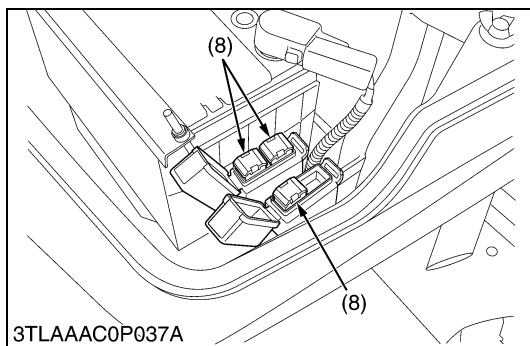
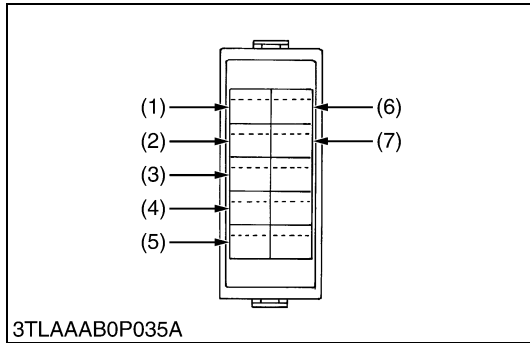
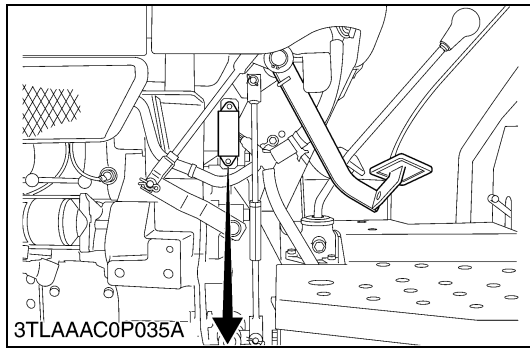
**Draining Clutch Housing Water****■ NOTE**

- **The tractor is equipped with split pin plug (1) under the clutch housing.**
- **After operating in rain, snow or tractor has been washed, water may get into the clutch housing.**

1. Check it by pushing in the split pin (1).
2. If water enters into the clutch housing, remove the plug (1) and drain the water, then reinstall the plug.

(1) Split Pin (Plug)

W1041999



### Replacing Fuse

1. The tractor electrical system is protected from potential damage by fuses.

A blown fuse indicates that there is an overload or short somewhere in the electrical system.

2. If any of the fuses should blow, replace with a new one of the same capacity.

#### ■ IMPORTANT

- Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system. Refer to troubleshooting section of this manual.

If any of them should blow, replace with a new one of the same capacity.

Fuse No.	Capacity (A)	Protected circuit
(1)	15	Hazard
(2)	10	Work light
(3)	10	Panel
(4)	15	Head light
(5)	5	Key stop
(6)	5	Glow lamp
(7)	5	Starter relay
(8)	Slow blow fuse	Check circuit against wrong battery connection.

W1039315

### Replacing Light Bulb

1. Head lights and rear combination lights :

Take the bulb out of the light body and replace with a new one.

2. Other lights :

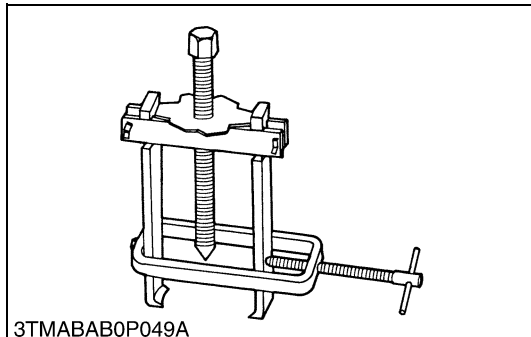
Detach the lens and replace the bulb.

Light	Capacity
Head lights	25 W / 25 W
Tail light	8 W
Turn signal / Hazard light (rear)	23 W
Turn signal / Hazard light (front)	27 W
Instrument panel light	1.7 W

W1039659

## 8. SPECIAL TOOLS

### [1] SPECIAL TOOLS FOR ENGINE

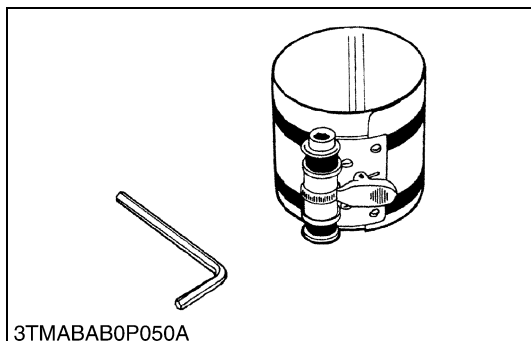


#### Special Use Puller Set

Code No : 07916-09032

Application : Use exclusively for pulling out bearing, gears and other parts with ease.

W10240500

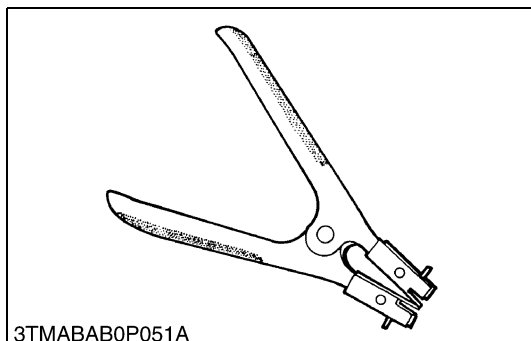


#### Piston Ring Compressor

Code No : 07909-32111

Application : Use exclusively for pushing in the piston with piston rings into the cylinder.

W10241000

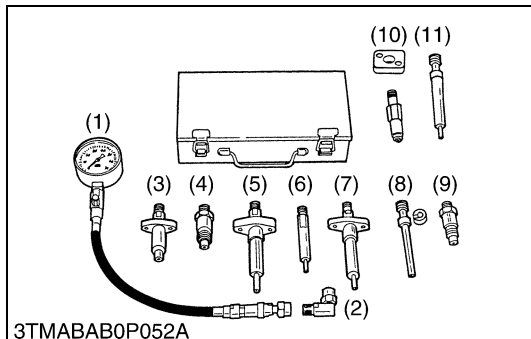


#### Piston Ring Tool

Code No : 07909-32121

Application : Use exclusively for removing or installing the piston ring with ease.

W10241500



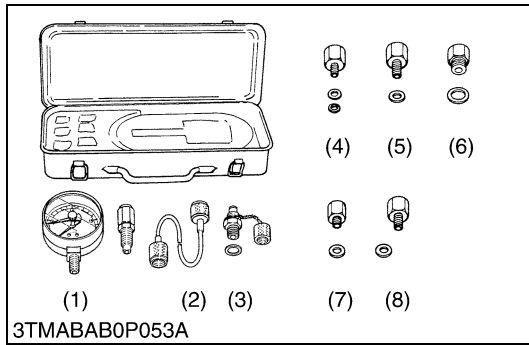
#### Diesel Engine Compression Tester

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 <b>F</b>  |
| (2) L Joint          | (8) Adaptor <b>G</b>  |
| (3) Adaptor <b>A</b> | (9) Adaptor <b>H</b>  |
| (4) Adaptor <b>B</b> | (10) Adaptor <b>I</b> |
| (5) Adaptor <b>C</b> | (11) Adaptor <b>J</b> |
| (6) Adaptor <b>E</b> |                       |

W10242000

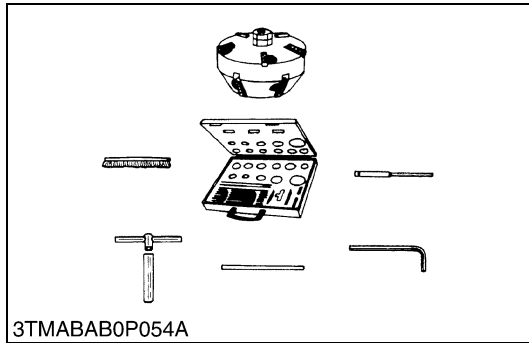
**Oil Pressure Tester**

Code No : 07916-32032

Application : Use to measure lubricating oil pressure.

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

W10243180

**Valve Seat Cutter**

Code No : Use to reseal valves.

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.)

W10244580

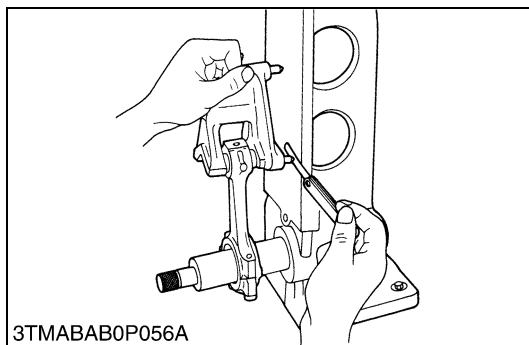
**Radiator Tester**

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

0000000815E0

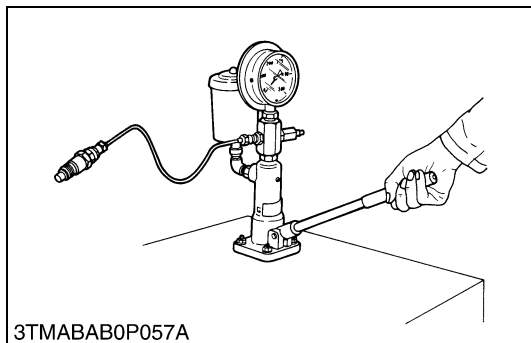
**Connecting Rod Alignment Tool**

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.)

W10245830

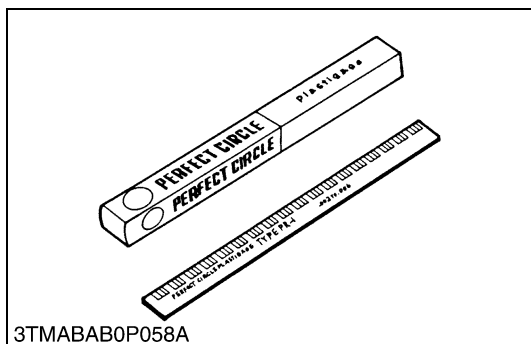
**Nozzle Tester**

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/cm<sup>2</sup>, 0 to 7000 psi)

W10246530

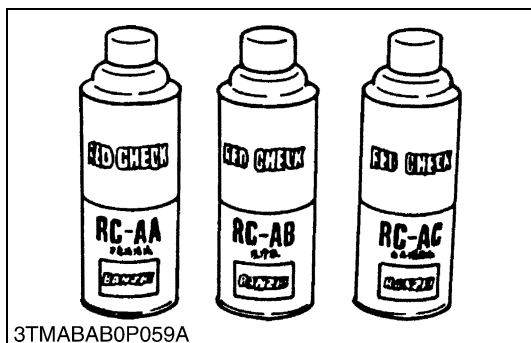
**Plastigage**

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.)

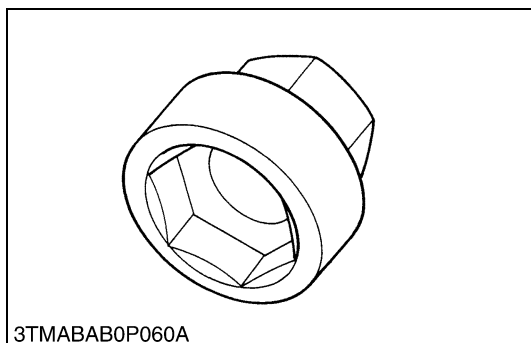
W10247190

**Red Check**

Code No : 07909-31371

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

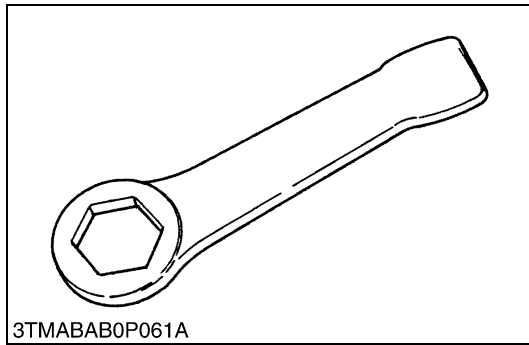
W10249090

**Crankshaft Nut Socket 46**

Code No : 07916-30821

Application : Use exclusively for removing or installing the crankshaft nut.

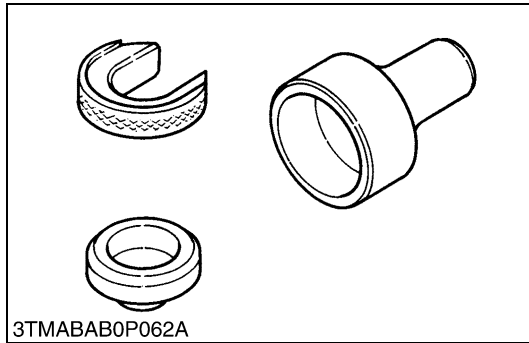
W1047906

**Socket Wrench 46**

Code No : 07916-30901

Application : Use exclusively for removing or installing the crankshaft nut.

W1048209

**Auxiliary Socket for Fixing Crankshaft Sleeve**

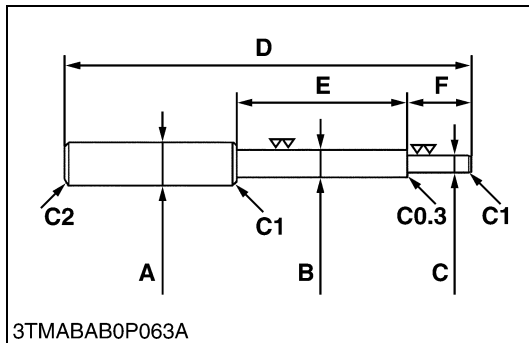
Code No : 07916-32091

Application : Use to fix the crankshaft sleeve of the diesel engine.

W1048398

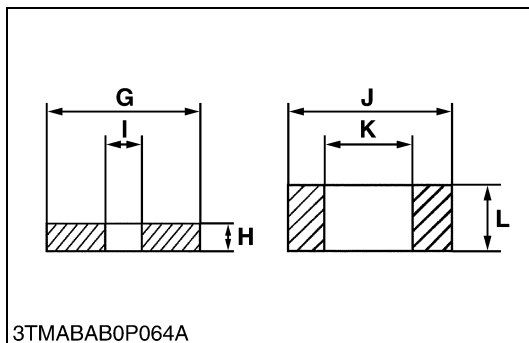
**NOTE**

- The following special tools are not provided, so make them referring to the figure.

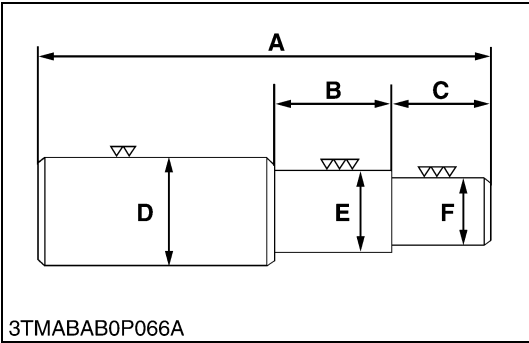
**Valve Guide Replacing Tool**

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

<b>A</b>	20 mm dia. (0.79 in. dia.)
<b>B</b>	11.7 to 11.9 mm dia. (0.460 to 0.468 in. dia.)
<b>C</b>	6.5 to 6.6 mm dia. (0.256 to 0.259 in. dia.)
<b>D</b>	225 mm (8.86 in.)
<b>E</b>	70 mm (2.76 in.)
<b>F</b>	45 mm (1.77 in.)
<b>G</b>	25 mm (0.98 in.)
<b>H</b>	5 mm (0.197 in.)
<b>I</b>	6.7 to 7.0 mm dia. (0.263 to 0.275 in. dia.)
<b>J</b>	20 mm dia. (0.787 in. dia.)
<b>K</b>	12.5 to 12.8 mm dia. (0.492 to 0.504 in. dia.)
<b>L</b>	8.9 to 9.1 mm (0.350 to 0.358 in.)
<b>C1</b>	Chamfer 1.0 mm (0.039 in.)
<b>C2</b>	Chamfer 2.0 mm (0.079 in.)
<b>C0.3</b>	Chamfer 0.3 mm (0.012 in.)



W10250170



**Bushing Replacing Tools**

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

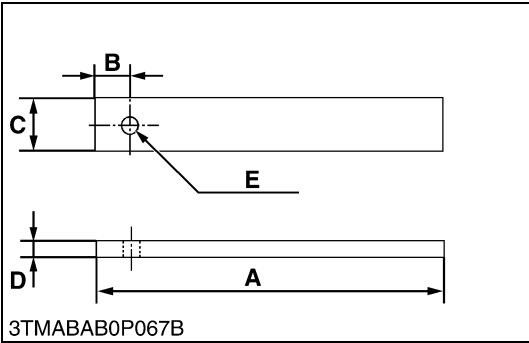
(1) For small end bushing

A	162 mm (6.38 in.)
B	35 mm (1.38 in.)
C	27 mm (1.06 in.)
D	35 mm dia. (1.38 in. dia.)
E	27.90 to 27.95 mm dia. (1.098 to 1.100 in. dia.)
F	25.00 to 25.01 mm dia. (0.984 to 0.985 in. dia.)

(2) For idle gear bushing

A	175 mm (6.89 in.)
B	40 mm (1.57 in.)
C	38 mm (1.49 in.)
D	45 mm dia. (1.77 in. dia.)
E	41.90 to 41.95 mm dia. (1.650 to 1.652 in. dia.)
F	37.95 to 37.97 mm dia. (1.494 to 1.495 in. dia.)

W10255000

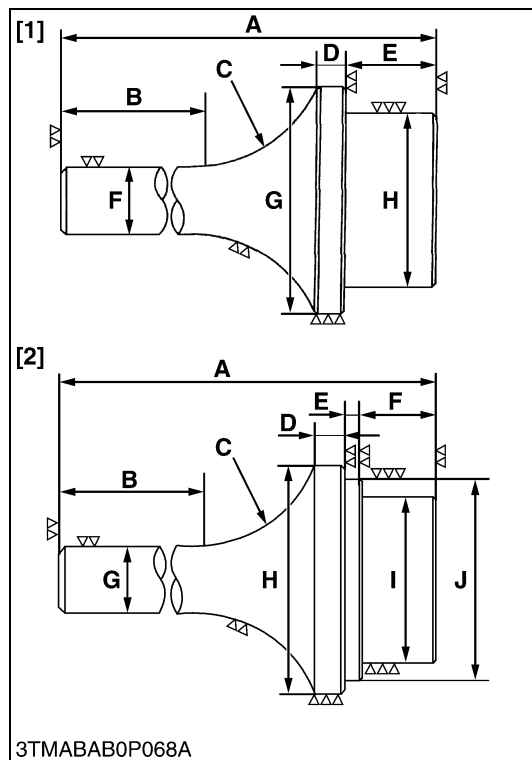


**Flywheel Stopper**

Application : Use to loosen and tighten the flywheel screw.

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

W10259480



### Crankshaft Bearing 1 Replacing Tool

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

#### 1. Extracting tool

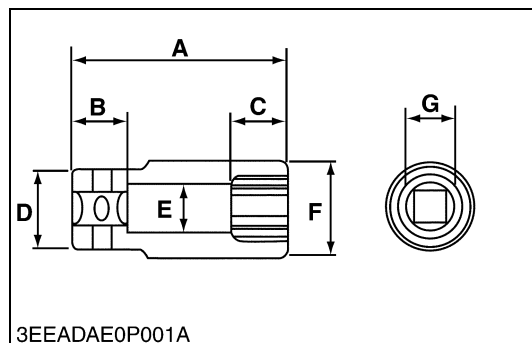
A	135 mm (5.31 in.)
B	72 mm (2.83 in.)
C	R40 mm (R1.57 in.)
D	10 mm (0.39 in.)
E	20 mm (0.79 in.)
F	20 mm dia. (0.79 in. dia.)
G	56.8 to 56.9 mm dia. (2.236 to 2.240 in. dia.)
H	59.8 to 59.9 mm dia. (2.354 to 2.358 in. dia.)

#### 2. Inserting tool

A	130 mm (5.12 in.)
B	72 mm (2.83 in.)
C	R40 mm (R1.57 in.)
D	9 mm (0.35 in.)
E	4 mm (0.16 in.)
F	20 mm (0.79 in.)
G	20 mm dia. (0.79 in. dia.)
H	68 mm dia. (2.68 in. dia.)
I	59.8 to 59.9 mm dia. (2.354 to 2.358 in. dia.)
J	64.8 to 64.9 mm dia. (2.551 to 2.555 in. dia.)

W10261390

### Socket Wrench for Crank Pulley Nut (46 mm Deep Socket Wrench)

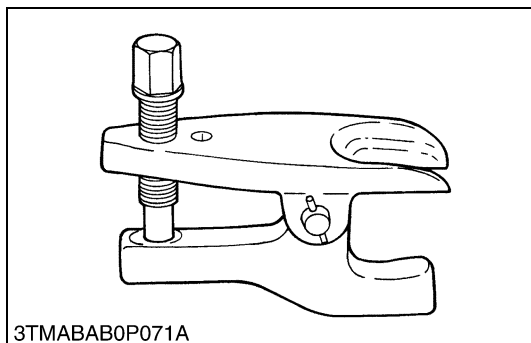


A	100 mm (3.94 in.)
B	25 mm (0.98 in.)
C	27.0 mm (1.06 in.)
D	45.0 mm dia. (1.77 in. dia.)
E	35.0 mm dia. (1.38 in. dia.)
F	62.5 mm dia. (2.46 in. dia.)
G	46.0 mm (1.81 in.)

W10490770



## [2] SPECIAL TOOLS FOR TRACTOR

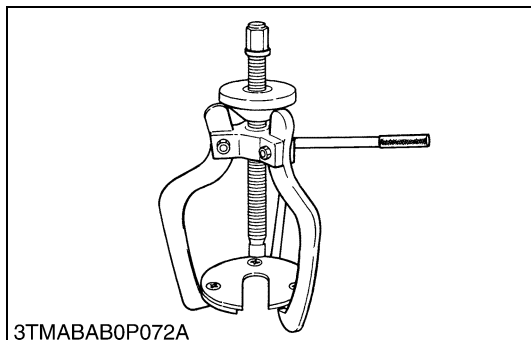


### Tie-rod End Lifter

Code No : 07909-39051

Application : Use for removing the tie-rod end with ease.

W10264720

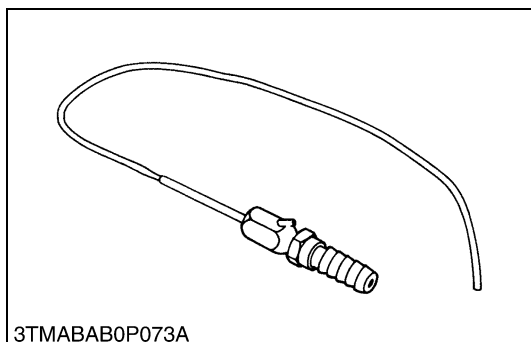


### Steering Wheel Puller

Code No : 07916-51090

Application : Use for removing the steering wheel without damaging the steering shaft.

W10265330

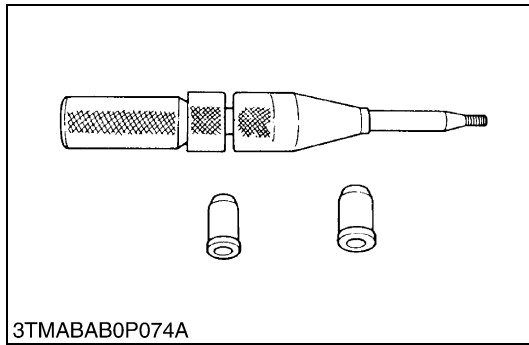


### Injector CH3

Code No : 07916-52501

Application : Use for injecting calcium chloride solution into, and removing it from, rear and 4WD type front wheel tires.

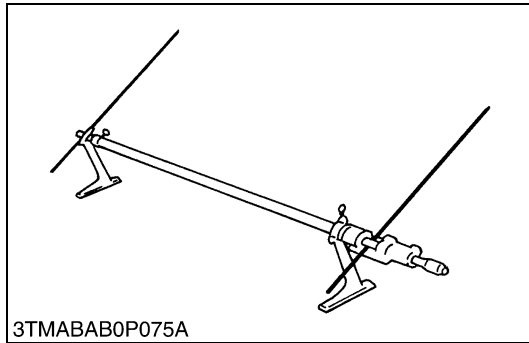
W10265850



### **Clutch Center Tool (For B and L Series Tractors)**

Application : The clutch center tool can be used for all **B** and **L** series tractors with a diaphragm clutch by changing tip guides. Center piece diameter is 20 mm (0.79 in.).

W10266370

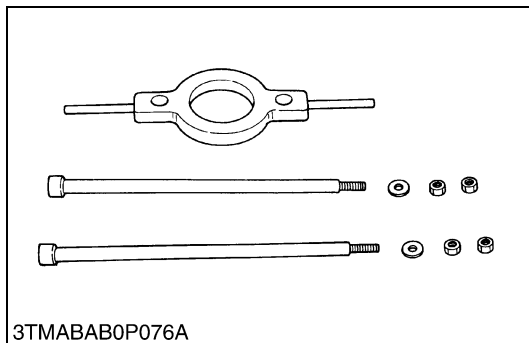


### **Toe-in Gauge**

Code No : 07909-31681

Application : This allows easy measurement of toe-in for all machine models.

W10266890

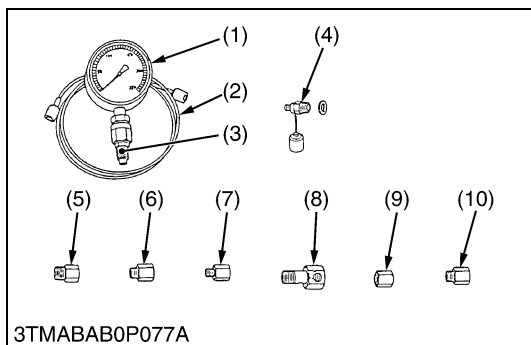


### **Rear Axle Cover Puller**

Code No : 07916-51041

Application : Use for removing a rear axle cover from rear axle.

W10769940



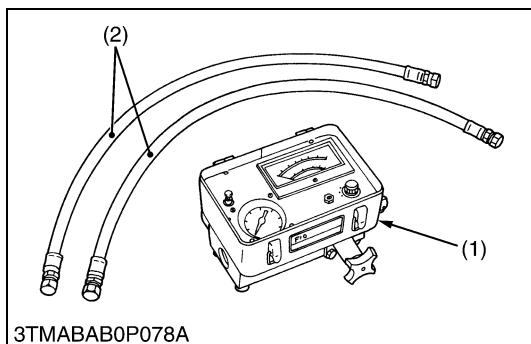
### Relief Valve Pressure Tester

Code No : 07916-50045

Application : This allows easy measurement of relief set pressure.

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

W10267410



### Flow Meter

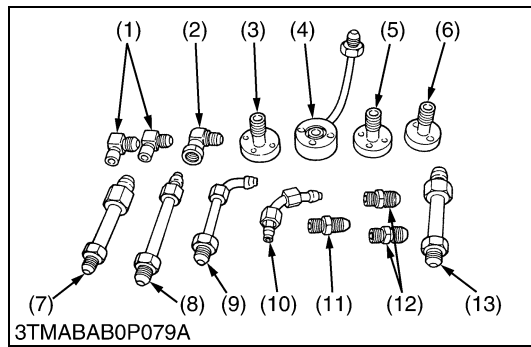
Code No : 07916-52791 (Flow Meter)

07916-52651 (Hydraulic Test Hose)

Application : This allows easy testing of hydraulic system.

- |                |                         |
|----------------|-------------------------|
| (1) Flow Meter | (2) Hydraulic Test Hose |
|----------------|-------------------------|

W10313180



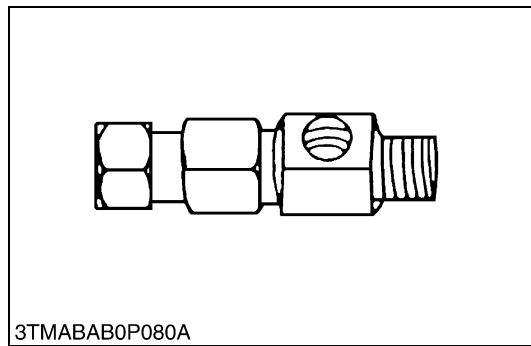
### Adaptor Set for Flow Meter

Code No : 07916-54031

Application : Use for testing the hydraulic system.

- |                       |                                 |
|-----------------------|---------------------------------|
| (1) Adaptor <b>52</b> | (8) Adaptor <b>65</b>           |
| (2) Adaptor <b>53</b> | (9) Adaptor <b>66</b>           |
| (3) Adaptor <b>54</b> | (10) Adaptor <b>67</b>          |
| (4) Adaptor <b>61</b> | (11) Adaptor <b>68</b>          |
| (5) Adaptor <b>62</b> | (12) Adaptor <b>69</b>          |
| (6) Adaptor <b>63</b> | (13) Hydraulic Adaptor <b>1</b> |
| (7) Adaptor <b>64</b> |                                 |

W10313960



### Power Steering Adapter

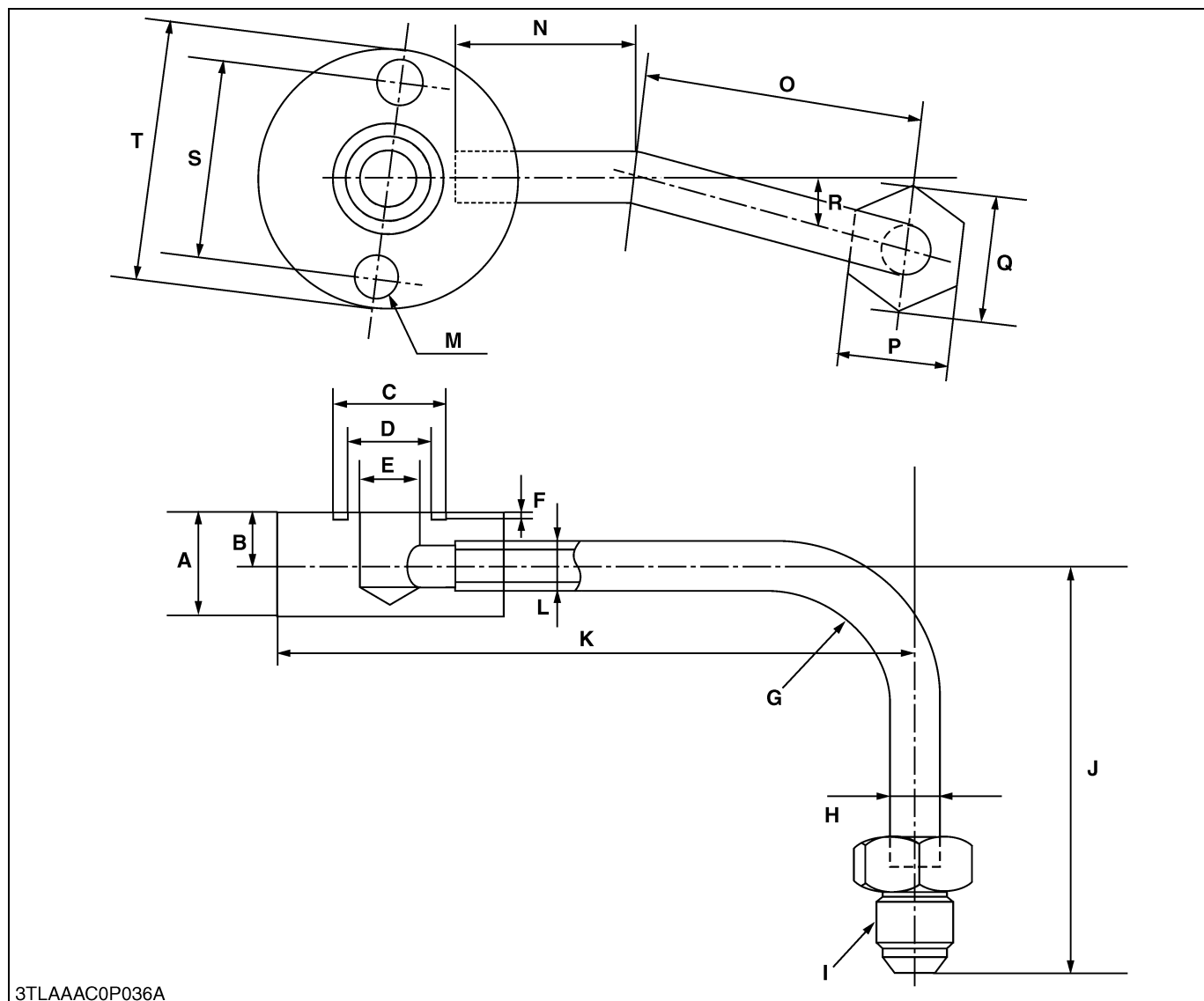
Code No : 07916-54021

Application : Use for measuring the relief valve setting pressure for power steering.

W10442870

**Pump Adaptor**

Application : Use for checking the main hydraulic pump.



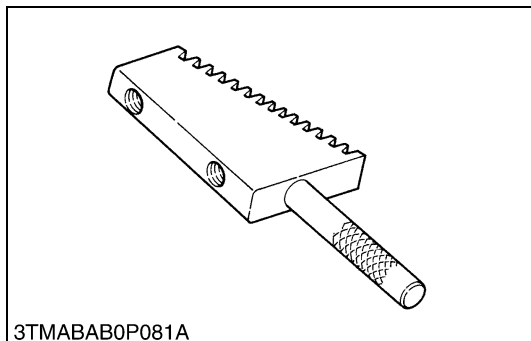
■ **NOTE**

- When using, attach with following parts.  
O-ring : 04811-00180
- This adaptor is modified from Adaptor 61 of flowmeter adaptor set. (See page G-43).

<b>A</b>	22 mm (0.872 in.)	<b>H</b>	10 mm dia. (0.39 in. dia.)	<b>O</b>	61.5 mm (2.42 in.)
<b>B</b>	11 mm (0.437 in.)	<b>I</b>	G 3/8	<b>P</b>	24 mm (0.94 in.)
<b>C</b>	24 mm dia. (0.94 in. dia.)	<b>J</b>	89 mm (3.50 in.)	<b>Q</b>	27.7 mm (1.09 in.)
<b>D</b>	18 mm dia. (0.71 in. dia.)	<b>K</b>	135 mm (5.31 in.)	<b>R</b>	0.244 rad (14°)
<b>E</b>	12 mm dia. (0.47 in. dia.)	<b>L</b>	7 mm (0.28 in. dia.)	<b>S</b>	40 mm (1.57 in.)
<b>F</b>	1.7 to 1.9 mm (0.067 to 0.075 in.)	<b>M</b>	8.5 mm dia. (0.33 in. dia.)	<b>T</b>	60 mm dia. (2.36 in. dia.)
<b>G</b>	30 mm Round (1.18 in. Round)	<b>N</b>	37 mm (1.46 in.)		

**(Reference)**

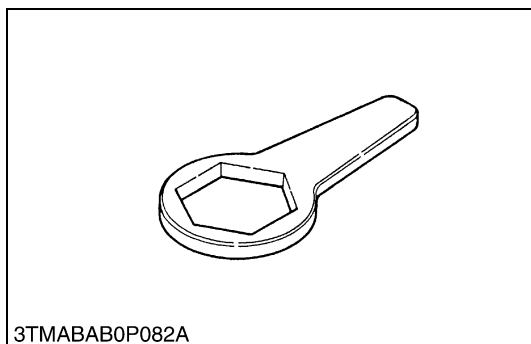
- Compared with adaptor 61, the followings are different.
  - 1) Dimensions S, T and number of holes M.
  - 2) Direction of pipe I.

**Pinion Locking Tool**

Code No : 07916-52311

Application : Use for preventing the shaft from turning when removing or tighten a bevel pinion shaft staking nut.

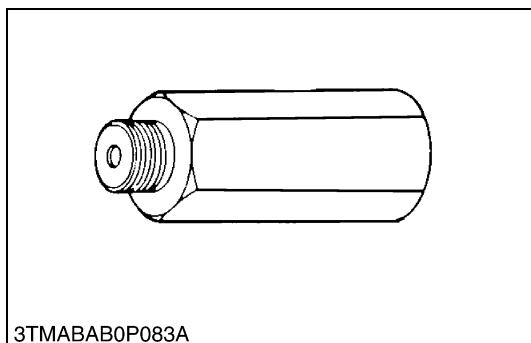
W10445520

**Rear Axle Nut Wrench 71**

Code No : 07916-52531

Application : Use for removing and installing a rear axle nut.

W10791100

**Relief Valve Setting Pressure Adaptor G**

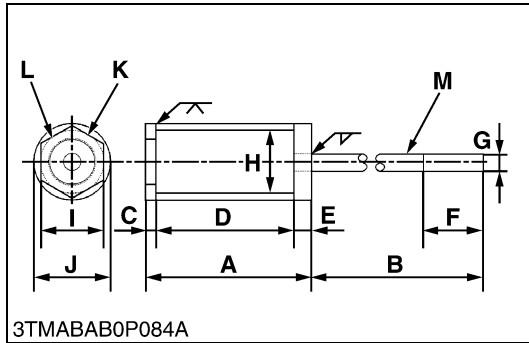
Code No : 07916-52751

Application : This offers easy measurement of relief valve setting pressure from the hydraulic coupler. This is available with the relief valve setting pressure tester.

W10623960

# ■ NOTE

- The following special tools are not provided, so make them referring to the figure.

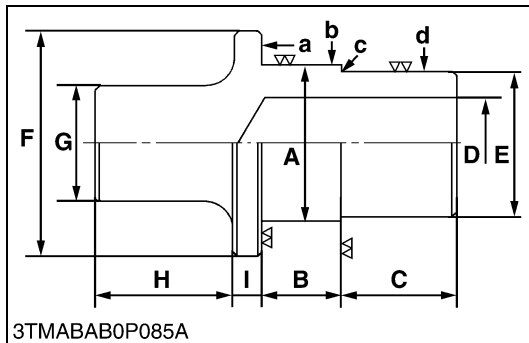


## **Pinion Shaft Remover**

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

A	106 mm (4.17 in.)
B	350 mm (13.78 in.)
C	6 mm (0.24 in.)
D	90 mm (3.54 in.)
E	10 mm (0.39 in.)
F	40 mm (1.57 in.)
G	10 mm (0.39 in.)
H	35.6 mm (1.40 in.)
I	36 mm (1.42 in.)
J	41.6 mm (1.64 in.)
K	Part code No. 3A201-4130 nut
L	M27 × 1.5
M	M10 × 1.25

W10315930



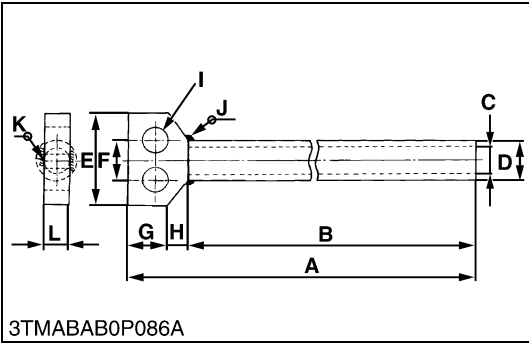
## **Hydraulic Arm Shaft Bushing Press-Fitting Tool**

Application : Use for replacing the hydraulic arm shaft bushings in the hydraulic cylinder body.

	Right	Left
A	54.7 to 54.9 mm (2.1535 to 5.1614 in.)	49.7 to 49.9 mm (1.9567 to 1.9646 in.)
B	24.5 to 25.5 mm (0.9646 to 1.0039 in.)	21.5 to 22.5 mm (0.8465 to 0.8858 in.)
C	40 mm (1.57 in.)	40 mm (1.57 in.)
D	32 mm (1.26 in.)	30 mm (1.18 in.)
E	49.7 to 49.9 mm (1.9567 to 1.9646 in.)	44.7 to 44.9mm (1.7598 to 1.7677 in.)
F	70 mm dia. (2.76 in. dia.)	
G	40 mm dia. (1.57 in. dia.)	
H	50 mm (1.97 in.)	
I	10 mm (0.39 in.)	
a	6.3 μm (250 μin.)	
b	6.3 μm (250 μin.)	
c	6.3 μm (250 μin.)	
d	6.3 μm (250 μin.)	

W10316550





**Draft Control Test Bar**

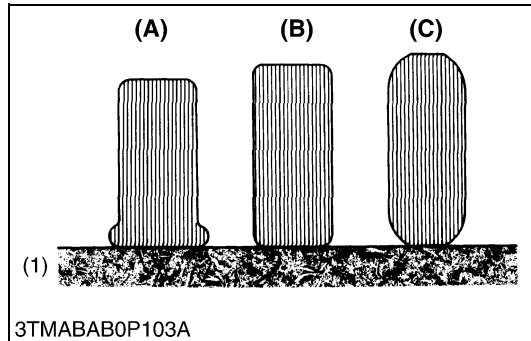
Application : Use for checking the lift range and floating range of hydraulic draft control.

A	1045 mm (41.14 in.)
B	1000 mm (29.37 in.)
C	20 mm dia. (0.79 in. dia.)
D	30 mm dia. (1.18 in. dia.)
E	90 mm (3.54 in.)
F	30 mm (1.18 in.)
G	30 mm (1.18 in.)
H	15 mm (0.59 in.)
I	20 mm dia. (0.79 in.dia.)
J	Weld all around
K	Weld all around
L	20 mm (0.79 in.)

W10715440

## 9. TIRES

### [1] TIRE PRESSURE



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. To inflate the wheel tires, use an air compressor or hand pump.

- **Recommended inflation pressure**

Maintain the pressure shown below.

	Tire sizes	Inflation Pressure
Rear	14.9-24, 6PR	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
	44 x 18-20, 4PR	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
	17.5L-24, 6PR	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
Front	6.00-16, 4PR	220 kPa (2.2 kgf/cm <sup>2</sup> , 32 psi)
	8.3-16, 6PR	150 kPa (1.5 kgf/cm <sup>2</sup> , 22 psi)
	27 x 8.50-15, 4PR	80 kPa (0.8 kgf/cm <sup>2</sup> , 11 psi)
	29 X 12.50-15, 4PR	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
	10-16.5, 6PR	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
	7.5L-15, 6PR	220 kPa (2.2 kgf/cm <sup>2</sup> , 32 psi)
	27-10.50LL15, 4PR	80 kPa (0.8 kgf/cm <sup>2</sup> , 11 psi)



#### CAUTION

- Do not attempt to mount a tire. This should be done by a qualified person with the proper equipment. Qualified person with the proper tire mounting equipment should recognize the following warning.



#### WARNING

- Never exceed 241 kPa (2.5 kgf/cm<sup>2</sup>, 35 psi) when attempting to seat a bead. If beads have not been seated by the time the pressure reached 241 kPa (2.5 kgf/cm<sup>2</sup>, 35 psi), deflate the assembly, reposition the tire on the rim, relubricate and reinflate. After seating the bead, adjust inflation pressure as recommended in the inflation pressure chart.

(1) Ground

(A) Insufficient  
(B) Standard  
(C) Excessive

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## [2] TREADS ADJUSTMENT



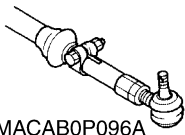
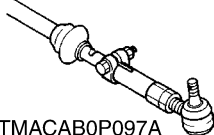
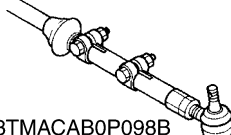
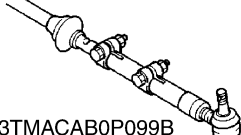
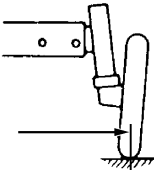
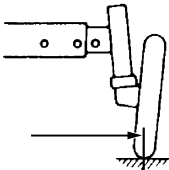
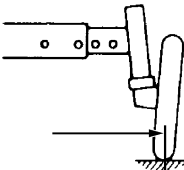
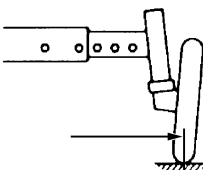
### CAUTION

- When working on slopes or working with trailer, set the wheel tread as wide as practice for the job for maximum stability.
- Support tractor securely on stands before removing a wheel.
- Do not work under any hydraulically supported devices. They can settle, suddenly leak down, or be accidentally lowered. If necessary to work under tractor or any machine elements for servicing or adjustment, securely support them with stands or suitable blocking beforehand.
- Never operate tractor with a loose rim, wheel, or axle.

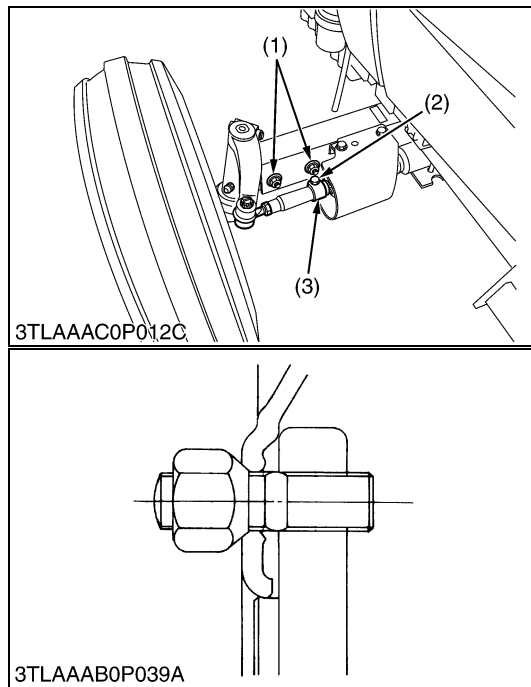
### (1) Front Wheels

#### Front Wheels (2WD)

Front tread can be adjusted in 4 steps.

Models		 3TMACAB0P096A	 3TMACAB0P097A	 3TMACAB0P098B	 3TMACAB0P099B
		 3TMABAB0P091A	 3TMABAB0P092A	 3TMABAB0P093A	 3TMABAB0P094A
Farm	6.00-16	1210 mm (47.6 in.)	1310 mm (51.6 in.)	1410 mm (55.5 in.)	1510 mm (59.4 in.)
	7.5L-15	1280 mm (50.4 in.)	1380 mm (54.3 in.)	1480 mm (58.3 in.)	1580 mm (62.2 in.)
Turf	20 x 8.5-15	1235 mm (48.6 in.)	1335 mm (52.6 in.)	1435 mm (56.5 in.)	1535 mm (60.4 in.)

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To adjust the tread.

1. Lift the front of the tractor with a jack.
2. Remove the front axle mounting bolts (1) and the tie-rod mounting bolts (2).
3. Move the front axles (right and left) to the desired position, and tighten the bolts.

Front axle mounting bolt	Factory spec.	124 to 147 N·m 12.6 to 15.0 Kg·m 91.5 to 108.4 ft-lbs
Tie-rod mounting bolt		61 to 71 N·m 6.2 to 7.2 Kg·m 44.8 to 52.1 ft-lbs

#### ■ IMPORTANT

- After adjusting the tread, adjust toe-in.  
Toe-in: 2 to 8 mm (0.08 to 0.31 in.)
- The front width for the front loader application on 2WD model should not be greater than 1280 mm (50.4 in.).

#### ■ NOTE

- Wheels with beveled or tapered holes: Use the tapered side of lug nut.

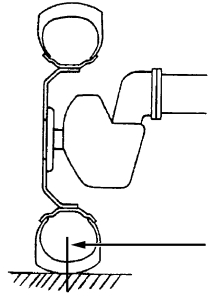
- (1) Front Axle Mounting Bolt  
(2) Tie-rod Mounting Bolt

- (3) Tie-rod Clamp

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**Front Wheels (4WD)**

Front tread can not be adjusted.

 <p>3TMABAB0P095A</p>	Tire	8.3-16 Farm	27 x 8.50-15 Turf	27 x 10.50LL15 Turf	10-16.5 IND
	Tread	1155 mm (45.5 in.)	1200 mm (47.2 in.)	1180 mm (46.5 in.)	1195 mm (47.0 in.)

■ **NOTE**

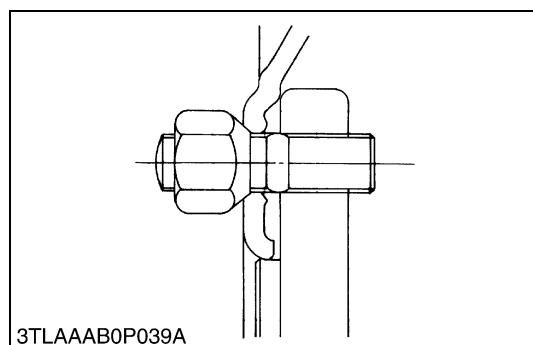
- IND : for Industrial

■ **IMPORTANT**

- Do not turn front discs to obtain wider tread.

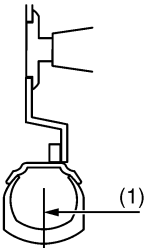
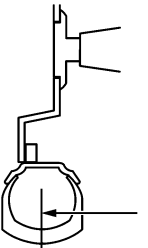
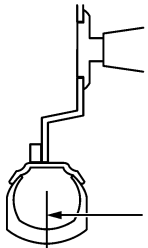
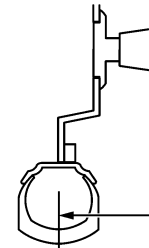
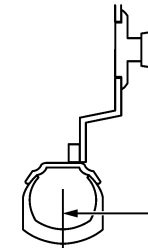
■ **NOTE**

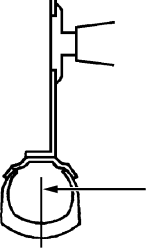
- Wheels with beveled or tapered holes: Use the tapered side of lug nut.



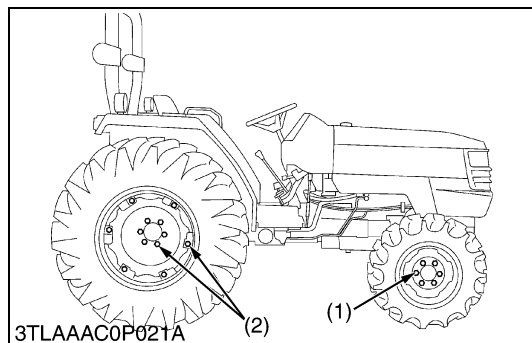
## (2) Rear Wheels

Rear tread can be adjusted in 6 steps depending on the model.

Models					
3TLAAAC0P039A	3TLAAAC0P040A	3TLAAAC0P041A	3TLAAAC0P042A	3TLAAAC0P043A	
14.9-24 Farm	1180 mm (46.5 in.)	1200 mm (47.2 in.)	1300 mm (51.2 in.)	1450 mm (57.1 in.)	1545 mm (60.8 in.)
17.5L-24 IND	—	1250 mm (49.2 in.)	1360 mm (53.5 in.)	1390 mm (54.7 in.)	1500 mm (59.1 in.)

Models	
3TMABAB0P101A	
44 x 18-20 Turf	1430 mm (56.3 in.)

### (1) Tread



To adjust the tread

1. Lift the rear tires off the ground.
2. Remove the wheel rim and / or disk mounting bolts.
3. Change the position of the rim and / or disk (right and left) to the desired position, and tighten the bolts.

#### ■ IMPORTANT

- If not attached as illustrated, transmission parts may be damaged.
- When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter according to service interval.

Tightening torque	Front wheel mounting screw and nut or lug nut	137 N·m 14.0 Kgf·m 100 ft·lbs
	Rear wheel mounting screw and nut	215 N·m 22.0 Kgf·m 160 ft·lbs

(1) Front Wheel Mounting Screw and Nut or Lug Nut

(2) Rear Wheel Mounting Screw and Nut

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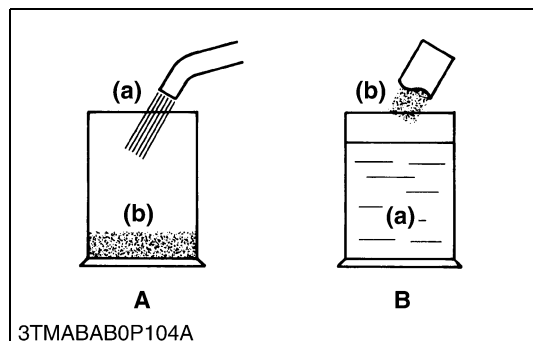
### [3] TIRE LIQUID INJECTION

Auxiliary weights can be used to increase traction force for plowing in fields or clayey ground.

Another way is to inject water or another liquid, such as a calcium chloride solution in the tires. Water must not be used in winter since it freezes at 0 °C (32 °F). The calcium chloride solution will not freeze and moreover, affords higher effect than water since its specific gravity is higher than that of water by about 20 %. Below is an explanation of calcium chloride solution injection.

#### ■ IMPORTANT

- Do not fill the front tires with liquid.



#### Preparation of Calcium Chloride Solution



#### CAUTION

- When making a calcium chloride solution, do not pour water over calcium chloride since this results in chemical reaction which will cause high temperature. Instead add a small amount of calcium chloride to the water at a time until the desired solution is achieved.

Freezing temp.	Weight of CaCl <sub>2</sub> to be dissolved in 100 L (26.5 U.S.gals., 22.0 Imp.gals.) of water
-5 °C (23 °F)	12 kg (26.4 lbs)
-10 °C (14 °F)	21 kg (46.3 lbs)
-15 °C (5 °F)	28 kg (61.7 lbs)
-20 °C (-4 °F)	34 kg (75.0 lbs)
-25 °C (-13 °F)	40 kg (88.2 lbs)
-30 °C (-22 °F)	44 kg (97.0 lbs)
-35 °C (-31 °F)	49 kg (108 lbs)
-40 °C (-40 °F)	52 kg (114.6 lbs)
-45 °C (-49 °F)	56 kg (123.5 lbs)
-50 °C (-58 °F)	61 kg (134.5 lbs)

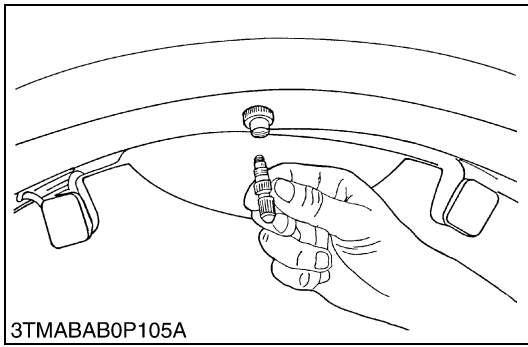
(a) Water

(b) CaCl<sub>2</sub> (Calcium Chloride)

A : Bad

B : Good

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**Attaching Injector**

1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the top.
3. Remove the air valve, and attach the injector. (Code No. 07916-52501)

(1) Injector

(2) Hose

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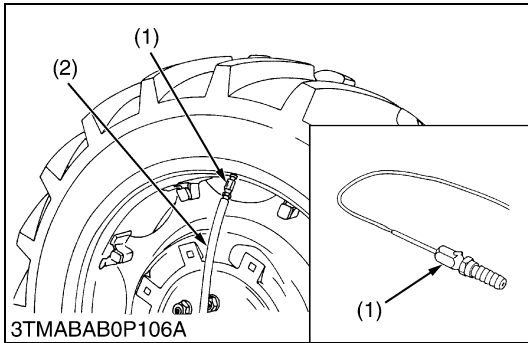




Fig. 1

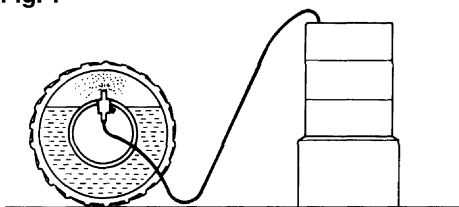


Fig. 2

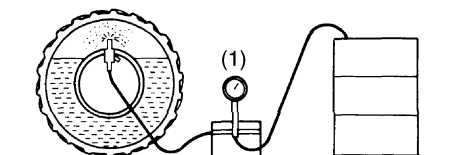
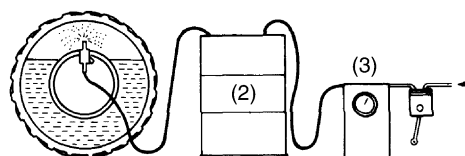


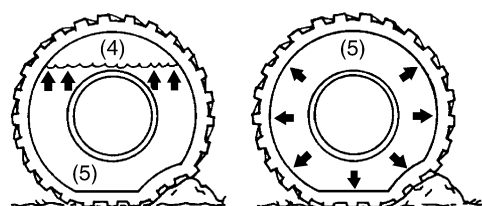
Fig. 3



3TMABAB0P111A

(A)

(B)



3TMABAB0P107A

## Injection



### CAUTION

- When a calcium chloride solution is used, cool it before pouring it into the tire.
- Do not fill tires with water or solution more than 75 % of full capacity (to the valve stem level).

The following four ways can be used to inject water or a calcium chloride solution into tires.

1. Gravity injection (Fig. 1)
2. Pump injection (Fig. 2)
3. Pressure tank injection (Fig. 3)
4. Injection directly from top (only when water is being used).

### NOTE

- Once injection is completed, reset the air valve, and pump air into the tire to the specified pressure.

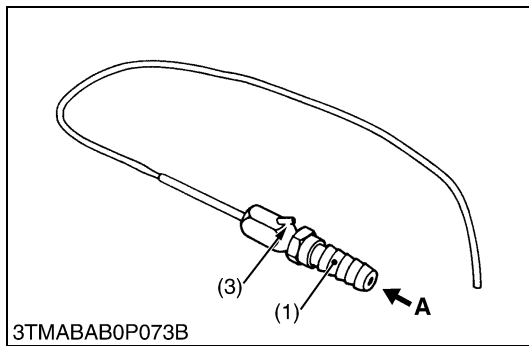
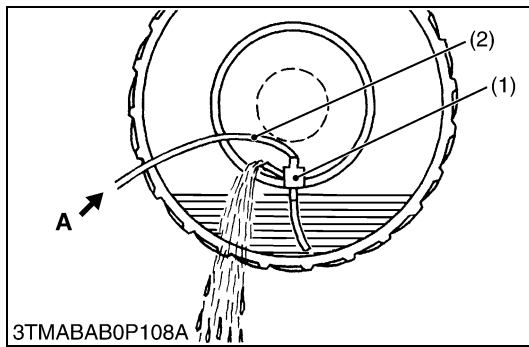
Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire.

Tire sizes	14.9-24	17.5L-24
Slush free at -10 °C (14 °F) Solid at -30 °C (-22 °F) [Approx. 1 kg (2 lbs.) CaCl <sub>2</sub> per 4 L (1 gal.) of water]	205 kg (450 lbs)	235 kg (515 lbs)
Slush free at -24 °C (-11 °F) Solid at -47 °C (-52 °F) [Approx. 1.5 kg (3.5 lbs.) CaCl <sub>2</sub> per 4 L (1 gal.) of water]	215 kg (475 lbs)	250 kg (550 lbs)
Slush free at -47 °C (-52 °F) Solid at -52 °C (-62 °F) [Approx. 2.25 kg (5 lbs.) CaCl <sub>2</sub> per 4 L (1 gal.) of water]	225 kg (495 lbs)	265 kg (585 lbs)

- (1) Pump
- (2) Pressure Tank
- (3) Compressor
- (4) Air
- (5) Water

- (A) Correct : 75 %  
Air Compresses Like A Cushion  
(B) Incorrect : 100 % Full  
Water Can Not Be Compressed

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### Draining Water or Solution

1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the bottom.
3. Remove the air valve, and drain liquid (liquid can only be drained to the level of the valve and liquid under that level remains inside).
4. To drain liquid completely, use the injector, and direct compressed air into the tire to force out the liquid through the injector's vent.

- (1) Injector
- (2) Hose
- (3) Vent

**A: Compressed Air**

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## [4] IMPLEMENT LIMITATIONS

The KUBOTA Tractor has been thoroughly tested for proper performance with implements sold or approved by KUBOTA. Use with 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 Tractor may result in malfunctions or failures of the tractor, damage to other property and injury to the operator or others. [Any malfunctions or failures of the tractor resulting from use with improper implements are not covered by the warranty.]

Tread (max. width)			Lower link end max. lifting capacity W0
Front		Rear	
2WD	4WD		
1580 mm (62.2 in.)	1155 mm (45.5 in.)	1545 mm (60.8 in.)	1300 kg (2870 lbs.)

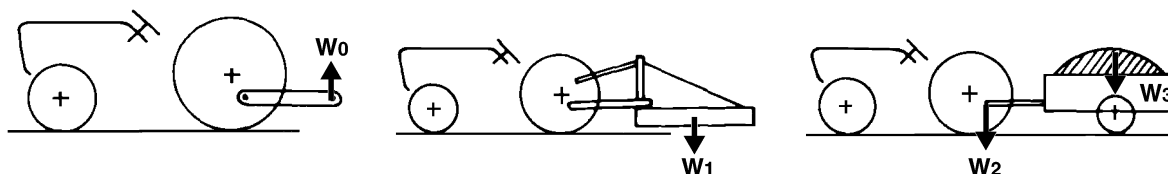
Actual figures		
Implement weight W1 and / or size	Max. Drawbar Load W2	Trailer loading weight W3 Max. capacity
See the following table	650 kg (1430 lbs)	3000 kg (6600 lbs)

Lower link end max. hydraulic lift capacity .....W0

Implement weight.....The implement's weight which can be put on the link : W1

Max. drawbar load .....W2

Trailer loading weight .....The max. loading weight for trailer (without trailer's weight ) : W3



3TMABAB0P109A

Implement size may vary depending on soil operating conditions.

No.	Implement		Remarks	L4400
1	Trailer		Max. load capacity      kg (lbs)	300 (6600)
			Max. Drawbar Load      kg (lbs)	650 (1430)
2	Mower	Rotary-cutter	Max. Cutting Width      mm (in.)	1829 (72)
			Max. Weight              kg (lbs)	400 (880)
		Flail Mower	Max. Cutting Width      mm (in.)	1524 (60)
			Max. Weight              kg (lbs)	400 (880)
		Sickle Bar	Max. Cutting Width      mm (in.)	2133 (84)
			Max. Weight              kg (lbs)	500 (1100)
3	Sprayer	Rear Mounted	Max. Tank-capacity L (U.S.gals)	400 (106)
		Pull Type	Max. Tank-capacity L (U.S.gals)	1200 (317)
4	Rotary Tiller		Max. Tilling Width      mm (in.)	1520 (60)
5	Bottom Plow		Max. Size	14 in. × 2
6	Disc-harrow Pull Type		Max. Harrowing Width mm (in.)	1981 (78)
			Max. Weight              kg (lbs)	400 (880)
7	Chisel Plow		Max. Width              mm (in.)	1829 (72)
			Max. Weight              kg (lbs)	350 (770)
8	Broad Caster		Max. Tank-capacity L (U.S.gals)	300 (80)
			Max. Weight              kg (lbs)	100 (220)
9	Manure Spreader		Max. Capacity              kg (lbs)	2000 (4400)
10	Cultivator		Max. Width              mm (in.)	2134 (84)
			Number of Rows	2
			Max. Weight              kg (lbs)	400 (880)
11	Front Blade		Max. Cutting Width      mm (in.)	1829 (72)
			Max. Oil Pressure      MPa (psi)	17.2 (2490)
			Sub Frame	Necessary
12	Rear Blade		Max. Cutting Width      mm (in.)	1829 (72)
			Max. Oil Pressure      MPa (psi)	17.2 (2490)
13	Front Loader		Max. Lifting Capacity    kg (lbs)	700 (1545)
			Max. Oil Pressure      MPa (psi)	18.0 (2560)
			Sub Frame	Necessary
14	Box Blade		Max. Cutting Width      mm (in.)	1651 (65)
			Max. Weight              kg (lbs)	350 (770)
15	Back Hoe		Max. Digging Depth      mm (in.)	2288 (90)
			Max. Weight              kg (lbs)	450 (990)
			Sub Frame	Necessary

W1012736

No.	Implement	Remarks	L4400
16	Snow Blade	Max. Width mm (in.)	1830 (72)
		Max. Weight kg (lbs)	350 (770)
17	Snow Blower	Max. Working Width mm (in.)	1676 (66)
		Max. Weight kg (lbs)	280 (620)

Implement size may vary depending on soil operating conditions.

W1102494

# 1 ENGINE

# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Engine Does Not Start</b>	No fuel	Replenish fuel	G-8
	Air in the fuel system	Bleed	G-32
	Water in the fuel system	Change fuel and repair or replace fuel system	–
	Fuel pipe clogged	Clean	–
	Fuel filter clogged	Change	G-20
	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 nut	1-S30
	Incorrect injection timing	Adjust	1-S18, S19
	Fuel camshaft worn	Replace	–
	Injection nozzle clogged	Clean	1-S19, S20
	Injection pump malfunctioning	Repair or replace	1-S18, S19
	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-S30, S31
	Improper valve timing	Correct or replace timing gear	1-S53
	Piston ring and cylinder worn	Replace	1-S40, S41, S62
	Excessive valve clearance	Adjust	1-S13
	OPC system defective	Refer to "Operator Presence Control" section	9-S13
<b>Starter Does Not Run</b>	Battery discharged	Charge	G-23, 24
	Starter malfunctioning	Repair or replace	9-S24, S27 to S29
	Main switch malfunctioning	Repair or replace	9-S10, S11
	Safety switches defective	Replace	9-S12
	Start relay defective	Replace	9-S16
	Wiring disconnected	Connect	–

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Symptom	Probable Cause	Solution	Reference Page
<b>Engine Revolution Is Not Smooth</b>	Fuel filter clogged or dirty	Change	G-20
	Air cleaner clogged	Clean or change	G-20
	Fuel leak due to loose injection pipe retaining nut	Tighten nut	1-S30
	Injection pump malfunctioning	Repair or replace	1-S18, S19
	Incorrect nozzle injection pressure	Adjust	1-S20
	Injection nozzle stuck or clogged	Repair or replace	1-S19, S20
	Governor malfunctioning	Repair	—
<b>Either White or Blue Exhaust Gas Is Observed</b>	Excessive engine oil	Reduce to specified level	G-13
	Piston ring and cylinder worn or stuck	Repair or replace	1-S42, S43, S62
	Incorrect injection timing	Adjust	1-S18, S19
	Deficient compression	Adjust top clearance	1-S14
<b>Either Black or Dark Gray Exhaust Gas Is Observed</b>	Overload	Loosen load	—
	Low grade fuel used	Use specified fuel	G-8
	Fuel filter clogged	Change	G-20
	Air cleaner clogged	Clean or replace	G-20
	Deficient nozzle injection	Repair or replace nozzle	1-S19, S20
<b>Deficient Output</b>	Incorrect injection timing	Adjust	1-S18, S19
	Engine's moving parts seem to be seizing	Repair or replace	—
	Uneven fuel injection	Repair or replace the nozzle	1-S18, S19
	Deficient nozzle injection	Repair or replace the nozzle	1-S19, S20
	Compression leak	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder	1-S30, S31
<b>Excessive Lubricant Oil Consumption</b>	Piston ring's gap facing the same direction	Shift ring gap direction	1-S42, S43
	Oil ring worn or stuck	Replace	1-S42, S43
	Piston ring groove worn	Replace the piston	1-S42, S43, S56
	Valve stem and valve guide worn	Replace	1-S48, S49
	Oil leaking due to defective seals or packing	Replace	—

W1014322

Symptom	Probable Cause	Solution	Reference Page
<b>Fuel Mixed into Lubricant Oil</b>	Injection pump's plunger worn	Replace pump element or pump	–
	Deficient nozzle injection	Repair or replace the nozzle	1-S19, S20, S31
	Injection pump broken	Replace	1-S18, S19, S34
<b>Water Mixed into Lubricant Oil</b>	Head gasket defective	Replace	1-S32
	Cylinder block or cylinder head flawed	Replace	–
<b>Low Oil Pressure</b>	Engine oil insufficient	Replenish	G-11
	Oil filter clogged	Clean	G-11
	Relief valve stuck with dirt	Clean	–
	Relief valve spring weaken or broken	Replace	–
	Excessive oil clearance of crankshaft bearing	Replace	1-S55
	Excessive oil clearance of crankpin bearing	Replace	1-S54
	Excessive oil clearance of rocker arm	Replace	1-S28
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-6
	Oil pump defective	Repair or replace	1-S34, S59
<b>High Oil Pressure</b>	Different type of oil	Use specified type of oil	G-8
	Relief valve defective	Replace	–
<b>Engine Overheated</b>	Engine oil insufficient	Replenish	G-13
	Fan belt broken or elongated	Replace or adjust	1-S16
	Coolant insufficient	Replenish	G-29
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	–
	Coolant flow route corroded	Clean or replace	–
	Radiator cap defective	Replace	1-S16
	Overload running	Loosen load	–
	Head gasket defective	Replace	1-S32
	Incorrect injection timing	Adjust	1-S18, S19
	Unsuitable fuel used	Use specified fuel	G-8

W1014322

## 2. SERVICING SPECIFICATIONS

### ENGINE BODY

Item		Factory Specification	Allowable Limit
Cylinder Head Surface	Flatness	—	0.05 mm / 500 mm 0.0020 in./ 19.69 in.
Compression Pressure (When Cranking with Starting Motor)		3.53 to 4.02 MPa / 290 min <sup>-1</sup> (rpm) 36 to 41 kgf/cm <sup>2</sup> / 290 min <sup>-1</sup> (rpm) 512 to 583 psi / 290 min <sup>-1</sup> (rpm)	2.55 MPa / 290 min <sup>-1</sup> (rpm) 26 kgf/cm <sup>2</sup> / 290 min <sup>-1</sup> (rpm) 370 psi / 290 min <sup>-1</sup> (rpm)
Difference among Cylinders		—	10 % or less
Top Clearance		0.55 to 0.70 mm 0.0217 to 0.0276 in.	—
Valve Clearance (When Cold)		0.18 to 0.22 mm 0.0071 to 0.0087 in.	—
Valve Seat	Width (Intake)	2.12 mm 0.0835 in.	—
	Width (Exhaust)	2.12 mm 0.0835 in.	—
Valve Seat	Width (Intake)	1.047 rad 60 °	—
	Width (Exhaust)	0.785 rad 45 °	—
Valve Face	Angle (Intake)	1.047 rad 60 °	—
	Angle (Exhaust)	0.785 rad 45 °	—
Valve Stem to Valve Guide	Clearance	0.040 to 0.070 mm 0.00157 to 0.00276 in.	0.1 mm 0.0039 in.
Valve Stem	O.D.	7.960 to 7.975 mm 0.31339 to 0.31398 in.	—
Valve Guide	I.D.	8.015 to 8.030 mm 0.31555 to 0.31614 in.	—
Valve Recessing	Protrusion	0.05 mm 0.0020 in.	—
	Recessing	0.15 mm 0.0059 in.	0.4 mm 0.0157 in.
Valve Timing (Intake Valve)	Open	0.14 rad (8 °) before T.D.C.	—
	Close	0.35 rad (20 °) after B.D.C.	—

W10138740

**ENGINE BODY (Continued)**

Item		Factory Specification	Allowable Limit
Valve Timing (Exhaust Valve)	Open	1.05 rad (60 °) before B.D.C.	—
	Close	0.21 rad (12 °) after T.D.C.	—
Valve Spring	Free Length	41.7 to 42.2 mm 1.6417 to 1.6614 in.	41.2 mm 1.6220 in.
	Setting Load / Setting Length	117.6 N / 35.0 mm 12.0 kgf / 35.0 mm 26.4 lbs / 1.3780 in.	100.0 N / 35.0 mm 10.2 kgf / 35.0 mm 22.5 lbs / 1.3780 in.
	Squareness	—	1.0 mm 0.039 in.
Rocker Arm Shaft to Rocker Arm	Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.1 mm 0.0039 in.
Rocker Arm Shaft	O.D.	13.973 to 13.984 mm 0.55012 to 0.55055 in.	—
Rocker Arm	I.D.	14.000 to 14.018 mm 0.55118 to 0.55189 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.
Tappet to Tappet Guide	Clearance	0.020 to 0.062 mm 0.00079 to 0.00244 in.	0.07 mm 0.0028 in.
Tappet	O.D.	23.959 to 23.980 mm 0.94327 to 0.94410 in.	—
Tappet Guide	I.D.	24.000 to 24.021 mm 0.94488 to 0.94571 in.	—
Timing Gear			
Crank Gear to Idle Gear	Backlash	0.0415 to 0.1122 mm 0.00163 to 0.00442 in.	0.15 mm 0.0059 in.
Idle Gear to Cam Gear	Backlash	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.	0.15 mm 0.0059 in.
Idle Gear to Injection Pump Gear	Backlash	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.	0.15 mm 0.0059 in.
Crank Gear to Oil Pump Gear	Backlash	0.0415 to 0.1090 mm 0.00163 to 0.00429 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.20 to 0.22 mm 0.0079 to 0.0087 in.	0.9 mm 0.0354 in.
Idle Gear Shaft to Idle Gear Bushing	Clearance	0.025 to 0.066 mm 0.00098 to 0.00260 in.	0.1 mm 0.0039 in.
Idle Gear Shaft	O.D.	37.959 to 37.975 mm 1.49445 to 1.49508 in.	—
Idle Gear Bushing	I.D.	38.000 to 38.025 mm 1.49606 to 1.49704 in.	—

W11145540

**ENGINE BODY (Continued)**

Item		Factory Specification	Allowable Limit
Crankshaft Journal to Crankshaft Bearing 2	Oil Clearance	0.040 to 0.104 mm 0.00157 to 0.00409 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	59.921 to 59.940 mm 2.35909 to 2.35984 in.	—
Crankshaft Bearing 2	I.D.	59.980 to 60.039 mm 2.36142 to 2.36374 in.	—
Crankpin to Crankpin Bearing	Oil Clearance	0.025 to 0.087 mm 0.00098 to 0.00343 in.	0.20 mm 0.0079 in.
Crankpin	O.D.	46.959 to 46.975 mm 1.84878 to 1.84941 in.	—
Crankpin Bearing	I.D.	47.000 to 47.046 mm 1.85039 to 1.85220 in.	—
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.5 mm 0.0197 in.
Crankshaft Sleeve	Wear	—	0.1 mm 0.0039 in.
Cylinder Bore [Standard]	I.D.	87.000 to 87.022 mm 3.42519 to 3.42606 in.	+ 0.15 mm + 0.0059 in.
[Oversize]	I.D.	87.500 to 87.522 mm 3.44488 to 3.44574 in.	+ 0.15 mm + 0.0059 in.
Flywheel	Sway	—	0.05 mm 0.0020 in.

W11210120

**LUBRICATING SYSTEM**

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	More than 98 kPa 1.0 kgf/cm <sup>2</sup> 14 psi	49 kPa 0.5 kgf/cm <sup>2</sup> 7 psi
	At Rated Speed	294 to 441 kPa 3.0 to 4.5 kgf/cm <sup>2</sup> 43 to 64 psi	245 kPa 2.5 kgf/cm <sup>2</sup> 35.6 psi
Engine Oil Pressure Switch	Working Pressure	49 kPa 0.5 kgf/cm <sup>2</sup> 7 psi	—
Inner Rotor to Outer Rotor	Clearance	0.10 to 0.16 mm 0.0039 to 0.0063 in.	0.2 mm 0.0079 in.
Outer Rotor to Pump Body	Clearance	0.11 to 0.19 mm 0.0043 to 0.0075 in.	0.25 mm 0.098 in.
Inner Rotor to Cover	End Clearance	0.105 to 0.150 mm 0.00413 to 0.00591 in.	0.2 mm 0.0079 in.

W10139730

**COOLING SYSTEM**

Fan Belt	Tension	7.0 to 9.0 mm / (0.28 to 0.35 in.) deflection at 98 N (10 kgf, 22 lbs) of force	—
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	Water Tightness	No leak at 137 kPa 1.4 kgf/cm <sup>2</sup> 20 psi	—
Radiator Cap	Pressure Falling Time	10 seconds or more for pressure falling from 88 to 59 kPa from 0.9 to 0.6 kgf/cm <sup>2</sup> , from 13 to 9 psi)	—

W10135990

**FUEL SYSTEM**

Item		Factory Specification	Allowable Limit
Injection Pump	Injection Timing	0.30 to 0.33 rad (17 to 19°) before T.D.C.	—
Pump Element	Fuel Tightness	—	14.7 MPa 150 kgf/cm <sup>2</sup> 2133 psi
Delivery Valve	Fuel Tightness	10 seconds or more for pressure falling from 14.7 to 13.7 MPa from 150 to 140 kgf/cm <sup>2</sup> from 2133 to 1990 psi	5 seconds for pressure falling from 14.7 to 13.7 MPa from 150 to 140 kgf/cm <sup>2</sup> from 2133 to 1990 psi
Injection Nozzle	Injection Pressure	13.8 to 14.7 MPa 140 to 150 kgf/cm <sup>2</sup> 1990 to 2130 psi	—
Injection Nozzle Valve Seat	Valve Seat Tightness	When the pressure is 12.75 MPa (130 kgf/cm <sup>2</sup> , 1849 psi), the valve seat must be fuel tightness.	—

W10139730

### 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	lbf-ft
Cap nut for hydraulic pipe	78.8 to 88.3	8.0 to 9.0	57.9 to 65.1
Start <b>B</b> terminal mounting nut	7.8 to 9.8	0.8 to 1.0	5.8 to 7.2
Main delivery hose retaining nut	46.6 to 50.9	4.8 to 5.2	34.4 to 37.6
Turning delivery hoses retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Engine to clutch housing mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Engine to clutch housing mounting stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Engine to engine frame mounting screw and nut	102.9 to 117.6	10.5 to 12.0	76.0 to 86.8
reamer stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Front axle frame mounting screw (M10)	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Front axle frame mounting screw (M12)	102.9 to 117.6	10.5 to 12.5	76.0 to 86.8
Alternator mounting screw (M10)	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Tension adjusting screw (M8)	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2
Coupling to fan drive pulley mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3

W1055580

Item	Size x Pitch	N-m	kgf-m	ft-lbs
Cylinder head cover screw	M6x 1.0	6.9 to 11.3	0.7 to 1.15	5.1 to 8.32
*Cylinder head screws	M11 x 1.25	93.1 to 98.0	9.5 to 10.0	68.7 to 72.3
*Main bearing case screws 1	M9 x 1.25	46.1 to 50.9	4.7 to 5.2	34.0 to 37.6
*Main bearing case screws 1	M10 x 1.25	68.6 to 73.5	7.0 to 7.5	50.6 to 54.2
*Flywheel screws	M12 x 1.25	98.0 to 107.8	10.0 to 11.0	72.3 to 79.5
*Connecting rod screws	M8 x 1.0	44.1 to 49.0	4.5 to 5.0	32.5 to 36.2
*Rocker arm bracket screw	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Fan drive pulley mounting nut	—	137.3 to 156.9	14.0 to 16.0	101.3 to 115.7
*Bearing case cover screws	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Glow plugs	M10 x 1.25	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
Nozzle holder	—	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Oil switch taper screw	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Injection pipe retaining nuts	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe assembly retaining nuts	—	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Camshaft set screw	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Idle gear shaft mounting screw	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3



**■ NOTE**

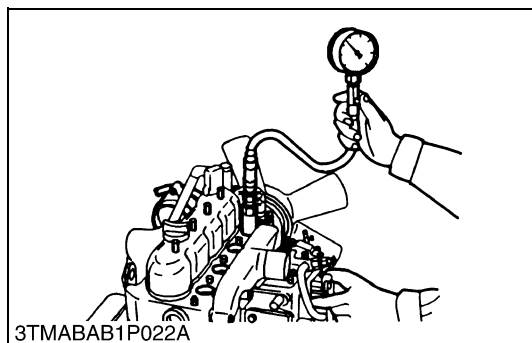
- For \* marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.
- The letter “M” in Size × Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.

W1013236

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING AND ADJUSTING

#### (1) Compression Pressure



#### Compression Pressure

1. Run the engine until it is warmed up.
2. Stop the engine and disconnect the **2P** connector from the stop solenoid in order to inject fuel.
3. Remove the air cleaner, the muffler and all injection nozzle.
4. Set a compression tester (Code No. 07909-30208) with the adaptor to the nozzle hole.
5. Keep the engine stop lever at "**Stop Position**".
6. While cranking the engine with the starter, measure the compression pressure.
7. Repeat steps 4 through 6 for each cylinder.
8. 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.
9. If the compression pressure is still less than the allowable limit, check the top clearance, valve cylinder head.
10. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

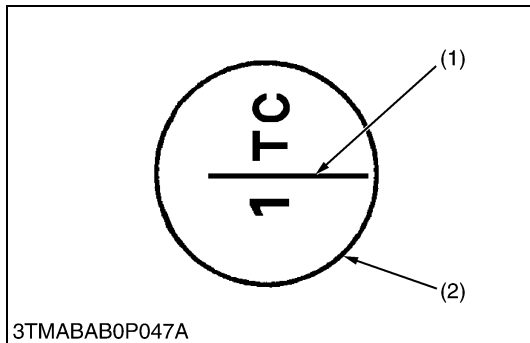
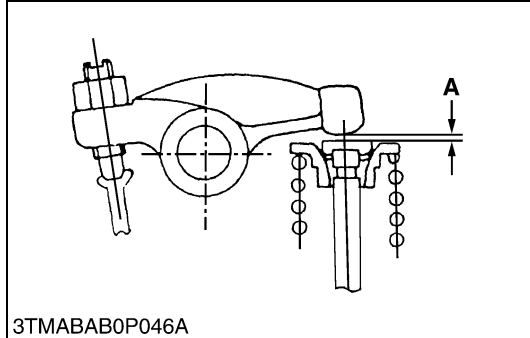
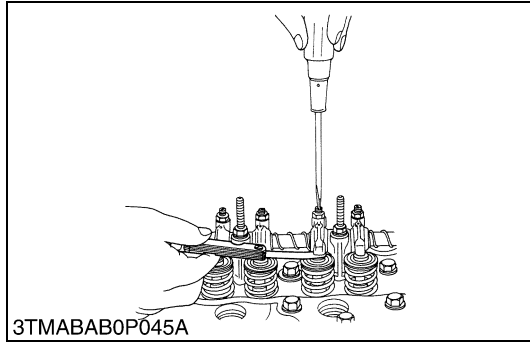
#### ■ NOTE

- 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.	3.53 to 4.02 MPa 36 to 41 kgf/cm <sup>2</sup> 512 to 583 psi
	Allowable limit	2.55 MPa 26 kgf/cm <sup>2</sup> 370 psi

W10178940

## (2) Valve Clearance



### Valve Clearance

#### ■ IMPORTANT

- Valve clearance must be checked and adjusted when engine is cold.
- Remove the head cover, the glow plugs and the timing window cover on the clutch housing.
  - Align the "1TC" mark line on the flywheel and center or timing window so that the No. 1 piston comes to the compression or overlap top dead center.
  - Check the following valve clearance marked with "☆" using a feeler gauge.
  - If the clearance is not within the factory specifications, adjust with the adjusting screw.
  - Finally turn the flywheel 6.28 rad (360 °), and align the "TC" marking line and the center of timing window. Adjust all the other valve clearance as required.

Valve clearance	Factory spec.	0.18 to 0.22 mm 0.0071 to 0.0087 in.
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#### ■ NOTE

- The "TC" marking line on the flywheel is just for No. 1 cylinder. There is no "TC" marking for the other cylinders.
- No. 1 piston comes to the T.D.C. position when the "TC" marking is aligned with center of timing window on clutch-housing. Turn the flywheel 0.26 rad (15°) clockwise and counterclockwise to see if the piston is at the compression top dead center or the overlap position. Now referring to the table below, readjust the valve clearance. (The piston is at the compression top dead center when both the IN. and EX. valves do not move; it is at the overlap position when both the valves move.)

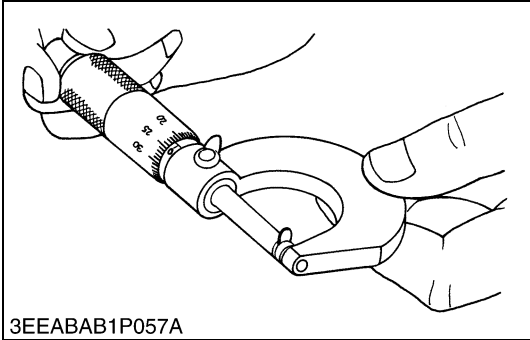
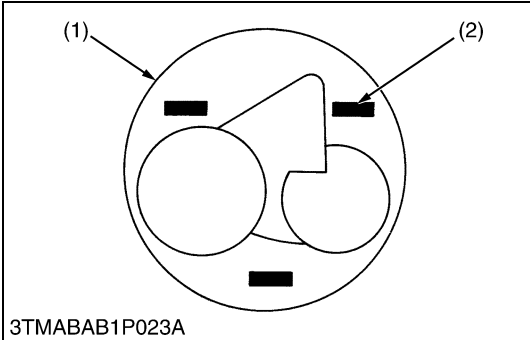
Condition	No. of cylinder	IN. Valve	EX. Valve
When No. 1 piston is compression top dead center	1st	☆	☆
	2nd	☆	
	3rd		☆
	4th		
When No. 1 piston is overlap position	1st		
	2nd		☆
	3rd	☆	
	4th	☆	☆

- (1) TC Mark Line  
(2) Timing Window

A : Valve Clearance

W1040087

(3) Top Clearance



Top Clearance

1. Remove the cylinder head.
2. Move the piston and place a strip of fuse on the piston head at three positions with grease.
3. Lower the piston, and install the cylinder head. (Use a new cylinder head gasket and tighten with a specified tightening torque.)
4. Turn the flywheel until the piston through the T.D.C..
5. Remove the cylinder head, and measure the thickness of the fuses.
6. If the measurement is not within the factory specifications, check the oil clearance between the crankpin and bearing and between the piston pin and bushing.

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

Top clearance	Factory spec.	0.55 to 0.70 mm 0.0217 to 0.0276 in.
Tightening torque	Cylinder head screws	93.1 to 98.0 N·m 9.5 to 10.0 kgf·m 68.7 to 72.3 ft-lbs

(1) Piston

(2) Fuse

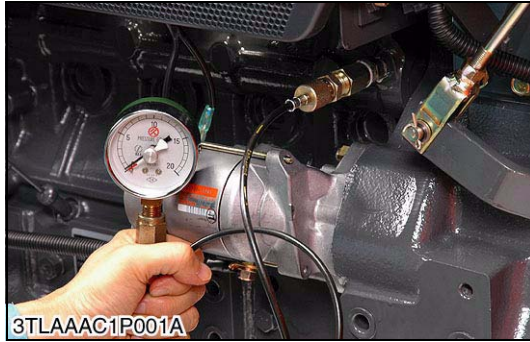
W1020190

**ENGINE BODY (Continued)**

Item		Factory Specification	Allowable Limit
Camshaft	Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.3 mm 0.0118 in.
Camshaft	Alignment	—	0.01 mm 0.0004 in.
Cam	Height (Intake / Exhaust)	33.47 mm 1.3177 in.	33.42 mm 1.3157 in.
Camshaft Journal to Cylinder Block Bore	Clearance	0.500 to 0.091 mm 0.00197 to 0.00358 in.	0.15 mm 0.0059 in.
Camshaft Journal	O.D.	39.934 to 39.950 mm 1.57221 to 1.57284 in.	—
Cylinder Block Bore	I.D.	40.000 to 40.025 mm 1.57480 to 1.57579 in.	—
Piston Pin Bore	I.D.	25.000 to 25.013 mm 0.98425 to 0.98476 in.	25.05 mm 0.9862 in.
Second Ring to Ring Groove	Clearance	0.093 to 0.128 mm 0.0037 to 0.0050 in.	0.2 mm 0.0079 in.
Oil Ring to Ring Groove	Clearance	0.020 to 0.060 mm 0.0079 to 0.0024 in.	0.15 mm 0.0059 in.
Top Ring	Ring Gap	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
Second Ring	Ring Gap	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
Oil Ring	Ring Gap	0.25 to 0.45 mm 0.0098 to 0.0177 in.	1.25 mm 0.0492 in.
Connecting Rod	Alignment	—	0.05 mm 0.0020 in.
Piston Pin to Small End Bushing	Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.15 mm 0.0059 in.
Piston Pin	O.D.	25.002 to 25.011 mm 0.98433 to 0.98468 in.	—
Small End Bushing	I.D.	25.025 to 25.040 mm 0.98523 to 0.98582 in.	—
Crankshaft	Alignment	—	0.08 mm 0.0031 in.
Crankshaft Journal to Crankshaft Bearing 1	Oil Clearance	0.040 to 0.118 mm 0.00157 to 0.00465 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	59.921 to 59.940 mm 2.35909 to 2.35984 in.	—
Crankshaft Bearing 1	I.D.	59.980 to 60.039 mm 2.36142 to 2.36374 in.	—

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#### (4) Engine Oil Pressure



##### Engine Oil Pressure

1. Remove the engine oil pressure switch, and set an oil pressure tester (Code No. 07916-32032). (Adaptor screw size : PT 1/8)
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 98 kPa 1.0 kgf/cm <sup>2</sup> 14 psi
		Allowable limit	49 kPa 0.5 kgf/cm <sup>2</sup> 7 psi
	At rated speed	Factory spec.	294 to 441 kPa 3.0 to 4.5 kgf/cm <sup>2</sup> 42.7 to 64.0 psi
		Allowable limit	245 kPa 2.5 kgf/cm <sup>2</sup> 35.6 psi

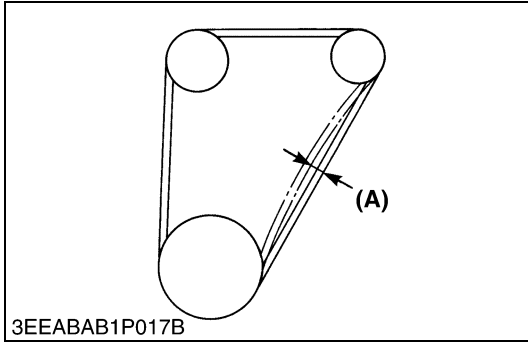
##### **(When reassembling)**

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

Tightening torque	Oil pressure switch	14.7 to 19.6 N·m 1.5 to 2.0 kgf·m 10.8 to 14.5 ft-lbs
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## (5) Fan Belt



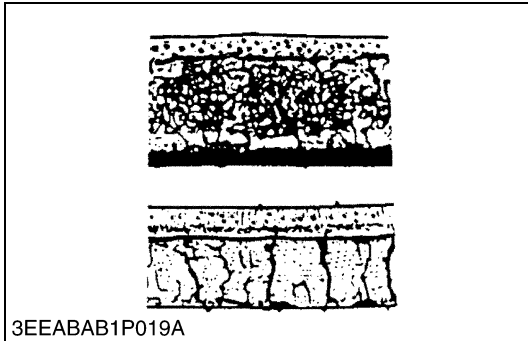
### Fan Belt Tension

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

Deflection <b>(A)</b>	Factory spec.	7.0 to 9.0 mm 0.28 to 0.35 in.
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**(A) Deflection**

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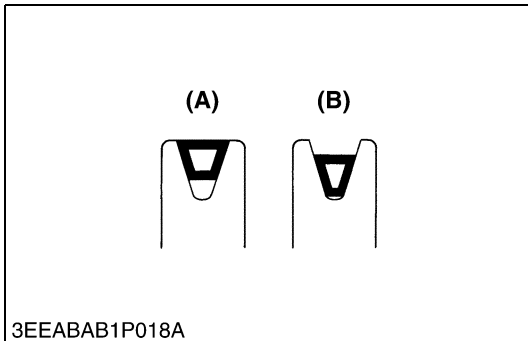
### Fan Belt Damage and Wear

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.

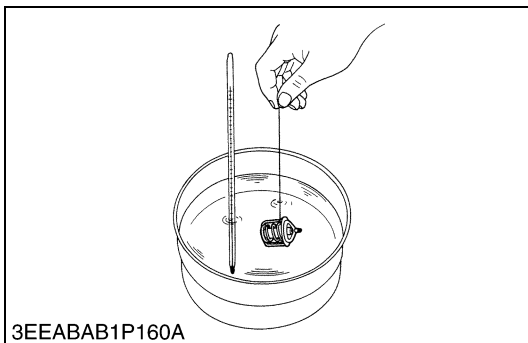
**(A) Good**

**(B) Bad**

W1016443



## (6) Radiator



### 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.

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

W1035849



### Radiator Cap Air Leakage

#### **! 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.
1. Set a radiator tester (Code No. 07909-31551) and an adaptor (BANZAI Code No. RCT-2A-30S) on the radiator cap.
  2. Apply the specified pressure 88 kPa (0.9 kgf/cm<sup>2</sup>, 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm<sup>2</sup>, 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 <sup>2</sup> , from 13 to 9 psi)
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W1054156



### Radiator Water Leakage

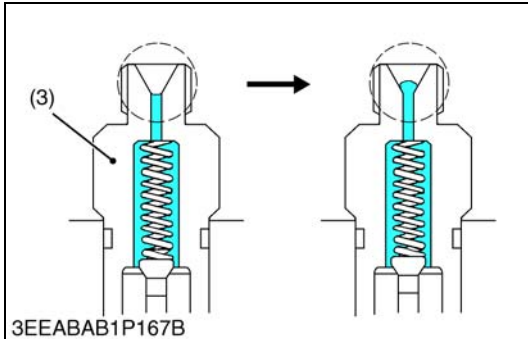
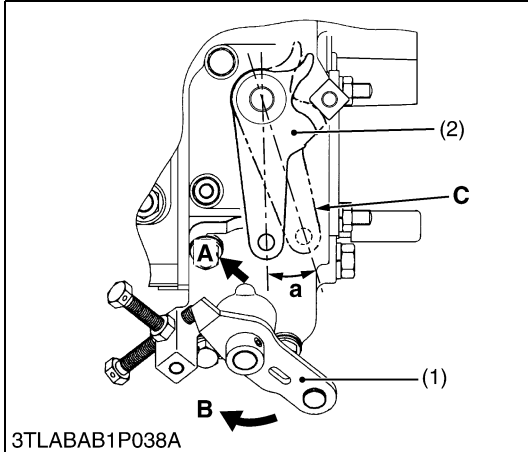
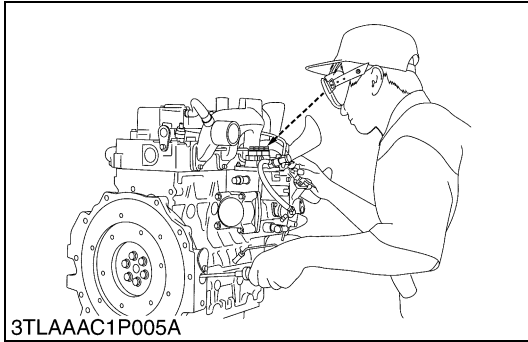
1. Pour a specified amount of water into the radiator.
2. Set a radiator tester (Code No. 07909-31551) with an adapter (BANZAI Code No. RCT-2A-30S) and raise the water pressure to the specified pressure.
3. Check the radiator for water leaks.
4. If any water leaks are detected, replace the radiator or repair with the radiator cement. If the water leak is excessive, replace the radiator.

Radiator water leakage test pressure	Factory spec.	No leak at 137 kPa 1.4 kgf/cm <sup>2</sup> 20 psi
--------------------------------------	---------------	---

W1016903



## (7) Injection Pump



### Injection Timing

1. Remove the stop solenoid.
2. Remove the injection pipes and nozzle.
3. Set the speed control lever to maximum fuel discharge position.

### (Reference)

- Turn the flywheel with screwdriver.
4. Turn the flywheel counterclockwise (facing the flywheel) until the fuel fills up to the hole of the delivery valve holder for 1st cylinder.
  5. Turn the flywheel further and stop turning when the fuel begins to flow over, to get the present injection timing.
  6. (The flywheel has mark 1TC and four lines indicating every 0.087 rad (5°) of crank angle from 0.175 rad (10°) to 0.436 rad (25°) before mark 1TC) Calculate the angle which the center of the window points out. If the calculation differs from specified injection timing, add or remove the shim to adjust.

### (Injection Timing)

Injection timing	Factory spec.	0.279 to 0.331 rad 17 to 19 ° B.T.D.C.
------------------	---------------	---

- (1) Speed Control Lever
- (2) Stop Lever
- (3) Delivery Valve Holder
- (4) TC Mark Line

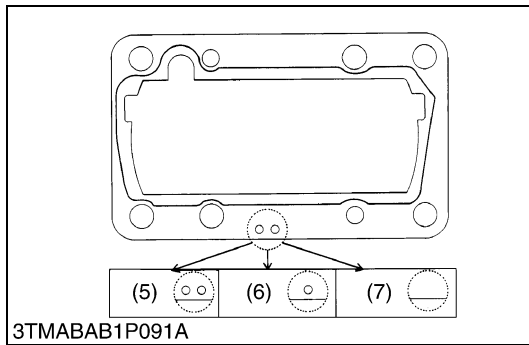
**A : To STOP Position**

**B : To Max. Speed Position**

**C : Stop Lever in Free Position**

**a : 0.267 ± 0.274 rad (15.3 ° to 15.7 °)**

W1018724



### Injection Timing (Continued)

#### ■ NOTE

- The sealant is applied to both side of the soft metal gasket shim. The liquid gasket is not required for assembling.
- Shims are available in thickness of 0.20 mm, 0.25 mm and 0.30 mm. Combine these shims for adjustment.
- 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.

(5) 2-Holes : 0.20 mm (Shim)

(6) 1-Holes : 0.25 mm (Shim)

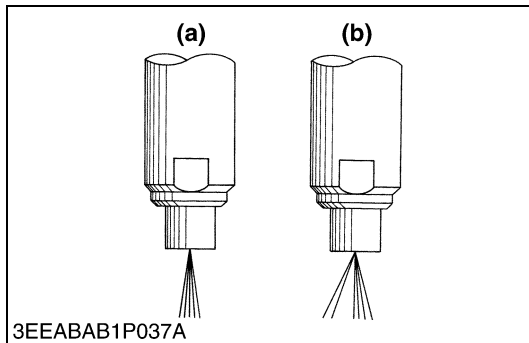
(7) Without Hole : 0.30 mm (Shim)

## (8) Injection Nozzle



### CAUTION

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



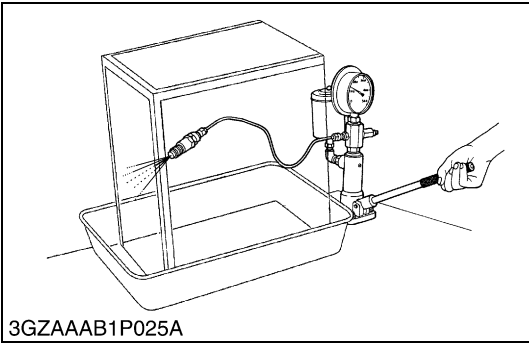
### Nozzle Spraying Condition

1. Set the injection nozzle to a nozzle tester, and check the nozzle spraying condition.
2. If the spraying condition is defective, replace the nozzle piece.

(a) Good

(b) Bad

W10181310



**Fuel Injection Pressure**

1. Set the injection nozzle to a nozzle tester.
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.

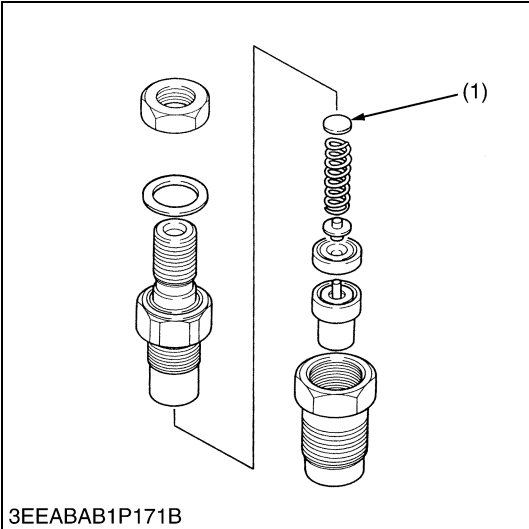
Fuel injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm <sup>2</sup> 1991 to 2134 psi
-------------------------	---------------	--

**(Reference)**

- Pressure variation with 0.01 mm (0.0004 in.) difference of adjusting washer thickness.  
Approx. 235 kPa (2.4 kgf/cm<sup>2</sup>, 34 psi)

(1) Adjusting Washer

W10182100

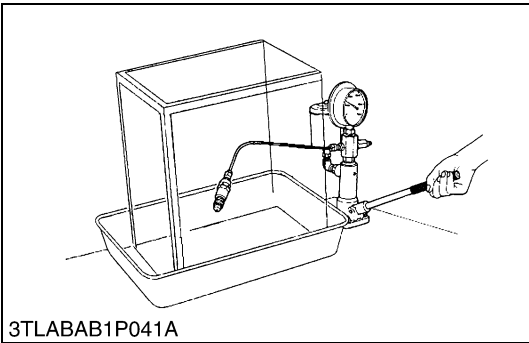


**Valve Seat Tightness**

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/cm<sup>2</sup>, 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

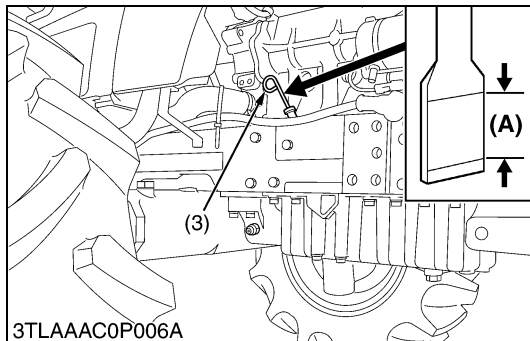
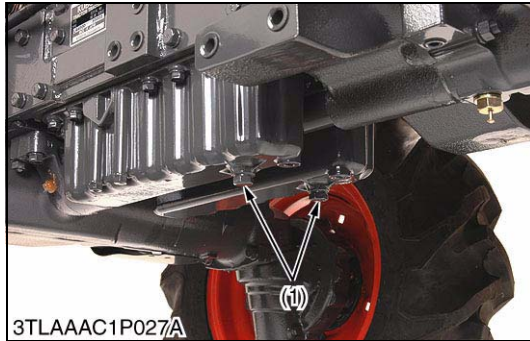
Valve seat tightness	Factory spec.	No fuel leak at 12.75 MPa 130 kgf/cm <sup>2</sup> 1849 psi
----------------------	---------------	---

W1113031



## [2] PREPARATION

### (1) Separating Engine and Clutch Housing



#### 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 plugs (1) to drain oil.
4. Reinstall the drain plugs (1).

#### **(When refilling)**

- Fill the engine oil up to the upper line on the dipstick (2).
- **IMPORTANT**
- **Never mix two different type of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**

Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-6.)

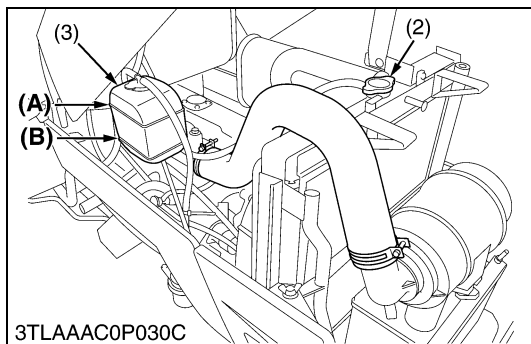
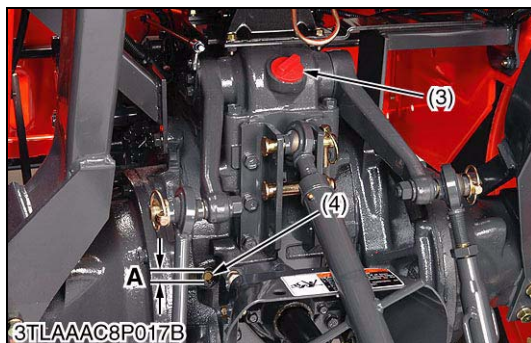
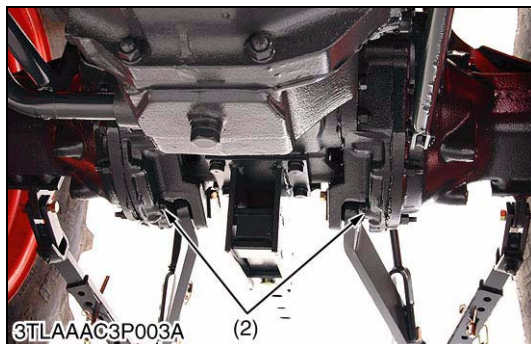
Engine Oil	Capacity	7.6 L 8.0 U.S.qts 6.7 Imp.qts
------------	----------	-------------------------------------

- (1) Drain Plug  
(2) Oil Inlet Plug  
(3) Dipstick

**A : Oil level is acceptable within this range.**

W1061746





### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### (When refilling)

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.qts
--------------------	----------	-------------------------------------

#### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.

W1040435

### Draining Coolant



#### CAUTION

- Never remove the radiator cap until coolant temperature is well below its boiling point. 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. Loosen the drain plug (1) to drain the coolant.
  3. Remove the radiator cap (2) to completely drain the coolant.
  4. After all coolant is drained, retighten the drain plug (1).

#### (When refilling)

- Fill the coolant between the "FULL" and "LOW" marks of recovery tank.

Coolant capacity (with recovery tank)	6.0 L 6.9 U.S.qts 5.7 Imp.qts
---------------------------------------	-------------------------------------

- (1) Drain Plug
- (2) Radiator Cap
- (3) Recover Tank

(A) FULL  
(B) LOW

W1062137

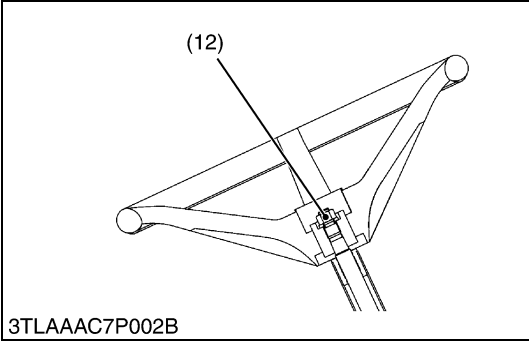
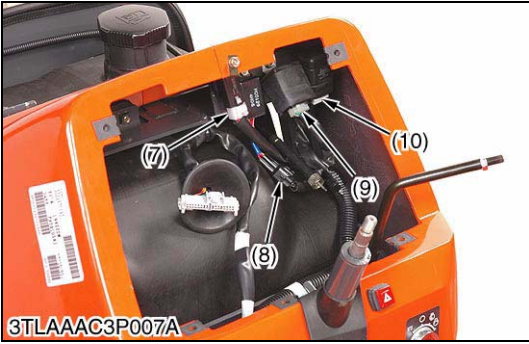
**Bonnet and Front Cover**

1. Disconnect the battery negative cable (1).
2. Disconnect the connector to head light and the head light wiring.
3. Remove bonnet (2) and side covers (3) on both sides.
4. Remove the front cover (4).

(1) Battery Negative Cable  
(2) Bonnet

(3) Side Cover  
(4) Front Cover

W1040763



Steering Wheel and Rear Bonnet

- 1. Remove steering wheel (1) with steering puller.
- 2. Remove throttle grip (2).
- 3. Disconnect hourmeter cable from engine.
- 4. Remove meter panel (3).
- 5. Disconnect **4P** connector (5) to main switch.
- 6. Disconnect **8P** connector (6) to combination switch.
- 7. Disconnect **4P** connector to starter relay (7), **4P** connector to OPC timer (8), **8P** connector to flasher (hazard) unit (9), **4P** connector to glow (Key stop solenoid) relay (10).
- 8. Disconnect fuel tank wiring (11).
- 9. Remove rear bonnet (4).

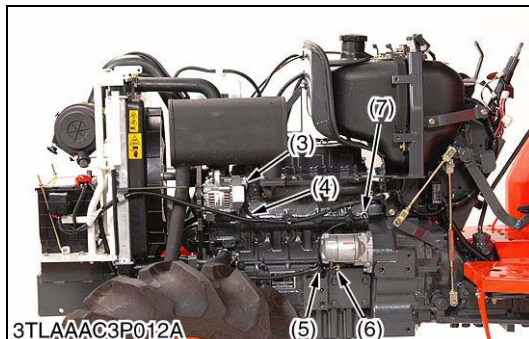
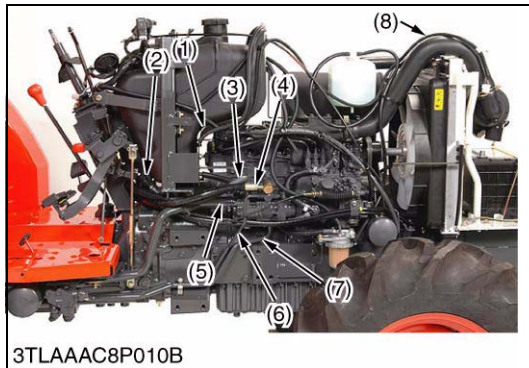
(When reassembling)

Tightening torque	Steering wheel mounting nut	48.0 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
-------------------	-----------------------------	---

- (1) Steering Wheel
  - (2) Throttle Grip
  - (3) Meter Panel
  - (4) Rear Bonnet
  - (5) **4P** Connector (Main Switch)
  - (6) **8P** Connector (Combination Switch)
- (7) **4P** Connector (Starter Relay)
  - (8) **4P** Connector (OPC Timer)
  - (9) **8P** Connector (Flasher (Hazard) Unit)
  - (10) **4P** Connector (Glow (Key Stop Solenoid) Relay)
  - (11) Fuel Tank Wiring
  - (12) Steering Wheel Mounting Nut

W1041819





### Wiring, Pipes and Rods

1. Disconnect **1P** connector (1) to water temperature sensor.
2. Disconnect glow plug terminal (10).
3. Disconnect accelerator rod cable (2), head light wiring (8), **2P** connector to key stop solenoid (9) and then set aside the wiring harness.
4. Disconnect power steering delivery hose (4), power steering return hose (3).
5. Disconnect pump inlet hose (5), I-PTO delivery pipe (6) and **3P** delivery pipe (7).

### (When reassembling)

Tightening torque	Independent PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs

- |  |   |
|--|---|
| (1) <b>1P</b> Connector (Water Temperature Sensor) | (6) I-PTO Delivery Pipe                     |
| (2) Accelerator Rod Cable                          | (7) <b>3P</b> Delivery Pipe                 |
| (3) Power Steering Return Hose                     | (8) Head Light Wiring                       |
| (4) Power Steering Delivery Hose                   | (9) <b>2P</b> Connector (Key Stop Solenoid) |
| (5) Pump Inlet Hose                                | (10) Glow Plug Terminal                     |

W1042550

### Wirings

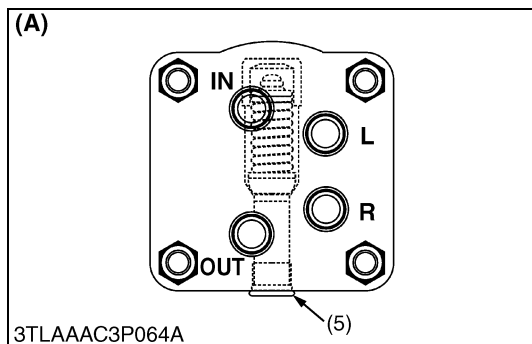
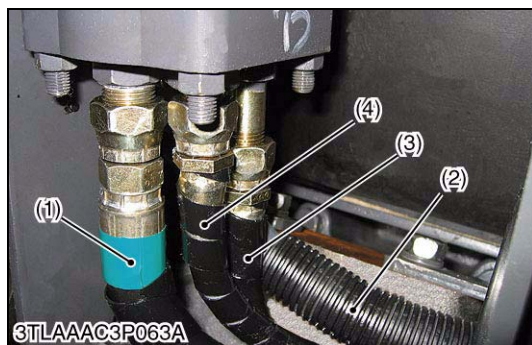
1. Disconnect **1P** battery connector (1) and remove slow blow fuse boxes (2).
2. Disconnect **2P** connector (3) to alternator and wings (4).
3. Disconnect **1P** connector (5) to Starter motor and **B** terminal (6).
4. Disconnect **1P** connector (7) to engine oil pressure switch, then set aside the wiring harness.

Tightening torque	Starter B terminal mounting nut	7.8 to 9.8 N·m 0.8 to 1.0 kgf·m 5.8 to 7.2 ft-lbs
-------------------	---------------------------------	---

- |                                      |  |
|--------------------------------------|--|
| (1) <b>1P</b> Connector (Battery)    | (5) <b>1P</b> Connector (Starter Motor)              |
| (2) Slow Blow Fuse Box               | (6) <b>B</b> Terminal (Starter)                      |
| (3) <b>2P</b> Connector (Alternator) | (7) <b>1P</b> Connector (Engine Oil Pressure Switch) |
| (4) Wiring (Alternator)              |  |

W1042794





### Hydraulic Pipe

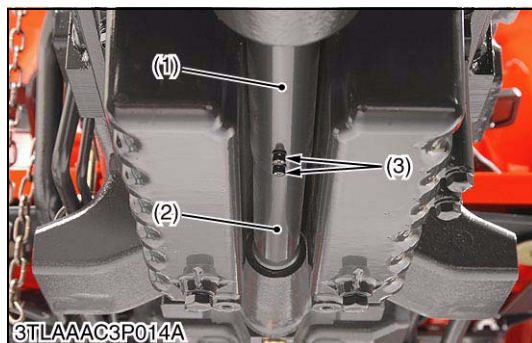
1. Disconnect the right delivery hose (3) and the left delivery hose (4).

Tightening torque	Main delivery hose retaining nut	46.2 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose
- (2) Return Hose
- (3) Right Delivery Hose
- (4) Left Delivery Hose
- (5) Relief Valve Plug (Engine Side)

(A) Steering Controller Viewing from the Bottom

W1043130



### Propeller Shaft (4WD only)

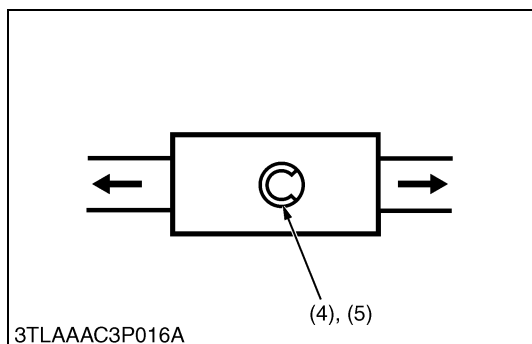
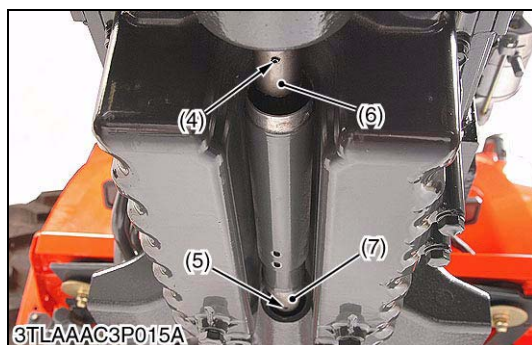
1. Slide propeller shaft front cover (1) and rear cover (2) after removing screws (3).
2. Tap out spring pins (4), (5), slide couplings (6), (7), and then remove propeller shaft together with propeller shaft covers.

#### (When reassembling)

- Apply grease to splines of propeller shaft.
- Tap in spring pin (4), (5) as shown in figure.

- (1) Propeller Shaft Front Cover
- (2) Propeller Shaft Rear Cover
- (3) Screw
- (4) Spring Pin
- (5) Spring Pin
- (6) Coupling
- (7) Coupling

W1043855





### **Separating Engine from Clutch Housing**

1. Place the disassembling stand under the engine and clutch housing case.
2. Remove the steering support plates connecting steering support and rear bonnet support.
3. Remove the engine and clutch housing mounting screws and nuts.
4. Separate the engine and clutch housing.

#### **(When reassembling)**

- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

W1044021



### **Clutch Assembly**

1. Insert the clutch center tool.
2. Remove the clutch assembly together with the clutch center tool.

#### **(When reassembling)**

- Direct the shorter end of the clutch disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch disc boss.
- Insert the pressure plate, noting the position of straight pins.

#### **■ IMPORTANT**

- **Be sure to align the center of disc and flywheel by inserting the clutch tool set.**

#### **■ NOTE**

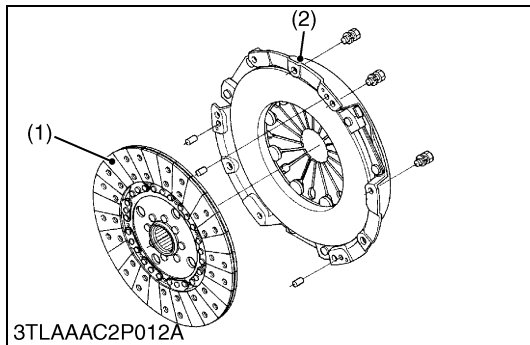
- **Do not allow grease and oil the clutch disc facing.**

Tightening torque	Clutch mounting screws	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	------------------------	---

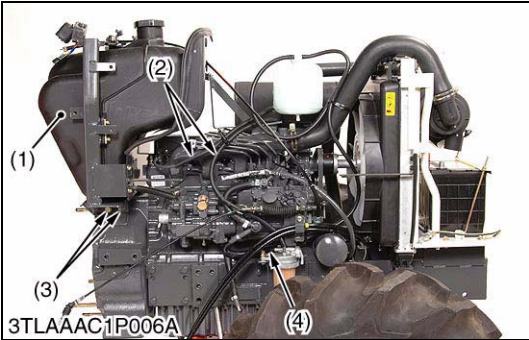
(1) Clutch Disc

(2) Pressure Plate Assembly

W1044164



(2) Separating Engine from Front Axle Frame

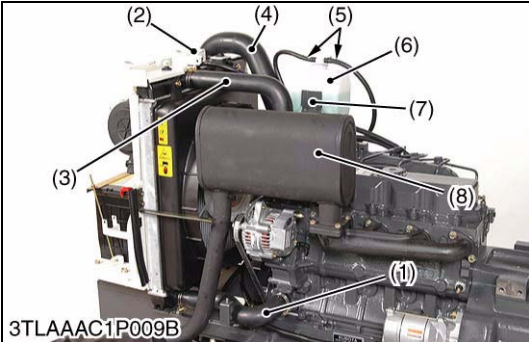
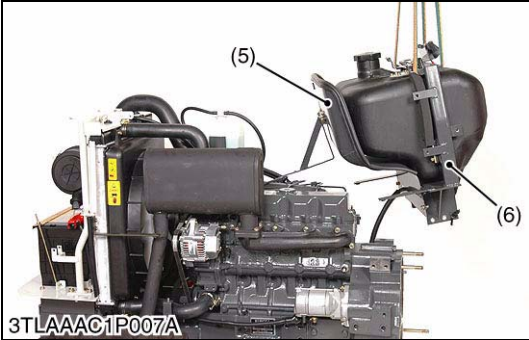


Fuel Tank

- 1. Disconnect the fuel pipe (4) and drain the fuel.
- 2. Disconnect fuel return tubes (2).
- 3. Remove rear bonnet support mounting screws (3) on both sides.
- 4. Remove fuel tank (1) together with rear bonnet support (6) and shutter plate (5).

- (1) Fuel Tank
- (2) Fuel Return Tubes
- (3) Bonnet Support Mounting Screws
- (4) Fuel Tube
- (5) Shutter Plate
- (6) Rear Bonnet Support

W1067362



Radiator Hose, Recovery Tank, Muffler

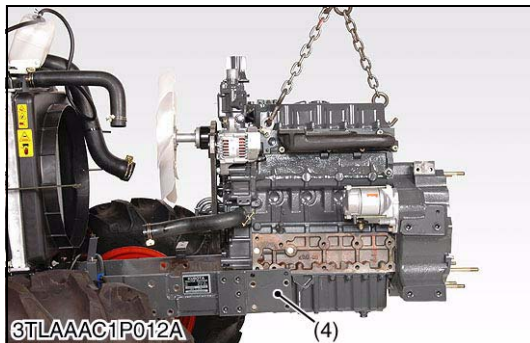
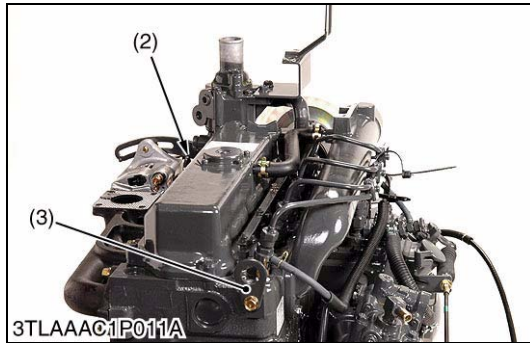
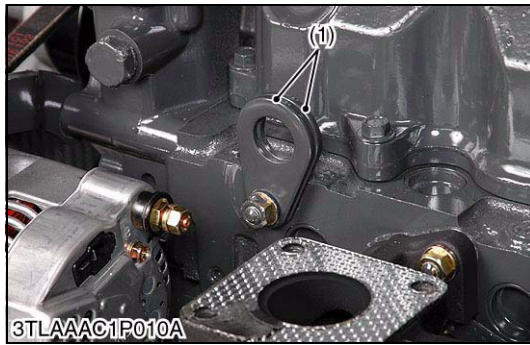
- 1. Disconnect radiator hose (1), (3) and air cleaner hose (4).
- 2. Disconnect recovery tank hoses (5) and then remove recovery tank (6), recovery tank stay (7).
- 3. Remove muffler (8).

(When reassembling)

Tightening torque	Muffler mounting screw	31.4 to 37.2 N·m 3.2 to 4.0 kgf·m 23.1 to 27.5 ft·lbs
-------------------	------------------------	---

- (1) Radiator Hose
- (2) Radiator Cap
- (3) Radiator Hose
- (4) Air Cleaner Hose
- (5) Radiator Tank Hose
- (6) Radiator Tank
- (7) Radiator Tankstay
- (8) Muffler

W23568914



### Separating Engine from Front Axle Frame

1. Remove one of the two engine hooks (1) and mount it on the right rear side of the engine.
2. Hoist the engine by the chain at the engine hook (2), (3).
3. Remove the front axle frame mounting screws.
4. Separate the engine from the front axle frame (4).

#### (When reassembling)

- Remove engine hook (3) and return it to the original position.

Tightening torque	Front axle frame mounting screw (M 10)	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
	Front axle frame mounting screw (M 12)	102.9 to 117.6 N·m 10.5 to 12.5 kgf·m 76.0 to 86.8 ft-lbs

(1) Engine Hook

(2) Engine Hook (Left Side)

(3) Engine Hook (Right Side)

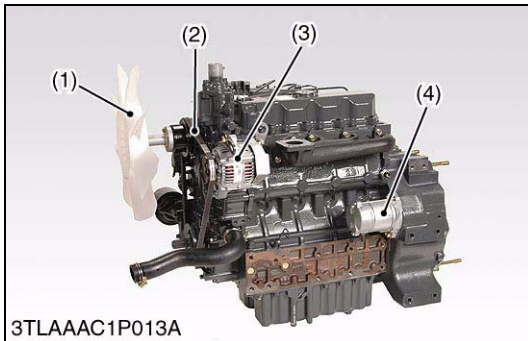
(4) Front Axle Frame

W56897412



## [3] DISASSEMBLING AND ASSEMBLING

### (1) Cylinder Head and Valves



#### External Components

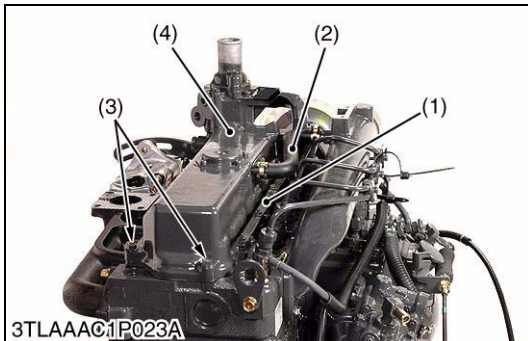
1. Set the engine to the disassembling stand.
2. Remove the cooling fan (1).
3. Remove the alternator (3) and fan belt (2).
4. Remove the starter motor (4).

#### ■ IMPORTANT

- After reassembling the fan belt, be sure to adjust the fan belt tension. (See page 1-S16.)

- |                 |                   |
|-----------------|-------------------|
| (1) Cooling Fan | (3) Alternator    |
| (2) Fan Belt    | (4) Starter Motor |

W1069577



#### Cylinder Head Cover

1. Remove the lead (1).
2. Remove the breather hose (2).
3. Remove the head cover screws (3).
4. Remove the cylinder head cover (4).

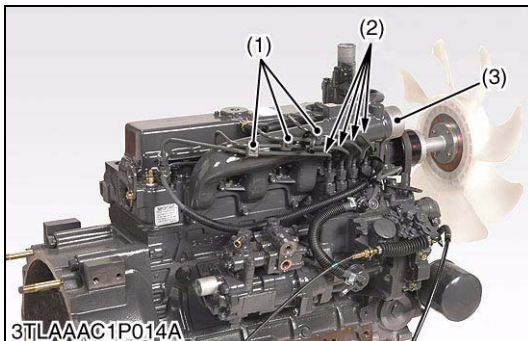
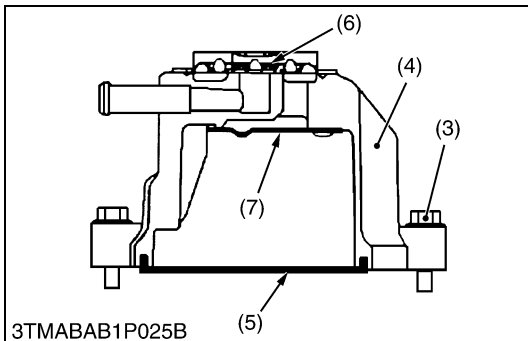
#### (When reassembling)

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

Tightening torque	Cylinder head cover screw	6.9 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.32 ft-lbs
-------------------	---------------------------	--

- |                         |                                |
|-------------------------|--------------------------------|
| (1) Lead                | (5) Cylinder Head Cover Gasket |
| (2) Breather Hose       | (6) Breather Valve             |
| (3) Head Cover Screw    | (7) Plate                      |
| (4) Cylinder Head Cover |                                |

W1028468



#### Injection Pipes

1. Loosen the screws on the pipe clamps (1).
2. Detach the injection pipes (2).
3. Remove the inlet Manifold (3).

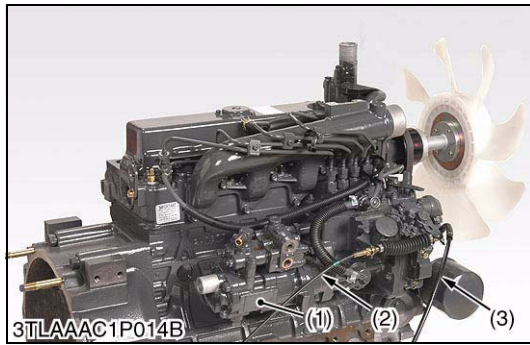
#### (When reassembling)

- Blow out dust inside the pipes.

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
-------------------	------------------------------	---

- |                    |                    |
|--------------------|--------------------|
| (1) Pipe Clamp     | (3) Inlet Manifold |
| (2) Injection Pipe |                    |

W1028640



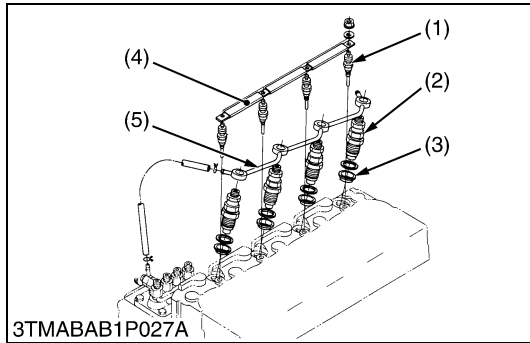
### Hydraulic Pump and Other External Components

1. Remove hydraulic pump mounting screws and detach hydraulic pump (1).
2. Remove accelerator cable (2), hour meter flexible cable (3).

(1) Hydraulic Pump  
(2) Accelerator

(3) Hour Meter Flexible Cable

W1047315



### Nozzle Holder Assembly and Glow Plug

1. Remove the overflow pipe assembly (5).
2. Remove the nozzle holder assemblies (2) using a 21 mm deep socket wrench.
3. Remove the copper gasket and heat seal (3).
4. Remove the glow plugs (1).

#### (When reassembling)

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

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

(1) Glow Plug

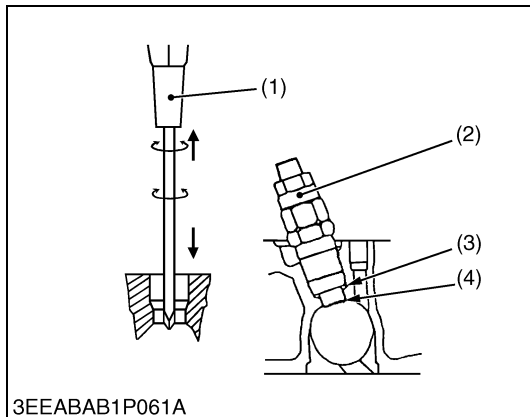
(2) Nozzle Holder Assembly

(3) Heat Seal

(4) Lead

(5) Overflow Pipe Assembly

W1024604



### Nozzle Heat Seal Service Removal Procedure

#### ■ IMPORTANT

- Use a plus (phillips head) screw driver (1) that has a Dia. which is bigger than the heat seal hole (Approx. 6 mm) 1/4 in.

1. Drove screw driver (1) lightly into the heat seal hole.
2. Turn screw driver three or four times each way.
3. While turning the screw driver, slowly pull the heat seal (4) out together with the copper gasket (3).
4. If the heat seal drops, repeat the above procedure.

#### (When reassembling)

- Heat seal and copper gasket must be changed when the injection nozzle is removed for cleaning or for service.

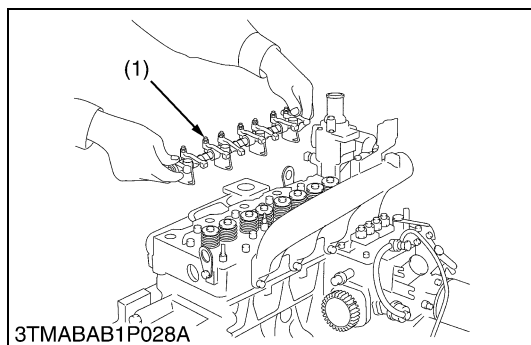
(1) Plus Screw Driver

(2) Nozzle Holder

(3) Copper Gasket

(4) Heat Seal

W1021255



### Rocker Arm and Push Rod

1. Remove the rocker arm bracket nuts.
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 grooves.

#### ■ IMPORTANT

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

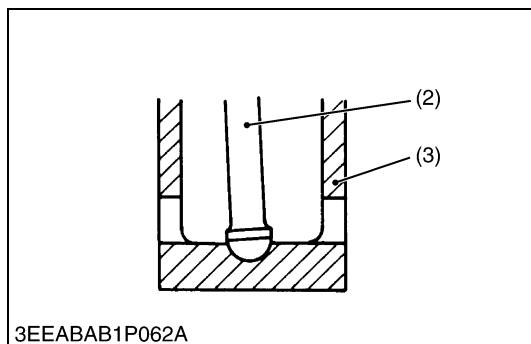
Tightening torque	Rocker arm bracket screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	--------------------------	---

(1) Rocker Arm Assembly

(2) Push Rod

(3) Tappet

W1021437



### Cylinder Head

1. Loosen the pipe clamp, and remove the water return pipe (1).
2. Remove the cylinder head screw in the order of (18) to (1).
3. Lift up the cylinder head (3) to detach.
4. Remove the cylinder head gasket.

#### (When reassembling)

- Replace the cylinder head gasket with a new one.
- Tighten the cylinder head screws after applying sufficient oil.
- Tighten the cylinder head screws in diagonal sequence starting from the center.
- Tighten them uniformly, or the head may deform in the long run.

Tightening torque	Cylinder head screw	93.1 to 98.0 N·m 9.5 to 10.0 kgf·m 68.7 to 72.3 ft-lbs
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(1) Return Pipe

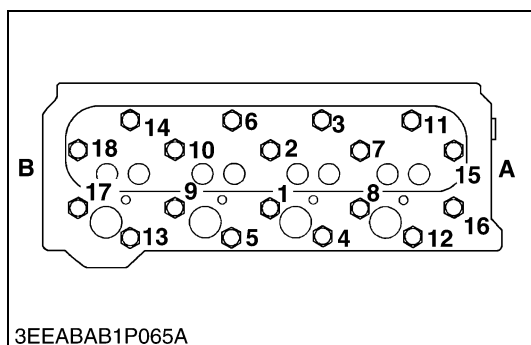
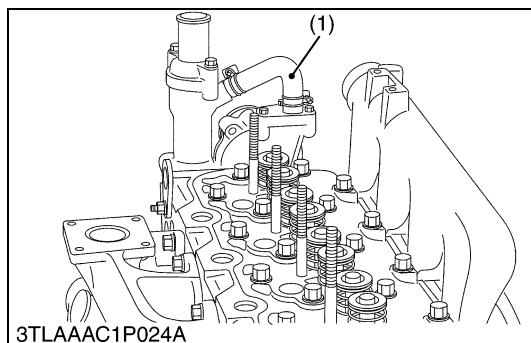
(18) to (1) : To Loosen

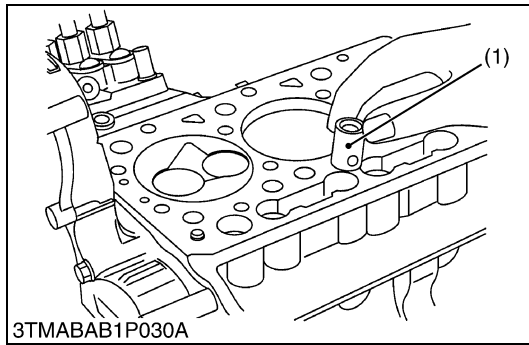
(1) to (18) : To Tighten

A : Gear Case Side

B : Flywheel Side

W1025645





### Tappets

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

#### **(When reassembling)**

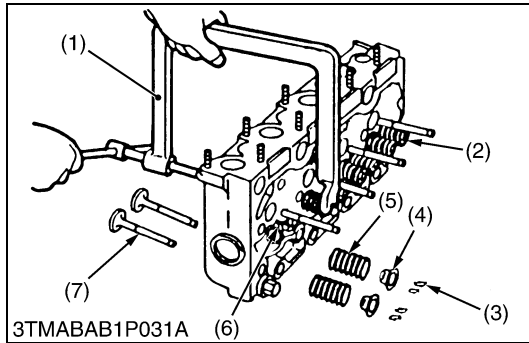
- Visually check the contact between tappets and cams for proper rotation. If defect is found, replace tappets.
- Before installing the tappets, apply engine oil thinly around them.

#### ■ **IMPORTANT**

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

(1) Tappet

W10209700



### 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

(2) Valve Cap

(3) Valve Spring Collet

(4) Valve Spring Retainer

(5) Valve Spring

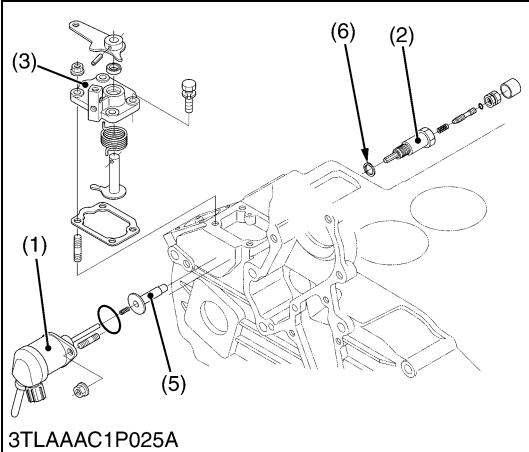
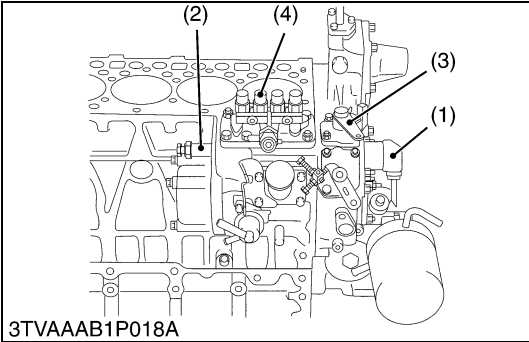
(6) Valve Stem Seal

(7) Valve

W10211070



(2) Timing Gears, Camshaft and Fuel Camshaft



Injection Pump

1. Remove the stop solenoid (1) and hi-idling body (2).
2. Remove the engine stop lever (3) and stop solenoid guide (5).
3. Remove the fuel injection pump assembly (4).

■ IMPORTANT

- Before removing the injection pump assembly (4), be sure to remove the stop solenoid (1), hi-idling body (2), engine stop lever (3) and stop solenoid guide (5).

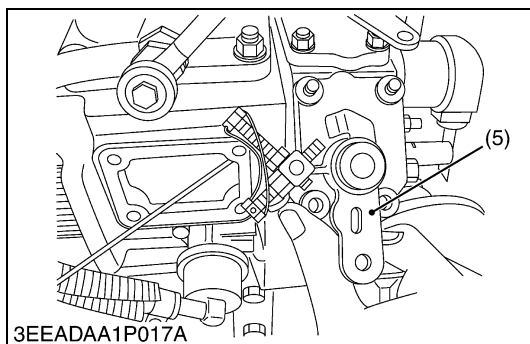
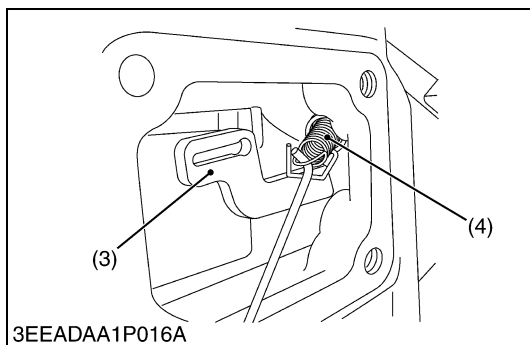
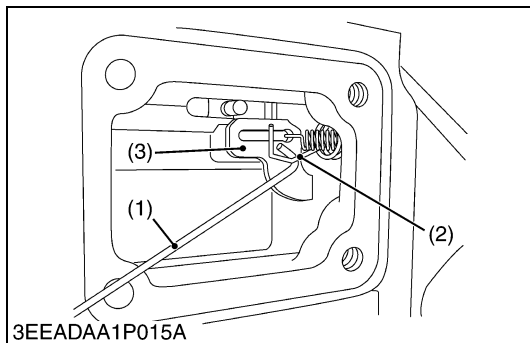
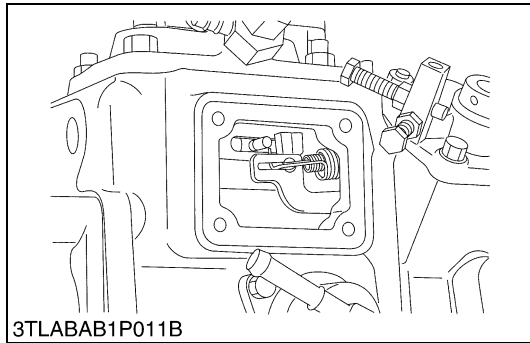
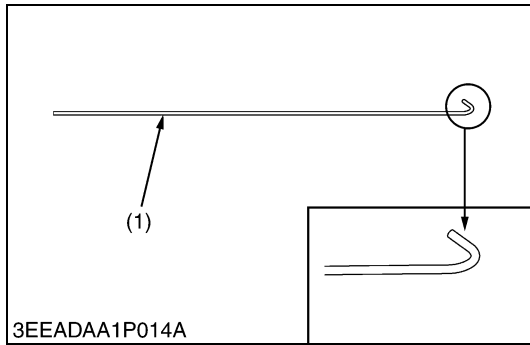
(When reassembling)

- Before attaching the stop solenoid (1), hi-idling body (2) and solenoid guide (5), install the injection pump first into position.
- Replace the hi-idling body gasket (6) with a new one.
- Before fitting the stop lever (3) to the gear case, install the solenoid guide (5) first into position. Then attach the stop lever and use it to see if it functions well.
- Before fitting the idling limiter in place, attach the solenoid guide (5) and the engine stop lever (3) in their respective positions.
- When installing the stop solenoid (1), be careful to keep the O-ring in place.
- Be sure to insert the push rod of the stop solenoid into the hole at the center of the solenoid guide (5).

Tightening torque	Hi-idling body	44.1 to 49.0 N·m 4.5 to 5.0 kgf·m 32.6 to 36.2 ft-lbs
-------------------	----------------	---

- |                    |                             |
|--------------------|-----------------------------|
| (1) Stop Solenoid  | (4) Injection Pump Assembly |
| (2) Hi-idling Body | (5) Stop Solenoid Guide     |
| (3) Stop Lever     | (6) Hi-idling Body Gasket   |

W1070522



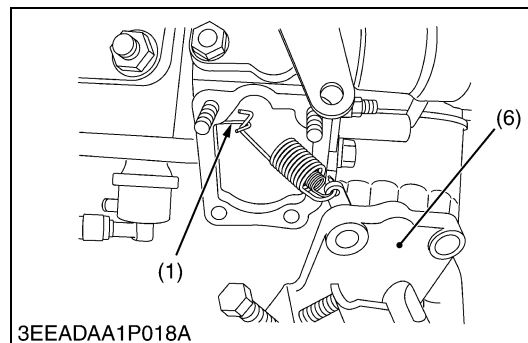
### Governor Springs and Speed Control Plate

#### NOTE

- Specific tool (1) :  
1.2 mm diameter hard wire with its end hooked, overall length 200 mm (7.87 in.)

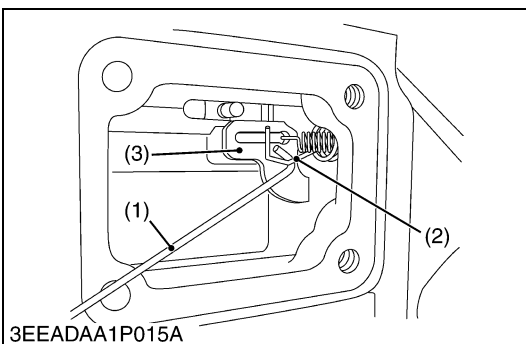
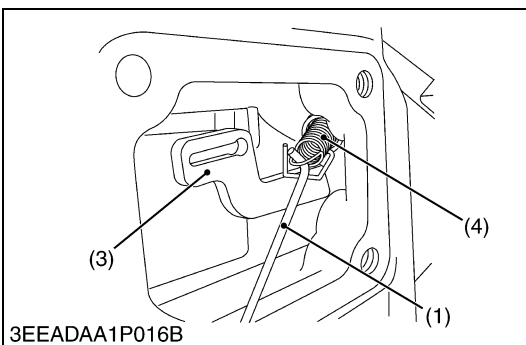
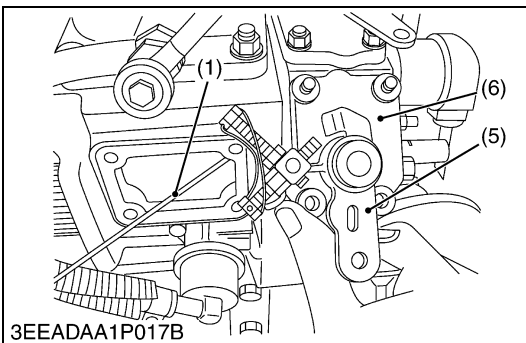
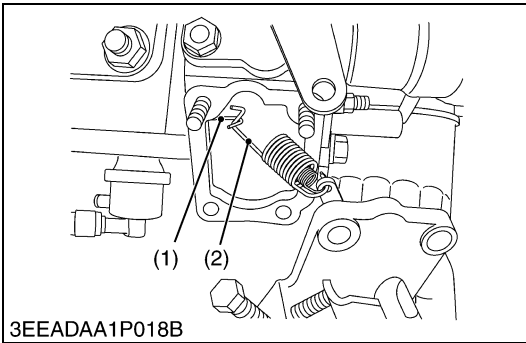
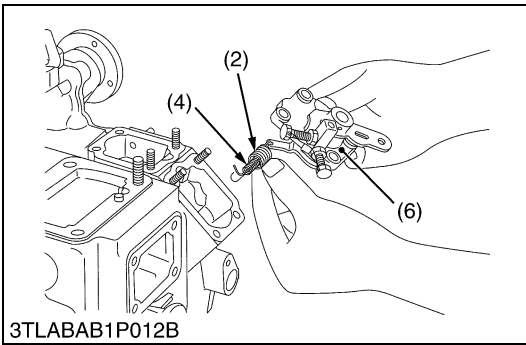
The tip of wire is bent like the hook to hang governor springs.

1. Remove the injection pump cover.
2. Remove the speed control plate (6) mounting nuts and bolts.
3. Using the specific tool (1), undo the large governor spring (2) from the fork lever (3).
4. Using the specific tool (1), undo the small governor spring (4) from the fork lever (3).
5. Set the speed control lever (5) as shown in the figure.
6. Take out the speed control plate (6) with care not to let the large (2) and small (4) governor springs come off this plate and fall into the gear case.



- |                           |                           |
|---------------------------|---------------------------|
| (1) Specific Tool         | (4) Small Governor Spring |
| (2) Large Governor Spring | (5) Speed Control Lever   |
| (3) Fork Lever            | (6) Speed Control Plate   |

W1081350



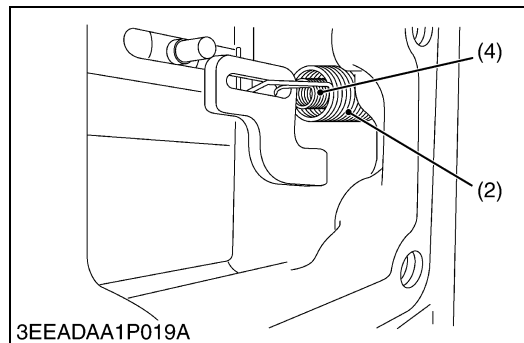
### Governor Springs and Speed Control Plate (Continued)

#### (When reassembling)

- Hook the small spring (4) first and then the large governor spring (2) on the speed control plate (6).
- Put the specific tool (1) from the injection pump side to catch the large governor spring (2). Keep this spring slightly extended and place the speed control plate (6) in its specified position.
- Using the specific tool (1), hook the small governor spring (4) onto the fork lever (3).

#### ■ NOTE

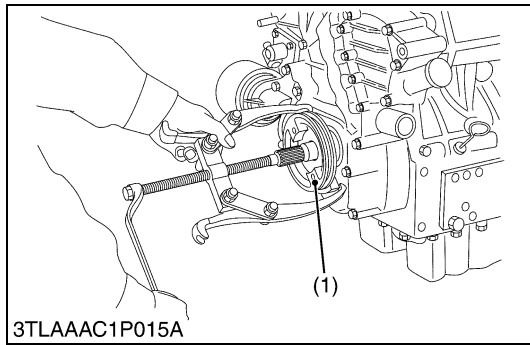
- Be careful not to stretch the small governor spring (4) too long because otherwise it may get deformed permanently.
- Using the specific tool (1), hook the large governor spring (2) onto the fork lever (3).
- Make sure both the governor springs (2), (4) are tight on the fork lever (3).
- Apply and tighten up the two bolts and two nuts on the speed control plate (6).
- Check that the speed control lever (5) positions low idle, after assembling governor springs.
- Check that the speed control lever (5) returns to the high idle position rather than the low idle position, after moving the lever to the maximum speed position.
- Finally attach the injection pump cover in position.



- (1) Specific Tool
- (2) Large Governor Spring
- (3) Fork Lever

- (4) Small Governor Spring
- (5) Speed Control Lever
- (6) Speed Control Plate

W1051665



### Fan Drive Pulley

1. Remove the crankshaft nut.
2. Draw out the fan drive pulley (1) with a puller.

#### (When reassembling)

- Do not tighten the nut excessively, it may damage the oil slinger, causing oil leakage.
- Apply engine oil to the crankshaft nut. And tighten it.

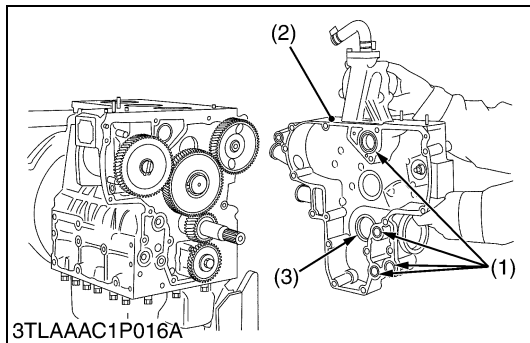
Tightening torque	Fan drive pulley mounting nut	137.3 to 156.9 N·m 14.0 to 16.0 kgf·m 101.3 to 115.7 ft-lbs
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### ■ IMPORTANT

- Install the fan drive pulley to the crankshaft, aligning the marks on them.

(1) Fan Drive Pulley

W659873210



### Gear Case

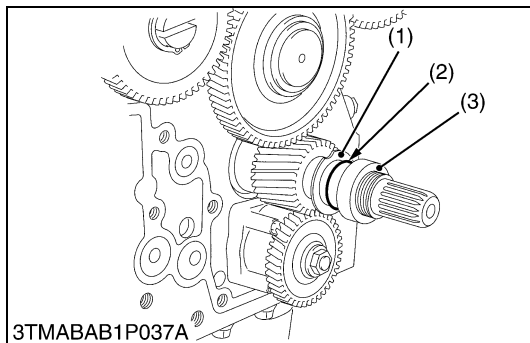
1. Remove the hour meter gear case.
2. Remove the gear case (2).
3. Remove the O-rings (1).

#### (When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) to both sides of hour meter gear case gasket.
- Check to see if there are four O-rings (1) inside the gear case (2).
- Apply a thin film of engine oil to the oil seal (3), and install it, noting the lip come off.
- Before installing the gear case gasket, apply a non-drying adhesive.

(1) O-ring  
(2) Gear Case

(3) Oil Seal



### Crankshaft Oil Slinger

1. Remove the crankshaft collar (3).
2. Remove the O-ring (2).
3. Detach the crankshaft oil slinger (1).

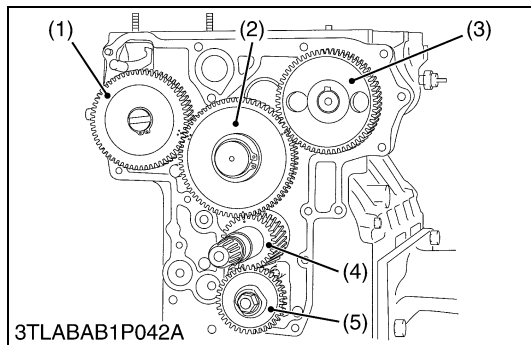
#### (When reassembling)

- Insert the crankshaft collar (3) after install the gear case to cylinder body.

(1) Crankshaft Oil Slinger  
(2) O-ring

(3) Crankshaft Collar

W1081429

**Idle Gear**

1. Remove the external snap ring.
2. Detach the idle gear collar.
3. Detach the idle gear (2).

**(When reassembling)**

- Check to see each gear is aligned with its aligning mark.
  - Idle gear (2) and crank gear (4).
  - Idle gear (2) and camshaft gear (3).
  - Idle gear (2) and injection pump gear (1).

(1) Injection Pump Gear

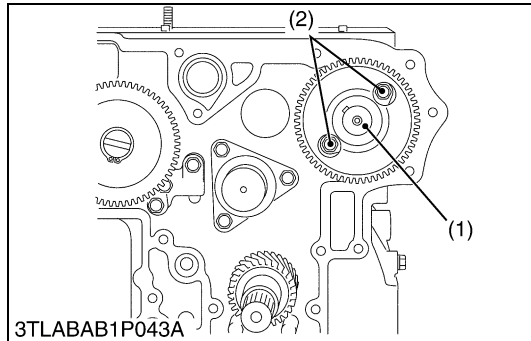
(4) Crank Gear

(2) Idle Gear

(5) Oil Pump Drive Gear

(3) Cam Gear

W1081507

**Camshaft**

1. Remove the camshaft set screws (2) and draw out the camshaft (1).

**(When reassembling)**

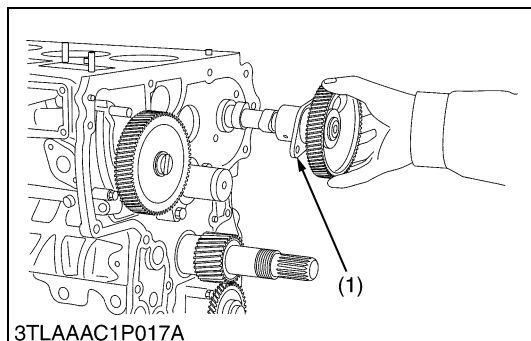
- When installing the idle gear, be sure to align the alignment marks on gears.

Tightening torque	Camshaft set screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft·lbs
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(1) Camshaft

(2) Camshaft Set Screw

W1030808

**Gear and Camshaft**

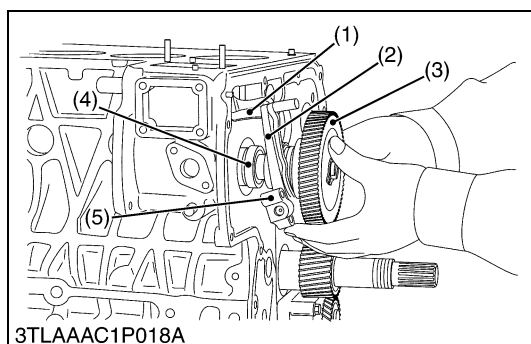
1. Remove the crankshaft stopper mounting screws.
2. Draw out the camshaft and the cam gear.

**(When reassembling)**

- Apply a thin film of engine oil to the camshaft before installation.

(1) Camshaft Stopper

W1053936

**Fuel Camshaft and Fork Lever Assembly**

1. Remove the external snap ring.
2. Detach the hydraulic pump drive gear.
3. Remove the fuel camshaft stopper.
4. Remove the three fork lever holder mounting screws.
5. Draw out the fuel camshaft assembly (3), (4) and fork lever assembly (1), (2), (5) at the same time.

**(When reassembling)**

- After installation, check to see that the fork lever 1 (1) and 2 (2) are fixed to the fork lever shaft, and that they can turn smoothly in the holder (5).

(1) Fork Lever 1

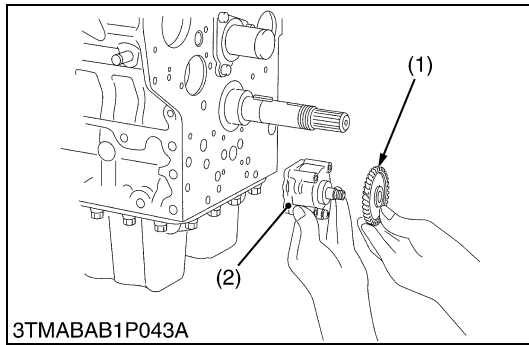
(4) Fuel Camshaft

(2) Fork Lever 2

(5) Fork Lever Holder

(3) Injection Pump Gear

W10178820



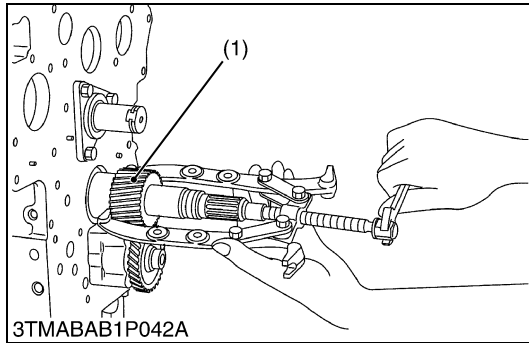
### Oil Pump

1. Remove the oil pump drive gear mounting nut, and draw out the oil pump drive gear (1) with a puller.
2. Remove the four oil pump mounting screws.
3. Detach the oil pump (2).

(1) Pump Drive Gear

(2) Oil Pump

W10180290



### Crank Gear

1. Loosen the oil pump drive gear mounting nut.
2. Draw out the crank gear (1) with a puller.
3. Remove the feather key on the crankshaft.

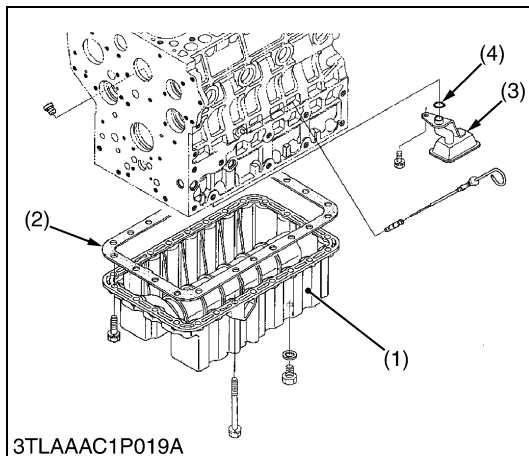
#### (When reassembling)

- Check to see that the feather key on the crankshaft. Heat the crank gear to approx. 80 °C (176 °F), and fit on the crankshaft.

(1) Crank Gear

W1081584

## (3) Piston and Connecting Rod



### Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws.
2. Remove the oil pan (1) by lightly tapping the rim of the pan with a wooden hammer.
3. Remove the oil pan gasket (2).
4. Remove the oil strainer (3) and O-ring.

#### (When reassembling)

- After cleaning the oil strainer (3), check to see that the filter mesh is clean, and install it.
- Visually check the O-ring (4), apply engine oil, and install it.
- Securely fit the O-ring (4) to the oil strainer (3).
- Apply a liquid gasket (Three Bond 1215 or equivalent) to the oil pan side of the oil pan gasket (2).
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order from the center.

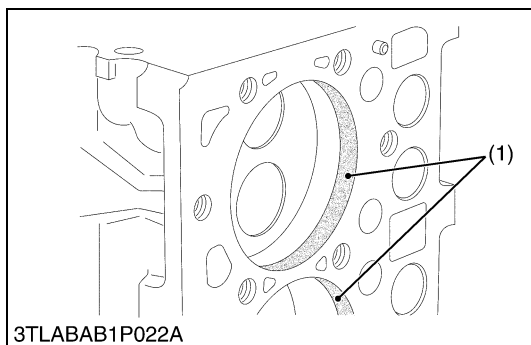
(1) Oil Pan

(3) Oil Strainer

(2) Oil Pan Gasket

(4) O-ring

W1086664



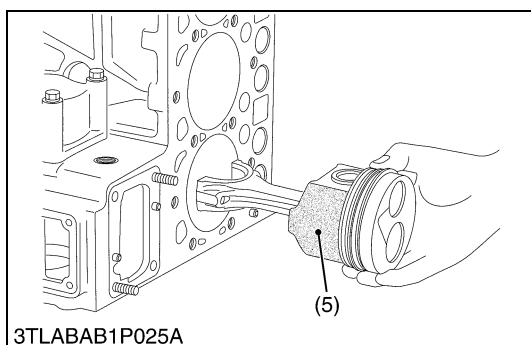
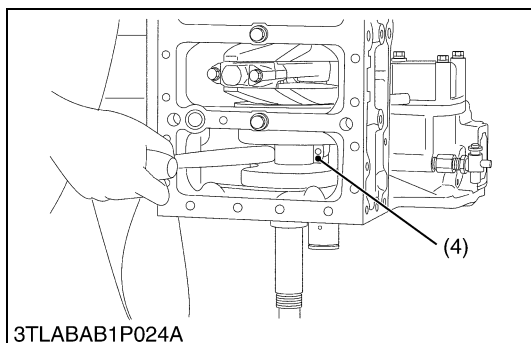
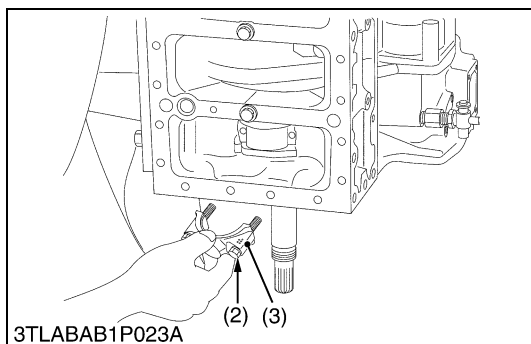
### Pistons

1. Completely clean carbon (1) from the cylinders.
2. Remove the connecting rod cap (3).
3. Turn the flywheel and bring the piston to top dead center.
4. Draw out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.
5. Draw out the other piston in the same method as above.

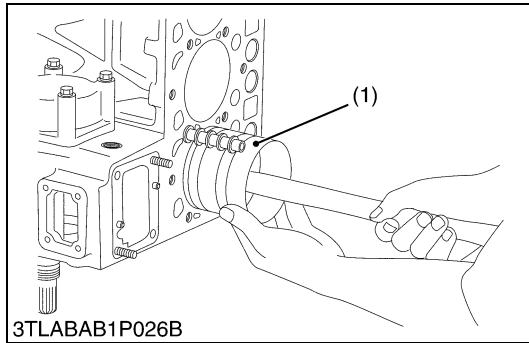
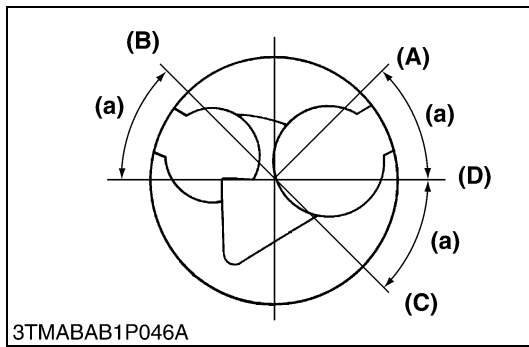
- (1) Carbon  
 (2) Connecting Rod Screw  
 (3) Connecting Rod Cap

- (4) Connecting Rod  
 (5) Molybdenum Disulfide Coating in  
 Piston Skirt

W10547370







### Pistons (Continued)

#### (When reassembling)

- Before inserting 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.
- Place the piston rings with their gaps at 0.785 rad (45°) from the piston pin's direction as shown in the figure.
- Carefully insert the pistons using a piston ring compressor (1).
- When inserting the piston in place, be careful not to get the molybdenum disulfide coating torn off its skirt. This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.

Tightening torque	Connecting rod screw	44.1 to 49.0 N·m 4.5 to 5.0 kgf·m 32.5 to 36.2 ft-lbs
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(1) Piston Ring Compressor

(C) Oil Ring Gap

(D) Piston Pin Hole

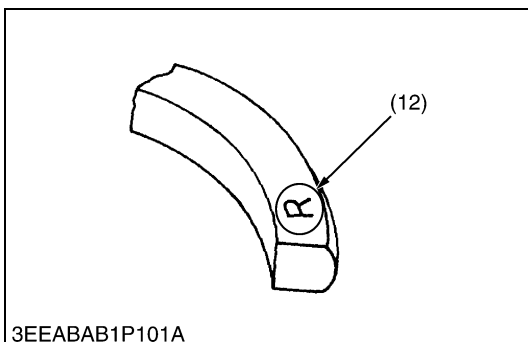
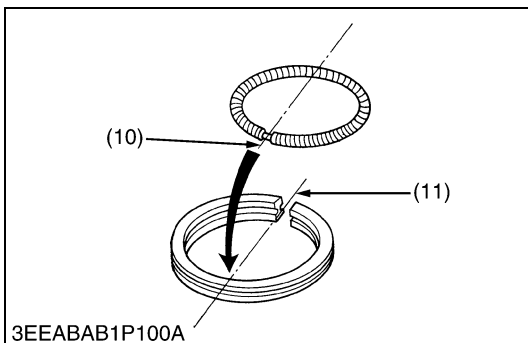
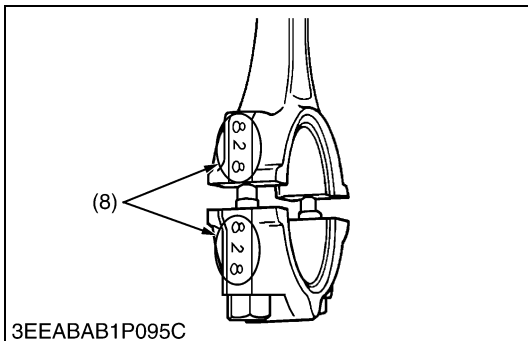
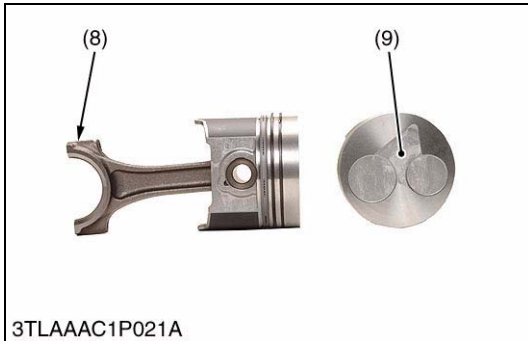
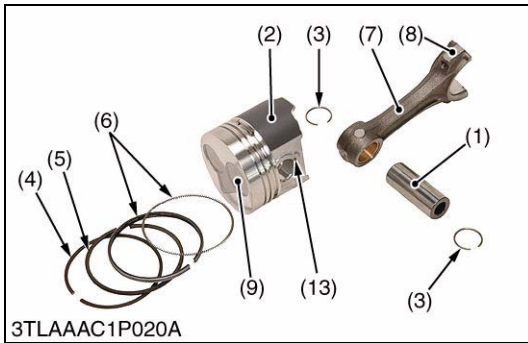
(A) Top Ring Gap

(B) Second Ring Gap

(a) 0.79 rad (45°)

W10277450





### Piston Ring and Connecting Rod

1. Remove the piston rings (4), (5), (6) using a piston ring tool (Code No. 07909-32121).
2. Place the tip of a small straight edge screwdriver at the piston hollow (13), compress the piston pin snap ring (3) in the radial direction and then remove the piston snap ring.
3. Remove the piston pin (1), and separate the connecting rod (7) from the piston (2).

#### (When reassembling)

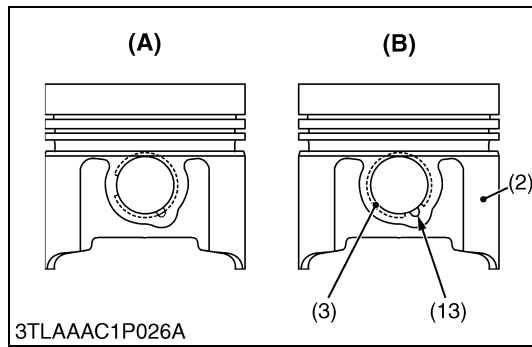
- When installing the rings, assemble the rings so that the manufacturer's mark (12) near the gap faces the top of the piston (2).
- When installing the oil ring (6) onto the piston (2), place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin.
- When installing the piston pin (1), immerse the piston (2) in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin (1) to the piston (2).
- When installing the connecting rod (7) to the piston (2), align the mark (8) on the connecting rod (7) to the fan-shaped concave (9).

#### ■ NOTE

- **Mark the same number on the connecting rod (7) and the piston (2) so as not to change the combination.**

- |                          |                          |
|--------------------------|--------------------------|
| (1) Piston Pin           | (7) Connecting Rod       |
| (2) Piston               | (8) Mark                 |
| (3) Piston Pin Snap Ring | (9) Fan-Shaped Concave   |
| (4) Top Ring             | (10) Expander Joint      |
| (5) Second Ring          | (11) Oil Ring Gap        |
| (6) Oil Ring             | (12) Manufacturer's Mark |
|                          | (13) Piston Hollow       |

W10281670



### Piston Ring and Connecting Rod

#### ■ NOTE

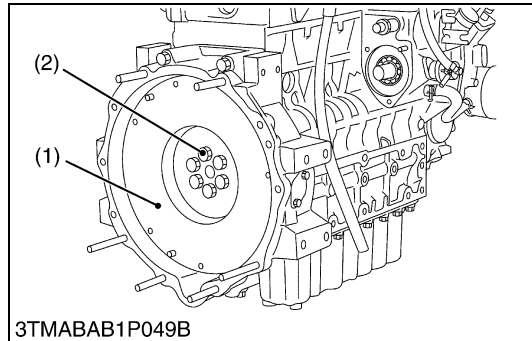
- Be sure not to position the gap of piston pin snap ring (3) facing the piston hollow (13).
- Use new piston pin snap rings when reassembling.

(2) Piston  
(3) Piston Pin Snap Ring  
(13) Piston Hollow

(A) Good  
(B) No Good

W10592170

### (4) Crankshaft



### Flywheel

1. Fit the stopper to the flywheel (1).
2. Remove the all flywheel screws (2).
3. Remove the flywheel (1) slowly.

#### **(When reassembling)**

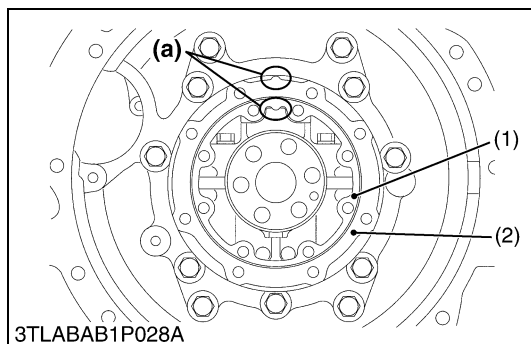
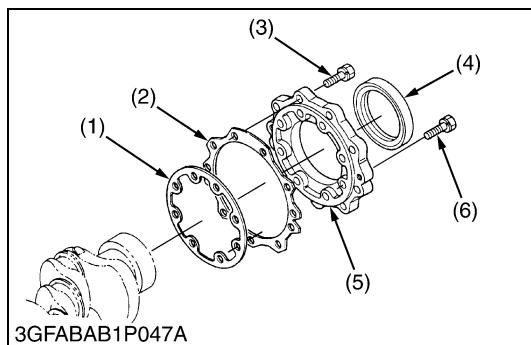
- Insert two pieces of the flywheel guide screws.
- Check to see that there are no metal particles left on the flywheel mounting surfaces.
- Apply engine oil to the threads and the undercut surface of the flywheel bolt and fit the bolt.

Tightening torque	Flywheel screw	98.0 to 107.8 N·m 10.0 to 11.0 kgf·m 72.3 to 79.5 ft-lbs
-------------------	----------------	--

(1) Flywheel

(2) Flywheel Screw

W1030810



### Bearing Case Cover

1. Remove the bearing case cover mounting screws. First, remove inside screws (6) and then outside screws (3).
2. Screw two removed screws into the screw hole of bearing case cover (5) to remove it.

#### ■ IMPORTANT

- The length of inside screws (6) and outside screws (3) are different. Do not take a mistake using inside screws and outside screws.

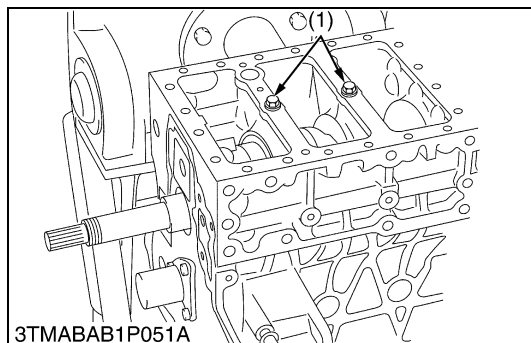
#### (When reassembling)

- Fit the bearing case gasket (1) and the bearing case cover gasket (2) with correct directions.
- Install the bearing case cover (5) to position the casting mark "UP" on it upward.
- Apply engine oil to the oil seal 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	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft·lbs
-------------------	-----------------------------------	---

- |                                       |                                       |
|---------------------------------------|---------------------------------------|
| (1) Bearing Case Gasket               | (5) Bearing Case Cover                |
| (2) Bearing Case Cover Gasket         | (6) Bearing Case Cover Mounting Screw |
| (3) Bearing Case Cover Mounting Screw |                                       |
| (4) Oil Seal                          | (a) Upside                            |

W1031168



### Crankshaft

#### ■ NOTE

- Before disassembling, check the side clearance of crankshaft. Also check it during reassembling.

1. Remove the main bearing case screw 2 (1).
2. Pull out the crankshaft assembly, taking care not to damage the crankshaft bearing 1.

#### (When reassembling)

#### ■ IMPORTANT

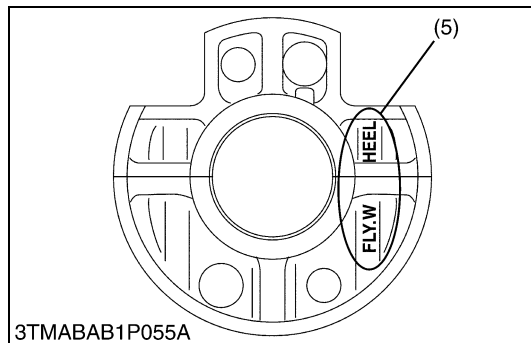
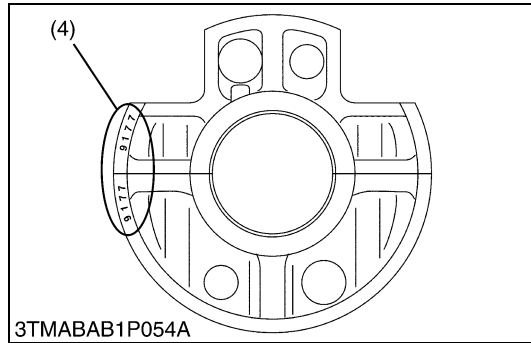
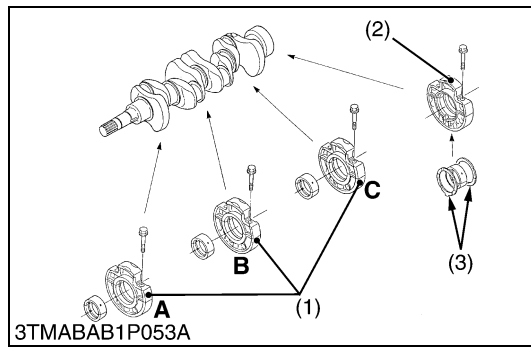
- Install the crankshaft sub assembly, aligning the screw hole of main bearing case 2 with the screw hole of cylinder block.
- When tightening the main bearing case screw 2, apply oil to the screw and screw by hand before tightening the specific torque.

If not smooth to screw by hand, align the screw holes between the cylinder block and the main bearing case.

Tightening torque	Main bearing case screw 2	68.6 to 73.5 N·m 7.0 to 7.5 kgf·m 50.6 to 54.2 ft·lbs
-------------------	---------------------------	---

- (1) Main Bearing Case Screw 2

W1099727



### Main Bearing Case Assembly

1. Remove the two main bearing case screws 1, and remove the main bearing case assembly (2) being careful with thrust bearing (3) and crankshaft bearing 2.
2. Remove the main bearing case 1, 2 and 3.

#### (When reassembling)

- Clean the oil passage in the main bearing case.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in the original positions. Since diameters of main bearing cases vary, install them in order of markings (A, B, C) from the gear case side.
- Match the alignment numbers (4) and mark (5) on the main bearing case.
- When installing the main bearing case 1, 2 and 3, face the mark "FLYWHEEL" to the flywheel.
- Install the thrust bearing 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	46.1 to 51.0 N·m 4.7 to 5.2 kgf·m 34.0 to 37.6 ft·lbs
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- (1) Main Bearing Case Assembly 1, 2 and 3  
 (2) Main Bearing Case Assembly  
 (3) Thrust Bearing  
 (4) Alignment Number  
 (5) Alignment Mark

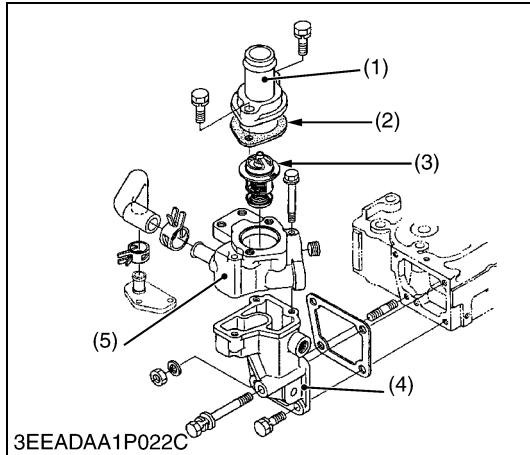
W1034602

## (5) Thermostat



### 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.



### Thermostat Assembly

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

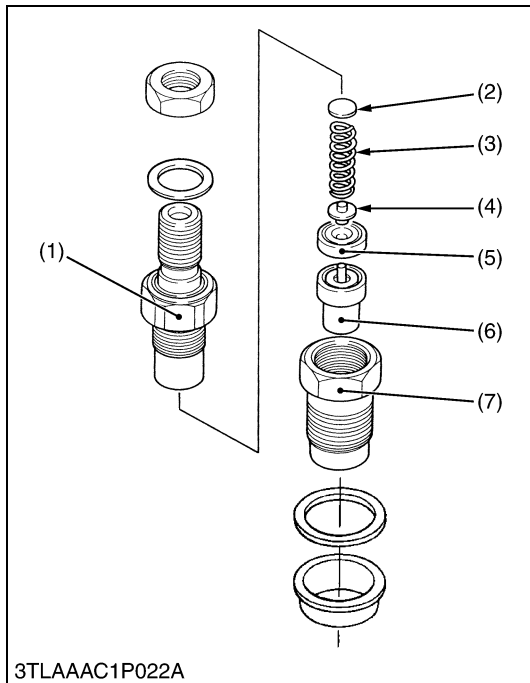
### (When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the thermostat cover gasket (2).
- Apply a liquid gasket (Three Bond 1215 or equivalent) to the thermostat flange 1 and flange 2.

- |                             |                         |
|-----------------------------|-------------------------|
| (1) Thermostat Cover        | (4) Thermostat Flange 1 |
| (2) Thermostat Cover Gasket | (5) Thermostat Flange 2 |
| (3) Thermostat Assembly     |                         |

W1105115

## (6) Injection Nozzle



### Nozzle Holder

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

### (When reassembling)

- Heat seal and copper gasket must be changed when the injection nozzle is removed for cleaning or for service.
- 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.

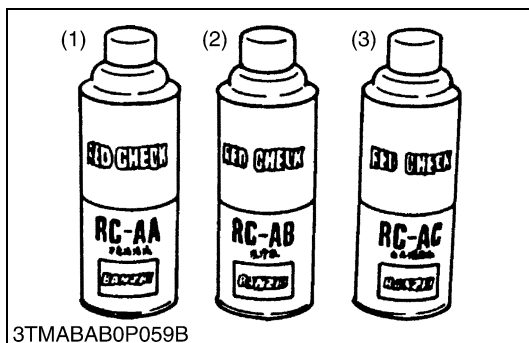
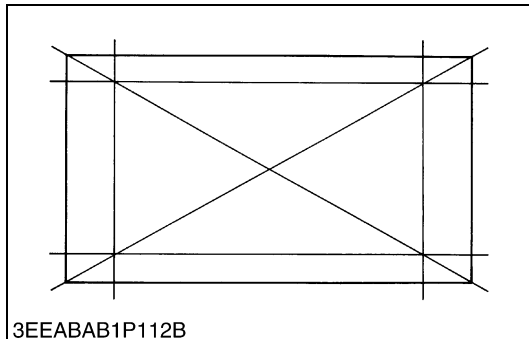
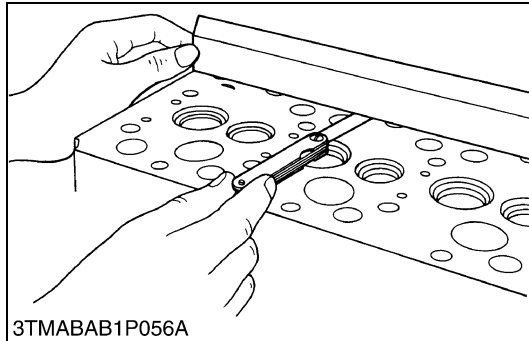
Tightening torque	Nozzle holder	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Overflow pipe nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 ft-lbs
	Nozzle holder assembly	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

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

W14789652

## [4] SERVICING

### (1) Cylinder Head and Valves



#### Cylinder Head Surface Flatness

1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides and two diagonal as shown in the figure.
3. Measure the clearance with a feeler 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.) per 500 mm (19.69 in.)
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W1027737

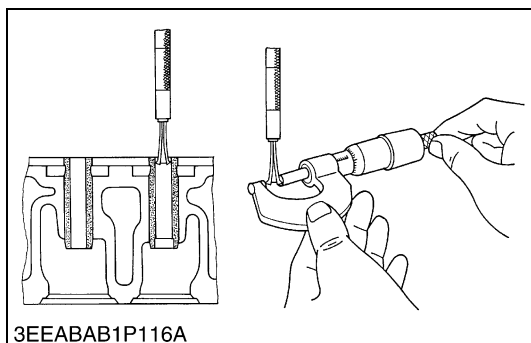
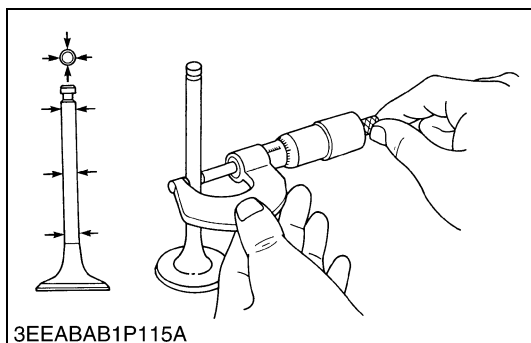
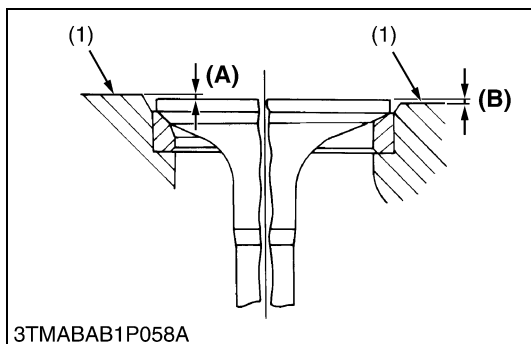
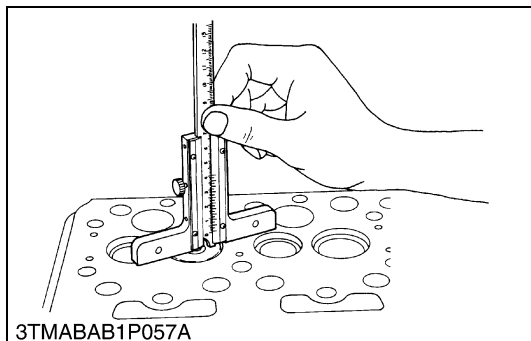
#### Cylinder Head Flaw

1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with 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 white developer (3).
6. If flawed, it can be identified as red marks.

- (1) Red Permeative Liquid  
(2) Detergent

- (3) White Developer

W1076542



### 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	Factory spec.	0.05 (protrusion) to 0.15 (recessing) mm 0.0020 (protrusion) to 0.0059 (recessing) in.
	Allowable limit	0.40 (recessing) mm 0.0157 (recessing) in.

(1) Cylinder Head Surface

(A) Recessing

(B) Protrusion

W10768800

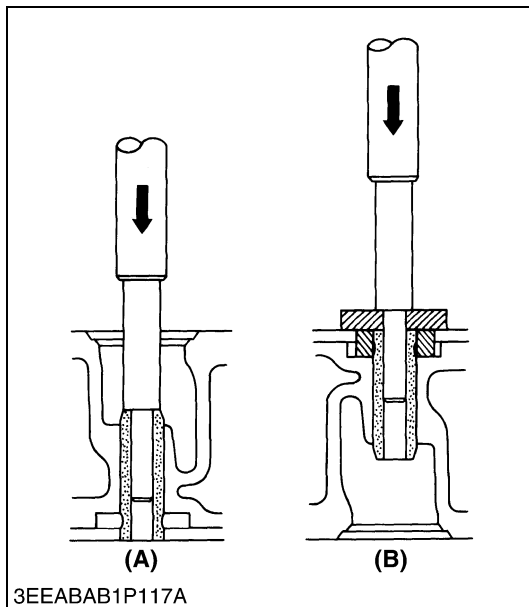
### Clearance between Valve Stem and Valve Guide

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.	0.040 to 0.070 mm 0.00157 to 0.00276 in.
	Allowable limit	0.10 mm 0.0039 in.

Valve stem O.D.	Factory spec.	7.960 to 7.975 mm 0.31339 to 0.31398 in.
Valve guide I.D.	Factory spec.	8.015 to 8.030 mm 0.31555 to 0.31614 in.

W10311740



### 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.	8.015 to 8.030 mm 0.31555 to 0.31614 in.
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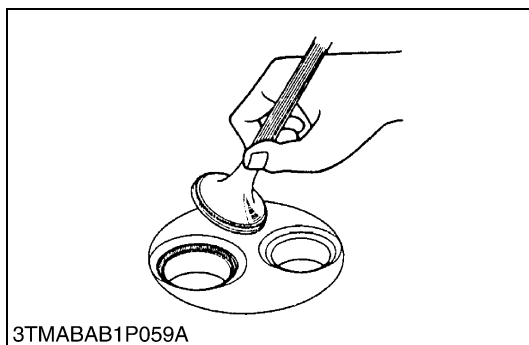
#### ■ IMPORTANT

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

(A) When Removing

(B) When Installing

W10314690



### Valve Seating

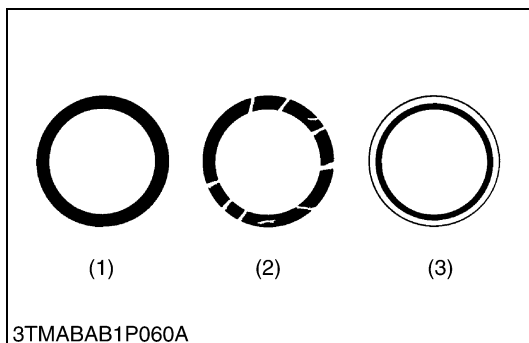
1. Coat the valve face lightly with prussian blue and put the valve on its seat to check the contact.
2. If the valve does not seat all the way around the valve seat or the valve contact is less than 70 %, correct the valve seating as follows.
3. If the valve contact does not comply with the reference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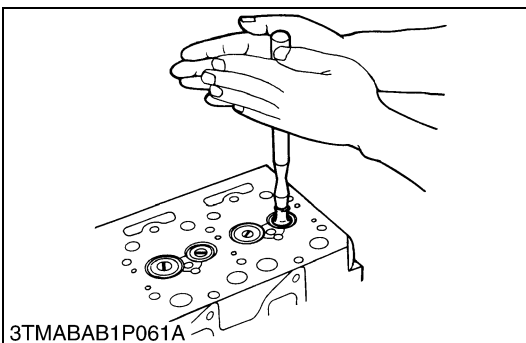
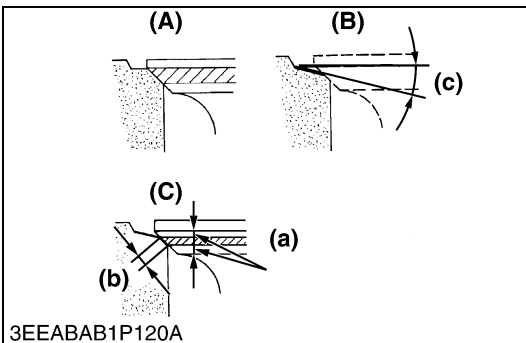
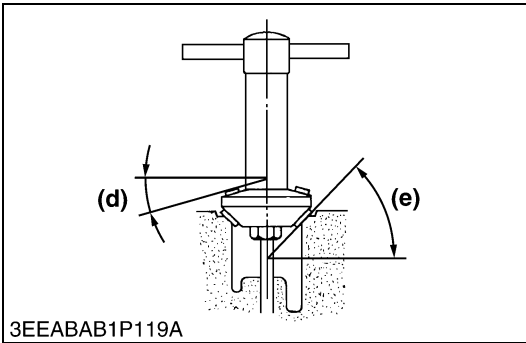
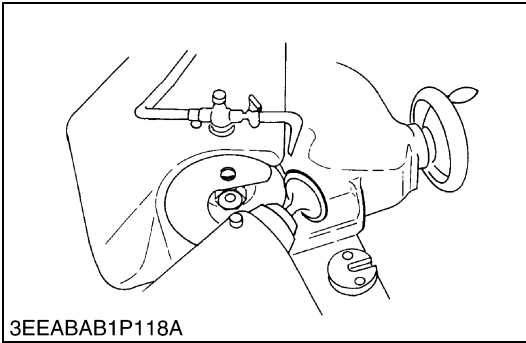
- (1) Correct  
(2) Incorrect

(3) Incorrect

W10282190







### 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.

#### 2) Correcting Valve Seat

1. Slightly correct the seat surface with a 1.047 rad (60 °) (intake valve) or 0.785 rad (45 °) (exhaust valve) seat cutter (Code No. 07909-33102).
2. Resurface the seat surface with a 0.523 rad (30 °) valve seat cutter to intake valve seat and with a 0.262 rad (15 °) valve seat cutter to exhaust valve seat so that the width is close to specified valve seat width (2.12 mm 0.0835 in.).
3. After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with valve lapping tool.
4. Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

(a) Identical Dimensions

A : Check Contact

(b) Valve Seat Width

B : Correct Seat Width

(c) 0.523 rad (30 °) or 0.262 rad (15 °)

C : Check Contact

(d) 0.262 rad (15 °) or 0.523 rad (30 °)

(e) 0.785 rad (45 °) or 1.047 rad (60 °)

W10283500

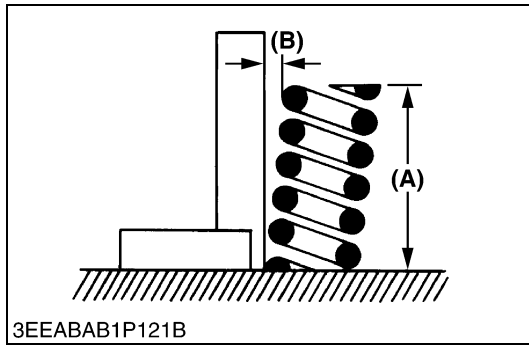
### Valve Lapping

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.

W10288140



### 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.

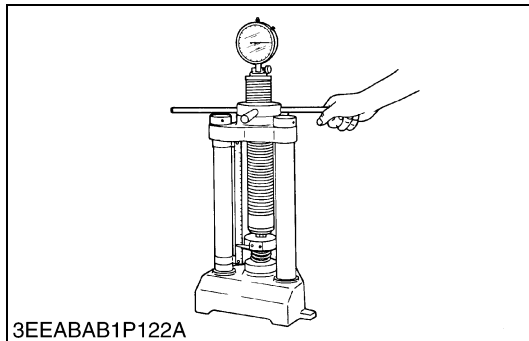
Free length (A)	Factory spec.	41.7 to 42.2 mm 1.6417 to 1.6614 in.
	Allowable limit	41.2 mm 1.6220 in.

Tilt (B)	Allowable limit	1.0 mm 0.039 in.
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(A) Free Length

(B) Tilt

W11157830

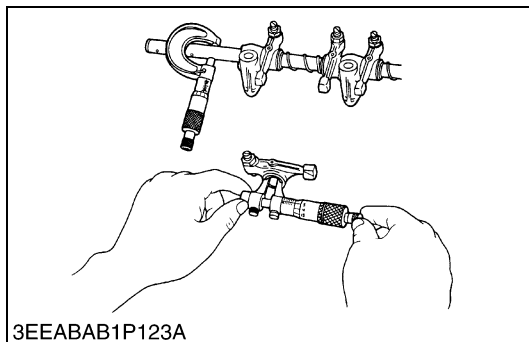


### Valve Spring Setting Load

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.

Setting load / Setting length	Factory spec.	117.6 N / 35.0 mm 12.0 kgf / 35.0 mm 26.4 lbs / 1.3780 in.
	Allowable limit	100 N / 35.0 mm 10.2 kgf / 35.0 mm 22.5 lbs / 1.3780 in.

W11177330



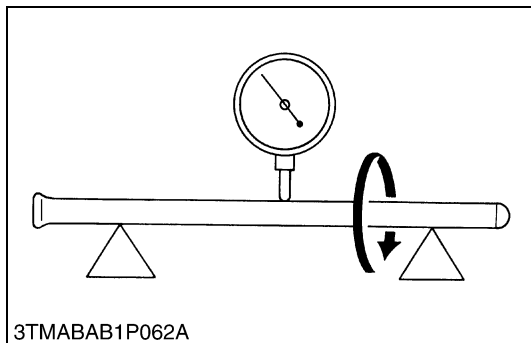
### Oil Clearance between Rocker Arm and Rocker Arm Shaft

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.

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	0.10 mm 0.0039 in.

Rocker arm shaft O.D.	Factory spec.	13.973 to 13.984 mm 0.55012 to 0.55055 in.
Rocker arm I.D.	Factory spec.	14.000 to 14.018 mm 0.55118 to 0.55189 in.

W11199710

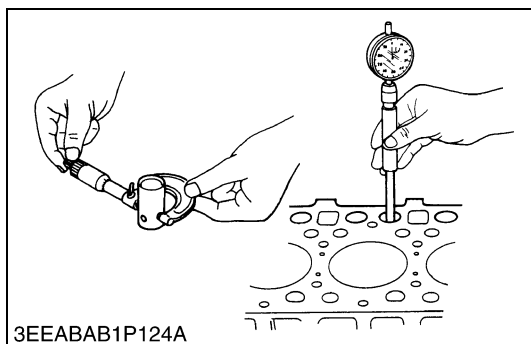


### Push Rod Alignment

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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W11220210



### Oil Clearance between Tappet and Tappet Guide Bore

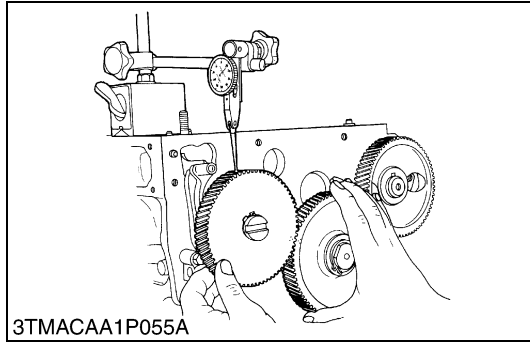
1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil clearance between tappet and tappet guide bore	Factory spec.	0.020 to 0.062 mm 0.00079 to 0.00244 in.
	Allowable limit	0.07 mm 0.0028 in.

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.94327 to 0.94410 in.
Tappet guide bore I.D.	Factory spec.	24.000 to 24.021 mm 0.94488 to 0.94571 in.

W11231410

## (2) Timing Gears, 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 shaft and the gear.
4. If the oil clearance is not correct, replace the gear.

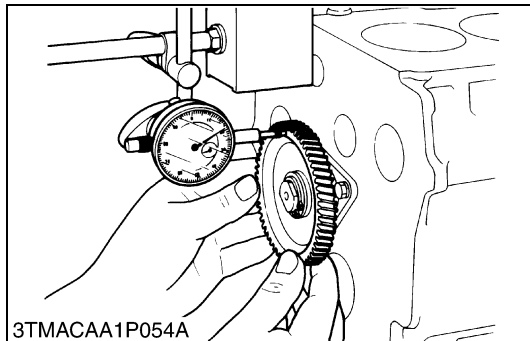
Backlash between idle gear and crank gear	Factory spec.	0.0415 to 0.1122 mm 0.00163 to 0.00442 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and cam gear	Factory spec.	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and injection pump gear	Factory spec.	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between crank gear oil pump gear	Factory spec.	0.0415 to 0.1090 mm 0.00163 to 0.00429 in.
	Allowable limit	0.15 mm 0.0059 in.

W11264830

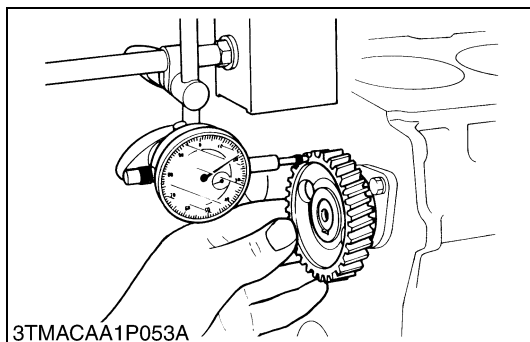


### Idle Gear Side Clearance

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.	0.12 to 0.48 mm 0.0047 to 0.0189 in.
	Allowable limit	0.90 mm 0.0354 in.

W11286770

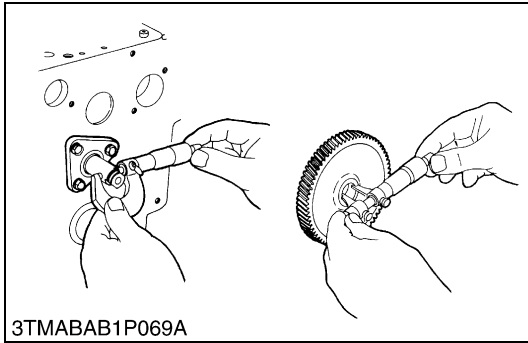


### Camshaft Side Clearance

1. Set a dial indicator with its tip on the cam gear.
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.	0.07 to 0.22 mm 0.0028 to 0.0087 in.
	Allowable limit	0.30 mm 0.0118 in.

W11299720



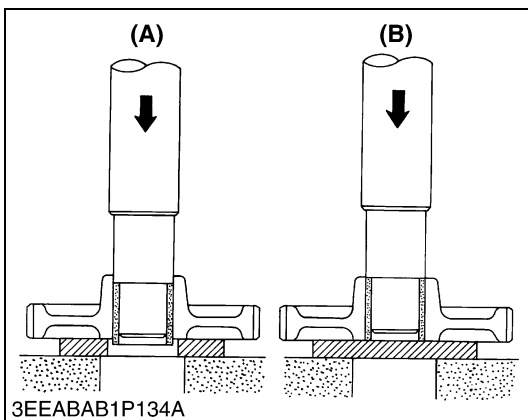
### **Oil Clearance between Idle Gear Shaft and Idle Gear Bushing**

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.	0.025 to 0.066 mm 0.00098 to 0.00260 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear shaft O.D.	Factory spec.	37.959 to 37.975 mm 1.49445 to 1.49508 in.
Idle gear bushing I.D.	Factory spec.	38.000 to 38.025 mm 1.49606 to 1.49705 in.

W11356150



### **Replacing Idle Gear Bushing**

#### **(When removing)**

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

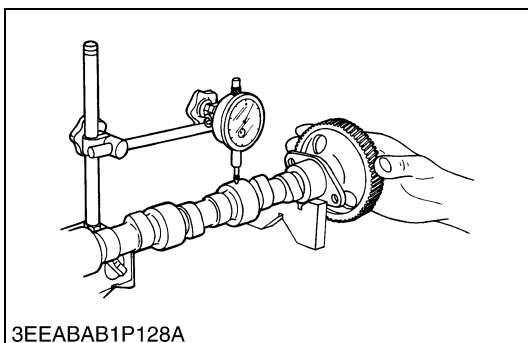
#### **(When installing)**

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

W11373220

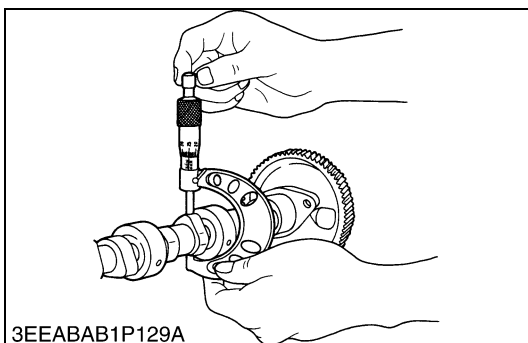


### **Camshaft Alignment**

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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W11312720

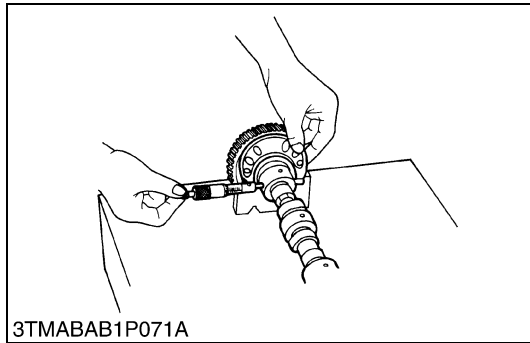
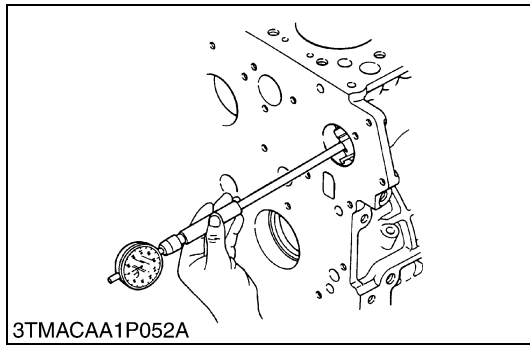


### **Cam Height**

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.	33.90 mm 1.3346 in.
	Allowable limit	33.85 mm 1.3327 in.

W11324040



### **Oil Clearance of Camshaft Journal**

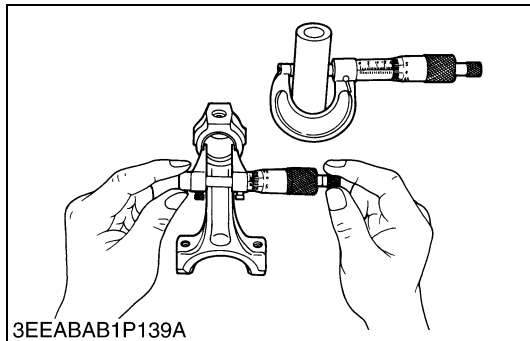
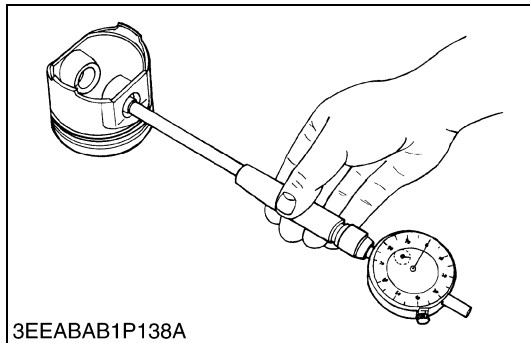
1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the camshaft.

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.	39.934 to 39.950 mm 1.57221 to 1.57284 in.
Camshaft Bearing I.D.	Factory spec.	40.000 to 40.025 mm 1.57480 to 1.57579 in.

W11335580

### **(3) Piston and Connecting Rod**



### **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.	25.000 to 25.013 mm 0.98425 to 0.98476 in.
	Allowable limit	25.05 mm 0.9862 in.

W11406200

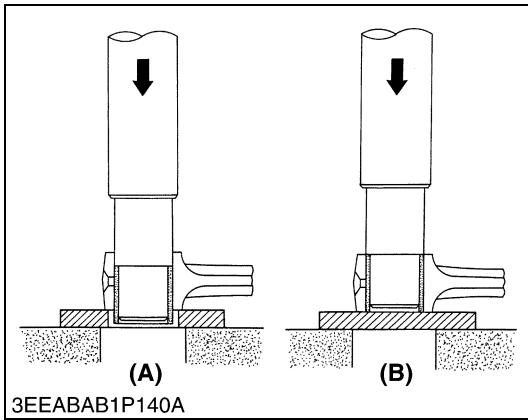
### **Oil Clearance between Piston Pin and Small End Bushing**

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	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	25.002 to 25.011 mm 0.98433 to 0.98469 in.
Small end bushing I.D.	Factory spec.	25.025 to 25.040 mm 0.98524 to 0.98583 in.

W11420110



### Replacing Connecting Rod Small End Bushing

#### (When removing)

1. Press out the small end bushing with a connecting rod small end bushing replacing tool.

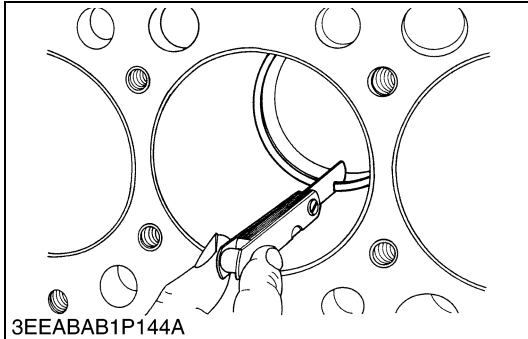
#### (When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Press fit a new bushing, taking due care to see that the connecting rod hole matches the bushing hole.

(A) When removing

(B) When installing

W11437590

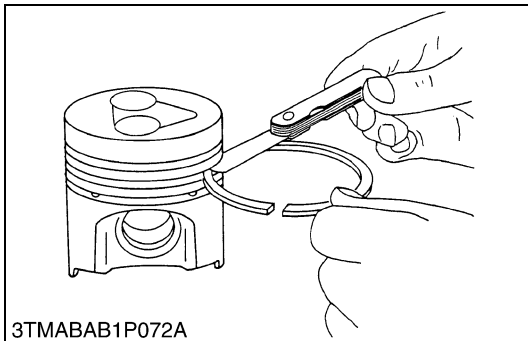


### Piston Ring Gap

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

Piston ring gap	Top ring	Factory spec.	0.25 to 0.40 mm 0.0098 to 0.0157 in.
		Allowable limit	1.25 mm 0.0492 in.
	Second ring	Factory spec.	0.30 to 0.45 mm 0.0118 to 0.0177 in.
		Allowable limit	1.25 mm 0.0492 in.
	Oil ring	Factory spec.	0.25 to 0.45 mm 0.0098 to 0.0177 in.
		Allowable limit	1.25 mm 0.0492 in.

W11466710



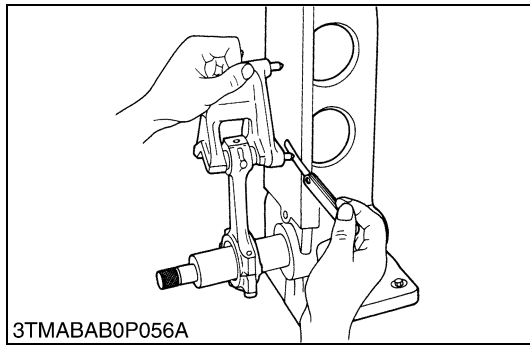
### Clearance between Piston Ring and Groove

1. Remove carbon from the ring grooves.
2. Measure the clearance between the ring and the groove with a feeler gauge or depth gauge.
3. If the clearance exceeds the allowable limit, replace the ring as compression leakage and oil loss or burning will result.
4. If the clearance still exceeds the allowable limit after replacing the ring, replace the piston.

Clearance between piston ring and piston ring groove	Second ring	Factory spec.	0.093 to 0.128 mm 0.0037 to 0.0050 in.
		Allowable limit	0.20 mm 0.0079 in.
	Oil ring	Factory spec.	0.020 to 0.060 mm 0.0008 to 0.0021 in.
		Allowable limit	0.15 mm 0.0059 in.

W11485500





### Connecting Rod Alignment

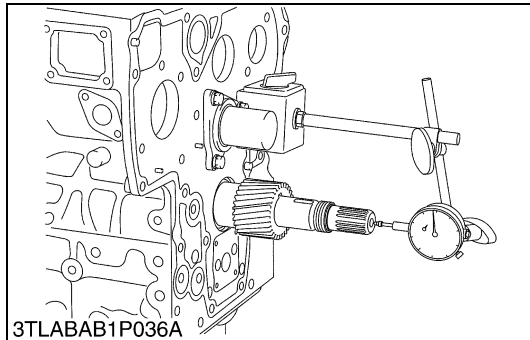
#### ■ NOTE

- Since the I.D. of the connecting rod small end bushing is the basis of this check, check bushing for wear beforehand.
1. Install the piston pin into the connecting rod.
  2. Install the connecting rod on the connecting rod alignment tool.
  3. Put a gauge over the piston pin, and move it against the face plate.
  4. If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.
  5. If the measurement exceeds the allowable limit, replace the connecting rod.

Connecting rod alignment	Allowable limit	0.05 mm 0.0020 in.
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W10314620

## (4) Crankshaft



### Side Clearance of Crankshaft

1. Move the crankshaft to the flywheel side.
2. Set a dial indicator to the crankshaft.
3. Measure the end play by pulling the crankshaft toward the crank gear.
4. If the measurement exceeds the allowable limit, replace the thrust bearing 1 and 2.

Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.5 mm 0.0197 in.

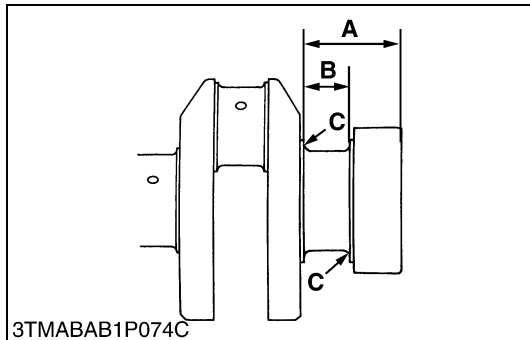
### (Reference)

- Oversize dimensions of crankshaft journal

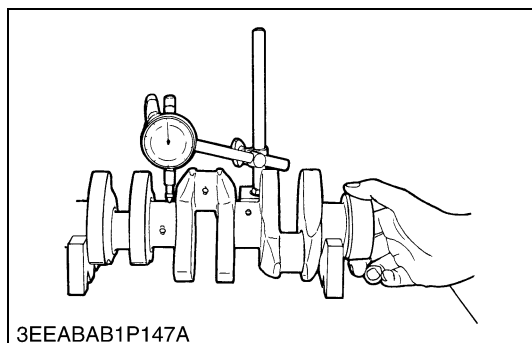
Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	26.20 to 26.25 mm 1.0315 to 1.0335 in.	26.40 to 26.45 mm 1.0394 to 1.0413 in.
Dimension B	54.5 to 54.7 mm 2.1457 to 2.1535 in.	54.6 to 54.8 mm 2.1496 to 2.1575 in.
Dimension C	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius

(0.8S)  
The crankshaft journal must be fine-finished to higher than ∇∇∇∇

W1032880





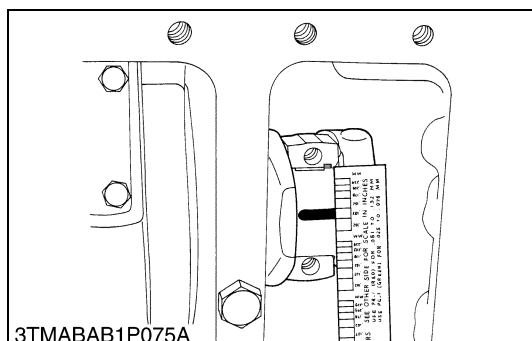


### Crankshaft Alignment

1. Support the crankshaft with V blocks on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle.
2. Rotate the crankshaft on the V blocks and get the misalignment (half of the measurement).
3. If the misalignment exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.00079 in.
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W10333001



### Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage on the center of the crankpin each direction as shown in the figure.
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.	0.025 to 0.087 mm 0.00098 to 0.00343 in.
	Allowable limit	0.20 mm 0.0079 in.

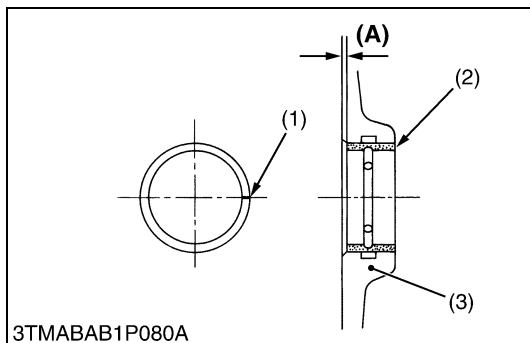
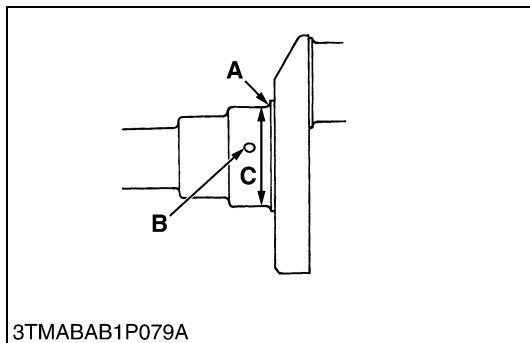
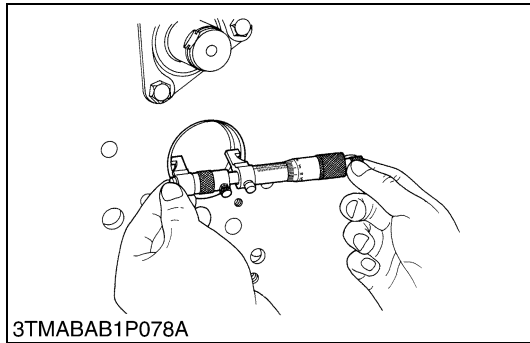
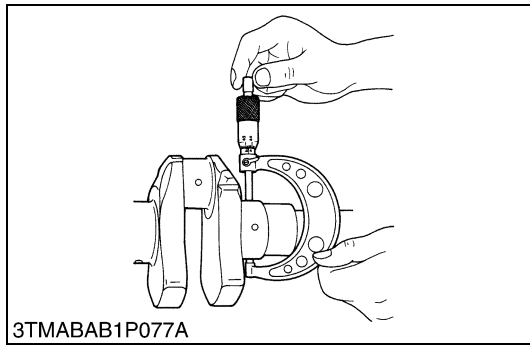
Crankpin O.D.	Factory spec.	46.959 to 46.975 mm 1.84878 to 1.84941 in.
Crankpin bearing I.D.	Factory spec.	47.000 to 47.046 mm 1.85039 to 1.85221 in.

### (Reference)

- Undersize dimensions of crankpin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	3.3 to 3.7 mm radius 0.1299 to 0.1457 in. radius	3.3 to 3.7 mm radius 0.1299 to 0.1457 in. radius
*Dimension B	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension C	46.759 to 46.775 mm dia. 1.84091 to 1.84154 in. dia.	46.559 to 46.575 mm dia. 1.83303 to 1.83366 in. dia.
(0.8S) The crankpin must be fine-finished to higher than ∇∇∇∇		

W1033106



### **Oil Clearance between Crankshaft Journal and Crankshaft Bearing 1**

1. Measure the O.D. of the crankshaft journal with an outside micrometer.
2. Measure the I.D. of the crankshaft bearing 1 with an inside micrometer, and calculate oil clearance.
3. If the clearance exceeds the allowable limit, replace the crankshaft bearing 1.
4. If the same size bearing is ineffective 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.	0.040 to 0.118 mm 0.00157 to 0.00465 in.
	Allowable limit	0.2 mm 0.0079 in.

Crankshaft journal O.D.	Factory spec.	59.921 to 59.940 mm 2.35910 to 2.35984 in.
Crankshaft bearing 1 I.D.	Factory spec.	59.980 to 60.039 mm 2.36142 to 2.36374 in.

### **(Reference)**

- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
*Dimension B	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension C	59.721 to 59.740 mm dia. 2.35122 to 2.35197 in. dia.	59.521 to 59.540 mm dia. 2.34335 to 2.34410 in. dia.
(0.8S) The crankshaft journal must be fine-finished to higher than $\nabla\nabla\nabla\nabla$		

W1033717

### **Replacing Crankshaft Bearing 1**

#### **(When removing)**

1. Press out the used crankshaft bearing 1 using a crankshaft bearing 1 replacing tool.

#### **(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.

Dimension (A)	Factory spec.	4.2 to 4.5 mm 0.1654 to 0.1772 in.
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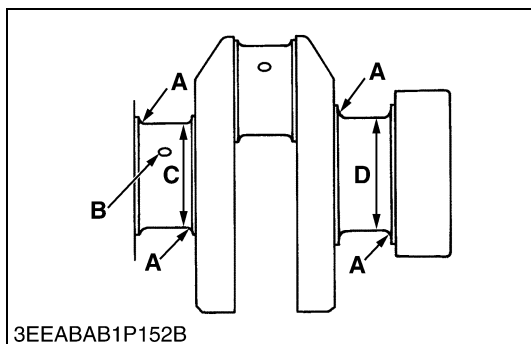
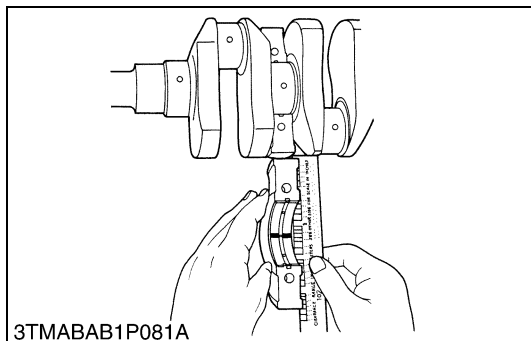
(1) Seam

(2) Crankshaft Bearing 1

(3) Cylinder Block

**(A) Dimension**

W10342000



### Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2

1. Put a strip of plastigage 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 clearance exceeds the allowable limit, replace the crankshaft bearing 2.
5. If the same size bearing is ineffective because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.

#### ■ NOTE

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

Oil clearance between crankshaft and crankshaft bearing 2	Factory spec.	0.040 to 0.104 mm 0.00157 to 0.00409 in.
	Allowable limit	0.20 mm 0.0079 in.

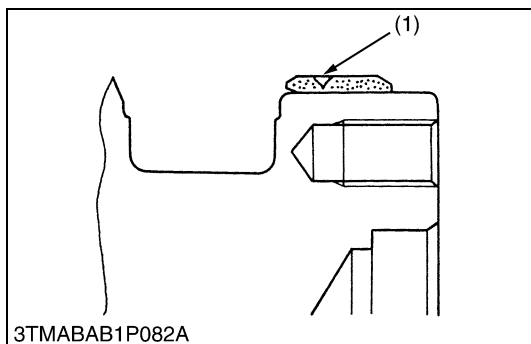
Crankshaft O.D.	Factory spec.	59.921 to 59.940 mm 2.35910 to 2.35984 in.
Crankshaft bearing 2 I.D.	Factory spec.	59.980 to 60.025 mm 2.36142 to 2.36319 in.

#### (Reference)

- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in. radius
*Dimension B	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension C, D	59.721 to 59.740 mm dia. 2.35122 to 2.35197 in. dia.	59.521 to 59.540 mm dia. 2.34335 to 2.34410 in. dia.
(0.8S) The crankshaft journal must be fine-finished to higher than ∇∇∇∇		

W1083821



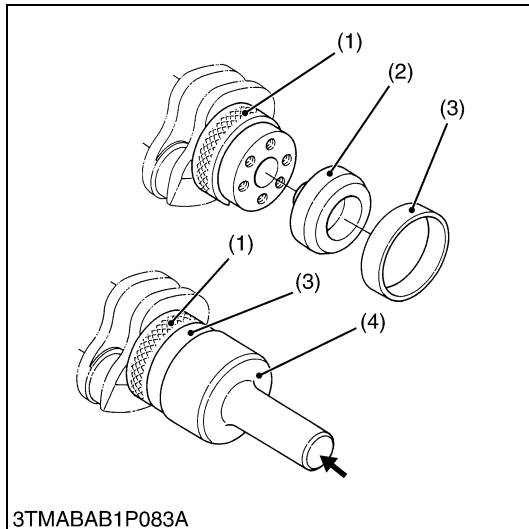
### Crankshaft Sleeve Wear

1. Check the wear on the crankshaft sleeve (1).
2. If the wear exceeds the allowable limit or when the engine oil leaks, replace the crankshaft sleeve.

Wear of sleeve	Allowable limit	0.1 mm 0.0039 in.
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(1) Crankshaft Sleeve

W1110651



### Replacing Crankshaft Sleeve

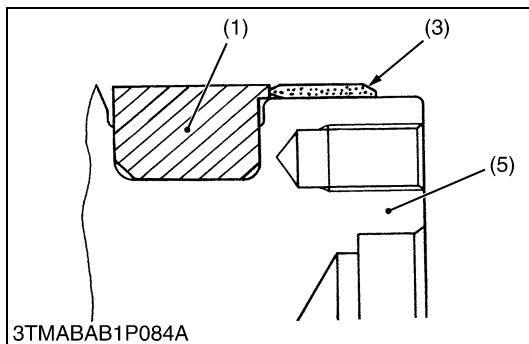
1. Remove the used crankshaft sleeve (3) using a special-use puller set (Code No. 07916-09032).
2. Set the sleeve guide (2) to the crankshaft (5).
3. Set the stopper (1) to the crankshaft as shown in figure.
4. Heat a new sleeve to a temperature between 150 to 200 °C (302 to 392 °F), and fix the sleeve to the crankshaft as shown in figure.
5. Press fit the sleeve using the auxiliary socket for pushing (4). (Refer to "SPECIAL TOOLS".)

#### ■ NOTE

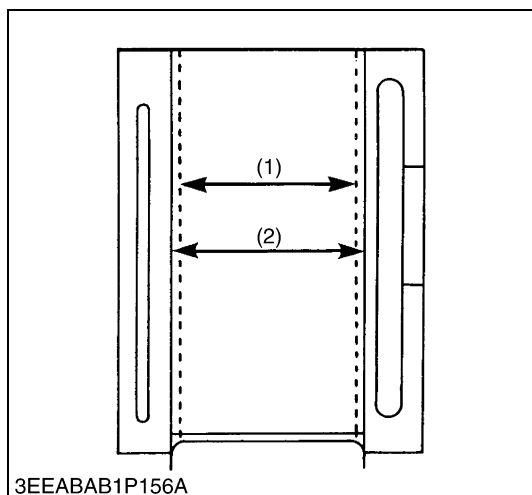
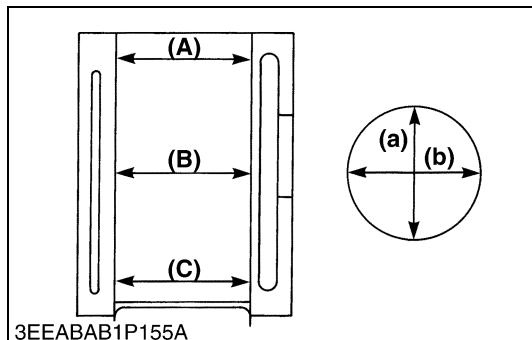
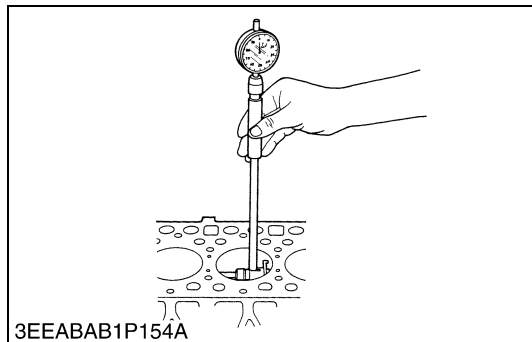
- Mount the sleeve with its largely chamfered surface facing outward.

- |                       |                                  |
|-----------------------|----------------------------------|
| (1) Stopper           | (4) Auxiliary Socket for Pushing |
| (2) Sleeve Guide      | (5) Crankshaft                   |
| (3) Crankshaft Sleeve |                                  |

W1033503



## (5) Cylinder



### 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 liner I.D.	Factory spec.	87.000 to 87.022 mm 3.42520 to 3.42606 in.
Maximum wear	Allowable limit	+0.15 mm +0.0059 in.

- (A) Top  
(B) Middle  
(C) Bottom (Skirt)
- (a) Right-angled to Piston Pin  
(b) Piston Pin Direction

W10360060

### Correcting Cylinder (Oversize +0.25 mm)

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

Oversize cylinder I.D.	Factory spec.	87.250 to 87.272 mm 3.43504 to 3.43591 in.
Maximum wear	Allowable limit	+0.15 mm +0.0059 in.
Finishing	Hone to 2.2 to 3.0 $\mu\text{m}$ Rz. (0.000087 to 0.000118 in.Rz.) ▽▽▽	

2. Replace the piston and piston rings with oversize (+0.25 mm) ones.

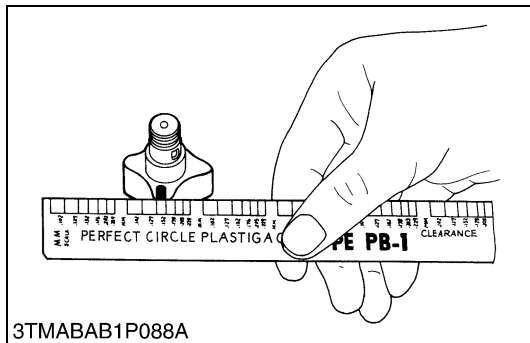
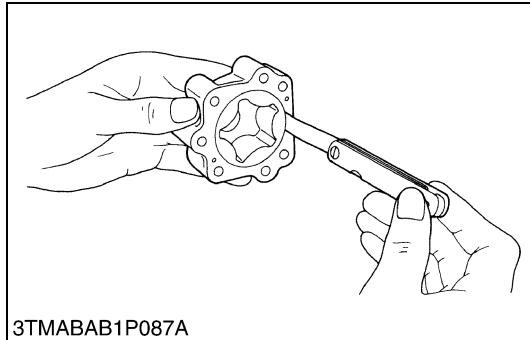
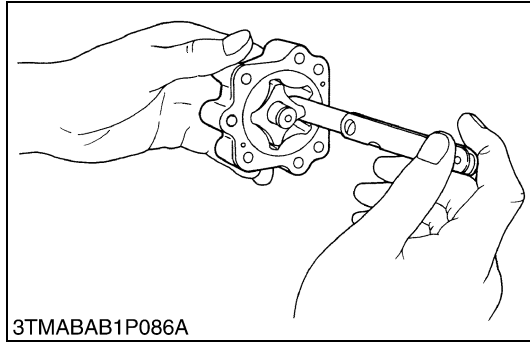
#### ■ NOTE

- 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) Oversize Cylinder I.D.

W10367470

## (6) Oil Pump



### Rotor Lobe Clearance

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

Clearance between inner rotor and outer rotor	Factory spec.	0.03 to 0.14 mm 0.0012 to 0.0055 in.
	Allowable limit	0.2 mm 0.0079 in.

Clearance between outer rotor and pump body	Factory spec.	0.11 to 0.19 mm 0.0043 to 0.0075 in.
	Allowable limit	0.25 mm 0.0098 in.

W10378950

### 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 width of the press gauge with a sheet of gauge.
4. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

End clearance between inner rotor and cover	Factory spec.	0.105 to 0.150 mm 0.00413 to 0.00591 in.
	Allowable limit	0.2 mm 0.0079 in.

W10382660

# 2 CLUTCH

# MECHANISM

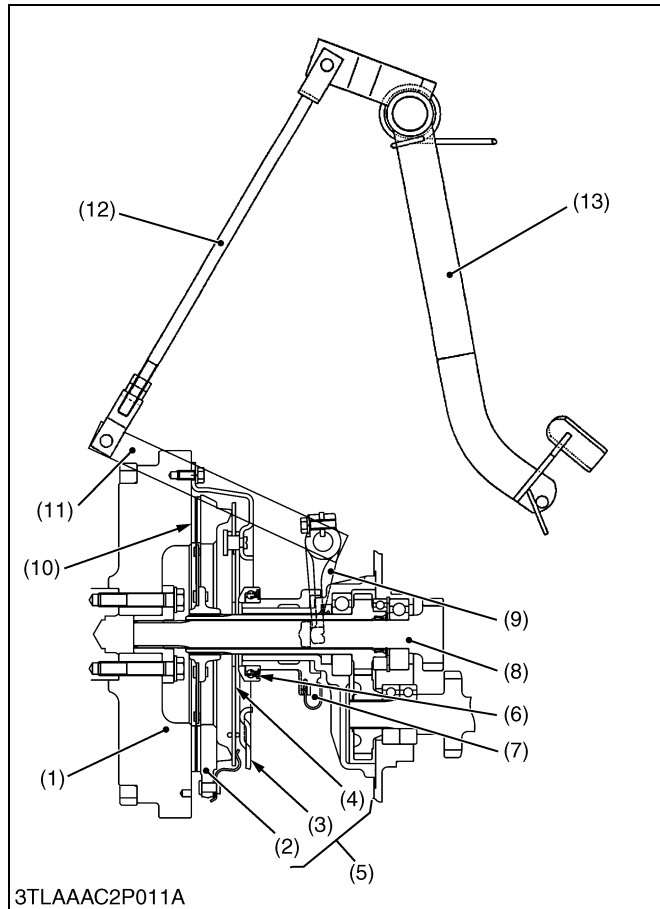
## CONTENTS

1. STRUCTURE .....	2-M1
[1] TRAVELING CLUTCH .....	2-M1
[2] HYDRAULIC PTO CLUTCH .....	2-M2



# 1. STRUCTURE

## [1] TRAVELING CLUTCH



This tractor is equipped with dry single plate type clutch.

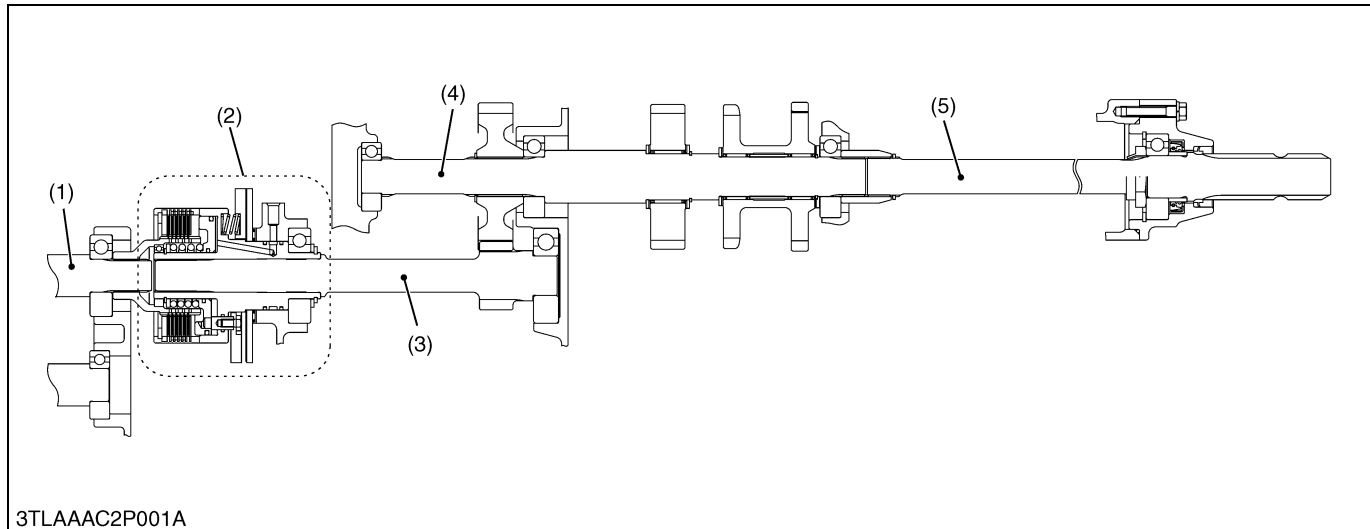
The clutch is located between the engine and the transmission and is operated by stepping on the clutch pedal (13).

When the clutch pedal is depressed, the clutch is disengaged and when the clutch pedal is released, the clutch is engaged and power from the engine is transmitted to the transmission.

- |                             |                       |
|-----------------------------|-----------------------|
| (1) Flywheel                | (8) Gear Shaft        |
| (2) Pressure Plate          | (9) Release Fork      |
| (3) Clutch Cover            | (10) Clutch Disk      |
| (4) Diaphragm Spring        | (11) Clutch Lever     |
| (5) Pressure Plate Assembly | (12) Clutch Pedal Rod |
| (6) Release Bearing         | (13) Clutch Pedal     |
| (7) Release Hub             |                       |

W1012642

## [2] HYDRAULIC PTO CLUTCH



Hydraulic multiple disk clutch is used for tractor with independent PTO.

PTO is controlled by PTO clutch pack (2) activated by PTO clutch valve and independent of the driving system.

PTO is "**ENGAGED**" or "**DISENGAGED**" by operating the shift lever of PTO clutch valve.

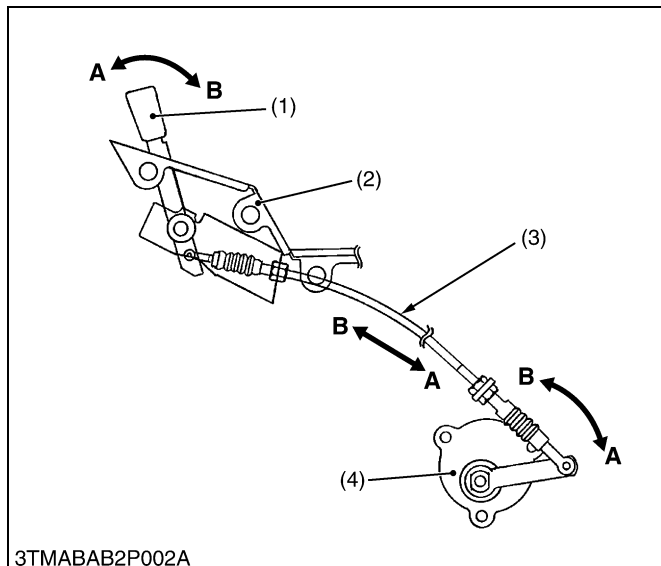
(1) I-PTO Counter Shaft

(3) I-PTO Gear Shaft

(4) PTO Drive Shaft

(5) PTO Shaft

(2) PTO Clutch Pack



### ■ Shift Linkage

The PTO Clutch control lever (1) and the PTO clutch valve (4) are connected by the shift cable (3) as shown in the left figure.

When the shift lever is moved to the **B** side, the PTO clutch valve (4) is set at "**ENGAGED**" position. Then the oil flows to clutch pack through the PTO clutch valve (4), and the clutch pack is engaged and the PTO shaft rotates. When the shift lever is moved to the **A** side, the PTO clutch valve (4) is set at the "**DISENGAGED**" position.

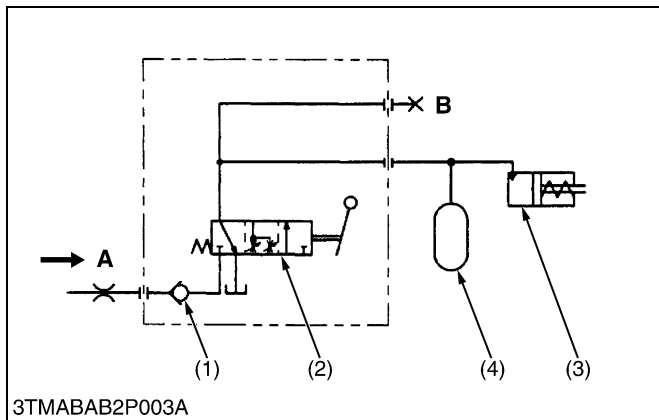
(1) PTO Clutch Control Lever

(3) Shift Cable

(2) Lever Guide

(4) PTO Clutch Valve

W1013899



### Oil Flow

The oil adjusted the pressure by the regulator valve flows into the PTO clutch valve (2). When the PTO lever is at the **"DISENGAGED"** position, the oil does not flow through the PTO clutch valve (2) to the PTO clutch pack (3).

When the PTO lever is at the **"ENGAGED"** position, the oil flows through the PTO clutch valve (2) to the accumulator (4) and the PTO clutch pack (3) to engage it.

- (1) Check Valve
- (2) PTO Clutch Valve
- (3) PTO Clutch Pack
- (4) Accumulator

**A : From Regulator Valve**  
**B : Pressure Check Port**

W1013451

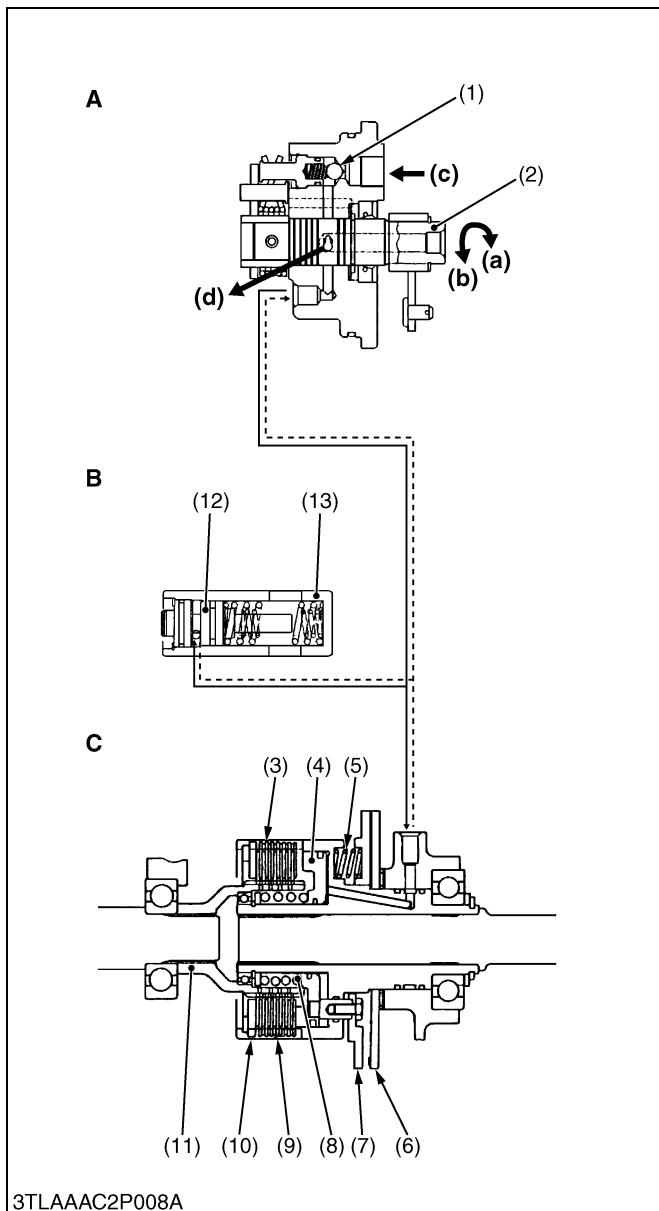
The oil from the regulator valve flows into the clutch valve and opens the check valve (1). When the shift lever is set at the **"ENGAGED"** position, the spool (2) is turned to **A** position, then the oil flows through the spool (2) into the accumulator and the clutch pack. Oil entering the clutch pack pushes the piston (4) to engage the clutch pack. The accumulator absorbs the engaging shock of the clutch pack.

When the shift lever is set at the **"DISENGAGED"** position, the spool (2) is turned to **B** position, then the oil from the regulator valve is stopped by the spool (2) and the oil in the PTO clutch pack and accumulator is drained into the transmission case. Thus the piston (4) is pushed back, the brake plate (7) is also moved to contact the brake disc (6) so as to stop the rotation and the drag of the PTO shaft.

- (1) Check Valve
- (2) Spool
- (3) Plate
- (4) Piston
- (5) Brake Spring
- (6) Brake Disc
- (7) Brake Plate
- (8) Return Spring
- (9) Clutch Disc
- (10) Back Plate
- (11) Clutch Hub
- (12) Accumulator Piston
- (13) Mid-PTO Bearing Case

**(a) ENGAGED Position**  
**(b) DISENGAGED Position**  
**(c) From Regulation Valve**  
**(d) Drain (To the Transmission Case)**  
**A : PTO Clutch Valve**  
**B : Accumulator**  
**C : PTO Clutch Pack**

W1013678



# SERVICING

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# 1. TROUBLESHOOTING

## [1] TRAVELING CLUTCH

Symptom	Probable Cause	Solution	Reference Page
<b>Clutch Drags</b>	Too much free play in the clutch	Adjust	2-S5
	Dust on clutch disc generated from clutch disc facing	Remove dust	—
	Release fork broken	Replace	2-S12
	Clutch disc or pressure plate warped	Replace	2-S11
<b>Clutch Slips</b>	Wire ring worn or broken (clutch cover side)	Replace (Pressure plate assembly)	2-S11
	Clutch disc excessively worn	Replace	2-S11
	Grease or oil on clutch disc facing	Replace	2-S11
	Clutch disc or pressure plate warped	Replace	2-S11
	Diaphragm spring weaken or broken	Replace	2-S11
<b>Chattering</b>	Grease or oil on clutch disc facing	Replace	2-S11
	Clutch disc or pressure plate warped	Replace	2-S11
	Clutch disc boss spline worn or rusted	Replace or remove rust	2-S11
	Pressure plate or flywheel face cracked or scored	Replace	2-S11
	Clutch disc boss and main shaft spline worn	Replace	2-S11
	Diaphragm spring strength uneven or diaphragm spring broken	Replace	2-S11
<b>Rattle During Running</b>	Clutch disc boss spline worn	Replace	2-S11
	Replace ball bearing worn or sticking	Replace	2-S12
<b>Clutch Squeaks</b>	Replace ball bearing sticking or dry	Replace	2-S12
	Clutch disc excessively worn	Replace	2-S11, S13
<b>Vibration</b>	Clutch disc rivet worn or broken	Replace	2-S11
	Clutch parts broken	Replace	2-S11

W1014322

**[2] PTO CLUTCH**

Symptom	Probable Cause	Solution	Reference Page
<b>PTO Clutch Slips</b>	Operating pressure is low	Adjust	2-S14
	PTO clutch valve malfunctioning	Repair or replace	2-S23
	Clutch disc or drive plate excessively worn	Replace	2-S24 to S26
	Deformation of piston or return plate	Replace	2-S24 to S26
<b>PTO Shaft Does Not Rotate</b>	PTO clutch malfunctioning	Repair or replace	2-S23
	PTO coupling left behind	Install	3-M1
<b>PTO Clutch Operating Pressure is Low</b>	Transmission oil improper or insufficient	Replenish or change	G-8
	Relief valve malfunctioning	Adjust or replace	2-S14
<b>PTO Clutch Drags</b>	Brake plate excessively worn	Replace	2-S25
	Return spring weaken or broken	Replace	2-S27
	Modulating valve malfunctioning	Repair or replace	2-S25
	Deformation or return plate or steal plate	Replace	2-S24 to S27

W1016923

## 2. SERVICING SPECIFICATIONS

### [1] TRAVELING CLUTCH

Item		Factory Specification	Allowable Limit
Clutch Pedal	Free Travel	20 to 30 mm 0.8 to 1.2 in.	—
Clutch Disc	Disc Surface to Rivet Top (Depth)	—	0.3 mm 0.012 in.
Clutch Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	—	2.0 mm 0.079 in.
Pressure Plate	Flatness	—	0.2 mm 0.008 in.
Diaphragm Spring	Mutual Difference	—	0.5 mm 0.020 in.

W10138740

### [2] PTO CLUTCH

Item		Factory Specification	Allowable Limit
PTO Clutch Valve Condition Engine Speed : Idling Oil Temperature : 40 to 60 °C 104 to 140 °F	Relief Valve Setting Pressure	2.25 to 2.45 MPa 23.0 to 25.0 kgf/cm <sup>2</sup> 327 to 356 psi	—
PTO Clutch Disc	Thickness	1.70 to 1.90 mm 0.067 to 0.075 in.	1.55 mm 0.061 in.
PTO Steel Plate	Thickness	1.15 to 1.25 mm 0.045 to 0.049 in.	1.10 mm 0.043 in.
PTO Piston	Flatness	—	0.15 mm 0.006 in.
PTO Steel Plate	Thickness	—	0.30 mm 0.012 in.
PTO Return Spring	Free Length	40.5 mm 1.59 in.	37.5 mm 1.48 in.
PTO Brake Spring	Free Length	20.3 mm 0.80 in.	18.0 mm 0.71 in.
Seal Ring	Thickness	2.45 to 2.5 mm 0.096 to 0.098 in.	2.0 mm 0.079 in.

W10179200

### 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.)

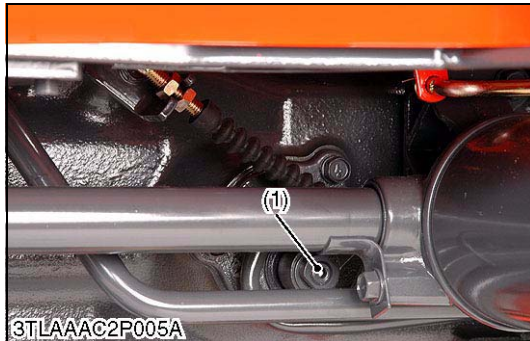
Item	N·m	kgf·m	ft-lbs
Main delivery pipe and return pipe retaining nut	46.6 to 50.9	4.8 to 5.2	34.4 to 37.6
Turning delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Starter's terminal <b>B</b> mounting nut	8.8 to 11.8	0.9 to 1.2	6.5 to 8.7
Engine and clutch housing mounting screw, nut	77.4 to 90.2	7.9 to 1.2	57.1 to 66.5
Engine and clutch housing mounting stud bolt	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Release fork setting screw	166.7 to 191.2	17.0 to 19.5	123.0 to 141.0
PTO clutch control valve mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
PTO clutch holder mounting screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Step mounting nut	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Step mounting screw (M16)	117.7 to 147.1	12.0 to 15.0	87.0 to 108.5
ROPS mounting screw M16 grade 9	259.9 to 304.0	26.5 to 31.0	192.0 to 224.0
Clutch housing and transmission case mounting screw, nut (M12, grade 11 nut)	103.0 to 117.7	10.5 to 12.0	75.9 to 86.8
Clutch housing and transmission case mounting screw, nut (M12, grade 7 screw, nut)	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Clutch housing and transmission case mounting screw, nut ( M10, grade 9 screw)	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Clutch housing and transmission case mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Brake plate mounting screw (I-PTO)	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3

W1013236



## 4. CHECKING, DISASSEMBLING AND SERVICING (TRAVELING CLUTCH)

### [1] CHECKING AND ADJUSTING



#### Adjusting Clutch Pedal Free Play

1. Slightly depress the clutch pedal (5) and measure free travel on top of clutch pedal.
2. If the measurement is not within the factory specifications, loosen the lock nut (2), remove the cotter pin (3) and the clevis pin (4), then adjust the length of rod (1) within acceptable limits.
3. Retighten the lock nut, reinstall the clevis pin, the cotter pin and split the cotter pin.

Clutch pedal free travel on top of clutch pedal	Factory spec.	20 to 30 mm 0.8 to 1.2 in.
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- (1) Clutch Pedal Rod  
(2) Lock Nut  
(3) Cotter Pin

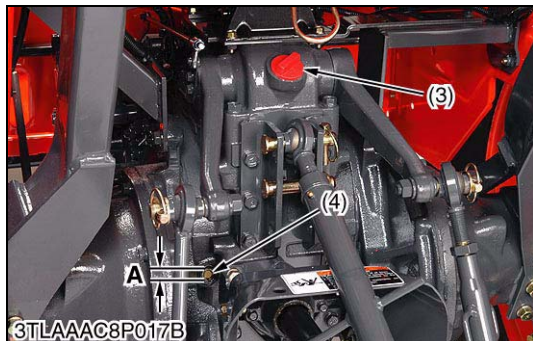
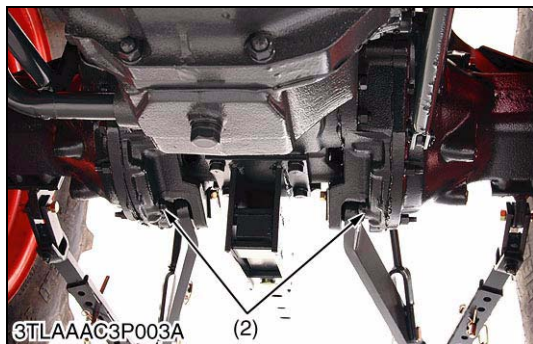
- (4) Clevis Pin  
(5) Clutch Pedal

**L : Clutch Pedal Free Travel**

W1015718

## [2] PREPARATION

### (1) Separating Engine from Clutch Housing



#### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### **(When refilling)**

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.gals
--------------------	----------	--------------------------------------

#### ■ **IMPORTANT**

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

**A : Oil level is acceptable within this range.**

W1062402



### **Bonnet and Front Cover**

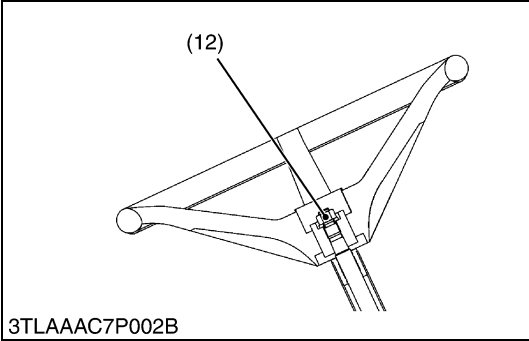
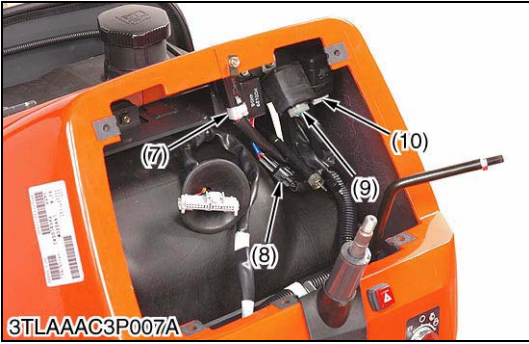
1. Disconnect the battery negative cable (1).
2. Disconnect the connector to head light and the head light wiring.
3. Remove bonnet (2) and side covers (3) on both sides.
4. Remove the front cover (4).

(1) Battery Negative Cable  
(2) Bonnet

(3) Side Cover  
(4) Front Cover

W1063478





Steering Wheel and Rear Bonnet

- 1. Remove steering wheel (1) with steering puller.
- 2. Remove throttle grip (2).
- 3. Disconnect hourmeter cable from engine.
- 4. Remove meter panel (3).
- 5. Disconnect **4P** connector (5) to main switch.
- 6. Disconnect **8P** connector (6) to combination switch.
- 7. Disconnect **4P** connector to starter relay (7), **4P** connector to OPC timer (8), **8P** connector to flasher (hazard) unit (9), **4P** connector to glow (Key stop solenoid) relay (10).
- 8. Disconnect fuel tank wiring (11).
- 9. Remove rear bonnet (4).

(When reassembling)

Tightening torque	Steering wheel mounting nut	48.0 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
-------------------	-----------------------------	---

- (1) Steering Wheel

(2) Throttle Grip

(3) Meter Panel

(4) Rear Bonnet

(5) **4P** Connector (Main Switch)

(6) **8P** Connector (Combination Switch)

(7) **4P** Connector (Starter Relay)
- (8) **4P** Connector (OPC Timer)

(9) **8P** Connector (Flasher (Hazard) Unit)

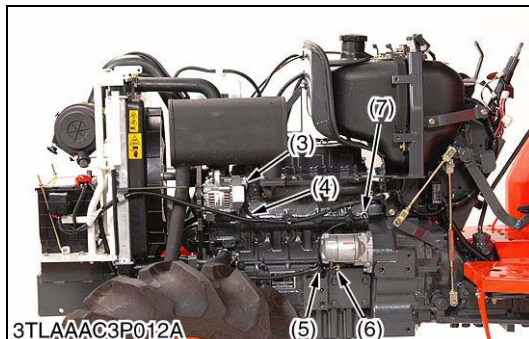
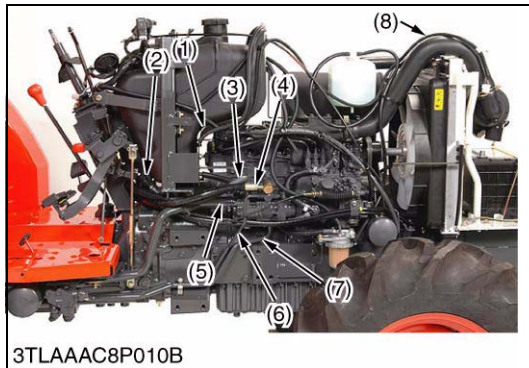
(10) **4P** Connector (Glow (Key Stop Solenoid) Relay)

(11) Fuel Tank Wiring

(12) Steering Wheel Mounting Nut

W1064593





### Wiring, Pipes and Rods

1. Disconnect **1P** connector (1) to water temperature sensor.
2. Disconnect glow plug terminal (10).
3. Disconnect accelerator rod cable (2), head light wiring (8), **2P** connector to key stop solenoid (9) and then set aside the wiring harness.
4. Disconnect power steering delivery hose (4), power steering return hose (3).
5. Disconnect pump inlet hose (5), I-PTO delivery pipe (6) and **3P** delivery pipe (7).

### (When reassembling)

Tightening torque	Independent PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs

- |  |   |
|--|---|
| (1) <b>1P</b> Connector (Water Temperature Sensor) | (6) I-PTO Delivery Pipe                     |
| (2) Accelerator Rod Cable                          | (7) <b>3P</b> Delivery Pipe                 |
| (3) Power Steering Return Hose                     | (8) Head Light Wiring                       |
| (4) Power Steering Delivery Hose                   | (9) <b>2P</b> Connector (Key Stop Solenoid) |
| (5) Pump Inlet Hose                                | (10) Glow Plug Terminal                     |

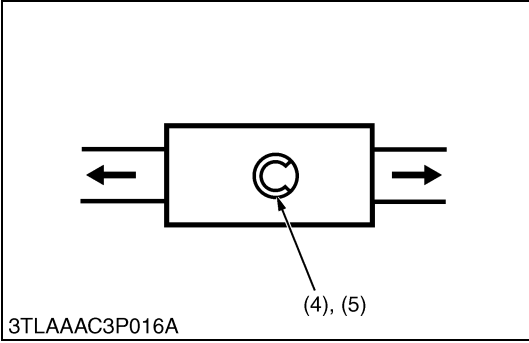
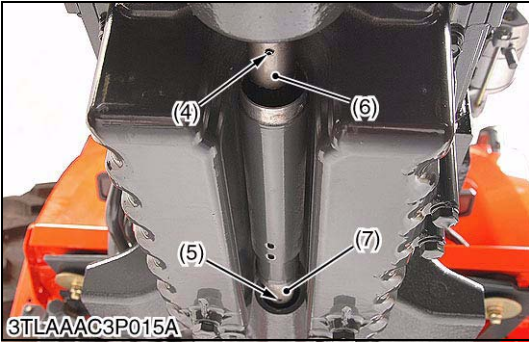
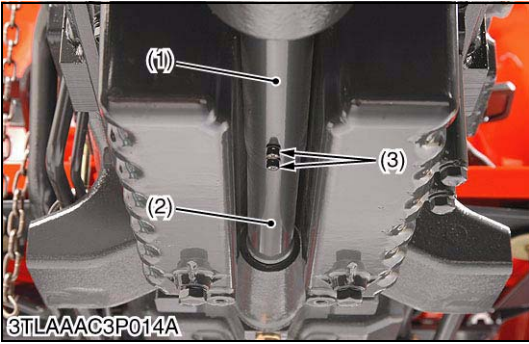
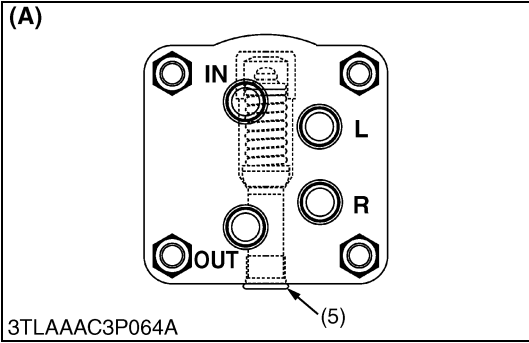
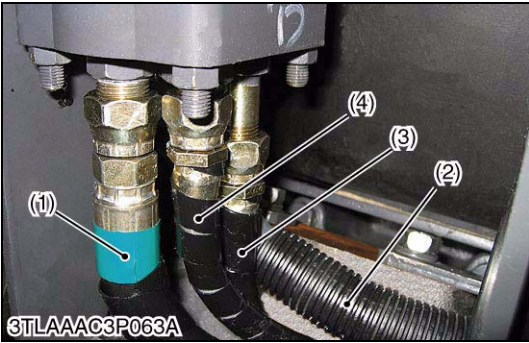
W1065019

### Wirings

1. Disconnect **1P** battery connector (1) and remove slow blow fuse boxes (2).
2. Disconnect **2P** connector (3) to alternator and wings (4).
3. Disconnect **1P** connector (5) to Starter motor and **B** terminal (6).
4. Disconnect **1P** connector (7) to engine oil pressure switch, then set aside the wiring harness.

- |                                      |  |
|--------------------------------------|--|
| (1) <b>1P</b> Connector (Battery)    | (5) <b>1P</b> Connector (Starter Motor)              |
| (2) Slow Blow Fuse Box               | (6) <b>B</b> Terminal (Starter)                      |
| (3) <b>2P</b> Connector (Alternator) | (7) <b>1P</b> Connector (Engine Oil Pressure Switch) |
| (4) Wiring (Alternator)              |  |

W1065603



Hydraulic Pipe

1. Disconnect the right delivery hose (3) and the left delivery hose (4).

Tightening torque	Main delivery hose retaining nut	46.2 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose  
(2) Return Hose  
(3) Right Delivery Hose  
(4) Left Delivery Hose  
(5) Relief Valve Plug (Engine Side)

(A) Steering Controller Viewing from the Bottom

W1065917

Propeller Shaft (4WD only)

1. Slide propeller shaft front cover (1) and rear cover (2) after removing screws (3).  
2. Tap out spring pins (4), (5), slide couplings (6), (7), and then remove propeller shaft together with propeller shaft covers.

(When reassembling)

- Apply grease to splines of propeller shaft.
  - Tap in spring pin (4), (5) as shown in figure.
- (1) Propeller Shaft Front Cover                      (5) Spring Pin  
(2) Propeller Shaft Rear Cover                    (6) Coupling  
(3) Screw    (7) Coupling  
(4) Spring Pin

W1066505



### **Separating Engine from Clutch Housing**

1. Place the disassembling stand under the engine and clutch housing case.
2. Remove the steering support plates connecting steering support and rear bonnet support.
3. Remove the engine and clutch housing mounting screws and nuts.
4. Separate the engine and clutch housing.

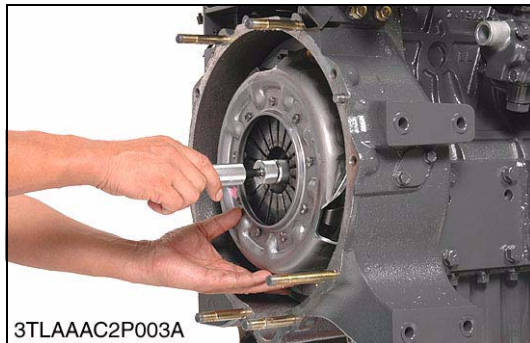
#### **(When reassembling)**

- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

W1023205

## **[3] DISASSEMBLING AND ASSEMBLING**



### **Clutch Assembly**

1. Insert the clutch center tool.
2. Remove the clutch assembly together with the clutch center tool..

#### **(When reassembling)**

- Direct the shorter end of the clutch disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of clutch disc boss.
- Insert the pressure plate, noting the position of straight pins.

#### **■ IMPORTANT**

- **Be sure to align the center of disc and flywheel by inserting the clutch tool set.**

#### **■ NOTE**

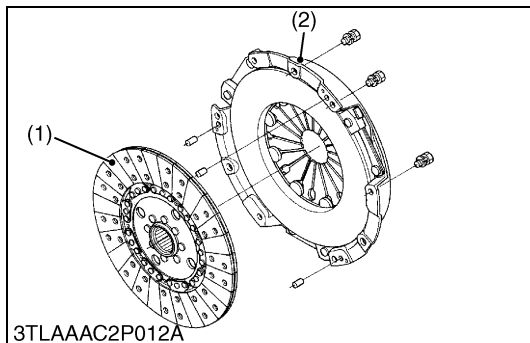
- **Do not allow grease and oil the clutch disc facing.**

Tightening torque	Clutch mounting screws	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
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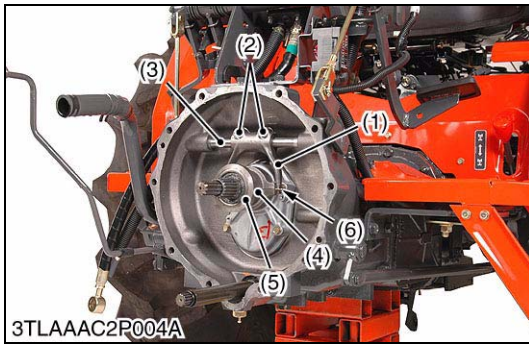
(1) Clutch Disc

(2) Pressure Plate Assembly

W1017217







### Release Fork and Clutch Lever

1. Draw out the clutch release hub (4) and the release bearing (5) as a unit.
2. Remove the release fork setting screws (2).
3. Draw out the clutch lever (3) to remove the release fork (1).

#### (When reassembling)

- Make sure the direction of the release fork (1) is correct.
- Inject grease to the release hub (4).
- Be sure to set the snap pins (6) on both sides.

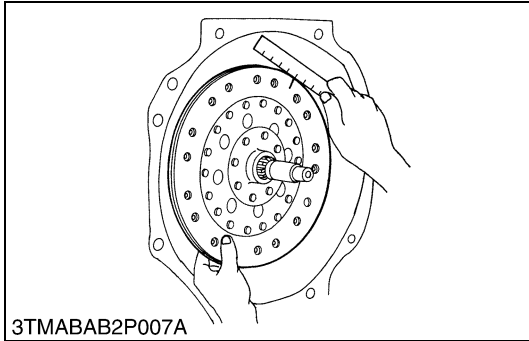
Tightening torque	Release fork setting screws	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	-----------------------------	---

- (1) Release Fork  
(2) Setting Screw  
(3) Clutch Lever

- (4) Release Hub  
(5) Release Bearing  
(6) Snap Pin

W1017279

## [4] SERVICING

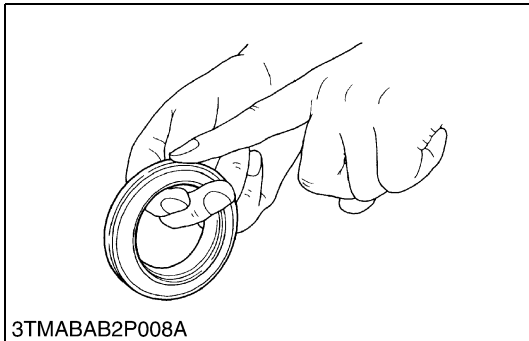


### Backlash between Clutch Disc Boss and Shaft

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

Backlash (Displacement around disc edge)	Allowable limit	2.0 mm 0.079 in.
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W1016866



### Release Bearing

1. Check for abnormal wear on contact surface.
2. Rotate the release bearing outer race, while applying pressure to it.
3. If the bearing rotation is rough or noisy, replace the release bearing.

#### ■ NOTE

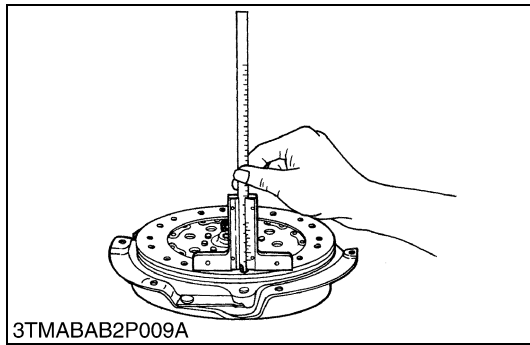
- Do not depress the release bearing outer race, when replacing the release bearing.
- Do not wash the release bearing with a cleaning solvent.

- (1) Release Bearing

W1024189







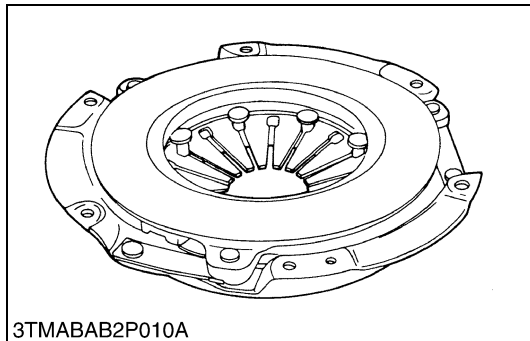
### Clutch Disc Wear

1. Measure the depth from clutch disc surface to the top of rivet at least 10 points with a depth gauge.
2. If the depth is less than the allowable limit, replace the disc.
3. If oil is sticking to clutch disc, or disc surface is carbonized, replace the clutch disc.

In this case, inspect transmission gear shaft oil seal, engine rear oil seal and other points for oil leakage.

Disc surface to rivet top (Depth)	Allowable limit	0.3mm 0.012 in.
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W1024724



### Checking Pressure Plate Assembly and Flywheel

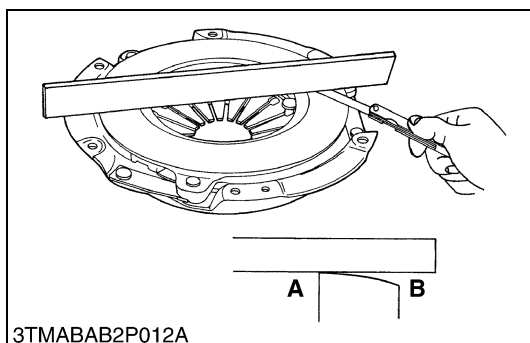
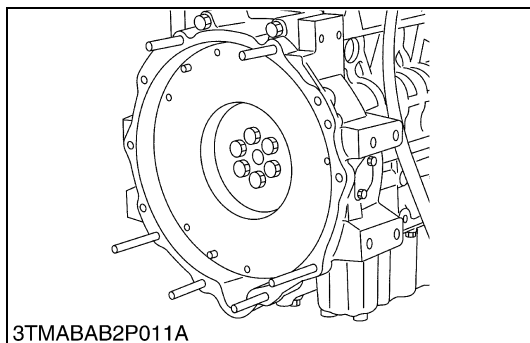
1. Wash the disassembling parts except clutch disc with a suitable cleaning solvent to remove dirt and grease before making inspection and adjustment.
2. Inspect the friction surface of pressure plate and flywheel for scoring or roughness.
  - Slight roughness may be smoothed by using fine emery cloth.
  - If these parts have deep scores or grooves on their surface, they should be replaced.
3. Inspect the surface of diaphragm spring for wear. If excessive wear is found, replace the clutch cover assembly.
4. Inspect thrust rings (wire ring) for wear or damage. As these parts are invisible from outside, shake pressure plate assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises indicates need of replace as a complete assembly

Diaphragm spring mutual difference	Allowable limit	0.5 mm 0.020 in.
---------------------------------------	-----------------	---------------------

A : Inside

B : Outside

W1025142



### Pressure Plate Flatness

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

Clearance between pressure plate and straightedge	Allowable limit	0.2 mm 0.008 in.
---	-----------------	---------------------

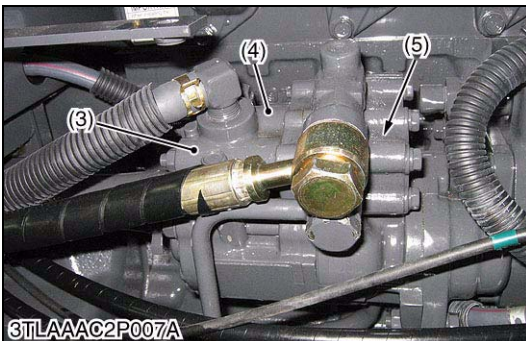
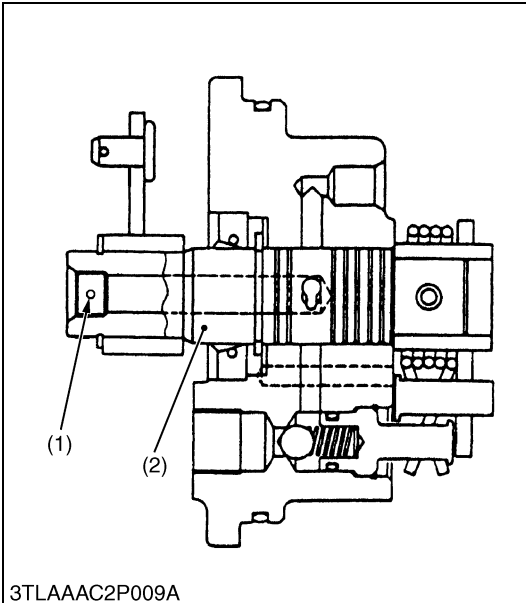
A : Inside

B : Outside

W1018116

## 5. CHECKING, DISASSEMBLING AND SERVICING (HYDRAULIC PTO CLUTCH)

### [1] CHECKING AND ADJUSTING



#### Adjusting Valve Setting Pressure

1. Start the engine and warm up the transmission fluid, and then stop the engine.
2. Remove the plug (1) (PT 1/8) on the PTO valve spool (2).
3. Set the pressure gauge.
4. Start the engine and measure the pressure.
5. For adjustment, use the reducing valve adjuster (3) of the regulator valve (5).

#### ■ IMPORTANT

- Do not connect the universal joint of the implement to the tractor PTO shaft while testing.

Independent PTO pressure	When PTO shift lever is "ENGAGED" position	2.25 to 2.45 MPa 23.0 to 25.0 kgf/cm <sup>2</sup> 327 to 356 psi
	When PTO shift lever is "DISENGAGED" position	No pressure

#### Condition

- Engine speed ..... Idling speed
- Oil temperature ..... 40 to 60 °C  
104 to 140 °F

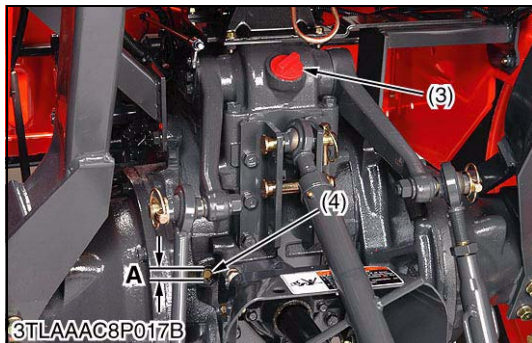
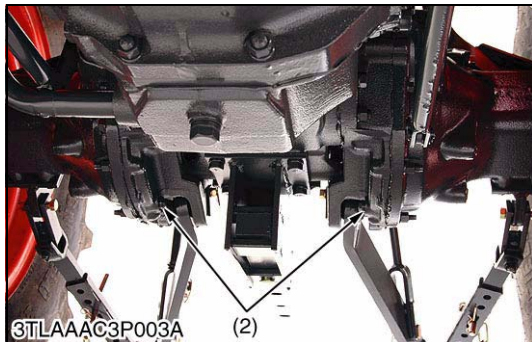
#### (Reference)

- Turn to clockwise direction → Pressure is increased
- Turn to counterclockwise direction → Pressure is decreased

- |                             |                           |
|-----------------------------|---------------------------|
| (1) Plug (PT 1/8)           | (4) Relief Valve Adjuster |
| (2) Spool                   | (5) Regulator Valve       |
| (3) Reducing Valve Adjuster |                           |

## [2] PREPARATION

### (1) Separating Engine from Clutch Housing



#### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### (When refilling)

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.gals
--------------------	----------	--------------------------------------

#### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.



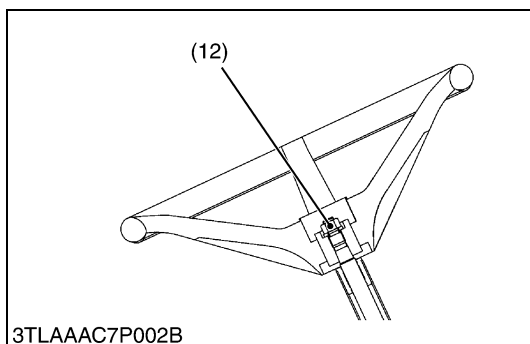
### **Bonnet and Front Cover**

1. Disconnect the battery negative cable (1).
2. Disconnect the connector to head light and the head light wiring.
3. Remove bonnet (2) and side covers (3) on both sides.
4. Remove the front cover (4).

(1) Battery Negative Cable  
(2) Bonnet

(3) Side Cover  
(4) Front Cover





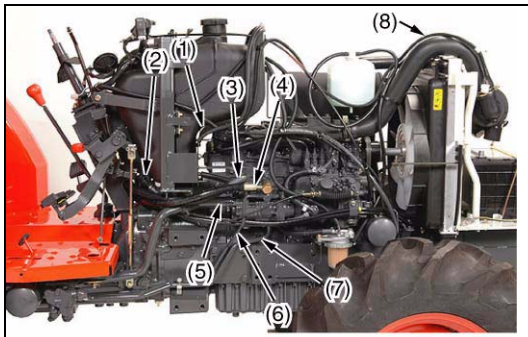
### Steering Wheel and Rear Bonnet

1. Remove steering wheel (1) with steering puller.
2. Remove throttle grip (2).
3. Disconnect hourmeter cable from engine.
4. Remove meter panel (3).
5. Disconnect **4P** connector (5) to main switch.
6. Disconnect **8P** connector (6) to combination switch.
7. Disconnect **4P** connector to starter relay (7), **4P** connector to OPC timer (8), **8P** connector to flasher (hazard) unit (9), **4P** connector to glow (Key stop solenoid) relay (10).
8. Disconnect fuel tank wiring (11).
9. Remove rear bonnet (4).

### (When reassembling)

Tightening torque	Steering wheel mounting nut	48.0 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
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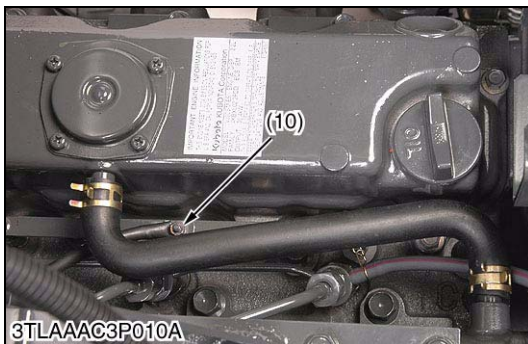
- |  |   |
|--|---|
| (1) Steering Wheel                           | (8) <b>4P</b> Connector (OPC Timer)                       |
| (2) Throttle Grip                            | (9) <b>8P</b> Connector (Flasher (Hazard) Unit)           |
| (3) Meter Panel                              | (10) <b>4P</b> Connector (Glow (Key Stop Solenoid) Relay) |
| (4) Rear Bonnet                              | (11) Fuel Tank Wiring                                     |
| (5) <b>4P</b> Connector (Main Switch)        | (12) Steering Wheel Mounting Nut                          |
| (6) <b>8P</b> Connector (Combination Switch) |   |
| (7) <b>4P</b> Connector (Starter Relay)      |   |



3TLAAAC8P010B



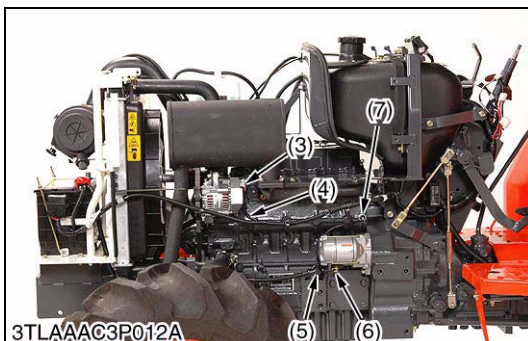
3TLAAAC3P009A



3TLAAAC3P010A



3TLAAAC3P011A



3TLAAAC3P012A

### Wiring, Pipes and Rods

1. Disconnect **1P** connector (1) to water temperature sensor.
2. Disconnect glow plug terminal (10).
3. Disconnect accelerator rod cable (2), head light wiring (8), **2P** connector to key stop solenoid (9) and then set aside the wiring harness.
4. Disconnect power steering delivery hose (4), power steering return hose (3).
5. Disconnect pump inlet hose (5), I-PTO delivery pipe (6) and **3P** delivery pipe (7).

### (When reassembling)

Tightening torque	Independent PTO delivery pipe joint bolt	34.3 to 39.2 N-m 3.5 to 4.0 kgf-m 25.3 to 28.9 ft-lbs
	Power steering delivery hose joint bolt	49.0 to 58.8 N-m 5.0 to 6.0 kgf-m 36.2 to 43.4 ft-lbs

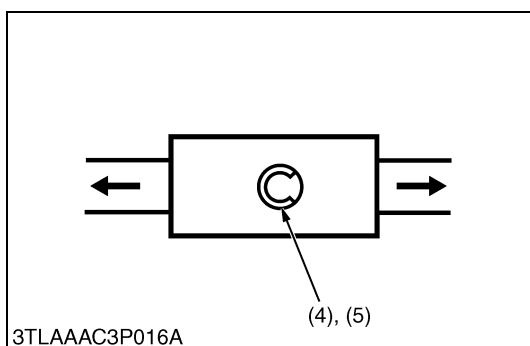
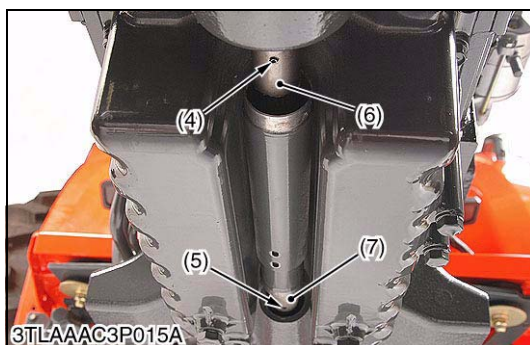
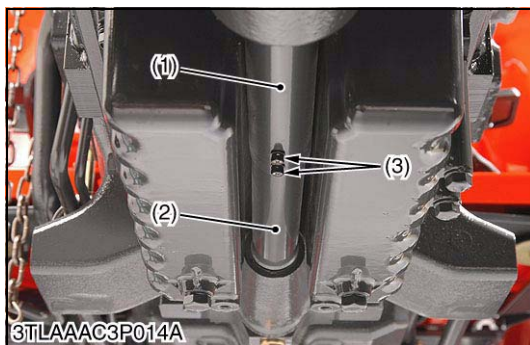
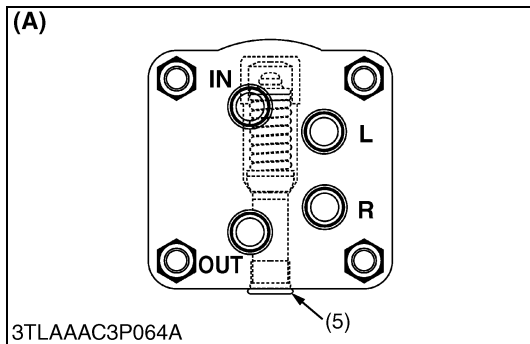
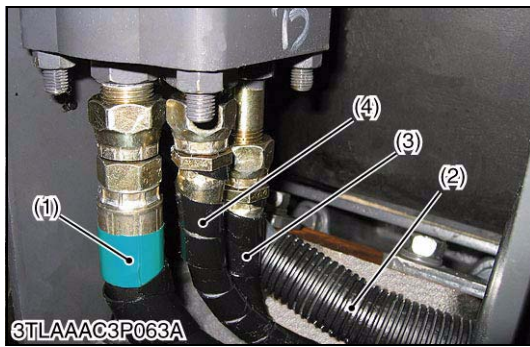
- |  |   |
|--|---|
| (1) <b>1P</b> Connector (Water Temperature Sensor) | (6) I-PTO Delivery Pipe                     |
| (2) Accelerator Rod Cable                          | (7) <b>3P</b> Delivery Pipe                 |
| (3) Power Steering Return Hose                     | (8) Head Light Wiring                       |
| (4) Power Steering Delivery Hose                   | (9) <b>2P</b> Connector (Key Stop Solenoid) |
| (5) Pump Inlet Hose                                | (10) Glow Plug Terminal                     |

### Wirings

1. Disconnect **1P** battery connector (1) and remove slow blow fuse boxes (2).
2. Disconnect **2P** connector (3) to alternator and wings (4).
3. Disconnect **1P** connector (5) to Starter motor and **B** terminal (6).
4. Disconnect **1P** connector (7) to engine oil pressure switch, then set aside the wiring harness.

- |                                      |  |
|--------------------------------------|--|
| (1) <b>1P</b> Connector (Battery)    | (5) <b>1P</b> Connector (Starter Motor)              |
| (2) Slow Blow Fuse Box               | (6) <b>B</b> Terminal (Starter)                      |
| (3) <b>2P</b> Connector (Alternator) | (7) <b>1P</b> Connector (Engine Oil Pressure Switch) |
| (4) Wiring (Alternator)              |  |





### Hydraulic Pipe

1. Disconnect the right delivery hose (3) and the left delivery hose (4).

Tightening torque	Main delivery hose retaining nut	46.2 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose
- (2) Return Hose
- (3) Right Delivery Hose
- (4) Left Delivery Hose
- (5) Relief Valve Plug (Engine Side)

(A) Steering Controller Viewing from the Bottom

### Propeller Shaft (4WD only)

1. Slide propeller shaft front cover (1) and rear cover (2) after removing screws (3).
2. Tap out spring pins (4), (5), slide couplings (6), (7), and then remove propeller shaft together with propeller shaft covers.

#### (When reassembling)

- Apply grease to splines of propeller shaft.
- Tap in spring pin (4), (5) as shown in figure.

- (1) Propeller Shaft Front Cover
- (2) Propeller Shaft Rear Cover
- (3) Screw
- (4) Spring Pin
- (5) Spring Pin
- (6) Coupling
- (7) Coupling



**Separating Engine from Clutch Housing**

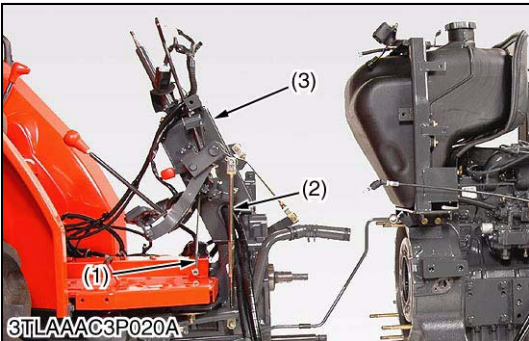
- 1. Place the disassembling stand under the engine and clutch housing case.
- 2. Remove the steering support plates connecting steering support and rear bonnet support.
- 3. Remove the engine and clutch housing mounting screws and nuts.
- 4. Separate the engine and clutch housing.

**(When reassembling)**

- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft·lbs

**(2) Separating Clutch Housing Mid Case**

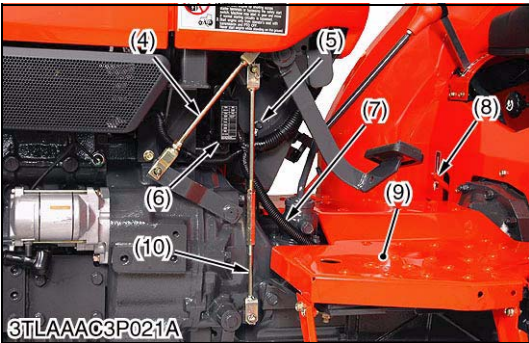


**Outer Components**

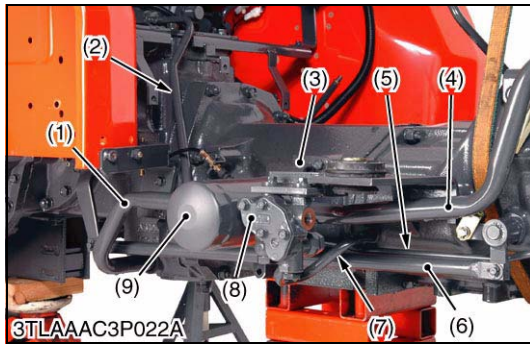
- 1. Disconnect foot accelerator rod (1).
- 2. Remove brake rod R.H. (2) and L.H. (10).
- 3. Remove mounting bolts and steering support (3).
- 4. Remove clutch rod (4).
- 5. Remove fuse box (6) and ground cable (5).
- 6. Disconnect differential lock pedal (8).
- 7. Remove step (9) and wiring (7).

- (1) Foot Accelerator Rod
- (2) Brake Rod R.H.
- (3) Steering Support
- (4) Clutch Rod
- (5) Ground Cable
- (6) Fuse Box
- (7) Wiring Harness
- (8) Differential Lock Pedal
- (9) Step
- (10) Brake Rod L.H.

W1028969







### Suction Pipe and Hydraulic Block

1. Remove suction pipe (1), (4).
2. Remove oil filter bracket (3) together with oil filter (9).
3. Remove hydraulic block (8) together with return pipe (7).
4. Remove **3P** delivery pipe (2), I-PTO delivery pipe (5).
5. Remove brake connecting rod RH (6) and LH.

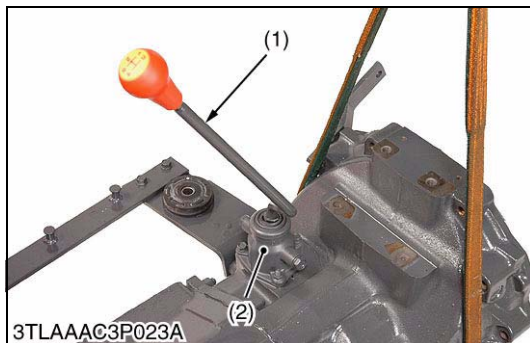
#### (When reassembling)

- Apply grease to the O-rings.

Tightening torque	<b>3P</b> delivery pipe joint bolts	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
-------------------	-------------------------------------	---

- |                             |                          |
|-----------------------------|--------------------------|
| (1) Suction Pipe            | (6) Brake Connecting Rod |
| (2) <b>3P</b> Delivery Pipe | (7) Return Pipe          |
| (3) Oil Filter Bracket      | (8) Hydraulic Block      |
| (4) Suction Pipe            | (9) Oil Filter           |
| (5) I-PTO Delivery Pipe     |                          |

W1029541



### Main Gear Shift Lever

1. Shift main gear shift lever (1) to **neutral** position.
2. Unscrew mounting screws and remove main gear shift base (2).

#### (When reassembling)

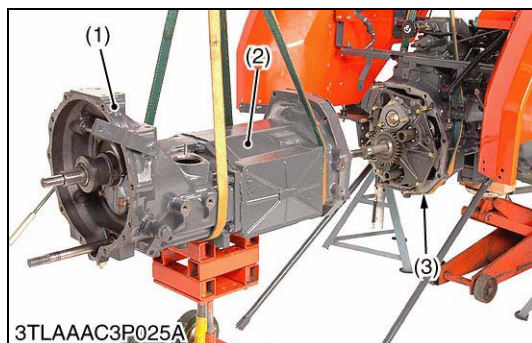
- Apply grease to the O-rings (3) and take care not to damage it.

Tightening torque	Main gear shift lever mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
-------------------	--------------------------------------	---

- |                           |            |
|---------------------------|------------|
| (1) Main Gear Shift Lever | (3) O-ring |
| (2) Main Gear Shift Base  |            |

W1030173





### **Separating Mid Case from Transmission Case**

1. Loosen and remove screws and nuts securing mid case (2) to transmission case (3).
2. Separate mid case from transmission case (3).

#### **(When reassembling)**

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of mid case and transmission case after eliminate water, oil and stuck liquid gasket.

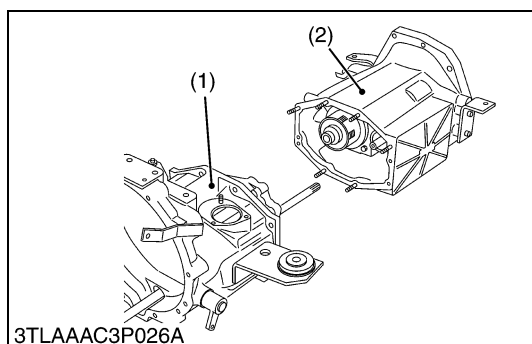
Tightening torque	Mid case and transmission case mounting screw and nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Mid case and transmission case mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

(1) Clutch Housing

(3) Transmission Case

(2) Mid Case

W1030573



### **Separating Clutch Housing from Mid Case**

1. Remove screws and nuts securing clutch housing to mid case.
2. Separate the clutch housing (1) from mid case (2).

#### **(When reassembling)**

- Replace the gasket with a new one.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the clutch housing and mid case.

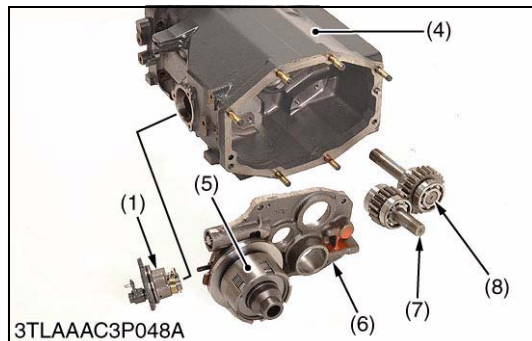
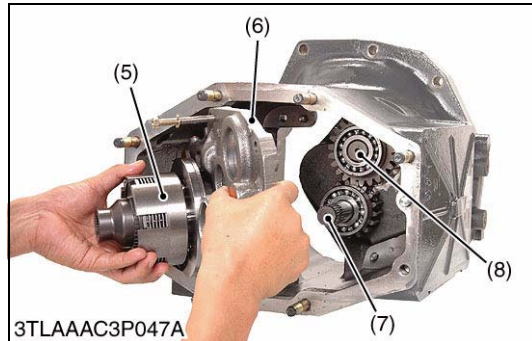
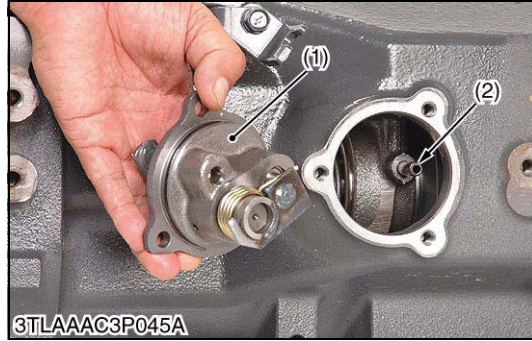
Tightening torque	Clutch housing and mid case mounting nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Clutch housing and mid case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Clutch housing and mid case mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

(1) Clutch Housing

(2) Mid Case

W1030814

### [3] DISASSEMBLING AND ASSEMBLING



#### PTO Clutch Valve, PTO Clutch Holder

1. Remove PTO clutch valve (1).
2. Remove PTO clutch holder (6) together with PTO clutch pack (5) by using two jack screw M8 (3).
3. Tap out 18T gear shaft (7).
4. Tap out 23T gear shaft (8).

#### **(When reassembling)**

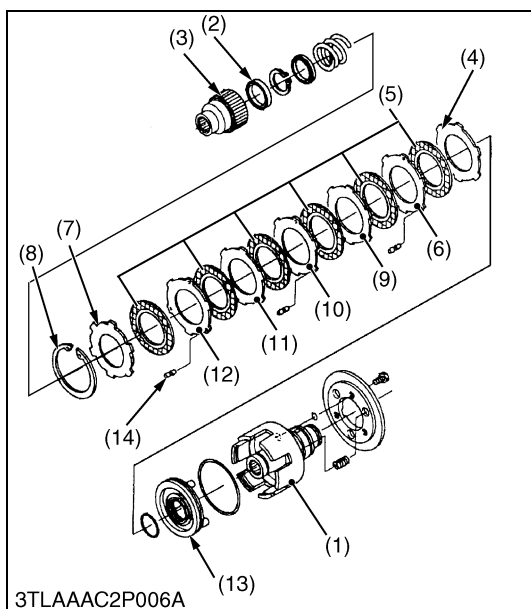
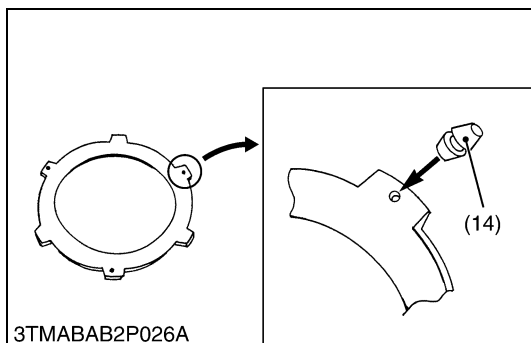
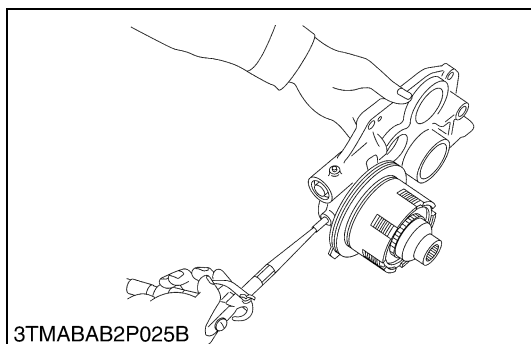
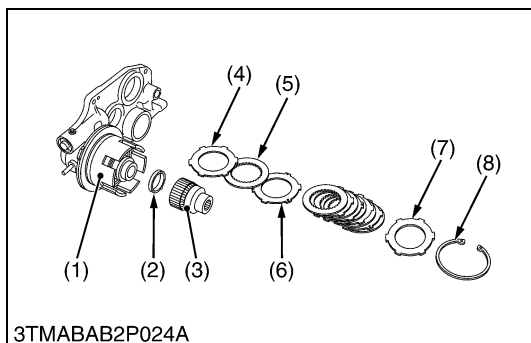
- Apply a small amount of transmission fluid to the O-ring.
- Install oil pipe (2) to the side hole of PTO clutch holder (6) firmly.

Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
	PTO clutch holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

- (1) PTO Clutch Valve
- (2) Oil Pipe
- (3) Jack Screw M8
- (4) Mid Case

- (5) PTO Clutch Pack
- (6) PTO Clutch Holder
- (7) 18T Gear Shaft
- (8) 23T Gear Shaft

W1031115



### Clutch Hub and Clutch Discs

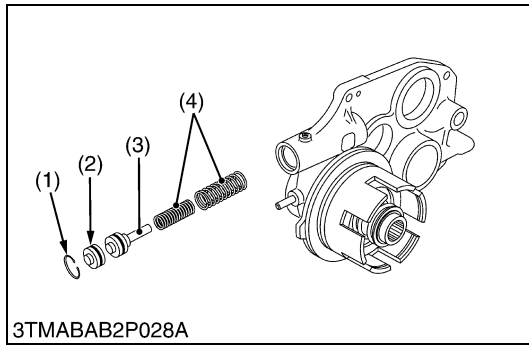
1. Remove the internal snap ring (8), and then take out the clutch discs (5), the back plate (7), the steel plates (6), (9), (10), (11) and (12), the hub (3) and the bearings (2).

#### (When reassembling)

- Install the clutch discs (5) and steel plates (12), (11), (10), (9) and (6) mutually. (Refer to figure below.)
- Do not confuse the two types steel plates. The steel plates with the plug rubbers (14) are (6), (10), (12) and without plug rubbers (14) are (9) and (11).
- Do not confuse the back plate (7) and steel plates. The back plate (7) is thicker than the steel plates.
- Assemble the plug rubbers portion of the three steel plates (6), (10) and (12) are same positions while assembling them. (Refer to figure below.)
- Apply enough transmission fluid to the discs (5).
- Confirm the moving of the piston (13) smoothly when pressure air at 0.29 to 0.39 MPa (3 to 4 kgf/cm<sup>2</sup>, 42 to 57 psi) is sent to clutch pack. (Refer to the figure left.)

- |                                       |  |
|---------------------------------------|--|
| (1) Clutch Case                       | (8) Internal Snap Ring                 |
| (2) Bearing                           | (9) Steel Plate (without Plug Rubber)  |
| (3) Hub                               | (10) Steel Plate (with Plug Rubber)    |
| (4) Steel Plate (without Plug Rubber) | (11) Steel Plate (without Plug Rubber) |
| (5) Clutch Disc                       | (12) Steel Plate (with Plug Rubber)    |
| (6) Steel Plate (with Plug Rubber)    | (13) Piston                            |
| (7) Back Plate                        | (14) Plug Rubber                       |



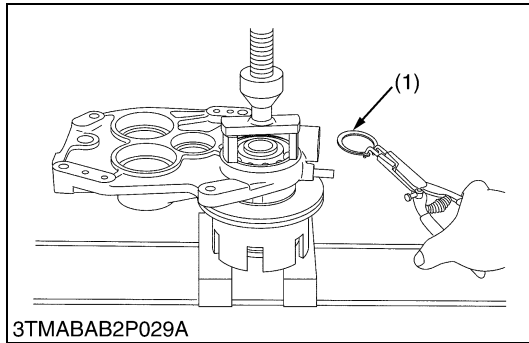


### **Modulating Valve**

1. Remove the internal snap ring (1).
2. Remove the spring seat (2).
3. Draw out the spring (3) and piston (4).

- |                        |            |
|------------------------|------------|
| (1) Internal Snap Ring | (3) Spring |
| (2) Spring Seat        | (4) Piston |

W1032071



### **Clutch Case**

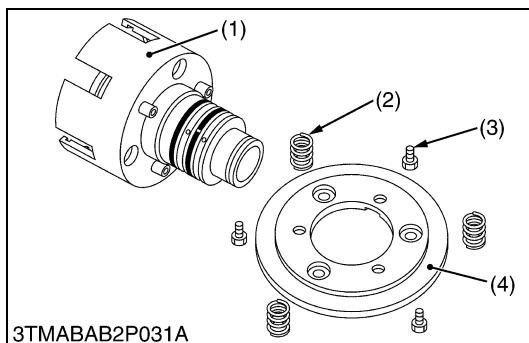
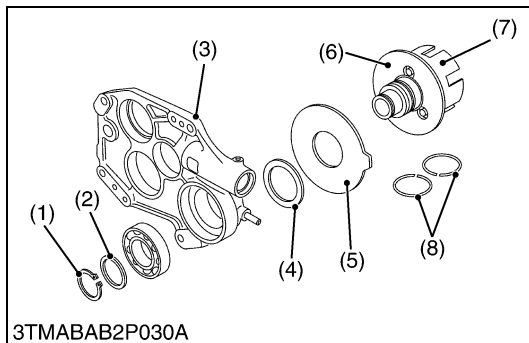
1. Remove the internal snap ring (1).
2. Remove the external snap ring (2).
3. Remove the clutch case (7) and brake disc (5).

#### **(When reassembling)**

- Direct the contact part of the brake disc (5) to the brake plate (6).
- Apply small amount of the grease to the seal rings (8).

- |                        |                 |
|------------------------|-----------------|
| (1) Internal Snap Ring | (5) Brake Disc  |
| (2) External Snap Ring | (6) Brake Plate |
| (3) Clutch Holder      | (7) Clutch Case |
| (4) Collar             | (8) Seal Ring   |

W1032347



### **Brake Plate**

1. Remove the brake plate mounting screws (3) and then take out the brake plate (4) and the springs (2).

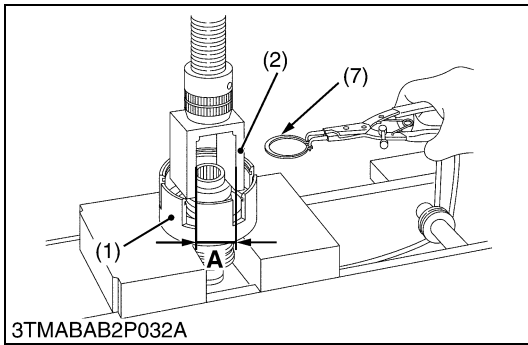
#### **(When reassembling)**

- Apply liquid lock (Three Bond 1372 or equivalent) to the brake plate mounting screws (3).

Tightening torque	Brake plate mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 ft·lbs
-------------------	----------------------------	--

- |                 |                                |
|-----------------|--------------------------------|
| (1) Clutch Case | (3) Brake Plate Mounting Screw |
| (2) Spring      | (4) Brake Plate                |

W1032576

**Clutch Case**

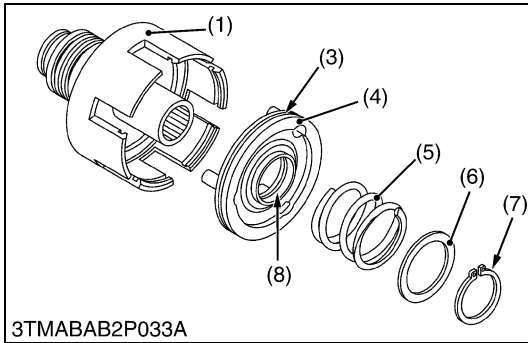
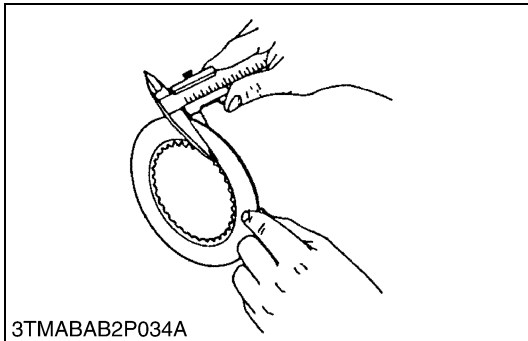
1. Press the washer (6) lightly by the hand press, using the hand made jig. (Refer to the figure.)
2. Draw out the piston (4).

**(When reassembling)**

- Apply enough transmission fluid to seal rings (3) and (8).

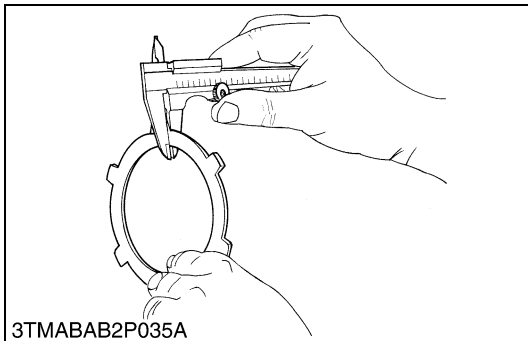
- |                 |                            |
|-----------------|----------------------------|
| (1) Clutch Case | (6) Washer                 |
| (2) Jig         | (7) External Snap Ring     |
| (3) Seal Ring   | (8) Seal Ring              |
| (4) Piston      |                            |
| (5) Spring      | <b>A : 41 mm (1.6 in.)</b> |

W1032846

**[4] SERVICING****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.

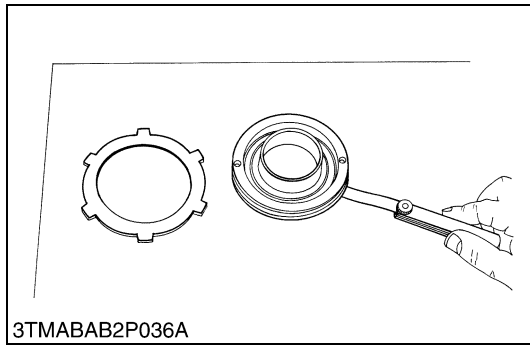
Clutch disc wear	Factory spec.	1.70 to 1.90 mm 0.067 to 0.075 in.
	Allowable limit	1.55 mm 0.061 in.

**PTO Steel Plate Wear**

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

Clutch disc wear	Factory spec.	1.15 to 1.25 mm 0.045 to 0.049 in.
	Allowable limit	1.10 mm 0.043 in.

W1033498

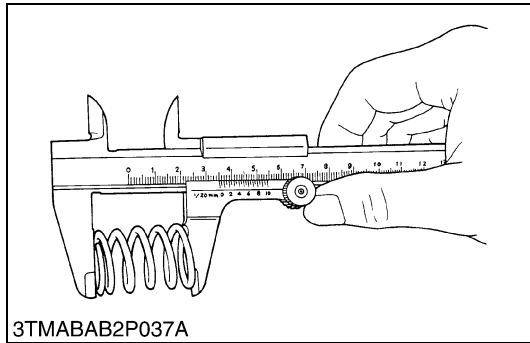


### **Flatness of PTO Piston and PTO Steel Plate**

1. Place the part on a surface plate.
2. Check it unable to insert a feeler gauge (allowable limit size) underneath it at least four points.
3. If the gauge can be inserted, replace it.

Flatness of PTO piston	Allowable limit	0.15 mm 0.006 in.
------------------------	-----------------	----------------------

Flatness of PTO steel plate	Allowable limit	0.30 mm 0.012 in.
-----------------------------	-----------------	----------------------



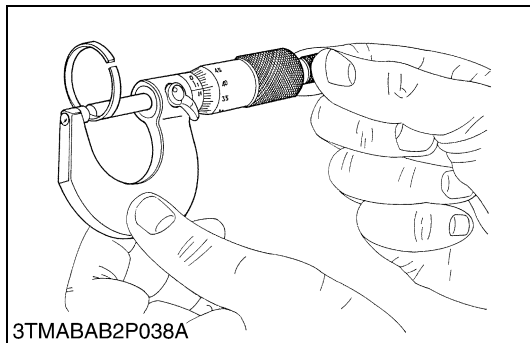
### **Piston Return Spring Free Length**

1. Measure the free length of spring with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

PTO return spring free length	Factory spec.	40.5 mm 1.59 in.
	Allowable limit	37.5 mm 1.48 in.

PTO brake spring free length	Factory spec.	20.3 mm 0.38 in.
	Allowable limit	18.0 mm 0.71 in.

W1033828

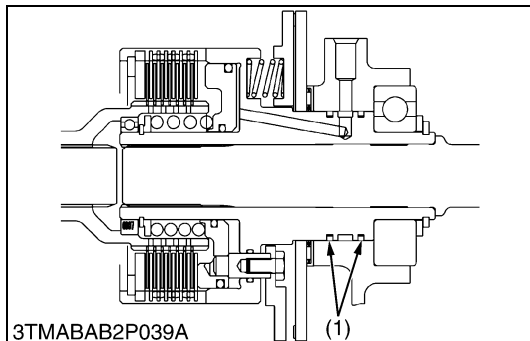


### **Thickness of Seal Ring**

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

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

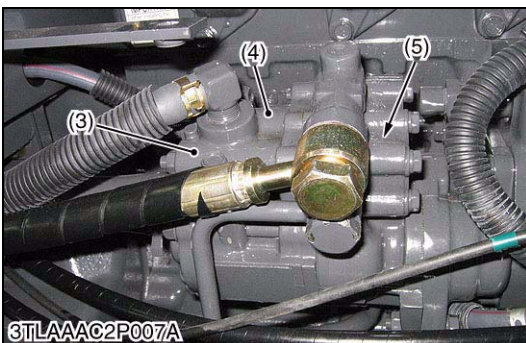
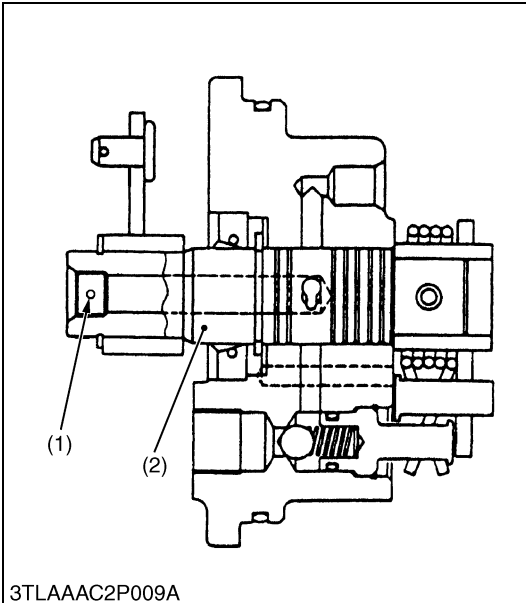
(1) Seal Ring





## 6. CHECKING, DISASSEMBLING AND SERVICING (HYDRAULIC PTO CLUTCH VALVE)

### [1] CHECKING AND ADJUSTING



#### Relief Valve Setting Pressure

1. Start the engine and warm up the transmission fluid, and then stop the engine.
2. Remove the plug (1) (PT 1/8) on the PTO valve spool (2).
3. Set the pressure gauge.
4. Start the engine and measure the pressure.
5. For adjustment, use the reducing valve adjuster (3) of the regulator valve (5).

#### ■ IMPORTANT

- Do not connect the universal joint of the implement to the tractor PTO shaft while testing.

Independent PTO pressure	When PTO shift lever is "ENGAGED" position	2.25 to 2.45 MPa 23.0 to 25.0 kgf/cm <sup>2</sup> 327 to 356 psi
	When PTO shift lever is "DISENGAGED" position	No pressure

#### Condition

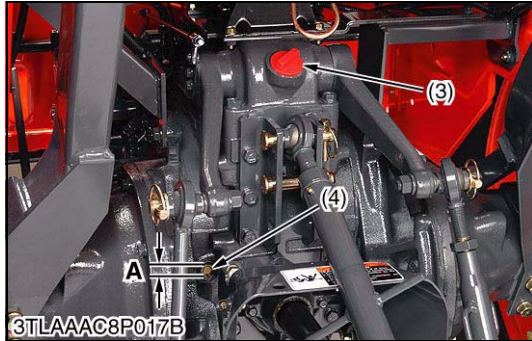
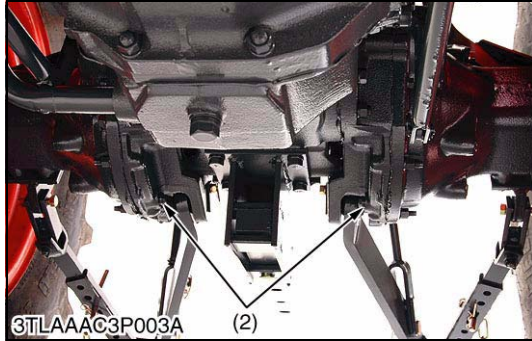
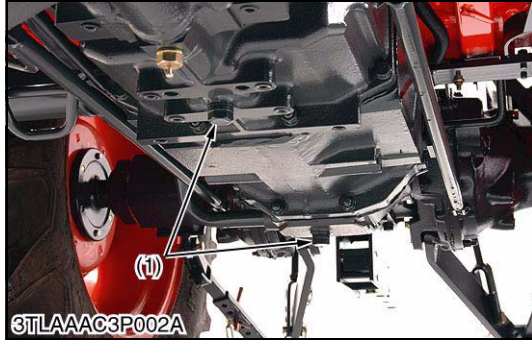
- Engine speed ..... Idling speed
- Oil temperature ..... 40 to 60 °C  
104 to 140 °F

#### (Reference)

- Turn to clockwise direction → Pressure is increased
- Turn to counterclockwise direction → Pressure is decreased

- |                             |                           |
|-----------------------------|---------------------------|
| (1) Plug (PT 1/8)           | (4) Relief Valve Adjuster |
| (2) Spool                   | (5) Regulator Valve       |
| (3) Reducing Valve Adjuster |                           |

## [2] PREPARATION



### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

### **(When refilling)**

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

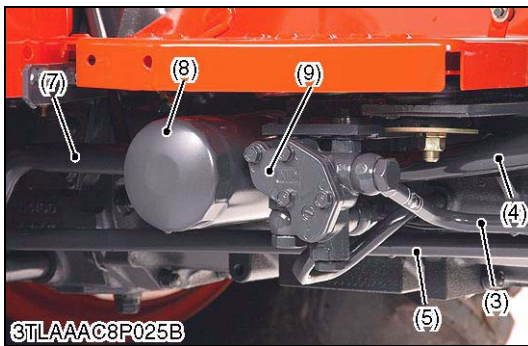
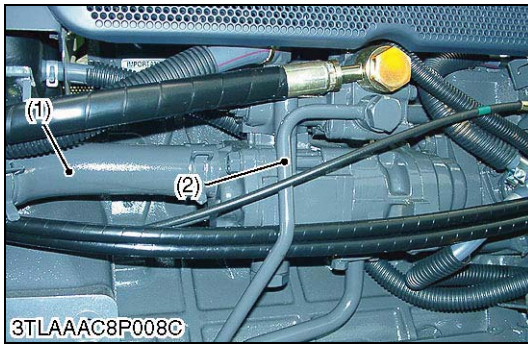
Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.gals
--------------------	----------	--------------------------------------

### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.



### Hose and Pipes

1. Remove the suction hose (1).
2. Remove the PTO delivery pipe (2) and 3P delivery pipe 2 (3).
3. Remove the suction pipe 1 (4).
4. Remove the brake rod (5).
5. Remove the 3P delivery pipe 1 (6).
6. Remove the hydraulic block (9).
7. Remove the hydraulic filter (8) with hydraulic bracket and suction pipe 2 (7).

### (When reassembling)

Tightening torque	3P delivery pipe 1, 2 joint bolt	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
	PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs

- |                        |                          |
|------------------------|--------------------------|
| (1) Suction Hose       | (6) 3P Delivery Pipe 2   |
| (2) PTO Delivery Pipe  | (7) Suction Pipe 2       |
| (3) 3P Delivery Pipe 1 | (8) Hydraulic Oil Filter |
| (4) Suction Pipe 1     | (9) Hydraulic Block      |
| (5) Brake Rod (R.H.)   |                          |

## [3] DISASSEMBLING AND ASSEMBLING



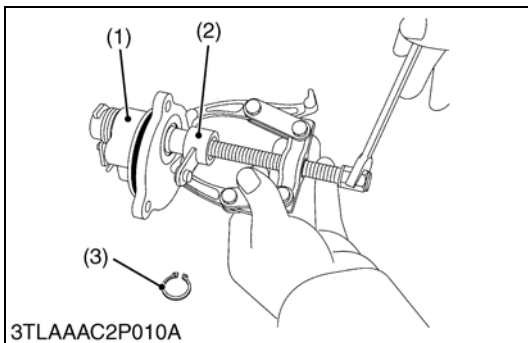
### PTO Clutch Valve

1. Make a marks on the spool and the lever arm (2).
2. Draw out the lever arm (2) by the bearing puller after removing the external snap ring (3).

### (When reassembling)

Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
-------------------	---------------------------------	---

- |                     |                      |
|---------------------|----------------------|
| (1) PTO Clutch Wire | (2) PTO Clutch Valve |
|---------------------|----------------------|



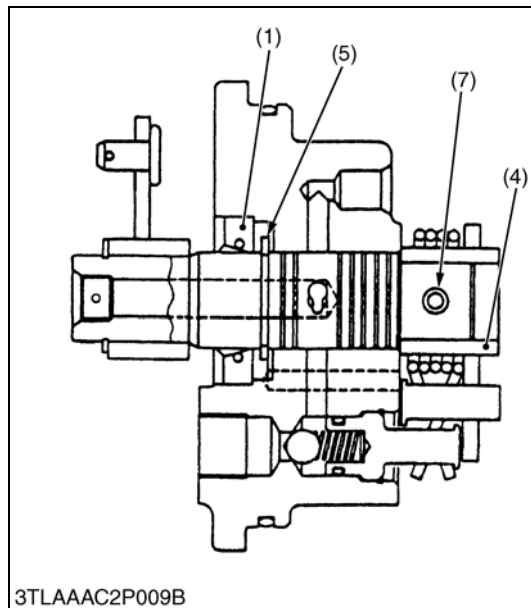
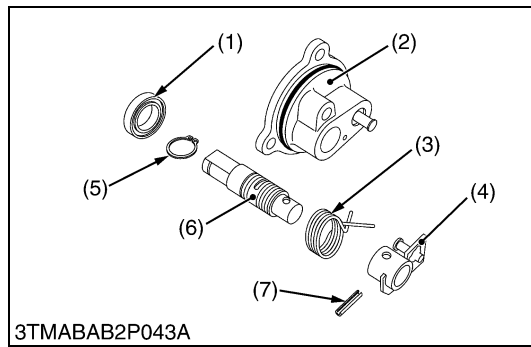
### Clutch Valve Spool

1. Make a marks on the spool and the lever arm (2).
2. Draw out the lever arm (2) by the bearing puller after removing the external snap ring (3).

### (When reassembling)

- Assemble them with aligning the marks.

- |                  |                        |
|------------------|------------------------|
| (1) Clutch Valve | (3) External Snap Ring |
| (2) Lever Arm    |                        |



### Clutch Valve Spool

1. Remove the oil seal and the external snap ring (5).
2. Draw out the spool (6).
3. Make a marks on the spool (6) and the lever (4).
4. Remove the spring (3) and tap out the spring pin (7), and then remove the lever (4).

### (When reassembling)

- Replace the oil seal (1).
- Assemble the spool (6) and lever (4) with aligning the marks.

(1) Oil Seal

(2) Clutch Valve Case

(3) Spring

(4) Lever

(5) External Snap Ring

(6) Spool

(7) Spring Pin

# **3 TRANSMISSION**

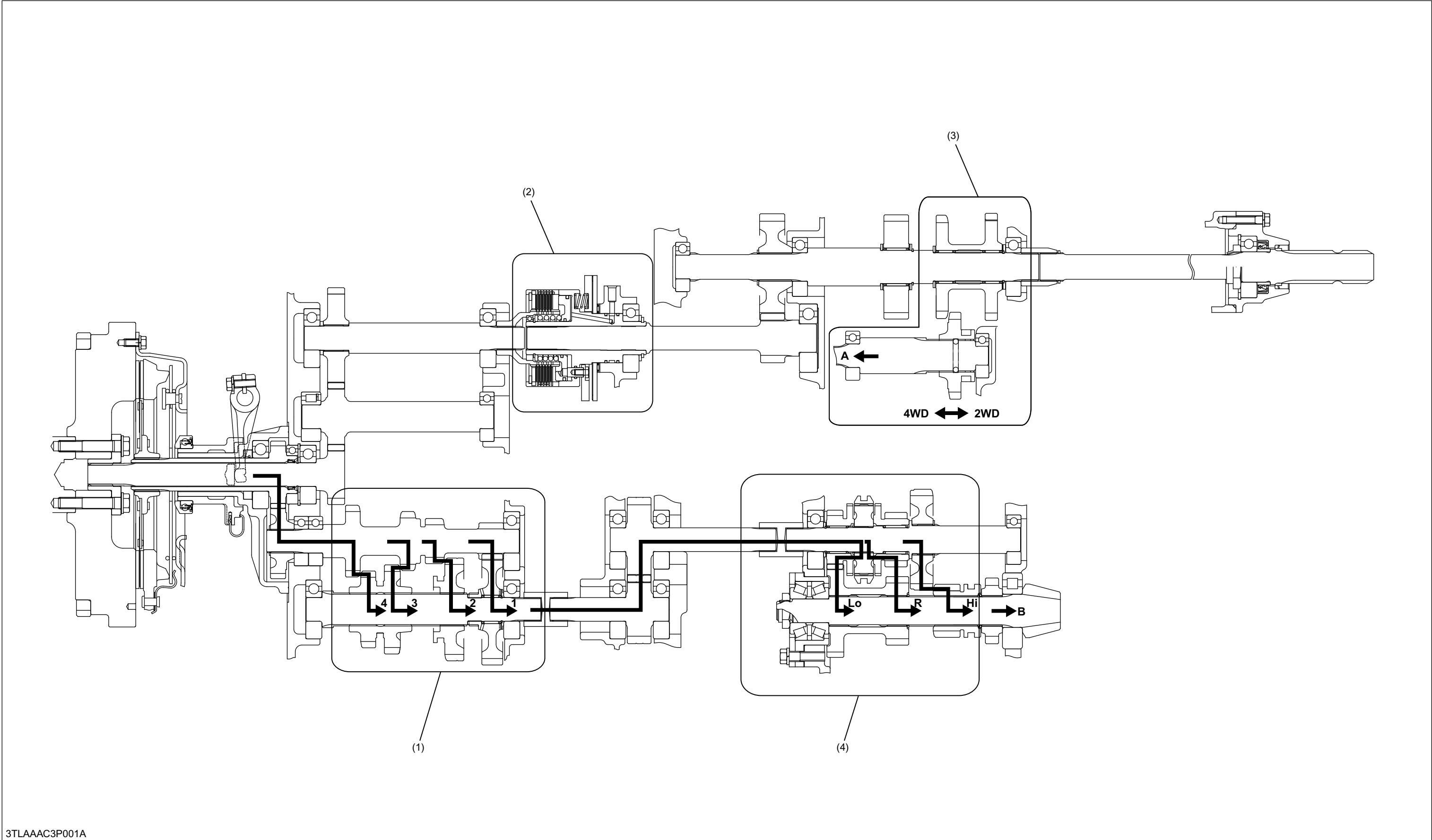
# MECHANISM

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--------------------	------



1. STRUCTURE



3TLAAAC3P001A

(1) Main Gear Shift Section

(2) PTO Clutch Pack

(3) Front Wheel Drive Shift Section

(4) Lo-Reverse, Hi Shift Section

A : To Front Wheels  
B : To Rear Wheels



# SERVICING

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(1) Clutch Housing.....	3-S31
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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Excessive Transmission Noise</b>	Transmission fluid insufficient	Replenish	3-S6
	Gear worn or backlash improper	Replace	3-S32
	Bearing worn or broken	Replace	3-S31
	Shift fork worn	Replace	3-S32
	Spline worn	Replace	3-S32
	Snap rings on the shaft come off	Repair or replace	–
	Spiral bevel pinion staking nut improperly tightened	Tighten	3-S25
	Improper backlash between spiral bevel pinion and spiral bevel gear	Adjust	3-S35
	Improper backlash between differential pinion and differential side gear	Adjust	3-S37
<b>Gear Slip Out of Mesh</b>	Shift linkages rusted	Repair	–
	Shifter or shift fork or damaged	Replace	3-S32
	Shift fork interlock ball spring weaken or damaged	Replace	3-S21
	Interlock ball fallen	Reassemble	–
	Gears worn or broken	Replace	–
<b>Hard Shifting</b>	Shifter or shift fork worn or damaged	Replace	3-S32
	Shift fork bent	Replace	–
	Shift linkage rusted	Repair	–
	Shaft part of shift arms rusted	Repair	–
<b>Gears Clash When Shifting</b>	Traveling clutch does not release	Adjust or repair	2-S5, S11
	Gears worn or damaged	Replace	–
<b>Differential Lock Can Not Be Set</b>	Differential lock shift fork damaged	Replace	–
	Differential lock shift fork mounting spring pin damaged	Replace	3-S28
	Differential lock shifter pin bent or damaged	Replace	3-S28
	Differential lock fork shaft bent or damaged	Replace	3-S28
<b>Differential Lock Pedal Does Not Return</b>	Differential lock pedal return spring weaken or damaged	Replace	–
	Differential lock shifter pin bent or damaged	Replace	3-S28
	Differential lock fork shaft bent	Replace	3-S28

W1014322

Symptom	Probable Cause	Solution	Reference Page
<b>Excessive or Unusual Noise at All Time</b>	Improper backlash between spiral bevel pinion and spiral bevel gear	Adjust	3-S35
	Improper backlash between differential pinion and differential side gear	Adjust	3-S37
	Bearings worn	Replace	3-S31
	Insufficient or improper type of transmission fluid	Replenish or replace	G-8, 3-S6
<b>Noise While Turning</b>	Differential pinions or differential side gears worn or damaged	Replace	3-S37
	Differential lock binding (does not disengage)	Replace	–
	Bearing worn	Replace	3-S31

W1046443

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Gear to Spline, Hub to Spline	Clearance	0.030 to 0.078 mm 0.00118 to 0.00307 in.	0.2 mm 0.008 in.
Shift Fork and Shift Gear Groove	Clearance	0.15 to 0.40 mm 0.006 to 0.0016 in.	0.2 mm 0.024 in.
Spiral Bevel Pinion and Differential Assembly	Combined Turning Torque	3.92 to 6.37 N·m 0.4 to 0.65 kgf·m 2.89 to 4.7 ft-lbs	—
Spiral Bevel Pinion to Bevel Gear	Backlash	0.15 to 0.30 mm 0.006 to 0.012 in.	—
	Tooth Contact	—	More than 35 %
	Center of Tooth Contact	—	1/3 to 1/2 of the entire width from the small end
Differential Case Bore (Differential Case Cover Bore) to Differential Side Gear Boss	Clearance	0.050 to 0.151 mm 0.00197 to 0.00594 in.	0.35 mm 0.0138 in.
Differential Case Bore	I.D.	40.500 to 40.550 mm 1.59449 to 1.59646 in.	—
Differential Side Gear Boss	I.D.	40.500 to 40.550 mm 1.59449 to 1.59646 in.	—
Differential Side Gear Boss	O.D.	40.338 to 40.450 mm 1.59008 to 1.59252 in.	—
Differential Pinion Shaft to Differential Pinion	Clearance	0.060 to 0.102 mm 0.00236 to 0.00402 in.	0.25 mm 0.0098 in.
Differential Pinion Shaft	O.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	—
Differential Pinion	I.D.	20.040 to 20.061 mm 0.78898 to 0.78980 in.	—
Differential Pinion to Differential Side Gear	Backlash	0.15 to 0.30 mm 0.006 to 0.012 in.	0.40 mm 0.0098 in.
Differential Side Gear Washer 1	Thickness	1.5 mm 0.059 in.	—
Differential Side Gear Washer 2	Thickness	1.6 mm 0.063 in.	—
Differential Side Gear Washer 3	Thickness	1.7 mm 0.067 in.	—

W1013874

### 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 main delivery hose retaining nut to controller	46.9 to 50.9	4.8 to 5.2	34.4 to 37.6
Turning delivery hoses retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Joint bolt for delivery pipe and front hydraulic block	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
Joint bolt for PTO delivery pipe and regulator valve	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Joint bolt (with orifice) for PTO valve	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Joint bolt for power steering delivery hose and regulator valve	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
Joint bolt for delivery pipe and hydraulic pump	39.3 to 49.0	4.0 to 5.0	29.0 to 36.2
Regulator valve mounting screws	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2
Joint bolt between regulator valve and hydraulic pump	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Regulator valve plate	9.8	1.0	7.2
Regulator valve case and regulator support mounting screw	9.8	1.0	7.2
Engine and clutch housing case mounting screws and nuts	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Engine and clutch housing case mounting stud bolts	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Clutch housing case and mid case mounting screws	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Clutch housing case and mid case mounting nuts	102.9 to 117.6	10.5 to 12.0	76.9 to 86.8
Clutch housing case and mid case mounting stud bolts	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Main shift base mounting screws	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
Main shift arm setting screw	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
Gear shaft case mounting screws	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
Release fork setting screws	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
Clutch housing bearing holder mounting screws	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Stopper screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Mid case and transmission case mounting screws, nuts	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Mid case and transmission case mounting stud bolts	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Independent PTO valve mounting screws	23.5 to 27.4	2.4 to 2.8	17.4 to 20.2
Mid case bearing holder mounting screws	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Independent PTO brake plate mounting screws	9.8 to 11.2	1.00 to 1.15	7.2 to 8.3
Rear PTO bearing case mounting lock nut	147 to 196	15 to 20	108 to 145
Rear PTO bearing case mounting screws	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Differential support mounting screws	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Differential case cover mounting screws	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Spiral bevel gear UBS screws	68.6 to 88.3	7.0 to 9.0	50.6 to 65.1
Hydraulic cylinder assembly mounting stud bolt	34.3 to 49.0	3.5 to 5.0	25.3 to 36.2
Hydraulic cylinder assembly mounting screws, nuts	77.4 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting M10 screws	48.0 to 55.9	4.9 to 5.7	35.4 to 41.2

W1012736

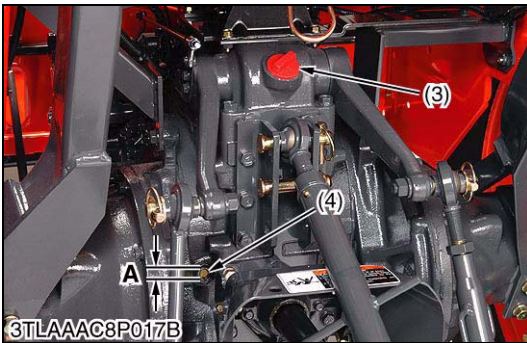
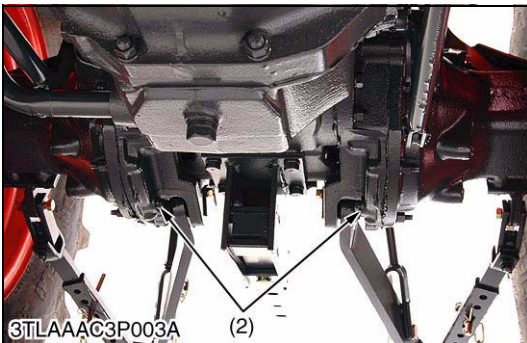
Item	N·m	kgf·m	ft-lbs
Rear axle case mounting M10 nuts	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Rear axle case mounting M12 screws and nuts	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting stud bolts	24.5 to 31.4	2.5 to 3.2	18.1 to 23.1
Rear wheel mounting screws and nuts	196 to 226	20 to 23	145 to 166
Brake case mounting stud bolts	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Brake case mounting screws, and nuts	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Brake case mounting lever shaft screw	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5
Spiral bevel pinion lock nut	147 to 196	15 to 20	108 to 145
Spiral bevel pinon bearing case mounting screws	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Transmission bearing holder mounting screws	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
ROPS mounting M12 screws	77.5 to 90.2	7.9 to 9.2	57 to 66
ROPS mounting M14 screws	166.7 to 196.1	17.0 to 20.0	123 to 144
ROPS mounting M16 screws	260.9 to 304.0	26.6 to 31.0	192 to 224
ROPS mounting 9/16-18 UNF screws	149.1 to 179.5	15.2 to 18.3	110 to 132
ROPS fulcrum screws	118 to 137	12.0 to 14.0	87 to 101
Oil level gauge (Transmission case)	1.0 to 1.5	0.1 to 0.15	0.7 to 1.1

W1022115

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] PREPARATION

#### (1) Separating Engine and Clutch Housing



#### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### (When refilling)

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.qts
--------------------	----------	-------------------------------------

#### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.

W1022472





### **Bonnet and Front Cover**

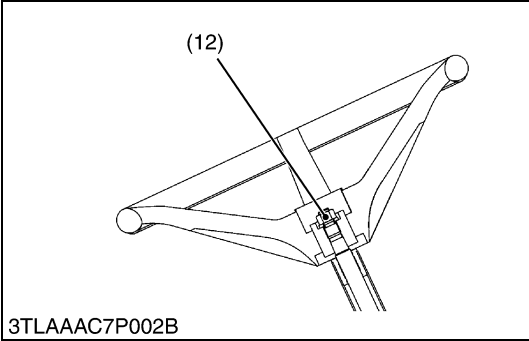
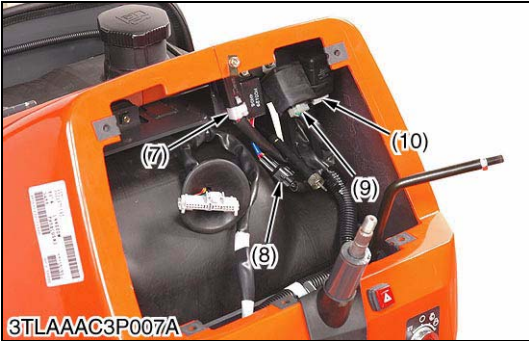
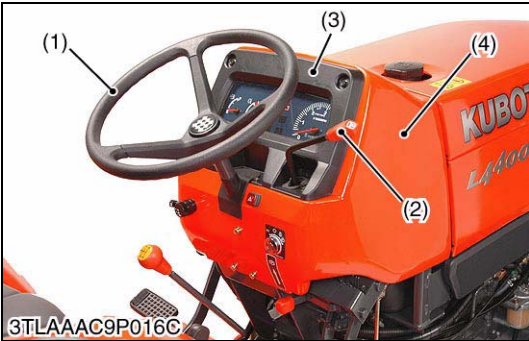
1. Disconnect the battery negative cable (1).
2. Disconnect the connector to head light and the head light wiring.
3. Remove bonnet (2) and side covers (3) on both sides.
4. Remove the front cover (4).

(1) Battery Negative Cable  
(2) Bonnet

(3) Side Cover  
(4) Front Cover

W1022852





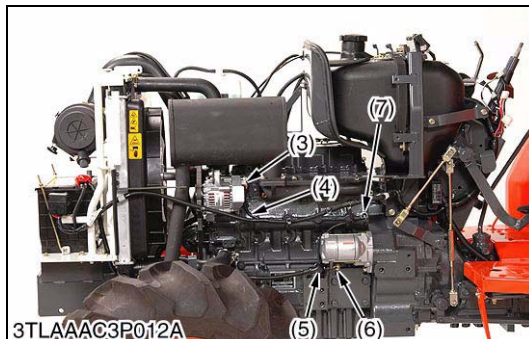
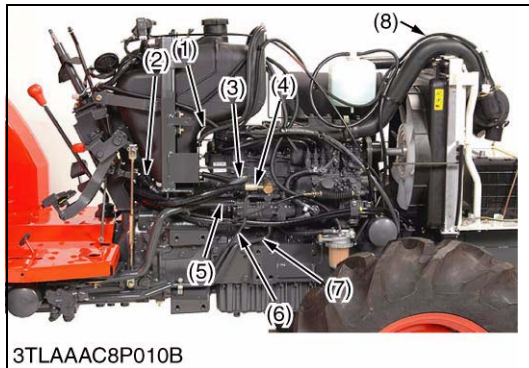
Steering Wheel and Rear Bonnet

- 1. Remove steering wheel (1) with steering puller.
- 2. Remove throttle grip (2).
- 3. Disconnect hourmeter cable from engine.
- 4. Remove meter panel (3).
- 5. Disconnect **4P** connector (5) to main switch.
- 6. Disconnect **8P** connector (6) to combination switch.
- 7. Disconnect **4P** connector to starter relay (7), **4P** connector to OPC timer (8), **8P** connector to flasher (hazard) unit (9), **4P** connector to glow (Key stop solenoid) relay (10).
- 8. Disconnect fuel tank wiring (11).
- 9. Remove rear bonnet (4).

(When reassembling)

Tightening torque	Steering wheel mounting nut	48.0 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
-------------------	-----------------------------	---

- (1) Steering Wheel
  - (2) Throttle Grip
  - (3) Meter Panel
  - (4) Rear Bonnet
  - (5) **4P** Connector (Main Switch)
  - (6) **8P** Connector (Combination Switch)
- (7) **4P** Connector (Starter Relay)
  - (8) **4P** Connector (OPC Timer)
  - (9) **8P** Connector (Flasher (Hazard) Unit)
  - (10) **4P** Connector (Glow (Key Stop Solenoid) Relay)
  - (11) Fuel Tank Wiring
  - (12) Steering Wheel Mounting Nut
- W1064593



### Wiring, Pipes and Rods

1. Disconnect **1P** connector (1) to water temperature sensor.
2. Disconnect glow plug terminal (10).
3. Disconnect accelerator rod cable (2), head light wiring (8), **2P** connector to key stop solenoid (9) and then set aside the wiring harness.
4. Disconnect power steering delivery hose (4), power steering return hose (3).
5. Disconnect pump inlet hose (5), I-PTO delivery pipe (6) and **3P** delivery pipe (7).

### (When reassembling)

Tightening torque	Independent PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs

- |  |   |
|--|---|
| (1) <b>1P</b> Connector (Water Temperature Sensor) | (6) I-PTO Delivery Pipe                     |
| (2) Accelerator Rod Cable                          | (7) <b>3P</b> Delivery Pipe                 |
| (3) Power Steering Return Hose                     | (8) Head Light Wiring                       |
| (4) Power Steering Delivery Hose                   | (9) <b>2P</b> Connector (Key Stop Solenoid) |
| (5) Pump Inlet Hose                                | (10) Glow Plug Terminal                     |

W1065019

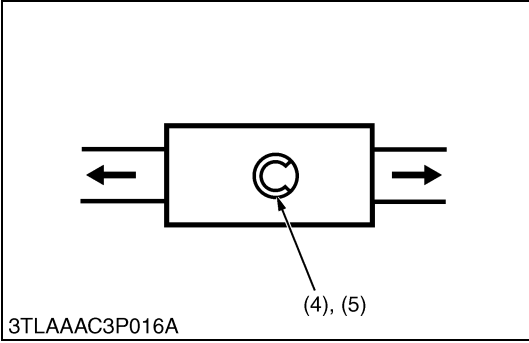
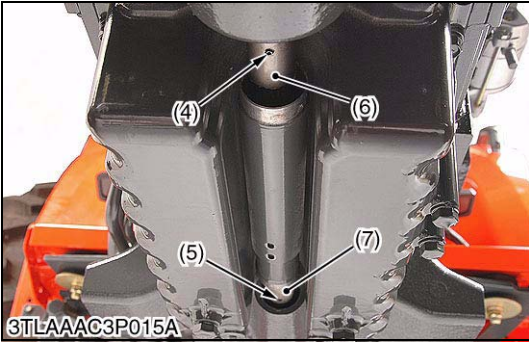
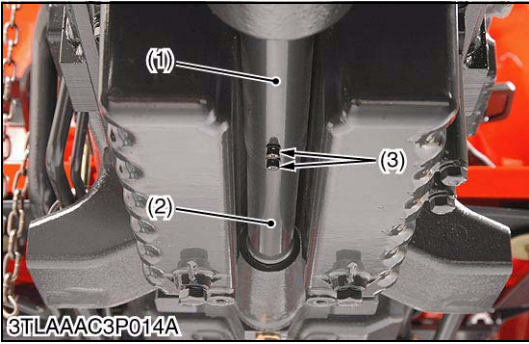
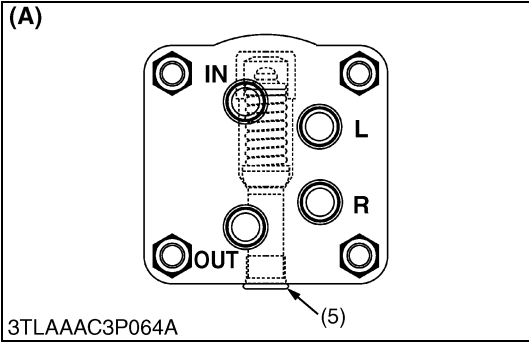
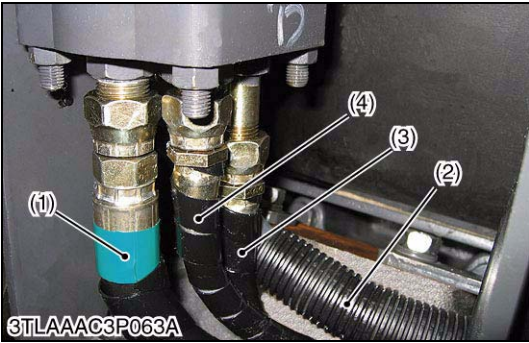
### Wirings

1. Disconnect **1P** battery connector (1) and remove slow blow fuse boxes (2).
2. Disconnect **2P** connector (3) to alternator and wings (4).
3. Disconnect **1P** connector (5) to Starter motor and **B** terminal (6).
4. Disconnect **1P** connector (7) to engine oil pressure switch, then set aside the wiring harness.

- |                                      |  |
|--------------------------------------|--|
| (1) <b>1P</b> Connector (Battery)    | (5) <b>1P</b> Connector (Starter Motor)              |
| (2) Slow Blow Fuse Box               | (6) <b>B</b> Terminal (Starter)                      |
| (3) <b>2P</b> Connector (Alternator) | (7) <b>1P</b> Connector (Engine Oil Pressure Switch) |
| (4) Wiring (Alternator)              |  |

W1065603





Hydraulic Pipe

1. Disconnect the right delivery hose (3) and the left delivery hose (4).

Tightening torque	Main delivery hose retaining nut	46.2 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hoses retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose  
(2) Return Hose  
(3) Right Delivery Hose  
(4) Left Delivery Hose  
(5) Relief Valve Plug (Engine Side)

(A) Steering Controller Viewing from the Bottom

W1065917

Propeller Shaft (4WD only)

1. Slide propeller shaft front cover (1) and rear cover (2) after removing screws (3).  
2. Tap out spring pins (4), (5), slide couplings (6), (7), and then remove propeller shaft together with propeller shaft covers.

(When reassembling)

- Apply grease to splines of propeller shaft.
  - Tap in spring pin (4), (5) as shown in figure.
- (1) Propeller Shaft Front Cover                      (5) Spring Pin  
(2) Propeller Shaft Rear Cover                    (6) Coupling  
(3) Screw    (7) Coupling  
(4) Spring Pin

W1066505



### **Separating Engine from Clutch Housing**

1. Place the disassembling stand under the engine and clutch housing case.
2. Remove the steering support plates connecting steering support and rear bonnet support.
3. Remove the engine and clutch housing mounting screws and nuts.
4. Separate the engine and clutch housing.

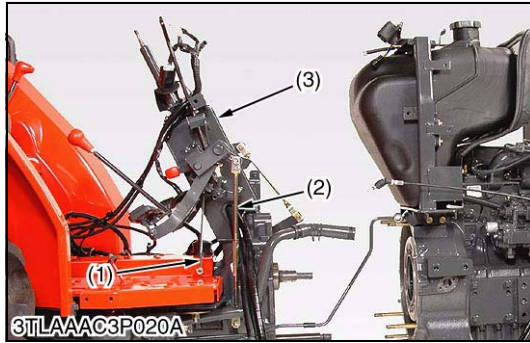
#### **(When reassembling)**

- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, grade 7	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Engine and clutch housing mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

W1067100

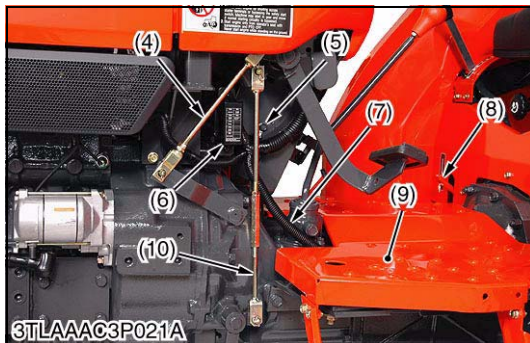
## **(2) Separating Clutch Housing from Mid Case**



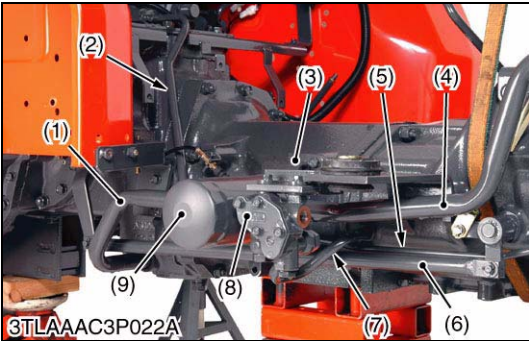
### **Outer Components**

1. Disconnect foot accelerator rod (1).
2. Remove brake rod R.H. (2) and L.H. (10).
3. Remove mounting bolts and steering support (3).
4. Remove clutch rod (4).
5. Remove fuse box (6) and ground cable (5).
6. Disconnect differential lock pedal (8).
7. Remove step (9) and wiring (7).

- |                          |                             |
|--------------------------|-----------------------------|
| (1) Foot Accelerator Rod | (6) Fuse Box                |
| (2) Brake Rod R.H.       | (7) Wiring Harness          |
| (3) Steering Support     | (8) Differential Lock Pedal |
| (4) Clutch Rod           | (9) Step                    |
| (5) Ground Cable         | (10) Brake Rod L.H.         |



W1013738



**Suction Pipe and Hydraulic Block**

- 1. Remove suction pipe (1), (4).
- 2. Remove oil filter bracket (3) together with oil filter (9).
- 3. Remove hydraulic block (8) together with return pipe (7).
- 4. Remove **3P** delivery pipe (2), I-PTO delivery pipe (5).
- 5. Remove brake connecting rod RH (6) and LH.

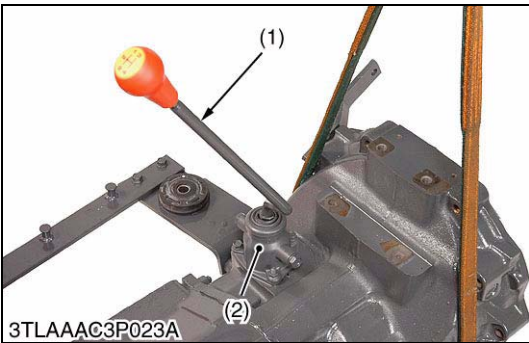
**(When reassembling)**

- Apply grease to the O-rings.

Tightening torque	<b>3P</b> delivery pipe joint bolt	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft·lbs
-------------------	------------------------------------	---

- (1) Suction Pipe
- (2) **3P** Delivery Pipe
- (3) Oil Filter Bracket
- (4) Suction Pipe
- (5) I-PTO Delivery Pipe
- (6) Brake Connecting Rod
- (7) Return Pipe
- (8) Hydraulic Block
- (9) Oil Filter

W1027079



**Main Gear Shift Lever**

- 1. Shift main gear shift lever (1) to **neutral** position.
- 2. Unscrew mounting screws and remove main gear shift base (2).

**(When reassembling)**

- Apply grease to the O-rings (3) and take care not to damage it.

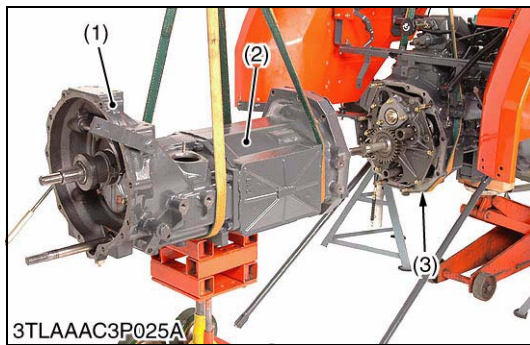
Tightening torque	Main gear shift lever mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs
-------------------	--------------------------------------	---

- (1) Main Gear Shift Lever
- (2) Main Gear Shift Base
- (3) O-ring

W1014109







### **Separating Mid Case from Transmission Case**

1. Loosen and remove screws and nuts securing mid case (2) to transmission case (3).
2. Separate mid case from transmission case (3).

#### **(When reassembling)**

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of mid case and transmission case after eliminate water, oil and stuck liquid gasket.

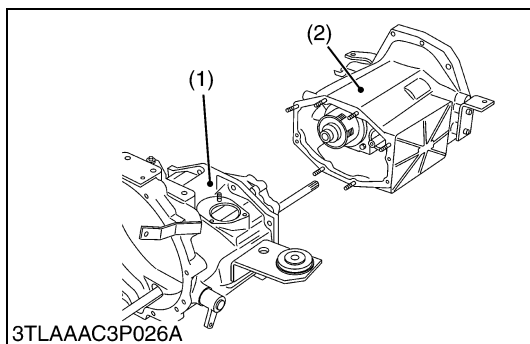
Tightening torque	Mid case and transmission case mounting screw and nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Mid case and transmission case mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

(1) Clutch Housing

(3) Transmission Case

(2) Mid Case

W1044273



### **Separating Clutch Housing from Mid Case**

1. Remove screws and nuts securing clutch housing to mid case.
2. Separate the clutch housing (1) from mid case (2).

#### **(When reassembling)**

- Replace the gasket with a new one.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the clutch housing and mid case.

Tightening torque	Clutch housing and mid case mounting nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Clutch housing and mid case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Clutch housing and mid case mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

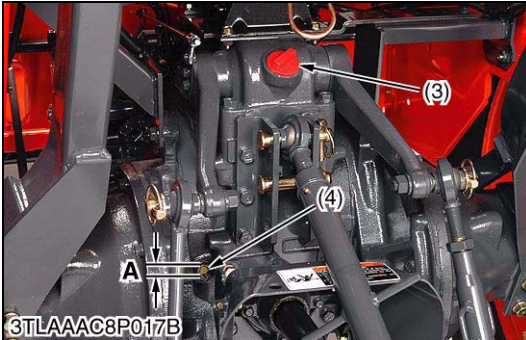
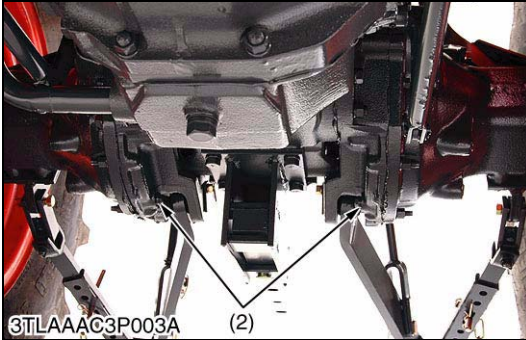
(1) Clutch Housing

(2) Mid Case

W1044068



### (3) Separating Transmission



#### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### (When reassembling)

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.qts
--------------------	----------	-------------------------------------

#### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.

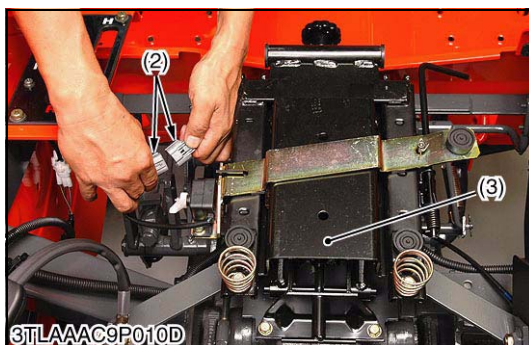
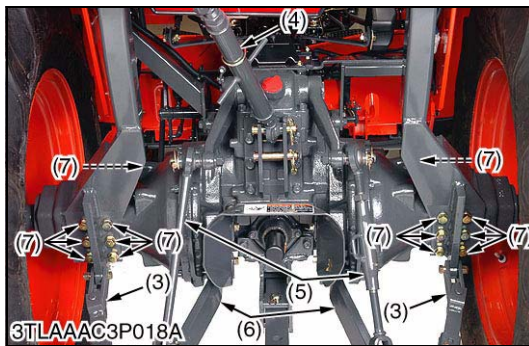
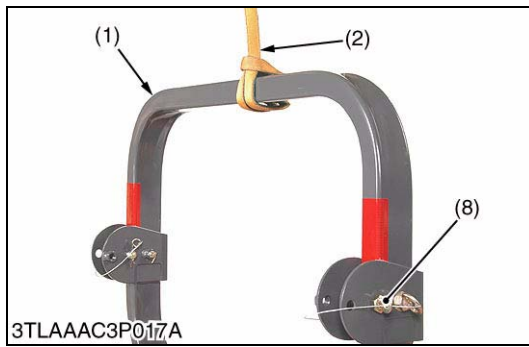
W1028669

#### Battery Negative Cable

1. Disconnect battery negative cable (1).

- (1) Battery Negative Cable

W1047493



### Three Point Linkage and ROPS

1. Secure the ROPS (1) with safety strap (2).
2. Remove stabilizer joint (3), top link (4), lift rods (5) and low links (6).
3. Unscrew ROPS mounting screws (7), then the ROPS.

#### (When reassembling)

Tightening torque	ROPS mounting screw	M14 screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123 to 144 ft-lbs
		M12 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	ROPS fulcrum screw		118 to 137 N·m 12 to 14 kgf·m 87 to 101 ft-lbs

- (1) ROPS  
(2) Safety Strap  
(3) Stabilizer Joint  
(4) Top Link

- (5) Lift Rod  
(6) Lower Link  
(7) ROPS Mounting Screw  
(7) ROPS Fulcrum Screw

W1027979

### Rear Wheels and Seat

1. Place the disassembling stand under the clutch housing and transmission case.
2. Loosen and remove the rear wheels mounting screws and nuts.
3. Remove the rear wheels.
4. Remove the seat (1).
5. Disconnect the seat switch connector (2), then remove the seat stay (3).

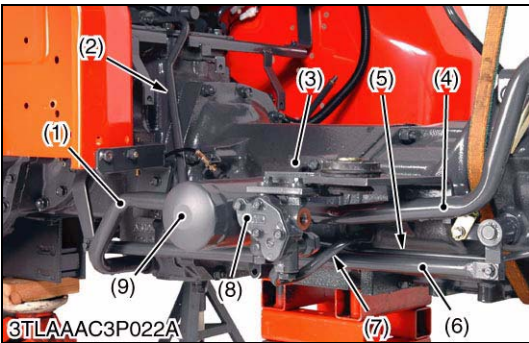
Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
	Rear wheel mounting stud bolt	98.1 to 112.7 N·m 10.0 to 11.5 kgf·m 72.3 to 83.1 ft-lbs

- (1) Seat  
(2) Seat Switch Connector

- (3) Seat Stay

W1014739





**Step and Center Cover**

- 1. Disconnect foot accelerator rod (1).
- 2. Disconnect differential lock pedal (2).
- 3. Remove step (3) and center cover (4).

- (1) Foot Accelerator Rod
- (2) Differential Lock Pedal
- (3) Step
- (4) Center Cover

W1015500

**Suction Pipe and Hydraulic Block**

- 1. Remove suction pipe (1), (4).
- 2. Remove oil filter bracket (3) together with oil filter (9).
- 3. Remove hydraulic block (8) together with return pipe (7).
- 4. Remove **3P** delivery pipe (2), I-PTO delivery pipe (5).
- 5. Remove brake connecting rod RH (6) and LH.

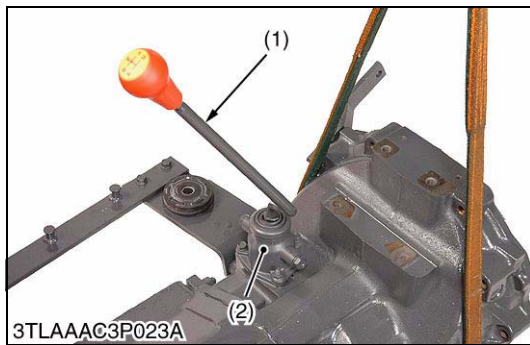
**(When reassembling)**

- Apply grease to the O-rings.

Tightening torque	<b>3P</b> delivery pipe joint bolts	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs
-------------------	-------------------------------------	---

- (1) Suction Pipe
- (2) **3P** Deliver Pipe
- (3) Oil Filter Bracket
- (4) Suction Pipe
- (5) I-PTO Delivery Pipe
- (6) Brake Connecting Rod
- (7) Return Pipe
- (8) Hydraulic Block
- (9) Oil Filter

W1015833



### Main Gear Shift Lever

1. Shift main gear shift lever (1) to **neutral** position.
2. Unscrew mounting screws and remove main gear shift base (2).

#### (When reassembling)

- Apply grease to the O-rings (3) and take care not to damage it.

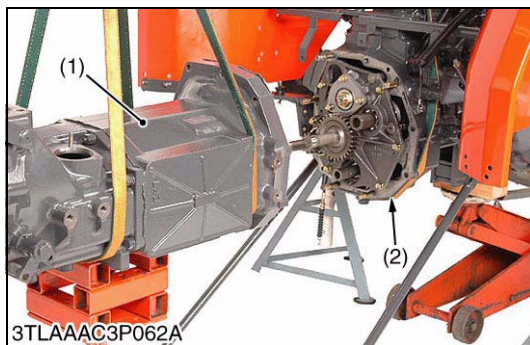
Tightening torque	Main gear shift lever mounting screw	23.6 to 27.4 N·m
		2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs

(1) Main Gear Shift Lever

(3) O-ring

(2) Main Gear Shift Base

W1051483



### Separating Mid Case from Transmission Case

1. Remove screws and nuts securing mid case (1) to transmission case (2).
2. Separate the mid case and transmission case.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of mid case and transmission case after eliminate water, oil and stuck liquid gasket.

Tightening torque	Mid case and transmission case mounting screw and nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 ft-lbs
	Mid case and transmission case mounting stud bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

(1) Mid Case

(2) Transmission Case

W1016201

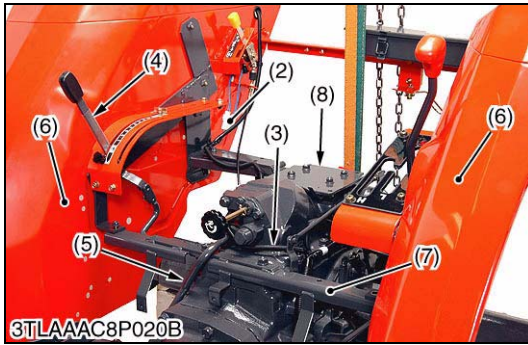


### Fender, Wiring Harness

1. Disconnect rear combination lamp connector RH (1) and LH, PTO switch connector (2), and then clear wiring harness (3) from the hydraulic cylinder.
2. Remove upper part of position control lever (4), 3P delivery pipe (5), fenders (6), fender stay (7), and seat support (8).

- |  |                      |
|--|----------------------|
| (1) Rear Combination Lamp Connector RH | (5) 3P Delivery Pipe |
| (2) PTO Switch Connector               | (6) Fender           |
| (3) Wiring Harness                     | (7) Fender Stay      |
| (4) Position Control Lever             | (8) Stay Support     |

W1052083



### Hydraulic Cylinder

1. Loosen and remove the hydraulic cylinder assembly mounting screws and nuts.
2. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then take out it.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.
- When replacing the hydraulic cylinder assembly mounting stud bolts, apply liquid lock (Three Bond 1372 or equivalent) to "A" portion of the stud bolt.

Tightening torque	Hydraulic cylinder assembly mounting stud bolts	34.3 to 49.0 N·m 3.5 to 5.0 kgf·m 25.3 to 36.2 ft·lbs
	Hydraulic cylinder assembly mounting screws and nuts	77.4 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs

#### NOTE

- Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod and draft control rod (if equipped). (See page 8-S12, S13.)

W1053360





### Rear Axle Case

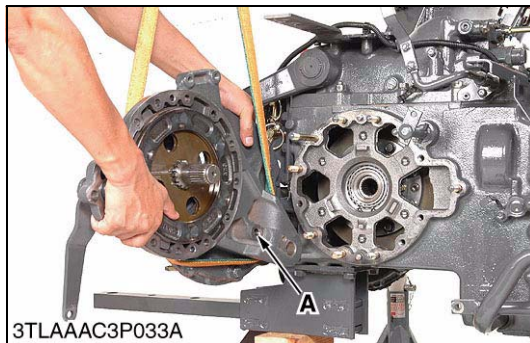
1. Place the support stand under the rear axle case.
2. Loosen and remove the rear axle case mounting screws and nuts.
3. Support the rear axle case with nylon lift strap and hoist.
4. Separate the rear axle case from brake case.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle case and brake case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear wheel mounting screw and nut		196 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
	Rear axle case mounting screws and nuts	M10 screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
		M10 nuts	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
		M12 screws	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		Stud bolts	24.5 to 31.4 N·m 2.5 to 3.2 kgf·m 18.1 to 23.1 ft-lbs

W1016596



### Brake Case

1. Remove the brake case mounting screws and nuts.
2. Separate the brake case, tapping the brake case lever lightly.

#### (When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.).
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the brake case and transmission case, around hole **A** after eliminate the water, oil and stuck liquid gasket.
- Before installing the brake case to the transmission case, install the cam plate to the transmission case.

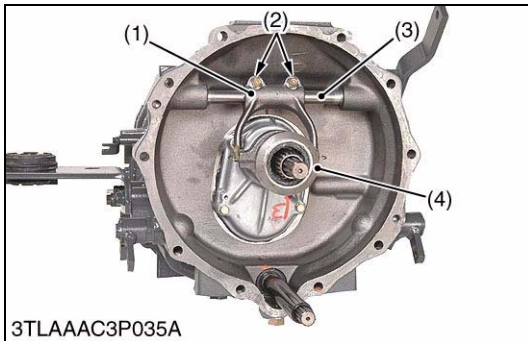


Tightening torque	Brake case mounting stud bolts	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Brake case mounting screws and nuts	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Brake case lever mounting screw	62.8 to 72.5 N·m 6.4 to 7.4 kgf·m 46.3 to 53.5 ft-lbs

W1016886

## [2] DISASSEMBLING AND ASSEMBLING

### (1) Clutch Housing



#### Clutch Lever, Release Fork and Release Bearing

1. Remove the release fork mounting screws (2).
2. Draw out the clutch lever (3) to remove the release fork (1).
3. Remove the release bearing (4) together with release holder.

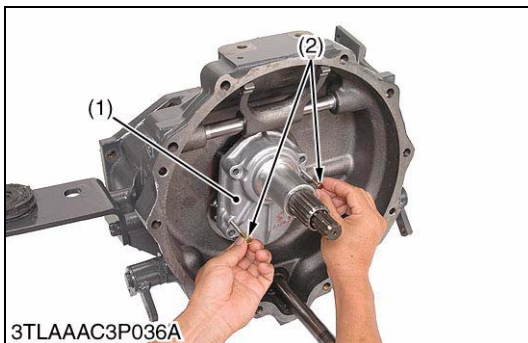
#### (When reassembling)

- Apply grease to the sliding surface of the clutch release hub.
- Apply grease to the clutch lever.

Tightening torque	Release fork mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
-------------------	-----------------------------	---

- (1) Release Fork (3) Clutch Lever  
(2) Release Fork Mounting Screw (4) Release Bearing

W1014296



#### Shaft Case

1. Remove the shaft case mounting screws.
2. Remove the shaft case (1) by using two jack screws M6.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint surface of the shaft case and clutch housing case after eliminating the water, oil and stuck liquid gasket.

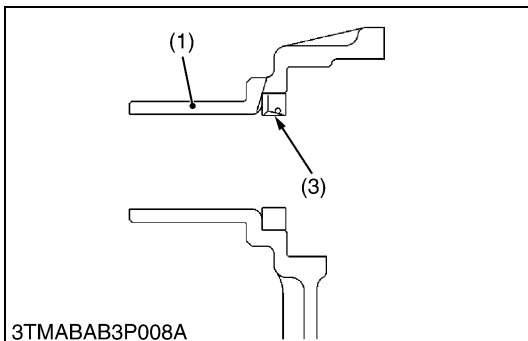
#### (When replacing oil seal in shaft case)

- Install the oil seal (3) as shown in the figure, noting its direction.
- Apply grease to the oil seal (3).

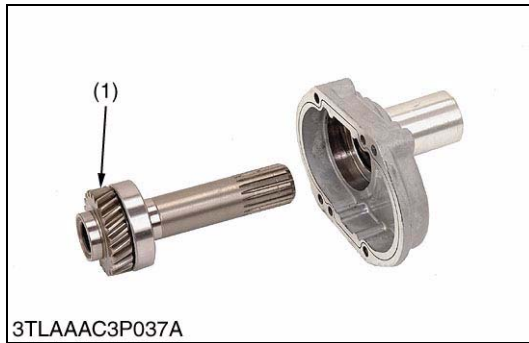
Tightening torque	Release fork setting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
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- (1) Shaft Case (3) Oil Seal  
(2) Jack Screw M6

W1017592





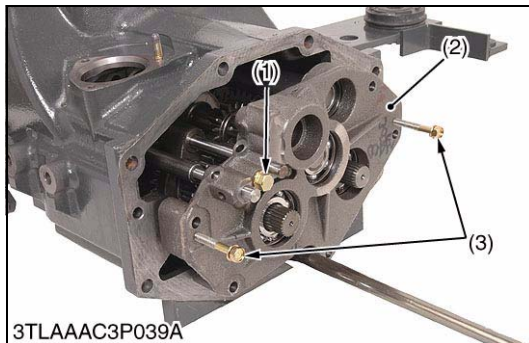
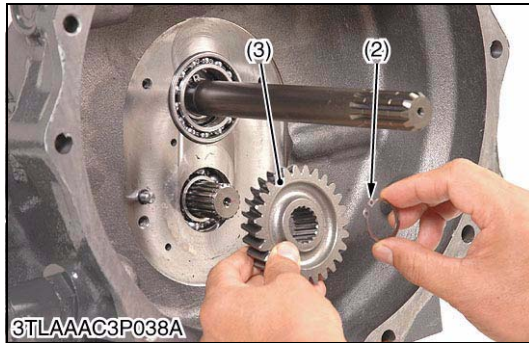


### 24T Gear Shaft and 27T Gear

1. Remove the 24T gear shaft (1).
2. Remove the external snap ring (2) and 27T gear (3).

- (1) 24T Gear Shaft  
(2) External Snap Ring  
(3) 27T Gear

W1014893



### Clutch Housing Bearing Holder

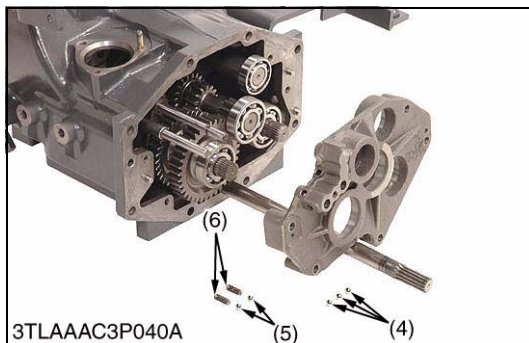
1. Remove clutch housing bearing holder (2) mounting screws.
2. Remove three interlock balls (4) after removing stopper screw (1).
3. Pull out clutch housing bearing holder (2) by using two jack screws M8 (3).

#### NOTE

- Take care not to fly out interlock balls (4) and springs (6) when pull out bearing holder (2).

#### (When reassembling)

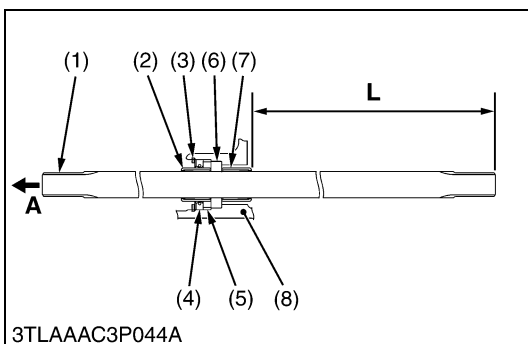
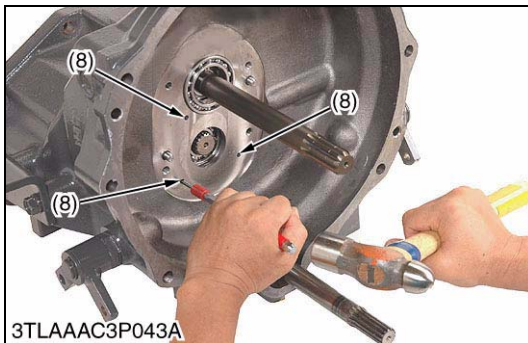
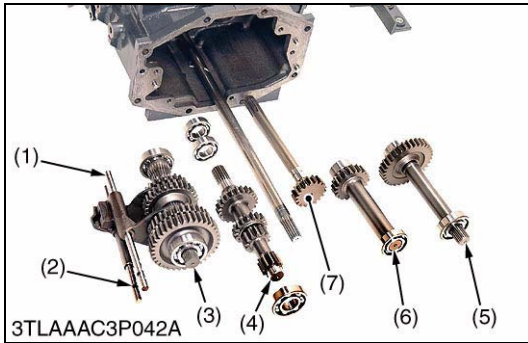
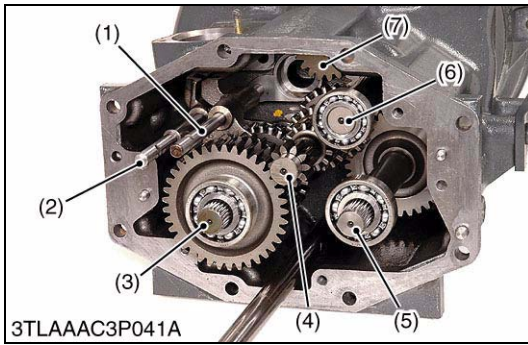
- Install three interlock balls (4) with a small amount of grease to clutch housing bearing holder (2) after setting the shift forks and shift rods to neutral position.



Tightening torque	Clutch housing bearing holder mounting screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
	Stopper screw	34.3 to 44.1 N·m 3.5 to 4.5 kgf·m 25.3 to 32.6 ft-lbs

- (1) Stopper Screw  
(2) Clutch Housing Bearing Holder  
(3) Jack Screw M8  
(4) Interlock Ball  
(5) Shift Lock Ball  
(6) Spring

W1015187



### Gear Shaft Assemblies

1. Remove shift fork assembly (1), (2) together with counter gear shaft assembly (3).
2. Remove main gear shaft assembly (4), I-PTO counter gear shaft assembly (5), I-PTO gear shaft assembly (6), and then PTO gear shaft (7).

#### NOTE

- To easily remove the gear shaft assembly, tap lightly a tool, like the one shown in the photo, through small holes (8) from front inside wall of clutch housing.

- |                                 |                                       |
|---------------------------------|---------------------------------------|
| (1) Shift Fork Assembly (1 - 2) | (5) I-PTO Counter Gear Shaft Assembly |
| (2) Shift Fork Assembly (3 - 4) | (6) I-PTO Gear Shaft Assembly         |
| (3) Counter Gear Shaft Assembly | (7) PTO Gear Shaft                    |
| (4) Main Gear Shaft Assembly    | (8) Hole                              |

W1018805

### Rear Propeller Shaft (4WD)

1. Pull out front axle drive shaft (1) from the rear.

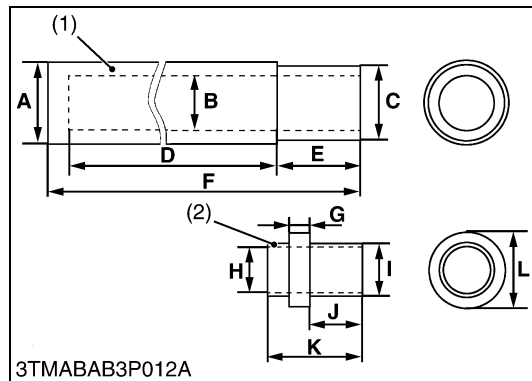
#### (When assembling)

- Install bearing (6), spacer (5), oil seal (4) and internal snap ring to clutch housing (8)
- Install sleeve (7) to the rear propeller shaft with dimension shown on the figure, then install the rear propeller shaft from the rear.
- Install sleeve (2) by using rear propeller shaft tool.

- |                          |                    |
|--------------------------|--------------------|
| (1) Rear Propeller Shaft | (7) Sleeve         |
| (2) Sleeve               | (8) Clutch Housing |
| (3) Internal Snap Ring   |                    |
| (4) Oil Seal             |                    |
| (5) Spacer               |                    |
| (6) Bearing              |                    |

**A : To Front Propeller Shaft**  
**L : 538 mm (21.182 in.)**

W1035817

**Rear Propeller Shaft Tool**

Application : For installing bearing, oil seals and sleeves on rear propeller shaft.

Bearing and oil seal : (1)

Sleeves : (1) and (2)

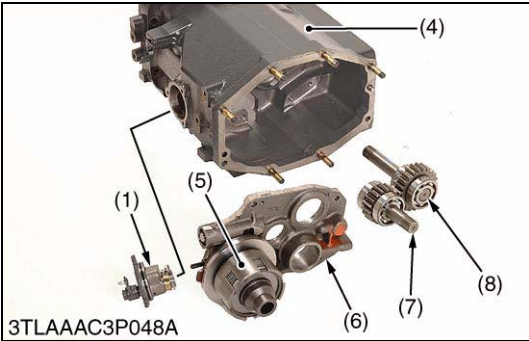
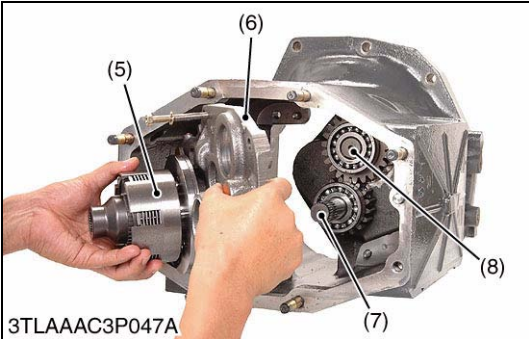
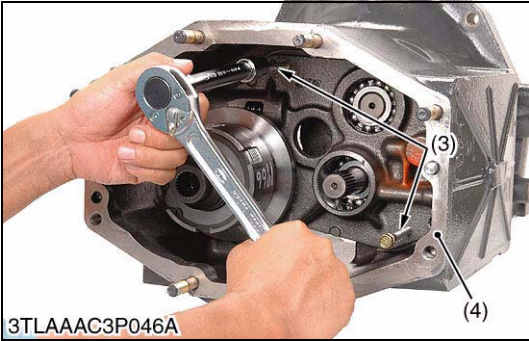
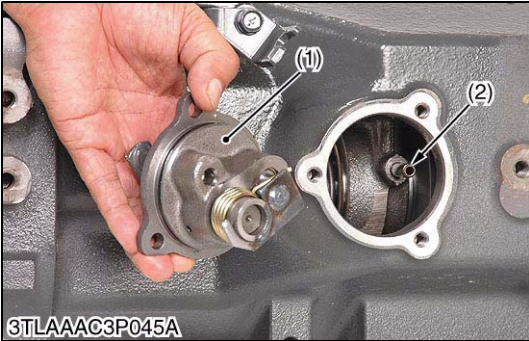
A	40 mm dia. (1.57 in. dia.)
B	26 mm dia. (1.02 in. dia.)
C	36 mm dia. (1.42 in. dia.)
D	200 mm (7.87 in.)
E	40 mm (1.57 in.)
F	250 mm (9.84 in.)
G	10 mm (0.39 in.)
H	22 mm dia. (0.87 in. dia.)
I	25 mm dia. (0.98 in. dia.)
J	25 mm (0.98 in.)
K	45 mm (1.77 in.)
L	36 mm dia. (1.42 in. dia.)

W10315930

(2) Mid Case

■ NOTE

- Refer to section 2. CLUTCH (See page 2-S14) for hydraulic PTO clutch.



**PTO Clutch Valve, PTO Clutch Holder**

1. Remove PTO clutch valve (1).
2. Remove PTO clutch holder (6) together with PTO clutch pack (5) by using two jack screw M8 (3).
3. Tap out 18T gear shaft (7).
4. Tap out 23T gear shaft (8).

**(When reassembling)**

- Apply a small amount of transmission fluid to the O-ring.
- Install oil pipe (2) to the side hole of PTO clutch holder (6) firmly.

Tightening torque	PTO clutch valve mounting screw	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs
	PTO clutch holder mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs

- (1) PTO Clutch Valve

(2) Oil Pipe

(3) Jack Screw M8

(4) Mid Case
- (5) PTO Clutch Pack

(6) PTO Clutch Holder

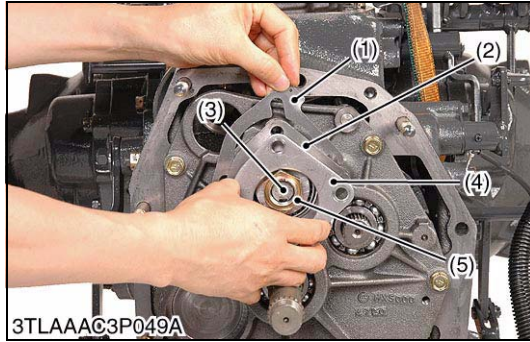
(7) 18T Gear Shaft

(8) 23T Gear Shaft

W1064877



### (3) Transmission Case



#### Pinion Bearing Cover

1. Remove the stake of lock nut (5).
2. Fix the 37T - 22T gear by pinion locking tool (Code No. 07916-52311) and remove the lock nut (5).
3. Remove the pinion bearing case mounting screws.
4. Take out the pinion bearing cover (4) and shims (1).

#### **(When reassembling)**

- Make sure of the number of shims in the pinion bearing case.
- Replace the lock nut (3) with a new one, and stake the lock nut firmly after installing the parts on the shaft.

Tightening torque	Lock nut	147 to 196 N·m 15 to 20 kgf·m 109 to 145 ft-lbs
	Pinion bearing case mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs

(1) Shim

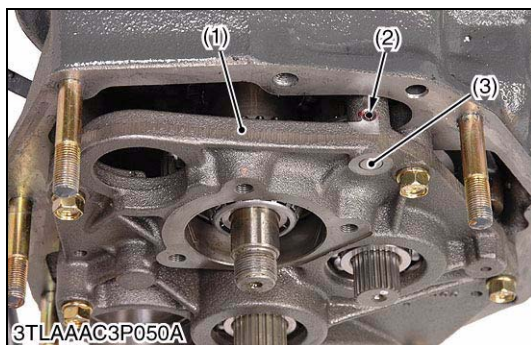
(2) Pinion Bearing Case

(3) Spiral Bevel Pinion Gear Shaft

(4) Pinion Bearing Cover

(5) Lock Nut

W1020909



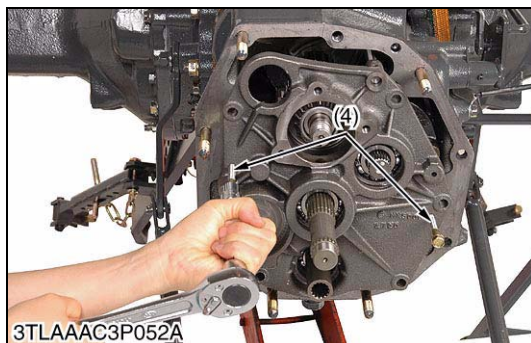
### Transmission Bearing Holder

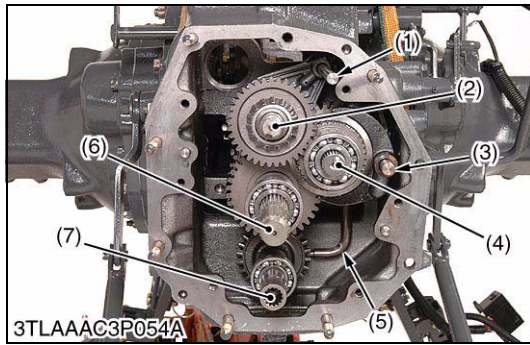
1. Remove spring pin (2) holding Hi-shift fork rod (3) to transmission bearing holder (1).
2. Remove transmission bearing holder by using 2 jack screws M8 (4).

(1) Transmission Bearing Holder  
(2) Spring Pin

(3) Hi-Shift Fork Rod  
(4) Jack Screws M8

W1020311



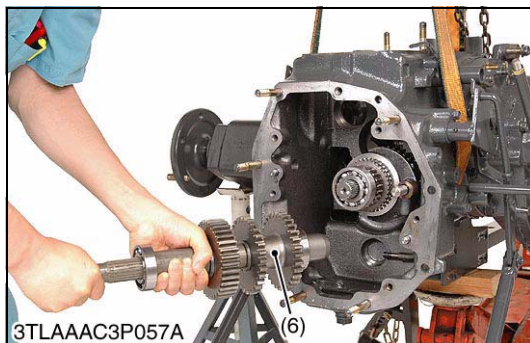
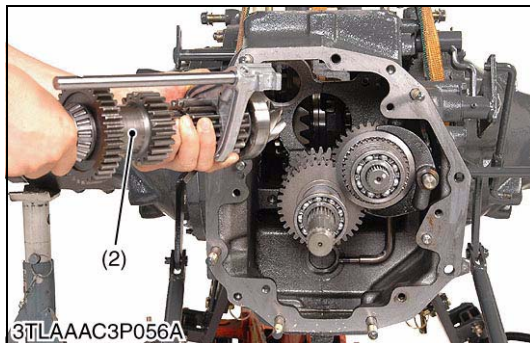
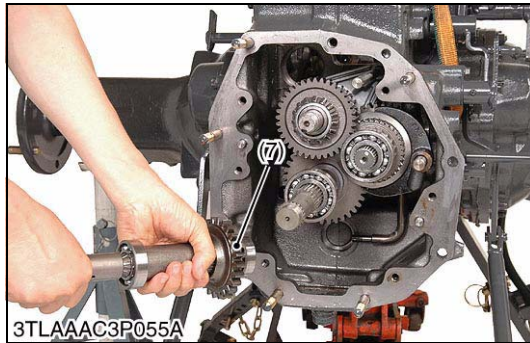


### Shaft Assemblies

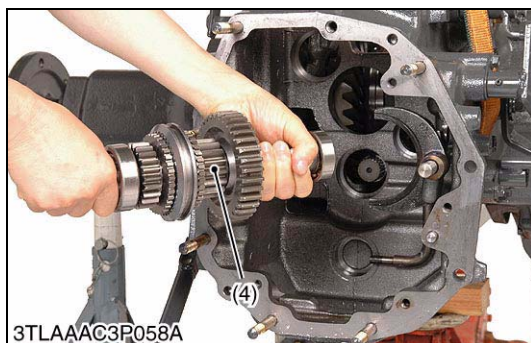
1. Remove front wheel drive gear shaft assembly (7).
2. Remove pinion gear shaft assembly (2) and Hi-shift fork (1).
3. Remove PTO gear shaft assembly (6).

- |                                    |   |
|------------------------------------|---|
| (1) Hi-shift Fork Rod              | (5) Front Wheel Drive Shift Lever         |
| (2) Pinion Gear Shaft Assembly     | (6) PTO Gear Shaft Assembly               |
| (3) Lo-reverse Fork Rod            | (7) Front Wheel Drive Gear Shaft Assembly |
| (4) Lo-reverse Gear Shaft Assembly |   |

W1020895





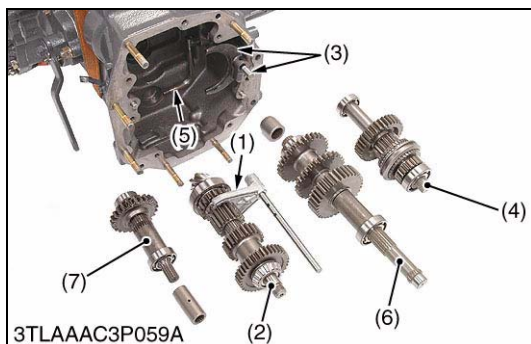


### Shaft Assemblies (Continued)

1. Remove Lo-reverse gear shaft assembly (4).
2. Remove Lo-reverse fork rod (3), front wheel drive shift lever (5).

- |                           |                                   |
|---------------------------|-----------------------------------|
| (1) Hi-shift Fork Rod     | (5) Front Wheel Drive Shift Lever |
| (2) Pinion Gear Shaft     | (6) PTO Gear Shaft Assembly       |
| (3) Lo-reverse Fork Rod   | (7) Front Wheel Drive Gear Shaft  |
| (4) Lo-reverse Gear Shaft | Assembly                          |

W1021656



### Differential Lock Shift Fork

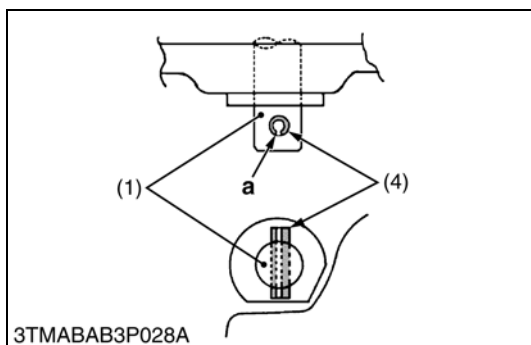
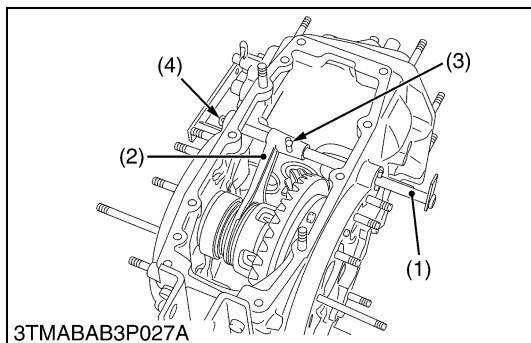
1. Tap out the left side spring pin (4).
2. Remove the cotter pin and take out the clevis pin (3).
3. Draw out the differential lock fork shaft (1) and take out the differential lock shift fork (2).

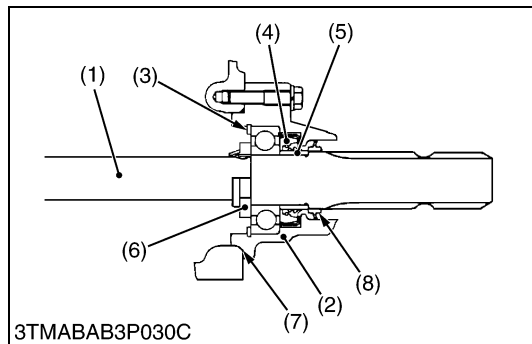
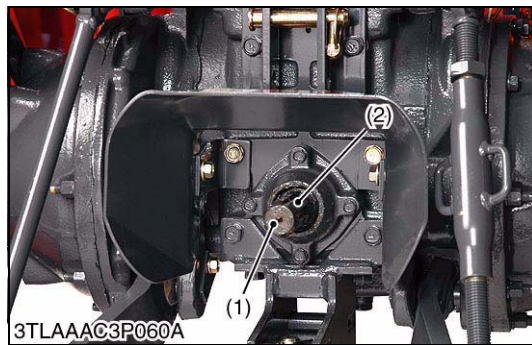
#### (When reassembling)

- Apply grease to the left and right oil seals on the transmission case.
- Insert the clevis pin (3) from the top and install the washer and cotter pin.
- Tap in the spring pin (4) so that its split portion a may face outward as shown in the figure.

- |                                  |                   |
|----------------------------------|-------------------|
| (1) Differential Lock Fork Shaft | a : Split Portion |
| (2) Differential Lock Shift Fork |                   |
| (3) Clevis Pin                   |                   |
| (4) Spring Pin                   |                   |

W25836914





### PTO Shaft

1. Remove the PTO shaft cover.
2. Remove the bearing case mounting screws, and draw out the PTO shaft (1) with bearing case (2).
3. Remove the internal snap ring (3).
4. Tap out the PTO shaft (1) to the front.

#### (When reassembling)

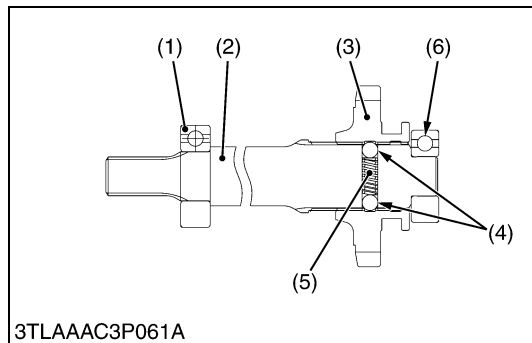
#### ■ NOTE

- If the lock nut (6) was removed, replace it with a new one. After replacing, be sure to stake it firmly.
- Install the slinger (8) firmly.
- Apply grease to the oil seal (4) and install it, nothing its direction.

Tightening torque	Lock nut	147 to 196 N·m 15 to 20 kgf·m 109 to 145 ft-lbs
	Bearing case mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

- |                        |                     |
|------------------------|---------------------|
| (1) PTO Shaft          | (5) Oil Seal Collar |
| (2) Bearing Case       | (6) Lock Nut        |
| (3) Internal Snap Ring | (7) O-ring          |
| (4) Oil Seal           | (8) Slinger         |

W1021874



### Front Wheel Drive Shaft

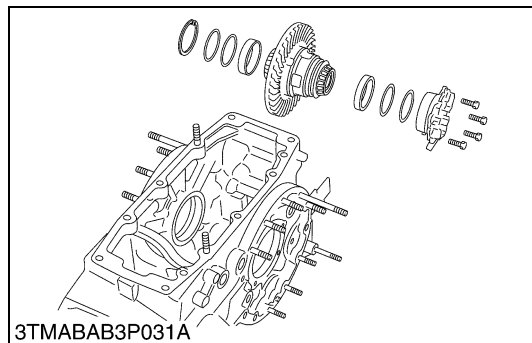
1. Remove the ball bearing (6).
2. Take out the 24T shifter gear (3), balls and spring (5).

#### ■ NOTE

- Take care not to fly out the balls (4) and spring (5) when take out the 24T shifter gear (3).

- |                             |                  |
|-----------------------------|------------------|
| (1) Ball Bearing            | (4) Ball         |
| (2) Front Wheel Drive Shaft | (5) Spring       |
| (3) 24T Shifter Gear        | (6) Ball Bearing |

W1029570



### Differential Gear Assembly

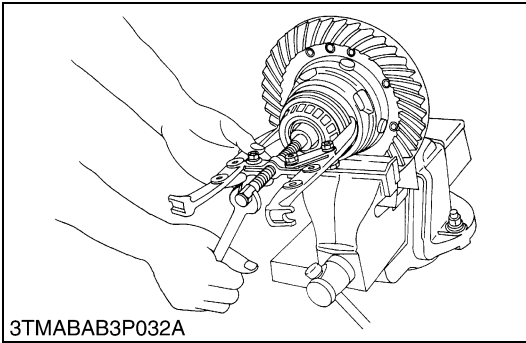
1. Remove the differential support, noting the number of left shims.
2. Take out the differential gear assembly, noting the number of right shims.

#### (When reassembling)

- Check the spiral bevel gear for wear or damage. If it is no longer serviceable, replace it. Then, also replace the spiral bevel pinion.
- Use same number of shims as before disassembling.

Tightening torque	Differential support mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
-------------------	-------------------------------------	---

W10247220

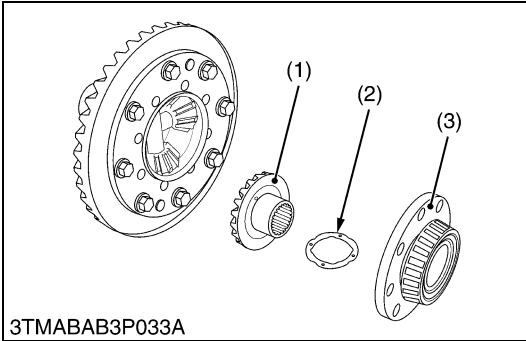


3TMABAB3P032A

### **Bearing and Differential Lock Shifter**

1. Secure the differential gear in a vise.
2. Remove the differential lock shifter and taper roller bearing as a unit with a puller.

W14789652



3TMABAB3P033A

### **Differential Case Cover and Differential Side Gear**

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

#### **(When reassembling)**

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

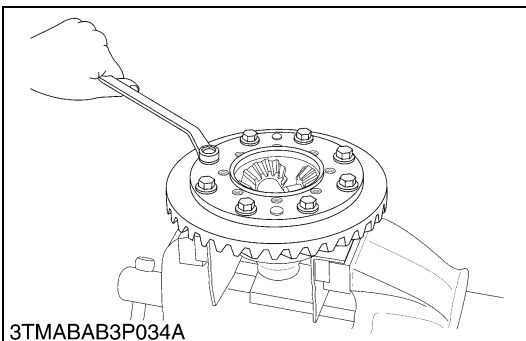
Tightening torque	Differential case cover mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
-------------------	--	---

(1) Differential Side Gear

(3) Differential Case Cover

(2) Differential Side Gear Washer

W10735860



3TMABAB3P034A

### **Spiral Bevel Gear**

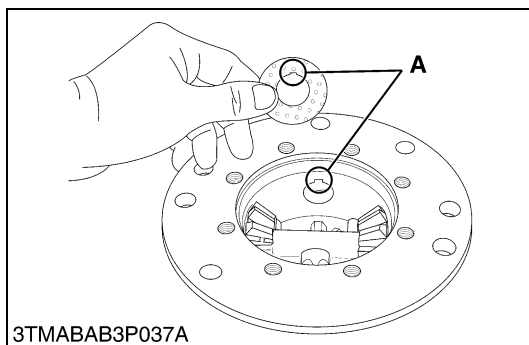
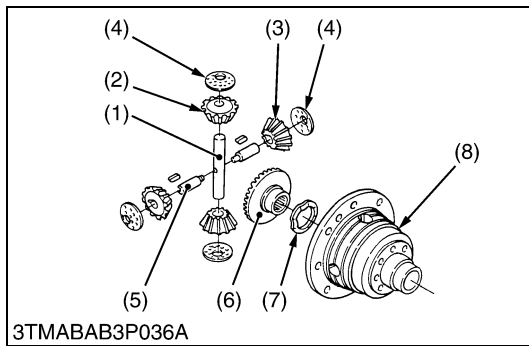
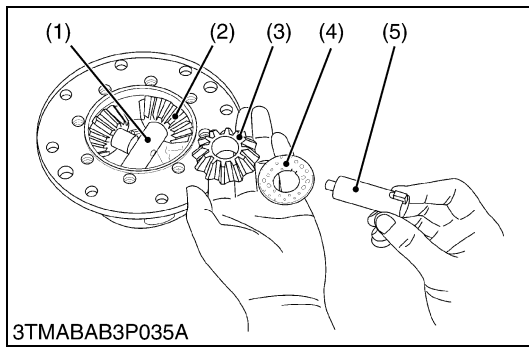
1. Remove the spiral bevel gear.

#### **(When reassembling)**

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

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

W10740260



### **Differential Pinion Shaft and Differential Pinion**

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

#### **NOTE**

- Arrange the parts to note their original position.

#### **(When reassembling)**

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

- (1) Differential Pinion Shaft
- (2) Differential Pinion
- (3) Differential Pinion
- (4) Differential Pinion Washers
- (5) Differential Pinion Shaft 2

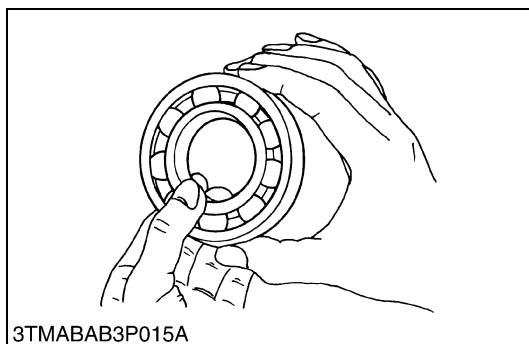
- (6) Differential Side Gear
- (7) Differential Side Gear Washer
- (8) Differential Case

**A : Fit Groove**

W10741630

## **[3] SERVICING**

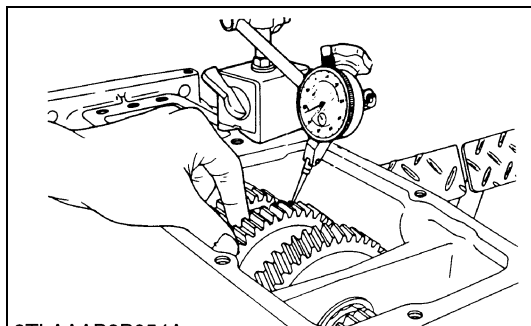
### **(1) Clutch Housing**



### **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.

W1023827



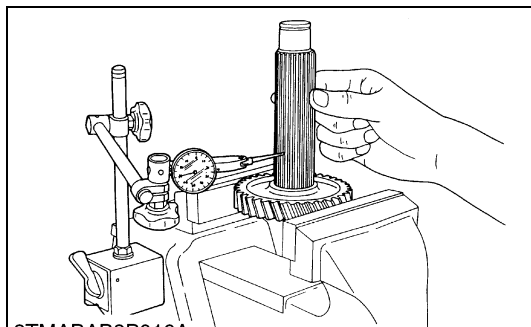
3TLAAB3P054A

**Gear Backlash**

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

Gear backlash	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

W1074953



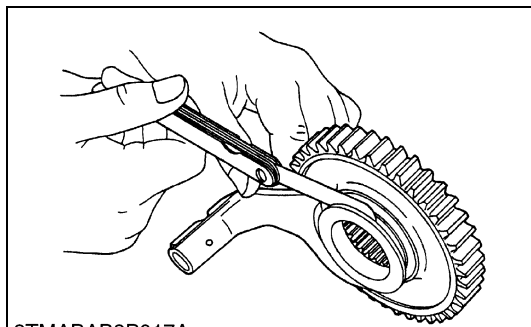
3TMABAB3P016A

**Clearance between Gear and Spline**

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

Clearance between gear and spline	Factory spec.	0.030 to 0.078 mm 0.0012 to 0.0031 in.
	Allowable limit	0.2 mm 0.0079 in.

W10258480



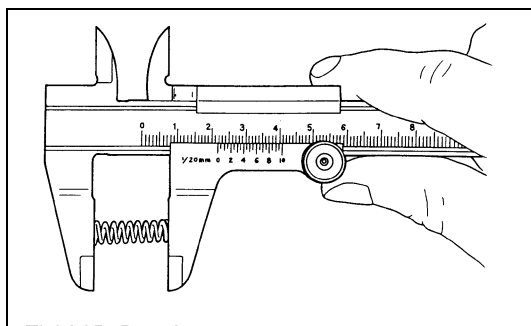
3TMABAB3P017A

**Clearance between Shift Fork and Shift Gear Groove or Shiftier Groove**

1. Place fork in the groove to check clearance with feeler gauge.
2. If the clearance exceeds allowable limit, replace.

Clearance between shift fork and shift gear groove	Factory spec.	0.15 to 0.40 mm 0.006 to 0.016 in.
	Allowable limit	0.6 mm 0.024 in.

W10269970



3TLAAB3P055A

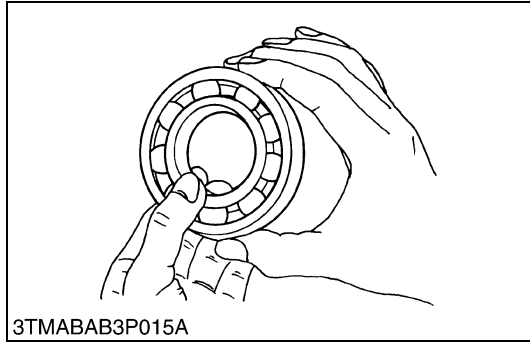
**Free Length of the Shift Fork Spring**

1. Measure free length of spring with vernier caliper.
2. If the free length is less than the allowable limit, replace.

Free length of the shift fork spring	Factory spec.	22 mm 0.866 in.
	Allowable limit	20 mm 0.787 in.

W1023724

## (2) Transmission Case

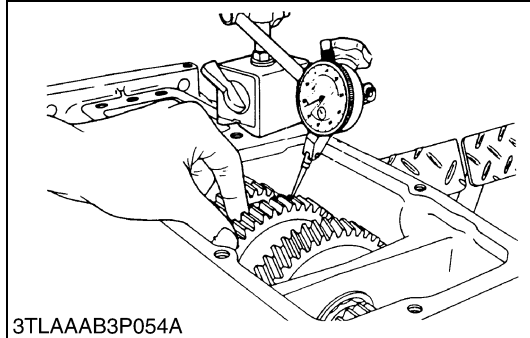


3TMABAB3P015A

### Checking Bearing

1. Hold the inner race, 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.

W123456980



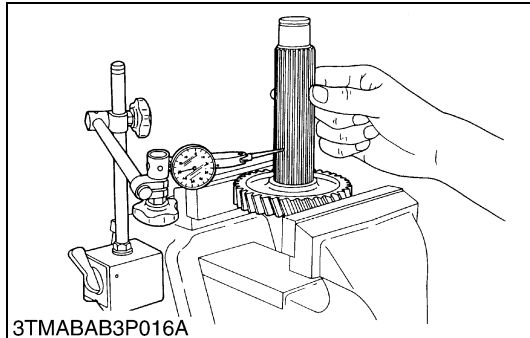
3TLAAAB3P054A

### Gear Backlash

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

Gear backlash	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

W1025475



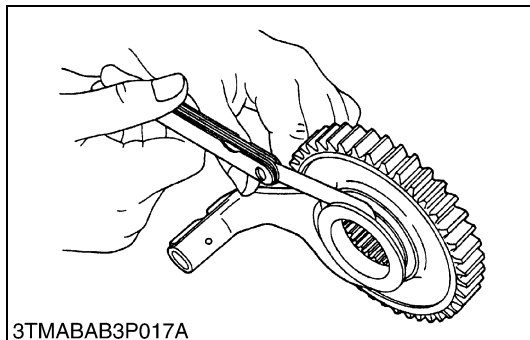
3TMABAB3P016A

### Clearance between Gear and Spline

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

Clearance between gear and spline	Factory spec.	0.030 to 0.078 mm 0.0012 to 0.0031 in.
	Allowable limit	0.2 mm 0.0079 in.

W1234567



3TMABAB3P017A

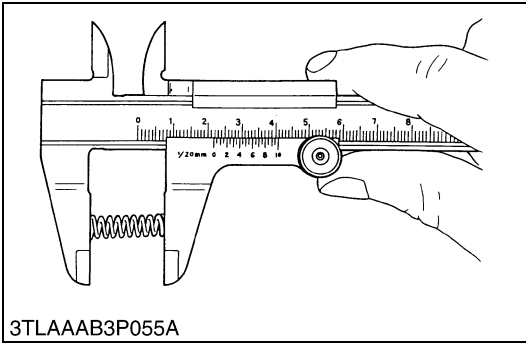
### Clearance between Shift Fork and Shift Gear Groove or Shifter Groove

1. Place fork in the groove to check clearance with feeler gauge.
2. If the clearance exceeds allowable limit, replace.

Clearance between shift fork and shift gear groove	Factory spec.	0.15 to 0.40 mm 0.006 to 0.016 in.
	Allowable limit	0.6 mm 0.024 in.

W963258140



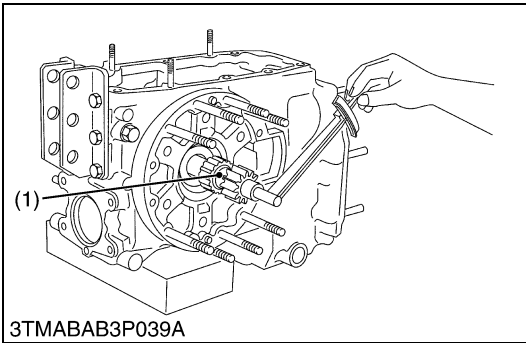


### Free Length of the Shift Fork Spring

1. Measure free length of spring with vernier caliper.
2. If the free length is less than the allowable limit, replace.

Free length of the shift fork spring	Factory spec.	22 mm 0.866 in.
	Allowable limit	20 mm 0.787 in.

W1025587



### Spiral Bevel Gear Turning Torque

#### ■ NOTE

- It is necessary to adjust the spiral bevel gear turning torque, when replacing the differential gears, transmission case or other relative parts.

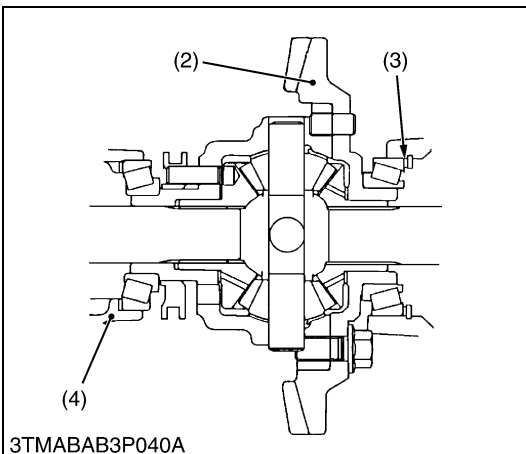
1. Assemble the differential gears to transmission case. At this time, install the some shims (3) to the spiral bevel gear side.
2. Check the turning torque by using turning torque tool (1).  
Turning Torque Tool : Weld socket on the brake shaft  
(Brake shaft Part No. TA040-26710).
3. Add or reduce the thickness of shims (3) to make the specified turning torque
4. After getting the specified turning torque, divide the thickness of shims to left and right side
5. Assemble the transmission case and adjust the backlash and tooth contact with spiral bevel pinion

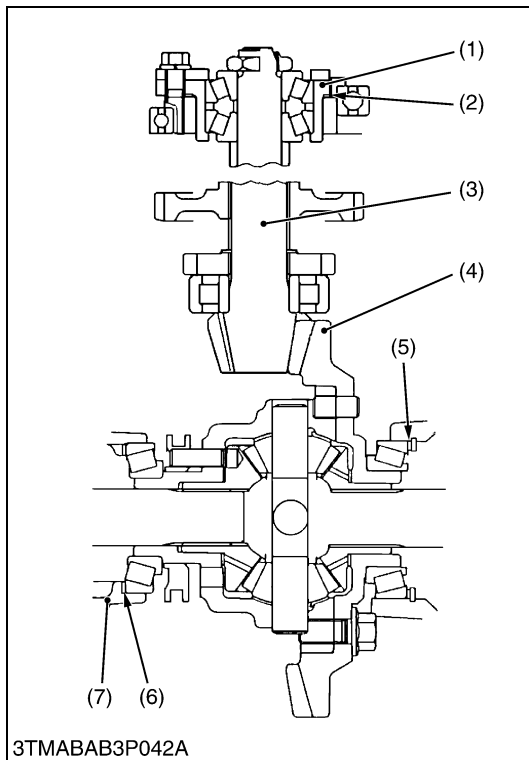
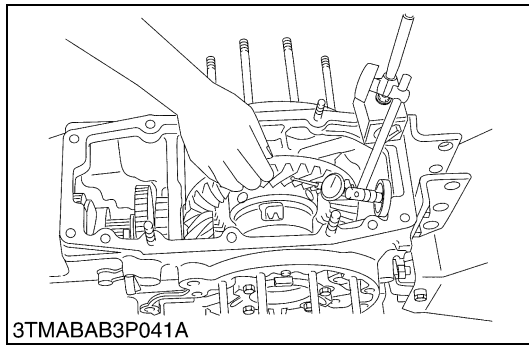
Turning torque of 37T spiral bevel gear	Factory spec.	3.92 to 6.37 N·m 0.40 to 0.65 ft-lbs 2.89 to 4.70 Kgf·m
---	---------------	---

- (1) Turning Torque  
(2) 37T Spiral Bevel Gear

- (3) Adjusting Shim  
(4) Differential Support

W1025673





### **Backlash and Tooth Contact between Spiral Bevel Gear and Spiral Bevel Pinion Shaft**

1. Set the dial indicator (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the spiral bevel pinion shaft (3) and moving the spiral bevel gear (4) by hand.
3. When the backlash is too large, decrease the number of shims (5) in the side of the spiral bevel gear, and insert the shims (6) of the same thickness as the removed ones to the opposite side. When the backlash is too small, do the opposite way of exceed backlash.
4. Adjust the backlash properly by repeating the above procedure.
5. Apply red lead lightly over several teeth at three positions equally spaced on the spiral bevel gear.
6. Turn the spiral bevel pinion shaft, while pressing a wooden piece against the periphery on the spiral bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions next page.

Backlash between spiral bevel gear and spiral bevel pinion shaft	Factory spec.	0.15 to 0.30 mm 0.006 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

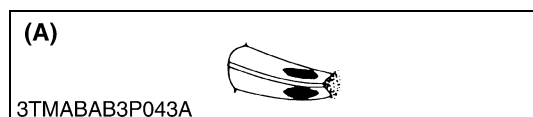
#### **(Reference)**

- Thickness of shims (2) :  
0.1 mm (0.004 in.) 0.2 mm (0.008 in.) 0.5 mm (0.020 in.)
- Thickness of shims (5) :  
0.4 mm (0.016 in.) 0.8 mm (0.031 in.) 1.2 mm (0.047 in.)  
0.6 mm (0.024 in.) 1.0 mm (0.039 in.) 1.6 mm (0.063 in.)

- (1) Pinion Bearing Case  
(2) Shim  
(3) Spiral Bevel Pinion  
(4) Spiral Bevel Gear

- (5) Shim  
(6) Shim  
(7) Differential Support

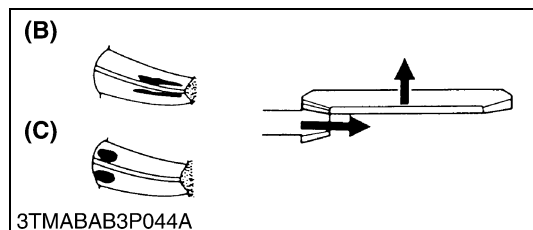
W10279260



More than 35 % red lead contact area on the gear tooth surface. The center of tooth contact at 1/3 of the entire width from the small end.

(A) Proper Contact

W10187470



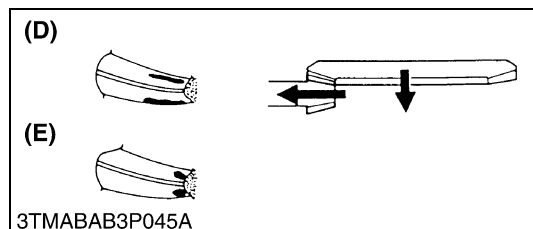
Replace the adjusting shim (2) with thicker one to move the spiral bevel pinion shaft backward.

For move the spiral bevel gear rightward, reduce right side shim (5) and add shim (6) of the same thickness as the right side to left side.

(B) Shallow Contact

(C) Heel Contact

W10189000



Replace the shim (5) with a thinner one to move the spiral bevel pinion shaft forward.

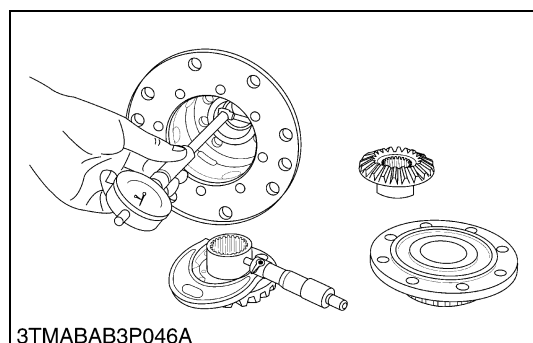
For move the spiral bevel gear leftward, reduce left side shim (6) and add shim (5) of the same thickness as the left side to right side.

Repeat above until the proper tooth contact and backlash are achieved.

(D) Deep Contact

(E) Toe Contact

W10189730



### Clearance between Differential Case Bore (Differential Case Cover Bore) and Differential Side Gear Boss

1. Measure the bore I.D. of the differential case and differential case cover.
2. Measure the differential side gear boss O.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

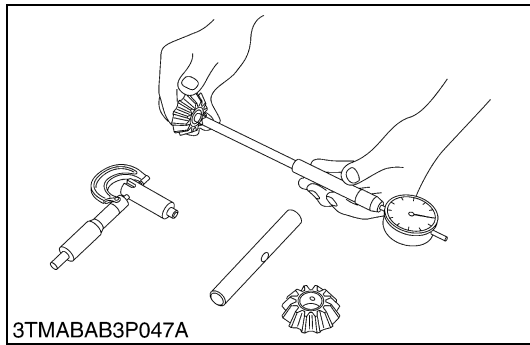
Clearance between differential case bore and differential side gear boss	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case bore I.D.	Factory spec.	40.500 to 40.550 mm 1.59449 to 1.59646 in.
Differential side gear boss O.D.	Allowable limit	40.388 to 40.450 mm 1.59008 to 1.59252 in.

Clearance between differential case cover bore and differential side gear boss	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case cover bore I.D.	Factory spec.	40.500 to 40.550 mm 1.59449 to 1.59646 in.
Differential side gear boss O.D.	Allowable limit	40.388 to 40.450 mm 1.59008 to 1.59252 in.

W102840310



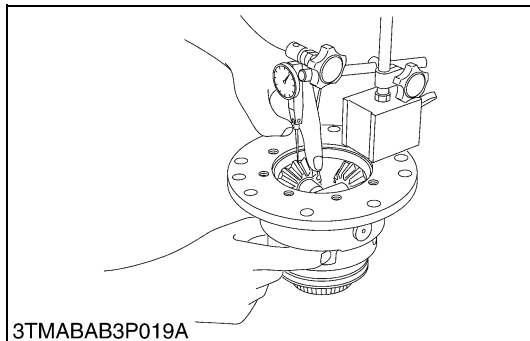
### **Clearance between Differential Pinion Shaft and Differential Pinion**

1. Measure the differential pinion shaft O.D.
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.060 to 0.102 mm 0.00236 to 0.00402 in.
	Allowable limit	0.25 mm 0.0098 in.

Differential pinion shaft O.D.	Factory spec.	19.959 to 19.980 mm 0.78579 to 0.78661 in.
Differential pinion I.D.	Allowable limit	20.040 to 20.061 mm 0.78898 to 0.78980 in.

W10287600



### **Backlash between Differential Pinion and Differential Side Gear**

1. Set a dial indicator (lever type) on the tooth of the differential pinion.
2. Hold the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement is not within the factory specifications, adjust with the differential side gear washer.

Backlash between differential pinion and differential side gear	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

### **(Reference)**

- Thickness of differential side gear washers :  
1.5 mm (0.059 in.) 1.7 mm (0.067 in.)  
1.6 mm (0.063 in.)

W10289200

### (3) Check and Adjustment of Range Gear Shift Lever

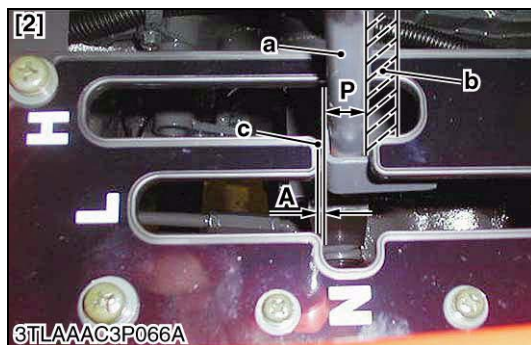
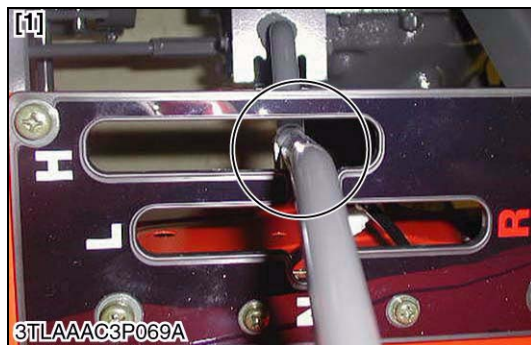
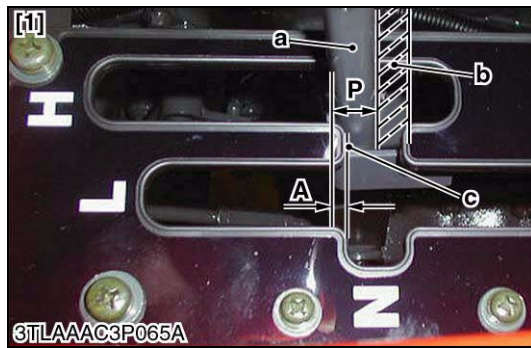
#### ⚠ CAUTION

- Park the tractor on a firm and level ground and set the parking brake.
- Lower the loader and other implement to the ground.
- Stop the engine, and remove the key.

When shifting slowly the range gear shift lever from the position **H** (High) to the position **N** (Neutral), the gear inside sometimes remains at the position **H** and does not move, although the range gear shift lever is at the position **N**.

It has been caused by a bad adjustment of the turnbuckle.

Please verify and adjust the turnbuckle as follows.



#### Points to be checked

1. Shift the range gear shift level to **N** (Neutral) position on the **H** (High) speed side. Keeping the lever slightly being pushed forward (to the left of the photo), measure the overlapping length (**A**) of the level and guide.

2. Judgement

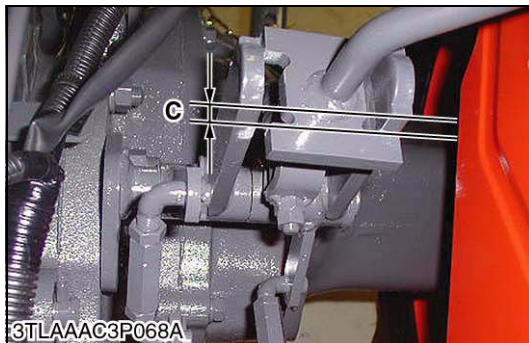
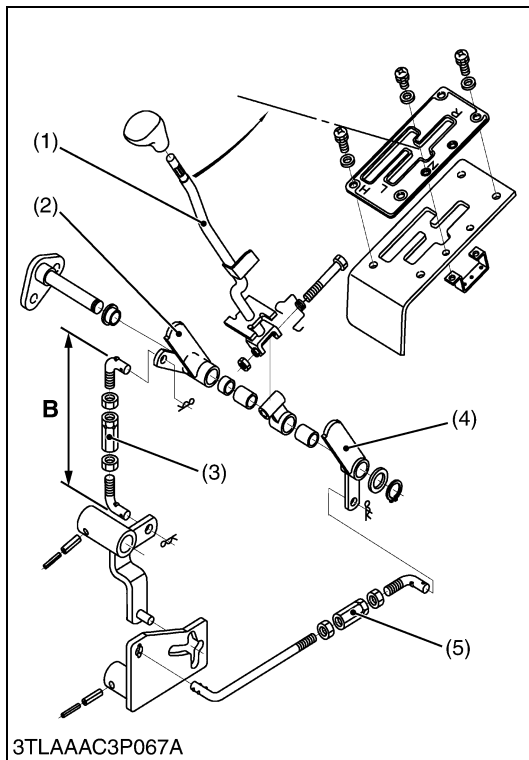
**[1] CORRECT** : Length (**A**) is 1 to 5 mm (0.04 to 0.2 in.) when the guide and lever are overlapping.

**[2] INCORRECT** : The overlapping length (**A**) is less than 1 mm (0.04 in.), or when there is a clearance between the guide and lever. In this case, carry out the following adjustment.

**A** : Overlapping length of the level and guide.  
**P** : The free play stroke of range lever.

**a** : The forward position of range lever in neutral position.  
**b** : The backward position of range lever in neutral position.  
**c** : The end of the guide.

W10781900



### Adjustment

- Adjust (shorten) the turnbuckle (H) (3) so that the length (A) becomes 1 to 5 mm (0.04 to 0.2 in.).

Length of the rod (B)	Reference value	85 mm 3.35 in.
-----------------------	-----------------	-------------------

- Repeat shifting in a sequence of (H → L → H → R → H) and confirm the shifting is possible.

1) If shifting to the directions of left and right (H → L and L → H) is possible, the adjustment has been completed.

2) When shifting to the directions of left and right is not possible, this is because the drift (C) in the forward and backward of the arm (H) (2) and arm (L - R) (4) in the neutral position has become too large. So make adjustment to the turnbuckle (L - R) (5) to correct the drift.

3) Again, check by shifting and complete the adjustment.

### NOTE

- Lock securely the lock screws of adjusted turnbuckle to prevent from becoming loose.

Tightening torque	Turnbuckle (3) (5) lock screw	39.2 to 45.1 N·m 4.0 to 4.6 kgf·m 28.9 to 33.3 ft-lbs
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- Range Gear Shift Lever
- Arm (H)
- Turnbuckle (H)
- Arm (L - R)
- Turnbuckle (L - R)

B : Length of the rod

C : Drift of arm in forward and backward directions

W10785670



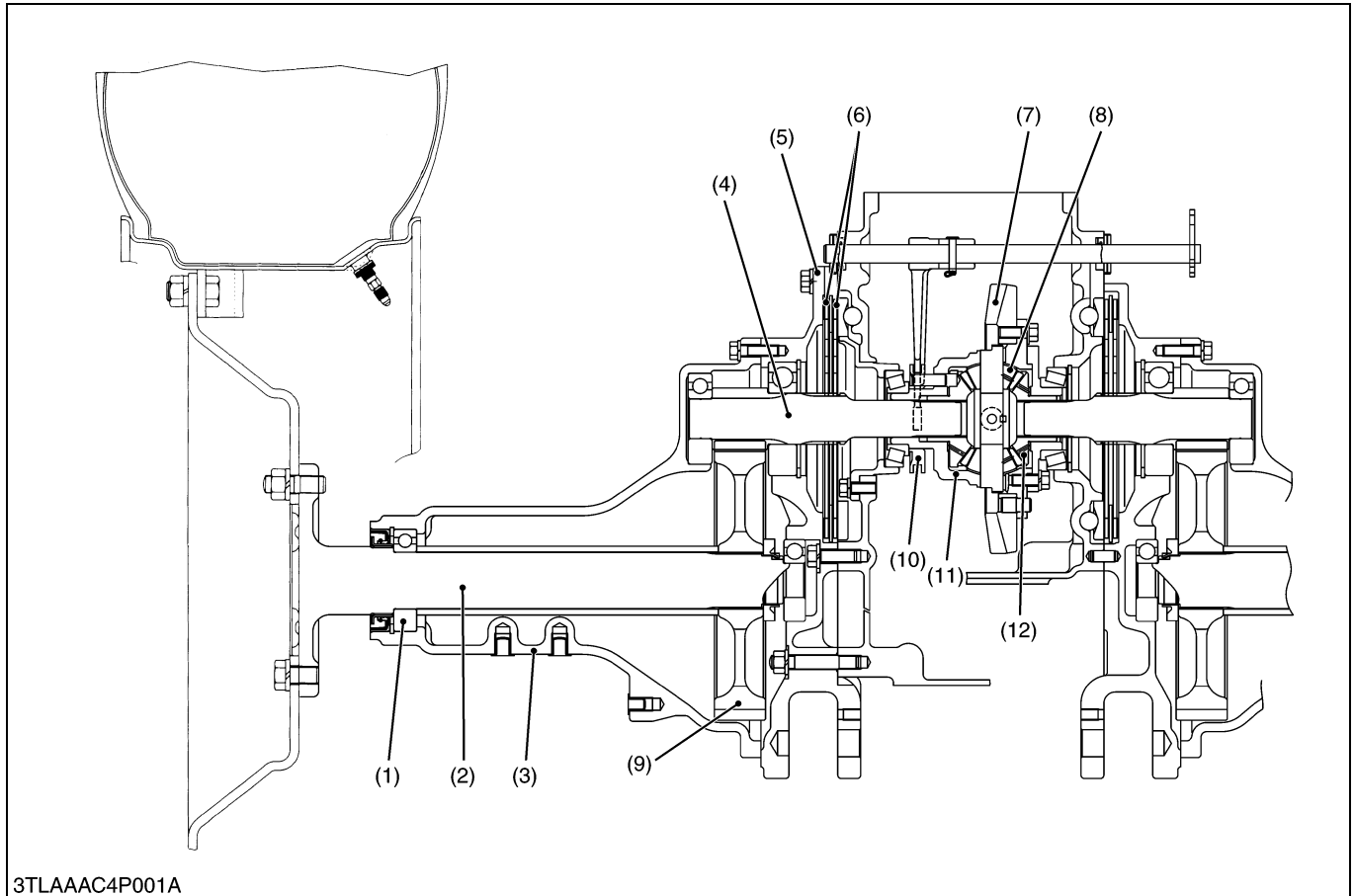
# 4 REAR AXLE

# MECHANISM

## CONTENTS

1. STRUCTURE .....	4-M1
--------------------	------

# 1. STRUCTURE



3TLAAAC4P001A

- |                  |                             |                         |                                |
|------------------|-----------------------------|-------------------------|--------------------------------|
| (1) Ball Bearing | (4) Differential Gear Shaft | (7) Ring Gear           | (10) Differential Lock Shifter |
| (2) Rear Axle    | (5) Brake Case              | (8) Differential Pinion | (11) Differential Case         |
| (3) Rear Axle    | (6) Brake Disc              | (9) Final Gear          | (12) Differential Side Gear    |

W1012765

The final gear (9) are final reduction mechanism which further reduces the speed of rotation. The direction of power transmitted is changed by the differential gear.

The rear axles (2) are the final transmission mechanism which transmit the power from the transmission to the rear wheels. The rotation speed is reduced by the final gears (9).

The rear axles are the semi-floating type with the ball bearing (1) between the rear axle (2) and rear axle case (3), which support the rear wheel load besides transmitting power to the rear wheel. The rear axles also support the weight of the tractor.

# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	4-S1
2. TIGHTENING TORQUES .....	4-S2
3. DISASSEMBLING AND SERVICING.....	4-S3
[1] PREPARATION .....	4-S3
[2] DISASSEMBLING REAR AXLE.....	4-S6
[3] SERVICING .....	4-S7

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Excessive or Unusual Noise at All Time</b>	Improper backlash between differential gear shaft and final gear	Replace	4-S5 to S6
	Bearing worn	Replace	4-S7
	Insufficient or improper type of transmission fluid used	Replenish or change	G-8
<b>Noise while Turning</b>	Differential gear shaft and final gear worn or damaged	Replace	4-S5 to S6

W10122140

## 2. 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.)

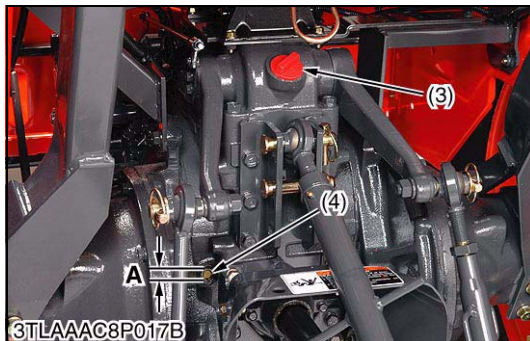
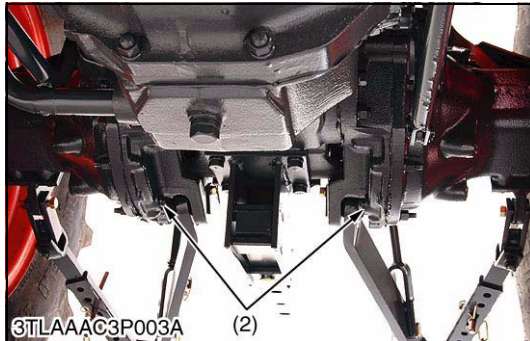
Item	N·m	kgf·m	ft-lbs
ROPS mounting M12, grade 7 screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
ROPS mounting M14, grade 9 screw	166.7 to 196.1	17.0 to 20.0	123 to 144
ROPS mounting M16, grade 11 screw	260.9 to 304.0	26.6 to 31.0	192 to 224
ROPS mounting 9/16-18 UNF, grade 8 screw	149.1 to 179.5	15.2 to 18.3	110 to 132
ROPS fulcrum screw	118 to 137	12 to 14	87 to 101
Rear wheel mounting stud bolt	98.1 to 112.7	10.0 to 11.5	72.3 to 83.1
Rear wheel mounting screw and nut	197 to 226	20 to 23	145 to 166
Rear axle case mounting M10 screws	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Rear axle case mounting M10 nut	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Rear axle case mounting M12 screws and nuts	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting stud bolt	24.5 to 31.4	2.5 to 3.2	18.1 to 23.1
Rear axle lock nut	196 to 245	20 to 25	145 to 181

W10127360



### 3. DISASSEMBLING AND SERVICING

#### [1] PREPARATION



#### Draining the Transmission Fluid

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### (When refilling)

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 7.3 U.S.qts 6.1 Imp.qts
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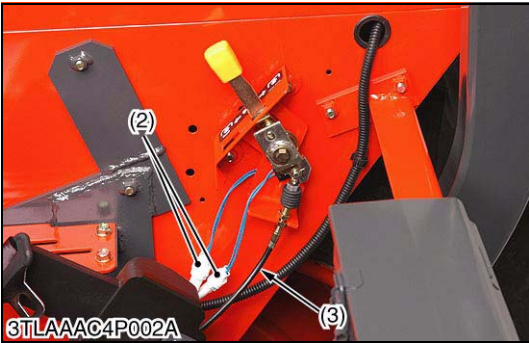
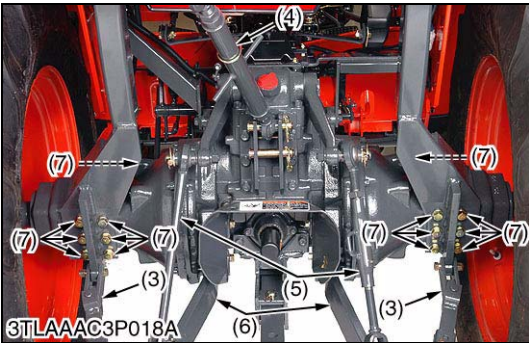
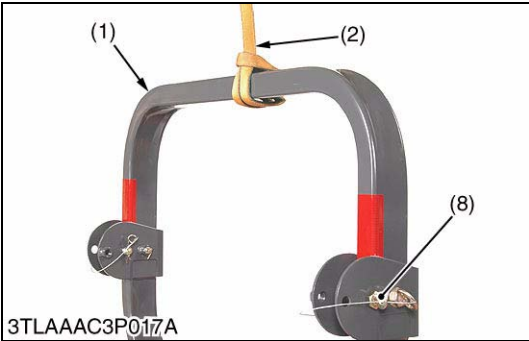
#### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.

W1014062



**Three Point Linkage and ROPS**

1. Secure ROPS (1) with safety strap (2).
  2. Remove stabilizer joint (3), top link (4), lift rods (5) and low links (6).
  3. Unscrew ROPS mounting screws (7), then the ROPS.
- (When reassembling)**

Tightening torque	ROPS mounting screw	M14 screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123 to 144 ft·lbs
		M12 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs
	ROPS fulcrum screw		118 to 137 N·m 12 to 14 kgf·m 87 to 101 ft·lbs

- (1) ROPS

(2) Safety Strap

(3) Stabilizer Joint

(4) Top Link
- (5) Lift Rod

(6) Low Link

(7) ROPS Mounting Screw

(8) ROPS Fulcrum Screw

W1014282

**Wiring Harness**

- Disconnect rear combination lamp, connector RH (1) and LH, PTO switch connectors (2), PTO wire (3), and then clear wiring harness from fender.
- (1) Rear Combination Lamp Connector R.H.

(2) PTO Switch Connectors

(3) PTO Wire

W1012862



### Rear Wheel and Fender

1. Place the disassembling stand under the transmission case.
2. Loosen and remove the rear wheel mounting screws and nuts.
3. Remove the rear wheel (2).
4. Remove the rear wheel fender (1).
5. Follow the same procedure as above for the other side.

#### (When reassembling)

Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
-------------------	-----------------------------------	---

(1) Rear Fender

(2) Rear Wheel

W1014857



### Rear Axle Case

1. Place a jack under the transmission case.
2. Loosen and remove the rear axle case mounting screws and nuts.
3. Support the rear axle case with nylon lift strap and hoist.
4. Separate the rear axle case from brake case.

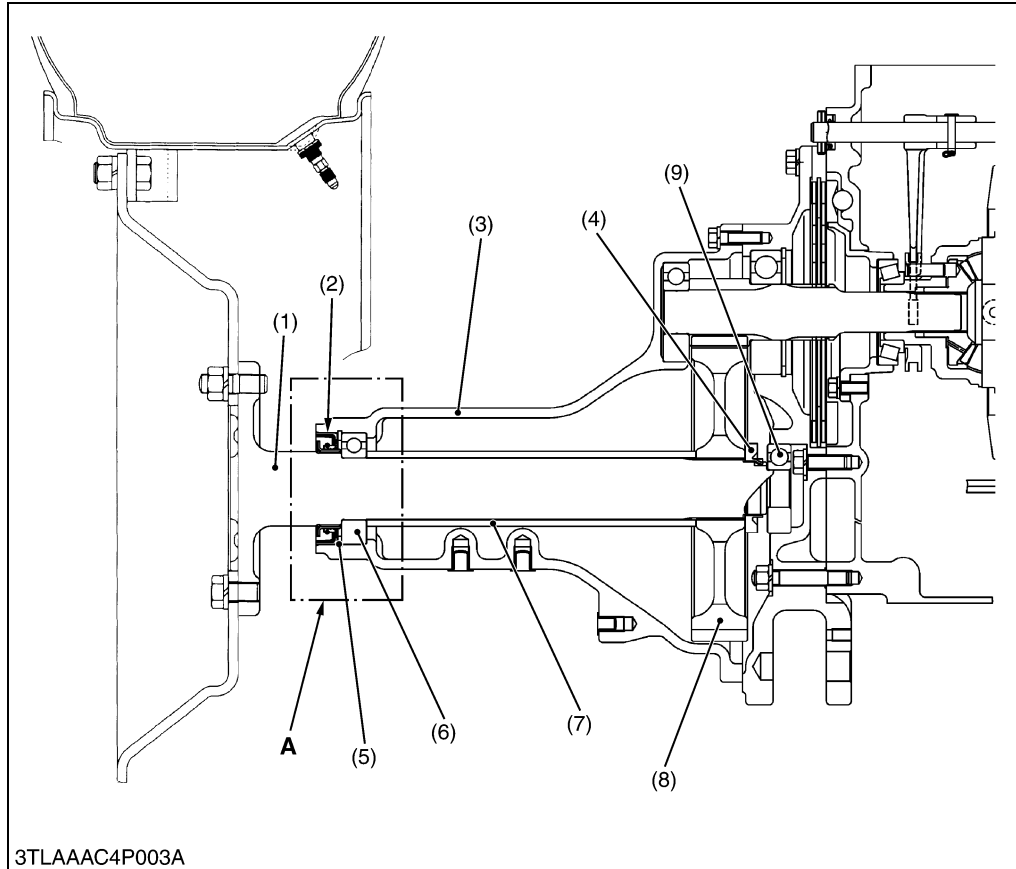
#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle case and brake case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screws and nuts	M10 screws	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
		M10 nuts	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
		M12 screws	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
		Stud bolts	24.5 to 31.4 N·m 2.5 to 3.2 kgf·m 18.1 to 23.1 ft-lbs

W1015033

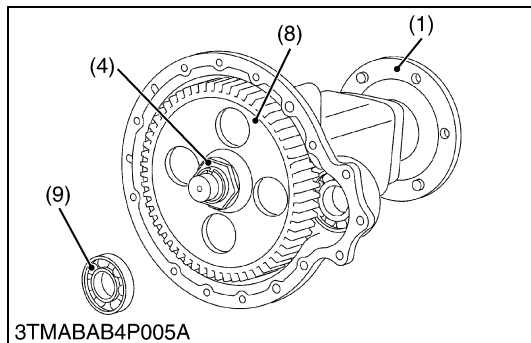
## [2] DISASSEMBLING REAR AXLE



3TLAAAC4P003A

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

W10115940



3TMABAB4P005A

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

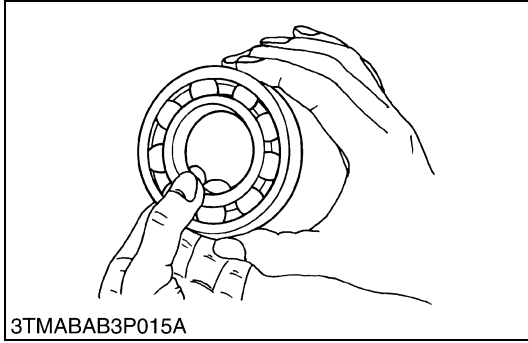
### (When reassembling)

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

Tightening torque	Lock nut	196 to 245 N·m 20 to 25 kgf·m 145 to 181 ft-lbs
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W10116810

### [3] SERVICING



#### 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.

W1015513

# 5 BRAKES

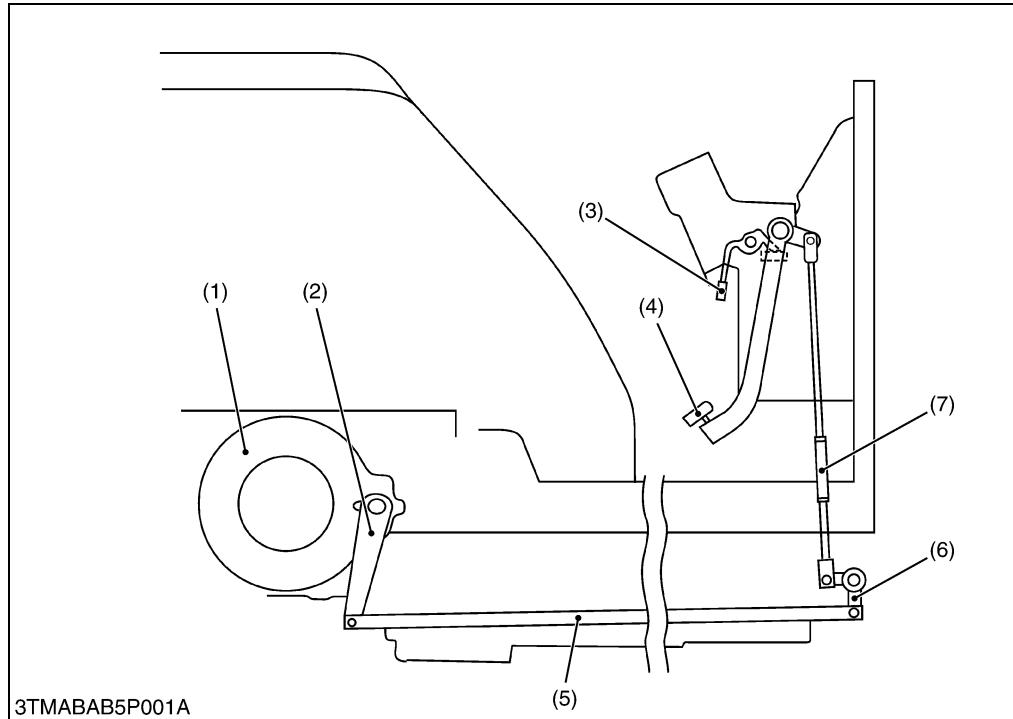


# MECHANISM

## CONTENTS

1. STRUCTURE .....	5-M1
2. OPERATION .....	5-M2

# 1. STRUCTURE



- (1) Brake Case
- (2) Brake Cam Lever
- (3) Parking Brake Lever
- (4) Brake Pedal
- (5) Brake Rod
- (6) Brake Lever Link
- (7) Tunbuckle

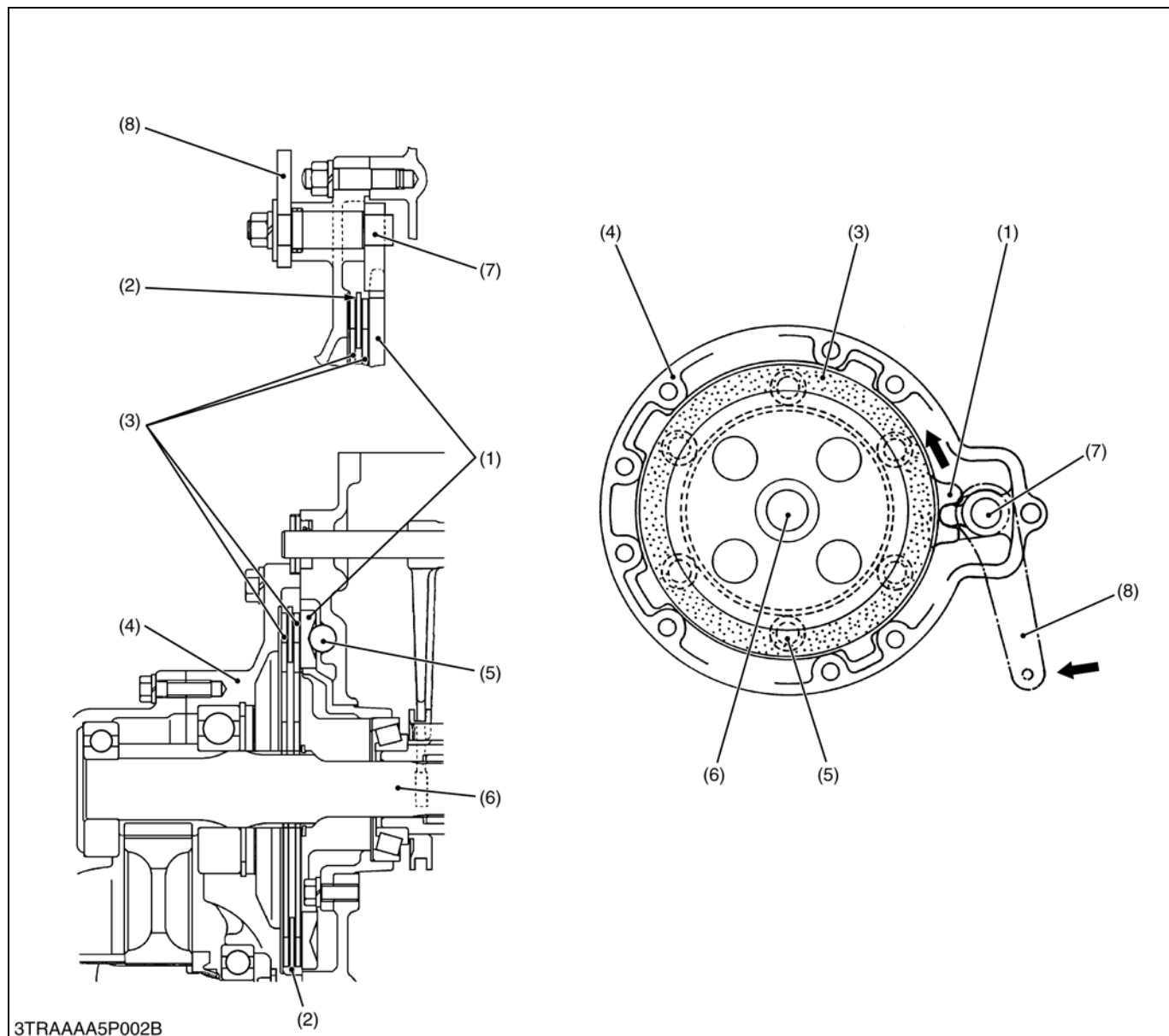
W1012638

This is used hanging type brake pedals to have wider space of the platform.

Independent mechanical wet disc brakes are used for the right and left traveling brakes. They are operated by the brake pedals through the mechanical linkages.

The parking brake is a mechanical type which is designed to actuate the traveling brakes. Pulling the parking brake lever (3) results in the same state as that obtained when the brake pedals are pressed.

## 2. OPERATION



- (1) Cam Plate
- (2) Steel Plate
- (3) Brake Disc

- (4) Brake Case
- (5) Steel Ball

- (6) Brake Shaft (Differential Gear Shaft)

- (7) Brake Cam
- (8) Brake Cam Lever

The brake body is incorporated in the brake case (4) filled with transmission oil and is designed to brake when the brake disc (3) splined with the differential gear shaft (6) is pressed against the cam plate (1) by means of the cam mechanism incorporating steel balls (5).

For greater braking force, two brake discs are provided at the right and left sides respectively, and the steel plate (2) fixed to the brake case is arranged between the brake discs.

**During Braking**

When the brake pedal is pressed, the linkage causes the brake cam lever (8) and brake cam (7) to turn into the direction of arrow shown in the above figure.

Therefore, the cam plate (1) also moves the direction of arrow. At this time, since the cam plate (1) rides on the steel balls (5) set in the grooves of the transmission case to press the brake disc (3), the differential gear shaft (6) is braked by the frictional force generated by the cam plate (1) and brake disc (3).

# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Uneven Braking Force</b>	Brake pedal play unevenly adjusted	Adjust	5-S4
	Brake disc worn	Replace	5-S10
	Cam plate warped	Replace	5-S9
<b>Brake Drags</b>	Too little free play in the brakes	Adjust	5-S4
	Ball holes of cam plate for uneven wear	Replace	5-S9
	Brake pedal return spring weaken or broken	Replace	—
	Brake cam rusted	Repair	—
<b>Poor Braking Force</b>	Too much free play in the brakes	Adjust	5-S4
	Brake disc worn	Replace	5-S10
	Cam plate warped	Replace	5-S9
	Brake cam or lever damaged	Replace	5-S9
	Improper type of transmission fluid is used	Change	5-S5

W10143220



## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	15 to 20 mm 0.6 to 0.8 in.	—
Brake Lever Link Shaft to Bushing	Clearance	0.125 to 0.195 mm 0.00492 to 0.00768 in.	1.0 mm 0.039 in.
Brake Lever Link Shaft	O.D.	19.955 to 19.975 mm 0.78563 to 0.78642 in.	—
Brake Lever Link Bushing	I.D.	20.100 to 20.150 mm 0.79134 to 0.79331 in.	—
Cam Plate	Flatness	—	0.3 mm 0.012 in.
Cam Plate and Ball	Height	20.9 to 21.1 mm 0.823 to 0.831 in.	20.5 mm 0.8071 in.
Brake Disc	Thickness	4.6 to 4.8 mm 0.181 to 0.189 in.	4.2 mm 0.165 in.
Plate	Thickness	2.54 to 2.66 mm 0.1000 to 0.1047 in.	2.1 mm 0.0827 in.

W10138740

### 3. TIGHTENING TORQUES

Tightening torques of screws, 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
ROPS mounting screw	M12, greade 7 screw	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
ROPS mounting screw	M14, greade 9 screw	166.7 to 196.1	17.0 to 20.0	123 to 144
ROPS fulcrim screw		118 to 137	12 to 14	87 to 101
Rear wheel mounting stud bolt		98.1 to 112.7	10.0 to 11.5	72.3 to 83.1
Rear wheel mounting screw and nut		197 to 226	20 to 23	145 to 166
Rear axle case mounting	M10 screws	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Rear axle case mounting	M10 nuts	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
Rear axle case mounting	M12 and nuts screws	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting	Stud bolts	24.5 to 31.4	2.5 to 3.2	18.1 to 23.1
Brake case mounting stud bolt		38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Brake case mounting screw and nut		77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Brake case mounting lever shaft screws		62.8 to 72.5	6.4 to 7.4	46.3 to 53.5

W10127360

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING AND ADJUSTING



#### Adjusting Brake Pedal Free Play

##### CAUTION

- Stop the engine and remove the key, then chock the wheel before checking brake pedals.

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel (A) at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut (1) and turn the turnbuckle (2) to adjust it within the factory specifications.

Brake pedal free travel (A)	Factory spec.	15 to 20 mm 0.59 to 0.79 in.
--------------------------------	---------------	---------------------------------

##### ■ IMPORTANT

- Keep the free travel in the right and left brake pedals equal.

##### ■ NOTE

- The difference between the right and left pedal free travels must be less than 5 mm (0.20 in.)
- After checking brake pedal free travel, be sure to engage the parking brake lock fully and check to see that the brake pedals are securely locked.

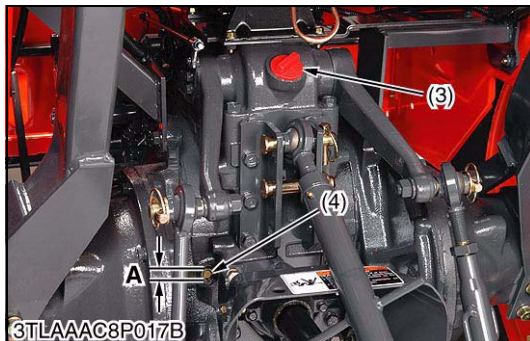
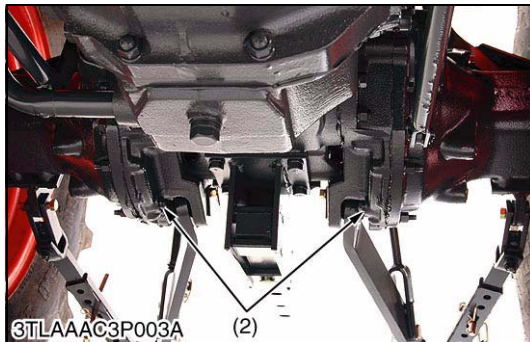
- (1) Lock Nut  
(2) Turnbuckle

A : Free Play

W1014038

## [2] PREPARATION

### (1) Separating Rear Axle Case from Transmission Case



#### Draining the Transmission Fluid

1. Place oil pans underneath the transmission case.
2. Remove the drain plugs (1), (2).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1), (2).

#### (When refilling)

- Fill up new oil from the oil filling port (3) up to the upper line of the oil level gauge (4).
- After running the engine for few minutes, stop it and check the oil level again, add oil to prescribed level, if necessary.

Transmission fluid	Capacity	40 L 10.6 U.S.qts 8.8 Imp.qts
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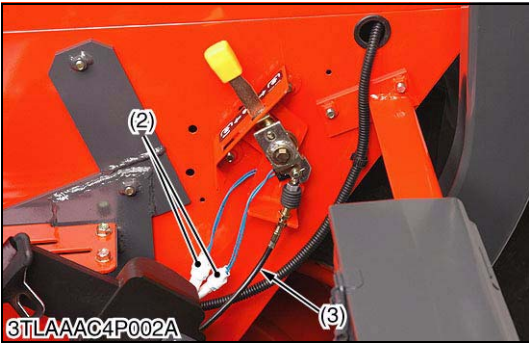
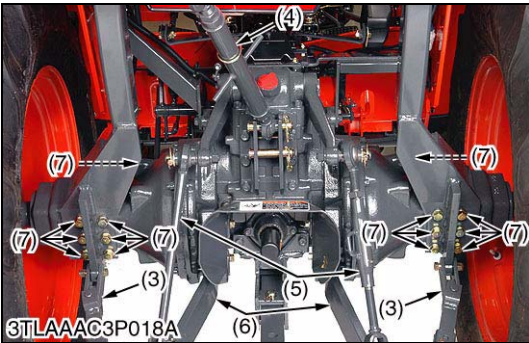
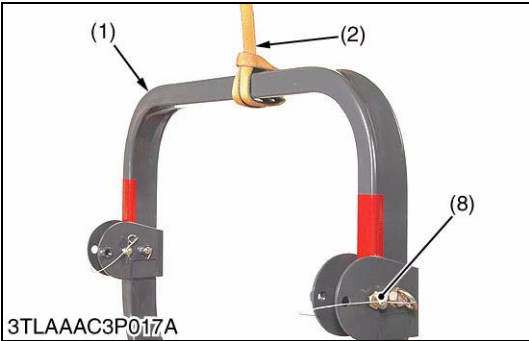
#### ■ IMPORTANT

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

- (1) Drain Plug
- (2) Drain Plug
- (3) Oil Filling Port
- (4) Oil Level Gauge

A : Oil level is acceptable within this range.

W1062402



Three Point Linkage and ROPS

- 1. Secure the ROPS (1) with safety strap (2).
  - 2. Remove stabilizer joint (3), top link (4), lift rods (5) and low links (6).
  - 3. Unscrew ROPS mounting screws (7), then the ROPS.
- (When reassembling)

Tightening torque	ROPS mounting screw	M14 screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123 to 144 ft·lbs
		M12 screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft·lbs
	ROPS fulcrum screw		118 to 137 N·m 12 to 14 kgf·m 87 to 101 ft·lbs

- (1) ROPS

(2) Safety Strap

(3) Stabilizer Joint

(4) Top Link
- (5) Lift Rod

(6) Low Link

(7) ROPS Mounting Screw

(8) ROPS Fulcrum Screw

W1022164

Wiring Harness

- Disconnect rear combination lamp connector RH (1) and LH, PTO switch connectors (2), PTO wire (3), and then clear wiring harness from frnder.
- (1) Rear Combination Lamp Connector R.H.

(2) PTO Switch connectors

(3) PTO wire

W1015614





### Rear Wheel and Fender

1. Place the disassembling stand under the transmission case.
2. Loosen and remove the rear wheel mounting screws and nuts.
3. Remove the rear wheel (2).
4. Remove the rear wheel fender (1).
5. Follow the same procedure as above for the other side.

#### (When reassembling)

Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
-------------------	-----------------------------------	---

(1) Rear Fender

(2) Rear Wheel

W1014678



### Rear Axle Case

1. Place a jack under the transmission case.
2. Loosen and remove the rear axle case mounting screws and nuts.
3. Support the rear axle case with nylon lift strap and hoist.
4. Separate the rear axle case from brake case.

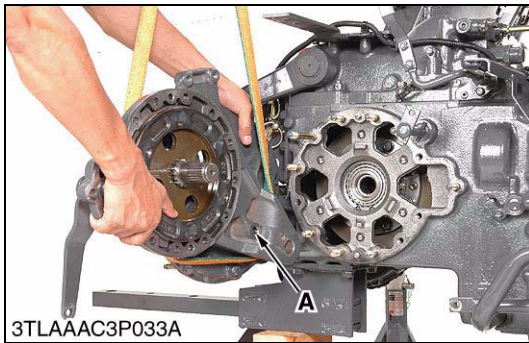
#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the rear axle case and brake case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw and nut	M10 screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft-lbs
		M10 nuts	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 ft-lbs
		M12 screw and nuts	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
			24.5 to 31.4 N·m 2.5 to 3.2 kgf·m 18.1 to 23.1 ft-lbs

W1014856





### Brake Case

1. Remove the brake case mounting screws and nuts.
2. Separate the brake case, tapping the brake case lever lightly.

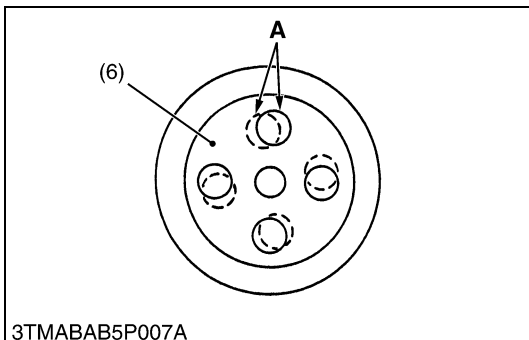
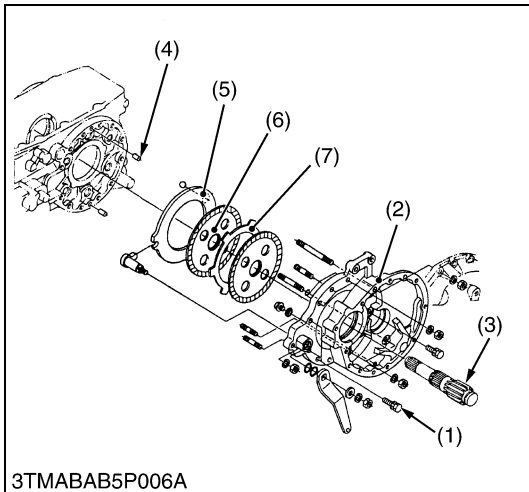
#### (When reassembling)

- Apply grease to the brake ball seats. (Do not grease excessively.)
- Apply liquid gasket (Three Bond 1208D, 1141 or equivalent) to joint face of the brake case and transmission case, around hole **A** after eliminate the water, oil and stuck liquid gasket.
- Before installing the brake case to the transmission case, install the cam plate to the transmission case.

Tightening torque	Brake case mounting stud bolt	38.2 to 45.1 N·m 3.9 to 4.6 kgf·m 28.2 to 33.3 ft-lbs
	Brake case mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs
	Brake case lever mounting screw	62.8 to 72.5 N·m 6.4 to 7.4 kgf·m 46.3 to 53.5 ft-lbs

W1015066

## [3] DISASSEMBLING AND ASSEMBLING



### Brake Case, Brake Assembly

1. Remove the brake case mounting screw(1).
2. Remove the brake case (2).
3. Remove the brake shaft (3) with brake discs (6) and plates(7).
4. Remove the brake cam plate (5) and steel balls.

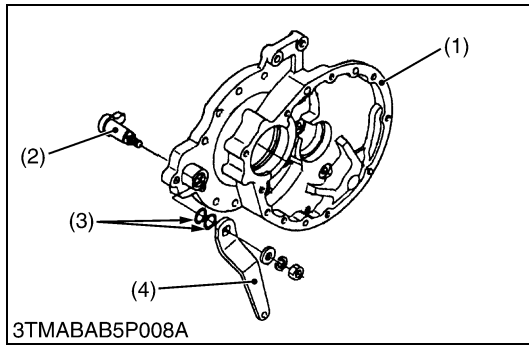
#### (When reassembling)

- Place the brake discs (6) so that the hole (**A**) of brake discs should be overlapped 50% or more.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the brake case and differential gear case, after eliminate the water, oil and stuck liquid fasket.

Tightening torque	Rear wheel mounting screw and nut	197 to 226 N·m 20 to 23 kgf·m 145 to 166 ft-lbs
-------------------	-----------------------------------	---

- |                               |                     |
|-------------------------------|---------------------|
| (1) Brake Case Mounting Screw | (5) Brake Cam Plate |
| (2) Brake Case                | (6) Brake Disc      |
| (3) Brake Shaft               | (7) Plate           |
| (4) Steel Ball                |                     |

W1017134



### Brake Cam and Brake Cam Lever

1. Remove the brake cam mounting nut and remove the brake cam (2) and brake cam lever (4).

#### (When reassembling)

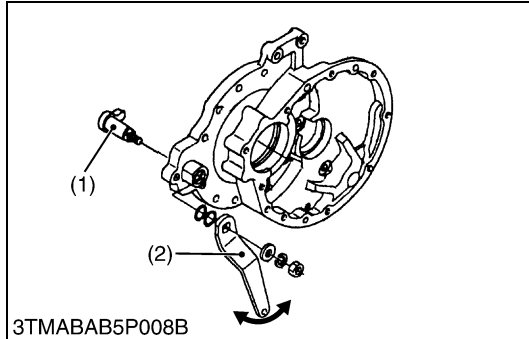
- Apply grease to the O-ring (3) and take care not damage the O-ring.

(1) Brake Case  
(2) Brake Cam

(3) O-rings  
(4) Brake Cam Lever

W1017712

## [4] SERVICING



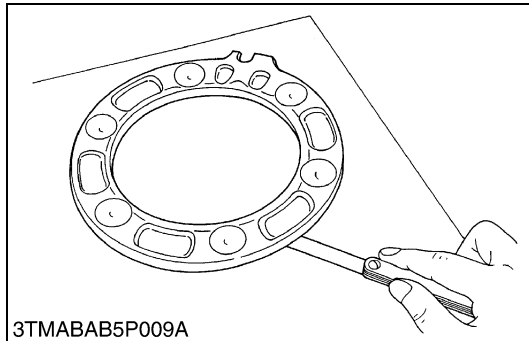
### Brake Cam Lever Movement

1. Assemble the brake cam (1) and brake cam lever (2).
2. Move the brake cam lever by hand to check the movement.
3. If the movement is heavy, refine the brake cam lever or brake cam with sandpaper.

(1) Brake Cam

(2) Brake Cam Lever

W10144750

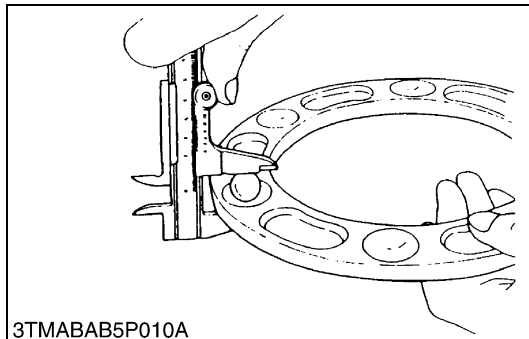


### Cam Plate Flatness

1. Place the cam plate on the surface plate.
2. Use a feeler gauge of 0.3 mm (0.012 in.) thick for judgement of the cam plate flatness. Measure the flatness diagonally at more than four locations.
3. If the measurement is above the allowable limit, replace it.

Cam Plate Flatness	Allowable limit	0.3 mm 0.012 in.
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W10145650

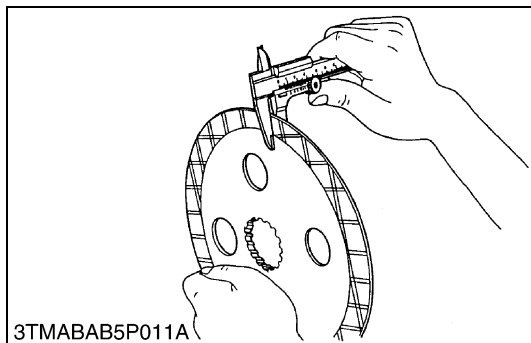


### Height of Brake Cam Plate and Ball

1. Measure the dimensions of the brake cam plate with the ball installed.
2. If the measurement is less than the allowable limit, replace the cam plate and balls.
3. Inspect the ball holes of cam plate for uneven wear. If uneven wear is found, replace it.

Height of brake cam plate and ball	Factory spec.	20.9 to 21.1 mm 0.823 to 0.831 in.
	Allowable limit	20.5 mm 0.807 in.

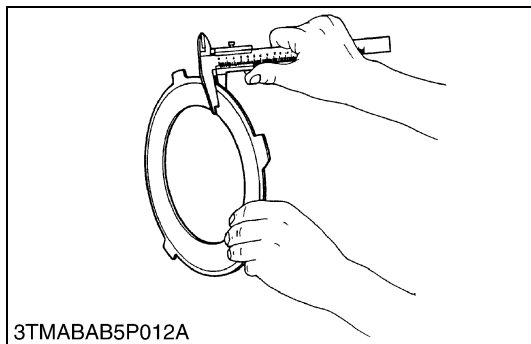
W10147220

**Brake Disc Wear**

1. Measure the brake disc thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Brake disc thickness	Factory spec.	4.6 to 4.8 mm 0.181 to 0.189 in.
	Allowable limit	4.2 mm 0.165 in.

W10148530

**Plate Wear**

1. Measure the plate thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Plate thickness	Factory spec.	2.54 to 2.66 mm 0.1000 to 0.1047 in.
	Allowable limit	2.1 mm 0.0827 in.

W10149690

# 6 FRONT AXLE

# MECHANISM

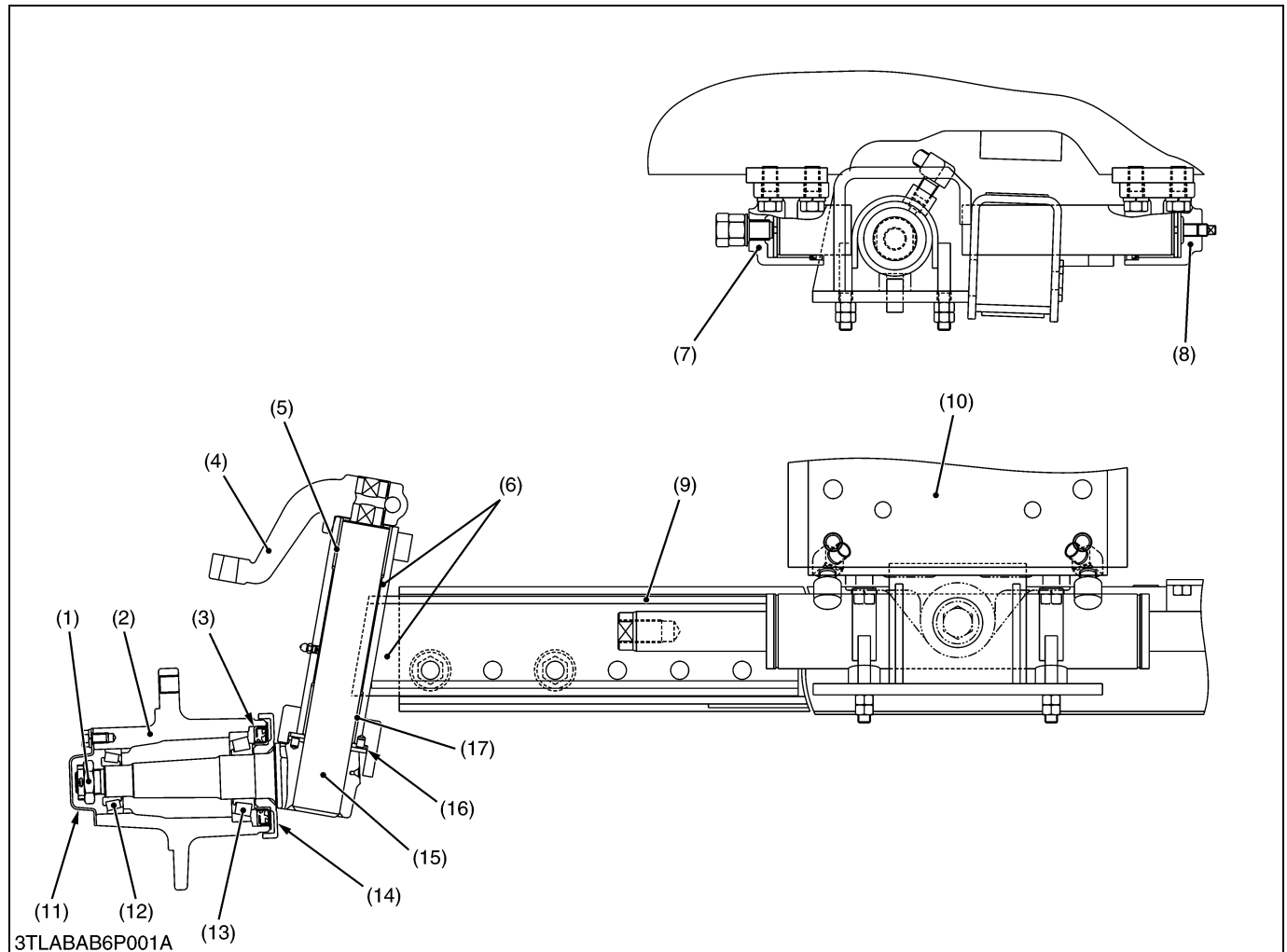
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## 1. STRUCTURE

The front axle supports the front of tractor and facilitates steering. There are two kinds of front axles. The two-wheel drive axle has free-running front wheels and the four-wheel drive axle has powered front wheels.

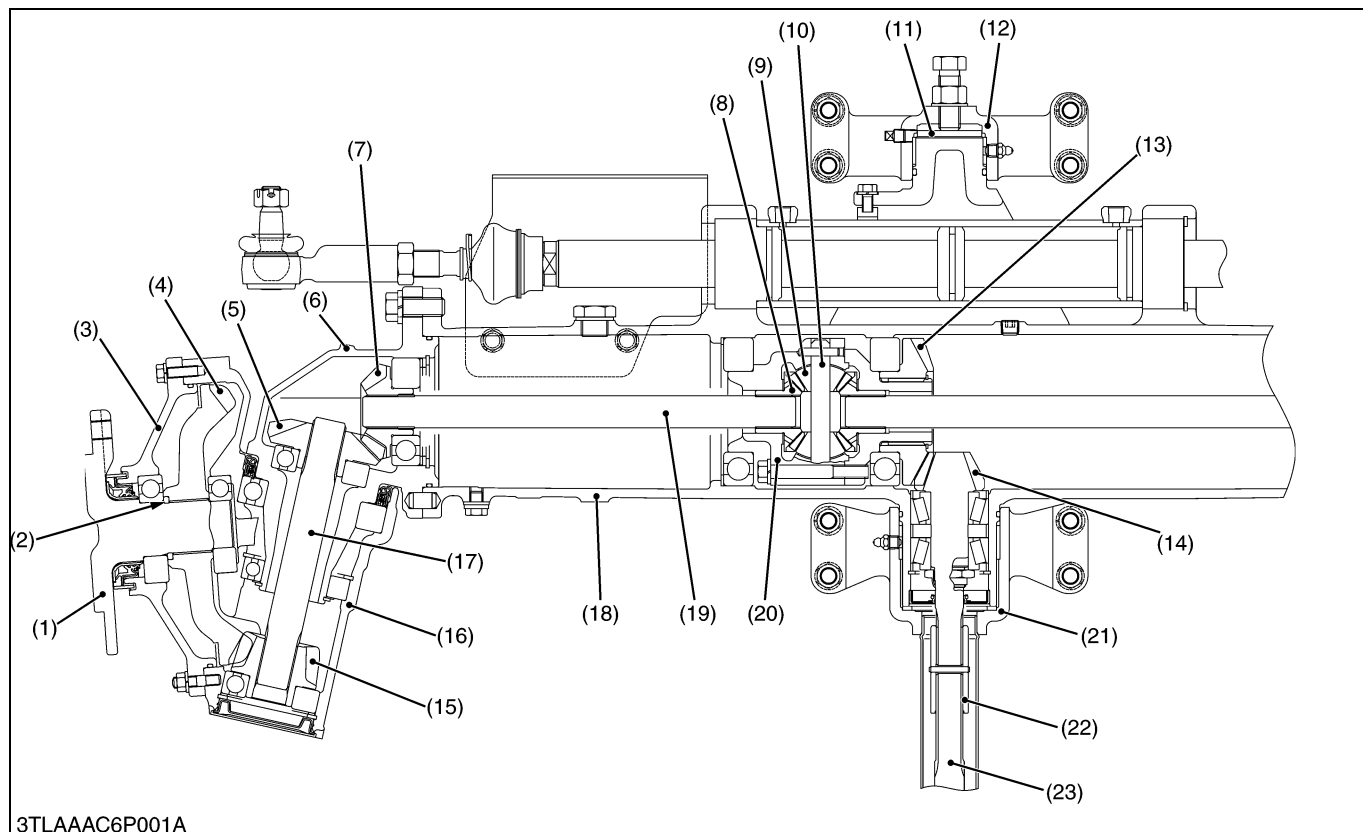
**[1] 2WD TYPE**



- |                     |                               |                           |                    |
|---------------------|-------------------------------|---------------------------|--------------------|
| (1) Slotted Nut     | (6) Front Axle, Out           | (10) Front Axle Frame     | (14) Dust Cover    |
| (2) Front Wheel Hub | (7) Front Axle Bracket, Front | (11) Front Wheel Cap      | (15) Knuckle Shaft |
| (3) Oil Seal        | (8) Front Axle Bracket, Rear  | (12) Taper Roller Bearing | (16) Thrust Collar |
| (4) Knuckle Arm     | (9) Front Axle, Middle        | (13) Taper Roller Bearing | (17) Bushing       |
| (5) Bushing         |                               |                           |                    |

The front axle of the 2WD type is constructed as shown above. The shape of the front axle is relatively simple, and the front axle is supported at its center with the front axle brackets (7), (8) on the front axle frame (10), so that steering operation is stable even on an uneven grounds in a farm field.



**[2] 4WD TYPE**

- |                     |                                |                                |                               |
|---------------------|--------------------------------|--------------------------------|-------------------------------|
| (1) Axle            | (7) Bevel Gear                 | (13) Spiral Bevel Gear         | (19) Differential Yoke Shaft  |
| (2) Collar          | (8) Differential Side Gear     | (14) Spiral Bevel Pinion Shaft | (20) Differential Case        |
| (3) Axle Flange     | (9) Differential Pinion        | (15) Bevel Gear                | (21) Front Axle Bracket, Rear |
| (4) Bevel Gear      | (10) Pinion Shaft              | (16) Front Gear Case           | (22) Coupling                 |
| (5) Bevel Gear      | (11) Collar                    | (17) Bevel Gear Shaft          | (23) Propeller Shaft          |
| (6) Bevel Gear Case | (12) Front Axle Bracket, Front | (18) Front Axle Case           |                               |

The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission through the propeller shaft (23) and to the spiral bevel pinion shaft (14), then to the spiral bevel gear (13) after that to the differential gear.

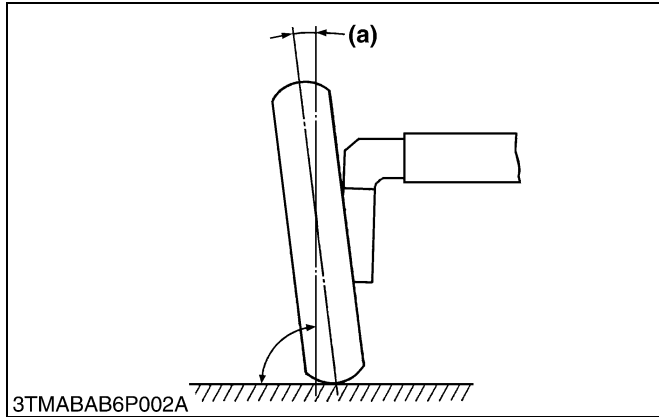
The power through the differential is transmitted to the differential yoke shaft (19), and to the bevel gear shaft (17) in the bevel gear case (6).

The revolution is greatly reduced by the bevel gears (15), (4), then the power is transmitted to the axle (1).

The differential system allows each wheel to rotate at a different speed to make turning easier.

## 2. FRONT WHEEL ALIGNMENT

To assure smooth mobility or maneuverability and enhance stable and straight running, the front wheels are mounted at an angle to the right, left and forward directions. This arrangement is referred to as the Front Wheel Alignment.



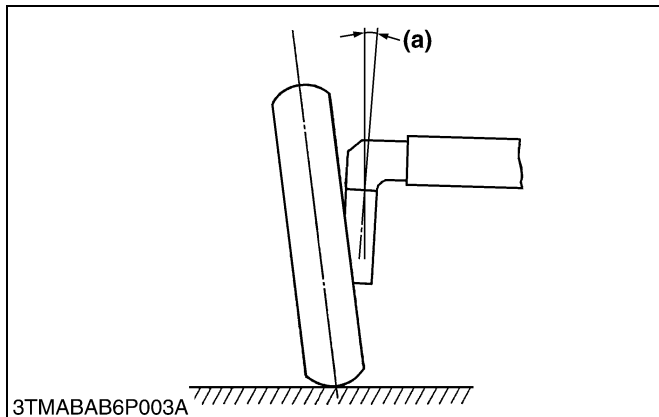
### ■ Camber

The front wheels are tilted from the vertical as viewed from the front, upper wheels are spreader than lower ones.

This inclination is called camber (a). Camber reduces bending or twisting of the front axle caused by vertical load or running resistance, and also maintains the stability in running.

Camber	2WD	0.035 rad 2 °
	4WD	0.070 rad 4 °

W1013540



### ■ Kingpin Angle

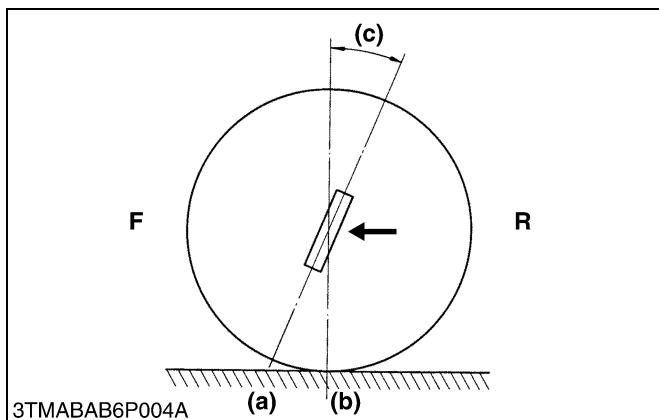
The Kingpin is tilted from the vertical as viewed from the front.

This angle is called kingpin angle (a). As with the camber, kingpin angle reduces rolling resistance of the wheels, and prevents any shimmy motion of the steering wheel.

It also reduces steering effort.

Kingpin angle	2WD	0.175 rad 10 °
	4WD	0.218 rad 12.5 °

W1013829



### ■ Caster

The kingpin is tilted forward as viewed from the side. The point (b) of the wheel center line is behind the point (a) of the kingpin shaft center line.

This inclination is called caster (c). Caster helps provide steering stability.

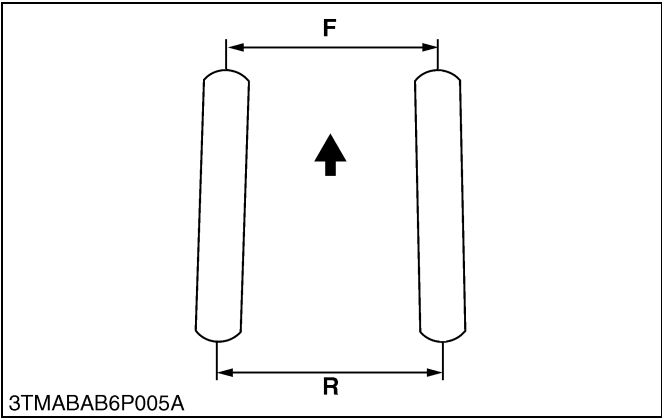
As with the kingpin inclination, caster reduces steering effort.

Caster	2WD	0.035 rad 2 °
	4WD	0.026 rad 1.5 °

F : Front

R : Rear

W1013978



■ Toe-in

Viewing the front wheels from above reveals that the distance between the toes of the front wheels is smaller than that between the heels.

It is called toe-in. The front wheels tend to roll outward due to the camber, but toe-in offsets it and ensures parallel rolling of the wheels. Another purpose of toe-in is to prevent excessive and uneven wear of tires.

Toe-in	2WD	2 to 8 mm
	4WD	0.08 to 0.32 in.

F : Front

R : Rear

W1014289

# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Front Wheels Wander to Right or Left</b>	Tire pressure uneven	Adjust	G-47
	Improper toe-in adjustment (improper alignment)	Adjust	6-S6
	Clearance between front axle middle boss and front axle shaft bracket bushing excessive [2WD Type]	Replace	6-S18
	Clearance between front axle case boss and front axle bracket (front, rear) bushing excessive [4WD Type]	Replace	6-S23
	Knuckle shaft bushings worn [2WD Type]	Replace	6-S18
	Front axle rocking force too small	Adjust	6-S7
	Front wheel sway excessive	Replace	6-S7
	Tie-rod end loose	Tighten	6-S11, 13
	Air sucked in power steering circuit	Bleed	7-S10
<b>Front Wheels Can Not Be Driven [4WD Type]</b>	Propeller shaft broken	Replace	6-S9
	Front differential gear broken	Replace	6-S17
	Shift lever broken	Replace	–
<b>Noise [4WD Type]</b>	Gear backlash excessive	Adjust or replace	6-S20 to S22
	Oil insufficient	Replenish	6-S8
	Bearings damaged or broken	Replace	–
	Gears damaged or broken	Replace	–
	Spiral bevel pinion shaft turning torque improper	Adjust	6-S20

W10143220

## 2. SERVICING SPECIFICATIONS

### 2WD TYPE

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	2 to 8 mm 0.08 to 0.32 in.	—
Front Wheel	Axial Sway	Less than 5 mm 0.20 in.	—
Front Axle	Rocking Force	49.0 to 117.7 N 5.0 to 12.0 kgf 11.0 to 26.5 lbs	—
Front Axle Shaft to Bushing	Clearance	0.000 to 0.285 mm 0.00000 to 0.01122 in.	0.4 mm 0.016 in.
Knuckle Shaft	O.D.	27.880 to 27.900 mm 1.09764 to 1.09842 in.	—
Bushing	I.D.	27.900 to 28.165 mm 1.09842 to 1.10886 in.	—
Front Axle Middle Boss to Front Axle Shaft Bracket Bushing	Clearance	0.000 to 0.147 mm 0.00000 to 0.00579 in.	0.3 mm 0.012 in.
Front Axle Middle Boss	O.D.	39.938 to 40.000 mm 1.57236 to 1.57480 in.	—
Bushing	I.D.	40.000 to 40.085 mm 1.57480 to 1.57815 in.	—

W1013973



**4WD TYPE**

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	2 to 8 mm 0.08 to 0.32 in.	—
Front Wheel	Steering Angle	0.925 to 0.960 rad. 53 to 55 °	—
	Axial Sway	5.0 mm 0.196 in.	—
	Radial Sway	5.0 mm 0.197 in.	—
Front Axle	Rocking Force	49.0 to 117.7 N 5.0 to 12.0 kgf 11.0 to 26.5 lbs	—
Differential Case, Differential Case Cover to Differential Side Gear	Clearance	0.050 to 0.151 mm 0.00197 to 0.00597 in.	0.20 mm 0.0079 in.
Differential Case	I.D.	32.000 to 32.064 mm 1.25984 to 1.26228 in.	—
Differential Case Cover	I.D.	32.000 to 32.025 mm 1.25984 to 1.26083 in.	—
Differential Side Gear	O.D.	31.911 to 31.950 mm 1.25634 to 1.25787 in.	—
Pinion Shaft to Differential Pinion	Clearance	0.064 to 0.100 mm 0.00252 to 0.00394 in.	0.25 mm 0.0096 in.
Pinion Shaft	O.D.	13.950 to 13.968 mm 0.54921 to 0.54992 in.	—
Differential Pinion	I.D.	14.032 to 14.050 mm 0.55244 to 0.55315 in.	—
Differential Pinion to Differential Side Gear	Backlash	0.2 to 1.18 mm 0.008 to 0.012 in.	0.4 mm 0.016 in.
Spiral Bevel Pinion Shaft	Turning Torque	0.98 to 1.18 N·m 0.10 to 0.12 Kgf·m 0.72 to 0.87 ft-lbf	—

W1015357

**4WD TYPE (Continued)**

Item		Factory Specification	Allowable Limit
Spiral Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	—
Bevel Gear to Bevel Gear	Backlash	0.15 to 0.35 mm 0.006 to 0.014 in.	0.6 mm 0.024 in.
Front Axle Case Boss (Front) to Bracket Bushing	Clearance	0.120 to 0.275 mm 0.00472 to 0.01083 in.	0.50 mm 0.19685 in.
Front Axle Case Boss (Front)	O.D.	49.950 to 49.975 mm 1.97224 to 1.96752 in.	—
Bushing	I.D.	50.095 to 50.225 mm 1.97224 to 1.97736 in.	—
Front Axle Case Boss (Rear) to Bracket Bushing	Clearance	0.100 to 0.292 mm 0.00394 to 0.01150 in.	1.0 mm 0.03937 in.
Front Axle Case Boss (Rear)	O.D.	69.970 to 70.000 mm 2.75472 to 2.75590 in.	—
Bushing	I.D.	70.100 to 70.262 mm 2.75984 to 2.76622 in.	—

W1013874

### 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.)

#### 2WD TYPE

Item	N·m	kgf·m	ft-lbs
Tie-rod clamp screw and nut	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Tie-rod end nut	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Front axle shaft bracket mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Front wheel mounting stud bolt	63.7 to 73.5	6.5 to 7.5	47.0 to 54.0
Front wheel mounting lug nut	137	14.0	100
Front wheel hub slotted nut	29.4 to 39.2	3.0 to 4.0	21.7 to 28.9
Knuckle arm mounting bolt and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Tie-rod joint lock nut	83.4 to 88.3	8.5 to 9.0	61 to 65
Locking force adjusting screw lock nut	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Power steering hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Cylinder cover mounting screw	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Front axle, out mounting bolt and nut	123 to 147	12.6 to 15.0	91.1 to 108.5

W1012736

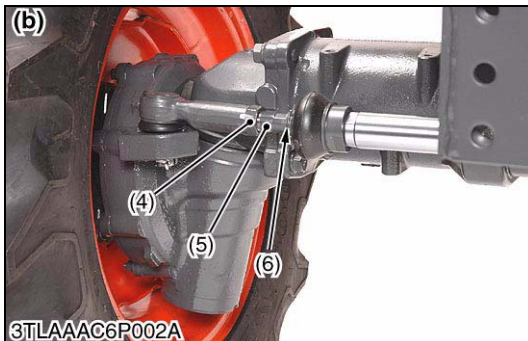
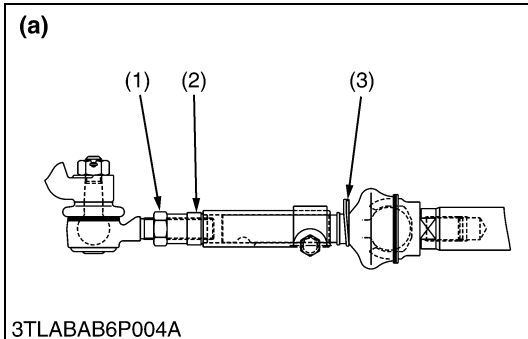
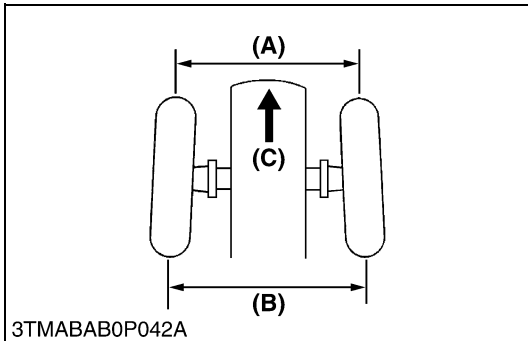
#### 4WD TYPE

Item	N·m	kgf·m	ft-lbs
Tie-rod clamp screw and nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Cylinder cover mounting screw	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Tie-rod joint lock nut	166.7 to 196.1	17.0 to 20.0	122.9 to 144.6
Front wheel mounting nut	137	14.0	100
Front bracket and rear bracket mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Tie-rod end nut	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Bevel gear case mounting screw	123 to 147	12.6 to 15.0	91.1 to 108.5
Front axle rocking force adjusting screw	19.6 to 29.4	2.0 to 3.0	14.5 to 21.7
Locking force adjusting screw lock nut	39.2 to 58.8	4.0 to 6.0	28.9 to 43.4
Axle flange mounting screw and nut	23.6 to 27.5	2.4 to 2.8	17.4 to 20.3
Differential case cover mounting screw	48.0 to 58.8	4.9 to 6.0	35.4 to 43.4

W1016391

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING AND ADJUSTING



#### Toe-in

1. Park the tractor on flat ground.
2. Inflate the tires to the specified pressure.
3. Turn steering wheel so front wheels are in the straight ahead position.
4. Lower the implement, lock the parking brake and stop the engine.
5. Measure distance between tire beads at front of tire, hub height.
6. Measure distance between tire beads at rear of tire, hub height.
7. Front distance should be 2 to 8 mm (0.08 to 0.32 in.) less than rear distance.
8. If the measurement is not within the factory specifications, adjust by changing the tie-rod length.

Toe-in ((B) - (A))	Factory spec.	2 to 8 mm 0.08 to 0.32 in.
--------------------	---------------	-------------------------------

#### ■ Adjusting

##### 2WD

1. Detach the snap ring (3).
2. Loosen the tie-rod lock nut (1).
3. Turn the outer tube (2) to adjust the tie-rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod lock nut (1) and rod mounting screw.
5. Attach the snap ring (3).

##### 4WD

1. Detach the snap ring (6).
2. Loosen the tie-rod lock nut (4).
3. Turn the outer tube (5) to adjust the tie-rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod lock nut (2).
5. Attach the snap ring (6).

Tightening torque	Tie-rod lock nut	2WD	83.4 to 88.3 N-m 8.5 to 9.0 Kgf-m 61 to 65 lbf-ft
		4WD	166.7 to 196.1 N-m 17.0 to 20.0 Kgf-m 123 to 145 lbf-ft

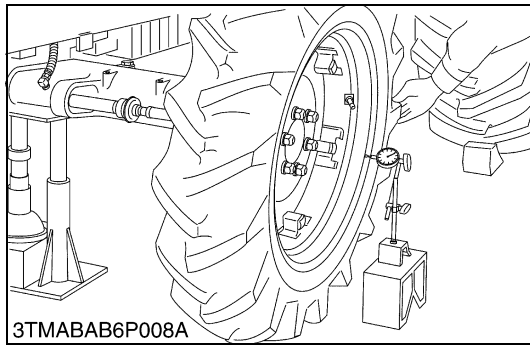
#### ■ IMPORTANT

- A right and left tie-rod joint is adjusted to the same length.

- (1) Tie-rod Lock Nut
- (2) Outer Tube
- (3) Snap Ring
- (4) Tie-rod Nut
- (5) Tie-rod joint
- (6) Snap Ring

- (A) Wheel to Wheel Distance at front
- (B) Wheel to Wheel Distance at rear
- (C) Front
- (a) 2WD
- (b) 4WD

W1236547



### **Axial Sway of Front Wheel**

1. Jack up the front side of tractor.
2. Set a dial gauge on the outside of rim.
3. Turn the wheel slowly and read the runout of rim.
4. If the runout exceeds the factory specifications, check the bearing, rim, and front wheel hub.

Axial sway of front wheel	Factory spec.	Less than 5.0 mm 0.20 in.
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W1012176



### **Front Axle Rocking Force (2WD)**

1. Jack up the front side of tractor.
2. Set a spring balance to the front axle flange.
3. Measure the front axle rocking force.
4. If the measurement is not within the factory specifications, adjust the adjusting screw (1).
5. Tighten the lock nut (2) firmly.

Front axle rocking force	Factory spec.	49.0 to 117.7 N·m 5.0 to 12.0 Kgf·m 11.0 to 26.5 lbs
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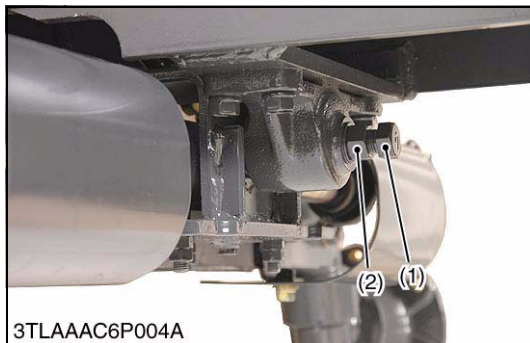
### **(When reassembling)**

Tightening torque	Lock nut	34.3 to 39.2 N·m 3.5 to 4.0 Kgf·m 17.4 to 20.2 ft-lbs
-------------------	----------	---

(1) Adjusting Screw

(2) Lock Nut

W1012289



### **Adjusting Front Axle Pivot (4WD)**

1. Jack up the tractor body, then loosen the lock nut (2).
2. Measure the adjusting screw tightening torque.
3. If tightening torque is not within the factory specifications, adjust the adjusting screw (1).
4. After adjustment, tighten the lock nut firmly.

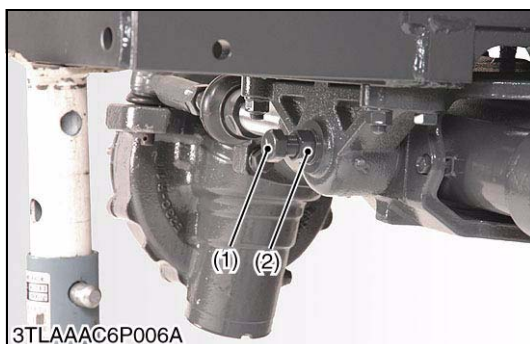
### **(When reassembling)**

Tightening torque	Front axle adjusting screw	19.6 to 29.4 N·m 2.0 to 4.0 Kgf·m 14.5 to 21.7 ft-lbs
	Lock nut	39.2 to 58.8 N·m 4.0 to 6.0 Kgf·m 28.9 to 43.4 ft-lbs

(1) Adjusting Screw

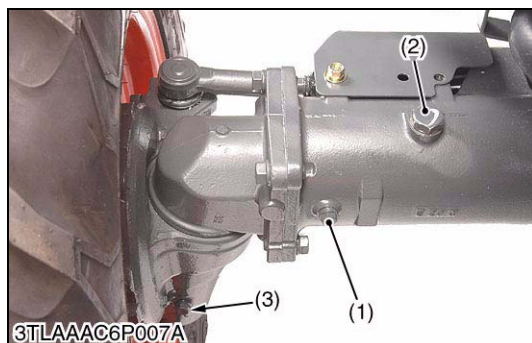
(2) Lock Nut

W1018685



## [2] PREPARATION

### (1) Separating Front Axle Case from Front Axle Frame



#### Draining Front Axle Case Oil

1. Place the oil pans underneath the front axle case.
2. Remove the drain plug (3) both sides and filling port plug (2) to drain the oil.
3. After draining, reinstall the drain plugs (3) and filling port plug (2).

#### **(When reassembling)**

- Remove the filling port plug (2) and right and left check plugs (1).
- Fill with the new oil.
- After filling, reinstall the port plug (2).

Capacity	Front axle case oil	6.5 L 6.9 U.S.qts 5.7 Imp.qts
----------	---------------------	-------------------------------------

#### ■ **IMPORTANT**

- **Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil.**  
**Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.)**

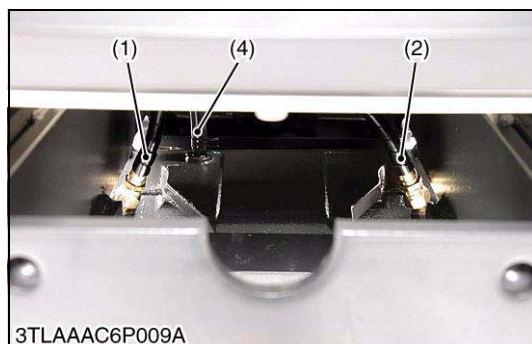
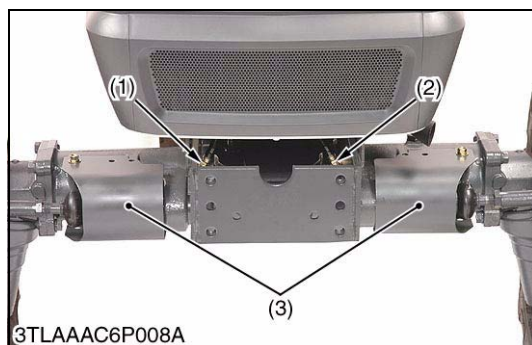
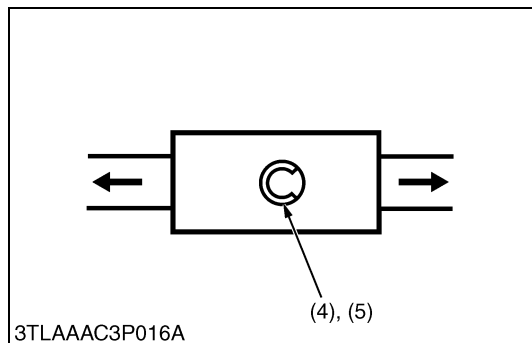
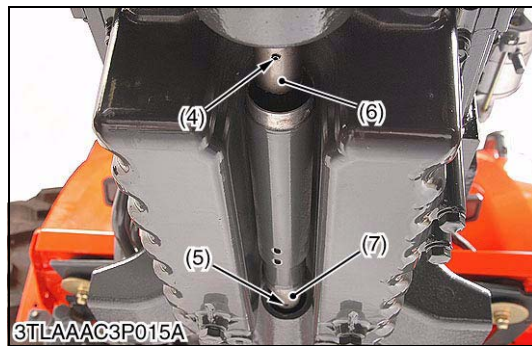
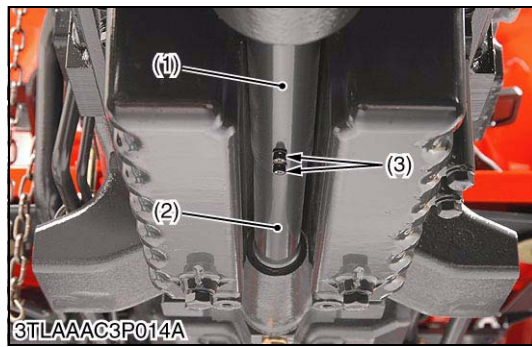
(1) Check Plug

(3) Drain Plug

(2) Filling Port Plug

W1012640





### Propeller Shaft (4WD only)

1. Slide propeller shaft front cover (1) and rear cover (2) after removing screws (3).
2. Tap out spring pins (4), (5), slide couplings (6), (7), and then remove propeller shaft together with propeller shaft covers.

### (When reassembling)

- Apply grease to the splines of the propeller shaft (7).
- Tap in spring pin (4), (5) as shown in figure.

- |                                 |                |
|---------------------------------|----------------|
| (1) Propeller Shaft Front Cover | (5) Spring Pin |
| (2) Propeller Shaft Rear Cover  | (6) Coupling   |
| (3) Screw                       | (7) Coupling   |
| (4) Spring Pin                  |                |

W1031273

### Power Steering Hoses

1. Disconnect power steering hoses (1), (2) and breather pipe (4) from steering cylinder.
2. Remove cylinder covers (3).

### (When reassembling)

Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Cylinder cover mounting screw	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs

- |                             |                    |
|-----------------------------|--------------------|
| (1) Power Steering Hose, RH | (3) Cylinder Cover |
| (2) Power Steering Hose, LH | (4) Breather Pipe  |

W1013537



### Front Wheel and Front Axle Assembly

1. Check the front axle and engine are securely mounted on the disassembly stand.
2. Loosen the front wheel mounting nuts.
3. Lift the front axle and remove the front wheels.
4. Remove the bracket (front) mounting screws and nuts.
5. Remove the bracket (rear) mounting screws and nuts.
6. Separate the front axle from front axle bracket.

#### (When reassembling)

#### ■ IMPORTANT

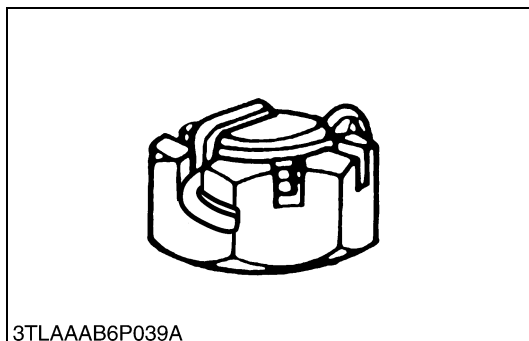
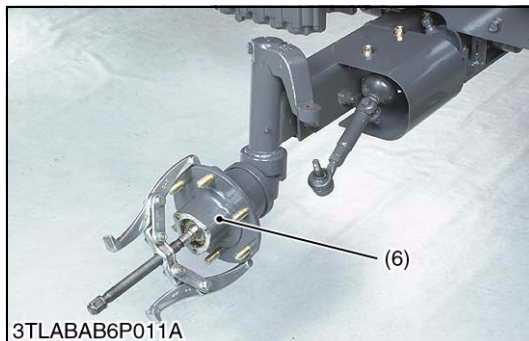
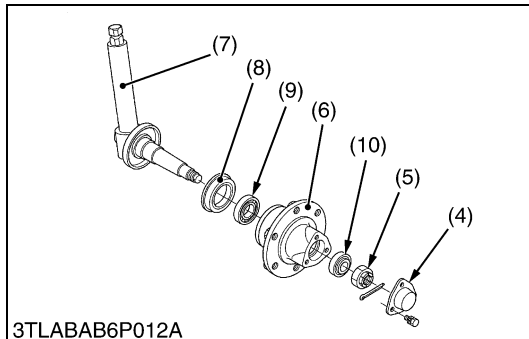
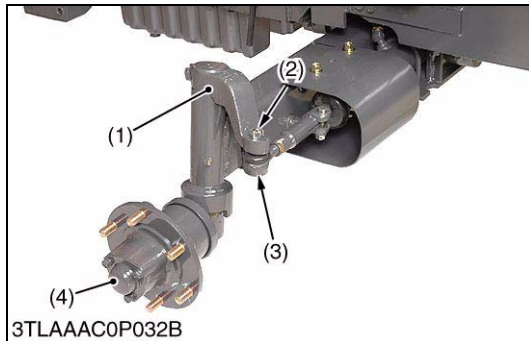
- Be sure to adjust the front axle rocking force. (See page 6-S7.)

Tightening torque	Front wheel mounting nut	137 N·m 14.0 kgf·m 100 ft-lbs
	Bracket mounting screw and nut	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs

W1013808

### [3] DISASSEMBLING AND ASSEMBLING

#### (1) 2WD Type Front Axle



#### Front Wheel Hub

1. Remove the front wheels.
2. Remove the cotter pin and remove the slotted nut (2).
3. Disconnect the knuckle arm (1) and tie-rod end (3).
4. Remove the front wheel cap (4).
5. Draw out the cotter pin.
6. Remove the slotted nut (5).
7. Remove the collar.
8. Remove the front wheel hub (6) with a puller.

#### (When reassembling)

- Replace cotter pin with a new one.
- Apply grease to the oil seal (8) in the front wheel hub.

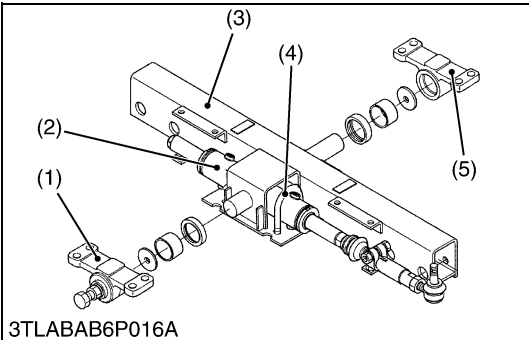
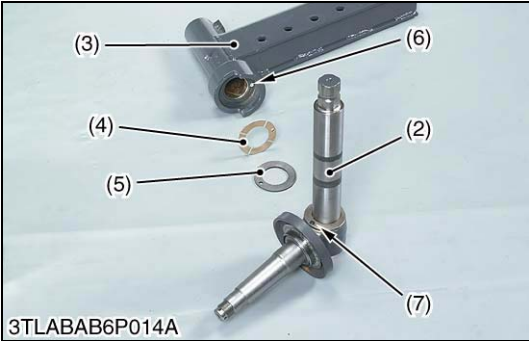
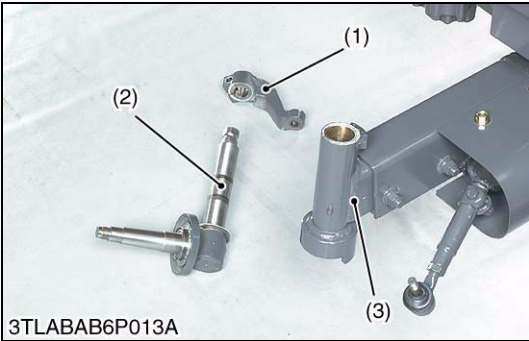
#### ■ IMPORTANT

- After tightening the slotted nut to the specified torque, insert a cotter pin and bend it as shown in the figure.
- Pack in the grease to the bearing in the front wheel hub.

Tightening torque	Front wheel mounting nut	137 N·m 14.0 kgf·m 100 ft-lbs
	Front wheel hub slotted nut	29.4 to 39.2 N·m 3.0 to 4.0 kgf·m 21.7 to 28.9 ft-lbs
	Tie-rod end slotted nut	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs

- |                                 |                           |
|---------------------------------|---------------------------|
| (1) Knuckle Arm                 | (6) Front Wheel Hub       |
| (2) Tie-rod End Slotted Nut     | (7) Knuckle Shaft         |
| (3) Front Wheel Hub             | (8) Oil Seal              |
| (4) Front Wheel Cap             | (9) Taper Roller Bearing  |
| (5) Front Wheel Hub Slotted Nut | (10) Taper Roller Bearing |

W1022004



**Knuckle Shaft and Front Axle, Out**

1. Remove the knuckle arm (1) and draw out the knuckle shaft (4) from the front axle.
2. Remove the front axle, out (3).

**(When reassembling)**

- Apply grease to the knuckle shaft (2) and thrust collar (4), (5).
- Do not interchange right and left knuckle arms.
- Be sure to install the thrust collars (4), (5) so that groove side is downward.
- Be sure to align the hole of thrust collars (4), (5) and knock pin (6), (7).
- A large size thrust collar (5) must be lower side.

Tightening torque	Knuckle arm mounting bolt and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
	Front axle, out mounting bolt and nut	123 to 147 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 ft-lbs

- |                     |                                 |
|---------------------|---------------------------------|
| (1) Knuckle Arm     | (5) Front Wheel Hub Slotted Nut |
| (2) Knuckle Shaft   | (6) Knock Pin                   |
| (3) Front Axle, Out | (7) Knock Pin                   |
| (4) Thrust Collar   |                                 |

W1022750

**Steering Cylinder**

1. Remove the clamps (4) and remove the steering cylinder (2).
2. Remove the bracket mounting screw and nut and remove the front axle, middle (3).

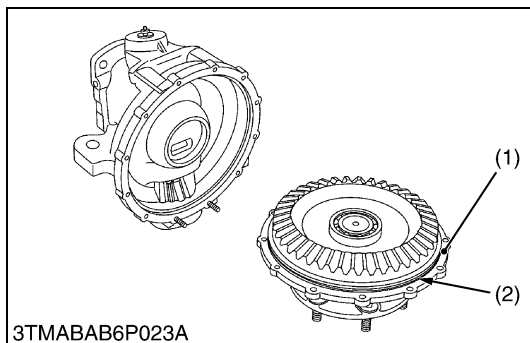
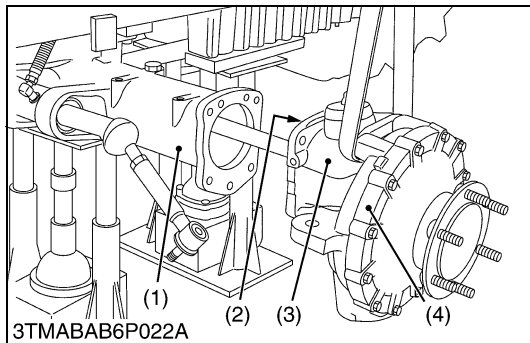
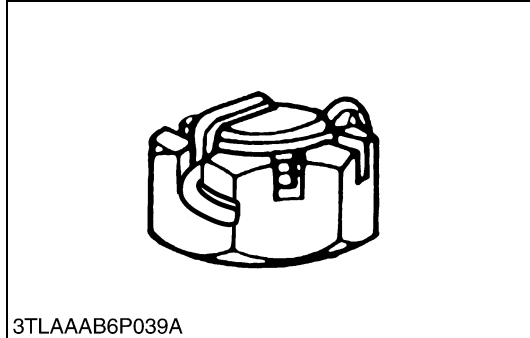
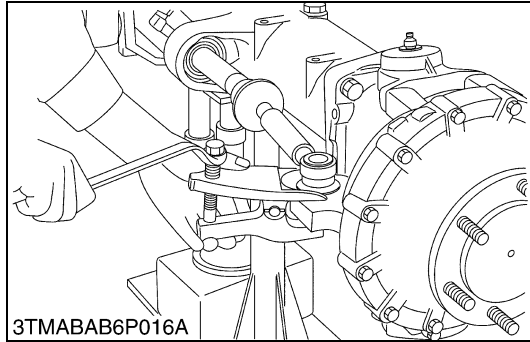
**(When reassembling)**

Tightening torque	Bracket mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 ft-lbs
-------------------	--------------------------------	---

- |                        |                   |
|------------------------|-------------------|
| (1) Bracket, Front     | (4) Clamp         |
| (2) Steering Cylinder  | (5) Bracket, Rear |
| (3) Front Axle, Middle |                   |

W1023704

## (2) 4WD Type Front Axle



### Tie-rods

1. Pull out the cotter pin and remove the tie-rod end slotted nuts.
2. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

### (When reassembling)

- After tightening the tie-rod end nut to the specified torques, install a cotter pin as shown in the figure left.

Tightening torque	Tie-rod end nut	39.2 to 45.1 N·m 4.6 to 4.6 kgf·m 28.9 to 33.3 ft-lbs
-------------------	-----------------	---

W1024158

### Bevel Gear Case and Front Gear Case

1. Remove the bevel gear case mounting screws.
2. Remove the bevel gear case (3) and front gear case (4) as a unit from the front axle case (1).

### (When reassembling)

- Apply grease to the O-ring (2) and take care not to damage it.
- Do not interchange right and left bevel gear case assemblies.

Tightening torque	Bevel gear case mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 122.9 to 144.6 ft-lbs
-------------------	--------------------------------	---

(1) Front Axle Case  
(2) O-ring

(3) Bevel Gear Case  
(4) Front Gear Case

W1015066

### Axle Flange and Front Gear Case

1. Remove the axle flange mounting screws.
2. Remove the axle flange (1).

### (When reassembling)

- Apply grease to the O-ring (2) of axle flange.
- Tighten the axle flange mounting screws and nuts diagonally in several steps.

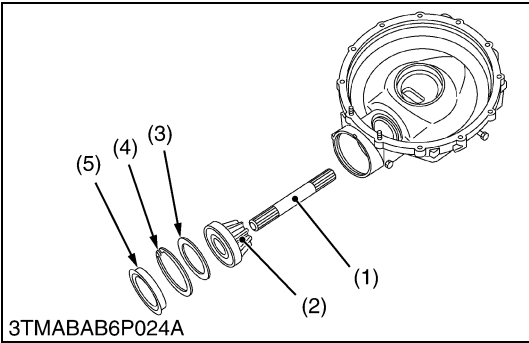
Tightening torque	Axle flange mounting screws and nuts	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
-------------------	--------------------------------------	---

(1) Axle Flange

(2) O-ring

W1015238



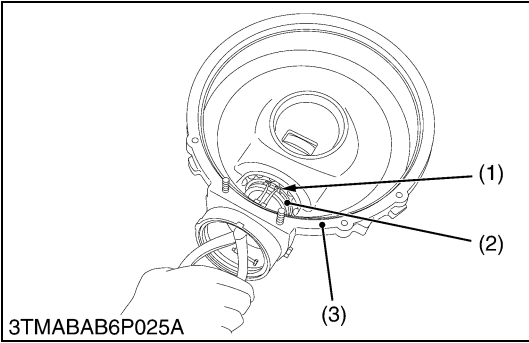


**Bevel Gear and Bevel Gear Shaft**

- 1. Remove the plug (5).
- 2. Remove the internal snap ring (4) and shim (3).
- 3. Tap out the bevel gear (2) with ball bearing.
- 4. Draw out the bevel gear shaft (1).

- (1) Bevel Gear Shaft
- (2) Bevel Gear
- (3) Shim
- (4) Internal Snap Ring
- (5) Plug

W1024523

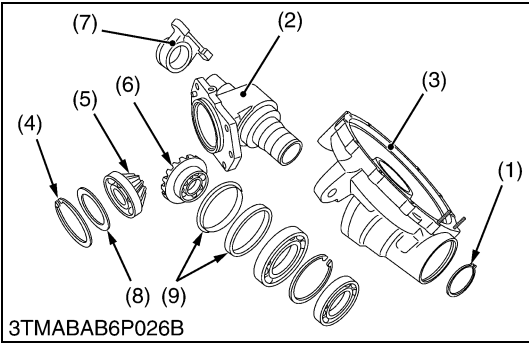


**Bevel Gear Case Gears**

- 1. Remove the axle case support (7). (L4330, L4630, L5030 only).
- 2. Remove the external snap ring (1).
- 3. Tap the bevel gear case (2) and separate it from the front gear case (3).
- 4. Remove the internal snap ring (1).
- 5. Take out the bevel gears (5), (6) with ball bearings, and shims (8).

**(When reassembling)**

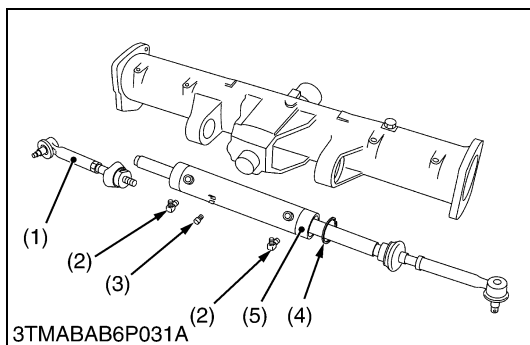
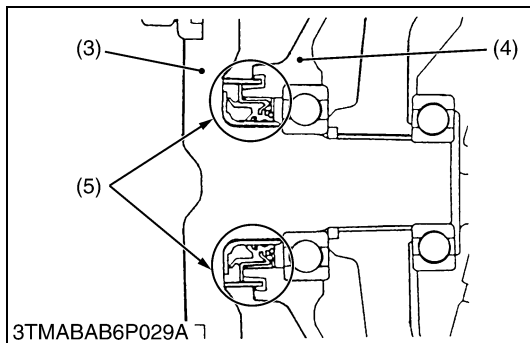
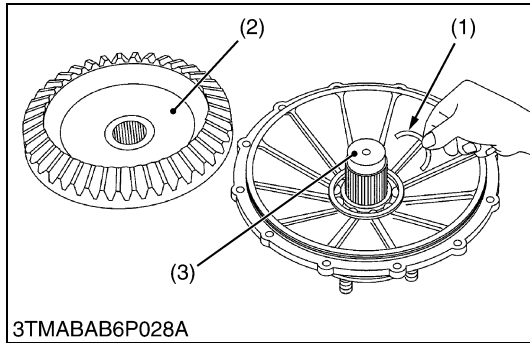
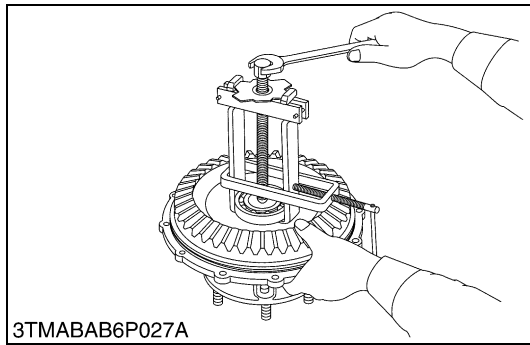
- Install the shims (8) to their original position.
- Install the oil seal (9) of bevel gear case, noting its direction.



Tightening torque	Axle case support mounting screw	127 to 142 N·m 13.0 to 14.5 kgf·m 94.0 to 104.9 ft·lbs
-------------------	----------------------------------	--

- (1) External Snap Ring
- (2) Bevel Gear Case
- (3) Front Gear Case
- (4) Internal Snap Ring
- (5) Bevel Gear
- (6) Bevel Gear
- (7) Axle Case Support
- (8) Shim
- (9) Oil Seal

W1015856



### Axle

1. Remove the bearing with a special use puller set (Code No. 07916-09032).
2. Take out the bevel gear (2).
3. Take out the collar (1).
4. Tap out the axle (3).

### (When reassembling)

- Install the oil seal (5) of axle flange (4), noting its direction as shown in the figure below.

- |                |                 |
|----------------|-----------------|
| (1) Collar     | (4) Axle Flange |
| (2) Bevel Gear | (5) Oil Seal    |
| (3) Axle       |                 |

W1016011

### Steering Cylinder

1. Remove the tie-rod joint (1) (right side).
2. Remove the cylinder set screw (3).
3. Remove the nipples (2) from steering cylinder.
4. Remove the internal snap ring (4).
5. Draw out the steering cylinder (5).

### (When reassembling)

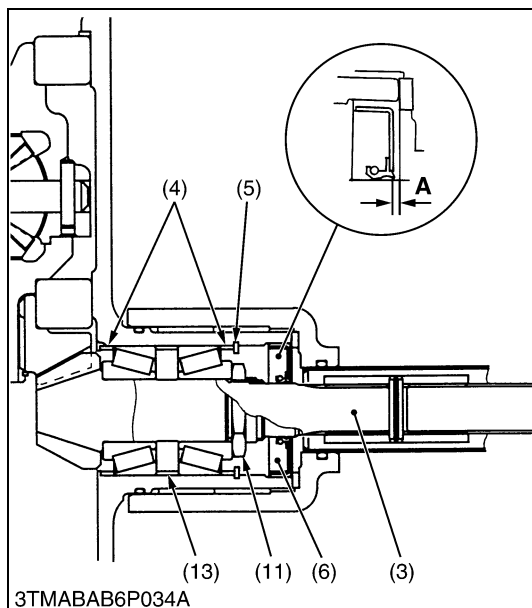
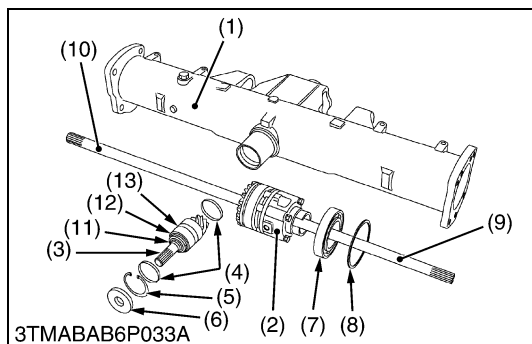
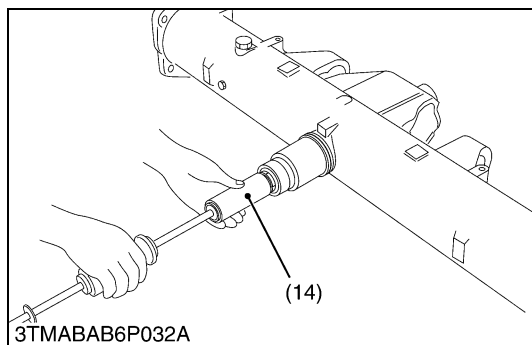
- Apply liquid lock (Three Bond 1372 or equivalent) to the tie-rod joint.

Tightening torque	Tie-rod joint and steering cylinder mounting screw	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 122.9 to 144.6 ft-lbs
-------------------	--	---

- |                        |                        |
|------------------------|------------------------|
| (1) Tie-rod Joint      | (4) Internal Snap Ring |
| (2) Nipple             | (5) Steering Cylinder  |
| (3) Cylinder Set Screw |                        |

W1029507





### **Spiral Bevel Pinion Shaft and Differential Gear Assembly**

1. Take out the differential yoke shaft (9), (10) both sides.
2. Remove the oil seal (6) and internal snap ring (5).
3. Remove the collar (4).
4. Remove the spiral bevel pinion shaft (3) by the pinion shaft remover (14).
5. Take out the differential gear assembly (2), ball bearing (7) and shim (8) from left side of front axle case (1).
6. Remove the stake of lock nut (11), and then remove the lock nut (11).
7. Remove the taper roller bearings (12).

#### **(When reassembling)**

- Replace the lock nut (11) and oil seal (6) with new ones.
- Apply grease to the oil seal (6).
- Install the shims and collars to their original position.
- Install the taper roller bearings correctly, noting their direction, and apply gear oil to them.
- Tighten up the lock nut (11) until the turning force of the spiral bevel pinion shaft reaches the factory specifications. (See page 6-S20.)
- When press-fitting the oil seal (6), observe the dimension "A" described in the figure.

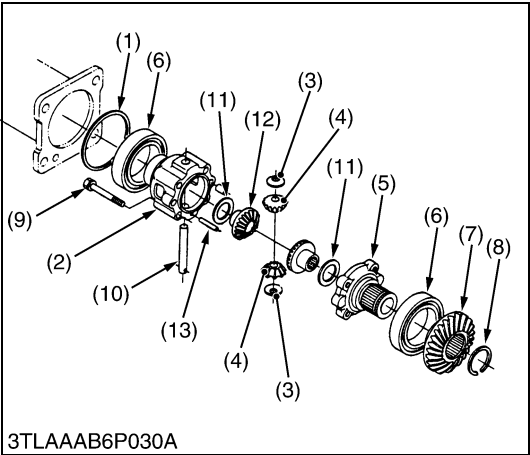
#### **■ IMPORTANT**

- After adjusting the turning torque stake the lock nut (11) firmly.

Turning torque of spiral bevel pinion shaft	Factory spec.	0.98 to 1.18 N·m 0.10 to 0.12 kgf·m 0.72 to 0.89 ft-lbs
---	---------------	---

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| (1) Front Axle Case              | (10) Differential Yoke Shaft L.H.    |
| (2) Differential Gear Assembly   | (11) Lock Nut                        |
| (3) Spiral Bevel Pinion Shaft    | (12) Taper Roller Bearing            |
| (4) Adjusting Collar             | (13) Collar                          |
| (5) Internal Snap Ring           | (14) Pinion Shaft Remover            |
| (6) Oil Seal                     |                                      |
| (7) Ball Bearing                 | <b>A : Dimension A : 0.5 to 1 mm</b> |
| (8) Shim                         | <b>(0.020 to 0.039 in.)</b>          |
| (9) Differential Yoke Shaft R.H. |                                      |

W1016385



Differential Gear

- 1. Remove the differential case cover mounting screws (9) and then take out the differential case cover (5), ball bearing (6) and spiral bevel gear (7) as a unit.
- 2. Remove the external snap ring (8), and then remove the ball bearing (6) and spiral bevel gear (7) as a unit with a puller.
- 3. Remove the straight pin (13).
- 4. Pull out the pinion shaft (10) and take out the differential pinions (4) and differential side gears (12).

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gears (12) and differential pinions (4).

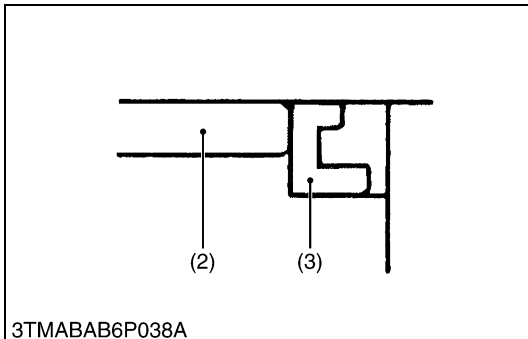
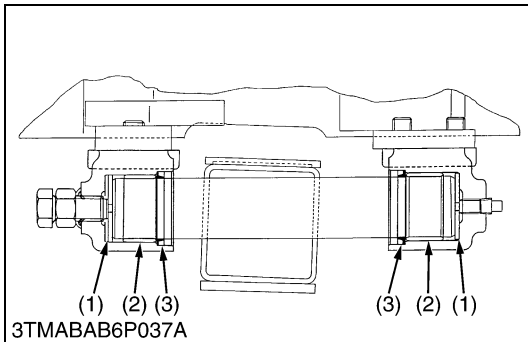
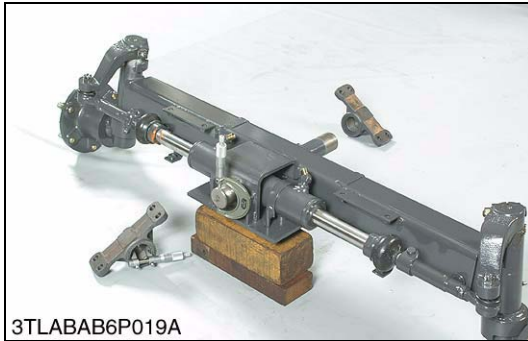
Tightening torque	Differential case cover mounting screw	48.0 to 58.8 N·m 4.9 to 6.0 kgf·m 35.4 to 43.4 ft·lbs
-------------------	--	---

- |                             |   |
|-----------------------------|---|
| (1) Shim                    | (8) External Snap Ring                      |
| (2) Differential Case       | (9) Differential Case Cover Mounting Screws |
| (3) Thrust Collar           | (10) Pinion Shaft                           |
| (4) Differential Pinion     | (11) Shim                                   |
| (5) Differential Case Cover | (12) Differential Side Gear                 |
| (6) Ball Bearing            | (13) Straight Pin                           |
| (7) Spiral Bevel Gear       |   |

W1017053

## [4] SERVICING

### (1) 2WD Type



#### **Clearance between Front Axle Middle Boss and Shaft Bracket Bushing**

1. Measure the front axle middle boss O.D. at several points where it contacts with the bushing.
2. Measure the shaft bracket 1 bushing I.D. and bracket 2 bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

#### **(When reassembling)**

- Before press-fitting the bushing, install the new thrust collar.

Clearance between front axle middle boss and bushing	Factory spec.	0.000 to 0.147 mm 0.00000 to 0.00579 in.
	Allowable limit	0.3 mm 0.012 in.

Front axle middle boss O.D.	Factory spec.	39.938 to 40.000 mm 1.57236 to 1.57480 in.
Bushing I.D.	Factory spec.	40.000 to 40.085 mm 1.57480 to 1.57815 in.

- (1) Thrust Collar  
(2) Bushing

- (3) Oil Seal

#### **Clearance between Knuckle Shaft (Kingpin) and Bushing**

1. Measure the shaft O.D. at several points where it contacts with the bushings.
2. Measure the bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

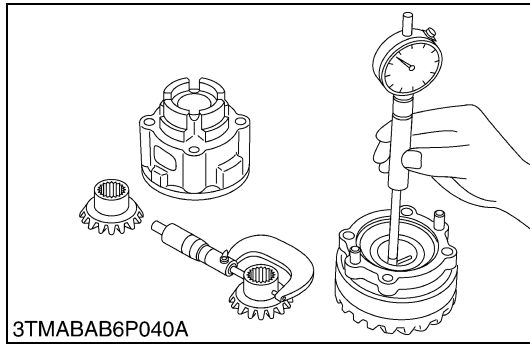
#### **(When reassembling)**

- Remove the bushing with a bushing puller.

Clearance between knuckle shaft (kingpin) and bushing	Factory spec.	0.000 to 0.285 mm 0.00000 to 0.01122 in.
	Allowable limit	0.4 mm 0.016 in.

Knuckle shaft O.D.	Factory spec.	27.880 to 27.900 mm 1.09764 to 1.09842 in.
Bushing I.D.	Factory spec.	27.900 to 28.165 mm 1.09842 to 1.10886 in.

W1032635

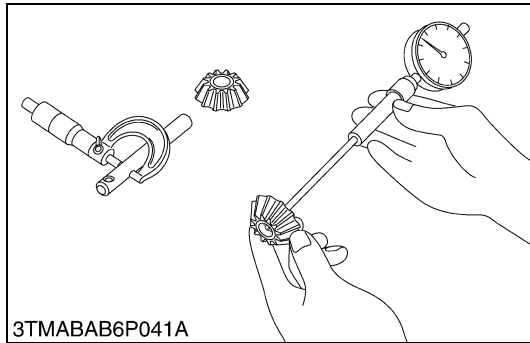
**(2) 4WD Type****Clearance between Differential Case (Differential Case Cover) and Differential Side Gear**

1. Measure the differential side gear O.D..
2. Measure the differential case bore I.D. and calculate the clearance.
3. Measure the differential case cover bore I.D. and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case (differential case cover) and differential side gear	Factory spec.	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.20 mm 0.0079 in.

Differential case bore I.D.	Factory spec.	32.000 to 32.064 mm 1.25984 to 1.26228 in.
Differential case cover bore I.D.	Factory spec.	32.000 to 32.025 mm 1.25984 to 1.26083 in.
Differential side gear O.D.	Factory spec.	31.911 to 31.950 mm 1.25634 to 1.25787 in.

W1018154

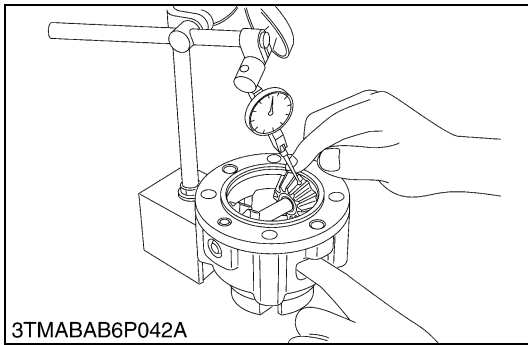
**Clearance between Pinion Shaft and Differential Pinion**

1. Measure the pinion shaft O.D..
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between pinion shaft and differential pinion	Factory spec.	0.064 to 0.100 mm 0.00252 to 0.00394 in.
	Allowable limit	0.25 mm 0.0096 in.

Pinion shaft O.D.	Factory spec.	13.950 to 13.968 mm 0.54921 to 0.54992 in.
Differential pinion I.D.	Factory spec.	14.032 to 14.050 mm 0.55244 to 0.55315 in.

W1018504



### **Backlash between Differential Pinon and Differential Side Gear**

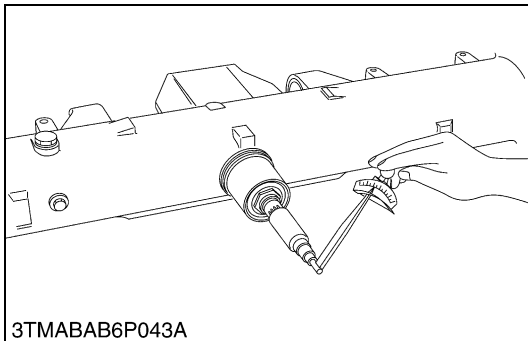
1. Set a dial gauge (lever type) on a tooth of the differential pinion.
2. Fix the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement exceeds the factory specifications, adjust with the differential side gears shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.2 to 0.3 mm 0.008 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

### **(Reference)**

- Thickness of adjusting shims :  
0.4 mm (0.016 in.)    1.0 mm (0.039 in.)  
0.6 mm (0.024 in.)    1.2 mm (0.047 in.)  
0.8 mm (0.031 in.)
- Tooth contact : More than 35 %

W1018659



### **Turning Force of Spiral Bevel Pinion Shaft (Pinion Shaft Only)**

1. Install the spiral bevel pinion shaft assembly only to the front axle case.
2. Measure the turning torque of spiral bevel pinion shaft.
3. If the turning torque is not within the factory specifications, adjust with the lock nut.  
If the turning torque is not able to adjust by lock nut (2), change the thickness of collar (1) and adjust with lock nut (2) again.

### **(Reference)**

- Standard size of collar (1) : 10.0 mm (0.349 in.) of thickness

Turning torque of spiral bevel pinion shaft	Factory spec.	0.98 to 1.18 N-m 0.10 to 0.12 Kgf-m 0.72 to 0.87 ft-lbs
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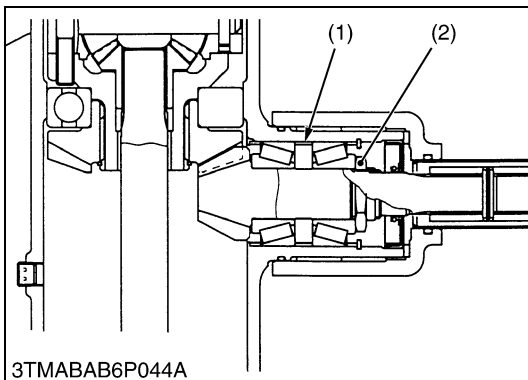
### **■ NOTE**

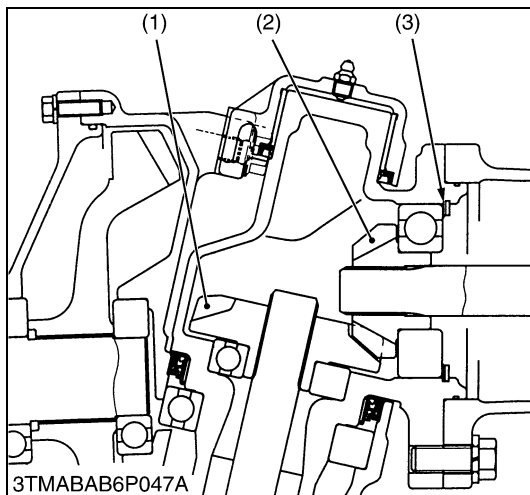
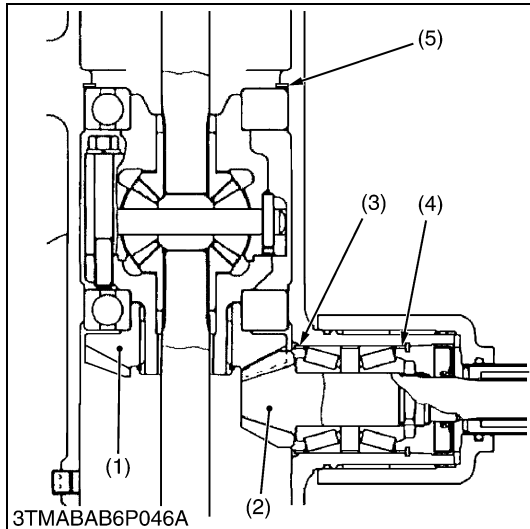
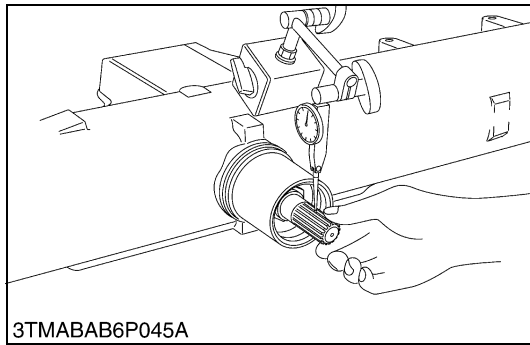
- After turning torque adjustment, be sure to stake the lock nut.

(1) Collar

(2) Lock Nut

W1018802





### **Backlash between Spiral Bevel Pinion Shaft and Spiral Bevel Gear**

1. Set a dial gauge (lever type) with its finger on the spline of spiral bevel pinion shaft.
2. Measure the backlash by moving the spiral bevel pinion shaft by hand lightly.
3. If the backlash is not within the factory specifications, change the adjusting collars (3), (4).

For example, when the backlash is too large, change the collar (3) to thinner one and change the collar (4) to thicker one. At this time, if the collar (3) is thinned by 1 mm, the collar (4) must be thickened by 1 mm.

#### **(Reference)**

- Standard size of adjusting collar (3), (4) :  
6.0 mm (0.236 in.) of thickness (total 12.0 mm)
- Standard size of adjusting shim (5) :  
2.0 mm (0.079 in.) of thickness

4. Adjust the backlash properly by repeating the above procedures.

Backlash between spiral bevel pinion shaft and spiral bevel gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
--	---------------	-------------------------------------

- (1) Spiral Bevel Gear (4) Adjusting Collar  
(2) Spiral Bevel Pinion Shaft (5) Shim  
(3) Adjusting Collar

W1019155

### **Backlash between 11T Bevel Gear and 16T Bevel Gear**

1. Stick a strip of fuse spots on the bevel gear (1) with grease.
2. Fix the front axle case, bevel gear case and front gear case.
3. Turn the axle.
4. Remove the bevel gear case from front axle case and measure the thickness of the fuses with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

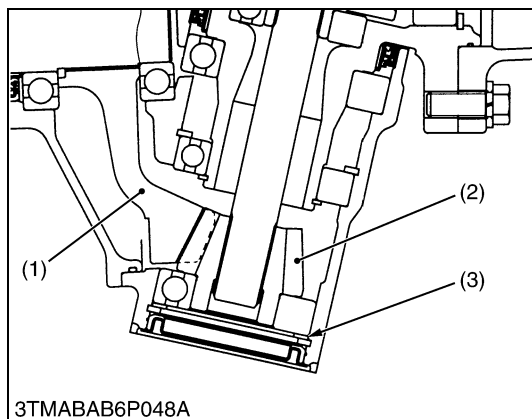
Backlash between bevel gear (2) and bevel gear	Factory spec.	0.15 to 0.35 mm 0.006 to 0.014 in.
	Allowable limit	0.6 mm 0.024 in.

#### **(Reference)**

- Thickness of adjusting shims :  
0.4 mm (0.031 in.)    1.0 mm (0.039 in.)  
0.6 mm (0.024 in.)    1.2 mm (0.047 in.)  
0.8 mm (0.031 in.)
- Tooth contact : More than 35 %

- (1) Bevel Gear (3) Shim  
(2) Bevel Gear

W1019327



### **Backlash between 11T Bevel Gear and 42T Bevel Gear**

1. Place a strip of fuse to three spots on the 42T bevel gear (1) with grease.
2. Fix the axle flange and front gear case.
3. Turn the axle.
4. Remove the axle flange from front gear case and measure the thickness of the fuse with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

Backlash between bevel gear (2) and bevel gear (1)	Factory spec.	0.15 to 0.35 mm 0.006 to 0.014 in.
	Allowable limit	0.6 mm 0.024 in.

### **(Reference)**

- Thickness of adjusting shims :
 

1.0 mm (0.039 in.)	1.2 mm (0.047 in.)
1.4 mm (0.055 in.)	1.6 mm (0.063 in.)
1.8 mm (0.071 in.)	2.0 mm (0.079 in.)
2.2 mm (0.087 in.)	
- Tooth contact : More than 35 %

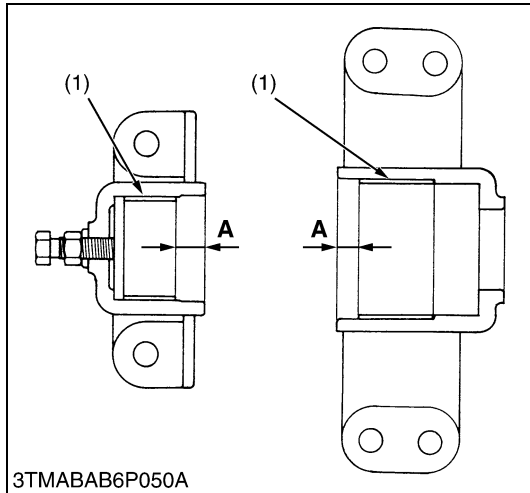
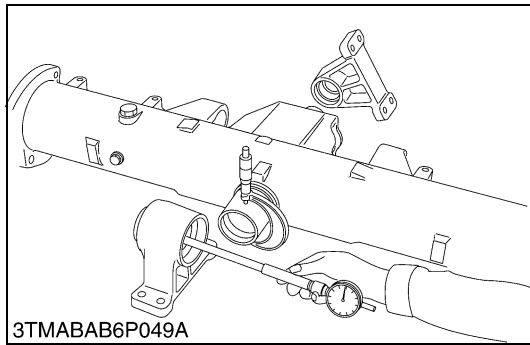
(1) Bevel Gear

(3) Shim

(2) Bevel Gear

W1019582





### **Clearance between Front Axle Case Bosses and Bracket Bushings**

1. Measure the front axle case bosses O.D. with an outside micrometer.
2. Measure the bracket bushing I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bracket bushing.

Clearance between front axle case boss (front) and bracket bushing (front)	Factory spec.	0.120 to 0.275 mm 0.00472 to 0.01083 in.
	Allowable limit	0.50 mm 0.01969 in.

Front axle case boss (front) O.D.	Factory spec.	49.950 to 49.975 mm 1.96653 to 1.96752 in.
Bracket bushing (front) I.D.	Factory spec.	50.095 to 50.225 mm 1.97224 to 1.97736 in.

Clearance between front axle case boss (rear) and bracket bushing (rear)	Factory spec.	0.100 to 0.292 mm 0.00394 to 0.01150 in.
	Allowable limit	1.0 mm 0.03937 in.

Front axle case boss (rear) O.D.	Factory spec.	69.970 to 70.000 mm 2.75472 to 2.75590 in.
Bracket bushing (rear) I.D.	Factory spec.	70.100 to 70.262 mm 2.78984 to 2.76622 in.

### **Press-fitting Bushing**

- When press-fitting a new bushing, observe the dimension described in the figure.

Press-fit depth of bushing (A)	Reference value	12.0 to 13.0 mm 0.47 to 0.51 in.
--------------------------------	-----------------	-------------------------------------

### **NOTE**

- After replacing the bushing, be sure to adjust the front axle rocking force. (See page 6-S7.)

(1) Bushing

A : Depth of Bushing

W1019812

# 7 STEERING

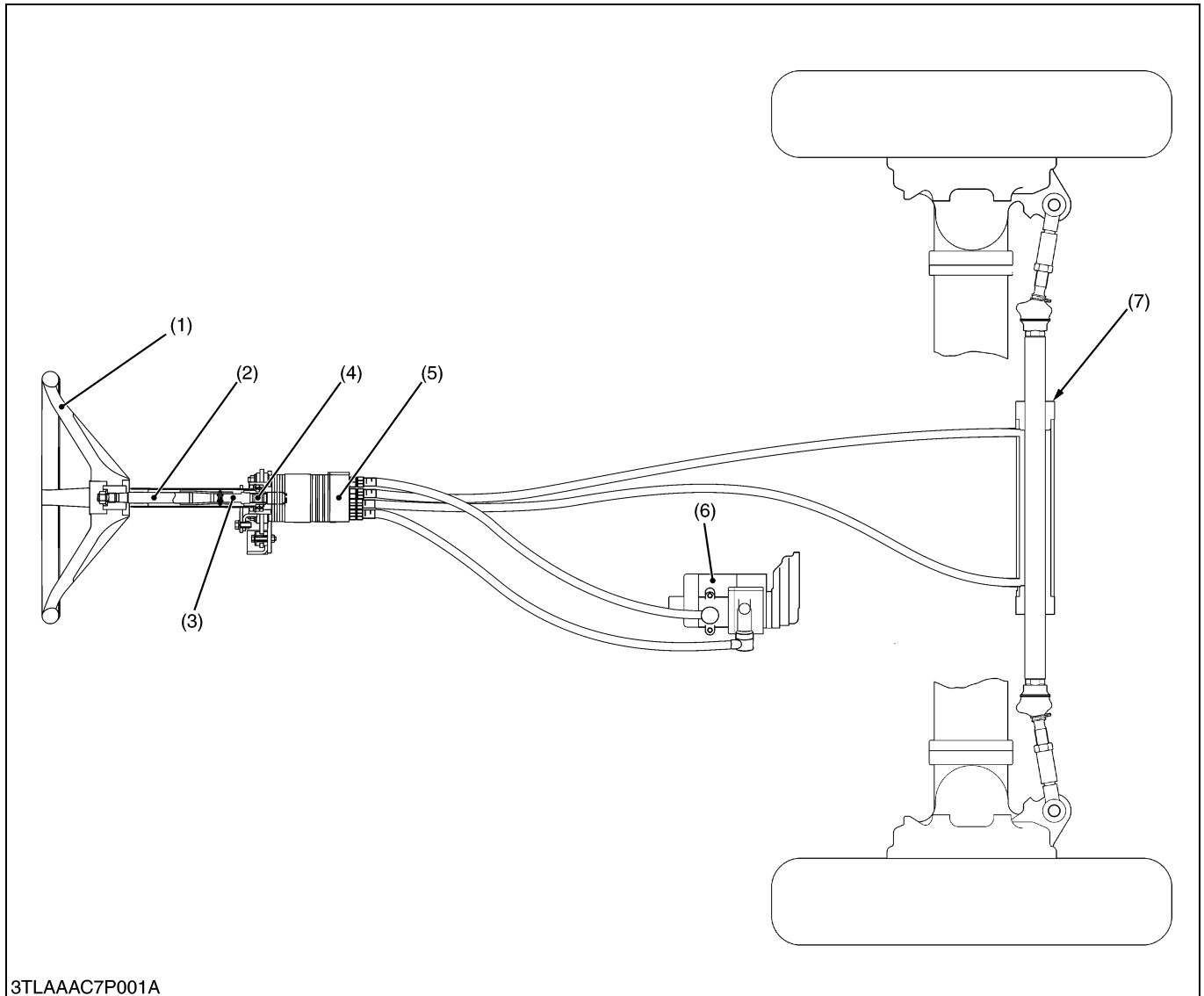
# MECHANISM

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## 1. STRUCTURE

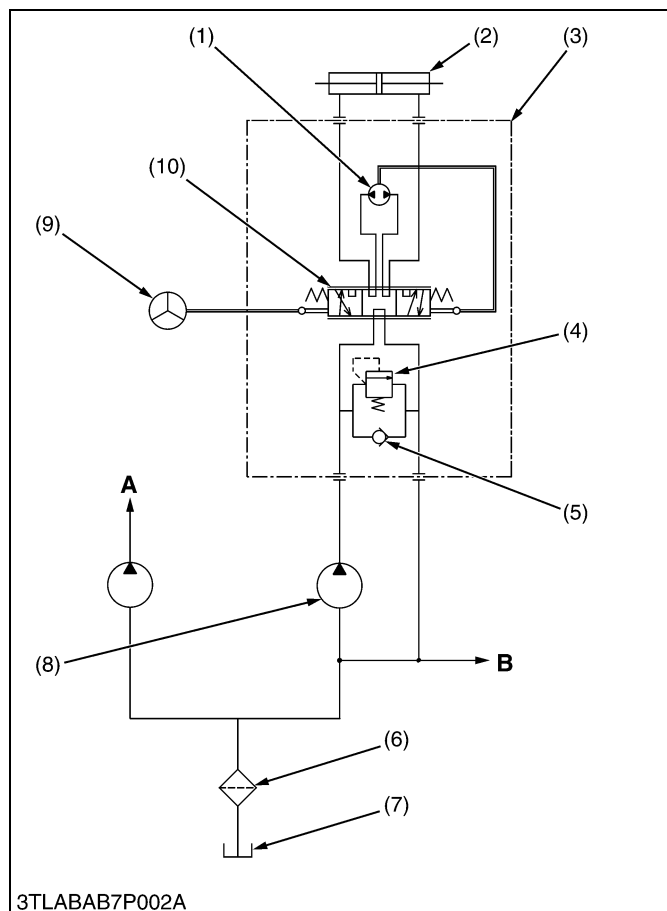
## [1] LINKAGE



- (1) Steering Wheel                      (3) Steering Shaft 2                      (5) Steering Controller                      (7) Steering Cylinder  
(2) Steering Shaft 1                      (4) Joint Shaft 2                      (6) Hydraulic Pump

Full hydrostatic type power steering is used on this tractor. The steering system is composed of steering wheel, steering controller, steering cylinder and other components shown in the figure.

## [2] HYDRAULIC CIRCUIT



When the engine starts, the hydraulic pump (8) pressure-feeds the oil, drawn from the transmission case (7) through the oil filter (6), to the steering controller (3).

The oil which has entered steering controller (3) is directed to control valve (10).

As the steering wheels is turned, control valve (10) operates and the oil passes through gerotor (1) and into steering cylinder (2). The cylinder rod then moves to control the directional movement of the front wheels.

Return oil from steering cylinder (2) passes through control valve (10) is sent to the PTO clutch valve.

When the engine is not operating, and the steering wheel is turned, gerotor (1) rotates to supply oil to steering cylinder (2). Thus the machine can be steered manually.

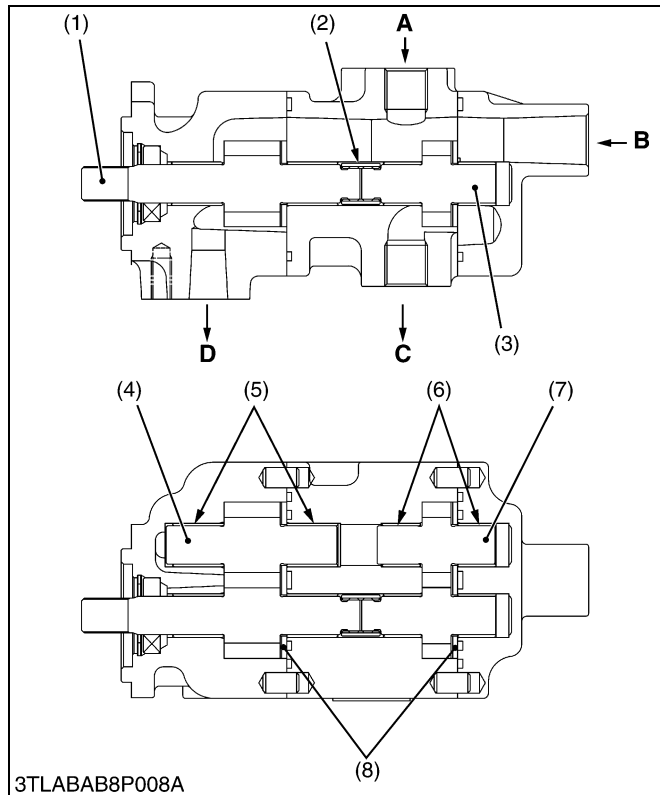
- (1) Gerotor
- (2) Steering Cylinder
- (3) Steering Controller
- (4) Relief Valve
- (5) Check Valve
- (6) Oil Filter
- (7) Transmission Case
- (8) Hydraulic Pump

- (9) Steering Wheel
- (10) Control Valve

**A : To Three Point Hydraulic System and Others**  
**B : To PTO Clutch Valve**

W1013713

### [3] HYDRAULIC PUMP



The gear type hydraulic pump is adopted for this tractor. This pump is tandem type and it is composed two pair of gears, side plates, bushings and other components as shown in the figure.

The hydraulic pump pressure-fed the oil drawn from the transmission case through oil filter to power steering circuit and main hydraulic circuit.

- (1) Drive Gear 1
- (2) Coupling
- (3) Drive Gear 2
- (4) Driven Gear 1
- (5) Bushing
- (6) Bushing
- (7) Driven Gear 2
- (8) Side Plate

**A : From Power Steering Controller**

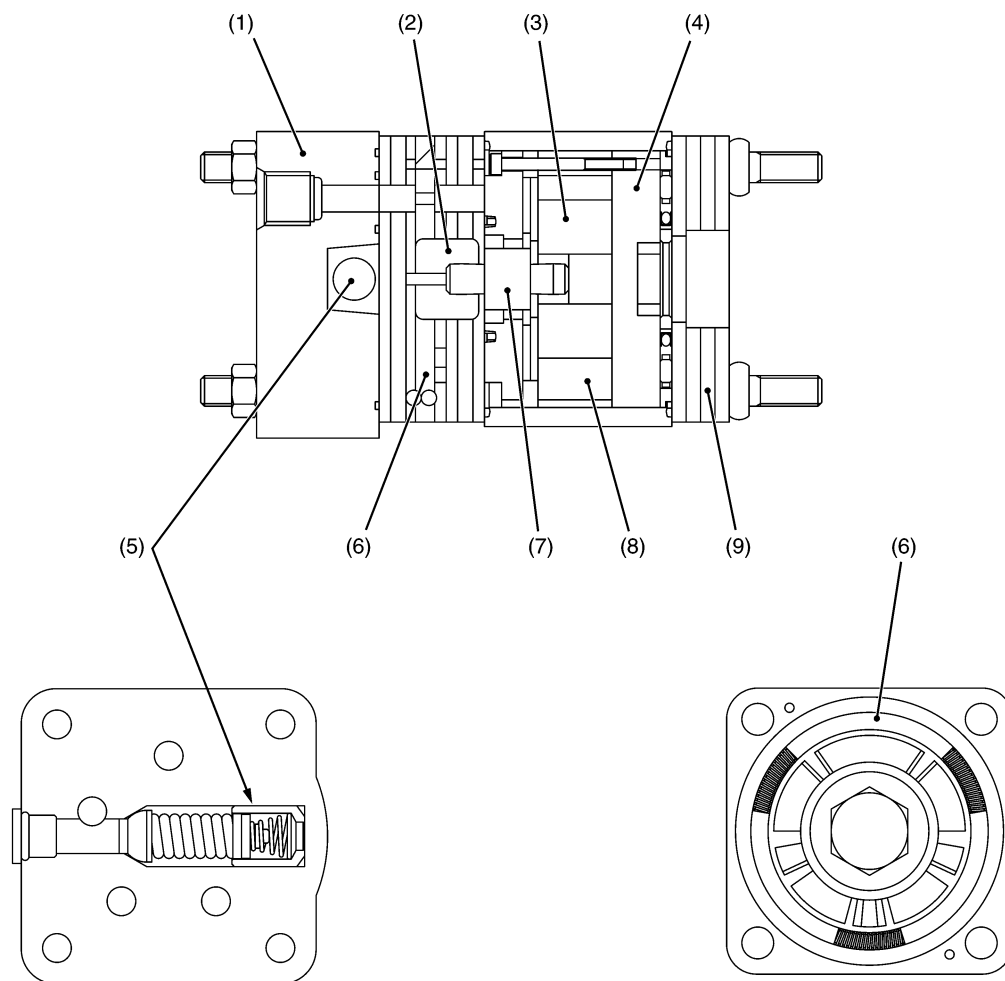
**B : From Transmission Case**

**C : To Power Steering Controller**

**D : To Main Hydraulic Circuit**

W1014295

## [4] STEERING CONTROLLER



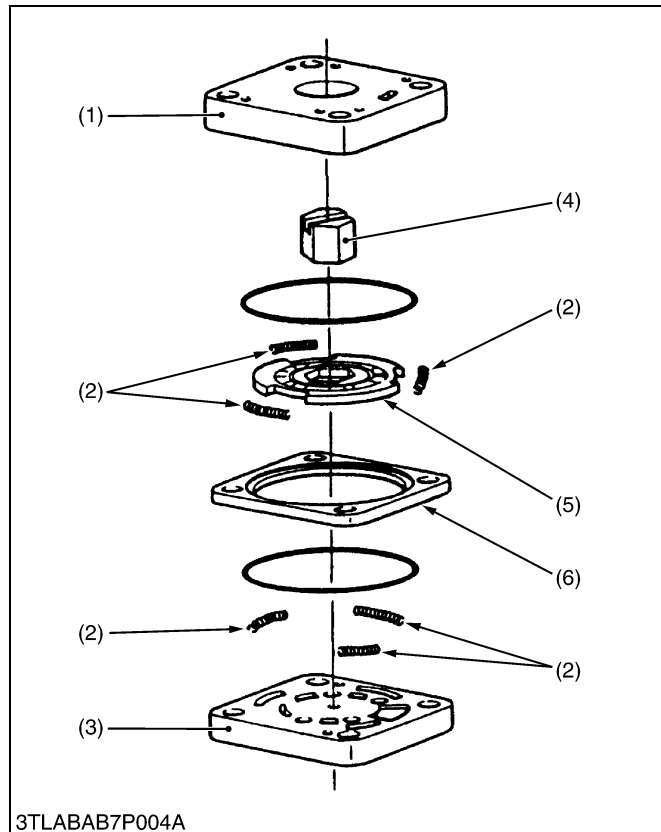
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- |                         |                  |                 |                 |
|-------------------------|------------------|-----------------|-----------------|
| (1) Port Cover          | (4) Drive Plate  | (6) Valve Plate | (8) Stator      |
| (2) Hex. Drive Assembly | (5) Relief Valve | (7) Drive Link  | (9) Upper Cover |
| (3) Rotor               |                  |                 |                 |

The steering controller mainly consists of a control valve, a metering device and a relief valve with check valve. The metering device comprises a set of special gear called "**Gerotor**".



## (1) Control Valve



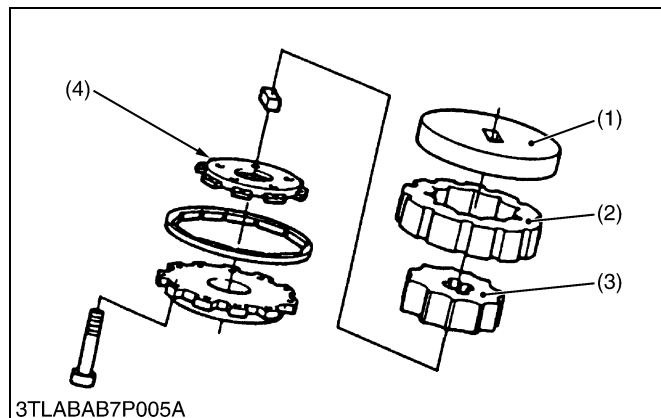
The control valve is a rotary plate type valve. When the steering wheel is not turned, the position of the valve plate (5) and the manifolds (1), (3) is kept neutral by the centering springs (2). This causes the forming of a **"Neutral"** oil circuit.

When the steering wheel is turned either clockwise or counterclockwise, the position of the valve plate (5) and manifolds (1), (3) changes against the centering spring. This allows the forming of a **"Right Turning"** or **"Left Turning"** oil circuit. At the same time, the gerotor rotates with the valve plate and sends the oil to the cylinder corresponding to the rotation of the steering wheel

- |                        |                         |
|------------------------|-------------------------|
| (1) Isolation Manifold | (4) Hex. Drive Assembly |
| (2) Centering Spring   | (5) Valve Plate         |
| (3) Port Manifold      | (6) Valve Ring          |

W1013776

## (2) Metering Device (Gerotor)



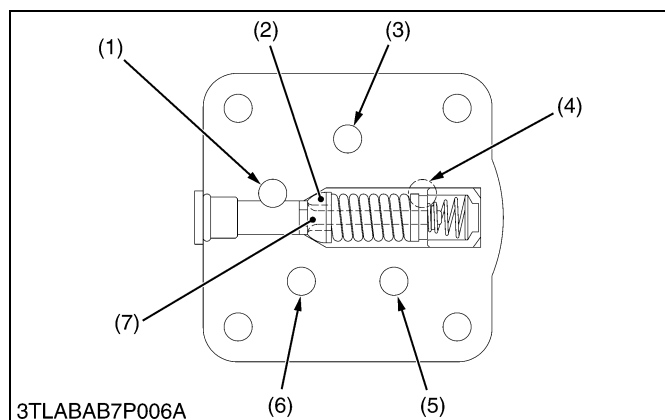
All oil directed from the hydraulic pump to the steering cylinder passes through the metering device (gerotor) on its way. This metering device is a trochoid pump. As the steering wheel is turned, the action is transmitted directly to stator (2) through drive plate (1). Thus, the gerotor sends the amount of oil corresponding to the turn of the steering wheel to the hydraulic cylinder, and the front wheels are moved through the angle corresponding to the turn of the steering wheel.

When the engine is not operating or the hydraulic pump fails. The gerotor serves as a manual pump, and thus the machine can be steered manually.

- |                 |                |
|-----------------|----------------|
| (1) Drive Plate | (3) Rotor      |
| (2) Stator      | (4) Commutator |

W1013318

### (3) Relief Valve (with Check Valve)

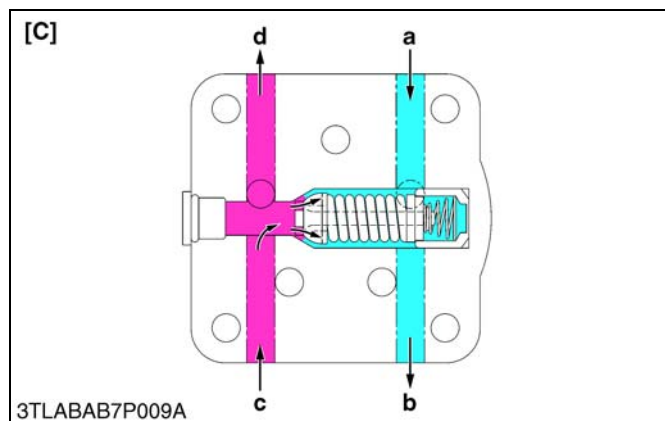
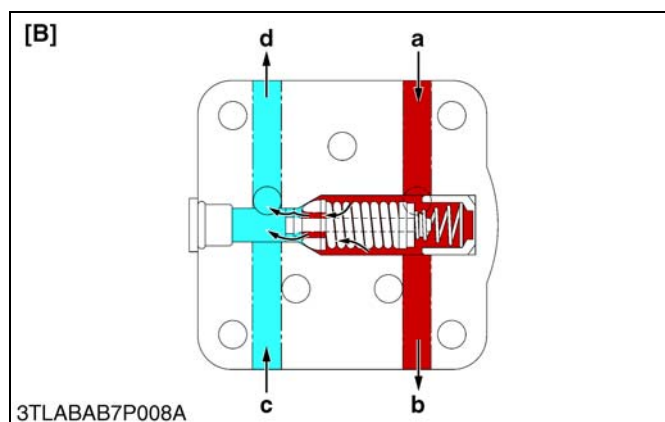
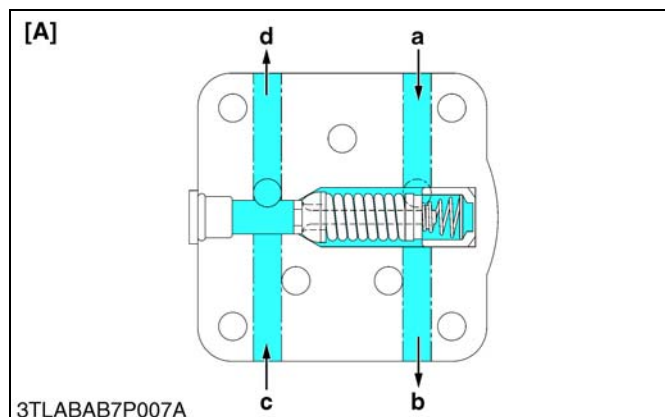


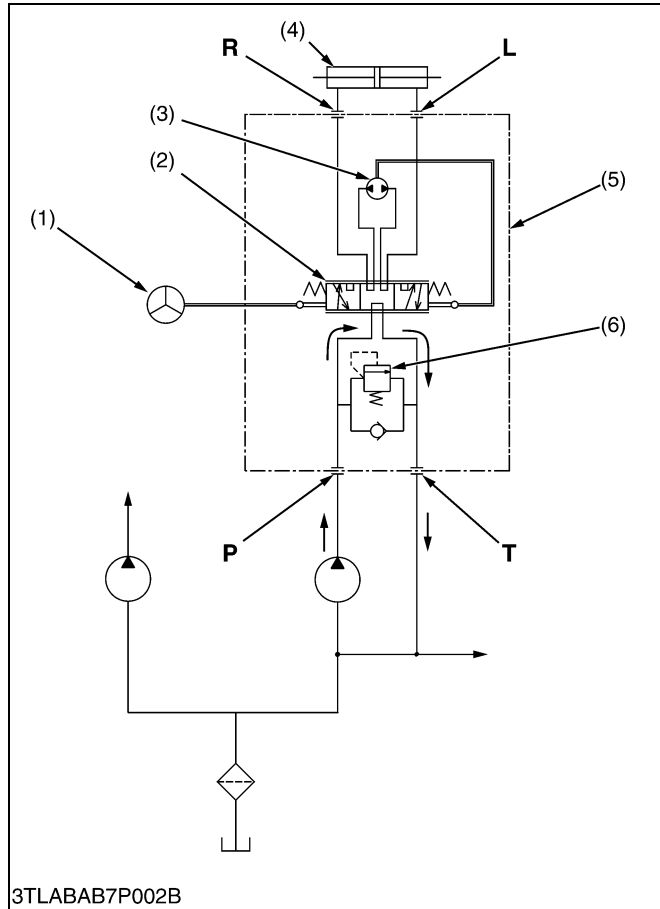
If the pressure in the hydraulic circuit rises above the set pressure of the relief valve, the relief valve will actuate to prevent the pressure from rising further and protect the hydraulic system. Also, if no oil is supplied from the hydraulic pump, the relief valve will act as a check valve and help draw oil from the return oil line to the drain hose, thus making it possible to steer the machine manually.

- (1) Outlet Port
- (2) Check Valve
- (3) Auxiliary Port
- (4) Inlet Port
- (5) R Port
- (6) L Port
- (7) Relief Valve

- [A] Normal Condition
- [B] Relief Valve in Operation
- [C] Check Valve in Operation
- a : From Hydraulic Pump
- b : To Control Valve
- c : From Control Valve
- d : To Drain Hose

W1013440



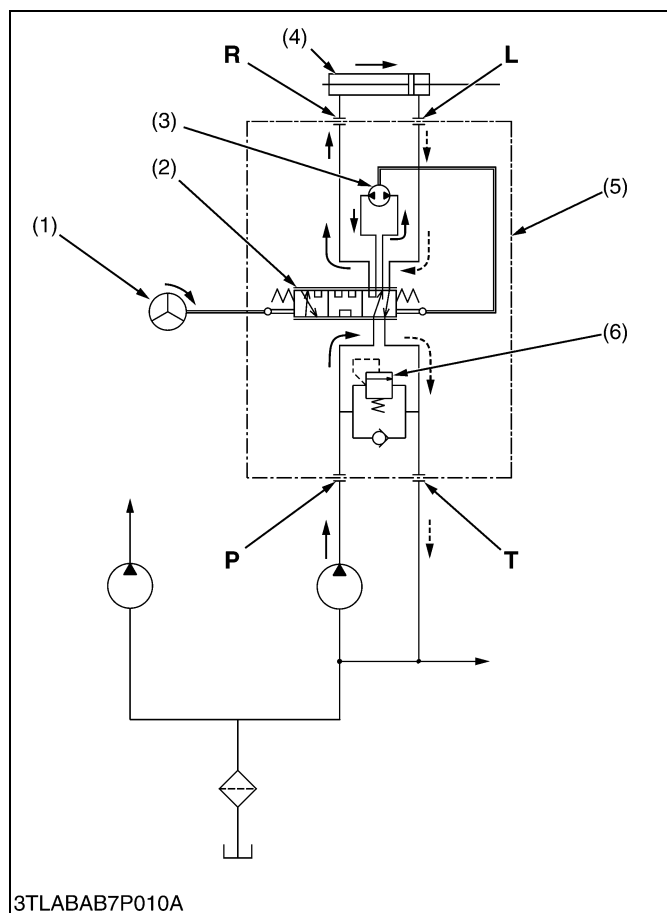
**(4) Oil Flow****■ Neutral Position**

When the steering wheel (1) is not being turned, valve plate (2) is held in the neutral position by centering spring. Under this condition, an oil passage is formed between **P** port (from pump) and **T** port (to transmission case) in the control valve, and all oil from the hydraulic pump flows to **T** port.

- (1) Steering Wheel
- (2) Valve Plate
- (3) Gerotor
- (4) Steering Cylinder
- (5) Steering Controller
- (6) Relief Valve

**P : Pump Port**  
**T : Tank Port**  
**R : Cylinder Port R**  
**L : Cylinder Port L**

W1013562



### ■ Right Turn

When the steering wheel is turned to the right, the action is transmitted through the drive plate, gerotor, and drive link to the control valve. Valve plate (2) then rotates to the right on manifolds, located on the opposite faces of the valve plate (2). Thus, the **P** port passage in the control valve is connected with gerotor (3).

The stator of gerotor (3) turns by the amount corresponding to the turn of the steering wheel (1), and the gerotor performs the metering function and lets oil through it, the amount of which corresponds to the turn of the steering wheel (1).

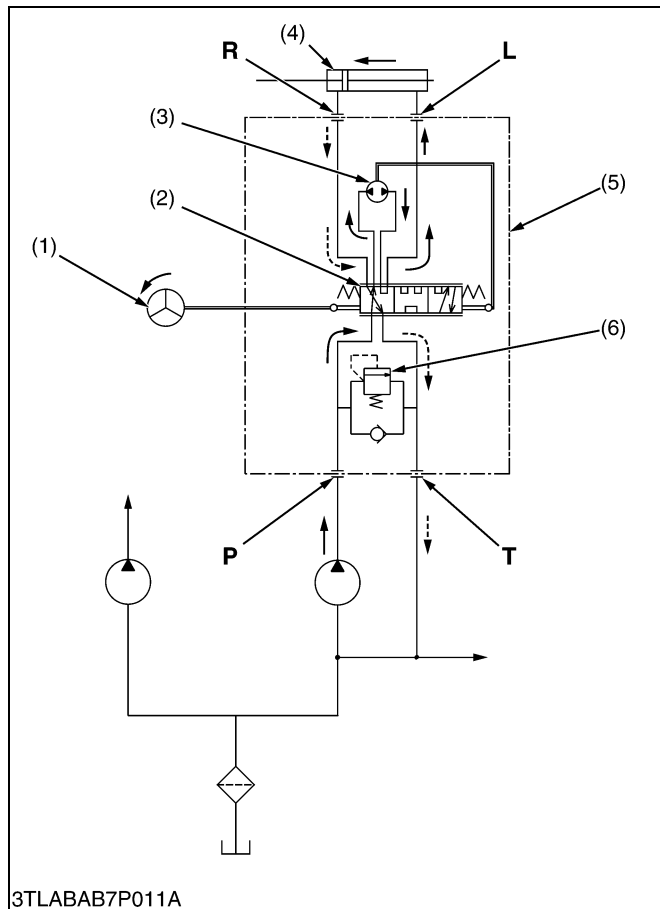
The oil which has passed through gerotor (3) flows back to the control valve, in which it is directed to cylinder port **R** to operate steering cylinder (4). Consequently, the front wheels are moved to the right through the angle corresponding to the amount of the oil.

When steering cylinder (4) operates, oil returning to cylinder port **L** flows back to the transmission case through the passage connected to **T** port in the control valve.

- (1) Steering Wheel
- (2) Valve Plate
- (3) Gerotor
- (4) Steering Cylinder
- (5) Steering Controller
- (6) Relief Valve

- P : Pump Port**
- T : Tank Port**
- R : Cylinder Port R**
- L : Cylinder Port L**

W1016544



### ■ Left Turn

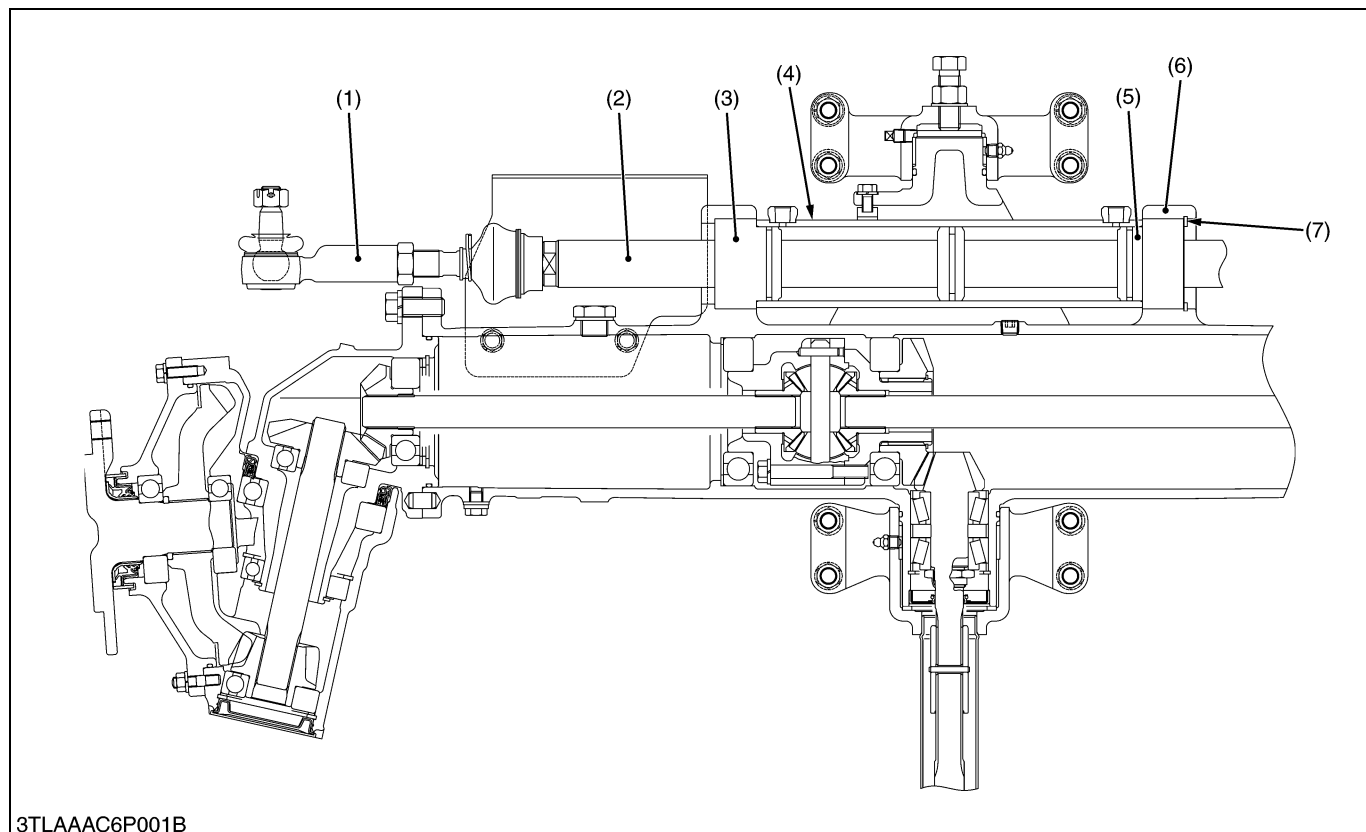
The steering system operates in the same way at a left-turn as well, except that oil flows into and out of steering cylinder in the directions opposite to those at a right-turn.

- (1) Steering Wheel
- (2) Valve Plate
- (3) Gerotor
- (4) Steering Cylinder
- (5) Steering Controller
- (6) Relief Valve

**P : Pump Port**  
**T : Tank Port**  
**R : Cylinder Port R**  
**L : Cylinder Port L**

W1016788

## [5] STEERING CYLINDER



(1) Tie-rod  
(2) Piston Rod

(3) Head Cover  
(4) Cylinder Tube

(5) Head Cover  
(6) Front Axle Case

(7) Internal Snap Ring

The steering cylinder is a single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods. (The above figure is shown for 4 wheel drive model. Refer to TRACTOR MECHANISM workshop manual for 2 wheel drive model.)

The tie-rods connected to both knuckle arms guarantee an equal steering movement to both front wheels.

The steering cylinder provides force in both directions. Depending on turning direction of the steering wheel, pressure oil enters at one end of the cylinder to extend, or at the other end to retract to operate front wheels of the tractor.

# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Tractor Can Not Be Steered</b>	Steering controller broken	Replace	7-S10, S11
	Pipe broken	Replace	–
<b>Front Wheels Vibration</b>	Improper toe-in adjustment	Adjust	6-S6
	Air in the hydraulic system	Bleed	7-S10
	Improperly mounted wheels	Change Wheels	–
	Tie-rod end loose or worn	Retighten or replace	6-S13
	Front wheel hub bearing worn	Replace	6-S11
	Clearance between front axle center pivots and bracket bushing excessive	Replace	6-S18, S23
	Steering controller malfunctioning	Replace	7-S10, S11
<b>Hard Steering</b>	Hydraulic pump malfunctioning	Replace	7-S8, S9
	Overload	–	–
	Transmission fluid improper or insufficient	Change or replenish	G-8
	Oil leak from pipe joint	Retighten	–
	Insufficient tire pressure	Inflate	G-49
	Steering controller malfunctioning	Replace	7-S10, S11
	Relief valve malfunctioning	Replace	7-S10, S11
<b>Steering Force Fluctuates</b>	Air sucked in pump due to leaking or missing of oil	Replenish	–
	Air sucked in pump from suction circuit	Repair	–
<b>Excessive Steering Wheel Free Play</b>	Steering controller malfunctioning	Replace	7-S10, S11
<b>Front Wheels Wander to Right or Left</b>	Air sucked in pump due to leak of oil	Replenish	–
	Air sucked in pump from suction circuit	Repair	–
	Tire pressure uneven	Inflate	G-49
	Insufficient bleeding	Bleed	7-S10
	Improper toe-in adjustment	Adjust	6-S6
	Clearance between front axle center pivots and brackets bushings excessive	Replace	6-S18, S23
	Tie-rod end loose or worn	Retighten or replace	6-S13
	Steering controller malfunctioning	Replace	7-S10, S11
<b>Noise</b>	Air sucked in pump due to lack of oil	Replenish	–
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	–
<b>Wheel are Turned to a Direction Opposite to Steering Direction</b>	Power steering hoses are connected in reverse	Reconnect steering hoses	–

W1014322

## 2. SERVICING SPECIFICATIONS

### HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump <b>Condition</b> Engine Speed : Approx. 2800 min <sup>-1</sup> (rpm) (Except L4330) Approx. 2800 min <sup>-1</sup> (rpm) (L4330) <b>Rated Pressure</b> 2WD: 8.0 to 9.0 MPa 81.6 to 91.8 kgf/cm <sup>2</sup> 1160 to 1305 psi 4WD: 10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi <b>Oil Temperature</b> 40 to 60 °C 104 to 140 °F	Delivery at No Pressure	Above 17.9 L/min 4.73 U.S.gals./min 3.94 Imp.gals./min	—
	Delivery at Rated Pressure	Above 17.6 L/min 4.65 U.S.gals./min 3.87 Imp.gals./min	15.7 L/min 4.15 U.S.gals./min 3.45 Imp.gals./min
Housing	Depth of Scratch	—	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	0.020 to 0.081 mm 0.0067 to 0.0110 in.	0.15 mm 0.0059 in.
	Gear Shaft (O.D.)	14.970 to 14.980 mm 0.5894 to 0.5898 in.	—
	Bushing (I.D.)	15.000 to 15.051 mm 0.5906 to 0.5926 in.	—
Side Plate	Thickness	2.48 to 2.50 mm 0.0976 to 0.984 in.	2.40 mm 0.0945 in.

W1013874

### STEERING CONTROLLER

Item		Factory Specification	Allowable Limit
Relief Valve <b>Condition</b> Engine Speed : Maximum Oil Temperature : 40 to 60 °C 104 to 140 °F	Setting Pressure 2WD	8.0 to 9.0 MPa 81.6 to 91.8 kgf/cm <sup>2</sup> 1160 to 1305 psi	—
	Setting Pressure 4WD	10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi	—

W1014010

**STEERING CYLINDER**

Item		Factory Specification	Allowable Limit
Steering Cylinder	I.D. (2WD)	50.000 to 50.062 mm 1.96850 to 1.97094 in.	50.100 mm 1.97244 in.
	I.D. (4WD)	55.000 to 55.074 mm 2.16535 to 2.16827 in.	55.100 mm 2.16929 in.
Rod to Bushing	Clearance	0.009 to 0.127 mm 0.00035 to 0.00500 in.	0.135 mm 0.00531 in.

W1014359

### 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.)

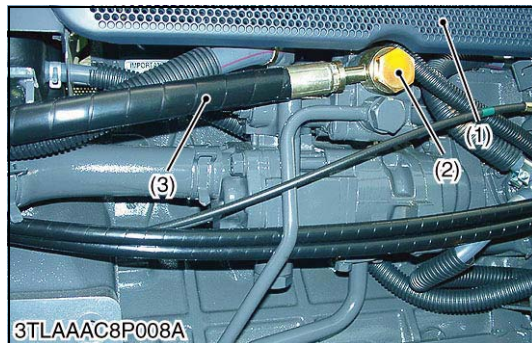
Item	N·m	kgf·m	ft-lbs
Regulator valve delivery pipe joint bolt (Hydraulic pump to regulator valve)	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Power steering delivery hose joint bolt	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
I-PTO delivery pipe joint bolt	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Regulator valve mounting screw	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2
Hydraulic pump assembly mounting screw and nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Pump cover mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Power steering right and left delivery hose retaining nut	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Power steering main delivery hose retaining nut	49.0 to 58.8	5.0 to 6.0	36.2 to 57.9
Front wheel mounting nut	137.3	14.0	101.3
Tie-rod joint	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Tie-rod clamp mounting bolt and nut (2WD)	60.8 to 70.6	6.2 to 7.2	44.8 to 52.1
Tie-rod end lock nut (2WD)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Guide assembly	181.1 to 288.9	18.5 to 29.5	133.6 to 213.1
Tie-rod end slotted nut	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Tie-rod joint lock nut (4WD)	166.7 to 196.1	17.0 to 20.0	123.0 to 144.7
Steering wheel mounting nut	48.0 to 55.9	4.9 to 5.7	35.4 to 41.2

W1012736

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING

#### (1) Hydraulic Pump Test Using Flow-meter (Power Steering)



##### Preparation

1. Remove side cover RH (1).
2. Remove the power steering main delivery hose (2).

##### **(When reassembling)**

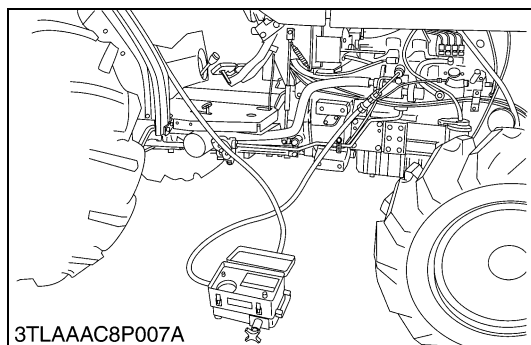
- Install the copper washers firmly.

Tightening torque	Delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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- (1) Side Cover RH  
(2) Joint Bolt

- (3) Power Steering Main Delivery Hose

W1012529



### Hydraulic Flow Test (Power Steering)

#### ■ IMPORTANT

- When using a flowmeter which is not specified by KUBOTA, be sure to follow the instructions for that flowmeter.
  - Since the flowmeter has no relief valve, do not close the flowmeter loading valve completely before testing.
1. Remove the power steering delivery pipe joint bolt and install the adaptor **52** to the pump discharge port.
  2. Connect the hydraulic test hose to the adaptor **52** and flowmeter inlet port.
  3. Connect the other hydraulic test hose to the flowmeter outlet port and to the transmission fluid filling plug hole.
  4. Open the flowmeter loading valve completely. (Turn counterclockwise.)
  5. Start the engine and set the engine speed at **2000 to 2200 min<sup>-1</sup> (rpm)**.
  6. Slowly close the loading valve to generate pressure approx. **9.8 MPa (100 kgf/cm<sup>2</sup>, 1422 psi)**. Hold in this condition until oil temperature reached approx. **40 °C (104 °F)**.
  7. Open the loading valve completely.
  8. Set the engine speed. (Refer to **Condition**.)
  9. Read and note the pump delivery at no pressure.
  10. Slowly close the loading valve to increase to the rated pressure. As the load is increased, engine speed drops, therefore, reset the engine speed.
  11. Read and note the pump delivery at rated pressure.
  12. Open the loading valve completely and stop the engine.
  13. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

#### Condition

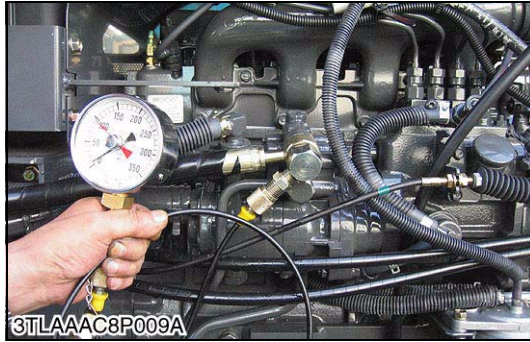
- Engine speed : Approx. 2600 min<sup>-1</sup> (rpm)
- Rated pressure :
 

[2WD]	8.0 to 9.0 MPa 81.4 to 91.4 kgf/cm <sup>2</sup> 1158 to 1300 psi
[4WD]	10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi
- Oil temperature : 40 to 60 °C (104 to 140 °F)

Hydraulic pump delivery at no pressure	Factory spec.	Above 17.9 L/min. 4.73 U.S.gals/min. 3.94 Imp.gals/min.
Hydraulic pump delivery at rated pressure	Factory spec.	Above 17.6 L/min. 4.65 U.S.gals/min. 3.87 Imp.gals/min.
	Allowable limit	15.7 L/min. 4.15 U.S.gals/min. 3.45 Imp.gals/min.

W1015559

## (2) Relief Valve (Power Steering)



### Relief Valve Setting Pressure

1. Disconnect the power steering delivery pipe joint bolt.
2. Install the adaptor **E** and adaptor **58** of relief valve setting pressure tester to the regulator valve, and then set a thread joint, cable and pressure gauge.
3. Start the engine and set the engine speed at max. speed.
4. Fully turn the steering wheel to the left or right and read the pressure when the relief valve functions.
5. Stop the engine.
6. If the pressure is not within the factory specifications, check the pump delivery line, adjust the relief valve by the adjusting screw (1), or repair the power steering.

Power steering relief valve setting pressure	Factory spec.	2WD	8.0 to 9.0 MPa 81.4 to 91.4 kgf/cm <sup>2</sup> 1158 to 1300 psi
		4WD	10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi

Tightening torque	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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### Condition

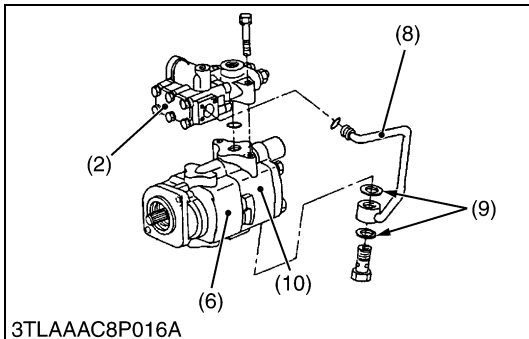
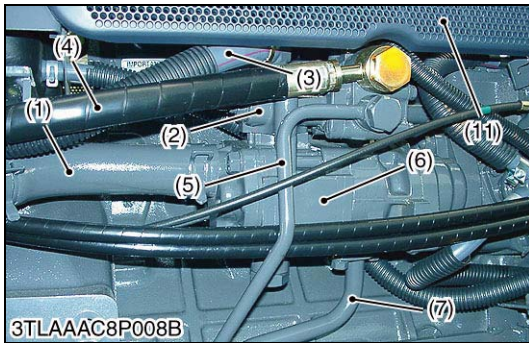
- Engine speed : Maximum
- Oil temperature : 40 to 60 °C (104 to 140 °F)

W1022630



## [2] DISASSEMBLING AND ASSEMBLING

### (1) Hydraulic Pump (Power Steering, Three Point System)



#### Preparation

1. Remove the side cover RH (11).
2. Disconnect the independent PTO delivery pipe (5), power steering delivery hose (4) and power steering return hose (3) from the regulator valve (2).
3. Remove the delivery pipe (8).
4. Disconnect the 3P delivery pipe 2 (7) from the three point system hydraulic pump (6).
5. Disconnect the suction rubber hose (1).

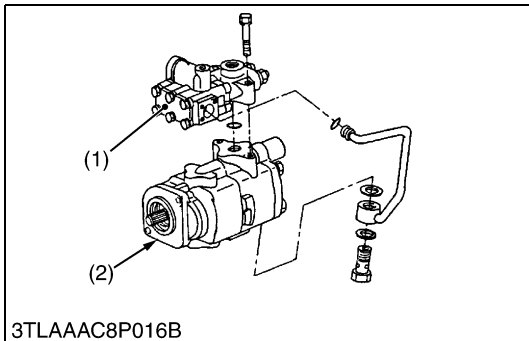
#### (When reassembling)

- Apply grease to the O-rings and take care not to damage them.
- Install the copper washers (9).

Tightening torque	Independent PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	Delivery pipe (8) joint bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 29.0 to 36.2 ft-lbs

- |   |                                      |
|---|--------------------------------------|
| (1) Suction Rubber Hose                 | (7) 3P Delivery Pipe                 |
| (2) Regulator Valve                     | (8) Delivery Pipe                    |
| (3) Power Steering Return Hose          | (9) Copper Washers                   |
| (4) Power Steering Delivery Hose        | (10) Hydraulic Pump (Power Steering) |
| (5) Independent PTO Delivery Pipe       | (11) Side Cover RH                   |
| (6) Hydraulic Pump (Three Point System) |                                      |

W1018543



#### Regulator Valve and Hydraulic Pump Assembly

1. Loosen and remove the regulator valve mounting screws.
2. Take out the regulator valve (1).
3. Loosen and remove the hydraulic pump assembly mounting screws and nuts, then take out the hydraulic pump assembly

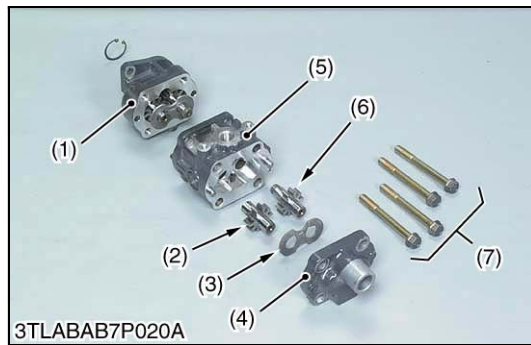
#### (When reassembling)

- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Regulator valve mounting screws	17.6 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

- |                     |                             |
|---------------------|-----------------------------|
| (1) Regulator Valve | (2) Hydraulic Pump Assembly |
|---------------------|-----------------------------|

W1016911



### Hydraulic Pump Assembly

1. Remove the pump cover mounting screw (7).
2. Remove the drive gear (6), driven gear (2) and side plate (3) from the casing.

#### (When reassembling)

- Take care not to damage the gasket.
- Align the hole of the pump cover (4) and casing 2 (5).
- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

Tightening torque	Pump cover mounting screw	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) Casing 1  
(2) Driven Gear  
(3) Side Plate  
(4) Pump Cover

- (5) Casing 2  
(6) Drive Gear  
(7) Screw

W1017259

### Hydraulic Pump Running-in

After reassembly, perform break-in operation in the following manner, and check the pump for abnormality before use. If the pump temperature should rise noticeably during running-in, recheck should be performed.

1. Install the hydraulic pump to the tractor, and mount the suction pipe and delivery pipe securely.
2. Set the engine speed at 1300 to 1500 mm<sup>-1</sup> (rpm), and operate the hydraulic pump at no load for about 10 minutes.
3. Set the engine speed at 2000 to 2200 mm<sup>-1</sup> (rpm), and with the hydraulic pump applied with 2.94 MPa (30 kgf/cm<sup>2</sup>, 427 psi) to 4.90 MPa (50 kgf/cm<sup>2</sup>, 711 psi) pressure, operate it for approx. 15 minutes.
4. With the engine set to maximum speed, fully turn the steering wheel to the left or right, then actuate the relief valve five times for 25 seconds (one time 5 seconds).

W1027641

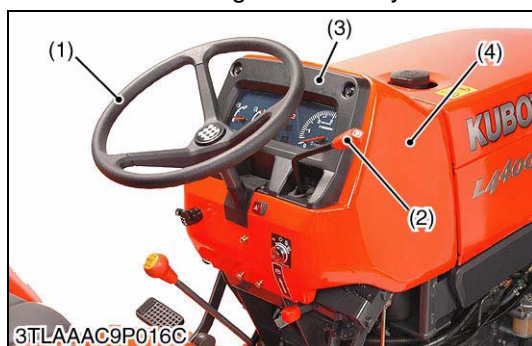
## (2) Steering Post and Steering Controller

### ■ IMPORTANT

- Use only the transmission fluid (See page G-8), in no case use mixture of oils of different brands.
  - Before disassembling the power steering system hydraulic components, check the performance of hydraulic pump and power steering using a flowmeter.  
Do not disassemble the power steering needlessly.
  - After removing or disassembling the power steering hydraulic components, be sure to bleed air.
  - If disassembly of power steering is needed, perform disassembly carefully following the instructions given below.
1. Since the sliding surfaces of those parts have been precisely finished, do not brush or grind with sandpaper. Use transmission fluid for cleaning and compressed air for blowing off.
  2. When reassembling, inspect each part for wear and damage. If seriously damaged, replace parts as sub-assembly or assembly.  
It is desirable to replace O-rings and seals with new ones.

### [Bleeding]

1. Start the engine.
2. Turn the steering wheel slowly in both directions all the way alternately several times, and stop the engine.



### Steering Wheel and Rear Bonnet

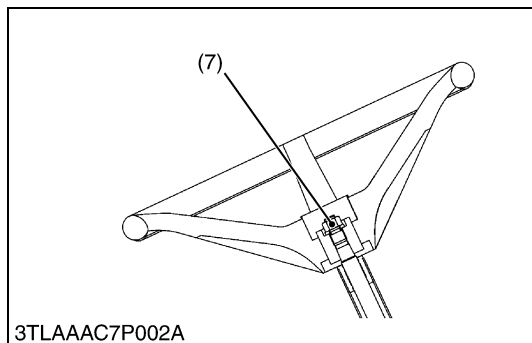
1. Remove steering wheel (1) with steering puller.
2. Remove throttle grip (2).
3. Disconnect hour-meter cable from engine.
4. Remove meter panel (3).
5. Disconnect **4P** connector (5) to main switch.
6. Disconnect **8P** connector (6) to combination switch.
7. Remove rear bonnet (4).

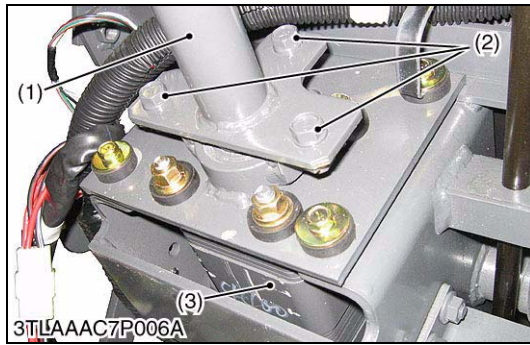
### (When reassembling)

Tightening torque	Steering wheel mounting nut	48.0 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 ft·lbs
-------------------	-----------------------------	---

- |                    |  |
|--------------------|--|
| (1) Steering Wheel | (5) <b>4P</b> Connector (Main Switch)        |
| (2) Throttle Grip  | (6) <b>8P</b> Connector (Combination Switch) |
| (3) Meter Panel    | (7) Steering Wheel Mounting Nut              |
| (4) Rear Bonnet    |  |

W1017052



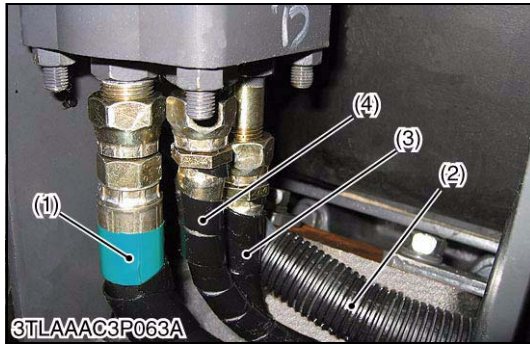


### Steering Post Assembly

Remove steering post assembly mounting screws (2) and then remove steering post assembly.

- (1) Steering Post Assembly (3) Steering Controller  
(2) Steering Post Assembly mounting screw

W1017573



### Hydraulic Hoses

1. Disconnect main delivery hose (1), return hose (2), right delivery hose (3) and left delivery hose (4).

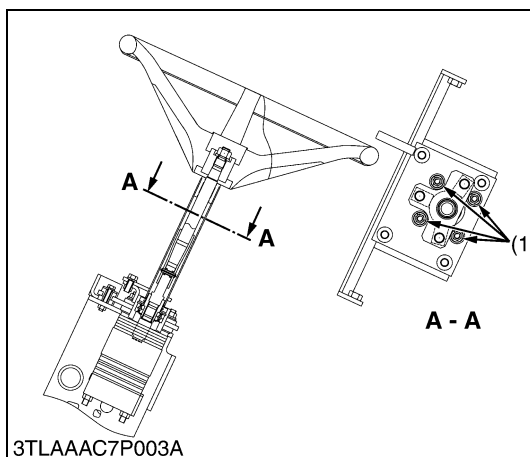
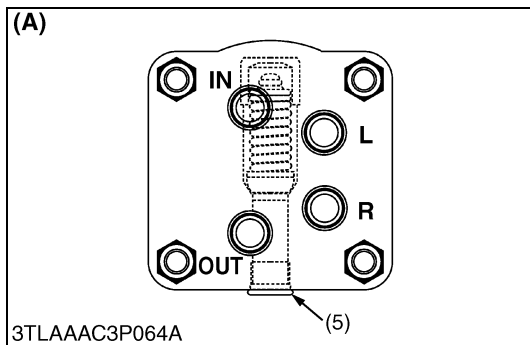
(When reassembling)

Tightening torque	Main delivery hose retaining nut	46.6 to 50.9 N·m 4.8 to 5.2 kgf·m 34.4 to 37.6 ft-lbs
	Turning delivery hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs

- (1) Main Delivery Hose (5) Relief Valve Plug (Engine Side)  
(2) Return Hose  
(3) Right Delivery  
(4) Left Delivery Hose

(A) Steering Controller Viewing from the bottom

W1017898



### Steering Controller Assembly

1. Remove steering controller mounting nuts (1) and then take out steering controller assembly.

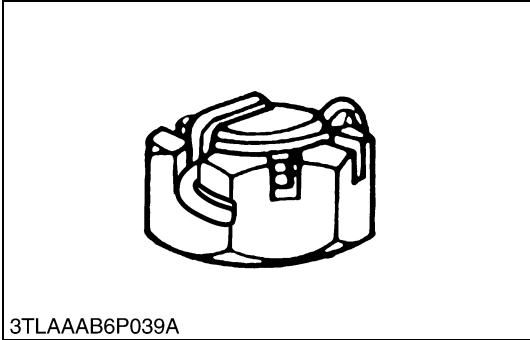
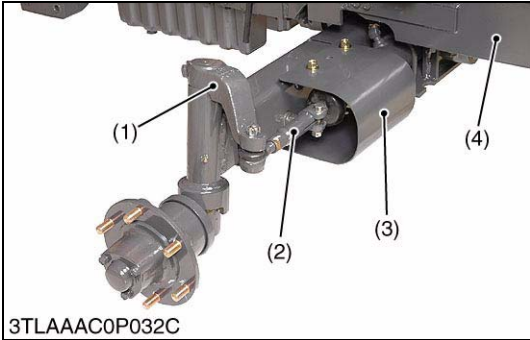
(When reassembling)

Tightening torque	Steering controller mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.3 to 20.3 ft-lbs
-------------------	----------------------------------	---

- (1) Steering Controller Mounting Nuts

W1018311

(3) Steering Cylinder (2WD)



Front Wheel, Cylinder Cover and Tie-rod

- 1. Place a disassembly stand under the front axle frame (4) and support it with a jack.
- 2. Remove the front wheel and cylinder cover (3).
- 3. Disconnect the tie-rod (2) from knuckle arm (1).
- 4. Disconnect the tie-rod (2) from knuckle arm (1).

(When reassembling)

- After tightening the tie-rod end slotted nut to the specified torque, install a cotter pin as shown in the figure.

Tightening torque	Front wheel mounting nut	137.3 N·m 14.0 kgf·m 101.3 ft-lbs
	Tie-rod end slotted nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

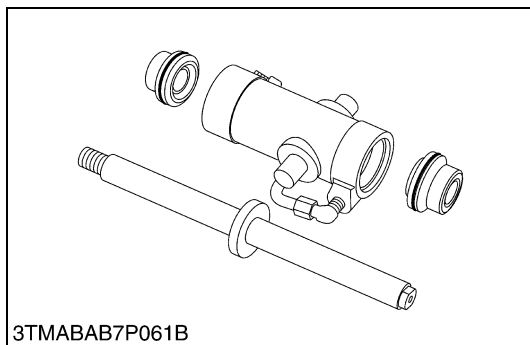
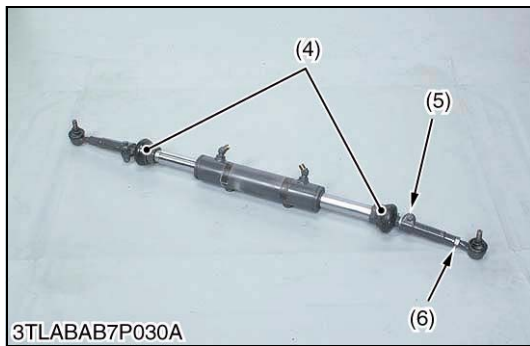
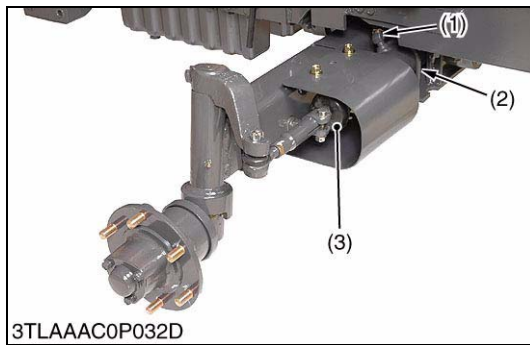
- (1) Knuckle Arm

(2) Tie-rod
- (3) Cylinder Cover

(4) Front Axle Frame

W1018652





### Steering Cylinder

1. Disconnect the power steering hoses (1).
2. Remove the cylinder clamps (2).
3. Take out the steering cylinder (3).
4. Remove the tie-rod joints (4).
5. Carefully clamp the steering cylinder in a vise.
6. Remove the guide assembly (7) and draw out the cylinder rod (8).

#### (When reassembling)

- Apply transmission fluid to the oil seal and O-ring.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) on the screw of guide assembly when tighten it.
- After tightening the guide assembly to the specified torque, stake the cylinder firmly.
- Apply liquid lock (Three Bond 1324B or equivalent) to the thread of tie-rod joint (4).

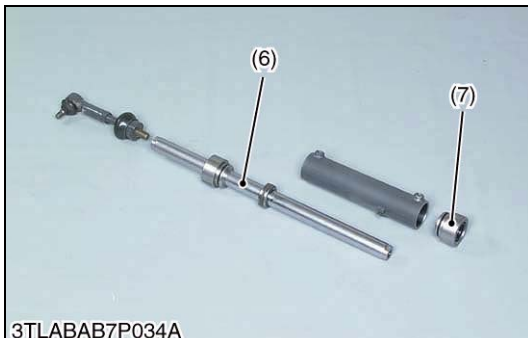
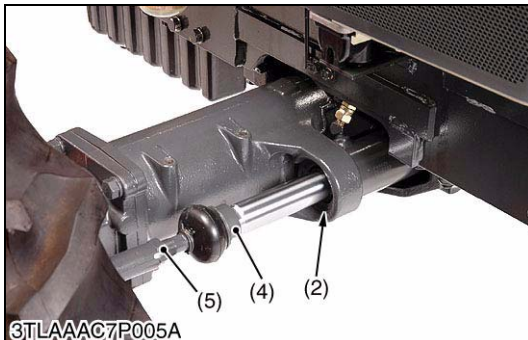
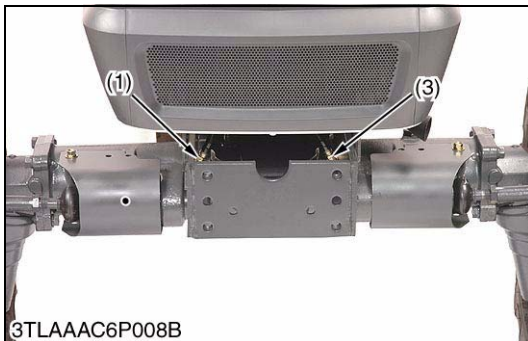
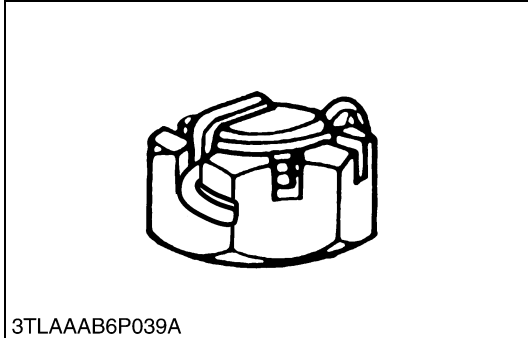
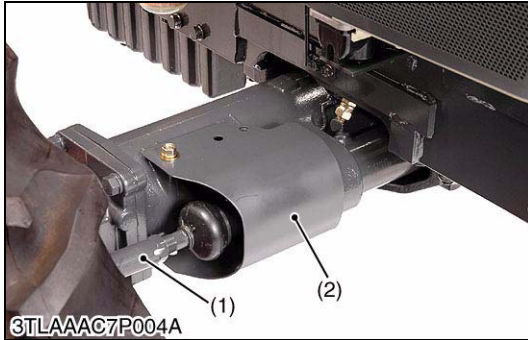
Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 ft-lbs
	Tie-rod joint	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs
	Tie-rod clamp mounting bolt and nut	60.8 to 70.6 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 ft-lbs
	Tie-rod end lock nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.7 ft-lbs
	Guide assembly	181.1 to 288.9 N·m 18.5 to 29.5 kgf·m 133.6 to 213.1 ft-lbs

- (1) Power Steering Hose  
(2) Cylinder Clamp  
(3) Steering Cylinder  
(4) Tie-rod Joint

- (5) Tie-rod Clamp  
(6) Lock Nut  
(7) Guide Assembly  
(8) Cylinder Rod

W1019025

#### (4) Steering Cylinder (4WD)



#### Front Wheel, Cylinder Cover and Tie-rod

1. Place a disassembly stand under the engine and support it with a jack.
2. Remove the front wheel and cylinder cover (2).
3. Pull out the cotter pin and remove the tie-rod end slotted nut.
4. Disconnect the tie-rod (1).

#### (When reassembling)

- After tightening the tie-rod end slotted nut to the specified torque, install a cotter pin as shown in the figure.

Tightening torque	Front wheel mounting nut	137.3 N-m 14.0 kgf-m 101.3 ft-lbs
	Tie-rod end slotted nut	39.2 to 45.1 N-m 4.0 to 4.6 kgf-m 28.9 to 33.3 ft-lbs

(1) Tie-rod

(2) Cylinder Cover

#### Steering Cylinder

1. Disconnect the power steering hoses (1), (3) and remove the elbows.
2. Disconnect the tie-rod joint LH (4).
3. Remove the internal snap ring (2).
4. Take out the steering cylinder to the left.
5. Remove the head cover (7) and draw out the cylinder rod (6).

#### (When reassembling)

- Apply transmission fluid to the oil seal and O-ring.
- Apply liquid lock (Three Bond 1324B or equivalent) to the thread of tie-rod joint (4).

Tightening torque	Power steering hose retaining nut	24.5 to 29.4 N-m 2.5 to 3.0 kgf-m 18.1 to 21.7 ft-lbs
	Tie-rod joint	166.7 to 196.1 N-m 17.0 to 20.0 kgf-m 123.0 to 144.7 ft-lbs
	Tie-rod end lock nut	166.7 to 196.1 N-m 17.0 to 20.0 kgf-m 123.0 to 144.7 ft-lbs

(1) Power Steering Hose RH

(5) Lock Nut

(2) Internal Snap Ring

(6) Cylinder Rod

(3) Power Steering Hose LH

(7) Head Cover

(4) Tie-rod Joint



### [3] SERVICING

#### (1) Hydraulic Pump (Power Steering)



##### Housing Bore (Depth of Scratch)

1. Check for the scratch on the interior surface of the housing caused by the gear.
2. If the scratch reaches more than half the area of the interior surface of the housing, replace at pump assembly.
3. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
4. If the values obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.
------------------	-----------------	-----------------------

##### (Reference)

- Use a cylinder gauge to measure the housing I.D.

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##### Clearance between Bushing and Gear Shaft

1. Measure the gear shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with an inside micrometer or cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the gear shaft and the bushings as a unit.

Clearance between bushing and gear shaft	Factory spec.	0.020 to 0.081 mm 0.0008 to 0.0032 in.
	Allowable limit	0.15 mm 0.0059 in.

TighteGear shaft O.D.	Factory spec.	14.970 to 14.980 mm 0.5894 to 0.5898 in.
Bushing I.D.	Factory spec.	15.000 to 15.051 mm 0.5906 to 0.5926 in.

W1258963



##### Side Plate Thickness

1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory spec.	2.48 to 2.50 mm 0.0976 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

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## (2) Steering Cylinder



### Steering Cylinder I.D.

1. Measure the steering cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceed the allowable limit, replace the cylinder tube.

Steering cylinder I.D.	Factory spec.	2WD	50.000 to 50.062 mm 1.96850 to 1.97094 in.
		4WD	55.000 to 55.074 mm 2.16535 to 2.16827 in.
	Allowable limit	2WD	50.100 mm 1.97244 in.
		4WD	55.100 mm 2.16929 in.

W10157020



### Clariance between Rod and Bushing

1. Measure the bushing I.D. with a cylinder gauge.
2. Measure the rod O.D. with a outside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace as a unit.

Clearance between rod and bushing	Factory spec.	0.009 to 0.127 mm 0.00035 to 0.00500 in.
	Allowable limit	0.135 mm 0.00531 in.

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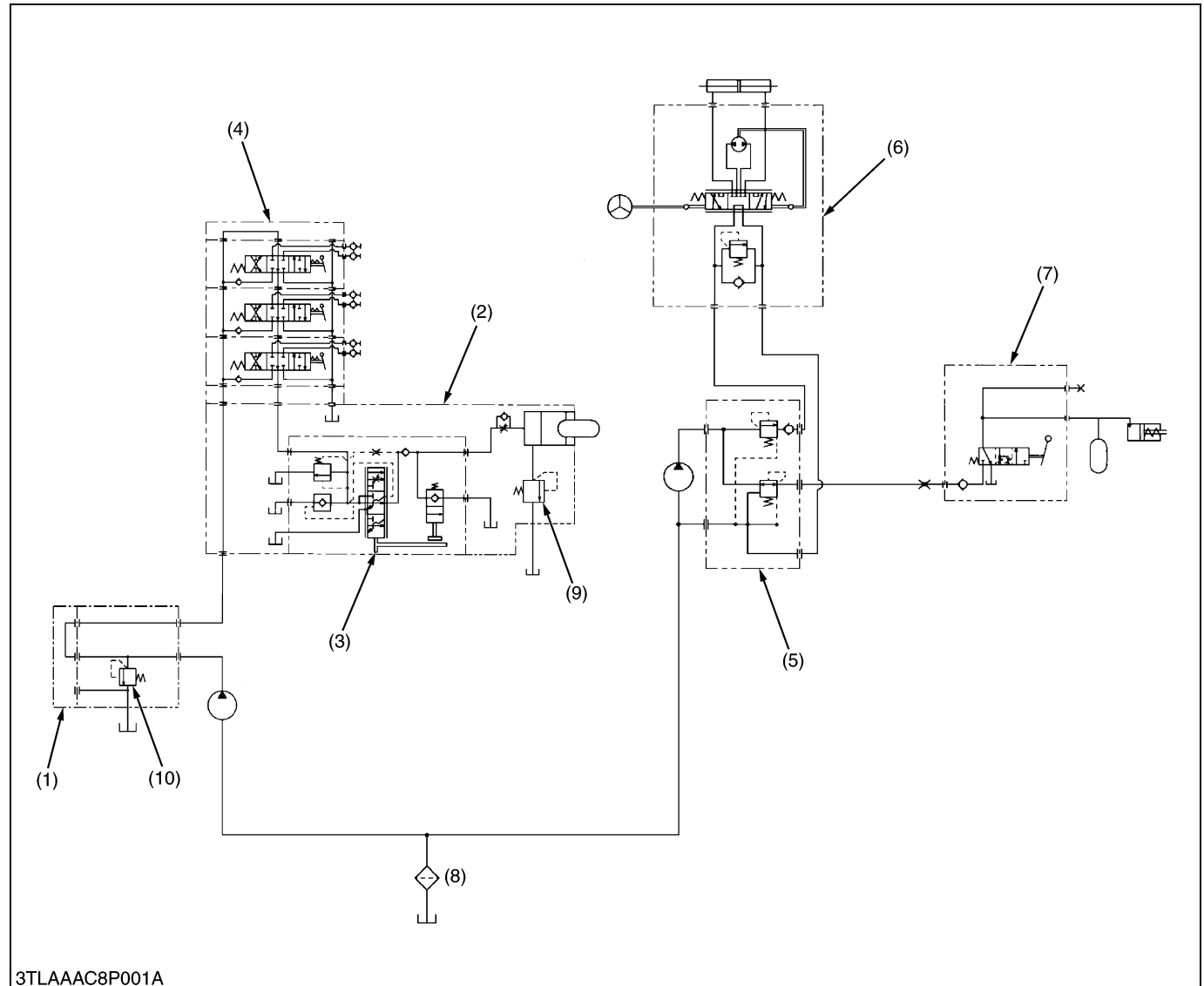
# **8 HYDRAULIC SYSTEM**

# MECHANISM

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1. HYDRAULIC CIRCUIT .....	8-M1
2. POSITION CONTROL VALVE .....	8-M2
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# 1. HYDRAULIC CIRCUIT



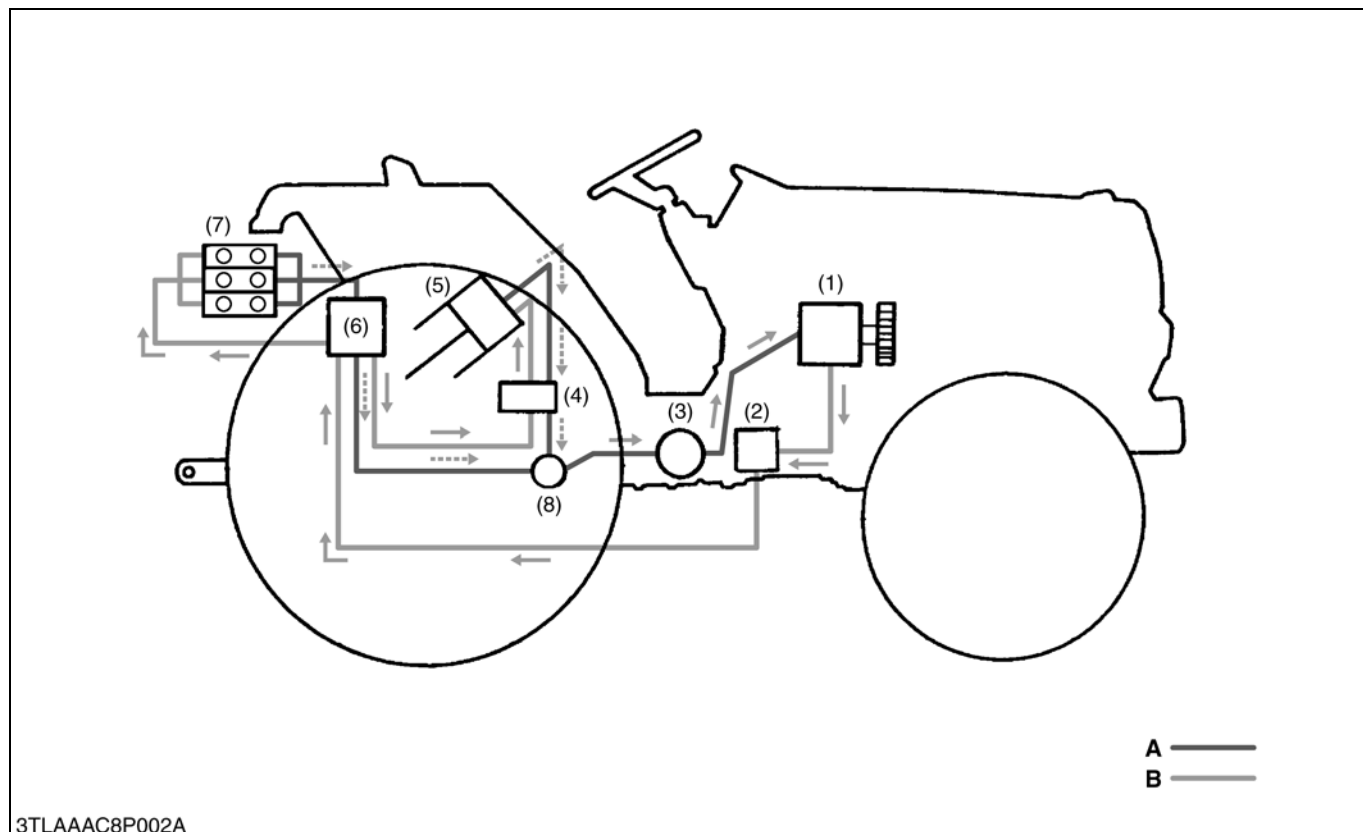
(1) Front Hydraulic Block  
 (2) Hydraulic Cylinder Block  
 (3) Position Control Valve

(4) Auxiliary Control Valve  
 (Option)  
 (5) Regulator Valve  
 (Refer to CLUTCH Section)

(6) Power Steering Controller  
 (Refer to STEERING Section)  
 (7) PTO Clutch Valve  
 (Refer to CLUTCH Section)

(8) Oil Filter  
 (9) Cylinder Safety Valve  
 (10) Relief Valve

## 2. POSITION CONTROL VALVE

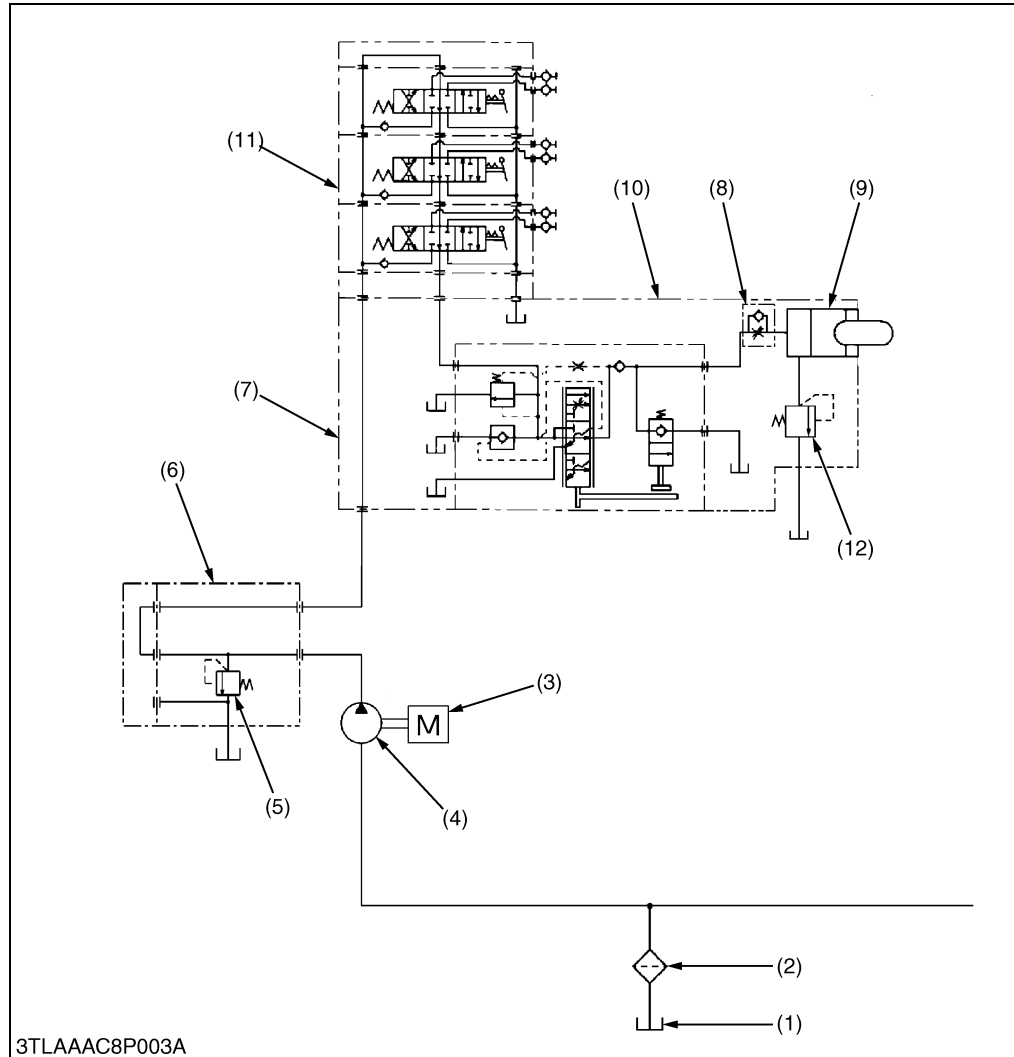


- |   |   |                                  |                                   |
|---|---|----------------------------------|-----------------------------------|
| (1) Three Point System Hydraulic Pump         | (4) Position Control Valve                | (7) Quick Coupler (If Equipped)  | <b>A : Delivery Lines</b>         |
| (2) Front Hydraulic Block (with Relief Valve) | (5) Hydraulic Cylinder                    | (8) Oil Tank (Transmission Case) | <b>B : Suction or Drain Lines</b> |
| (3) Hydraulic Oil Filter Cartridge            | (6) Auxiliary Control Valve (If Equipped) |                                  |                                   |

Hydraulic system of this tractors is composed of main components as shown in the figure. This system has the three functions as follows :

- To raise and lower the implement connected to the three point hitch.  
For this motion, the position control valve (4) and the linkage installed on the hydraulic cylinder body provide three difference applications : position control, draft control, and mixed control
- Takes out hydraulic power from the front hydraulic block assembly (2) to operate an implement's hydraulic actuator.
- Takes out hydraulic power from the quick couplers (7) induced in the auxiliary control valves assembly (6) (if equipped) for the implements with actuators. In this case, the implement's cylinders can be actuated by operating the auxiliary control valves.

### 3. HYDRAULIC CIRCUIT FOR THREE POINT HYDRAULIC SYSTEM



- (1) Oil Tank  
(Transmission Case)
- (2) Hydraulic Oil Filter Cartridge
- (3) Engine
- (4) Three Point System  
Hydraulic Pump
- (5) Relief Valve
- (6) Front Hydraulic Block
- (7) Position Control Valve
- (8) Lowering Speed Adjusting  
Valve
- (9) Hydraulic Cylinder
- (10) Hydraulic Cylinder Block
- (11) Auxiliary Control Valve
- (12) Cylinder Safety Valve

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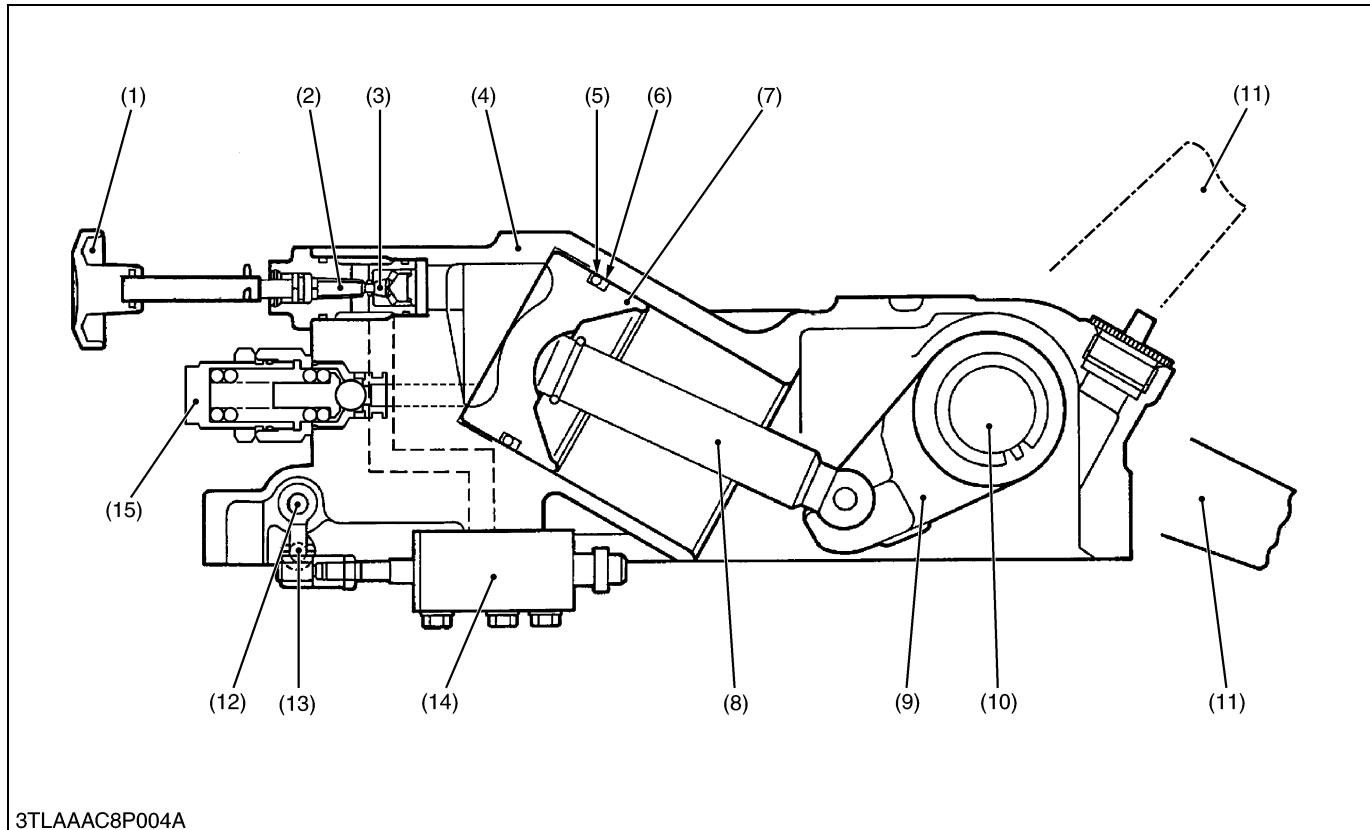
3TLAAAC8P003A

#### ■ Hydraulic Oil Flow

1. When the engine (3) is started, the hydraulic pump (4) is rotated to draw oil from the transmission case (1) through the suction pipe. Supplied oil is filtered by the hydraulic oil filter cartridge (2).
2. Filtered oil is forced out by the hydraulic pump to the front hydraulic block (6). When a front end loader is equipped with the tractor, oil pressure is taken from the front hydraulic block (6), and the return oil from the front end loader flows back to this front hydraulic block (6), then into the position control valve (7) through the delivery pipe.
3. The position control valve (7) switches the oil to the hydraulic cylinder (9) for the three-point hydraulic system or return to the oil tank (transmission case) (1).
  - The hydraulic system has a relief valve (5) which restricts the maximum pressure in the circuit and a cylinder safety valve which relieves shock pressure in the hydraulic cylinder.
  - When hydraulic power is taken out to use a hydraulically-operated implement, implement's cylinders can be actuated by operating the double-acting auxiliary control valve (11).



## 4. HYDRAULIC CYLINDER



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- |                                    |                        |                          |                             |
|------------------------------------|------------------------|--------------------------|-----------------------------|
| (1) Lowering Speed Adjusting Knob  | (4) Hydraulic Cylinder | (8) Hydraulic Rod        | (12) Position Control Arm   |
| (2) Lowering Speed Adjusting Shaft | (5) O-ring             | (9) Hydraulic Arm        | (13) Spool Drive Lever      |
| (3) Lowering Speed Adjusting Valve | (6) Back-up Ring       | (10) Hydraulic Arm Shaft | (14) Position Control Valve |
|                                    | (7) Hydraulic Piston   | (11) Lift Arm            | (15) Cylinder Safety Valve  |

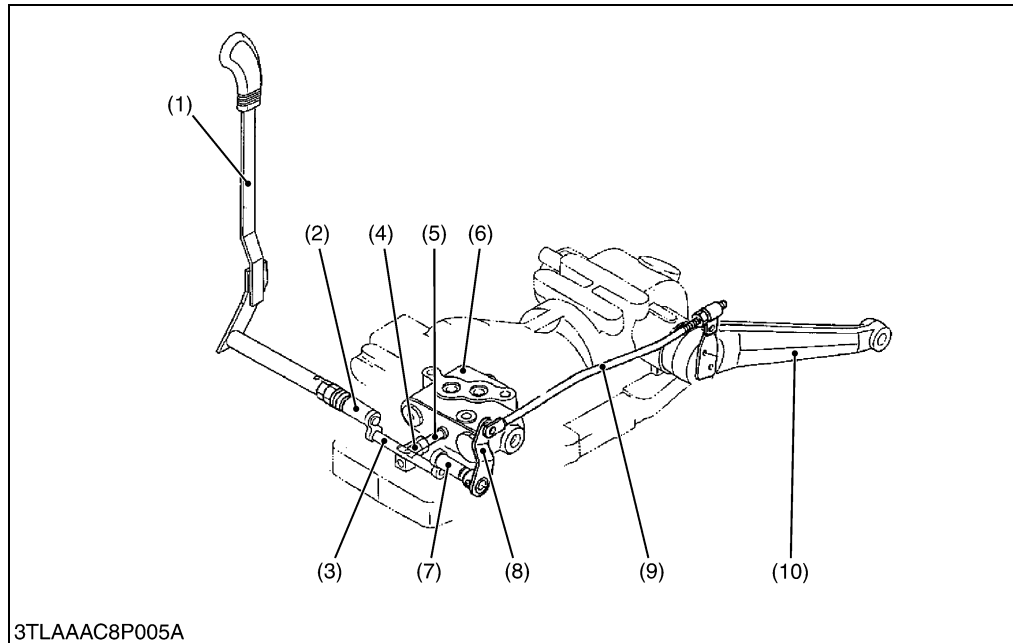
The main components of the hydraulic cylinder are shown in the figure above.

While the lift arm (11) is rising, oil from the hydraulic pump flows into the hydraulic cylinder through the piston control valve (14). Then oil pushes out the piston (7).

While the lift arm (11) is lowering, oil in the hydraulic cylinder is discharge to the transmission case through the position control valve (14) by the weight of the implement. At this time, the lowering speed of the implement can be controlled by the lowering speed adjusting valve (3) attached to the hydraulic cylinder (4). Turning the lowering speed adjusting knob (1) clockwise decreases the lowering speed, and counterclockwise increases lowering speed. When the lowering speed adjusting valve (3) is completely closed, the lift arm (11) is held at its position since oil in the hydraulic cylinder is sealed between the piston (7) and lowering speed adjusting valve (3).

## 5. LINKAGE MECHANISM

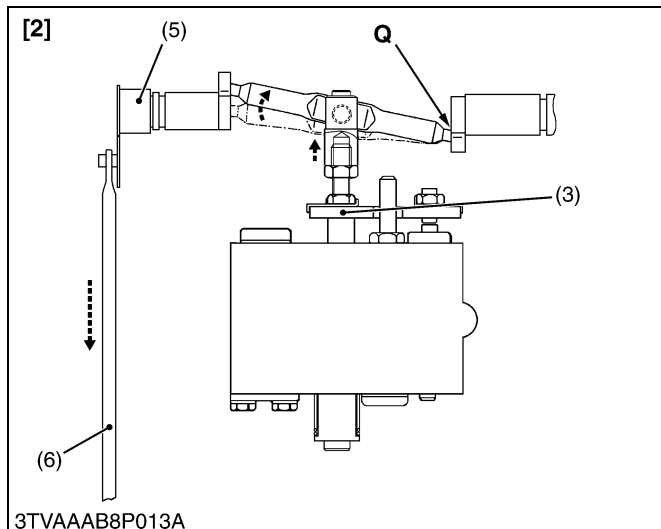
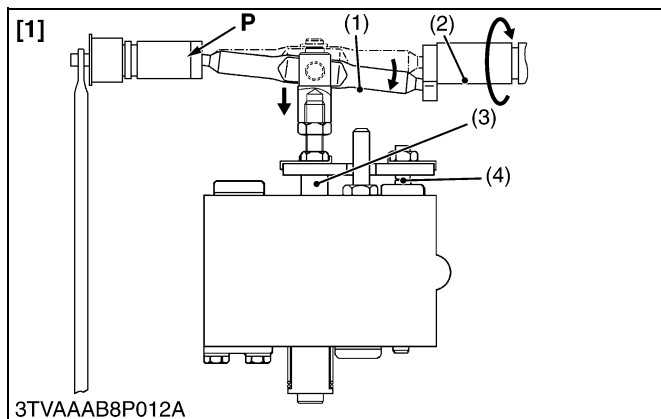
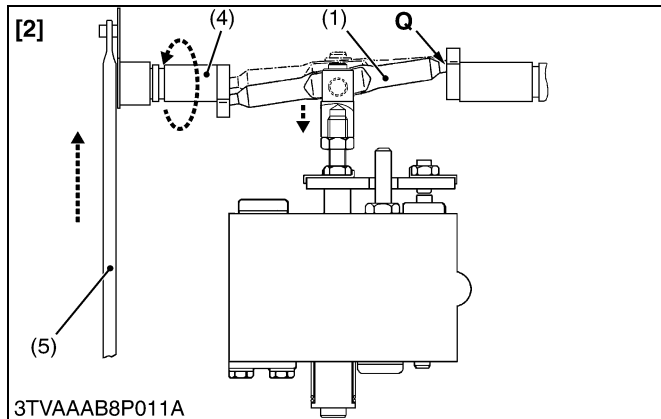
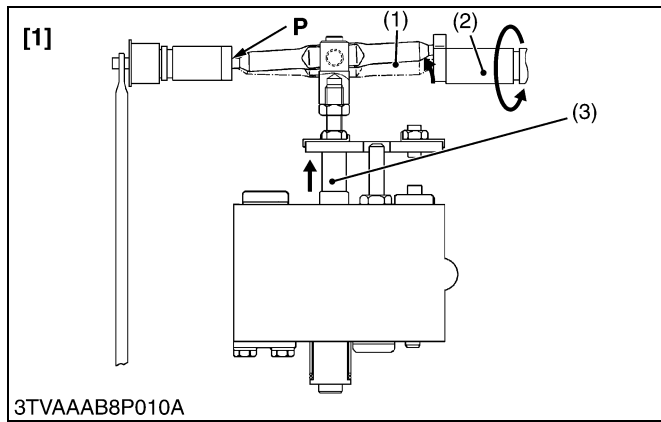
### [1] POSITION CONTROL



- (1) Position Control Lever
- (2) Control Arm
- (3) Spool Drive Lever
- (4) Spool Joint 1
- (5) Spool Head
- (6) Valve Body
- (7) Feedback Lever Shaft
- (8) Feedback Lever
- (9) Feedback Rod
- (10) Lift Arm

W1016975

Position control is a mechanism to raise or lower the implement attached to the tractor in proportion to the movement of the control lever. The implement can be positioned at any height by moving the position control lever. Fine position adjustment is also easy.



### ■ Lifting

1. When the position control lever is moved to the **LIFT** position, the control arm (2) rotates to the arrow. Therefore, the spool drive lever (1) moves around the fulcrum **P** and pull the spool (3) opening the **LIFT** circuit.
2. When the lift arm moves upward, the feedback lever shaft (4) is rotated to the arrow, since the feedback rod (5) is actuated. Therefore, the spool drive lever (1) moves around the fulcrum **Q** and pushes the spool (3).
3. The lift arm stops when the spool returns to the neutral position.

- (1) Spool Drive Lever
- (2) Control Arm
- (3) Spool
- (4) Feedback Lever Shaft
- (5) Feedback Rod

[1] Lifting

[2] Lifting to Neutral

W10161940

### ■ Lowering

4. When the position control lever is moved to the **Lowering** position, the control arm (2) rotates to the arrow. Therefore, the spool drive lever (1) moves around the fulcrum **P** and push the spool (3) and poppet 2 (4) opening the Lowering circuit.
5. When the lift arm moves downward, the feedback lever shaft (5) is rotated to the arrow, since the feedback rod (6) is actuated. Therefore, the spool drive lever (1) moves around the fulcrum **Q** and pull the spool (3).
6. The lift arm stops when the spool (3) returns to the neutral position.

- (1) Spool Drive Lever
- (2) Control Arm
- (3) Spool
- (4) Feedback Lever Shaft
- (5) Feedback Rod

[1] Lifting

[2] Lifting to Neutral

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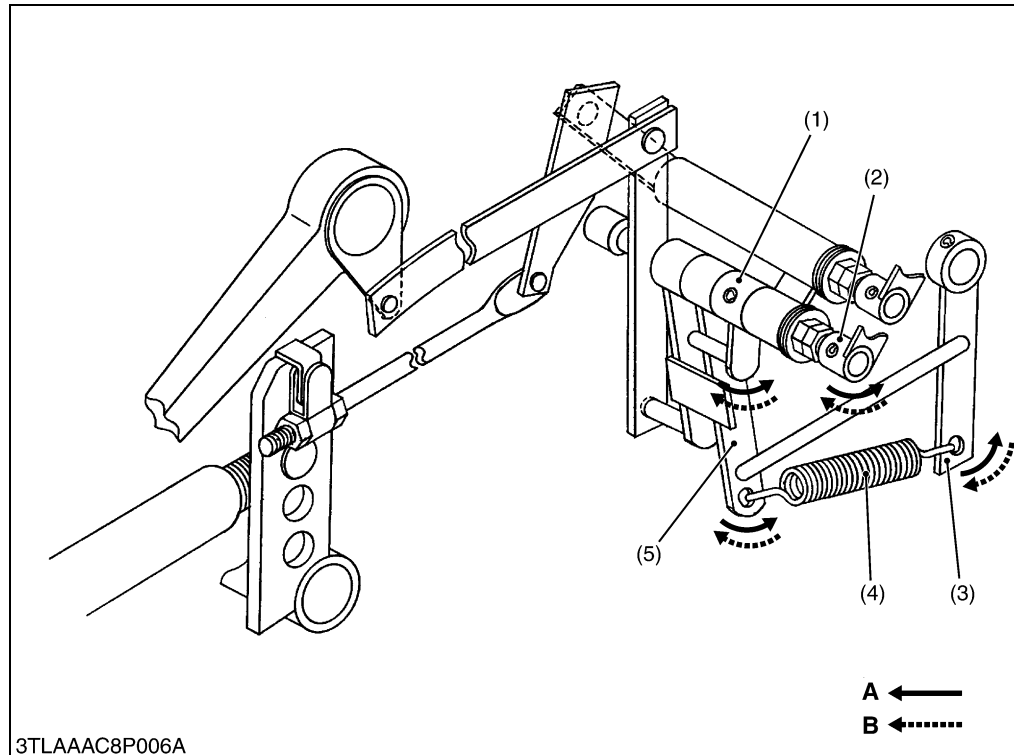
## [2] POSITION CONTROL WITH DRAFT OPERATION (IF EQUIPPED)

Draft control is a system which maintains a constant traction load, and is suited for the work which needs heavy traction load such as plowing.

The implement is automatically raised when its traction load is increased, and lowers when the traction load is decreased. By maintaining a constant load level, it prevents the tractor from slipping and being loaded excessively. The setting traction load can be adjusted by changing the position of the draft control lever.

The draft control system uses the same control valves as the position control system. Therefore it is possible to use the mixed control. The traction load applied to the tractor is sensed and is fed back to the control valve by means of the other linkage mechanism.

### ■ Position Control Operation



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#### • Lift

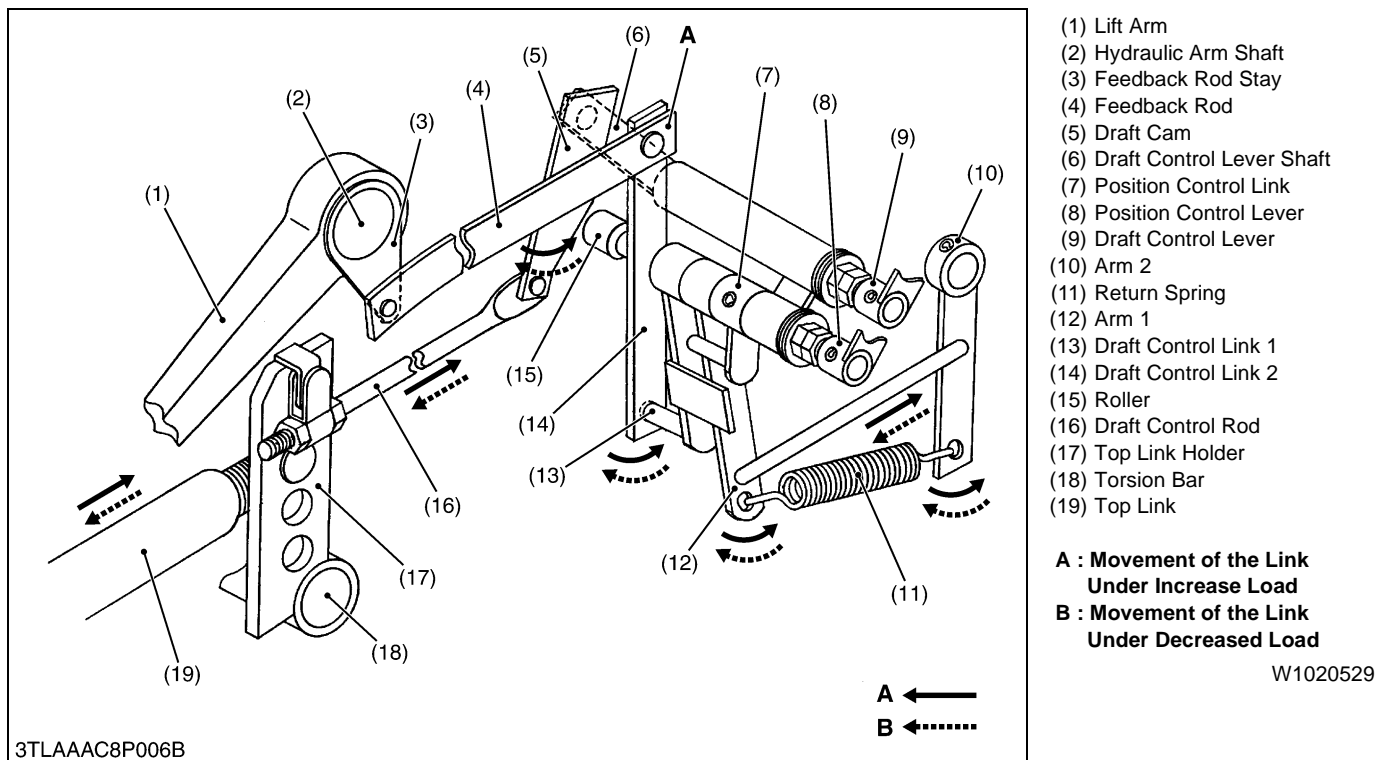
1. When the position control lever (2) is moved to the **LIFT** side, the position control link (1) is also rotated and pushes the arm 1 (5).
2. At the same time, the arm 2 (3) is moved, the connected position control valve becomes the lift circuit, and the lift arm goes up.

#### • Down

1. When the position control lever (2) is moved to the **DOWN** side, the position control link (1) is also rotated.
2. By the action, the arm 2 (3) and the arm 1 (5) are returned by the return spring (4).
3. The position control valve becomes the down circuit and the lift arm is lowered.

#### (Reference)

- For the feedback mechanism of the position control, refer to "[1] POSITION CONTROL".



When the draft control lever (9) is operated in the draft control operating range, the draft control lever shaft (6) is rotated, causing the draft cam (5) to move toward the roller (15) installed on the draft control link 2 (14).

#### (Reference)

- The sensitivity of the draft control can be adjusted by changing the gap between the draft cam (5) and the roller (15) by the draft control lever (9).

#### ■ Movement of the Link Under Increased Load

- When the traction load is increased, the torsion bar (18) is twisted according to the load, the draft control rod (16) and the draft cam (5) are pushed to come into contact with the roller (15).
- Using the **A** portion as the fulcrum, the draft control link 2 (14) and the draft control link 1 (13) move to push the arm 1 (12).
- At the same time, the arm 2 (10) is moved, the connected position control valve becomes the lift circuit, and the lift arm (1) goes up.

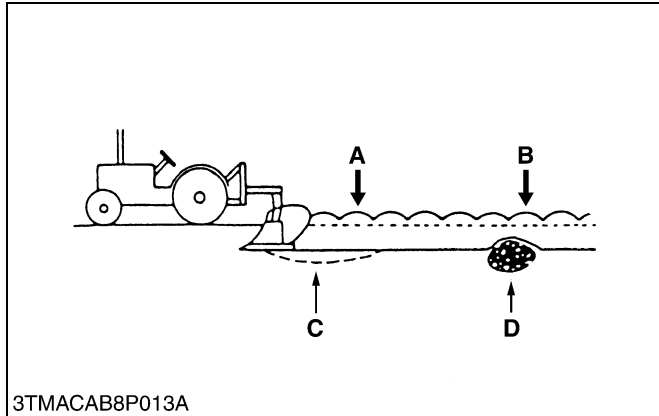
#### ■ Movement of the Link Under decreased Load

- When the lift arm (1) goes up, the traction load is decreased, and the draft control rod (16) is returned.
- At the same time, the arm 2 (10), arm 1 (12), and draft control link 1 (13) are returned by the return spring (11).
- The position control valve becomes the down circuit, and the lift arm (1) is lowered.

#### (Reference)

- The feedback rod (4) of the draft control is provided to maintain the positional relation of the draft cam (5) and the roller (15) to certain state regardless of the height of the lift arm (1).

### [3] MIXED CONTROL



Mixed control is a system combining position control with draft control.

When traction load increases, the draft control functions to raise the lift arms (implement). When traction load decreases, the lift arms (implement) lower to the height set by the position control lever.

With the position control only when traction load increases, slippage or engine stop may occur unless the implement is raised.

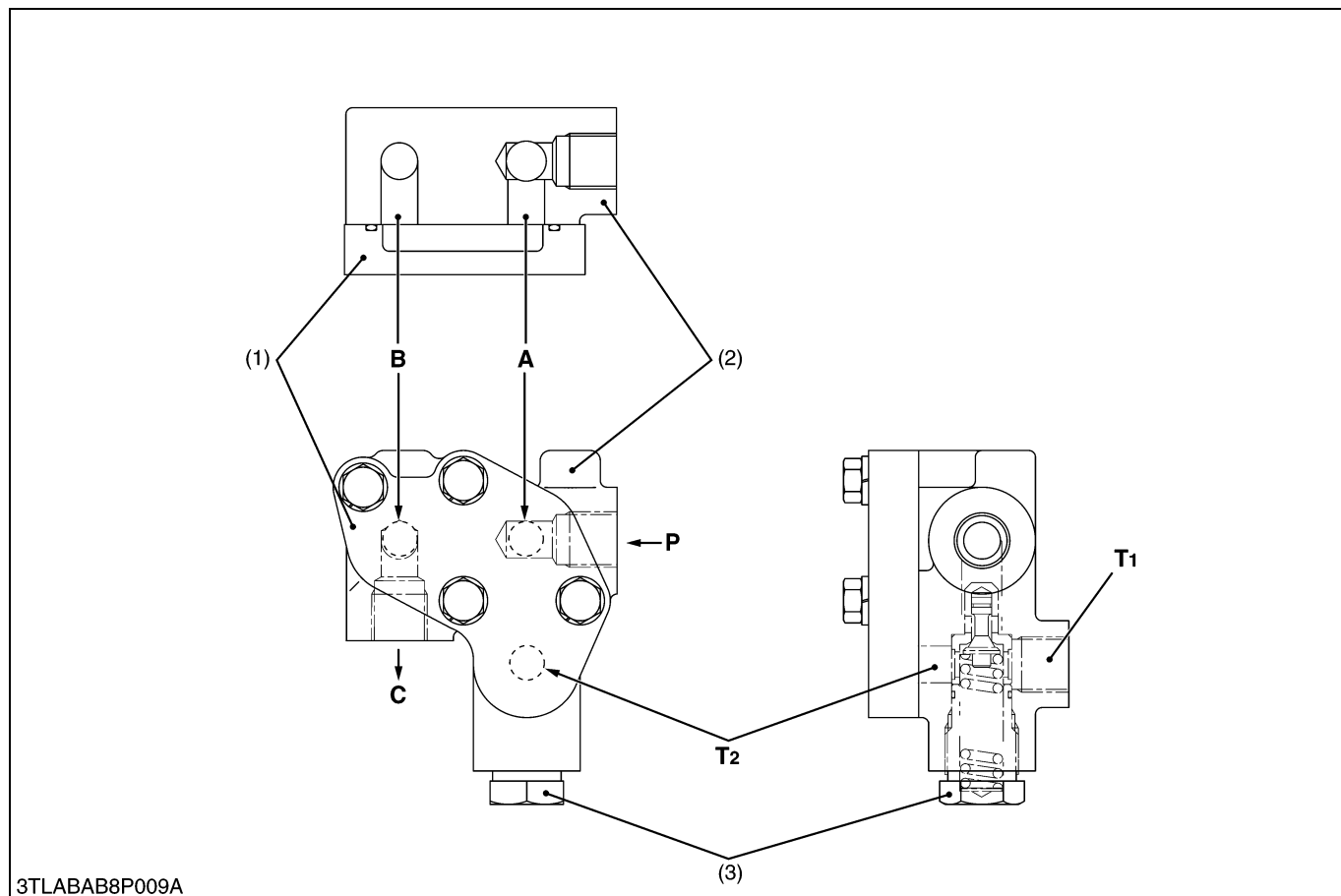
With the draft control only, plowing depth cannot be kept constant if soil hardness changes greatly.

The mixed control serves to eliminate such disadvantages.

- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| <b>A : Position Controlled</b>        | <b>D : Shallow where Resistance</b> |
| <b>B : Draft Controlled</b>           | <b>Occur</b>                        |
| <b>C : Not Deep Even in Soft Soil</b> |                                     |

W10165370

## 6. FRONT HYDRAULIC BLOCK



- (1) Cap
- (2) Front Hydraulic Block
- (3) Relief Valve

**A : To Implement Control Valve**  
**B : From Implement Control Valve**

**C : To Position Control Valve**  
**P : From Hydraulic Valve**

**T1 : To Transmission Case**  
**T2 : From Implement Control Valve**

The front hydraulic block is provided to take power out from the tractor to operate the hydraulic cylinders on the implement, such as front loader, front blade and so on.



# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Implement Does Not Rise (Without Noise)</b>	Control linkage improperly adjusted	Adjust	8-S11, S13
	Control linkage improperly assembled or damaged	Repair or replace	8-S12, S20, S21
	Position control valve malfunctioning (unload poppet, spool, poppet 1, 2)	Repair or replace	8-S20
	Relief valve spring weaken or broken	Replace	8-S21
<b>Implement Does Not Rise (With Noise)</b>	Hydraulic piston O-ring, cylinder damaged	Replace	8-S17
	Transmission fluid improper or insufficient	Change or replenish	8-S8
	Hydraulic oil filter clogged	Replace	8-S15
	Suction pipe loosen or broken	Repair or replace	–
	Relief valve setting pressure too low	Adjust	8-S11
	Relief valve spring weaken or damaged	Replace	8-S11
	Hydraulic pump malfunctioning	Repair or replace	8-S10
<b>Implement Does Not Reach Maximum Height</b>	Position control feedback rod improperly adjusted	Adjust	8-S12
	Top link length improperly adjusted	Adjust	–
	Position control valve spool joint 1 improperly adjusted	Adjust	8-S20, S21
	Hydraulic arm shaft, hydraulic arm, lift arm improperly assembled	Adjust	8-S19
	3 point link improperly set	Adjust	–
<b>Implement Does Not Lower</b>	Position control valve malfunctioning (Spool damaged)	Replace	8-S20, S21
	Position control valve malfunctioning (Poppet2, adjusting set screw improperly adjusted)	Adjust	8-S20, S21
	Draft control rod improperly adjusted	Adjust	8-S13
<b>Implement Drops by Weight</b>	Hydraulic cylinder worn or damaged	Replace	8-S24, S25
	Hydraulic piston and O-ring worn or damaged	Replace	8-S17
	Lowering speed adjusting valve damaged	Replace	8-S17
	Poppet 1 seat surface damaged (control valve)	Replace	8-S20, S21
	Poppet 1 O-ring damaged (control valve)	Replace	8-S20, S21
	Poppet 2 seat surface damaged (control valve)	Replace	8-S20, S21
	Poppet 2 O-ring damaged (control valve)	Replace	8-S20, S21

W1014322

Symptom	Probable Cause	Solution	Reference Page
<b>Implement Hunts (Moves Up and Down)</b>	Poppet 1 seat surface damaged (control valve)	Replace	8-S20, S21
	Poppet 1 O-ring damaged (control valve)	Replace	8-S20, S21
	Poppet 2 seat surface damaged (control valve)	Replace	8-S20, S21
	Poppet 2 O-ring damaged (control valve)	Replace	8-S20, S21
	Poppet 2, adjusting set screw improperly adjusted	Adjust	8-S20, S21
<b>Draft Control Malfunctioning</b>	Draft control linkage improperly adjusted	Adjust	8-S13
	Torsion bar weaken or broken	Replace	—
<b>Oil Temperature Increases Rapidly</b>	Relief valve operating	Adjust	8-S11
	Hydraulic pump leak or damaged	Repair or replace	8-S10
	Oil leaks from valves	Repair or replace	—
	Gear or bearing damaged in the transmission case	Replace	—

W1019184

## 2. SERVICING SPECIFICATIONS

### POWER STEERING HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump <b>Condition</b> <ul style="list-style-type: none"> <li>Engine speed : Approx. 2600 min<sup>-1</sup> (rpm)</li> <li>Rated Pressure : [2WD] 8.0 to 9.0 MPa 81.4 to 91.4 kgf/cm<sup>2</sup> 1158 to 1300 psi [4WD] 10.7 to 11.7 MPa 109 to 119 kgf/cm<sup>2</sup> 1552 to 1697 psi</li> <li>Oil Temperature : 40 to 60 °C 104 to 140 °F</li> </ul>	Delivery at No Pressure	Above 17.9 L/min. 4.73 U.S.gals./min. 3.94 Imp.gals./min.	—
	Delivery at Rated Pressure	Above 17.6 L/min. 4.65 U.S.gals./min. 3.87 Imp.gals./min.	15.7 L/min. 4.15 U.S.gals./min. 3.45 Imp.gals./min.
Housing Bore	Depth of Scratch	—	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	0.020 to 0.081 mm 0.0008 to 0.0032 in.	0.15 mm 0.0059 in.
Gear Shaft	O.D.	14.970 to 14.980 mm 0.5894 to 0.5898 in.	—
Bushing	I.D.	15.000 to 15.051 mm 0.5906 to 0.5926 in.	—
Side Plate	Thickness	2.48 to 2.50 mm 0.0976 to 0.0984 in.	2.40 mm 0.0945 in.

W1013874

### RELIEF VALVE (POWER STEERING)

Relief Valve <b>Condition</b> <ul style="list-style-type: none"> <li>Engine Speed : Maximum</li> <li>Oil Temperature : 40 to 60 °C 104 to 140 °F</li> <li>Location of Measurement : Outlet Port Area of Hydraulic Pump</li> </ul>	Setting Pressure (2WD)	8.0 to 9.0 MPa 81.4 to 91.4 kgf/cm <sup>2</sup> 1158 to 1300 psi	—
	Setting Pressure (4WD)	10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi	—

W1013874

**THREE POINT SYSTEM HYDRAULIC PUMP**

Item		Factory Specification	Allowable Limit
Hydraulic Pump <b>Condition</b> <ul style="list-style-type: none"> <li>Engine speed : Approx. 2600 min<sup>-1</sup> (rpm)</li> <li>Rated Pressure : 17.1 to 18.1 MPa 175 to 185 kgf/cm<sup>2</sup> 2489 to 2631 psi</li> <li>Oil Temperature : 40 to 60 °C 104 to 140 °F</li> </ul>	Delivery at No Pressure	Above 29.4 L/min. 7.77 U.S.gals./min. 6.47 Imp.gals./min.	—
	Delivery at Rated Pressure	Above 28.8 L/min. 7.61 U.S.gals./min. 6.34 Imp.gals./min.	25.8 L/min. 6.82 U.S.gals./min. 5.68 Imp.gals./min.
Housing Bore	Depth of Scratch	—	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	0.020 to 0.081 mm 0.0008 to 0.0032 in.	0.15 mm 0.0059 in.
Gear Shaft	O.D.	14.970 to 14.980 mm 0.5894 to 0.5898 in.	—
Bushing	I.D.	15.000 to 15.051 mm 0.5906 to 0.5926 in.	—
Side Plate	Thickness	2.48 to 2.50 mm 0.0976 to 0.0984 in.	2.40 mm 0.0945 in.

W1012055

**RELIEF VALVE (THREE POINT SYSTEM)**

Relief Valve <b>Condition</b> <ul style="list-style-type: none"> <li>Engine Speed : Maximum</li> <li>Oil Temperature : 40 to 60 °C 104 to 140 °F</li> <li>Location of Measurement : Front Hydraulic Block</li> </ul>	Setting Pressure	17.1 to 18.1 MPa 175 to 185 kgf/cm <sup>2</sup> 2489 to 2631 psi	—
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W1012295

**CYLINDER SAFETY VALVE**

Cylinder Safety Valve	Operating Pressure	19.6 to 22.6 MPa 200 to 230 kgf/cm <sup>2</sup> 2845 to 3277 psi	—
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W1029624

**CONTROL LINKAGE**

Lift Arm	Free Play (at Maximum Raising Position)	10 to 15 mm 0.39 to 0.58 in.	—
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W1013874

**HYDRAULIC CYLINDER**

Item		Factory Specification	Allowable Limit
Cylinder Bore	I.D.	90.000 to 90.050 mm 3.54330 to 3.54527 in.	90.150 mm 3.54921 in.
Hydraulic Arm Shaft to Bushing	Clearance (Right)	0.125 to 0.230 mm 0.00492 to 0.00906 in.	0.50 mm 0.0197 in.
	Clearance (Left)	0.125 to 0.220 mm 0.00492 to 0.00866 in.	0.50 mm 0.0197 in.
Hydraulic Arm Shaft	O.D. (Right)	44.920 to 44.950 mm 1.76850 to 1.76968 in.	—
	O.D. (Left)	39.920 to 39.950 mm 1.57165 to 1.57283 in.	—
Bushing	I.D. (Right)	45.0756 to 45.150 mm 1.77460 to 1.77756 in.	—
	I.D. (Left)	40.075 to 40.140 mm 1.57775 to 1.58031 in.	—

W1011871

### 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
Relief valve plug	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Hydraulic pump mounting bolt	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
3P delivery pipe 1 mounting screw (hydraulic cylinder side)	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
3P delivery pipe 2 mounting screw	17.6 to 20.6	1.8 to 2.1	13.0 to 15.2
3P delivery pipe joint bolt	49.0 to 69.0	5.0 to 7.0	36.2 to 50.6
Pump cove mounting screw	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Hydraulic cylinder mounting screw and nut	77.4 to 90.2	7.9 to 9.2	57.1 to 66.5
Hydraulic cylinder assembly mounting stud bolt	38.2 to 45.1	3.9 to 4.6	28.2 to 33.3
Position control valve mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Position control valve seat plug 1 and 2	29.4 to 49.0	3.0 to 5.0	21.7 to 36.2
Poppet lock nut	3.9 to 6.9	0.4 to 0.7	2.9 to 5.1
Position control valve unload plug	39.2 to 58.5	4.0 to 6.0	28.9 to 43.4

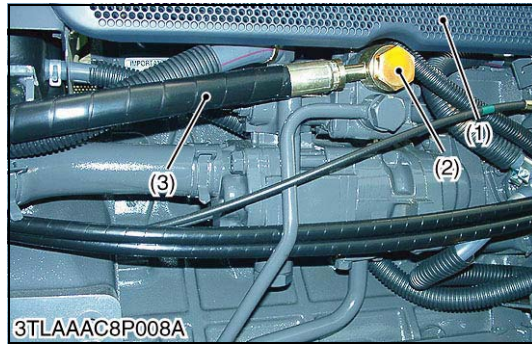
W1012736



## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING, DISASSEMBLING AND ASSEMBLING

#### (1) Hydraulic Pump Test Using Flow-meter (Power Steering)



##### Preparation

1. Remove side cover RH (1).
2. Remove the power steering main delivery hose (2).

##### **(When reassembling)**

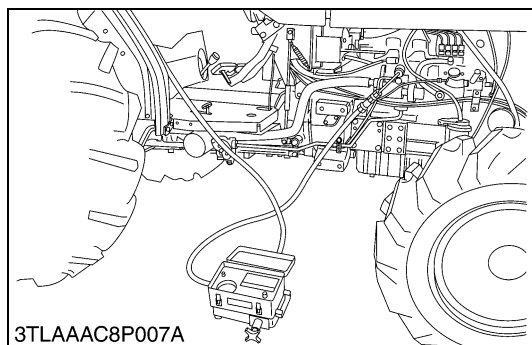
- Install the copper washers firmly.

Tightening torque	Delivery pipe joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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- (1) Side Cover RH  
(2) Joint Bolt

- (3) Power Steering Main Delivery Hose

W1012497



### Hydraulic Flow Test (Power Steering)

#### ■ IMPORTANT

- When using a flowmeter which is not specified by KUBOTA, be sure to follow the instructions for that flowmeter.
  - Since the flowmeter has no relief valve, do not close the flowmeter loading valve completely before testing.
1. Remove the power steering delivery pipe joint bolt and install the adaptor **52** to the pump discharge port.
  2. Connect the hydraulic test hose to the adaptor **52** and flowmeter inlet port.
  3. Connect the other hydraulic test hose to the flowmeter outlet port and to the transmission fluid filling plug hole.
  4. Open the flowmeter loading valve completely. (Turn counterclockwise.)
  5. Start the engine and set the engine speed at **2000 to 2200 min<sup>-1</sup> (rpm)**.
  6. Slowly close the loading valve to generate pressure approx. **9.8 MPa (100 kgf/cm<sup>2</sup>, 1422 psi)**. Hold in this condition until oil temperature reached approx. **40 °C (104 °F)**.
  7. Open the loading valve completely.
  8. Set the engine speed. (Refer to **Condition**.)
  9. Read and note the pump delivery at no pressure.
  10. Slowly close the loading valve to increase to the rated pressure. As the load is increased, engine speed drops, therefore, reset the engine speed.
  11. Read and note the pump delivery at rated pressure.
  12. Open the loading valve completely and stop the engine.
  13. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

#### Condition

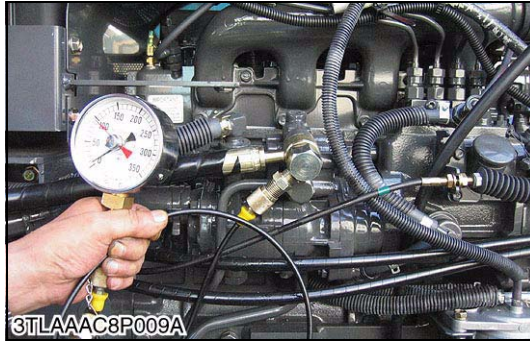
- Engine speed : Approx. 2600 min<sup>-1</sup> (rpm)
- Rated pressure :
 

[2WD]	8.0 to 9.0 MPa 81.4 to 91.4 kgf/cm <sup>2</sup> 1158 to 1300 psi
[4WD]	10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi
- Oil temperature : 40 to 60 °C (104 to 140 °F)

Hydraulic pump delivery at no pressure	Factory spec.	Above 17.9 L/min. 4.73 U.S.gals/min. 3.94 Imp.gals/min.
Hydraulic pump delivery at rated pressure	Factory spec.	Above 17.6 L/min. 4.65 U.S.gals/min. 3.87 Imp.gals/min.
	Allowable limit	15.7 L/min. 4.15 U.S.gals/min. 3.45 Imp.gals/min.

W1018791

## (2) Relief Valve (Power Steering)



### Relief Valve Setting Pressure

1. Disconnect the power steering delivery pipe joint bolt.
2. Install the adaptor **E** and adaptor **58** of relief valve setting pressure tester to the regulator valve, and then set a thread joint, cable and pressure gauge.
3. Start the engine and set the engine speed at max. speed.
4. Fully turn the steering wheel to the left or right and read the pressure when the relief valve functions.
5. Stop the engine.
6. If the pressure is not within the factory specifications, check the pump delivery line, adjust the relief valve by the adjusting screw (1), or repair the power steering.

Power steering relief valve setting pressure	Factory spec.	2WD	8.0 to 9.0 MPa 81.4 to 91.4 kgf/cm <sup>2</sup> 1158 to 1300 psi
		4WD	10.7 to 11.7 MPa 109 to 119 kgf/cm <sup>2</sup> 1552 to 1697 psi

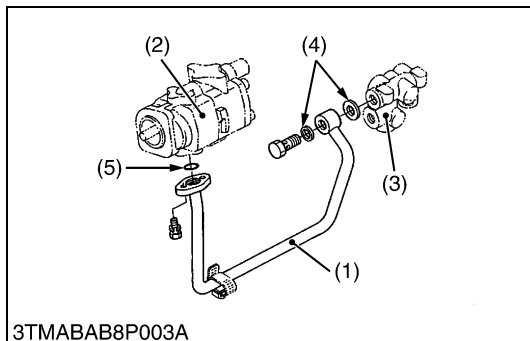
Tightening torque	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
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### Condition

- Engine speed : Maximum
- Oil temperature : 40 to 60 °C (104 to 140 °F)

W1022630

## (3) Hydraulic Pump Test Using Flow-meter (Three Point Hydraulic System)



### Preparation

Remove **3P** delivery pipe 2 (1) between hydraulic pump (2) and front hydraulic block (3).

### (When reassembling)

- Apply grease to the O-ring and take care not to damage it.
- Install the copper washers firmly.

Tightening torque	3P delivery pipe 2 screw	17.6 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	3P delivery pipe joint bolt	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

- (1) **3P** Delivery Pipe 2 (4) Copper Washers  
 (2) Three Point System Hydraulic Pump (5) O-ring  
 (3) Front Hydraulic Block

W1019191



### Hydraulic Flow Test (3P Hydraulic System)

#### ■ IMPORTANT

- When using a flowmeter which is not specified by KUBOTA, be sure to flow the instructions for that flowmeter.
  - Since the flowmeter has no relief valve, do not close the flowmeter loading valve completely before testing.
1. Install the pump adaptor (see page G-42, 43) with O-ring to the pump discharge port.
  2. Connect the hydraulic test hose to the adaptor and flowmeter inlet port.
  3. Connect the other hydraulic test hose to the flowmeter outlet port and to the transmission fluid filling plug hole.
  4. Open the flowmeter loading valve completely. (Turn counterclockwise.)
  5. Start the engine and set the engine speed at **2000 to 2200 min<sup>-1</sup> (rpm)**.
  6. Slowly close the loading valve to generate pressure approx. **14.7 MPa (150 kgf/cm<sup>2</sup>, 2133 psi)**. Hold in this condition until oil temperature reached approx. **40 °C (104 °F)**.
  7. Open the loading valve completely.
  8. Set the engine speed. (Refer to Condition.)
  9. Read and note the pump delivery at no pressure.
  10. Slowly close the loading valve to increase the pressure to the rated pressure. As the load is increased, engine speed drops, therefore, reset the engine speed.
  11. Read and note the pump delivery at rated pressure.
  12. Open the loading valve completely and stop the engine.
  13. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

#### Condition

- Engine speed : Approx. 2600 min<sup>-1</sup> (rpm)
- Rated pressure : 17.1 to 18.1 MPa  
175 to 185 kgf/cm<sup>2</sup>  
2489 to 2631 psi
- Oil temperature : 40 to 60 °C (104 to 140 °F)

Hydraulic pump delivery at no pressure	Factory spec.	Above 29.4 L/min. 7.77 U.S.gals/min. 6.47 Imp.gals/min.
Hydraulic pump delivery at rated pressure	Factory spec.	Above 28.8 L/min. 7.61 U.S.gals/min. 6.34 Imp.gals/min.
	Allowable limit	25.8 L/min. 6.82 U.S.gals/min. 5.68 Imp.gals/min.

W1014546

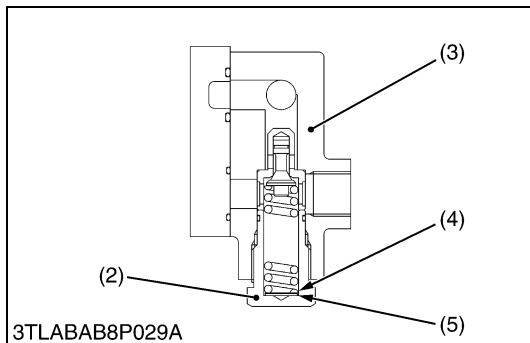
#### (4) Relief Valve (Three Point Hydraulic System)



3TLAAAC8P012A



3TLAAAC8P013A



3TLABAB8P029A

##### Relief Valve Setting Pressure

1. Remove the delivery pipe joint bolt from front hydraulic block.
2. Install the adaptor **E**. Then connect the hose and pressure gauge to adaptor **E**.
3. Remove the position control lever stopper (1).
4. Start the engine and set at maximum speed.
5. Move the position control lever all way up to operate the relief valve and read the gauge.
6. If the pressure is not within the factory specifications, remove the relief plug (2) of front hydraulic block (3) and adjust with the adjusting shims (4).
7. After the relief valve setting pressure test, reset the position control lever stopper firmly.

Relief valve setting pressure	Factory spec.	17.1 to 18.1 MPa 175 to 185 kgf/cm <sup>2</sup> 2489 to 2631 psi
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##### **Condition**

- Engine speed : Maximum
- Oil temperature : 40 to 60 °C (104 to 140 °F)

##### **(Reference)**

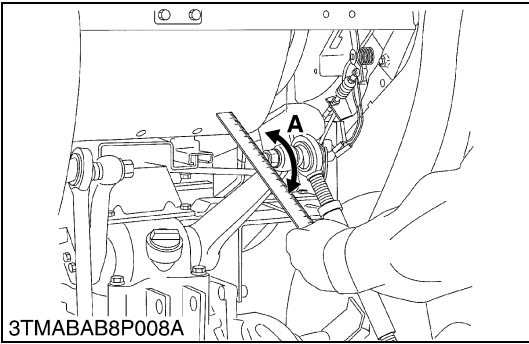
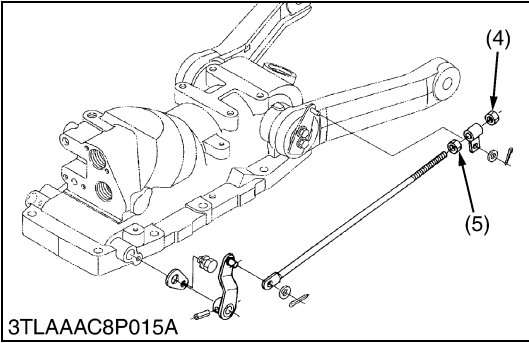
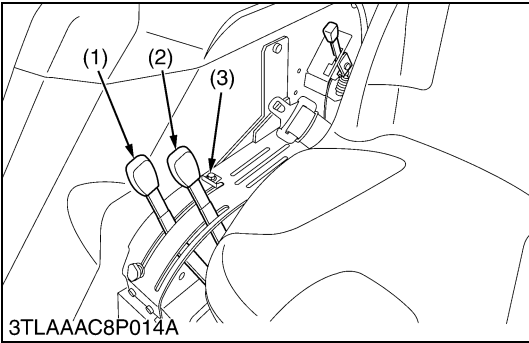
- Thickness of shims (4) :  
0.1 mm (0.0039 in.)  
0.2 mm (0.0079 in.)  
0.4 mm (0.0157 in.)
- Pressure change per  
0.1 mm (0.0039 in.) shim :  
Approx. 264.8 kPa  
2.7 kgf/cm<sup>2</sup>  
38.4 psi

- (1) Stopper  
(2) Relief Plug  
(3) Front Hydraulic Block

- (4) Adjusting Shim  
(5) Washer  
(6) POsition Contorol Lever

W65478932





**Position Control Feedback Rod Adjustment**

1. Set the position control lever (1) (the draft control lever (2), if equipped) to the lowest position.
2. Start the engine and set the engine at idling speed (allow the engine to warm up for approx. 5 minutes).
3. Move the position control lever (1) to the uppermost position. [Contact to the position control lever stopper (3).]
4. Turn the adjusting nut (4) and lock nut (5) together clockwise until the relief valve begins to be operated.
5. Turn the adjusting nut (4) and lock nut (5) together counter clockwise 2 turns.
6. Tighten the lock nut (5).
7. Set the engine speed at the maximum.
8. Move the position control lever (1) to the lowest position and uppermost position (3 to 5 times) to check the relief valve does not operate.
9. Set the position control lever (1) to the uppermost position, then move the lift arm to the upper end by hand and measure the free play.
10. Stop the engine.
11. If the measurement is not within the factory specifications, adjusting position control feedback rod again.

Lift arm free play at maximum raising position	Factory spec.	10 to 15 mm 0.39 to 0.58 in.
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- (1) Position Control Lever

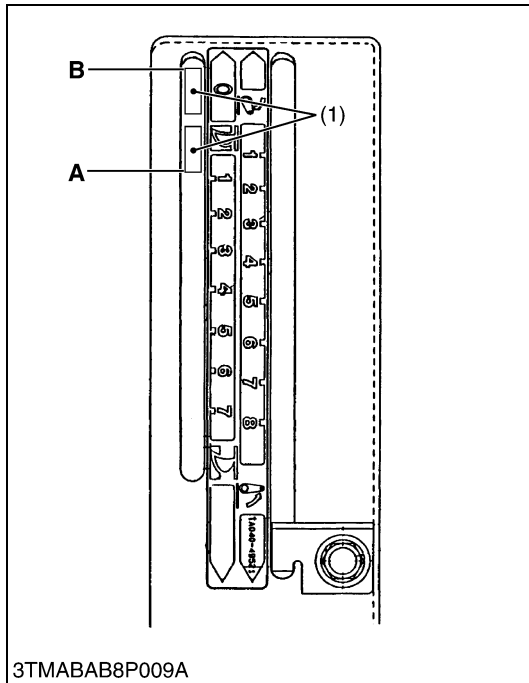
(2) Draft Control Lever (If Equipped)

(3) Position Control Feedback Rod
- (4) Adjusting Nut

(5) Lock Nut

**A : Lift Arm Free Play**

W1020369



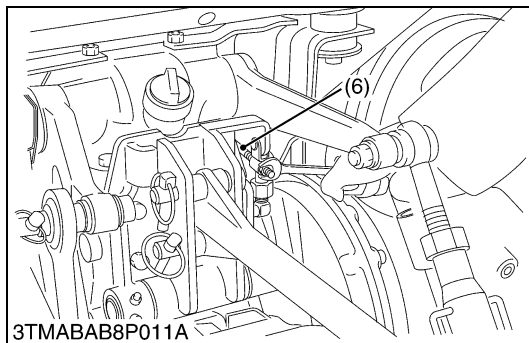
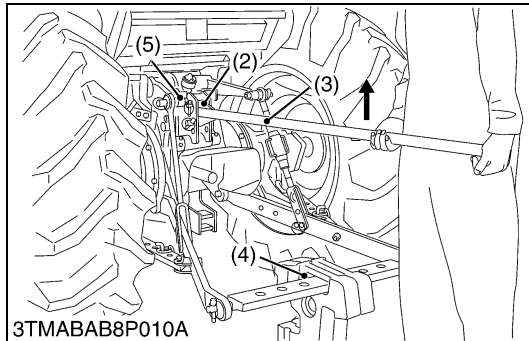
### Adjusting Draft Control Rod (If Equipped)

1. Set the draft control lever (1) to the lowest position.
2. Adjust the position control feedback rod. (Refer to "Adjusting Position Control Feedback Rod" See page 8-S12).
3. Start the engine.
4. Move the position control lever and adjust so that the lower link is level.
5. Set the rear side (A) of the draft control lever (1) to the scale 1 of the lever guide. (Refer to the figure left.).
6. Set the engine speed at the maximum.
7. Attach the test bar (3) (see page G-48) to the top link bracket (2).
8. Pull the test bar (3) upward and adjust the draft control rod (6) so that the lower link is raised when the top link bracket (2) and the top link bracket holder (5) come in contact. (Confirm that the lower link is lowered when the test bar (3) is pushed downward.)
9. Confirm that the draft control will not operate (float) when the draft control lever (1) is set to lowest position (B).
10. After adjustment, tighten the lock nut firmly.

- (1) Draft Control lever  
(2) Top Link Bracket  
(3) Test Bar

- (4) Weight  
(5) Top Link Bracket Holder  
(6) Draft Control Rod

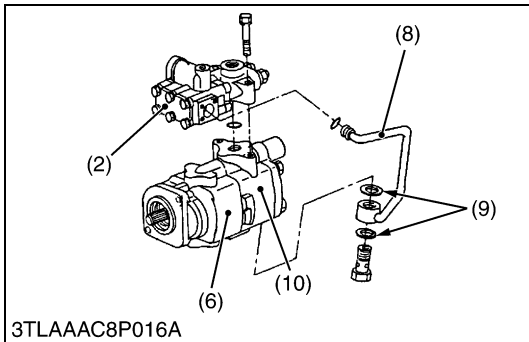
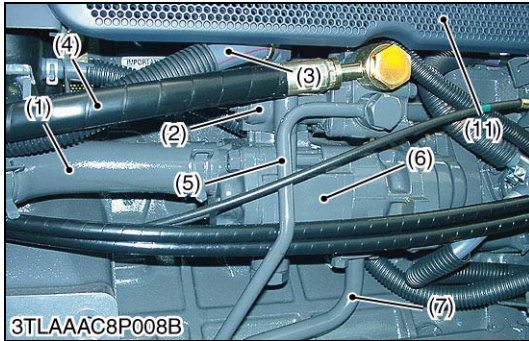
W1020380





## [2] DISASSEMBLING AND ASSEMBLING

### (1) Hydraulic Pump (Power Steering, Three Point Hydraulic System)



#### Preparation

1. Remove the side cover RH (11).
2. Disconnect the independent PTO delivery pipe (5), power steering delivery hose (4) and power steering return hose (3) from the regulator valve (2).
3. Remove the delivery pipe (8).
4. Disconnect the 3P delivery pipe 2 (7) from the three point system hydraulic pump (6).
5. Disconnect the suction rubber hose (1).

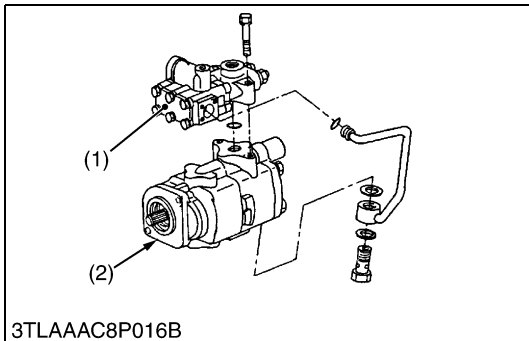
#### (When reassembling)

- Apply grease to the O-rings and take care not to damage them.
- Install the copper washers (9) firmly.

Tightening torque	Independent PTO delivery pipe joint bolt	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 ft-lbs
	Power steering delivery hose joint bolt	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 ft-lbs
	Delivery pipe (8) joint bolt	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 29.0 to 36.2 ft-lbs

- |   |                                      |
|---|--------------------------------------|
| (1) Suction Rubber Hose                 | (7) 3P Delivery Pipe                 |
| (2) Regulator Valve                     | (8) Delivery Pipe                    |
| (3) Power Steering Return Hose          | (9) Copper Washers                   |
| (4) Power Steering Delivery Hose        | (10) Hydraulic Pump (Power Steering) |
| (5) Independent PTO Delivery Pipe       | (11) Side Cover RH                   |
| (6) Hydraulic Pump (Three Point System) |                                      |

W1018543



#### Regulator Valve and Hydraulic Pump Assembly

1. Loosen and remove the regulator valve mounting screws.
2. Take out the regulator valve (1).
3. Loosen and remove the hydraulic pump assembly mounting screws and nuts, then take out the hydraulic pump assembly

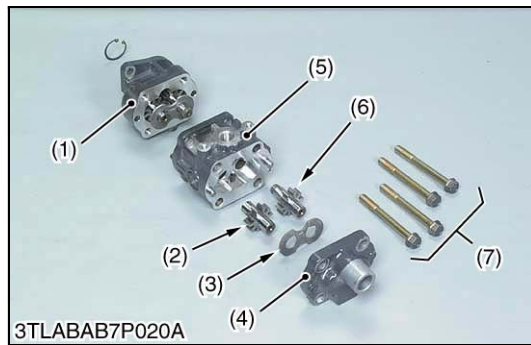
#### (When reassembling)

- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Regulator valve mounting screws	17.6 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs
	Hydraulic pump assembly mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs

- |                     |                             |
|---------------------|-----------------------------|
| (1) Regulator Valve | (2) Hydraulic Pump Assembly |
|---------------------|-----------------------------|

W1016911



### Hydraulic Pump Assembly

1. Remove the pump cover mounting screw (7).
2. Remove the drive gear (6), driven gear (2) and side plate (3) from the casing.

#### (When reassembling)

- Take care not to damage the gasket.
- Align the hole of the pump cover (4) and casing 2 (5).
- Install the side plate, noting its location and direction.
- Install the gears, noting its direction.

Tightening torque	Pump cover mounting screw	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) Casing 1  
(2) Driven Gear  
(3) Side Plate  
(4) Pump Cover

- (5) Casing 2  
(6) Drive Gear  
(7) Screw

W1017259

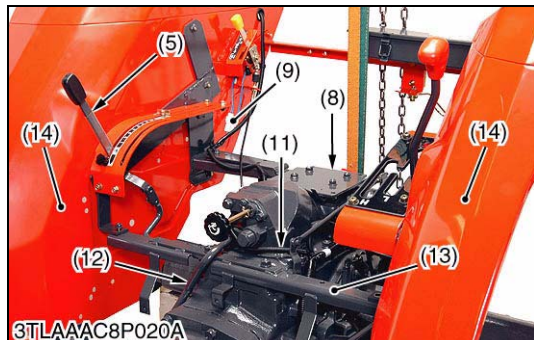
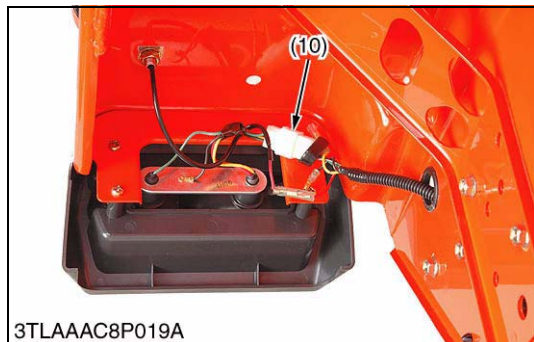
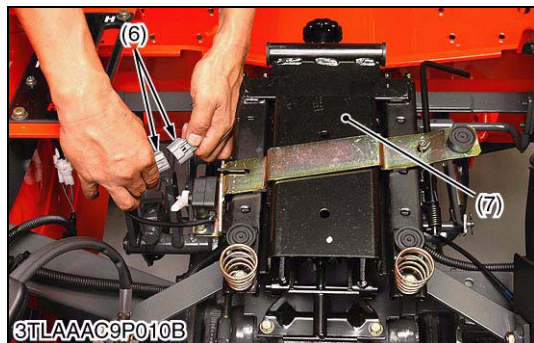
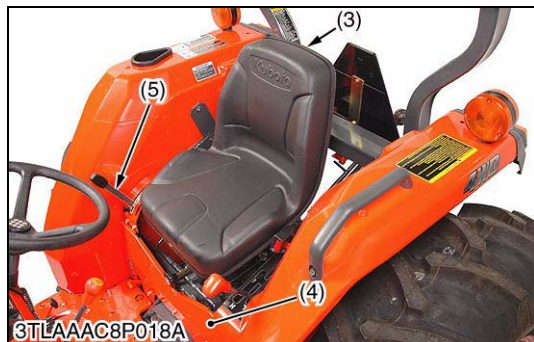
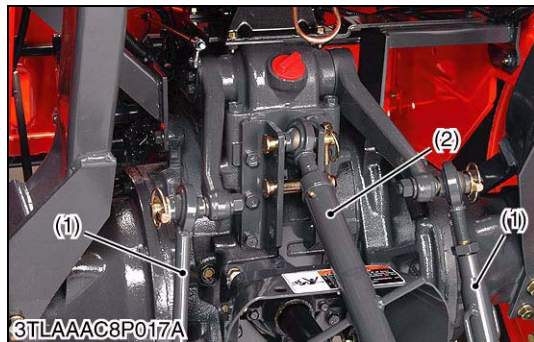
### Hydraulic Pump Running-in

After reassembly, perform break-in operation in the following manner, and check the pump for abnormality before use. If the pump temperature should rise noticeably during running-in, recheck should be performed.

1. Install the hydraulic pump to the tractor, and mount the suction pipe and delivery pipe securely.
2. Set the engine speed at 1300 to 1500 mm<sup>-1</sup> (rpm), and operate the hydraulic pump at no load for about 10 minutes.
3. Set the engine speed at 2000 to 2200 mm<sup>-1</sup> (rpm), and with the hydraulic pump applied with 2.94 MPa (30 kgf/cm<sup>2</sup>, 427 psi) to 4.90 MPa (50 kgf/cm<sup>2</sup>, 711 psi) pressure, operate it for approx. 15 minutes.
4. With the engine set to maximum speed, fully turn the steering wheel to the left or right, then actuate the relief valve five times for 25 seconds (one time 5 seconds).

W1027641

## (2) Hydraulic Cylinder



### Preparation

1. Remove lift-rods (1), top link (2) and rear wheels.
2. Remove seat (3).
3. Remove step cover (4).
4. Remove upper part of position control lever (5).
5. Disconnect OPC switch connector (6) and then remove the seat stay (7) and seat support (8).
6. Disconnect PTO switch connector (9), rear combination lamp RH connector (10) and then clear wiring harness (11) from the hydraulic cylinder.
7. Disconnect 3P delivery pipe 1 (12), fender stay (13) and fenders (14).

### (When reassembling)

- Install the copper washers firmly.

Tightening torque	3P delivery pipe 1 mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 ft-lbs
	Delivery pipe joint bolt	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 ft-lbs

- |                            |   |
|----------------------------|---|
| (1) Lift Rod               | (8) Seat Support                        |
| (2) Top Link               | (9) PTO Switch Connector                |
| (3) Seat                   | (10) Rear Combination Lamp RH Connector |
| (4) Step Cover             | (11) Wiring Harness                     |
| (5) Position Control Lever | (12) 3P delivery Pipe 1                 |
| (6) OPC Switch Connector   | (13) Fender Stay                        |
| (7) Seat Stay              | (14) Fender                             |

W1021098



### Hydraulic Cylinder

1. Loosen and remove the hydraulic cylinder assembly mounting screws and nuts.
2. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then take out it.

#### (When reassembling)

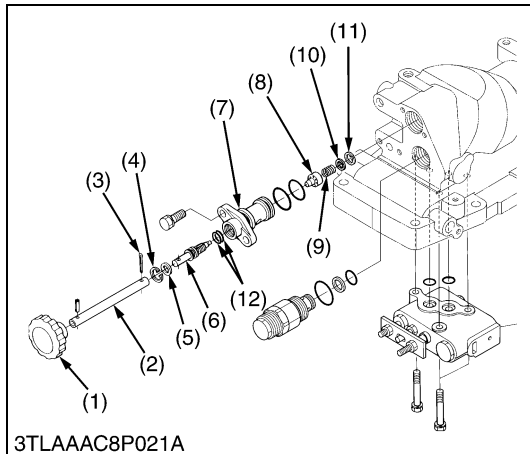
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.
- When replacing the hydraulic cylinder assembly mounting stud bolts, apply liquid lock (Three Bond 1372 or equivalent) to "A" portion of the stud bolt.

Tightening torque	Hydraulic cylinder assembly mounting stud bolts	34.2 to 49.0 N·m 3.5 to 5.0 kgf·m 25.3 to 36.2 ft-lbs
	Hydraulic cylinder assembly mounting screws and nuts	77.4 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 ft-lbs

#### ■ NOTE

- Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod and draft control rod (if equipped). (See page 8-S12, S13.)

W9632587



### Lowering Speed Adjusting valve

1. Remove the lowering speed adjusting valve assembly from hydraulic cylinder block.
2. Remove the internal snap ring (4), and remove the hydraulic adjusting shaft (6).
3. Remove the internal snap ring (11), and draw out the spring (9) and adjusting collar (8).

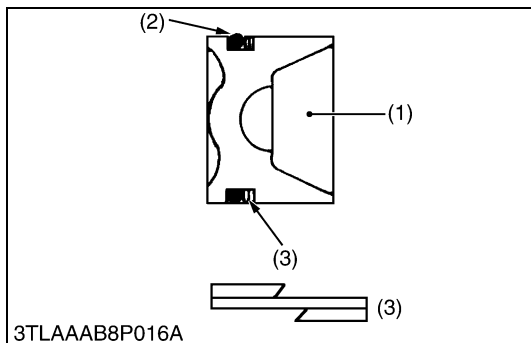
#### (When reassembling)

- Install the hydraulic adjusting shaft (6) to valve body (7), noting two O-rings (12).

- |                               |                         |
|-------------------------------|-------------------------|
| (1) Grip                      | (7) Valve Body          |
| (2) Extension Shaft           | (8) Adjusting Collar    |
| (3) Cotter Pin                | (9) Spring              |
| (4) Internal Snap Ring        | (10) Washer             |
| (5) Washer                    | (11) Internal Snap Ring |
| (6) Hydraulic Adjusting Shaft | (12) O-ring             |

W1021758





### Hydraulic Rod and Hydraulic Piston

1. Tap out the spring pin.
2. Remove the hydraulic rod.
3. Remove the plug (screw head size: 17 mm) from front of hydraulic cylinder.
4. Inject the compressed air through the plug hole, and take out the hydraulic piston.



#### CAUTION

- Do not put your hand into the hydraulic cylinder block because the hydraulic piston jumps out with a strong force, which is dangerous

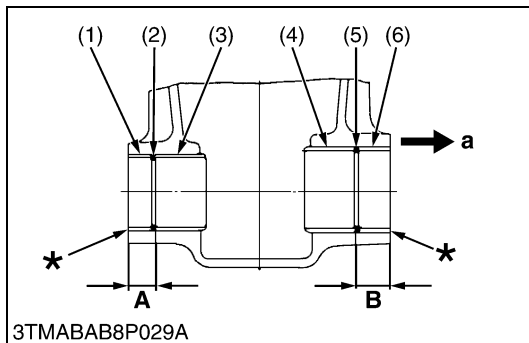
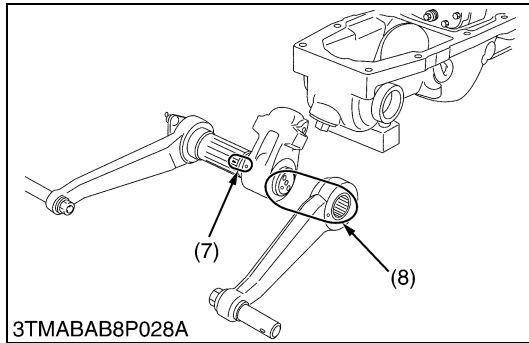
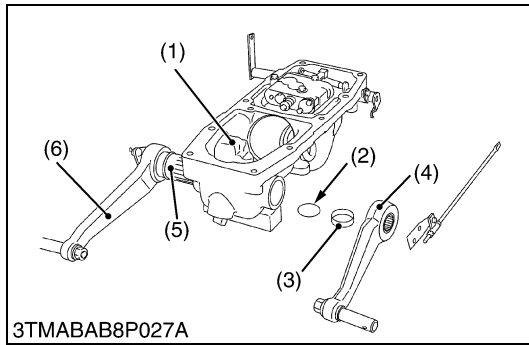
#### (When reassembling)

- Install the piston, noting O-ring and back-up ring (3). (See figure).
- Apply grease to the piston bottom contacts with hydraulic rod.
- Apply transmission fluid to the cylinder, and then install the hydraulic piston (1).

- (1) Hydraulic Piston  
(2) O-ring

- (2) Back-up

W1030125



### Lift Arm, Hydraulic Arm and Hydraulic Arm Shaft

1. Disconnect the feedback rod from feedback lever.
2. Remove the lift arm setting screws.
3. Remove the lift arm LH (4).
4. Draw out the hydraulic arm shaft (5) and lift arm RH (6) as a unit.
5. Take out the hydraulic arm (1).
6. Remove the collar (3) and O-ring (2).

#### (When reassembling)

- Align the alignment marks (7) of the hydraulic arm (1) and hydraulic arm shaft (5).
- Align the alignment marks (8) of the lift arms (6), (4) and hydraulic arm shaft (5).
- Apply grease to the right and left bushings of hydraulic cylinder block and O-ring (2).
- Take care not to damage the O-ring (2).

- |                         |  |
|-------------------------|--|
| (1) Hydraulic Arm       | (7) Alignment Mark (Hydraulic Arm Shaft and Hydraulic Arm) |
| (2) O-ring              | (8) Alignment Mark (Hydraulic Arm Shaft and Lift Arm)      |
| (3) Collars             |  |
| (4) Lift Arm LH         |  |
| (5) Hydraulic Arm Shaft |  |
| (6) Lift Arm RH         |  |

W1031551

### Bushings

1. Remove the bushings (3) and (4).

#### (When reassembling)

- When press-fitting new bushings (3), (4) with a press-fitting tool (see page G-47) observe the dimensions described in the figure.
- Apply transmission fluid to the hydraulic cylinder boss and bushing.
- Press- fit the bushing so that each seam face upward.

Press-fit location of bushings	Factory spec.	A (Left side)	20.0 to 21.0 mm 0.79 to 0.83 in.
		B (Right side)	18.0 to 19.0 mm 0.71 to 0.75 in.

- |                    |   |
|--------------------|---|
| (1) Collar (Left)  | <b>a : Right Side *Flush the end of collar with the end of hydraulic cylinder body.</b> |
| (2) O-ring         |   |
| (3) Bushing (Left) |   |
| (4) Bushing        |   |
| (5) O-ring         |   |
| (6) Collar (Right) |   |

W1032912

### (3) Position Control Valve



#### Position Control Valve

1. Loosen and remove the position control valve mounting screws.
2. Take out the position control valve (1).

#### (When reassembling)

- Take care not to damage the O-rings.

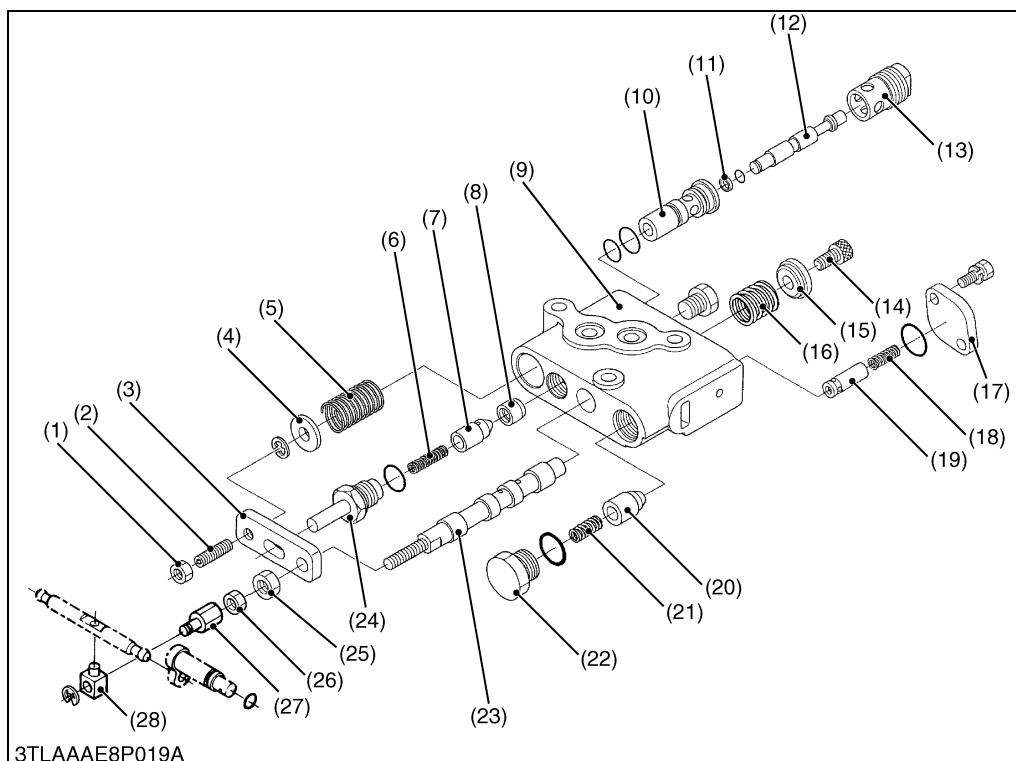
Tightening torque	Position control valve mounting screws	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
-------------------	--	---

#### ■ IMPORTANT

- Measure the distance between the spool edge and spool joint 2 edge before disassembling.

(1) Position Control Valve

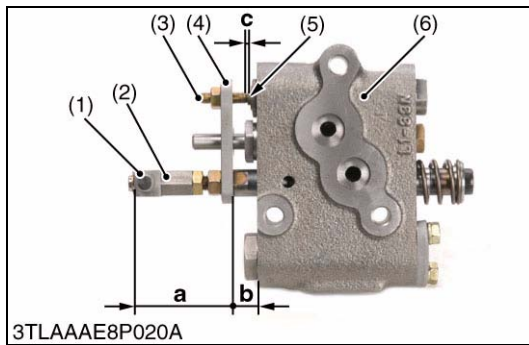
W1034144



- (1) Nut 1
- (2) Set Screw
- (3) Plate 1
- (4) Washer
- (5) Spring
- (6) Spring
- (7) Poppet 1
- (8) Valve Seat
- (9) Valve Body
- (10) Sleeve
- (11) Backup Ring
- (12) Poppet 2
- (13) Plug 1
- (14) Screw
- (15) Spring Holder
- (16) Spring
- (17) Plate 2
- (18) Spring
- (19) Poppet 3
- (20) Unload Poppet
- (21) Spring
- (22) Unload Plug
- (23) Spool
- (24) Plug 2
- (25) Nut
- (26) Lock Nut
- (27) Spool Joint 1
- (28) Spool Joint 2

W1016748





#### ■ IMPORTANT

- Set screw (3) and spool joint 1 (2) are adjusted to very close accuracy. Do not disassemble them unless necessary. If disassembled due to unavoidable reasons, be sure to make the following adjustments before assembling.

#### ■ Spool joint 1 (2)

1. Turn and adjust the spool joint 1 (2) so that the dimension (a) between the spool joint 2 (1) and the plate 1 (4) is 47.0 to 48.0 mm (1.85 to 1.89 in.).
2. After the adjustment, be sure to adjust the position control feedback rod.

#### ■ Set screw (3)

1. Set the dimension (b) between the plate 1 (4) and the valve body to 16.0 mm (0.63 in.).
2. Turn and adjust the set screw (3) so that the clearance (c) between the set screw (3) and the poppet 2 (5) becomes 0.1 to 0.2 mm (0.0039 to 0.0079 in.).

#### (When reassembling)

Tightening torque	Plug 1	39.2 to 58.8 N·m 4.0 to 6.0 kgf·m 28.9 to 43.4 ft-lbs
	Plug 2	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.2 ft-lbs
	Unload plug	39.2 to 58.8 N·m 4.0 to 6.0 kgf·m 28.9 to 43.4 ft-lbs

- (1) Spool Joint 2
- (2) Spool Joint 1
- (3) Set Screw
- (4) Plate 1
- (5) Poppet 2
- (6) Valve Body

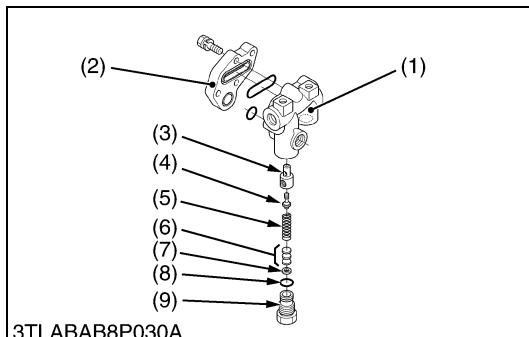
a : Dimension

b : Dimension

c : Clearance

W1017128

## (4) Relief Valve



#### Relief Valve

1. Remove the plug (9), and draw out the spring (5) and the poppet (4).
2. Take out the valve seat (3).

#### (When reassembling)

- Take care not to damage the O-rings.

Tightening torque	Relief valve plug	49.0 to 69.0 N·m 5.0 to 7.0 kgf·m 36.1 to 50.6 ft-lbs
-------------------	-------------------	---

#### ■ IMPORTANT

- After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure.

- (1) Front Hydraulic Block
- (2) Cap
- (3) Valve Seat
- (4) Poppet
- (5) Spring

(6) Adjusting Shim

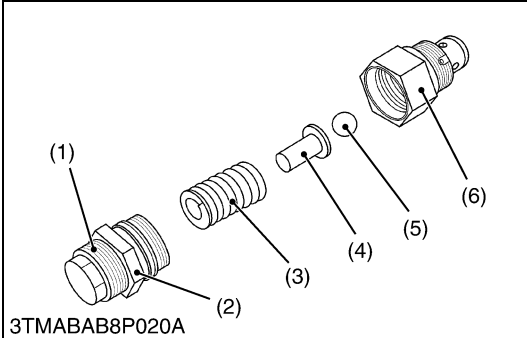
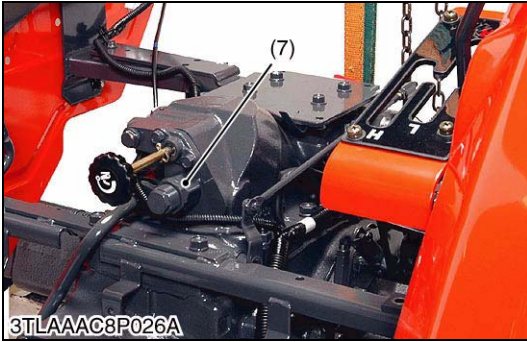
(7) Washer

(8) O-ring

(9) Plug

W1024698

## (5) Cylinder Safety Valve



### Cylinder Safety Valve

1. Remove the cylinder safety valve assembly (7).
2. Secure the cylinder safety valve assembly with a vise.
3. Loosen the lock nut (2), and remove the adjust screw (1).
4. Draw out the spring (3), seat (4), and ball (5).

#### (When reassembling)

- Install the cylinder safety valve to the hydraulic cylinder block, taking care not to damage the O-ring.

Tightening torque	Cylinder safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 ft-lbs
	Cylinder safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 ft-lbs

#### ■ IMPORTANT

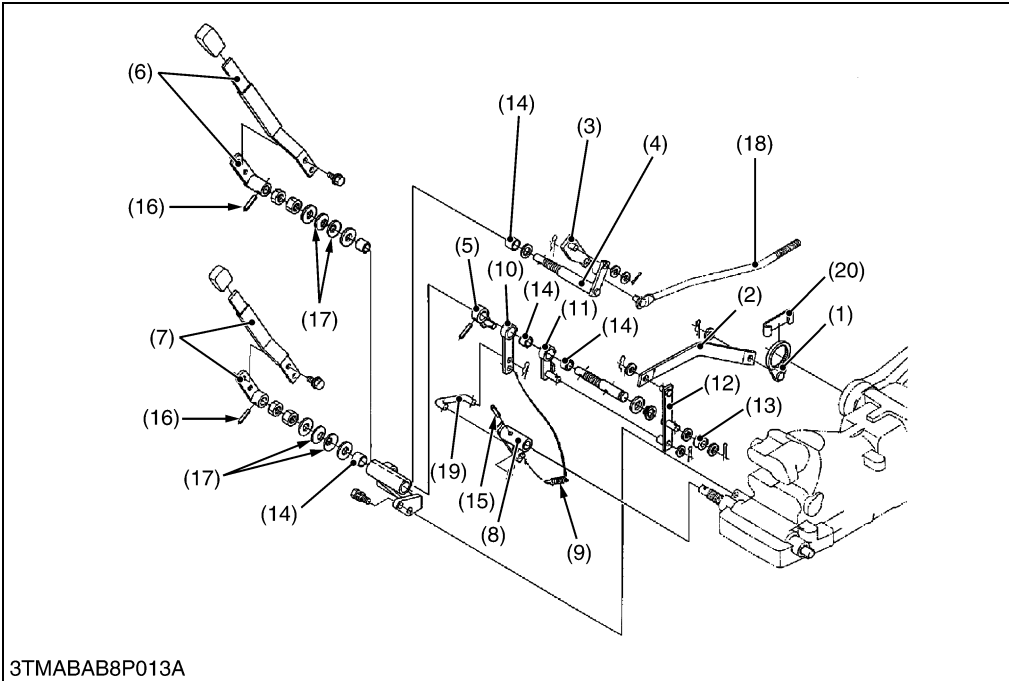
- After disassembling and assembling the cylinder safety valve assembly, be sure to check the operating pressure.

- (1) Adjust Screw  
(1) Lock Nut  
(1) Spring  
(1) Seat

- (5) Ball  
(5) Housing  
(5) Safety valve Assembly

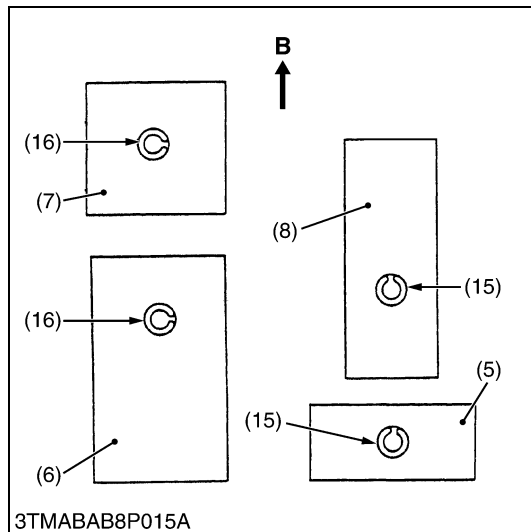
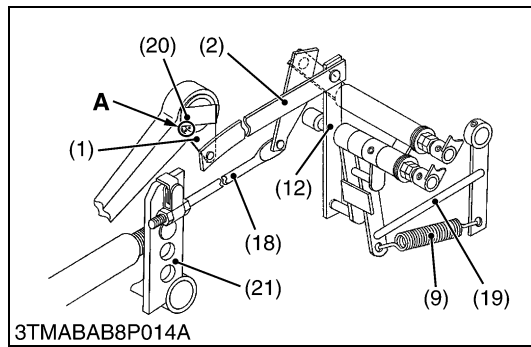
W1023313

## (6) Position Control and Draft Control Linkage (If Equipped)



- (1) Feedback Rod Stay  
(2) Feedback Rod  
(3) Draft Cam  
(4) Draft Control Lever Shaft  
(5) Position Control Link  
(6) Position Control Lever  
(7) Draft Control Lever  
(8) Arm 2  
(9) Return Spring  
(10) Arm 1  
(11) Draft Control Link 1  
(12) Draft Control Link 2  
(13) Roller  
(14) Bushings  
(15) Spring Pins  
(16) Spring Pins  
(17) Disc Springs  
(18) Draft Control Rod  
(19) Control Rod  
(20) Stopper  
(21) Top Link Bracket  
**A : Punched Marks**  
**B : Hydraulic Cylinder Block Side**

W1037832



1. Disconnect the draft control rod (18) from the top link bracket (21).
2. Remove the position control lever (6) and draft control lever (7).
3. Disconnect the draft control feedback rod (2) from the draft control link 2 (12).
4. Remove the control rod (19) and return spring (9).
5. Remove the position and draft control linkage assembly mounting screws, and then take out the position and draft control linkage assembly.
6. Remove the draft control feedback rod stay stopper (20) and draft control feedback rod stay (1).

#### (When reassembling)

- Assemble so that the punch mark of the feedback rod stay (1) is set to the punch mark of the hydraulic arm shaft.
- Securely fit the rod stay stopper (20) into the groove of the hydraulic arm shaft.
- After reassembling, be sure to adjust the position control feedback rod and draft control rod (if equipped). (See page 8-S12, 13.).
- Apply grease to the bushings (14), roller (13), draft control link 1 (11) and disc springs (17).
- Tap in the spring pins (15), (16) so that their split portion as shown in the figure left.

Tightening torque	Control linkage assembly mounting screws	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
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W1022485

## [3] SERVICING

### (1) Hydraulic Pump (Power Steering, Three Point System)



#### Housing Bore (Depth of Scratch)

1. Check for the scratches on the interior surface of the housing caused by the gear.
2. If the scratches reach more than half the area of the interior surface of the housing, replace the pump assembly.
3. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
4. If the values obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.
------------------	-----------------	-----------------------

#### (Reference)

- Use a cylinder gauge to measure the housing I.D..

W1014649



### **Clearance between Bushing and Gear Shaft**

1. Measure the gear shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with an inside micrometer or cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the gear shaft and the bushings as a unit.

Clearance between bushing and gear shaft	Factory spec.	0.020 to 0.081 mm 0.0008 to 0.0032 in.
	Allowable limit	0.15 mm 0.0059 in.

Gear shaft O.D.	Factory spec.	14.970 to 14.980 mm 0.5894 to 0.5898 in.
Bushing I.D.	Factory spec.	15.000 to 15.051 mm 0.5906 to 0.5926 in.

W1029112



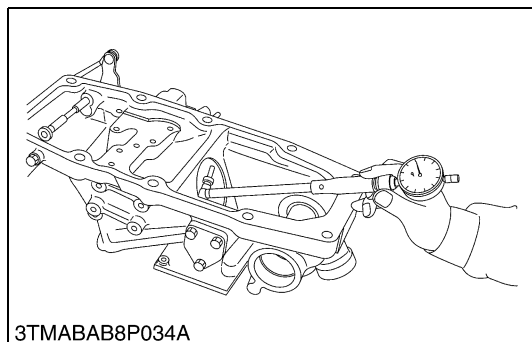
### **Side Plate Thickness**

1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory spec.	2.48 to 2.50 mm 0.0976 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

W1023443

## **(2) Hydraulic Cylinder**

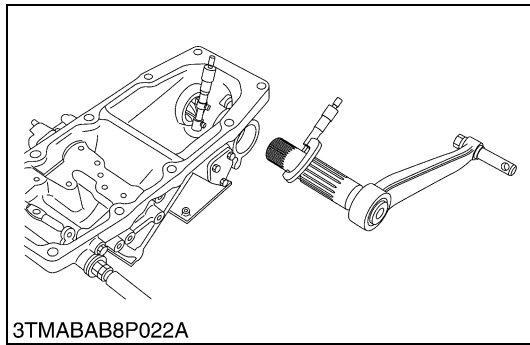


### **Hydraulic Cylinder Bore**

1. Check the cylinder internal surface for scoring or damage.
2. Measure the cylinder I.D. with a cylinder gauge.
3. If the measurement exceeds the allowable limit, replace the hydraulic cylinder block.

Cylinder I.D.	Factory spec.	90.000 to 90.050 mm 3.54330 to 3.54527 in.
	Allowable limit	90.150 mm 3.54921 in.

W1026023



### Clearance between Hydraulic Arm Shaft and Bushing

1. Measure the hydraulic arm shaft O.D. with an outside micrometer.
2. Measurement the bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

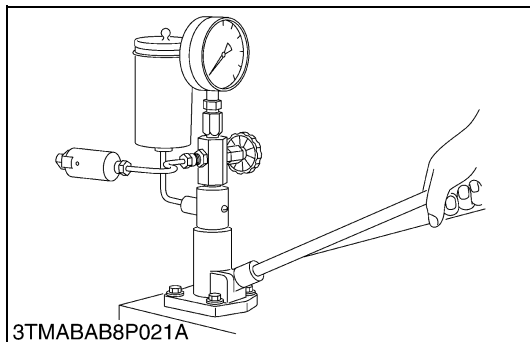
Clearance between hydraulic arm shaft and bushing	Factory spec.	Right	0.125 to 0.230 mm 0.0049 to 0.0091 in.
		Left	0.125 to 0.220 mm 0.00492 to 0.00866 in.
	Allowable limit	Right	0.50 mm 0.197 in.
		Left	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D.	Factory spec.	Right	44.920 to 44.950 mm 1.76850 to 1.76968 in.
		Left	39.920 to 39.950 mm 1.57165 to 1.57283 in.

Bushing I.D. (after press fitted)	Factory spec.	Right	45.075 to 45.150 mm 1.77460 to 1.77756 in.
		Left	40.075 to 40.140 mm 1.57775 to 1.58031 in.

W1026122

### (3) Cylinder Safety Valve



### Operating Pressure of Cylinder Safety Valve

1. Attach the cylinder safety valve to injection nozzle tester with a safety valve setting adaptor.
2. Measurement the operating pressure of the cylinder safety valve.
3. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw (1).
4. After adjustment, tighten the lock nut (2) firmly.

#### NOTE

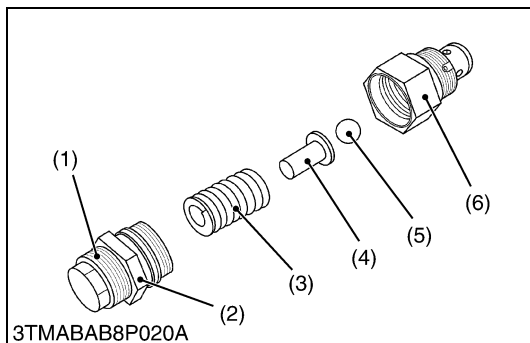
- Use specified transmission fluid (see page G-8) to test the operating pressure of the cylinder safety valve.

Cylinder safety valve operating pressure	Factory spec.	19.6 to 22.6 MPa 200 to 230 kgf/cm <sup>2</sup> 2845 to 3277 psi
--	---------------	--

Tightening torque	Lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 ft·lbs
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- (1) Adjusting Screw  
(2) Lock Nut  
(3) Spring

- (4) Seat  
(5) Ball  
(6) Housing



W1029814

# **9 ELECTRICAL SYSTEM**

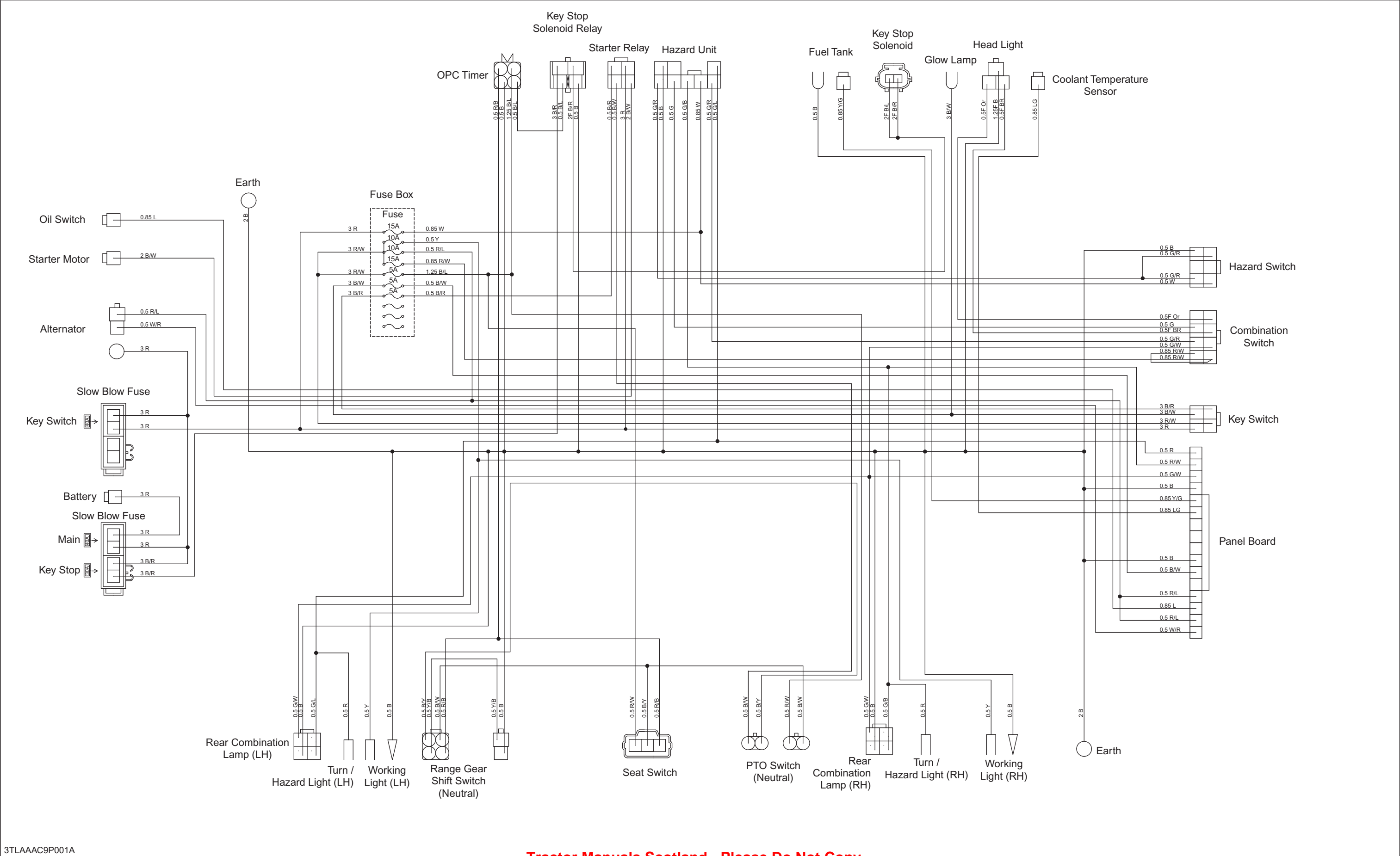
# MECHANISM

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1. WIRING DIAGRAM .....	9-M1
2. OPERATOR PRESENCE CONTROL .....	9-M3
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[2] SEAT SWITCH AND OPC TIMER .....	9-M8



1. WIRING DIAGRAM



**Color of Wiring**

B ..... Black	L/R ..... Blue / Red	R/W ..... Red / White
B/L ..... Black / Blue	L/W ..... Blue / White	R/Y ..... Red / Yellow
B/R ..... Black / Red	L/Y ..... Blue / Yellow	Sb ..... Sky Blue
B/W ..... Black / White	L/Or ..... Blue / Orange	W ..... White
B/Y ..... Black / Yellow	Lg ..... Light Green	W/B ..... White / Black
Br ..... Brown	Lg/B ..... Light Green / Blue	W/G ..... White / Green
G ..... Green	Lg/Y ..... Light Green / Yellow	W/L ..... White / Blue
G/L ..... Green / Blue	Or ..... Orange	W/R ..... White / Red
G/R ..... Green / Red	P ..... Pink	W/Y ..... White / Yellow
G/W ..... Green / White	R ..... Red	Y ..... Yellow
L ..... Blue	R/B ..... Red / Black	Y/B ..... Yellow / Black
L/B ..... Blue / Black	R/G ..... Red / Green	Y/G ..... Yellow / Green
L/G ..... Blue / Green	R/L ..... Red / Blue	Y/R ..... Yellow / Red

W1019456

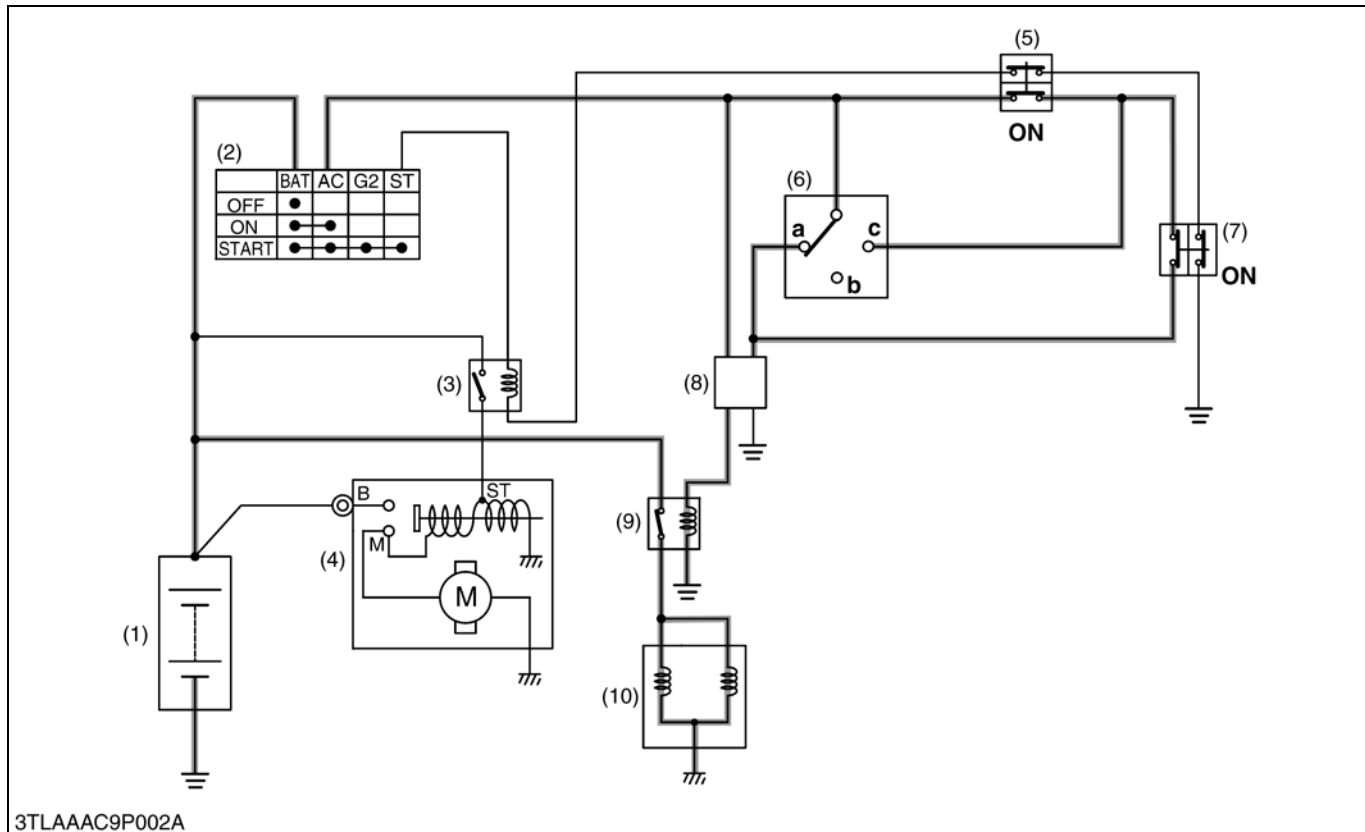
## 2. OPERATOR PRESENCE CONTROL

This tractor is equipped with Operator Presence Control (OPC) system which automatically stops the engine when operator gets up from the seat while shifting the PTO lever (PTO clutch control lever) or the range gear shift lever (Lo-R, Hi).

The system is controlled by a seat switch (6), OPC timer (8), key stop solenoid relay (9), key stop solenoid (10), PTO switch (5) and range gear shift switch (7).

### [1] ELECTRIC CIRCUIT

When sitting on the seat, the engine in the state of running, the PTO lever (PTO clutch control lever) in "OFF" position and the range gear shift lever (Lo-R, Hi) in "Neutral" position, the current flow is shown in Figure below.



- (1) Battery
- (2) Main Switch
- (3) Starter Relay
- (4) Starter

- (5) PTO Switch (2 pieces)
- (6) Seat Switch
- (7) Range Gear Shift Switch (2 pieces)

- (8) OPC Timer
- (9) Key Stop Solenoid Relay
- (10) Key Stop Solenoid

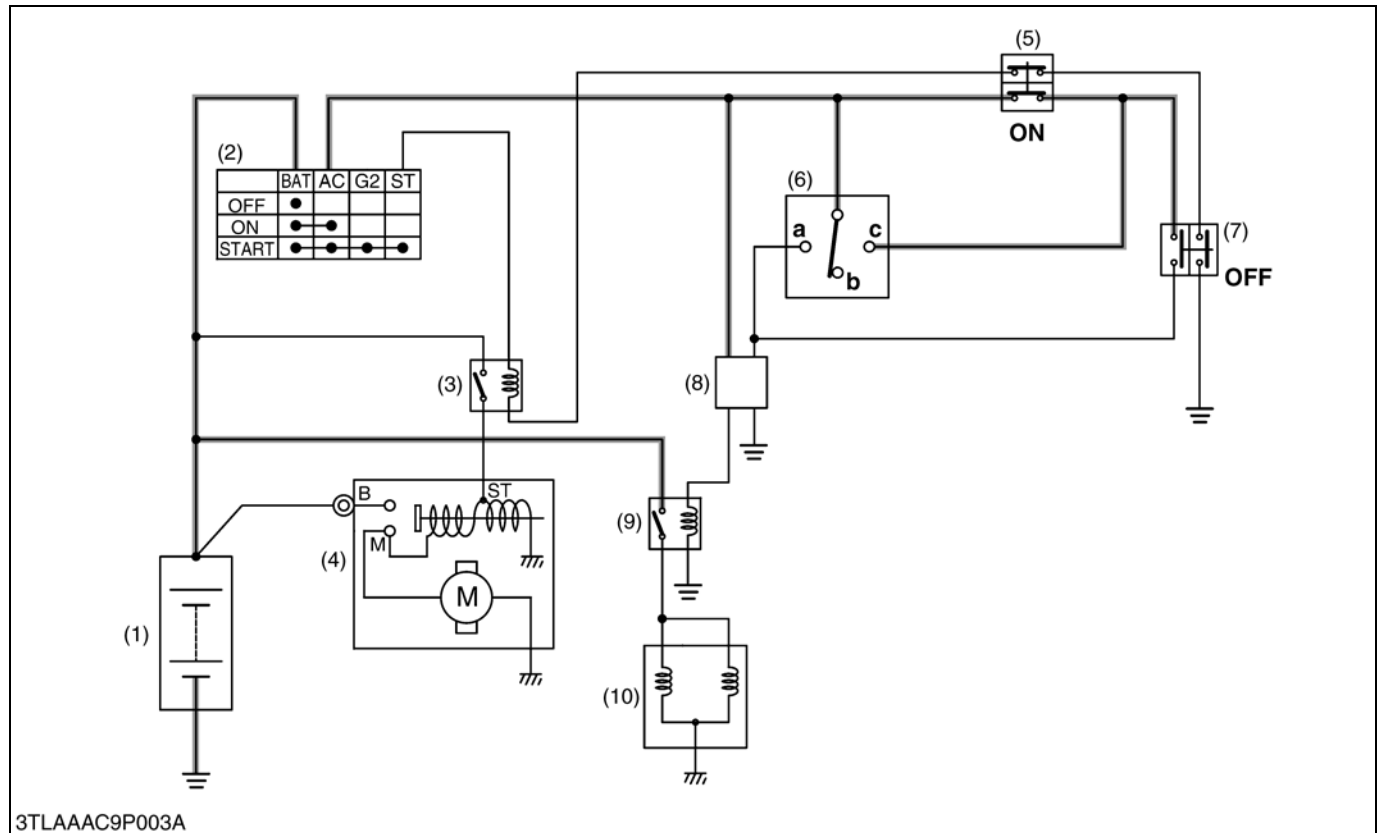
- a: When operator sits on the seat.
- b: When operator does not sit on the seat (When operator gets up from the seat)
- c: When seat is tilted forward

#### ■ NOTE

- PTO switch is "ON" when PTO lever in "OFF" position.
- Range gear shift switch is "ON" when range gear shift lever in "Neutral" position.

### ■ Engine Stops (Case 1)

When operator gets up from the seat while placing the PTO lever in "**OFF**" position and the range gear shift lever in "**Low**" or "**Reverse**" or "**High**" position, the current flow is shown in Figure below.



- (1) Battery
- (2) Main Switch
- (3) Starter Relay
- (4) Starter

- (5) PTO Switch (2 pieces)
- (6) Seat Switch
- (7) Range Gear Shift Switch (2 pieces)

- (8) OPC Timer
- (9) Key Stop Solenoid Relay
- (10) Key Stop Solenoid

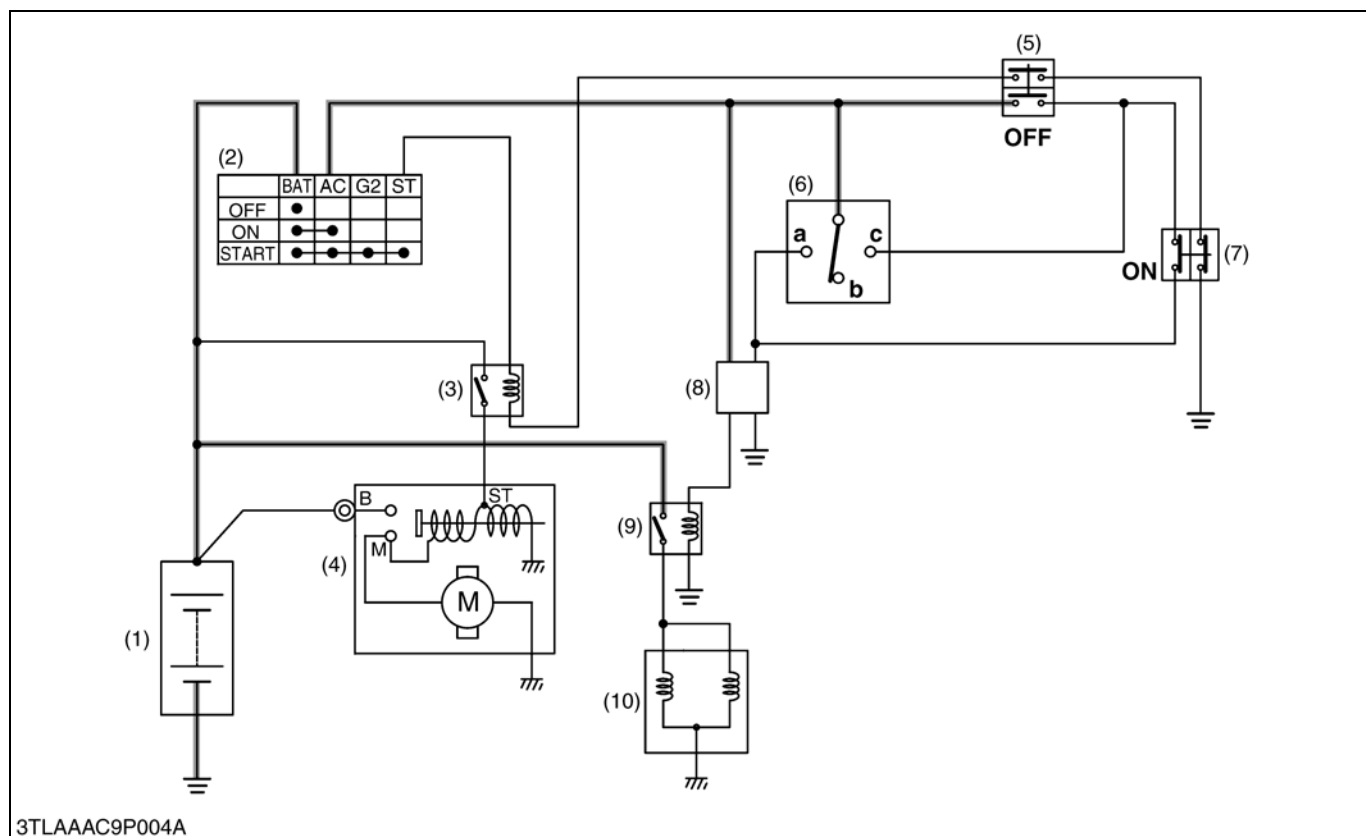
- a: When operator sits on the seat.
- b: When operator does not sit on the seat (When operator gets up from the seat)
- c: When seat is tilted forward

### ■ NOTE

- PTO switch is "**ON**" when PTO lever in "**OFF**" position.
- Range gear shift switch is "**ON**" when range gear shift lever in "**Neutral**" position.

### ■ Engine Stops (Case 2)

When operator gets up from the seat while placing the PTO lever in "**ON**" position and the range gear shift lever (Lo-R, Hi) in "**Neutral**" position. The current flow is shown in Figure below.



- (1) Battery
- (2) Main Switch
- (3) Starter Relay
- (4) Starter

- (5) PTO Switch (2 pieces)
- (6) Seat Switch
- (7) Range Gear Shift Switch (2 pieces)

- (8) OPC Timer
- (9) Key Stop Solenoid Relay
- (10) Key Stop Solenoid

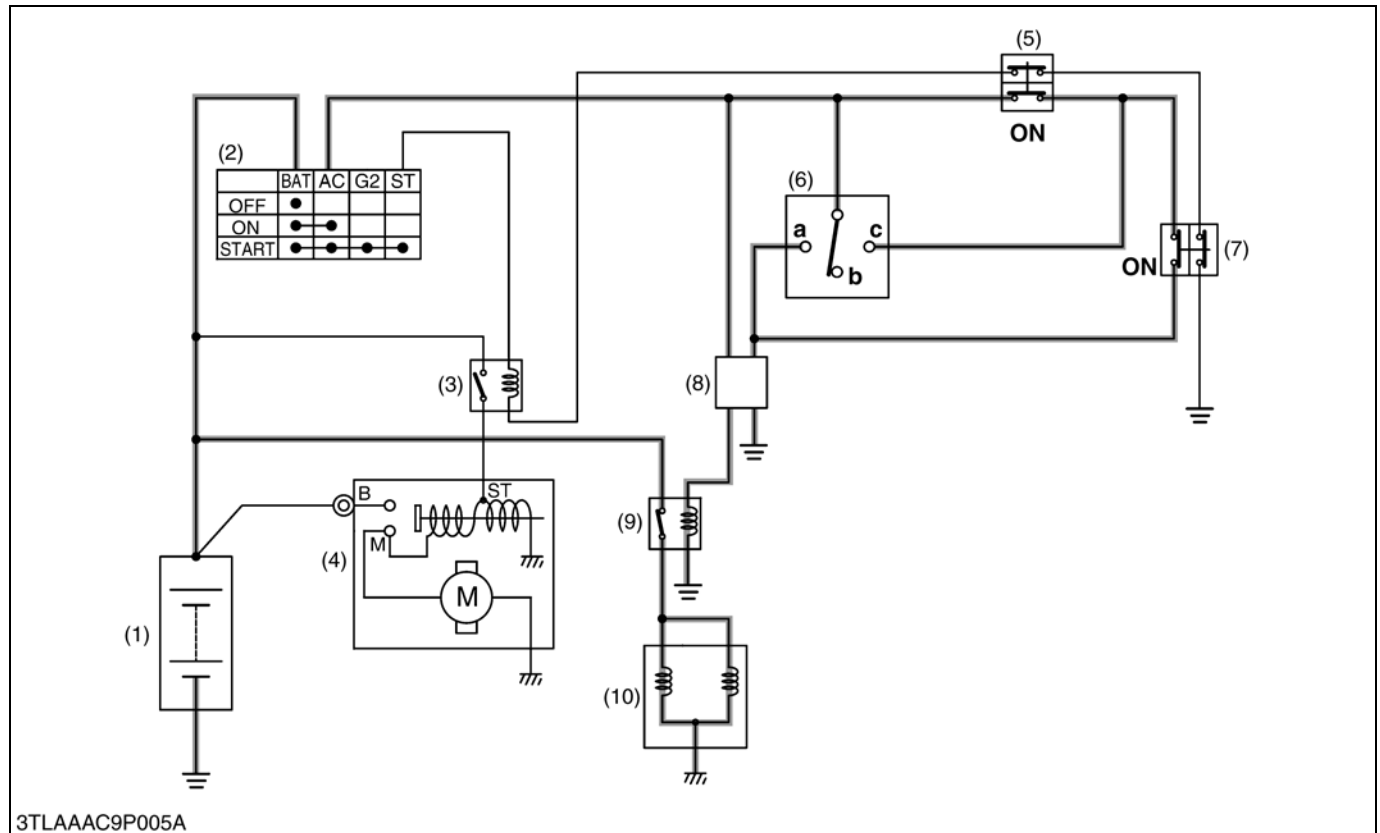
- a: When operator sits on the seat.
- b: When operator does not sit on the seat (When operator gets up from the seat)
- c: When seat is tilted forward

### ■ NOTE

- PTO switch is "**ON**" when PTO lever in "**OFF**" position.
- Range gear shift switch is "**ON**" when range gear shift lever in "**Neutral**" position.

### ■ Engine Does Not Stop (Case 1)

When operator gets up from the seat while placing the PTO lever in "**OFF**" position and the range gear shift lever (Lo-R, Hi) in "**Neutral**" position. The current flow is shown in Figure below.



- (1) Battery
- (2) Main Switch
- (3) Starter Relay
- (4) Starter

- (5) PTO Switch (2 pieces)
- (6) Seat Switch
- (7) Range Gear Shift Switch (2 pieces)

- (8) OPC Timer
- (9) Key Stop Solenoid Relay
- (10) Key Stop Solenoid

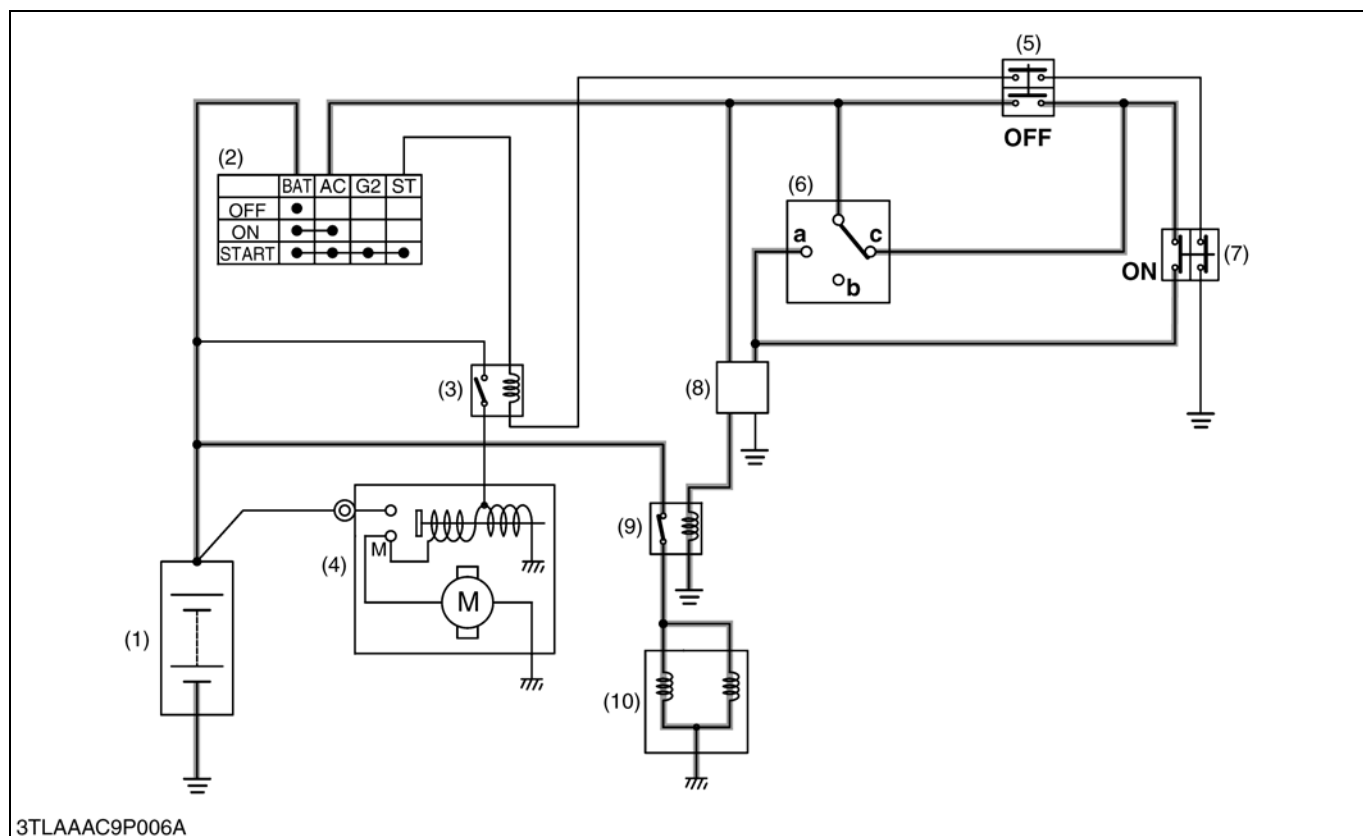
- a: When operator sits on the seat.
- b: When operator does not sit on the seat (When operator gets up from the seat)
- c: When seat is tilted forward

### ■ NOTE

- PTO switch is "**ON**" when PTO lever in "**OFF**" position.
- Range gear shift switch is "**ON**" when range gear shift lever in "**Neutral**" position.

### ■ Engine Does Not Stop (Case 2)

When operator gets off the tractor and then tilts the operator's seat forward (The PTO lever in "**ON**" position and the range gear shift lever (Lo-R, Hi) in "**Neutral**" position). The current flow is shown in Figure below.



- (1) Battery
- (2) Main Switch
- (3) Starter Relay
- (4) Starter

- (5) PTO Switch (2 pieces)
- (6) Seat Switch
- (7) Range Gear Shift Switch (2 pieces)

- (8) OPC Timer
- (9) Key Stop Solenoid Relay
- (10) Key Stop Solenoid

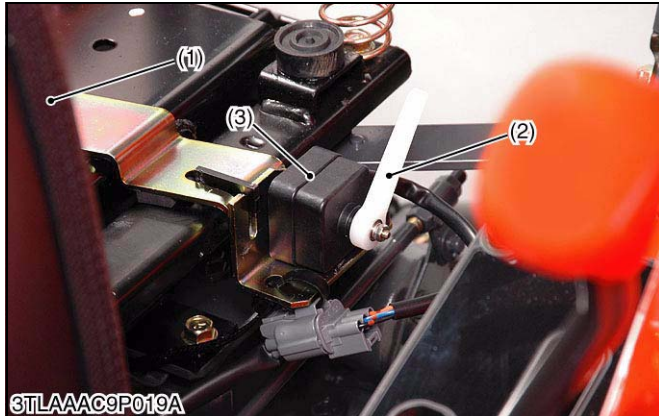
- a: When operator sits on the seat.
- b: When operator does not sit on the seat (When operator gets up from the seat)
- c: When seat is tilted forward

### ■ NOTE

- PTO switch is "**ON**" when PTO lever in "**OFF**" position.
- Range gear shift switch is "**ON**" when range gear shift lever in "**Neutral**" position.



## [2] SEAT SWITCH AND OPC TIMER



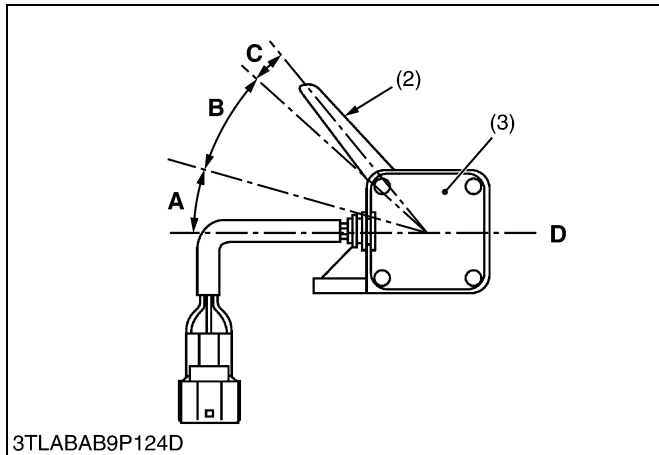
The seat switch (3) has three positions. One is **"ON"** when operator sits on the seat, **"OFF"** when operator gets up from the seat and **"ON"** again when the seat is tilted forward.

The OPC timer retains in **"ON"** position for about one second after cutting the current supply.

- (1) Seat
- (2) Sensor Bar
- (3) Seat Switch

- A : Seat Switch is ON
- B : Seat Switch is OFF
- C : Seat Switch is ON
- D : Seat Suspension Plate (Reference Line)

W1013834



# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>All Electrical Equipments Do Not Operate</b>	Battery discharged or defective	Recharge or replace	9-S8
	Battery positive cable disconnected or improperly connected	Repair or replace	9-S8
	Battery negative cable disconnected or improperly connected	Repair or replace	9-S8
	Slow-blow fuse blown	Replace	G-32
<b>Fuse Blown Frequently</b>	Short-circuit	Repair or replace	—

W1014322

## BATTERY

<b>Battery Discharges Too Quickly</b>	Battery defective	Recharge or replace	9-S8
	Alternator defective	Repair or replace	9-S25 to S27, S30, S31
	Wiring harness disconnected or improperly connected (between battery positive terminal and alternator <b>B</b> terminal)	Repair or replace	—
	Cooling fan belt slipping	Adjust tension	—

W1013718

**STARTING SYSTEM**

Symptom	Probable Cause	Solution	Reference Page
<b>Starter Motor Does Not Operate</b>	Battery discharged or defective	Recharge or replace	9-S8
	Slow blow fuse blown	Replace	G-32
	Safety switch defective (PTO and range gear shift lever (Lo-R, Hi))	Replace	9-S12
	Safety switch improperly adjusted	Repair	9-S12
	Wiring harness disconnected or improperly connected (between main switch <b>ST</b> terminal and safety switch between battery positive terminal and starter motor <b>B</b> terminal)	Repair or replace	—
	Starter motor defective	Repair or replace	9-S24, S27 to S29
	OPC timer defective	Replace	9-S13
	Main switch defective	Replace	9-S10, S11

W1013718

**OPC (OPERATOR'S PRESENCE CONTROL)**

<b>Does Not Stop Engine</b>	Seat switch defective	Replace	9-S14
	Key stop solenoid relay defective	Replace	9-S18
	Key stop solenoid defective	Replace	—
	OPC timer defective	Replace	—
	Safety switch defective (PTO and range gear shift lever (Lo-R, Hi))	Replace	—

W1013718

**CHARGING SYSTEM**

Symptom	Probable Cause	Solution	Reference Page
<b>Charging Lamp Does Not Light When Main Switch is Turned ON</b>	Fuse blown (10 A)	Replace	G-32
	Wiring harness disconnected or improperly connected (between main switch <b>AC</b> terminal and panel board, between panel board and alternator <b>L</b> terminal)	Repair or replace	—
<b>Charging Lamp Does Not Go Off When Engine is Running</b>	Short circuit between alternator terminal <b>L</b> lead and chassis	Repair or replace	—
	Alternator defective	Repair or replace	9-S25 to S27, S30, S31

W1013580

## LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
<b>Headlight Does Not Light</b>	Fuse blown (15 A)	Replace	G-32
	Bulb blown	Replace	G-32
	Wiring harness disconnected or improperly connected (between main switch <b>AC</b> terminal and combination switch <b>B1</b> terminal, between combination switch <b>1</b> terminal and head light, between combination switch <b>2</b> terminal and head light)	Repair or replace	—
<b>Illumination Light Does Not Light</b>	Fuse blown (10 A)	Replace	G-32
	Bulb blown	Replace	G-32
	Wiring harness disconnected or improperly connected (between combination switch <b>T</b> terminal and panel board)	Repair or replace	—
<b>Tail Light Does Not Light</b>	Fuse blown (15 A)	Replace	G-32
	Wiring harness disconnected or improperly connected (between combination switch <b>T</b> terminal and tail lights)	Repair or replace	—
<b>Hazard and Turn Signal Light Does Not Light</b>	Fuse blown (15 A)	Replace	G-32
	Bulb blown	Replace	G-32
	Wiring harness disconnected or improperly connected	Repair or replace	—
	Hazard unit defective	Replace	9-S22
	Hazard switch defective	Replace	9-S22
	Combination switch (turn signal switch) defective	Replace	—
<b>Hazard and Turn Signal Indicator Lamp Does Not Light</b>	Bulb blown	Replace	G-32
	Wiring harness disconnected or improperly connected	Repair or replace	—
<b>Hazard and Turn Signal Light Does Not Go ON and OFF</b>	Hazard unit defective	Replace	9-S22
<b>Work Light Does Not Light (Option)</b>	Fuse blown (10 A)	Replace	G-32
	Bulb blown	Replace	G-32
	Wiring harness disconnected or improperly connected (between starter motor <b>B</b> terminal and work light)	Repair or replace	—

W1013718

**EASY CHECKER**

Symptom	Probable Cause	Solution	Reference Page
<b>Engine Oil Pressure Lamp Lights Up When Engine is Running</b>	Engine oil pressure too low	Repair engine	1-S15
	Engine oil insufficient	Replenish	G-13
	Engine oil pressure switch defective	Replace	—
	Short circuit between engine oil pressure switch lead and chassis	Repair	—
	Circuit in panel board defective	Replace	—
<b>Engine Oil Pressure Lamp Does Not Light When Main Switch is Turned ON and Engine Is Not Running</b>	Bulb blown	Replace	—
	Engine oil pressure switch defective	Replace	—
	Wiring harness disconnected or improperly connected (between panel board and engine oil pressure switch)	Repair or replace	—
	Circuit in panel board defective	Replace	9-S81

W1013580

**GAUGES**

<b>Fuel Gauge Does Not Function</b>	Fuel gauge defective	Replace	9-S23
	Fuel level sensor (tank unit) defective	Replace	9-S23
	Wiring harness disconnected or improperly connected (between panel board and fuel level sensor)	Repair or replace	—
	Circuit in panel board defective	Replace	—
<b>Coolant Temperature Gauge Does Not Function</b>	Coolant temperature sensor defective	Replace	9-S23
	Wiring harness disconnected or improperly connected (between panel board and coolant temperature sensor)	Repair or replace	—
	Circuit in panel board defective	Replace	—

W1082345



## 2. SERVICING SPECIFICATIONS

### STARTER MOTOR

Item		Factory Specification	Allowable Limit
Commutator	O.D.	30.0 mm 1.181 in.	29.0 mm 1.142 in.
Mica	Undercut	0.50 to 0.80 mm 0.020 to 0.031 in.	0.2 mm 0.008 in.
Brush	Length	15.0 mm 0.591 in.	11.0 mm 0.433 in.
Brush Holder and Holder Support	Resistance	Infinity	—

W1013874

### ALTERNATOR

Brush	Length	10.5 mm 0.413 in.	8.4 mm 0.331 in.
Slip Ring	O.D.	14.4 mm 0.567 in.	14.0 mm 0.551 in.

W1082764

### GLOW PLUG

Glow Plug	Resistance	Approx. 0.9 $\Omega$	—
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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
Alternator pulley nut	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2
Starter terminal nut	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7

W1012736

## 4. CHECKING, DISASSEMBLING AND SERVICING



### CAUTION

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

### IMPORTANT

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

## [1] CHECKING AND ADJUSTING

### (1) Battery

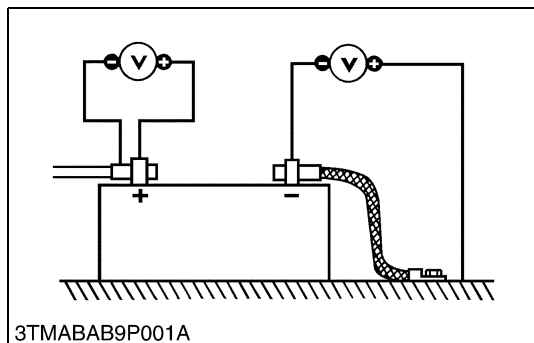


#### Battery Voltage

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 and the (+) lead to the positive terminal post, and measure the battery voltage.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Battery voltage	Reference value	More than 12 V
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W1027185

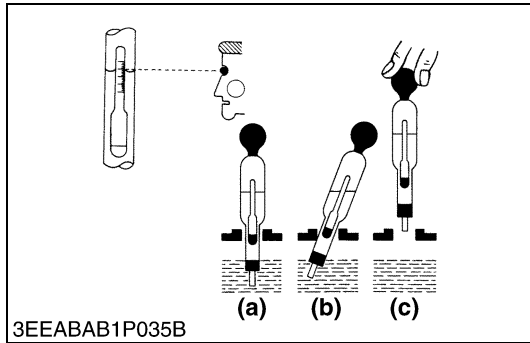
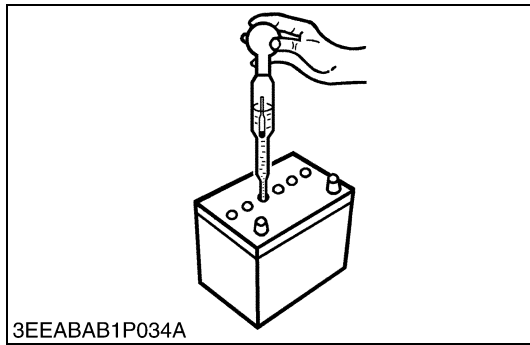


#### Battery Terminal Connection

1. Turn the main switch on, and turn on the head light.
2. Measure the voltage 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	Reference value	Less than 0.1 V
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W1028448



### Battery Specific Gravity

1. Check the specific gravity of the electrolyte in each cell with a hydrometer.
2. When the electrolyte temperature differs from that at which the hydrometer was calibrated, correct the specific gravity reading following the formula mentioned in **(Reference)**.
3. If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.
4. If the specific gravity differs between any two cells by more than 0.05, replace the battery.

#### NOTE

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

#### (Reference)

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

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

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

Specific Gravity	State of Charge
1.260 Sp. Gr.	100 % Charged
1.230 Sp. Gr.	75 % Charged
1.200 Sp. Gr.	50 % Charged
1.170 Sp. Gr.	25 % Charged
1.140 Sp. Gr.	Very Little Useful Capacity
1.110 Sp. Gr.	Discharged

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

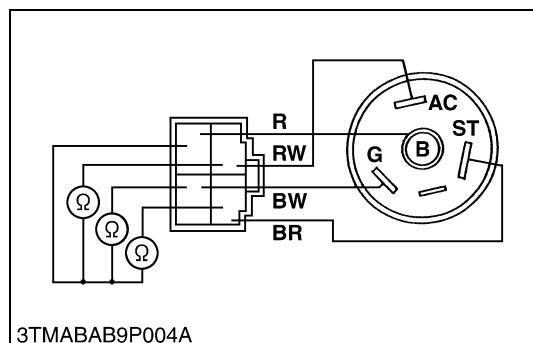
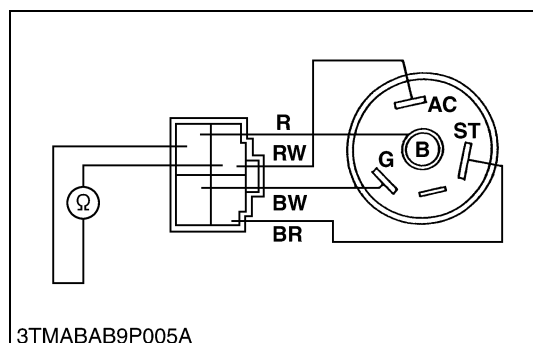
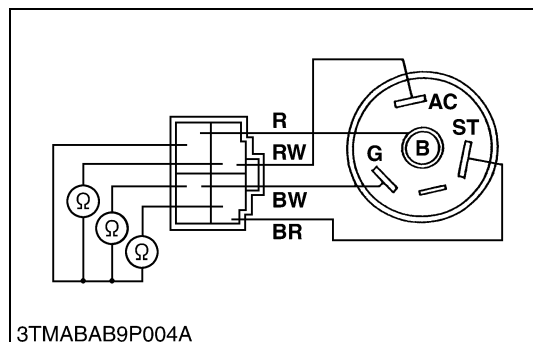
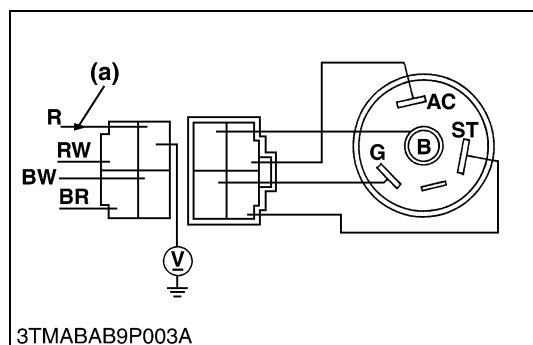
(a) Good

(b) Bad

(b) Bad

W1028851

## (2) Main Switch



### Connector Voltage

1. Measure the voltage with a voltmeter across the connector **B** terminal and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector <b>B</b> terminal - Chassis	Approx. battery voltage
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### (a) From Battery Positive Terminal

W1036621

### Main Switch Key at OFF Position

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

Resistance	<b>B</b> terminal - <b>AC</b> terminal	Infinity
	<b>B</b> terminal - <b>ST</b> terminal	Infinity
	<b>B</b> terminal - <b>G</b> terminal	Infinity

W1062472

### Main Switch Key at ON Position

1. Turn the main switch on.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **AC** terminal.
3. If 0 ohm is not indicated, the **B** - **AC** contacts of the main switch are faulty.

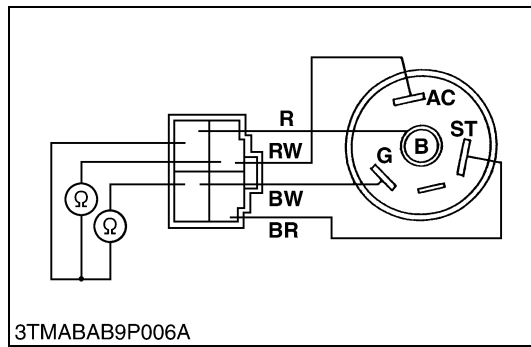
Resistance	<b>B</b> terminal - <b>AC</b> terminal	0 Ω
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### Main Switch at START Position

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

Resistance	<b>B</b> terminal - <b>G</b> terminal	0 Ω
	<b>B</b> terminal - <b>ST</b> terminal	0 Ω
	<b>B</b> terminal - <b>AC</b> terminal	0 Ω

W1063250



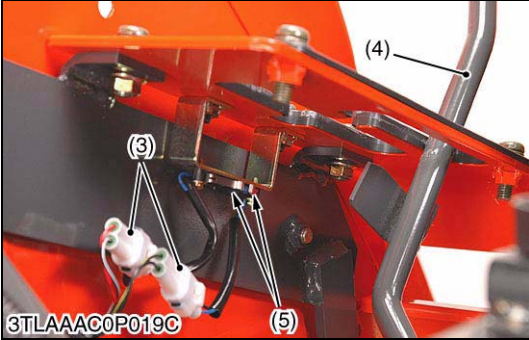
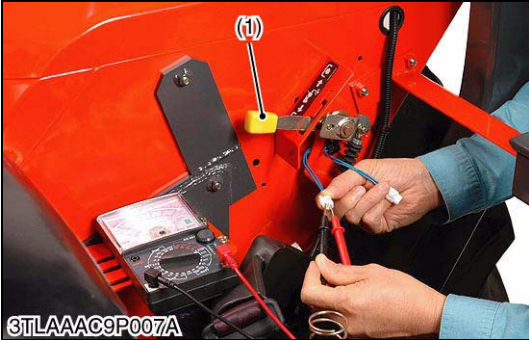
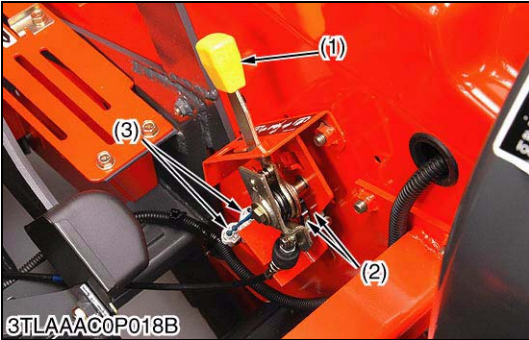
### **Main Switch Key at PREHEAT Position**

1. Turn and hold the main switch key at the **PREHEAT** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **2**, and across the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	B terminal - G terminal	0 Ω
	B terminal - AC terminal	0 Ω

W1064191

(3) Safety Switch



Safety Switch Continuity

- 1. Disconnect PTO lever safety switch connectors (3) and range gear shift lever safety switch connectors (6).
- 2. Connect the circuit tester to each safety switch's terminals.
- 3. Measure the resistance between terminals.
- 4. If any safety switch is defective, replace it.

Resistance (Across switch terminals)	When switch is pushed	0 Ω
	When switch is released	Infinity

- (1) PTO Lever (PTO Clutch Control Lever)

(2) PTO Lever Safety Switch

(3) Connector
- (4) Range Gear Shift Lever (Lo-R, Hi) Lever

(5) Range Gear Shift Lever Safety Switch

W1066307



#### (4) Operator Presence Control

##### ■ Preparation before checking

1. Sit on operator's seat.
2. Set the parking brake.
3. Shift the main gear shift lever and the range gear shift lever (Lo-R, Hi) to "**NEUTRAL**" position.
4. Shift the PTO lever (PTO clutch control lever) to "**OFF**" position.
5. Fully depress the clutch pedal and start the engine.
6. Check the OPC system by following four steps listed in the table below.

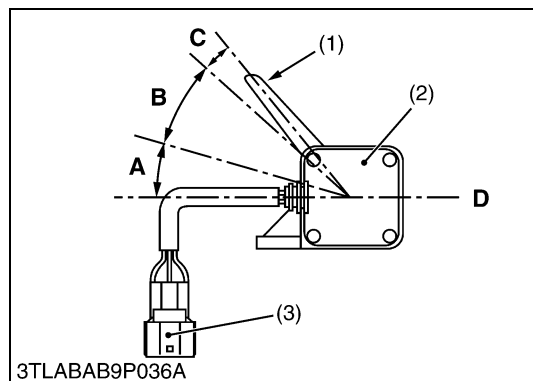
##### ■ IMPORTANT

- Main gear shift lever is "**NEUTRAL**" position.

##### Checking System

Step	PTO lever	Range gear shift lever	Operator	OPC system is " <b>NORMAL</b> " if
1	" <b>OFF</b> " (Switch : <b>ON</b> )	" <b>L</b> " or " <b>R</b> " or " <b>H</b> " (Switch : <b>OFF</b> )	Gets up from the seat (Seat switch : <b>OFF</b> )	Engine stops
2	" <b>ON</b> " (Switch : <b>OFF</b> )	" <b>NEUTRAL</b> " (Switch : <b>ON</b> )	Gets up from the seat (Seat switch : <b>OFF</b> )	Engine stops
3	" <b>OFF</b> " (Switch : <b>ON</b> )	" <b>NEUTRAL</b> " (Switch : <b>ON</b> )	Gets up from the seat (Seat switch : <b>OFF</b> )	Engine does not stop
4	" <b>OFF</b> " (Switch : <b>ON</b> )	" <b>NEUTRAL</b> " (Switch : <b>ON</b> )	Gets off the tractor, tilts the seat forward, and then place PTO lever in <b>ON</b> position (Seat switch : <b>ON</b> )	Engine does not stop

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### Checking Seat Switch

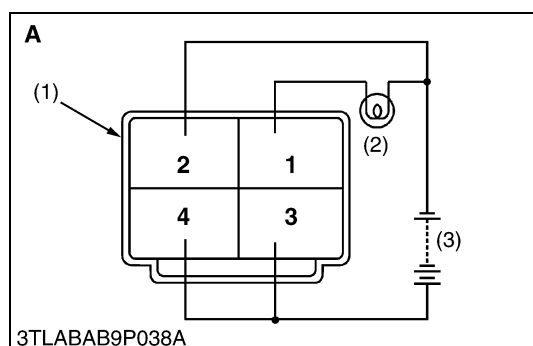
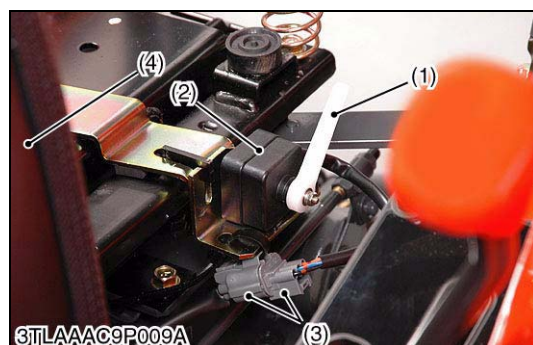
1. Remove the seat.
2. Disconnect the seat switch connector (3).
3. Change the sensor bar angle (1) and measure the resistance between connector terminals, referring to the table below.
4. If resistance is not correct, switch is faulty.

Sensor bar angle	Measuring terminal	Resistance
Approx 18° (Angle A)	a - c	0 Ω
	a - b, b - c	Infinity
Approx 25° (Angle B)	a - b, a - c, b - c	Infinity
Approx 5° (Angle C)	b - c	0 Ω
	a - b, a - c	Infinity

- (1) Sensor Bar  
(2) Seat Switch  
(3) Seat Switch Connector  
(4) Seat

**D : Seat Suspension Plate Line  
(Reference Line)**

W1042630



### Checking OPC Timer

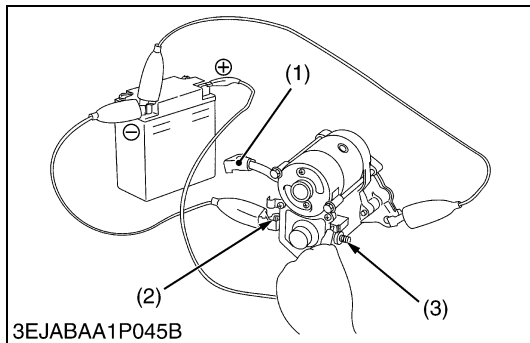
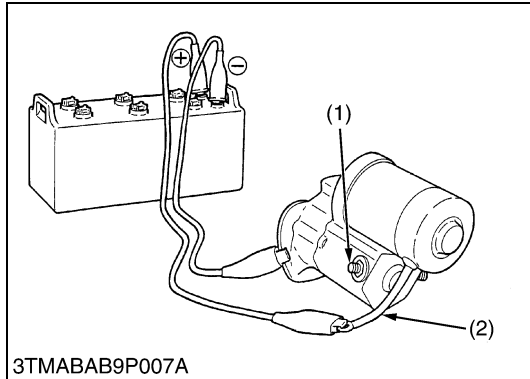
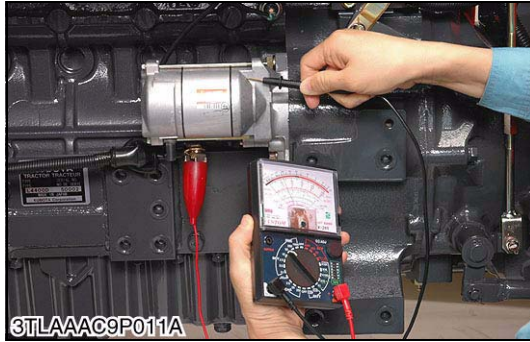
1. Remove the timer. (OPC timer is located behind the panel.)
2. Connect jumper leads across the battery positive terminal and the timer 3 terminal, and across the battery positive terminal and the timer 4 terminal.
3. Connect jumper leads across the battery negative terminal and the timer 2 terminal, and across the battery negative terminal and the bulb terminal.
4. Connect jumper leads across the timer 1 terminal and the bulb terminal.
5. The bulb lights up when disconnecting a jumper lead from the 3 terminal 0.7 to 1.3 seconds late, the timer is proper.

- (1) OPC Timer  
(2) Load (Lamp)  
(3) Battery (12 V)

**A : OPC Timer Relay Side Connector  
4A**

W1081012

## (5) Starter and Starter Relay



### Starter Motor B Terminal Voltage

1. Measure the voltage across the **B** terminal and chassis.
2. If the voltage differs from the battery voltage, check the battery's cable.

Voltage	Factory spec.	Approx. battery voltage
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W1084111

### 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

### Magnet Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter **M** terminal.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (1) from the starter **C** terminal (2).
5. Connect a jumper lead from the starter **S** terminal (3) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter **C** terminal (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

#### **NOTE**

- **This test should be carried out for a short time, about 3 to 5 seconds.**

(1) Connecting Lead

(3) **S** Terminal(2) **C** Terminal

W1085422



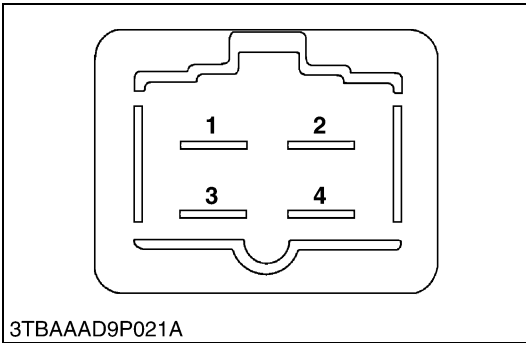
### Starter Relay

1. Open the panel board and remove the starter relay.
2. Apply battery voltage between terminal **2** and **4**, and check for continuity between terminal **1** and **3**.
3. If 0 ohm is not indicated, renew the starter relay.

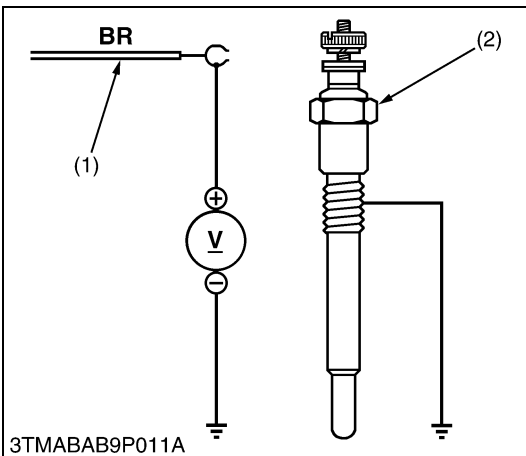
Resistance	Terminal 1 - Terminal 3	0 $\Omega$
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(1) Starter Relay

W1088137



## (6) Glow Control System



### Glow Plug Lead Terminal Voltage

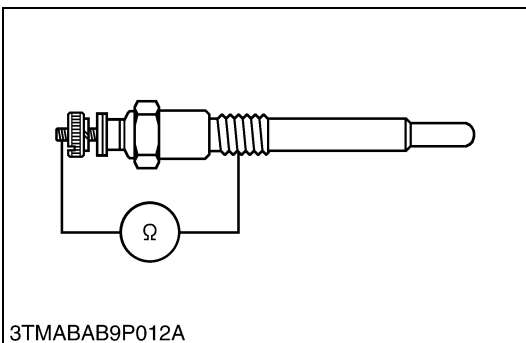
1. Disconnect the wiring lead (1) from the glow plug (2) after turning the main switch off.
2. Turn the main switch key to the **"PREHEAT"** position, and measure the voltage between the lead terminal and the chassis.
3. Turn the main switch key to the **"START"** position, and measure the voltage between 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 <b>"PREHEAT"</b>	Approx. battery voltage
	Main switch key at <b>"START"</b>	Approx. battery voltage

(1) Wiring Lead (Positive)

(2) Glow Plug

W1093015



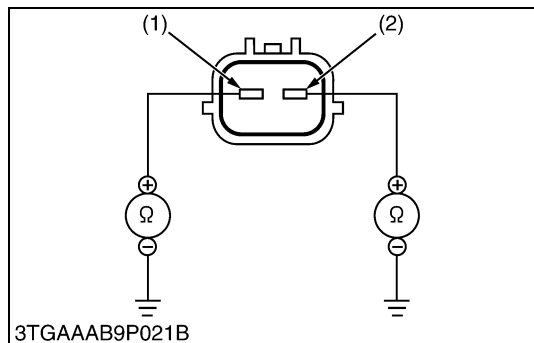
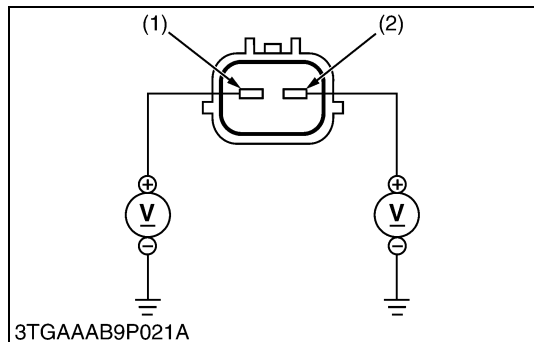
### Glow Plug Continuity

1. Disconnect the lead from the glow plugs.
2. Measure the resistance 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 $\Omega$
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W1093427

## (7) Engine Stop Solenoid



### Connector Voltage

1. Disconnect the **2P** connector from engine stop solenoid.
2. Turn the main switch key to the "**ON**" position.
3. Measure the voltage between the terminal **1**, terminal **2** and body.
4. If the voltage differs from the battery voltage, the wiring harness or main switch is faulty.

Voltage	Terminal <b>1</b> - Body	Approx. battery voltage
	Terminal <b>2</b> - Body	

- (1) Terminal 1  
(2) Terminal 2

(A) Engine Stop Solenoid  
(B) 2P Connector

W1096779

### Stop Solenoid Coil

1. Disconnect the **2P** connector from engine stop solenoid.
2. Measure the resistance between the terminal **1**, terminal **2** and body.
3. If resistance differs from the factory specifications, the coil is faulty.

Resistance	Terminal <b>1</b> - Body	Approx. 0.375 Ω
	Terminal <b>2</b> - Body	Approx. 15.6 Ω

(1) Terminal **1** (Pulling Coil)

(2) Terminal **2** (Pulling Coil)

W1098612



### Glow Relay (Key Stop Solenoid Relay)

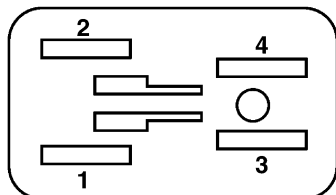
1. Turn the main switch off.
2. Disconnect the **4P** connector from glow relay (1).
3. Measure the voltage across the terminal **3** (Positive) and chassis (Negative).
4. If the voltage differs from the battery voltage, the wiring harness is faulty.
5. Turn the main switch on.
6. Measure the voltage across the terminal **1** (Positive) and chassis (Negative).
7. If the voltage differs from the battery voltage, the wiring harness is faulty.

- (1) Glow Relay  
(Key Stop Solenoid Relay)

**A:** Connector of Wire Harness Side  
**B:** Connector of Glow Relay

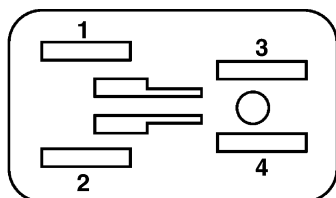
W1099885

**A**



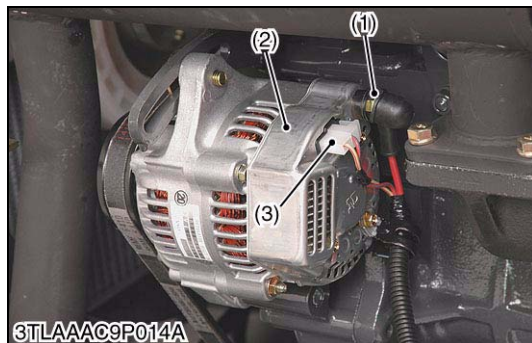
3TLABAB9P039A

**B**



3TLABAB9P039B

## **(8) Charging System**

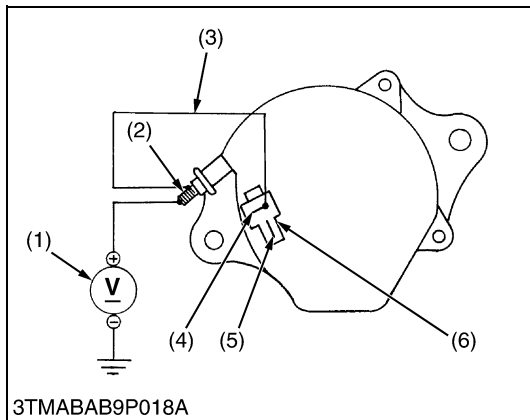
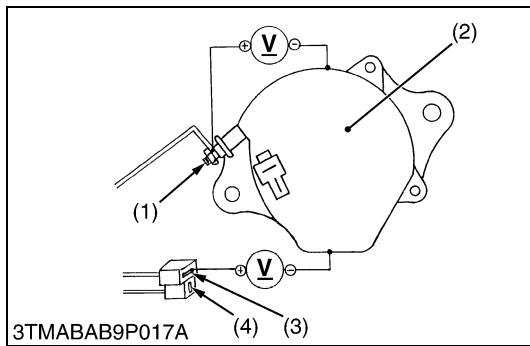
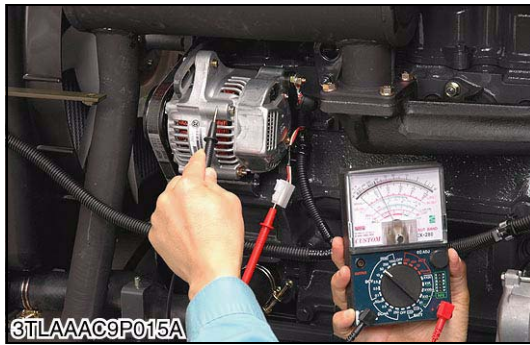


### Alternator

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

- (1) **B** Terminal  
(2) Alternator  
(3) **2P** Connector





### Connector Voltage

1. Turn the main switch **OFF**. Measure the voltage between the **B** terminal (1) and the chassis.
2. Turn the main switch **ON**. Measure the voltage between the **IG** terminal (3) and the chassis.

Voltage (Main switch at <b>OFF</b> )	<b>B</b> terminal - Chassis	Approx. battery voltage
Voltage (Main switch at <b>ON</b> )	<b>IG</b> terminal - Chassis	Approx. battery voltage

(1) **B** Terminal  
(2) Alternator

(3) **IG** Terminal  
(4) **L** Terminal

W1103012

### No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning the main switch **OFF**.
2. Connect the jumper lead (3) between **IG** terminal (4) and **B** terminal (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the **B** terminal (2) and the chassis.
6. If the measurement is less than the factory specifications, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V
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### (Reference)

- Once the engine has started, the alternator temperature rises quickly up to an ambient temperature of 70 to 90 °C (158 to 194 °F). As the temperature goes higher than 50 °C (122 °F), the alternator voltage slowly drops; at higher than 100 °C (212 °F), it drops by about 1 V.

(1) Voltmeter  
(2) **B** Terminal  
(3) Jumper Lead

(4) **IG** Terminal  
(5) **L** Terminal  
(6) **2P** Connector

W1102619



## (9) Combination Switch



1. Turn off the main switch (1).
2. Remove the panel board (2).
3. Perform the following checkings.

- (1) Main Switch (3) Combination Switch  
(2) Panel Board

W1107080



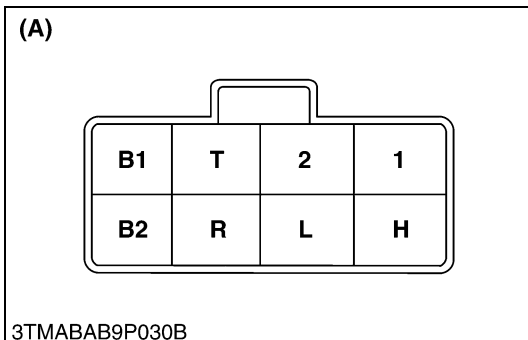
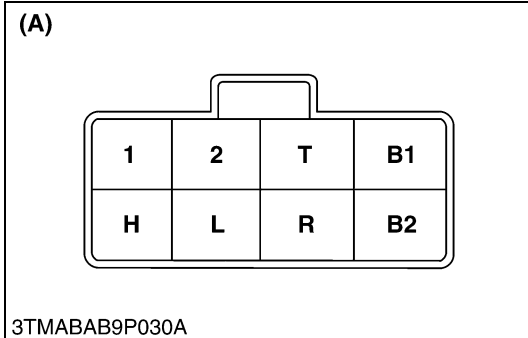
### Connector Voltage (Wire Harness Side)

1. Disconnect the connector **8P** (1) from the combination switch.
2. Measure the voltage with a voltmeter across the connector **B1** terminal and chassis when the main switch is **OFF** position.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.
4. Measure the voltage with a voltmeter across the connector **B2** terminal and chassis when the main switch is **ON** position.
5. If the voltage differs from the battery voltage, check the wiring harness and main switch.

Voltage	Main switch at <b>OFF</b> position	<b>B1</b> Terminal - Chassis	Battery voltage
	Main switch at <b>ON</b> position	<b>B2</b> Terminal - Chassis	

### (A) Connector 8P (Wire Harness Side)

W1108114



### Head Light Switch Continuity when Setting Switch at OFF Position

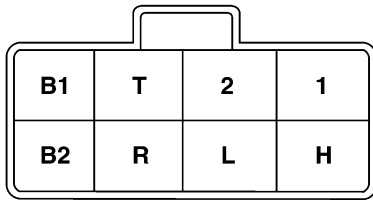
1. Disconnect the connector **8P** from the combination switch.
2. Set the light switch to the **OFF** position.
3. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal, the **B1** terminal to the **1** terminal and the **B1** terminal to the **2** terminal.
4. If infinity is not indicated, renew the switch.

Resistance (Switch at <b>OFF</b> position)	<b>B1</b> terminal - <b>T</b> terminal	Infinity
	<b>B1</b> terminal - <b>1</b> terminal	
	<b>B1</b> terminal - <b>2</b> terminal	

### (A) Combination Switch Side Connector 8P

W1109195

(A)



3TMABAB9P030B

**Head Light Switch Continuity when Setting Switch at ON1 Position**

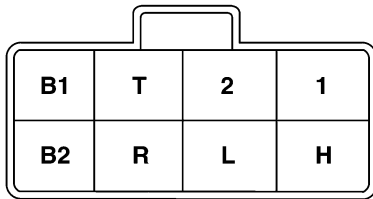
1. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal and the **B1** terminal to the **1** terminal.
2. If 0 ohm is not indicated, renew the head light switch.

Resistance (Switch at <b>HI-BEAM</b> position)	<b>B1</b> terminal - <b>T</b> terminal	0 $\Omega$
	<b>B1</b> terminal - <b>1</b> terminal	

(A) Combination Switch Side  
Connector 8P

W1113563

(A)



3TMABAB9P030B

**Head Light Switch Continuity when Setting Switch at ON2 Position**

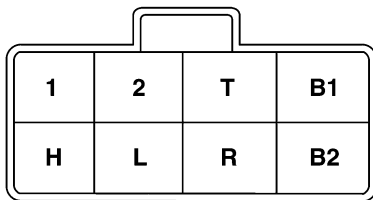
1. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal and the **B1** terminal to the **2** terminal.
2. If 0 ohm is not indicated, renew the head light switch.

Resistance (Switch at <b>LO-BEAM</b> position)	<b>B1</b> terminal - <b>T</b> terminal	0 $\Omega$
	<b>B1</b> terminal - <b>2</b> terminal	

(A) Combination Switch Side  
Connector 8P

W1114916

(A)



3TMABAB9P030A

**Connector Voltage (Turn Signal Switch)**

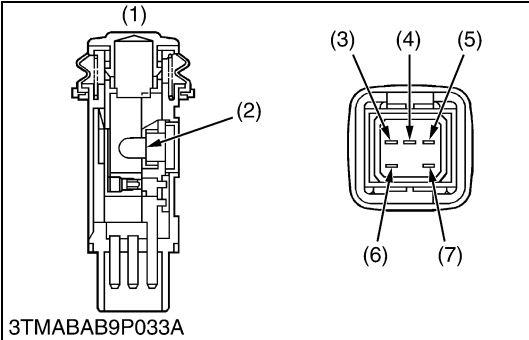
1. Disconnect the connector **8P** from the combination switch.
2. Measure the voltage with a voltmeter across the connector **B2** terminal and chassis when the main switch is **ON** position.
3. If the voltage differs from the battery voltage, check the wiring harness

Voltage	Main switch at <b>ON</b> position	<b>B2</b> Terminal - Chassis	Battery voltage
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(A) Wire Harness Side Connector 8P

W1116305

(10) Hazard Switch



Hazard Switch Continuity

1. Measure the resistance with ohmmeter between the **a** terminal and **c** terminal, between the **d** terminal and **e** terminal.
2. If the measurement is not the same as below, the hazard switch or the bulb is faulty.

Resistance (Switch at <b>OFF</b> )	<b>a</b> Terminal - <b>c</b> Terminal	Infinity
Resistance (Switch at <b>ON</b> )	<b>a</b> Terminal - <b>c</b> Terminal	0 Ω
Resistance (Bulb)	<b>d</b> Terminal - <b>e</b> Terminal	Approx. 13 Ω



- (1) Hazard Switch

(2) Bulb

(3) **a** Terminal

(4) **b** Terminal
- (5) **c** Terminal

(6) **d** Terminal

(7) **e** Terminal

(8) Turn Signal Switch

W1052837

(11) Hazard Unit



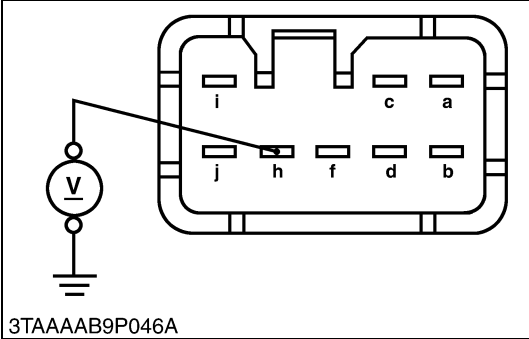
Hazard Unit

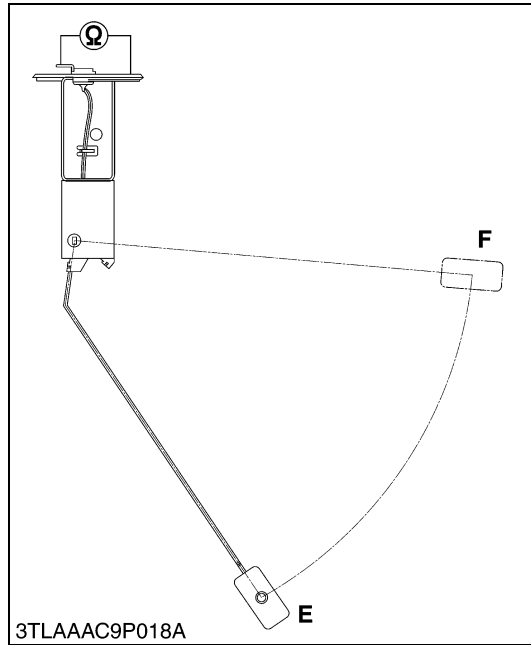
1. Disconnect the connector from the hazard unit (1).
2. Measure the voltage with a voltmeter across the **h** terminal and chassis.
3. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	<b>h</b> Terminal - Chassis	Approx. battery voltage
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- (1) Hazard Unit

W1053948

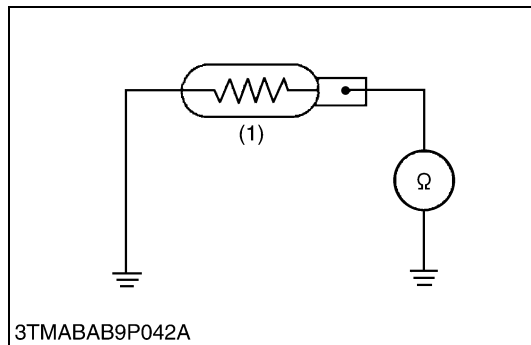


**(12) Fuel Level Sensor****Fuel Level Sensor**

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance across the sensor terminal and its body.
3. If resistance does not meet reference value, the sensor is faulty.

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

W1121151

**(13) Coolant Temperature Sensor****Coolant Temperature Sensor Continuity**

1. Measure the resistance across the sensor terminal and the chassis.
2. If resistance does not meet factory specifications, the sensor is faulty.

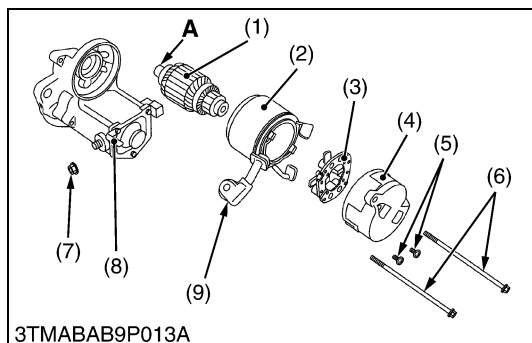
Resistance (Sensor terminal - Chassis)	Factory spec.	Approx. 16 $\Omega$ at 120 °C (248 °F) Approx. 50 $\Omega$ at 80 °C (176 °F) Approx. 149 $\Omega$ at 50 °C (122 °F)
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(1) Coolant Temperature Sensor

W1121784

## [2] DISASSEMBLING AND ASSEMBLING

### (1) Starter



#### Disassembling Motor

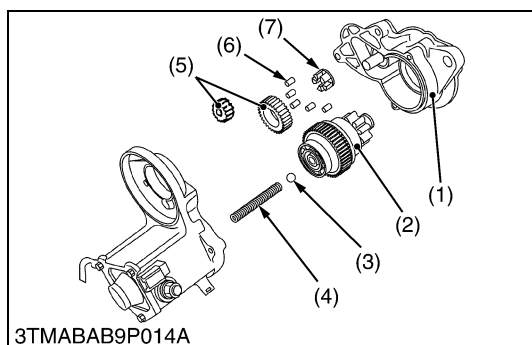
1. Disconnect the connecting lead (9) from the magnet switch (8).
2. Remove the screws (6), and then separate the end frame (4), yoke (2) and armature (1).
3. Remove the two screws (5), and then take out the brush holder (3) from the end frame (4).

#### (When reassembling)

- Apply grease to the spline teeth **A** of the armature (1).

- |                  |                        |
|------------------|------------------------|
| (1) Armature     | (7) Nut                |
| (2) Yoke         | (8) Magnet Switch      |
| (3) Brush Holder | (9) Connecting Lead    |
| (4) End Frame    |                        |
| (5) Screw        |                        |
| (6) Screw        | <b>A: Spline Teeth</b> |

W1128720



#### Disassembling Magnet Switch

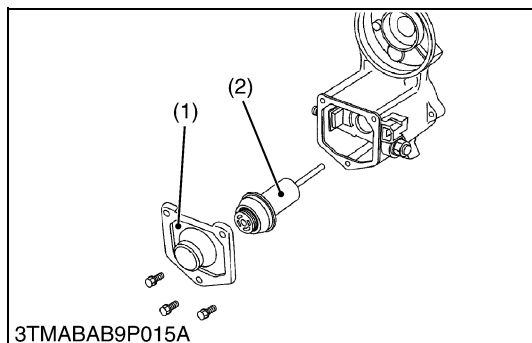
1. Remove the drive end frame (1) mounting screws.
2. Take out the overrunning clutch (2), ball (3), spring (4), gears (5), rollers (6) and retainer (7).

#### (When reassembling)

- Apply grease to the gear teeth of the gears (5) and overrunning clutch (2), and ball (3).

- |                        |              |
|------------------------|--------------|
| (1) Drive End Frame    | (5) Gear     |
| (2) Overrunning Clutch | (6) Roller   |
| (3) Ball               | (7) Retainer |
| (4) Spring             |              |

W1129998



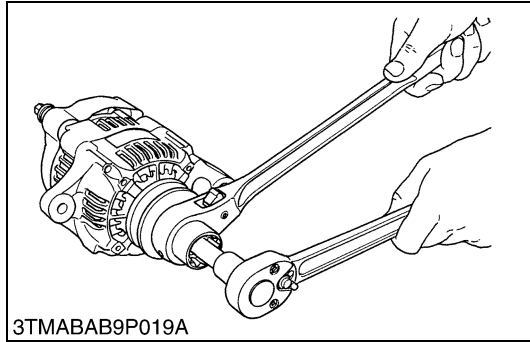
#### Plunger

1. Remove the end cover (1).
2. Take out the plunger (2)

- |               |             |
|---------------|-------------|
| (1) End Cover | (2) Plunger |
|---------------|-------------|

W1026689

## (2) Alternator



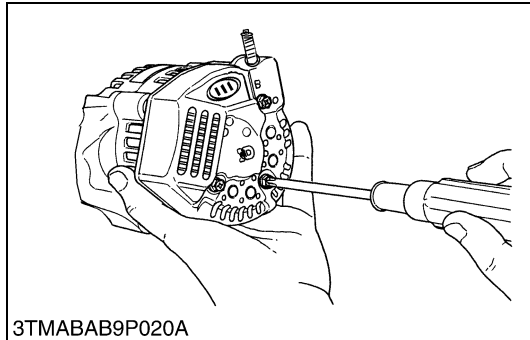
### Pulley

1. Secure the hexagonal end of the pulley shaft with a double-ended ratchet wrench as shown in the figure, loosen the pulley nut with a socket wrench and remove it.

### (When reassembling)

Tightening torque	Pulley nut	58.3 to 78.9 N·m 5.95 to 8.05 kgf·m 43.0 to 58.2 ft-lbs
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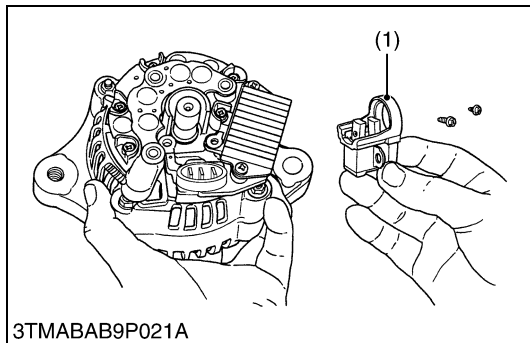
W1067140



### Rear End Cover

1. Unscrew the three rear end cover screws and the **B** terminal nut, and remove the rear end cover.

W1067274

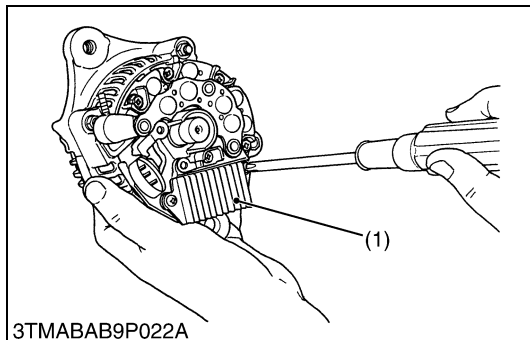


### Brush Holder

1. Unscrew the two screws holding the brush holder, and remove the brush holder (1).

(1) Brush Holder

W1134820

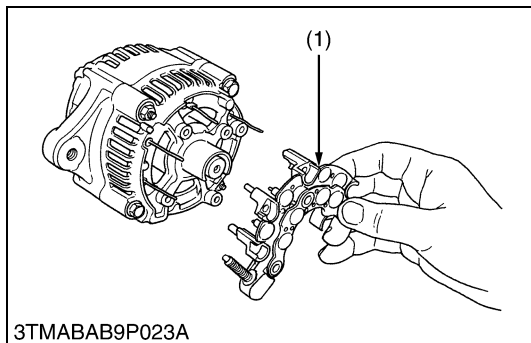


### IC Regulator

1. Unscrew the three screws holding the IC regulator, and remove the IC regulator (1).

(1) IC Regulator

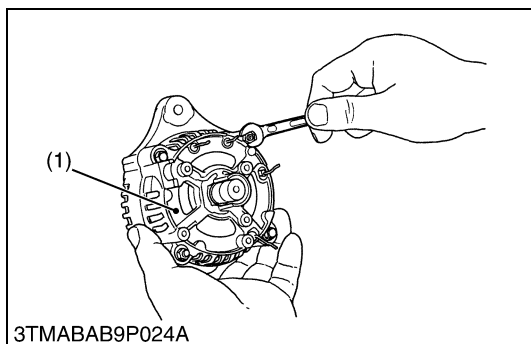
W1136436

**Rectifier**

1. Remove the four screws holding the rectifier and the stator lead wires.
2. Remove the rectifier (1).

(1) Rectifier

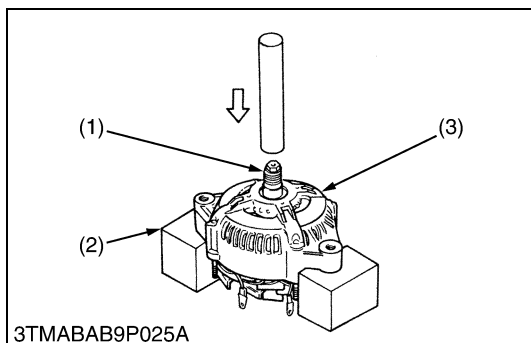
W1136721

**Rear End Frame**

1. Unscrew the two nuts and two screws holding the drive end frame and the rear end frame.
2. Remove the rear end frame (1).

(1) Rear End Frame

W1161022

**Rotor**

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

**■ IMPORTANT**

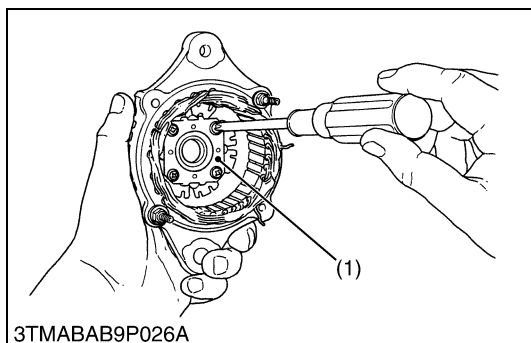
- Take special care not to drop the rotor and damage the slip ring or fan, etc..

(1) Rotor

(3) Drive End Frame

(2) Block

W1136998

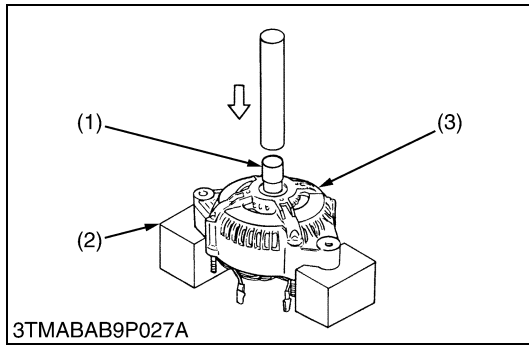
**Retainer Plate**

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

(1) Retainer Plate

W1137353





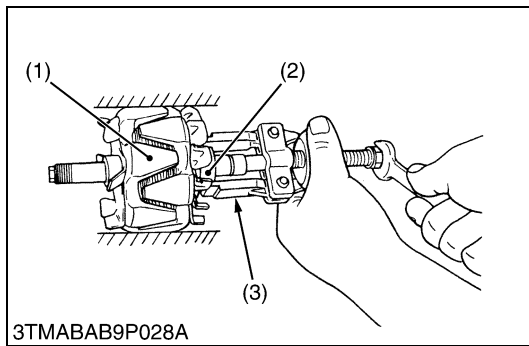
#### **Bearing on Drive End Side**

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

(1) Jig  
(2) Block

(3) Drive End Frame

W1137587



#### **Bearing at Slip Ring Side**

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

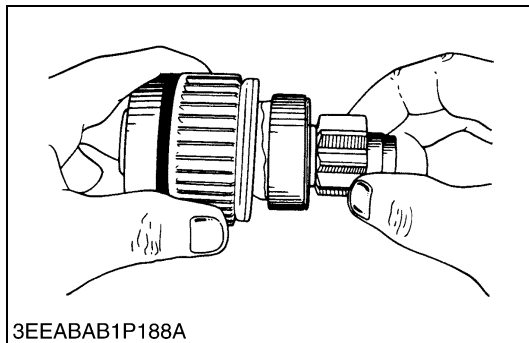
(1) Rotor  
(2) Bearing

(3) Puller

W1139213

### **[3] SERVICING**

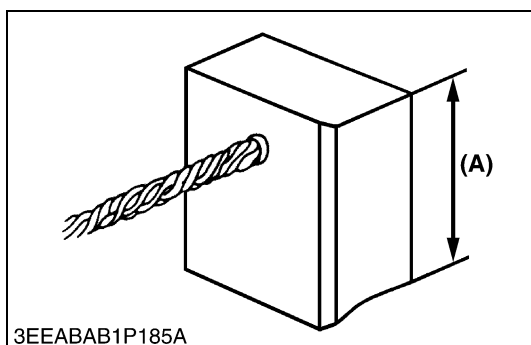
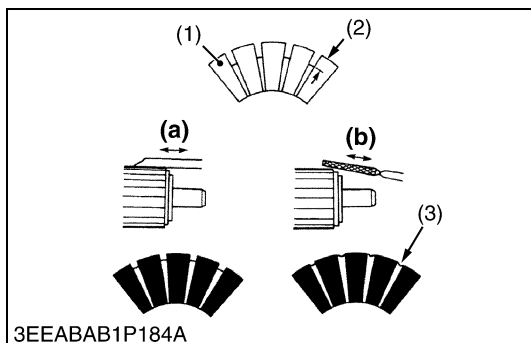
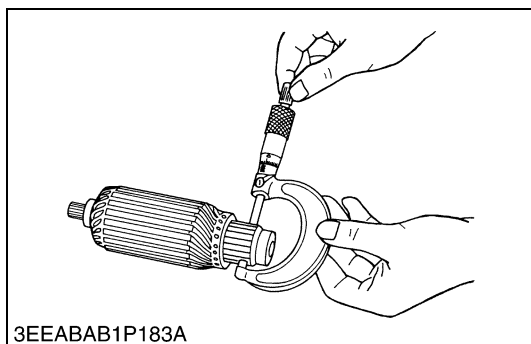
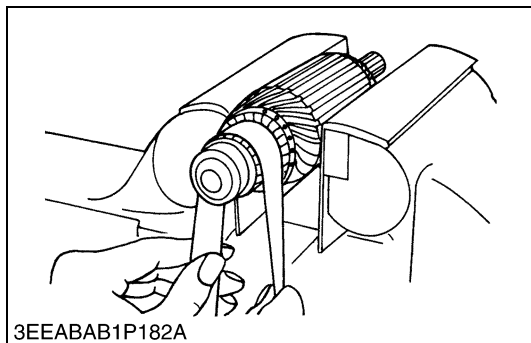
#### **(1) Starter**



#### **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.

W1143575



### Commutator and Mica

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

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

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

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

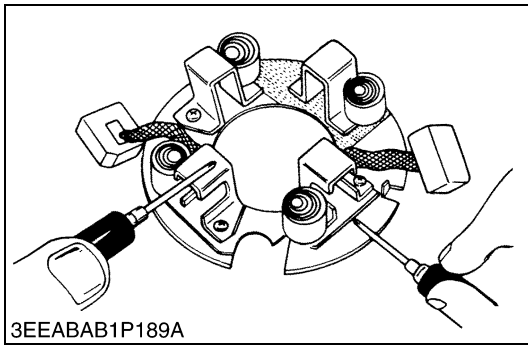
- (a) Correct  
(b) Incorrect

### 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.	15.0 mm 0.591 in.
	Allowable limit	11.0 mm 0.433 in.

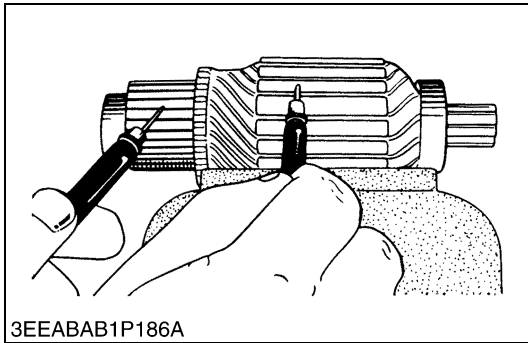
W1143919

**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.

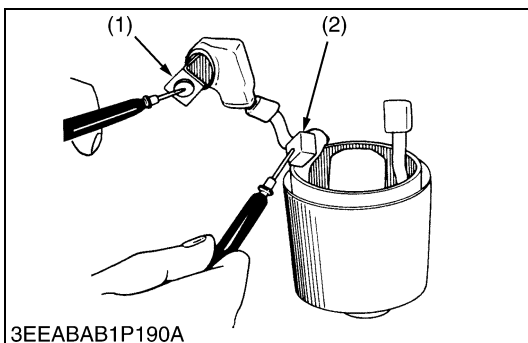
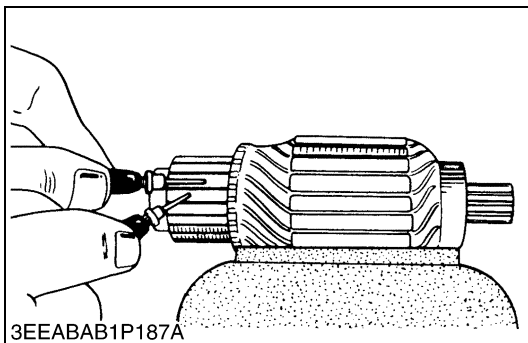
Resistance	Brush holder – Holder support	Infinity
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**Armature Coil**

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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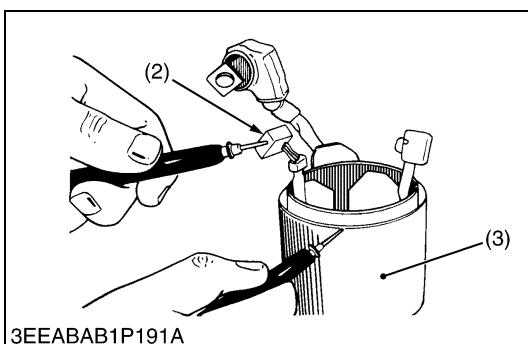
**Field Coil**

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.

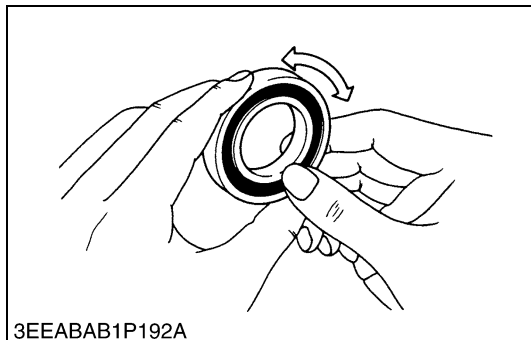
(1) Lead  
(2) Brush

(3) Yoke

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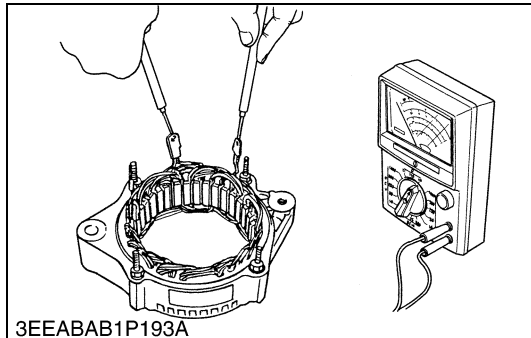
## (2) Alternator



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### Bearing

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

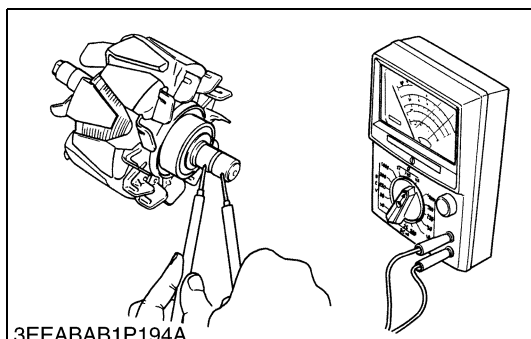


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### Stator

1. Measure the resistance across each lead of the stator coil with an ohmmeter.
2. If the measurement is not within factory specification, replace it.
3. Check the continuity across each stator coil lead and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory spec.	Less than 1.0 $\Omega$
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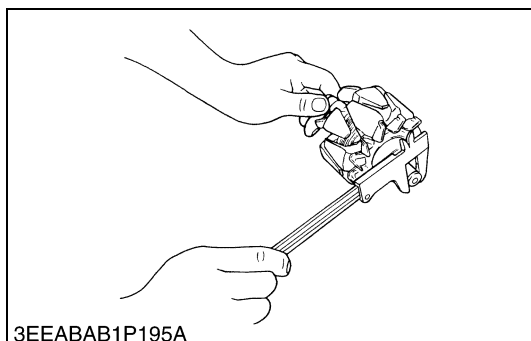


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### Rotor

1. Measure the resistance across the slip rings with an ohmmeter.
2. If the resistance is not the factory specification, replace it.
3. Check the continuity across the slip ring and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory spec.	2.9 $\Omega$
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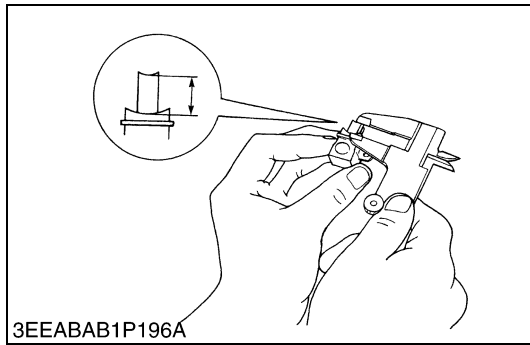


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### Slip Ring

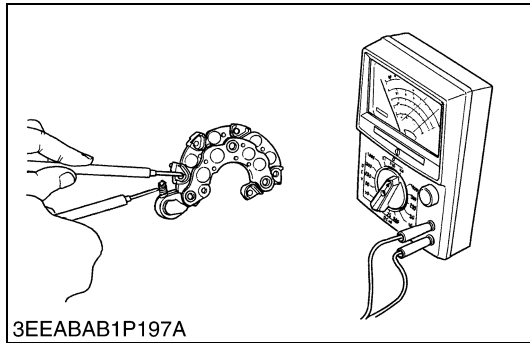
1. Check the slip ring for score.
2. If scored, correct with an emery paper or on a lathe.
3. Measure the O.D. of slip ring with vernier calipers.
4. If the measurement is less than the allowable limit, replace it.

Slip ring O.D.	Factory spec.	14.4 mm 0.567 in.
	Allowable limit	14.0 mm 0.551 in.

**Brush Wear**

1. Measure the brush length with vernier calipers.
2. If the measurement is less than allowable limit, replace it.
3. Make sure that the brush moves smoothly.
4. If the brush is defective, replace it.

Brush length	Factory spec.	10.5 mm 0.413 in.
	Allowable limit	8.4 mm 0.331 in.

**Rectifier**

1. Check the continuity across each diode of rectifier with an analog ohmmeter. Conduct the test in the (R x 1) setting.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

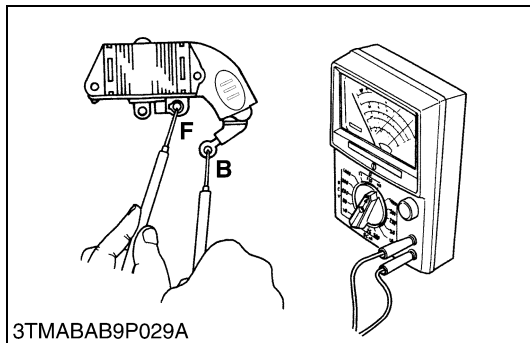
**■ IMPORTANT**

- Do not use a 500 V megger for measuring because it will destroy the rectifier.

**■ NOTE**

- Do not use an auto digital multimeter. Because it's very hard to check the continuity of rectifier by using it.

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**IC Regulator**

1. Check the continuity across the B terminal and the F terminal of IC regulator with an analog ohmmeter. Conduct the test in the (R x 1) setting.
2. The IC regulator is normal if the IC regulator conducts in one direction and does not conduct in the reverse direction.

**■ IMPORTANT**

- Do not use a 500 V megger for measuring because it will destroy the IC regulator.

**■ NOTE**

- Do not use an auto digital multimeter. Because it's very hard to check the continuity of IC regulator by using it.

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