

# WSM

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WORKSHOP MANUAL  
**TRACTOR**

**M5640SU**

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**Kubota**

# TO THE READER

This Workshop Manual tells the servicing personnel about the mechanism, servicing and maintenance of the M5640SU and M5640DT-SU. It contains 4 parts: "**Information**", "**General**", "**Mechanism**" and "**Servicing**".

## ■ **Information**

This section contains information below.

- Safety First
- Safety Label
- Specification
- Dimension

## ■ **General**

This section contains information below.

- Engine Identification
- Model Identification
- General Precautions
- Maintenance Check List
- Check and Maintenance
- Special Tools

## ■ **Mechanism**

This section contains information on the structure and the function of the unit. Before you continue with the subsequent sections, make sure that you read this section.

Refer to the latest version of Workshop Manual (Code No. 9Y021-01870 / 9Y021-18200) for the diesel engine / tractor mechanism that this workshop manual does not include.

## ■ **Servicing**

This section contains information below.

- Troubleshooting
- Servicing Specifications
- Tightening Torques
- Checking, Disassembling and Servicing

All illustrations, photographs and specifications contained in this manual are of the newest information available at the time of publication.

KUBOTA reserves the right to change all information at any time without notice.

Since this manual includes many models, information or illustrations and photographs can show more than one model.

# **I INFORMATION**

# INFORMATION

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# 1. SAFETY FIRST

## SAFETY FIRST

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

### DANGER

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

### WARNING

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

### CAUTION

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

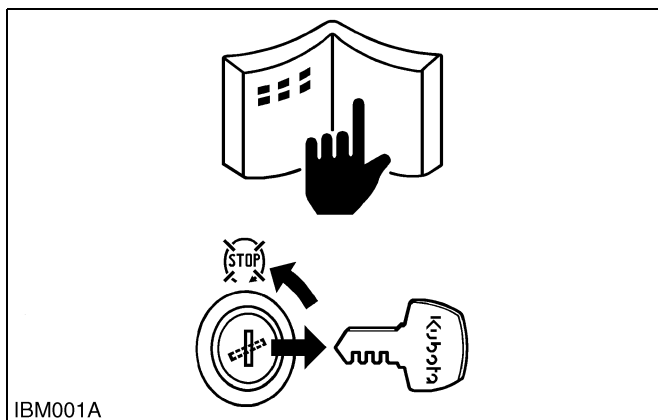
### ■ IMPORTANT

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

### ■ NOTE

- Gives helpful information.

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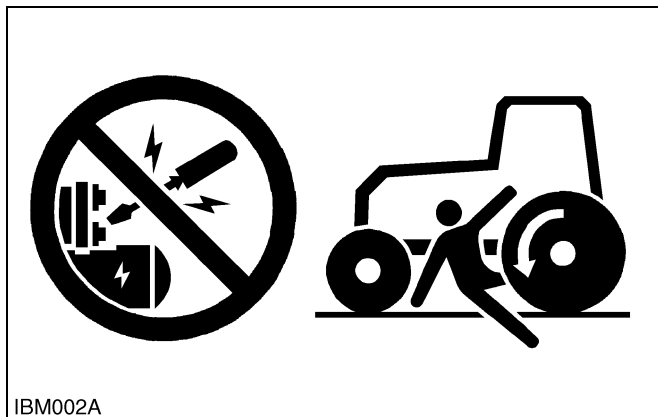


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### BEFORE YOU START SERVICE

- 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 stable and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, then remove the key.
- Disconnect the battery negative cable.
- Hang a "**DO NOT OPERATE**" tag in the operator station.

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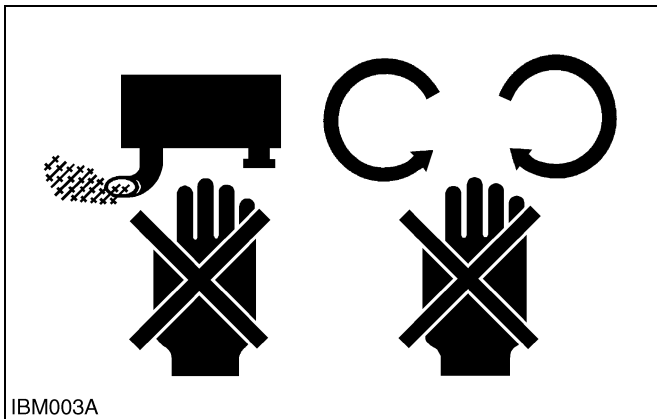


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### START SAFELY

- Do not do the procedures below when you start the engine.
  - short across starter terminals
  - bypass the safety start switch
- Do not alter or remove any part of machine safety system.
- Before you start the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Do not start the engine when you stay on the ground. Start the engine only from operator's seat.

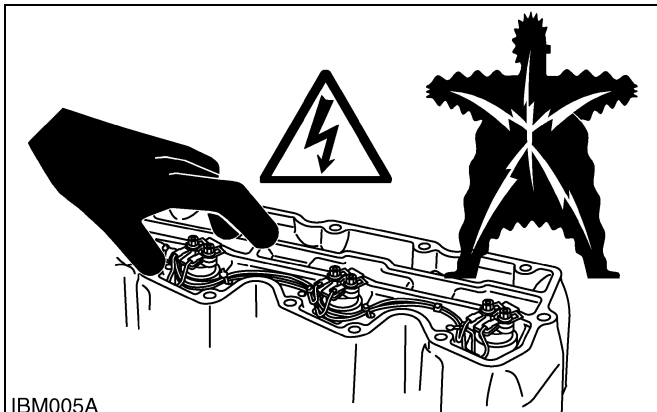
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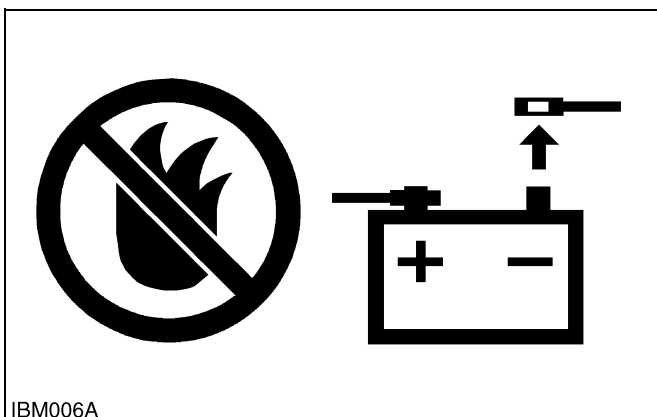
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## OPERATE SAFELY

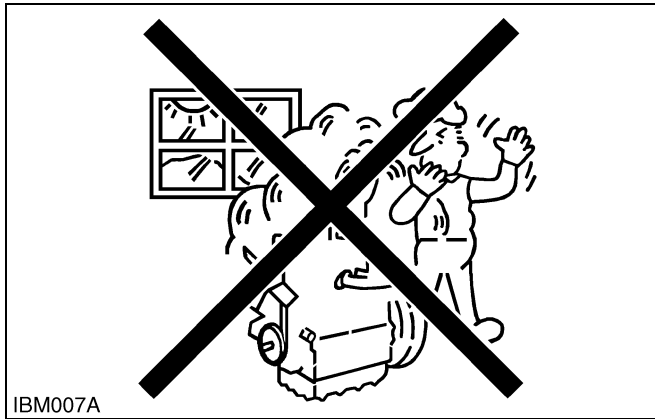
- Do not use the machine after you consume alcohol or medication or when you are tired.
- Put on applicable clothing and safety equipment.
- Use applicable tools only. Do not use alternative tools or parts.
- When 2 or more persons do servicing, make sure that you do it safely.
- Do not operate below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

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## PREVENT A FIRE

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

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**KEEP A GOOD AIRFLOW IN THE WORK AREA**

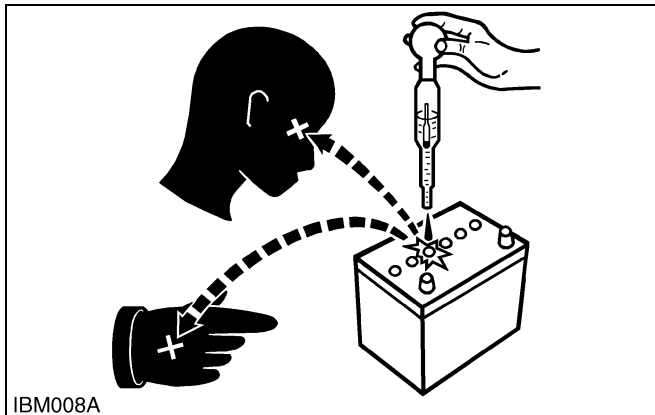
- If the engine is in operation, make sure that the area has good airflow. Do not operate the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

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**DISCARD FLUIDS CORRECTLY**

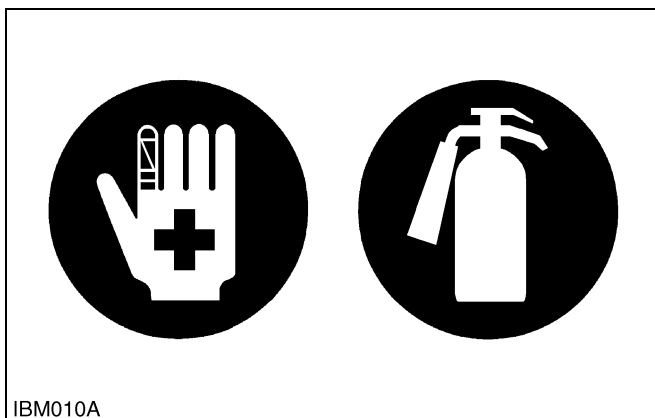
- Do not discard fluids on the ground, down the drain, into a stream, pond, or lake. Obey related environmental protection regulations when you discard oil, fuel, coolant, electrolyte and other dangerous waste.

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**PREVENT ACID BURNS**

- Keep electrolyte away from your eyes, hands and clothing. Sulfuric acid in battery electrolyte is poisonous and it can burn your skin and clothing and cause blindness. If you spill electrolyte on yourself, clean yourself with water, and get medical aid immediately.

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**PREPARE FOR EMERGENCIES**

- Keep a first aid kit and fire extinguisher ready at all times.
- Keep the emergency contact telephone numbers near your telephone at all times.

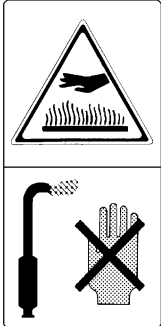
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## 2. SAFETY DECALS

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.

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- (1) Part No. 32310-4958-1  
Do not touch hot surface like muffler, etc.



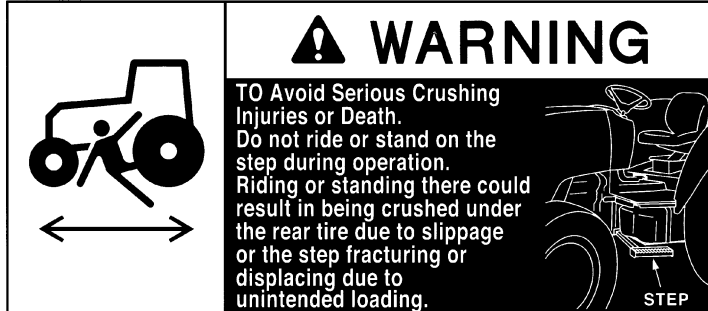
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- (3) Part No. 6C090-4958-2  
Do not get your hands close to engine fan and fan belt.



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- (2) Part No. 3A111-9801-1

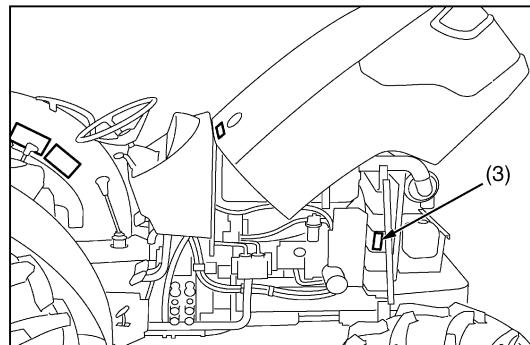
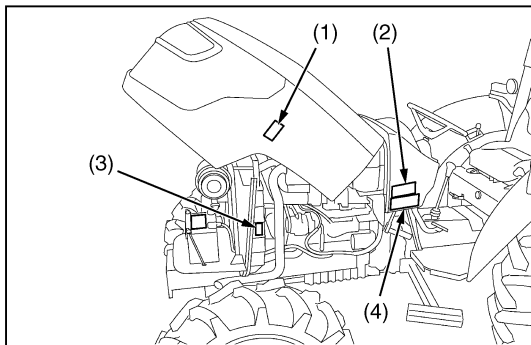


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- (4) Part No. TA040-4965-2



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(1) Part No. 6C040-4742-2

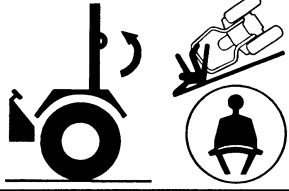
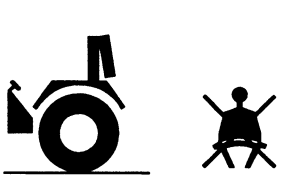
**⚠ CAUTION**

**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.

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(2) Part No. 3A111-9848-2

	<p><b>⚠ WARNING</b></p> <p><b>TO AVOID INJURY OR DEATH FROM ROLL-OVER:</b></p> <ul style="list-style-type: none"> <li>• Keep Roll-Over Protective Structures (ROPS) in the upright and locked position.</li> <li>• Fasten SEAT BELT before operating.</li> </ul>
	<p><b>THERE IS NO OPERATOR PROTECTION WHEN THE ROPS IS IN THE FOLDED POSITION.</b></p> <ul style="list-style-type: none"> <li>• Check the operating area and fold the ROPS only when absolutely necessary.</li> <li>• Do not wear SEAT BELT if ROPS is folded.</li> <li>• Raise and lock ROPS as soon as vertical clearance allows.</li> <li>• Read ROPS related instructions and warnings.</li> </ul>

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(4) Part No. 6C300-4744-1

**⚠ WARNING**

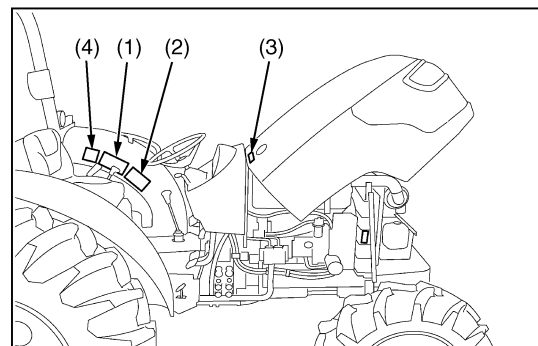
Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrester may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

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(3) Part No. TC230-4956-1

Diesel fuel only	No fire
	
<p><b>LOW SULFUR FUEL OR ULTRA LOW SULFUR FUEL ONLY</b></p>	

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(1) Part No. 3A111-9554-1

**⚠ WARNING**  
 Never modify or repair a ROPS because welding, grinding, drilling or cutting any portion may weaken the structure.

**⚠ CAUTION**  
**TO AVOID INJURY WHEN RAISING OR FOLDING ROPS:**

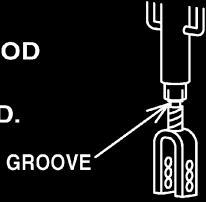
- Set parking brake and stop engine.
- Remove any obstruction that may prevent raising or folding of the ROPS.
- Do not allow any bystanders.
- Always perform function from a stable position at the rear of the tractor.
- Hold the top of the ROPS securely when raising or folding.
- Make sure all pins are installed and locked.

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(2) Part No. 3A272-9856-1

**⚠ CAUTION**  
**TO AVOID INJURY FROM SEPARATION :**

**DO NOT EXTEND LIFT ROD BEYOND THE GROOVE ON THE THREADED ROD.**



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(3) Part No. TA040-4935-1

**⚠ WARNING**  
**TO AVOID PERSONAL INJURY:**

1. Attach pulled or towed loads to the drawbar only.
2. Use the 3-point hitch only with equipment designed for 3-point hitch usage.

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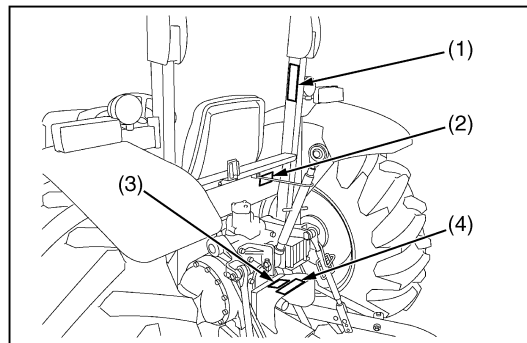
(4) Part No. TA040-4959-3



**⚠ WARNING**  
**TO AVOID PERSONAL INJURY.**

1. Keep PTO shield in place at all times.
2. Do not operate the PTO at speeds faster than the speed recommended by the implement manufacturer.
3. For trailing PTO-driven implements, set drawbar at towing position. (see operator's manual)

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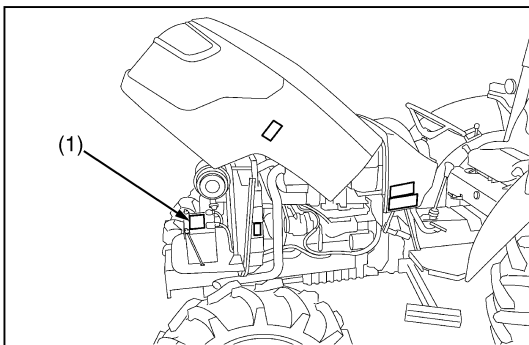
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(1) Part No. TD060-3012-1

<p><b>RECYCLE</b></p>	<p><b>FLAMMABLES</b></p>	<p><b>SHIELD EYES</b></p>	<p><b>KEEP OUT OF THE REACH OF CHILDREN</b></p>	<p><b>CAUTION OF SULFURIC ACID</b></p>	<p><b>READ INSTRUCTION MANUAL CAREFULLY</b></p>	<p><b>EXPLOSIVE</b></p>	<p><b>HYDROMETER</b></p> <p><b>DK 60059</b></p>																																													
<p><b>NX110-5MF 12V</b></p> <p>AMP HR (20HR) 55</p> <p>RESERVE CAPACITY (MIN) 133</p> <p>COLD CRANKING AMPS (-18°C) 582</p>	<p><b>⚠ DANGER</b></p> <ul style="list-style-type: none"> <li>• DUE TO HYDROGEN GAS GENERATED FROM BATTERY, HANDLING WITHOUT CARE CAN CAUSE FIRE AND EXPLOSION.</li> <li>• THIS 12V BATTERY IS ONLY FOR STARTING ENGINE. DO NOT APPLY THIS PRODUCT FOR OTHER USES.</li> <li>• CHARGE THIS BATTERY ONLY AT WELL VENTILATED PLACES, AND AVOID SHORTS OR SPARKS.</li> <li>• REFER TO THE INSTRUCTION MANUAL OF VEHICLE OR BATTERY BEFORE USING BOOSTER CABLE</li> <li>• 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.</li> <li>• BATTERY FILLED WITH ACID (DO NOT TILT OR SPILL) • FLAMMABLE. DO NOT CHARGE NEAR FIRE OR SPARKS</li> <li>• DO NOT CHARGE RAPIDLY • DO NOT DISASSEMBLE THE BATTERY (SEALED TYPE)</li> </ul>																																																			
<h1>NX110-5MF</h1>			<h1>80D26R</h1>																																																	
<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. <b>KEEP OUT OF REACH OF CHILDREN</b></p>																																																	
<p><b>FITTING DATE</b></p> <table border="0"> <tr> <td>①</td><td>②</td><td>③</td><td>④</td><td>⑤</td><td>⑥</td><td>⑦</td><td>⑧</td><td>⑨</td><td>⑩</td><td>⑪</td><td>⑫</td> </tr> <tr> <td colspan="11">YEAR</td> </tr> <tr> <td>①</td><td>②</td><td>③</td><td>④</td><td>⑤</td><td>⑥</td><td>⑦</td><td>⑧</td><td>⑨</td><td>⑩</td><td>⑪</td><td>⑫</td> </tr> <tr> <td colspan="11">MONTH</td> </tr> </table>							①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	YEAR											①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	MONTH										
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**CARE OF DANGER, WARNING AND CAUTION LABELS**

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

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### 3. SPECIFICATIONS

Model			M5640SU	
			2WD	4WD
Engine	Model		V2403-M-TE3	
	Type		Vertical, water-cooled, 4-cycle diesel engine	
	Number of cylinders		4	
	Total displacement		2434 cm <sup>3</sup> (148.6 cu.in.)	
	Bore and stroke		87 × 102.4 mm (3.4 × 4.0 in.)	
	Net power		41.1 kW (55.1 HP)*	
	PTO power (factory observed)		37.3 kW (50 HP)* / 2700 min <sup>-1</sup> (rpm)	
	Maximum torque		181 N·m (133.2 lbf·ft) / 1400 to 1600min <sup>-1</sup> (rpm)	
	Battery		12 V, RC : 133 min., CCA 582A	
	Fuel tank capacity		57.0 L (15.1 U.S. gals, 12.5 Imp. gals)	
	Engine crankcase capacity		7.2 L (7.6 U.S.qts, 6.3 Imp.qts)	
	Engine coolant capacity		8.0 L (8.5 U.S.qts, 7.0 Imp.qts)	
Dimensions	Overall length		3505 mm (138.0 in.)	3420 mm (134.6 in.)
	Overall width (Minimum tread)		1850 mm (72.83 in.)	
	Overall height		2360 mm (92.91 in.)	
	Wheel base		2000 mm (78.7 in.)	
	Tread	Front	1420 to 1820 mm (55.9 to 71.7 in.)	1300, 1400 mm (51.2, 55.1 in.)
		Rear	1320 to 1720 mm (52.0 to 67.7 in.)	
Minimum ground clearance		430 mm (16.9 in.) (BRACKET DRAWBAR)		
Weight			1700 kg (3750 lbs)	1750 kg (3860 lbs)
Travelling system	Standard tire size	Front	6.5-16	8.3-24
		Rear	14.9-28	
	Clutch		Dry, Single plate	
	Steering		Hydrostatic power steering	
	Brake	Travelling	Wet type, multiple discs (mechanical)	
Differential		Bevel gears with differential lock (Rear)		
Hydraulic system	Hydraulic control system		Position control	
	Pump-up capacity		41.6 L (11.0 U.S.gals, 9.15 Imp.gals)/min.	
	Three point hitch		Category I & II	
	Maximum lifting force		1900 kg (4189 lbs) at lower link end 1500 kg (3307 lbs) at 610 mm (24 in.) behind lifting point	
	System pressure		19.1 MPa (195 kgf/cm <sup>2</sup> , 2773 psi)	
PTO	Independent clutch		Wet type, multiple discs	
	Live PTO	Direction of turning	Clockwise, viewed from tractor rear	
		PTO speed	6 spline : 540 min <sup>-1</sup> (rpm) at 2295 engine min <sup>-1</sup> (rpm)	

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

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## 4. TRAVELING SPEEDS

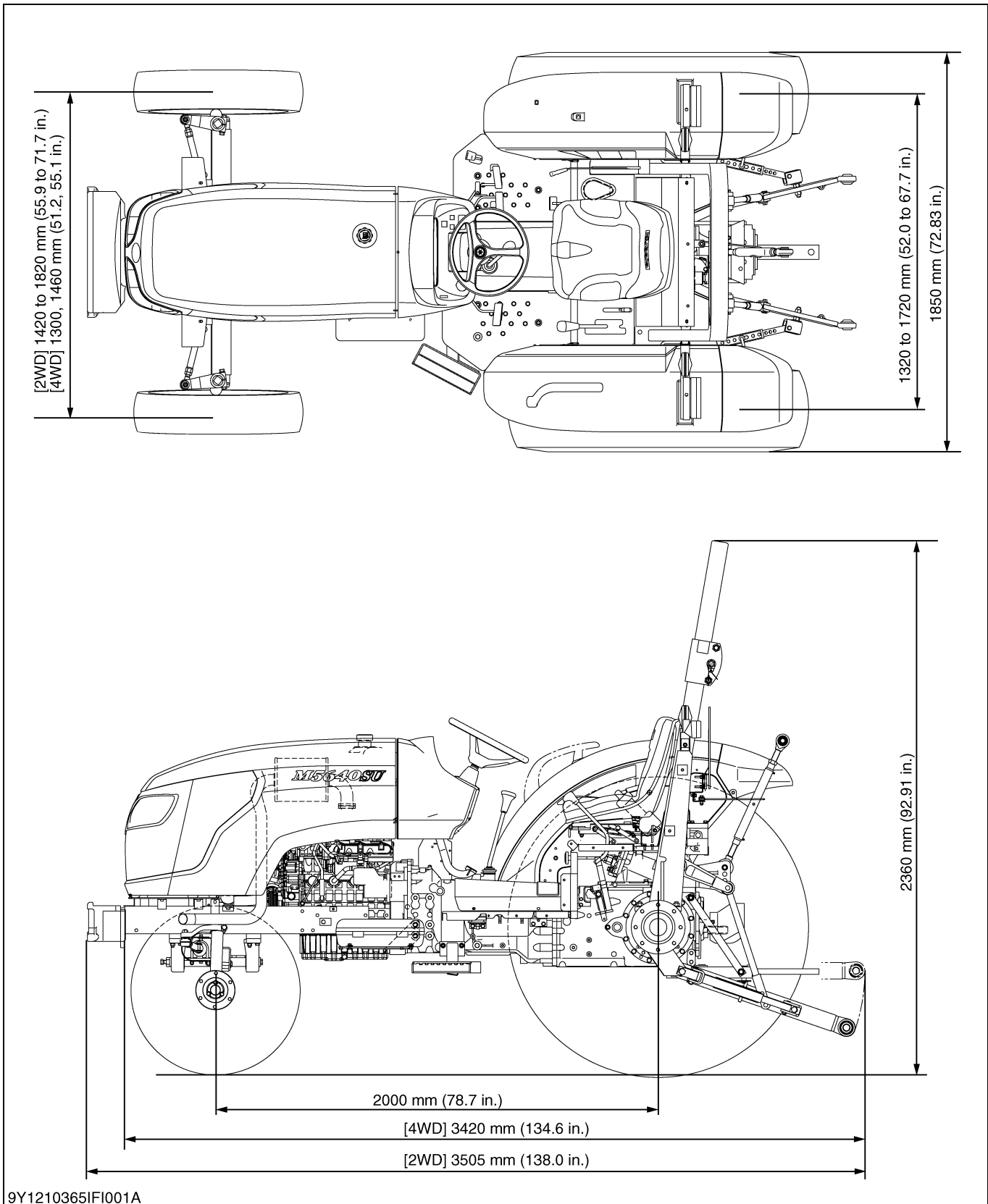
(At rated engine rpm)

Model		M5640SU	
Tire size (Rear)		14.9-28	
Range gear Shift lever	Main gear Shift lever	km/h	mph
<b>L</b> (Low)	1	2.4	1.5
	2	3.3	2.0
	3	5.0	3.1
	4	7.4	4.6
<b>H</b> (High)	1	8.9	5.5
	2	12.0	7.5
	3	18.3	11.4
	4	27.3	16.9
<b>R</b> (Reverse)	1	3.1	1.9
	2	4.2	2.6
	3	6.4	4.0
	4	9.5	5.9

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

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# 5. DIMENSIONS



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# **G GENERAL**

# GENERAL

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(2) Front Wheels [4WD Model] .....	G-60
(3) Rear Wheels.....	G-61
[3] TIRE LIQUID INJECTION .....	G-62
10. IMPLEMENT LIMITATIONS .....	G-65

# 1. TRACTOR IDENTIFICATION

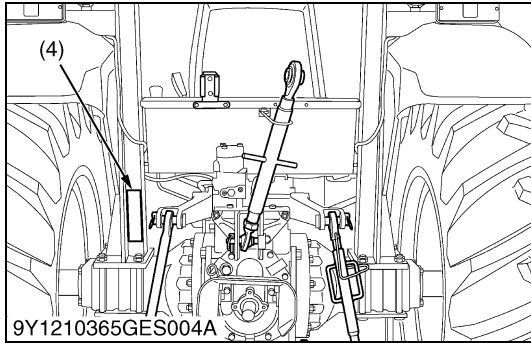
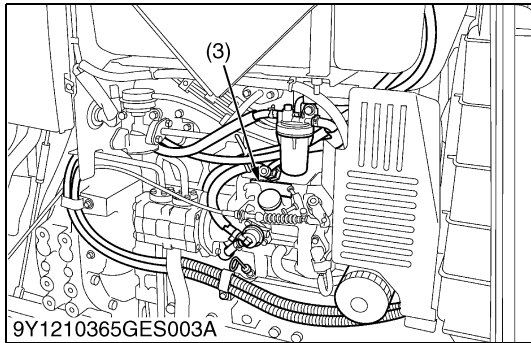
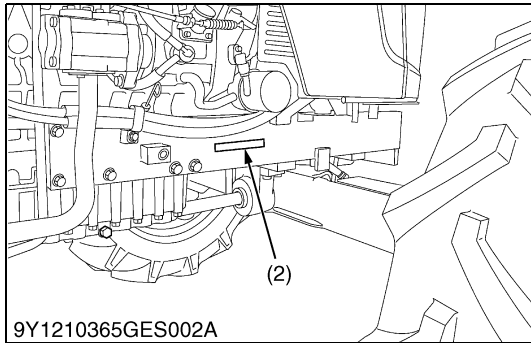
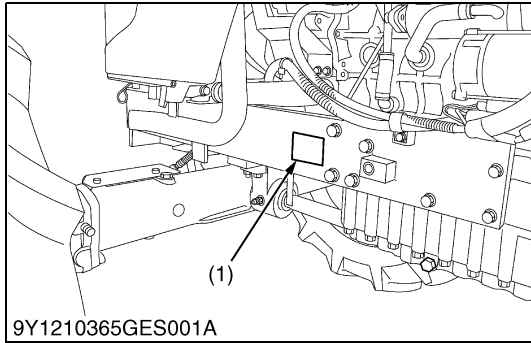
## [1] MODEL NAME AND SERIAL NUMBERS

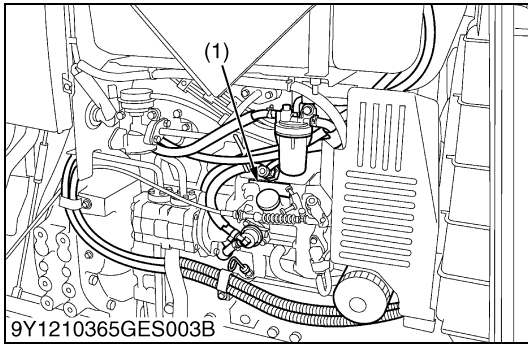
When contracting your local KUBOTA distributor, always specify engine serial number, tractor serial number and hourmeter reading.

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

- (4) ROPS Identification Plate  
(ROPS Serial Number)

9Y1210365GEG0001US0





### Engine Serial Number

The engine serial number is an identified number for the engine. It is marked after the engine model number.

It indicates month and year of manufacture as follows.

#### Year of manufacture

Alphabet or Number	Year	Alphabet or Number	Year
1	2001	F	2015
2	2002	G	2016
3	2003	H	2017
4	2004	J	2018
5	2005	K	2019
6	2006	L	2020
7	2007	M	2021
8	2008	N	2022
9	2009	P	2023
A	2010	R	2024
B	2011	S	2025
C	2012	T	2026
D	2013	V	2027
E	2014		

#### Month of manufacture

Month	Engine Lot Number	
	0001 ~ 9999	10000 ~
January	A0001 ~ A9999	B0001 ~
February	C0001 ~ C9999	D0001 ~
March	E0001 ~ E9999	F0001 ~
April	G0001 ~ G9999	H0001 ~
May	J0001 ~ J9999	K0001 ~
June	L0001 ~ L9999	M0001 ~
July	N0001 ~ N9999	P0001 ~
August	Q0001 ~ Q9999	R0001 ~
September	S0001 ~ S9999	T0001 ~
October	U0001 ~ U9999	V0001 ~
November	W0001 ~ W9999	X0001 ~
December	Y0001 ~ Y9999	Z0001 ~

e.g. V2403-M-TE3-9E0001

"9" indicates 2009 and "E" indicates March.

So, 9E indicates that the engine was manufactured on March, 2009.

(1) Engine Model and Serial Number

9Y1210365GEG0002US0

## [2] E3B ENGINE

[Example : Engine Model Name V2403-M-TE3]

The emission controls previously implemented in various countries to prevent air pollution will be stepped up as Non-Road Emission Standards continue to change. The timing or applicable date of the specific Non-Road Emission regulations depends on the engine output classification.

Over the past several years, Kubota has been supplying diesel engines that comply with regulations in the respective countries affected by Non-Road Emission regulations. For Kubota Engines, E3 will be the designation that identifies engine models affected by the next emission phase (See the table below).

When servicing or repairing engine, use only replacement parts for that specific E3 engine, designated by the appropriate E3 Kubota Parts List and perform all maintenance services listed in the appropriate Kubota Operator's Manual or in the appropriate E3 Kubota Workshop Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E2 engines), may result in emission levels out of compliance with the original E3 design and EPA or other applicable regulations. Please refer to the emission label located on the engine head cover to identify Output classification and Emission Control Information. E3 engines are identified with "ET" at the end of the Model designation, on the US EPA label. Please note : E3 is not marked on the engine.

TYPE : #####  
 FAMILY : #####  
 APPROVAL NUMBER: #####/#####/#####  
**Kubota** KUBOTA Corporation  
 #####

(1) (2)

---

**EMISSION CONTROL INFORMATION**

THIS ENGINE MEETS 2008 ##### EMISSION REGULATIONS FOR U.S. EPA AND CALIFORNIA NONROAD ENGINES.

**Kubota** KUBOTA Corporation

MODEL : ### -ET ENGINE DISP. : ####  
 FAMILY : 8 ### EGS : EM  
 OUTPUT : ## kW / ### rpm CATEGORY : ## - ## kW  
 VALVE CLEARANCE (COLD) : IN ## mm EX ## mm  
 INJ. TIMING : ### DEG BTDC LOW IDLE : ## - ## rpm  
 LOW SULFUR FUEL OR ULTRA LOW SULFUR FUEL ONLY  
 CONTACT KUBOTA FOR FUEL SETTING. #####

3EEAEAE0P002A

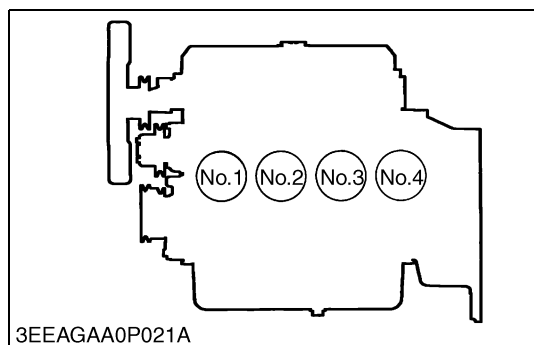
Category (1)	Engine output classification	EU regulation
K	From 19 to less than 37 kW	STAGE IIIA
J	From 37 to less than 75 kW	STAGE IIIA
I	From 75 to less than 130 kW	STAGE IIIA

Category (2)	Engine output classification	EPA regulation
ET	Less than 19kW	Tier 4
	From 19 to less than 56 kW	Interim Tier 4
	From 56 to less than 75 kW	Tier 3
	From 75 to less than 130 kW	Tier 3

- (1) EU regulation engine output classification category
- (2) "E3B" engines are identified with "ET" at the end of the Model designation, on the US EPA label.  
 "E3B" designates Tier 3 and some Interim Tier 4 / Tier 4 models, depending on engine output classification.

9Y1210365GEG0076US0

## [3] CYLINDER NUMBER

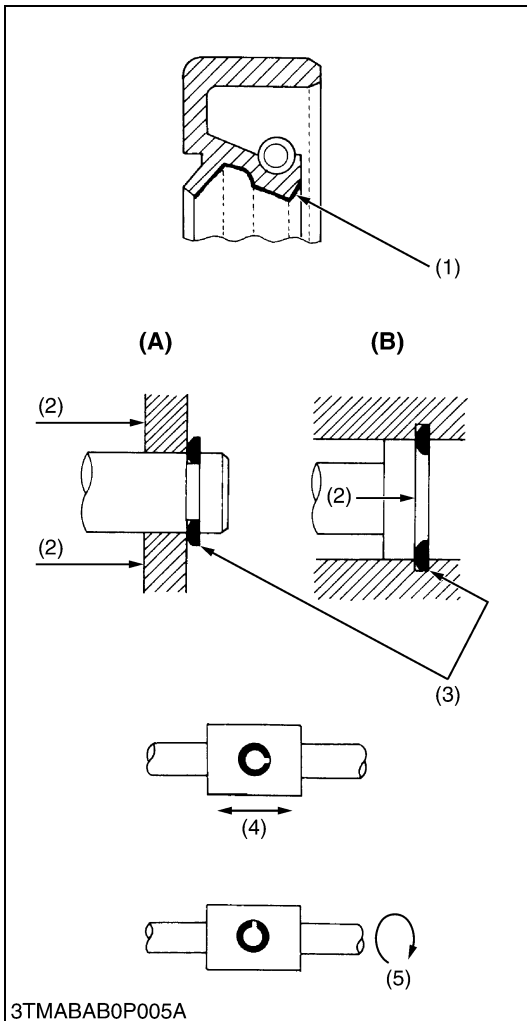


The cylinder numbers of V2403-M-TE3 diesel engine are designated as shown in the figure.

The sequence of cylinder numbers is given as No. 1, No. 2, No. 3 and No. 4 starting from the **gear case side**.

9Y1210365GEG0077US0

## 2. GENERAL PRECAUTIONS



- When you disassemble, carefully put the parts in a clean area to make it easy to find the parts. You must install the screws, bolts and nuts in their initial position to prevent the reassembly errors.
- When it is necessary to use special tools, use KUBOTA special tools. Refer to the drawings when you make special tools that you do not use frequently.
- Before you disassemble or repair machine, make sure that you always disconnect the ground cable from the battery first.
- Remove oil and dirt from parts before you measure.
- Use only KUBOTA genuine parts for replacement to keep the machine performance and to make sure of safety.
- You must replace the gaskets and O-rings when you assemble again. Apply grease (1) to new O-rings or oil seals before you assemble.
- When you assemble the external or internal snap rings, make sure that the sharp edge (3) faces against the direction from which force (2) is applied.
- 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.
- Clean the parts before you measure them.
- Tighten the nipples to the specified torque. Too much torque can cause damage to the hydraulic units or the nipples. Not sufficient torque can cause oil leakage.
- When you use a new hose or pipe, tighten the nuts to the specified torque. Then loosen (approx. by 45 °) and let them be stable before you tighten to the specified torque (This is not applied to the parts with seal tape).
- When you remove the two ends of a pipe, remove the lower end first.
- Use two pliers in removal and installation. One to hold the stable side, and the other to turn the side you remove to prevent twists.
- Make sure that the sleeves of fearless connectors and taper sections of hoses are free of dust and scratches.
- After you tighten the nipples, clean the joint and apply the maximum operation pressure 2 to 3 times to examine oil leakage.

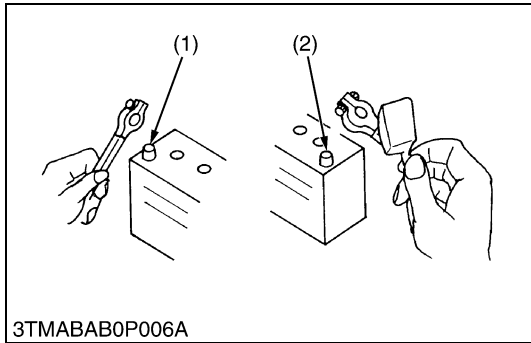
- (1) Grease
- (2) Force
- (3) Sharp Edge
- (4) Axial Force
- (5) Rotating Movement

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

WSM000001GEG0106US1



# 3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



3TMABAB0P006A

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

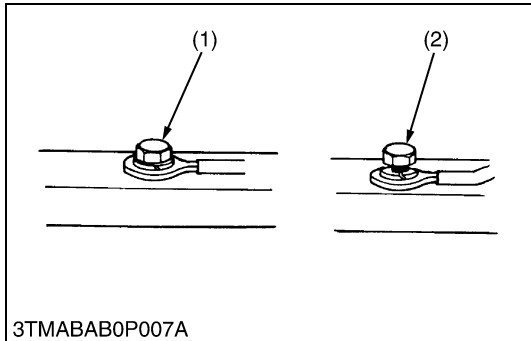
**■ IMPORTANT**

- 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

WSM000001GEG0062US1

## [1] WIRING

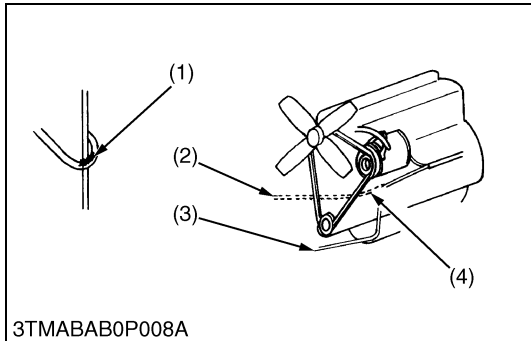


3TMABAB0P007A

- Securely tighten wiring terminals.

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

WSM000001GEG0063US1

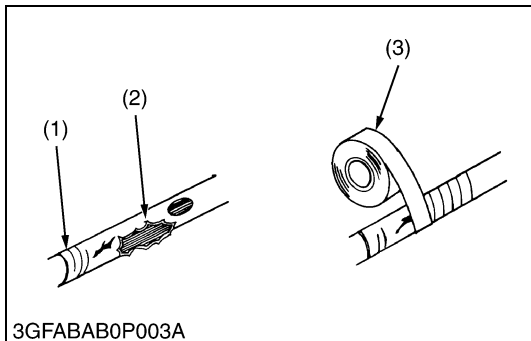


3TMABAB0P008A

- Do not let wiring contact dangerous part.

- (1) Dangerous Part (Sharp Edge) (2) Wiring (Incorrect) (3) Wiring (Correct) (4) Dangerous Part

WSM000001GEG0064US1

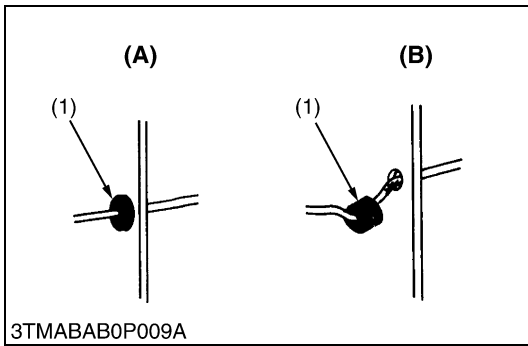


3GFABAB0P003A

- Repair or change torn or aged wiring immediately.

- (1) Aged (2) Torn (3) Insulating Vinyl Tape

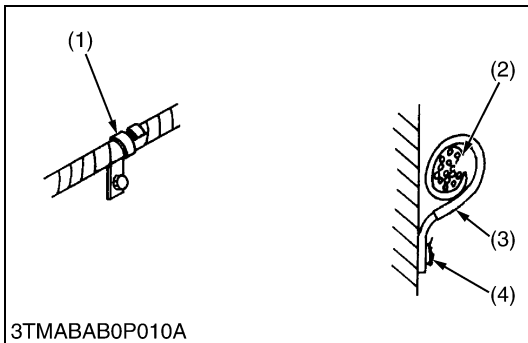
WSM000001GEG0065US1



• Securely insert grommet.

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

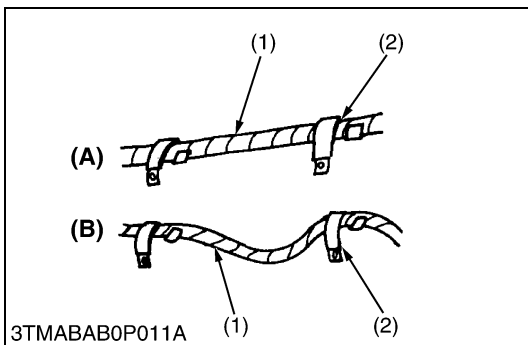
WSM000001GEG0066US1



• Securely clamp, being careful not to damage wiring.

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

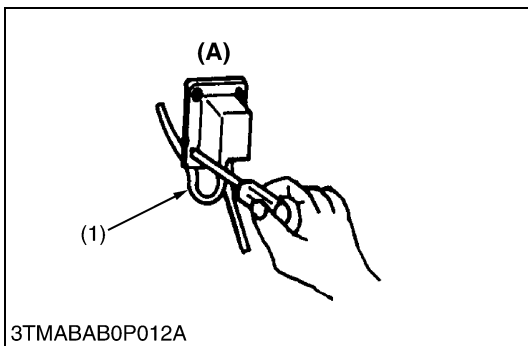
WSM000001GEG0067US1



• 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

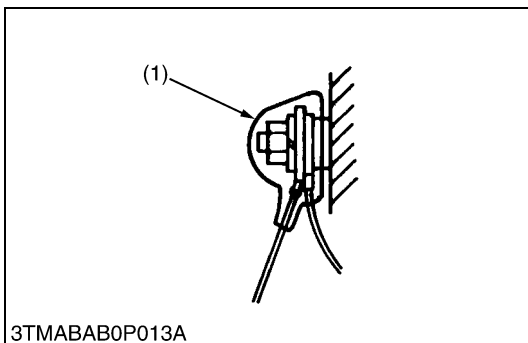
WSM000001GEG0068US1



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

- (1) Wiring
- (A) Incorrect

WSM000001GEG0069US1

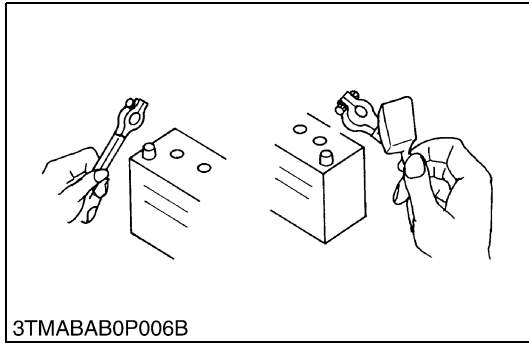


• After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover (Securely Install Cover)

WSM000001GEG0070US1

## [2] BATTERY



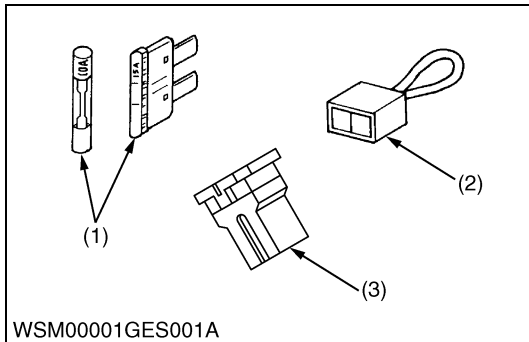
- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting 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.

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## [3] FUSE



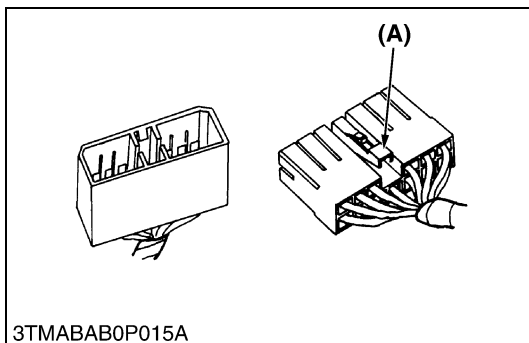
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse  
(2) Fusible Link

(3) Slow Blow Fuse

WSM000001GEG0072US1

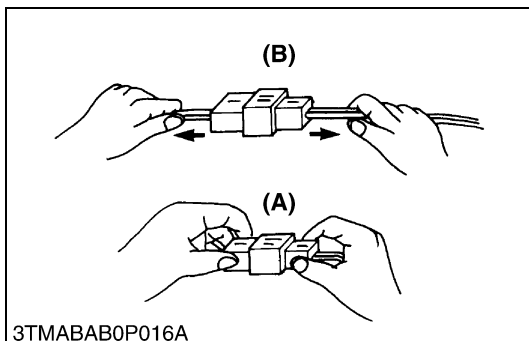
## [4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

WSM000001GEG0073US1

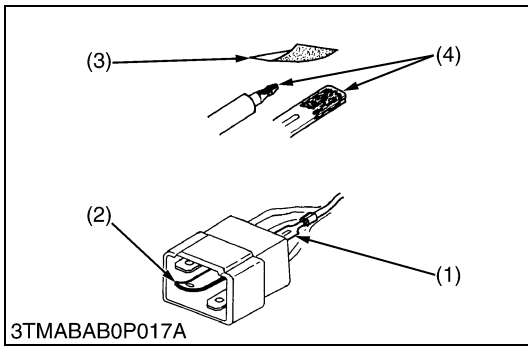


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

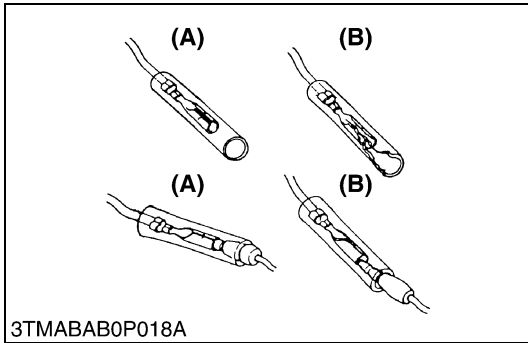
WSM000001GEG0074US1



- 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

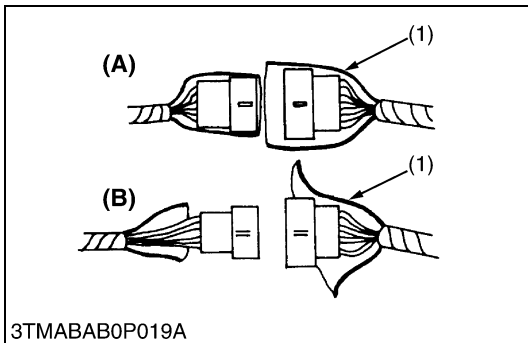
WSM000001GEG0075US1



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

- (A) Correct
- (B) Incorrect

WSM000001GEG0076US1

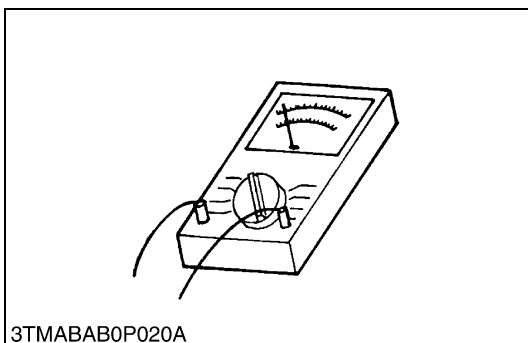


- Make certain plastic cover is large enough to cover whole connector.

- (1) Cover
- (A) Correct
- (B) Incorrect

WSM000001GEG0077US1

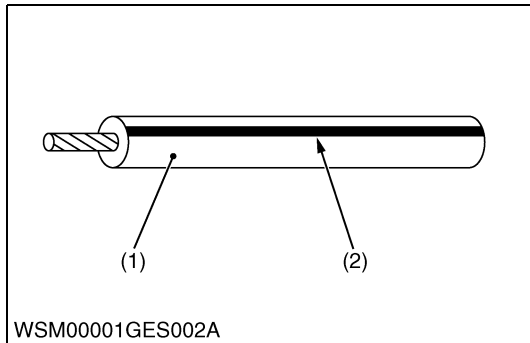
## [5] HANDLING OF CIRCUIT TESTER



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

WSM000001GEG0078US1

## [6] COLOR OF WIRING



- Colors of wire are specified to the color codes.
- This symbol of "/" shows color with stripe(s).

**(An example)**

Red stripe on white color : W/R

Color of wiring	Color code
Black	B
Brown	Br
Green	G
Gray	Gy or Gr
Blue	L
Light Green	Lg
Orange	Or
Pink	P
Purple	Pu or V
Red	R
Sky Blue	Sb
White	W
Yellow	Y

(1) Wire Color

(2) Stripe

WSM000001GEG0079US0

## 4. LUBRICANTS, FUEL AND COOLANT

	Place	Capacity		Lubricants, fuel and coolant	
		M5640SU	M5640SUD		
1	Fuel tank	57.0 L 15.1 U.S. gals 12.5 Imp. gals		<ul style="list-style-type: none"> <li>No. 2-D diesel fuel</li> <li>No. 1-D diesel fuel if temperature is below -10 °C (14 °F)</li> </ul>	
2	Coolant	8.0 L 8.5 U.S.qts 7.0 Imp.qts		Fresh clean water with anti-freeze	
3	Engine crankcase (with filter)	7.2 L 7.6 U.S.qts 6.3 Imp.qts		<b>Engine oil</b> API Service Classification CC or CD <ul style="list-style-type: none"> <li>Below 0 °C (32 °F) SAE10W, 10W-30 or 10W-40</li> <li>0 to 25 °C (32 to 77 °F) SAE20, 10W-30 or 10W-40</li> <li>Above 25 °C (77 °F) SAE30, 10W-30 or 10W-40</li> </ul>	
4	Transmission case	40.0 L 42.3 U.S.qts 35.2 Imp.qts		KUBOTA UDT or SUPER UDT fluid*	
5	Front axle case	–	8.0 L 8.5 U.S.qts 7.0 Imp.qts	KUBOTA UDT or SUPER UDT fluid* or SAE80, SAE90 gear oil	
<b>Greasing</b>					
	Place	No. of greasing point		Capacity	Type of grease
6	Top link	2		Until grease overflows	Multipurpose type grease NLGI-2 or NLGI-1 (GC-LB)
	Lift rod	1			
	Front axle gear case support	–	2		
	Front axle support	2			
	Front wheel hub	2	–		
	Knuckle shaft	2	–		
	Battery terminal	2		Moderate amount	

\* KUBOTA original transmission hydraulic fluid.

9Y1210365GEG0003US0

## ■ 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 or better" lubricating oil with a high Total Base Number (TBN of 10 minimum).
- Refer to the following table for the suitable API classification engine oil according to the engine type (with internal EGR, external EGR or non-EGR) and the fuel (low-sulfur or high-sulfur fuel).

Fuel used	Engine oil classification (API classification)	
	Oil class of engines except external EGR	Oil class of engines with external EGR
High Sulfur Fuel (≥ 500 ppm)	<b>CF</b> (If the "CF-4, CG-4, CH-4, or CI-4" lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals. (approximately half))	—
Low Sulfur Fuel (< 500 ppm) or Ultra Low Sulfur Fuel (< 15 ppm)	<b>CF, CF-4, CG-4, CH-4 or CI-4</b>	<b>CF or CI-4</b> (Class CF-4, CG-4 and CH-4 engine oils cannot be used on EGR type engines)

EGR : Exhaust Gas Re-circulation

- The **CJ-4** engine oil is intended for DPF (Diesel Particulate Filter) type engines, and cannot be used on this tractor.

### Fuel

- Cetane number of 45 minimum. Cetane number greater than 50 is preferred, especially for temperatures below -20 °C (-4 °F) or elevations above 1500 m (5000 ft).
- If diesel fuel with sulfur content greater than 0.5 % sulfur content in used, reduce the service interval for engine oil and filter by 50%.
- DO NOT use diesel fuel with sulfur content greater than 1.0 %.
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.
- No.2-D is a distillate fuel of lower volatility for engine in industrial and heavy mobile service. (SAE J313 JUB87)
- Since this engine adopts EPA Tier 4 and Interim Tier 4 standards, the use of low sulfur fuel or ultra low sulfur fuel is mandatory in EPA regulated area (North America). Therefore, please use No.2-D S500 or S15 diesel fuel as an alternative to No.2-D, or use No.1-D S500 or S15 diesel fuel as an alternative to No.1-D if outside air temperature is below -10 °C (14 °F).

### Transmission oil

- The oil used to lubricate the transmission is also used as hydraulic fluid. To insure proper operation of the hydraulic system and to complete lubrication of the transmission, it is important that a multi-grade transmission fluid is used in this system. We recommend the use of KUBOTA UDT or SUPER UDT fluid for optimum protection and performance.

Do not mix different brands together.

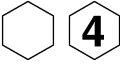


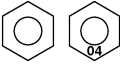
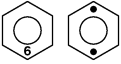
- Indicated capacities of water and oil are manufacturer's estimate.

9Y1210365GEG0004US0

## 5. TIGHTENING TORQUES

### [1] GENERAL USE SCREWS, BOLTS AND NUTS

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

Indication on top of bolt	 4 No-grade or 4T						 7 7T						 9 9T		
Indication on top of nut	 No-grade or 4T												 6T		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6	7.9	0.80	5.8	7.9	0.80	5.8	9.81	1.00	7.24	7.9	0.80	5.8	12.3	1.25	9.05
	to 9.3	to 0.95	to 6.8	to 8.8	to 0.90	to 6.5	to 11.2	to 1.15	to 8.31	to 8.8	to 0.90	to 6.5	to 14.2	to 1.45	to 10.4
M8	18	1.8	13	17	1.7	13	24	2.4	18	18	1.8	13	30	3.0	22
	to 20	to 2.1	to 15	to 19	to 2.0	to 14	to 27	to 2.8	to 20	to 20	to 2.1	to 15	to 34	to 3.5	to 25
M10	40	4.0	29	32	3.2	24	48	4.9	36	40	4.0	29	61	6.2	45
	to 45	to 4.6	to 33	to 34	to 3.5	to 25	to 55	to 5.7	to 41	to 44	to 4.5	to 32	to 70	to 7.2	to 52
M12	63	6.4	47	-	-	-	78	7.9	58	63	6.4	47	103	10.5	76.0
	to 72	to 7.4	to 53	-	-	-	to 90	to 9.2	to 66	to 72	to 7.4	to 53	to 117	to 12.0	to 86.7
M14	108	11.0	79.6	-	-	-	124	12.6	91.2	-	-	-	167	17.0	123
	to 125	to 12.8	to 92.5	-	-	-	to 147	to 15.0	to 108	-	-	-	to 196	to 20.0	to 144
M16	167	17.0	123	-	-	-	197	20.0	145	-	-	-	260	26.5	192
	to 191	to 19.5	to 141	-	-	-	to 225	to 23.0	to 166	-	-	-	to 304	to 31.0	to 224
M18	246	25.0	181	-	-	-	275	28.0	203	-	-	-	344	35.0	254
	to 284	to 29.0	to 209	-	-	-	to 318	to 32.5	to 235	-	-	-	to 402	to 41.0	to 296
M20	334	34.0	246	-	-	-	368	37.5	272	-	-	-	491	50.0	362
	to 392	to 40.0	to 289	-	-	-	to 431	to 44.0	to 318	-	-	-	to 568	to 58.0	to 419

WSM000001GEG0001US1

### [2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8	12	1.2	8.7	8.9	0.90	6.5
	to 15	to 1.6	to 11	to 11	to 1.2	to 8.6
M10	25	2.5	18	20	2.0	15
	to 31	to 3.2	to 23	to 25	to 2.6	to 18
M12	30	3.0	22	31	3.2	23
	to 49	to 5.0	to 36			
M14	62	6.3	46	-	-	-
	to 73	to 7.5	to 54			
M16	98.1	10.0	72.4	-	-	-
	to 112	to 11.5	to 83.1			
M18	172	17.5	127	-	-	-
	to 201	to 20.5	to 148			

WSM000001GEG0002US1



**[3] HYDRAULIC FITTINGS****(1) Hydraulic Hose Fitting**

Hose size	Thread side	Tightening torque		
		N·m	kfg·m	lbf·ft
02	1/8	13.8 to 15.6	1.40 to 1.60	10.2 to 11.5
03	1/4	22.6 to 27.4	2.30 to 2.80	16.7 to 20.2
04				
05	3/8	45.2 to 52.9	4.60 to 5.40	33.3 to 39.0
06				

WSM000001GEG0097US0

**(2) Hydraulic Pipe Cap Nuts**

Pipe size	Tightening torque		
	N·m	kfg·m	lbf·ft
φ4 × t1.0	19.7 to 29.4	2.00 to 3.00	14.5 to 21.6
φ6 × t1.0	24.6 to 34.3	2.50 to 3.50	18.1 to 25.3
φ8 × t1.0	29.5 to 39.2	3.00 to 4.00	21.7 to 28.9
φ10 × t1.0	39.3 to 49.0	4.00 to 5.00	29.0 to 36.1
φ12 × t1.5	49.1 to 68.6	5.00 to 7.00	36.2 to 50.6
φ15 × t1.6	108 to 117	11.0 to 12.0	79.6 to 86.7
φ18 × t1.6	108 to 117	11.0 to 12.0	79.6 to 86.7

WSM000001GEG0098US0

**(3) Adaptors, Elbows and Others**

Item	Thread side	Tightening torque		
		N·m	kfg·m	lbf·ft
POA-PF (Nipple with O-ring)	PF 1/8	45 to 53	4.5 to 5.5	33 to 39
	PF 1/4	74 to 83	7.5 to 8.5	55 to 61
	PF 3/8	93.2 to 102	9.50 to 10.5	68.8 to 75.9
	PF 1/2	113 to 122	11.5 to 12.5	83.2 to 90.4
POB-PF (Elbow with O-ring and no nut)	PF 1/8	23 to 26	2.3 to 2.7	17 to 19
	PF 1/4	36 to 43	3.6 to 4.4	26 to 31
	PF 3/8	54 to 63	5.5 to 6.5	40 to 47
	PF 1/2	73 to 83	7.4 to 8.5	54 to 61
Adaptor (NPT)	PF 1/8	9.8 to 14	1.0 to 1.5	7.3 to 10
	PF 1/4	30 to 34	3.0 to 3.5	22 to 25
	PF 3/8	49 to 68	5.0 to 7.0	37 to 50
	PF 1/2	69 to 88	7.0 to 9.0	51 to 65

WSM000001GEG0099US0

## 6. MAINTENANCE

No.	Item		Service Interval														Since then	Important	Reference page	
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr		G-20
2	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr		G-20
3	Battery condition	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*4	G-26	
4	Greasing	–		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		G-21	
5	Fan belt	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		G-23	
6	Brake pedal	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		G-24	
7	Clutch pedal	Adjust	★	☆		☆		☆		☆		☆		☆		☆	every 100 Hr		G-19	
8	Fuel filter	Clean		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		G-22	
		Replace								☆							every 400 Hr	@	G-28	
9	Air cleaner element	Primary element	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	*1	G-22		
		Replace															every 1 year	*2	@ G-30	
		Secondary element	Replace														every 1 year		G-30	
10	Fuel line	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		@ G-23	
		Replace															every 2 years	*3	G-33	
11	Toe-in	Adjust				☆				☆				☆			every 200 Hr		G-28	
12	Power steering oil line	Check				☆				☆				☆			every 200 Hr		G-27	
		Replace															every 2 years		G-33	
13	Radiator hose and clamp	Check				☆				☆				☆			every 200 Hr		G-27	
		Replace															every 2 years		G-33	
14	Intake air line	Check				☆				☆				☆			every 200 Hr		@ G-23	
		Replace															every 2 years		G-33	
15	Hydraulic oil filter	Replace	★					☆						☆			every 300 Hr		G-18	
16	Engine oil	Change	★							☆							every 400 Hr		G-17	
17	Greasing (2WD front wheel hub)	–								☆							every 400 Hr		G-29	
18	Engine oil filter	Replace	★							☆							every 400 Hr		G-17	
19	Transmission fluid	Change	★											☆			every 600 Hr		G-19	
20	Front axle case oil	Change												☆			every 600 Hr		G-29	
21	Front axle pivot	Adjust												☆			every 600 Hr		G-29	
22	Engine valve clearance	Adjust															every 800 Hr		G-29	
23	Fuel injection nozzle injection pressure	Check															every 1500 Hr	@	G-30	

No.	Item		Service Interval														Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
24	Turbocharger	Check																every 3000 Hr	@	G-30
25	Injection pump	Check																every 3000 Hr	@	G-30
26	Cooling system	Flush																every 2 years		G-31
27	Coolant	Change																every 2 years		G-31
28	Fuel system	Bleed																Service as required		G-34
29	Clutch housing water	Drain																	G-34	
30	Fuse	Replace																	G-35	
31	Light bulb	Replace																	G-35	

■ **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 listed above (@ marked) are registered as emission related critical parts by KUBOTA in U.S.EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.  
Please see the Warranty Statement in detail.

9Y1210365GEG0005US0

## 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.

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### [1] DAILY CHECK

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

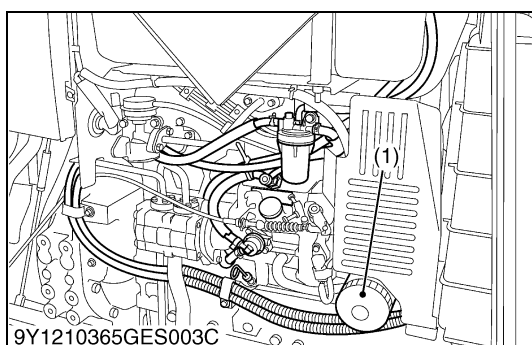
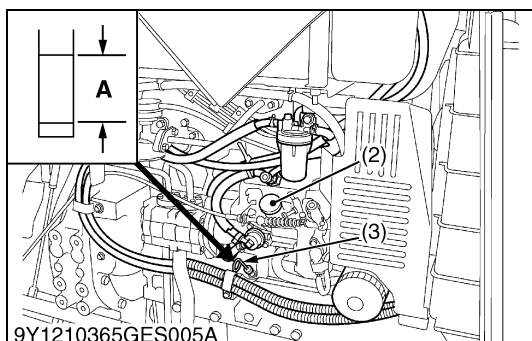
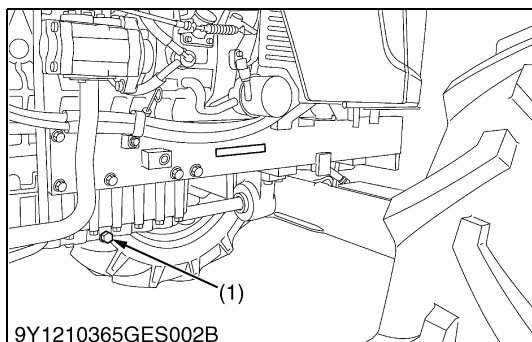
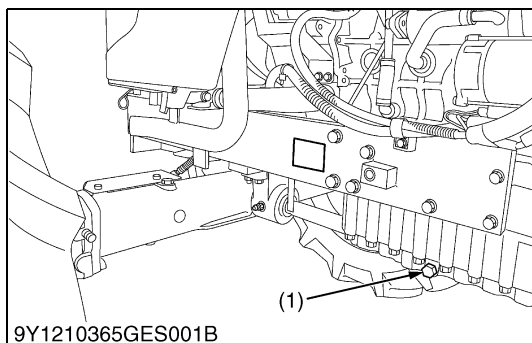
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#### Checking

- 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 leaks.
  3. Check the engine oil level.
  4. Check the transmission fluid level.
  5. Check the coolant level.
  6. Check and clean the radiator screen and grill.
  7. Check the bolts and nuts of the tires are tight.
  8. Check the number plate or SMV emblem for damage and cleaner replace as necessary if equipped.
  9. Care of danger, warning and caution labels.
  10. Clean around the exhaust manifold and the muffler of the engine.
  11. Check the ROPS.
    - While sitting in the operator's seat.
      1. Check the throttle pedal, brake pedals and clutch pedal.
      2. Check the parking brake.
      3. Check the steering wheel.
      4. Check the seat belt condition.
        - Turning the key switch.
          1. Check the performance of the Easy Checker lights.
          2. Check head lights, tail lights and hazard light.  
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.
              3. Check the brakes for proper operation.

9Y1210365GEG0008US0

## [2] CHECK POINT OF INITIAL 50 HOURS



### Changing Engine Oil

#### ⚠ CAUTION

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

1. To drain the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely into the oil pan. All the used oil can be drained out easily when the engine is still warm.
2. After draining reinstall the drain plug (1).
3. Fill with the new oil up to the upper notch on the dipstick (3).

#### ■ NOTE

- Refer to "4. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.

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

A : Oil level is acceptable within this range.

9Y1210365GEG0026US0

### Replacing Engine Oil Filter Cartridge

#### ⚠ CAUTION

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

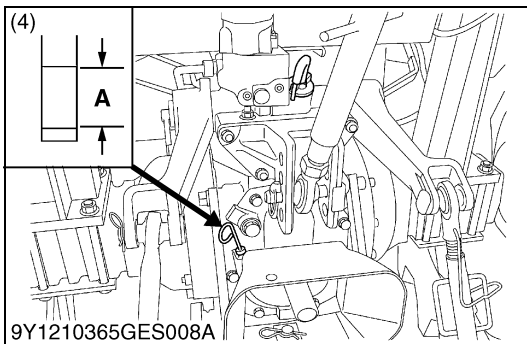
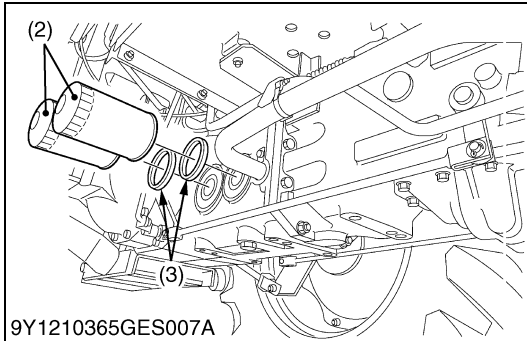
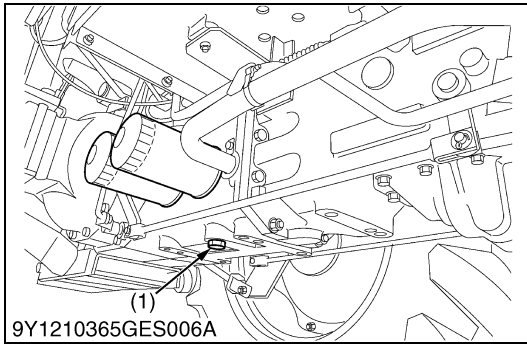
1. Remove the oil filter (1).
2. Put a film of clean engine oil on the rubber seal of the new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases 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, use only a KUBOTA genuine filter.

- (1) Engine Oil Filter Cartridge

9Y1210365GEG0027US0



## Replacing Hydraulic Oil Filter Cartridge

### ⚠ CAUTION

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

1. Remove the drain plug (1) at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug (1).
3. Remove the two oil filters (2).
4. Wipe off metal filings from the magnetic filter (3) with a clean rag.
5. Put a film of clean transmission oil on the rubber seal of the new filters.
6. Tighten the filter quickly until it contacts the mounting surface. tighten filter by hand an additional 1/2 turn only.
7. After the new filters have been replaced, fill the transmission oil up to the upper notch on the dipstick (4).
8. After running the engine for a few minutes, stop the engine and check the oil level again, add oil to the prescribed level.
9. Make sure that the transmission fluid does not leak pass the seal on the filters.

### ■ IMPORTANT

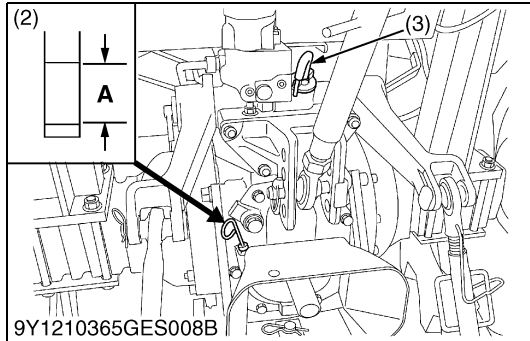
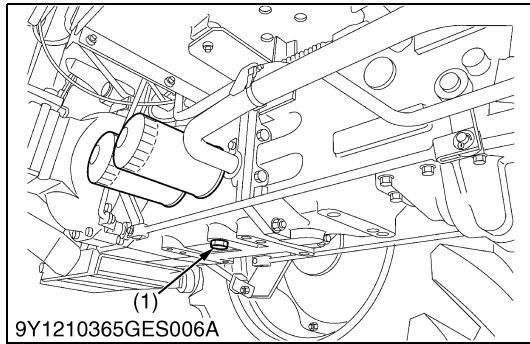
- To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.
- Do not operate the tractor immediately after changing the transmission fluid.

**Run the engine at medium speed for a few minutes to prevent damage to the transmission.**

- (1) Drain Plug
- (2) Hydraulic Oil Filter Cartridge
- (3) Magnetic Filter
- (4) Dipstick

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

9Y1210365GEG0028US0



### Changing Transmission Fluid

#### ⚠ CAUTION

- Allow engine to cool down sufficiently, oil can be hot and can burn.
1. To drain the used oil, remove the drain plug (1) at the bottom of the transmission case and drain the oil completely into the oil pan.
  2. After draining reinstall the drain plug (1).
  3. Fill with the new KUBOTA SUPER UDT fluid up to the upper notch on the dipstick (2).
  4. After running the engine for a few minutes, stop it and check the oil level again; add oil to prescribed level.

#### ■ IMPORTANT

- Do not operate the tractor immediately after changing the transmission fluid.  
Run the engine at medium speed for a few minutes to prevent damage to the transmission.

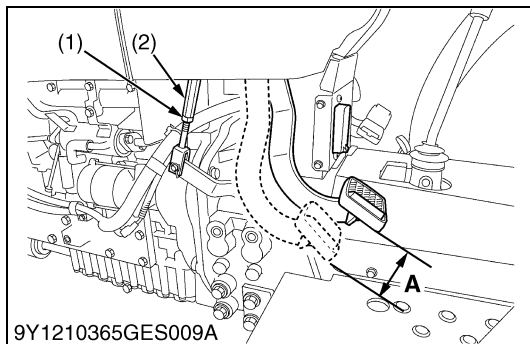
#### ■ NOTE

- Refer to "4. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.

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

A : Oil level is acceptable within this range.

9Y1210365GEG0029US0



### Clutch Pedal Free Travel

1. Stop the engine and remove the key.
2. Slightly depress the clutch pedal and measure free travel "L" at top of pedal.
3. If adjustment is needed, loosen the lock nut (1), and turn the turnbuckle (2) to adjust the clutch rod length within acceptable limits.
4. Retighten the lock nut (1).

Clutch pedal free travel "L" on the pedal	Factory spec.	35 to 45 mm 1.4 to 1.8 in.
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- (1) Lock Nut  
(2) Turnbuckle

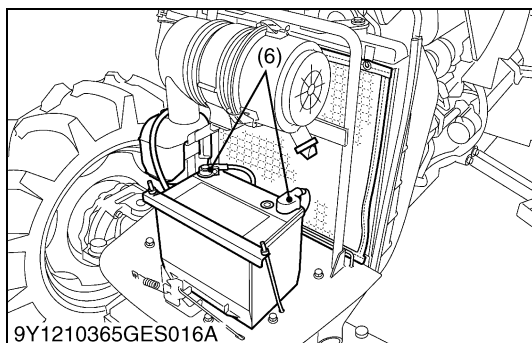
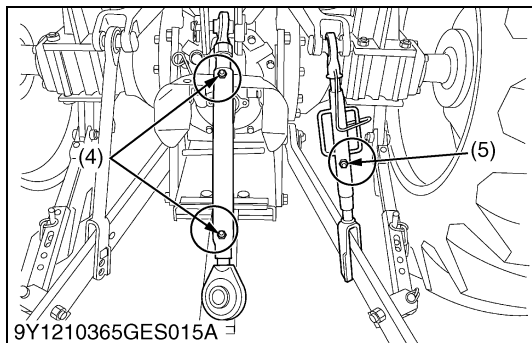
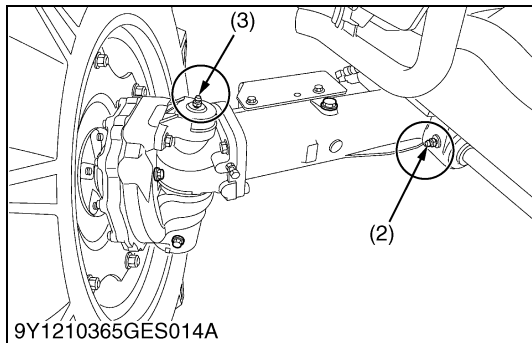
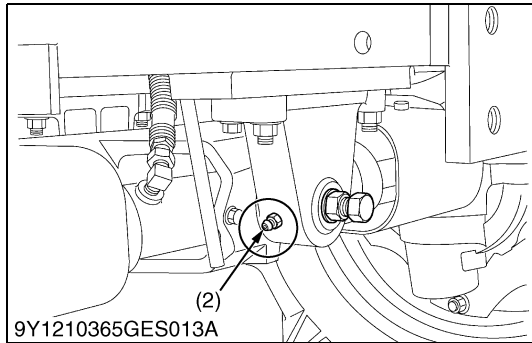
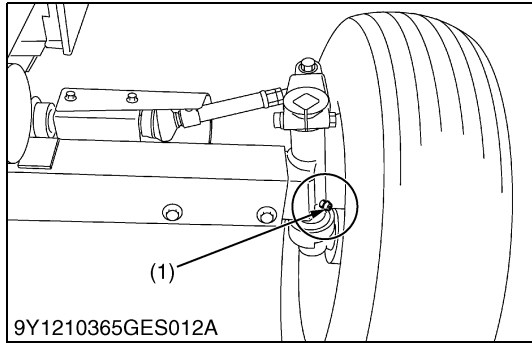
L : Free Travel

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## [4] CHECK POINTS OF EVERY 100 HOURS

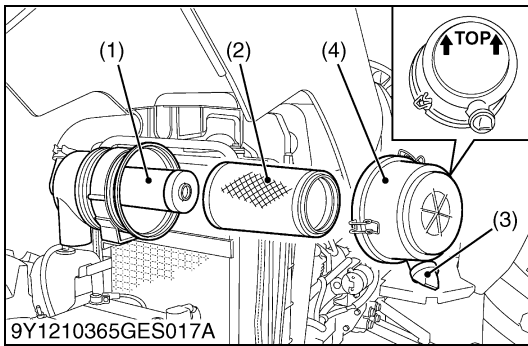


### Greasing

1. Apply a small amount of multipurpose grease to the following points every 100 hours.
2. If you operated the machine in extremely wet and muddy conditions, lubricate grease fittings more often.

- |  |                                       |
|--|---------------------------------------|
| (1) Grease Fitting (Knuckle Shaft)                     | (4) Grease Fitting (Top Link)         |
| (RH, LH)   | (5) Grease Fitting (Lift Rod) (RH)    |
| (2) Grease Fitting (Front Axle Support)                | (6) Grease Fitting (Battery Terminal) |
| (3) Grease Fitting (Front Wheel Case Support) (RH, LH) |                                       |

9Y1210365GEG0012US0



### Cleaning Air Cleaner Element

1. Remove the air cleaner cover (4) 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 air cleaner primary element :  
Once yearly or after every sixth cleaning, whichever comes first.

#### ■ NOTE

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

#### ■ IMPORTANT

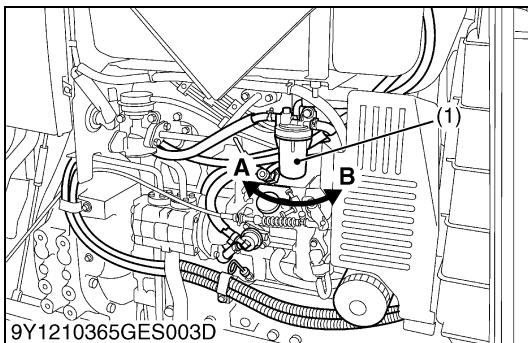
- The air cleaner uses a dry element, never apply oil.
- Do not run the engine with filter element removed.
- Be sure to refit the dust cup with the arrow ↑ (on the rear of cup) upright. If the dust cup is improperly fitted, evacuator valve will not function and dust will adhere to the element.
- Do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

#### ■ Evacuator Valve

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 (Safety) Element | (3) Evacuator Valve |
| (2) Primary Element            | (4) Cover           |

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### Cleaning Fuel Filter

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

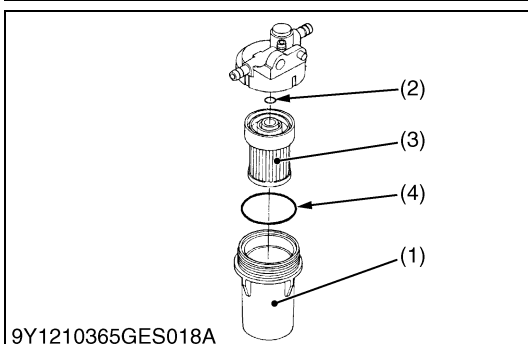
1. Loosen and remove the filter bowl (1), and rinse the inside with kerosene.
2. Take out the filter element (3) and dip it in the kerosene to rinse.
3. After cleaning, reassemble the fuel filter, keeping out dust and dirt.
4. Bleed the fuel system. (See "Bleeding Fuel System".)

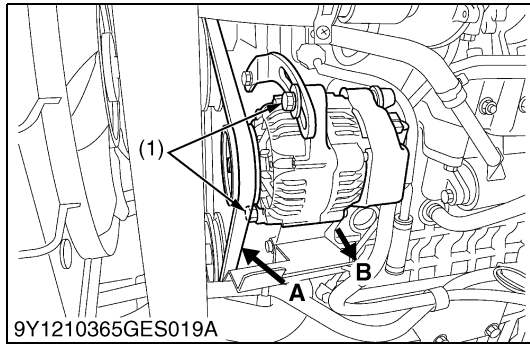
#### ■ IMPORTANT

- If dust and dirt enters the fuel system the fuel pump and injection nozzles are subject to premature wear. To prevent this, be sure to clean the fuel filter bowl periodically.

- |                      |             |
|----------------------|-------------|
| (1) Fuel Filter Bowl | A : Loosen  |
| (2) O-ring           | B : Tighten |
| (3) Filter Element   |             |
| (4) O-ring           |             |

9Y1210365GEG0014US0





9Y1210365GES019A

### Fan Belt Tension

#### **⚠ CAUTION**

To avoid personal injury :

- **Be sure to stop the engine before checking 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 screws (1) and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
  4. Replace fan belt if it is damaged.

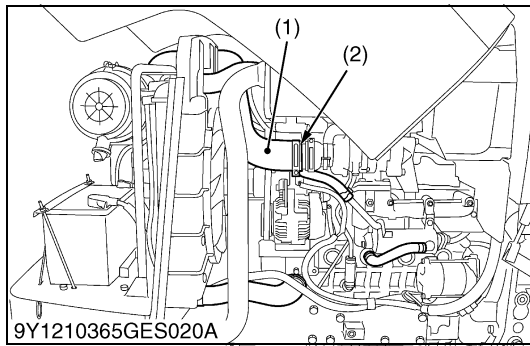
Deflection (A) when the belt is pressed (98 N [10 kgf, 22 lbf]) in the middle of the span.	Factory spec.	7 to 9 mm 0.28 to 0.35 in.
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(1) Screw

**A : Check the belt tension**

**B : To tighten**

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9Y1210365GES020A

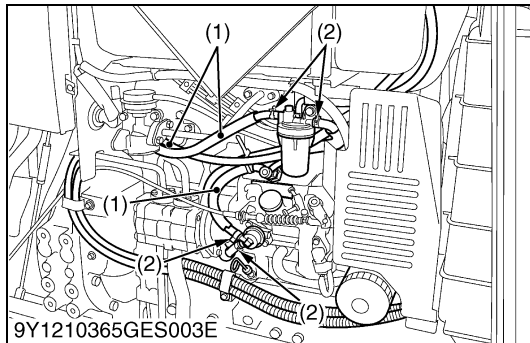
### Checking Intake Air Line

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 Clamps

9Y1210365GEG0020US0



9Y1210365GES003E

### Checking Fuel Line

1. Check to see that all lines (1) and hose clamps (2) 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.**  
(See "Bleeding Fuel System".)

(1) Fuel Lines

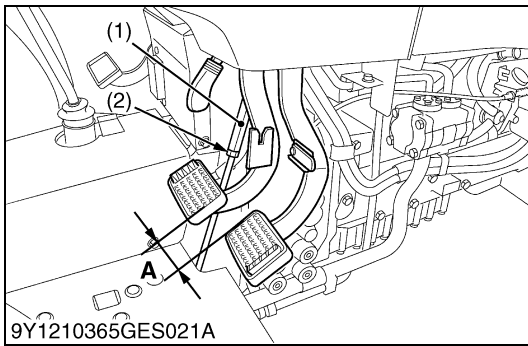
(2) Clamp Bands

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### Adjusting Clutch Pedal Free Travel

- Refer to the "4.-[1] TRAVELING CLUTCH" at "2. CLUTCH" section.

9Y1210365GEG0016US0



### **Adjusting Brake Pedal Free Travel**

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 (2) and turn the turnbuckle (1) to adjust the rod length within acceptable limit.
4. Retighten the lock nut (2).

Brake pedal free travel "A"	Factory spec.	40 to 45 mm 1.6 to 1.8 in.
--------------------------------	---------------	-------------------------------

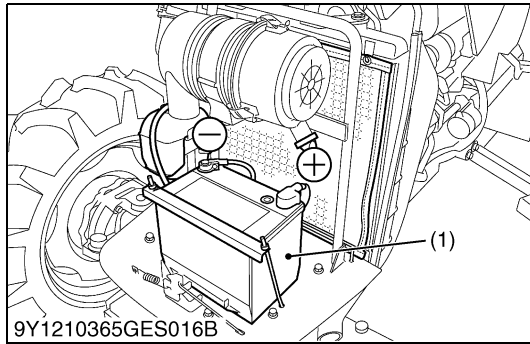
#### ■ **IMPORTANT**

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

- (1) Turnbuckle  
(2) Lock Nut

**A : Free Travel**

9Y1210365GEG0017US0



## 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 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 slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
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.

### Table

Battery type	Volts (V)	Reserve capacity (min)	Cold cranking ampere (SAE)	Normal charging rate (A)
80D26R	12	133	582	6.5

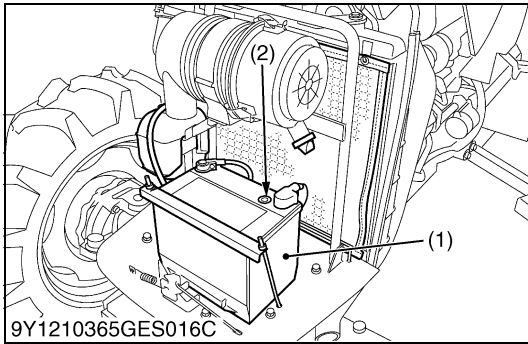
CCA : Cold Cranking Ampere

### ■ 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 once every six months in cold seasons.

(1) Battery

9Y1210365GEG0018US0



### Checking Battery Condition

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

#### **!** DANGER

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

#### **!** CAUTION

- Never remove the vent plugs while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are splattered with it, wash it away completely with water immediately and get medical attention.
- Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.
- 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.
1. Mishandling the battery shortens the service life and adds to maintenance costs.
  2. The original battery is maintenance free type battery, but need some servicing.  
If the battery is weak, the engine is difficult to start and the lights be dim. It is important to check the battery periodically.
  3. Check the battery condition by reading the indicator.

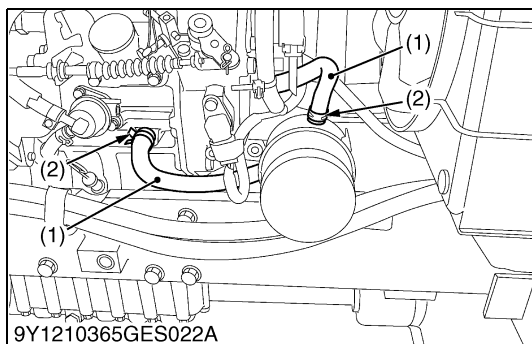
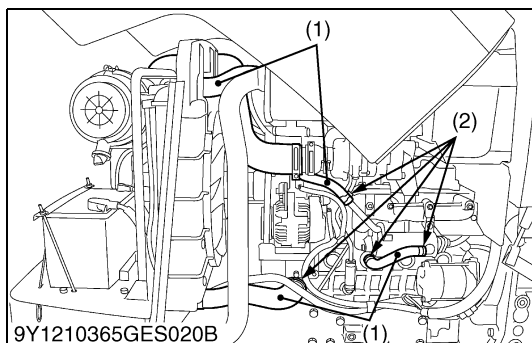
State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery.
White	Needs replacing battery.

(1) Battery

(2) Indicator

9Y1210365GEG0019US0

## [5] CHECK POINTS OF EVERY 200 HOURS



### 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 bands (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

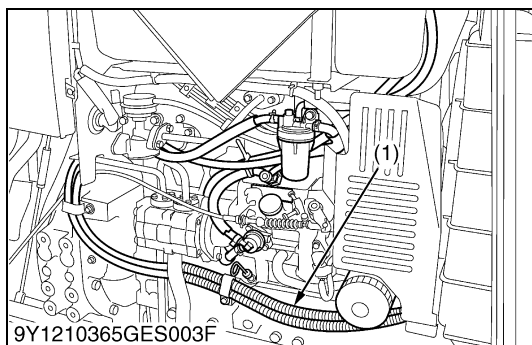
Take the following actions in the event the coolant temperature be nearly or more than the boiling point, what is called "Overheating".

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 burns. Get rid of the causes of overheating according to the manual, see "TROUBLESHOOTING" section at 1. ENGINE Section, and then start again the engine.

(1) Radiator Hose

(2) Clamp

9Y1210365GEG0022US0



### Checking Power Steering Line

#### **⚠ CAUTION**

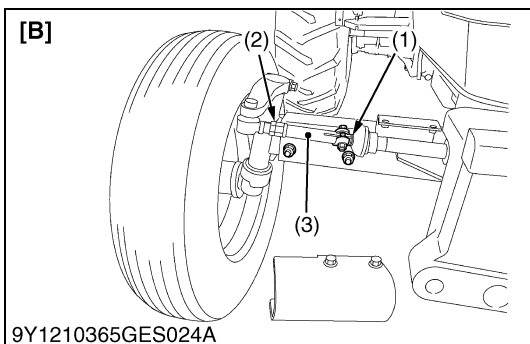
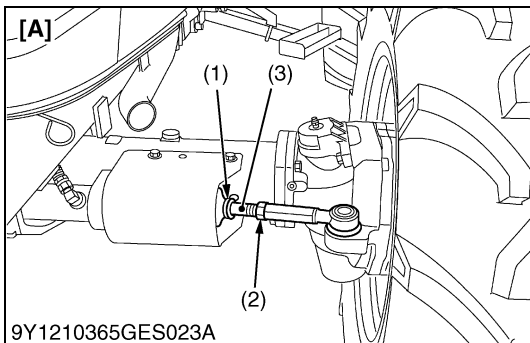
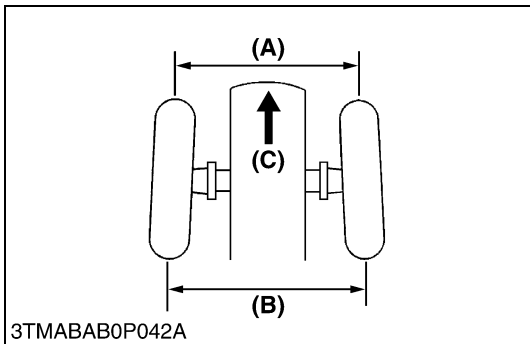
- Stop the engine when attempting the check and change prescribed below.
- Remember to check the fuel line periodically. The fuel line is subject to wear and aging, fuel may leak out onto the running engine, causing a fire.

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

(1) Power Steering Hose

(2) Clamp

9Y1210365GEG0023US0



**Adjusting Toe-in**

1. Park tractor on a flat place.
2. Turn steering wheel so front wheels are in the straight ahead position.
3. Lower the implement, lock the park brake and stop the engine.
4. Measure distance between tire beads at front of tire, at hub height.
5. Measure distance between tire beads at rear of tire, at hub height.
6. Front distance should be shorter than rear distance. If not, adjust tie-rod length.

Toe-in (B-A)	Factory spec.	4WD	2 to 8 mm 0.08 to 0.3 in.
		2WD	1 to 5 mm 0.04 to 0.2 in.

**■ Toe-in Adjustment**

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

Tightening torque	Tie-rod nut	167 to 196 N-m 17 to 20 kgf-m 123.2 to 144.6 lbf-ft
-------------------	-------------	---

- (1) Snap Ring
- (2) Tie-rod Nut
- (3) Tie-rod Joint

- (A) Wheel-to-wheel distance at front
- (B) Wheel-to-wheel distance at rear
- (C) "FRONT"
- [A] 4WD Model
- [B] 2WD Model

9Y1210365GEG0024US0

**[6] CHECK POINT OF EVERY 300 HOURS**

**Replacing Hydraulic Oil Filter**

- Refer to "Replacing Hydraulic Oil Filter" in "Check Point of Initial 50 Hours".

9Y1210365GEG0033US0

**[7] CHECK POINTS OF EVERY 400 HOURS**

**Changing Engine Oil**

- Refer to "Changing Engine Oil" in "Check Point of Initial 50 Hours".

9Y1210365GEG0030US0

**Changing Engine Oil Filter**

- Refer to "Changing Engine Oil" in "Check Point of Initial 50 Hours".

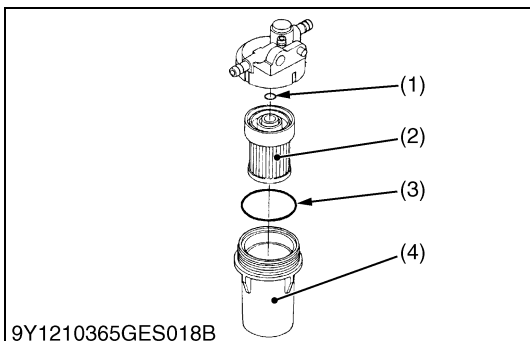
9Y1210365GEG0031US0

**Replacing Fuel Filter Element**

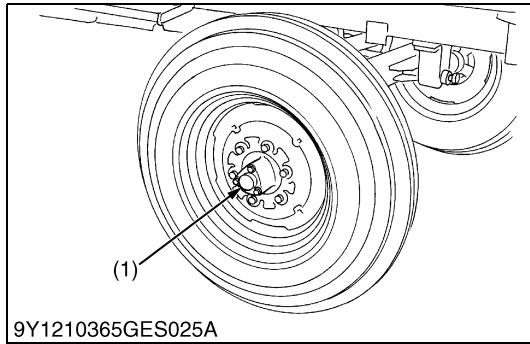
1. The fuel filter element (2) should be replaced every 400 hours.

- (1) O-ring
- (2) Fuel Filter Element
- (3) O-ring
- (4) Filter Bowl

9Y1210365GEG0025US0





**Greasing (2WD Model)**

1. Detach the cover (1), and apply bearing grease.

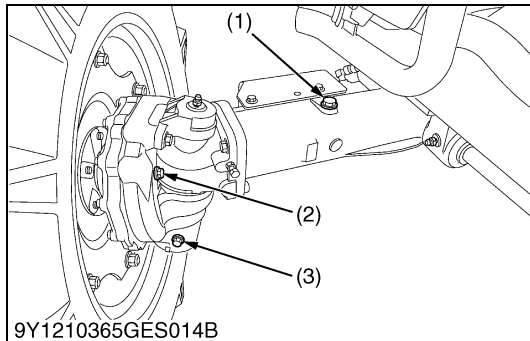
(1) Cover (Front Wheel Hub)

9Y1210365GEG0032US0

**[8] CHECK POINTS OF EVERY 600 HOURS****Changing Transmission Fluid**

- Refer to "Changing Transmission Fluid" in "Check Point of Initial 50 Hours".

9Y1210365GEG0034US0

**Changing Front Axle Case Oil (4WD Model)**

1. To drain the used oil, remove the right and left drain plugs (3) and filling plug (1) at the front axle case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs (3).
3. Remove the right and left breather plugs (2).
4. Fill with the new oil.
5. After filling reinstall the filling plug (1) and breather plugs (2).

Oil capacity	8.0 L
	8.5 U.S.qts
	7.0 Imp.qts

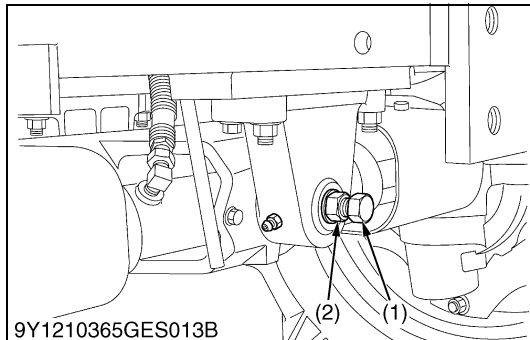
**NOTE**

- Refer to "4. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.

(1) Filling Plug  
(2) Breather Plug

(3) Drain Plug

9Y1210365GEG0035US0

**Adjusting Front Axle Pivot****IMPORTANT**

- If the front axle pivot pin adjustment is not correct, front wheel vibration can occur causing vibration in the steering wheel.

1. Loosen the lock nut (2), screw-in the adjusting screw (1) until seated, then tighten the screw with an additional 1/6 turn.
2. Re-tighten the lock nut (2).

**(When reassembling)**

Tightening torque	Lock nut	98.1 to 147.1 N·m 10.0 to 15.0 kgf·m 72.3 to 108.5 lbf·ft
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(1) Adjusting Screw

(2) Lock Nut

9Y1210365GEG0036US0

**[9] CHECK POINT OF EVERY 800 HOURS****Adjusting Engine Valve Clearance**

- Refer to "Checking and Adjusting" at "1. ENGINE" section.

9Y1210365GEG0078US0

**[10] CHECK POINT OF EVERY 1500 HOURS****Checking Fuel Injection Nozzle (Injection Pressure)**

- Refer to "Checking and Adjusting" at "1. ENGINE" section.

9Y1210365GEG0079US0

**[11] CHECK POINT OF EVERY 3000 HOURS****Checking Turbocharger**

- Refer to "Checking and Adjusting" at "1. ENGINE" section.

9Y1210365GEG0080US0

**Checking Injection Pump**

- Refer to "Checking and Adjusting" at "1. ENGINE" section.

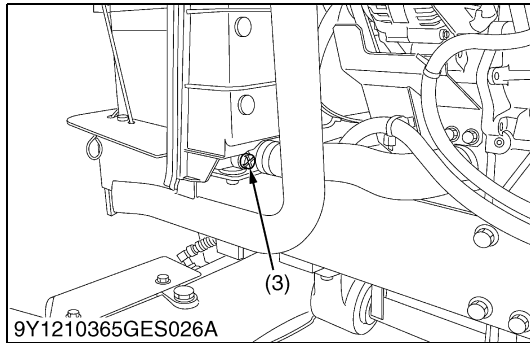
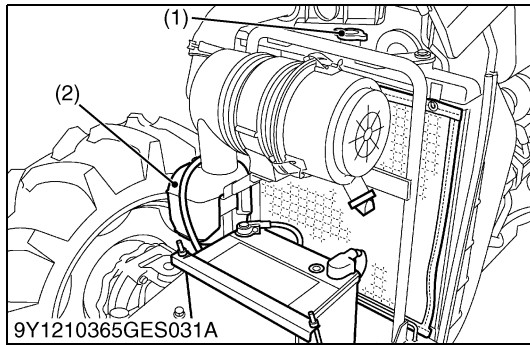
9Y1210365GEG0081US0

**[12] CHECK POINT OF EVERY 1 YEAR****Replacing Air Cleaner Primary Element and Secondary Element**

- Refer to "Cleaning Air Cleaner Element" in "(4) Every 100 Hours Section".

9Y1210365GEG0037US0

## [13] CHECK POINTS OF EVERY 2 YEARS



### Flush Cooling System and Changing Coolant

#### **CAUTION**

- **Do not remove the radiator cap when the engine is hot. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**
1. Stop the engine, remove the key and let cool down.
  2. To drain the coolant, open the radiator drain plug (3) and remove radiator cap (1). The radiator cap (1) must be removed to completely drain the coolant.
  3. After all coolant is drained, install the radiator drain plug (3) securely.
  4. Fill with clean water and cooling system cleaner.
  5. Follow directions of the cleaner instruction.
  6. After flushing, fill with clean soft water and anti-freeze until the coolant level is just below the radiator cap (1). 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 few minutes.
  9. Stop the engine.
  10. Check coolant level of recovery tank (2) and add coolant if necessary.
  11. Properly dispose of used coolant.

#### **IMPORTANT**

- **Do not start engine without coolant.**
- **Use clean, fresh soft water and anti-freeze to fill the radiator and recovery tank (2).**
- **When mixing with water, the anti-freeze mixing ratio is 50 %.**
- **Securely tighten radiator cap (1). If the cap is loose or improperly fitted, water may leak out and the engine could overheat.**

Coolant capacity	8.0 L
	8.5 U.S.qts
	7.0 Imp.qts

- (1) Radiator Cap  
(2) Recovery Tank

- (3) Drain Plug

9Y1210365GEG0038US0

## ■ Anti-Freeze



### CAUTION

To avoid personal injury :

- 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 recovery 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	Freeze Point		Boiling Point*	
	°C	°F	°C	°F
40	-24	-12	106	222
50	-37	-34	108	226

\*At 1.013 x 10<sup>5</sup> Pa (760 mmHg) pressure (atmospheric). A higher boiling points is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

**(To be continued)**

**(Continued)**

5. Adding the LLC
  - a) Add only water if the mixture reduces in amount by evaporation.
  - b) 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.)
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anticorrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

**■ NOTE**

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

9Y1210365GEG0082US0

**Replacing Radiator Hose (Water Pipes)**

1. Replace the hoses and clamps.  
Refer to "Checking Radiator Hose and Clamp" in "EVERY 200 HOURS".

9Y1210365GEG0039US0

**Replacing Power Steering Hose**

1. Replace the hoses and clamps, if necessary.  
Refer to "Checking Power Steering Line" in "EVERY 200 HOURS".

9Y1210365GEG0040US0

**Replacing Fuel Hose**

1. Replace the fuel hoses and clamps, if necessary.  
Refer to "Checking Fuel Line" in "EVERY 100 HOURS".

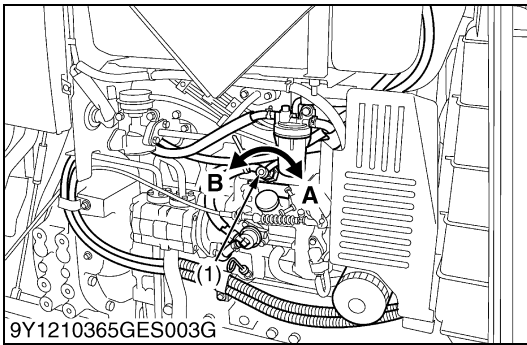
9Y1210365GEG0041US0

**Replacing Intake Air Line**

1. Replace the intake hoses and clamps, if necessary.  
Refer to "Checking Intake Line" in "EVERY 200 HOURS".

9Y1210365GEG0083US0

## [14] SERVICE AS REQUIRED (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.

#### ■ 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. Start the engine and run for about 30 seconds, and then stop the engine.
4. Close the air vent cock (1).

#### ■ IMPORTANT

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

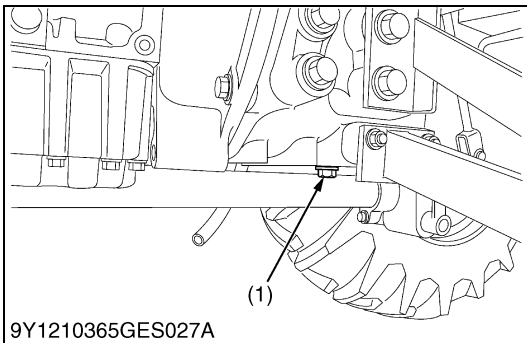
Otherwise, engine runs irregularly or stalls frequently.

(1) Air Vent Cock

A : Close

B : Open

9Y1210365GEG0042US0

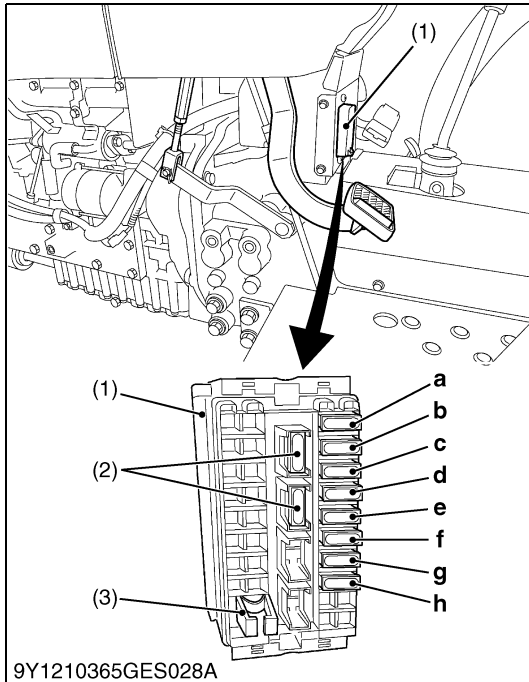


### Draining Clutch Housing Water

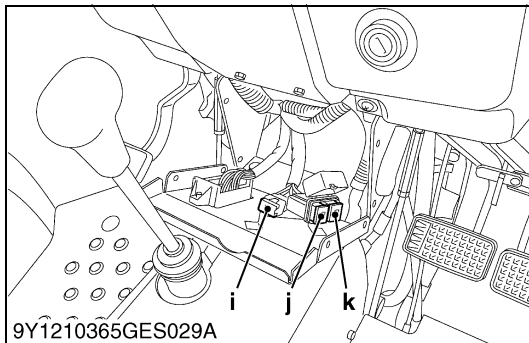
1. The tractor is equipped with drain plug (1) under the clutch housing.
2. After operating in rain, snow or tractor has been washed, water may get into the clutch housing.
3. Remove the drain plug (1) and drain the water, then install the plug (1) again.

(1) Water Drain Plug

9Y1210365GEG0043US0



9Y1210365GES028A



9Y1210365GES029A

**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 for specific information dealing with electrical problems.

■ **Protected Circuit**

Fuse I.D.	Capacity (A)	Protected circuit
a	5	Alternator, Engine, Glow Plug
b	5	Meter Panel, OPC
c	5	Turn Signal
d	15	Work Light
e	5	Meter (Back Up)
f	15	Head Light, Tail Lamp
g	15	Flasher (Hazard)
h	5	Starter Relay
i	50	Charge, Glow Plug
j	30	Fuel Cut Solenoid
k	40	Key Switch, Head Light, Hazard

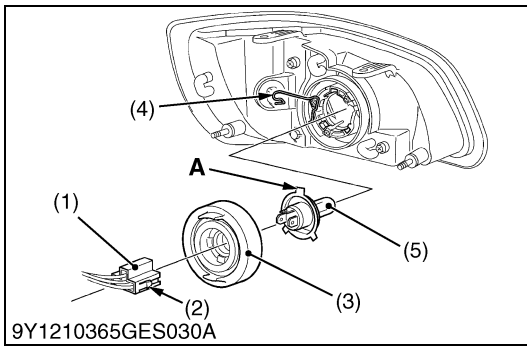
9Y1210365GEG0044US0

**Replacing Light Bulb**

1. Head 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 light	12 V, 55 / 60 W (H4)
Hazard lights	12 V, 23 W
Turn signal	12 V, 21 W
Tail light	12 V, 21 / 5 W

9Y1210365GEG0045US0



## Replacing Head Lamp

### ⚠ CAUTION

To avoid personal injury :

- Be careful not to drop the bulb, hit anything against the lamp, apply excess force, and get the lamp scratched. If broken, glass may cause injury. Pay more attention to halogen lamps in particular, which have high pressure inside.
- Before replacing the lamp, be sure to turn off the light and wait until the bulb cools down, otherwise, you may get burned.

1. While pushing the right and left lock buttons (2), pull and remove the electrical connector (1).
2. remove the rubber boot (3).
3. Remove the clamping fixture (4) and take out the bulb (5).
4. Replace with a new bulb and reinstall the head lamp assembly in the reverse order.

### ■ IMPORTANT

- Be sure to use a new bulb of the specified wattage.
- Never touch the bulb surface (glass) with bare hands. Fingerprints, for example, may break the bulb.

- (1) Electrical Connector  
 (2) Lock Buttons  
 (3) Rubber Boot  
 (4) Clamping Fixture  
 (5) Bulb

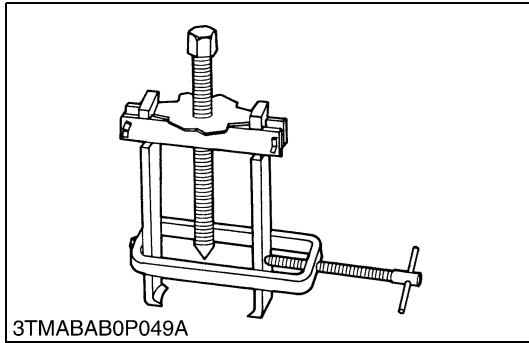
A : "Base's wider projection to face upward"

9Y1210365GEG0084US0



## 8. SPECIAL TOOLS

### [1] SPECIAL TOOLS FOR ENGINE



#### Special Use Puller Set

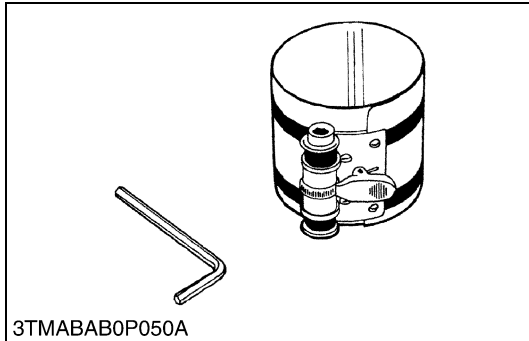
##### Code No.

- 07916-09032

##### Application

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

WSM000001GEG0011US0



#### Piston Ring Compressor

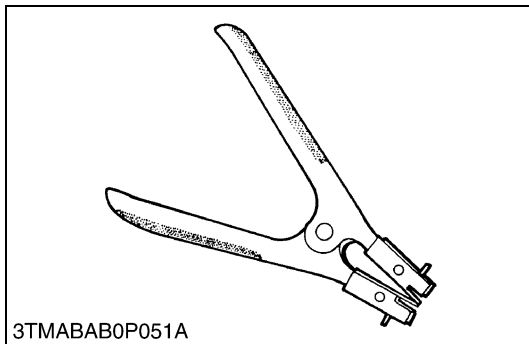
##### Code No.

- 07909-32111

##### Application

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

WSM000001GEG0012US0



#### Piston Ring Tool

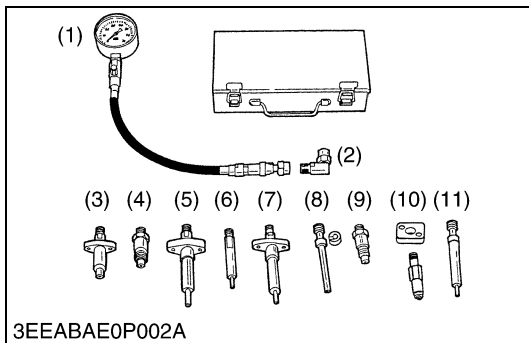
##### Code No.

- 07909-32121

##### Application

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

WSM000001GEG0013US0



#### Diesel Engine Compression Tester

##### Code No.

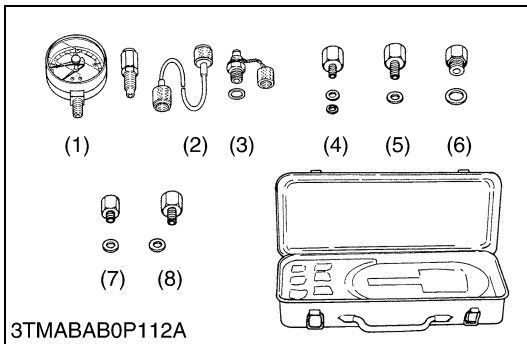
- 07909-30208 (Assembly)
- 07909-30934 (A to F)
- 07909-31211 (E and F)
- 07909-31231 (H)
- 07909-31251 (G)
- 07909-31271 (I)
- 07909-31281 (J)

##### Application

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

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

WSM000001GEG0014US0

**Oil Pressure Tester****Code No.**

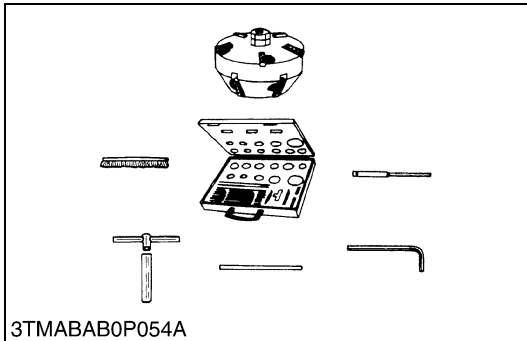
- 07916-32032

**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 |

WSM000001GEG0015US0

**Valve Seat Cutter****Code No.**

- 07909-33102

**Application**

- Use to reseal valves.

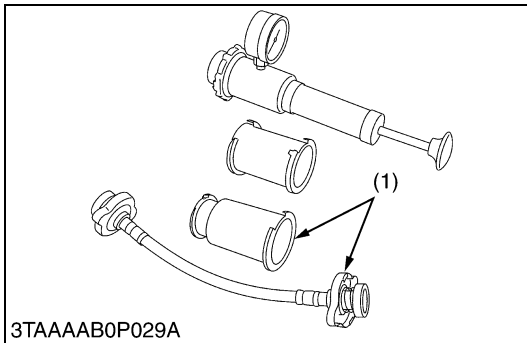
**Angle**

- 0.79 rad (45 °)
- 0.26 rad (15 °)

**Diameter**

- 28.6 mm (1.13 in.)
- 31.6 mm (1.24 in.)
- 35.0 mm (1.38 in.)
- 38.0 mm (1.50 in.)
- 41.3 mm (1.62 in.)
- 50.8 mm (2.00 in.)

WSM000001GEG0016US0

**Radiator Tester****Code No.**

- 07909-31551

**Application**

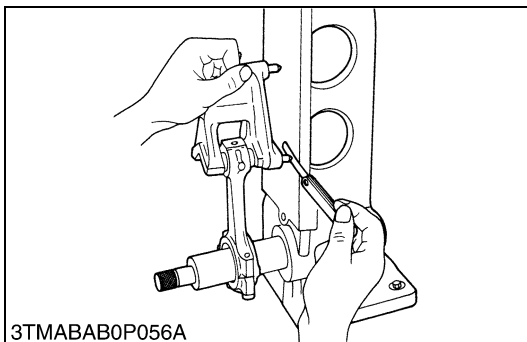
- Use to check of radiator cap pressure, and leaks from cooling system.

**Remarks**

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

- (1) Adaptor

WSM000001GEG0017US0

**Connecting Rod Alignment Tool****Code No.**

- 07909-31661

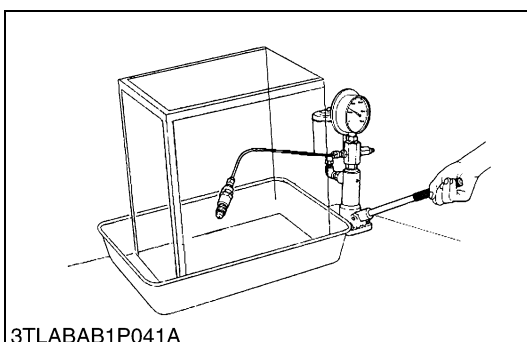
**Application**

- Use to check the connecting rod alignment.

**Applicable range**

- Connecting rod big end I.D.  
30 to 75 mm dia. (1.18 to 2.95 in. dia.)
- Connecting rod length  
65 to 300 mm (2.57 to 11.81 in.)

WSM000001GEG0020US0

**Nozzle Tester****Code No.**

- 07909-31361

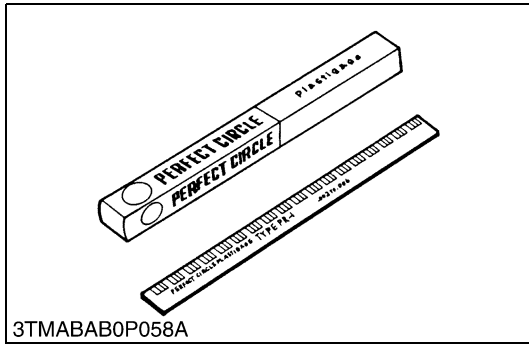
**Application**

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

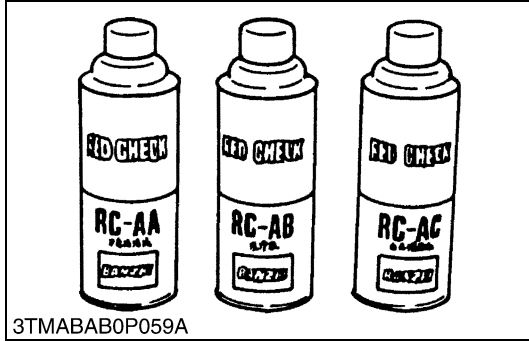
**Measuring range**

- 0 to 50 MPa (0 to 500 kgf/cm<sup>2</sup>, 0 to 7000 psi)

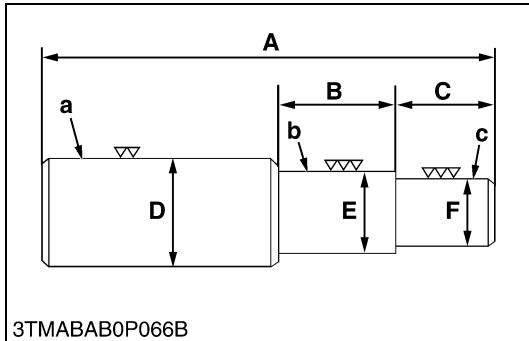
WSM000001GEG0021US0



3TMABABOP058A



3TMABABOP059A



3TMABABOP066B

### Plastigage

#### Code No.

- 07909-30241

#### Application

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

#### Measuring range

- Green : 0.025 to 0.076 mm (0.001 to 0.003 in.)
- 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.)

WSM000001GEG0022US0

### Red Check

#### Code No.

- 07909-31371

#### Application

- Use to check cracks on cylinder head, cylinder block, etc..

WSM000001GEG0023US0

### Bushing Replacing Tools

#### Application

- Use to press out and to press fit the bushing.

#### ■ NOTE

- These special tools are not provided, so make it referring to the figure.

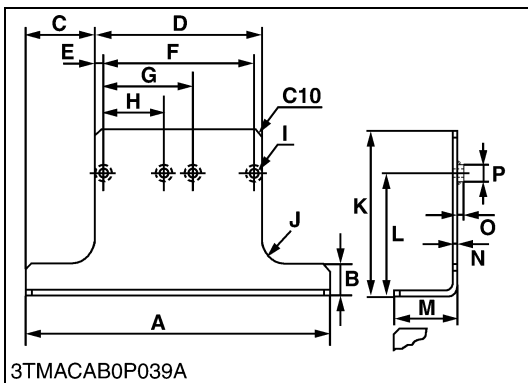
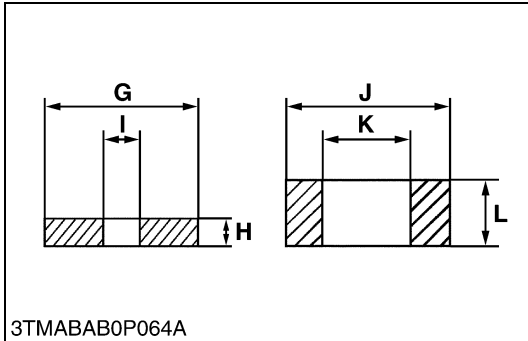
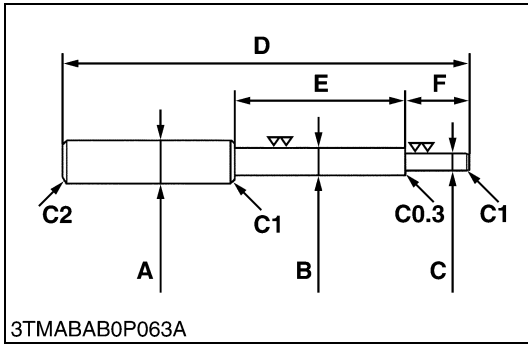
#### [For small end bushing]

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.)
a	6.3 $\mu\text{m}$ (250 $\mu\text{in.}$ )
b	1.25 $\mu\text{m}$ (50 $\mu\text{in.}$ )
c	1.25 $\mu\text{m}$ (50 $\mu\text{in.}$ )

#### [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.)
a	6.3 $\mu\text{m}$ (250 $\mu\text{in.}$ )
b	1.25 $\mu\text{m}$ (50 $\mu\text{in.}$ )
c	1.25 $\mu\text{m}$ (50 $\mu\text{in.}$ )

9Y1210365GEG0064US0



**Valve Guide Replacing Tool**

**Application**

- Use to press out and press fit the valve guide.

■ **NOTE**

- These special tools are not provided, so make it referring to the figure.

<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 dia. (0.98 in. dia.)
<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.)

9Y1210365GEG0065US0

**Engine Stand**

**Application**

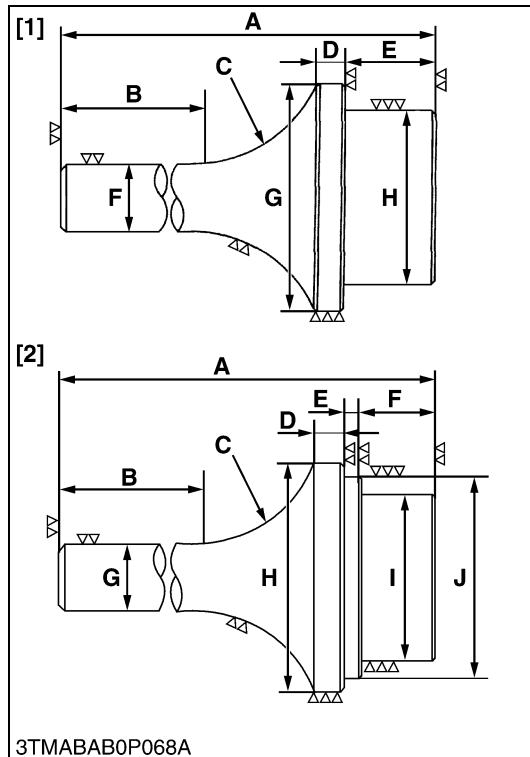
- Use to support engine.

■ **NOTE**

- This special tool is not provided, so make it referring to the figure.

<b>A</b>	480 mm (18.90 in.)
<b>B</b>	50 mm (1.97 in.)
<b>C</b>	108.5 mm (4.272 in.)
<b>D</b>	263 mm (10.35 in.)
<b>E</b>	12.5 mm (0.492 in.)
<b>F</b>	237.5 mm (9.350 in.)
<b>G</b>	142.5 mm (5.610 in.)
<b>H</b>	95 mm (3.74 in.)
<b>I</b>	4.14 mm dia. (0.55 in. dia.)
<b>J</b>	40 mm (1.57 in.)
<b>K</b>	210 mm (8.27 in.)
<b>L</b>	190 mm (7.48 in.)
<b>M</b>	100 mm (3.94 in.)
<b>N</b>	6 mm (0.24 in.)
<b>O</b>	6 mm (0.24 in.)
<b>P</b>	25 mm dia. (0.98 in. dia.)
<b>C10</b>	Chamfer 10 mm (0.394 in.)

9Y1210365GEG0066US0



### Crankshaft Bearing 1 Replacing Tool

#### Application

- Use to press out and press fit the crankshaft bearing 1.

#### NOTE

- These special tools are not provided, so make it referring to the figure.

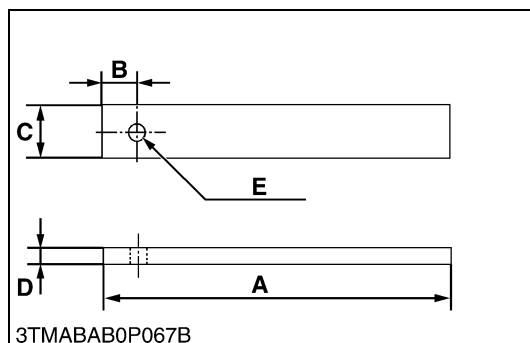
#### [Extracting tool]

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	51.8 to 51.9 mm dia. (2.039 to 2.043 in. dia.)

#### [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	51.8 to 51.9 mm dia. (2.039 to 2.043 in. dia.)
J	56.8 to 56.9 mm dia. (2.236 to 2.240 in. dia.)

9Y1210365GEG0067US0



### Flywheel Stopper

#### Application

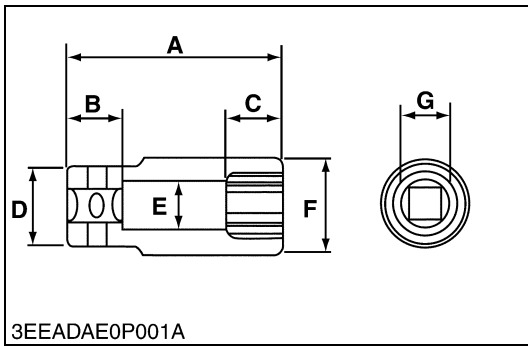
- Use to loosen and tighten the flywheel screw.

#### NOTE

- This special tool is not provided, so make it referring to the figure.

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.)

9Y1210365GEG0068US0



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

**Application**

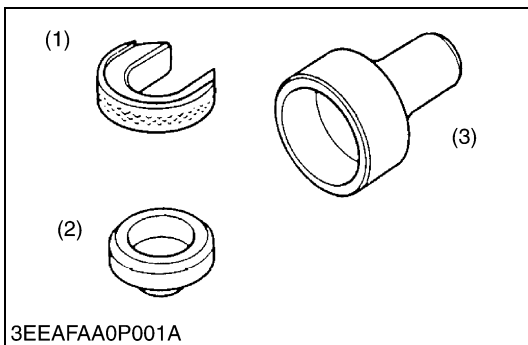
- Use to loosen and tighten the fan drive pulley mounting nut.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

<b>A</b>	100 mm (3.94 in.)
<b>B</b>	25.0 mm (0.98 in.)
<b>C</b>	27.0 mm (1.06 in.)
<b>D</b>	45.0 mm dia. (1.77 in. dia.)
<b>E</b>	35.0 mm dia. (1.38 in. dia.)
<b>F</b>	62.5 mm dia. (2.46 in. dia.)
<b>G</b>	46.0 mm (1.81 in.)

9Y1210365GEG0057US0



**Auxiliary Socket for Fixing Crankshaft Sleeve**

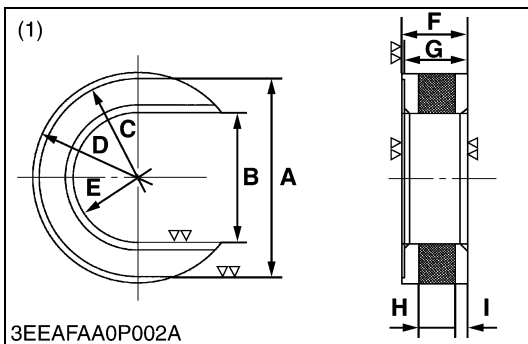
**Application**

- Use to fix the crankshaft sleeve of the diesel engine.

■ **NOTE**

- **These special tools are not provided, so make it referring to the figure.**

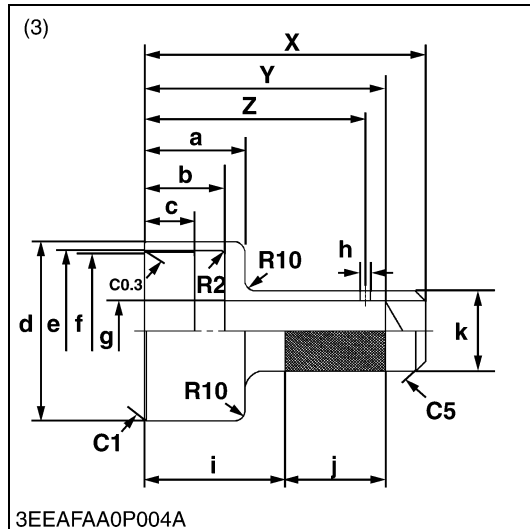
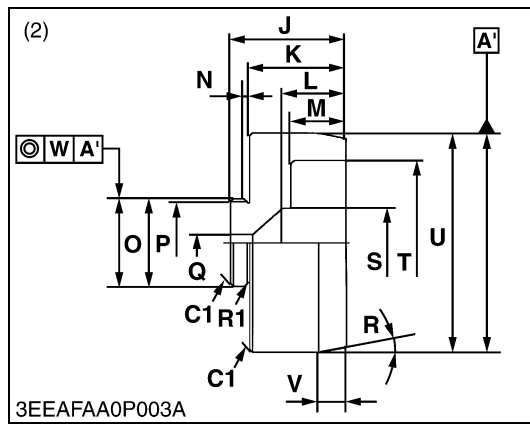
<b>A</b>	80.0 mm (3.1496 in.)
<b>B</b>	60.1 to 60.3 mm (2.3661 to 2.3740 in.)
<b>C</b>	80.0 mm dia. (3.1496 in. dia.)
<b>D</b>	85.0 mm dia. (3.3465 in. dia.)
<b>E</b>	60.1 to 60.3 mm dia. (2.3661 to 2.3740 in. dia.)
<b>F</b>	26.3 to 26.4 mm (1.0354 to 1.0394 in.)
<b>G</b>	25.85 to 25.90 mm (1.0177 to 1.0197 in.)
<b>H</b>	15.0 mm (0.5906 in.)
<b>I</b>	5.0 mm (0.1969 in.)



- (1) Stopper
- (2) Sleeve Guide
- (3) Auxiliary Socket for Pushing

**(To be continued)**

(Continued)

**Application**

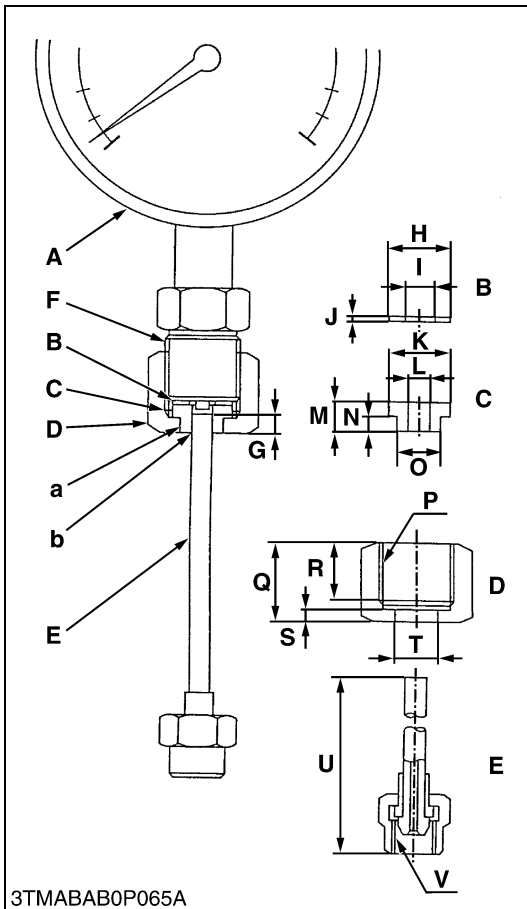
- Use to fix the crankshaft sleeve of the diesel engine.

J	42.0 mm (1.6535 in.)
K	30.5 to 30.6 mm (1.2008 to 1.2047 in.)
L	23.0 mm (0.9055 in.)
M	20.0 mm (0.7874 in.)
N	2.0 mm (0.0787 in.)
O	31.911 to 31.950 mm dia. (1.2563 to 1.2579 in. dia.)
P	30.0 mm dia. (1.1811 in. dia.)
Q	5.0 mm dia. (0.1969 in. dia.)
R	0.087 rad (5 °)
S	25.0 mm dia. (0.9843 in. dia.)
T	60.0 mm dia. (2.3622 in. dia.)
U	79.80 to 79.85 mm dia. (3.1417 to 3.1437 in. dia.)
V	10.0 mm (0.3937 in.)
W	0.04 mm dia. (0.0016 in. dia.)
X	140 mm (5.5118 in.)
Y	120 mm (4.7244 in.)
Z	110 mm (4.3307 in.)
a	50.0 mm (1.9685 in.)
b	39.9 to 40.0 mm (1.5709 to 1.5748 in.)
c	25.0 mm (0.9843 in.)
d	90.0 mm dia. (3.5433 in. dia.)
e	81.0 mm dia. (3.1890 in. dia.)
f	80.10 to 80.15 mm dia. (3.1535 to 3.1555 in. dia.)
g	30.0 mm dia. (1.1811 in. dia.)
h	5.0 mm dia. (0.1969 in. dia.)
i	70.0 mm (2.7559 in.)
j	50.0 mm (1.9685 in.)
k	40.0 mm dia. (1.5748 in. dia.)
C1	Chamfer 1.0 mm (0.0394 in.)
C5	Chamfer 5.0 mm (0.1969 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)
R1	1.0 mm radius (0.0394 in. radius)
R2	2.0 mm radius (0.0787 in. radius)
R3	10.0 mm radius (0.3937 in. radius)

(2) Sleeve Guide

(3) Auxiliary Socket for Pushing

9Y1210365GEG0058US0



### Injection Pump Pressure Tester

#### Application

- Use to check fuel tightness of injection pumps.

#### NOTE

- This special tool is not provided, so make it referring to the figure.

A	Pressure gauge full scale : More than 29.4 MPa (300 kgf/cm <sup>2</sup> , 4267 psi)
B	Copper gasket
C	Flange (Material : Steel)
D	Hex. nut 27 mm (1.06 in.) across the plat
E	Injection pipe
F	PF 1/2
G	5 mm (0.20 in.)
H	17 mm dia. (0.67 in. dia.)
I	8 mm dia. (0.31 in. dia.)
J	1.0 mm (0.039 in.)
K	17 mm dia. (0.67 in. dia.)
L	6.10 to 6.20 mm dia. (0.2402 to 0.2441 in. dia.)
M	8 mm (0.31 in.)
N	4 mm (0.16 in.)
O	11.97 to 11.99 mm dia. (0.4713 to 0.4721 in. dia.)
P	PF 1/2
Q	23 mm (0.91 in.)
R	17 mm (0.67 in.)
S	4 mm (0.16 in.)
T	12.00 to 12.02 mm dia. (0.4724 to 0.4732 in. dia.)
U	100 mm (3.94 in.)
V	M12 × P1.5
a	Adhesive application
b	Fillet welding on the enter circumference

9Y1210365GEG0059US0



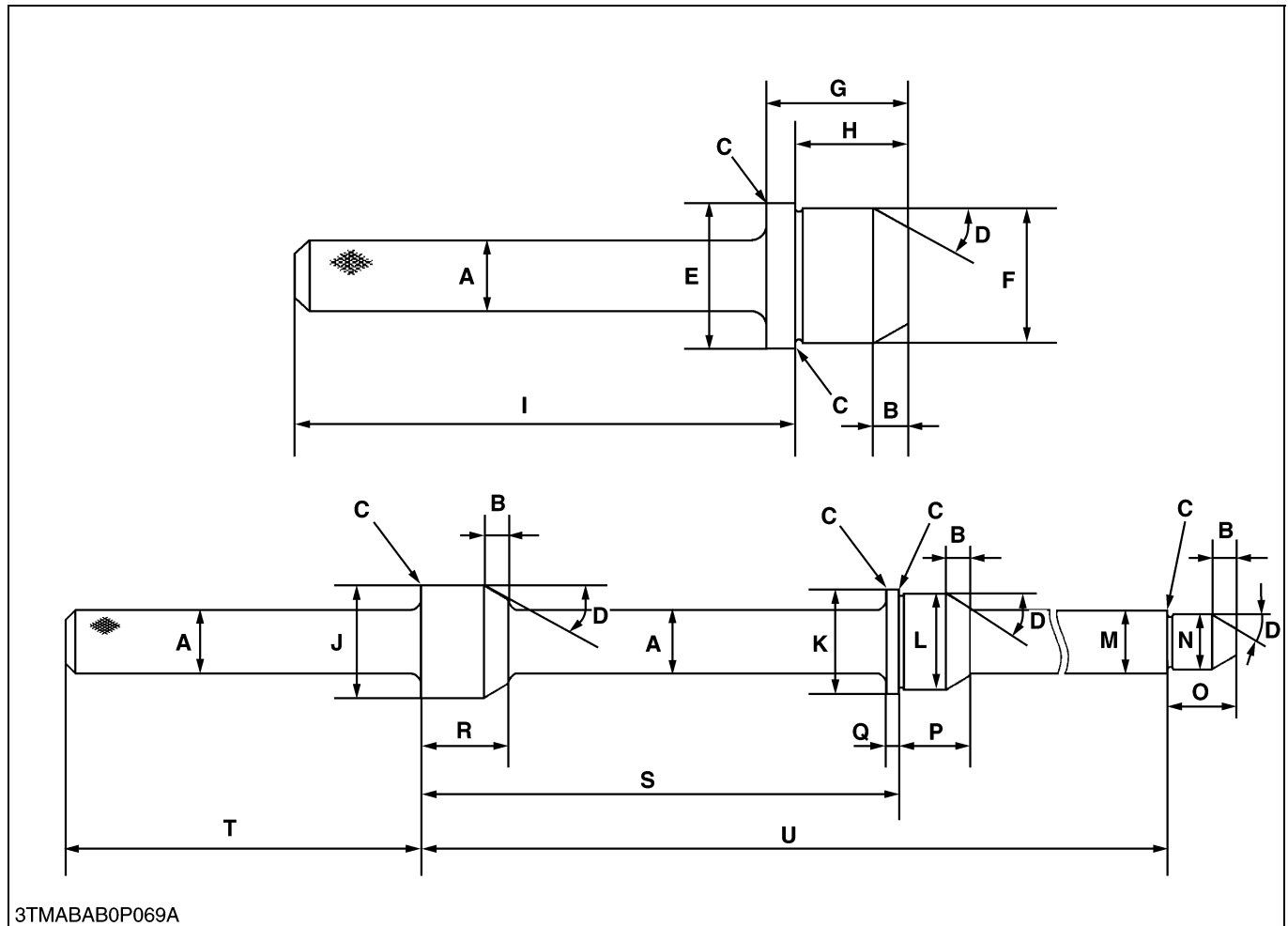
**Balancer Metal Replacing Tool (for Removing)**

**Application**

- Use to remove the metal bearing.

**NOTE**

- These special tools are not provided, so make it referring to the figure.



3TMABAB0P069A

<b>A</b>	25 mm (0.98 in. dia.)	<b>L</b>	41.934 to 41.950 mm dia. (1.6509 to 1.6516 in. dia.)
<b>B</b>	10 mm (0.39 in.)	<b>M</b>	24.959 to 24.980 mm dia. (0.9826 to 0.9835 in. dia.)
<b>C</b>	Chamfer 0.3 mm (0.01 in.)	<b>N</b>	21.947 to 21.960 mm dia. (0.8641 to 0.8646 in. dia.)
<b>D</b>	0.52 rad (30 °)	<b>O</b>	28 mm (1.10 in.)
<b>E</b>	46.950 to 46.975 mm dia. (1.8484 to 1.8494 in. dia.)	<b>P</b>	29 mm (1.14 in.)
<b>F</b>	43.934 to 43.950 mm dia. (1.7297 to 1.7303 in. dia.)	<b>Q</b>	5 mm (0.20 in.)
<b>G</b>	41 mm (1.61 in.)	<b>R</b>	36 mm (1.42 in.)
<b>H</b>	32.5 mm (1.28 in.)	<b>S</b>	195.25 to 195.75 mm (7.687 to 7.707 in.)
<b>I</b>	148.5 mm (5.85 in.)	<b>T</b>	145 mm (5.71 in.)
<b>J</b>	46.50 to 46.75 mm dia. (1.831 to 1.841 in. dia.)	<b>U</b>	384.75 to 385.25 mm (15.148 to 15.167 in.)
<b>K</b>	44.950 to 44.975 mm dia. (1.7697 to 1.7707 in. dia.)		

9Y1210365GEG0060US0

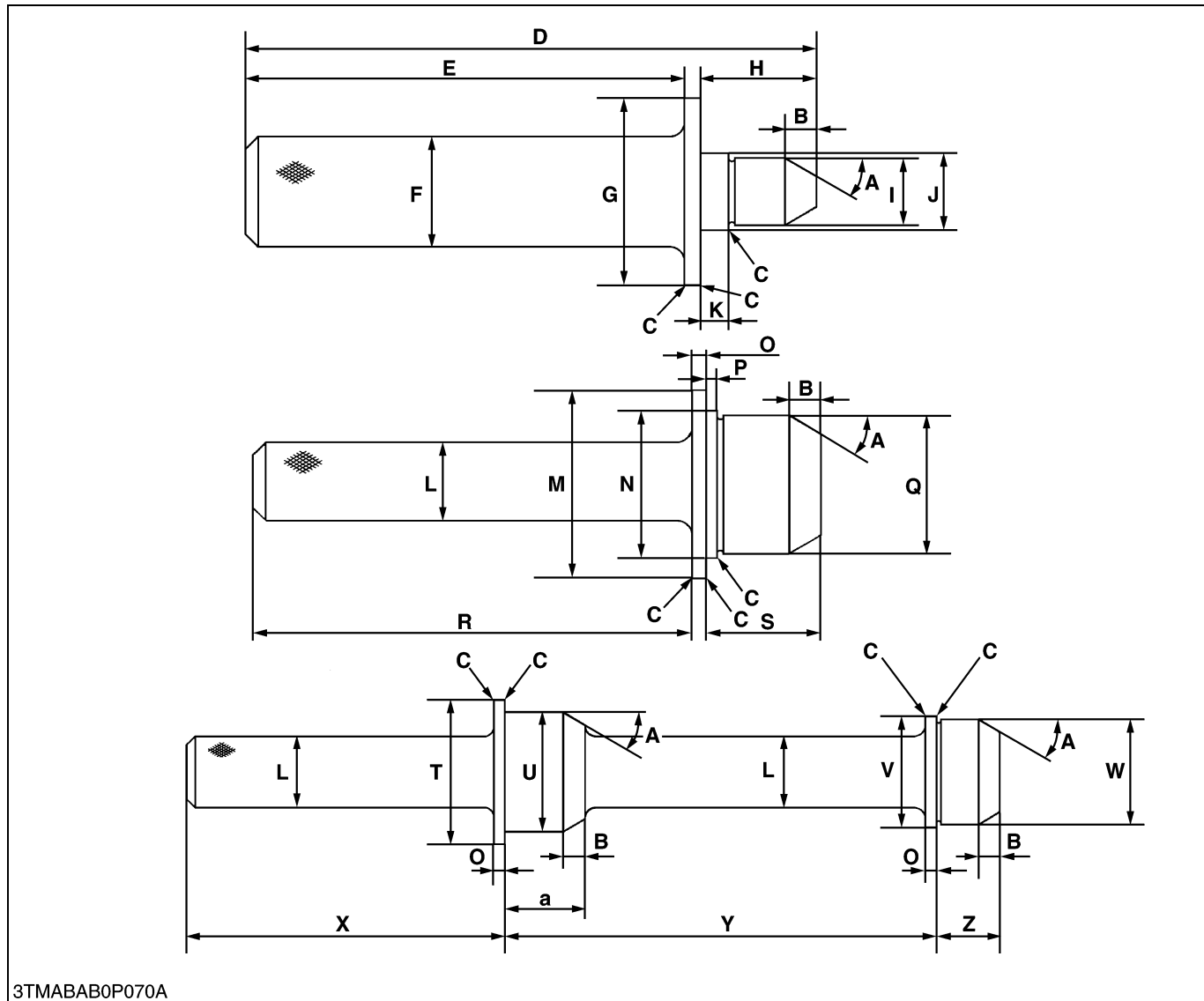
**Balancer Metal Replacing Tool (for Fitting)**

**Application**

- Use to press fit the metal bearing.

**NOTE**

- These special tools are not provided, so make it referring to the figure.



3TMABAB0P070A

<b>A</b>	0.52 rad (30 °)	<b>O</b>	5 mm (0.20 in.)
<b>B</b>	10 mm (0.39 in.)	<b>P</b>	3.3 to 3.7 mm (0.130 to 0.146 in.)
<b>C</b>	Chamfer 0.3 mm (0.01 in.)	<b>Q</b>	43.934 to 43.950 mm dia. (1.7297 to 1.7303 in. dia.)
<b>D</b>	182 mm (7.16 in.)	<b>R</b>	140 mm (5.51 in.)
<b>E</b>	140 mm (5.51 in.)	<b>S</b>	36 mm (1.42 in.)
<b>F</b>	35 mm dia. (1.38 in. dia.)	<b>T</b>	60 mm dia. (2.36 in. dia.)
<b>G</b>	60 mm dia. (2.36 in. dia.)	<b>U</b>	46.950 to 46.975 mm dia. (1.8484 to 1.8494 in. dia.)
<b>H</b>	37 mm (1.46 in.)	<b>V</b>	44.950 to 44.975 mm dia. (1.7697 to 1.7707 in. dia.)
<b>I</b>	21.947 to 21.960 mm dia. (0.8641 to 0.8646 in. dia.)	<b>W</b>	41.934 to 41.950 mm dia. (1.6509 to 1.6516 in. dia.)
<b>J</b>	24.959 to 24.980 mm dia. (0.9826 to 0.9835 in. dia.)	<b>X</b>	145 mm (5.71 in.)
<b>K</b>	8.8 to 9.2 mm (0.346 to 0.362 in.)	<b>Y</b>	195.25 to 195.75 mm (7.687 to 7.707 in.)
<b>L</b>	25 mm dia. (0.98 in. dia.)	<b>Z</b>	29 mm (1.14 in.)
<b>M</b>	60 mm dia. (2.36 in. dia.)	<b>a</b>	36 mm (1.42 in.)
<b>N</b>	46.950 to 46.975 mm dia. (1.8484 to 1.8494 in. dia.)		

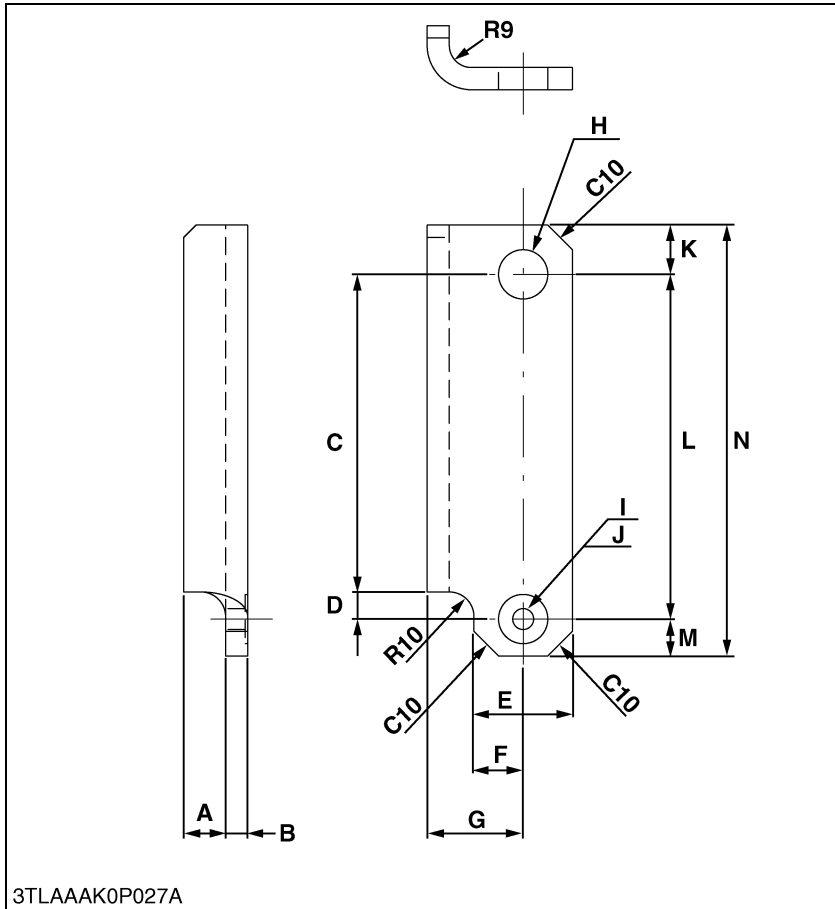
**Engine Hook 1**

**Application**

- Use to fix the engine when hooking, instead of the original hook with hook 2 as a set.

**NOTE**

- This special tool is not provided, so make it referring to the figure.



3TLAAAK0P027A

<b>A</b>	17 mm (0.67 in.)
<b>B</b>	9 mm (0.35 in.)
<b>C</b>	129 mm (5.08 in.)
<b>D</b>	10.8 to 11.2 mm (0.426 to 0.440 in.)
<b>E</b>	40 mm (1.6 in.)
<b>F</b>	20 mm (0.79 in.)
<b>G</b>	39 mm (1.5 in.)
<b>H</b>	20 mm Hole (0.79 in. Hole)
<b>I</b>	8.50 to 8.80 mm Drilled hole (0.335 to 0.346 in. Drilled hole)
<b>J</b>	20 mm Spot-faced hole 1 mm deep (0.79 in. Spot-faced hole 0.04 in. deep)
<b>K</b>	20 mm (0.79 in.)
<b>L</b>	140 mm (5.51 in.)
<b>M</b>	15 mm (0.59 in.)
<b>N</b>	175 mm (6.89 in.)
<b>C10</b>	Chamfer 10 mm (0.39 in.)
<b>R9</b>	Radius 9.0 mm (0.35 in.)
<b>R10</b>	Radius 10 mm (0.39 in.)

9Y1210365GEG0062US0

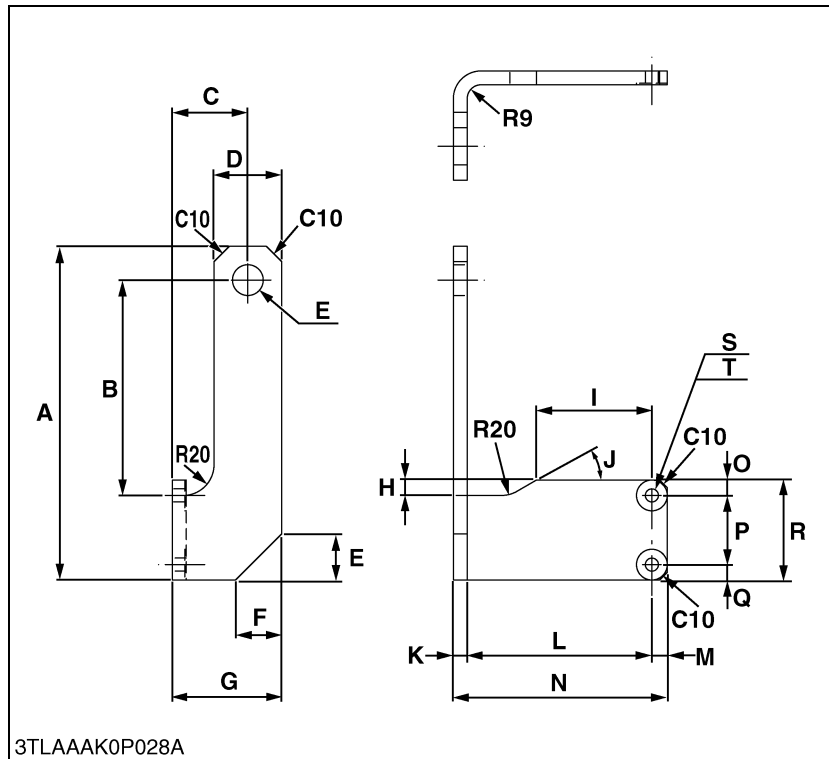
**Engine Hook 2**

**Application**

- Use to fix the engine when hooking, instead of the original hook with hook 1 as a set.

**NOTE**

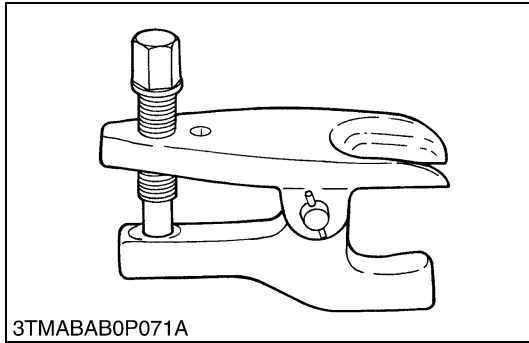
- This special tool is not provided, so make it referring to the figure.



<b>A</b>	217 mm (8.54 in.)
<b>B</b>	140 mm (5.51 in.)
<b>C</b>	49 mm (1.9 in.)
<b>D</b>	44 mm (1.7 in.)
<b>E</b>	20 mm Hole (0.79 in. Hole)
<b>F</b>	30 mm (1.2 in.)
<b>G</b>	71 mm (2.8 in.)
<b>H</b>	10 mm (0.39 in.)
<b>I</b>	85 mm (3.3 in.)
<b>J</b>	0.52 rad (30 °)
<b>K</b>	9.0 mm (0.35 in.)
<b>L</b>	120 mm (4.72 in.)
<b>M</b>	10 mm (0.39 in.)
<b>N</b>	139 mm (5.12 in.)
<b>O</b>	10 mm (0.39 in.)
<b>P</b>	44.7 to 45.3 mm (1.76 to 1.78 in.)
<b>Q</b>	10 mm (0.39 in.)
<b>R</b>	65 mm (2.6 in.)
<b>S</b>	2 x 8.50 to 8.80 mm Drilled hole (2 x 0.335 to 0.346 in. Drilled hole)
<b>T</b>	20 mm Spot-faced hole 1 mm deep (0.79 in. Spot-faced hole 0.04 in. deep)
<b>C10</b>	Chamfer 10 mm (0.39 in.)
<b>R9</b>	Radius 9.0 mm (0.35 in.)
<b>R10</b>	Radius 10 mm (0.39 in.)
<b>R20</b>	Radius 20 mm (0.79 in.)

9Y1210365GEG0063US0

## [2] SPECIAL TOOLS FOR TRACTOR



3TMABAB0P071A

### Tie-rod End Lifter

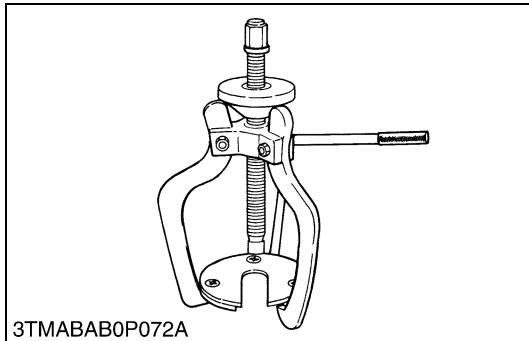
**Code No.**

- 07909-39051

**Application**

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

WSM000001GEG0029US0



3TMABAB0P072A

### Steering Wheel Puller

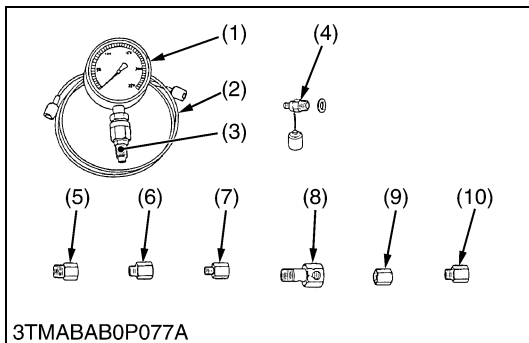
**Code No.**

- 07916-51090

**Application**

- Use for removing the steering wheel without damaging the steering shaft.

WSM000001GEG0030US0



3TMABAB0P077A

### Relief Valve Pressure Tester

**Code No.**

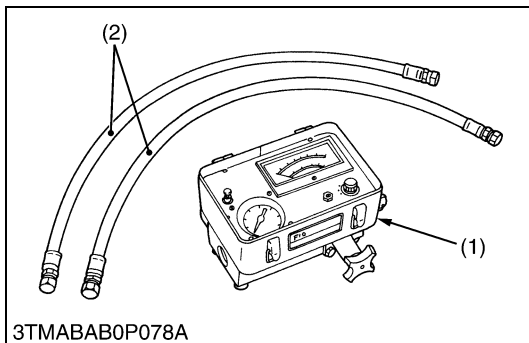
- 07916-50045

**Application**

- This allows easy measurement of relief set pressure.

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

WSM000001GEG0027US0



3TMABAB0P078A

### Flow Meter

**Code No.**

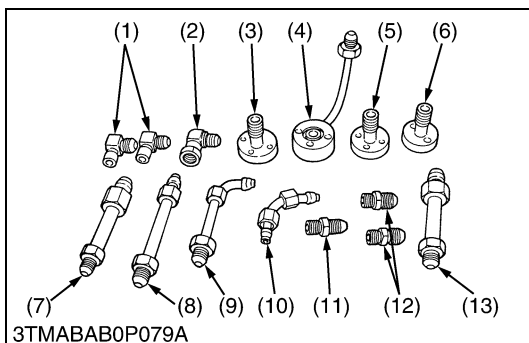
- 07916-52791 (Flow Meter)
- 07916-52651 (Hydraulic Test Hose)

**Application**

- This allows easy testing of hydraulic system.

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

WSM000001GEG0036US0



3TMABAB0P079A

### Adaptor Set for Flow Meter

**Code No.**

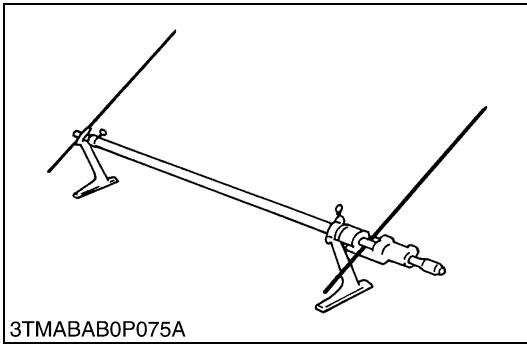
- 07916-54031

**Application**

- Use for testing the hydraulic system.

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

WSM000001GEG0037US0

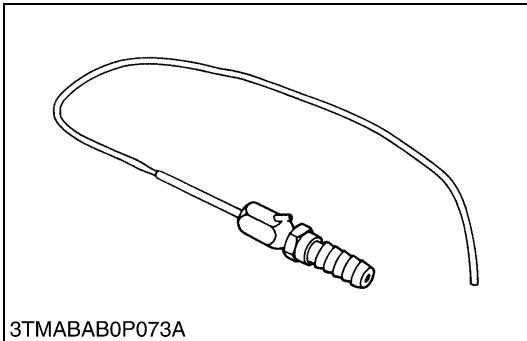
**Toe-in Gauge****Code No.**

- 07909-31681

**Application**

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

WSM000001GEG0034US0

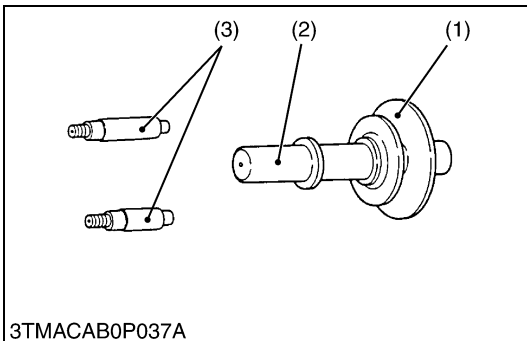
**Injector CH3****Code No.**

- 07916-52501

**Application**

- Use for injecting calcium chloride solution into, and removing it from, rear wheel.

WSM000001GEG0031US0

**Clutch Tool B****Code No.**

- 07916-53041

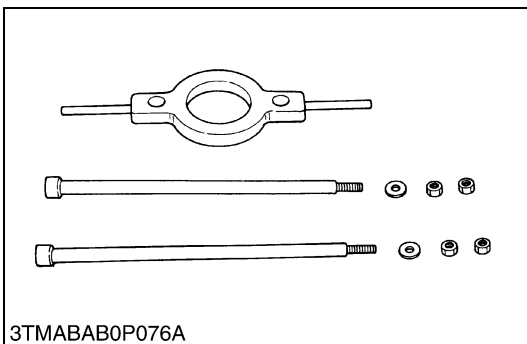
**Application**

- Use for mounting the travelling clutch to the flywheel.

- (1) Gauge Ring  
(2) Center Bar

- (3) Centering Guide

WSM000001GEG0107US0

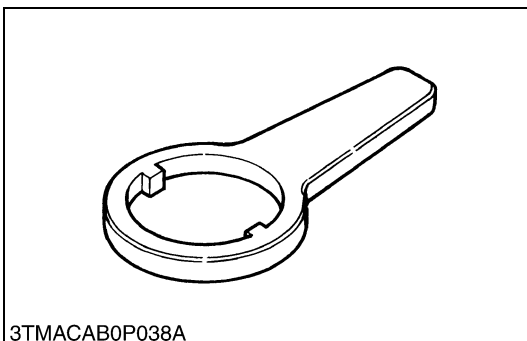
**Rear Axle Cover Puller****Code No.**

- 07916-51041

**Application**

- Use for removing a rear axle cover from rear axle.

WSM000001GEG0035US0

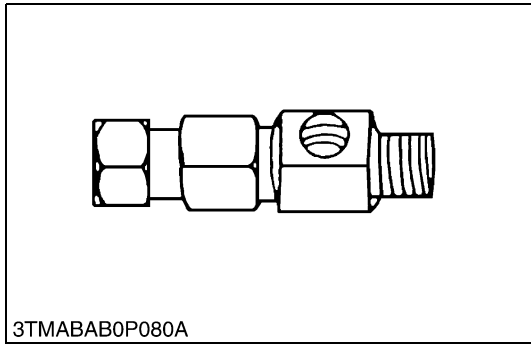
**Rear Axle Nut Wrench 85****Code No.**

- 07916-52541

**Application**

- Use for removing and installing a rear axle nut.

WSM000001GEG0108US0



**Power Steering Adaptor**

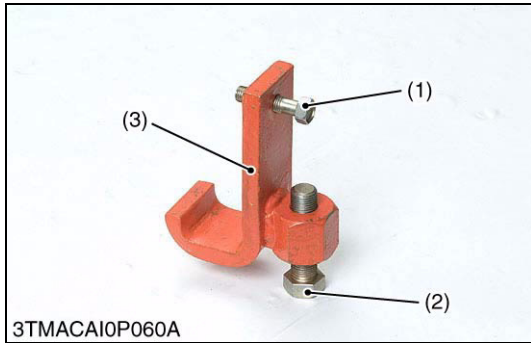
**Code No.**

- 07916-54021

**Application**

- Use for measuring the relief valve setting pressure for power steering.

WSM000001GEG0038US0

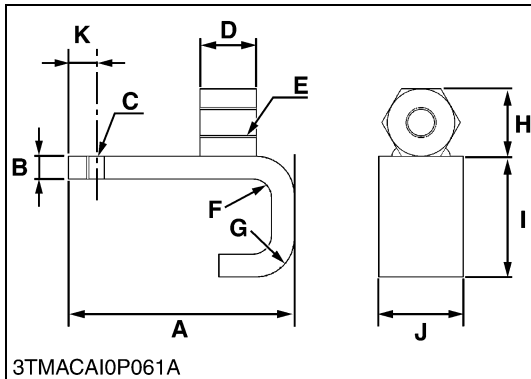


**Front Axle Rocking Restrictor**

■ **NOTE**

- This special tool is not provided, so make it referring to the figure.

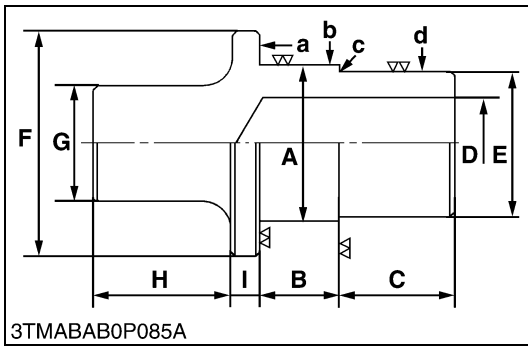
A	120 mm (4.72 in.)
B	12 mm (0.72 in.)
C	M10 x P1.25
D	30 mm (1.18 in.)
E	M16 x P1.5
F	10 mm (0.39 in.)
G	20 mm (0.79 in.)
H	36 mm (1.42 in.)
I	50 mm (2.0 in.)
J	45 mm (1.77 in.)
K	20 mm (0.79 in.)



- (1) Screw  
M10 x P1.25 x L50 mm (2 in.)
- (2) Screw  
M16 x P1.5 x L50 mm (2 in.)

- (3) Rocking Restrictor

9Y1210365GEG0073US0



### Hydraulic Arm Shaft Bushing Press-Fitting Tool

#### Application

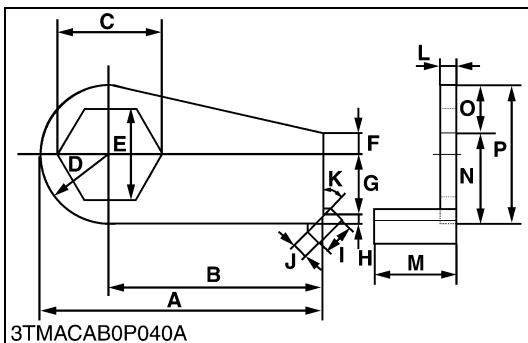
- Use for replacing the hydraulic arm shaft bushings in the hydraulic cylinder body.

#### NOTE

- This special tool is not provided, so make it referring to the figure.
- Unless otherwise specified : All surface 12.5 μm (500 μin.)

	Right	Left
A	54.7 to 54.9 mm dia. (2.1535 to 2.1614 in. dia.)	49.7 to 49.9 mm dia. (1.9567 to 1.9646 in. dia.)
B	22.5 to 23.5 mm (0.729 to 0.767 in.)	18.5 to 19.0 mm (0.886 to 0.925 in.)
C	55 mm (2.10 in.)	60 mm (2.36 in.)
D	32 mm dia. (1.26 in. dia.)	30 mm dia. (1.18 in. dia.)
E	49.7 to 49.9 mm dia. (1.9567 to 1.9646 in. dia.)	44.7 to 44.9 mm dia. (1.7598 to 1.7677 in. dia.)
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.)	

9Y1210365GEG0069US0



### Locking Wrench

#### Application

- Use for locking a front pinion nut.

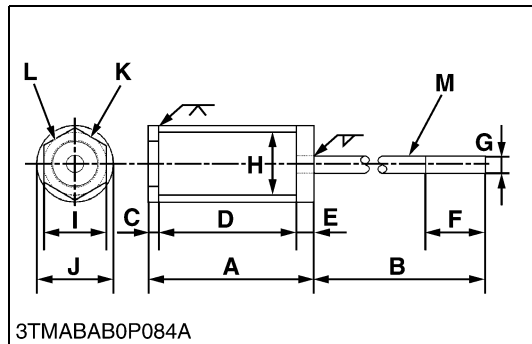
#### NOTE

- This special tool is not provided, so make it referring to the figure.

A	170 mm (6.69 in.)
B	130 mm (5.12 in.)
C	63.5 mm (2.5 in.)
D	40 mm radius (1.57 in. radius)
E	55 mm (2.17 in.)
F	15 mm (0.59 in.)
G	35 mm (1.38 in.)
H	5 mm (0.2 in.)
I	20 mm (0.55 in.)
J	10 mm (0.39 in.)
K	0.78 rad (45 °)
L	10 mm (0.39 in.)
M	50 mm (1.97 in.)
N	55 mm (2.17 in.)
O	25 mm (0.97 in.)
P	80 mm (3.15 in.)

9Y1210365GEG0070US0





### Pinion Shaft Remover

#### Application

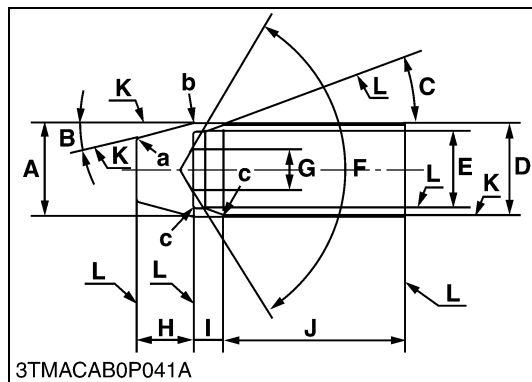
- Use for removing a pinion shaft.

#### NOTE

- This special tool is not provided so make it referring to the figure.

A	106 mm (4.17 in.)
B	350 mm (13.078 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 dia. (0.39 in. dia.)
H	35.6 mm dia. (1.40 in. dia.)
I	36 mm (1.42 in.)
J	41.6 mm dia. (1.64 in. dia.)
K	Part code No. 3A201-4130 nut
L	M27 x P1.5
M	M10 x P1.25

9Y1210365GEG0071US0



### PTO Propeller Shaft Guide

#### Application

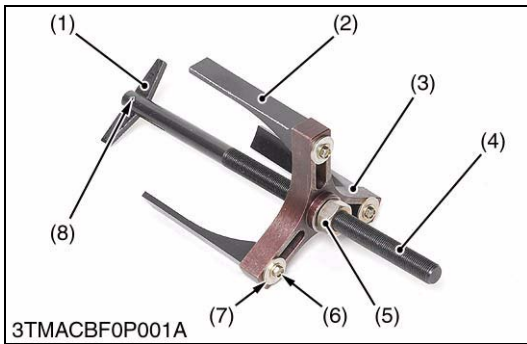
- Use to installing the propeller shaft to 21T gear shaft.

#### NOTE

- This special tool is not provided, so make it referring to the figure.

A	24.85 to 24.95 mm dia. (0.9783 to 0.9823 in. dia.)
B	0.26 rad (15 °)
C	0.35 rad (20 °)
D	23.7 to 23.8 mm dia. (0.9331 to 0.9370 in. dia.)
E	20 mm dia. (0.79 in. dia.)
F	2.1 rad (120 °)
G	Under 12 mm dia. (0.47 in. dia.)
H	15 mm (0.59 in.)
I	8 mm (0.31 in.)
J	48 mm (1.89 in.)
K	Rmax = 25 S
L	Rmax = 6.3 S
a	1.0 mm radius (0.039 in. radius)
b	2.0 mm radius (0.079 in. radius)
c	0.8 mm radius (0.031 in. radius)

9Y1210365GEG0072US0



3TMACBF0P001A

### Hydraulic Clutch Spring Compressor

#### Application

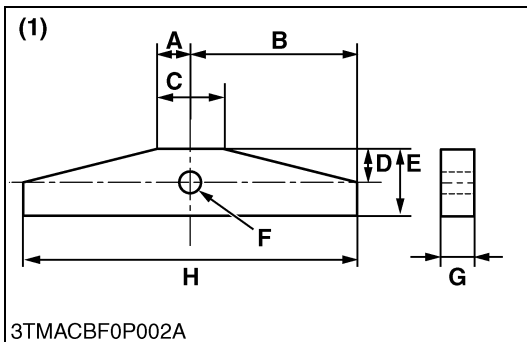
- Use exclusively for pushing the spring, to remove the circlip for hydraulic clutch.

#### NOTE

- These special tools are not provided, so make it referring to the figure.

- |                         |                                       |
|-------------------------|---------------------------------------|
| (1) Tool 4 (Plate)      | (5) Nut (M x P1.5)                    |
| (2) Tool 3 (Clow)       | (6) Screw (M5 x P1.0 - L10 mm)        |
| (3) Tool 1 (Body)       | (7) Washer (M5)                       |
| (4) Tool 2 (Center Bar) | (8) Spring Pin (5.0 mm Dia. - L16 mm) |

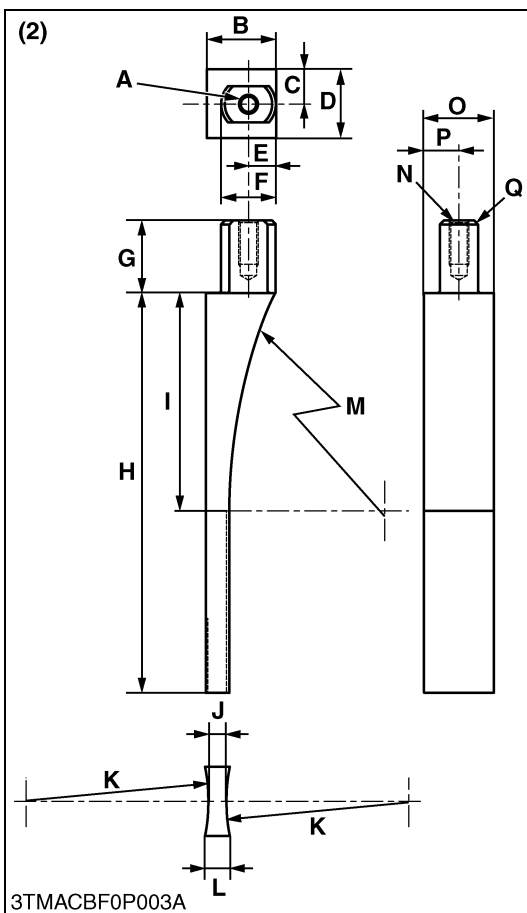
9Y1210365GEG0087US0



3TMACBF0P002A

#### (1) Tool 4 (Plate)

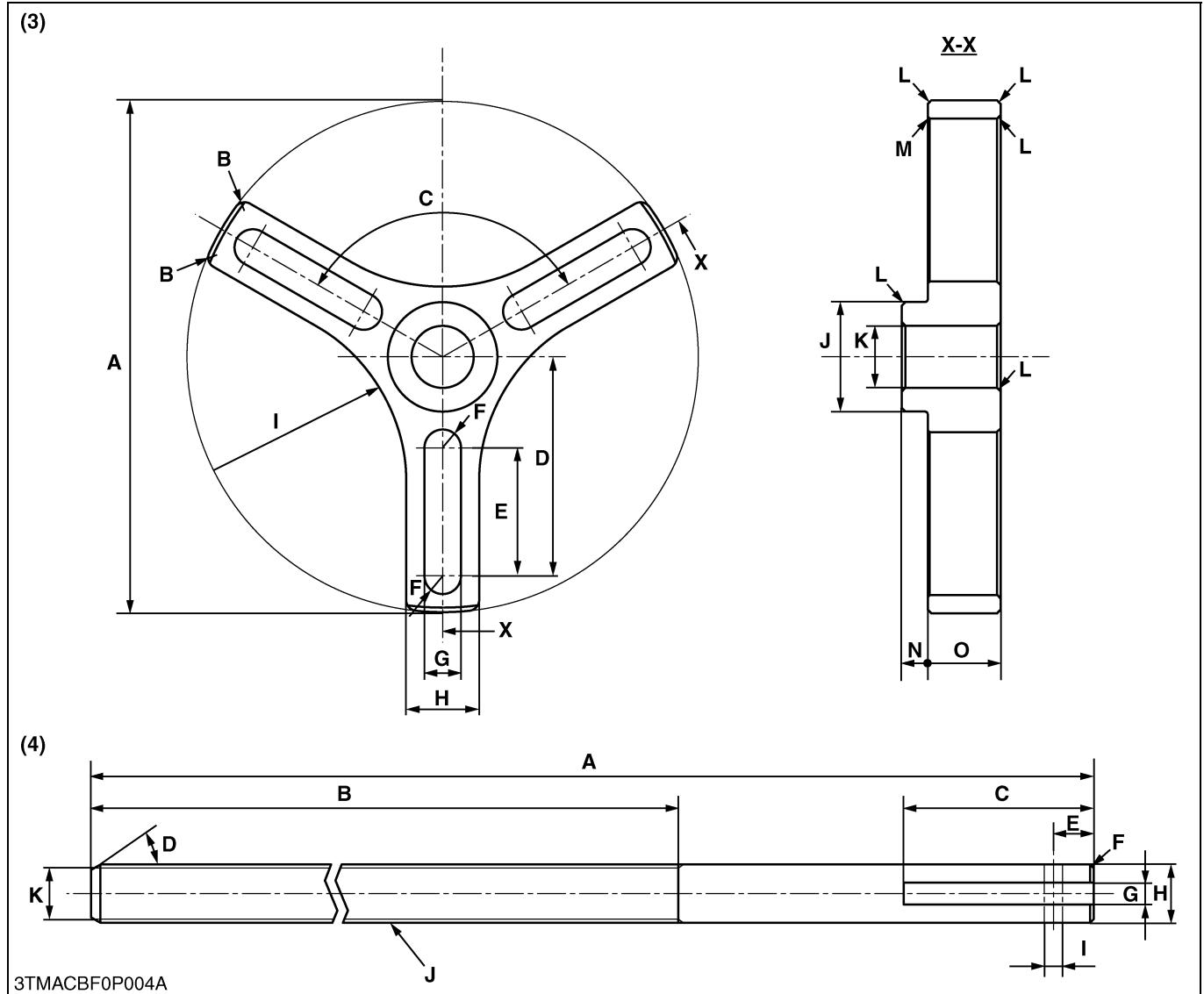
<b>A</b>	8 mm (0.3 in.)
<b>B</b>	40 mm (1.6 in.)
<b>C</b>	16 mm (0.63 in.)
<b>D</b>	8 mm (0.3 in.)
<b>E</b>	16 mm (0.63 in.)
<b>F</b>	5.2 mm dia. (0.20 in. dia.)
<b>G</b>	5.70 to 5.90 mm (0.225 to 0.232 in.)
<b>H</b>	80 mm (3.1 in.)



3TMACBF0P003A

#### (2) Tool 3 (Clow) : 3 pcs.

<b>A</b>	M5 x P1.0 x 12 mm depth (0.47 in. depth)
<b>B</b>	19 mm (0.75 in.)
<b>C</b>	5 mm (0.2 in.)
<b>D</b>	9.73 to 10.0 mm (0.383 to 0.393 in.)
<b>E</b>	7.5 mm (0.30 in.)
<b>F</b>	15 mm dia. (0.59 in. dia.)
<b>G</b>	20.05 to 20.10 mm (0.7894 to 0.7913 in.)
<b>H</b>	110 mm (4.33 in.)
<b>I</b>	60 mm (2.4 in.)
<b>J</b>	5 mm (0.2 in.)
<b>K</b>	50 mm (2.0 in.)
<b>L</b>	6.8 mm (0.27 in.)
<b>M</b>	Radius 150 to 160 mm (5.91 to 6.29 in.)
<b>N</b>	4.2 mm dia. x 15 mm depth (0.17 in. dia. x 0.59 in. depth)
<b>O</b>	19 mm (0.75 in.)
<b>P</b>	9.5 mm (0.37 in.)
<b>Q</b>	Chamfer 1.0 mm (0.039 in.)



**(3) Tool 1 (Body)**

<b>A</b>	140 mm dia. (5.51 in. dia.)	<b>I</b>	Radius 50 mm (2.0 in.)
<b>B</b>	Radius 3 mm (0.1 in.)	<b>J</b>	30 mm dia. (1.2 in. dia.)
<b>C</b>	2.09 rad (120 °)	<b>K</b>	17 mm dia. (0.67 in. dia.)
<b>D</b>	60 mm (2.4 in.)	<b>L</b>	Chamfer 1.0 mm (0.039 in.)
<b>E</b>	35 mm (1.4 in.)	<b>M</b>	Chamfer 0.5 mm (0.02 in.)
<b>F</b>	Radius 5 mm (0.2 in.)	<b>N</b>	7 mm (0.3 in.)
<b>G</b>	10.00 to 10.27 mm (0.3937 to 0.4043 in.)	<b>O</b>	20 mm (0.79 in.)
<b>H</b>	20 mm (0.79 in.)	<b>X (X-X)</b>	View direction

**(4) Tool 2 (Center Bar)**

<b>A</b>	330 mm (13.0 in.)	<b>G</b>	6.00 to 6.58 mm (0.237 to 0.259 in.)
<b>B</b>	210 mm (8.27 in.)	<b>H</b>	16 mm dia. (0.63 in. dia.)
<b>C</b>	52 mm (2.0 in.)	<b>I</b>	5.00 to 5.18 mm dia. (0.197 to 0.203 in. dia.)
<b>D</b>	0.52 rad (30 °)	<b>J</b>	M16 x P1.5 mm
<b>E</b>	11 mm (0.43 in.)	<b>K</b>	13 mm dia. (0.51 in. dia.)
<b>F</b>	Chamfer 1.0 mm (0.039 in.)		

9Y1210365GEG0074US0

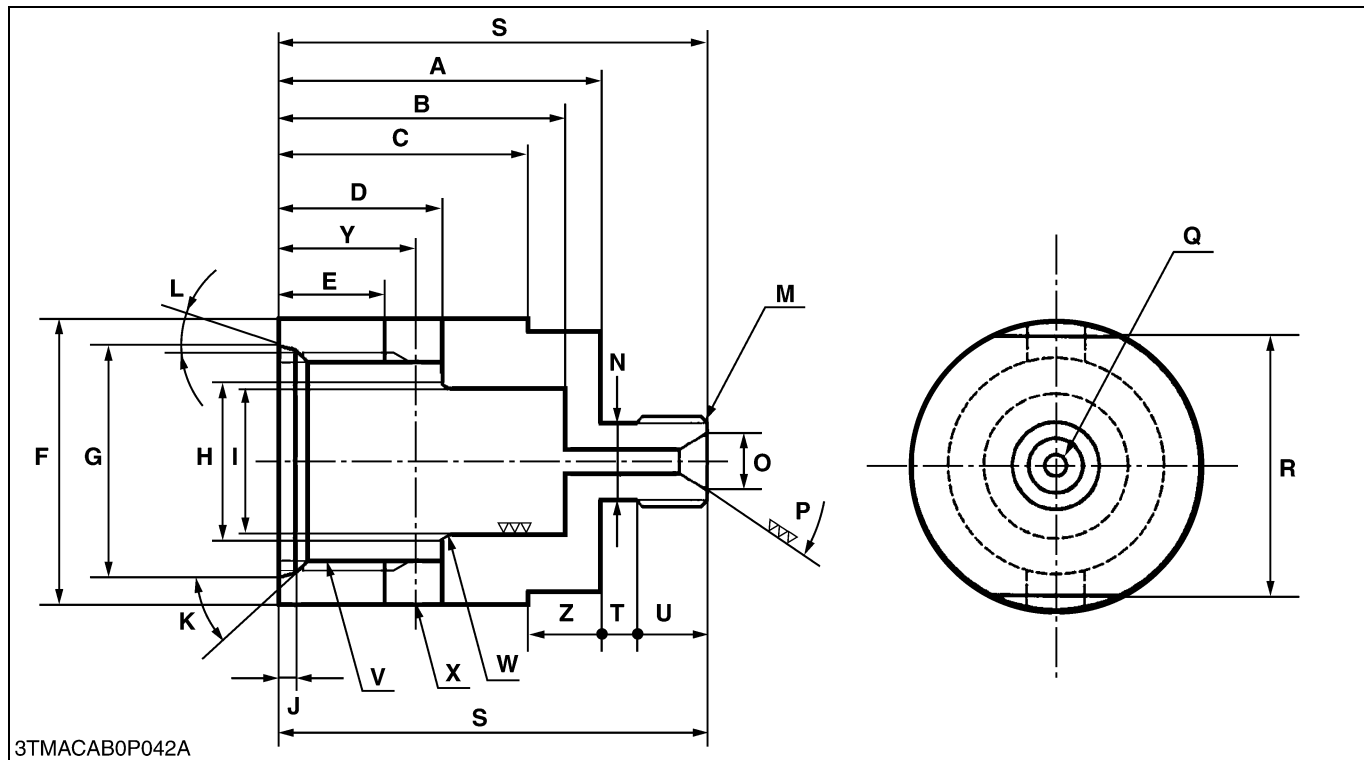
## Cylinder Safety Valve Setting Pressure Adaptor

### Application

- Use for setting the safety valve to the nozzle tester to measure cracking pressure and check oil tightness of the safety valves.

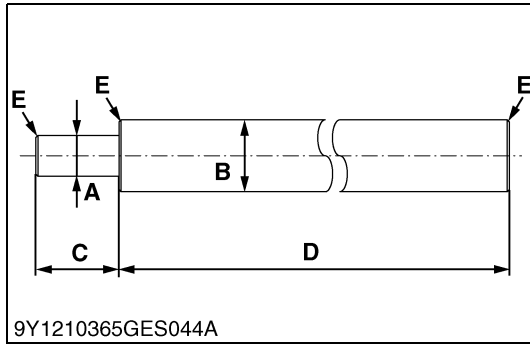
### NOTE

- This special tool is not provided, so make it referring to the figure.



<b>A</b>	45 mm (1.77 in.)	<b>N</b>	10 mm dia. (0.39 in. dia.)
<b>B</b>	40 mm (1.58 in.)	<b>O</b>	7.5 mm dia. (0.3 in. dia.)
<b>C</b>	35 mm (1.38 in.)	<b>P</b>	1.05 rad (60 °)
<b>D</b>	23.0 to 23.3 mm (0.9055 to 0.9713 in.)	<b>Q</b>	3 mm dia. (1.18 in. dia.)
<b>E</b>	16 mm (0.63 in.)	<b>R</b>	36 mm (1.18 in.)
<b>F</b>	40 mm dia. (1.58 in. dia.)	<b>S</b>	60 mm (2.36 in.)
<b>G</b>	32.4 to 32.7 mm dia. (1.2756 to 1.2874 in. dia.)	<b>T</b>	5 mm (0.20 in.)
<b>H</b>	21 mm dia. (0.83 in. dia.)	<b>U</b>	10 mm (0.39 in.)
<b>I</b>	20.00 to 20.05 mm dia. (0.7874 to 0.7894 in. dia.)	<b>V</b>	M30 × P1.5
<b>J</b>	2.50 to 2.59 mm (0.0984 to 0.1097 in.)	<b>W</b>	0.52 rad (30 °)
<b>K</b>	0.79 rad (45 °)	<b>X</b>	8 mm dia. (0.32 in. dia.)
<b>L</b>	0.26 rad (15 °)	<b>Y</b>	19 mm (0.75 in.)
<b>M</b>	M12 × P1.5	<b>Z</b>	10 mm (0.39 in.)

9Y1210365GEG0075US0



### Clutch Center Tool

#### Application

- Use for mounting the travelling to the flywheel.

#### NOTE

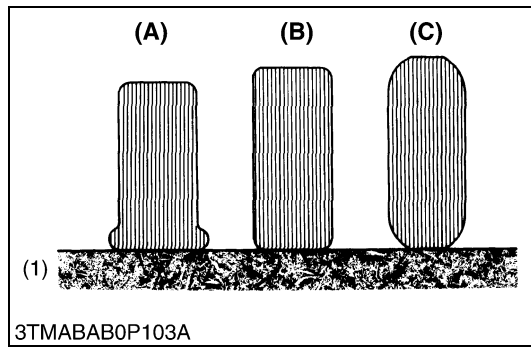
- This special tool is not provided, so make it referring to the figure.

A	18.9 to 19.2 mm dia. (0.744 to 0.755 in. dia.)
B	34.20 to 34.50 mm dia. (1.347 to 1.358 in. dia.)
C	40 mm (1.6 in.)
D	260 mm (10.2 in.)
E	Chamfer 1.0 mm (0.039 in.)

9Y1210365GEG0086US0

# 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.

### ■ NOTE

- **Maintain the maximum pressure in front tires, if using a front loader or when equipped with a full load of front weights.**

	Tire sizes	Inflation Pressure
Front 4WD	8.3-24, 6PR	200 kPa (2.0 kgf/cm <sup>2</sup> , 29 psi)
	9.5-22, 6PR	200 kPa (2.0 kgf/cm <sup>2</sup> , 29 psi)
	29 x 12.5-15NHS	138 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
	12.5 / 80-18, R4	317 kPa (3.2 kgf/cm <sup>2</sup> , 46 psi)
Front 2WD	6.50-16, 6PR	317 kPa (3.2 kgf/cm <sup>2</sup> , 46 psi)
	7.50-16, 6PR	276 kPa (2.8 kgf/cm <sup>2</sup> , 40 psi)
	9.5L-15, 6PR	220 kPa (2.2 kgf/cm <sup>2</sup> , 32 psi)
	29 x 12.5-15NHS	138 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
Rear	14.9-28	138 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
	16.9-28	124 kPa (1.3 kgf/cm <sup>2</sup> , 18 psi)
	21.5L-16.1, R3	83 kPa (0.84 kgf/cm <sup>2</sup> , 12 psi)
	16.9-24, R4	193 kPa (2.0 kgf/cm <sup>2</sup> , 28 psi)

### ⚠ WARNING

- **Do not attempt to mount a tire on a rim. This should be done by a qualified person with the proper equipment.**
- **Always maintain the correct tire pressure.**  
**Do not inflate tires above the recommended pressure shown in the operator's manual.**

### ■ IMPORTANT

- **Do not use tires other than those approved by KUBOTA.**

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

(1) Ground

9Y1210365GEG0046US0

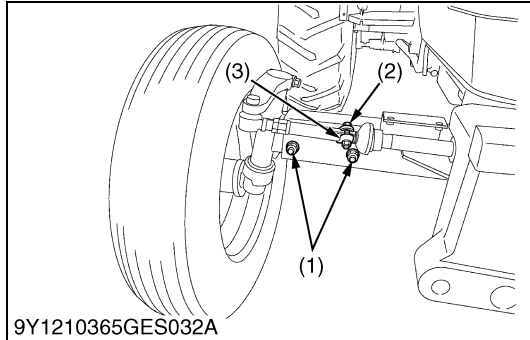
## [2] WHEEL ADJUSTMENT

### CAUTION

- When working on slopes or when working with trailer, set the wheel tread as wide as practical 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.

9Y1210365GEG0047US0

### (1) Front Wheels [2WD Model]



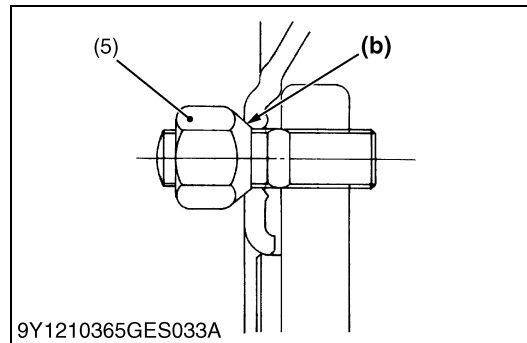
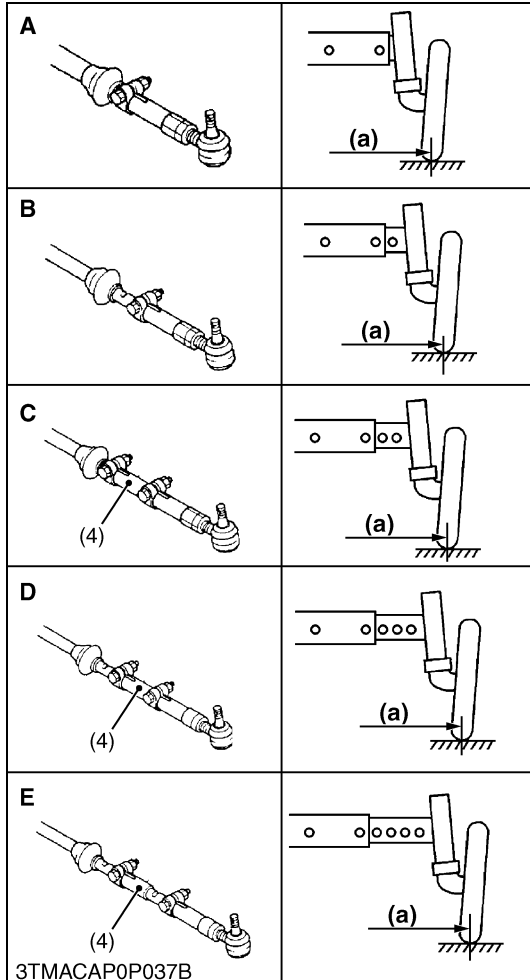
Front tread width can be adjusted as shown with the standard equipped tires.

To change the tread width

1. Remove the front axle mounting bolts (1) and the tie-rod mounting bolt (2).
2. Move the front axles (right and left) to the desired position, and tighten the bolts.
3. Adjust the toe-in.

#### ■ NOTE

- **Wheels with beveled or tapered holes: Use the tapered side (b) of lug nut (5).**



Toe-in	Factory spec.	1.0 to 5.0 mm 0.04 to 0.20 in.
--------	---------------	-----------------------------------

Tightening torque	Front axle mounting bolt	124 to 147 N·m 12.6 to 15.0 kgf·m 91.5 to 108.9 lbf·ft
	Tie-rod mounting bolt	61 to 71 N·m 6.2 to 7.2 kgf·m 44.8 to 52.1 lbf·ft

	A	B	C	D	E
Tread (a)	1420 mm 55.9 in.	1520 mm 59.8 in.	1620 mm 63.8 in.	1720 mm 67.7 in.	1820 mm 71.7 in.

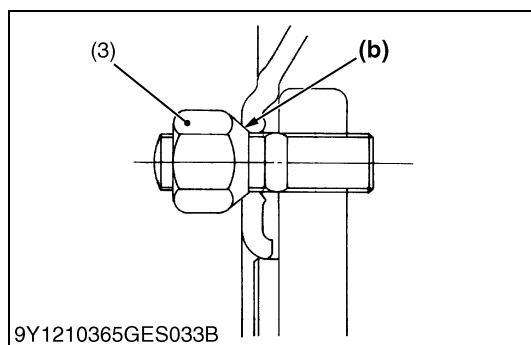
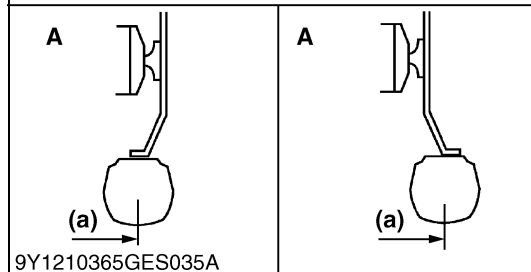
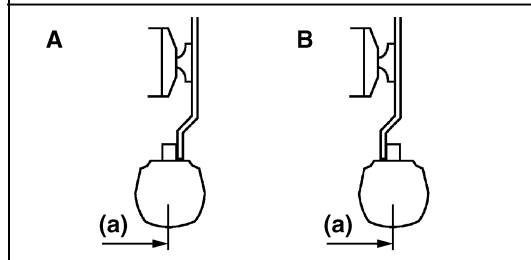
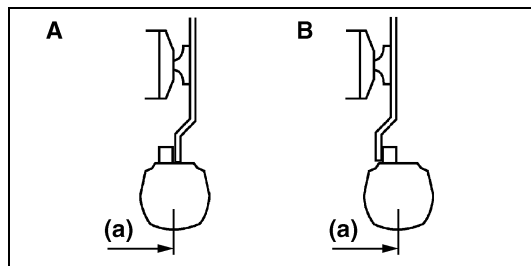
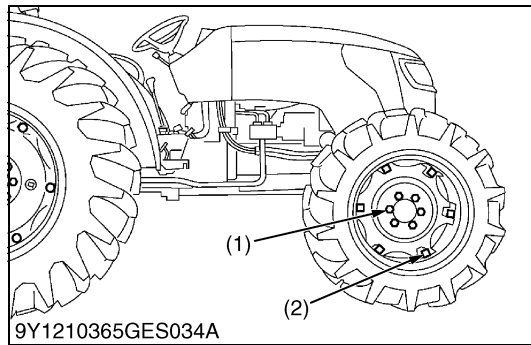
#### ■ IMPORTANT

- **The front tread width for the front loader application on 2WD models should not be greater than 1420 mm (55.9 in.).**

- |                              |                  |
|------------------------------|------------------|
| (1) Front Axle Mounting Bolt | (a) Tread        |
| (2) Tie-rod Mounting Bolt    | (b) Tapered Side |
| (3) Tie-rod Clamp            |                  |
| (4) Extension 1              |                  |
| (5) Lug Nut                  |                  |

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## (2) Front Wheels [4WD Model]



Front tread width can be adjusted as shown with the standard equipped tires.

To change the tread width

1. Remove the wheel rim and disc mounting bolts.
2. Change the position of the rim and disc (right and left) to the desired position, and tighten the bolts.
3. Adjust the toe-in.

■ **IMPORTANT**

- Always attach wheels as shown in the figure.
- 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. (Refer to "7. CHECK AND MAINTENANCE" in this section.)

■ **NOTE**

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

Toe-in	Factory spec.	2.0 to 8.0 mm 0.08 to 0.31 in.
--------	---------------	-----------------------------------

Tightening torque	Front wheel mounting nut (4WD)	168 to 196 N·m 17.1 to 20.0 kgf·m 124 to 145 lbf·ft
-------------------	--------------------------------	---

Tightening torque	Front disc mounting nut	8.3-24	244 N·m 24.9 kgf·m 180 lbf·ft
	Front disc mounting nut	9.5-22	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft

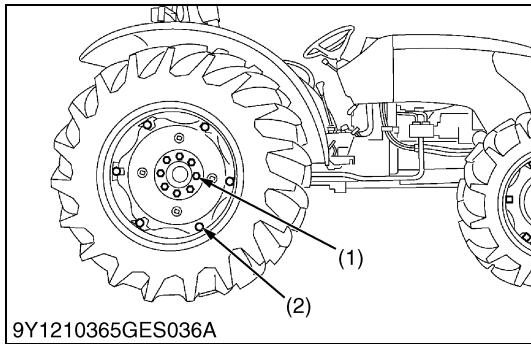
General	Tread (a)	
	A	B
8.3-24	1300 mm 57.2 in.	1400 mm 55.1 in.
9.5-22	1330 mm 52.4 in.	1430 mm 56.3 in.
29 x 12.5-15	1400 mm 55.1 in.	—
12.5/80-18	1390 mm 54.7 in.	—

- (1) Front Wheel Mounting Nut
- (2) Front Disc Mounting Nut
- (3) Lug Nut
- (a) Tread
- (b) Tapered Side

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### (3) Rear Wheels



Rear tread width can be adjusted as shown with the standard equipped tires.

To change the tread width

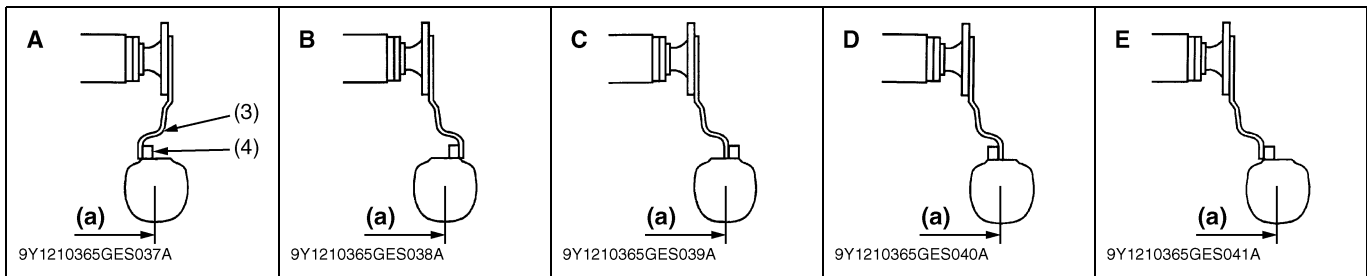
1. Remove the wheel rim and / or disc mounting bolts.
2. Change the position of the rim and disc (right and left) to the desired position, and tighten the bolts.

**■ IMPORTANT**

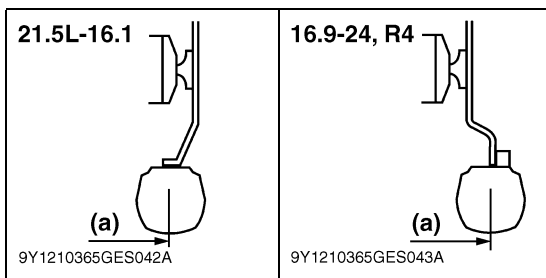
- Always attach wheels as shown in the figure.
- If not attached as illustrated, transmission parts may be damaged.
- When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter according to service interval. (Refer to "7. CHECK AND MAINTENANCE" in this section.)

Tightening torque	Rear wheel mounting nut	M16	259.9 to 304.0 N·m 26.5 to 31.0 kgf·m 191.7 to 224.2 lbf·ft
-------------------	-------------------------	-----	---

Tightening torque	Rear disc mounting nut (steel disc) (4WD)		244 N·m 24.9 kgf·m 180 lbf·ft
-------------------	---	--	-------------------------------------



Tread (a)	A	B	C	D	E
14.9-28	1320 mm 52.0 in.	1420 mm 55.9 in.	1520 mm 59.8 in.	1620 mm 63.8 in.	1720 mm 67.7 in.
16.9-28	—				



	Tread (a)
21.5L-16.1	1500 mm 59.1 in.
16.9-24, R4	1540 mm 60.6 in.

- (1) Rear Wheel Mounting Nut  
(2) Rear Disc Mounting Nut

- (3) Rear Wheel Disc

- (4) Rear Wheel Rim

- (a) Tread

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### [3] TIRE LIQUID INJECTION

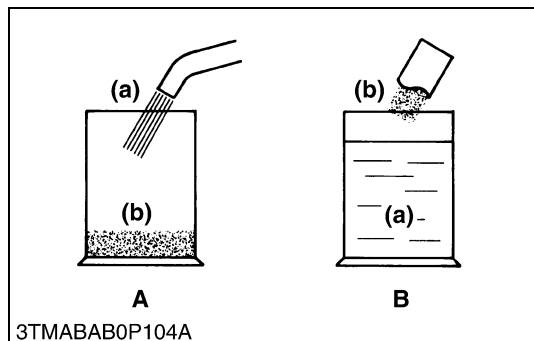
Auxiliary weights can be used to increase traction force for plowing in fields or clayey ground.

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.

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#### Preparation of Calcium Chloride Solution

**⚠ CAUTION**

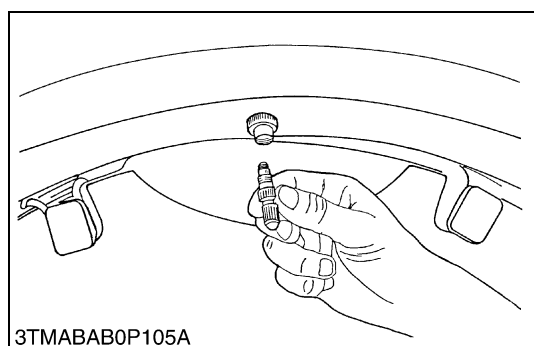
- When making a calcium chloride solution, do not pour water over calcium chloride since this results in chemical reaction which will cause high temperature. Instead add a small amount of calcium chloride to the water at a time until the desired solution is achieved.

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)
-33 °C (-22 °F)	44 kg (97.0 lbs)
-35 °C (-31 °F)	49 kg (108.0 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)

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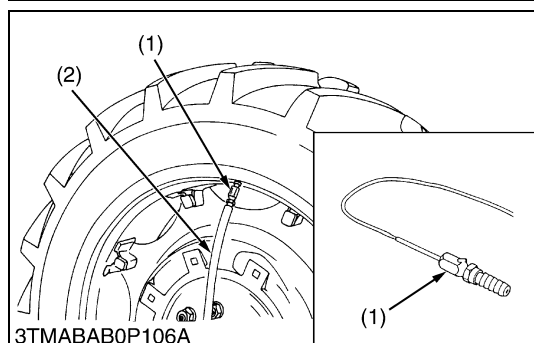
#### Attaching Injector

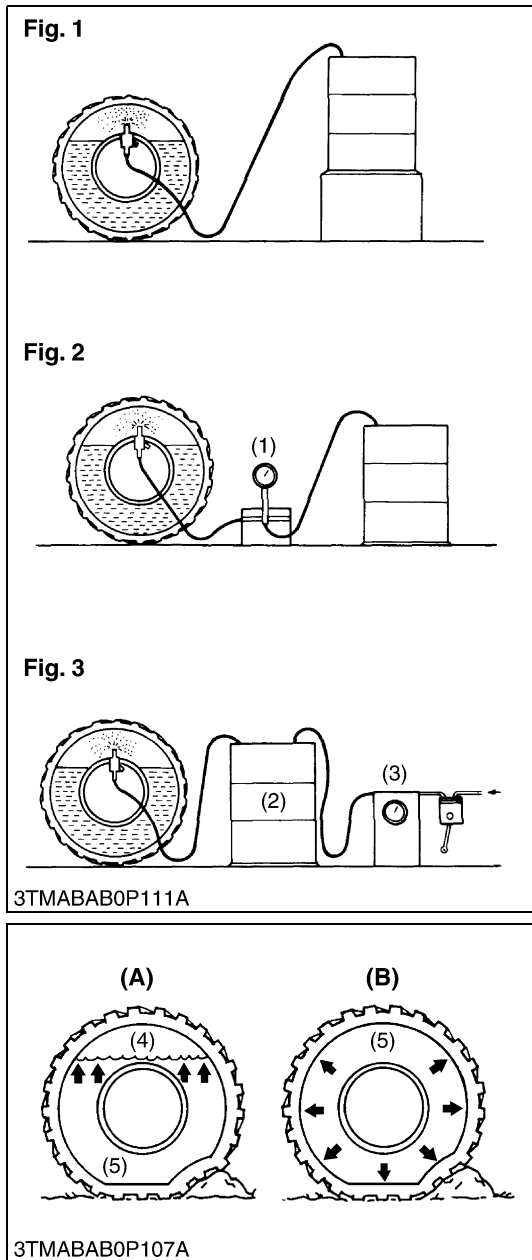
1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the top.
3. Remove the air valve, and attach the injector. (Code No. 07916-52501)

(1) Injector

(2) Hose

9Y1210365GEG0052US0





**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 tap (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.

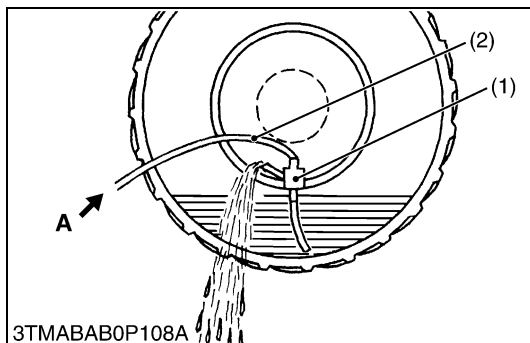
Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire

Tire sizes	14.9-28	16.9-28	21.5L-16.1	16.9-24, R4
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]	230 kg (507 lbs)	295 kg (651 lbs)	-	-
Slush free at -24 °C (-11 °F) Solid at -47 °C (-53 °F) [Approx. 1.5 kg (3.5 lbs) CaCl <sub>2</sub> per 4 L (1 gal.) of water]	247 kg (545 lbs)	317 kg (699 lbs)	290 kg (639 lbs)	280 kg (616 lbs)
Slush free at -47 °C (-53 °F) Solid at -52 °C (-62 °F) [Approx. 2.25 kg (5 lbs) CaCl <sub>2</sub> per 4 L (1 gal.) of water]	260 kg (574 lbs)	339 kg (747 lbs)	308 kg (680 lbs)	296 kg (654 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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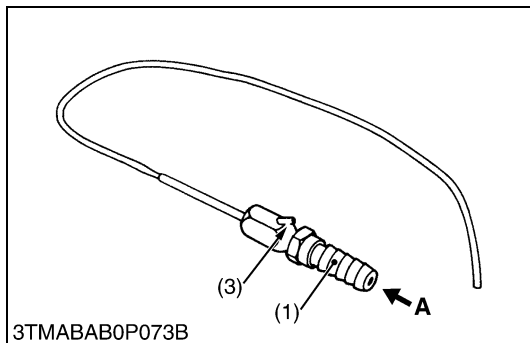


### Draining Water or Solution

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 (1), and direct compressed air into the tire to force out the liquid through the injector's vent (3).

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

**A : Compressed Air**



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# 10. 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.]

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Tread (max. width) with farm tires			Lower link end max. loading weight <b>W<sub>0</sub></b>
Front		Rear	
2WD	4WD		
1820 mm (71.7 in.)	1430 mm (56.3 in.)	1720 mm (67.7 in.)	1900 kg (4190 lbs)

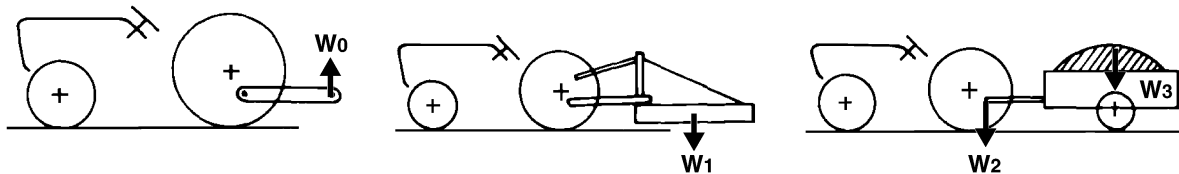
Actual figures			
Implement Weight <b>W<sub>1</sub></b> and / or size	Max. Drawbar Load <b>W<sub>2</sub></b>	Trailer loading weight <b>W<sub>3</sub></b> Max. capacity	
As in the following list (shown on the next page)	1000 kg (2200 lbs)	2WD	4WD
		4000 kg (8800 lbs)	4500 kg (9900 lbs)

Lower link end max. hydraulic lifting capacity **W<sub>0</sub>**

Implement weight **W<sub>1</sub>** : The implement's weight which can be put on the lower link

Max. drawbar load **W<sub>2</sub>**

Trailer loading weight **W<sub>3</sub>** :The max. loading weight for trailer (without trailer's weight)



3TMABAB0P109A

■ **NOTE**

- Implement size may vary depending on soil operating conditions.

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No.	Implement		Remarks	M5640SU		
				2WD	4WD	
1	Slurry Tank		Max. Tank Capacity	3000 L (792 U.S.gals, 660 Imp.gals)		
			Max. Load Capacity	4000 kg (8800 lbs)		
2	Trailer		Max. Load Capacity	4000 kg (8800 lbs)	4500 kg (9900 lbs)	
			Max. Drawbar Load	1000 kg (2200 lbs)		
3	Mower	Rotary-cutter	Max. Cutting Width	2130 mm (84 in.)		
			Max. Weight	540 kg (1200 lbs)		
	Flail Mower (Heavy)	Max. Cutting Width	3050 mm (120 in.)			
		Max. Weight	800 kg (1760 lbs)			
Sickle Bar	Max. Cutting Width	2130 mm (84 in.)				
4	Sprayer		Max. Tank-capacity	Mid	680 L (180 U.S.gals, 150 Imp.gals)	
				Rear 3P	680 L (180 U.S.gals, 150 Imp.gals)	
				Drawbar	3000 L (800 U.S.gals, 660 Imp.gals)	3500 L (920 U.S.gals, 770 Imp.gals)
5	Rotary Tiller		Max. Tilling Width	2130 mm (84 in.)		
			Max. Weight	800 kg (1760 lbs)		
6	Bottom Plow		Max. Size	16 in. × 2 18 in. × 1	14 in. × 3 16 in. × 2 18 in. × 1	
			Max. Weight	450 kg (1000 lbs)		
7	Disc-harrow	3P Type	Max. Size	18 in. × 24		
			Max. Harrowing Width	2130 mm (84 in.)		
	Drawbar Type	Max. Harrowing Width	2450 mm (96 in.)	2750 mm (108 in.)		
8	Disc Plow		Max. Size	24 in. × 3 26 in. × 2		
			Max. Weight	450 kg (1000 lbs)		
9	Sub Soiler		Numbers of Cultivating Tines	2		
			Cultivating Depth	300 mm (12 in.)	400 mm (16 in.)	
10	Cultivator		Max. Width	3050 mm (120 in.)	3660 mm (144 in.)	
			Number of Rows	4		
			Max. Weight	450 kg (1000 lbs)		
11	Front Blade*. **		Max. Cutting Width	1820 mm (72 in.)		
			Max. Oil Pressure	19.1 MPa (195 kgf/cm <sup>2</sup> , 2773 psi)		
12	Rear Blade		Max. Cutting Width	1820 mm (72 in.)		
			Max. Oil Pressure	19.1 MPa (195 kgf/cm <sup>2</sup> , 2773 psi)		
13	Front Loader*. **		Max. Lifting Capacity	1000 kg (2200 lbs)		
			Max. Oil Pressure	19.1 MPa (195 kgf/cm <sup>2</sup> , 2773 psi)		
14	Box Blade		Max. Cutting Width	1820 mm (72 in.)		
			Max. Weight	450 kg (1000 lbs)		

■ **NOTE**

- Implement size may vary depending on soil operating conditions.

\* Must remove front weight with this implement.

\*\* Need subframe

No.	Implement	Remarks	M5640SU	
			2WD	4WD
15	Back Hoe**	Max. Digging Depth	2530 mm (100 in.)	
		Max. Weight	900 kg (2000 lbs)	
16	Snow Blade	Max. Width	1820 mm (72 in.)	
		Max. Weight	450 kg (1000 lbs)	

■ **NOTE**

- **Implement size may vary depending on soil operating conditions.**
  - \* **Must remove front weight with this implement.**
  - \*\* **Need subframe**

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# 1 ENGINE



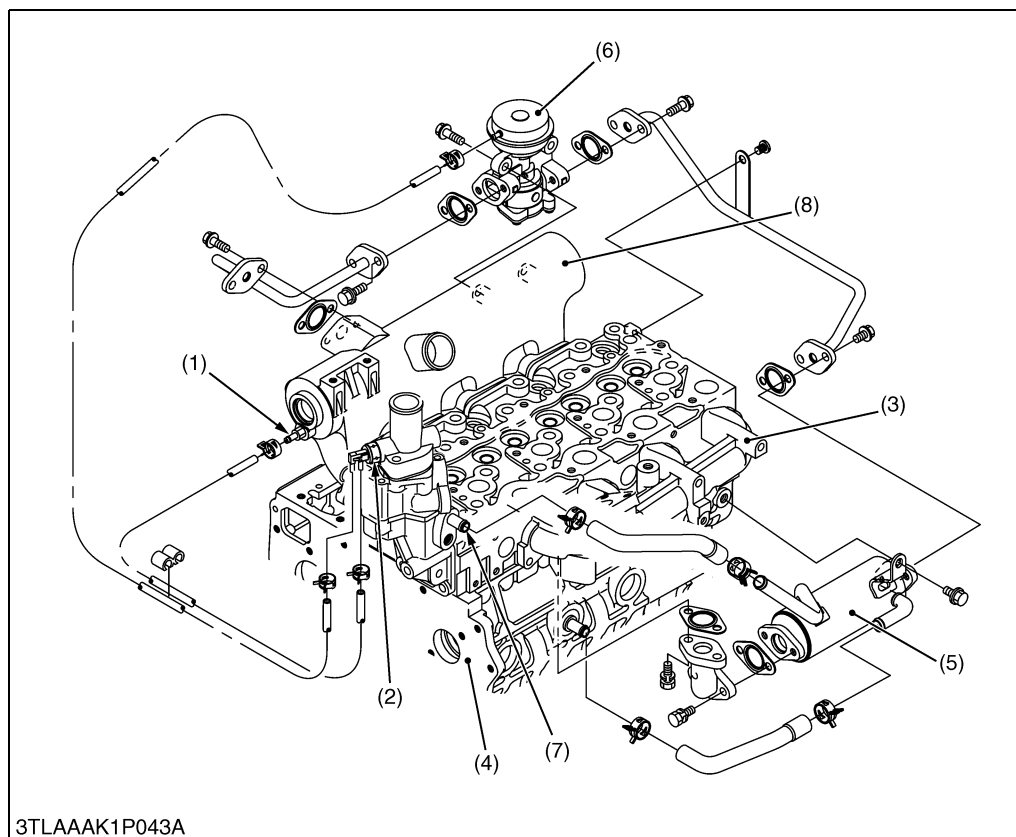
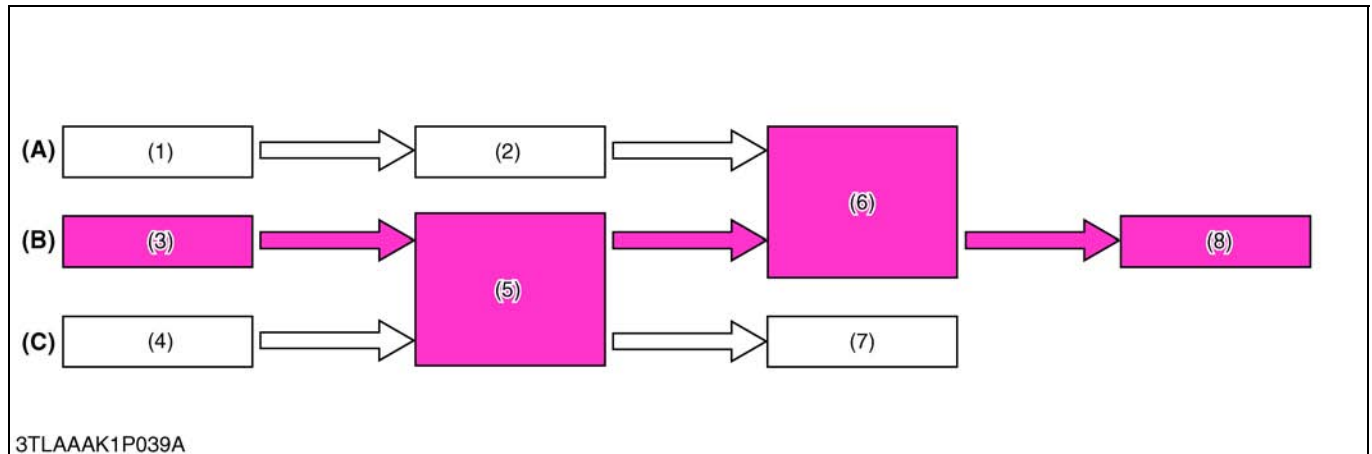
# MECHANISM

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[1] EGR VALVE .....	1-M2
[2] EGR COOLER.....	1-M2

# 1. EGR (EXHAUST GAS RECIRCULATION) SYSTEM

In order to meet with the strict emission regulations. Kubota has adapted the Exhaust Gas Recirculation (EGR) system.



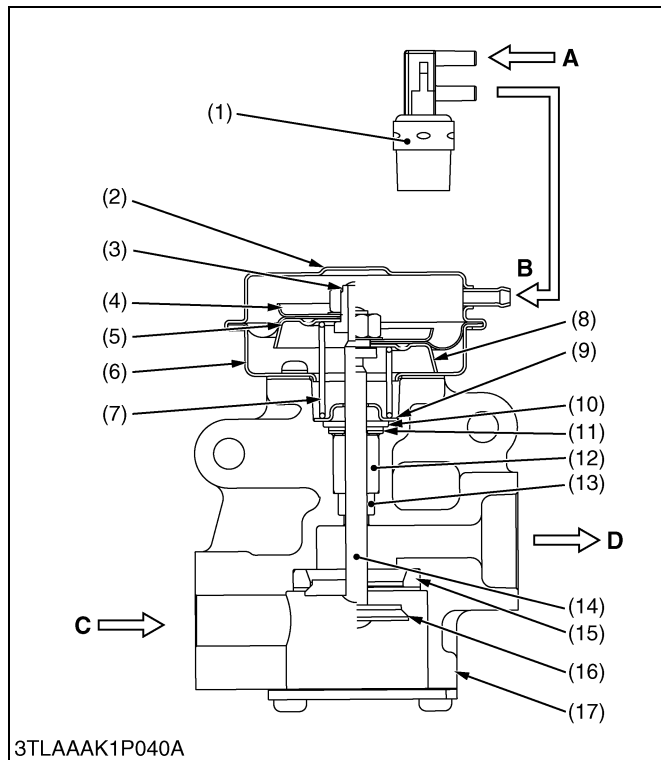
- (1) Boost Compensator
- (2) Thermo Valve
- (3) Exhaust Manifold
- (4) Crankcase
- (5) EGR Cooler
- (6) EGR Valve
- (7) Water Flange
- (8) Inlet Manifold

- (A) Boost Pressure
- (B) EGR Gas
- (C) Coolant

The EGR (Exhaust Gas Recirculation) system is used to lower the combustion temperature and efficiently cool EGR gas, with the aim of reducing the Nox that is in the exhaust gas of diesel engine.

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# [1] EGR VALVE



When the temperature of coolant rises above 65 °C (149 °F), the thermo valve (1) opens and boost pressure (B) flows to EGR valve.

This boost pressure (B) pushes down EGR valve's diaphragm (5), and opens valve (16). Then exhaust gas cooled by EGR cooler returns to the intake manifold.

- |                       |              |
|-----------------------|--------------|
| (1) Thermo Valve      | (14) Shaft   |
| (2) Diaphragm Cover   | (15) Sheet   |
| (3) Retainer          | (16) Valve   |
| (4) Diaphragm Plate   | (17) Housing |
| (5) Diaphragm         |              |
| (6) Diaphragm Stay    |              |
| (7) Valve Spring      |              |
| (8) Diaphragm Plate   |              |
| (9) Plate             |              |
| (10) Plate            |              |
| (11) Insulator        |              |
| (12) Valve Shaft Bush |              |
| (13) Filter           |              |

**A : Boost Pressure (from Boost Compensator / Intake Manifold)**

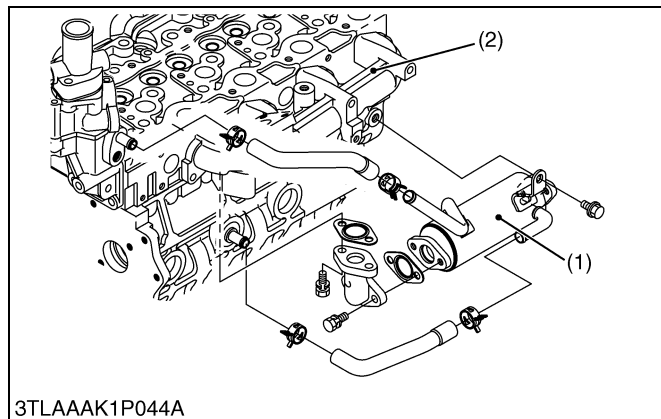
**B : Boost Pressure (from Thermo Valve)**

**C : Cooled EGR Gas (from EGR Gas)**

**D : Cooled EGR Gas (to Intake Manifold)**

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# [2] EGR COOLER



The EGR cooler (1) is placed between the exhaust manifold (2) and the intake manifold of the engine and returns the cooled exhaust gas to the engine suction side.

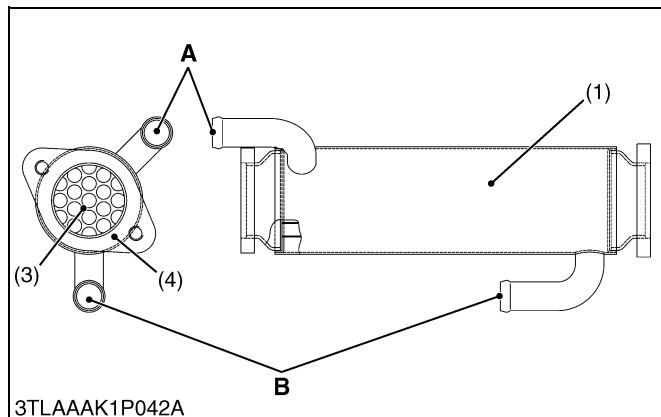
The EGR cooler (1) has resistance to clogging up, compact and efficient tubes (3) internally.

- |                      |                                |
|----------------------|--------------------------------|
| (1) EGR Cooler       | <b>A : Coolant Outlet Port</b> |
| (2) Exhaust Manifold | <b>B : Coolant Inlet Port</b>  |
| (3) Tubes            |                                |
| (4) Coolant Passage  |                                |

**A : Coolant Outlet Port**

**B : Coolant Inlet Port**

9Y1210365ENM0003US0



# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Engine Does Not Start</b>	No fuel	Replenish fuel	G-10
	Air in the fuel system	Bleed	G-34
	Water in the fuel system	Change fuel and repair or replace fuel system	G-22, G-28, G-34
	Fuel pipe clogged	Clean	1-S28
	Fuel filter clogged	Replace	G-22
	Excessively high viscosity of fuel or engine oil at low temperature	Use the specified fuel or engine oil	G-10
	Fuel with low cetane number	Use the specified fuel	G-11
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S28
	Incorrect injection timing	Adjust	1-S15
	Fuel camshaft worn	Replace	1-S38
	Injection nozzle clogged	Repair or replace	1-S28
	Injection pump malfunctioning	Repair or replace	1-S33
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	1-S39
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S11, 1-S28, 1-S30
	Improper valve timing	Correct or replace timing gear	1-S37
	Piston and cylinder worn	Replace	1-S39
	Excessive valve clearance	Adjust	1-S12
Stop solenoid malfunctioning	Replace	1-S21	
<b>Starter Does Not Run</b>	Battery discharged	Charge	9-S9
	Starter malfunctioning	Repair or replace	1-S22
	Main switch malfunctioning	Repair or replace	9-S11
	PTO switch defective	Replace	9-S23
	Neutral switches improperly adjusted or defective	Repair or replace	9-S23
	Starter relay defective	Replace	9-S28
	Wiring disconnected	Connect	–
<b>Engine Revolution is Not Smooth</b>	Fuel filter clogged or dirty	Replace	G-22
	Air cleaner clogged	Clean or change	G-22
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S28
	Injection pump malfunctioning	Repair or replace	1-S33
	Incorrect nozzle injection pressure	Adjust	1-S17
	Injection nozzle stuck or clogged	Repair or replace	1-S28
	Governor malfunctioning	Repair	1-S34

Symptom	Probable Cause	Solution	Reference Page
<b>Either White or Blue Exhaust Gas is Observe</b>	Excessive engine oil	Reduce to the specified level	1-S20
	Piston ring and cylinder worn or stuck	Repair or replace	1-S41
	Incorrect injection timing	Adjust	1-S15
	Deficient compression	Adjust top clearance	1-S11
<b>Either Black or Dark Gray Exhaust Gas Is Observe</b>	Overload	Reduce the load	–
	Low grade fuel used	Use the specified fuel	G-11
	Fuel filter clogged	Replace	G-22
	Air cleaner clogged	Clean or replace	G-22
	Deficient nozzle injection	Repair or replace the nozzle	1-S28
<b>Deficient Output</b>	Incorrect injection timing	Adjust	1-S15
	Engine's moving parts seem to be seizing	Repair or replace	–
	Injection pump malfunctioning	Repair or replace	1-S33
	Deficient nozzle injection	Repair or replace the nozzle	1-S17, 1-S28
	Compression leak	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder	1-S11, 1-S28, 1-S30
	Air cleaner dirty or clogged	Clean or replace	G-22
	Fuel filter dirty or clogged	Clean or replace	G-22
<b>Excessive Lubricant Oil Consumption</b>	Piston ring's gap facing the same direction	Shift ring gap direction	1-S40
	Oil ring worn or stuck	Replace	1-S41
	Piston ring groove worn	Replace the piston	1-S41
	Valve stem and guide worn	Replace	1-S32
	Oil leaking due to defective seals or packing	Replace	–
<b>Fuel Mixed Into Lubricant Oil</b>	Injection pump's plunger worn	Replace pump	1-S33
	Deficient nozzle injection	Repair or replace the nozzle	1-S17, 1-S28
	Injection pump broken	Replace	1-S33
<b>Water Mixed Into Lubricant Oil</b>	Head gasket defective	Replace	1-S30
	Cylinder block or cylinder head flawed	Replace	–

Symptom	Probable Cause	Solution	Reference Page
<b>Low Oil Pressure</b>	Engine oil insufficient	Replenish	G-10
	Oil strainer clogged	Clean	1-S39
	Relief valve stuck with dirt	Clean	1-S37
	Relief valve spring weaken or broken	Replace	1-S37
	Excessive oil clearance of crankshaft bearing	Replace	1-S58
	Excessive oil clearance of crankpin bearing	Replace	1-S57
	Excessive oil clearance of rocker arm	Replace	1-S49
	Oil passage clogged	Clean	–
	Different type of oil	Use the specified type of oil	G-10
Oil Pump defective	Repair or replace	1-S38	
<b>High Oil Pressure</b>	Different type oil	Use the specified type of oil	G-10
	Relief valve defective	Replace	1-S37
<b>Engine Overheated</b>	Engine oil insufficient	Replenish	G-10
	Fan belt broken or elongated	Replace or adjust	1-S13
	Coolant insufficient	Replenish	G-10
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	G-31
	Coolant flow route corroded	Clean or replace	–
	Radiator cap defective	Replace	G-31
	Overload running	Reduce the load	–
	Head gasket defective	Replace	1-S30
	Incorrect injection timing	Adjust	1-S15
	Unsuitable fuel used	Use the specified fuel	G-11

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## 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)		3.24 to 3.72 MPa 33.0 to 38.0 kgf/cm <sup>2</sup> 470 to 540 psi	2.5 MPa 26 kgf/cm <sup>2</sup> 370 psi
Difference among Cylinders		–	10 % or less
Valve Clearance (When Cold)		0.18 to 0.22 mm 0.0071 to 0.0087 in.	–
Valve Seat	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
Valve Face	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 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 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	118 N / 35 mm 12.0 kgf / 35 mm 26.5 lbf / 1.4 in.	100.0 N / 35 mm 10.2 kgf / 35 mm 22.5 lbf / 1.4 in.
	Tilt	–	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.



Item		Factory Specification	Allowable Limit	
Tappet to Tappet Guide	Clearance	0.020 to 0.062 mm 0.00079 to 0.00244 in.	0.07 mm 0.003 in.	
	• Tappet	O.D. 23.959 to 23.980 mm 0.94327 to 0.94409 in.	–	
	• Tappet Guide	I.D. 24.000 to 24.021 mm 0.94488 to 0.94570 in.	–	
Timing Gear	• Crank Gear to Idle Gear	Backlash 0.04150 to 0.1122 mm 0.001634 to 0.004417 in.	0.15 mm 0.0059 in.	
	• Idle Gear to Cam Gear	Backlash 0.04150 to 0.1154 mm 0.001634 to 0.004543 in.	0.15 mm 0.0059 in.	
	• Idle Gear to Injection Pump Gear	Backlash 0.04150 to 0.1154 mm 0.001634 to 0.004543 in.	0.15 mm 0.0059 in.	
	• Crank Gear to Oil Pump Gear	Backlash 0.0415 to 0.109 mm 0.00163 to 0.00429 in.	0.15 mm 0.0059 in.	
	• Idle Gear to Balancer Gear	Backlash (Intake side)	0.0350 to 0.116 mm 0.00138 to 0.00456 in.	0.15 mm 0.0059 in.
		Backlash (Exhaust side)	0.0350 to 0.116 mm 0.00138 to 0.00456 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.12 to 0.48 mm 0.0048 to 0.018 in.	0.9 mm 0.035 in.	
Idle Gear Shaft to Idle Gear Bushing	Clearance	0.025 to 0.066 mm 0.00099 to 0.0025 in.	0.10 mm 0.0039 in.	
	• Idle Gear Shaft	O.D. 37.959 to 37.975 mm 1.4945 to 1.4950 in.	–	
	• Idle Gear Bushing	I.D. 38.000 to 38.025 mm 1.4961 to 1.4970 in.	–	
Camshaft	Side Clearance	0.070 to 0.22 mm 0.0028 to 0.0086 in.	0.30 mm 0.012 in.	
Camshaft	Alignment	–	0.01 mm 0.0004 in.	
Cam	Height (Intake / Exhaust)	33.90 mm 1.335 in.	33.85 mm 1.333 in.	
Camshaft Journal to Cylinder Block Bore	Clearance	0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.	
	• Camshaft Journal	O.D. 39.934 to 39.950 mm 1.5722 to 1.5728 in.	–	
	• Cylinder Block Bore	I.D. 40.000 to 40.025 mm 1.5748 to 1.5757 in.	–	
Balancer Shaft	Side Clearance	0.070 to 0.22 mm 0.0028 to 0.0086 in.	0.3 mm 0.012 in.	

Item		Factory Specification	Allowable Limit
Balancer Shaft Journal 1 to Balancer Shaft Bearing 1	Clearance	0.030 to 0.111 mm 0.00119 to 0.00437 in.	0.2 mm 0.0079 in.
• Balancer Shaft Journal 1	O.D.	43.934 to 43.950 mm 1.7297 to 1.7303 in.	–
• Balancer Shaft Bearing 1	I.D.	43.980 to 44.045 mm 1.7315 to 1.7340 in.	–
Balancer Shaft Journal 2 to Balancer Shaft Bearing 2	Clearance	0.030 to 0.111 mm 0.00119 to 0.00437 in.	0.2 mm 0.0079 in.
• Balancer Shaft Journal 2	O.D.	41.934 to 41.950 mm 1.6510 to 1.6515 in.	–
• Balancer Shaft Bearing 2	I.D.	41.980 to 42.045 mm 1.6528 to 1.6553 in.	–
Balancer Shaft Journal 3 to Balancer Shaft Bearing 3	Clearance	0.020 to 0.094 mm 0.00079 to 0.0037 in.	0.2 mm 0.0079 in.
• Balancer Shaft Journal 3	O.D.	21.947 to 21.960 mm 0.86406 to 0.86456 in.	–
• Balancer Shaft Bearing 3	I.D.	21.980 to 22.041 mm 0.86536 to 0.86775 in.	–
Piston Pin Bore	I.D.	25.000 to 25.013 mm 0.98426 to 0.98476 in.	25.050 mm 0.98622 in.
Second Ring to Ring Groove	Clearance	0.093 to 0.120 mm 0.00367 to 0.00472 in.	0.200 mm 0.00787 in.
Oil Ring to Ring Groove	Clearance	0.020 to 0.060 mm 0.00079 to 0.0023 in.	0.15 mm 0.00591 in.
Top Ring	Ring Gap	0.25 to 0.40 mm 0.0099 to 0.015 in.	1.25 mm 0.0492 in.
Second Ring	Ring Gap	0.30 to 0.45 mm 0.012 to 0.017 in.	1.25 mm 0.0492 in.
Oil Ring	Ring Gap	0.25 to 0.45 mm 0.0099 to 0.017 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 0.00056 to 0.0014 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 0.98524 to 0.98582 in.	–
Crankshaft	Alignment	–	0.020 mm 0.00079 in.

Item		Factory Specification	Allowable Limit
Crankshaft Journal to Crankshaft Bearing 1	Oil Clearance	0.040 to 0.118 mm 0.00158 to 0.00464 in.	0.2 mm 0.0079 in.
	• Crankshaft Journal	O.D. 59.921 to 59.940 mm 2.3591 to 2.3598 in.	–
	• Crankshaft Bearing 1	I.D. 59.980 to 60.039 mm 2.3615 to 2.3631 in.	–
Crankshaft Journal to Crankshaft Bearing 2	Oil Clearance	0.0400 to 0.104 mm 0.00158 to 0.00409 in.	0.20 mm 0.0079 in.
	• Crankshaft Journal	O.D. 59.921 to 59.940 mm 2.3591 to 2.3598 in.	–
	• Crankshaft Bearing 2	I.D. 59.980 to 60.025 mm 2.3615 to 2.3631 in.	–
Crankpin to Crankpin Bearing	Oil Clearance	0.025 to 0.087 mm 0.00099 to 0.0034 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 1.8504 to 1.8522 in.	–
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.012 in.	0.50 mm 0.020 in.
Crankshaft Sleeve	Wear	–	0.10 mm 0.0039 in.
Cylinder Bore	I.D.	87.000 to 87.022 mm 3.4252 to 3.4260 in.	+ 0.15 mm + 0.0059 in.
	<b>[Oversize]</b>	I.D. 87.250 to 87.272 mm 3.4351 to 3.4359 in.	+ 0.15 mm + 0.0059 in.

**LUBRICATING SYSTEM**

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	98 kPa or more 1.0 kgf/cm <sup>2</sup> or more 14 psi or more	50 kPa 0.5 kgf/cm <sup>2</sup> 7 psi
	At Rated Speed	300 to 440 kPa 3.0 to 4.5 kgf/cm <sup>2</sup> 43 to 64 psi	250 kPa 2.5 kgf/cm <sup>2</sup> 36 psi
Inner Rotor to Outer Rotor	Clearance	0.03 to 0.14 mm 0.0012 to 0.0055 in.	0.2 mm 0.0079 in.
Outer Rotor to Pump Body	Clearance	0.11 to 0.19 mm 0.0044 to 0.0074 in.	0.25 mm 0.0098 in.
Inner Rotor to Cover	Clearance	0.105 to 0.150 mm 0.00414 to 0.00590 in.	0.2 mm 0.0079 in.

**COOLING SYSTEM**

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7.0 to 9.0 mm (0.28 to 0.35 in.) deflection at 98 N (10 kgf, 22 lbf) 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	—

**FUEL SYSTEM**

Item		Factory Specification	Allowable Limit
Injection Pump	Injection Timing	0.149 to 0.174 rad (8.50 to 10.0 °) before T.D.C.	–
Pump Element	Fuel Tightness	–	13.7 MPa 140 kgf/cm <sup>2</sup> 1991 psi
Delivery Valve	Fuel Tightness	10 seconds or more for pressure falling from 13.7 to 12.8 MPa (from 140 to 130 kgf/cm <sup>2</sup> , from 1990 to 1850 psi)	5 seconds for pressure falling from 13.7 to 12.8 MPa (from 140 to 130 kgf/cm <sup>2</sup> , from 1990 to 1850 psi)
Injection Pump	Injection Pressure	13.8 to 14.7 MPa 140 to 150 kgf/cm <sup>2</sup> 2000 to 2130 psi	–
Injection Nozzle Valve Seat	Valve Seat Tightness	When the pressure is 12.8 MPa (130 kgf/cm <sup>2</sup> , 1850 psi), the valve seat must be fuel tightness.	–

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### 3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

Item	N·m	kgf·m	lbf·ft
Starter's terminal <b>B</b> mounting nut	7.8 to 9.8	0.8 to 1.0	5.8 to 7.2
Main delivery pipe and return pipe retaining nut	47.1 to 51.0	4.8 to 5.2	34.7 to 37.6
Delivery hose retaining nut	23 to 29	2.3 to 2.8	17 to 19
Engine and clutch housing mounting screw and nut (M12, 7T)	77.5 to 90.2	7.9 to 9.2	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
3P delivery pipe joint screw nut	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
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
Clutch mounting screw	23.5 to 27.5	2.4 to 2.8	17.5 to 20.3

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Cylinder head cover screw	M6 × 1.0	9.81 to 11.2	1.0 to 1.15	7.23 to 8.31
Injection pipe retaining nuts	M12 × 1.5	25 to 34	2.5 to 3.5	18 to 25
Nozzle holder assembly	M20 × 2.0	49 to 68	5.0 to 7.0	37 to 50
Overflow pipe assembly retaining nuts	–	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Glow plugs	M10 × 1.25	20 to 24	2.0 to 2.5	15 to 18
* Rocker arm bracket screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
* Cylinder head screws	M11 × 1.25	93.2 to 98.0	9.5 to 10.0	68.8 to 72.3
Hi-idling body	–	45 to 49	4.5 to 5.0	33 to 36
Fan drive pulley mounting nut	–	138 to 156	14.0 to 16.0	102 to 115
Cover mounting screw (Relief valve)	M18 × 1.5	34.1 to 34.5	3.48 to 3.51	25.2 to 25.4
Camshaft set screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Balancer shaft set screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
* Connecting rod screws	M8 × 1.0	45 to 49	4.5 to 5.0	33 to 36
* Flywheel screws	M12 × 1.25	98.1 to 107	10.0 to 11.0	72.4 to 79.5
* Bearing case cover screws	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
* Main bearing case screws 2	M10 × 1.25	69 to 73	7.0 to 7.5	51 to 54
* Main bearing case screws 1	M9 × 1.25	46 to 50	4.7 to 5.2	34 to 37

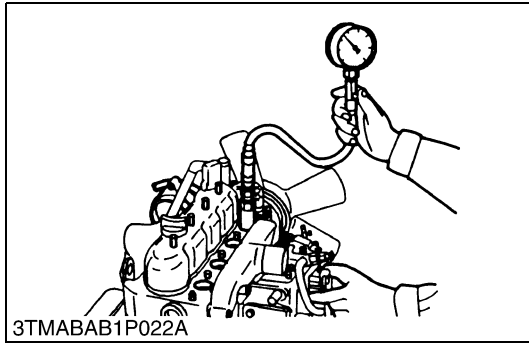
#### ■ NOTE

- For \* marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.
- The letter "M" in Size x 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.

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## 4. CHECKING AND ADJUSTING

### [1] ENGINE BODY



#### Compression Pressure

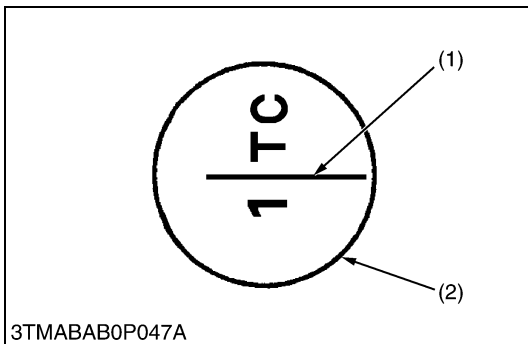
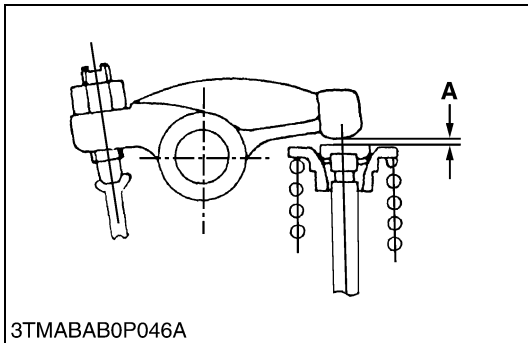
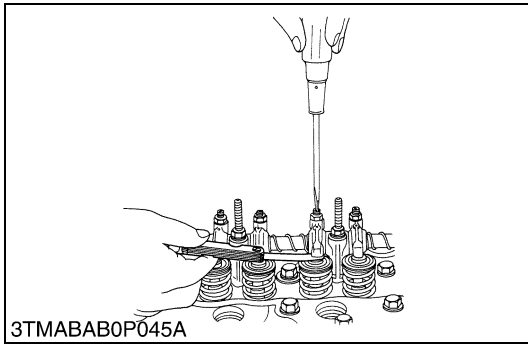
1. Run the engine until it is warmed up.
2. Stop the engine and disconnect the **2P** connector from the fuel pump.
3. Remove the air cleaner, the muffler and all injection nozzles.
4. Set a compression tester (Code No. 07909-30208) with the adaptor to the nozzle hole.
5. Keep the engine stop lever at "**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 and 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

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**Valve Clearance**

■ **IMPORTANT**

- **Valve clearance must be checked and adjusted when engine is cold.**
1. Remove the head cover, the glow plugs and the timing window cover on the clutch housing.
  2. Align the "1TC" mark line on the flywheel and center of timing window so that the No. 1 piston comes to the compression or overlap top dead center.
  3. Check the following valve clearance marked with "☆" using a feeler gauge.
  4. If the clearance is not within the factory specifications, adjust with the adjusting screw.

Valve clearance	Factory spec.	0.18 to 0.22 mm 0.0071 to 0.0086 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.)
- 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.
- After turning the flywheel counterclockwise twice or three times, recheck the valve clearance, firmly tighten the lock nut of the adjusting screw.

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

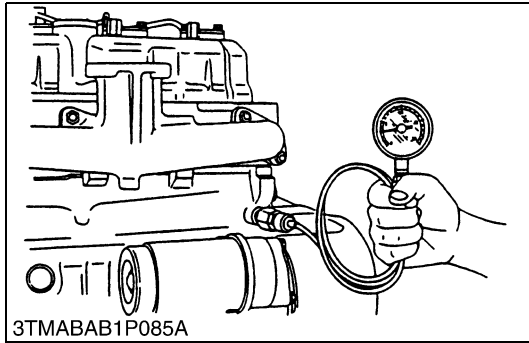
- (1) TC Mark Line
- (2) Timing Window

**A : Valve Clearance**

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## [2] LUBRICATING SYSTEM



### Engine Oil Pressure

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

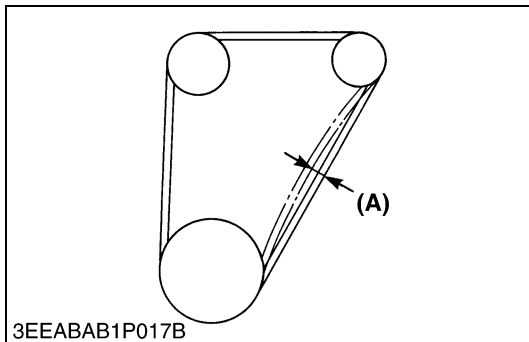
Engine oil pressure	At idle speed	Factory spec.	More than 98 kPa 1.0 kgf/cm <sup>2</sup> 14 psi
		Allowable limit	50 kPa 0.5 kgf/cm <sup>2</sup> 7 psi
	At rated speed	Factory spec.	300 to 440 kPa 3.0 to 4.5 kgf/cm <sup>2</sup> 42.7 to 64 psi
		Allowable limit	250 kPa 2.5 kgf/cm <sup>2</sup> 36 psi

### (When reassembling)

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

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## [3] COOLING SYSTEM



### Fan Belt Tension

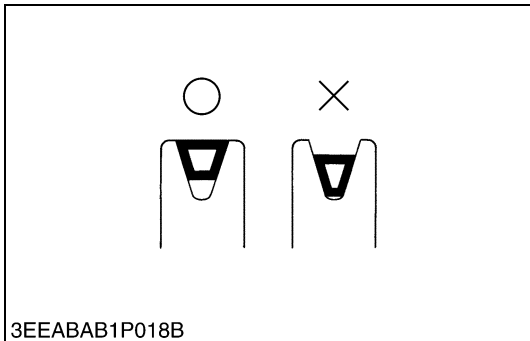
1. Measure the deflection **(A)**, depressing the belt halfway between the fan drive pulley and alternator pulley at specified force (98 N, 10 kgf, 22 lbf).
2. If the measurement is not within the factory specifications, loosen the alternator mounting screws and relocate the alternator to adjust.

Deflection <b>(A)</b>	Factory spec.	7.0 to 9.0 mm 0.28 to 0.35 in.
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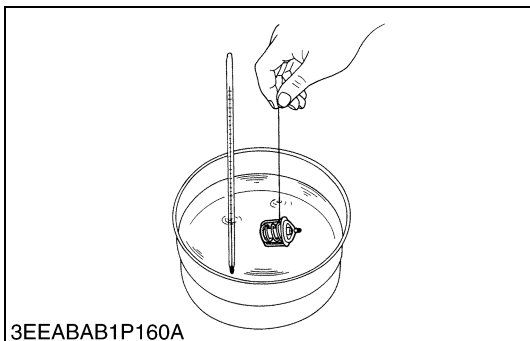
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**Fan Belt Damage and Wear**

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.

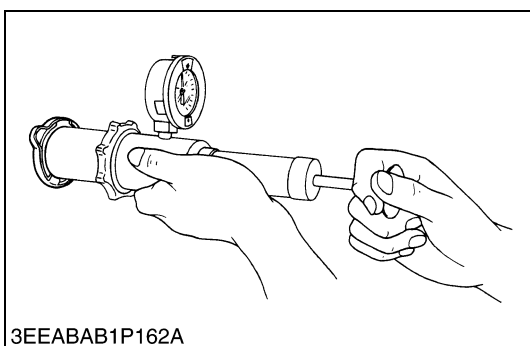
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**Thermostat Valve Opening Temperature**

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

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

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**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.**

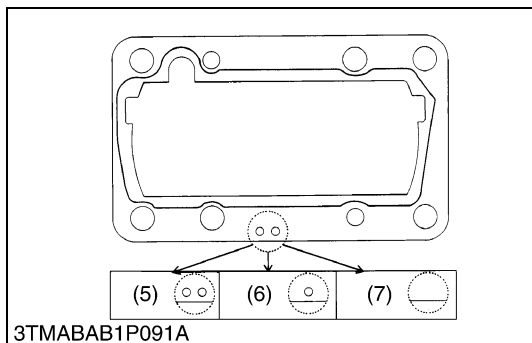
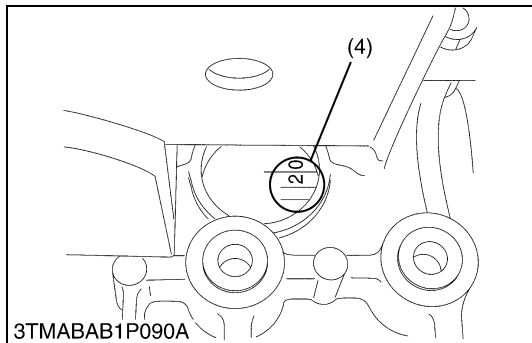
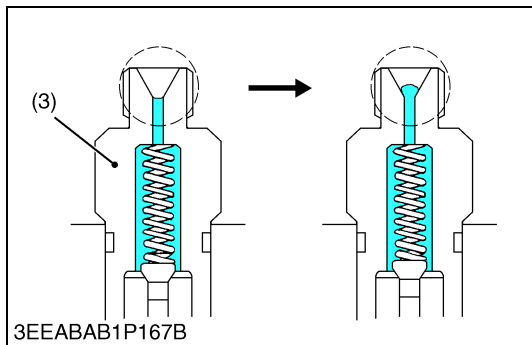
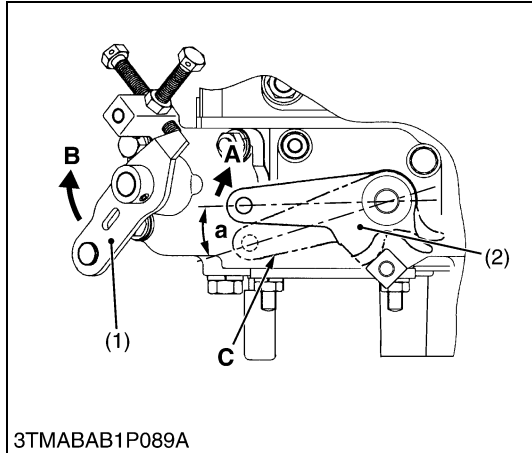
1. Set a radiator tester (Code No.: 07909-31551) on the radiator cap.
2. Apply the specified pressure (88 kPa, 0.9 kgf/cm<sup>2</sup>, 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm<sup>2</sup>, 9 psi).
3. If the measurement is less than the factory specification, replace 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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## [4] FUEL SYSTEM

### (1) Injection Pump



#### Injection Timing

1. Remove the injection pipes.
2. Set the speed control lever to maximum fuel discharge position.

#### (Reference)

- Remove the starter motor and turn the flywheel with screwdriver.

#### NOTE

- The pumps have a displacement angle. In adjusting the injection timing, pull the stop lever from its free position by  $0.267 \pm 0.035$  rad ( $15.3 \pm 2^\circ$ ) toward the stop position.
3. Turn the flywheel counterclockwise (facing the flywheel) until the fuel fills up to the hole of the delivery valve holder for 1st cylinder.
  4. Turn the flywheel further and stop turning when the fuel begins to flow over, to get the present injection timing.
  5. (The flywheel has mark 1TC and four lines indicating every  $0.087$  rad ( $5^\circ$ ) of crank angle from  $0.175$  rad ( $10^\circ$ ) to  $0.436$  rad ( $25^\circ$ ) 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)

$0.149$  to  $0.174$  rad ( $8.5^\circ$  to  $10.0^\circ$ ) B.T.D.C.

#### NOTE

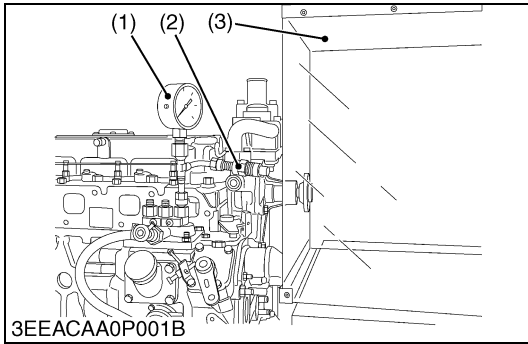
- The sealant is applied to both sides of the soft metal gasket shim. The liquid gasket is not required for assembling.
- Shims are available in thickness of  $0.20$  mm,  $0.25$  mm and  $0.30$  mm. Combine these shims for adjustments.
- Addition or reduction of shim ( $0.05$  mm,  $0.0020$  in.) delays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

- (1) Speed Control Lever
- (2) Stop Lever
- (3) Delivery Valve Holder
- (4) Timing Mark
- (5) 2-Holes:  $0.20$  mm (Shim)
- (6) 1-hole:  $0.25$  mm (Shim)
- (7) Without hole:  $0.30$  mm (Shim)

- A : To STOP Position  
 B : To Max. Speed Position  
 C : Stop Lever in Free Position

a :  $0.267 \pm 0.035$  rad ( $15.3 \pm 2^\circ$ )

9Y1210365ENS0011US0



**Fuel Tightness of Pump Element**

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

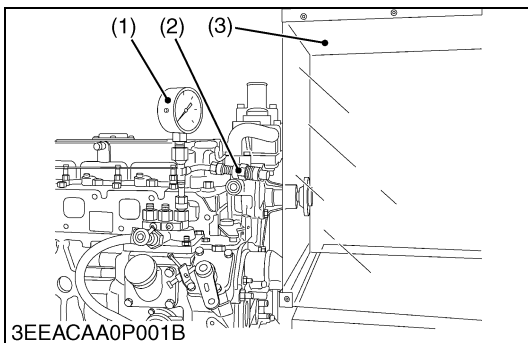
Fuel tightness of pump element	Allowable limit	13.7 MPa 140 kgf/cm <sup>2</sup> 1991 psi
--------------------------------	-----------------	---

■ **NOTE**

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

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

9Y1210365ENS0081US0



**Fuel Tightness of Delivery Valve**

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Set a pressure tester to the fuel injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1).
5. Run the starter to increase the pressure.
6. Stop the starter when the fuel jets from the injection nozzle. After that, turn the flywheel by the hand and raise the pressure to approx. 13.7 MPa (140 kgf/cm<sup>2</sup>, 1991 psi).
7. Now turn the flywheel back about half a turn (to keep the plunger free). Maintain the flywheel at this position and clock the time taken for the pressure to drop from 13.7 to 12.8 MPa (from 140 to 130 kgf/cm<sup>2</sup>, from 1990 to 1850 psi).
8. Measure the time needed to decrease the pressure from 13.7 to 12.8 MPa (140 to 130 kgf/cm<sup>2</sup>, 1990 to 1850 psi).
9. If the measurement is less than allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

Fuel tightness of delivery valve	Factory spec.	10 seconds 13.7 → 12.8 MPa 140 → 130 kgf/cm <sup>2</sup> 1990 → 1850 psi
	Allowable limit	5 seconds 13.7 → 12.8 MPa 140 → 130 kgf/cm <sup>2</sup> 1990 → 1850 psi

■ **NOTE**

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

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

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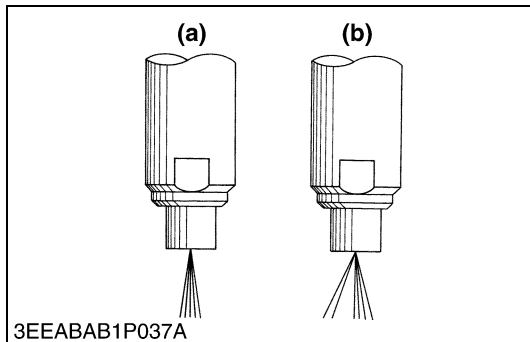
## (2) Injection Nozzle



### CAUTION

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

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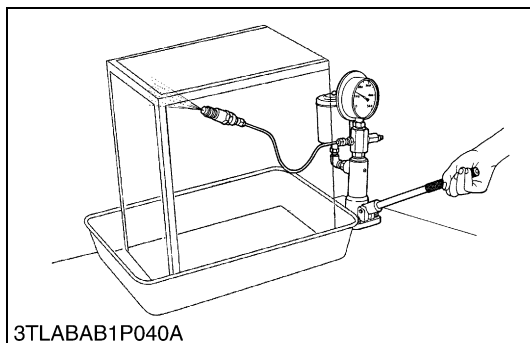
### Nozzle Spraying Condition

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

(a) Good

(b) Bad

9Y1210365ENS0013US0



3TLABAB1P040A

### Nozzle Injection Pressure

1. Set the injection nozzle to the 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, disassemble the injection nozzle, and change adjusting washer (1) until the proper injection pressure is obtained.

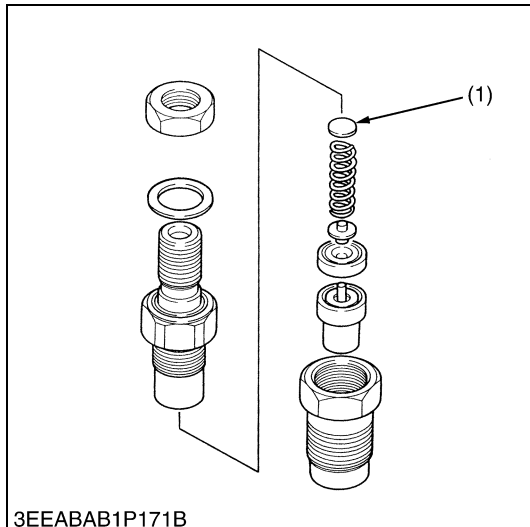
#### (Reference)

- Pressure variation with 0.025 mm (0.0010 in.) difference of adjusting washer thickness.  
Approx. 590 kPa (6.0 kgf/cm<sup>2</sup>, 85 psi)

Fuel injection pressure	Factory spec.	13.73 to 14.71 MPa 140 to 150 kgf/cm <sup>2</sup> 2000 to 2130 psi
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(1) Adjusting Washer

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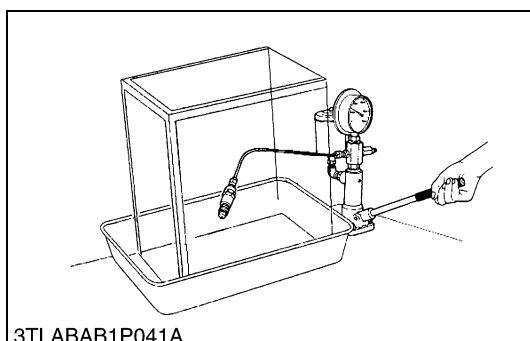
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### Valve Seat Tightness

1. Set the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 12.8 MPa (130 kgf/cm<sup>2</sup>, 1850 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

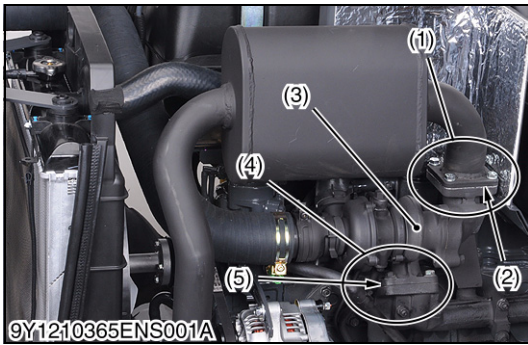
Valve seat tightness	Factory spec.	No fuel leak at 12.8 MPa 130 kgf/cm <sup>2</sup> 1850 psi
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## [5] TURBOCHARGER

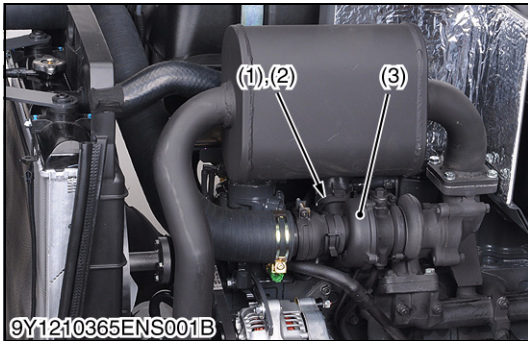


### Turbine Side

1. Check the exhaust port (1) and inlet port (4) side of the turbine housing (3) to see if there is no exhaust gas leak.
2. If any gas leak is found, retighten the bolts and nuts or replace the gasket (2) / (5) with new one.

- |                     |                |
|---------------------|----------------|
| (1) Exhaust Port    | (4) Inlet Port |
| (2) Gasket          | (5) Gasket     |
| (3) Turbine Housing |                |

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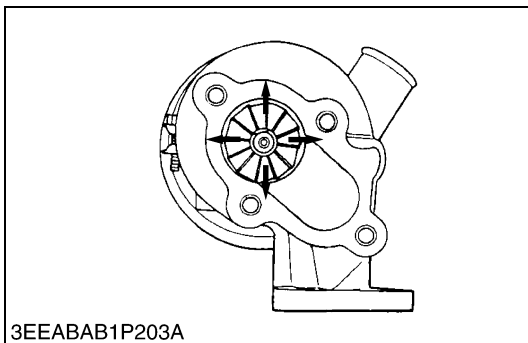


### Compressor Side

1. Check the inlet pipe 1 (1) of the compressor cover (3) to see if there is no air leak.
2. Check for loose connections or cracks in the suction side of the intake pipe.
3. If any air leak is found, change the clamp (2) and or inlet pipes.

- |                  |                      |
|------------------|----------------------|
| (1) Inlet Pipe 1 | (3) Compressor Cover |
| (2) Clamp        |                      |

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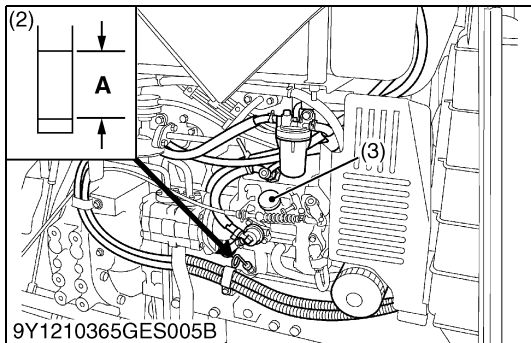
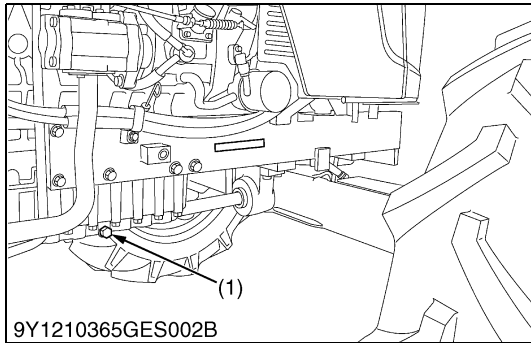
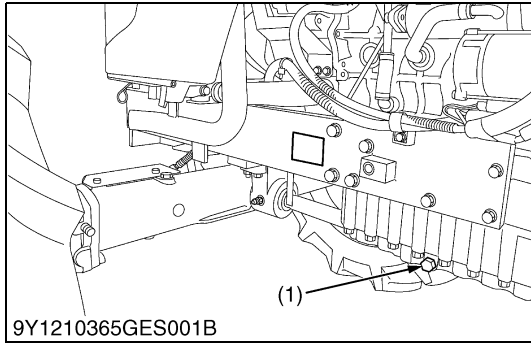
### Radial Clearance

1. If the wheel contact to the housing, replace the turbocharger assembly with new one.

9Y1210365ENS0085US0

## 5. PREPARATION

### [1] SEPARATING ENGINE FROM CLUTCH HOUSING CASE



#### 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. Screw in 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.**

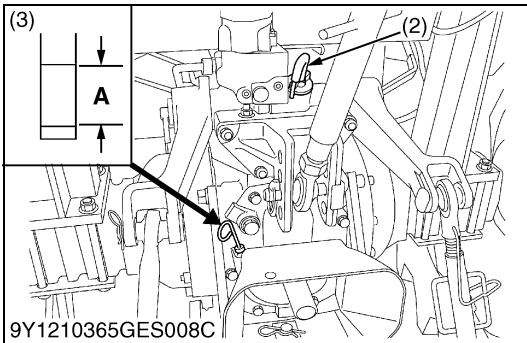
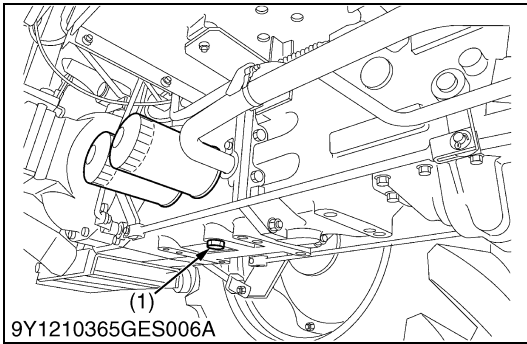
**Refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.**

Engine oil capacity	7.2 L 7.6 U.S.qts 6.3 Imp.qts
---------------------	-------------------------------------

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

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

9Y1210365ENS0016US0



**Draining the Transmission Fluid**

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

**(When refilling)**

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	40 L 42.3 U.S.qts 35.2 Imp.qts
-----------------------------	--------------------------------------

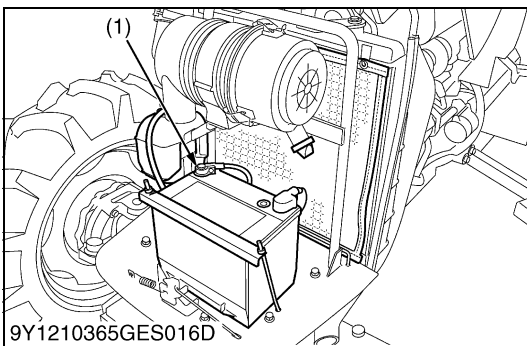
**■ IMPORTANT**

- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.**
- **Do not mix different brands of fluid together.**

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

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

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**Bonnet**

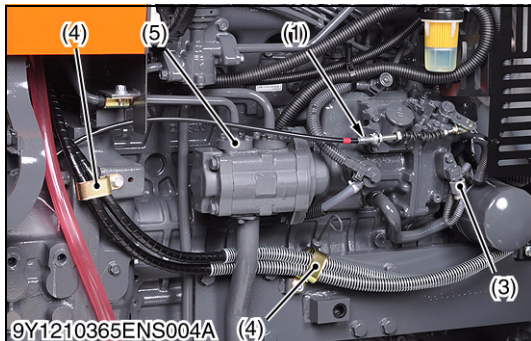
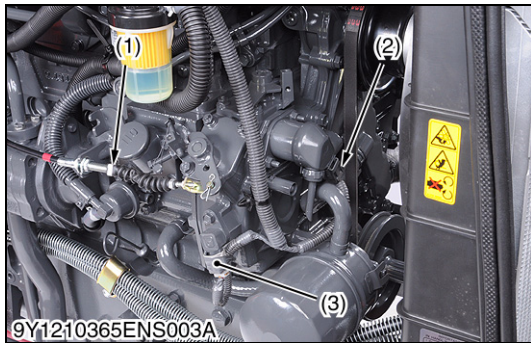
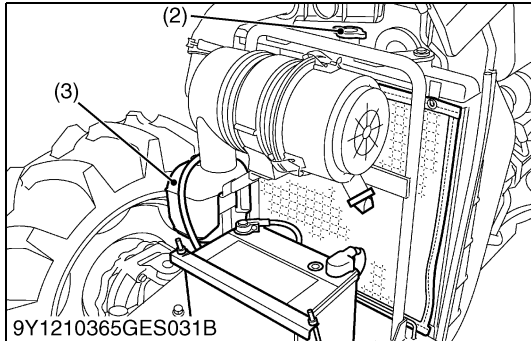
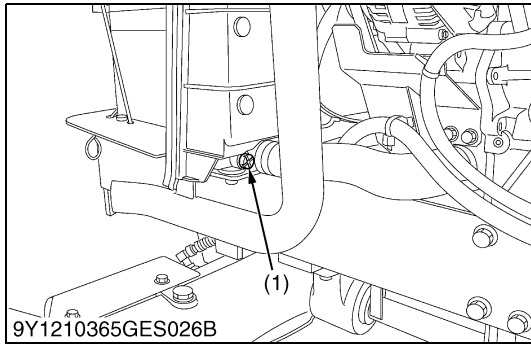
1. Disconnect the battery negative cable (1).
2. Disconnect the head light **4P** connector and remove the wire harness from the bonnet (2).
3. Remove the bonnet (2).

- (1) Battery Negative Cable
- (2) **4P** Connector
- (3) Damper

9Y1210365ENS0018US0







## Draining Coolant

### ⚠ CAUTION

- **Never remove the radiator cap (2) 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 (3).

Coolant capacity	8.0 L
	8.5 U.S.qts
	7.0 Imp.qts

- (1) Drain Plug  
(2) Radiator Cap

- (3) Recovery Tank

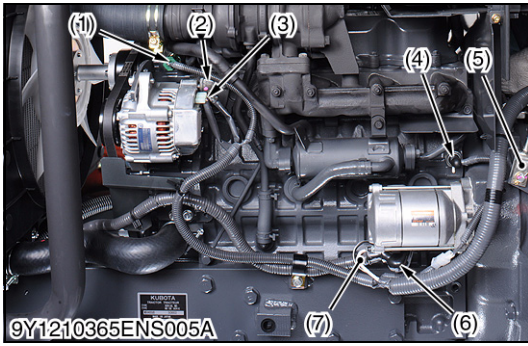
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## Wiring, Pipes and Hose

1. Remove the accelerator wire (1).
2. Disconnect the connector (2) for engine stop solenoid and connector (3) for engine speed.
3. Remove the clamps (4).
4. Remove the power steering delivery pipe (5).

- (1) Accelerator Wire  
(2) Connector (Engine Stop Solenoid)  
(3) Connector (Engine Speed Sensor)  
(4) Clamp  
(5) Power Steering Delivery Pipe

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**Wirings**

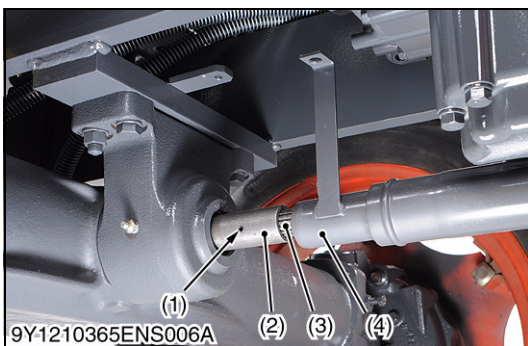
1. Disconnect the connector (1) from coolant temperature sensor.
2. Disconnect the **2P** connector (3) and wiring (2) for the alternator.
3. Disconnect the **B** terminal (6) and **1P** connector (7) for the starter motor.
4. Remove the clutch rod (5).
5. Disconnect the **1P** connector for the engine oil pressure switch.

**(When reassembling)**

Tightening torque	Starter <b>B</b> terminal mounting nut	7.8 to 9.8 N·m 0.8 to 1.0 kgf·m 5.8 to 7.2 lbf·ft
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- |  |  |
|--|--|
| (1) Connector (Coolant Temperature Sensor) | (4) <b>1P</b> Connector (Engine Oil Pressure Switch) |
| (2) Wiring (Alternator)                    | (5) Clutch Rod                                       |
| (3) <b>2P</b> Connector (Alternator)       | (6) <b>B</b> Terminal (Starter Motor)                |
|  | (7) <b>1P</b> Connector (Starter Motor)              |

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**Propeller Shaft**

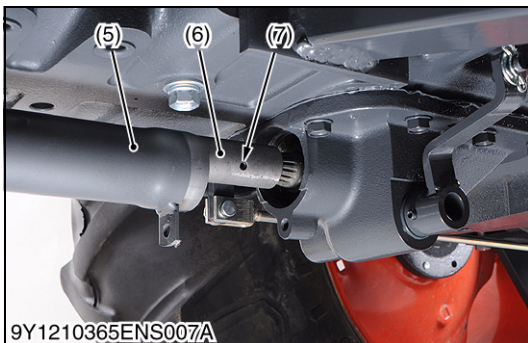
1. Slide the propeller shaft cover (4) and (5) after removing the screws.
2. Tap out the spring pin (1), (7) and then slide the coupling (2), (6) to the front and rear.

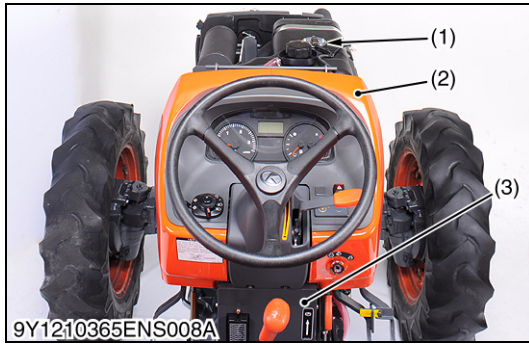
**(When reassembling)**

- Apply grease to the splines of the propeller shaft (3).

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

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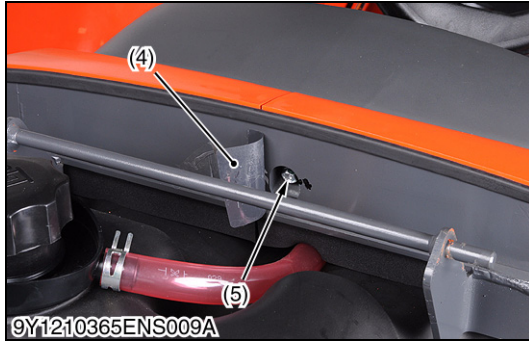


**Rear Bonnet**

1. Remove the lower cover (3).
2. Detach the sticker (4) then remove the screw (5).
3. Remove the rear bonnet (2).
4. Disconnect the connector (1) for the fuel sensor.

- |                             |             |
|-----------------------------|-------------|
| (1) Connector (Fuel Sensor) | (4) Sticker |
| (2) Rear Bonnet             | (5) Screw   |
| (3) Under Cover             |             |

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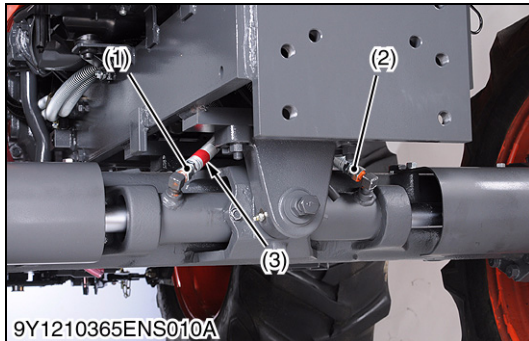


**Piping for Power Steering**

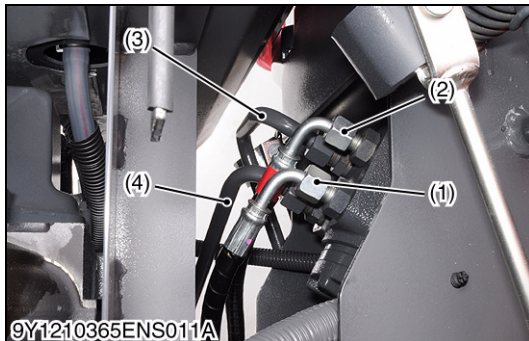
1. Remove the delivery hose (1) and (2) from the steering cylinder.
2. Disconnect the main delivery pipe (4).

**(When reassembling)**

- Assemble the delivery hose with a Id. tape (3) to R.H. side.

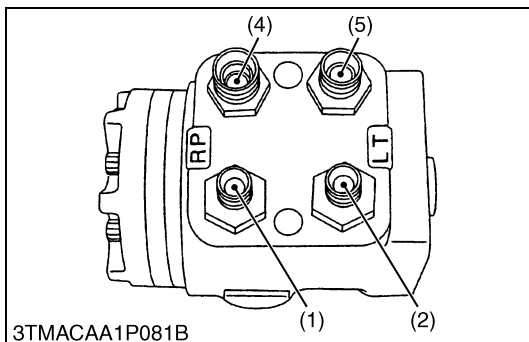


Tightening torque	Main delivery pipe and return pipe retaining nut	47.1 to 51.0 N·m 4.8 to 5.2 kgf·m 34.7 to 37.6 lbf·ft
	Delivery hose retaining nut	23 to 29 N·m 2.3 to 2.8 kgf·m 17 to 19 lbf·ft

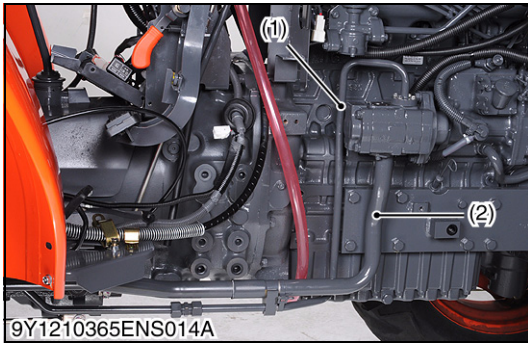


- |                          |                        |
|--------------------------|------------------------|
| (1) Delivery Hose (R.H.) | (4) Main Delivery Pipe |
| (2) Delivery Hose (L.H.) | (5) Return Pipe        |
| (3) Id. Tape             |                        |

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**Suction Pipe and 3P Delivery Pipe**

1. Remove the suction pipe (2).
2. Remove the 3P delivery pipe (1).

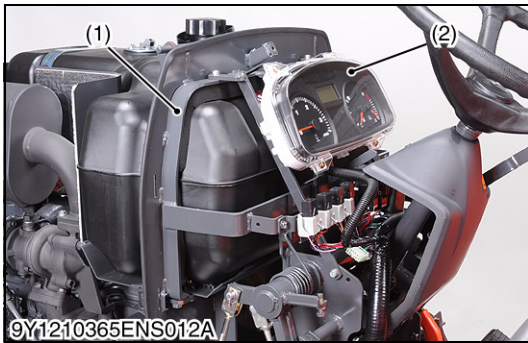
**(When reassembling)**

Tightening torque	3P delivery pipe joint screw nut	49.0 to 58.8 N·m 5.0 to 6.0 kgf·m 36.2 to 43.4 lbf·ft

(1) 3P Delivery Pipe

(2) Suction Pipe

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**Separating Engine and Clutch Housing**

1. Place the disassembling stand under the engine and clutch housing case and install the front axle rocking resister (refer to the "8. SPECIAL TOOLS" at "G. GENERAL" section.).
2. Remove the fuel tank support frame (1) with meter panel (2).
3. Remove the engine and clutch housing mounting screws and nuts.
4. Separate the engine and clutch housing.

**(When reassembling)**

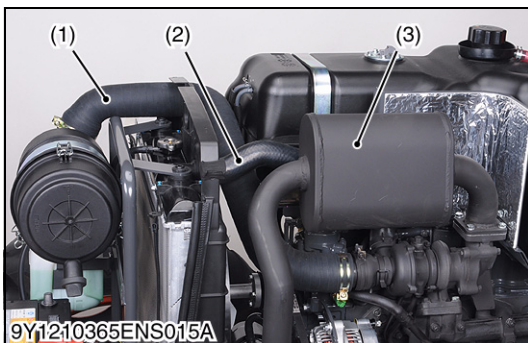
- Apply grease to the spline of clutch shaft.
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the flywheel housing and clutch housing.

Tightening torque	Engine and clutch housing mounting screw and nut M12, 7T	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft
	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 lbf·ft

(1) Fuel Tank Support Frame

(2) Meter Panel

9Y1210365ENS0025US0



**Muffler and Hoses**

1. Remove the muffler (3) and recovery tank.
2. Disconnect the radiator hose (2).
3. Disconnect the air cleaner hose (1).
4. Disconnect the radiator hose (4).

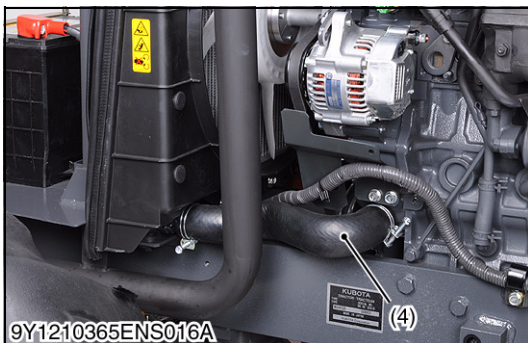
(1) Air Cleaner Hose

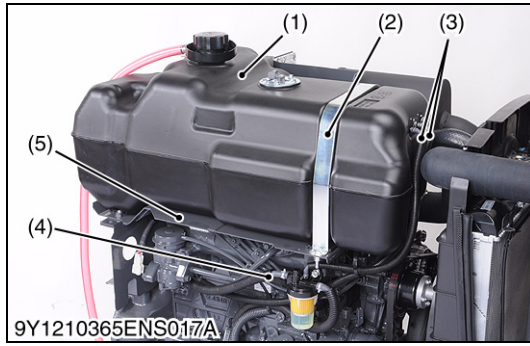
(3) Muffler

(2) Radiator Hose

(4) Radiator Hose

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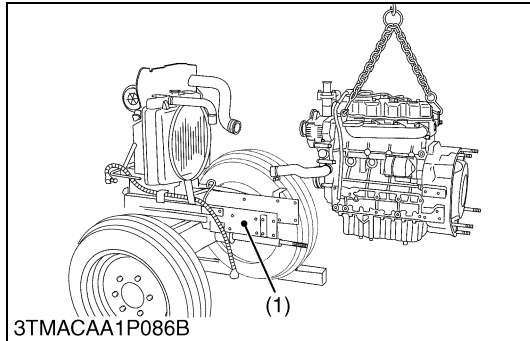


### Fuel Tank

1. Remove the fuel pipe (4) from fuel filter and then drain the fuel.
2. Disconnect the fuel return pipes (3).
3. Remove the fuel tank band (2).
4. Remove the fuel tank (1) and fuel tank support (5).

- |                      |                       |
|----------------------|-----------------------|
| (1) Fuel Tank        | (4) Fuel Pipe         |
| (2) Fuel Tank Band   | (5) Fuel Tank Support |
| (3) Fuel Return Pipe |                       |

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### Separating Engine from Front Axle Frame

1. Remove the original engine hooks.
2. Install the engine hooks. (Refer to the "8. SPECIAL TOOLS" at "G. GENERAL" section.)
3. Hoist the engine by the chain at the engine hook.
4. Remove the front axle frame mounting screw.
5. Separate the engine from the front axle frame (1).

#### (When reassembling)

- Lift the front of the axle frame by the gap in the bolt hole, and tighten the front axle mounting screws.

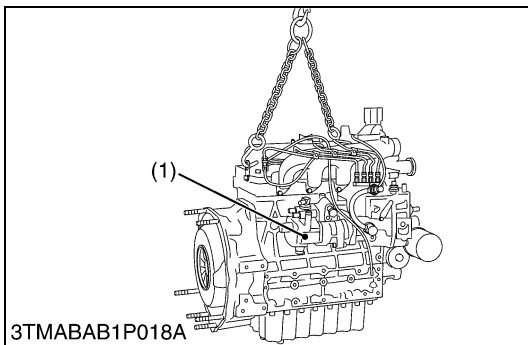
Tightening torque	Front axle frame mounting screw (M10)	60.8 to 70.5 N·m 6.2 to 7.2 kgf·m 44.9 to 52.1 lbf·ft
	Front axle frame mounting screw (M12)	44.9 to 52.1 lbf·ft 10.5 to 12.5 kgf·m 76.0 to 86.8 lbf·ft

- (1) Front Axle Frame

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## 6. DISASSEMBLING AND ASSEMBLING

### [1] EXTERNAL COMPONENT



#### Outer Parts of Engine

1. Remove the hydraulic pump (1).
2. Remove the alternator (2).
3. Remove the starter motor (3).
4. Remove the turbocharger.

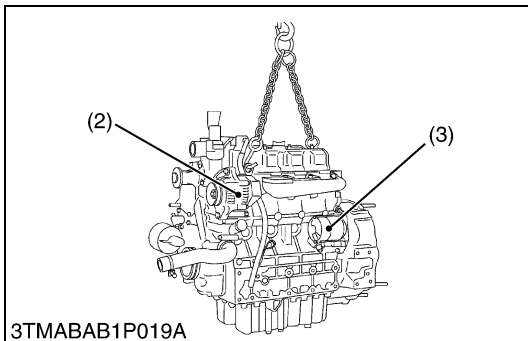
#### **(When reassembling)**

- Be sure to adjust the fan belt tension.

- (1) Hydraulic Pump  
(2) Alternator

- (3) Starter Motor

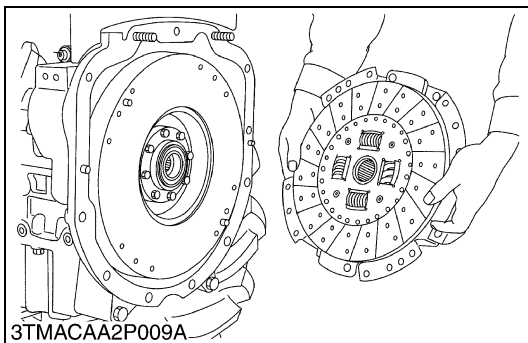
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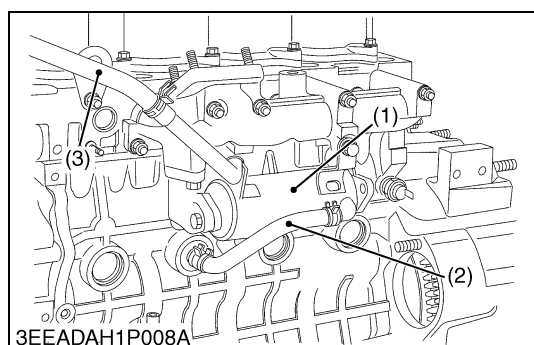
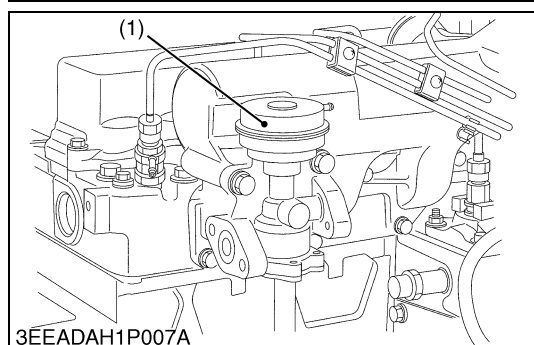
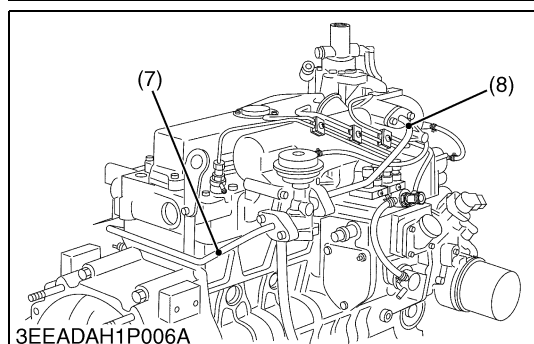
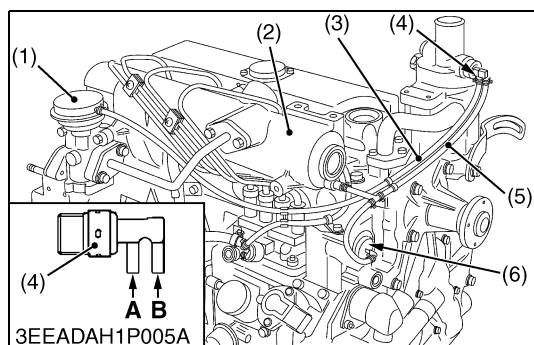
#### Clutch Assembly

1. Refer to the "[1] TRAVELING CLUTCH " at "2. CLUTCH" section.

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## [2] EGR VALVE AND EGR COOLER



### EGR Valve

1. Remove the air tube 1 (3) from the thermo valve (4) and EGR valve (1).
2. Remove the air tube 2 (5) from the thermo valve (4), inlet manifold (2) and boost compensator (6).
3. Remove the pipe (8) and pipe (7).
4. Remove the EGR valve (1).

### **(When reassembling)**

- Be sure to assemble the air tube 1 (3) and 2 (5) to original position as follow.
- When connecting the air tube 1 (3) to the EGR valve (1) and "A" side of thermo valve (4).
- When connecting the air tube 2 (5) to the inlet manifold, boost compensator (6) and "B" side of thermo valve (4).
- Replace the gasket with new one.

- |                       |          |
|-----------------------|----------|
| (1) EGR Valve         | (7) Pipe |
| (2) Inlet Manifold    | (8) Pipe |
| (3) Air Tube 1        |          |
| (4) Thermo Valve      |          |
| (5) Air Tube 2        |          |
| (6) Boost Compensator |          |

**A : Connect with Air Tube 1 (3)**  
**B : Connect with Air Tube 2 (5)**

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### EGR Cooler

#### **CAUTION**

- While the engine is running and or just after it stops, the EGR cooler is hot, be careful not to touch the EGR.

1. Remove the hose (2) and (3).
2. Remove the EGR cooler (1).

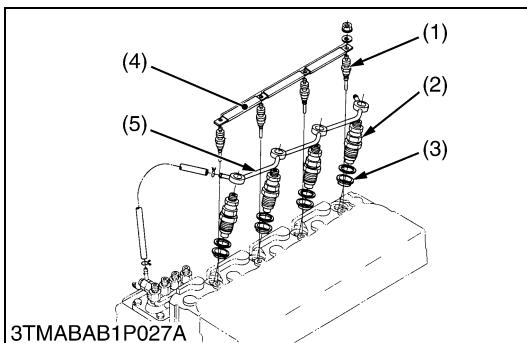
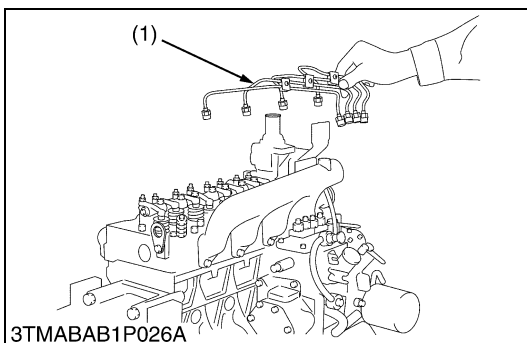
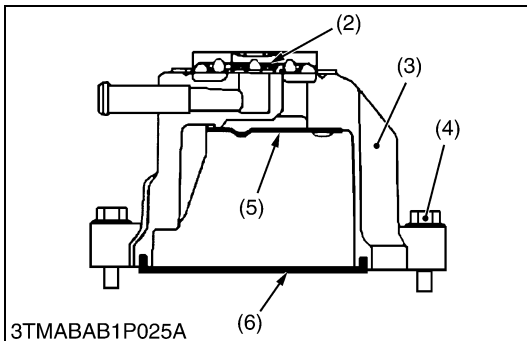
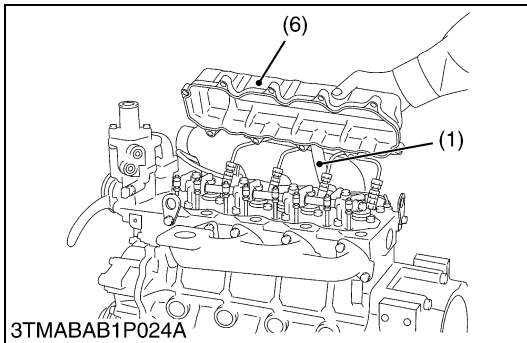
### **(When reassembling)**

- Replace the gaskets with new one.

- |                |          |
|----------------|----------|
| (1) EGR Cooler | (3) Hose |
| (2) Hose       |          |

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## [3] CYLINDER HEAD AND VALVES



### Cylinder Head Cover

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

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

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

Tightening torque	Cylinder head cover screw	9.81 to 11.2 N·m 1.0 to 1.15 kgf·m 7.23 to 8.31 lbf·ft
-------------------	---------------------------	--

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

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### Injection Pipes

1. Loosen the screws on the pipe clamps.
2. Detach the injection pipes (1).

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

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

Tightening torque	Injection pipe retaining nut	25 to 34 N·m 2.5 to 3.5 kgf·m 18 to 25 lbf·ft
-------------------	------------------------------	---

- |                    |
|--------------------|
| (1) Injection Pipe |
|--------------------|

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### 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)**

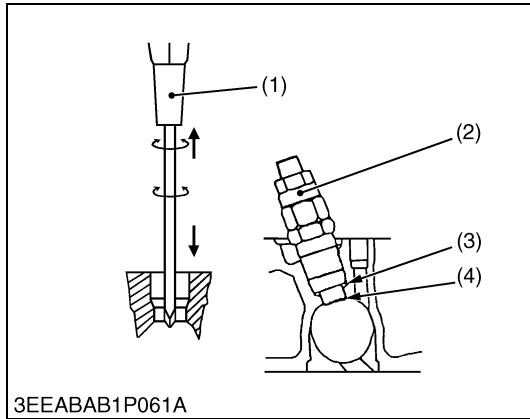
- Replace the copper gasket and heat seal with new one.

Tightening torque	Nozzle holder assembly	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft
	Overflow pipe assembly retaining nut	19.6 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.1 lbf·ft
	Glow plug	20 to 24 N·m 2.0 to 2.5 kgf·m 15 to 18 lbf·ft

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

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### Nozzle Head Seal Service Removal Procedure

#### ■ IMPORTANT

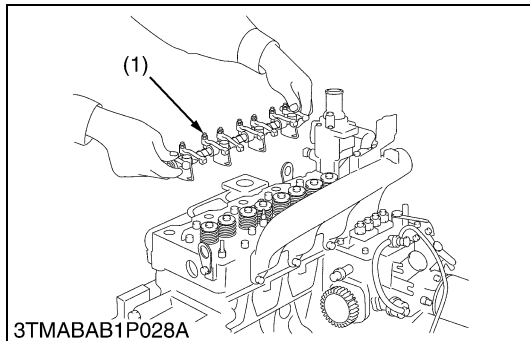
- Use a plus (Phillips head) screw driver (1) that has a Dia. which is bigger than the heat seal hole (Approx. 6 mm) 1/4 in.
1. Drove screw driver (1) lightly into the heat seal hole.
  2. Turn screw driver three or four times each way.
  3. While turning the screw driver, slowly pull the heat seal (4) 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 (3) Copper Gasket  
 (2) Nozzle Holder (4) Heat Seal

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### 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.

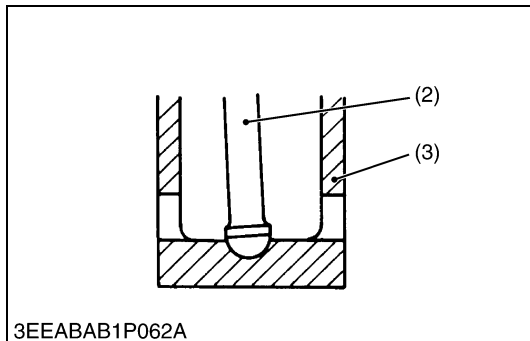
#### ■ IMPORTANT

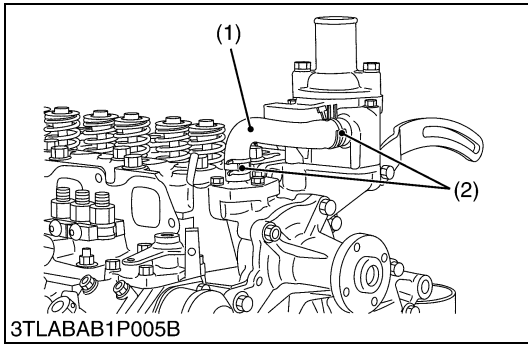
- After installing the rocker arm, be sure to adjust the valve clearance.

Tightening torque	Rocker arm bracket nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
-------------------	------------------------	---

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

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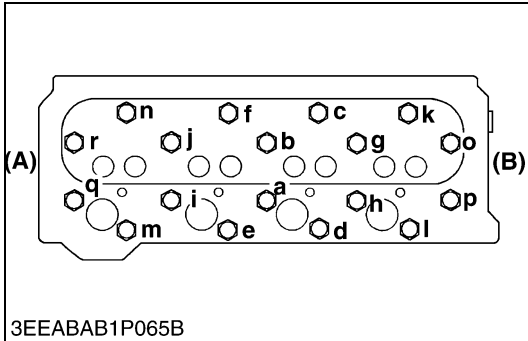


**Cylinder Head**

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

**(When reassembling)**

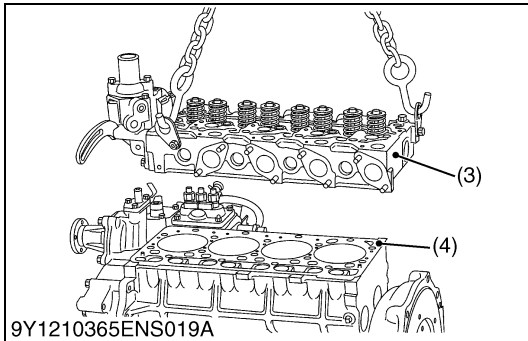
- Replace the cylinder head gasket (4) with a new one.
- Tighten the cylinder head screws after applying sufficient oil.
- Tighten the cylinder head screws in diagonal sequence starting from the center in the order of (a) to (n or r).
- Tighten them uniformly, or the head may deform in the long run.



Tightening torque	Cylinder head screw	93.2 to 98.0 N·m 9.50 to 10.0 kgf·m 68.8 to 72.3 lbf·ft
-------------------	---------------------	---

**■ IMPORTANT**

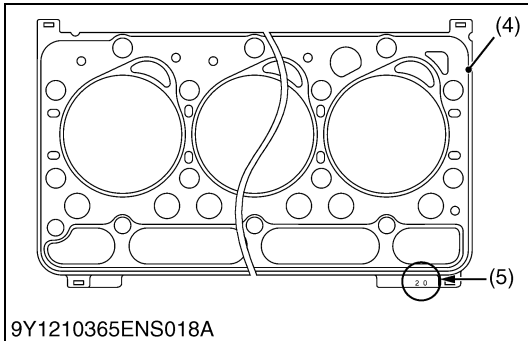
- To replace the cylinder head gasket (4), in advance make sure the marking (5) of cylinder head gasket in the original engine, and replace the same marking as the original cylinder head gasket.



Gasket Marking & Code Number	V2403-M-T
15	1G790-03600
20	1G790-03310
25	1G790-03610
30	1G790-03620
35	1G790-03630

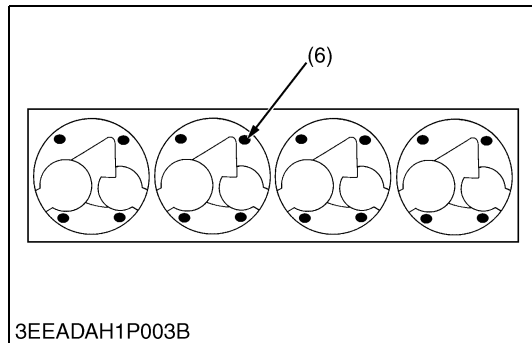
- (1) Return Pipe
- (2) Pipe Clamp
- (3) Cylinder Head
- (4) Cylinder Head Gasket
- (5) Marking

- (n or r) to (a) : To Loosen  
 (a) to (n or r) : To Tighten  
 (A) Flywheel Side  
 (B) Gear Case Side



**(To be continued)**

(Continued)



#### ■ IMPORTANT

- When replacing piston, piston pin, small end bushing, connecting rod, or crankpin bearings, measure piston head's protrusion or recessing from the level of crankcase cylinder face (average of all pistons) after installing the pistons, and select the cylinder head gasket following the below table

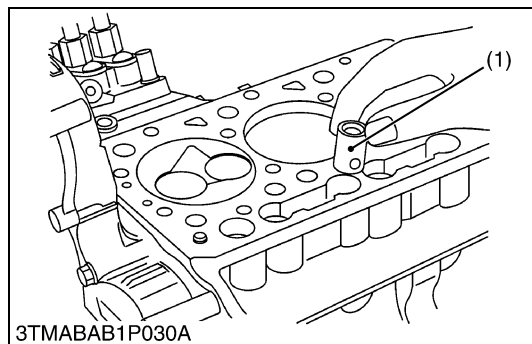
#### Selecting the cylinder head gasket

1. Measure the piston head's protrusion or recessing from the crankcase cylinder face 4 spots per each piston (average of all pistons) using the dial gauge.
2. Select the suitable cylinder head gasket refer to the table below.

Gasket Size (Number)	Piston Protrusion
	V2403-M-T
15	0.500 to 0.540 mm 0.0197 to 0.0212 in.
20	0.550 to 0.590 mm 0.0217 to 0.0232 in.
25	0.600 to 0.640 mm 0.0237 to 0.0251 in.
30	0.650 to 0.690 mm 0.0256 to 0.0271 in.
35	0.700 to 0.740 mm 0.0276 to 0.0291 in.

(6) Measuring Points

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#### Tappets

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

#### (When reassembling)

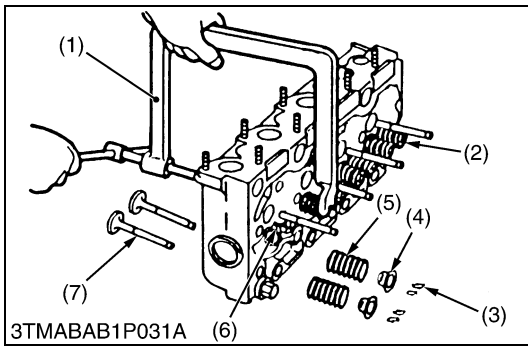
- Visually check the contact between tappets and cams for proper rotation. If defect is found, replace tappets.
- Before installing the tappets, apply engine oil thinly around them.

#### ■ IMPORTANT

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

(1) Tappet

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### Valves

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

#### (When reassembling)

- Wash the valve stem 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.

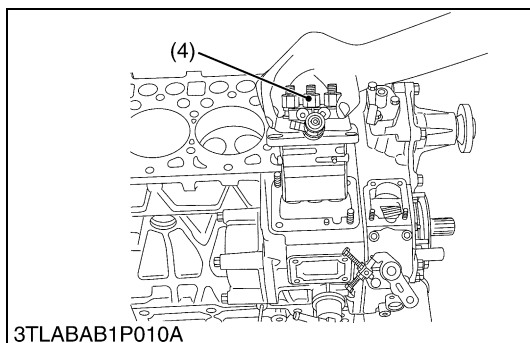
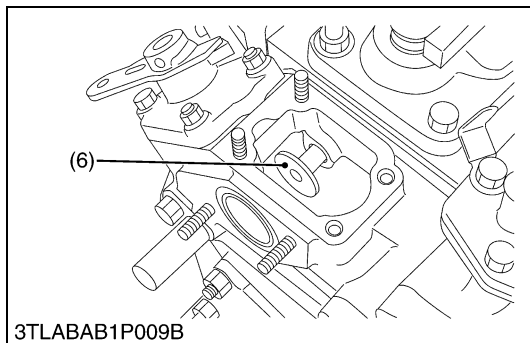
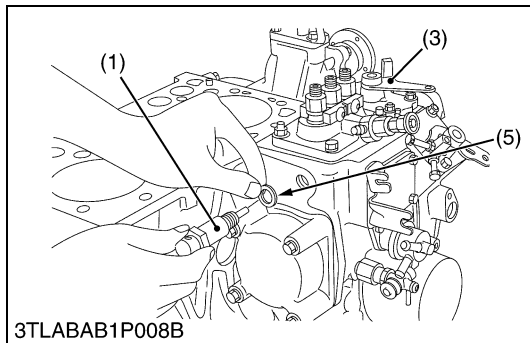
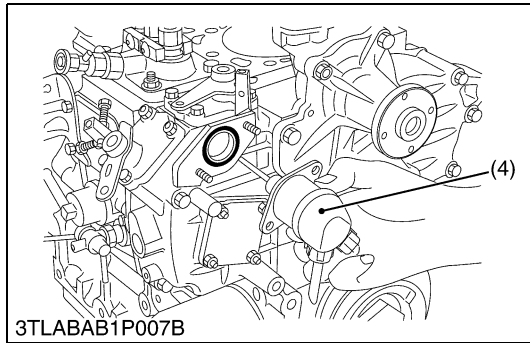
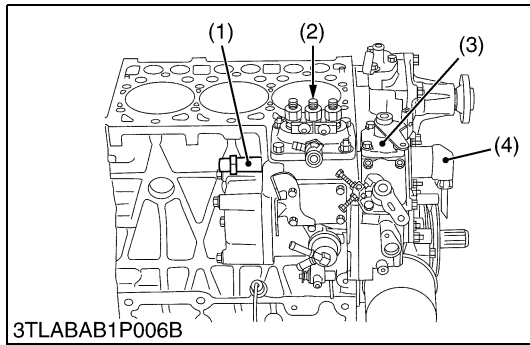
#### ■ IMPORTANT

- **Don't change the combination of valve and valve guide.**

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

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## [4] TIMING GEARS, CAMSHAFT AND FUEL CAMSHAFT



### Injection Pump

1. Remove the stop solenoid (4) and the hi-idling body (1).
2. Remove the engine stop lever (3) and the stop solenoid guide (6).
3. Remove the fuel injection pump assembly (2).

### ■ IMPORTANT

- Before removing the injection pump assembly (2), be sure to remove the stop solenoid (4), hi-idling body (1), engine stop lever (3) and stop solenoid guide (6).

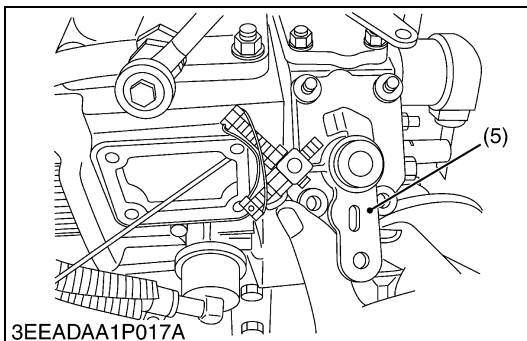
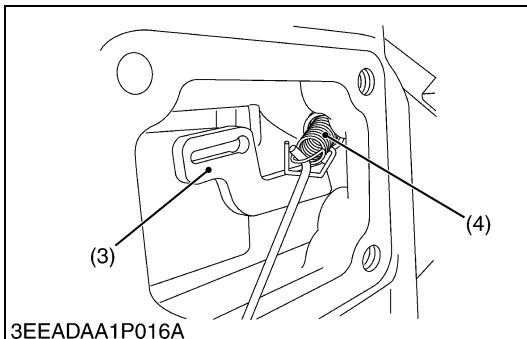
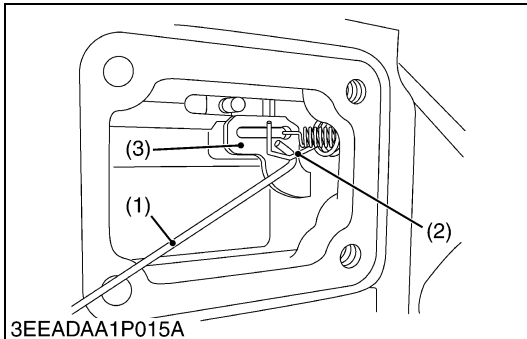
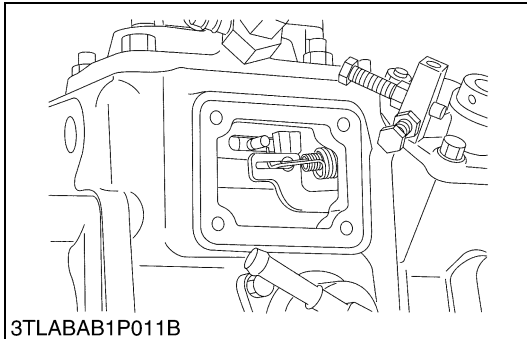
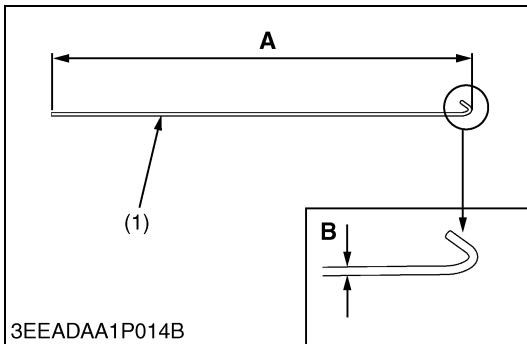
### (When reassembling)

- Before attaching the stop solenoid (4), the hi-idling body (1) and the stop solenoid guide (6), install the injection pump first into position.
- Replace the hi-idling body gasket (5) with a new one.
- Before fitting the stop lever (3) to the gear case, install the stop solenoid guide (6) 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 stop solenoid guide (6) and the engine stop lever (3) in their respective positions.
- When installing the stop solenoid (4), 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 (6).

Tightening torque	Hi-idling body	45 to 49 N·m 4.5 to 5.0 kgf·m 33 to 36 lbf·ft

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

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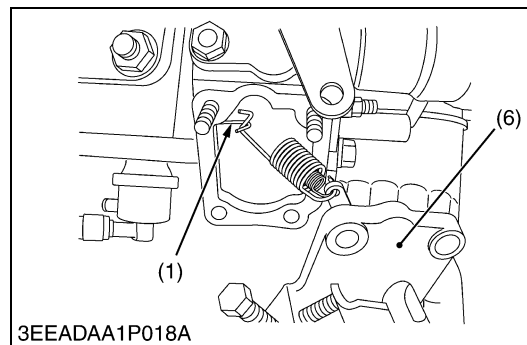


### Governor Springs and Speed Control Plate

#### 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 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, undo the small governor spring (4) from the fork lever (3).
5. Set the speed control lever (5) as the figure.
6. Take out the speed control plate (6) with care not to let the large and small governor springs come off this plate and fall in to the gear case (2), (4).

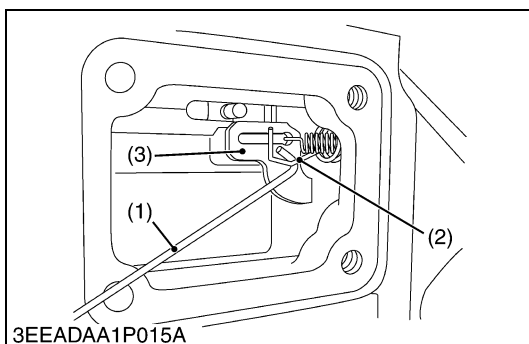
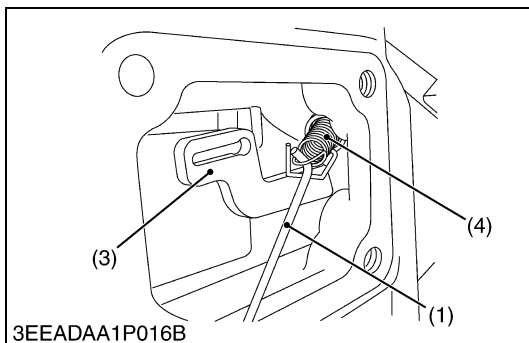
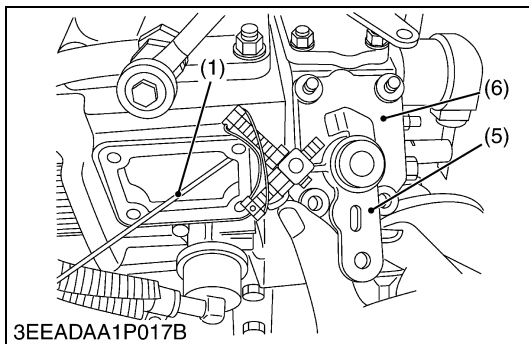
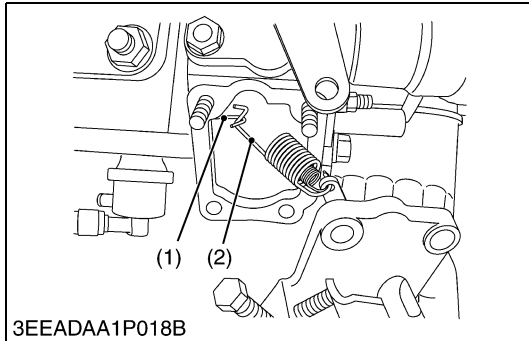
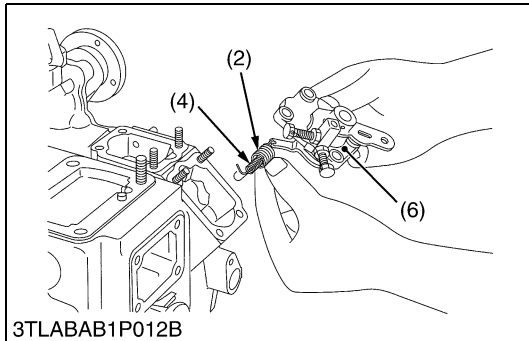


- (1) Specific Tool
- (2) Large Governor Spring
- (3) Fork Lever
- (4) Small Governor Spring
- (5) Speed Control Lever
- (6) Speed Control Plate

**A : 200 mm (7.87 in.) length**  
**B : 1.2 mm (0.047 in.) diameter**

**(To be continued)**

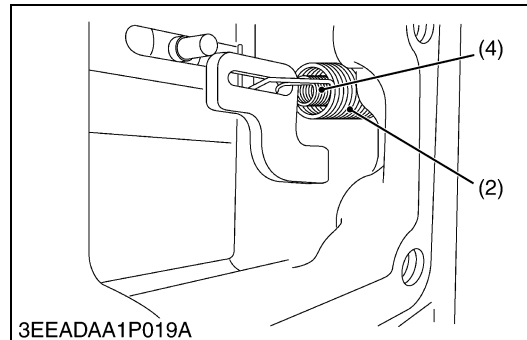
(Continued)

**(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 onto the fork lever (3).

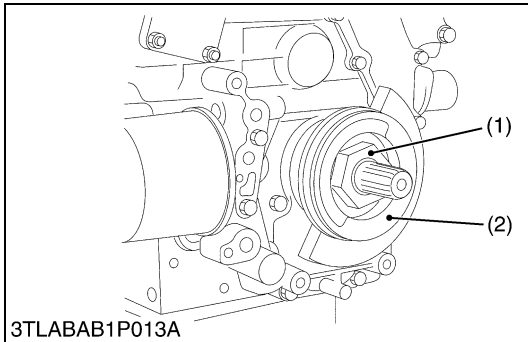
**NOTE**

- **Be careful not to stretch the small governor spring 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         | (4) Small Governor Spring |
| (2) Large Governor Spring | (5) Speed Control Lever   |
| (3) Fork Lever            | (6) Speed Control Plate   |

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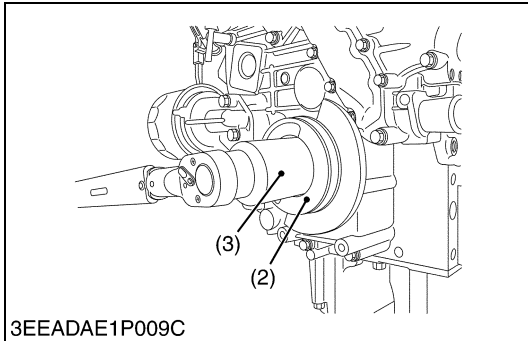
**Fan Drive Pulley**

1. Lock the flywheel not to turn using the flywheel stopper.
2. Remove the fan drive pulley mounting nut (1) using 46 mm deep socket wrench (3).
3. Remove the fan drive pulley (2) with gear puller (4).
4. Remove the feather key.

**(When reassembling)**

- Apply grease to the splines of coupling.

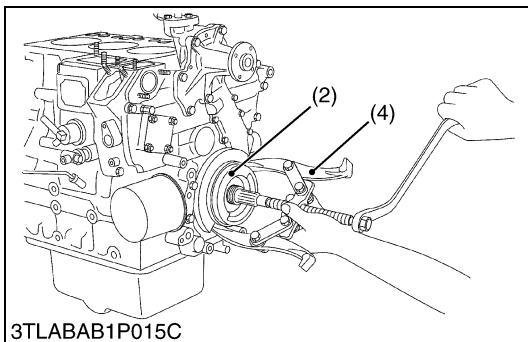
Tightening torque	Fan drive pulley mounting nut	138 to 156 N·m 14.0 to 16.0 kgf·m 102 to 115 lbf·ft
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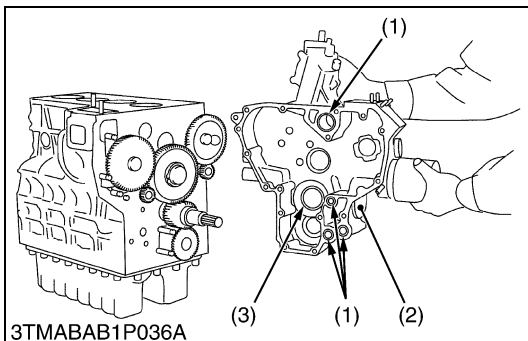
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- |                      |                              |
|----------------------|------------------------------|
| (1) Nut              | (3) 46 mm Deep Socket Wrench |
| (2) Fan Drive Pulley | (4) Gear Puller              |

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3TLABAB1P015C



3TMABAB1P036A

**Gear Case**

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

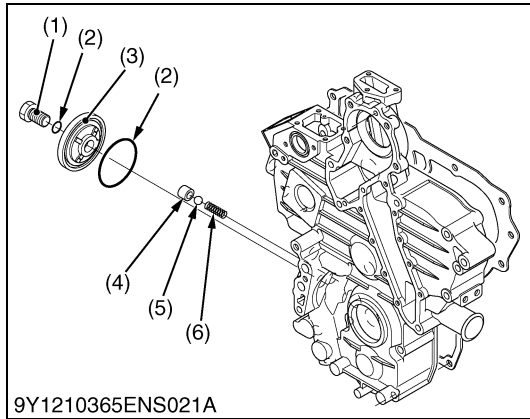
**(When reassembling)**

- Apply liquid gasket (Three Bond 1215 or equivalent) to both side 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    | (3) Oil Seal |
| (2) Gear Case |              |

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### Relief Valve

1. Remove the cover mounting screw (1) and cover (3).
2. Remove the poppet (4), ball (5) and spring (6).

#### NOTE

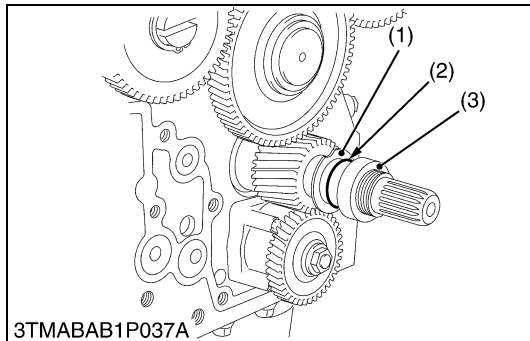
- This relief valve is not adjustable.
- (When reassembling)**

- Apply oil to the O-rings (2).

Tightening torque	Cover mounting screw	34.1 to 34.5 N·m 3.48 to 3.51 kgf·m 25.2 to 25.4 lbf·ft
-------------------	----------------------	---

- |                          |            |
|--------------------------|------------|
| (1) Cover Mounting Screw | (4) Poppet |
| (2) O-ring               | (5) Ball   |
| (3) Cover                | (6) Spring |

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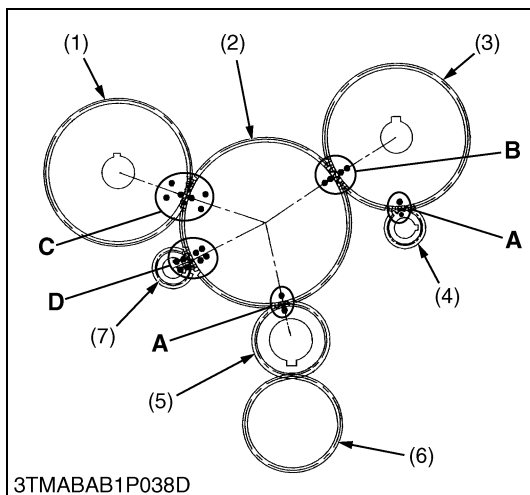


### Crankshaft Oil Slinger

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

- |                            |                       |
|----------------------------|-----------------------|
| (1) Crankshaft Oil Slinger | (3) Crankshaft Collar |
| (2) O-ring                 |                       |

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### Idle Gear

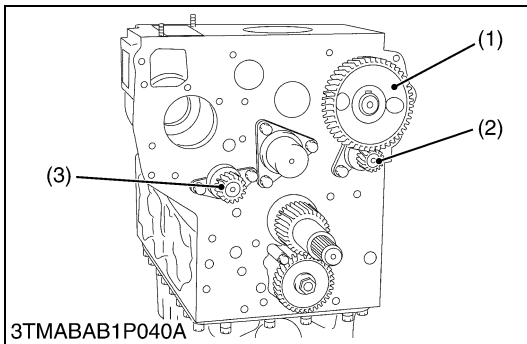
1. Remove the external snap ring.
2. Detach the idle gear collar.
3. Detach the idle gear.

#### (When reassembling)

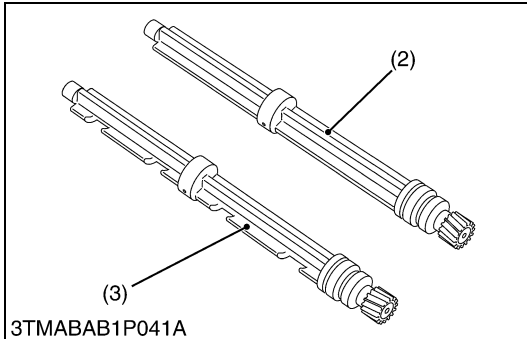
- Check to see each gear is aligned with its aligning mark:
  - 1 Mark : Idle gear and crank gear, cam gear and balancer gear
  - 2 Marks : Cam gear and idle gear
  - 3 Marks : Idle gear and injection pump gear
  - 4 Marks : Idle gear and balancer gear

- |                         |                    |
|-------------------------|--------------------|
| (1) Injection Pump Gear | <b>A : 1 Mark</b>  |
| (2) Idle Gear           | <b>B : 2 Marks</b> |
| (3) Cam Gear            | <b>C : 3 Marks</b> |
| (4) Balancer Gear       | <b>D : 4 Marks</b> |
| (5) Crank Gear          |                    |
| (6) Oil Pump Drive Gear |                    |
| (7) Balancer Gear       |                    |

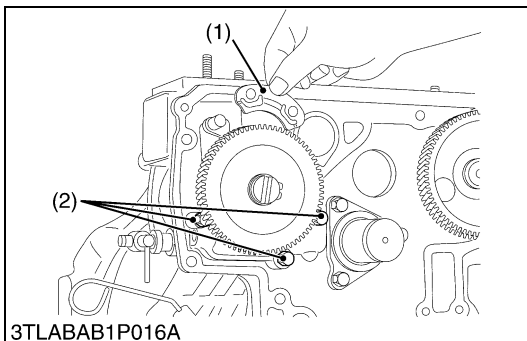
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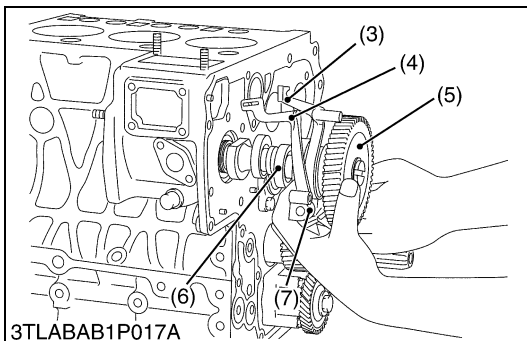
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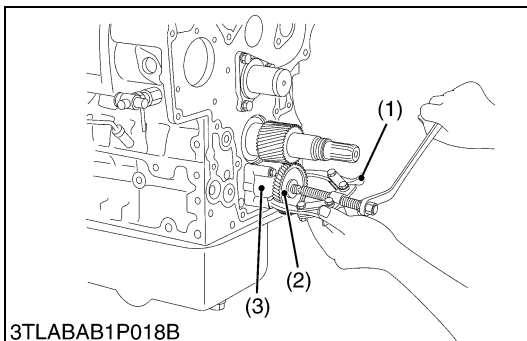
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### Camshaft and Balancer Shaft

1. Remove the camshaft set bolts and draw out the camshaft (1).
2. Remove the balancer shaft 1 (2) set bolts and draw out the balancer shaft 1 (2).
3. Remove the balancer shaft 2 (3) set bolts and draw out the balancer shaft 2 (3).

#### (When reassembling)

- When install the balancer shaft 1 and 2, be sure to place the 4th cylinders piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the idle gear last.

Tightening torque	Camshaft set bolt	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Balancer shaft set bolt	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

- (1) Camshaft (3) Balancer Shaft 2  
(2) Balancer Shaft 1

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### Fuel Camshaft and Fork Lever Assembly

1. Remove the fuel feed pump.
2. Detach the fuel camshaft stopper (1).
3. Remove the three fork lever holder mounting screws (2).
4. Draw out the fuel camshaft assembly (5), (6) and fork lever assembly (3), (4), (7) at the same time.

#### (When reassembling)

- After installation, check to see that the fork lever 1 (3) and fork lever 2 (4) are fixed to the fork lever shaft, and that they can turn smoothly in the holder (7).

- (1) Fuel Camshaft Stopper (5) Injection Pump Gear  
(2) Fork Lever Holder Mounting Screws (6) Fuel Camshaft  
(3) Fork Lever 1 (7) Fork Lever Holder  
(4) Fork Lever 2

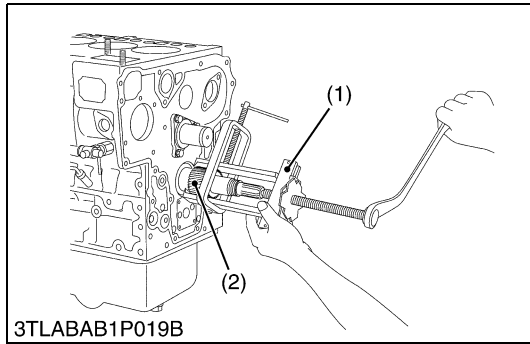
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### Oil Pump

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

- (1) Gear Puller (3) Oil Pump  
(2) Oil Pump Drive Gear

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### Crank Gear

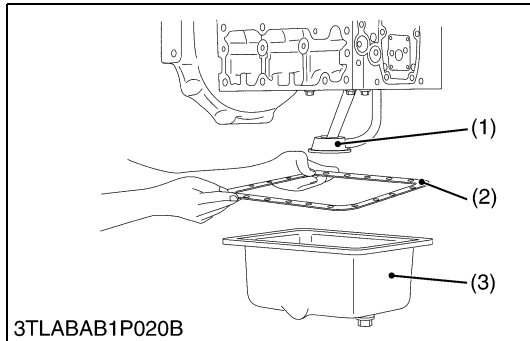
1. Draw out the crank gear (2) with a puller (1).
2. Remove the feather key.

(1) Crank Puller

(2) Crank Gear

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## [5] PISTON AND CONNECTING ROD



### Oil Pan and Oil Strainer

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

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

- After cleaning the oil strainer (1), 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 (1).
- 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 the oil pan mounting screws in diagonal order from the center.

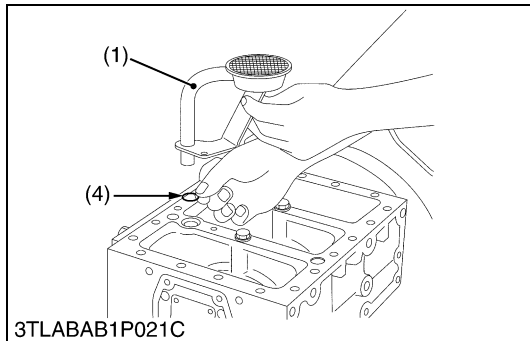
(1) Oil Strainer

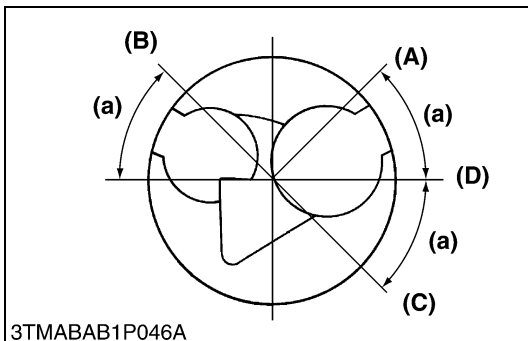
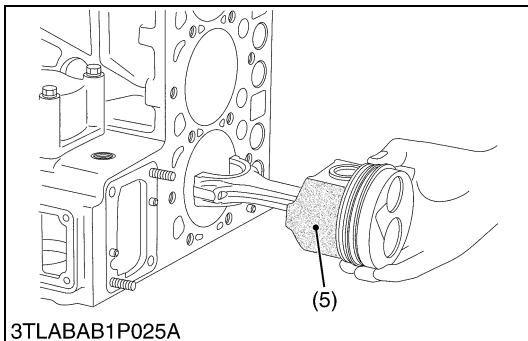
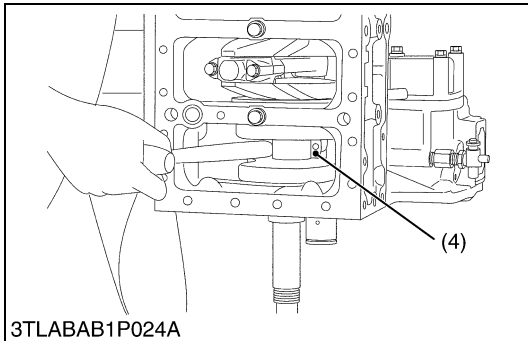
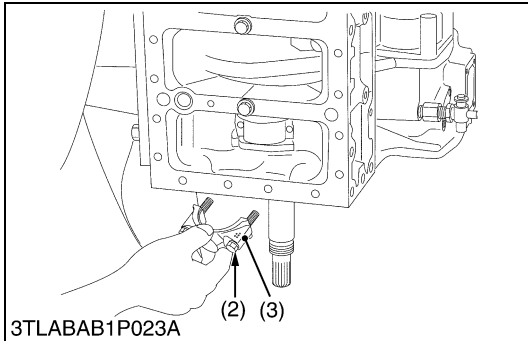
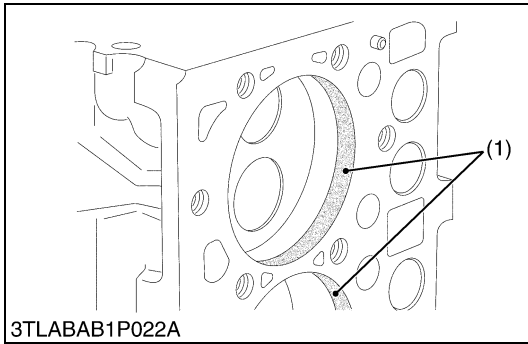
(3) Oil Pan

(2) Oil Pan Gasket

(4) O-ring

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**Pistons**

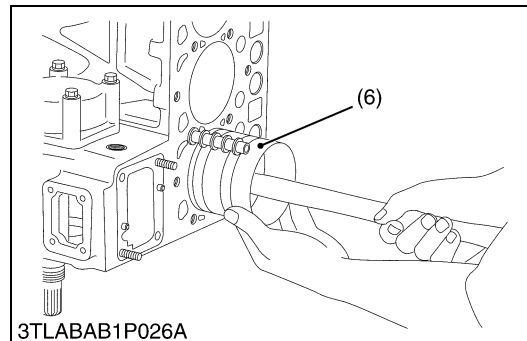
1. Completely clean carbon (1) in the cylinders.
2. Remove the connecting rod cap (3).
3. Turn the flywheel and bring the piston to top dead center.
4. Draw out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.
5. Draw out the other piston in the same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

**(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**

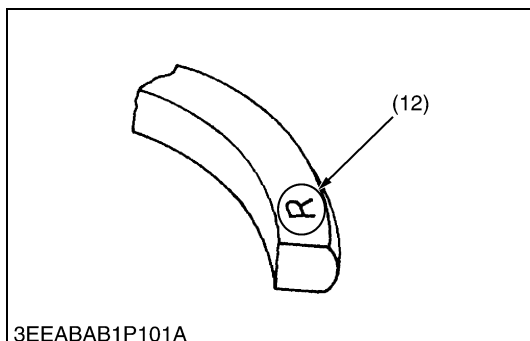
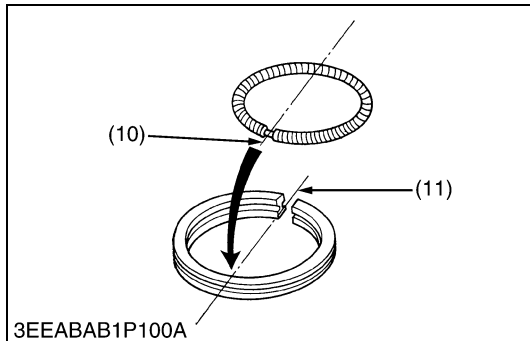
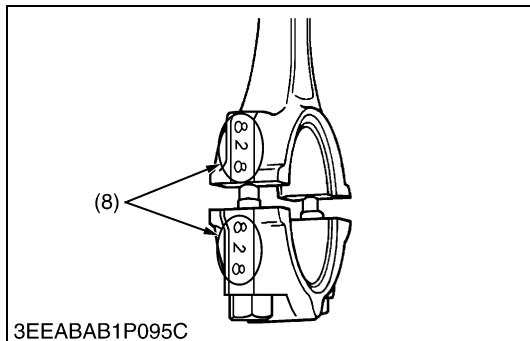
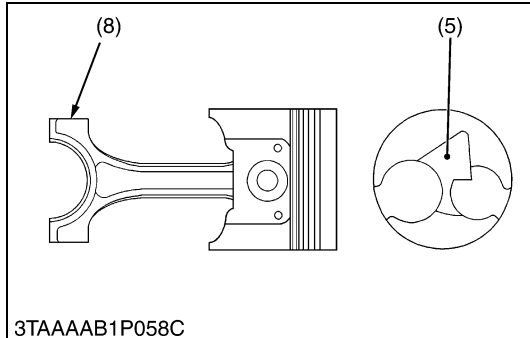
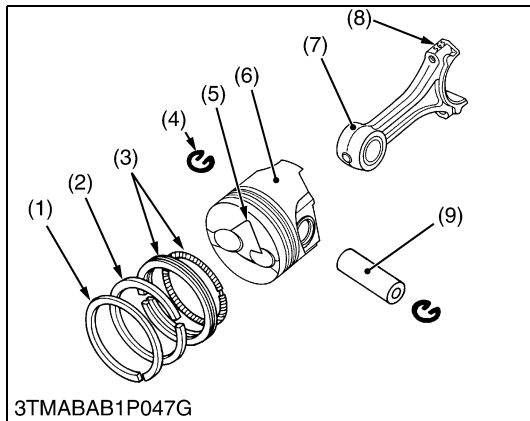
- **Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 piston.**
- **Place the piston rings with their gaps at 0.79 rad (45 °) from the piston pin's direction as shown in the figure.**
- **Carefully insert the pistons using a piston ring compressor (6).**
- **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	45 to 49 N·m 4.5 to 5.0 kgf·m 33 to 36 lbf·ft
-------------------	----------------------	---

- |  |                     |
|--|---------------------|
| (1) Carbon                                       | (A) Top Ring Gap    |
| (2) Connecting Rod Screw                         | (B) Second Ring Gap |
| (3) Connecting Rod Cap                           | (C) Oil Ring Gap    |
| (4) Connecting Rod                               | (D) Piston Pin Hole |
| (5) Molybdenum Disulfide Coating in Piston Skirt | (a) 0.79 rad (45 °) |
| (6) Piston Ring Compressor                       |                     |

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### Piston Ring and Connecting Rod

1. Remove the piston rings (1), (2), (3) using a piston ring tool.
2. Remove the piston pin (9), and separate the connecting rod (7) from the piston (6).

#### (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 (6).
- When installing the oil ring (3) onto the piston (6), place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin (9).
- When installing the connecting rod (7) to the piston (6), immerse the piston (6) in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin (9) to the piston (6).
- When installing the connecting rod (7) to the piston (6), align the mark (8) on the connecting rod (7) to the fan-shaped concave (5).

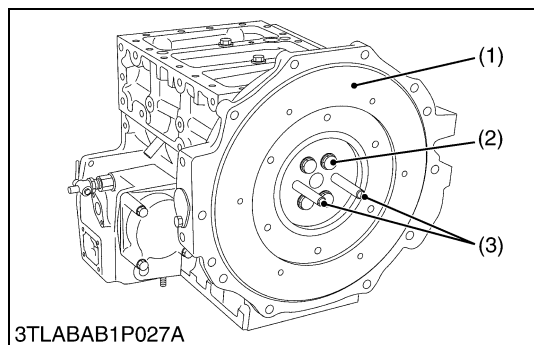
#### NOTE

- **Mark the same number on the connecting rod (7) and the piston (6) so as not to change the combination.**

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

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# [6] CRANKSHAFT



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## Flywheel

1. Fit the stopper to the flywheel (1).
2. At first, remove two pieces of the flywheel screws (2).
3. Insert two pieces of the flywheel guide screws (3) in the holes.
4. Remove the all flywheel screws (2).
5. Remove the flywheel (1) slowly along the flywheel guide screws (3).

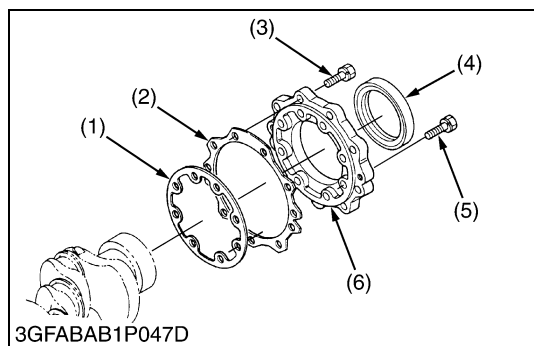
### (When reassembling)

- 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 screws	98.1 to 107 N·m 10.0 to 11.0 kgf·m 72.4 to 79.5 lbf·ft
-------------------	-----------------	--

- (1) Flywheel (3) Flywheel Guide Screws  
(2) Flywheel Screw

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## Bearing Case Cover

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

### ■ IMPORTANT

- The length of inside screws (5) and outside screws (3) are different. Do not take a mistake using inside screws and outside screws.

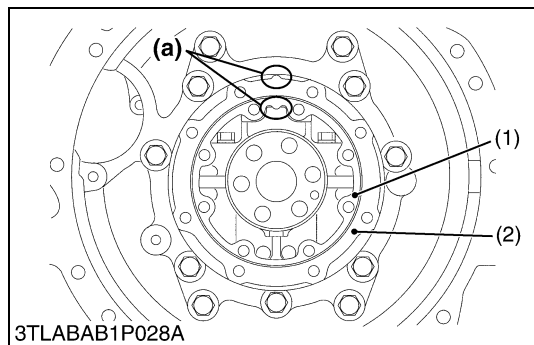
### (When reassembling)

- Fit the bearing case gasket (1) and the bearing case cover gasket (2) with correct directions.
- Install the bearing case cover (6) 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.

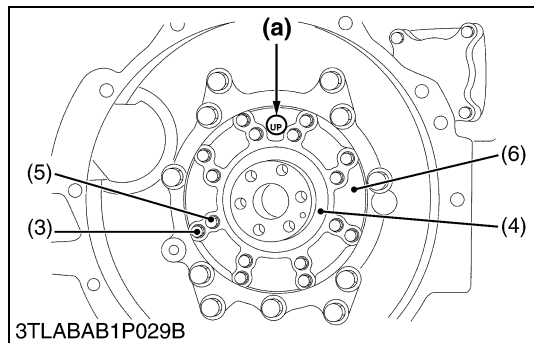
Tightening torque	Bearing case cover mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
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- (1) Bearing Case Gasket (5) Bearing Case Cover Mounting Screw  
(2) Bearing Case Cover Gasket (6) Bearing Case Cover  
(3) Bearing Case Cover Mounting Screw  
(4) Oil Seal (a) Upside

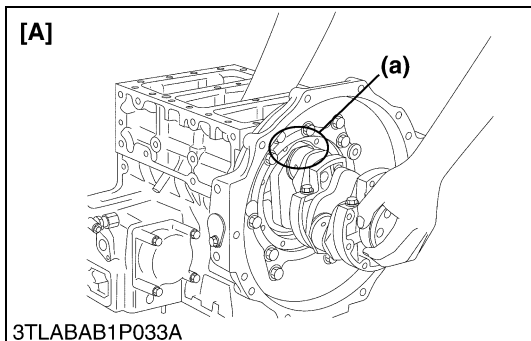
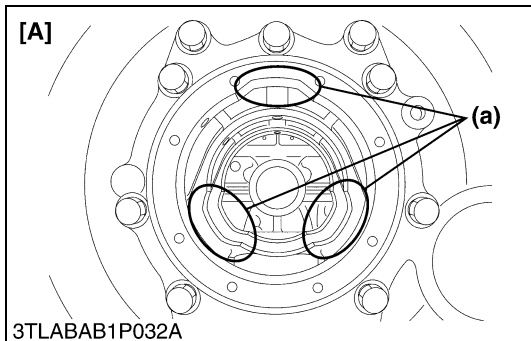
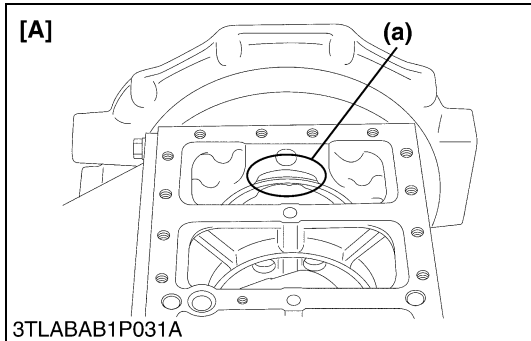
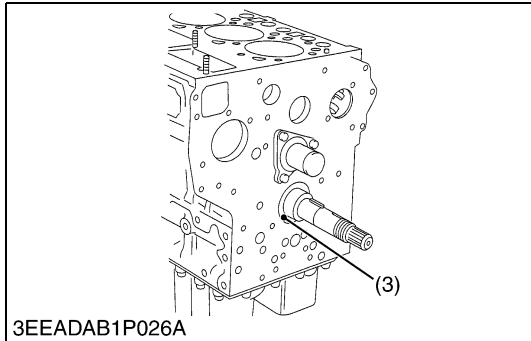
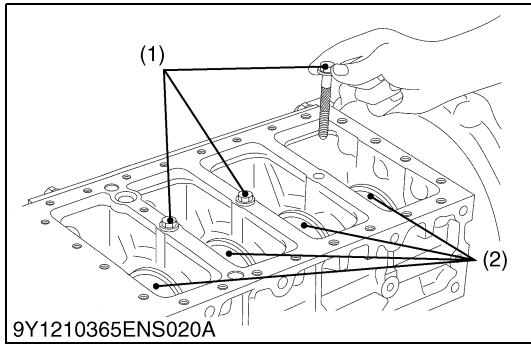
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### Crankshaft

■ **NOTE**

- Before disassembling, check the side clearance of crankshaft. Also check it during reassembling.
1. Remove the main bearing case screw 2 (1).
  2. Turn the crankshaft to set the crank pin of the 4th cylinder to the horizontal directions (Right or Left). Then draw out all the crankshaft, holding the crank pins to the horizontal directions (Right or Left).

**(When reassembling)**

■ **IMPORTANT**

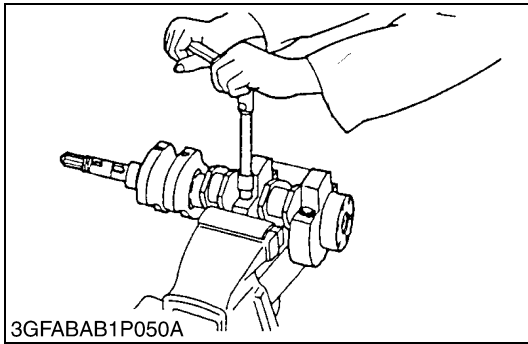
- Install the crankshaft sub assembly, aligning the screw hole of main bearing case 2 (2) with the screw hole of cylinder block.
  - When tightening the main bearing case screw 2 (1), apply oil to the screw and screw by hand before tightening the specific torque.
- If not smooth to screw by hand, align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

Tightening torque	Main bearing case screws	69 to 73 N·m
	2	7.0 to 7.5 kgf·m 51 to 54 lbf·ft

- (1) Main Bearing Case Screw 2
- (2) Main Bearing Case 2
- (3) Crankshaft Bearing 1

- (a) Cut place for removing and installing the crankshaft
- [A] D1803-M

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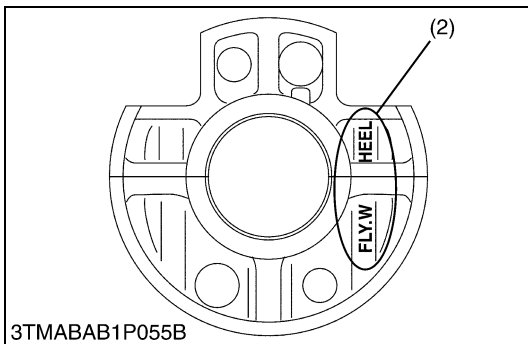
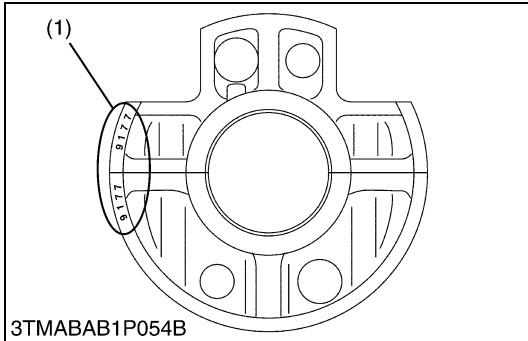


**Main Bearing Case Assembly**

1. Remove the two main bearing case screws 1, and remove the main bearing case assembly being careful with thrust bearing and crankshaft bearing.
2. Remove the main bearing case 1, 2 as above.

**(When reassembling)**

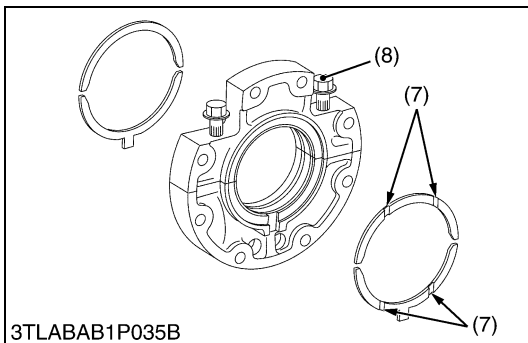
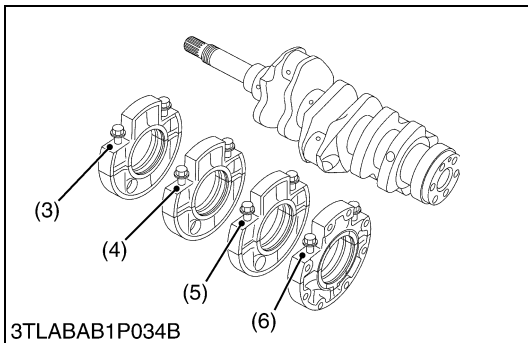
- Clean the oil passage in the main bearing case.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in the original positions. Since diameters of main bearing cases vary, install them in order of markings (A, B, C) from the gear case side.
- Match the alignment numbers (1) and mark (2) on the main bearing case.
- When installing the main bearing case 1 and 2, face the mark "FLYWHEEL" to the flywheel.
- Install the thrust bearing with its oil groove facing (7) outward.
- Confirm that the main bearing case moves smoothly after tightening the main bearing case screw 1 (8) to the specified torque.



Tightening torque	Main bearing case screw 1	46 to 50 N·m 4.7 to 5.2 kgf·m 34 to 37 lbf·ft
-------------------	---------------------------	---

- |                      |                               |
|----------------------|-------------------------------|
| (1) Alignment Number | (5) C                         |
| (2) Alignment Mark   | (6) No Mark                   |
| (3) A                | (7) Oil Groove                |
| (4) B                | (8) Main Bearing Case Screw 1 |

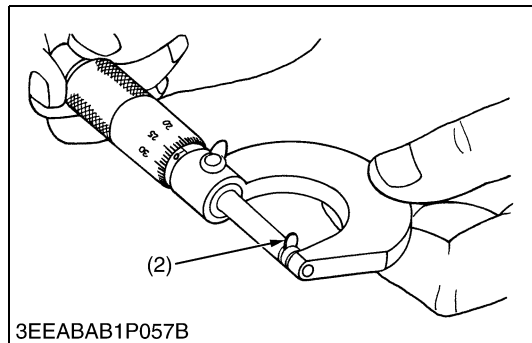
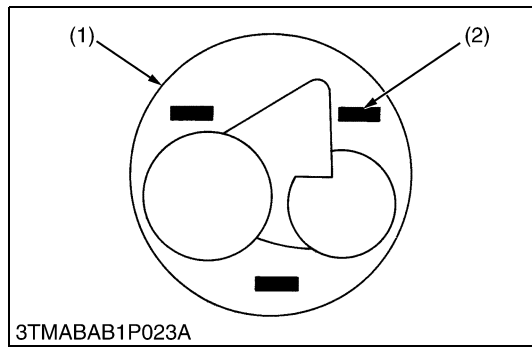
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## 7. SERVICING

### [1] CYLINDER HEAD AND VALVES



#### Top Clearance

1. Remove the cylinder head.
2. Move the piston up and stick 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 exceeds top dead center.
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 clearances between the crankpin and bearing and between the piston pin and bushing.

#### ■ NOTE

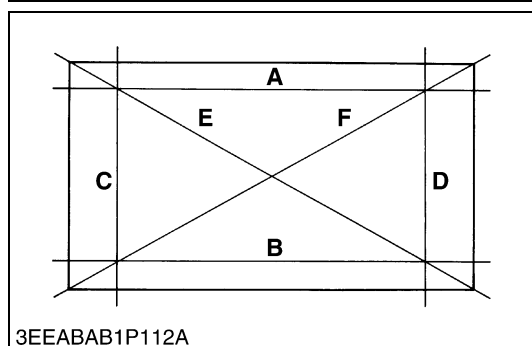
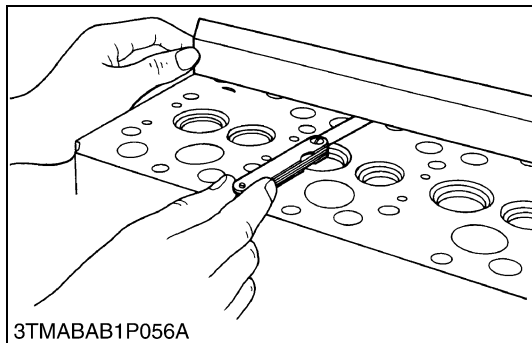
- After checking the top clearance, be sure to assemble the cylinder head with a new cylinder head gasket.

Top clearance	Factory spec.	0.575 to 0.675 mm 0.0227 to 0.0265 in.
Tightening torque	Cylinder head screws	93.2 to 98.0 N·m 9.50 to 10.0 kgf·m 68.8 to 72.3 lbf·ft

(1) Piston

(2) Fuse

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#### Cylinder Head Surface Flatness

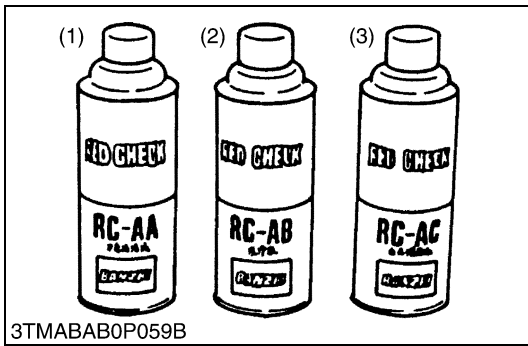
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides (A), (B), (C) and (D) and two diagonal (E) and (F) as shown in the figure.
3. Measure the clearance with a feeler gauge.
4. If the measurement exceeds the allowable limit, correct it with a surface grinder.

#### ■ IMPORTANT

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

Cylinder head surface flatness	Factory spec.	0.05 mm / 500 mm 0.002 in. / 19.7 in.
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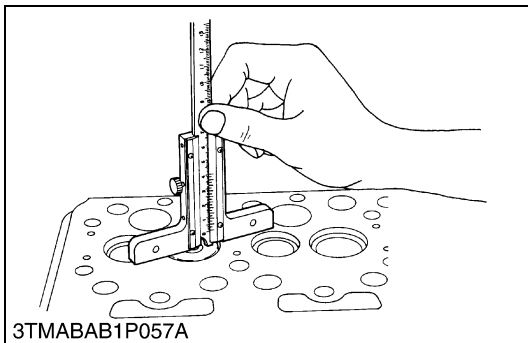


**Cylinder Head Flaw**

1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with detergent (2).
3. Spray the cylinder head surface with the read permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the read 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.

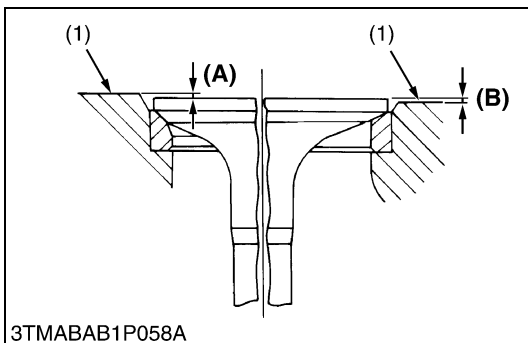
- (1) Red Permeative Liquid                      (3) White Developer  
 (2) Detergent

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**Valve Recessing**

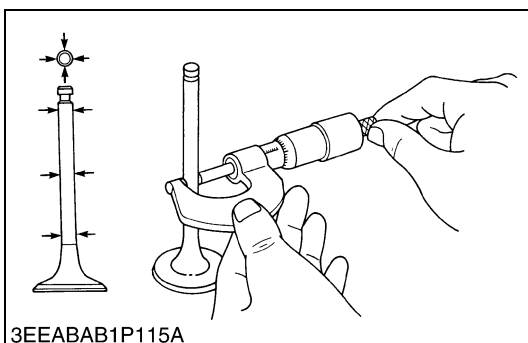
1. Clean the cylinder head surface, valve face and valve seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
5. If it still exceeds the allowable limit after replacing the valve, correct the valve seat face of the cylinder head with a valve seat cutter (Code No. 07909-33102) or valve seat grinder.
6. Then, correct the cylinder head surface with a surface grinder, or 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 0.016 (recessing) in.

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

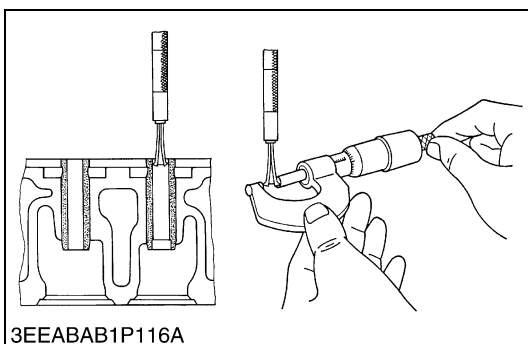
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**Clearance between Valve Stem and Valve Guide**

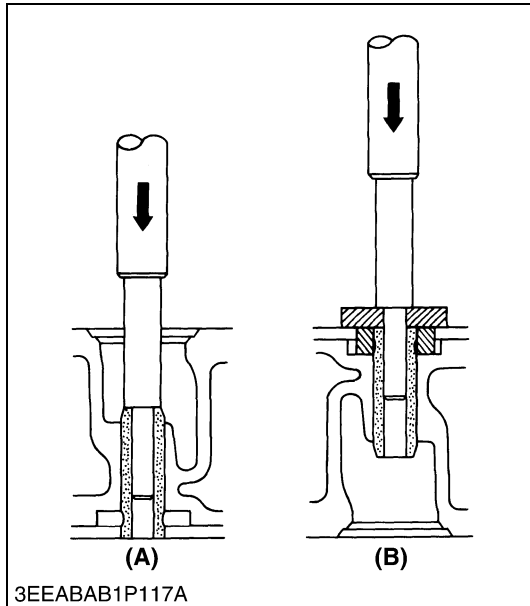
1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. with a small hole gauge, and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit,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

Clearance between valve stem and guide	Factory spec.	0.040 to 0.070 mm 0.0016 to 0.0027 in.
	Allowable limit	0.1 mm 0.004 in.



Valve stem O.D.	Factory spec.	7.960 to 7.975 mm 0.3134 to 0.3139 in.
Valve guide I.D.	Factory spec.	8.015 to 8.030 mm 0.3156 to 0.3161 in.

9Y1210365ENS0043US0



### 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 0.3156 to 0.3161 in.
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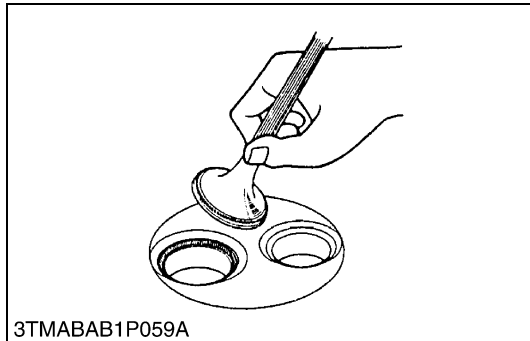
#### ■ IMPORTANT

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

(A) When Removing

(B) When Installing

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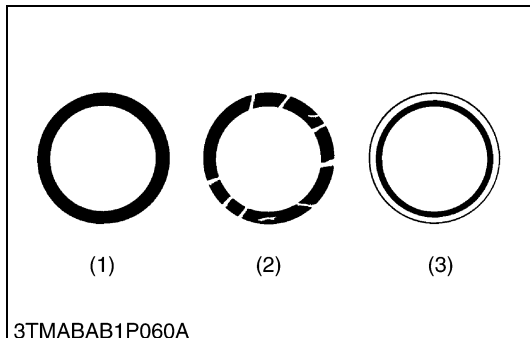
### Valve Seating

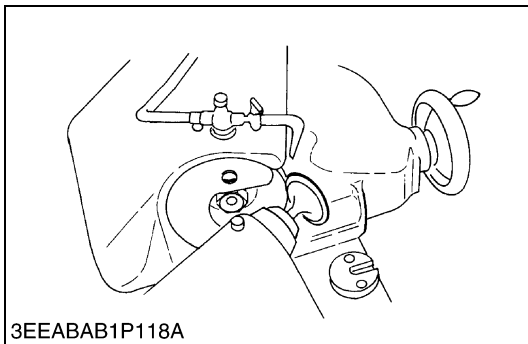
1. Coat the valve face lightly with prussian blue and put the valve on its seat to check the contact.
2. If the valve does not seat all the way around the valve seat or the valve contact is less than 70 %, correct the valve seating as follows.
3. If the valve contact does not comply with the reference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

- (1) Correct  
(2) Incorrect

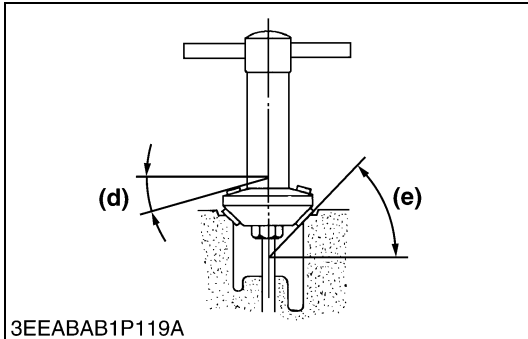
(3) Incorrect

9Y1210365ENS0045US0

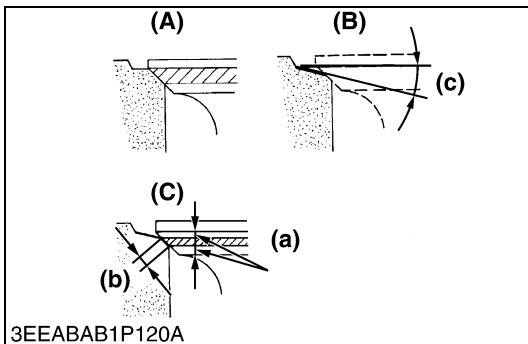




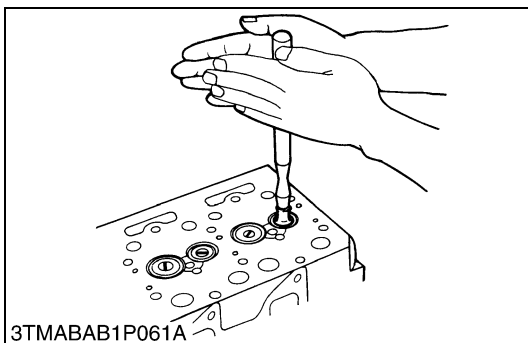
3EEABAB1P118A



3EEABAB1P119A



3EEABAB1P120A



3TMABAB1P061A

**Correcting Valve and Valve Seat**

■ **NOTE**

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

**1) Correcting Valve**

1. Correct the valve with a valve refacer.

Valve face angle	Factory spec.	IN.	1.0 rad 60 °
		EX.	0.79 rad 45 °

**2) Correcting Valve Seat**

1. Slightly correct the seat surface with a 1.0 rad (60 °) (intake valve) or 0.79 rad (45 °) (exhaust valve) valve seat cutter.
2. Resurface the seat surface with a 0.52 rad (30 °) valve seat cutter to intake valve seat and with a 0.26 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.

Valve face angle	Factory spec.	IN.	1.0 rad 60 °
		EX.	0.79 rad 45 °

- (a) Identical Dimensions
- (b) Valve Seat Width
- (c) 0.523 rad (30 °) or 0.262 rad (15 °)
- (d) 0.262 rad (15 °) or 0.523 rad (30 °)
- (e) 0.785 rad (45 °) or 1.047 rad (60 °)
- (A) heck Correct
- (B) Correct Seat Width
- (C) Check Contact

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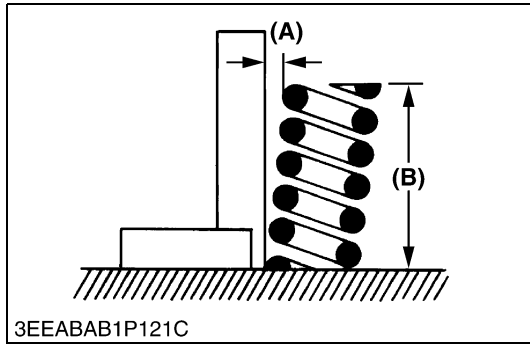
**Valve Lapping**

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

■ **IMPORTANT**

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

9Y1210365ENS0047US0



### Free Length and Tilt of Valve Spring

1. Measure the free length **(B)** 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 **(A)**. Check the entire surface of the valve spring for scratches. If there is any defect, replace it.

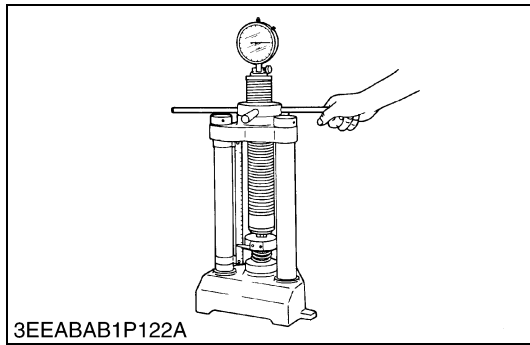
Free length <b>(B)</b>	Factory spec.	41.7 to 42.2 mm 1.65 to 1.66 in.
	Allowable limit	41.2 mm 1.62 in.

Tilt <b>(A)</b>	Allowable limit	1.0 mm 0.039 in.
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(A) Tilt

(B) Free Length

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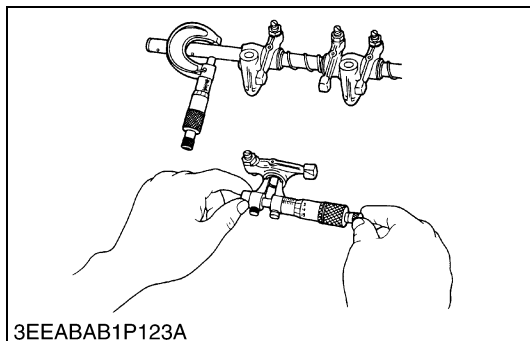


### Valve Spring Setting Load

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

Setting load / Setting length	Factory spec.	118 N / 35 mm 12.0 kgf / 35 mm 26.5 lbf / 1.4 in.
	Allowable limit	100.0 N / 35 mm 10.2 kgf / 35 mm 22.5 lbf / 1.4 in.

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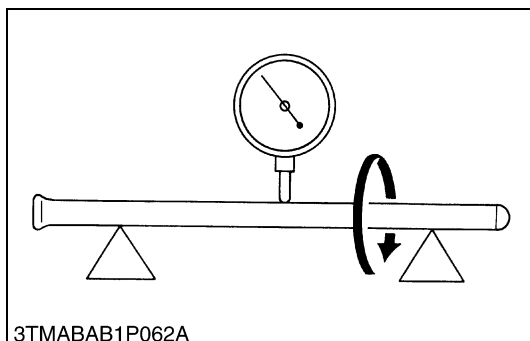
### Oil Clearance between Rocker Arm and Rocker Arm Shaft

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

Oil clearance between rocker arm and rocker arm shaft	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.0017 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 0.55119 to 0.55188 in.

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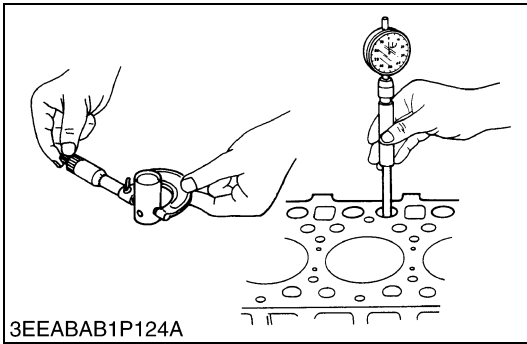


### Push Rod Alignment

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

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

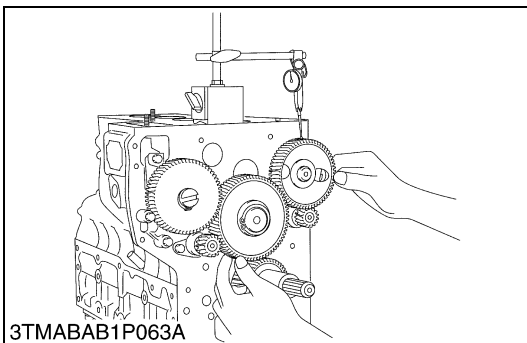
1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

Oil Clearance between tappet and tappet guide bore	Factory spec.	0.020 to 0.062 mm 0.00079 to 0.0024 in.
	Allowable limit	0.07 mm 0.003 in.

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.94327 to 0.94409 in.
Tappet guide bore I.D.	Factory spec.	24.000 to 24.021 mm 0.94489 to 0.94570 in.

9Y1210365ENS0052US0

## [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 shafts and the gear.
4. If the oil clearance is proper, replace the gear.

Backlash between idle gear and crank gear	Factory spec.	0.04150 to 0.1122 mm 0.00164 to 0.004417 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and cam gear	Factory spec.	0.04150 to 0.1154 mm 0.001634 to 0.004543 in.
	Allowable limit	0.15 mm 0.0059 in.

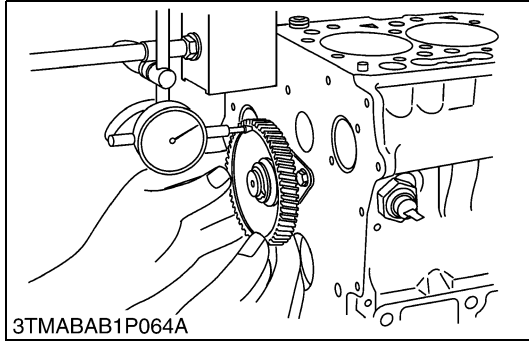
Backlash between idle gear and injection pump gear	Factory spec.	0.04150 to 0.1154 mm 0.00163 to 0.00454 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between crank gear and oil pump gear	Factory spec.	0.0415 to 0.109 mm 0.00164 to 0.00429 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear and balancer gear (IN. side)	Factory spec.	0.0350 to 0.116 mm 0.00138 to 0.00456 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between cam gear and balancer gear (EX. gear)	Factory spec.	0.0350 to 0.116 mm 0.00138 to 0.00456 in.
	Allowable limit	0.15 mm 0.0059 in.

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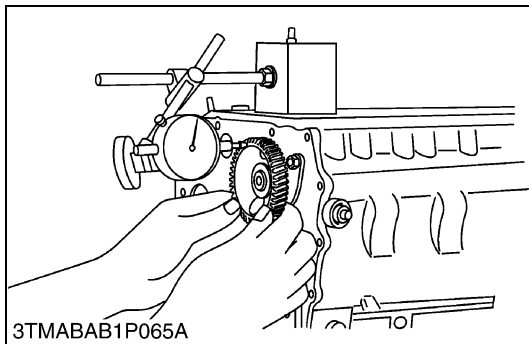


### **Idle Gear Side Clearance**

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

Idle gear side clearance	Factory spec.	0.12 to 0.48 mm 0.0048 to 0.018 in.
	Allowable limit	0.9 mm 0.035 in.

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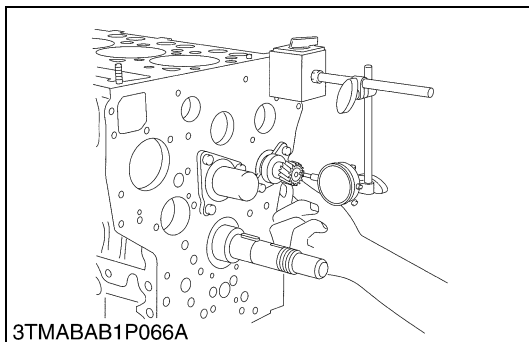


### **Camshaft Side Clearance**

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

Camshaft side clearance	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0088 in.
	Allowable limit	0.30 mm 0.012 in.

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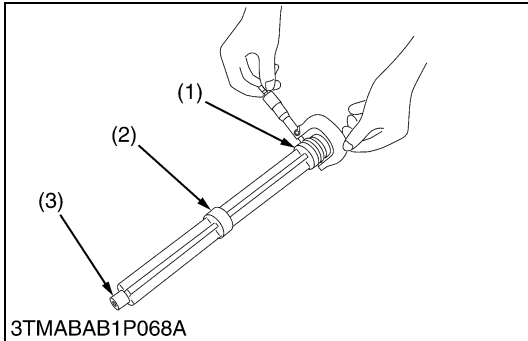
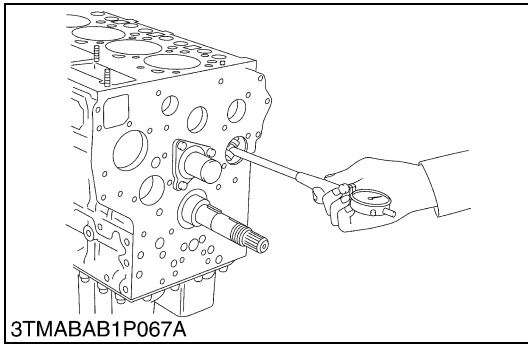


### **Balancer Shaft Side Clearance**

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

Side clearance of balancer shaft	Factory spec.	0.07 to 0.22 mm 0.0028 to 0.0086 in.
	Allowable limit	0.30 mm 0.012 in.

9Y1210365ENS0056US0



**Oil Clearance of Balancer Shaft Journal**

1. Measure the balancer shaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for balancer shaft with an inside micrometer or cylinder gauge.
3. If the clearance exceeds the allowable limit, replace the balancer shaft.

Oil clearance of balancer shaft journal 1	Factory spec.	0.030 to 0.111 mm 0.00119 to 0.00437 in.
	Allowable limit	0.20 mm 0.0079 in.

Balancer shaft journal 1 O.D.	Factory spec.	43.934 to 43.950 mm 1.7297 to 1.7303 in.
Balancer shaft bearing 1 I.D.	Factory spec.	43.980 to 44.045 mm 1.7315 to 1.7340 in.

Oil clearance of balancer shaft journal 2	Factory spec.	0.030 to 0.111 mm 0.00119 to 0.00437 in.
	Allowable limit	0.2 mm 0.0079 in.

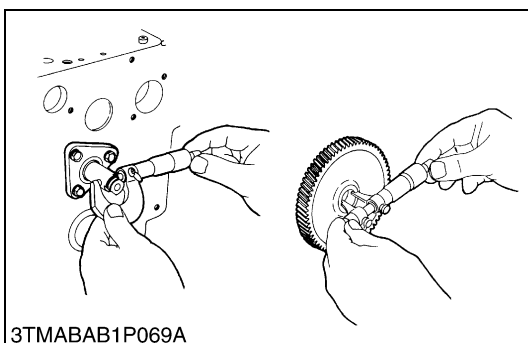
Balancer shaft journal 2 O.D.	Factory spec.	41.934 to 41.950 mm 1.6510 to 1.6515 in.
Balancer shaft bearing 2 I.D.	Factory spec.	41.980 to 42.045 mm 1.6528 to 1.6553 in.

Oil clearance of balancer shaft journal 3	Factory spec.	0.020 to 0.094 mm 0.00079 to 0.0037 in.
	Allowable limit	0.2 mm 0.0079 in.

Balancer shaft journal 3 O.D.	Factory spec.	21.947 to 21.960 mm 0.86406 to 0.86456 in.
Balancer shaft bearing 3 I.D.	Factory spec.	21.980 to 22.041 mm 0.86536 to 0.86775 in.

- (1) Balancer Shaft Journal 1                      (3) Balancer Shaft Journal 3  
 (2) Balancer Shaft Journal 2

9Y1210365ENS0057US0



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

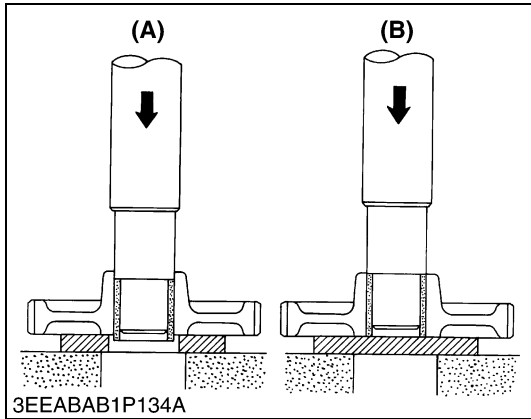
1. Measure the idle gear shaft O.D. with an outside micrometer.
2. Measure the idle gear bushing I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing.

Clearance between idle gear shaft and idle gear bushing	Factory spec.	0.025 to 0.066 mm 0.00099 to 0.0025 in.
	Allowable limit	0.1 mm 0.0039 in.

Idle gear shaft O.D.	Factory spec.	37.959 to 37.975 mm 1.4945 to 1.4950 in.
Idle gear bushing I.D.	Factory spec.	38.000 to 38.025 mm 1.4961 to 1.4970 in.

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**Replacing Idle Gear Bushing**

**(A) (When removing)**

1. Using an idle gear bushing replacing tool, press out the used bushing.

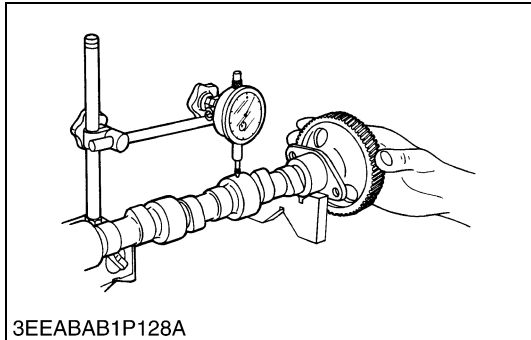
**(B) (When installing)**

1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Using an idle gear bushing replacing tool, press in a new bushing (service parts) to the specified dimension. (See figure.)

**(A) When removing**

**(B) When installing**

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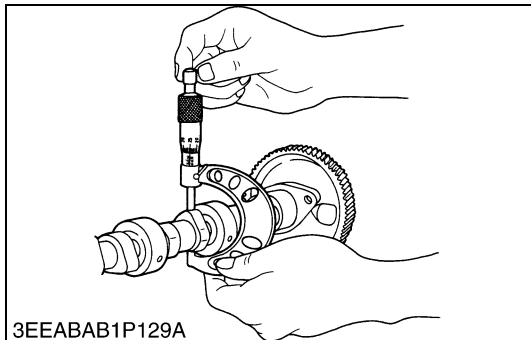


**Camshaft Alignment**

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

Camshaft alignment	Allowable limit	0.01 mm 0.0004 in.
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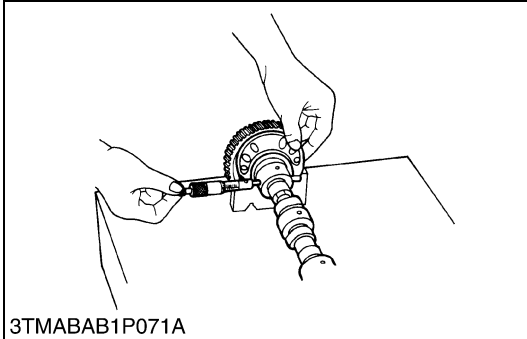
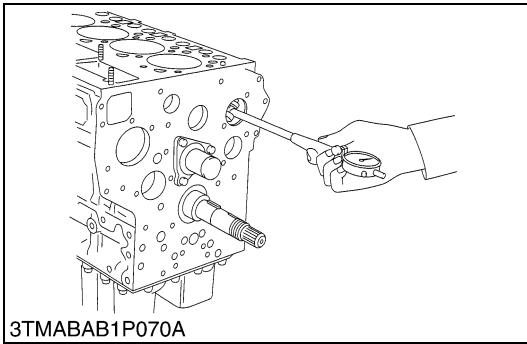
**Cam Height**

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

Cam height of intake	Factory spec.	33.90 mm 1.335 in.
	Allowable limit	33.85 mm 1.333 in.

Cam height of exhaust	Factory spec.	33.90 mm 1.335 in.
	Allowable limit	33.85 mm 1.333 in.

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### Oil Clearance of Camshaft Journal

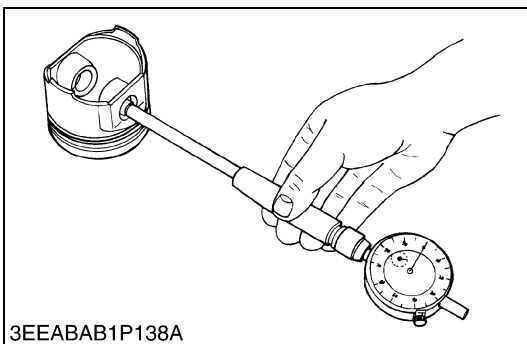
1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the camshaft.

Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal O.D.	Factory spec.	39.934 to 39.950 mm 1.5722 to 1.5728 in.
Cylinder block bore I.D.	Factory spec.	40.000 to 40.025 mm 1.5748 to 1.5757 in.

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## [3] PISTON AND CONNECTING ROD

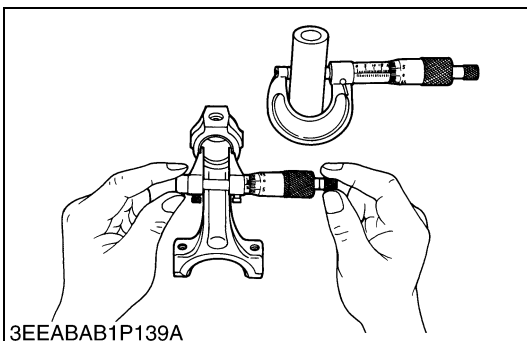


### Piston Pin Bore I.D.

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 0.98426 to 0.98476 in.
	Allowable limit	25.050 mm 0.98622 in.

9Y1210365ENS0063US0



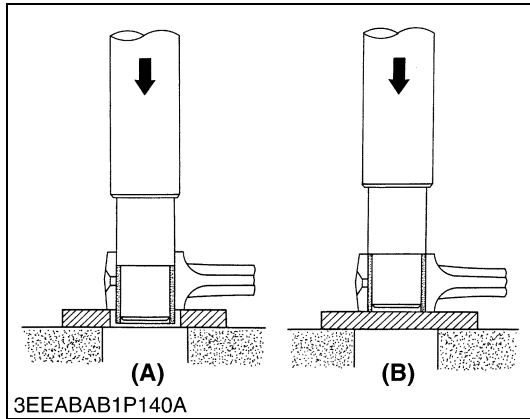
### Oil Clearance between Piston Pin and Small End Bushing

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 0.00056 to 0.0014 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory spec.	25.002 to 25.011 mm 0.98433 to 0.98468 in.
Small end bushing I.D.	Factory spec.	25.025 to 25.040 mm 0.98524 to 0.98582 in.

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### Replacing Connecting Rod Small End Bushing

#### (A) (When removing)

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

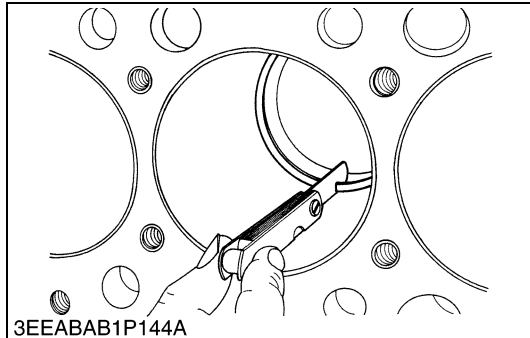
#### (B) (When installing)

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

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### Piston Ring Gap

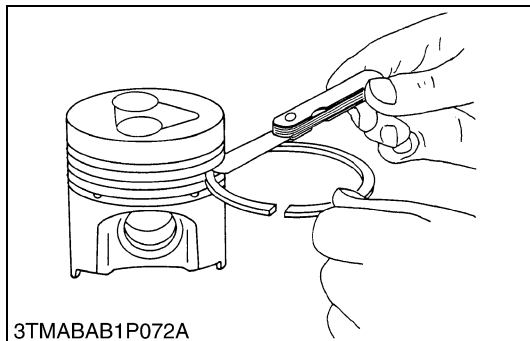
1. Insert the piston ring into the lower part of the liner (the least worn out part) with the piston.
2. Measure the ring gap with a feeler gauge.
3. If the gap exceeds the allowable limit, replace the ring.

Top ring	Factory spec.	0.25 to 0.40 mm 0.0099 to 0.015 in.
	Allowable limit	1.25 mm 0.0492 in.

Second ring	Factory spec.	0.30 to 0.45 mm 0.012 to 0.017 in.
	Allowable limit	1.25 mm 0.0492 in.

Oil ring	Factory spec.	0.25 to 0.45 mm 0.0099 to 0.017 in.
	Allowable limit	1.25 mm 0.0492 in.

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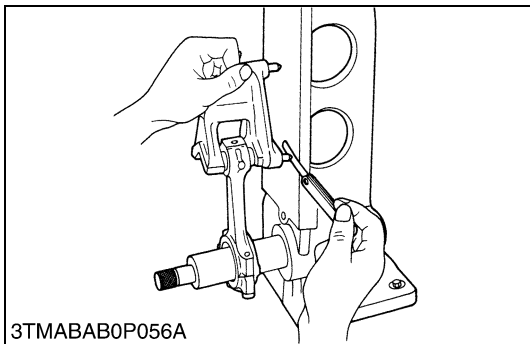
### Clearance between Piston Ring and Groove

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 allowable limit, replace the ring since compression leak and oil shortage result.
4. If the clearance still exceeds the allowable limit after replacing the ring, replace the piston.

Second ring	Factory spec.	0.093 to 0.128 mm 0.00367 to 0.00503 in.
	Allowable limit	0.200 mm 0.00787 in.

Oil ring	Factory spec.	0.020 to 0.060 mm 0.00079 to 0.0023 in.
	Allowable limit	0.15 mm 0.00591 in.

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**Connecting Rod Alignment**

■ **NOTE**

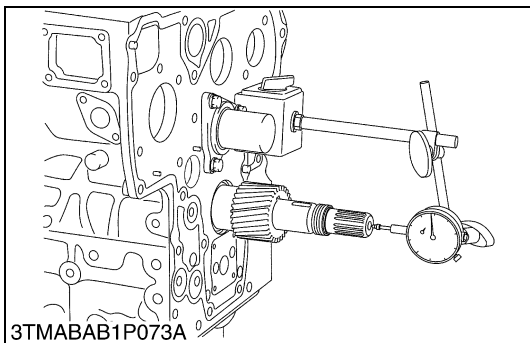
- Since the I.D. of the connecting rod small end bushing is the basis of this check, check bushing for wear beforehand.

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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9Y1210365ENS0068US0

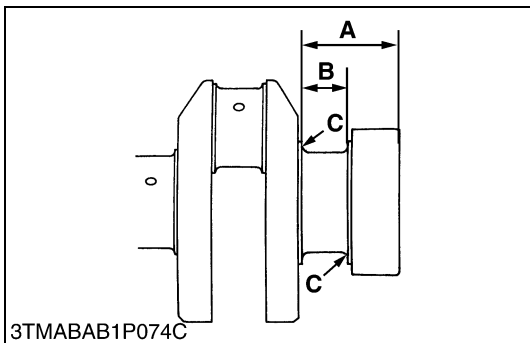
**[4] CRANKSHAFT**



**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 0.012 in.
	Allowable limit	0.5 mm 0.020 in.



**(Reference)**

- Oversize thrust bearing

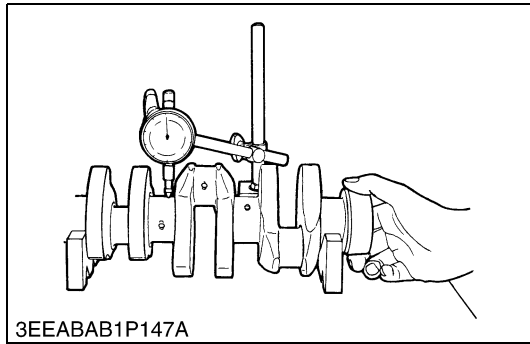
Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	1A091-23951	020 OS
	Thrust bearing 2 02	1A091-23971	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	1A091-23961	040 OS
	Thrust bearing 2 04	1A091-23981	040 OS

- Oversize dimensions of crankshaft journal

Oversize	0.20 mm 0.0079 in.	0.40 mm 0.016 in.
Dimension "A"	54.50 to 54.70 mm 2.146 to 2.153 in.	54.60 to 54.80 mm 2.150 to 2.157 in.
Dimension "B"	26.20 to 26.25 mm 1.032 to 1.033 in.	26.40 to 26.45 mm 1.040 to 1.041 in.
Dimension "C"	2.80 to 3.20 mm radius 0.111 to 0.125 in. radius	2.80 to 3.20 mm radius 0.111 to 0.125 in. radius

The crankshaft journal must be fine-finished to higher than Rmax = 0.8S.

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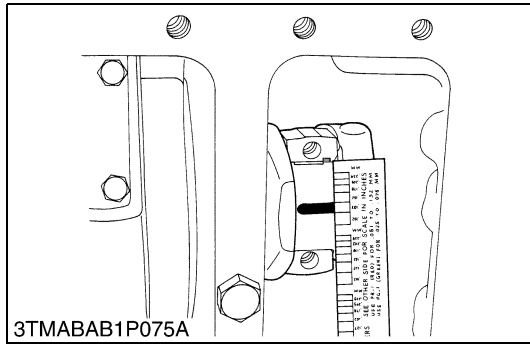


### Crankshaft Alignment

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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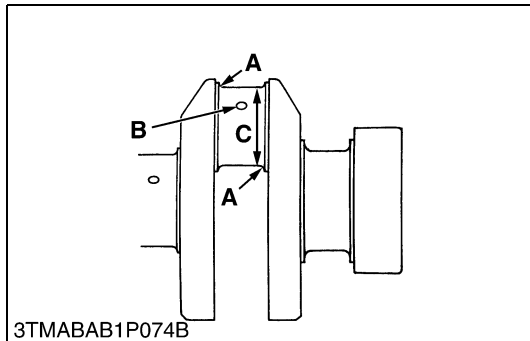


### Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage on the center of the crankpin in 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 0.00099 to 0.0034 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankpin O.D.	Factory spec.	46.959 to 46.975 mm 1.8488 to 1.8494 in.
Crankpin bearing I.D.	Factory spec.	47.000 to 47.046 mm 1.8504 to 1.8522 in.

### (Reference)

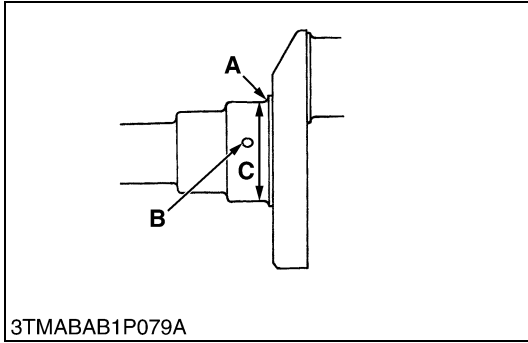
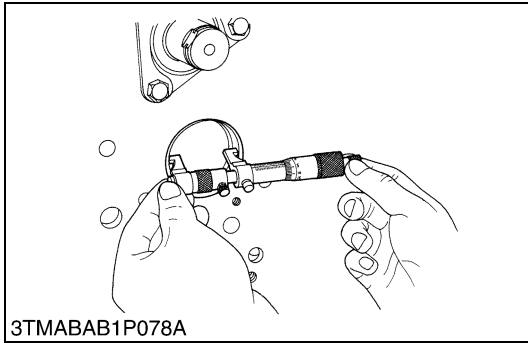
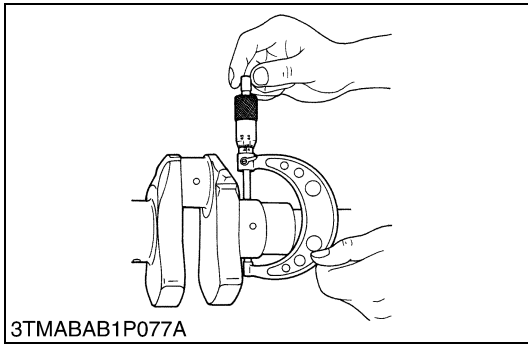
- Undersize crankpin bearing

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankpin bearing 02	17331-22970	020 US
0.4 mm 0.016 in.	Crankpin bearing 04	17331-22980	040 US

- Oversize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension "A"	3.30 to 3.70 mm radius 0.130 to 0.145 in. radius	3.30 to 3.70 mm radius 0.130 to 0.145 in. radius
Dimension "B"	1.00 to 1.50 mm radius 0.0394 to 0.0590 in. radius	1.00 to 1.50 mm radius 0.0394 to 0.0590 in. radius
Dimension "C"	46.759 to 46.775 mm 1.8409 to 1.8415 in.	46.559 to 46.575 mm 1.8331 to 1.8336 in.
The crankpin must be fine-finished to higher than Rmax = 0.8S.		

9Y1210365ENS0071US0



**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 useless because of the crankshaft journal wear, replace it with an undersize one referring to the table and figure.

Oil clearance between crankshaft journal and crankshaft bearing 1	Factory spec.	0.0400 to 0.118 mm 0.00158 to 0.00464 in.
	Allowable limit	0.2 mm 0.0079 in.

Crankshaft journal O.D.	Factory spec.	59.921 to 59.940 mm 2.3591 to 2.3598 in.
Crankshaft bearing 1 I.D.	Factory spec.	59.980 to 60.039 mm 2.3615 to 2.3637 in.

**(Reference)**

- Undersize crankshaft bearing 1

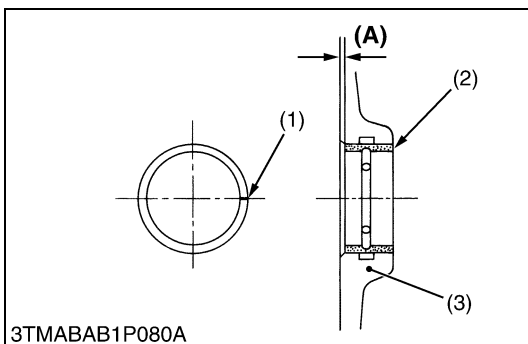
Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 1 02	1A091-23911	020 US
0.4 mm 0.016 in.	Crankshaft bearing 1 04	1A091-23921	040 US

- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension "A"	2.80 to 3.20 mm radius 0.111 to 0.125 in. radius	2.80 to 3.20 mm radius 0.111 to 0.125 in. radius
Dimension "B"	1.00 to 1.50 mm radius 0.0394 to 0.0590 in. radius	1.00 to 1.50 mm radius 0.0394 to 0.0590 in. radius
Dimension "C"	59.721 to 59.740 mm 2.3513 to 2.3519 in.	59.521 to 59.540 mm 2.3433 to 2.3441 in.

The crankshaft journal must be fine-finished to higher than Rmax = 0.8S.

9Y1210365ENS0072US0



**Replacing Crankshaft Bearing 1**

**(When removing)**

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

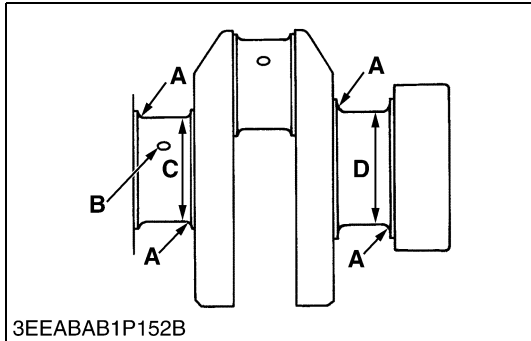
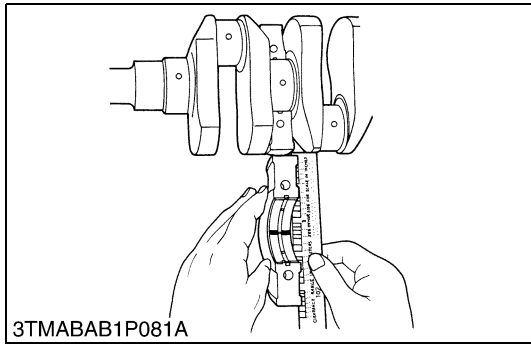
**(When installing)**

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.	4.20 to 4.50 mm 0.166 to 0.177 in.
---------------	---------------	---------------------------------------

- (1) Seam
- (2) Crankshaft Bearing 1
- (3) Cylinder Block

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**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 useless 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 0.00158 to 0.00409 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft O.D.	Factory spec.	59.921 to 59.940 mm 2.3591 to 2.3598 in.
Crankshaft bearing 2 I.D.	Factory spec.	59.980 to 60.025 mm 2.3615 to 2.3631 in.

**(Reference)**

- Undersize crankshaft bearing 2

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 2	1A091-23931	020 US
0.4 mm 0.016 in.	Crankshaft bearing 2	1A091-23941	040 US

- Undersize dimensions of crankshaft journal

Undersize	0.20 mm 0.008 in.	0.40 mm 0.016 in.
Dimension "A"	2.80 to 3.20 mm radius 0.111 to 0.125 in. radius	2.80 to 3.20 mm radius 0.111 to 0.125 in. radius
Dimension "B"	1.00 to 1.50 mm radius 0.0394 to 0.0590 in. radius	1.00 to 1.50 mm radius 0.0394 to 0.0590 in. radius
Dimension "C", "D"	59.721 to 59.740 mm 2.3513 to 2.3519 in.	59.521 to 59.540 mm 2.3434 to 2.3441 in.

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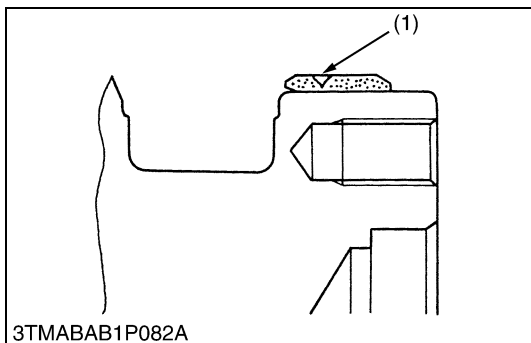
**Crankshaft Sleeve Wear**

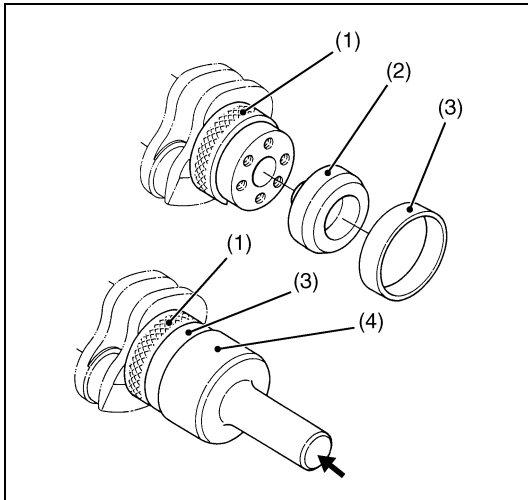
1. Check the wear on the crankshaft sleeve (1).
2. If the wear exceeds the allowable limit or when the engine oil leaks, replace the crankshaft sleeve.

Wear of sleeve	Allowable limit	0.10 mm 0.0039 in.
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- (1) Crankshaft Sleeve

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**Replacing Crankshaft Sleeve**

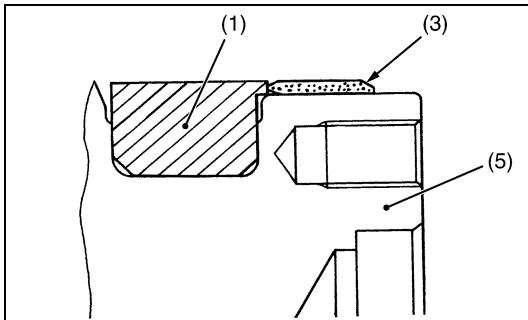
1. Remove the used crankshaft sleeve using a special-use puller set (Code No.: 07916-32091).
2. Set the sleeve guide (2) to the crankshaft.
3. Set the stopper (1) to the crankshaft as shown in figure.
4. Heat a new sleeve to a temperature between 150 and 200 °C (302 to 392 °F), and fix the sleeve to the crankshaft as shown in figure.
5. Press fit the sleeve using the auxiliary socket for pushing (4).

■ **NOTE**

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

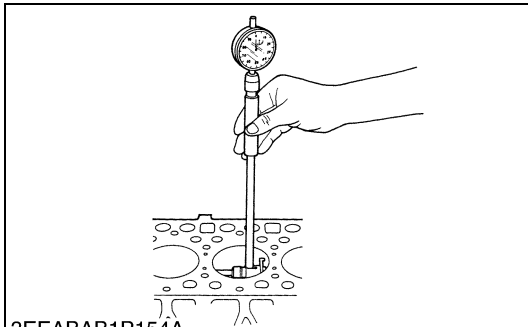
- |                       |                                  |
|-----------------------|----------------------------------|
| (1) Stopper           | (4) Auxiliary Socket for Pushing |
| (2) Sleeve Guide      | (5) Crankshaft                   |
| (3) Crankshaft Sleeve |                             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

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**[5] CYLINDER**



3EEABAB1P154A

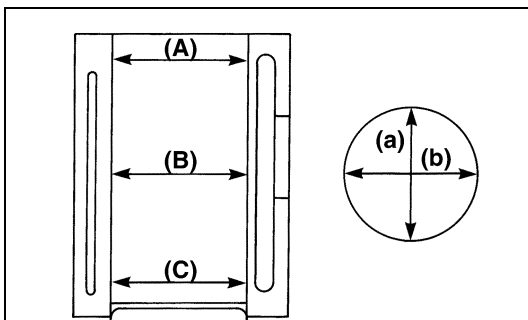
**Cylinder Wear**

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 bores. (Refer to "**Correcting Cylinder**".)

Cylinder I.D.	Factory spec.	87.000 to 87.022 mm 3.4252 to 3.4260 in.
Maximum wear	Allowable limit	+0.15 mm +0.0059 in.

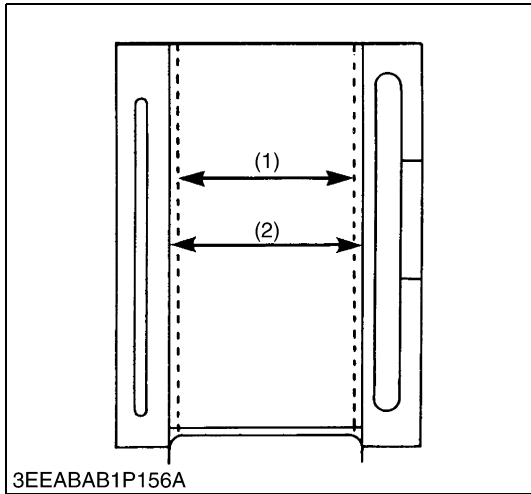
- |                    |                                |
|--------------------|--------------------------------|
| (A) Top            | (a) Right-angled to Piston Pin |
| (B) Middle         | (b) Piston Pin Direction       |
| (C) Bottom (Skirt) |                                |

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3EEABAB1P155A





**Correcting Cylinder (Oversize +0.25 mm, 0.0098 in.)**

- 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 3.4351 to 3.4359 in.
Maximum wear	Allowable limit	+0.15 mm +0.0059 in.
Finishing	Hone to 2.20 to 3.00 μR max. (0.0867 to 0.0118 in. μR max.)	

- Replace the piston and piston rings with oversize (+0.25 mm, +0.0098 in.) ones.

Parts Name	Code Number	Marking
Piston	1A091-21901	0.25 OS
Piston ring assembly	1A091-21091	0.25 OS

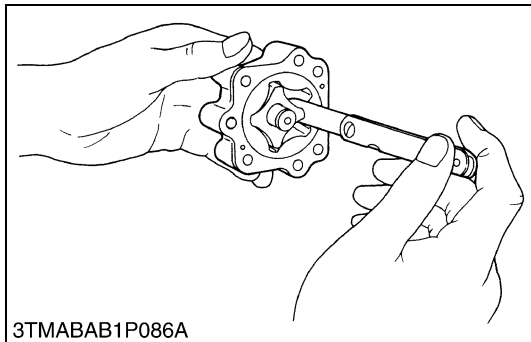
**NOTE**

- 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.

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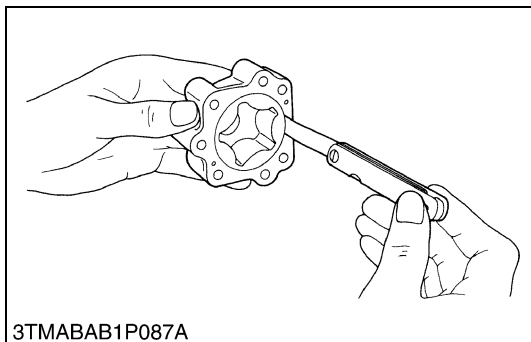
**[6] OIL PUMP**



**Rotor Lobe Clearance**

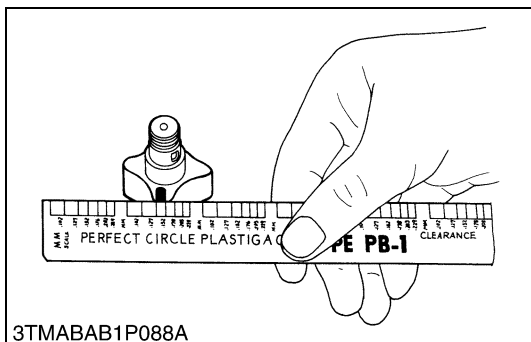
- Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge.
- Measure the clearance between the outer rotor and the pump body with a feeler gauge.
- If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

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 0.0044 to 0.0074 in.
	Allowable limit	0.25 mm 0.0098 in.

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**Clearance between Rotor and Cover**

- Put a strip of plastigage (Code No.: 07909-30241) onto the rotor face with grease.
- Install the cover and tighten the screws.
- Remove the cover carefully, and measure the width of the press gauge with a sheet of gauge.
- If the clearance exceeds the factory specifications, replace oil pump rotor assembly.

End clearance between inner rotor and cover	Factory spec.	0.105 to 0.150 mm 0.00414 to 0.00590 in.
	Allowable limit	0.2 mm 0.0079 in.

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# **2 CLUTCH**

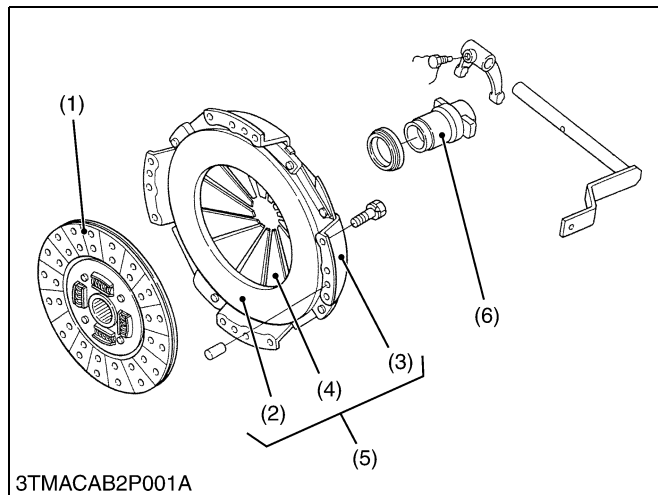
# MECHANISM

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1. TRAVELLING CLUTCH.....	2-M1
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[2] TRAVELLING CLUTCH LINKAGE .....	2-M1
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[1] STRUCTURE .....	2-M2
[2] OIL FLOW .....	2-M4
[3] PTO CLUTCH VALVE .....	2-M4

# 1. TRAVELLING CLUTCH

## [1] FEATURES



This tractor is used dry single plate type clutch.

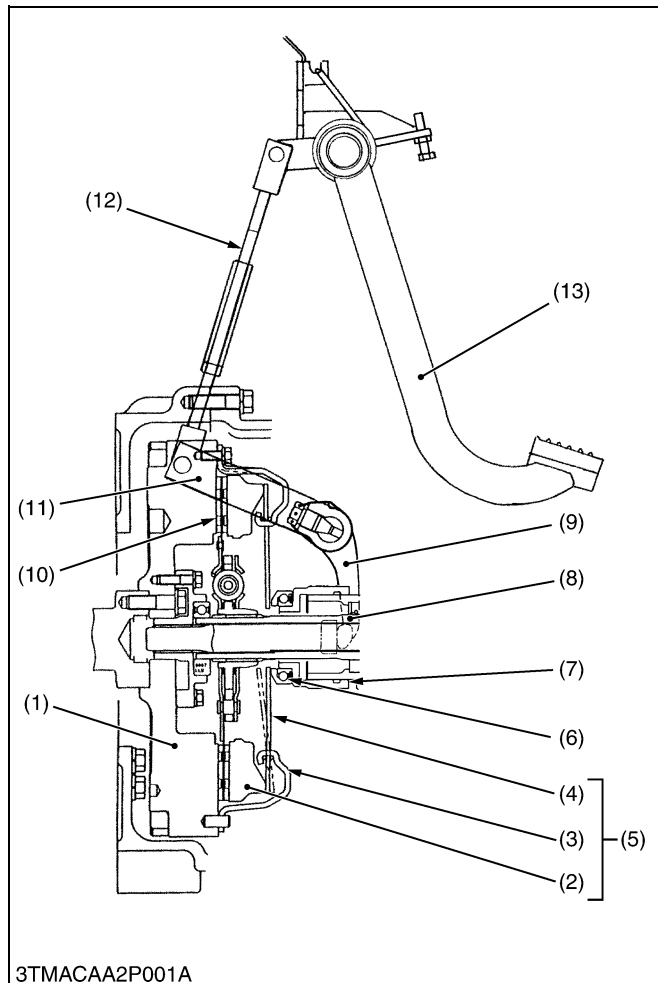
The clutch is located between the engine and transmission and is operated by stepping on the clutch pedal.

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

- |                    |                             |
|--------------------|-----------------------------|
| (1) Clutch Disc    | (4) Diaphragm Spring        |
| (2) Pressure Plate | (5) Pressure Plate Assembly |
| (3) Clutch Cover   | (6) Release Hub             |

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## [2] TRAVELLING CLUTCH LINKAGE



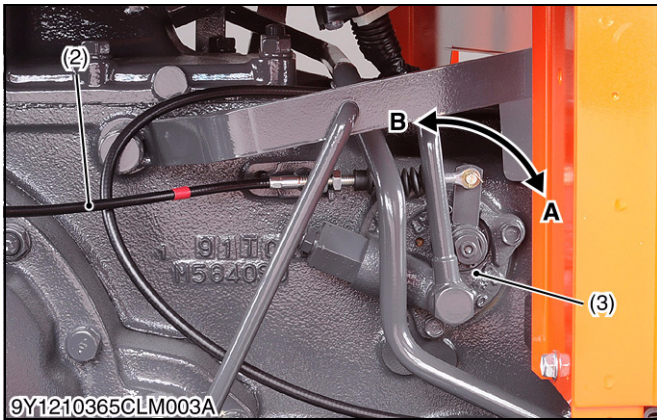
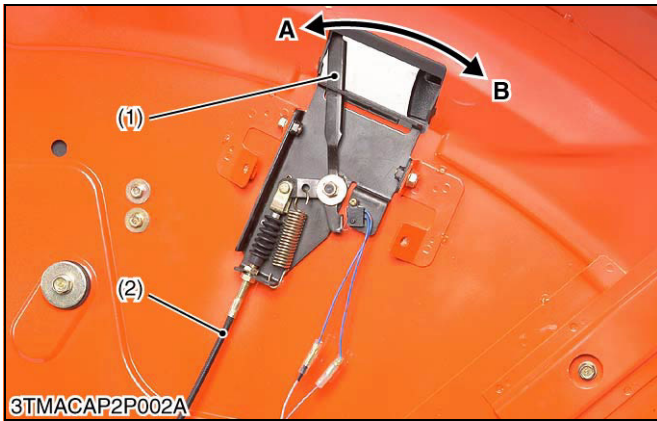
This tractor uses hanging type clutch pedal to have wider space about the platform.

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

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## 2. PTO CLUTCH

### [1] STRUCTURE



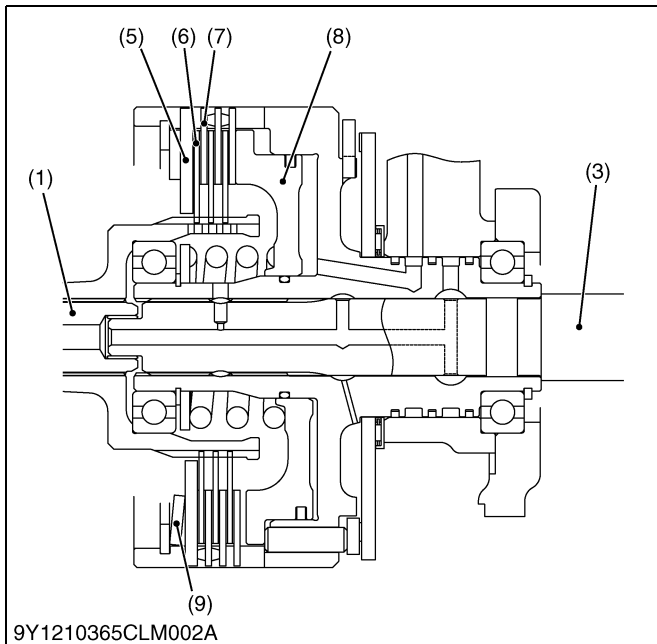
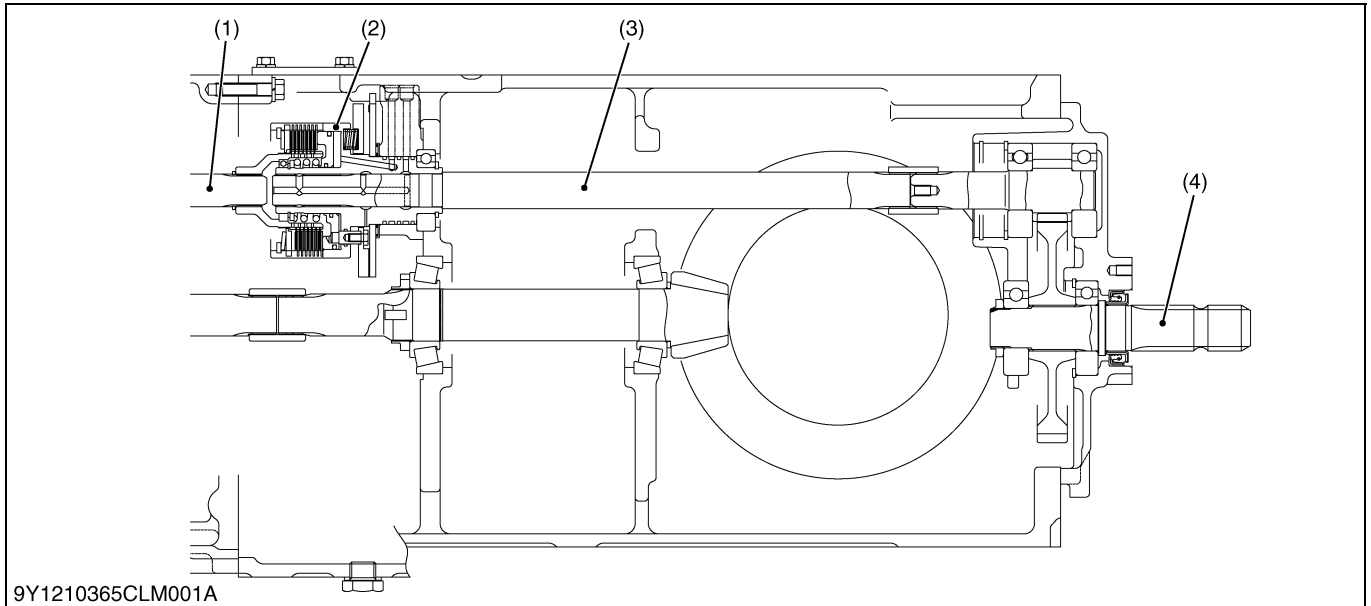
The PTO shift lever (1) and the PTO clutch valve (3) are connected by the PTO shift cable (2) as shown in the photo.

When the PTO shift lever (1) is moved to the **B** side, the PTO clutch valve (3) is set at "**Engaged**" position. Then the oil flows to clutch pack through the clutch valve (3). When the shift lever is moved to the **A** side, the PTO clutch is set at "**Disengaged**" position.

- (1) PTO Shift Lever
- (2) PTO Shift Cable
- (3) PTO Clutch Valve

**A : Disengage**  
**B : Engage**

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As shown in the figure above, the PTO propeller shaft 1 is splined to the spline hub and is always rotating while the engine is running.

The PTO clutch pack has three clutch discs (6), three drive plates (7), a belleville washer (cupped spring washer) (9) and one pressure plate (5). The clutch piston (8) actuated by hydraulic from PTO clutch valve, tightly presses the clutch discs (6) and drive plates (7) toward the pressure plate (5).

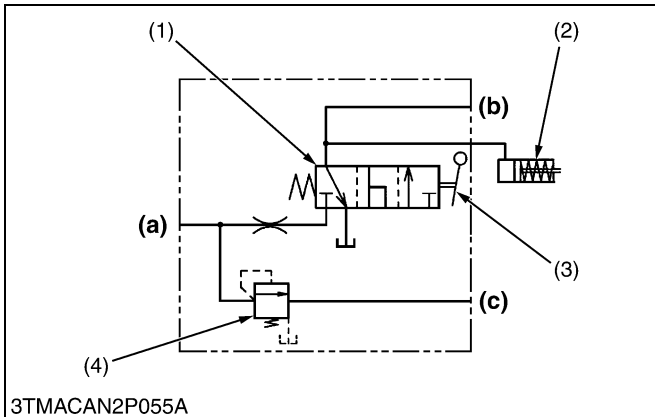
As a result, the rotation of the PTO propeller shaft 1 is transmitted to the PTO propeller shaft 2 (3) through the PTO clutch pack (2).

The belleville washer (cupped spring washer) (9) reduce the engaging shock. Thereby, the PTO clutch is engaged very smoothly.

- |                           |   |
|---------------------------|---|
| (1) PTO Propeller Shaft 1 | (6) Clutch Disc                                 |
| (2) PTO Clutch Pack       | (7) Drive Plate                                 |
| (3) PTO Propeller Shaft 2 | (8) Clutch Piston                               |
| (4) PTO Shaft             | (9) Belleville Washer<br>(Cupped Spring Washer) |
| (5) Pressure Plate        |   |

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## [2] OIL FLOW



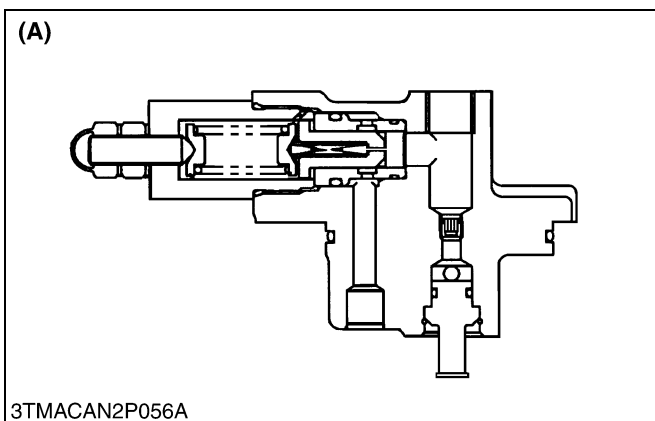
When the PTO lever (3) is at the disengaged position, the oil flow is stopped by the PTO clutch valve (1). When the PTO lever (3) is at the engaged position, the oil flows through the PTO clutch valve (1) to the PTO clutch pack (2) to engage it.

The relief valve (4) maintains the oil pressure and supplies the oil to lubricate the shuttle section, synchromesh gears, PTO hydraulic pack and PTO brake.

- |                      |                         |
|----------------------|-------------------------|
| (1) PTO Clutch Valve | (a) Pressure Port       |
| (2) PTO Clutch Pack  | (b) Pressure Check Port |
| (3) PTO Lever        | (c) Lubricating Port    |
| (4) Relief Valve     |                         |

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## [3] PTO CLUTCH VALVE



PTO clutch valve is composed of the following parts.

### (A) Main Relief Valve

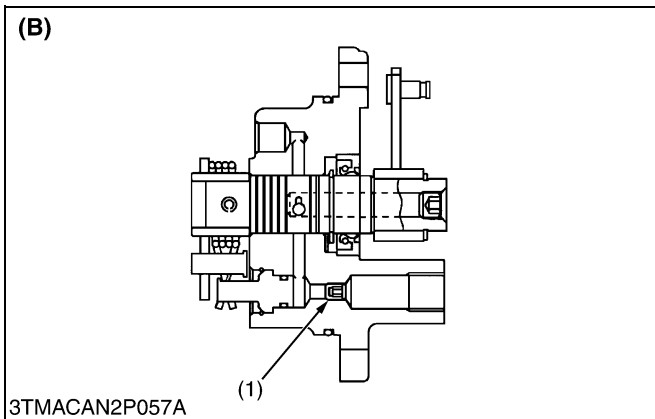
PTO clutch inner pressure is kept in approx. 2157.5 kPa (22.0 kgf/cm<sup>2</sup>, 313.1 psi) by the main relief valve.

### (B) Rotary Valve

This valve changes the oil flow to the PTO clutch. This is rotated by the PTO operation lever via the PTO clutch cable. The oil from the steering controller passes through the orifice (1) and flows to the PTO clutch.

- (1) Orifice

9Y1210365CLM0006US0



# SERVICING

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# 1. TROUBLESHOOTING

## TRAVELLING CLUTCH

Symptom	Probable Cause	Solution	Reference Page
<b>Clutch Drags</b>	Clutch pedal free travel excessive	Adjust	2-S5
	Dust on clutch disc generated from clutch disc facing	Remove rust	2-S9
	Release fork broken	Replace	2-S10
	Clutch disc or pressure plate warped	Replace	2-S9, 2-S18
	Pressure plate worn	Replace (Pressure plate assembly)	2-S9
<b>Clutch Slips</b>	Clutch pedal free travel too small	Adjust	2-S5
	Clutch disc excessively worn	Replace	2-S9, 2-S18
	Grease or oil on clutch disc facing	Replace	2-S9
	Clutch disc or pressure plate warped	Replace	2-S9, 2-S18
	Diaphragm spring weaken or broken	Replace	2-S9
	Pressure plate worn	Replace (Pressure plate assembly)	2-S9
<b>Chattering</b>	Grease or oil on clutch disc facing	Replace	2-S9
	Clutch disc or pressure plate warped	Replace	2-S9, 2-S18
	Clutch disc boss spline worn or rusted	Replace or remove rust	2-S18
	Gear shaft bent	Replace	–
	Pressure plate or flywheel face cracked or scored	Replace	2-S9
	Clutch disc boss spline and gear shaft spline worn	Replace	2-S18
	Diaphragm spring strength uneven or diaphragm spring broken	Replace	2-S9
<b>Rattle During Running</b>	Clutch disc boss spline worn	Replace	2-S18
	Release bearing worn or sticking	Replace	2-S18
<b>Clutch Squeaks</b>	Release bearing sticking or dry	Replace or lubricate	2-S18
	Clutch disc excessively worn	Replace	2-S9, 2-S18
<b>Vibration</b>	Gear shaft bent	Replace	–
	Clutch disc rivet worn or broken	Replace	2-S9, 2-S18
	Clutch parts broken	Replace	–

**PTO CLUTCH**

<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>	<b>Reference Page</b>
<b>PTO Clutch Slip</b>	Operating pressure is low	Adjust	2-S6
	PTO clutch valve malfunctioning	Repair or replace	2-S10
	Clutch disc or drive plate excessively worn	Replace	2-S11, 2-S16, 2-S19
	Deformation of piston or return plate	Replace	2-S16
<b>PTO Shaft Does Not Rotate</b>	PTO clutch malfunctioning	Repair or replace	2-S16
	PTO propeller shaft coupling disengaged	Engage	–
<b>PTO Clutch Operating Pressure Is Low</b>	Transmission fluid improper or insufficient	Replenish or change	G-10
	Relief valve malfunctioning	Adjust or replace	2-S6
<b>PTO Clutch Drags</b>	Brake plate excessively worn	Replace	–
	Return spring weaken or broken	Replace	2-S20
	Deformation or return plate or steel plate	Replace	2-S16

9Y1210365CLS0001US0

## 2. SERVICING SPECIFICATIONS

### TRAVELLING CLUTCH

Item		Factory Specification	Allowable Limit
Clutch Pedal	Free Travel	35 to 45 mm 1.4 to 1.7 in.	–
Clutch Pedal	Total Stroke	165 to 170 mm 6.50 to 6.69 in.	–
Clutch Pedal Shaft to Clutch Pedal Bushing	Clearance	0.0250 to 0.185 mm 0.000985 to 0.00728 in.	1.00 mm 0.0394 in.
• Clutch Pedal Shaft	O.D.	27.900 to 27.975 mm 1.0985 to 1.1013 in.	–
• Clutch Pedal Bushing	I.D.	28.000 to 28.085 mm 1.1024 to 1.1057 in.	–
Clutch Disc Boss to Gear Shaft	Backlash (Displacement Around Disc Edge)	–	2.0 mm 0.079 in.
Clutch Disc	Disc Surface to Rivet Top (Depth)	–	0.3 mm 0.01 in.
Diaphragm Spring	Mutual Difference	–	0.5 mm 0.02 in.
Pressure Plate	Flatness	–	0.2 mm 0.008 in.

### PTO CLUTCH

Item		Factory Specification	Allowable Limit
PTO Clutch Valve <b>Condition</b> • Engine Speed Maximum • Oil temperature 45 to 55 °C (113 to 131 °F)	Relief Valve Setting Pressure	2.36 to 2.54 MPa 24.0 to 26.0 kgf/cm <sup>2</sup> 342 to 369 psi	–
PTO Clutch Disc	Thickness	1.70 to 1.90 mm 0.0670 to 0.0748 in.	1.55 mm 0.0610 in.
PTO Steel Plate	Thickness	1.15 to 1.25 mm 0.0453 to 0.0492 in.	1.1 mm 0.043 in.
PTO Piston	Flatness	–	0.15 mm 0.0059 in.
PTO Steel Plate	Flatness	–	0.30 mm 0.01 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 0.799 in.	18 mm 0.71 in.
Seal Ring	Thickness	2.45 to 2.50 mm 0.0965 to 0.0984 in.	2.0 mm 0.079 in.

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### 3. TIGHTENING TORQUES

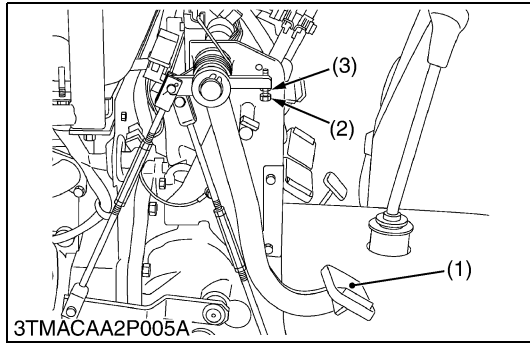
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

Item	N·m	kgf·m	lbf·ft
Clutch mounting screw	24 to 27	2.4 to 2.8	18 to 20
Release fork setting screw	167 to 191	17.0 to 19.5	123 to 141
PTO clutch control valve mounting screw	24 to 27	2.4 to 2.8	18 to 20
Rear wheel mounting nut	260 to 304	26.5 to 31.0	192 to 224
ROPS under frame mounting bolt and nut (M6, 9T)	260 to 304	26.5 to 31.0	192 to 224
Clutch housing and transmission case mounting screw, nut (M12, grade 11 nut)	103 to 117	10.5 to 12.0	76.0 to 86.7
Clutch housing and transmission case mounting screw, nut (M12, grade 7 screw, nut)	78 to 90	7.9 to 9.2	58 to 66
Clutch housing and transmission case mounting screw, nut (M10, grade 9 screw)	61 to 70	6.2 to 7.2	45 to 52
Transmission upper cover mounting screw	24 to 27	2.4 to 2.8	18 to 20
PTO clutch case bearing holder mounting screw	24 to 27	2.4 to 2.8	18 to 20
Brake plate mounting screw	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31

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## 4. CHECKING AND ADJUSTMENT

### [1] TRAVELING CLUTCH



#### Clutch Pedal Stroke

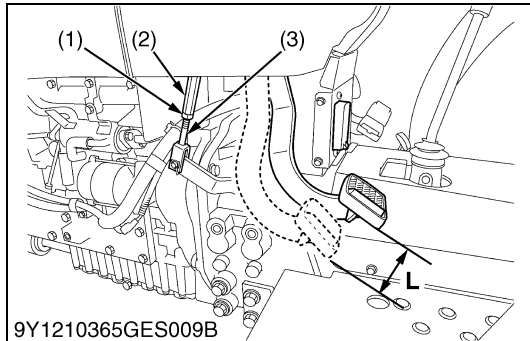
1. Measure the clutch pedal (1) total stroke.
2. If the measurement is not within the factory specifications, adjust it.
3. After adjustment, tighten the lock nut (3) firmly.
4. Check the pedal total stroke.

Total stroke	Factory spec.	165 to 170 mm 6.50 to 6.69 in.

- (1) Clutch Pedal  
(2) Adjusting Bolt

(3) Lock Nut

9Y1210365CLS0004US0



#### Clutch Peal Free Travel

1. Stop the engine and remove the key.
2. Slightly depress the clutch pedal and measure free travel "L" at top of pedal.
3. If adjustment is needed, loosen the lock nut (1), and turn the turnbuckle (2) to adjust the clutch rod (3) length.
4. Retighten the lock nut (1).

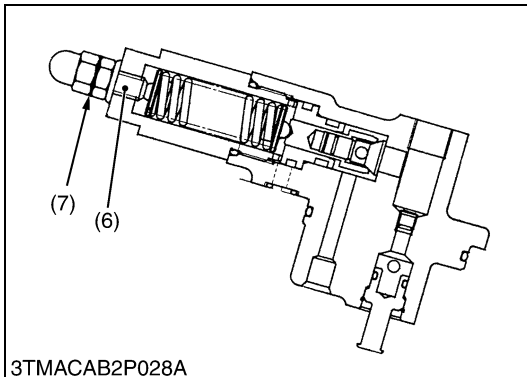
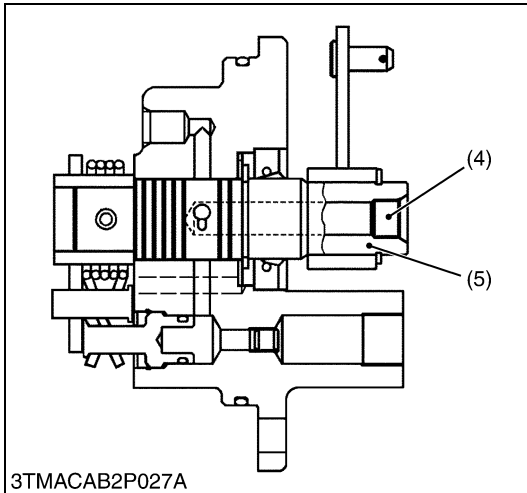
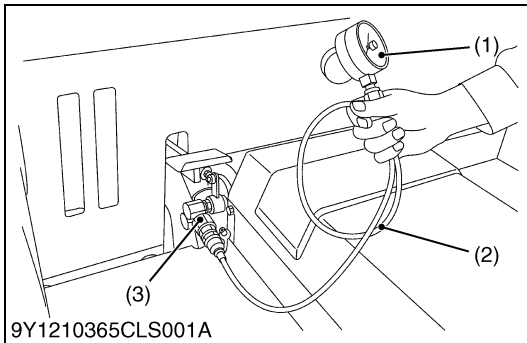
Clutch pedal free travel "L" on the pedal	Factory spec.	35 to 45 mm 1.4 to 1.7 in.

- (1) Lock Nut  
(2) Turnbuckle

(3) Clutch Rod

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## [2] PTO CLUTCH



### Relief Valve Setting Pressure

1. Start the engine and warm up the transmission fluid, and then stop the engine.
2. Remove the plug (4) (PT 1/8) on the PTO valve spool (5).
3. Set the adaptor (PT 1/8) (Use the oil pressure tester for diesel engines. Code No. 07916-32032, adaptor 7), threaded joint (3), cable (2) and pressure gauge (1).
4. Start the engine and set the engine speed maximum.
5. Move the PTO clutch lever to the **"ON"** position, and measure the pressure.
6. If only the pressure in the PTO clutch engaged position is low, check the hydraulic PTO clutch system.
7. If the measurement is not within the factory specifications, loosen the lock nut (7) and turn the screw (6) to adjust.

### ■ IMPORTANT

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

PTO pressure (When PTO shift lever is "Engaged" position)	Factory spec.	2.36 to 2.54 MPa 24.0 to 26.0 kgf/cm <sup>2</sup> 342 to 369 psi
PTO pressure (When PTO shift lever is "Dis-engaged" position)	Factory spec.	No pressure

### Condition

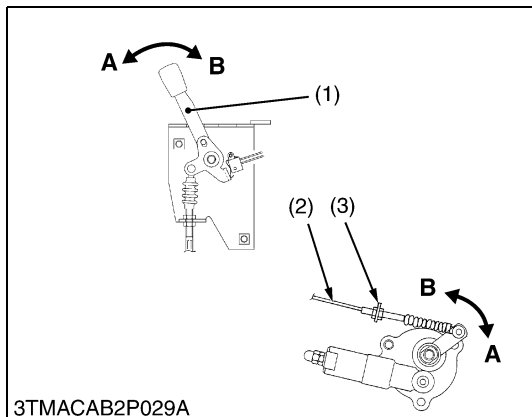
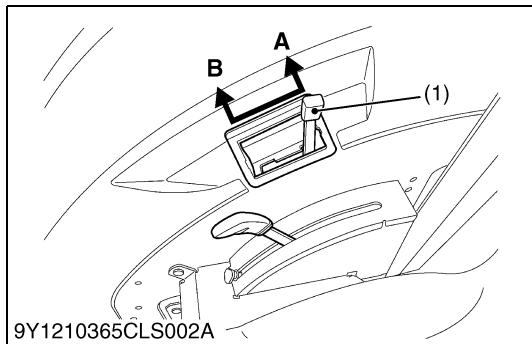
- Engine speed  
Maximum
- Oil temperature  
45 to 55 °C (113 to 131 °F)

### (Reference)

- Turn the screw (6) to clockwise direction → Pressure increase
- Turn the screw (6) to counterclockwise direction → Pressure decrease

- |                    |              |
|--------------------|--------------|
| (1) Pressure Gauge | (5) Spool    |
| (2) Cable          | (6) Screw    |
| (3) Threaded Joint | (7) Lock Nut |
| (4) Plug (PT 1/8)  |              |

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### PTO Clutch Lever Movement

1. Stop the engine and remove the key.
2. Check the PTO clutch lever (1) on the "ON" and "OFF" position of PTO clutch lever guide.
3. If adjustment is needed, loosen the lock nuts (3) and adjust the clutch control cable (2) length.
4. Retighten the lock nuts (3) firmly.

#### ■ IMPORTANT

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

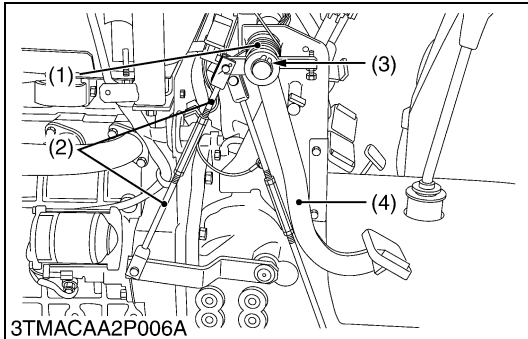
- |                          |         |
|--------------------------|---------|
| (1) PTO Clutch Lever     | A : OFF |
| (2) Clutch Control Cable | B : ON  |
| (3) Lock Nut             |         |

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## 5. DISASSEMBLING AND ASSEMBLING

### [1] TRAVELING CLUTCH

#### (1) Separating Engine from Clutch Housing Case



#### Clutch Pedal and Shaft

1. Remove the bonnet and rear bonnet.
2. Remove the clevis pin at the end of clutch rod (2).
3. Remove the external snap ring (3).
4. Remove the clutch pedal (4).

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

- Apply the grease to the clutch pedal bush and pedal shaft.

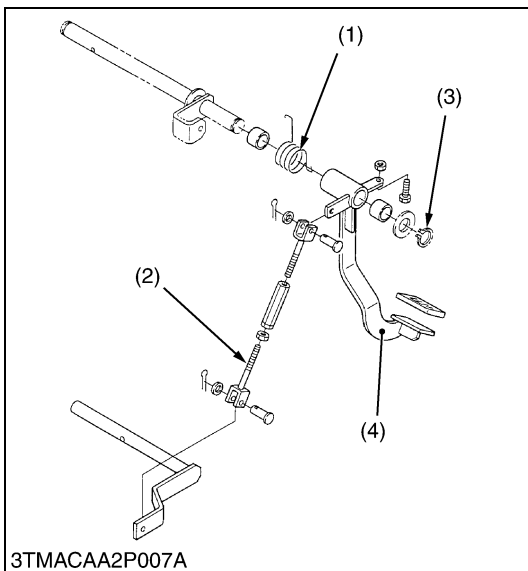
#### ■ **IMPORTANT**

- **After reassembling the clutch pedal, be sure to adjust the clutch pedal free travel.**

- (1) Return Spring  
(2) Clutch Rod

- (3) External Snap Ring  
(4) Clutch Pedal

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#### Separating Engine from Clutch Housing

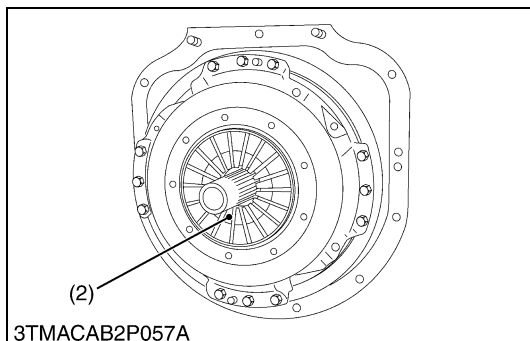
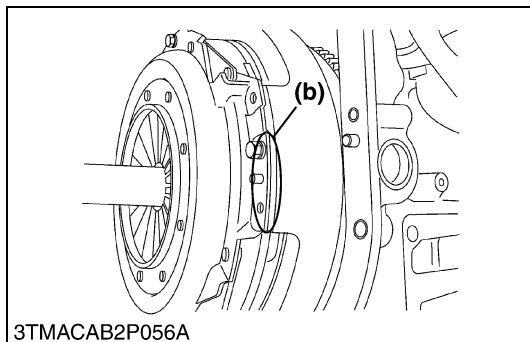
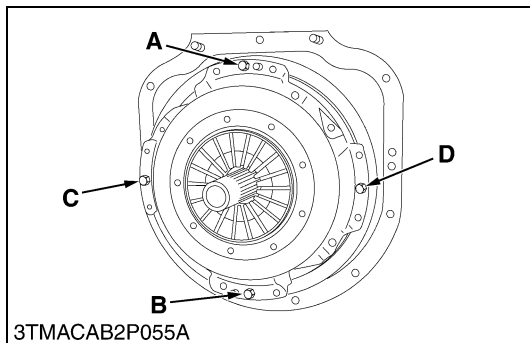
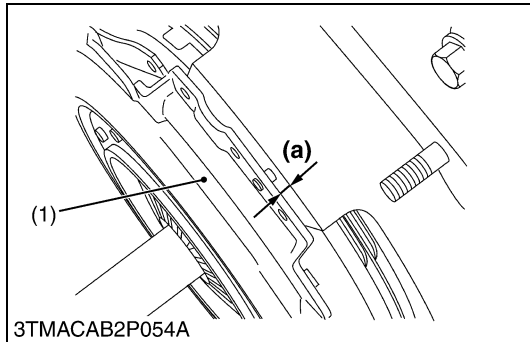
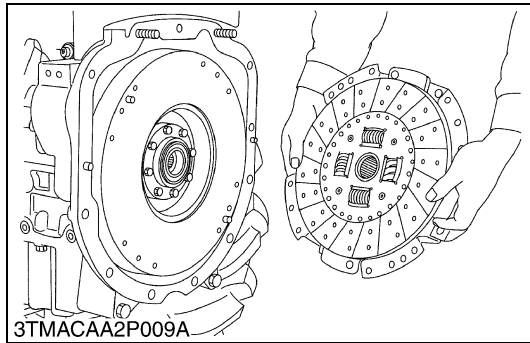
1. Refer to the "[1] SEPARATING ENGINE FROM CLUTCH HOUSING CASE" at "1. ENGINE" section.

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## (2) Removing Clutch



### Removing Clutch

1. Remove the clutch from the flywheel.

#### (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.
- Install the pressure plate, noting the position of straight pins.
- When the clutch cover (1) is mounted, there is a clearance (a) between the clutch cover (1) and the flywheel mounting face.
- Tighten the four screws "A", "B", "C" and "D" until the clutch cover comes into contact with the flywheel mounting face. Tighten the screws evenly three times in the order of "A-B-C-D" until no clearance (b) is left.
- Tighten all the other screws evenly in diagonal order.
- Tighten all the screws to their specified torques.
- Make sure that the height of diaphragm hooks spring (2) is uniform. If not, repeat steps 2, 3 and 4.

#### ■ IMPORTANT

- Align the center of disc and flywheel by inserting the clutch center tool.

#### ■ NOTE

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

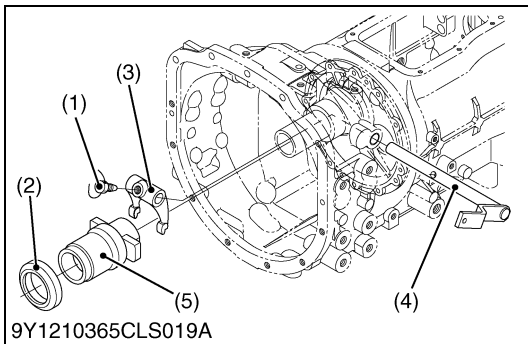
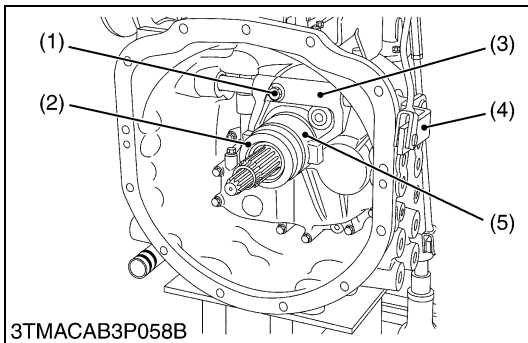
Tightening torque	Clutch mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

- (1) Clutch Cover  
(2) Diaphragm Spring

- (a) Clearance  
(b) No Clearance

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### (3) Release Holder and Clutch Lever



#### Release Holder and Clutch Lever

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

#### (When reassembling)

- Make sure the direction of the release fork (3) is correct.
- Inject grease to the release holder (5).
- Apply grease to the bushing and clutch lever.
- After tightening the release fork setting screw to the specified torque, insert a wire through the hole on the setting screw head and bind with release fork together.

Tightening torque	Release fork setting screw	167 to 191 N·m 17.0 to 19.5 kgf·m 123 to 141 lbf·ft
-------------------	----------------------------	---

- |                     |                    |
|---------------------|--------------------|
| (1) Setting Screw   | (4) Clutch Lever   |
| (2) Release Bearing | (5) Release Holder |
| (3) Release Fork    |                    |

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## [2] PTO CLUTCH

### (1) Removing PTO Clutch Valve



#### Rear Wheel

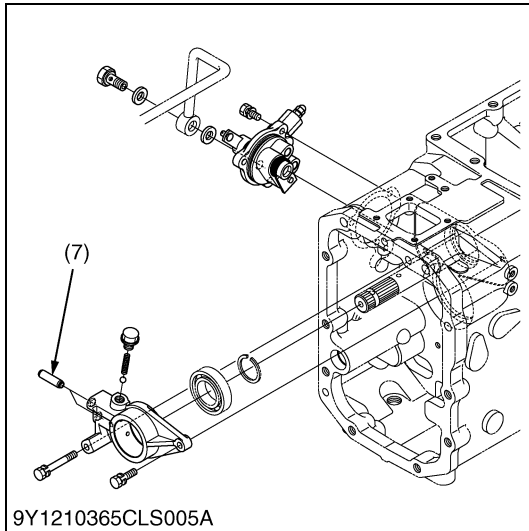
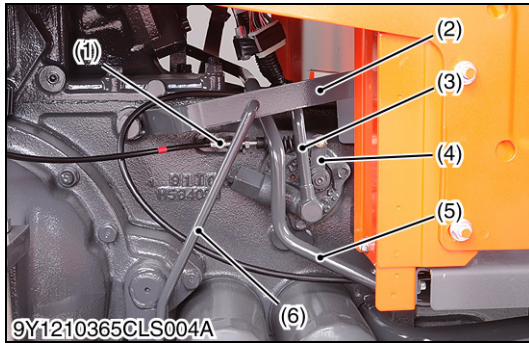
1. Place the disassembling stand under the transmission case and install the front axle rocking resister (refer to the "8. SPECIAL TOOLS" at "G. GENERAL" section).
2. Remove the rear wheel R.H. (1).

#### (When reassembling)

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
-------------------	-------------------------	---

- (1) Rear Wheel R.H.

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**Removing PTO Clutch Valve**

1. Disconnect the PTO delivery pipe (3).
2. Remove the differential lock rod (6).
3. Disconnect the PTO clutch wire cable (1) at PTO valve side.
4. Remove the PTO clutch valve (4).

**(When reassembling)**

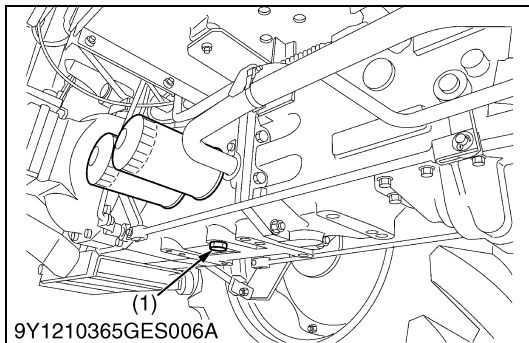
- Apply grease to the O-ring.
- Take care not to damage the O-ring.
- Replace the oil pipes (7) with new ones.
- Apply transmission oil to oil pipes (7).

Tightening torque	PTO clutch control valve mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
-------------------	---	---

- |                             |                           |
|-----------------------------|---------------------------|
| (1) PTO Clutch Wire Cable   | (5) 3P-Delivery Pipe      |
| (2) Differential Lock Pedal | (6) Differential Lock Rod |
| (3) PTO Delivery Pipe       | (7) Oil Pipe              |
| (4) PTO Clutch Valve        |                           |

9Y1210365CLS0012US0

**[3] PTO CLUTCH PACK**  
**(1) Separating Transmission Case**



**Draining Transmission Fluid**

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

**(When reassembling)**

- Fill up from filling port after removing the filling plug until reaching the gauge.
- After running the engine for a few minutes, stop it and check the fluid level again, add fluid to prescribed level if it is not correct level.

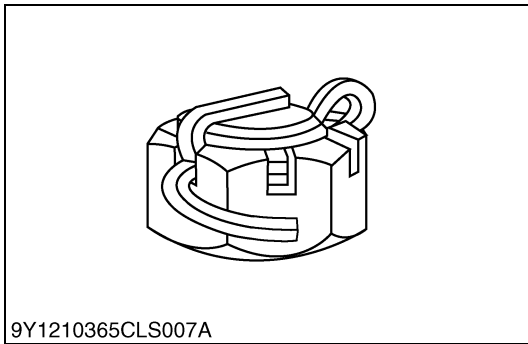
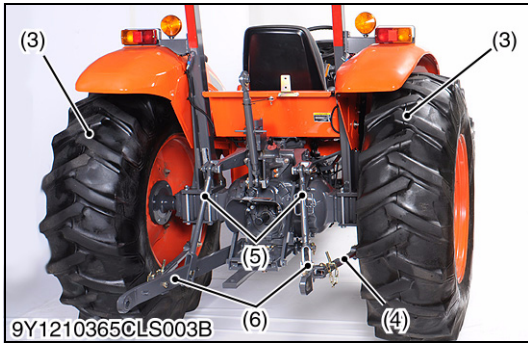
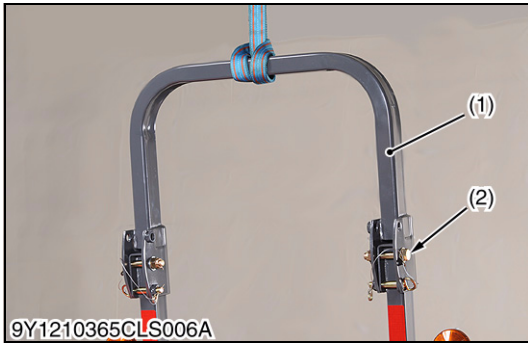
Transmission fluid	Capacity	40.0 L 42.3 U.S.qts 35.2 Imp.qts
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**■ IMPORTANT**

- Use only KUBOTA SUPER UDT fluid. Use of other fluids may damage the transmission or hydraulic system.
- Refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.
- Do not mix different brands fluid together.

(1) Drain Plug

9Y1210365CLS0015US0



**ROPS Upper and Rear Wheels**

1. Place the disassembling stand under the clutch housing case and transmission case.
2. Install the front axle rocking resister (refer to the "8. SPECIAL TOOLS" at "G. GENERAL" section).
3. Remove the lift rod (5), lower link (6) and stabilizer (4).
4. Remove the ROPS upper frame (1).
5. Remove the rear wheels (3).

**(When reassembling)**

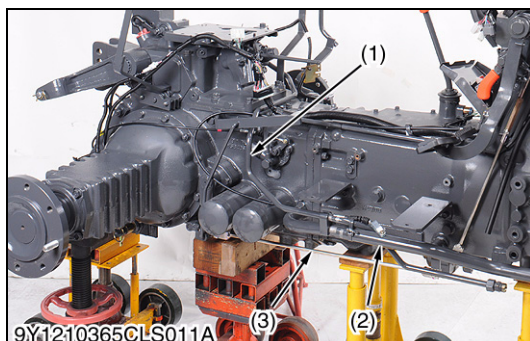
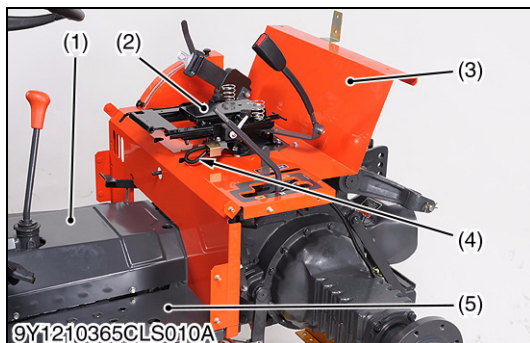
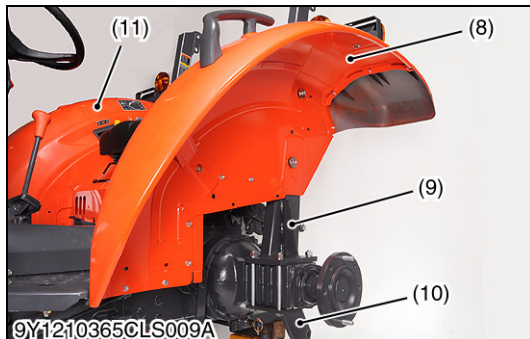
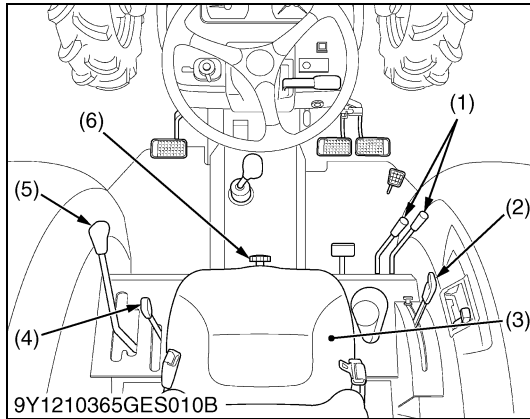
- After tighten the ROPS mounting bolt (2) and nut, install the cotter pin as shown in the figure.
- Tighten the ROPS upper frame mounting bolts and nuts so that the ROPS upper frame (1) does not fall down when the ROPS upper frame (1) positioned at horizontal.

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
-------------------	-------------------------	---

- |                        |                |
|------------------------|----------------|
| (1) ROPS Upper Frame   | (4) Stabilizer |
| (2) ROPS Mounting Bolt | (5) Lift Rod   |
| (3) Rear Wheel         | (6) Lower Link |

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### Seat, Fender and ROPS Under Frame

1. Remove the seat (3).
2. Remove the position control lever grips (2).
3. Remove the auxiliary speed change lever grip (5), DT shift lever grip (4) and 3-point hitch lowering speed control grip (6).
4. Remove the auxiliary control valve lever assembly (1).
5. Remove the center frame screws (7).
6. Disconnect the connector for rear combination lamp.
7. Remove the fender L.H. (8).
8. Remove the PTO lever cover from the fender R.H. (10) and disconnect the connectors for PTO switch.
9. Remove the fender R.H. (11).
10. Remove the ROPS under frames (9) and bracket (10).

### (When reassembling)

Tightening torque	ROPS under frame mounting bolt and nut (M16, 9T)	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
-------------------	--	---

- |   |                        |
|---|------------------------|
| (1) Auxiliary Control Lever                   | (7) Center Frame Screw |
| (2) Position Control Lever Grip               | (8) Fender L.H.        |
| (3) Seat                                      | (9) ROPS Under Frame   |
| (4) DT Shift Lever Grip                       | (10) Bracket           |
| (5) Auxiliary Speed Change Lever Grip         | (11) Fender R.H.       |
| (6) 3-Point Hitch Lowering Speed Control Grip |                        |

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### Seat Stay, Center Frame and Step

1. Disconnect the wire harness (4) from seat switch.
2. Remove the seat stay (2).
3. Remove the center frame (3).
4. Remove the cover (1) and step (5) for both side.

- |                  |                  |
|------------------|------------------|
| (1) Cover        | (4) Wire Harness |
| (2) Seat Stay    | (5) Step         |
| (3) Center Frame |                  |

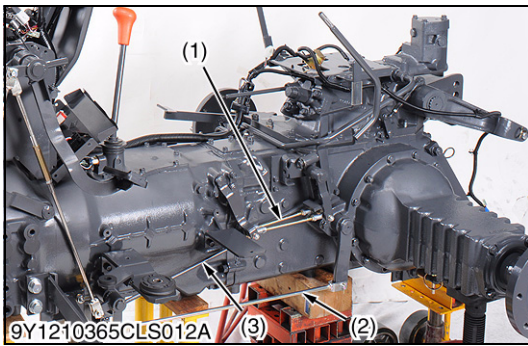
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### Hydraulic Pipes

1. Remove the suction pipe (2).
2. Remove the delivery pipe (1) for the three point hydraulic system.
3. Remove the brake rod (3).

- |                   |               |
|-------------------|---------------|
| (1) Delivery Pipe | (3) Brake Rod |
| (2) Suction Pipe  |               |

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**Auxiliary Shift Lever and Brake Rod**

1. Disconnect the shift rods (1).
2. Remove the brake rods (2).
3. Remove the DT rod (3).

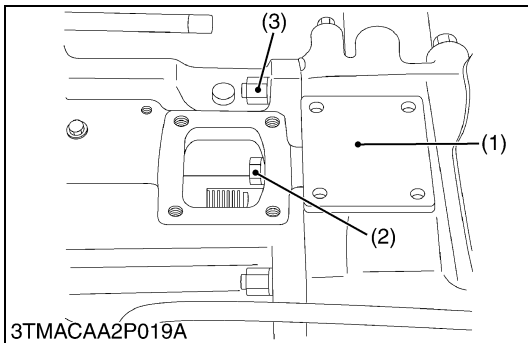
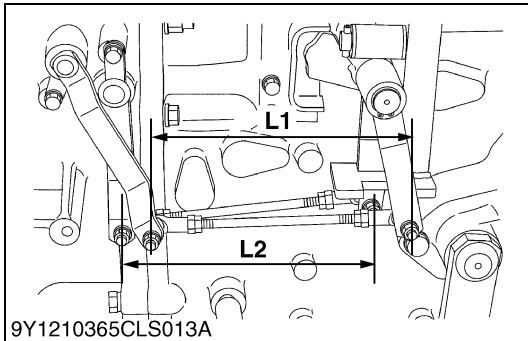
**(When reassembling)**

- Be sure to adjusting the shift rod.

Shift rod length L1 and L2	Factory spec.	Approx. 209 mm 8.23 in.
----------------------------	---------------	-------------------------------

- (1) Shift Rod (3) DT Rod  
(2) Brake Rod

9Y1210365CLS0017US0



**Separating Transmission Case**

1. Remove the transmission upper cover (1).
2. Remove the transmission case mounting screws and nut, and separate the transmission case from the clutch housing.

**(When reassembling)**

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the transmission case and clutch housing, transmission upper cover and transmission case.

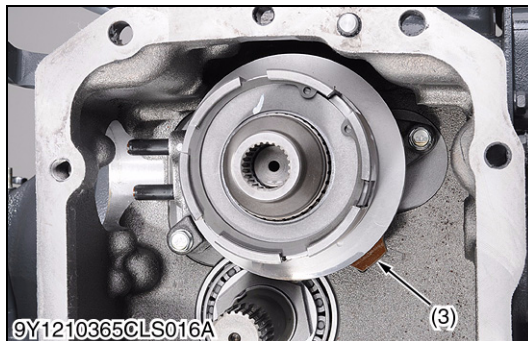
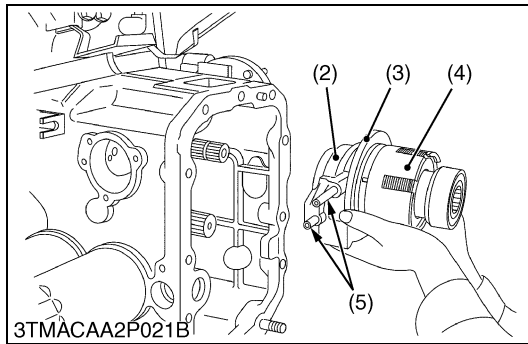
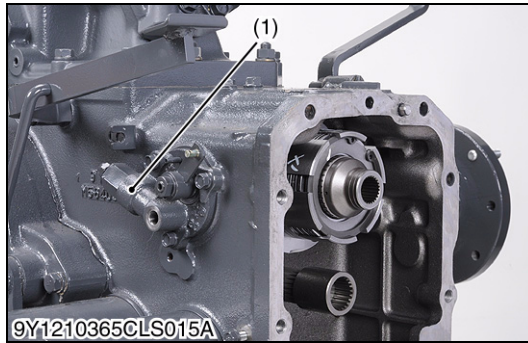


Tightening torque	Transmission case and clutch housing mounting screw, nut	M12, grade 11 nut (3)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft
		M12, grade 7 screw, nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
		M10, grade 9 screw (2)	61 to 70 N·m 6.2 to 7.2 kgf·m 45 to 52 lbf·ft
	Transmission upper cover mounting screw		24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

- (1) Transmission Upper Cover (3) Transmission Case Mounting Nut  
(2) Transmission Case Mounting Screw

9Y1210365CLS0018US0

## (2) Removing PTO Clutch



### PTO Clutch Valve, PTO Clutch and Holder

1. Remove the PTO clutch valve (1).
2. Remove the PTO clutch pack (4) with holder (2).

#### (When reassembling)

- Apply transmission fluid to the O-ring.
- Remove the two oil pipes (5) from the PTO clutch holder.
- Insert both the hydraulic pipes into the PTO clutch valve holes down to the bottom.
- Now while aligning the hydraulic pipe ends with the PTO clutch holder holes, assemble the PTO clutch valve (1) to the transmission case.

Tightening torque	PTO clutch valve mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	PTO clutch case bearing holder mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

#### ■ IMPORTANT

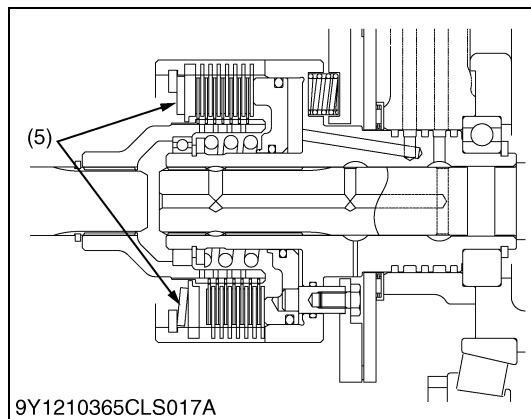
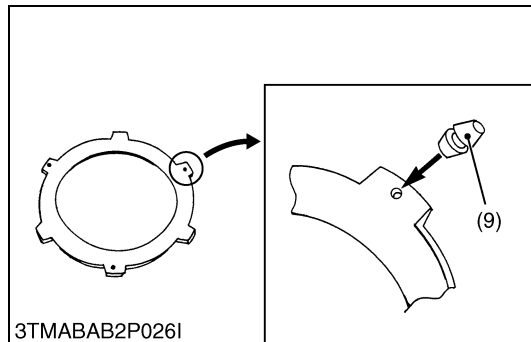
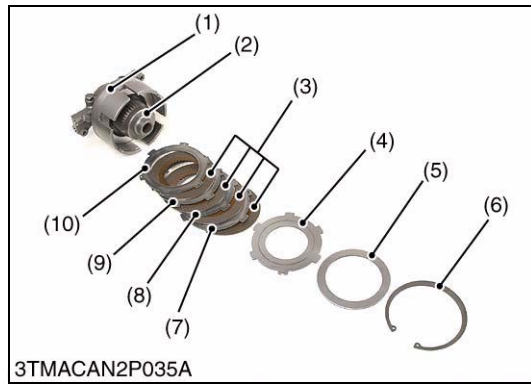
- **When reassembling the PTO clutch assembly, direct the projection part of brake plate (3) as a figure.**
- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-blowing.**

- |                      |                     |
|----------------------|---------------------|
| (1) PTO Clutch Valve | (4) PTO Clutch Pack |
| (2) Holder           | (5) Oil Pipe        |
| (3) Brake Plate      |                     |

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### (3) Disassembling PTO Clutch Pack

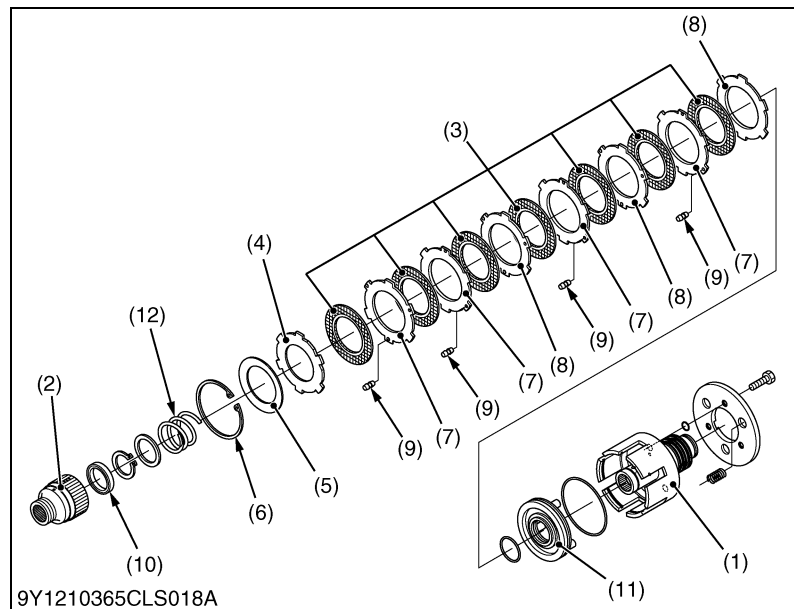


#### Clutch Hub and Clutch Discs

1. Remove the internal circlip (6), and then take out the clutch discs (3), belleville washer (cupped spring washer) (5), back plate (4), steel plates (7), (8), and the hub (2).

#### (When reassembling)

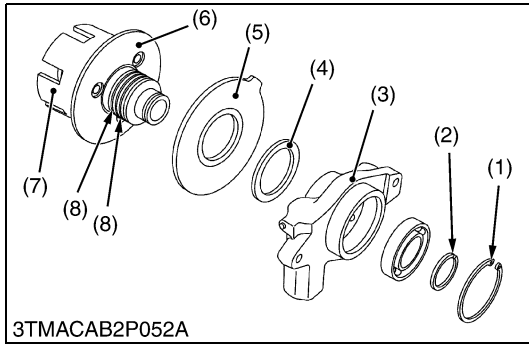
- Install the clutch discs (3) and steel plates (7), (8) alternately. (Refer to figure below.)
- Do not confuse the two types steel plates. The steel plates with the plug rubbers (7), and without plug rubbers (8).
- Do not confuse the back plate (4) and steel plates. The back plate (4) is thicker than the steel plates.
- Assemble the plug rubbers portion of the two steel plates for back plate side are same positions while assembling them. (Refer to figure below.)
- Apply enough transmission fluid to the discs (3).
- Confirm the moving of the piston (11) 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 photo.)
- Assemble the steel plates with rubber (7) and steel plates without rubber (8) alternately, and steel plates are built in so that the part of rubber is not corresponding to the part of the hole.
- Be sure to assemble the belleville washer (cupped spring washer) (5) as shown in the figure.



- |  |  |
|--|--|
| (1) Clutch Case                              | (7) Steel Plate (With Plug Rubbers)    |
| (2) Hub (Hydraulic Shuttle Model)            | (8) Steel Plate (Without Plug Rubbers) |
| (3) Clutch Discs                             | (9) Plug Rubber                        |
| (4) Back Plate                               | (10) Bearing                           |
| (5) Belleville Washer (Cupped Spring Washer) | (11) Piston                            |
| (6) Internal Circlip                         | (12) Spring                            |

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**Clutch Case**

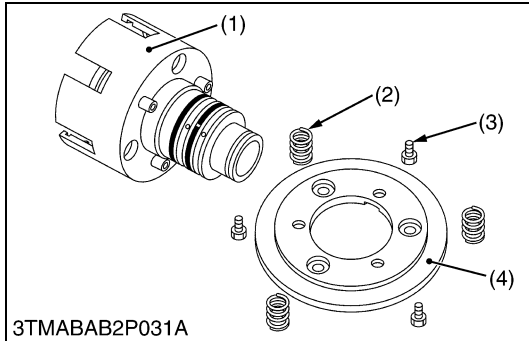
1. Remove the internal snap ring (1).
2. Remove the external snap ring (2).
3. Remove the clutch case (7) and brake disc (5).

**(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   |

9Y1210365CLS0019US0



**Brake Plate**

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

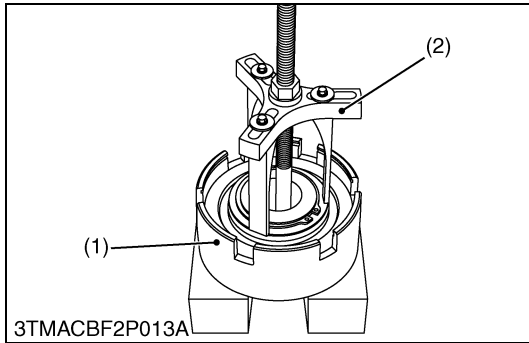
**(When reassembling)**

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

Tightening torque	Brake plate mounting screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
-------------------	----------------------------	---

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

9Y1210365CLS0020US0



**Piston**

1. Press the washer (6) using the hydraulic clutch spring compressor. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. Remove the external circlip (7).
3. Remove the piston (4).

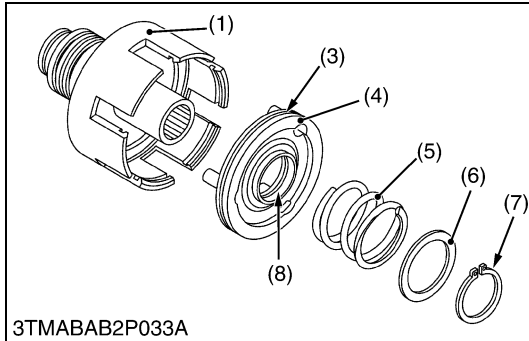
**(When reassembling)**

- Apply enough transmission fluid to seal ring (3) and (7).

- |                 |                        |
|-----------------|------------------------|
| (1) Clutch Case | (6) Washer             |
| (2) Jig         | (7) External Snap Ring |
| (3) Seal Ring   | (8) Seal Ring          |
| (4) Piston      |                        |
| (5) Spring      |                        |

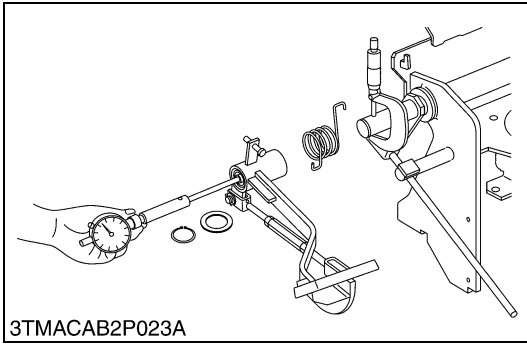
**A : 41 mm (1.6 in.)**

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## 6. SERVICING

### [1] TRAVELLING CLUTCH



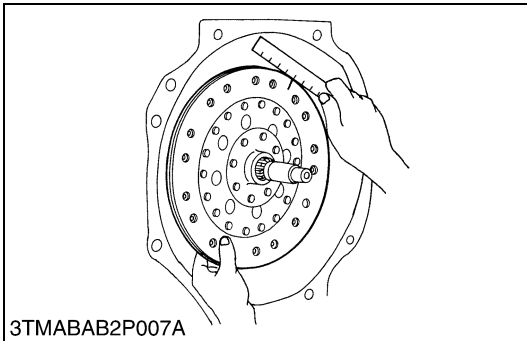
#### Clearance between Clutch Pedal Shaft and Pedal Bushing

1. Measure the clutch pedal shaft O.D. with an outside micrometer.
2. Measure the clutch pedal bushing I.D. with a cylinder gauge.
3. Calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between clutch pedal shaft and pedal bushing	Factory spec.	0.0250 to 0.185 mm 0.000985 to 0.00728 in.
	Allowable limit	1.00 mm 0.0394 in.

Clutch pedal shaft O.D.	Factory spec.	27.900 to 27.975 mm 1.0985 to 1.1013 in
Clutch pedal bushing I.D.	Factory spec.	28.000 to 28.085 mm 1.1024 to 1.1057 in.

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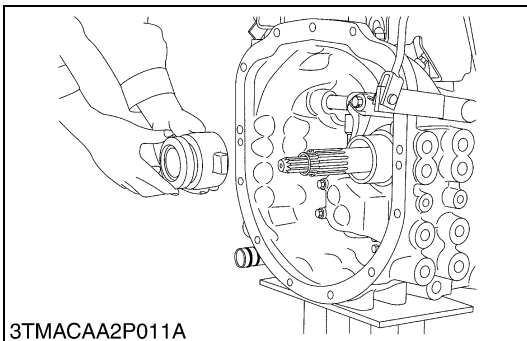


#### Backlash between Clutch Disc Boss and Shaft

1. Mount the clutch disc to the gear shaft.
2. Hold the 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.

Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.
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9Y1210365CLS0022US0



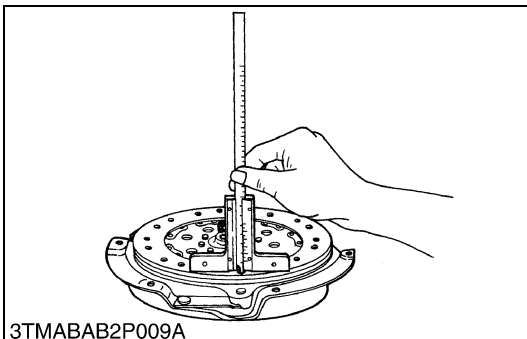
#### Release Bearing

1. Check for abnormal wear on contact surface.
2. Rotate 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 bearing outer race, when replacing release bearing.
- Do not wash the release bearing with a cleaning solvent.

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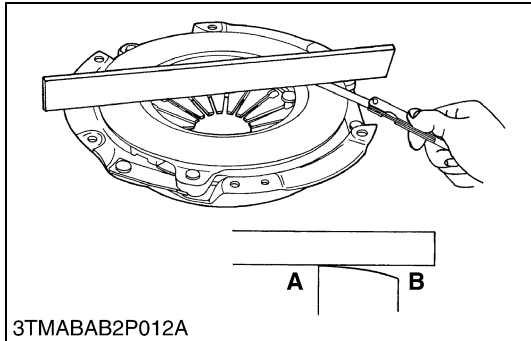
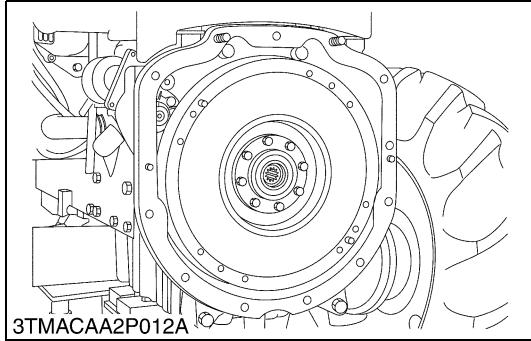
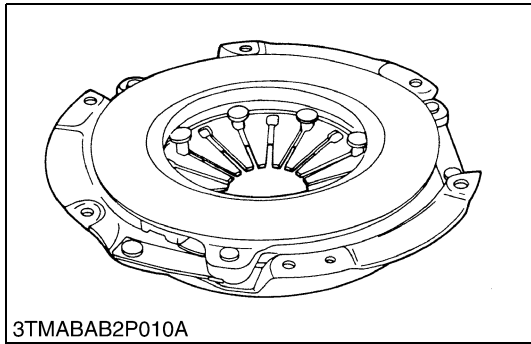


#### Clutch Disc Wear

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	0.3 mm 0.01 in.
-----------------------------------	-----------------	--------------------

9Y1210365CLS0024US0



**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 0.02 in.
------------------------------------	-----------------	--------------------

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**Pressure Plate Flatness**

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

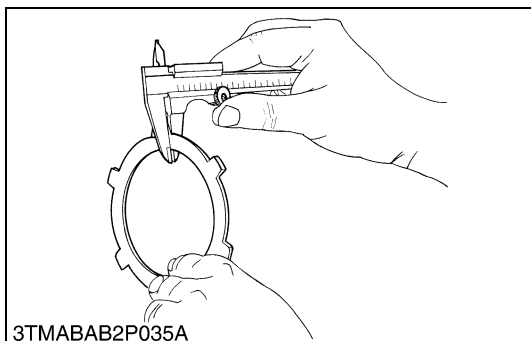
Clearance between pressure plate and straightedge	Allowable limit	0.2 mm 0.008 in.
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A : Inside

B : Outside

9Y1210365CLS0026US0

**[2] PTO CLUTCH**

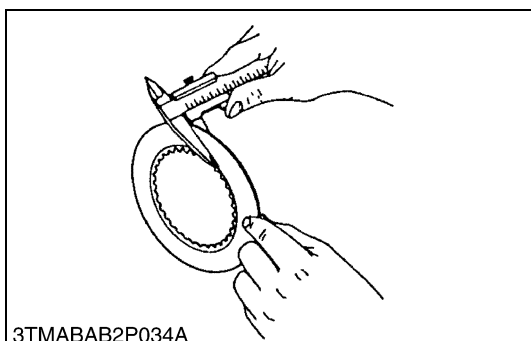


**PTO Steel Plate Wear**

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

Thickness of PTO steel plate	Factory spec.	1.15 to 1.25 mm 0.0453 to 0.0492 in.
	Allowable limit	1.1 mm 0.043 in.

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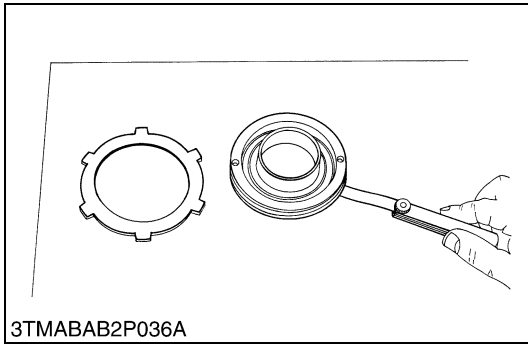


**PTO Clutch Disc Wear**

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

Thickness of PTO clutch disc	Factory spec.	1.70 to 1.90 mm 0.0670 to 0.0748 in.
	Allowable limit	1.55 mm 0.0610 in.

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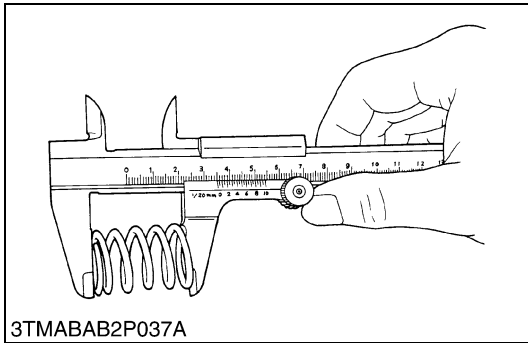
**Flatness of PTO Piston and PTO Steel Plate**

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 0.0059 in.
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Flatness of PTO steel plate	Allowable limit	0.30 mm 0.01 in.
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9Y1210365CLS0028US0



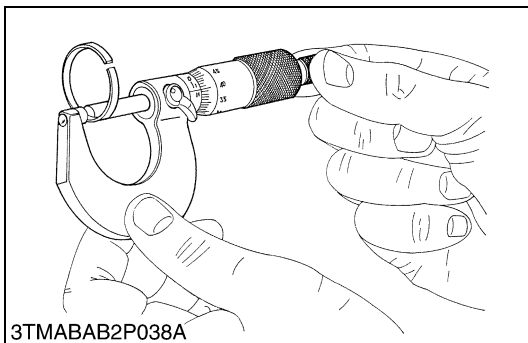
**Piston Return Spring Free Length**

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 0.799 in.
	Allowable limit	18 mm 0.71 in.

9Y1210365CLS0029US0



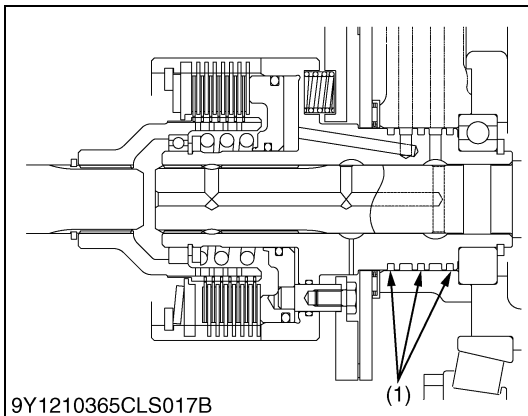
**Thickness of Seal Ring**

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 0.0965 to 0.0984 in.
	Allowable limit	2.0 mm 0.0079 in.

(1) Seal Ring

9Y1210365CLS0030US0



# **3 TRANSMISSION**

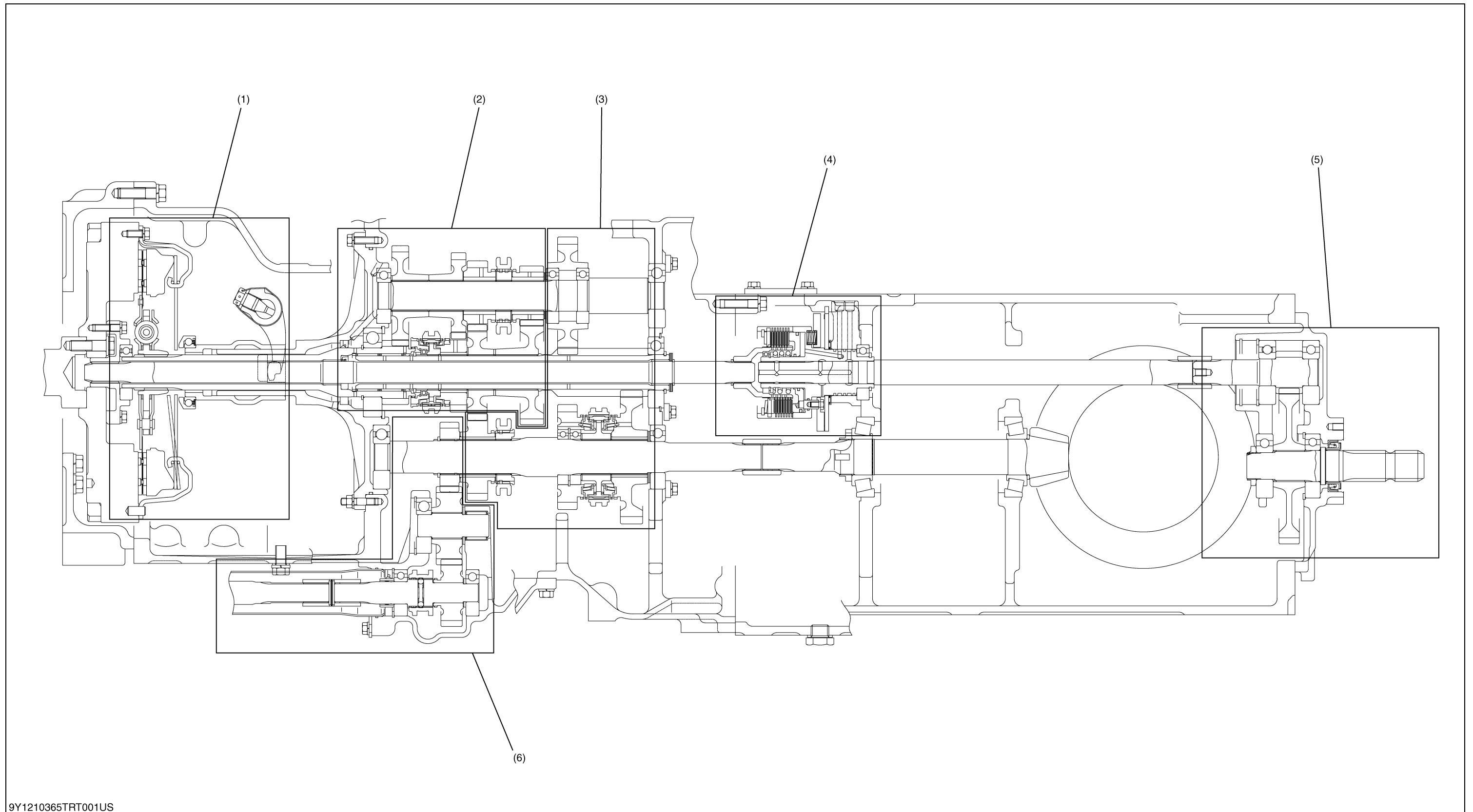
# MECHANISM

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1. STRUCTURE.....	3-M1
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[3] HI-RANGE SHIFT SECTION.....	3-M5
[4] SHIFT LINKAGE MECHANISM.....	3-M6
[5] FOUR WHEEL DRIVE SECTION.....	3-M7
3. PTO SYSTEM.....	3-M8

# 1. STRUCTURE

## [1] 4WD MODEL



9Y1210365TRT001US

(1) Clutch Section

(2) Main Gear Shift Section

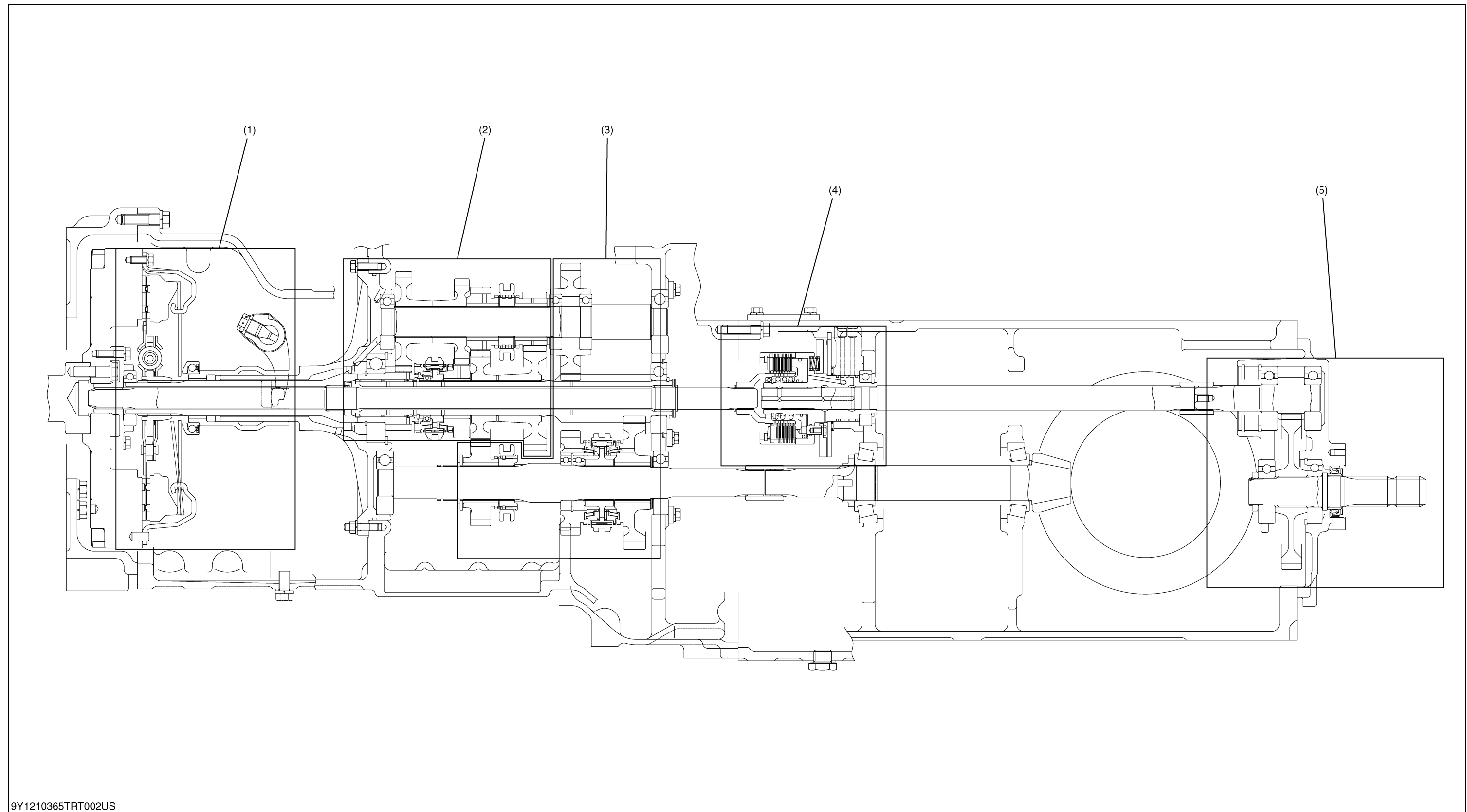
(3) Auxiliary Change (H, R-L) Section

(4) PTO Clutch

(5) PTO Gear Section

(6) Front Drive Section

[2] 2WD MODEL



9Y1210365TRT002US

(1) Clutch Section

(2) Main Gear Shift Section

(3) Auxiliary Change (H, R-L) Section

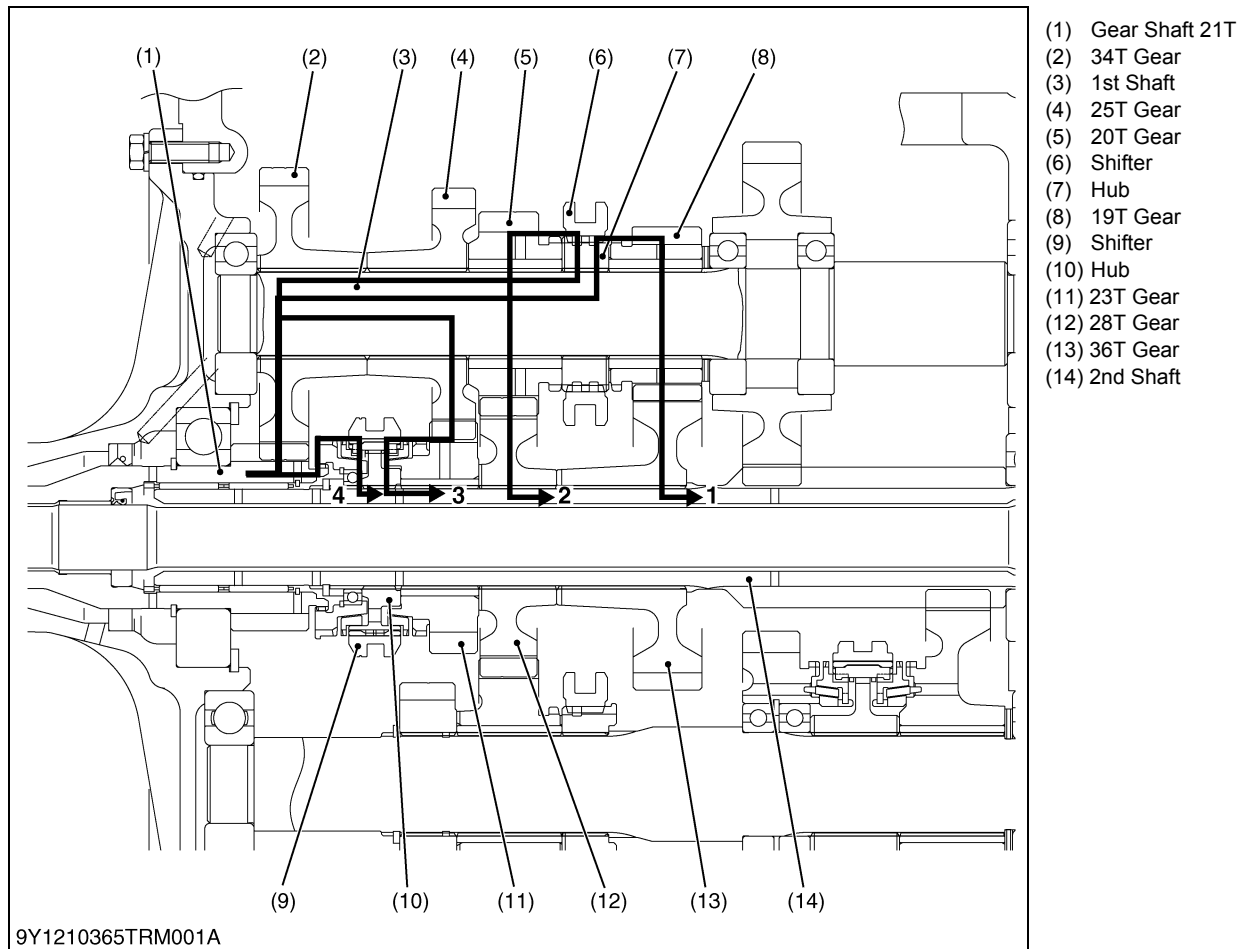
(4) PTO Clutch

(5) PTO Gear Section



## 2. TRAVELING SYSTEM

### [1] MAIN GEAR SHIFT SECTION



The main shift section uses a synchromesh and constant-mesh type transmission.

The power which is transmitted from the engine to the gear shaft (1) via the clutch is changed in four ways by operating the main shift lever to shift the shifters, and transmits to the 2nd shaft (14).

The power is transmitted as follows.

#### 1) 1st Speed

Gear Shaft 21T (1) → 34T Gear (2) → 1st Shaft (3) → Hub (7) → Shifter (6) → 19T Gear (8) → 36T Gear (13) → 2nd Shaft (14).

#### 2) 2nd Speed

Gear Shaft 21T (1) → 34T Gear (2) → 1st Shaft (3) → Hub (7) → Shifter (6) → 20T Gear (5) → 28T Gear (12) → 2nd Shaft (14).

#### 3) 3rd Speed

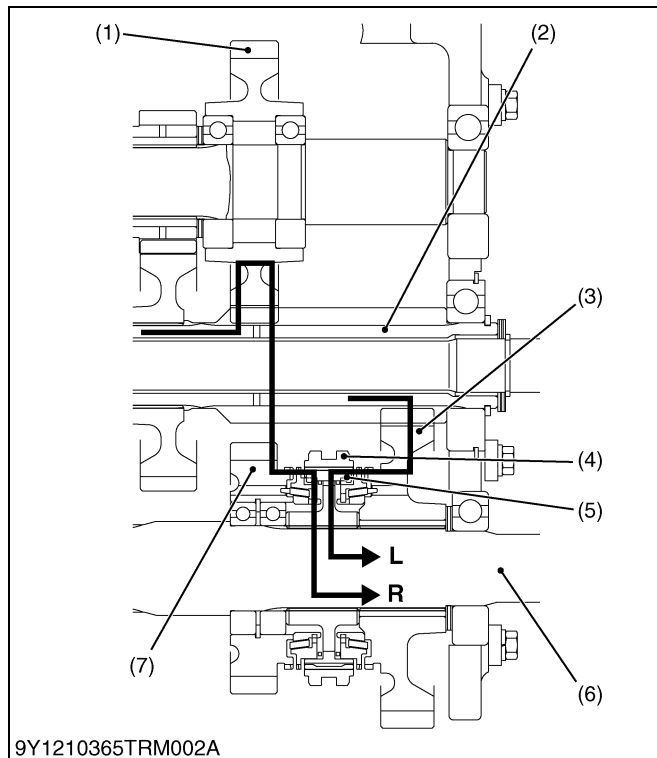
Gear Shaft 21T (1) → 34T Gear (2) → 1st Shaft (3) → 25T Gear (4) → 23T Gear (11) → Shifter (9) → Hub (10) → 2nd Shaft (14).

#### 4) 4th Speed

Gear Shaft 21T (1) → Shifter (9) → Hub (10) → 2nd Shaft (14).

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## [2] SHUTTLE SHIFT SECTION (LOW-REVERSE)



### Shuttle Shift Section

The shuttle shift section allows the operators to change forward and reverse with a auxiliary speed change lever. It is used synchromesh type gear shift.

It also operates as a reduction until when shifting from forward to reverse.

When the auxiliary speed change lever is move to the **L** or **R** position, the shifter (4) is slid to the rear or front by the mechanical linkage to be engaged with the 32T (7) or 41T gear (3).

Then, the power is transmitted to the 3rd shaft (6).

The power is transmitted as follows.

#### **L : Low (Forward)**

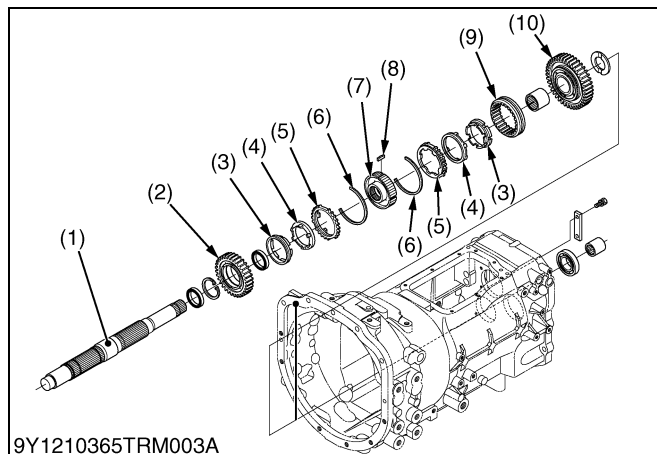
13T Gear (2) → 41T Gear (3) → Shifter (4) → Hub (5) → 3rd Shaft (6).

#### **R : Reverse**

13T Gear (2) → 35T Gear (1) → 32T Gear (7) → Shifter (4) → Hub (5) → 3rd Shaft (6).

- |                                |                          |
|--------------------------------|--------------------------|
| (1) 35T Gear                   | (6) 3rd Shaft            |
| (2) 13T Gear Shaft (2nd Shaft) | (7) 32T Gear             |
| (3) 41T Gear                   |                          |
| (4) Shifter                    | <b>L : Low (Forward)</b> |
| (5) Hub                        | <b>R : Reverse</b>       |

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### Synchromesh (Double Corn Type)

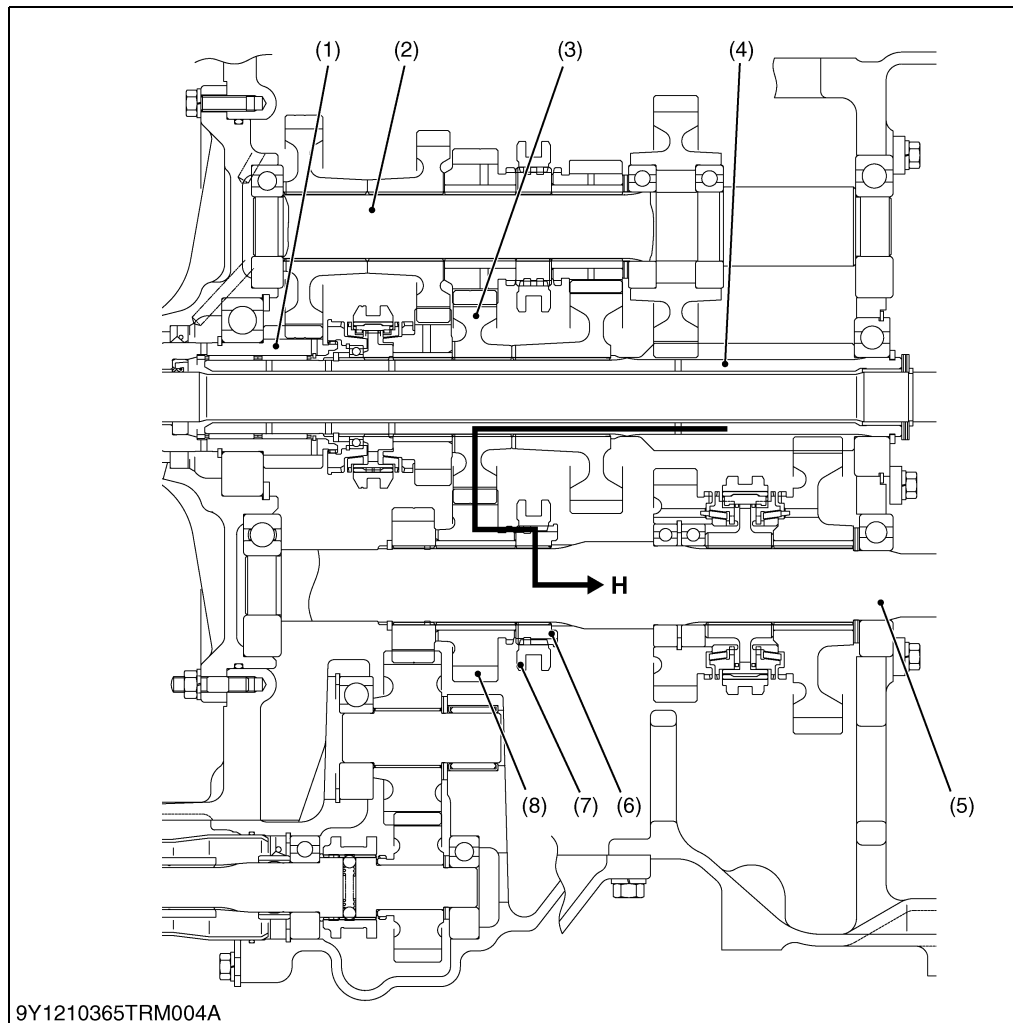
The double corn type synchromesh is characterized by its light operating force and durability because it engages with the gear in reverse rotation when the speed is changed from forward to reverse position or vice versa.

Two synchronizing rings (3) and (5) are installed on one side, and the center ring (4) is provided between the synchronizing rings. This construction doubles the and improves the durability as compared with the ordinary key type synchromesh.

- |                             |                         |
|-----------------------------|-------------------------|
| (1) 3rd Shaft               | (6) Synchronizer Spring |
| (2) 32T Gear                | (7) Hub                 |
| (3) Outer Synchronizer Ring | (8) Synchronizer Key    |
| (4) Center Ring             | (9) Shifter             |
| (5) Inner Synchronizer Ring | (10) 41T Gear           |

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### [3] HI-RANGE SHIFT SECTION



- (1) 21T Gear Shaft
- (2) 1st Shaft
- (3) 28T Gear
- (4) 2nd Shaft
- (5) 3rd Shaft
- (6) Hub
- (7) Shifter
- (8) 24T Gear

9Y1210365TRM004A

The Hi-Range shift section allows the operator to change Hi with an auxiliary speed change lever.

When the auxiliary speed change lever is move to the Hi position. The shifter (6) is slide to the front by mechanical linkage to be engaged with the 24T gear (8).

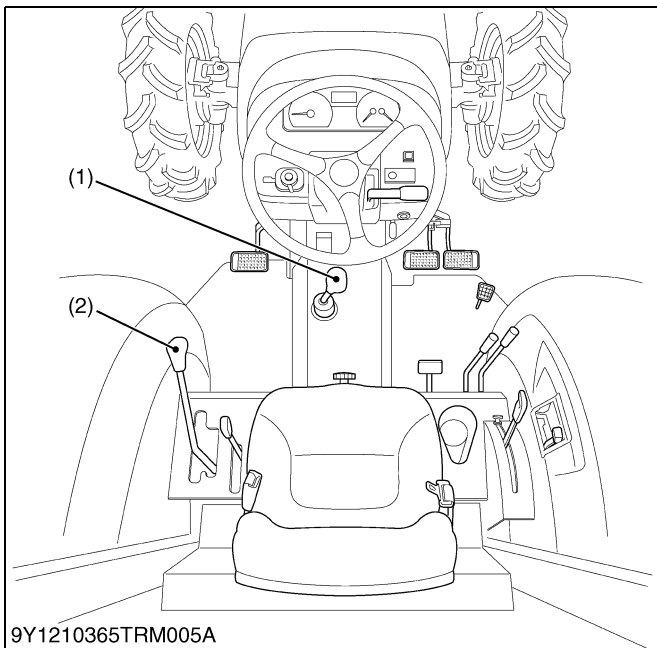
Then, power is transmitted as follows.

#### **H : Hi-Range**

2nd Shaft (4) → 28T Gear (3) → 24T Gear (8) → Shifter (7) → Hub (6) → 3rd Shaft (5).

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# [4] SHIFT LINKAGE MECHANISM



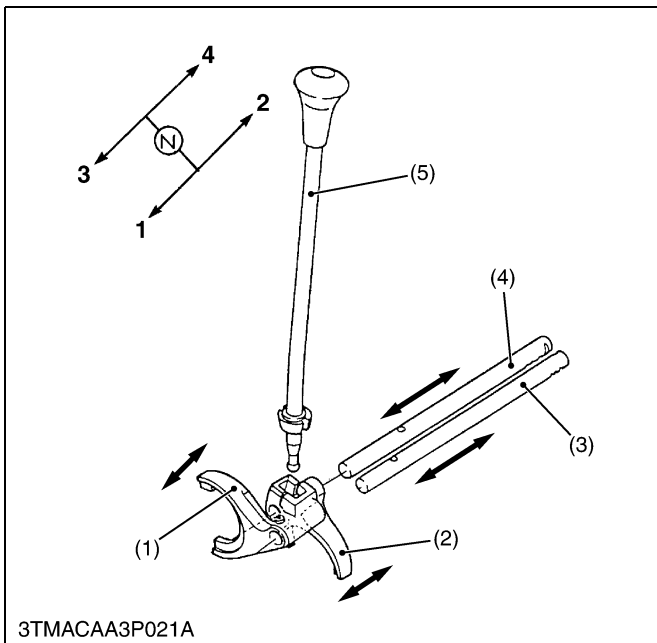
## Shift Levers

The main shift lever (1) is located on clutch housing case.

The auxiliary speed shift lever (2) is located left side of side of the seat.

- (1) Main Shift Lever
- (2) Auxiliary Speed Shift Lever

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## Main Gear Shift

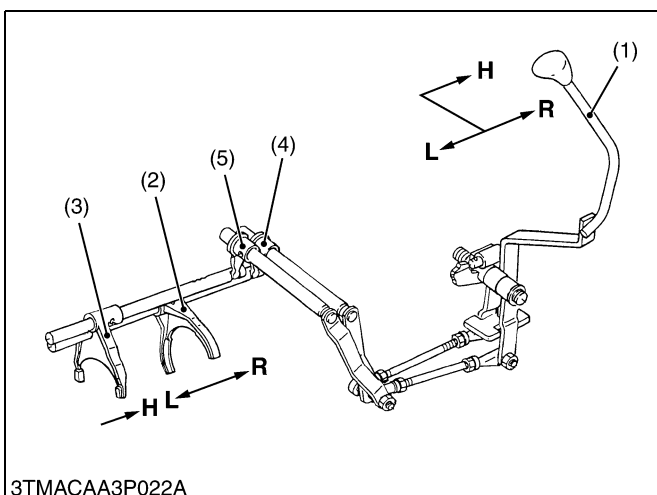
The links are connected from the shift lever (5) to the shift forks (1) and (2) as shown in the left figure. Each speed from the 1st to 4th can be change by shift lever (5).

When the shift lever (5) is move to the left, the shift lever is engaged with the 1-2 shift fork (1), allowing the operator to change the 1st or 2nd speed.

When the shift lever (5) is move to the right, the shift lever is engaged with the 3-4 shift fork (2), allowing the operator to change the 3rd or the 4th speed.

- (1) 1-2 Shift Fork
- (2) 3-4 Shift Fork
- (3) Shift Rod 1
- (4) Shift Rod 2
- (5) Shift Lever

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## Auxiliary Speed Shift Lever

The links from the shift lever (1) to the shift fork (2) and (3) are connected as shown in the left figure.

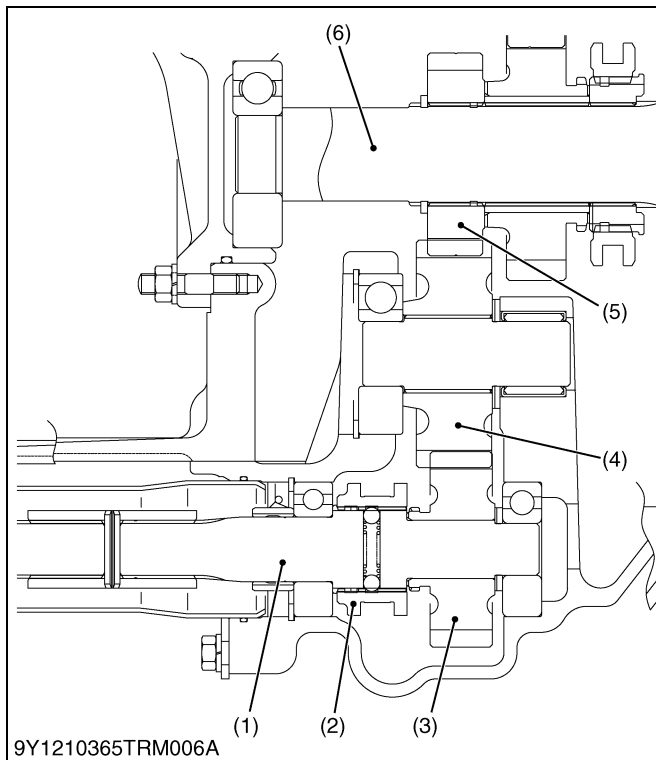
When the shift lever (1) is moved to the left, the shift arm (4) is engaged with the L-R shift fork (2), allowing the operator to change the Low speed or reverse speed.

When the shift lever (1) is moved to the right, the shift arm (5) is engaged with the H shift fork (3), allowing the operator to change the Hi speed.

- (1) Shift Lever
- (2) L-R Shift Fork
- (3) H Shift Fork
- (4) Shift Arm
- (5) Shift Arm

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## [5] FOUR WHEEL DRIVE SECTION



2 wheel drive or 4 wheel drive is selected by changing the position of shifter (2) on the propeller shaft 1 (1) using the front wheel drive lever.

When the front wheel drive lever is set to **"Disengaged"**, the shifter is in neutral and power is not transmitted to the propeller shaft 1 (1).

### ■ 4 Wheel Drive Engaged

3rd Shaft (6) → 23T Gear (5) → 25T Gear (4) → 21T Gear (3) → Shifter (2) → Propeller Shaft 1 (1).

- |                       |               |
|-----------------------|---------------|
| (1) Propeller Shaft 1 | (4) 25T Gear  |
| (2) Shifter           | (5) 23T Gear  |
| (3) 21T Gear          | (6) 3rd Shaft |

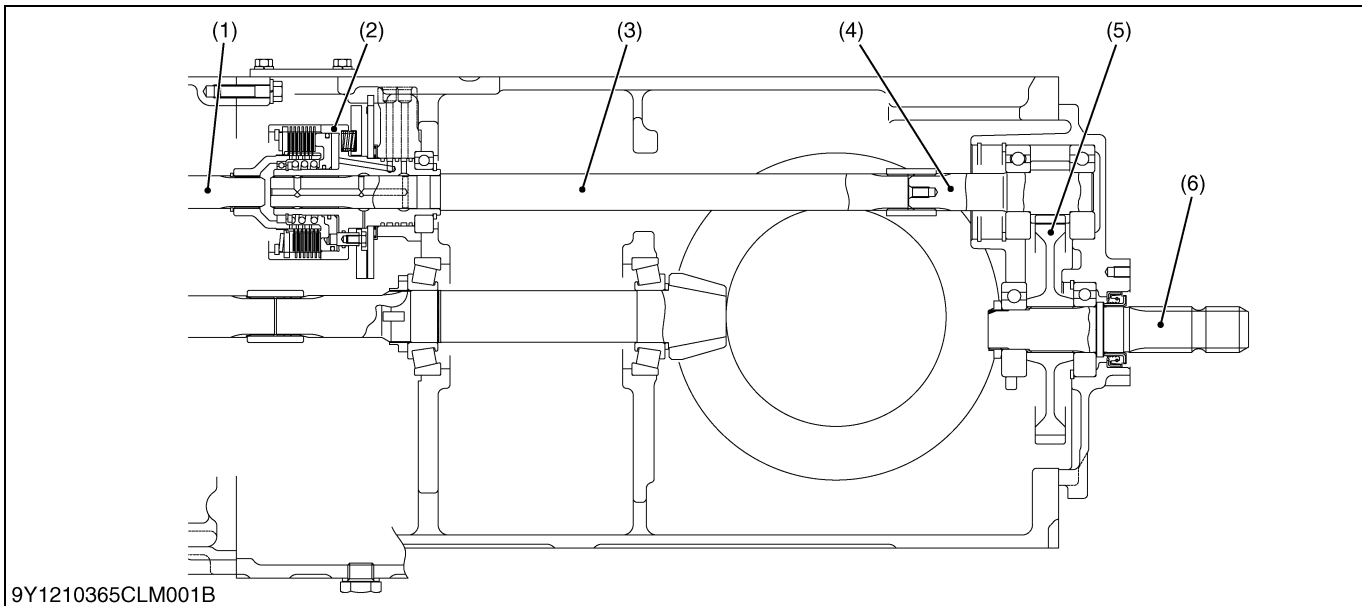
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### 3. PTO SYSTEM

All models have Live PTO's (Independent PTO's) which have their own clutch controls completely separate from the travelling clutch and transmission.

Therefore, the PTO can operate while the tractor is stopped and also the PTO can be disengaged and engaged while the tractor is in motion.

The PTO system offers  $540 \text{ min}^{-1}$  (rpm) on the rear PTO speed.



(1) PTO Propeller Shaft  
(2) PTO Clutch

(3) PTO Propeller Shaft 2  
(4) 12T Gear Shaft

(5) 51T Gear

(6) PTO Shaft

By operating the PTO clutch lever from **"OFF"** to **"ON"** position to engage the PTO clutch (2), the PTO propeller shaft (1) is connected to the gear shaft (3) through PTO propeller shaft 2 (3).

So the rotation of PTO propeller shaft (1) is transmitted to the gear shaft (3), the power is transmitted as follows.

PTO Propeller Shaft (1) → PTO Clutch (2) → PTO Propeller Shaft 2 (3) → 12T Gear Shaft (4) → 51T Gear (5) → PTO Shaft (6).

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# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Excessive Transmission Noise</b>	Transmission fluid insufficient	Replenish	G-10
	Improper backlash between bevel pinion shaft and bevel gear	Replace	3-S25
	Improper backlash between differential pinion and side gear	Adjust	3-S26
	Collars or shims have not been installed	Repair	3-S18
	Bearings worn	Replace	–
<b>Gears Slip Out of Mesh</b>	Shifter or shift fork worn or damaged	Replace	3-S8
	Shift fork spring weaken or damaged	Replace	3-S8
	Interlock ball fallen	Reassemble	3-S8
	Synchronizer unit damaged	Repair or replace	3-S11
<b>Hard Shifting</b>	Shifter or shift fork worn or damaged	Replace	3-S8
	Shift fork bent	Replace	3-S8
	Synchronizer unit damaged	Repair or replace	3-S11
<b>Gears Clash When Shifting</b>	Synchronizer unit damaged	Repair or replace	3-S11
	Clutch does not release	Adjust	2-S5
<b>Differential Lock Can Not Be Set</b>	Differential lock shift fork damaged	Replace	3-S17
	Differential lock shift fork mounting spring pin damaged	Replace	3-S17
	Movement of differential lock shifter improperly adjusted	Adjust	3-S18
<b>Differential Lock Pedal Does Not Return</b>	Differential lock cam spring weaken or damaged	Replace	3-S17
	Differential shifter pin damaged	Repair or replace	3-S17

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## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Shift Fork to Shifter Groove • 3rd-4th  • Other	Clearance	0.05 to 0.3 mm 0.062 to 0.01 in.	0.80 mm 0.031 in.
	Clearance	0.15 to 0.40 mm 0.0059 to 0.015 in.	0.80 mm 0.031 in.
Shift Rod	Length	Approx. 209 mm 8.23 in.	—
Spiral Bevel Pinion Shaft	Turning Torque	3.0 to 3.4 N·m 0.30 to 0.35 kgf·m 2.2 to 2.5 lbf·ft	—
Spiral Bevel Gear to Spiral Bevel Pinion Shaft	Backlash	0.20 to 0.30 mm 0.0079 to 0.011 in.	0.4 mm 0.02 in.
Differential Case Bore (Differential Case Cover Bore) to Differential Side Gear Boss  • Differential Case Bore  • Differential Case Cover Bore  • Differential Side Gear Boss	Clearance	0.0500 to 0.151 mm 0.00197 to 0.00594 in.	0.35 mm 0.014 in.
	I.D.	40.500 to 40.550 mm 1.5945 to 1.5964 in.	—
	I.D.	40.500 to 40.550 mm 1.5945 to 1.5964 in.	—
Differential Pinion Shaft to Differential Pinion  • Differential Pinion Shaft  • Differential Pinion	O.D.	40.388 to 40.450 mm 1.5901 to 1.5925 in.	—
	Clearance	0.060 to 0.102 mm 0.00237 to 0.00401 in.	0.25 mm 0.0098 in.
	O.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	—
Differential Pinion to Differential Side Gear	I.D.	20.040 to 20.061 mm 0.78898 to 0.78980 in.	—
	Backlash	0.15 to 0.30 mm 0.0059 to 0.011 in.	0.4 mm 0.02 in.
Differential Lock Shifter	Displacement	6.0 to 8.0 mm 0.24 to 0.31 in.	—

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### 3. TIGHTENING TORQUES

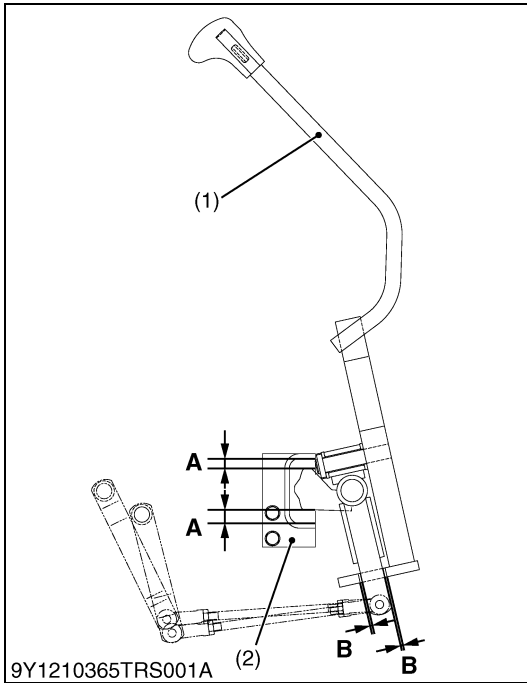
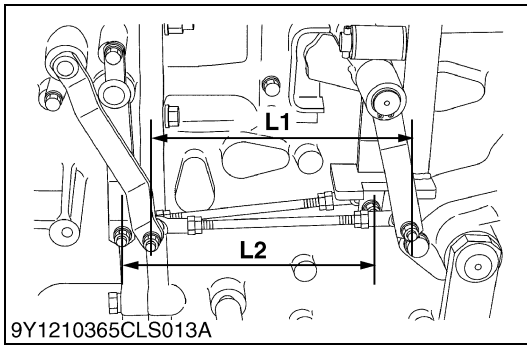
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

Item	N·m	kgf·m	lbf·ft
Steering support unit	78 to 90	7.9 to 9.2	58 to 66
Speed change cover mounting screw	24 to 27	2.4 to 2.8	18 to 20
Release fork setting screw	167 to 186	17.0 to 19.0	123 to 137
Bearing holder mounting screw and nut	24 to 27	2.4 to 2.8	18 to 20
Bearing retainer mounting screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
DT gear case mounting screw	48 to 55	4.9 to 5.7	36 to 41
Rear axle case mounting screw and nut	78 to 90	7.9 to 9.2	58 to 66
Hydraulic cylinder assembly mounting screw and nut	78 to 90	7.9 to 9.2	58 to 66
PTO gear case mounting screw and reamer screw	78 to 90	7.9 to 9.2	58 to 66
PTO shaft staking nut	226 to 264	23.0 to 27.0	167 to 195
Spiral bevel pinion shaft staking nut	118 to 127	12.0 to 13.0	86.8 to 94.0
Differential bearing support mounting screw	48 to 55	4.9 to 5.7	36 to 41
Differential case cover mounting screw	48 to 55	4.9 to 5.7	36 to 41
Spiral bevel gear UBS screw	71 to 90	7.2 to 9.2	52 to 66

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## 4. CHECKING AND ADJUSTING

### [1] AUXILIARY SHIFT LEVER



#### Checking Function of Auxiliary Shift

1. Check the function of the main gear shift.
  - Neutral position to H gear position.
  - Neutral position to L gear position.
  - Neutral position to R gear position.
  - Neutral position to L gear position.
2. If shifting is not smooth, check the length of shift rod **L1** and shift rod **L2**.
3. Set the auxiliary shift lever (1) to neutral position and check the clearance **A** at stopper (2) is same clearance. If the clearance **A** is not same, adjust the shift rod length.
4. Select the auxiliary shift lever to the R-L side, and check the clearance **B** is same clearance. If the clearance **B** is not same, adjust the shift rod for R-L length. And then adjust the shift rod length H side, so that the H side clearance **B** is same.

Shift rod length <b>L1</b> and <b>L2</b>	Factory spec.	Approx. 209 mm 8.23 in.
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(1) Auxiliary Shift Lever

(2) Stopper

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# 5. DISASSEMBLING AND ASSEMBLING

## [1] PREPARATION FOR SEPARATING ENGINE, CLUTCH HOUSING CASE AND TRANSMISSION CASE

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



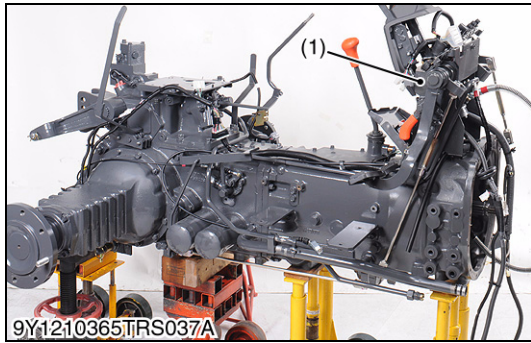
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#### Separating Engine from Clutch Housing and Panel Frame

1. Refer to the "[1] SEPARATING ENGINE FROM CLUTCH HOUSING CASE" at "1. ENGINE" section.

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### (2) Separating Clutch Housing Case and Transmission Case



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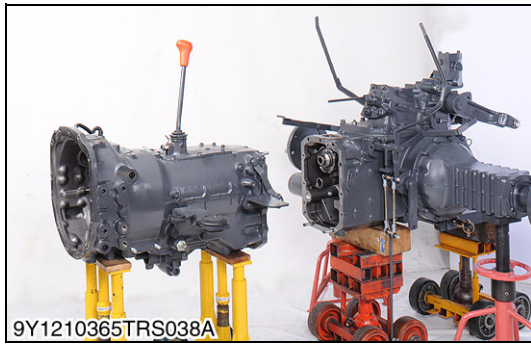
#### Separating Transmission Case

1. Refer to the "[3]-(1) Separating Transmission Case" at "2. CLUTCH" section.
2. Remove the steering support unit (1).

Tightening torque	Steering support unit mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
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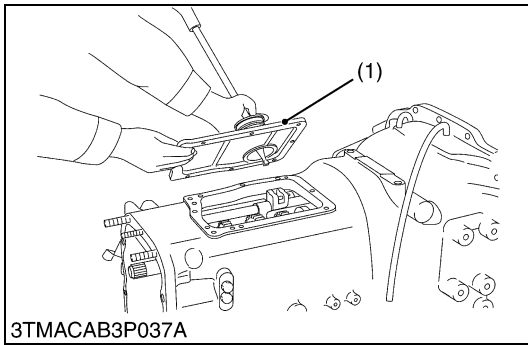
- (1) Steering Support Unit

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## [2] DISASSEMBLING CLUTCH HOUSING



### Speed Change Cover

1. Remove the speed change cover (1).
2. Remove the spring (2) and ball (3) using a magnet tool.

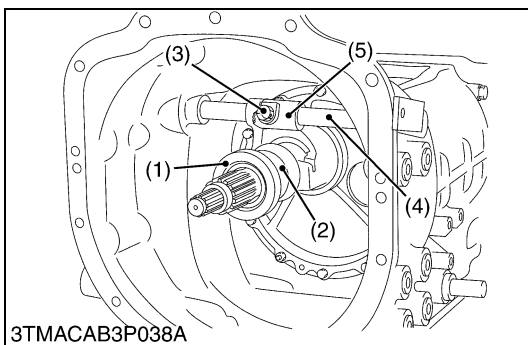
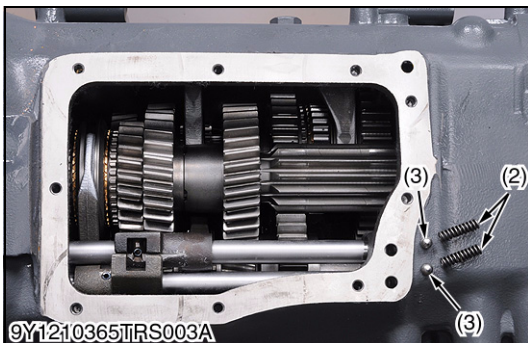
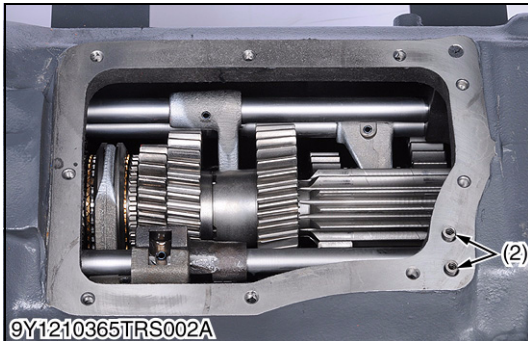
#### (When reassembling)

- When reassembling the speed change cover (1), set the shifter and fork in neutral position.
- Be sure to assemble the balls (3) and springs (2).
- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of speed change cover (1) and clutch housing.

Tightening torque	Speed change cover mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
-------------------	-----------------------------------	---

- (1) Speed Change Cover (3) Ball (Detent)  
(2) Spring

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### Clutch Release Bearing and Bearing Case

1. Remove the release bearing (1) and the release hub (2) together.
2. Remove the release fork setting screw (3).
3. Remove the control shaft (4) and the release fork (5).

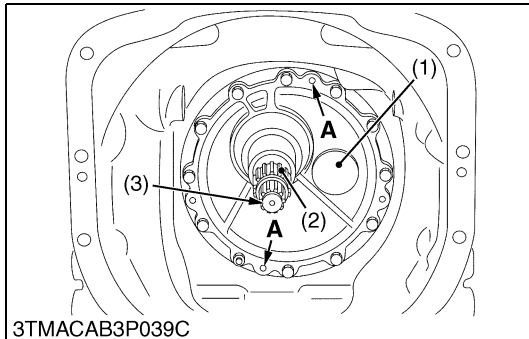
#### (When reassembling)

- After tightening the release fork setting screw (3) to the specified torque, insert a wire through the holes of the setting screw head and release fork.
- Apply grease to the sliding surface of the clutch release hub.
- Apply grease to the bushing of control shaft.

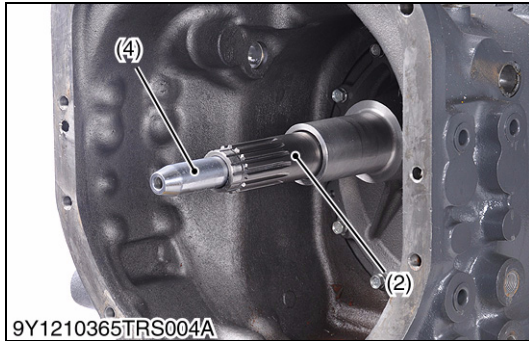
Tightening torque	Release fork setting screw	167 to 186 N·m 17.0 to 19.0 kgf·m 123 to 137 lbf·ft
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- (1) Release Bearing (4) Control Shaft  
(2) Release Hub (5) Release Fork  
(3) Release Fork Setting Screw

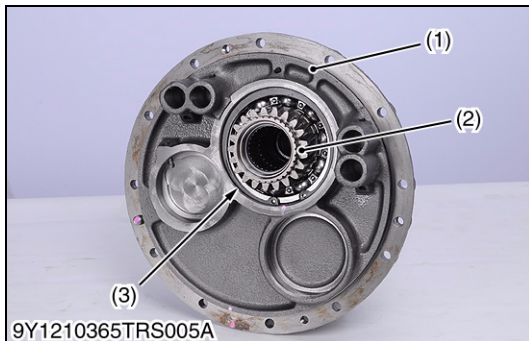
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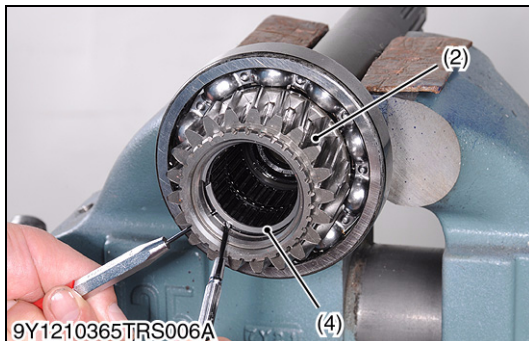
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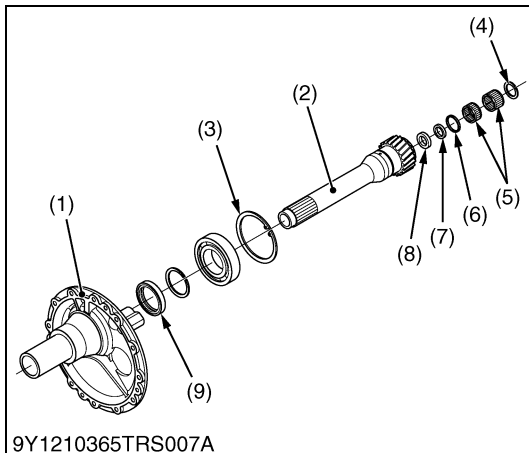
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**Bearing Holder**

1. Remove the PTO propeller shaft (3) to the rearward.
2. Remove the bearing holder (1) with the 21T gear shaft (2) by screwing M8 × Pitch 1.25 screws into the threaded holes "A".

**(When reassembling)**

- Apply grease or transmission fluid to the O-ring.
- Use the propeller shaft guide (4), when assemble the PTO propeller shaft (3) to prevent the oil seal damaging (refer to the "[8] SPECIAL TOOLS" at "G. GENERAL" section).

Tightening torque	Bearing holder mounting screw and nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
-------------------	---------------------------------------	---

- |                         |                               |
|-------------------------|-------------------------------|
| (1) Bearing Holder      | (4) PTO Propeller Shaft Guide |
| (2) 21T Gear Shaft      |                               |
| (3) PTO Propeller Shaft | <b>A : Threaded Hole</b>      |

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**Disassembling Bearing Holder and 21T Gear Shaft**

1. Remove the internal snap ring (3).
2. Tap out the 21T gear shaft (2) with bearing.
3. Press the internal snap ring (4) and remove the internal snap ring (4) as shown photo.
4. Remove the needle bearings (5) and collar (6).

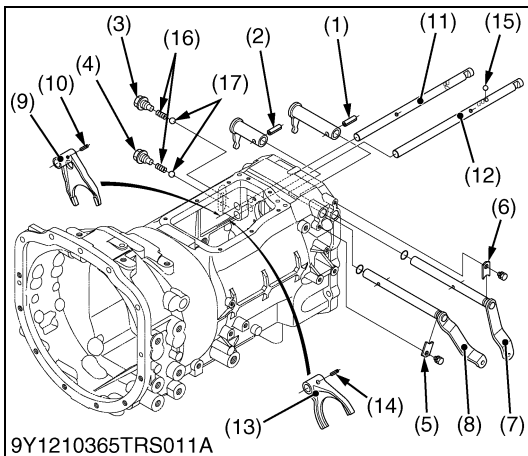
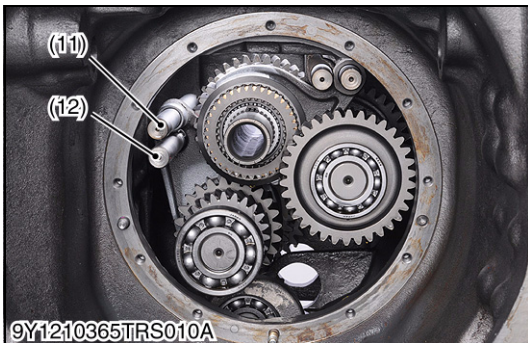
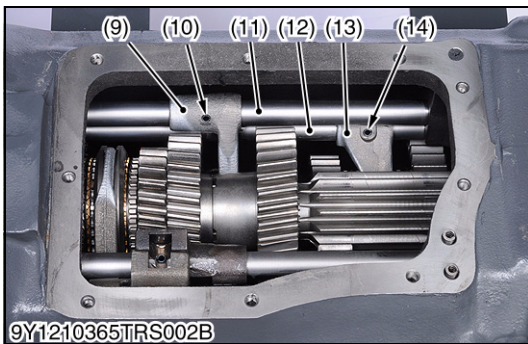
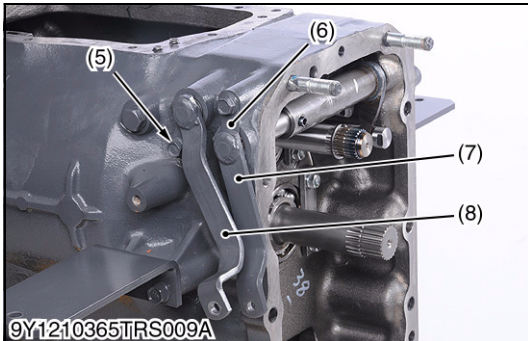
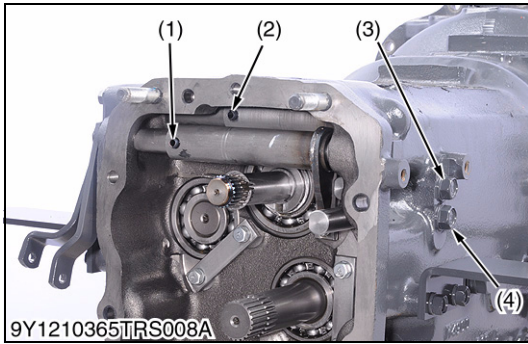
**(When reassembling)**

- Take care of direction of the oil seal.
- Apply grease to the oil seal and bushing.
- Take care of the position of needle bearing and collars.
- Apply transmission fluid to the bearing.
- Put on the PTO propeller shaft guide to the PTO propeller shaft to prevent the oil seal (7) damaging.

- |                        |              |
|------------------------|--------------|
| (1) Bearing Holder     | (6) Collar   |
| (2) 21T Gear Shaft     | (7) Oil Seal |
| (3) Internal Snap Ring | (8) Bushing  |
| (4) Internal Snap Ring | (9) Oil Seal |
| (5) Needle Bearing     |              |

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**Shift Levers and Shift Rods (Auxiliary Shift Change H, R-L)**

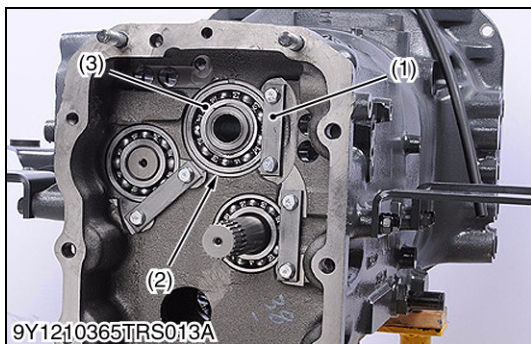
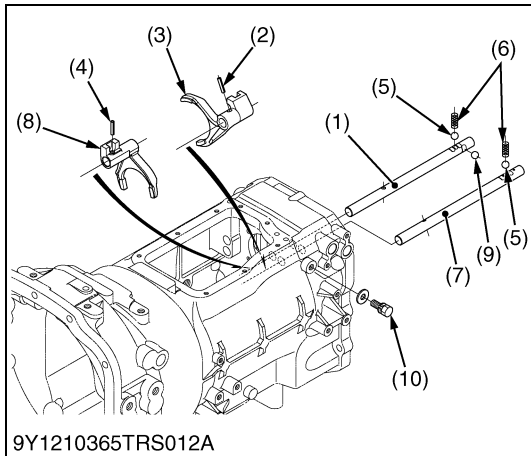
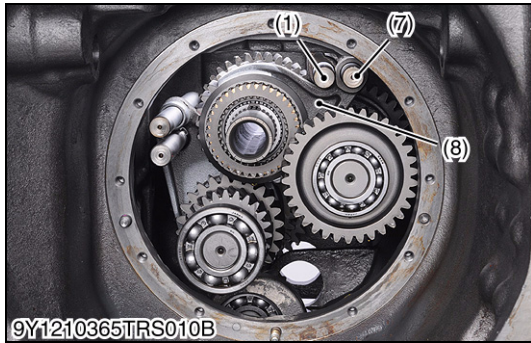
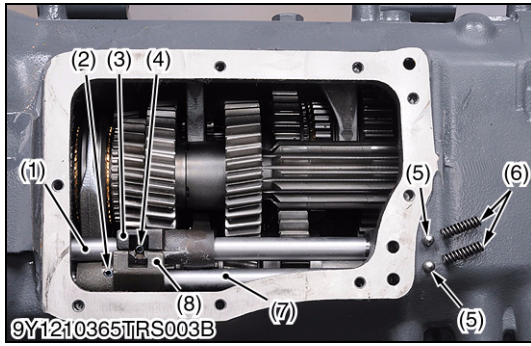
1. Remove the spring pin (1) and (2).
2. Remove the lock screw (3) and (4), then remove the balls (7) and springs (16).
3. Remove the stopper plate (5) and (6).
4. Remove the shift lever (H) (8) and (L-R) (7).
5. Remove the spring pin (10) and (11).
6. Set the shift rod (H) (11) and (L-R) (12) at neutral position.
7. Remove the shift rod (H) (11) and (L-R) (12).

**(When reassembling)**

- Be sure to assemble the ball (15) for inter lock, balls (17) for detent and spring (16).
- Apply grease to the O-rings.
- Apply liquid lock (Three Bond 1206C or equivalent) the lock screw (3) and (4).

- |                       |                        |
|-----------------------|------------------------|
| (1) Spring Pin        | (10) Spring Pin        |
| (2) Spring Pin        | (11) Shift Rod (H)     |
| (3) Lock Screw        | (12) Shift Rod (L-R)   |
| (4) Lock Screw        | (13) Spring Pin        |
| (5) Stopper Plate     | (14) Spring Pin        |
| (6) Stopper Plate     | (15) Ball (Inter Lock) |
| (7) Shift Lever (L-R) | (16) Spring (Detent)   |
| (8) Shift Lever (H)   | (17) Ball (Detent)     |
| (9) Shift Fork (H)    |                        |

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**Shift Rod and Shift Fork (Main Shift 1-2-3-4)**

1. Remove the spring pin (2) and (4).
2. Remove the shift rod (1st-2nd) (1) and (3rd-4th) (7).
3. Remove the shift fork (1st-2nd) (8) and (3rd-4th) (3).
4. Remove the screw (10) and ball (9).

**(When reassembling)**

- Be sure to assemble the ball (9) for inter lock.
- Be sure to assemble the balls (5) and springs (6) for detent.

- |                          |                          |
|--------------------------|--------------------------|
| (1) Shift Rod (1st-2nd)  | (6) Spring (Detent)      |
| (2) Spring Pin           | (7) Shift Rod (3rd-4th)  |
| (3) Shift Fork (1st-2nd) | (8) Shift Fork (3rd-4th) |
| (4) Spring Pin           | (9) Ball (Inter Lock)    |
| (5) Ball (Detent)        | (10) Screw               |

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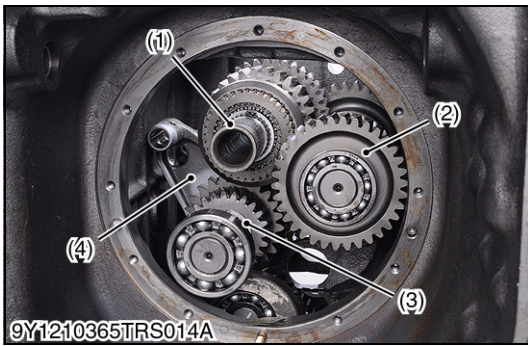
**Bearing Retainer**

1. Remove the bearing retainer (1).
2. Tap out the 2nd shaft assembly and remove the external snap ring (2) from the bearing (3).

- |                        |             |
|------------------------|-------------|
| (1) Bearing Retainer   | (3) Bearing |
| (2) External Snap Ring |             |

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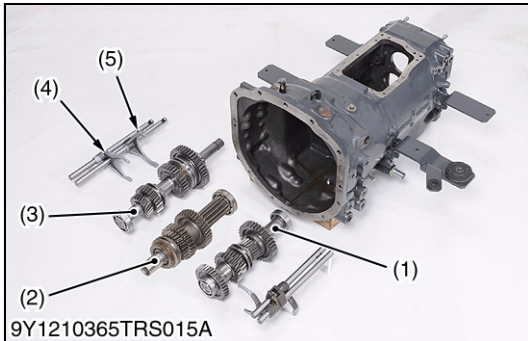


**1st Shaft, 2nd Shaft and 3rd Shaft**

1. Tap out the 1st shaft (1), 2nd shaft (2) and 3rd shaft (3) to forward.
2. Remove the 3rd shaft assembly (3) together with shift fork (4) and (5).

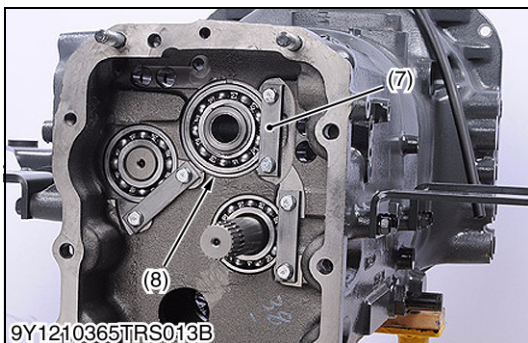
**(When reassembling)**

- Stand the clutch housing case (6) as shown photo.
- Assemble the shift forks (4) and (5) together with 3rd shaft assembly (3).
- Assemble the external snap ring (8) and bearing retainer (7).



- |                        |                         |
|------------------------|-------------------------|
| (1) 1st Shaft Assembly | (5) Shift Fork (L-R)    |
| (2) 2nd Shaft Assembly | (6) Clutch Housing Case |
| (3) 3rd Shaft Assembly | (7) Bearing Retainer    |
| (4) Shift Fork (H)     | (8) External Snap Ring  |

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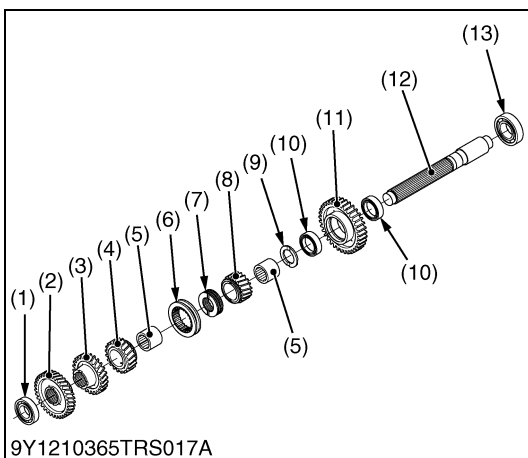


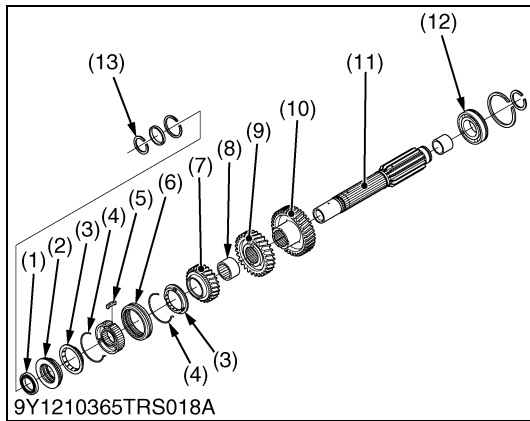
**1st Shaft**

1. Remove the bearing (1).
2. Remove the gears.

- |                  |                   |
|------------------|-------------------|
| (1) Ball Bearing | (8) 19T Gear      |
| (2) 34T Gear     | (9) Thrust Collar |
| (3) 25T Gear     | (10) Bearing      |
| (4) 20T Gear     | (11) 35T Gear     |
| (5) Inner Race   | (12) 1st Shaft    |
| (6) Shifter      | (13) Bearing      |
| (7) Hub          |                   |

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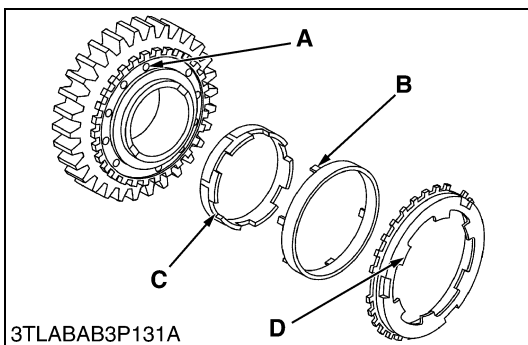
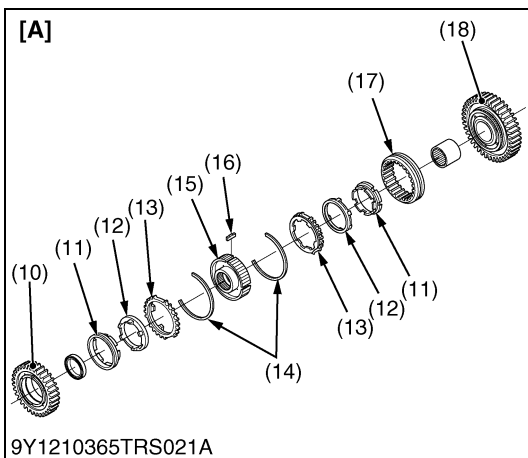
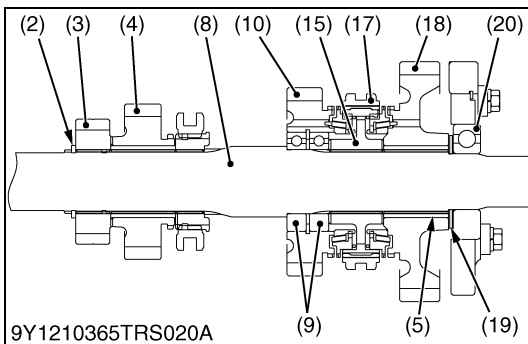
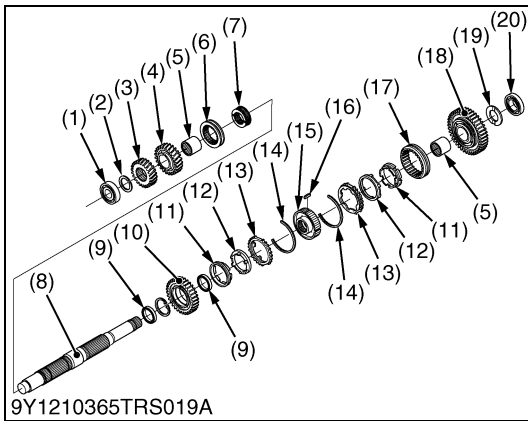


### 2nd Shaft

1. Remove the external snap ring (13).
2. Remove the gears.

- |                              |                                 |
|------------------------------|---------------------------------|
| (1) Bearing                  | (8) Inner Race                  |
| (2) Synchronizer Ring (Corn) | (9) 28T Gear                    |
| (3) Synchronizer Ring        | (10) 36T Gear                   |
| (4) Synchronizer Spring      | (11) 2nd Shaft (13T Gear Shaft) |
| (5) Synchronizer Key         | (12) Bearing                    |
| (6) Shifter                  | (13) External Snap Ring         |
| (7) 23T Gear                 |                                 |

9Y1210365TRS0041US0



**3rd Shaft**

1. Remove the bearing (20) and gears.
2. Remove the bearing (1) and external snap ring (2).
3. Remove the gears.

**(When reassembling)**

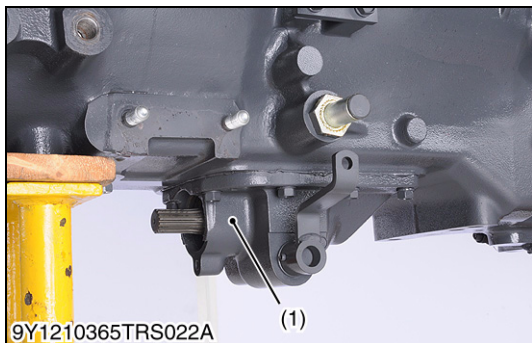
- Apply enough transmission fluid to the synchronizer portion.
- Install the protrusion portions "B" of the center rings (12) to the holes "A" of the gear (10) and (18) firmly. (Refer to the figure left.)
- Install the protrusion portion "D" of the outer synchronizer rings (13) to the grooves "C" of the inner synchronizer rings (11). (Refer to the figure left.)
- Install the synchronizer keys (16) in the key grooves of the outer synchronizer rings (13) firmly.

- (1) Bearing
- (2) External Snap Ring
- (3) 23T Gear (4WD Model)
- (4) 24T Gear
- (5) Inner Race
- (6) Shifter (H)
- (7) Hub
- (8) 3rd Shaft
- (9) Bearing
- (10) 32T Gear
- (11) Inner Synchronizer Ring
- (12) External Snap Ring
- (13) Outer Synchronizer Ring
- (14) Synchronizer Spring
- (15) Coupling
- (16) Synchronizer Key
- (17) Shifter (L-R)
- (18) 41T Gear
- (19) Thrust Collar
- (20) Bearing

- [A] Double Cone Type Synchromesh**
- A : Holes of the gear**
- B : Protrusion portions of the center ring**
- C : Grooves of the inner synchronizer ring**
- D : Protrusion portion of the outer synchronizer ring**

9Y1210365TRS0042US0

### [3] SEPARATING DT GEAR



#### **Removing DT Gear Case**

1. Remove the DT gear case (1).

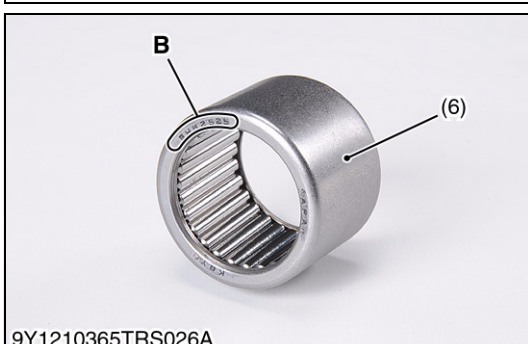
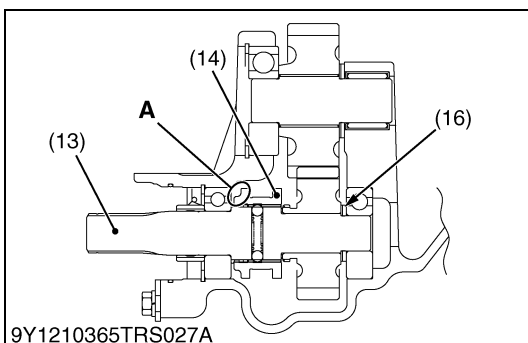
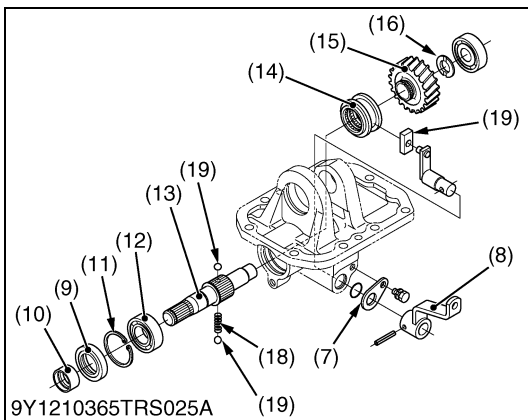
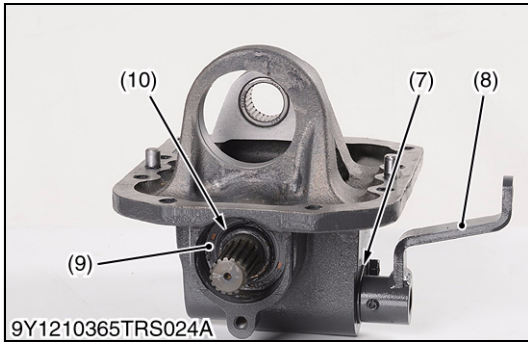
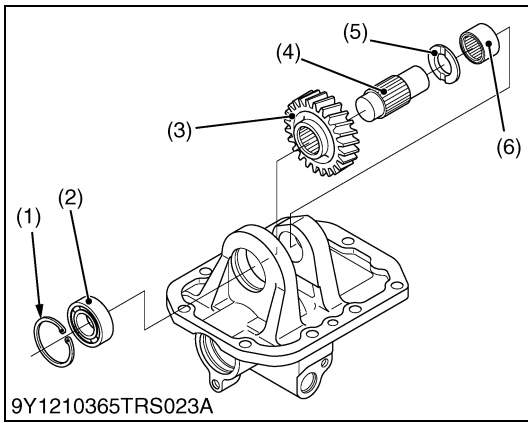
#### **(When reassembling)**

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the clutch housing and DT gear case.

Tightening torque	DT gear case mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
-------------------	-----------------------------	---

(1) DT Gear Case

9Y1210365TRS0043US0



**DT Gear Case**

1. Remove the internal snap ring (1).
2. Tap out the idle shaft (4) with bearing (2) to the forward.

■ **NOTE**

- Do not hit the needle bearing (6) when tap out the idle shaft (9).

3. Remove the 25T gear (3).
4. Remove the stopper (7) and pull the DT shift lever (8) to disengage the shifter piece (17) from the shifter (14).
5. Remove the oil seal (9) and internal snap ring (11).
6. Tap out the propeller shaft (13) with bearing (12) and shifter (14).
7. Remove the 21T gear (15).
8. Remove the shifter (14), balls (19) and spring (18).

**(When reassembling)**

- The groove of thrust collar (16) toward the 21T gear (15).
- Toward the portion **A** of shifter (14) to the forward.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the spline part of 21T gear (15), propeller shaft (13) and thrust collar (16).
- Replace the oil seal (9) with new one.
- Toward the stamp mark **B** of needle bearing (6) to the forward.

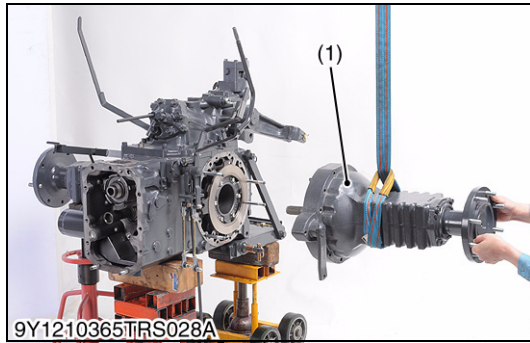
- |                         |                      |
|-------------------------|----------------------|
| (1) Internal Snap Ring  | (12) Bearing         |
| (2) Bearing             | (13) Propeller Shaft |
| (3) 25T Gear            | (14) Shifter         |
| (4) Idle Shaft          | (15) 21T Gear        |
| (5) Thrust Collar       | (16) Thrust Collar   |
| (6) Needle Bearing      | (17) Shifter Piece   |
| (7) Stopper             | (18) Spring          |
| (8) DT Shift Lever      | (19) Ball            |
| (9) Oil Seal            |                      |
| (10) Sleeve             |                      |
| (11) Internal Snap Ring |                      |

**A : Portion**  
**B : Stamp Mark**

9Y1210365TRS0044US0

## [4] TRANSMISSION CASE

### (1) Separating Rear Axle Assembly



#### Rear Axle

1. Support the rear axle case assembly (1) with nylon lift strap and hoist.
2. Remove the rear axle case mounting screws and nuts.
3. Separate the rear axle case from transmission case.

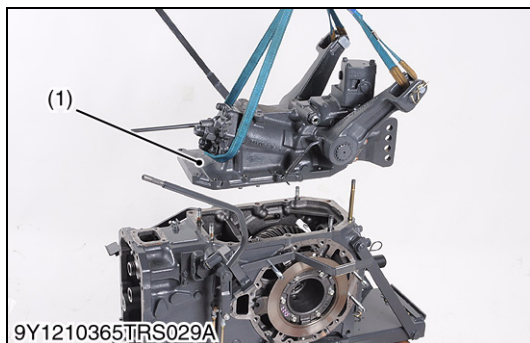
#### **(When reassembling)**

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.

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

(1) Rear Axle Case Assembly

9Y1210365TRS0045US0



#### Hydraulic Cylinder Assembly

1. Remove the delivery pipe.
2. Remove the hydraulic cylinder assembly mounting screws and nuts.
3. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and take out it.

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

- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.

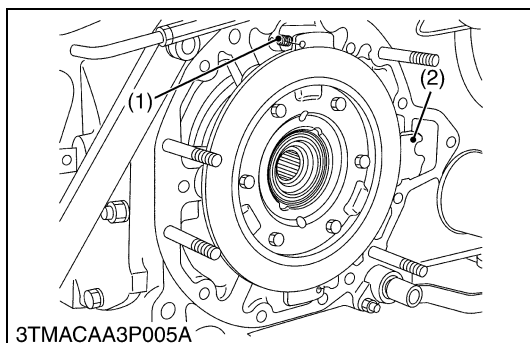
Tightening torque	Hydraulic cylinder assembly mounting screw and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	--	---

#### ■ NOTE

- Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod.

(1) Hydraulic Cylinder Assembly

9Y1210365TRS0008US0



#### Brake Cam Plate

1. Remove the return spring (1).
2. Remove the brake cam plate (2).

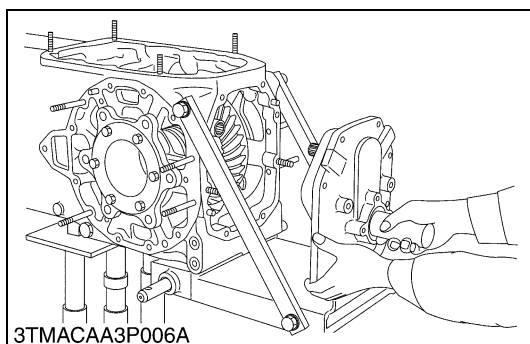
#### **(When reassembling)**

- Apply grease to the brake ball seats. (Do not grease excessively.)

(1) Return Spring

(2) Brake Cam Plate

9Y1210365TRS0009US0



#### PTO Gear Case Assembly

1. Remove the PTO gear case and PTO drive shaft as a unit.

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

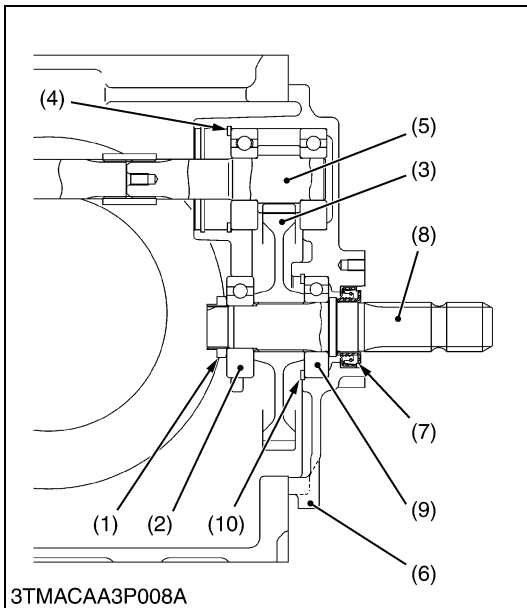
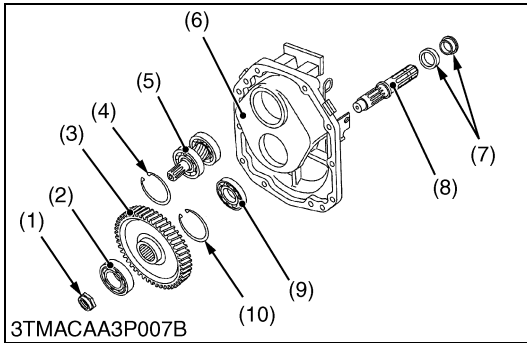
- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the PTO gear case and transmission case.

Tightening torque	PTO gear case mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	------------------------------	---

9Y1210365TRS0010US0



## (2) PTO Gear Case



### Disassembling PTO Gear Case Assembly

1. Remove the stake of the staking nut and remove the staking nut (1).
2. Tap out the PTO shaft (8).
3. Remove the internal snap ring (4).
4. Remove the 12T gear shaft (5).

### (When reassembling)

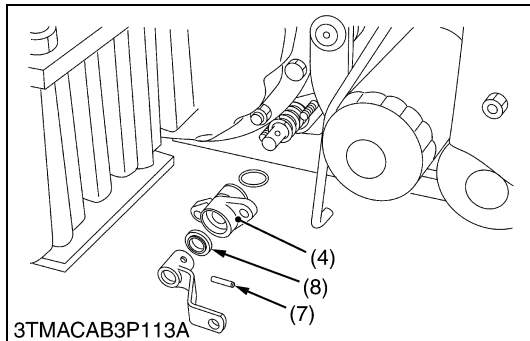
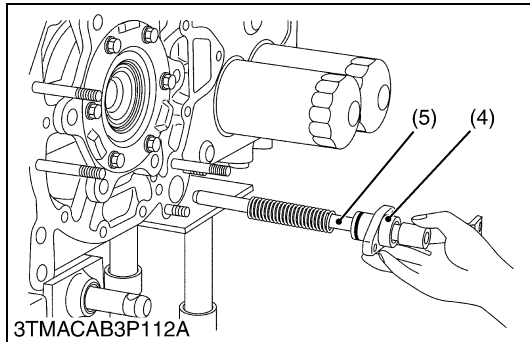
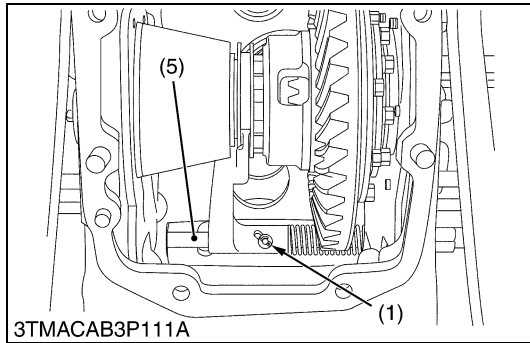
- Assembling the oil seal (7) with correct direction.
- Apply grease to the oil seal (7).
- Replace the staking nut with a new one, and after tightening it to specified torque, stake the nut (1) firmly.

Tightening torque	PTO shaft staking nut	226 to 264 N·m 23.0 to 27.0 kgf·m 167 to 195 lbf·ft
-------------------	-----------------------	---

- |                        |                         |
|------------------------|-------------------------|
| (1) Staking Nut        | (6) Gear Case           |
| (2) Ball Bearing       | (7) Oil Seal            |
| (3) 51T Gear           | (8) PTO Shaft           |
| (4) Internal Snap Ring | (9) Ball Bearing        |
| (5) 12T Gear Shaft     | (10) Internal Snap Ring |

9Y1210365TRS0011US0

### (3) Differential Lock Fork



#### Differential Lock Fork

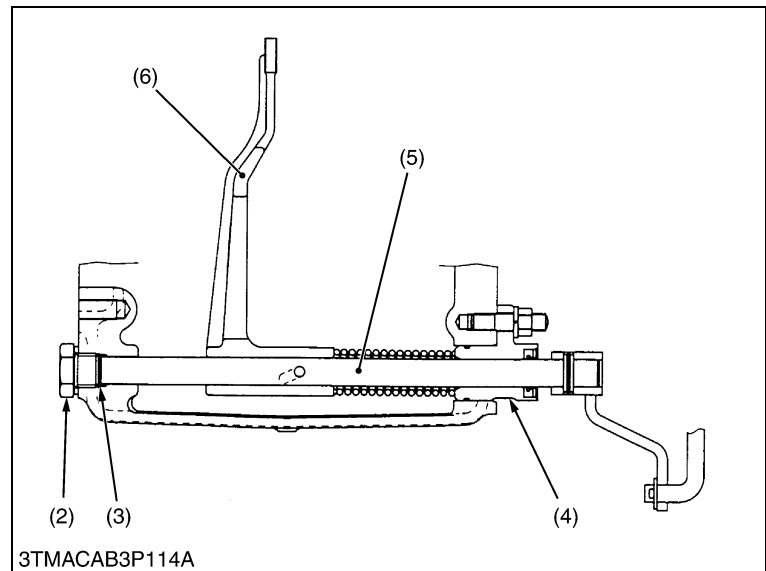
1. Remove the clevis pin (1).
2. Remove the plug (2) and adjusting shims (3).
3. Remove the spring holder mounting nuts.
4. Tap out the differential lock shaft (5) with the spring holder (4).

#### NOTE

- Remove the differential lock fork (6), after remove the differential gear assembly.
- When replacing the oil seal (8) only, tap out the differential lock lever spring pin (7), then remove the spring holder (4) and replace the oil seal (8).

#### (When reassembling)

- Apply grease to the oil seal.

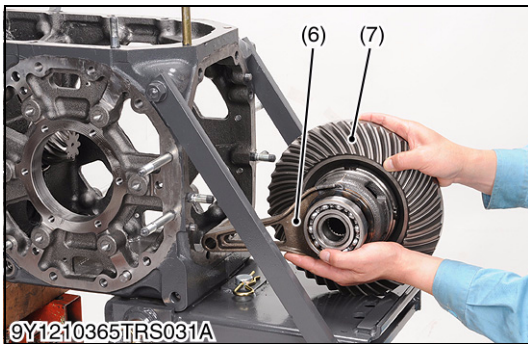
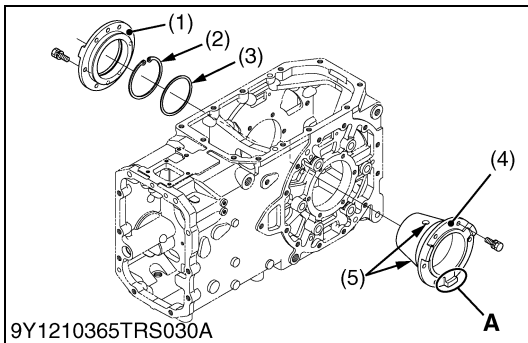


- |                    |                             |
|--------------------|-----------------------------|
| (1) Clevis Pin     | (5) Differential Lock Shaft |
| (2) Plug           | (6) Differential Lock Fork  |
| (3) Adjusting Shim | (7) Spring Pin              |
| (4) Spring Holder  | (8) Oil Seal                |

9Y1210365TRS0012US0



### (4) Removing Differential Gear Assembly



#### Differential Gear Assembly

1. Remove the differential support (1), (4), noting the number of shims (3).
2. Take out the differential gear assembly (7) from transmission case together with differential lock shifter (6).

#### (When reassembling)

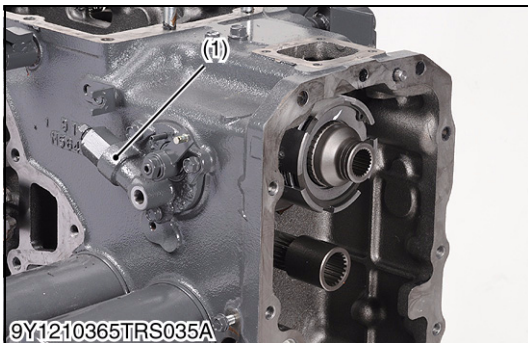
- Be sure to adjust the backlash and tooth contact between the spiral bevel gear and spiral bevel pinion shaft. (Refer to the "6. SERVICING" in this section.)
- Toward the projection **A** of differential support (1) and (4) to the bottom.
- Assemble the differential support (4), so that the oil holes (5) are positioned at vertically.

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

- |                               |                                |
|-------------------------------|--------------------------------|
| (1) Differential Support R.H. | (6) Differential Lock Shifter  |
| (2) Internal Snap ring        | (7) Differential Gear Assembly |
| (3) Shim                      |                                |
| (4) Differential Support L.H. | <b>A : Projection</b>          |
| (5) Oil Hole                  |                                |

9Y1210365TRS0013US0

### (5) Spiral Bevel Pinion Shaft



#### PTO Clutch Valve

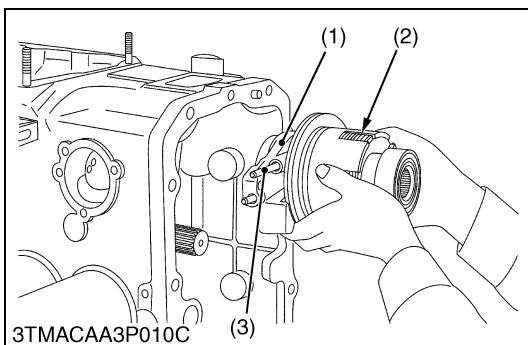
1. Disconnect the PTO clutch valve cable.
2. Remove the PTO clutch valve (1).

#### (When reassembling)

- Apply transmission fluid to O-ring.
- Install the pipes to the hole of the PTO clutch valve firmly.

- (1) PTO Clutch Valve

9Y1210365TRS0014US0



#### PTO Clutch and Holder

1. Remove the PTO clutch holder mounting screws.
2. Remove the PTO clutch (2) with PTO clutch holder (1).

#### (When reassembling)

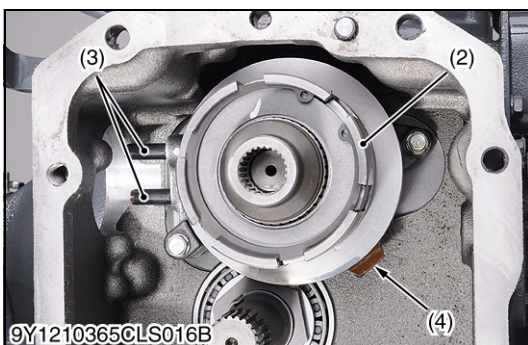
- Apply transmission fluid to O-ring.
- Take care not to damage the oil pipes (3).

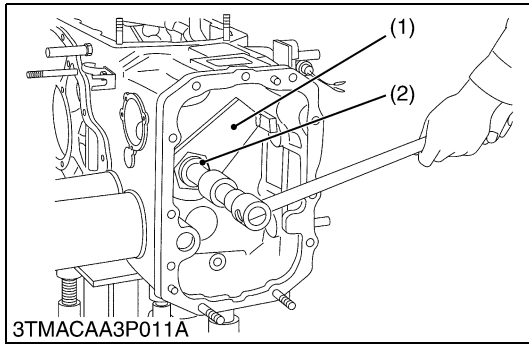
#### ■ IMPORTANT

- **When reassembling the PTO clutch assembly, direct the projection part of brake plate (4) as a figure.**
- **After assembling the PTO clutch assembly, be sure to check the piston operation by air-blowing.**

- |                       |                 |
|-----------------------|-----------------|
| (1) PTO Clutch Holder | (3) Oil Pipe    |
| (2) PTO Clutch        | (4) Brake Plate |

9Y1210365TRS0015US0





### 9T Spiral Bevel Pinion Shaft

1. Remove the stake of staking nut (2).
2. Set the staking nut locking wrench (1).
3. Set the spiral bevel pinion shaft turning wrench.
4. Turn the spiral bevel pinion shaft turning wrench to the clockwise, then remove it.
5. Tap out the shaft to the rear.

#### (When reassembling)

- Replace the staking nut with a new one, and be sure to adjust the turning torque of spiral bevel pinion shaft only. (Refer to the "6. SERVICING" in this section.)
- Stake the staking nut after adjusted the specified turning torque of 9T spiral bevel pinion shaft.

Tightening torque	(Reference) Spiral bevel pinion shaft staking nut	118 to 127 N·m 12.0 to 13.0 kgf·m 86.8 to 94.0 lbf·ft
-------------------	---	---

(1) Locking Wrench

(2) Staking Nut

9Y1210365TRS0016US0

## (6) Differential Gear



### Bearing and Differential Lock Shifter

1. Remove the differential bearing (1) with a puller.

(1) Bearing

9Y1210365TRS0017US0



### Differential Case Cover and Differential Side Gear

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

#### (When reassembling)

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

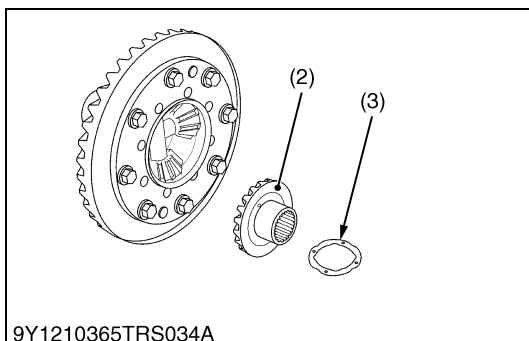
Tightening torque	Differential case cover mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
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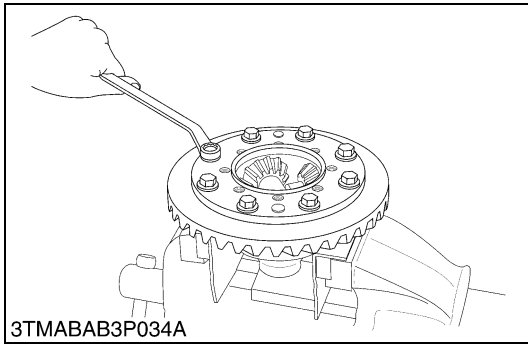
(1) Differential Case Cover

(3) Differential Side Gear Washer

(2) Differential Side Gear

9Y1210365TRS0018US0





**Spiral Bevel Gear**

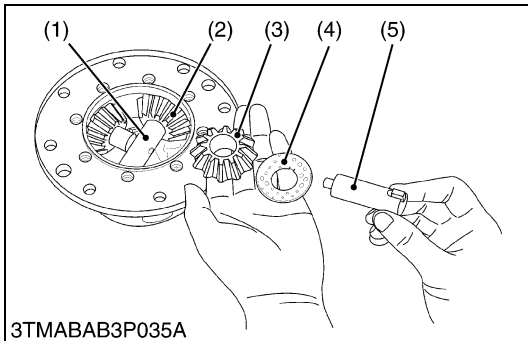
1. Remove the spiral bevel gear.

**(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 shaft.
- Apply liquid lock (Three Bond 1324B or equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	71 to 90 N·m 7.2 to 9.2 kgf·m 52 to 66 lbf·ft
-------------------	-----------------------------	---

9Y1210365TRS0019US0



**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**

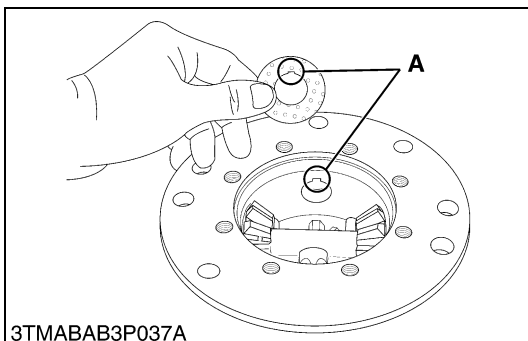
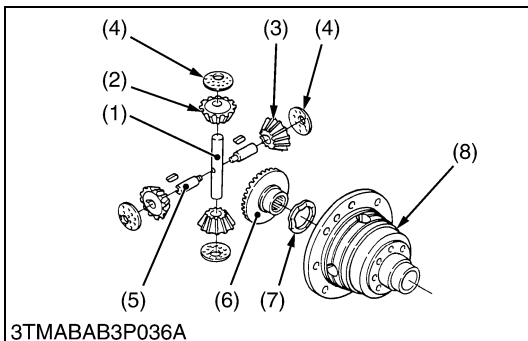
- **Arrange the parts to know their original position.**

**(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 their parts they are in mesh with, or they sliding 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 washer (4), noting its groove position.

- |                                 |                                   |
|---------------------------------|-----------------------------------|
| (1) Differential Pinion Shaft   | (6) Differential Side Gear        |
| (2) Differential Pinion         | (7) Differential Side Gear Washer |
| (3) Differential Pinion         | (8) Differential Case             |
| (4) Differential Pinion Washer  |                                   |
| (5) Differential Pinion Shaft 2 | <b>A : Fit Groove</b>             |

9Y1210365TRS0020US0



**Differential Side Gear**

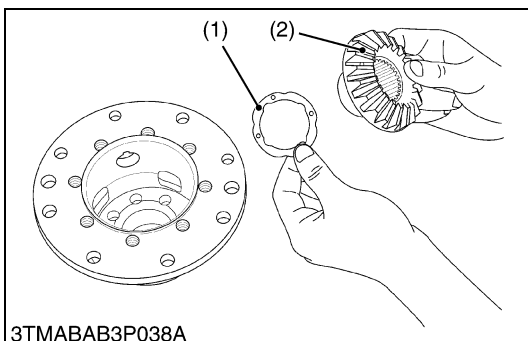
1. Take out the differential side gear (2) and differential side gear washer (1).

**(When reassembling)**

- Check the thrust and bearing surface of both differential side gears (2). If they are worn or damaged, bores in the differential case may also be damaged. Be sure to replace their parts.

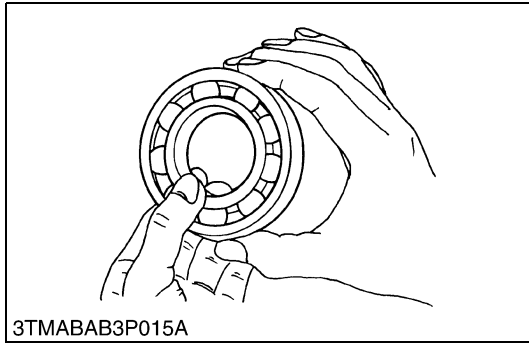
- |                                   |                            |
|-----------------------------------|----------------------------|
| (1) Differential Side Gear Washer | (2) Differential Side Gear |
|-----------------------------------|----------------------------|

9Y1210365TRS0021US0



## 6. SERVICING

### [1] BEARING, SHIFT FORK AND SYNCHRONIZER

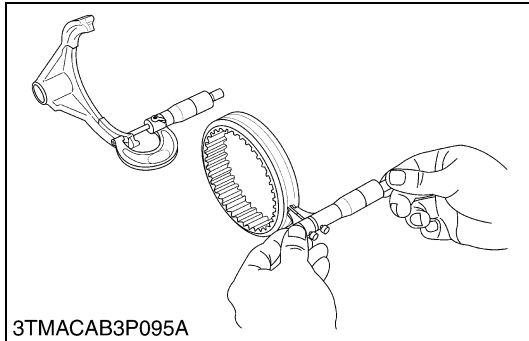


3TMABAB3P015A

#### Ball 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.

9Y1210365TRS0046US0



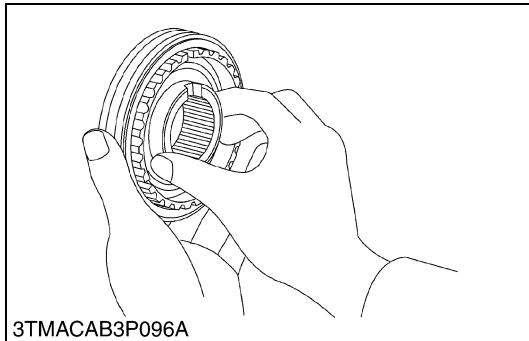
3TMACAB3P095A

#### Clearance between Shift Fork and Shifter Groove

1. Measure the width of shift fork.
2. Measure the shifter groove width, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between shift fork and shift groove for main change section and range section	Factory spec.	3rd-4th	0.05 to 0.3 mm 0.002 to 0.01 in.
		Other	0.15 to 0.40 mm 0.0059 to 0.015 in.
Allowable limit			0.80 mm 0.031 in.

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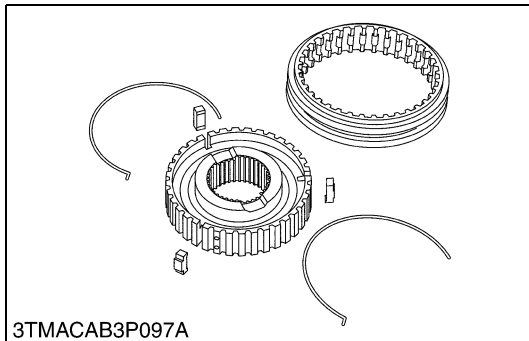


3TMACAB3P096A

#### Checking Contact between Coupling and Shifter

1. Check to see if there is flaw or wear on the spline of the coupling and shifter, and the key groove on the coupling.
2. Engage the shifter with the coupling, and check that they slide smoothly.
3. Similarly, check that there is any flaw or wear on the gear splines.
4. If there is any defect, replace them.

9Y1210365TRS0048US0



3TMACAB3P097A

#### Flaw on Synchronizer Key and Spring

1. Check the projection in the center of the synchronizer key for wear.
2. Check the spring for fatigue or wear on the area where the spring contacts with the keys.
3. If there is any defect, replace them.

9Y1210365TRS0049US0

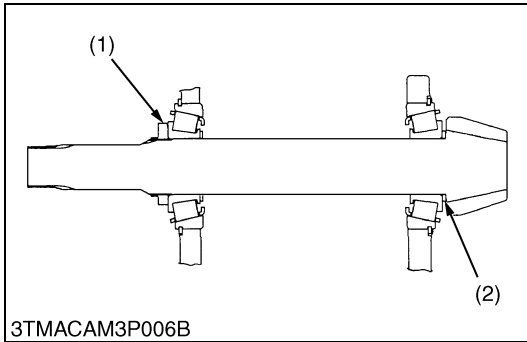
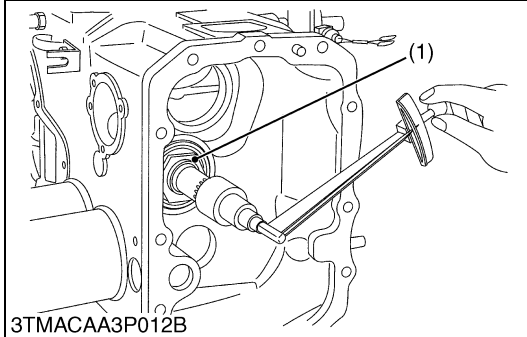
## [2] DIFFERENTIAL GEAR

### ■ IMPORTANT

- When reassembling spiral bevel pinion shaft and differential assembly, be sure to adjust the following.
  - Turning torque of spiral bevel pinion shaft only.
  - Backlash and tooth contact between spiral bevel pinion shaft and spiral bevel gear.

9Y1210365TRS0022US0

### (1) Turning Torque of 9T Pinion Shaft



#### Turning Torque of Spiral Bevel Pinion Shaft Only

1. Reassemble the spiral bevel pinion shaft and tighten the staking nut (1) with locking wrench and turning wrench.
2. After tapping the bevel pinion shaft to the front and rear, retighten the staking nut (1) to specified torque.
3. Measure the turning torque of spiral bevel pinion shaft.
4. If the measurement is not within the factory specifications, adjust the tightening torque of staking nut (1).

Turning torque	Factory spec.	3.0 to 3.4 N·m 0.30 to 0.35 kgf·m 2.2 to 2.5 lbf·ft
----------------	---------------	---

Tightening torque	(Reference) Staking nut	117.7 N·m 12.0 kgf·m 86.8 lbf·ft
-------------------	----------------------------	--

#### (Reference)

- Thickness of adjusting collar (2)
  - 1.00 mm (0.039 in.)
  - 1.50 mm (0.059 in.)
  - 1.70 mm (0.067 in.)
  - 1.75 mm (0.069 in.)
  - 1.80 mm (0.071 in.)
  - 1.90 mm (0.075 in.)
  - 2.00 mm (0.079 in.)
  - 2.10 mm (0.083 in.)
  - 2.20 mm (0.087 in.)
  - 2.25 mm (0.089 in.)
  - 2.30 mm (0.091 in.)

#### ■ NOTE

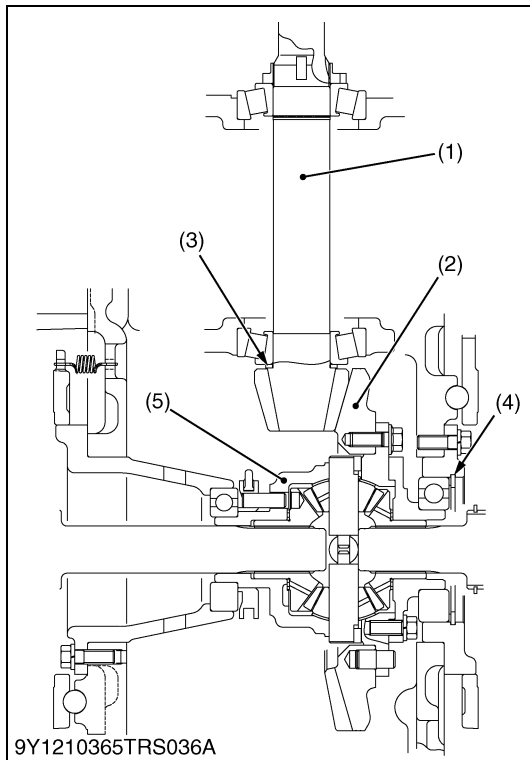
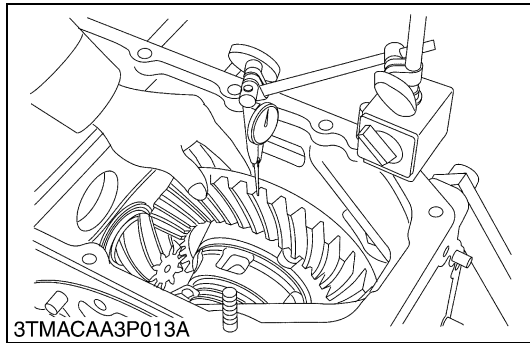
- Stake the staking nut after performing adjustments described in the following pages.
- Assemble the adjusting collar, total standard thickness is 2.7 mm (0.106 in.).

(1) Stake Nut

(2) Collar

9Y1210365TRS0023US0

## (2) Backlash and Tooth Contact



### 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 (1) and moving the spiral bevel gear (2) by hand.
3. When the backlash is too large, decrease the number of shims in the side of the spiral bevel gear, and insert the shims in opposite side. When the backlash is too small, decrease the number of shims in the side of the differential case, and insert and removed shims in the opposite side.
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.	0.20 to 0.30 mm 0.0079 to 0.011 in.
	Allowable limit	0.4 mm 0.02 in.

#### (Reference)

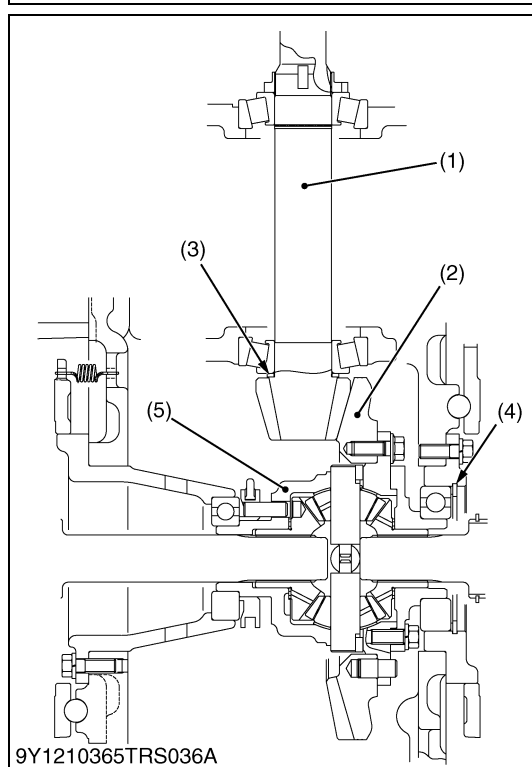
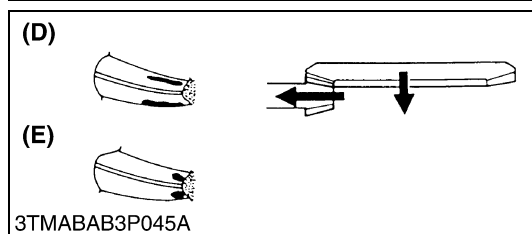
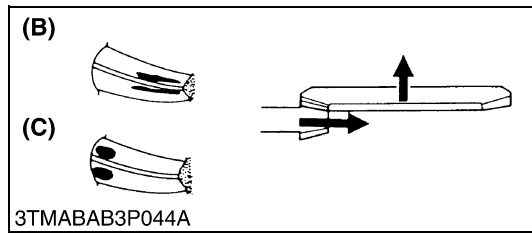
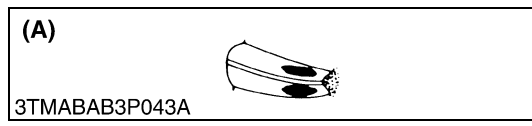
- Thickness of collar (3)
  - 1.00 mm (0.039 in.)
  - 1.50 mm (0.059 in.)
  - 1.70 mm (0.067 in.)
  - 1.75 mm (0.069 in.)
  - 1.80 mm (0.071 in.)
  - 1.90 mm (0.075 in.)
  - 2.00 mm (0.079 in.)
  - 2.10 mm (0.083 in.)
  - 2.20 mm (0.087 in.)
  - 2.25 mm (0.089 in.)
  - 2.30 mm (0.091 in.)
- Thickness of shims (4)
  - 0.4 mm (0.02 in.)
  - 0.8 mm (0.03 in.)
  - 1.0 mm (0.039 in.)
  - 1.2 mm (0.047 in.)

- (1) Spiral Bevel Pinion Shaft  
 (2) Spiral Bevel Gear  
 (3) Adjusting Collar 1

- (4) Shim  
 (5) Differential Case

**(To be continued)**

(Continued)



• **Proper Contact**

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.

• **Shallow or Heel Contact**

Replace the adjusting collar 1 (3) with thicker one to move the spiral bevel pinion shaft backward.

And place the left side shim to the right to move the spiral bevel gear rightward.

Repeat above until the proper tooth contact and backlash are achieved.

• **Deep or Toe Contact**

Replace the adjusting collar 1 (3) with a thinner one to move the spiral bevel pinion shaft forward.

And place the right side shim to the left to move the spiral bevel gear leftward.

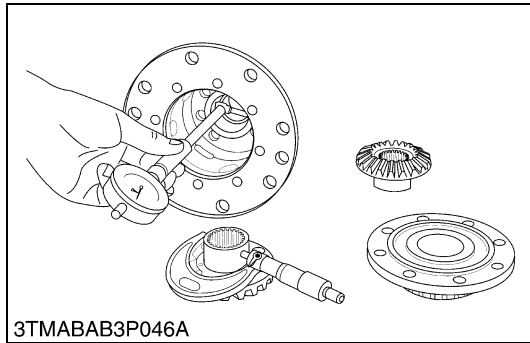
Repeat above until the proper tooth contact and backlash are achieved.

- (1) Spiral Bevel Pinion Shaft
- (2) Spiral Bevel Gear
- (3) Adjusting Collar 1
- (4) Shim
- (5) Differential Case

- (A) **Proper Contact**
- (B) **Shallow Contact**
- (C) **Heel Contact**
- (D) **Deep Contact**
- (E) **Toe Contact**

9Y1210365TRS0024US0

### (3) Differential Gear



3TMABAB3P046A

#### 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.	0.0500 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case bore I.D.	Factory spec.	40.500 to 40.550 mm 1.5945 to 1.5964 in.
-----------------------------	---------------	---

Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.5901 to 1.5925 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 0.014 in.

Differential case cover bore I.D.	Factory spec.	40.500 to 40.550 mm 1.5945 to 1.5964 in.
-----------------------------------	---------------	---

Differential side gear boss O.D.	Factory spec.	40.388 to 40.450 mm 1.5901 to 1.5925 in.
----------------------------------	---------------	---

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#### Clearance between Differential Pinion Shaft and Differential Pinion

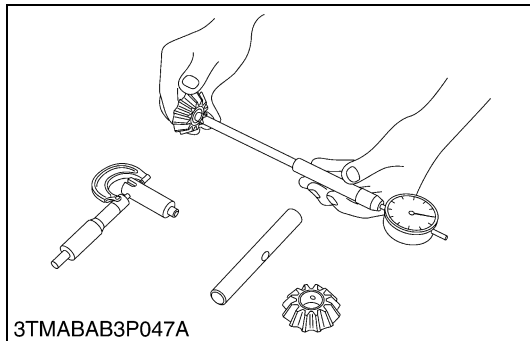
1. Measure the differential pinion shaft O.D..
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceed the allowable limit, replace them.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.0600 to 0.102 mm 0.00237 to 0.0041 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.
--------------------------------	---------------	---

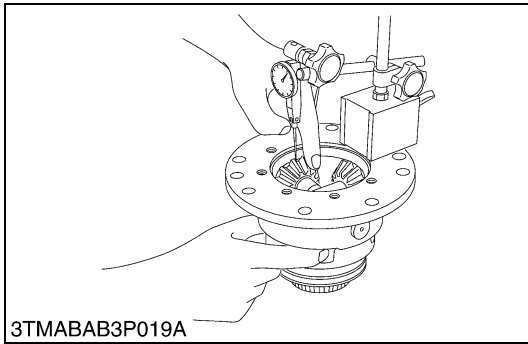
Differential pinion I.D.	Factory spec.	20.040 to 20.061 mm 0.78898 to 0.78980 in.
--------------------------	---------------	---

9Y1210365TRS0029US0



3TMABAB3P047A





3TMABAB3P019A

**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.

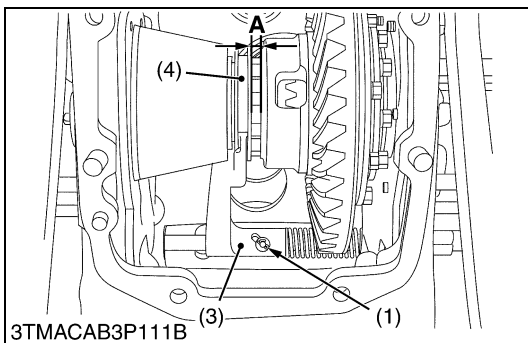
Backlash between differential pinion and differential side gear	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.011 in.
	Allowable limit	0.4 mm 0.02 in.

**(Reference)**

- Thickness of differential side gear washer
  - 1.5 mm (0.059 in.)
  - 1.6 mm (0.063 in.)
  - 1.7 mm (0.067 in.)
  - 1.8 mm (0.071 in.)
  - 2.0 mm (0.079 in.)

9Y1210365TRS0030US0

**[3] DIFFERENTIAL LOCK FORK**

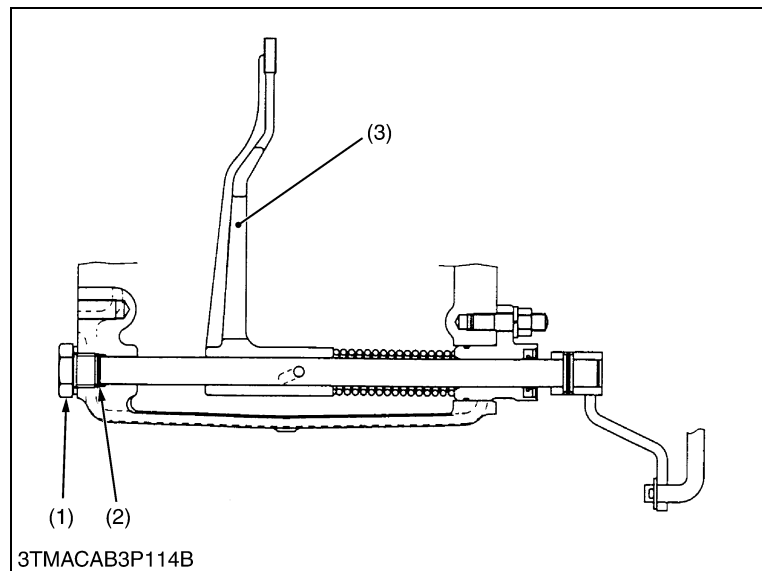


3TMACAB3P111B

**Displacement of Differential Lock Shifter**

1. Measure the displacement "A" of the shift fork (3) by pushing down the differential lock pedal as far as not to bend the shift fork to get the displacement of the differential lock shifter (4).
2. If the measurement is not within the factory specifications, adjust with the differential lock adjusting shim (2).

Displacement "A" of differential lock shifter	Factory spec.	6.0 to 8.0 mm 0.24 to 0.31 in.
---	---------------	-----------------------------------



3TMACAB3P114B

- (1) Plug
- (2) Adjusting Shim
- (3) Shift Fork
- (4) Differential Lock Shifter

9Y1210365TRS0031US0

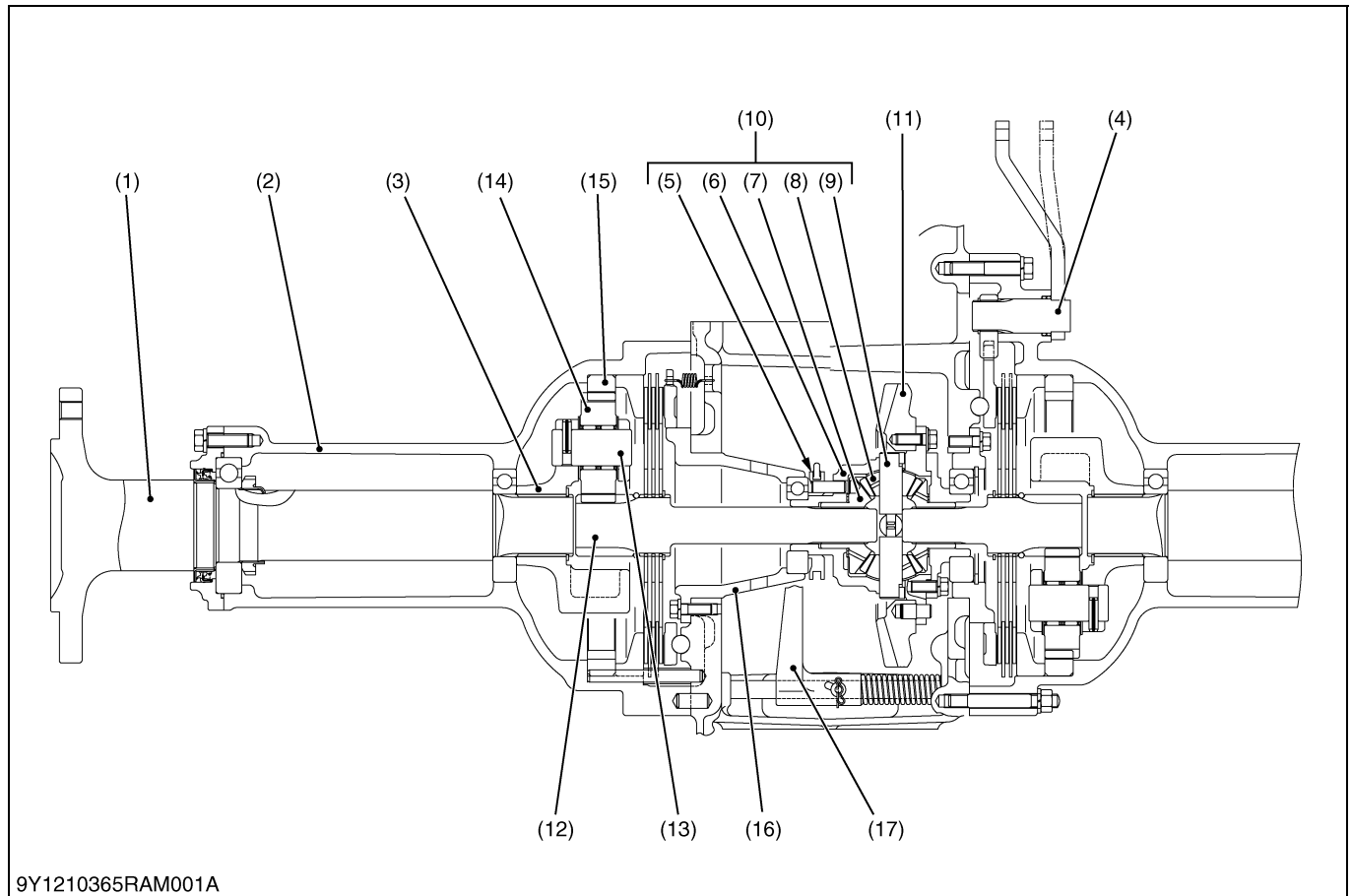
# **4 REAR AXLE**

# MECHANISM

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1. FEATURES.....	4-M1
------------------	------

# 1. FEATURES



9Y1210365RAM001A

- |                               |                               |                             |                                   |
|-------------------------------|-------------------------------|-----------------------------|-----------------------------------|
| (1) Rear Axle                 | (6) Differential Case         | (10) Differential Gear      | (14) 25T Planetary Gear           |
| (2) Rear Axle Case            | (7) Differential Side Gear    | (11) 42T Bevel Gear         | (15) 65T Internal Gear            |
| (3) Planetary Gear Support    | (8) Differential Pinion Gear  | (12) Brake Shaft (13T Gear) | (16) Differential Bearing Support |
| (4) Brake Cam Shaft           | (9) Differential Pinion Shaft | (13) Planetary Gear Pin     | (17) Differential Lock Shift Fork |
| (5) Differential Lock Shifter |                               |                             |                                   |

The rear axles are the final mechanism which transmit power from the transmission to the rear wheels. Direction of power transmitted is changed at a right angle by the differential gear (10) and, at the same time, speed is reduced. It is further reduced by the planetary gear to drive the rear axles.

The rear axles (1) are semi-floating type with the ball bearing between the rear axle (1) and rear axle case (2), which support the rear wheel load as well as transmitting power to the rear wheel. They withstand all the forces caused by tire rotation and side skidding.

9Y1210365RAM0001US0

# SERVICING

## CONTENTS

1. TROUBLESHOOTING.....	4-S1
2. SERVICING SPECIFICATIONS.....	4-S2
3. TIGHTENING TORQUES.....	4-S3
4. DISASSEMBLING AND ASSEMBLING.....	4-S4
[1] SEPARATING RAR AXLE CASE FROM TRANSMISSION CASE.....	4-S4
[2] DISASSEMBLING PLANETARY GEAR.....	4-S6
[3] DISASSEMBLING REAR AXLE.....	4-S7
5. SERVICING.....	4-S8

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Excessive or Unusual Noise at All Time</b>	Improper backlash between brake shaft's 13T gear and planetary gear	Replace	4-S6, 4-S7
	Improper backlash between planetary gear and internal gear	Replace	4-S8
	Bearings worn	Replace	–
	Insufficient or improper type of transmission fluid used	Replenish or change	G-10
<b>Noise while Turning</b>	Brake shaft's 13T gear, planetary gears and internal gear worn or damaged	Replace	4-S6, 4-S7
	Needed bearings or planetary gear shafts worn or broken	Replace	4-S8

9Y1210365RAS0001US0

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Internal Gear to Planetary Gear	Backlash	0.08 to 0.3 mm 0.004 to 0.01 in.	0.5 mm 0.02 in.
Planetary Gear Thrust Collar	Thickness	1.55 to 1.65 mm 0.0611 to 0.0649 in.	1.2 mm 0.047 in.
Planetary Gear to Planetary Gear Shaft	Clearance	0.0090 to 0.048 mm 0.00036 to 0.0018 in.	0.30 mm 0.012 in.
• Planetary Gear Shaft	O.D.	31.989 to 32.000 mm 1.2594 to 1.2598 in.	–
• Planetary Gear	I.D.	39.000 to 39.025 mm 1.5355 to 1.5364 in.	–
• Needle	O.D.	3.494 to 3.500 mm 0.1376 to 0.1377 in.	–

9Y1210365RAS0002US0

### 3. TIGHTENING TORQUES

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

(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

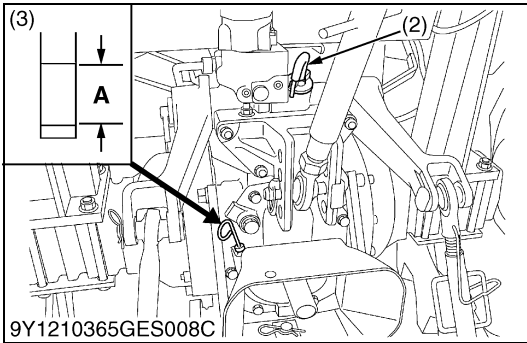
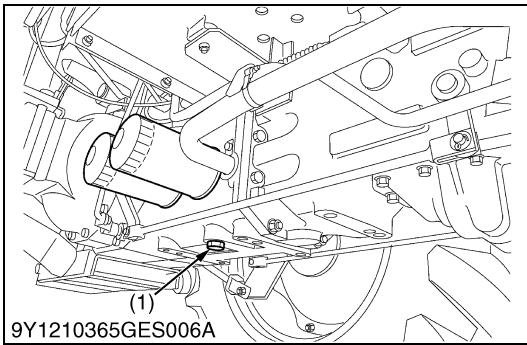
Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	260 to 304	26.5 to 31.0	192 to 224
ROPS under frame mounting screw and nut (M16, 9T)	260 to 304	26.5 to 31.0	192 to 224
Rear axle case mounting screw and nut	78 to 90	7.9 to 9.2	58 to 66
Rear axle cover mounting screw	78 to 90	7.9 to 9.2	58 to 66
Rear axle nut	540 to 637	55.0 to 65.0	398 to 470

9Y1210365RAS0003US0



## 4. DISASSEMBLING AND ASSEMBLING

### [1] SEPARATING RAR AXLE CASE FROM TRANSMISSION CASE



#### Draining the Transmission Fluid

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

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

- Fill up from filling port after removing the filling plug (2) up to the line of the level gauge (3).
- After running the engine for few minutes, stop it and check the oil level again, add the fluid to prescribed level if it is not correct level.

Transmission fluid capacity	40 L 42.3 U.S.qts 35.2 Imp.qts
-----------------------------	--------------------------------------

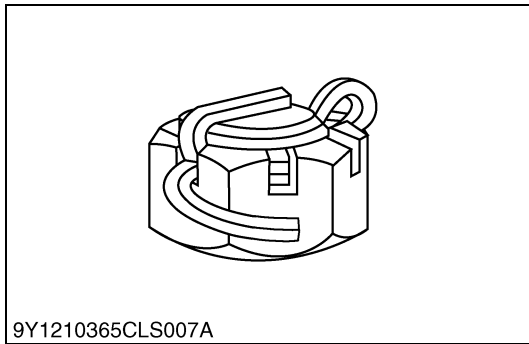
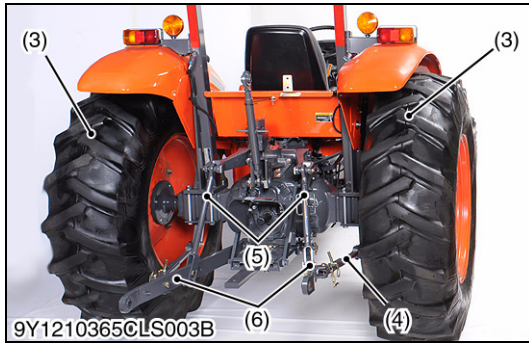
#### ■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission or hydraulic system. Refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.
- Do not mix different brands of fluid together.

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

A : Oil level is acceptable within this range.

9Y1210365ENS0017US0



**ROPS Upper and Rear Wheels**

1. Place the disassembling stand under the clutch housing case and transmission case.
2. Install the front axle rocking resistor (refer to the "8. SPECIAL TOOLS" at "G. GENERAL" section).
3. Remove the lift rod (5), lower link (6) and stabilizer (4).
4. Remove the ROPS upper frame (1).
5. Remove the rear wheels (3).

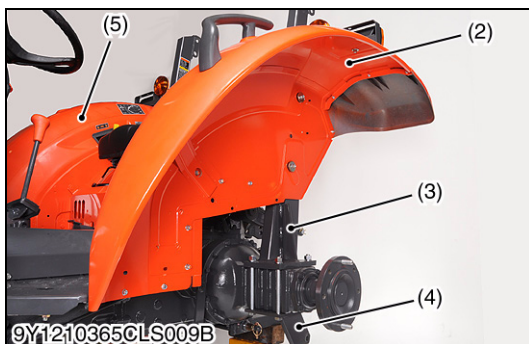
**(When reassembling)**

- After tighten the ROPS mounting bolt (2) and nut, install the cotter pin as shown in the figure.
- Tighten the ROPS upper frame mounting bolts and nuts so that the ROPS upper frame (1) does not fall down when the ROPS upper frame (1) positioned at horizontal.

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
-------------------	-------------------------	---

- |                        |                |
|------------------------|----------------|
| (1) ROPS Upper Frame   | (4) Stabilizer |
| (2) ROPS Mounting Bolt | (5) Lift Rod   |
| (3) Rear Wheel         | (6) Lower Link |

9Y1210365CLS0032US0



**Fender and ROPS Under Frame**

1. Remove the center frame screws (1).
2. Disconnect the connector for rear combination lamp.
3. Remove the fender L.H. (2).
4. Remove the PTO lever cover from the fender R.H. (5) and disconnect the connectors for PTO switch.
5. Remove the fender R.H. (5).
6. Remove the ROPS under frames (3) and bracket (4).

**(When reassembling)**

Tightening torque	ROPS under frame mounting bolt and nut (M16, 9T)	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
-------------------	--	---

- |                        |                 |
|------------------------|-----------------|
| (1) Center Frame Screw | (4) Bracket     |
| (2) Fender L.H.        | (5) Fender R.H. |
| (3) ROPS Under Frame   |                 |

9Y1210365RAS0004US0



**Rear Axle Case**

1. Remove the brake rod (1)
2. Remove the differential lock rod. (If separating right side.)
3. Remove the rear axle case mounting screws and nuts.
4. Support the rear axle with nylon lift strap and hoist.
5. Separate the rear axle case (2) from transmission case.

**(When reassembling)**

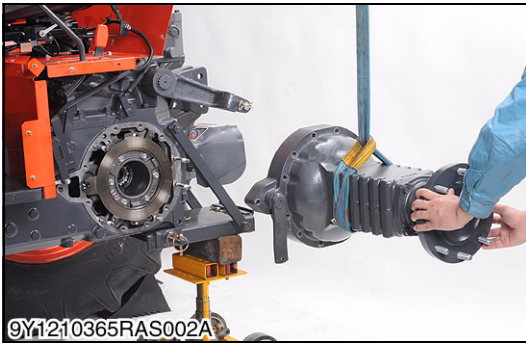
- Apply liquid gasket (Three Bond 1206C or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.

Tightening torque	Rear axle case mounting screw and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	---------------------------------------	---

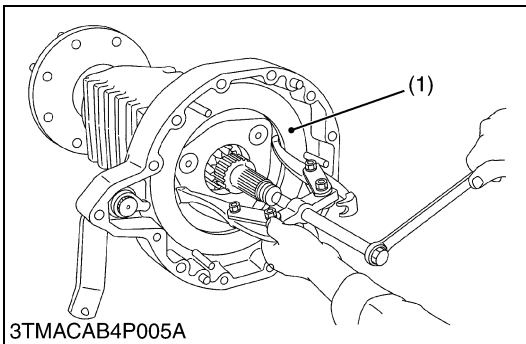
(1) Brake Rod

(2) Rear Axle Case

9Y1210365RAS0005US0



**[2] DISASSEMBLING PLANETARY GEAR**



**Planetary Gear Support**

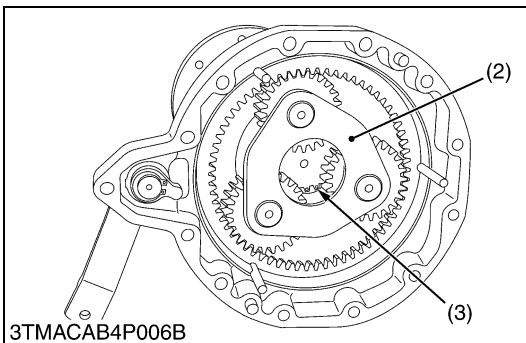
1. Remove the brake plate (1).
2. Remove the external snap ring (3).
3. Carefully remove the planetary gear support (2).

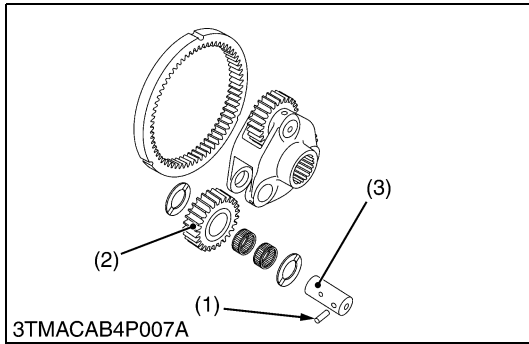
(1) Brake Plate

(3) External Snap Ring

(2) Planetary Gear Support

9Y1210365RAS0006US0





**Planetary Gear**

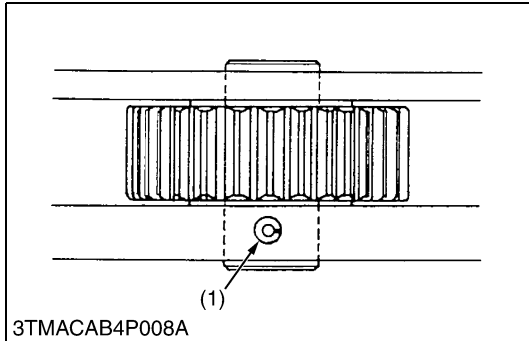
1. Tap the spring pin (1) into the planetary gear shaft (3).
2. Draw out the planetary gear shaft (3), and remove the planetary gear (2).
3. Tap out the spring pin from the planetary gear shaft.

**(When reassembling)**

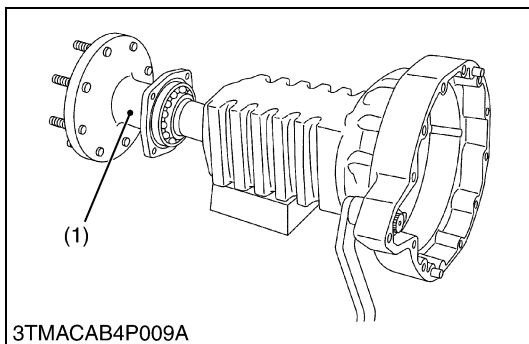
- Apply transmission fluid to the inner surface of planetary gear (2).
- Tap in the spring pin (1) as shown in the figure.

- (1) Spring Pin (3) Planetary Gear Shaft  
 (2) Planetary Gear

9Y1210365RAS0007US0



**[3] DISASSEMBLING REAR AXLE**



**Rear Axle**

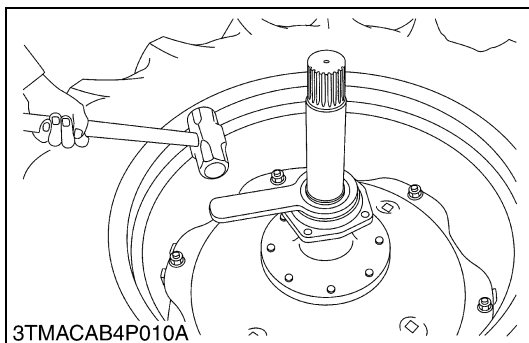
1. Unscrew the rear axle cover mounting screws, and remove the rear axle (1).

**(When reassembling)**

Tightening torque	Rear axle cover mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	--------------------------------	---

- (1) Rear Axle

9Y1210365RAS0008US0



**Rear Axle Nut**

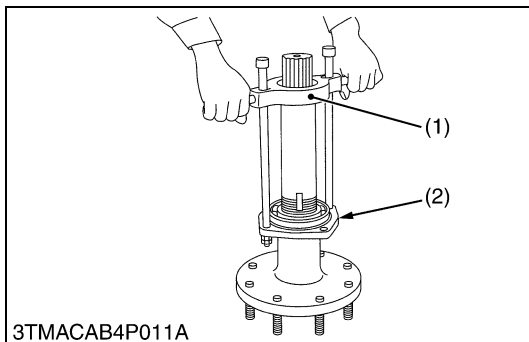
1. Fix the rear axle on the repair table or set to the rear wheel.
2. Remove the stake on the rear axle nut.
3. Remove the rear axle nut with a rear axle nut wrench 85 (Code No. 07916-52541).

**(When reassembling)**

- Replace the rear axle nut with a new one, and stake if firmly after tightening.

Tightening torque	Rear axle nut	540 to 637 N·m 55.0 to 65.0 kgf·m 398 to 470 lbf·ft
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9Y1210365RAS0009US0



**Rear Axle Cover**

1. Remove the rear axle cover (2) with a rear axle cover puller (1) (Code No. 07916-51041).

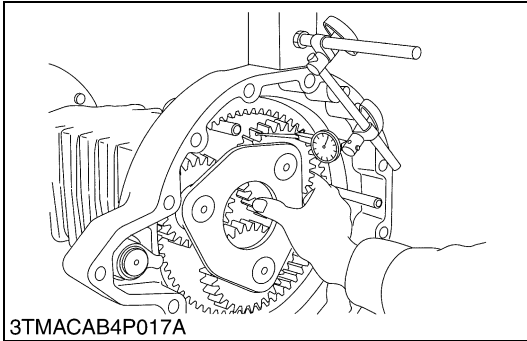
**(When reassembling)**

- Apply grease to the oil seal lips.

- (1) Rear Axle Cover Puller (2) Rear Axle Cover

9Y1210365RAS0010US0

## 5. SERVICING

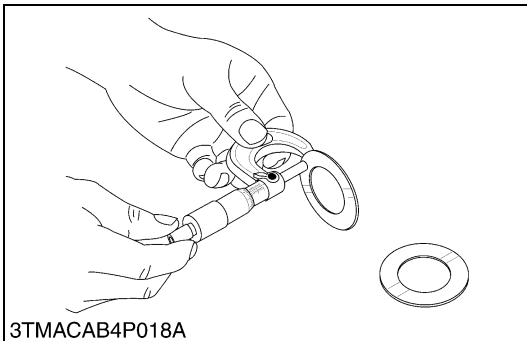


### Backlash between Internal Gear and Planetary Gear

1. Set a dial indicator (lever type) on the tooth of the planetary gear.
2. Hold the planetary gear support and move only the planetary gear to measure the backlash.
3. If the measurement exceeds the allowable limit, check the planetary gear and planetary shaft.

Backlash between internal gear and planetary gear	Factory spec.	0.08 to 0.3 mm 0.004 to 0.01 in.
	Allowable limit	0.5 mm 0.02 in.

9Y1210365RAS0011US0

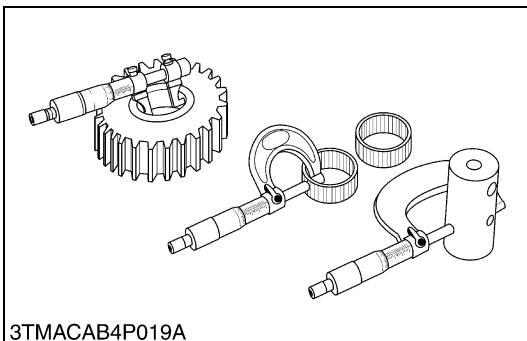


### Thrust Collar Thickness

1. Measure the thickness of the thrust collar.
2. If the measurement is less than the allowable limit, replace it.

Thrust collar thickness	Factory spec.	1.55 to 1.65 mm 0.0611 to 0.0649 in.
	Allowable limit	1.2 mm 0.047 in.

9Y1210365RAS0012US0



### Clearance between Planetary Gear and Planetary Gear Shaft

1. Measure the planetary gear shaft O.D. (rubbing surface).
2. Measure the planetary gear I.D. (rubbing surface).
3. Measure the O.D. of the two needles installed diagonally in the needle bearing.
4. Calculate the clearance.
5. (Clearance = Planetary gear I.D. - {(2 × Needle O.D.) + Planetary gear shaft O.D.}).
6. If the clearance exceeds the allowable limit, replace them.

Clearance between planetary gear and planetary gear shaft	Factory spec.	0.0090 to 0.048 mm 0.00036 to 0.0018 in.
	Allowable limit	0.30 mm 0.012 in.

Planetary gear shaft O.D.	Factory spec.	31.989 to 32.000 mm 1.2591 to 1.2598 in.
Planetary gear I.D.	Factory spec.	39.000 to 39.025 mm 1.5355 to 1.5364 in.
Needle O.D.	Factory spec.	3.494 to 3.500 mm 0.1376 to 0.1377 in.

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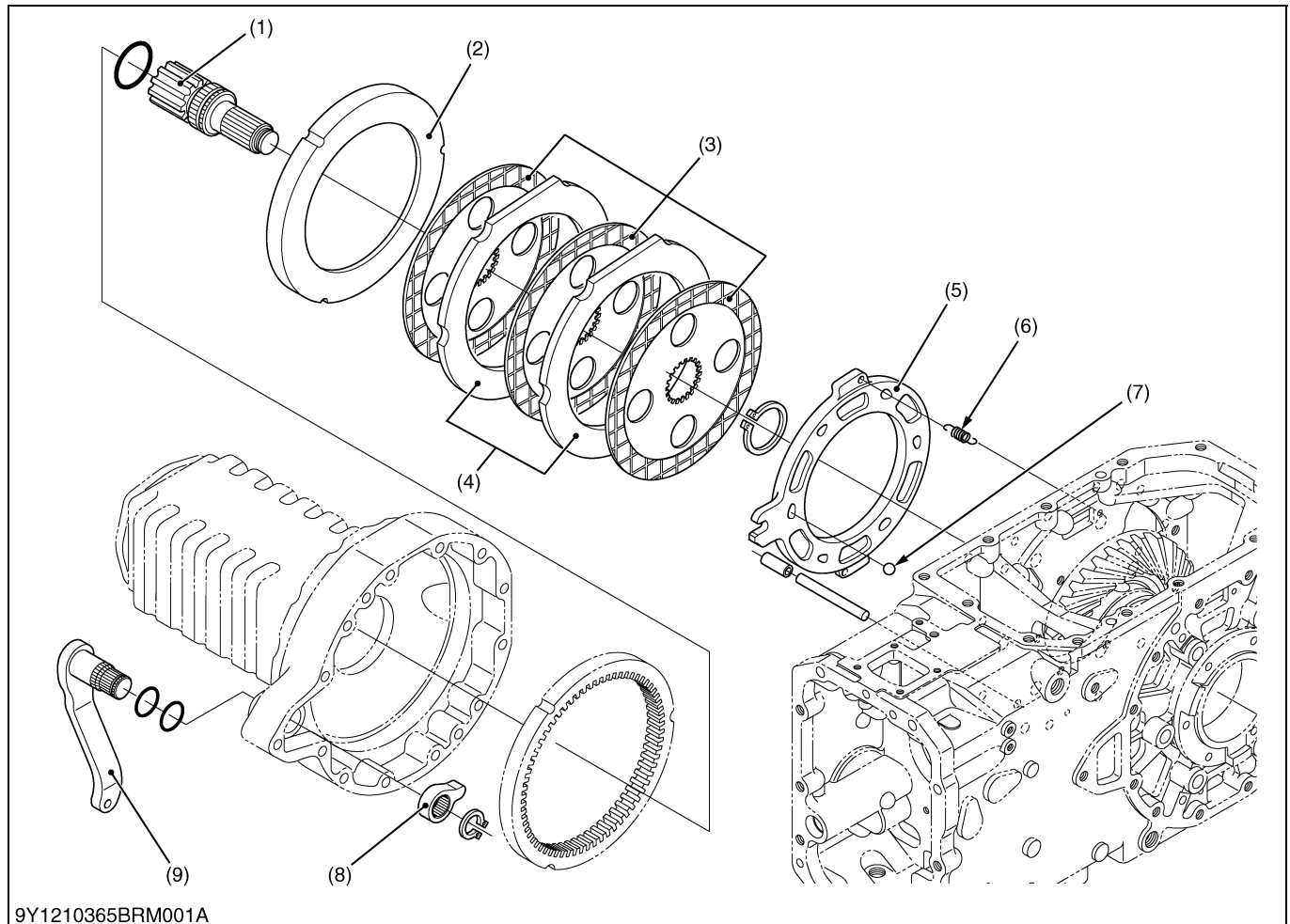
# **5 BRAKES**

# MECHANISM

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1. STRUCTURE.....	5-M1
-------------------	------

# 1. STRUCTURE



9Y1210365BRM001A

- |                 |                 |            |                     |
|-----------------|-----------------|------------|---------------------|
| (1) Brake Shaft | (4) Brake Plate | (6) Spring | (8) Brake Cam       |
| (2) Brake Plate | (5) Cam Plate   | (7) Ball   | (9) Brake Cam Lever |
| (3) Brake Disc  |                 |            |                     |

These tractors are 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.

## NOTE

- **2WD Model : Two brake discs (3) and one plate (4).**
- **4WD Model : Three brake discs (3) and two plates (4).**

9Y1210365BRM0001US0



# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Uneven Braking Force</b>	Brake pedal free travel unevenly adjusted	Adjust	5-S3
	Brake disc worn	Replace	5-S5, 5-S7
	Cam plate warped	Replace	5-S5, 5-S7
<b>Brake Drags</b>	Brake pedal free travel too small	Adjust	5-S3
	Ball holes of cam plate for uneven wear	Replace	5-S7
	Brake pedal return spring weaken or broken	Replace	5-S4
	Brake cam rusted	Repair	5-S7
<b>Poor Braking Force</b>	Brake pedal free travel excessive	Adjust	5-S3
	Brake disc worn	Replace	5-S5, 5-S7
	Cam plate warped	Replace	5-S5, 5-S7
	Brake cam or lever damaged	Replace	5-S5
	Transmission fluid improper	Change	G-10

9Y1210365BRS0001US0

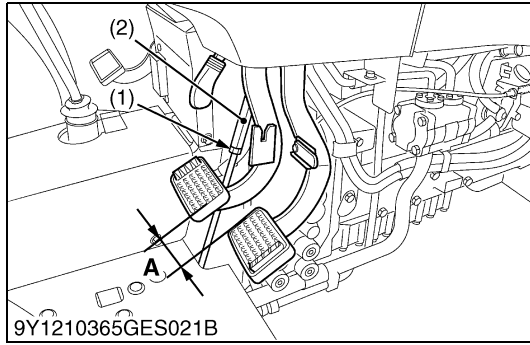
## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	40 to 45 mm 1.6 to 1.8 in.	–
Brake Pedal Shaft to Brake Pedal Bushing	Clearance	0.0250 to 0.185 mm 0.000985 to 0.00728 in.	1.00 mm 0.0394 in.
• Brake Pedal Shaft	O.D.	27.900 to 27.975 mm 1.0985 to 1.1013 in.	–
• Brake Pedal Bushing	I.D.	28.000 to 28.085 mm 1.1024 to 1.10571 in.	–
Brake Lever Link Shaft to Brake Lever Link Bushing	Clearance	0.020 to 0.25 mm 0.00079 to 0.0098 in.	1.00 mm 0.0394 in.
• Brake Lever Link Shaft	O.D.	19.90 to 19.98 mm 0.7835 to 0.7866 in.	–
• Brake Lever Link Bushing	I.D.	20.00 to 20.15 mm 0.7874 to 0.7933 in.	–
Cam Plate	Flatness	–	0.3 mm 0.01 in.
Cam Plate and Ball	Height	22.45 to 22.55 mm 0.8839 to 0.8877 in.	22.0 mm 0.866 in.
Brake Disc	Thickness	4.15 to 4.35 mm 0.164 to 0.171 in.	3.3 mm 0.130 in.
Plate	Thickness	2.25 to 2.35 mm 0.0886 to 0.0925 in.	1.5 mm 0.059 in.
Brake Stopper Plate	Flatness	–	0.3 mm 0.01 in.

9Y1210365BRS0002US0

# 3. CHECKING AND ADJUSTING

## [1] BRAKE PEDAL



### Brake Pedal Free Travel

#### **CAUTION**

- **Stop the engine and remove the key, then choke the wheel before checking brake pedal.**
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 needed, loosen the lock nut (1) and turn the turnbuckle (2) to adjust the rod length within acceptable limits.

Brake pedal free travel "A"	Factory spec.	40 to 45 mm 1.6 to 1.8 in.
--------------------------------	---------------	-------------------------------

#### **IMPORTANT**

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

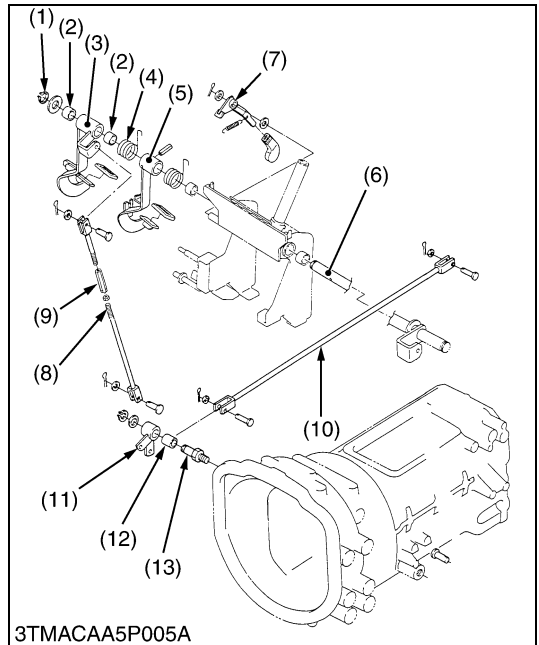
- (1) Lock Nut  
(2) Turnbuckle

**A : Free Travel**

9Y1210365BRS0003US0

# 4. DISASSEMBLING AND ASSEMBLING

## [1] BRAKE PEDAL AND LINKAGE



### Brake Pedal and Brake Pedal Shaft

1. Remove the bonnet and rear bonnet.
2. Remove the clevis pin at the end of brake rod 1 (8).
3. Remove the return spring (4) and external snap ring (1).
4. Draw out the brake pedal shaft (6).

### **(When reassembling)**

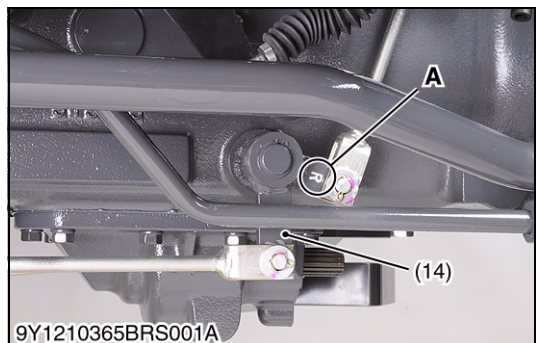
- Apply the grease to the brake pedal bush and pedal shaft.
- The brake lever (14) with stamp (A) assemble to the R.H. side.

### ■ **IMPORTANT**

- **After reassembling the brake pedal, be sure to adjust the brake pedal free travel.**

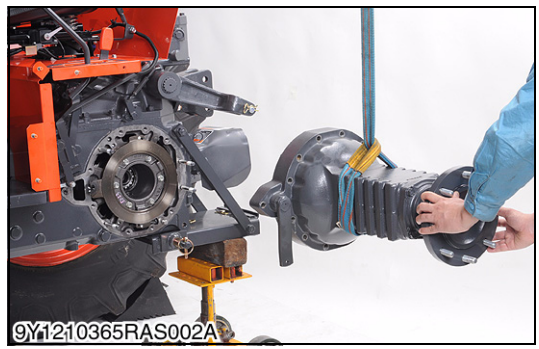
- |                        |                             |
|------------------------|-----------------------------|
| (1) External Snap Ring | (9) Turnbuckle              |
| (2) Bushing            | (10) Brake Rod 2            |
| (3) Brake Pedal RH     | (11) Brake Lever            |
| (4) Return Spring      | (12) Bushing                |
| (5) Brake Pedal LH     | (13) Brake Lever Link Shaft |
| (6) Brake Pedal Shaft  | (14) Brake Lever (R.H.)     |
| (7) Parking Brake Lock |                             |
| (8) Brake Rod 1        |                             |
- A : Stamp**

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## [2] BRAKE CASE

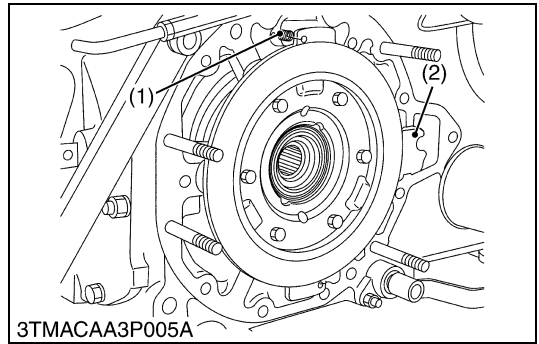
### (1) Separating Rear Axle Case from Transmission Case



### Rear Axle Case

1. Refer to the "[1] SEPARATING REAR AXLE CASE FROM TRANSMISSION" at "4. REAR AXLE" section.

9Y1210365BRS0005US0



### Brake Cam Plate

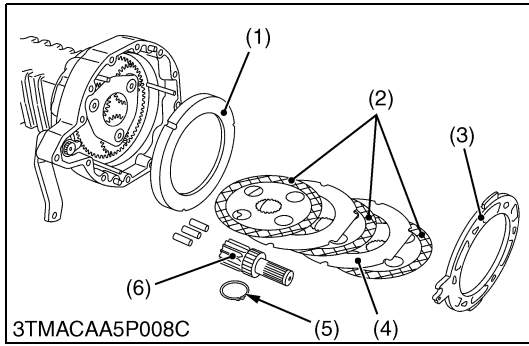
1. Remove the return spring (1).
2. Remove the brake cam plate (2).

### **(When reassembling)**

- Apply grease to the brake ball seats. (Do not grease excessively.)

- |                   |                     |
|-------------------|---------------------|
| (1) Return Spring | (2) Brake Cam Plate |
|-------------------|---------------------|

9Y1210365BRS0006US0



**Brake Shaft, Brake Disc and Brake Plate**

1. Draw out the brake shaft (6) with brake disc (2).
2. Remove the external snap ring (5).
3. Remove the brake plate (1).

**(When reassembling)**

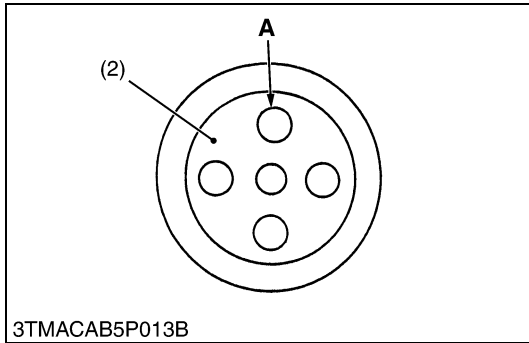
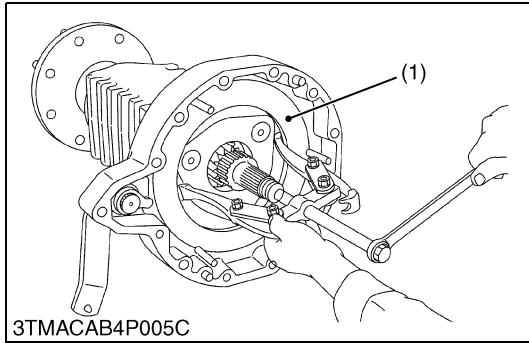
- Place the brake discs (2) so that the hole "A" of the second disc should be overlapped.

**NOTE**

- **2WD Model : Two brake discs (2) and one brake plate (4).**
- **4WD Model : Three brake discs (2) and two brake plates (4).**

- |                     |                        |
|---------------------|------------------------|
| (1) Brake Plate     | (5) External Snap Ring |
| (2) Brake Disc      | (6) Brake Shaft        |
| (3) Brake Cam Plate |                        |
| (4) Brake Plate     | <b>A : Hole</b>        |

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**Brake Cam and Brake Cam Lever**

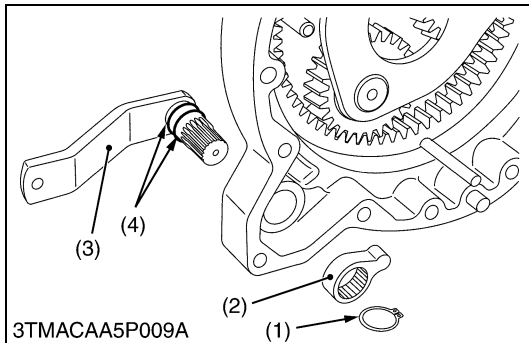
1. Remove the external snap ring (1).
2. Remove the brake cam (2) and brake cam lever (3).

**(When reassembling)**

- Apply grease to the O-ring (4) and take care not to damage the O-ring.

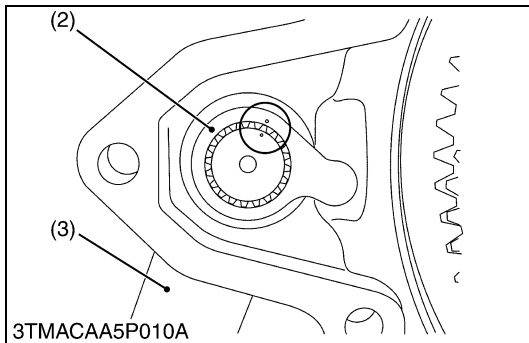
**IMPORTANT**

- **Install the brake cam (2) to brake cam lever, aligning the marks on them.**



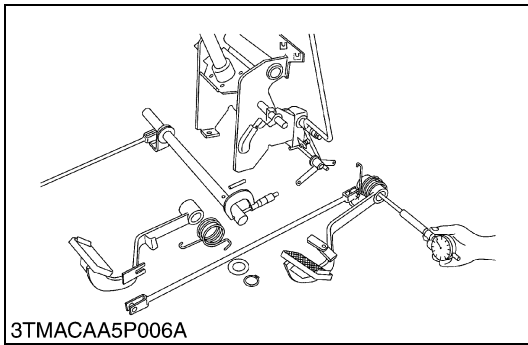
- |                        |                     |
|------------------------|---------------------|
| (1) External Snap Ring | (3) Brake Cam Lever |
| (2) Brake Cam          | (4) O-ring          |

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## 5. SERVICING

### [1] BRAKE PEDAL AND LINKAGE



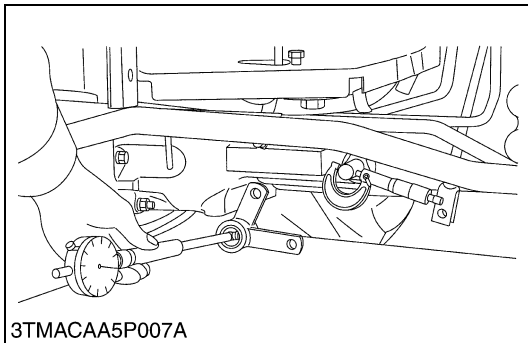
#### Clearance between Brake Pedal Shaft and Pedal Bushing

1. Measure the brake pedal shaft O.D. with an outside micrometer.
2. Measure the brake pedal bushing I.D. with a cylinder gauge.
3. Calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between brake pedal shaft and pedal bushing	Factory spec.	0.0250 to 0.185 mm 0.000985 to 0.00728 in.
	Allowable limit	1.00 mm 0.0394 in.

Brake pedal shaft O.D.	Factory spec.	27.900 to 27.975 mm 1.0985 to 1.10138 in.
Brake pedal bushing I.D.	Factory spec.	28.000 to 28.085 mm 1.1024 to 1.10571 in.

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#### Clearance between Brake Lever Link Shaft and Bushing

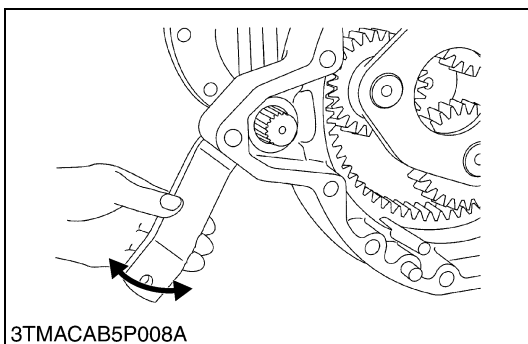
1. Measure the brake lever link shaft O.D. with an outside micrometer.
2. Measure the brake lever link bushing I.D. with a cylinder gauge.
3. Calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between brake lever link shaft and brake lever link bushing	Factory spec.	0.020 to 0.25 mm 0.00079 to 0.0098 in.
	Allowable limit	1.00 mm 0.0394 in.

Brake lever link shaft O.D.	Factory spec.	19.90 to 19.98 mm 0.7835 to 0.7866 in.
Brake lever link bushing I.D.	Factory spec.	20.00 to 20.15 mm 0.7874 to 0.7933 in.

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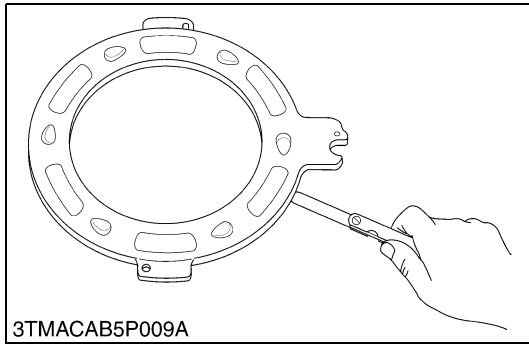
### [2] BRAKE DISC AND PLATE



#### Brake Cam Lever Movement

1. Move the brake cam lever by hand to check the movement.
2. If the movement is heavy, refine the brake cam with emery paper.

9Y1210365BRS0011US0



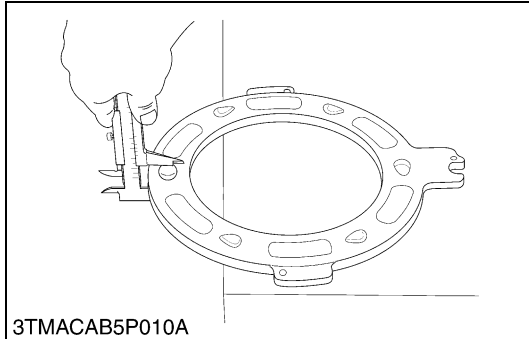
3TMACAB5P009A

**Cam Plate Flatness**

1. Place the cam plate on the surface plate.
2. Measure the flatness of cam plate with a feeler gauge at four points on a diagonal line.
3. If the measurement exceeds the allowable limit, replace it.

Cam plate flatness	Allowable limit	0.3 mm 0.01 in.
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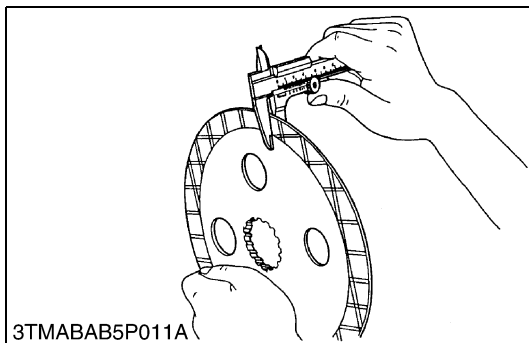
3TMACAB5P010A

**Height of Cam Plate and Ball**

1. Measure the dimensions of the 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 the uneven wear is found, replace it.

Height of cam plate and ball	Factory spec.	22.45 to 22.55 mm 0.8839 to 0.8877 in.
	Allowable limit	22.0 mm 0.866 in.

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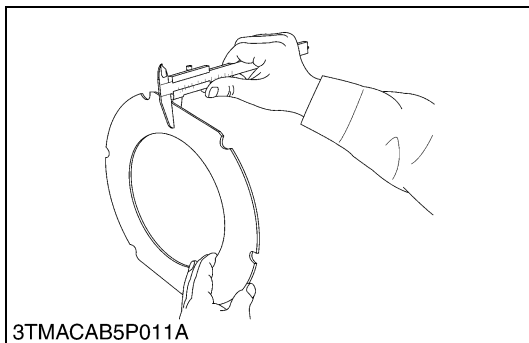
3TMABAB5P011A

**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.	4.15 to 4.35 mm 0.164 to 0.171 in.
	Allowable limit	3.3 mm 0.13 in.

9Y1210365BRS0014US0



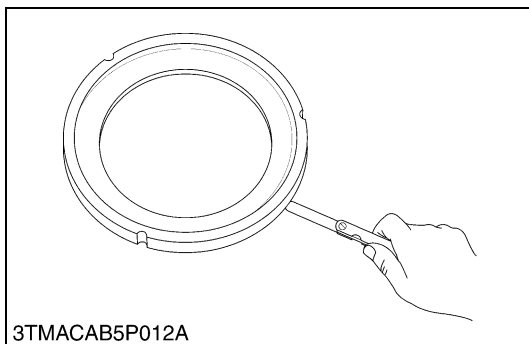
3TMACAB5P011A

**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.	2.25 to 2.35 mm 0.0886 to 0.0925 in.
	Allowable limit	1.5 mm 0.059 in.

9Y1210365BRS0015US0



3TMACAB5P012A

**Brake Plate Flatness**

1. Place the brake plate on the surface plate.
2. Measure the flatness of brake plate with a feeler gauge at four points on a diagonal line.
3. If the measurement exceeds the allowable limit, replace it.

Brake plate flatness	Allowable limit	0.3 mm 0.01 in.
----------------------	-----------------	--------------------

9Y1210365BRS0016US0



# **6 FRONT AXLE**

# MECHANISM

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1. STRUCTURE.....	6-M1
[1] 4 WHEEL DRIVE .....	6-M1
[2] 2 WHEEL DRIVE .....	6-M2

# 1. STRUCTURE

The front axle supports the front of tractor and facilitates steering.

There are two kinds of front axles.

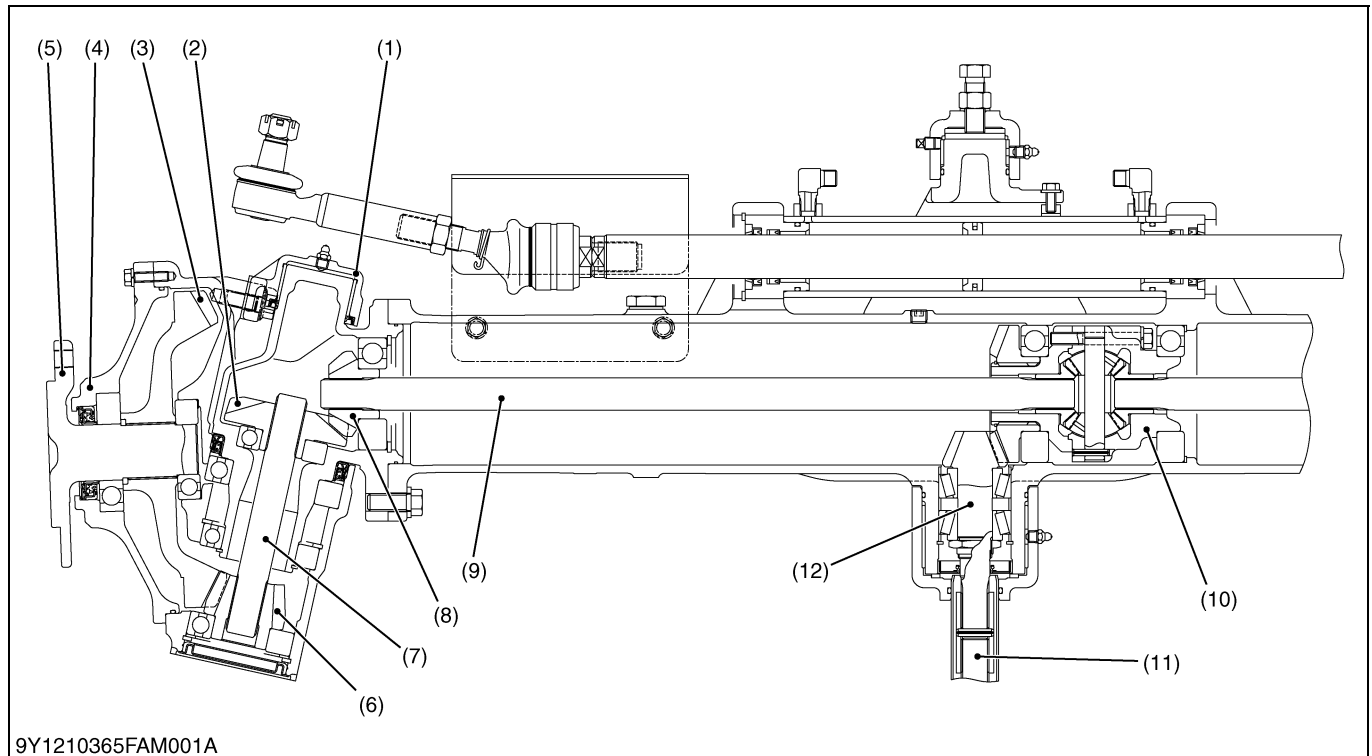
The two-wheel drive axle has free-running front wheels and four-wheel drive axle has powered front wheels.

## ■ NOTE

- Refer to "6. FRONT AXLE" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

9Y1210365FAM0001US0

## [1] 4 WHEEL DRIVE



9Y1210365FAM001A

(1) Front Axle Case Support  
 (2) 17T Bevel Gear  
 (3) 43T Bevel Gear  
 (4) Front Axle Case Cover

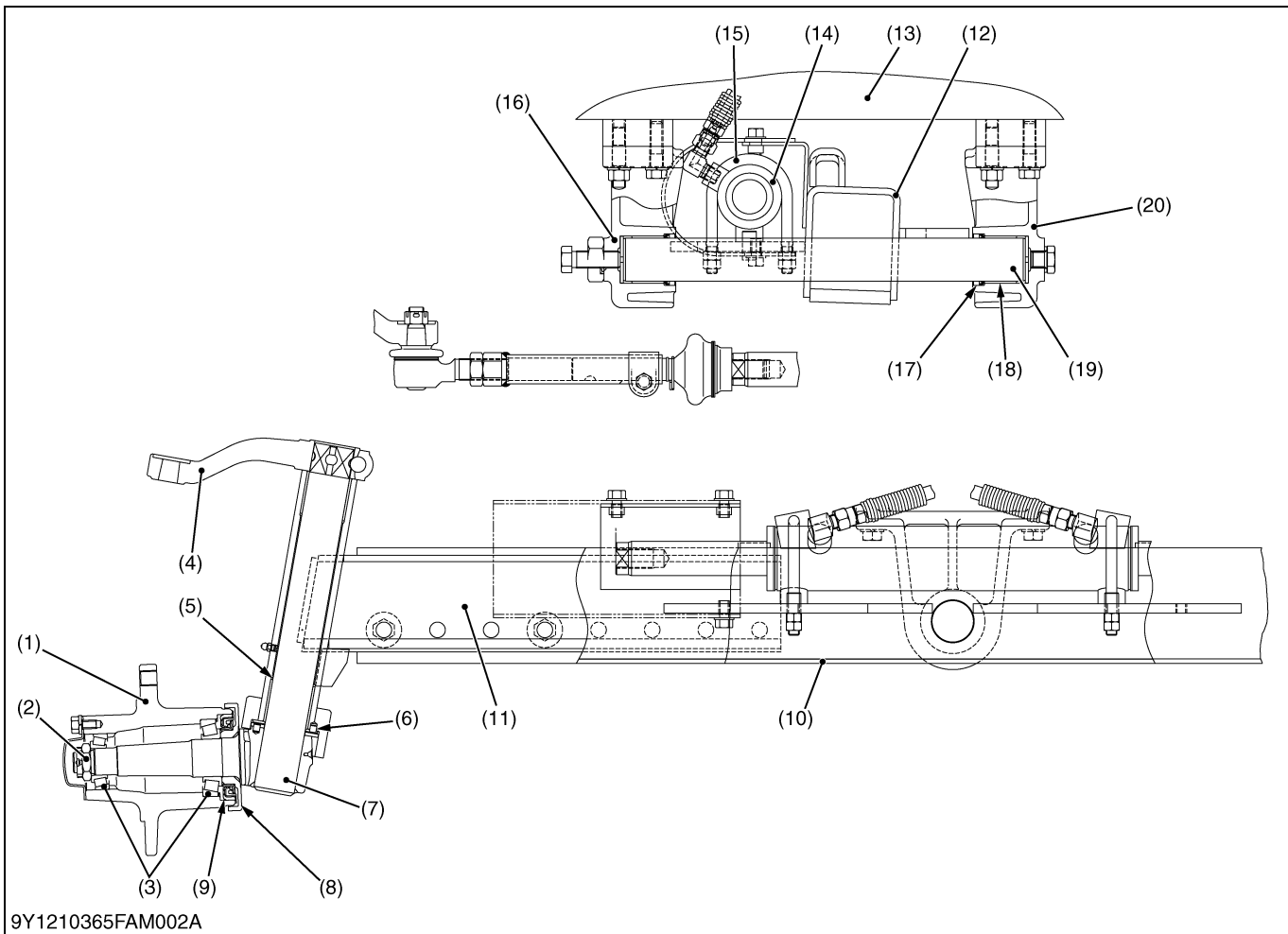
(5) Front Axle  
 (6) 9T Bevel Gear  
 (7) Bevel Gear Shaft

(8) 10T Bevel Gear  
 (9) Differential Yoke Shaft  
 (10) Differential Gear Assembly

(11) Propeller Shaft  
 (12) 8T Bevel Pinion Shaft  
 (13) 21T Bevel Gear

9Y1210365FAM0002US0

## [2] 2 WHEEL DRIVE



- |                             |                              |                              |                      |
|-----------------------------|------------------------------|------------------------------|----------------------|
| (1) Front Wheel Hub         | (7) Knuckle Shaft            | (12) Front Axle Support      | (16) Bracket (Front) |
| (2) Slotted Nut             | (8) Knuckle Dust Proof Cover | (13) Front Axle Bracket      | (17) Oil Seal        |
| (3) Taper Roller Bearing    | (9) Knuckle Stub Gasket      | (14) Power Steering Cylinder | (18) Bushing         |
| (4) Knuckle Arm             | (10) Front Axle Middle       | (15) Power Steering Cylinder | (19) Center Pin      |
| (5) Knuckle Shaft Bushing   | (11) Front Axle              | Bracket                      | (20) Bracket (Rear)  |
| (6) Knuckle Shaft Dowel Pin |                              |                              |                      |

The front axle of the 2WD model is constructed as shown above.

The knuckle shaft (7) is installed to the front axle (11) by the "**RUMOAN**" method.

With this method, the shape of the front axle is relatively simple, and front axle is supported at its center with the front axle support (12) on the front axle bracket (13), so that steering operation is stable even on an uneven ground encountered in a farm field.

9Y1210365FAM003US0

# SERVICING

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6. SERVICING.....	6-S16
[1] 4WD MODEL.....	6-S16
[2] 2WD MODEL.....	6-S23

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Front Wheels Wander to Right or Left</b>	Tire pressure uneven	Adjust	G-58
	Improper toe-in adjustment (improper alignment)	Adjust	6-S6
	Clearance between front axle case boss and front axle bracket (front, rear) bushing excessive	Replace	6-S22, 6-S23
	Front axle rocking force too small	Adjust	6-S6
	Front wheel sway excessive	Replace	6-S6
	Tie-rod end loose	Tighten	6-S10, 6-S15
	Air sucked in power steering circuit	Bleed	–
	Knuckle shaft bushings worn [2WD model]	Replace	6-S15, 6-S23
<b>Front Wheels Can Not Be Driven [4WD Model]</b>	Propeller shaft broken	Replace	6-S8
	Front wheel drive gears in transmission broken	Replace	–
	Front differential gear broken	Replace	6-S13
	Coupling displaced	Reassemble	6-S8
<b>Noise [4WD Model]</b>	Gear backlash excessive	Adjust or replace	–
	Oil insufficient	Replenish	G-10
	Bearings damaged or broken	Replace	–
	Gears damaged or broken	Replace	–
	Spiral bevel pinion shaft turning force improper	Adjust	6-S17

9Y1210365FAS0001US0

## 2. SERVICING SPECIFICATIONS

### [1] 4WD MODEL

Item		Factory Specification	Allowable Limit
Toe-in		2.0 to 8.0 mm 0.079 to 0.31 in.	–
Front Wheel	Steering Angle	0.882 to 0.916 rad 50.5 to 52.5 °	–
	Axial Sway	5.0 mm 0.20 in.	–
	Radial Sway	5.0 mm 0.20 in.	–
Front Axle	Swing Angle	0.12 to 0.13 rad 6.5 to 8.0 °	–
Differential Case, Differential Case Cover to Differential Side Gear	Clearance	0.040 to 0.123 mm 0.00157 to 0.00484 in.	0.20 mm 0.0079 in.
• Differential Case	I.D.	32.000 to 32.062 mm 1.2599 to 1.2622 in.	–
• Differential Case Cover	I.D.	32.000 to 32.062 mm 1.2599 to 1.2622 in.	–
• Differential Side Gear	O.D.	31.939 to 31.960 mm 1.2575 to 1.2582 in.	–
Pinion Shaft to Differential Pinion	Clearance	0.064 to 0.10 mm 0.0026 to 0.0039 in.	0.25 mm 0.0098 in.
• Pinion Shaft	O.D.	13.950 to 13.968 mm 0.54922 to 0.54992 in.	–
• Differential Pinion	I.D.	14.032 to 14.050 mm 0.55244 to 0.55314 in.	–
Differential Pinion to Differential Side Gear	Backlash	0.20 to 0.30 mm 0.0079 to 0.011 in.	0.40 mm 0.016 in.
Spiral Bevel Pinion Shaft	Turning Torque	0.98 to 1.1 N·m 0.10 to 0.12 kgf·m 0.73 to 0.86 lbf·ft	–
Bevel Pinion Shaft to Bevel Gear	Backlash	0.20 to 0.30 mm 0.0079 to 0.011 in.	0.40 mm 0.016 in.
10T Bevel Gear to 17T Bevel Gear	Backlash	0.20 to 0.30 mm 0.0079 to 0.011 in.	0.60 mm 0.024 in.
Front Axle and Front Gear Case	Clearance	0.0 to 0.1 mm 0 to 0.03 in.	–
9T Bevel Gear to 43T Bevel Gear	Backlash	0.20 to 0.30 mm 0.0079 to 0.011 in.	0.60 mm 0.024 in.

Item		Factory Specification	Allowable Limit
Front Axle Case Boss (Front) to Bracket Bushing	Clearance	0.120 to 0.275 mm 0.00473 to 0.0108 in.	0.35 mm 0.014 in.
	• Front Axle Case Boss (Front)	O.D. 49.950 to 49.975 mm 1.9666 to 1.9675 in.	–
	• Bushing	I.D. 50.095 to 50.225 mm 1.9723 to 1.9773 in.	–
Front Axle Case Boss (Rear) to Bracket Bushing	Clearance	0.0250 to 0.195 mm 0.000985 to 0.00767 in.	0.35 mm 0.014 in.
	• Front Axle Case Boss (Rear)	O.D. 80.000 to 80.035 mm 3.1496 to 3.1509 in.	–
	• Bushing	I.D. 80.060 to 80.195 mm 3.1520 to 3.1572 in.	–
Press-fitting	Depth of bushing	12.0 to 13.0 mm 0.473 to 0.511 in.	–
Bevel Gear Case Boss to Front Axle Support Bushing	Clearance	0.060 to 0.22 mm 0.0024 to 0.0086 in.	0.50 mm 0.020 in.
	• Bevel Gear Case Boss	O.D. 54.970 to 55.000 mm 2.1642 to 2.1653 in.	–
	• Front Axle Support Bushing	I.D. 55.060 to 55.190 mm 2.1678 to 2.1728 in.	–

9Y1210365FAS0002US0



**[2] 2WD MODEL**

Item		Factory Specification	Allowable Limit
Toe-in		1.0 to 5.0 mm 0.04 to 0.20 in.	–
Front Wheel	Steering Angle	0.925 to 0.960 rad 53 to 55 °	–
	Axial Sway (Face Runout of Wheel at Bead)	Less than 5.0 mm 0.197 in.	–
Front Axle	Swing Angle	0.16 to 0.19 rad 9.0 to 11 °	–
Front Wheel Hub	Turning Torque	3.0 to 4.9 N·m 0.30 to 0.50 kgf·m 2.2 to 3.6 lbf·ft	–
Front Axle Middle Boss to Bracket Bushing	Clearance	0.050 to 0.150 mm 0.00197 to 0.00590 in.	0.35 mm 0.0138 in.
• Front Axle Middle Boss	O.D.	39.938 to 40.000 mm 1.57236 to 1.57480 in.	–
• Bracket Bushing	I.D.	40.050 to 40.088 mm 1.57677 to 1.57827 in.	–
Knuckle Shaft (Kingpin) to Bushing	Clearance	0.020 to 0.125 mm 0.00079 to 0.00492 in.	0.35 mm 0.0138 in.
• Knuckle Shaft	O.D.	37.975 to 38.000 mm 1.49508 to 1.49606 in.	–
• Bushing	I.D.	38.020 to 38.100 mm 1.49685 to 1.50000 in.	–

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### 3. TIGHTENING TORQUES

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

#### [4WD]

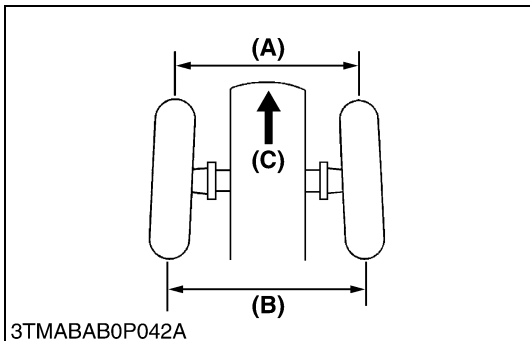
Item	N·m	kgf·m	lbf·ft
Tie-rod nut	167 to 196	17.0 to 20.0	123 to 144
Front axle rocking force adjusting lock nut	98.1 to 147.1	10.0 to 15.0	72.4 to 108.5
Delivery hose retaining nut	23 to 29	2.3 to 2.8	17 to 19
Front wheel mounting nut (M14)	167 to 196	17.0 to 20.0	123 to 144
Bracket mounting screw	103 to 117	10.5 to 12.0	76.0 to 86.7
Bracket mounting nut	78 to 90	7.9 to 9.2	58 to 66
Tie-rod end slotted nut	78 to 90	7.9 to 9.2	58 to 66
Bevel gear case mounting screw (M16, 9T)	167 to 196	17.0 to 20.0	123 to 144
Front axle cover mounting screw	30 to 34	3.0 to 3.5	22 to 25
Differential case cover mounting screw	61 to 70	6.2 to 7.2	45 to 52

#### [2WD]

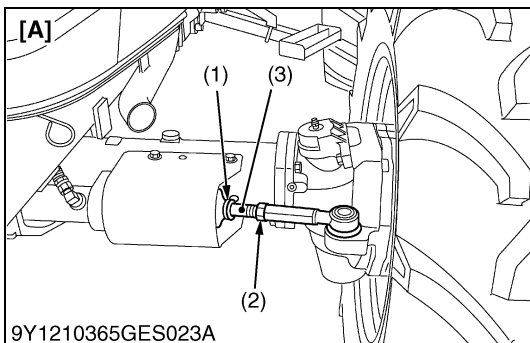
Item	N·m	kgf·m	lbf·ft
Tie-rod nut	167 to 196	17.0 to 20.0	123 to 144
Front axle rocking force adjusting lock nut	98.1 to 147.1	10.0 to 15.0	72.4 to 108.5
Delivery hose retaining nut	23 to 29	2.3 to 2.8	17 to 19
Front wheel mounting nut (M14)	167 to 196	17.0 to 20.0	123 to 144
Bracket mounting screw	103 to 117	10.5 to 12.0	76.0 to 86.7
Bracket mounting nut	78 to 90	7.9 to 9.2	58 to 66
Front wheel hub slotted nut	30 to 39	3.0 to 4.0	22 to 28
Tie-rod end slotted nut	78 to 90	7.9 to 9.2	58 to 66
Knuckle arm mounting screw and nut	124 to 147	12.6 to 15.0	91.2 to 108

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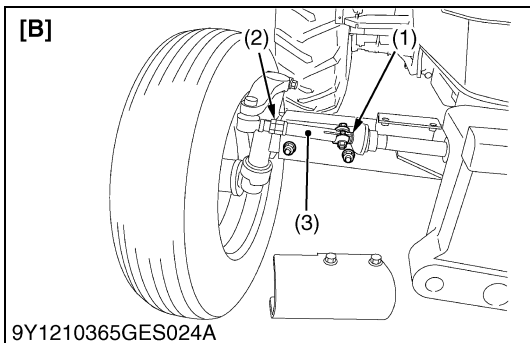
# 4. CHECKING AND ADJUSTING



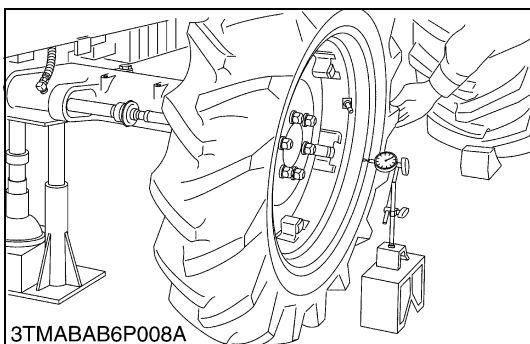
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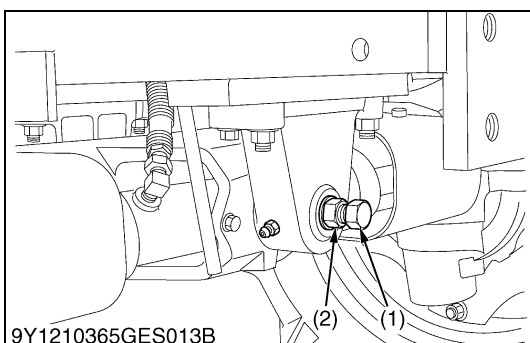
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9Y1210365GES024A



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9Y1210365GES013B

## Adjusting Toe-in

1. Park tractor on a flat place.
2. Turn steering wheel so front wheels are in the straight ahead position.
3. Lower the implement, lock the park brake and stop the engine.
4. Measure distance between tire beads at front of tire, hub height.
5. Measure distance between tire beads at rear of tire, hub height.
6. Front distance should be shorter than rear distance.
7. If not, adjust tie-rod length.

Toe-in (b-a)	Factory spec.	4WD	2.0 to 8.0 mm 0.079 to 0.315 in.
		2WD	1.0 to 5.0 mm 0.04 to 0.20 in.

## ■ Toe-in Adjustment

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

Tightening torque	Tie-rod nut	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
-------------------	-------------	---

- (1) Snap Ring
- (2) Tie-rod Nut
- (3) Tie-rod Joint

- (a) Wheel-to-wheel distance at front
- (b) Wheel-to-wheel distance at rear
- (c) "FRONT"
- [A] 4WD Model
- [B] 2WD Model

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## 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 rear the runout of rim.
4. If the measurement 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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## Adjusting Front Axle Pivot

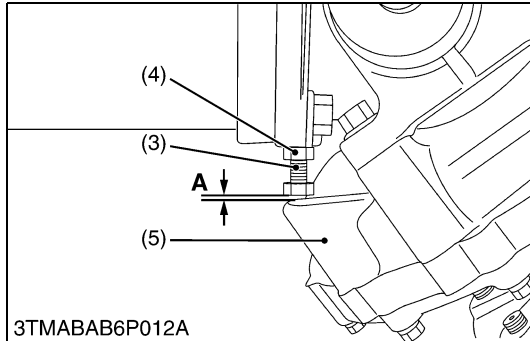
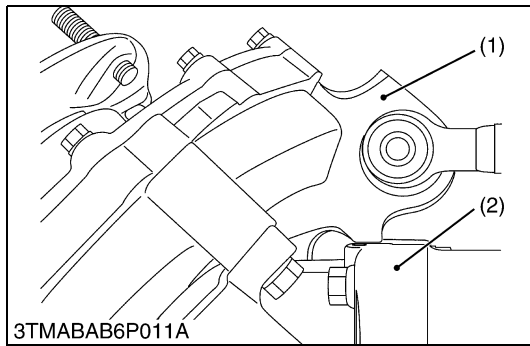
1. Jack up the tractor body, then loosen the lock nut (2).
  2. Screw in the adjusting screw (1) until seated, then tighten the screw (1) with an additional 1/6 turn.
- Re-tighten the lock nut (2).

Tightening torque	Lock nut	98.1 to 147 N·m 10.0 to 15.0 kgf·m 72.4 to 108 lbf·ft
-------------------	----------	---

- (1) Adjusting Screw

- (2) Lock Nut

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### Front Wheel Steering Angle [4WD Model]

1. Inflate the tires to the specified pressure.
2. Steer the wheels to the extreme right until the front gear case (1) contacts with the bevel gear case (2) at right hand side of the front axle.
3. If the front gear case (1) can not be contacted with the bevel gear case (2), shorten the length of stopper (3).
4. Keeping the front gear case (1) contact with the bevel gear case (2), make a specified clearance "A" as shown in the lower table.
5. After adjustment, secure the stopper with the lock nut (4).
6. For adjusting the left steering angle, perform the same procedure as mentioned in right steering angle.

Clearance "A" between bevel gear case and stopper	Factory spec.	1.0 to 3.0 mm 0.040 to 0.11 in.
---	---------------	------------------------------------

- (1) Front Gear Case  
 (2) Bevel Gear Case  
 (3) Stopper  
 (4) Lock Nut

(5) Front Gear Case

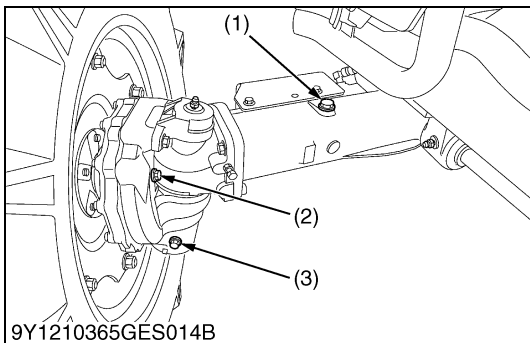
**A : Clearance**

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# 5. DISASSEMBLING AND ASSEMBLING

## [1] SEPARATING FRONT AXLE

### (1) 4WD Model



#### Draining Front Axle Case Oil

1. To drain the used oil, remove the right and left drain plugs (3) and filling plug (1) at the front axle case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs (3).
3. Remove the right and left breather plugs (2).
4. Fill with the new oil.
5. After filling reinstall the filling plug (1) and breather plugs (2).

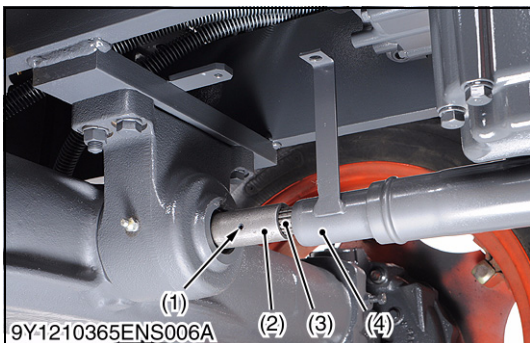
Front axle case oil	Capacity	8.0 L 8.5 U.S.qts 7.0 Imp.qts
---------------------	----------	-------------------------------------

#### NOTE

- Use KUBOTA SUPER UDT fluid or SAE80, 90 gear oil. Refer to "5. LUBRICANTS, FUEL AND COOLANT" at GENERAL Section.

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

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#### Propeller Shaft

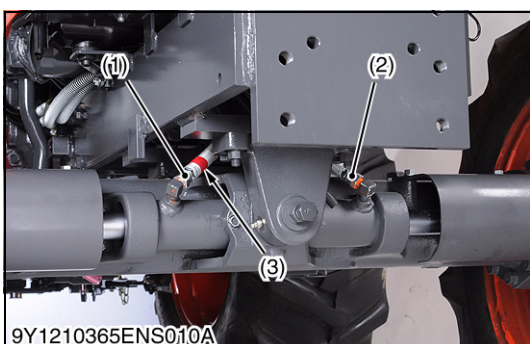
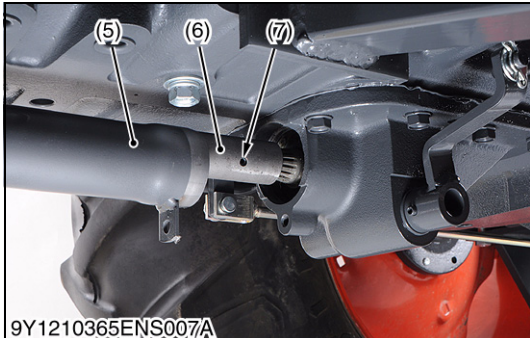
1. Slide the propeller shaft cover (4) and (5) after removing the screws.
2. Tap out the spring pin (1), (7) and then slide the coupling (2), (6) to the front and rear.

#### (When reassembling)

- Apply grease to the splines of the propeller shaft (3).

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

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#### Power Steering Hoses

1. Remove the power steering delivery hose (1) and (2) from the steering cylinder.

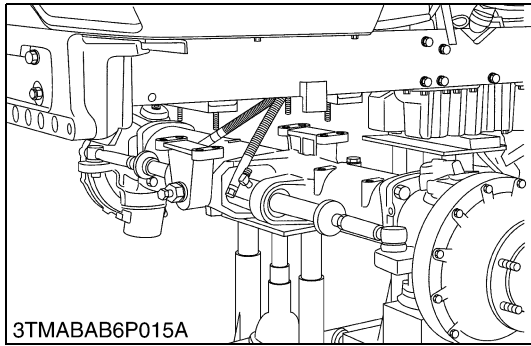
#### (When reassembling)

- Assemble the power steering delivery hose with Id. tape (3) to R.H. side.

Tightening torque	Delivery hose retaining nut	23 to 29 N·m 2.3 to 2.8 kgf·m 17 to 19 lbf·ft
-------------------	-----------------------------	---

- (1) Delivery Hose (R.H.) (3) Id. Tape  
(2) Delivery Hose (L.H.)

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**Front Wheel and Front Axle**

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)**

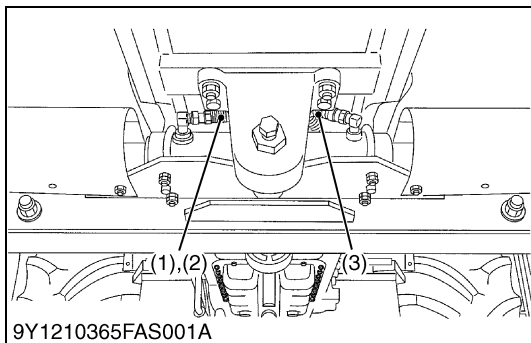
Tightening torque	Front wheel mounting nut	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Bracket mounting screw (M12, 9T)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft
	Bracket mounting nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

**■ IMPORTANT**

- Be sure to adjust the front axle rocking force.

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**(2) 2WD Model**



**Front Wheel and Power Steering Hoses**

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. Disconnect the power steering delivery hoses (1), (3).

**(When reassembling)**

- Assemble the power steering delivery hose with Id. tape (2) to the R.H. side.

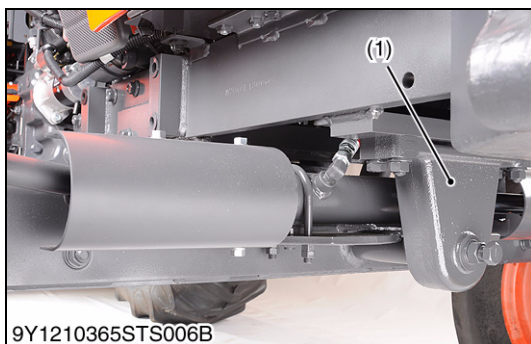
Tightening torque	Power steering hose retaining nut	23 to 29 N·m 2.3 to 2.8 kgf·m 17 to 19 lbf·ft
	Front wheel mounting nut (M14)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft

(1) Delivery Hose (R.H.)

(3) Id. Tape

(2) Delivery Hose (L.H.)

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**Front Axle**

1. Place a disassembly stand under the front axle case and support it with a jack.
2. Remove the bracket (front) (1) mounting screws and nuts.
3. Remove the bracket (rear) mounting screws and nuts.
4. Separating the front axle from front axle bracket.

**(When reassembling)**

Tightening torque	Bracket mounting screw (M12, 9T)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft
	Bracket mounting nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

**■ IMPORTANT**

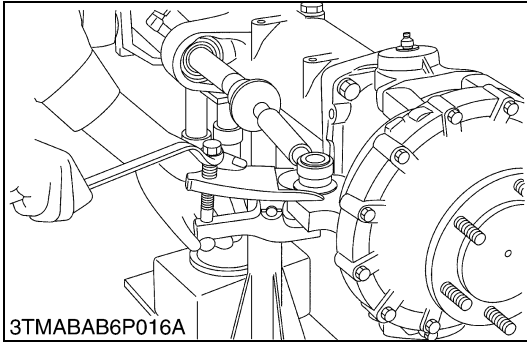
- Be sure to adjust the front axle pivot.

(1) Front Bracket

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## [2] DISASSEMBLING FRONT AXLE

### (1) 4WD Model



#### Tie-rod

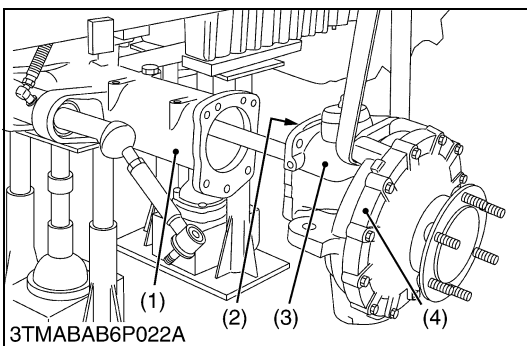
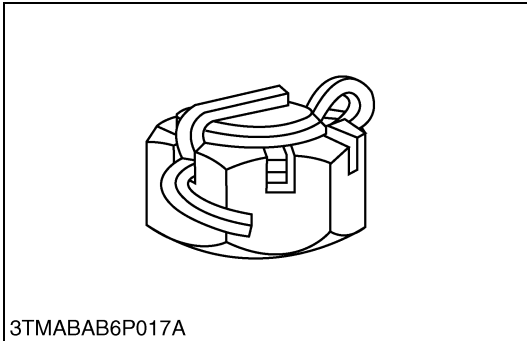
1. Pull out the cotter pin and loosen the tie-rod end slotted nut.
2. Disconnect the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

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

- After tightening the tie-rod end nut to the specified torques, install a cotter pin as shown in the figure.

Tightening torque	Tie-rod end slotted nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
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#### **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)**

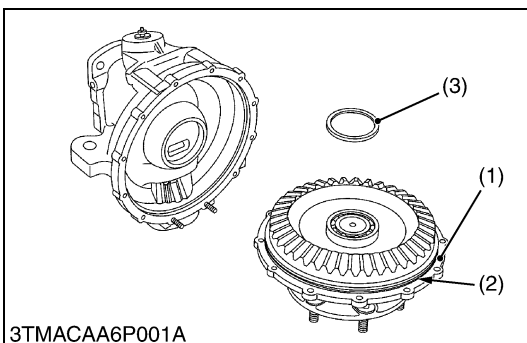
- Apply grease to the O-ring (2) and take care not to damage it.
- Do not interchange right and left bevel gear case assemblies.

Tightening torque	Bevel gear case mounting screw	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
-------------------	--------------------------------	---

- (1) Front Axle Case  
(2) O-ring

- (3) Bevel Gear Case  
(4) Front Gear Case

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#### **Front Axle Cover and Front Gear Case**

1. Remove the front axle cover mounting screws.
2. Remove the front axle cover (1) and shim (3).

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

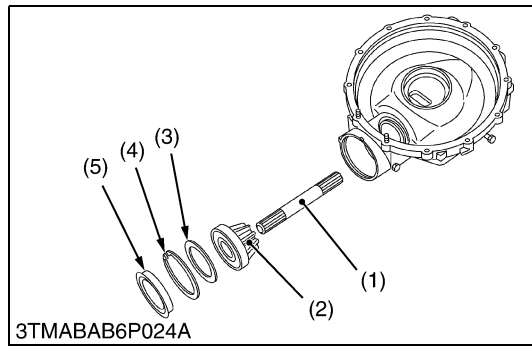
- Apply grease to the O-ring (2) of axle flange.
- Tighten the axle flange mounting screws and nuts diagonally in several steps.
- Install the shim (3) to its original position.
- The thickness of shim (3) uses 0.4 mm (0.016 in.) by the standard. There some difference in the production lot.
- Check and adjust the backlash and tooth contact, refer to the "6. SERVICING" in this section.

Tightening torque	Front axle cover mounting screw	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft
-------------------	---------------------------------	---

- (1) Axle Flange  
(2) O-ring

- (3) Shim

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### Bevel Gear and Bevel Gear Shaft

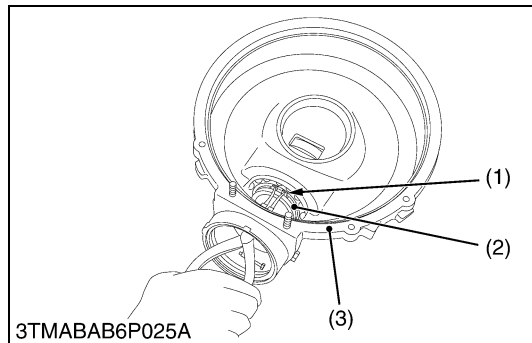
1. Remove the plug (5).
2. Remove the internal snap ring (4) and shim (3).
3. Tap out the bevel gear (2) with ball bearing.
4. Draw out the bevel gear shaft (1).

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

- Install the shim (3) to its original position.
- The thickness of shim (3) uses 2.0 mm (0.008 in.) by the standard. There some difference in the production lot.
- Check and adjust the backlash and tooth contact, refer to the "6. SERVICING" in this section.

- |                      |                        |
|----------------------|------------------------|
| (1) Bevel Gear Shaft | (4) Internal Snap Ring |
| (2) Bevel Gear       | (5) Plug               |
| (3) Shim             |                        |

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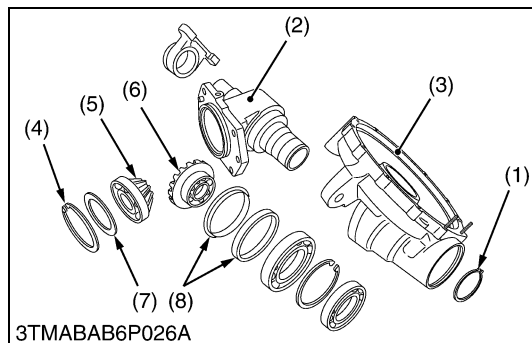


### Bevel Gear Case

1. Remove the external snap ring (1).
2. Tap the bevel gear case (2) and separate it from the front gear case (3).

- |                        |                     |
|------------------------|---------------------|
| (1) External Snap Ring | (3) Front Gear Case |
| (2) Bevel Gear Case    |                     |

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### Bevel Gear Case Gears

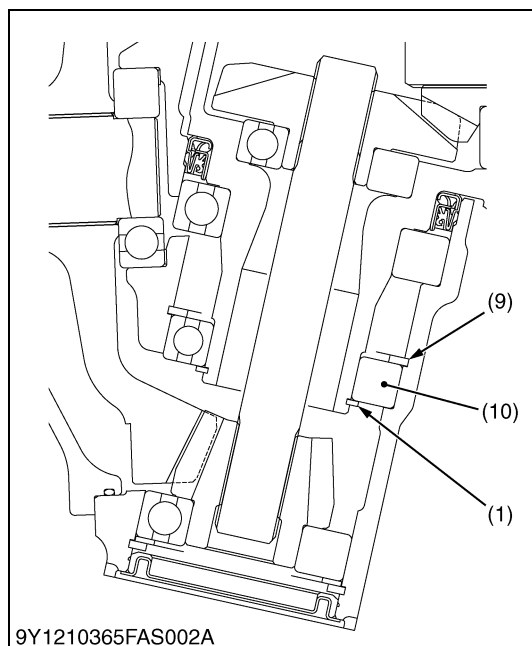
1. Remove the internal snap ring (4).
2. Take out the bevel gears (5), (6) with ball bearings, and shims (7).

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

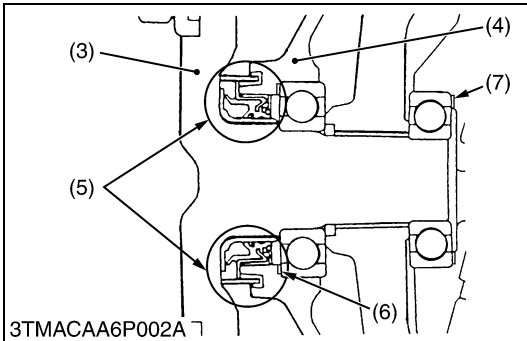
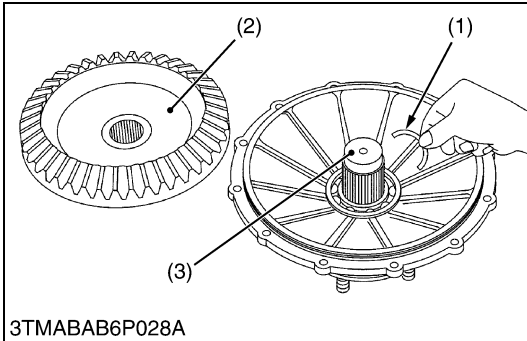
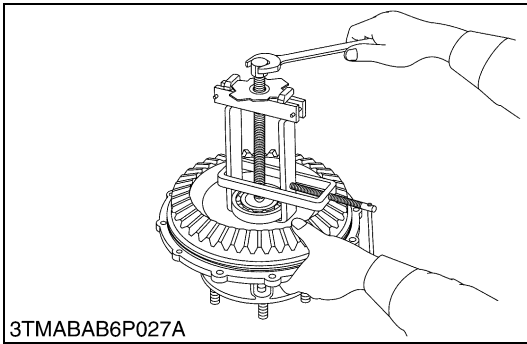
- Install the shims (7) to their original position.
- The thickness of shim (7) uses 1.0 mm (0.039 in.) by the standard. There some difference in the production lot.
- Check and adjust the backlash, refer to the "6. SERVICING" in this section.
- Toward the **R** shape side of the external snap ring (1) and internal snap ring (9) to the bearing (10).
- Install the oil seal (8) of bevel gear case, noting its direction.

- |                        |                        |
|------------------------|------------------------|
| (1) External Snap Ring | (6) Bevel Gear         |
| (2) Bevel Gear Case    | (7) Shim               |
| (3) Front Gear Case    | (8) Oil Seal           |
| (4) Internal Snap Ring | (9) Internal Snap Ring |
| (5) Bevel Gear         | (10) Bearing           |

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### Axle

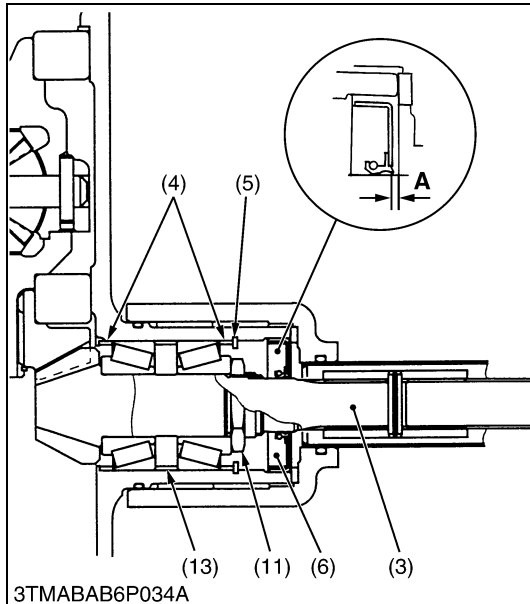
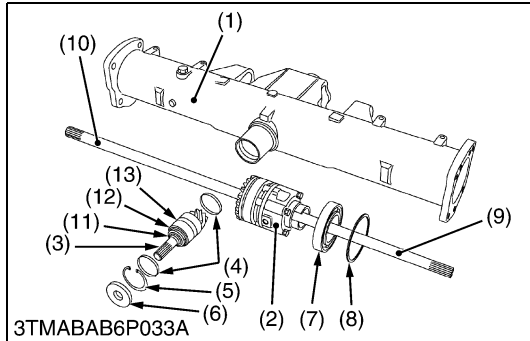
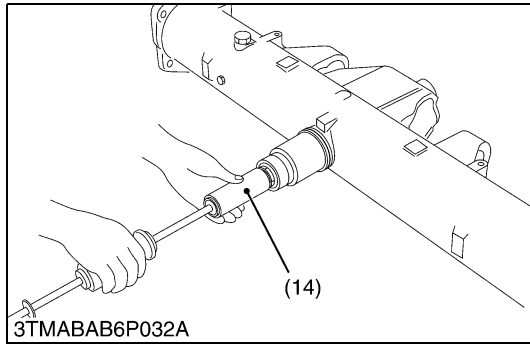
1. Remove the bearing with a special use puller set (Code No. 07916-09032).
2. Take out the bevel gear (2).
3. Take out the collar (1).
4. Tap out the axle (3).

### (When reassembling)

- Install the oil seal (5) of axle flange (4), noting its direction as shown in the figure below.
- End play of axle shaft adjusts with shim (6), (7) to 0.1 mm (0.004 in.) or less while axle flange and front case were assembled.
- Install the shims (6), (7) to their original position.
- The thickness of shim (6) uses 0.5 mm (0.020 in.) and shim (7), uses 0.4 mm (0.016 in.) by the standard. There some difference in the production lot.
- Check and adjust the backlash and tooth contact, refer to the "6. SERVICING" in this section.

- |                 |              |
|-----------------|--------------|
| (1) Collar      | (5) Oil Seal |
| (2) Bevel Gear  | (6) Shim     |
| (3) Axle        | (7) Shim     |
| (4) Axle Flange |              |

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### 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.
- When press-fitting an oil seal (6), observe the dimension "A" described in the figure.
- Be sure to adjust the spiral bevel pinion shaft turning torque with lock nut (11) after assemble the spiral bevel pinion shaft assembly.

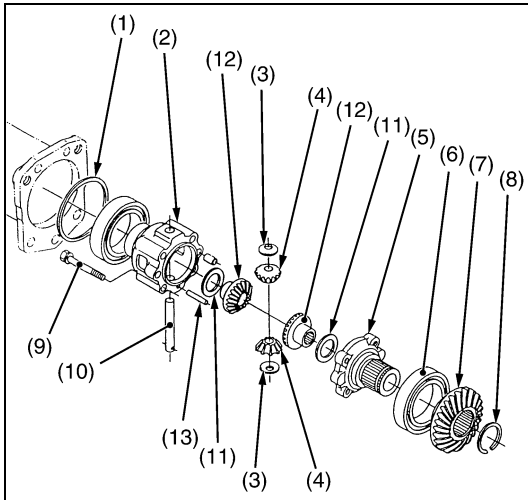
#### ■ IMPORTANT

- After adjusting the turning torque stake the lock nut (11) firmly.

Turning torque of spiral bevel pinion shaft	Factory spec.	0.98 to 1.1 N·m 0.10 to 0.12 kgf·m 0.73 to 0.86 lbf·ft
---	---------------	--

- |                                  |  |
|----------------------------------|--|
| (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 1.0 mm</b> |
| (8) Shim                         | <b>(0.020 to 0.039 in.)</b>            |
| (9) Differential Yoke Shaft R.H. |  |

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**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)**

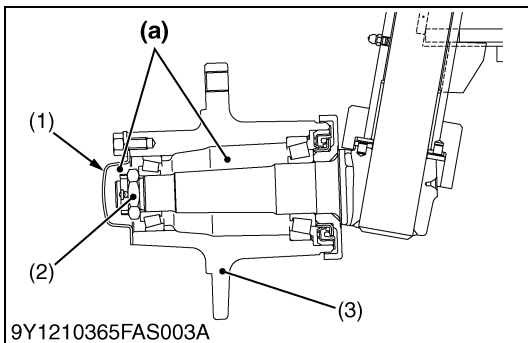
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential side gears (12) and differential pinions (4).

Tightening torque	Differential case cover mounting screw	61 to 70 N·m 6.2 to 7.2 kgf·m 45 to 52 lbf·ft
-------------------	--	---

- |                             |  |
|-----------------------------|--|
| (1) Shim                    | (8) External Snap Ring                     |
| (2) Differential Case       | (9) Differential Case Cover Mounting Screw |
| (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       |  |

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**(2) 2WD Model**



9Y1210365FAS003A

**Front Wheel Hub**

1. Remove the front wheel cap (1).
2. Draw out the cotter pin.
3. Remove the slotted nut (2).
4. Remove the collar.
5. Remove the front wheel hub (3) with puller.

**(When reassembling)**

- Replace cotter pin with a new one.
- Apply grease to the oil seal and bearing in the front wheel hub.
- After tightening the slotted nut to the specified torques, install a cotter pin as shown in the figure.

Tightening torque	Front wheel hub slotted nut	30 to 39 N·m 3.0 to 4.0 kgf·m 22 to 28 lbf·ft
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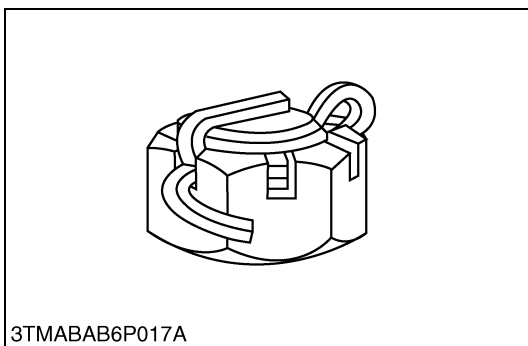
**■ IMPORTANT**

- **After tightening the slotted nut to the specified torque, measure the front wheel hub turning torque.**
- **If the measurement is not within the factory specifications, adjust with the slotted nut.**

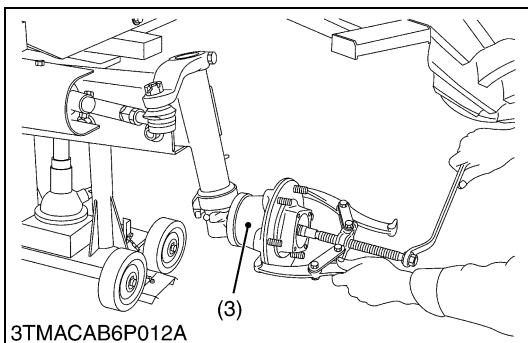
Front wheel hub turning torque	Factory spec.	2.94 to 4.90 N·m 0.3 to 0.5 kgf·m 2.17 to 3.62 lbf·ft
--------------------------------	---------------	---

- |                     |            |
|---------------------|------------|
| (1) Front Wheel Cap | (a) Grease |
| (2) Slotted Nut     |            |
| (3) Front Wheel Hub |            |

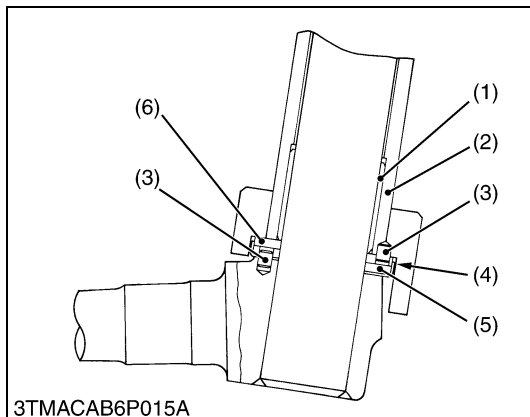
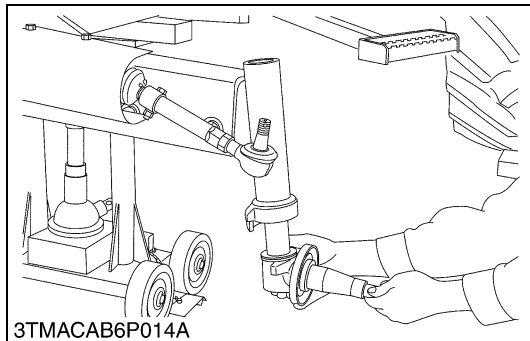
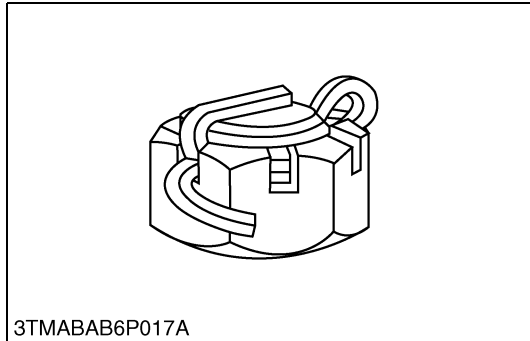
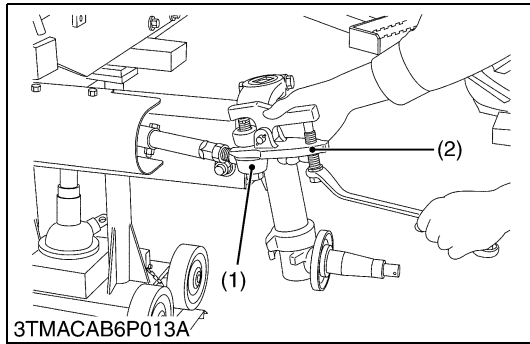
9Y1210365FAS0033US0



3TMABAB6P017A



3TMACAB6P012A



### Tie-rod

1. Pull out the cotter pin and loosen the tie-rod end nut.
2. Disconnect the tie-rod (1) with a tie-rod end lifter (2) (Code No. 07909-39051).
3. Remove the tie-rod end nut and tie-rod end.

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

- Replace cotter pin with a new one.
- After tightening the tie-rod end nut to the specified torques, install a cotter pin as shown in the figure.

Tightening torque	Tie-rod end slotted nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
-------------------	-------------------------	---

(1) Tie-rod

(2) Tie-rod End Lifter

9Y1210365FAS0034US0

### Knuckle Shaft

1. Remove the knuckle arm and remove the knuckle shaft from the front axle.

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

- Assemble the knuckle shaft, making sure that the hole of the thrust collars (5), (6) at properly fitted to the knuckle shaft dowel pins (3).

Tightening torque	Knuckle arm mounting screw and nut	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
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(1) Knuckle Shaft Bushing

(4) Thrust Collar Cap

(2) Front Axle

(5) Thrust Collar 1

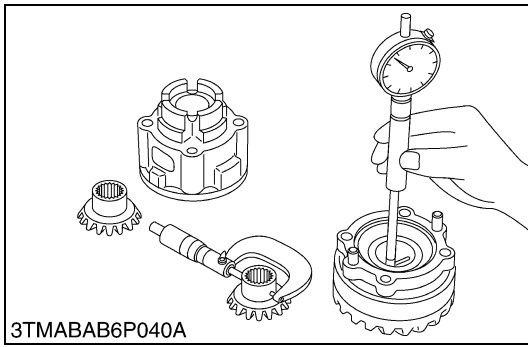
(3) Dowel Pin

(6) Thrust Collar 2

9Y1210365FAS0035US0

## 6. SERVICING

### [1] 4WD MODEL



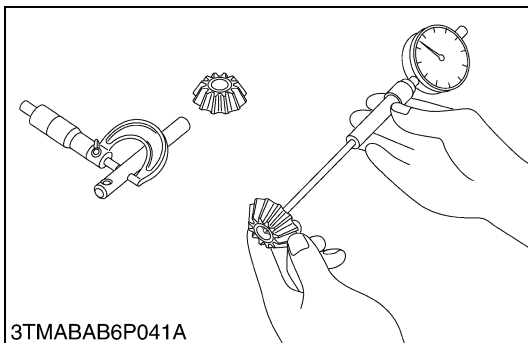
#### Clearance between Differential Case (Differential Case Cover) and Differential Side Gear

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.	0.040 to 0.123 mm 0.00157 to 0.00484 in.
	Allowable limit	0.20 mm 0.0079 in.

Differential case bore I.D.	Factory spec.	32.000 to 32.062 mm 1.2599 to 1.2622 in.
Differential case cover bore I.D.	Factory spec.	32.000 to 32.062 mm 1.2599 to 1.2622 in.
Differential side gear O.D.	Factory spec.	31.939 to 31.960 mm 1.2575 to 1.2582 in.

9Y1210365FAS0018US0



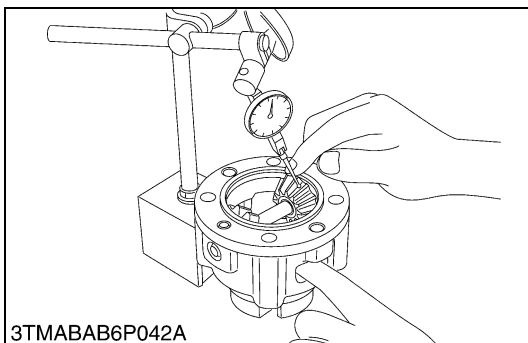
#### Clearance between Pinion Shaft and Differential Pinion

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 0.10 mm 0.0026 to 0.0039 in.
	Allowable limit	0.25 mm 0.0098 in.

Pinion shaft O.D.	Factory spec.	13.950 to 13.968 mm 0.54922 to 0.54992 in.
Differential pinion I.D.	Factory spec.	14.032 to 14.050 mm 0.55244 to 0.55314 in.

9Y1210365FAS0019US0



#### Backlash between Differential Pinion and Differential Side Gear

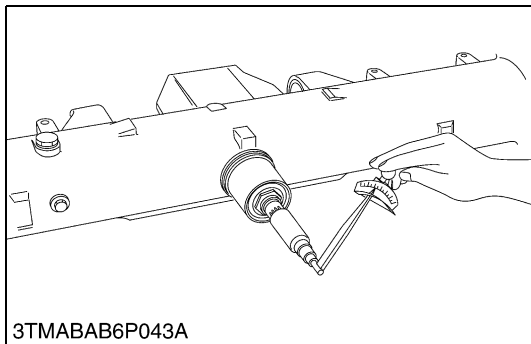
1. Set a dial gauge (lever type) on a tooth of the differential pinion.
2. Fix the differential side gear and move the differential pinion to measure the backlash.
3. If the measurement exceeds the factory specifications, adjust with the differential side gears shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.011 in.
	Allowable limit	0.40 mm 0.016 in.

#### **(Reference)**

- Thickness of adjusting shims  
0.8 mm (0.031 in.)  
1.0 mm (0.039 in.)  
1.2 mm (0.047 in.)
- Tooth contact : More than 35 %

9Y1210365FAS0020US0



### Turning Torque of Spiral Bevel Pinion Shaft (Pinion Shaft Only)

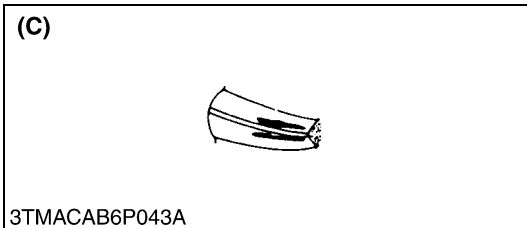
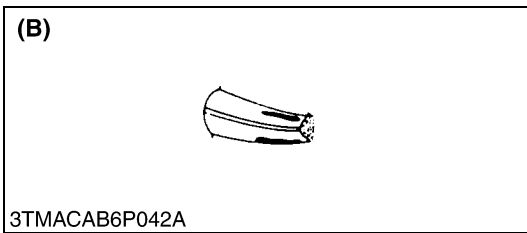
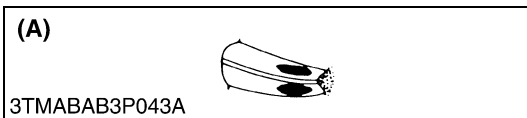
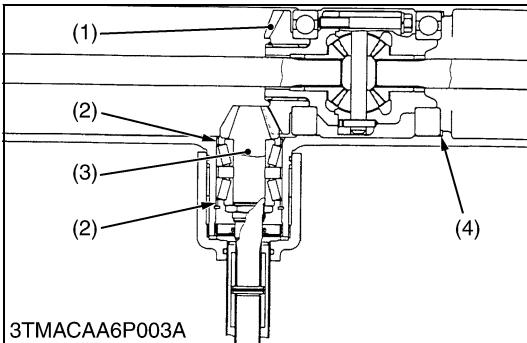
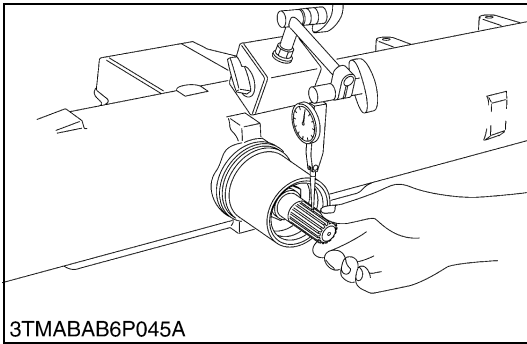
1. Install the spiral bevel pinion shaft assembly only to the front axle case.
2. Measure the turning torque of spiral bevel pinion shaft.
3. If the turning torque is not within the factory specifications, adjust with the lock nut.

Turning torque of spiral bevel pinion shaft	Factory spec.	0.98 to 1.1 N·m 0.10 to 0.12 kgf·m 0.73 to 0.86 lbf·ft
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#### ■ NOTE

- **After turning torque adjustment, be sure to stake the lock nut.**

9Y1210365FAS0021US0



**Backlash and Tooth Contact between Bevel Pinion Shaft and Bevel Gear**

1. Set a dial indicator (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the bevel pinion shaft (3) and moving the bevel gear (1) by hand.
3. If the backlash exceeds the allowable limit, adjust with the shim (4).
4. Adjust the backlash properly by repeating the above procedures.

Backlash between bevel gear and bevel pinion shaft	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.011 in.
	Allowable limit	0.40 mm 0.016 in.

5. Apply red lead lightly over several teeth at three positions equally spaced on the bevel gear (1).
6. Turn the bevel pinion shaft (3), while pressing a wooden piece against the periphery of the bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions shown in the figure.

**(Reference)**

- Thickness of adjusting collar (2) :

5.8 mm (0.228 in.)	6.2 mm (0.244 in.)
5.9 mm (0.232 in.)	6.4 mm (0.252 in.)
6.0 mm (0.236 in.)	10.0 mm (0.394 in.)
6.1 mm (0.240 in.)	

- Thickness of adjusting shims (4) :

1.6 mm (0.063 in.)	2.2 mm (0.087 in.)
1.8 mm (0.071 in.)	2.4 mm (0.094 in.)
2.0 mm (0.079 in.)	

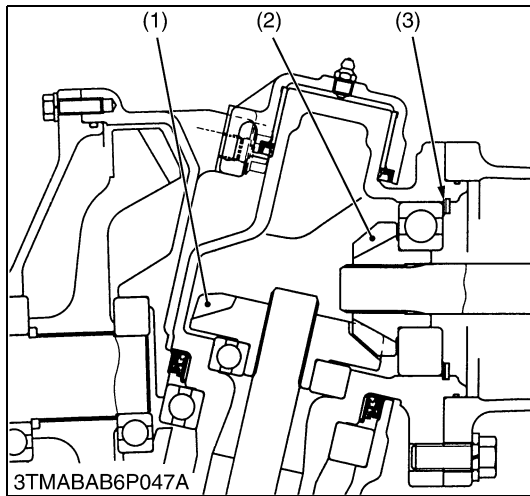
**■ IMPORTANT**

- **After adjusting the tooth contact, check the backlash between spiral bevel pinion shaft and spiral bevel gear again.**

- (1) Bevel Gear
- (2) Collar
- (3) Bevel Pinion Shaft
- (4) Shim

- (A) **Proper Contact :**  
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.
- (B) **Deep Contact :**  
Decrease the shims.
- (C) **Shallow Contact :**  
Increase the shims.

9Y1210365FAS0022US0



### **Backlash between 10T Bevel Gear and 17T Bevel Gear**

1. Use thick grease to attach the solder strips to the 17T bevel gear (1) at three evenly spaced locations.
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 determine the average thickness of the solder strips with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

Backlash between 10T bevel gear and 17T bevel gear	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.011 in.
	Allowable limit	0.60 mm 0.024 in.

### **(Reference)**

- The thickness of shim (3) uses 1.0 mm (0.039 in.) by the standard. There are some difference in the production lot.
- Thickness of adjusting shims
  - 0.4 mm (0.016 in.)
  - 0.6 mm (0.024 in.)
  - 0.8 mm (0.031 in.)
  - 1.0 mm (0.039 in.) "Standard"
  - 1.2 mm (0.047 in.)
- Tooth contact : More than 30 %

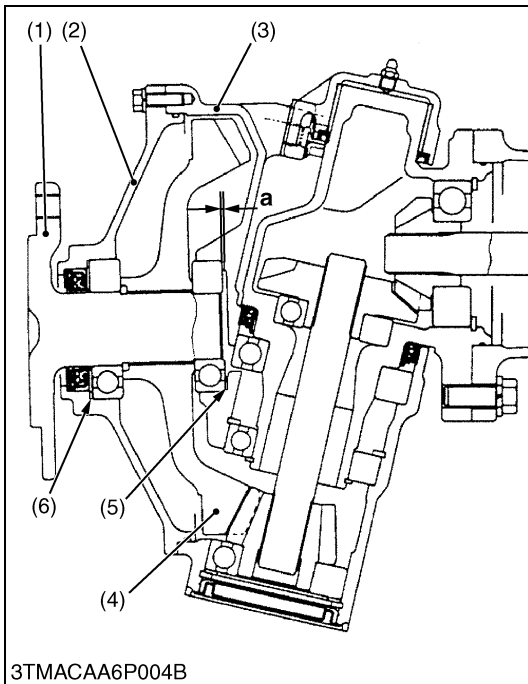
(1) 17T Bevel Gear

(3) Shim

(2) 10T Bevel Gear

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**Clearance between Front Axle and Front Gear Case**

1. Assemble the front axle (1) and 43T gear (4) and related parts with "standard" thickness of shims (5) and (6) or "original" shims (5) and (6).
2. Use thick grease to attach the solder strips to three evenly spaced points on the face of the shim (5).
3. Assemble the front axle cover (2) and front gear case (3).
4. Remove the front axle cover (2) from front gear case (3) and determine the average thickness of the solder strips with an outside micrometer.
5. If the clearance is not within the factory specifications, adjust with shim (5).

■ **IMPORTANT**

- **Do not change the overall thickness of these shims during the next step (backlash between 9T bevel gear and 43T bevel gear).**

Clearance between front axle and front gear case	Factory spec.	0.0 to 0.1 mm 0 to 0.03 in.
--	---------------	--------------------------------

**(Reference)**

- Thickness of adjusting shims  
 Shim (5) :  
 0.1 mm (0.004 in.)  
 0.2 mm (0.008 in.)  
 0.4 mm (0.016 in.) "Standard"  
 Shim (6) :  
 0.1 mm (0.004 in.)  
 0.2 mm (0.008 in.)  
 0.5 mm (0.020 in.) "Standard"
- Shims shown in the table below are considered the "standard" shims. "Original" shim thickness, however, may vary among production machines.

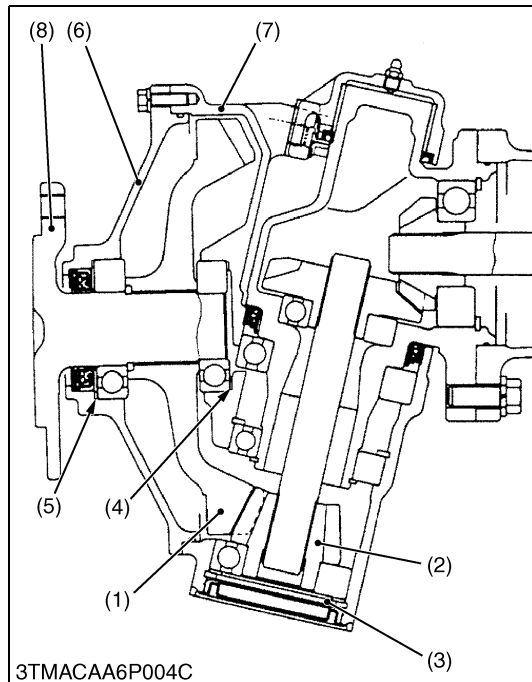
Shim (5)	Standard thickness	0.4 mm (0.016 in.)
Shim (6)		0.5 mm (0.020 in.)

- (1) Front Axle
- (2) Front Axle Cover
- (3) Front Gear Case
- (4) 43T Bevel Gear
- (5) Shim

(6) Shim

**a : Clearance between Front Axle and Front Gear Case**

9Y1210365FAS0024US0



### Backlash between 9T Bevel Gear and 43T Bevel Gear

1. Use thick grease to attach the solder strips to the 43T bevel gear (1) at three evenly spaced locations.
2. Assemble the front axle cover (6) and front gear case (7).
3. Turn the front axle (8).
4. Remove the front axle cover (6) from front gear case (7) and determine the average thickness of the solder strips with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).
6. Check the condition for tooth contact. The tooth contact may be adjusted by exchanging the locations of shims (4) and (5), but do not change the overall thickness of shims (4) and (5).

Backlash between 9T bevel gear and 43T bevel gear	Factory spec.	0.20 to 0.30 mm 0.0079 to 0.011 in.
	Allowable limit	0.60 mm 0.024 in.

### (Reference)

- Thickness of adjusting shims  
Shim (3) :  
1.0 mm (0.039 in.)  
1.2 mm (0.047 in.)  
1.6 mm (0.063 in.)  
1.8 mm (0.071 in.)  
2.0 mm (0.079 in.) "Standard"  
Shim (4) :  
0.1 mm (0.004 in.)  
0.2 mm (0.008 in.)  
0.4 mm (0.016 in.) "Standard"  
Shim (5) :  
0.1 mm (0.004 in.)  
0.2 mm (0.008 in.)  
0.5 mm (0.020 in.) "Standard"

### ■ IMPORTANT

- **Tooth contact : More than 35 %**
- **If the tooth contact not proper, change the thickness of shim (3) and location of the shim (4) and (5) to adjust.**
- **After adjusting the tooth contact, check the backlash again.**

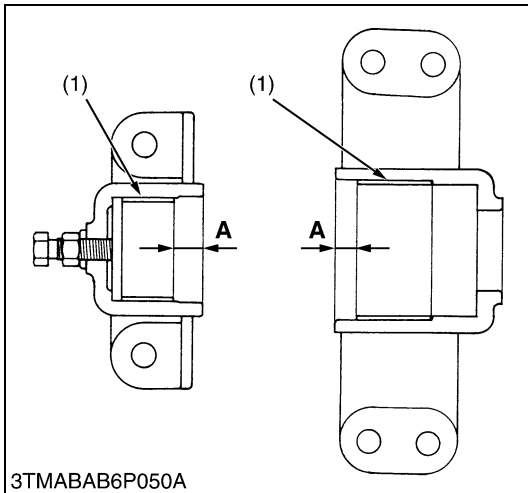
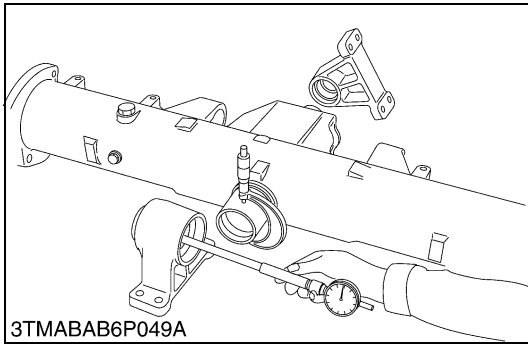
### ■ NOTE

- **Shims shown in the table below are considered the "standard" shims. "Original" shim thickness, however, may vary among production machines.**

Shim (3)	Standard thickness	2.0 mm (0.079 in.)
Shim (4)		0.4 mm (0.016 in.)
Shim (5)		0.5 mm (0.020 in.)

- |                    |                      |
|--------------------|----------------------|
| (1) 43T Bevel Gear | (5) Shim             |
| (2) 9T Bevel Gear  | (6) Front Axle Cover |
| (3) Shim           | (7) Front Gear Case  |
| (4) Shim           | (8) Front Axle       |

9Y1210365FAS0025US0



**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 0.0473 to 0.0108 in.
	Allowable limit	0.35 mm 0.014 in.

Front axle case boss (front) O.D.	Factory spec.	49.950 to 49.975 mm 1.9666 to 1.9675 in.
Bracket bushing (front) I.D.	Factory spec.	50.095 to 50.225 mm 1.9723 to 1.9773 in.

Clearance between front axle case boss (rear) and bracket bushing (rear)	Factory spec.	0.0250 to 0.195 mm 0.000985 to 0.00767 in.
	Allowable limit	0.35 mm 0.014 in.

Front axle case boss (rear) O.D.	Factory spec.	80.000 to 80.035 mm 3.1496 to 3.1509 in.
Bracket bushing (rear) I.D.	Factory spec.	80.060 to 80.195 mm 3.1520 to 3.1572 in.

■ **Press-fitting Bushing**

- When press-fitting a new bushing, observe the dimension described in the figure

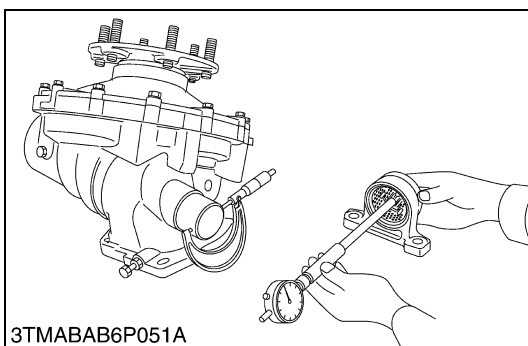
Press-fit depth of bushing "A"	Reference value	12.0 to 13.0 mm 0.473 to 0.511 in.
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■ **NOTE**

- **After replacing the bushing, be sure to adjust the front axle rocking force.**

(1) Bushing

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**Clearance between Bevel Gear Case Boss and Front Axle Support Bushing**

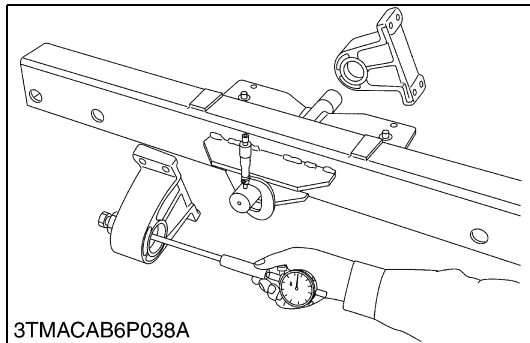
1. Measure the bevel gear case boss O.D. with an outside micrometer.
2. Measure the support bushing I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between bevel gear case boss and front axle support bushing	Factory spec.	0.060 to 0.22 mm 0.0024 to 0.0086 in.
	Allowable limit	0.50 mm 0.020 in.

Bevel gear case boss O.D.	Factory spec.	54.970 to 55.000 mm 2.1642 to 2.1653 in.
Front axle support bushing I.D.	Factory spec.	55.060 to 55.190 mm 2.1678 to 2.1728 in.

9Y1210365FAS0027US0

## [2] 2WD MODEL



### Clearance between Front Axle Middle Boss and Bracket Bushing

1. Measure the front axle middle boss O.D. at several points where it contacts with the bushings.
2. Measure the front axle bracket (front) bushing I.D. and bracket (rear) bushing I.D. in the same method, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

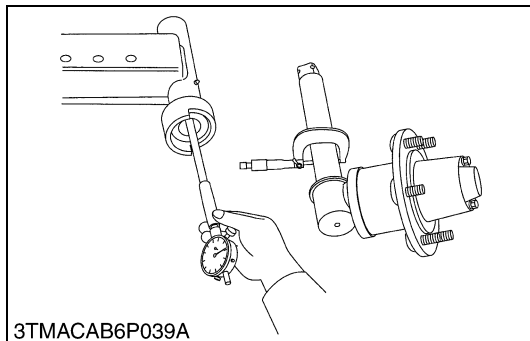
Clearance between front axle middle boss and bracket bushing	Factory spec.	0.050 to 0.150 mm 0.00197 to 0.00590 in.
	Allowable limit	0.35 mm 0.0138 in.

Front axle middle boss O.D.	Factory spec.	39.938 to 40.000 mm 1.57236 to 1.57480 in.
Bracket bushing I.D.	Factory spec.	40.050 to 40.088 mm 1.57677 to 1.57827 in.

#### **(When replacing bushing)**

- Before press-fitting the bushing, install the new thrust collar.
- Install the oil seals, noting their direction.

9Y1210365FAS0036US0



### Clearance between Knuckle Shaft (Kingpin) and Bushing

1. Measure the shaft O.D. at several point 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.

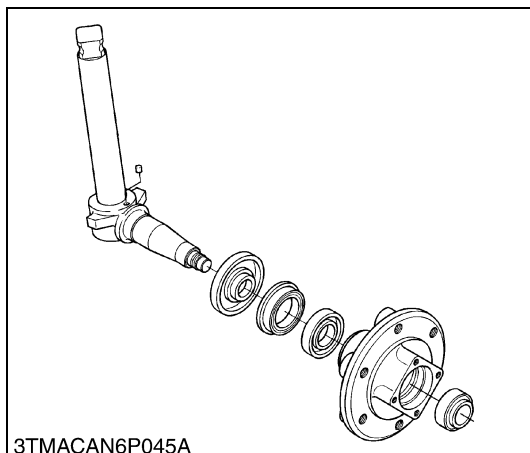
Clearance between knuckle shaft (kingpin) and bushing	Factory spec.	0.020 to 0.125 mm 0.00079 to 0.00492 in.
	Allowable limit	0.35 mm 0.0138 in.

Knuckle shaft O.D.	Factory spec.	37.975 to 38.000 mm 1.49508 to 1.49606 in.
Bushing I.D.	Factory spec.	38.020 to 38.100 mm 1.49685 to 1.50000 in.

#### **(When replacing bushing)**

- Remove the bushing with a bushing puller set (Code No. 07916-51011).

9Y1210365FAS0037US0



### Taper Roller Bearing

1. Check the bearing for abrasion, color change or other damage.
2. If there is any doubt as to the condition of a taper roller bearing, replace it.

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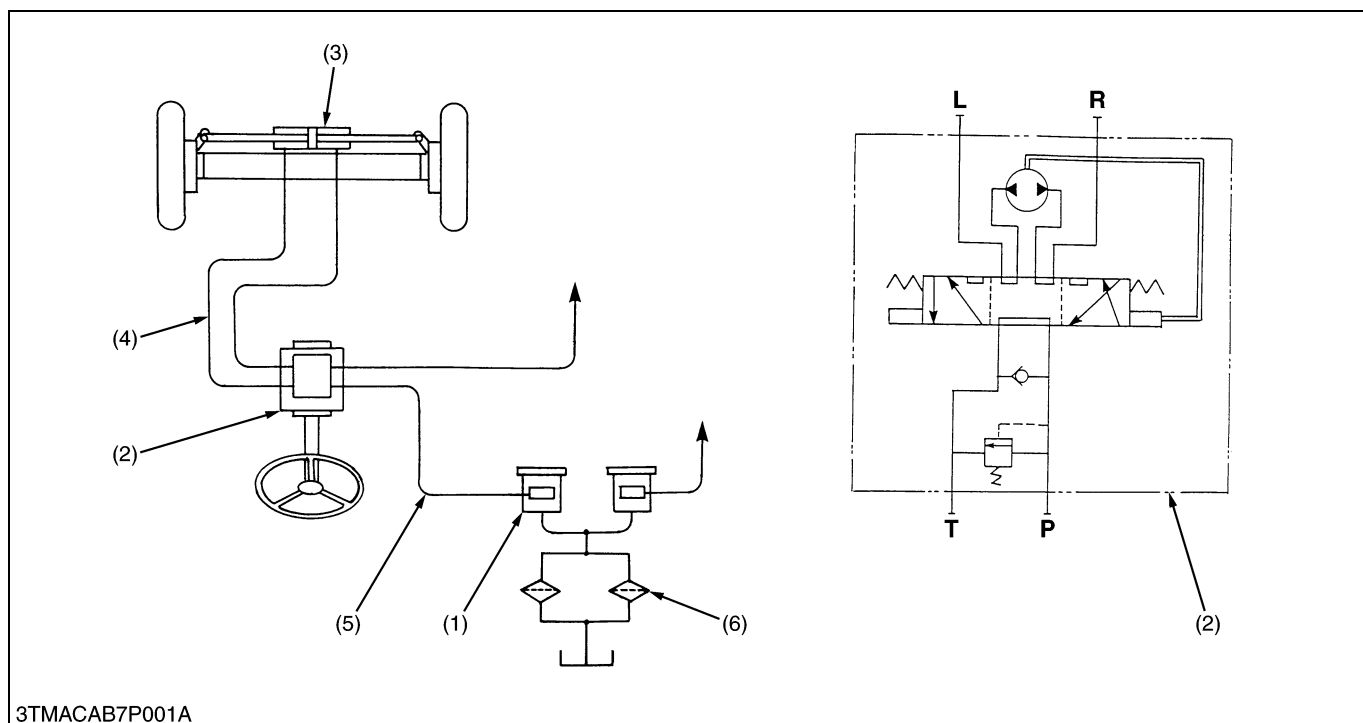
# 7 STEERING

# MECHANISM

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

# 1. STEERING MECHANISM



- |                         |                         |                         |                   |
|-------------------------|-------------------------|-------------------------|-------------------|
| (1) Hydraulic Pump      | (3) Steering Cylinder   | (5) Power Steering Pipe | (6) Magnet Filter |
| (2) Steering Controller | (4) Power Steering Hose |                         |                   |

All models are provided with a full hydrostatic power steering. Generally power steering systems are divided into 4 types: booster type, integral type, semi-integral type and full hydrostatic type.

In the full hydrostatic power steering, the steering controller is connected to the steering cylinder with only the hydraulic piping. This steering is actuated by oil pressure. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc.. Therefore, it is simple in construction.

This steering system consists of the hydraulic pump (1), steering controller (2), steering cylinder (3), magnet filter (6), etc..

The full hydrostatic power steering systems are divided into two types : non-load reaction type and load reaction type.

They are distinguished by whether the cylinder port is blocked or not with the controller in neutral. In these models, load reaction type is used.

With the load reaction type power steering, the steering wheel returns almost to the straight forward position as with an automobile when the operator releases his hands from the steering wheel.

## (Reference)

With the non-load reaction type power steering, the steering wheel maintains their position when the operator releases his hands from the steering wheel.

Vibration at the wheels is not transmitted to the steering wheel.

## ■ NOTE

- Refer to "7. STEERING" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

9Y1210365STM0001US0

# SERVICING

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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Tractor Cannot Be Steered</b>	Drive shaft in the power steering body improper assembled	Reassemble	7-S9
	Pipe broken	Replace	–
<b>Hard Steering</b>	Oil improper	Change with specified oil	G-10
	Hydraulic pump malfunctioning	Replace	7-S6
	Relief valve malfunctioning	Replace	7-S4
	Control valve (spool and sleeve) malfunctioning	Repair or replace	7-S9
	Oil leak due to seal damaged	Replace	–
<b>Steering Force Fluctuates</b>	Control valve malfunctioning	Replace	7-S8
	Air sucked in pump due to leaking or missing of oil	Replenish	G-10
	Air sucked in pump from suction circuit	Repair	–
<b>Heavy Steering Especially in the Beginning of Steering</b>	Control valve malfunctioning	Repair or replace	7-S8, 7-S9
<b>Steering Wheel Turns Spontaneously When Released</b>	Control valve malfunctioning	Repair or replace	7-S8, 7-S9
<b>Front Wheels Wander to Right and Left</b>	Control valve malfunctioning	Repair or replace	7-S8
	Air sucked in pump due to lack of oil	Replenish	G-10
	Air sucked in pump from suction circuit	Repair	–
	Insufficient bleeding	Bleed	–
	Cylinder malfunctioning	Repair or replace	7-S12, 7-S14
<b>Wheels Are Turned to a Direction Opposite to Steering Direction</b>	Cylinder piping connected in reverse	Repair	–
<b>Steering Wheel Turns Idle in Manual Steering</b>	Insufficient bleeding	Bleed	–
	Air sucked in due to lack of oil	Replenish	G-10
<b>Noise</b>	Air sucked in pump due to lack of oil	Replenish	G-10
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	–
<b>Oil Temperature Increases Rapidly</b>	Control valve malfunctioning	Replace	7-S8
<b>Front Wheels Vibrate</b>	Mechanical connections or wheel bearings worn	Replace defective parts	–

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## 2. SERVICING SPECIFICATIONS

### HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition	Delivery	Above 21.3 L/min. Above 5.63 U.S.gals/min. Above 4.69 Imp.gals/min.	17.4 L/min. 4.60 U.S.gals/min. 3.83 Imp.gals/min.
<ul style="list-style-type: none"> <li>• Engine Speed 2700 min<sup>-1</sup> (rpm)</li> <li>• Rated Pressure 16.8 MPa (170 kgf/cm<sup>2</sup>, 2418 psi)</li> <li>• Oil Temperature 45 to 55 °C (113 to 131 °F)</li> </ul>			
Housing Bore	Depth of Scratch	–	0.09 mm 0.004 in.
Bushing to Gear Shaft	Clearance	–	0.15 mm 0.0059 in.
Gear Shaft	O.D.	–	17.968 mm 0.70740 in.
Bushing	Length	–	18.965 mm 0.74665 in.

### STEERING CONTROLLER

Item		Factory Specification	Allowable Limit
Relief Valve Condition	Setting Pressure	18.6 MPa 190 kgf/cm <sup>2</sup> 2700 psi	–
<ul style="list-style-type: none"> <li>• Engine Speed : Maximum</li> <li>• Oil Temperature 45 to 55 °C (113 to 131 °F)</li> </ul>			

### STEERING CYLINDER [4WD]

Item		Factory Specification	Allowable Limit
Steering Cylinder	I.D. (Reference)	55.0 mm 2.17 in.	–
Rod Bushing	I.D.	35.075 to 35.121 mm 1.3809 to 1.3827 in.	–
Rod	O.D. (Reference)	35.0 mm 1.38 in.	–

### STEERING CYLINDER [2WD]

Item		Factory Specification	Allowable Limit
Steering Cylinder	I.D. (Reference)	50.0 mm 1.97 in.	–
Rod Bushing	I.D. (Reference)	32.0 mm 1.26 in.	–
Rod	O.D. (Reference)	32.0 mm 1.26 in.	–

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### 3. TIGHTENING TORQUES

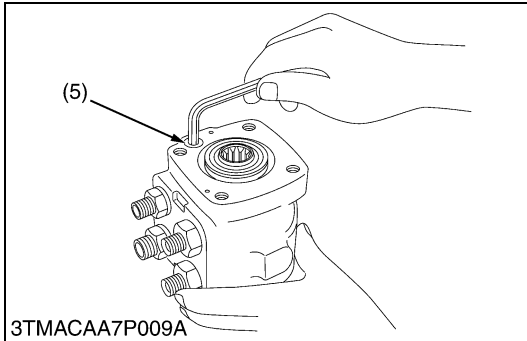
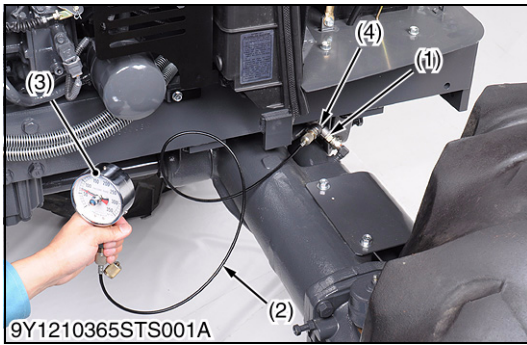
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

Item	N·m	kgf·m	lbf·ft
Hydraulic pipe mounting screw	18 to 20	1.8 to 2.1	13 to 15
Hydraulic pump assembly mounting screw and nut	24 to 27	2.4 to 2.8	18 to 20
Steering wheel mounting nut	48 to 55	4.9 to 5.7	36 to 41
Delivery pipe and return pipe retaining nut	47 to 51	4.8 to 5.2	35 to 37
Turning delivery hose retaining nut	23 to 27	2.3 to 2.8	17 to 19
Steering controller mounting screw	78 to 90	7.9 to 9.2	58 to 66
Gerotor assembly mounting screw	26 to 28	2.6 to 2.9	18.8 to 21
Slotted nut	78 to 90	7.9 to 9.2	58 to 66
Cylinder clamp nut (2WD)	35 to 39	3.5 to 4.0	26 to 28
Cylinder clamp lock nut	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Hose joint	30 to 34	3.0 to 3.5	22 to 25
Tie-rod joint and steering cylinder	167 to 196	17.0 to 20.0	123 to 144
Tie-rod joint lock nut (2WD)	167 to 196	17.0 to 20.0	123 to 144
Cylinder head(2WD)	182 to 289	18.5 to 29.5	134 to 213

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## 4. CHECKING AND ADJUSTING

### [1] STEERING CONTROLLER



#### Relief Valve Setting Pressure

1. Disconnect the delivery hose 1 (or 2) from steering cylinder and set a pressure gauge (3) (Code No. 07916-50321) between them using power steering adaptor (1) (Code No. 07916-54021), joint (Code No. 07916-50401) and cable (Code No. 07916-50331).
2. Start the engine and set the engine speed at maximum speed.
3. Fully turn the steering wheel to the left or right and read the pressure when the relief valve operates.
4. Return the steering wheel to the front position and read the pressure gauge when the steering control valve is in neutral.
5. If the difference between the relief pressure and the pressure in neutral is not within the factory specifications, adjust the relief pressure by the adjust plug (5).

#### **Condition**

- Engine speed :  
Maximum
- Oil temperature :  
45 to 55 °C (113 to 131 °F)

#### ■ **IMPORTANT**

##### **(Air Bleeding)**

- **Start the engine, then turn the steering wheel slowly in both directions all the way alternately a few times, and stop the engine.**

Relief valve setting pressure	Factory spec.	18.6 MPa 190 kgf/cm <sup>2</sup> 2700 psi
-------------------------------	---------------	---

- |                            |                                  |
|----------------------------|----------------------------------|
| (1) Power Steering Adaptor | (4) Joint                        |
| (2) Cable                  | (5) Adjust Plug for Relief Valve |
| (3) Pressure Gauge         |                                  |

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## [2] POWER STEERING HYDRAULIC PUMP



### Hydraulic Flow Test

#### ■ IMPORTANT

- When using a flowmeter other than KUBOTA specified flowmeter (Code No. 07916-52792), be sure to use the instructions with the flowmeter.
  - Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.
1. Disconnect the delivery pipe which is connected from hydraulic pump to steering controller.
  2. Install the adaptor **53** and **54** to the pump discharge port. [Adaptor **53** and **54** are included in adaptor set (Code No. 07916-54301).]
  3. Connect the hydraulic test hose to the adaptor **53** and flowmeter inlet port.
  4. Connect the other hydraulic test hose to the flowmeter outlet and put the end of the hose into the transmission oil port.
  5. Open the flowmeter loading valve completely. (Turn counterclockwise.)
  6. Start the engine and set the engine speed at 2000 to 2200 min<sup>-1</sup> (rpm).
  7. 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 reaches approx. 50 °C (122 °F).
  8. Open the loading valve completely.
  9. Set the engine speed. (Refer to condition.)
  10. Read and note the pump delivery at no pressure.
  11. Slowly close the loading valve to increase rated pressure. (Refer to condition.) As the load is increased, engine speed drops, therefore, reset the engine speed.
  12. Read and note the pump delivery at rated pressure.
  13. Open the loading valve completely and stop the engine.
  14. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

#### Condition

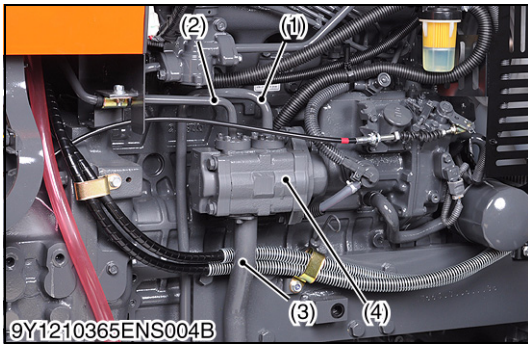
- Engine speed :  
Approx. 2700 min<sup>-1</sup> (rpm)
- Rated pressure :  
16.8 MPa (170 kgf/cm<sup>2</sup>, 2418 psi)
- Oil temperature :  
45 to 55 °C (113 to 131 °F)

Hydraulic pump delivery at no pressure	Factory spec.	22.6 L/min. 5.97 U.S.gals/min. 4.97 Imp. gals/min.
Hydraulic pump delivery at rated pressure	Factory spec.	21.3 L/min. 5.63 U.S.gals/min. 4.69 Imp. gals/min.
	Allowable limit	17.4 L/min. 4.6 U.S.gals/min. 3.83 Imp.gals/min.

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## 5. DISASSEMBLING AND ASSEMBLING

### [1] REMOVING HYDRAULIC PUMP



#### Removing Hydraulic Pump

1. Disconnect the delivery pipe (1), (2) from the hydraulic pump (4).
2. Disconnect the suction pipe (3) from the hydraulic pump (4).
3. Remove the hydraulic pump assembly mounting screws and nuts.
4. Take out the hydraulic pump assembly.

#### (When reassembling)

- Apply grease to the O-ring and take care not to damage it.

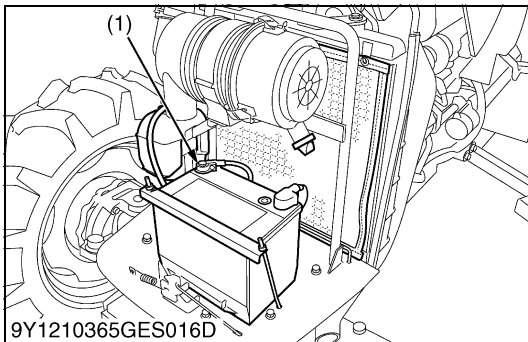
Tightening torque	Hydraulic pipe mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Hydraulic pump assembly mounting screw and nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

- |   |                    |
|---|--------------------|
| (1) Delivery Pipe<br>(Three Point Hydraulic Pipe) | (3) Suction Pipe   |
| (2) Delivery Pipe<br>(Power Steering Pipe)        | (4) Hydraulic Pump |

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### [2] STEERING CONTROLLER

#### (1) Removing Steering Controller



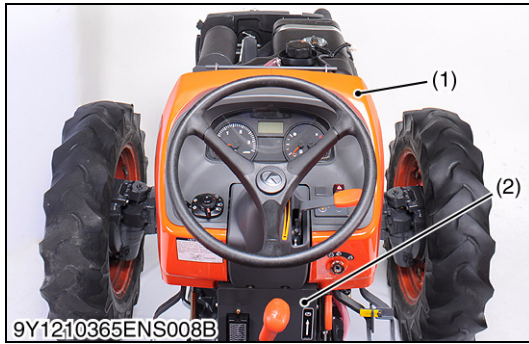
#### Bonnet

1. Disconnect the battery negative cable (1).
2. Disconnect the head light **4P** connector and remove the wire harness from the bonnet (2).
3. Remove the bonnet (2).

- |                            |            |
|----------------------------|------------|
| (1) Battery Negative Cable | (3) Damper |
| (2) <b>4P</b> Connector    |            |

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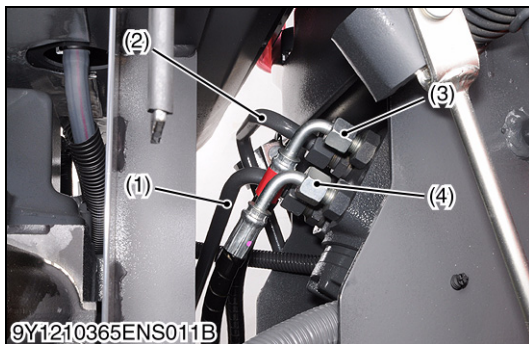
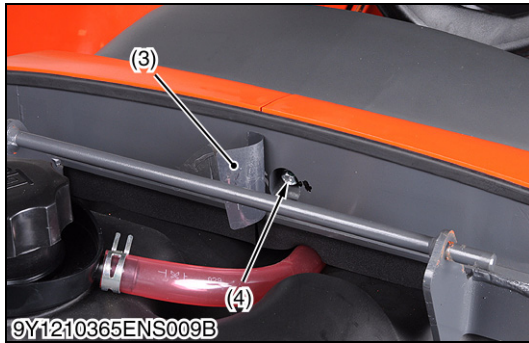


**Rear Bonnet**

1. Detach the sticker (3) then remove the screw (4).
2. Remove the rear bonnet (2).

- (1) Rear Bonnet
- (2) Under Cover
- (3) Sticker
- (4) Screw

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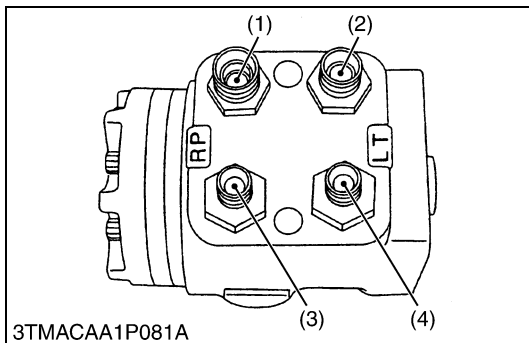


**Piping for Power Steering**

1. Disconnect the main delivery pipe (1), return pipe 1 (2), turning delivery hose (3) and turning delivery hose (4).

**(When reassembling)**

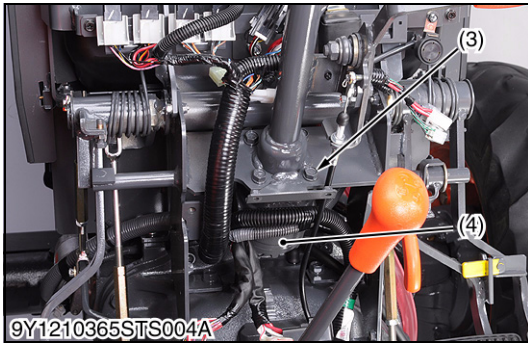
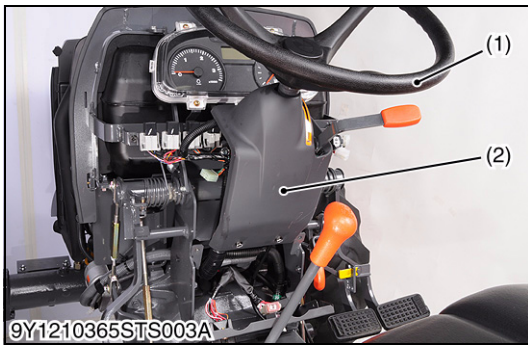
Tightening torque	Main delivery pipe and return pipe retaining nut	47 to 51 N·m 4.8 to 5.2 kgf·m 35 to 37 lbf·ft
	Turning delivery hose retaining nut	23 to 29 N·m 2.3 to 2.8 kgf·m 17 to 19 lbf·ft



- (1) Main Delivery Pipe
- (2) Return Pipe 1
- (3) Turning Delivery Hose (R.H.)
- (4) Turning Delivery Hose (L.H.)

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**Steering Controller**

1. Remove the steering wheel (1).
2. Remove the steering post cover (2).
3. Remove the steering controller mounting screws (3).
4. Remove the steering controller (4).

**(When reassembling)**

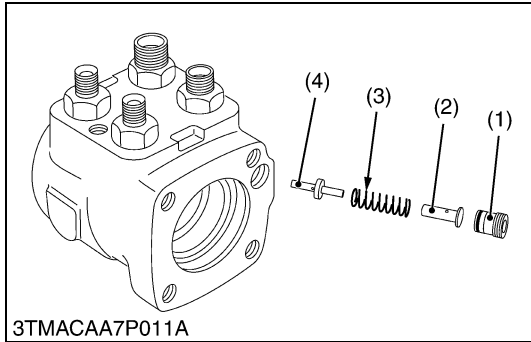
Tightening torque	Steering wheel mounting nut	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Steering controller mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

- |                         |  |
|-------------------------|--|
| (1) Steering Wheel      | (3) Steering Controller Mounting Screw |
| (2) Steering Post Cover | (4) Steering Controller                |

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## (2) Disassembling Steering Controller



### Relief Valve Assembly

1. Remove the adjust plug (1) and draw out the collar (2), spring (3) and poppet (4).

#### (When reassembling)

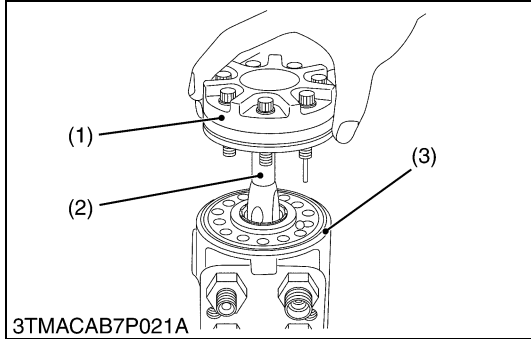
- Take care not to damage the O-ring.

#### ■ IMPORTANT

- **After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure.**

- |                 |            |
|-----------------|------------|
| (1) Adjust plug | (3) Spring |
| (2) Collar      | (4) Poppet |

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### Removing Gerotor

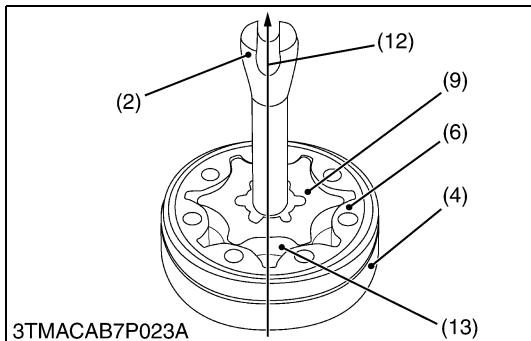
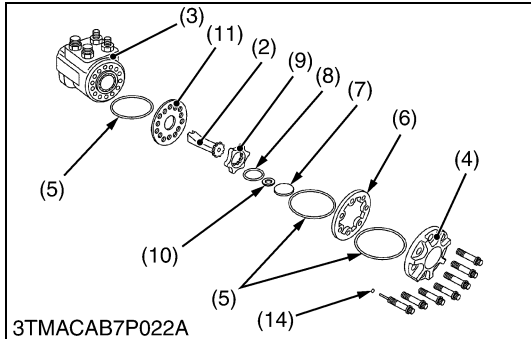
1. Secure the housing (3) in a vise and remove seven gerotor mounting screws and gerotor assembly (1).
2. Remove the distributor plate (11) and drive shaft (2).
3. Remove the rotor (9), O-ring (5) between the distributor plate and stator (6).
4. Take out the spacer ring (10) and spacer (7).
5. Remove the O-ring (8) from the rotor.

#### (When reassembling)

1. Fit an O-ring into the groove of the end cap (4), and insert 2 or 3 bolts.
  2. Fit an O-ring into the groove of the stator (6), and put it on the end cap, with the O-ring upward.
  3. Apply clean transmission fluid (specified fluid) to the rotor (9), fit an O-ring (8) into the groove of the rotor and put the spacer on it. Keeping the spacer on the rotor, fit it into the stator (6) with the spline bevelled side upward.
  4. After putting the spacer into the rotor (9), insert the splines of drive shaft (2) into the rotor (9), aligning the direction of drive shaft pin groove (12) with the rotor tooth bottom (13).
  5. Fit an O-ring into the groove of the housing.
- Fit the pin groove of the drive shaft (2) to the dowel pin inside the housing.

#### ■ IMPORTANT

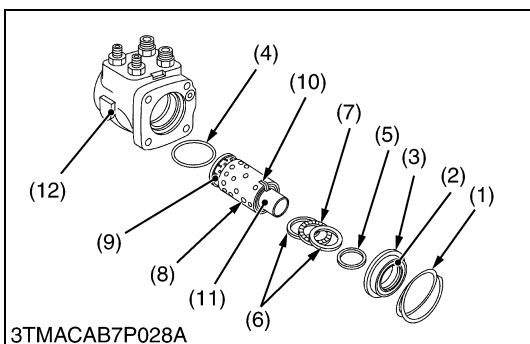
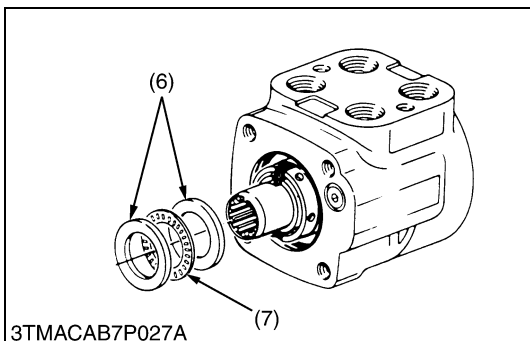
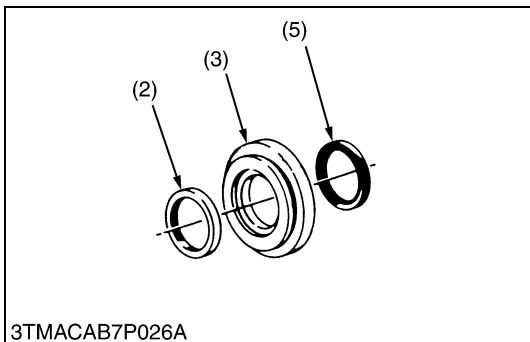
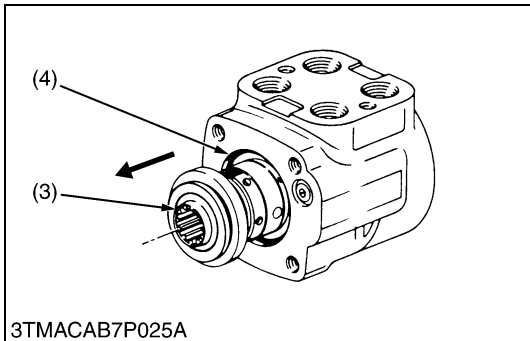
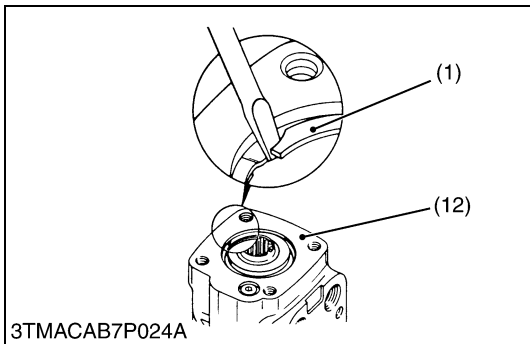
- **Be sure to align the direction of the drive shaft pin groove (12) with the rotor tooth bottom (13).**



Tightening torque	Gerotor assembly mounting screw (5/16')	26 to 28 N·m 2.6 to 2.9 kgf·m 19 to 21 lbf·ft
-------------------	---	---

- |                      |                              |
|----------------------|------------------------------|
| (1) Gerotor Assembly | (8) O-ring                   |
| (2) Drive Shaft      | (9) Rotor                    |
| (3) Housing          | (10) Spacer Ring             |
| (4) End Cap          | (11) Distributor Plate       |
| (5) O-ring           | (12) Direction of Pin Groove |
| (6) Stator           | (13) Rotor Tooth Bottom      |
| (7) Spacer           | (14) Ball                    |

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**Grand Seal, Needle Bearing, Sleeve and Spool**

1. Remove the retaining ring (1) with a screw driver.
2. Hold the control valve unit vertically and spool and sleeve align the cross pin parallels to flat side of housing (flow priority valve mounting side), the cross pin is visible through open end of spool.
3. At this time, take care so as not to allow the cross pin to be caught in the groove of the housing. If the cross pin is caught, adjust its position with a fingertip.
4. Push the spool and sleeve to the allow direction and remove the seal grand bushing (3) with dust seal (2) and quad ring seal (5).
5. Remove the O-ring (4) from the housing (12).
6. Remove the dust seal from the seal grand bushing (3).
7. Remove the O-ring (4).

**(When reassembling)**

- Replace O-ring with new one.
  - Apply transmission oil to the dust seal, quad ring seal and O-ring.
8. Remove the quad ring seal (5) from the sleeve (9).
  9. Remove the bearing races and needle bearing from valve assembly.

**(When reassembling)**

- Apply transmission oil to the bearing races and needle bearing.
10. Draw out the sleeve (9) and spool (11) assembly from the gerotor side, with the port surface of the housing downward. At this time, take care so as not to allow the dowel pin to be caught in the groove of the housing (12). If the dowel pin is caught, adjust its position with a fingertip and draw out the sleeve and spool assembly slowly.

**■ IMPORTANT**

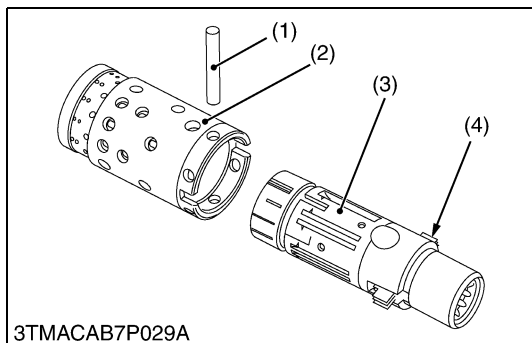
- **As the clearance between the housing and sleeve is very narrow, do not forcibly draw out the sleeve.**

**(When reassembling)**

- When fitting the sleeve (9) and spool (11) assembly into the housing (12), apply clean transmission oil to the assembly and then insert it while turning it slowly, taking care so that the parts are not inclined. Also, pay attention to the dowel pin so that it is not caught in the housing groove. If the pin is caught, adjust its position with a fingertip.

- |                        |                       |
|------------------------|-----------------------|
| (1) Retaining Ring     | (7) Needle Bearing    |
| (2) Dust Seal          | (8) Pin               |
| (3) Seal Grand Bushing | (9) Sleeve            |
| (4) O-ring             | (10) Centering Spring |
| (5) Quad Ring Seal     | (11) Spool            |
| (6) Bearing Race       | (12) Housing          |

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### Sleeve and Spool

1. Draw out the dowel pin (1).
2. Draw out the spool (3) from the sleeve (2).
3. Push out the centering spring (4).

#### ■ IMPORTANT

- **As the clearance between the sleeve (2) and spool (3) is very narrow, draw out the spool by turning it slowly with due care.**

#### (When reassembling)

- For easier assembly, first insert a couple of centering springs assembled back to back and then fit springs in one after another.
- Align the centering spring notch with the sleeve notch.

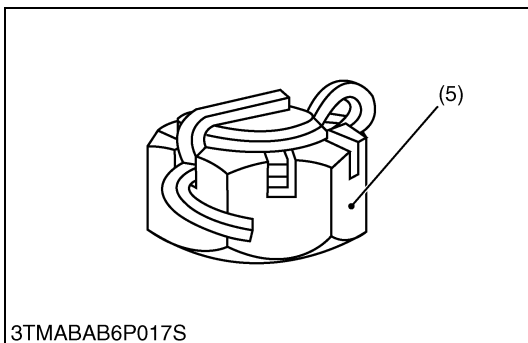
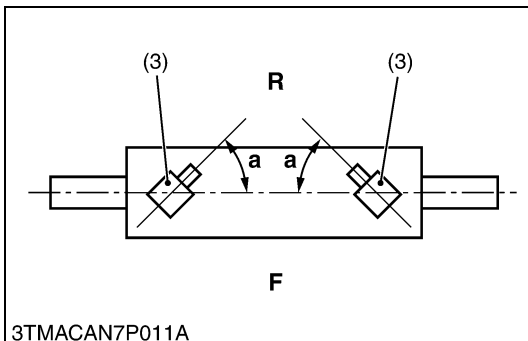
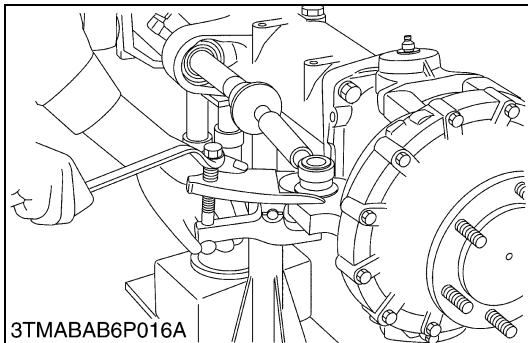
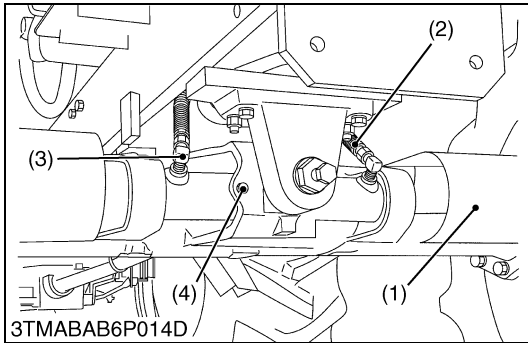
(1) Dowel Pin  
(2) Sleeve

(3) Spool  
(4) Centering Spring

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## [3] STEERING CYLINDER

### (1) Steering Cylinder (4WD Model)



#### Tie-rod

1. Remove the both cylinder covers (1).
2. Disconnect the both power steering delivery hoses (2) from cylinder.
3. Remove the both hose joints (3) from steering cylinder.
4. Pull out the cotter pin and remove the slotted nuts (5).
5. Remove the tie-rod with a tie-rod end lifter (Code No. 07909-39051).

#### (When reassembling)

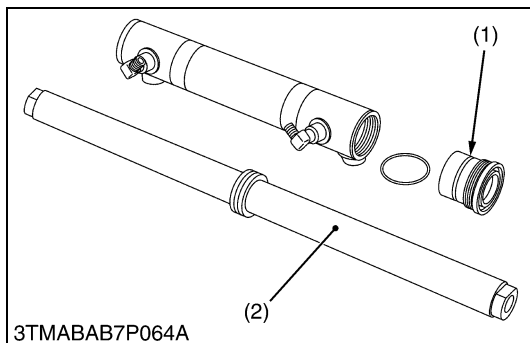
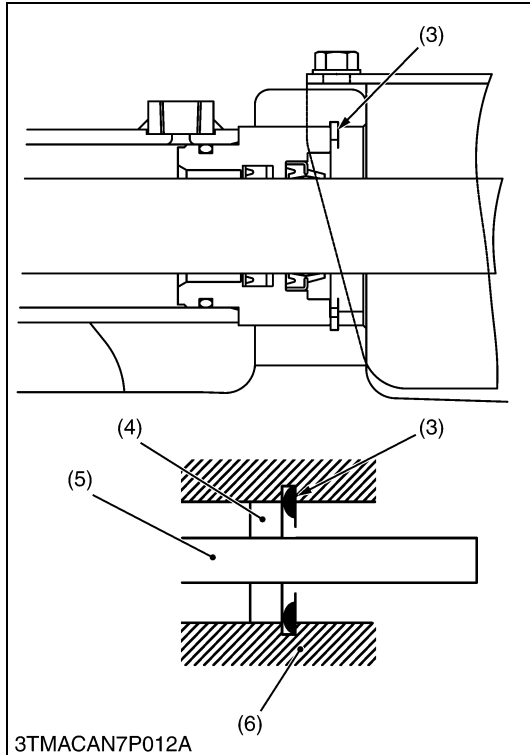
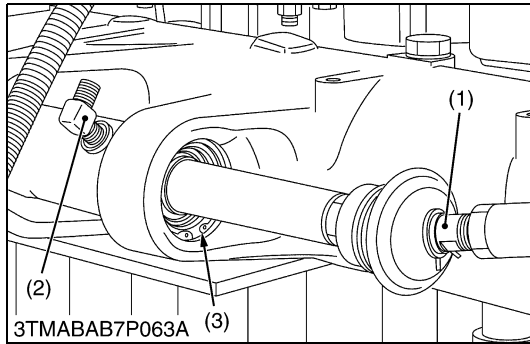
- Apply teflon tape to joint and set the joint as shown in figure.
- Connect the power steering delivery hose with red tape to the R.H..
- Replace cotter pin with a new one.
- After tightening the slotted nut (5) to the specified torque, install a cotter pin as shown in the figure left.
- After assembling the power steering cylinder and tie-rod, check the toe-in and adjust it if necessary.

Tightening torque	Power steering delivery hose	23 to 27 N·m 2.3 to 2.8 kgf·m 17 to 19 lbf·ft
	Slotted nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
	Hose joint	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft

Toe-in	Factory spec.	2.0 to 8.0 mm 0.079 to 0.31 in.
--------	---------------	------------------------------------

- |                                  |                            |
|----------------------------------|----------------------------|
| (1) Cylinder Cover               | <b>F : Front</b>           |
| (2) Power Steering Delivery Hose | <b>R : Rear</b>            |
| (3) Hose Joint                   | <b>a : 0.79 rad (45 °)</b> |
| (4) Set Screw                    |                            |
| (5) Slotted Nut                  |                            |

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### Steering Cylinder

1. Remove the tie-rod joint (1) (right and left).
2. Remove the nipples (2) from steering cylinder.
3. Remove the internal snap ring (3).
4. Draw out the steering cylinder to the left.

#### (When reassembling)

- Apply liquid lock (Three Bond 1372 or equivalent) to the tie-rod joint.
- When reassembling internal circlip (3), should be positioned so that sharp edge face to outward as shown in the figure.

Tightening torque	Tie-rod and steering cylinder	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
-------------------	-------------------------------	---

- |                        |                     |
|------------------------|---------------------|
| (1) Tie-rod Joint      | (4) Cylinder        |
| (2) Nipple             | (5) Cylinder Rod    |
| (3) Internal Snap Ring | (6) Front Axle Case |

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### Disassembling Steering Cylinder

1. Remove the guide assembly (1) and remove the piston rod (2).

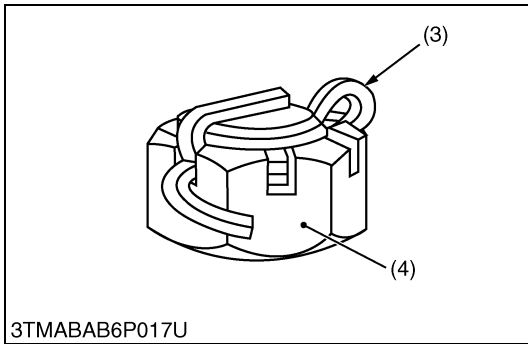
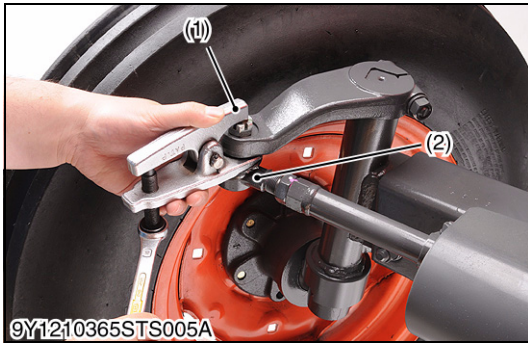
#### (When reassembling)

- Apply transmission fluid to the oil seal and O-ring.
- Apply liquid lock (Three Bond 1215 or equivalent) to the joint face of piston rod and tube.

- |                    |                |
|--------------------|----------------|
| (1) Guide Assembly | (2) Piston Rod |
|--------------------|----------------|

9Y1210365STS0016US0

## (2) Steering Cylinder (2WD Model)



### Tie-rod

1. Remove the cotter pin (3) and loosen slotted nut (4).
2. Remove the tie-rod (2) with tie-rod end lifter (1) (Code No. 07909-39051).
3. Remove the slotted nut (4) and tie-rod (2).

### (When reassembling)

- Replace the cotter pin (3) with new one.
- After tighten the slotted nut (4) to the specified torque, install a cotter pin (3) as shown in figure.
- After assembling the power steering cylinder and tie-rod, check the toe-in and adjust it if necessary.

Tightening torque	Slotted nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
	Tie-rod joint lock nut	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft

Toe-in	Factory spec.	1.0 to 5.0 mm 0.040 to 0.19 in.
--------	---------------	------------------------------------

- (1) Tie-rod End Lifter (3) Cotter Pin  
(2) Tie-rod (4) Slotted Nut

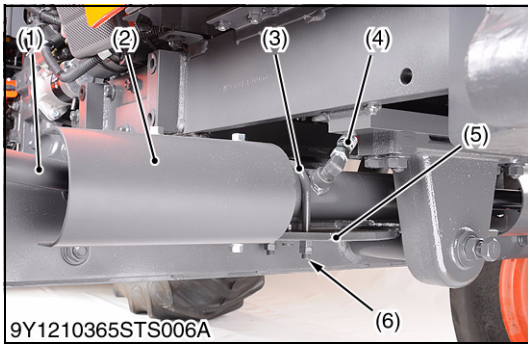
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### Steering Cylinder

1. Remove the cylinder cover (2).
2. Remove the tie-rod joint (1).
3. Remove the delivery hose (4).
4. Remove the cylinder clamp (3).
5. Remove the cylinder.

### (When reassembling)

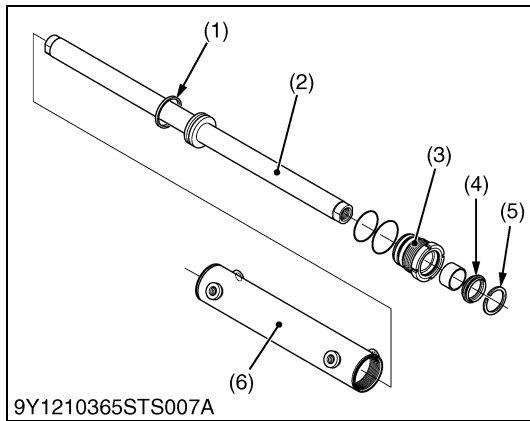
- Apply liquid lock (Three Bond 1324 or equivalent) to the tie-rod joint.



Tightening torque	Tie-rod joint	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Delivery hose	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft
	Cylinder clamp nut	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
	Cylinder clamp lock nut	40 to 45 N·m 4.0 to 4.6 kgf·m 29 to 33 lbf·ft

- (1) Tie-rod Joint (4) Delivery Hose  
(2) Cylinder Cover (5) Clamp Nut  
(3) Clamp (6) Cylinder Clamp Lock Nut

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### Disassembling Steering Cylinder

1. Remove the cylinder head (3) and remove the piston rod (2).

#### (When reassembling)

- Apply liquid lock (Three Bond 1901 or equivalent) to cylinder head (3).

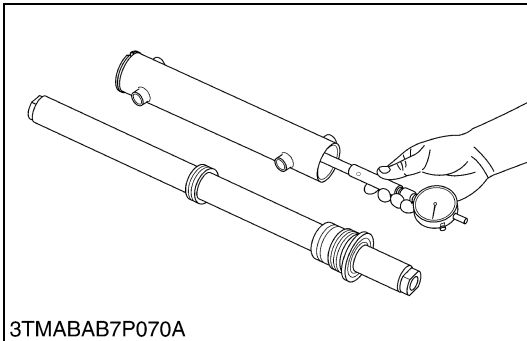
Tightening torque	Cylinder head	182 to 289 N·m 18.5 to 29.5 kgf·m 134 to 213 lbf·ft
-------------------	---------------	---

- (1) Piston Gasket  
(2) Piston Rod  
(3) Cylinder Head

- (4) Dust Seat  
(5) Internal Snap Ring

9Y1210365STS0021US0

## 6. SERVICING



### Steering Cylinder I.D.

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

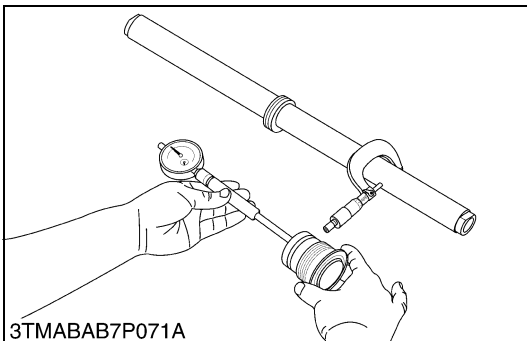
#### **[4WD Model]**

Steering cylinder I.D.	Reference	55.0 mm 2.17 in.
------------------------	-----------	---------------------

#### **[2WD Model]**

Steering cylinder I.D.	Reference	32.0 mm 1.26 in.
------------------------	-----------	---------------------

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### Rod and Bushing

1. Measure the bushing I.D. with a cylinder gauge.
2. Measure the rod O.D. with a outside micrometer.

#### **[4WD Model]**

Rod O.D.	Reference	35.0 mm 1.38 in.
Rod bushing I.D.	Factory spec.	35.075 to 35.121 mm 1.3809 to 1.3827 in.

#### **[2WD Model]**

Rod O.D.	Reference	32.0 mm 1.26 in.
Rod bushing I.D.	Reference	32.0 mm 1.26 in.

9Y1210365STS0018US0



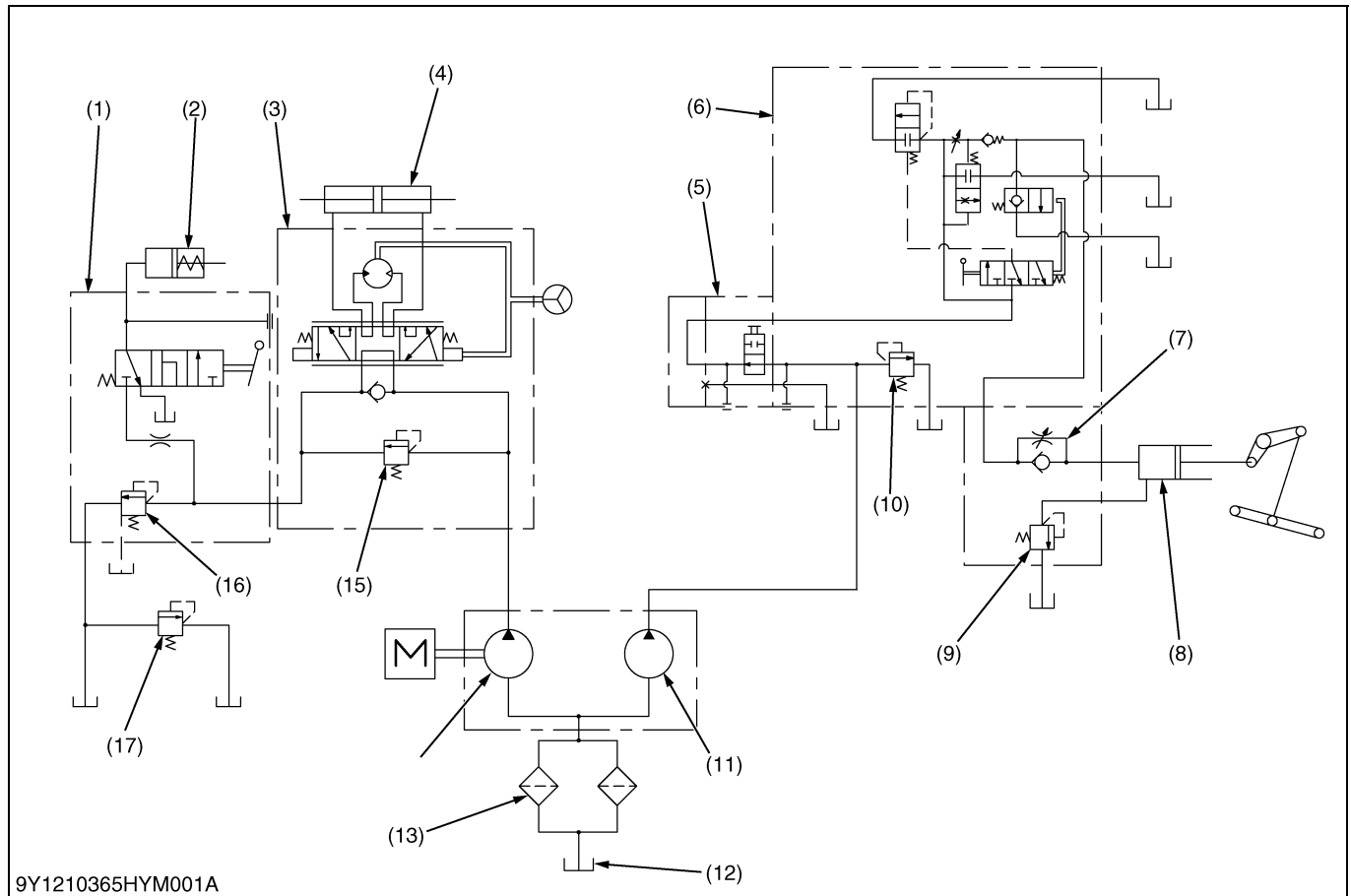
# **8 HYDRAULIC SYSTEM**

# MECHANISM

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1. HYDRAULIC CIRCUIT .....	8-M1
2. HYDRAULIC CIRCUIT FOR THREE POINT HYDRAULIC SYSTEM .....	8-M2
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4. LINKAGE MECHANISM .....	8-M4
[1] GENERAL OUTLINE.....	8-M4
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# 1. HYDRAULIC CIRCUIT



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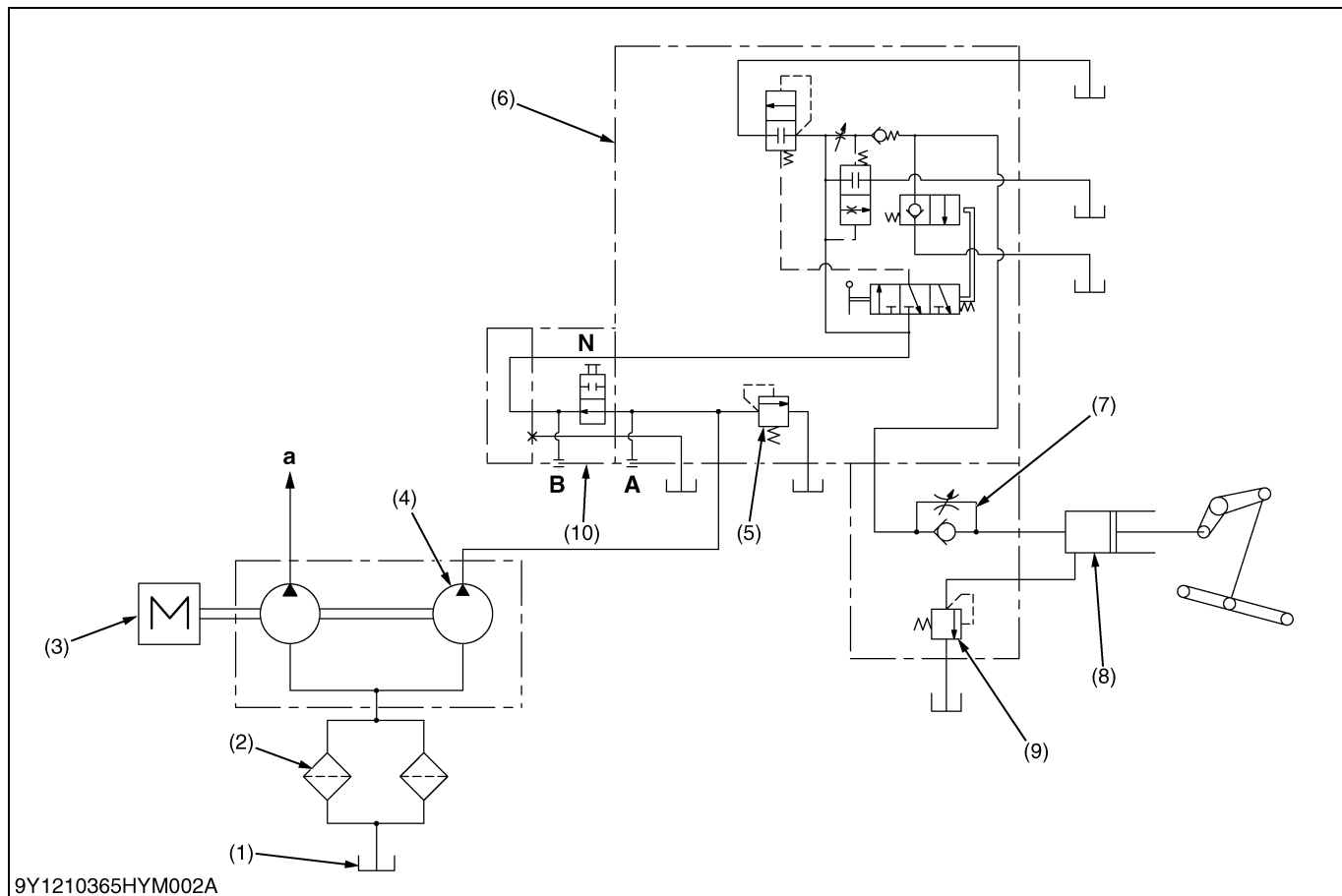
- |   |  |   |   |
|---|--|---|---|
| (1) PTO Clutch Valve                    | (7) Lowering Speed Adjusting Valve           | (10) Relief Valve (for 3-Point Linkage)   | (14) Hydraulic Pump (for Power Steering and PTO Clutch) |
| (2) PTO Clutch Pack                     | (8) Hydraulic Cylinder (for 3-Point Linkage) | (11) Hydraulic Pump (for 3-Point Linkage) | (15) Relief Valve (Steering Controller)                 |
| (3) Power Steering Controller           | (9) Cylinder Safety Valve                    | (12) Oil Tank (Transmission Case)         | (16) Relief Valve (PTO Valve)                           |
| (4) Steering Cylinder                   |  | (13) Hydraulic Oil Filter Cartridge       | (17) Relief Valve (Lubricating Line)                    |
| (5) Hydraulic Outlet Valve              |  |   |   |
| (6) Control Valve (for 3-Point Linkage) |  |   |   |

The hydraulic system of this tractor is composed of the main components as shown in the figure.

- To raise and lower the implement connected to the three-point hitch. For this motion, the position control valve and the linkage installed on the hydraulic cylinder body.
- Take out hydraulic power from the hydraulic cylinder body to operate an implement's hydraulic actuator.

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## 2. HYDRAULIC CIRCUIT FOR THREE POINT HYDRAULIC SYSTEM

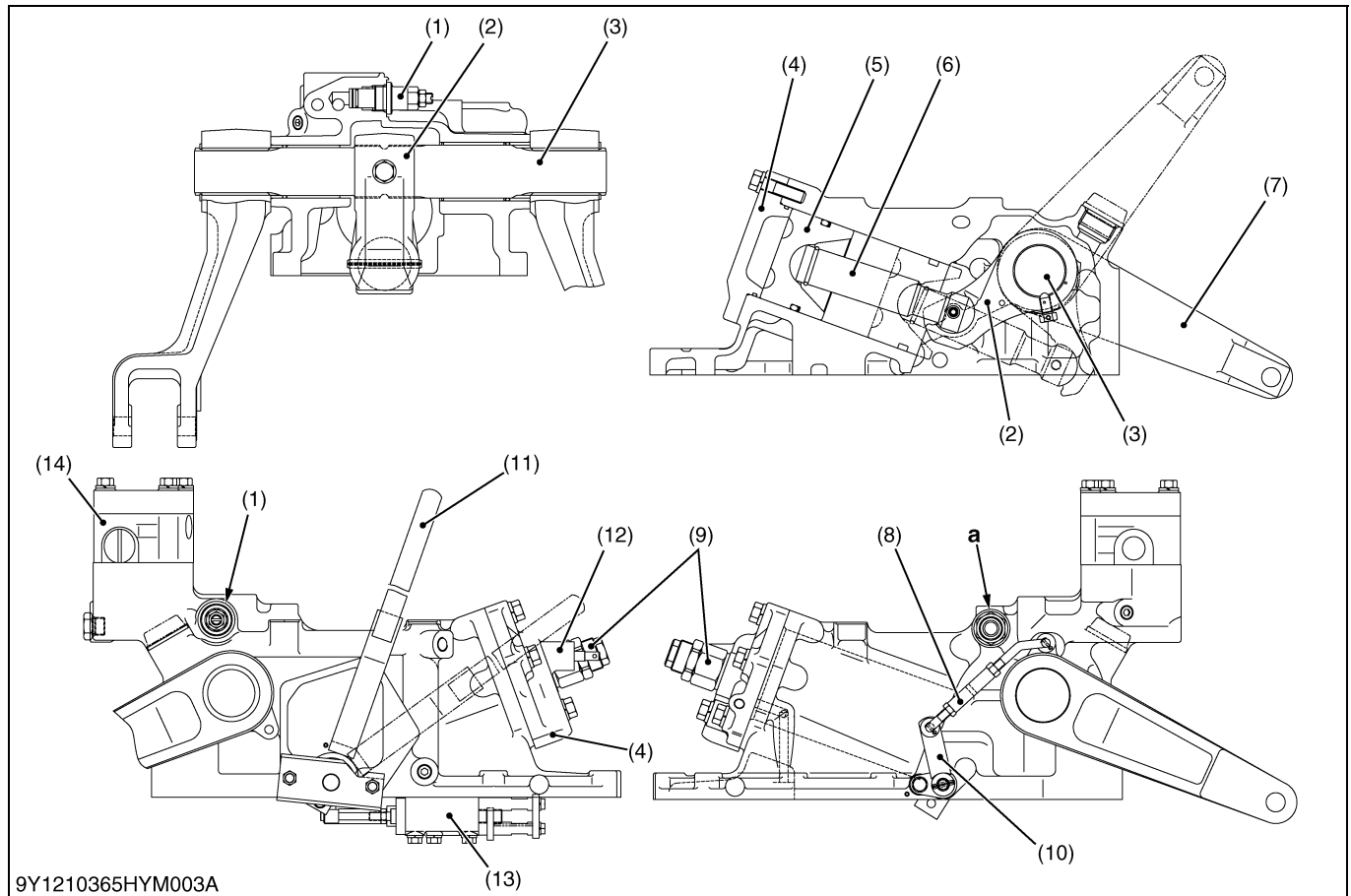


- |                                    |                                    |                             |   |
|------------------------------------|------------------------------------|-----------------------------|---|
| (1) Oil Tank (Transmission Case)   | (5) Relief Valve                   | (8) Hydraulic Cylinder      | <b>A : To Implement Cylinder</b>            |
| (2) Hydraulic Oil Filter Cartridge | (6) Control Valve                  | (9) Cylinder Safety Valve   | <b>B : From Implement Cylinder</b>          |
| (3) Engine                         | (7) Lowering Speed Adjusting Valve | (10) Hydraulic Outlet Valve | <b>N : N Port</b>                           |
| (4) Hydraulic Pump                 |                                    |                             | <b>a : To Power Steering and PTO Clutch</b> |

- When the engine is started, the hydraulic pump (4) is rotated to suck oil from transmission case (1) through the suction pipe.  
Supplied oil is filtered by the hydraulic oil filter cartridge (2).
- Filtered oil is forced out by the hydraulic pump to the auxiliary control valve (10) through the hydraulic outlet valve (10).
- The hydraulic system has a relief valve (5) which restricts the maximum pressure in the circuit.  
The hydraulic cylinder (8) has a cylinder safety valve (9) to relieve shock pressure due to heavy implement bounce.
- The control valve is actuated by the mechanical linkage for **"Position control"**.

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### 3. HYDRAULIC BLOCK



- |                              |                             |                                     |                                |
|------------------------------|-----------------------------|-------------------------------------|--------------------------------|
| (1) Relief Valve             | (6) Hydraulic Rod           | (11) Position Control Lever         | <b>(a) From Hydraulic Pump</b> |
| (2) Hydraulic Arm            | (7) Lift Arm                | (12) Lowering Speed Adjusting Valve |                                |
| (3) Hydraulic Arm Shaft      | (8) Position Feedback Rod   | (13) Control Valve                  |                                |
| (4) Hydraulic Cylinder Cover | (9) Cylinder Safety Valve   | (14) Hydraulic Outlet Valve         |                                |
| (5) Hydraulic Piston         | (10) Position Feedback Link |                                     |                                |

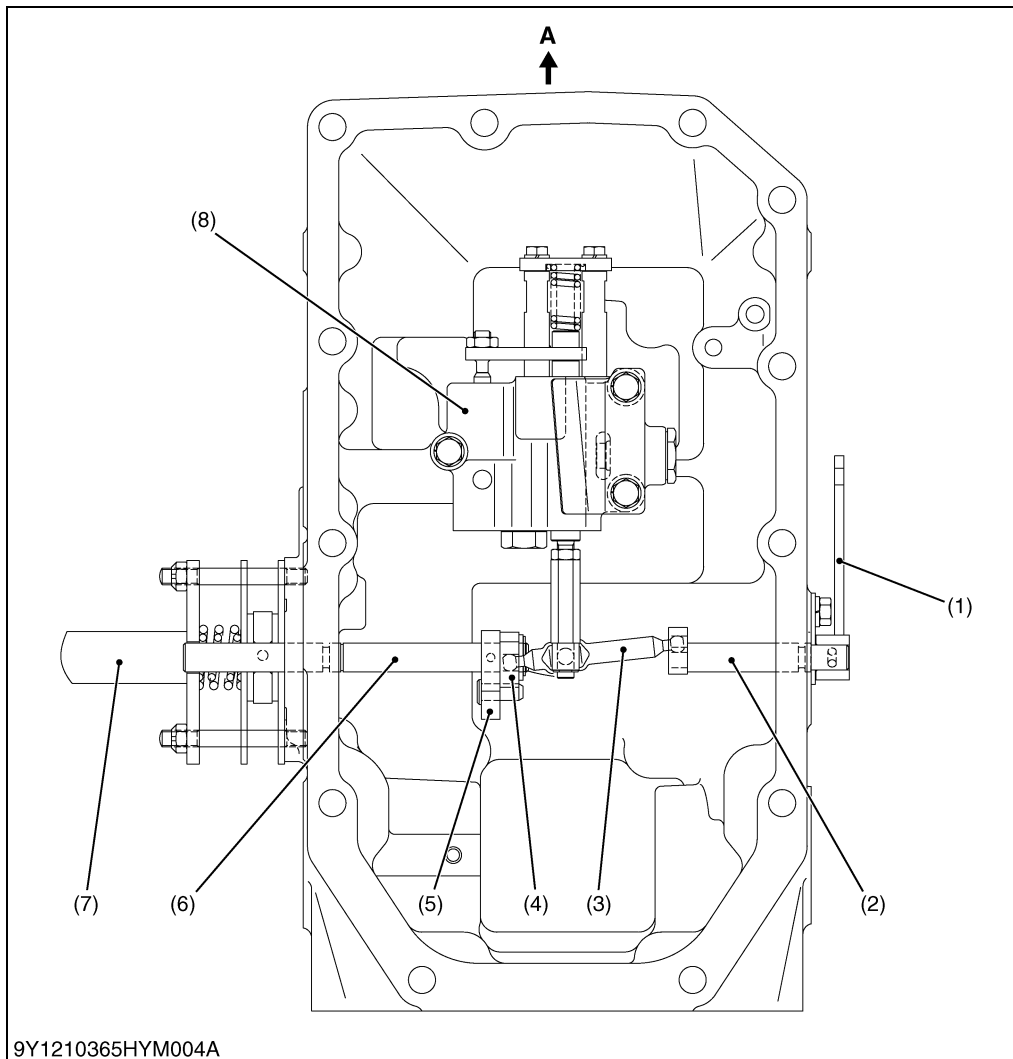
The hydraulic block is equipped with cylinder safety valve (9), relief valve (1), lowering speed adjusting valve (2), control valve (13), lift arm (7), hydraulic lift arm shaft (7), piston (6), position feedback rod (8) and etc..

- To operate the control valve, refer to "8. HYDRAULIC SYSTEM / (7) Position Control Valve - Type 7" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).
- To operate the relief valve operation, refer to "8. HYDRAULIC SYSTEM / 4. RELIEF VALVE / [2] PILOT OPERATED TYPE" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).
- To operate the cylinder safety valve (surge relief valve) operation, refer to "8. HYDRAULIC SYSTEM / 7. CYLINDER SAFETY VALVE (SURGE RELIEF VALVE)" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).

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## 4. LINKAGE MECHANISM

### [1] GENERAL OUTLINE



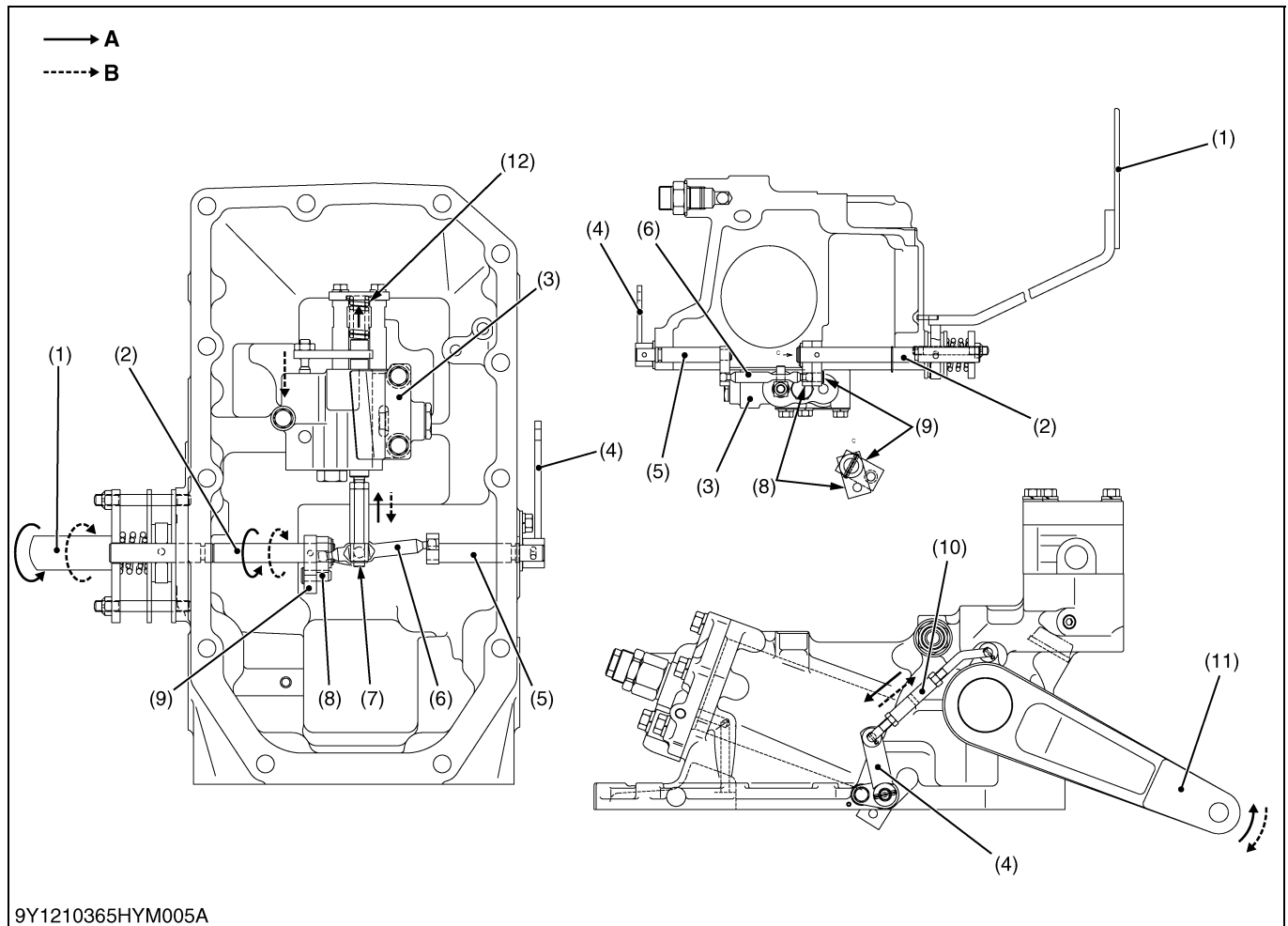
- (1) Position Feedback Link
- (2) Position Feedback Shaft
- (3) Spool Drive Lever (Position)
- (4) Position Link 1
- (5) Position Link 2
- (6) Position Lever Shaft
- (7) Position Control Lever
- (8) Control Valve

**A : Forward**

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9Y1210365HYM0004A

## [2] POSITION CONTROL



9Y1210365HYM005A

- |                            |                             |                     |
|----------------------------|-----------------------------|---------------------|
| (1) Position Control Lever | (5) Position Feedback Shaft | (9) Position Link 2 |
| (2) Position Lever Shaft   | (6) Spool Drive Lever       | (10) Feedback Rod   |
| (3) Control Valve          | (7) Spool                   | (11) Lift Arm       |
| (4) Position Feedback Link | (8) Position Link 1         | (12) Spool Spring   |

**A : Lift**  
**B : Down**

### ■ Lift

- When the position control lever (1) is moved to the **"LIFT"** position, the position lever shaft (2) and position link 1 (8) rotates and turn the position link 2 (9).  
The position link 2 (9) rotates and pushes the spool (7) by the spool drive lever (6), opening the **"LIFT"** circuit.
- When the lift arm (11) moves upward, position feedback shaft (5) rotates via position feedback rod (10), feedback lever (4) and pulls the spool (7) by the spool drive lever (6).  
The lift arm (11) stops when the spool (7) returns to the neutral position.

### ■ Down

- When the position control lever (12) is moved to the **"DOWN"** position, the position link 2 (8) is free.  
The spool (7) of control valve moves by spool spring (12) to opening the **"DOWN"** circuit.
- When the lift arm (11) moves downward, feedback shaft (5) rotates via position feedback rod (10), feedback lever (4) and push the spool (7) by the spool drive lever (6).  
The lift arm (11) stops when the spool returns to the neutral position.

9Y1210365HYM0005US0

# SERVICING

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[2] REMOVING HYDRAULIC PUMP.....	8-S15
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# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Implement Does Not Rises (Not Noise)</b>	Control linkage improperly assembled or damaged	Repair or replace	8-S13
	Control valve malfunctioning (unload valve, spool, check valve, poppet valve)	Repair or replace	8-S12
	Control valve broken	Replace	8-S12
	Control valve improperly adjusted	Adjust	8-S12
	Relief valve spring damaged	Replace	8-S6
	Hydraulic piston O-ring, cylinder damaged	Replace	8-S14
	Safety valve damaged	Replace	8-S7
<b>(Noise)</b>	Transmission fluid improper or insufficient	Change or replenish	G-10
	Oil filter clogged	Replace	G-18
	Relief valve setting pressure too low	Adjust	8-S6
	Relief valve spring weak or damaged	Replace	8-S6
	Hydraulic pump malfunctioning	Repair or replace	8-S15
<b>Implement Does Not Reach Maximum Height</b>	Position rod and feedback rod improperly adjusted	Adjust	8-S8
	Lever stopper position improper	Adjust	–
<b>Implement Does Not Lower</b>	Control valve malfunctioning	Repair or replace	8-S12
	Spool damaged	Replace	–
	Poppet valve improperly adjusted (Adjusting screw of poppet valve)	Adjust	–
	Lowering speed adjusting valve closed	Open	–
<b>Implement Drops by Weight</b>	Hydraulic cylinder worn or damaged	Replace	8-S14
	Hydraulic piston O-ring worn or damaged	Replace	8-S14
	Safety valve damaged	Replace	8-S7
	Lowering speed adjusting valve damaged	Replace	–
	Check valve seat surface damaged (Control valve malfunctioning)	Replace	–
	Poppet valve seat surface damaged (Control valve malfunctioning)	Replace	–
<b>Implement Hunts (Moves Up and Down)</b>	Poppet valve, poppet seat surface damaged	Replace	–
	Check valve, check valve seat surface damaged	Replace	–
	Control valve O-ring worn or damaged	Replace	8-S12

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## 2. SERVICING SPECIFICATIONS

### HYDRAULIC PUMP

Item		Factory Specification	Allowable Limit
Hydraulic Pump Condition	Delivery	Above 38.1 L/min. Above 10.1 U.S. gals/min. Above 8.38 Imp. gals/min.	31.1 L/min. 8.22 U.S. gals/min. 6.84 Imp. gals/min.
<ul style="list-style-type: none"> <li>• Engine Speed 2600 min<sup>-1</sup> (rpm)</li> <li>• Rated Pressure 18.6 MPa (190 kgf/cm<sup>2</sup>, 2700 psi)</li> <li>• Oil Temperature 50 to 60 °C (122 to 140 °F)</li> </ul>			

### RELIEF VALVE

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure	18.7 to 19.1 MPa 190 to 195 kgf/cm <sup>2</sup> 2710 to 2770 psi	–
Relief Valve	Setting Pressure	21.1 to 22.5 MPa 215 to 230 kgf/cm <sup>2</sup> 3060 to 3270 psi	–

### POSITION AND DRAFT CONTROL LINKAGE

Item		Factory Specification	Allowable Limit
Position Feedback Rod	Length	140 mm 5.5 in.	–
Position Control	Floating Range	10 to 35 mm 0.40 to 1.3 in.	–
Uppermost Position of Lift Arm	Free Play at Edge of Lift Arm	5.0 to 20 mm 0.20 to 0.78 in.	–
Position Control Lever	Operating Force	15 to 50 N 1.6 to 5.0 kgf 3.4 to 11 lbf	–

**HYDRAULIC CYLINDER**

Item		Factory Specification	Allowable Limit	
Spool Joint	Length Joint Spool Mounting Screw	78.80 to 79.20 mm 3.103 to 3.118 in.	–	
Cylinder Liner Bore	I.D.	90.000 to 90.050 mm 3.5433 to 3.5452 in.	90.15 mm 3.549 in.	
Hydraulic Arm Shaft to Bushing	Clearance (Right)	0.0490 to 0.154 mm 0.00193 to 0.00606 in.	0.50 mm 0.020 in.	
	Clearance (Left)	0.0490 to 0.149 mm 0.00193 to 0.00586 in.	0.50 mm 0.020 in.	
	• Hydraulic Arm Shaft	O.D. (Right)	49.950 to 49.975 mm 1.9666 to 1.9675 in.	–
		O.D. (Left)	44.950 to 44.975 mm 1.7697 to 1.7706 in.	–
	• Bushing	I.D. (Right)	50.024 to 50.104 mm 1.9695 to 1.9725 in.	–
		I.D. (Left)	45.024 to 45.099 mm 1.7726 to 1.7755 in.	–
		Press-fit Location (Right)	22.5 to 23.5 mm 0.886 to 0.925 in.	–
		Press-fit Location (Left)	14.5 to 15.5 mm 0.571 to 0.610 in.	–

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### 3. TIGHTENING TORQUES

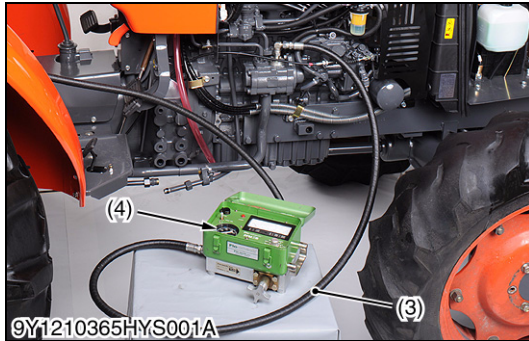
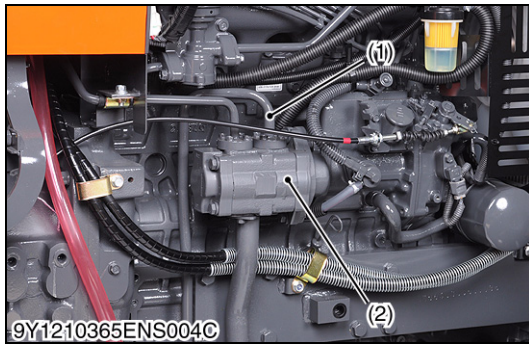
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

Item	N·m	kgf·m	lbf·ft
Relief valve	35 to 39	3.5 to 4.0	26 to 28
Cylinder safety valve	40 to 49	4.0 to 5.0	29 to 36
Cylinder safety valve lock nut	59 to 78	6.0 to 8.0	44 to 57
Rear wheel mounting nut	260 to 304	26.5 to 31.0	192 to 224
Delivery pipe retaining nut	108 to 117	11.0 to 12.0	79.6 to 86.7
Hydraulic cylinder assembly mounting screw and nut	78 to 90	7.9 to 9.2	58 to 66
Control valve mounting screw	20 to 23	2.0 to 2.4	15 to 17
Hydraulic arm setting screw	40 to 45	4.0 to 4.6	29 to 33

9Y1210365HYS0003US0

## 4. CHECKING AND ADJUSTING

### [1] HYDRAULIC PUMP



#### Hydraulic Flow Test

##### ■ IMPORTANT

- When using a flowmeter other than KUBOTA specified flowmeter (Code No. 07916-52792), be sure to use the instructions with the flowmeter.
  - Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.
  - Set the main change lever and range shift lever in Neutral position.
  - Set parking brake lever in parking position.
1. Disconnect the delivery pipe (1) which is connected from hydraulic pump (2) to hydraulic cylinder.
  2. Install the adaptor **53** and **54** to the pump discharge port. [Adaptor **53** and **54** are included in adaptor set (Code No. 07916-54301).]
  3. Install the adaptor **64** to the delivery pipe joint. [Hydraulic adaptor **64** is included in adaptor set (Code No. 07916-54031).]
  4. Connect the hydraulic test hose (3) to the adaptor **53** and flowmeter inlet port.
  5. Connect the other hydraulic test hose to the flowmeter outlet insert the hydraulic test hose other end to transmission oil filling port at PTO case.
  6. Open the flowmeter loading valve completely. (Turn counterclockwise.).
  7. Start the engine and set the engine speed at 2000 to 2200 min<sup>-1</sup> (rpm).
  8. 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 reaches approx. 50 °C (122 °F).
  9. Open the loading valve completely.
  10. Set the engine speed. (Refer to condition.)
  11. Read and note the pump delivery at no pressure.
  12. Slowly close the loading valve to increase rated pressure. (Refer to condition.) As the load is increased, engine speed drops, therefore, reset the engine speed.
  13. Read and note the pump delivery at rated pressure.
  14. Open the loading valve completely and stop the engine.
  15. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

(1) Delivery Pipe  
(2) Hydraulic PUmp

(3) Test Hose  
(4) Flowmeter

**(To be continued)**

(Continued)

**Condition**

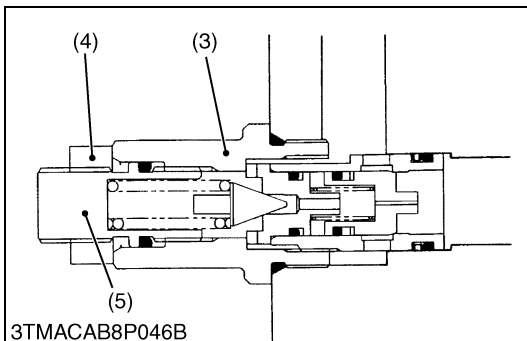
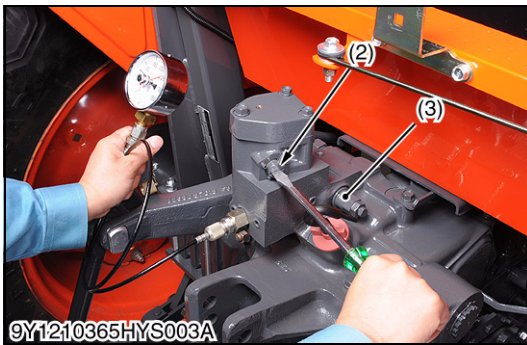
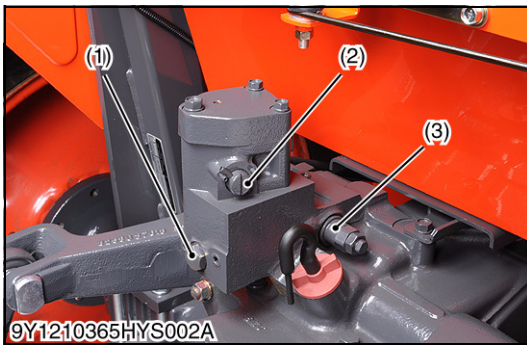
- Engine speed :  
Approx. 2600 min<sup>-1</sup> (rpm)
- Rated pressure :  
18.6 MPa (190 kgf/cm<sup>2</sup>, 2700 psi)
- Oil temperature :  
50 to 60 °C (122 to 140 °F)

Hydraulic pump delivery at no pressure	Factory spec.	Above 41.6 L/min. 11.0 U.S.gals/min. 9.15 Imp.gals/min.
Hydraulic pump delivery at rated pressure	Factory spec.	38.1 L/min. 10.1 U.S.gals/min. 8.38 Imp.gals/min.
	Allowable limit	31.1 L/min. 8.22 U.S.gals/min. 6.84 Imp.gals/min.

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**[2] RELIEF AND SAFETY VALVE**

**(1) Relief Valve**



**Relief Valve Setting Pressure Test Using Pressure Tester**

1. Remove the plug (3/8) (1).
2. Install the relief valve set pressure adaptor C (Code No. 07916-50371) and then install a pressure gauge (Code No. 07916-50322).
3. Start the engine, set at maximum speed.
4. Operate the control screw (2) to clockwise (as shown photo) using a screwdriver and read the pressure gauge when the relief valve is actuated.
5. If the pressure is not within the factory specification, adjust the relief valve adjuster (5).

**■ IMPORTANT**

- **Be sure to operate the control screw (2) to counterclockwise as an original position.**

**Condition**

- Engine speed  
Approx. 2600 min<sup>-1</sup> (rpm)
- Oil temperature  
50 to 60 °C (122 to 140 °F)

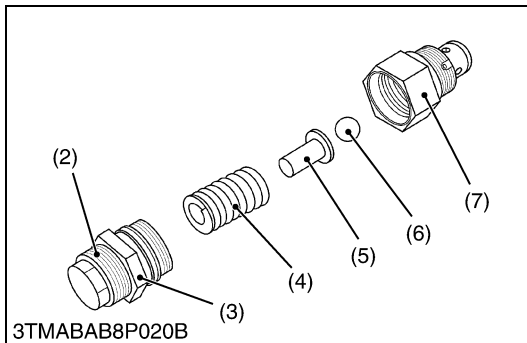
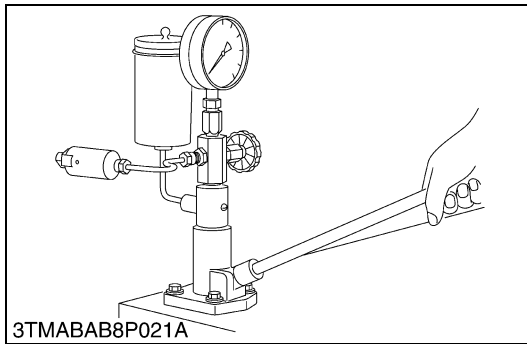
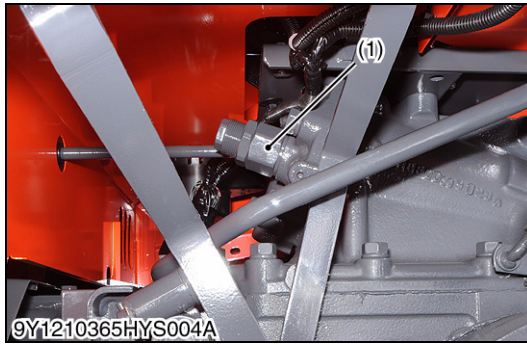
Tightening torque	Relief valve assembly	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
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Relief valve setting pressure	Factory spec.	18.7 to 19.1 MPa 185 to 195 kgf/cm <sup>2</sup> 2710 to 2770 psi
-------------------------------	---------------	--

- (1) Plug (3/8)
- (2) Control Screw
- (3) Relief Valve
- (4) Lock Nut
- (5) Adjuster

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## (2) Safety Valve



### Safety Valve Setting Pressure Test Using Injection Nozzle Tester

1. Remove the safety valve assembly (1).
2. Attach the safety valve to an injection nozzle tester with a safety valve setting adaptor (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section).
3. Measure the operating pressure of the safety valve.
4. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw (2).
5. After adjustment, tighten the lock nut (3) firmly.

#### (When reassembling)

- Install the safety valve to the hydraulic cylinder block, taking care not to damage the O-ring and apply transmission fluid.

Tightening torque	Safety valve assembly	40 to 49 N·m 4.0 to 5.0 kgf·m 29 to 36 lbf·ft
	Safety valve lock nut	59 to 78 N·m 6.0 to 8.0 kgf·m 44 to 57 lbf·ft

Safety valve operating pressure	Factory spec.	21.1 to 22.5 MPa 215 to 230 kgf/cm <sup>2</sup> 3060 to 3270 psi
---------------------------------	---------------	--

#### NOTE

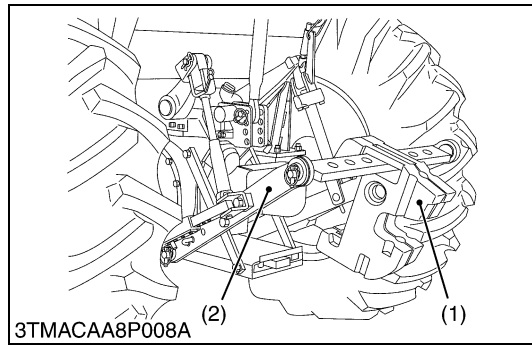
- Use specified transmission fluid (refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section) to test the operating pressure of the cylinder safety valve.

- |                           |             |
|---------------------------|-------------|
| (1) Safety Valve Assembly | (5) Seat    |
| (2) Adjusting Screw       | (6) Ball    |
| (3) Lock Nut              | (7) Housing |
| (4) Spring                |             |

9Y1210365HYS0019US0



### [3] POSITION CONTROL LINKAGE



#### Adjusting Uppermost Position

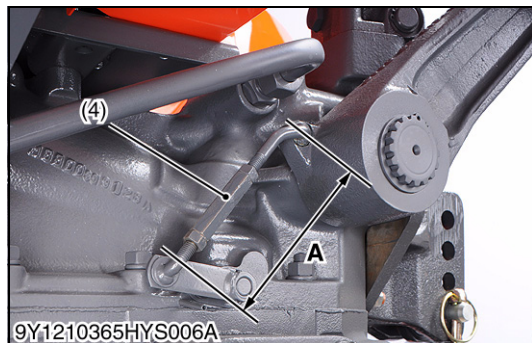
1. Attach the weight (1) of 490 N (50 kgf, 110 lbf) to the end of lower link (2).
2. Set the position control lever (3) to the lowest position.
3. Start the engine, and set the engine speed at the 1000 min<sup>-1</sup> (rpm).
4. Set the position control lever (3) to the uppermost position.
5. Shorten the feedback rod by turning the turnbuckle (4) until the relief valve begins to be operated.
6. From the relief valve operating position, turn the turnbuckle 1.5 turn to lengthen the feedback rod (4), then tighten the lock nut.
7. Move the position control lever down then all the way up and check the relief valve does not operates. Stop the engine and check that the lift arm has 5.0 to 20 mm (0.20 to 0.78 in.) play upward on its edge.
8. If the specified play is not obtained, repeat from 4 again.



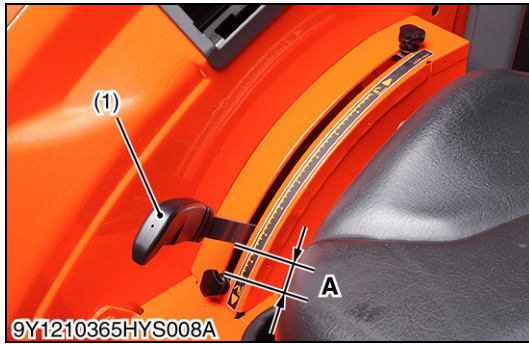
Position control feedback rod "A"	Factory spec.	Approx. 140 mm 5.51 in.
-----------------------------------	---------------	----------------------------

- |                            |                |
|----------------------------|----------------|
| (1) Weight                 | (4) Turnbuckle |
| (2) Lower Link             | (5) Lift Arm   |
| (3) Position Control Lever |                |

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**Checking Floating Position**

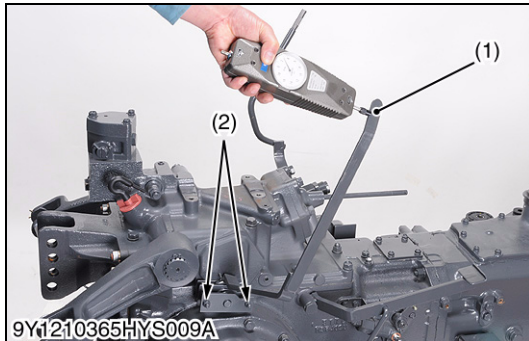
1. Attach the weight of 490 N (50 kgf, 110 lbf) to the end of lower link.
2. Set the position control lever (1) to the lowest position, and set the engine speed at the maximum.
3. Gradually move the position control lever (1) until the lower link begins to rise.
4. Check the distance "A".
5. If the specified play is not obtained, readjust the feedback rod. (Refer to Adjusting of uppermost position section.)

Distance "A"	Factory spec.	10 to 35 mm 0.40 to 1.3 in.
--------------	---------------	--------------------------------

(1) Position Control Lever

**A : Distance**

9Y1210365HYS0006US0



**Position Control Lever Operating Force**

1. Check the position control lever (1) operating force.
2. If the measurement is not within the factory specification, adjust with the tightening nuts (2).

Operating force for position control lever	Factory spec.	15 to 50 N 1.6 to 2.0 kgf 3.4 to 11 lbf
--	---------------	---

(1)

(2)

9Y1210365HYS0020US0

## 5. DIASSEMBLING AND ASSEMBLING

### [1] HYDRAULIC CYLINDER AND POSITION CONTROL VALVE

#### (1) Removing Hydraulic Cylinder Assembly



#### Lift Rods, Lower Links and Rear Wheels

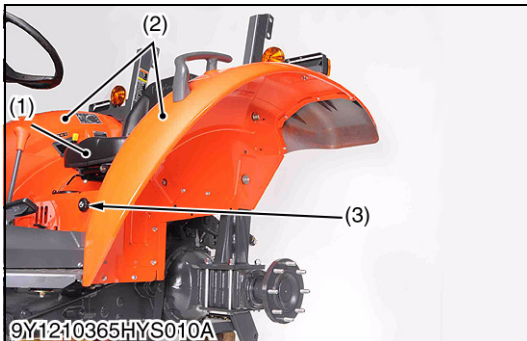
1. Remove the lift rods (1), stabilizer (2) with lower link (4).
2. Remove the top link (5).
3. Check the clutch housing case and transmission case are securely mounted on the disassembling stands.
4. Remove the rear wheels (3).

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

Tightening torque	Rear wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
-------------------	-------------------------	---

- |                |                |
|----------------|----------------|
| (1) Lift Rod   | (4) Lower Link |
| (2) Stabilizer | (5) Top Link   |
| (3) Rear Wheel |                |

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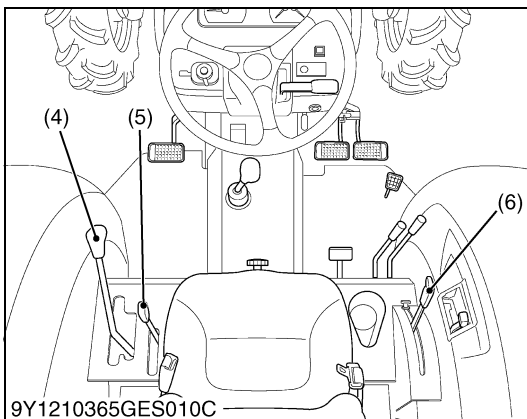


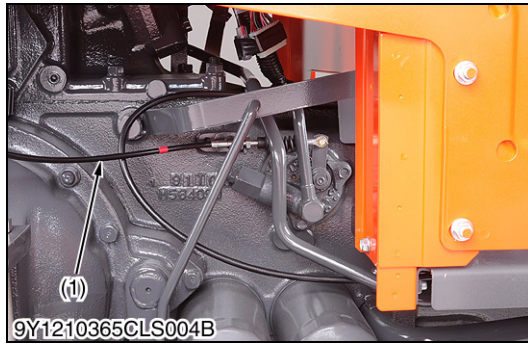
#### Seat and Fenders

1. Disconnect the connectors at both side for rear combination lamp.
2. Disconnect the connector for PTO switch. (For fender R.H..)
3. Remove the fenders (2).
4. Remove the seat (1) and lowering speed dial (3).
5. Remove the grips for position control lever (6), range shift lever (4) and front wheel drive lever (5).

- |                         |                             |
|-------------------------|-----------------------------|
| (1) Seat                | (4) Range Shift Lever       |
| (2) Fender              | (5) Front Wheel Drive Lever |
| (3) Lowering Speed Dial | (6) Position Control Lever  |

9Y1210365HYS0021US0



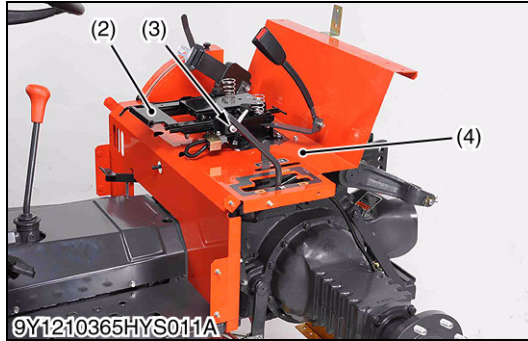


### Seat Stay and Center Frame

1. Remove the PTO clutch cable (1).
2. Disconnect the connector for OPC seat switch (3).
3. Remove the seat stay (2).
4. Remove the center frame (4).

- |                      |                     |
|----------------------|---------------------|
| (1) PTO Clutch Cable | (3) OPC Seat Switch |
| (2) Seat Stay        | (4) Center Frame    |

9Y1210365HYS0008US0

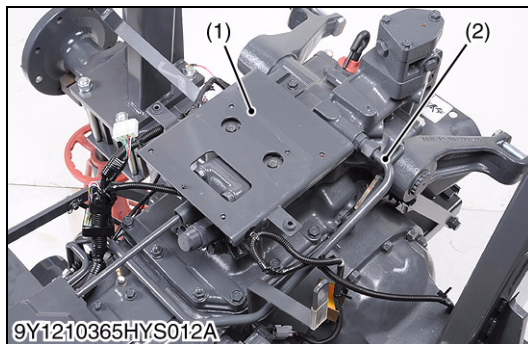


### Hydraulic Cylinder Assembly

1. Remove the delivery pipe (2).
2. Remove the seat support (1).
3. Remove the hydraulic cylinder assembly mounting screws and nuts.
4. Support the hydraulic cylinder assembly with nylon lift strap and hoist, and then remove it.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208C or equivalent) to joint face of the hydraulic cylinder assembly and transmission case after eliminate the water, oil and stuck liquid gasket.



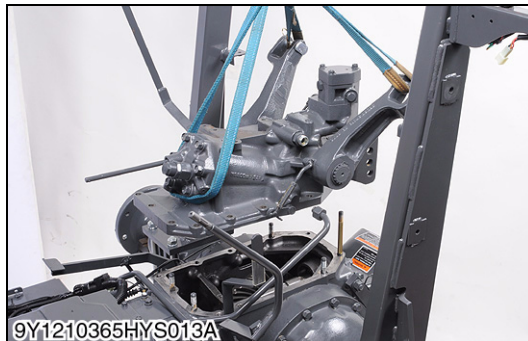
Tightening torque	Delivery pipe retaining nut	108 to 117 N·m 11.0 to 12.0 kgf·m 79.6 to 86.7 lbf·ft
	Hydraulic cylinder assembly mounting screw and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

#### NOTE

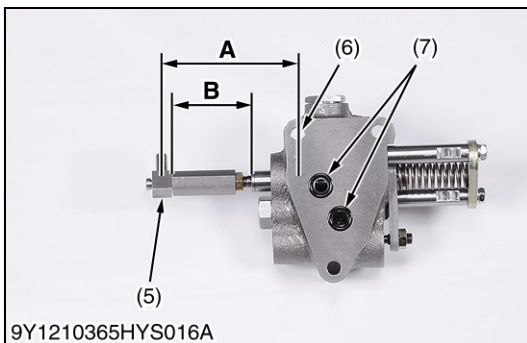
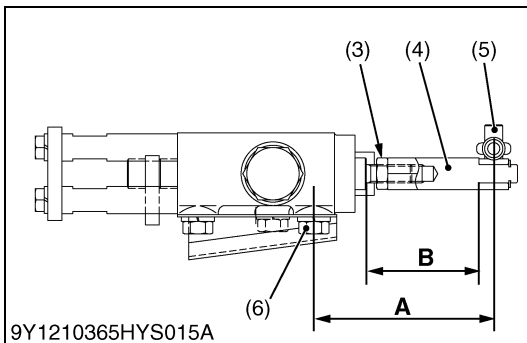
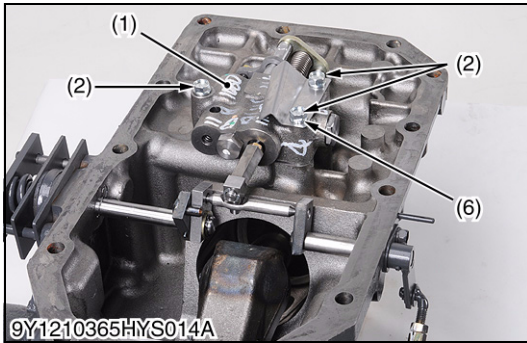
- Reassemble the hydraulic cylinder assembly to the tractor, be sure to adjust the position control feedback rod.

- |                  |                   |
|------------------|-------------------|
| (1) Seat Support | (2) Delivery Pipe |
|------------------|-------------------|

9Y1210365HYS0009US0



## (2) Removing Control Valve



### Removing Control Valve

1. Remove the control valve mounting screws (2).
2. Remove the control valve (1).

#### ■ NOTE

- Do not loosen adjusting section of the spool (4) unless necessary.

#### (When reassembling)

- If the spool link (4) is removed, be sure to adjust its position according to the following procedure.
- Be sure to fit the O-rings (7) and apply grease to the O-rings (7).

Tightening torque	Control valve mounting screw	19.6 to 23.5 N·m 2.0 to 2.4 kgf·m 14.5 to 17.4 lbf·ft
-------------------	------------------------------	---

#### ■ Adjusting Spool Link

1. Measure the distance **A** between measurement point (6) and spool joint (5).
2. If the measurement is not within the factory specifications, loosen the lock nut (6) and adjust by the spool link (4).
3. Check the distance **B** after adjusted the distance **A**, so the distance **B** to be the reference.

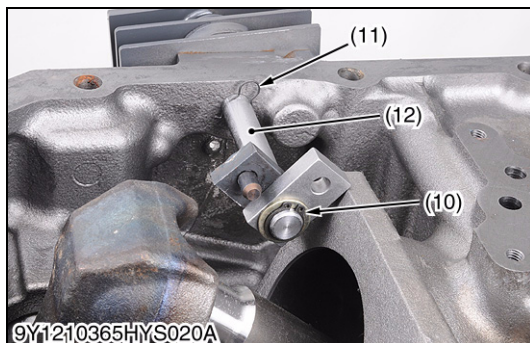
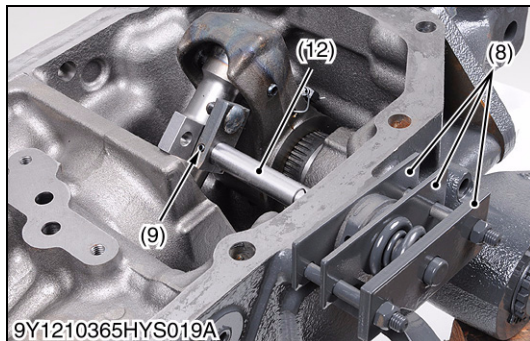
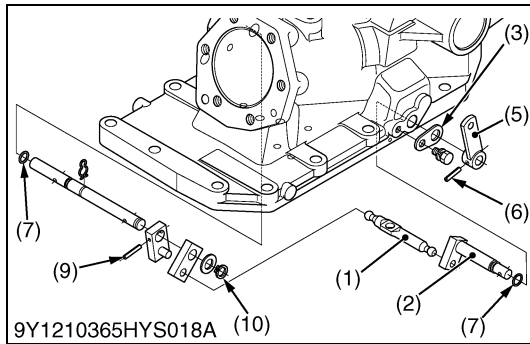
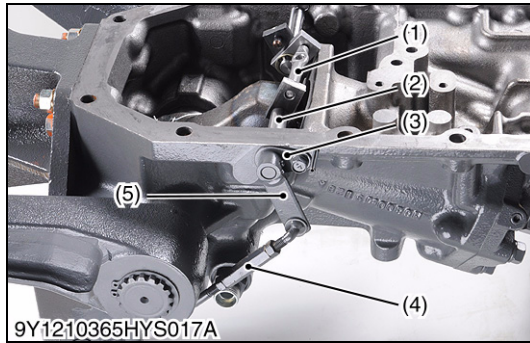
Distance ( <b>A</b> ) between measurement point and spool joint	Factory spec.	78.80 to 79.20 mm 3.103 to 3.118 in.
Distance ( <b>B</b> ) between spool edge and spool link step position	Factory spec.	49.5 mm 1.95 in.

- |                                  |                                 |
|----------------------------------|---------------------------------|
| (1) Control Valve                | (6) Measurement Point           |
| (2) Control Valve Mounting Screw | (7) O-ring                      |
| (3) Lock Nut                     |                                 |
| (4) Spool Link                   | <b>A : Distance</b>             |
| (5) Spool Joint                  | <b>B : Distance (Reference)</b> |

9Y1210365HYS0010US0



### (3) Disassembling the Linkage



#### Position Linkage

1. Remove the position feedback rod (4).
2. Remove the feedback lever (5) after removed the roll pin (6).
3. Remove the set plate (3) mounting screw.
4. Slide the feedback shaft (2) and remove the spool drive lever (1).
5. Remove the position lever holder mounting nut.
6. Remove the external snap ring (10) and roll pin (9).
7. Remove the clip (11) and position shaft (12) with position control lever.

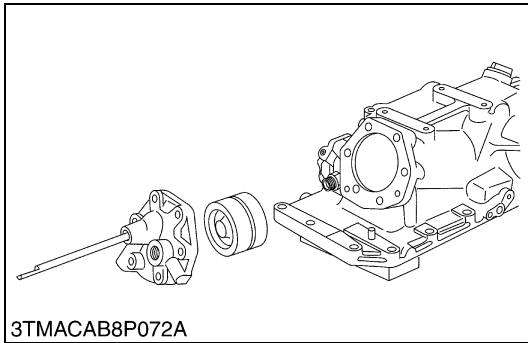
#### (When reassembling)

- Set the O-rings (7) from out side of the case.
- Adjust the position control lever operating force after assembled.

- |                           |                           |
|---------------------------|---------------------------|
| (1) Spool Drive Lever     | (7) O-ring                |
| (2) Feedback Shaft        | (8) Position Lever Holder |
| (3) Set Plate             | (9) Roll Pin              |
| (4) Position Feedback Rod | (10) External Snap Ring   |
| (5) Feedback Lever        | (11) Clip                 |
| (6) Roll Pin              | (12) Position Shaft       |

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### (4) Disassembling Hydraulic Cylinder Assembly

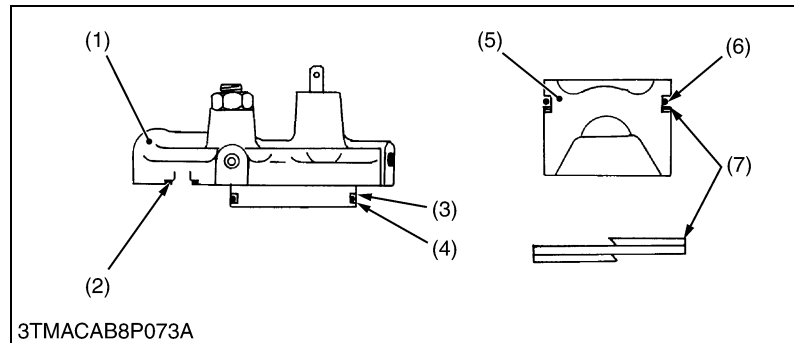


#### Hydraulic Cylinder Cover and Hydraulic Piston

1. Remove the hydraulic cylinder cover (1).
2. Push out the hydraulic piston (5) from the hydraulic cylinder.

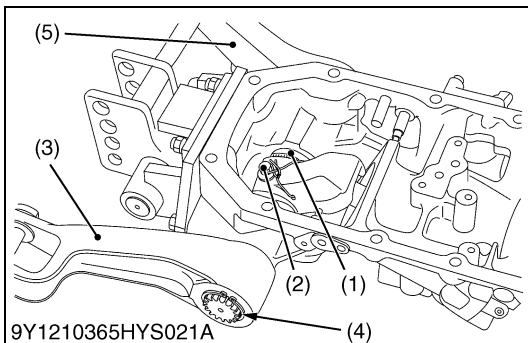
#### (When reassembling)

- Install the hydraulic piston, noting O-ring (6) and backup ring (7).
- Install the hydraulic cylinder cover, noting O-ring (2), (4) and backup ring (3).
- Apply grease to the hydraulic piston bottom contacts with hydraulic rod.



- |                              |                      |
|------------------------------|----------------------|
| (1) Hydraulic Cylinder Cover | (5) Hydraulic Piston |
| (2) O-ring                   | (6) O-ring           |
| (3) Backup Ring              | (7) Backup Ring      |
| (4) O-ring                   |                      |

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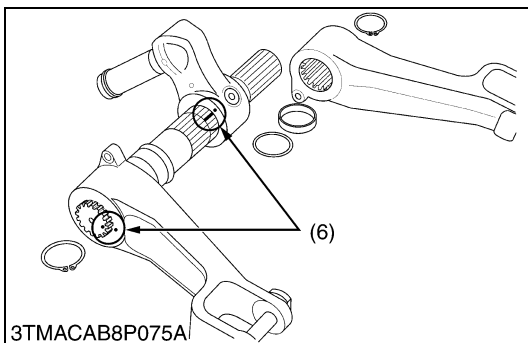


#### Lift Arm and Hydraulic Arm Shaft

1. Disconnect the position feedback rod from the lift arm L.H. (3).
2. Remove the wire and unscrew the setting screw (2).
3. Remove the external snap ring (4).
4. Draw out the hydraulic arm shaft (1) and lift arm R.H. (5) as a unit.
5. Remove the collar and O-ring.

#### (When reassembling)

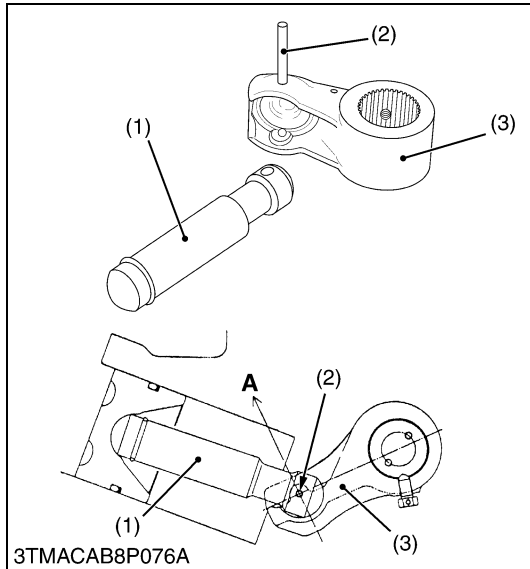
- Align the alignment marks of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks of the lift arm and hydraulic arm shaft.
- Apply grease to the right and left bushings of hydraulic cylinder body and O-ring.
- Take care not to damage the O-ring.
- After tightening the hydraulic arm setting screw to the specified torque, insert a wire through the holes of the screw head and hydraulic arm.



Tightening torque	Hydraulic arm setting screw	40 to 45 N·m 4.0 to 4.6 kgf·m 29 to 33 lbf·ft
-------------------	-----------------------------	---

- |                         |                        |
|-------------------------|------------------------|
| (1) Hydraulic Arm Shaft | (4) External Snap Ring |
| (2) Setting Screw       | (5) Lift Arm R.H.      |
| (3) Lift Arm L.H.       | (6) Alignment Mark     |

9Y1210365HYS0013US0



### Hydraulic Arm and Hydraulic Rod

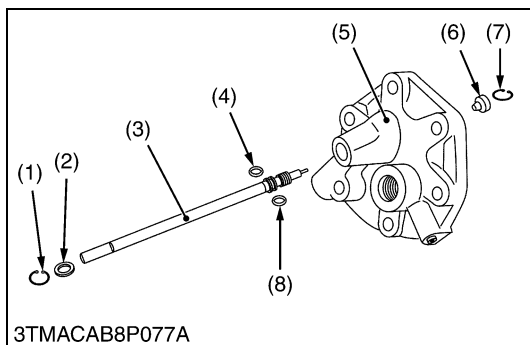
1. Remove the spring pin (2), and separate the hydraulic arm (3) and the hydraulic rod (1).

#### (When reassembling)

- Apply grease to the joints of the hydraulic arm, hydraulic rod, set pin and piston.
- Be sure to fix the spring pin (2), its spirts must face the direction "A" as shown in figure.

- |                   |                   |
|-------------------|-------------------|
| (1) Hydraulic Rod | (3) Hydraulic Arm |
| (2) Spring Pin    |                   |

9Y1210365HYS0014US0



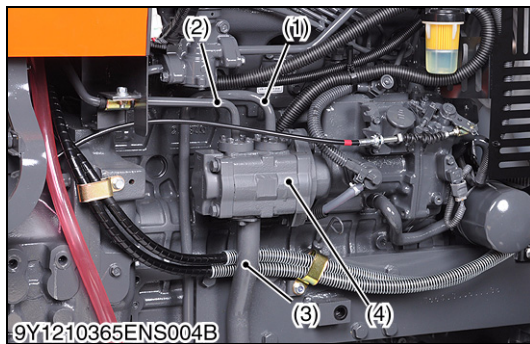
### Lowering Speed Adjusting Valve

1. Remove the internal snap ring (1) and adjusting screw (3).
2. Remove the internal snap ring (7), and draw out the poppet valve (6).

- |                        |                              |
|------------------------|------------------------------|
| (1) Internal Snap Ring | (5) Hydraulic Cylinder Cover |
| (2) Plain Washer       | (6) Poppet Valve             |
| (3) Adjusting Screw    | (7) Internal Snap Ring       |
| (4) O-ring             | (8) O-ring                   |

9Y1210365HYS0015US0

## [2] REMOVING HYDRAULIC PUMP



### Removing Hydraulic Pump

1. Disconnect the delivery pipe (1), (2) from the hydraulic pump (4).
2. Disconnect the suction pipe (3) from the hydraulic pump (4).
3. Remove the hydraulic pump assembly mounting screws and nuts.
4. Take out the hydraulic pump assembly.

#### (When reassembling)

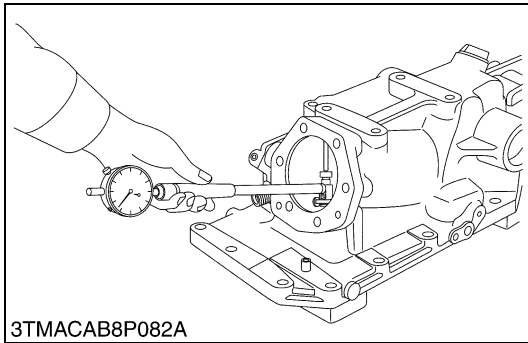
- Apply grease to the O-ring and take care not to damage it.

Tightening torque	Hydraulic pipe mounting screw	18 to 20 N·m 1.8 to 2.1 kgf·m 13 to 15 lbf·ft
	Hydraulic pump assembly mounting screw and nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

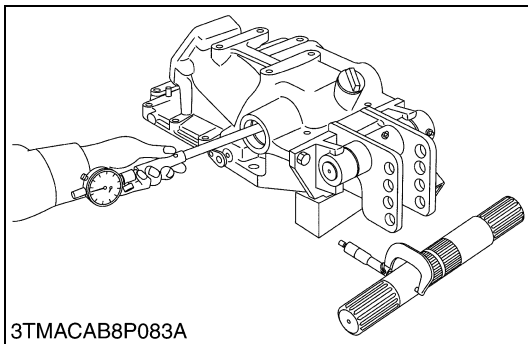
- |   |                    |
|---|--------------------|
| (1) Delivery Pipe<br>(Three Point Hydraulic Pipe) | (3) Suction Pipe   |
| (2) Delivery Pipe<br>(Power Steering Pipe)        | (4) Hydraulic Pump |

9Y1210365STS0006US0

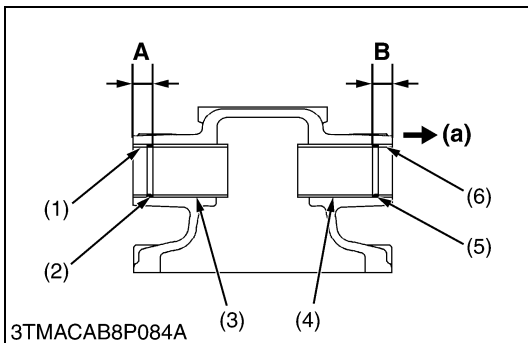
# 6. SERVICING



3TMACAB8P082A



3TMACAB8P083A



3TMACAB8P084A

## 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 it.

Cylinder I.D.	Factory spec.	90.000 to 90.050 mm 3.5433 to 3.5452 in.
	Allowable limit	90.15 mm 3.549 in.

9Y1210365HYS0016US0

## Clearance between Hydraulic Arm Shaft and Bushing

1. Measure the hydraulic arm shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

Clearance between hydraulic arm shaft and bushing (Right side)	Factory spec.	0.0490 to 0.154 mm 0.00193 to 0.00606 in.
	Allowable limit	0.50 mm 0.020 in.

Hydraulic arm shaft O.D. (Right side)	Factory spec.	49.950 to 49.975 mm 1.9666 to 1.9675 in.
Bushing I.D. (After press-fitted) (Right side)	Factory spec.	50.024 to 50.104 mm 1.9695 to 1.9725 in.

Clearance between hydraulic arm shaft and bushing (Left side)	Factory spec.	0.0490 to 0.149 mm 0.00193 to 0.00587 in.
	Allowable limit	0.50 mm 0.020 in.

Hydraulic arm shaft O.D. (Left side)	Factory spec.	44.950 to 44.975 mm 1.7697 to 1.7706 in.
Bushing I.D. (After press-fitted) (Left side)	Factory spec.	45.024 to 45.099 mm 1.7726 to 1.7755 in.

### (When reassembling)

- When press-fitting a new bushing with a press-fitting tool (refer to "9. SPECIAL TOOLS" at GENERAL Section), observe the dimensions described in the figure.
- When press-fitting a new bushing, apply transmission fluid to the hydraulic cylinder liner boss and bushing.
- When press-fitting a new bushing, press-fit it so that each seam faces up.

Press-fit location of bushing	Factory spec.	"A"	14.5 to 15.5 mm 0.571 to 0.610 in.
		"B"	22.5 to 23.5 mm 0.886 to 0.925 in.

- (1) Collar (Left)
- (2) O-ring
- (3) Bushing (Left)
- (4) Bushing (Right)
- (5) O-ring
- (6) Collar (Right)

(a) **Right Side**  
(Flush the end of collar with the end of hydraulic cylinder body.)

9Y1210365HYS0017US0



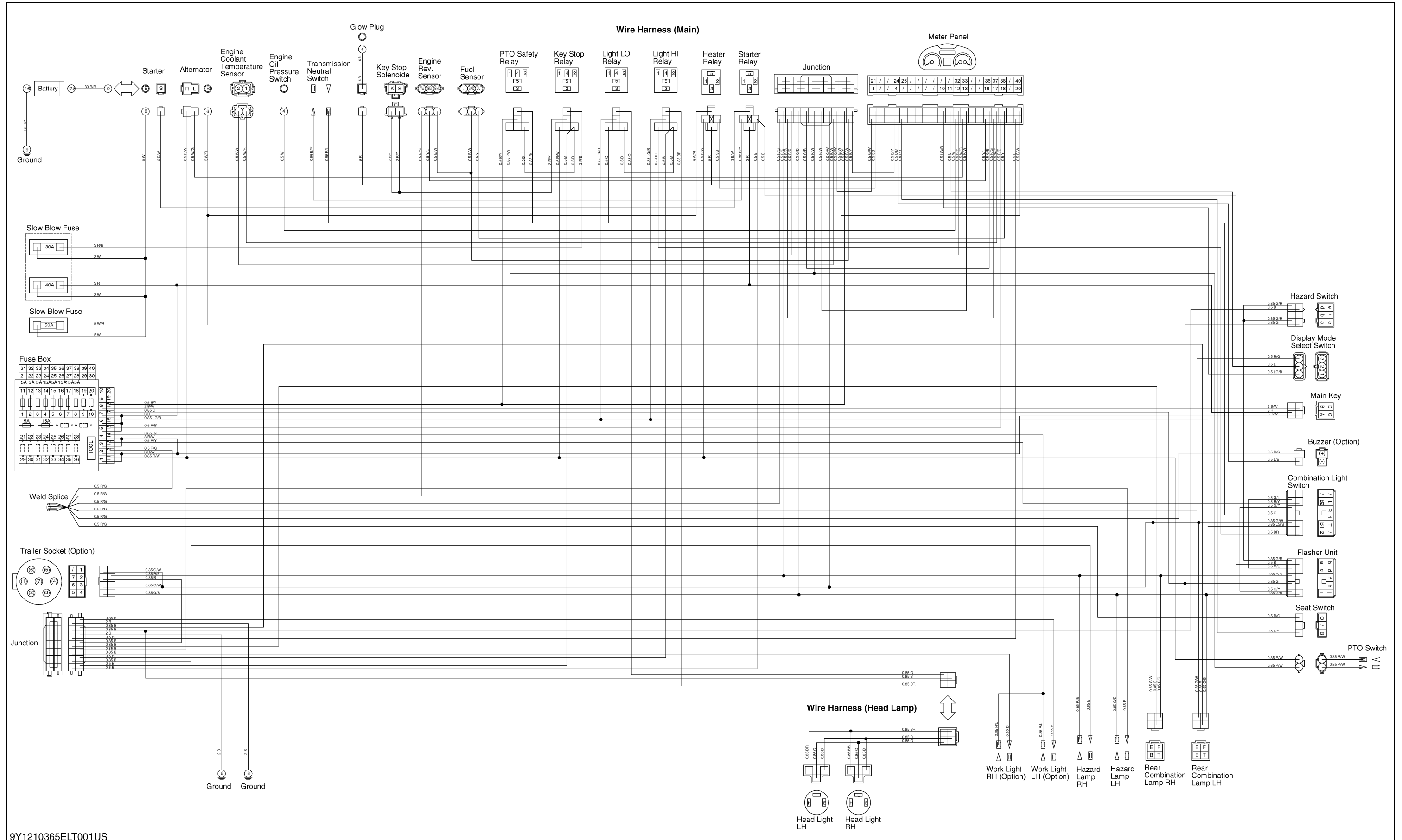
# **9 ELECTRICAL SYSTEM**

# MECHANISM

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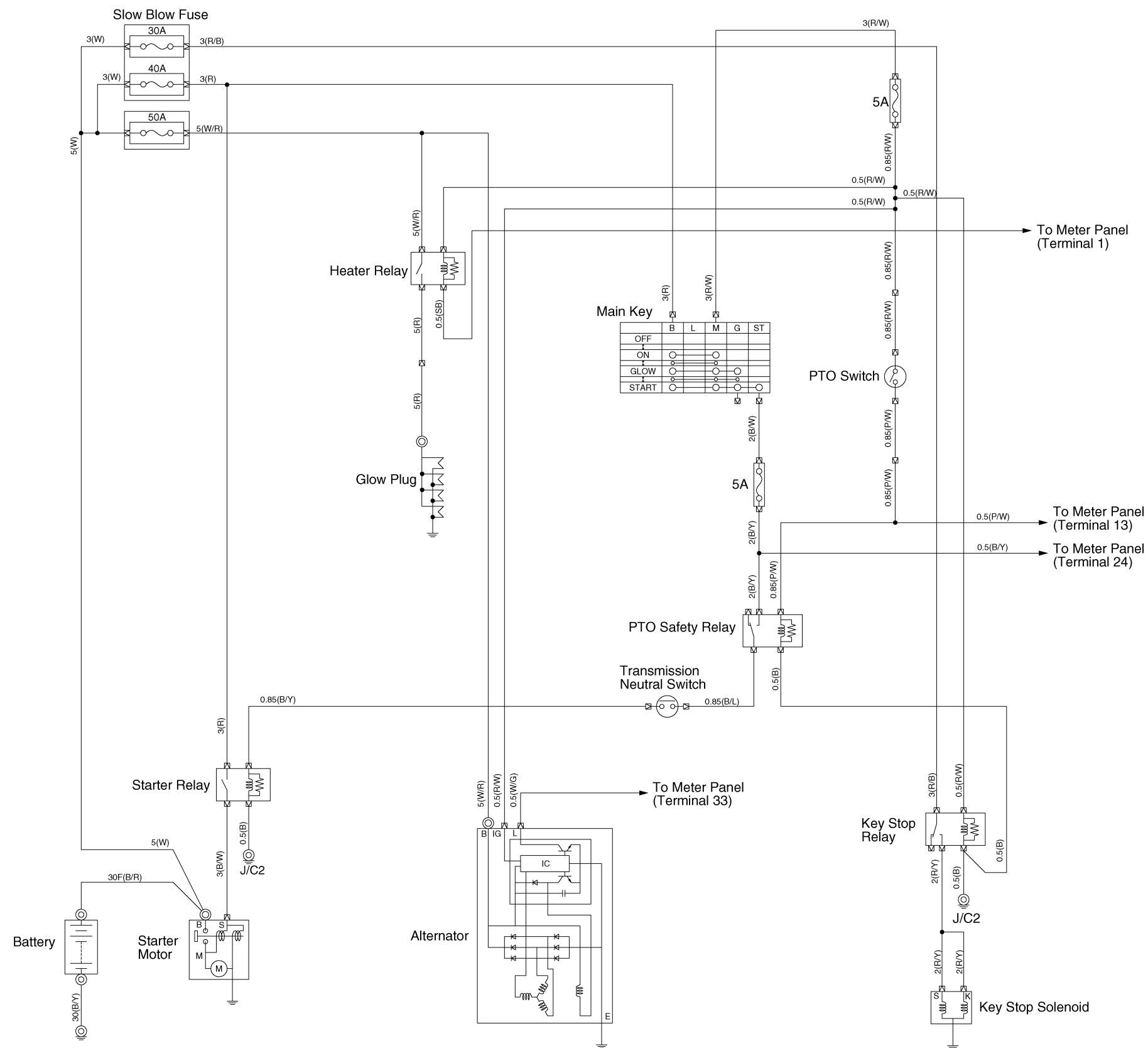
# 1. WIRING DIAGRAM



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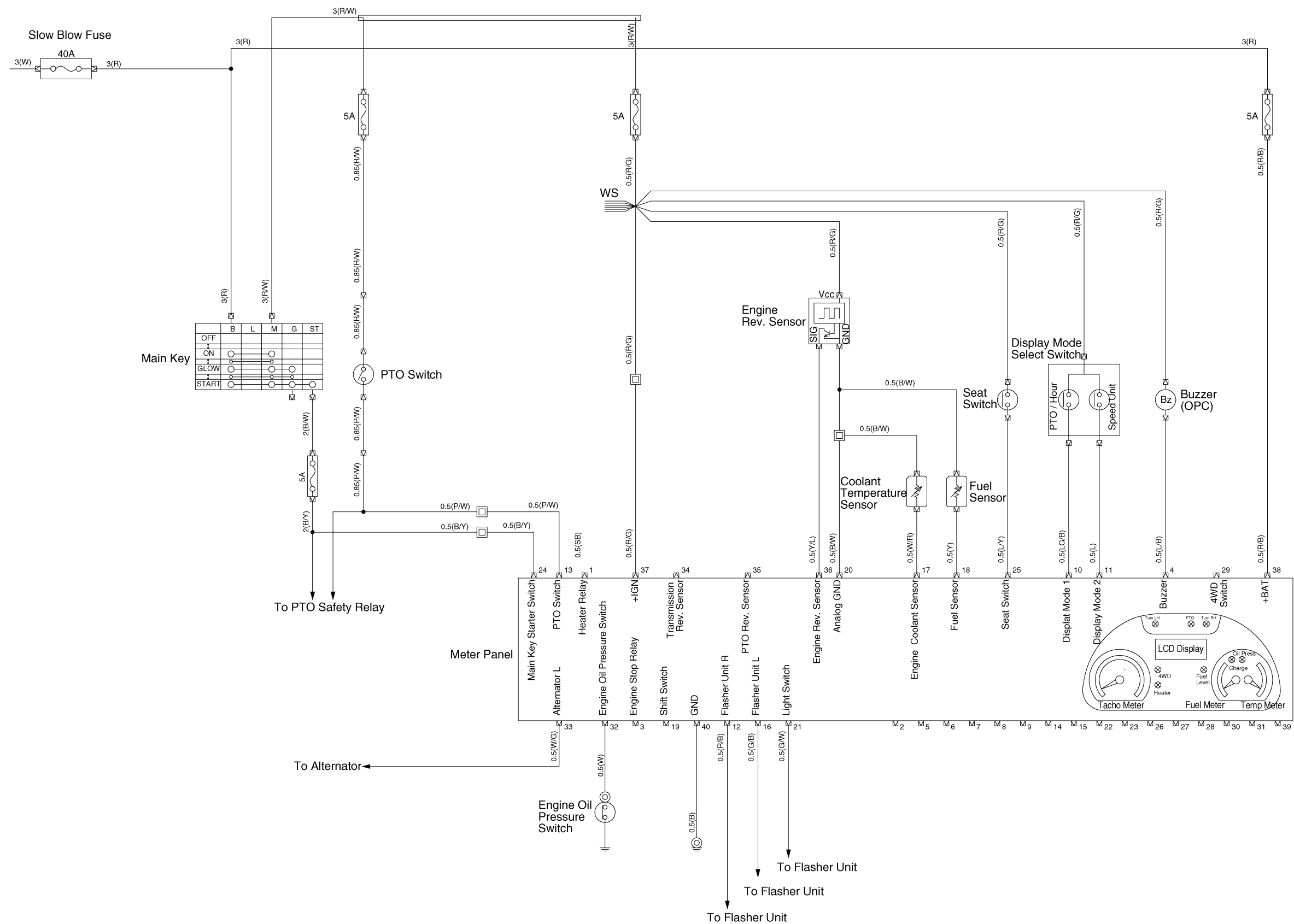
## 2. ELECTRICAL CIRCUIT DETAILED CHART

### [1] STARTING SYSTEM AND CHARGING SYSTEM



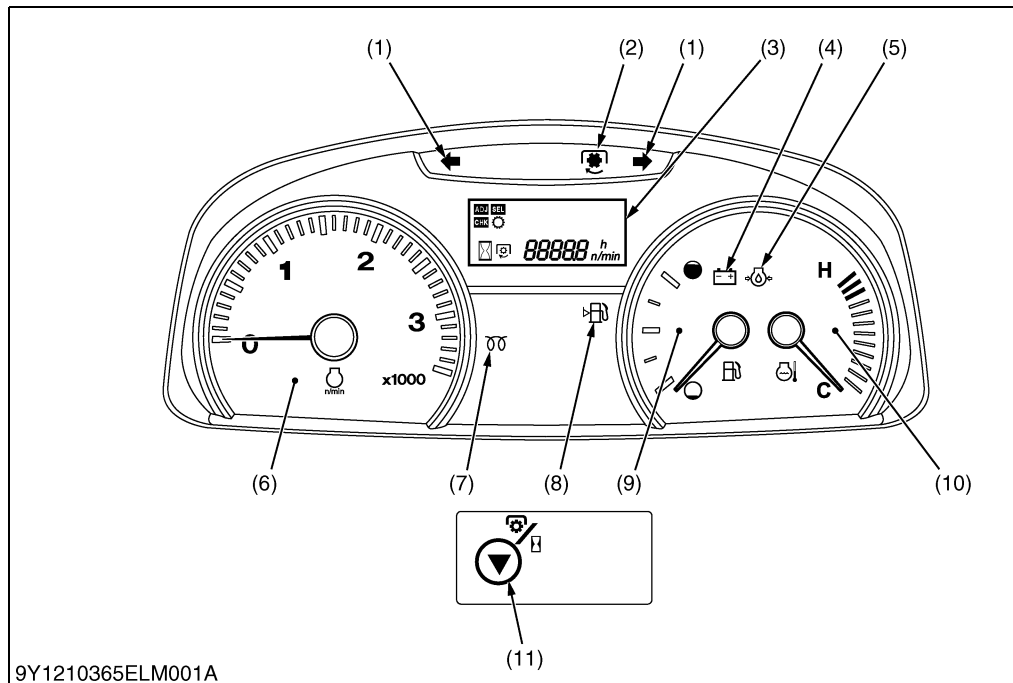


[3] METER PANEL



## 3. INSTRUMENT PANEL

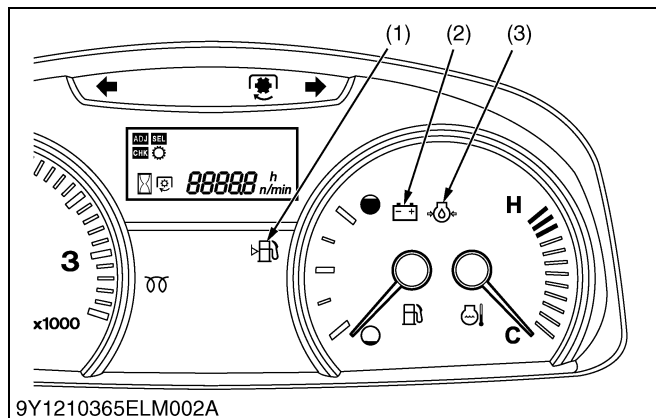
### [1] INDICATION ITEMS OF METER PANEL



- (1) Hazard/Turn Signal Indicator
- (2) PTO Clutch Indicator
- (3) Liquid Crystal Display
- (4) Electrical Charge Indicator
- (5) Engine Oil Pressure Indicator
- (6) Tachometer
- (7) Heater Indicator
- (8) Fuel Level Indicator
- (9) Fuel Gauge
- (10) Coolant Temperature Gauge
- (11) PTO/Hour Meter Select Switch

9Y1210365ELM0005US0

### [2] EASY CHECKER™



If the warning lamps in the Easy Checker™ come on during operation, immediately stop the engine, and find the cause as shown below.

Never operate the tractor while Easy Checker™ lamp is on.

#### ■ Engine Oil Pressure

If the oil pressure in the engine goes below the prescribed level, the warning lamp in the Easy Checker™ will come on.

If this should happen during operation, and it does not go off when the engine is accelerated to more than 1000 min<sup>-1</sup> (rpm), check level of engine oil.

#### ■ Fuel Level

If the fuel in the tank goes below the prescribed level, the warning lamp in the Easy Checker™ will come on.

If this should happen during operation, refuel as soon as possible.

Prescribed level	12 L 3.2 U.S.gals 2.6 Imp.gals
------------------	--------------------------------------

#### ■ Electrical Charge

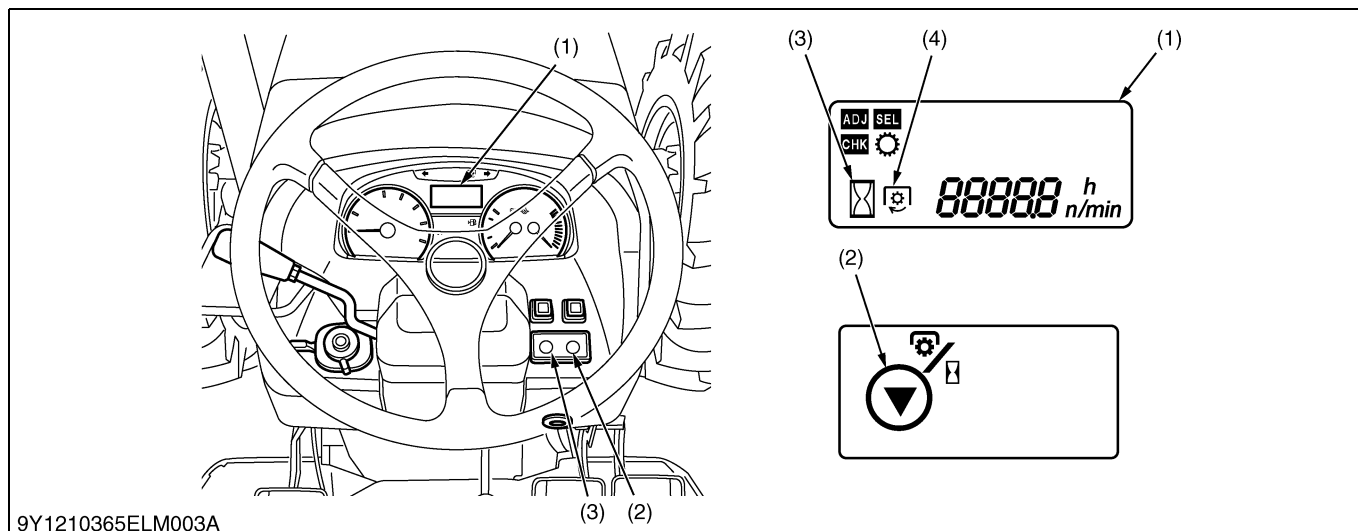
If the alternator is not charging battery, the Easy Checker will come on.

If this should happen during operation, check the electrical charging system.

- (1) Fuel Level Indicator
- (2) Electrical Charge Indicator
- (3) Engine Oil Pressure Indicator

9Y1210365ELM0006US0

### [3] LCD MONITOR INDICATION



9Y1210365ELM003A

- (1) LCD Monitor
- (2) PTO/Hour Meter Select Switch
- (3) Hour Meter Indication
- (4) PTO Indication

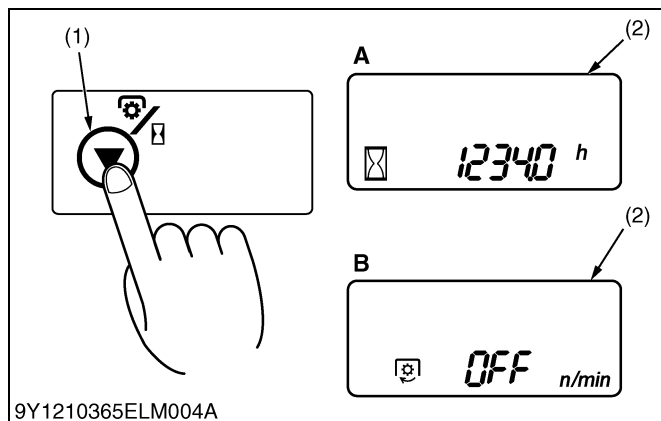
The LCD monitor (1) gives three different modes : "display mode", "setting mode" and "checking mode".

9Y1210365ELM0007US0

#### (1) Display Mode

1. The LCD monitor gives two different modes : "hour meter" and "PTO speed". Each time the PTO/Hour meter select switch is pressed, the mode is switched to the changing display.
2. The PTO clutch control lever works for the following automatic display modes.
  - PTO clutch control lever **"ON"** : traveling speed and PTO speed are displayed.
  - clutch control lever **"OFF"** : traveling speed and hour meter are displayed.

9Y1210365ELM0008US0



9Y1210365ELM004A

#### Switching Hour Meter Mode and PTO Speed Mode

Press the PTO/Hour meter select switch (1) to change the "hour meter mode" and "PTO speed mode".

##### (Hour meter mode)

- Total operating hours are displayed.
- The hour meter indicates in five digits the hours the tractor indicates in five digits the hours the tractor has been used; the last digit indicates 1/10 of an hour.

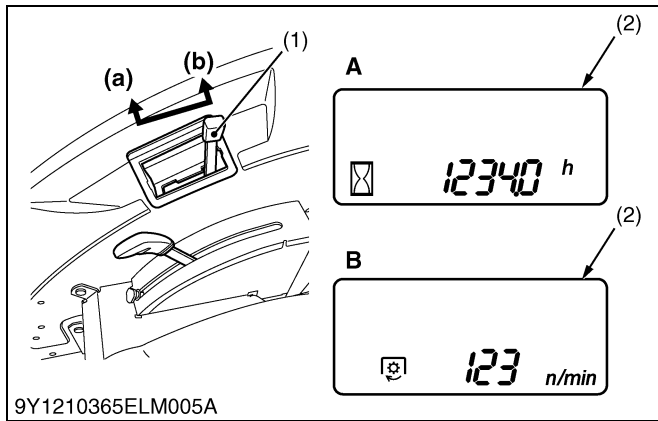
##### (PTO speed mode)

- PTO speed are displayed.
- When the PTO clutch control lever is in **"OFF"** position, **"OFF"** is displayed.

- (1) PTO/Hour Meter Select Switch
- (2) LCD Monitor
- A : Hour Meter Mode**
- B : PTO Speed Mode**

9Y1210365ELM0009US0





9Y1210365ELM005A

**When Operate PTO Clutch Control Lever**

**(At hour meter mode)**

- Total operating hours are displayed.
- The hour meter indicates in five digits the hours the tractor has been used; the last digit indicates 1/10 of an hour.
- When the PTO/Hour meter select switch is pressed in this state, "OFF" is displayed.

**(At PTO speed mode)**

- PTO speed are displayed.
- When the PTO/Hour meter select switch is pressed in this state, the display mode switches to hour meter mode.

- (1) PTO Clutch Control Lever     **A : PTO OFF (Hour Meter Mode)**
- (2) LCD Monitor
- B :**
- (a) **ON Position**
- (b) **OFF Position**

9Y1210365ELM0010US0

**(2) Setting Mode**

- Input the various data to RAM.
- There are two different setting modes : "PTO speed display mode switching" and "model select mode".

■ **PTO Speed Display Mode Switching**

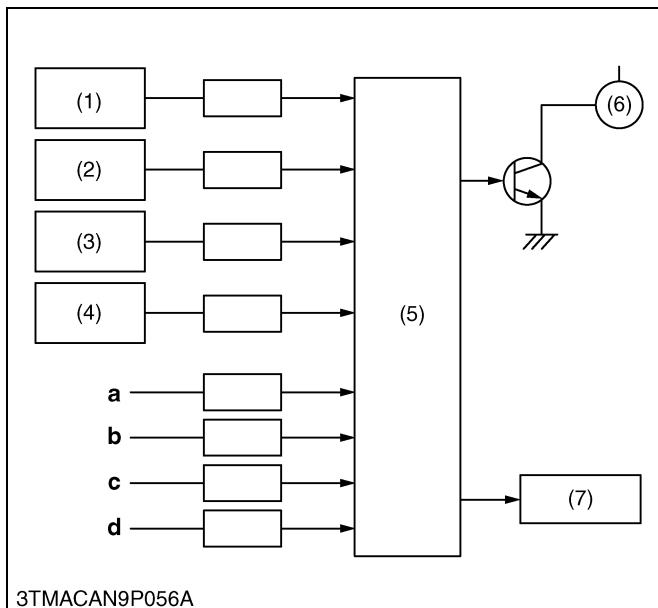
The PTO speed display mode switching is set at factory. When replacing the instrument panel assembly, enter the numerical code.

■ **Mode Select Mode**

The mode select mode is set at factory. When replacing the instrument panel assembly, enter the model code.

9Y1210365ELM0011US0

**(3) Checking Mode**



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The checking mode checking for sensors, battery voltage and engine revolution.

The CPU (5) process the input dates from sensors resistance, taco pulse and voltage to indicate with the LCD monitor (7).

The check mode shows four items as below.

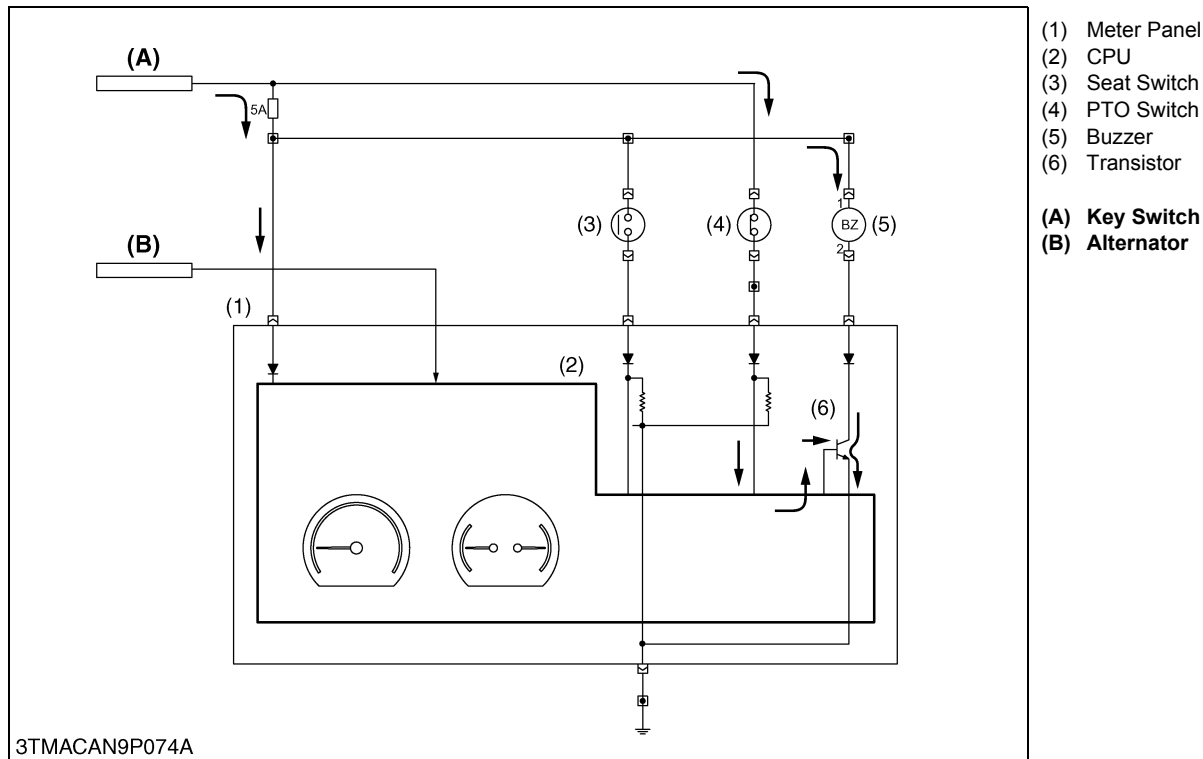
No.	Contents	Condition	Displayed unit
1	Fuel sensor voltage	F to E	V
2	Coolant temperature sensor voltage	-30 to 120 °C (-4 to 248 °F)	V
3	Battery voltage	-	V
4	Engine revolution	Idling to max.	n/min

- (1) Engine Speed Sensor     **a : From Alternator Terminal L**
- (2) Fuel Sensor             **b : From PTO/Hour Meter Select Switch**
- (3) Battery Voltage
- (4) Coolant Temperature Sensor   **c : From Traveling Speed Select Switch**
- (5) CPU
- (6) Buzzer                     **d : From Main Key Switch**
- (7) LCD Monitor

9Y1210365ELM0012US0

## 4. OPC (OPERATOR PRESENCE CONTROL)

### [1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT



This tractor equips operator presence control (OPC) system which automatically whistling when operator stands from the seat while engaging PTO clutch.

This system is controlled by the seat switch (3), CPU (2), PTO switch (4) and buzzer (5).

#### ■ Electric Circuit

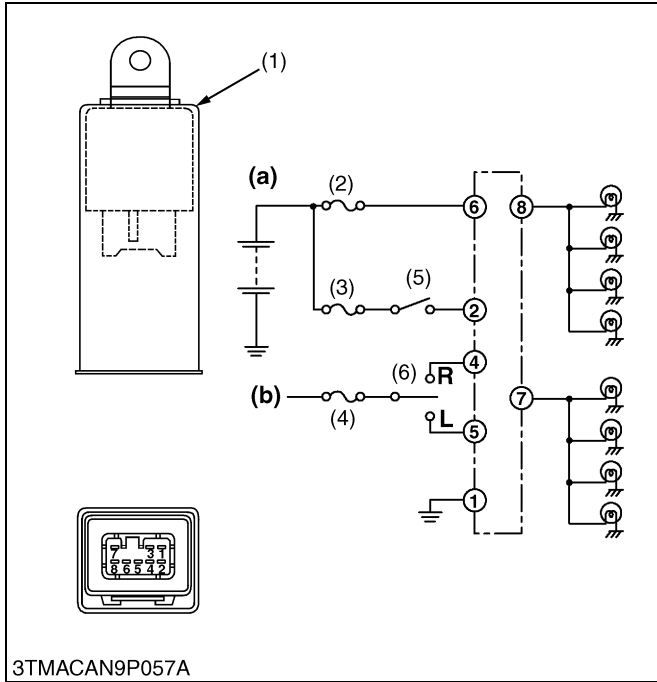
1. When sitting on the seat in the state at engine running, the battery voltage passes the seat switch (3) and the CPU (2).
2. The CPU (2) detect the seat switch (3), PTO switch (4) position and engine running through the L terminal of alternator.
3. When standing from the operators seat while shifting the PTO clutch lever at "ON" position, the CPU (2) turn on the transistor (6) and buzzer (5) is whistled.

9Y1210365ELM0013US0

# 5. LIGHTING SYSTEM

## [1] COMPONENTS

### (1) Flasher Unit



### Flasher Unit

Flasher unit controls the blinking frequency as a only one side of lamp blinking of turn signal and both right and left side lamps blinking of hazard signal.

The blinking frequency is 55 to 115 times per minutes.

- (1) Flasher Unit
- (2) Fuse
- (3) Fuse
- (4) Fuse
- (5) Hazard Switch
- (6) Turn Signal Switch

- (a) To Slow Blow Fuse
- (b) To Main Switch ACC
- R : Right Turn
- L : Left Turn

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# SERVICING

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# 1. TROUBLESHOOTING

## GENERAL

Symptom	Probable Cause	Solution	Reference Page
<b>All Electrical Equipment Do Not Operate</b>	Battery discharged or defective	Recharge or replace	9-S7
	Battery positive cable disconnected or improperly connected	Repair or replace	–
	Battery negative cable disconnected or improperly connected	Repair or replace	–
	Slow-Blow fuse blown	Replace	9-S10
<b>Fuse Blown Frequently</b>	Short-circuited	Repair or replace	–

## BATTERY

Symptom	Probable Cause	Solution	Reference Page
<b>Battery Discharges Too Quickly</b>	Battery defective	Recharge or replace	9-S7
	Alternator defective	Repair or replace	9-S14, 9-S32
	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	G-23

## STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
<b>Starter Motor Does Not Operate</b>	Battery discharged or defective	Recharge or replace	9-S7
	Slow blow fuse blown	Replace	9-S10
	Starter relay defective	Replace	9-S28
	PTO switch defective	Repair or replace	9-S23
	Wiring harness disconnected or improperly connected	Repair or replace	–
	Starter motor defective	Repair or replace	9-S13, 9-S31
	Main switch defective	Replace	9-S11

## OPC

Symptom	Probable Cause	Solution	Reference Page
<b>Buzzer Does Not Buzz</b>	Fuse blown	Replace	9-S10
	Buzzer defective	Replace	9-S30
	Seat switch defective	Replace	9-S30
	Wiring harness disconnected or improperly connected	Repair or replace	–

**LIGHTING SYSTEM**

<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>	<b>Reference Page</b>
<b>Head Light Does Not Light</b>	Fuse blown	Replace	9-S10
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected	Repair or replace	–
<b>Illumination Light Does Not Light</b>	Fuse blown	Replace	9-S10
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected	Repair or replace	–
<b>Tail Light Does Not Light</b>	Fuse blown	Replace	9-S10
	Wiring harness disconnected or improperly connected	Repair or replace	–
<b>Hazard Light Does Not Light</b>	Fuse blown	Replace	9-S10
	Bulb blown	Replace	G-35
	Flasher unit defective	Replace	9-S27
	Hazard switch defective	Replace	9-S26
	Turn signal switch defective	Replace	9-S25
<b>Hazard and Turn Signal Indicator Lamp Does Not Light</b>	Meter panel defective	Replace	–
	Wiring harness disconnected or improperly connected	Repair or replace	–
<b>Hazard and Turn Signal Light Does Not Go ON and OFF</b>	Flasher unit defective	Replace	9-S27
<b>Work Light Does Not Light</b>	Fuse blown	Replace	9-S10
	Bulb blown	Replace	G-35
	Wiring harness disconnected or improperly connected	Repair or replace	–
<b>Brake Light Does Not Light</b>	Fuse blown	Replace	9-S10
	Bulb blown	Replace	G-35

**EASY CHECKER**

<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>	<b>Reference Page</b>
<b>Engine Oil Pressure Lamp Lights Up When Engine Is Running</b>	Engine oil pressure too low	Repair engine	1-S13
	Engine oil insufficient	Replenish	G-10
	Engine oil pressure switch defective	Replace	9-S22
	Short circuit between engine oil pressure switch lead and chassis	Repair	–
	Circuit in panel board defective	Replace	9-S20
<b>Engine Oil Pressure Lamp Does Not Light When Main Switch Is Turned ON and Engine Is Not Running</b>	Meter panel defective	Replace	9-S20
	Engine oil pressure switch defective	Replace	9-S22
	Wiring harness disconnected or improperly connected (between panel board and engine oil pressure switch)	Repair or replace	–
	Circuit in meter panel board defective	Replace	9-S20
<b>Charge Lamp Does Not Go OFF When Engine Is Running</b>	Alternator defective	Repair or replace	9-S14, 9-S32
	Short circuit between alternator terminal L and chassis	Repair	–
	Circuit in meter panel defective	Replace	9-S20
<b>Charge Lamp Does Not Light When Main Switch Is Turned ON</b>	Wiring harness disconnected or improperly connected (between meter panel and alternator)	Repair or replace	–
	Circuit in meter panel defective	Replace	9-S20
<b>PTO Lamp Lights Up When PTO Switch Is OFF Position</b>	PTO switch is defective	Replace	9-S23
<b>PTO Lamp Does Not Light Up When PTO Switch Is ON Position</b>	PTO switch is defective	Replace	9-S23
	Meter panel defective	Replace	9-S20
<b>Fuel Level Indicator Lamp Lights Up</b>	Fuel insufficient	Replenish	–
	Fuel level sensor defective	Replace	9-S24
	Short circuit between fuel unit lead and chassis	Repair	–
	Circuit in meter panel defective	Replace	9-S20
<b>Fuel Level Indicator Lamp Does Not Light When Fuel Tank Is Empty</b>	Fuel level sensor defective	Replace	9-S24
	Wiring harness disconnected or improperly connected (between meter panel and fuel unit)	Repair or replace	–
	Circuit in meter panel defective	Replace	9-S20

**ENGINE KEY SWITCH SHUT-OFF SYSTEM**

Symptom	Probable Cause	Solution	Reference Page
<b>Engine Does Not Stop When Main Switch Is Turned OFF</b>	Fuse blown	Replace	9-S10
	Key stop relay defective	Replace	9-S29
	Meter panel defective	Replace	9-S20
	Wiring harness disconnected or improperly connected	Repair or replace	–
<b>Engine Does Not Start</b>	Fuse or slow blow fuse blown	Replace	9-S10
	Engine stop solenoid defective	Replace	9-S14
	Key stop relay defective	Replace	9-S29
	PTO switch defective	Replace	9-S23
	Neutral switch defective	Replace	9-S23

**GAUGES**

Symptom	Probable Cause	Solution	Reference Page
<b>Fuel Gauge Does Not Function</b>	Fuel level sensor defective	Replace	9-S24
	Wiring harness disconnected or improperly connected (between panel board and fuel level sensor)	Repair or replace	–
	Circuit in meter panel board defective	Replace	9-S20
<b>Coolant Temperature Gauge Does Not Function</b>	Coolant temperature sensor defective	Replace	9-S22
	Wiring harness disconnected or improperly connected (between panel board and coolant temperature sensor)	Repair or replace	–
	Circuit in meter panel board defective	Replace	9-S20

**LCD MONITOR**

Symptom	Probable Cause	Solution	Reference Page
<b>Nothing is Displayed in LCD</b>	Battery discharged or defective (Battery voltage is below 10 V)	Recharge or replace	9-S7
	Slow blow fuse blown	Replace	9-S10
	Meter panel connector disconnect	Connect	–
	Meter panel defective	Replace	9-S20
<b>Indication on LCD Does Not Change When Pushing the Display Mode Switch</b>	PTO/Hour meter select switch defective	Replace	9-S22
	Wiring harness disconnected	Repair	–
<b>PTO Speed in Not Indicating</b>	Wiring harness disconnected	Repair	–
	Engine rotation sensor defective	Replace	9-S24

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## 2. SERVICING SPECIFICATIONS

### STARTER MOTOR

Item		Factory Specification	Allowable Limit
Commutator	O.D.	30.0 mm 1.18 in.	29.0 mm 1.14 in.
Mica	Undercut	0.50 to 0.80 mm 0.020 to 0.031 in.	0.2 mm 0.008 in.
Brush	Length	14.0 mm 0.551 in.	9.0 mm 0.35 in.

### ALTERNATOR

Item		Factory Specification	Allowable Limit
Brush	Length	10.5 mm 0.413 in.	8.4 mm 0.33 in.
Slip Ring	O.D.	15.0 mm 0.591 in.	11.0 mm 0.433 in.

### GLOW PLUG

Item		Factory Specification	Allowable Limit
Glow Plug	Resistance	1.05 to 1.29 $\Omega$	–

### FUEL LEVEL SENSOR

Item		Factory Specification	Allowable Limit
Float at Uppermost Position	Resistance	3.0 to 5.0 $\Omega$	–
Float at Lowermost Position	Resistance	107.5 to 112.5 $\Omega$	–

### COOLANT TEMPERATURE SENSOR

Item		Factory Specification	Allowable Limit
Coolant Temperature at 120 °C (248 °F)	Resistance	Approx. 117 $\Omega$	–
Coolant Temperature at 100 °C (212 °F)	Resistance	Approx. 189 $\Omega$	–
Coolant Temperature at 80 °C (176 °F)	Resistance	Approx. 290 to 354 $\Omega$	–
Coolant Temperature at 50 °C (122 °F)	Resistance	Approx. 808 $\Omega$	–
Coolant Temperature at 20 °C (68 °F)	Resistance	Approx. 2.21 to 2.69 k $\Omega$	–

### FLASHER UNIT

Item		Factory Specification	Allowable Limit
Flasher Blinking	Times	55 to 115 times / minutes	–

9Y1210365ELS0004US0

### 3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : Refer to "6. TIGHTENING TORQUES" at GENERAL Section.)

Item	N·m	kgf·m	lbf·ft
Pulley nut (Alternator)	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2

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## 4. CHECKING, DISASSEMBLING AND SERVICING



### CAUTION

- To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the ground 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 splattered 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.

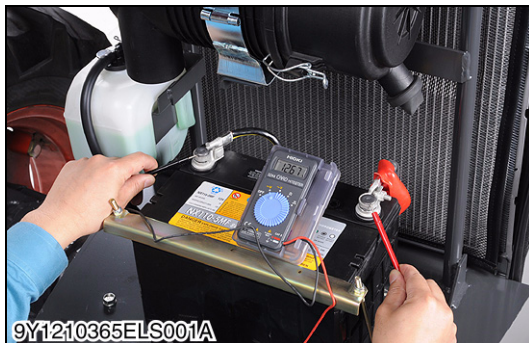
### IMPORTANT

- If the tractor is to be operated for a short time without battery (using a slave battery for starting), do not, under any circumstances, interrupt the circuit by switching off the key switch before stopping the engine by pulling engine stop knob. Use additional current (lights) while engine is running.
- Insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.

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## [1] BATTERY, FUSE, GROUNDING AND CONNECTOR

### (1) Battery



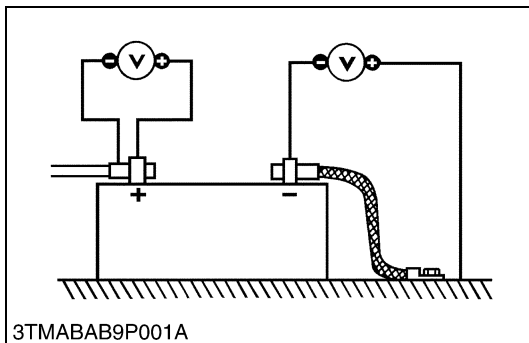
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#### Battery Voltage

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

Battery voltage	Factory spec.	More than 12 V
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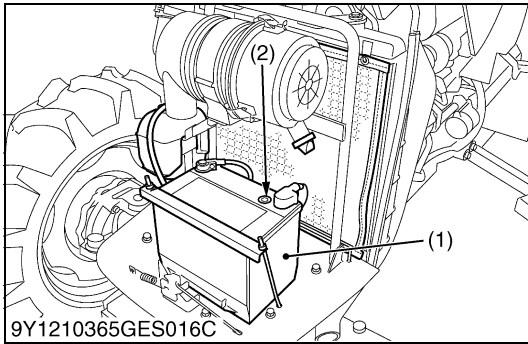
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#### Battery Terminal Connection

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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### Checking Battery Condition

#### ⚠ DANGER

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

#### ■ NOTE

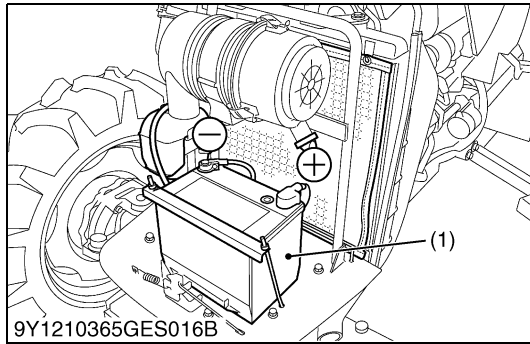
- The factory-installed battery is of non-refillable type. If the indicator turns white, do not charge the battery but replace it with new one.
1. Mishandling the battery shortens the service life and adds to maintenance costs.
  2. The original battery is maintenance free type battery, but need some servicing.  
If the battery is weak, the engine is difficult to start and the lights be dim. It is important to check the battery periodically.
  3. Check the battery condition by reading the indicator display.  
State of indicator display.  
Green : Specify gravity of electrolyte and quality of electrolyte are both in good condition.  
Black : Need charging battery.  
White : Need changing battery.  
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 charging battery.
White	Needs changing battery.

(1) Battery

(2) Indicator

9Y1210365ELS0007US0



## 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 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 slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
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.

#### Table

Battery type	Volts (V)	Capacity at 5H.R (A.H)	Reserve capacity (min)	Cold Cranking Amps (SAE)	Normal Charging Rate (A)
80D26R	12	55AH	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 once every six months in cold seasons.

(1) Battery

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**Directions for Storage**

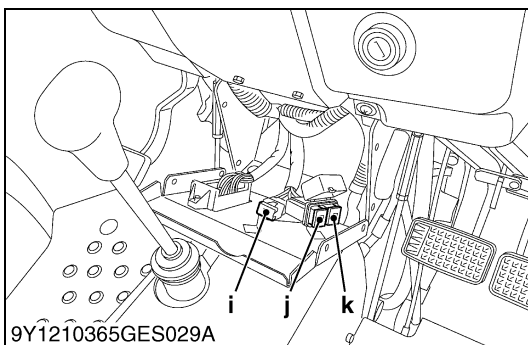
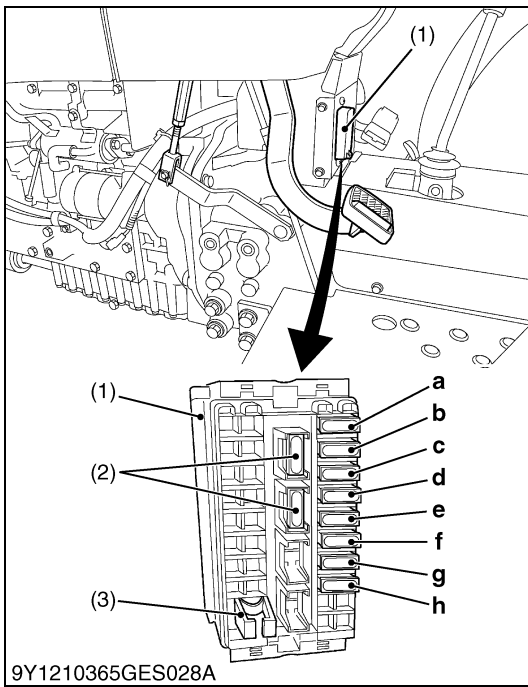
1. When shutting down the tractor for long periods of time, remove the battery from the tractor, store the battery in a well ventilated placed where it is not exposed to direct sunlight.
2. Since the battery self-discharges by approx. 0.5 % per day even in storage, it must be once every two months in cold season.
3. When storing the battery mounted on the tractor, disconnect the ground cable from the battery's negative terminal post.

**(Reference)**

- Self-discharge Rate

Temperature	Self-discharge rate
30 °C (86 °F)	Approx. 1.0 % per day
20 °C (68 °F)	Approx. 0.5 % per day
10 °C (50 °F)	Approx. 0.25 % per day

9Y1210365ELS0010US0



**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 for specific information dealing with electrical problems.

■ **Protected Circuit**

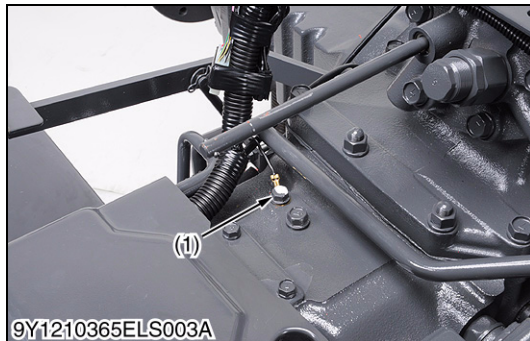
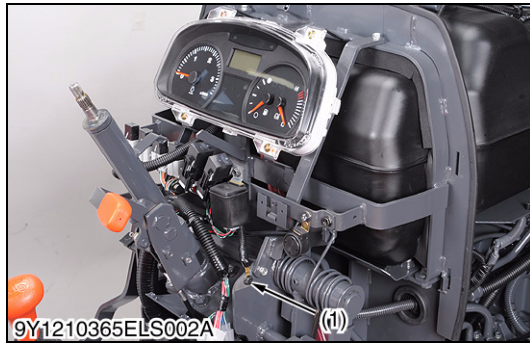
Fuse I.D.	Capacity (A)	Protected circuit
a	5	Alternator, Engine, Glow Plug
b	5	Meter Panel, OPC
c	5	Turn Signal
d	15	Work Light
e	5	Meter (Back Up)
f	15	Head Light, Tail Lamp
g	15	Flasher (Hazard)
h	5	Starter Relay
i	50	Charge, Glow Plug
j	30	Fuel Cut Solenoid
k	40	Key Switch, Head Light, Hazard

- (1) Fuse Case
- (2) Spare Fuse

- (3) Fuse Puller

9Y1210365ELS0008US0

## (2) Checking Grounding Wires



### Grounding Wire

1. Check the whether the grounding wire (1) is connected securely to the tractor chassis.
2. If the grounding wire is broken or disconnected, replace it.

(1) Grounding Wire

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## (3) Connector

### Checking Connector

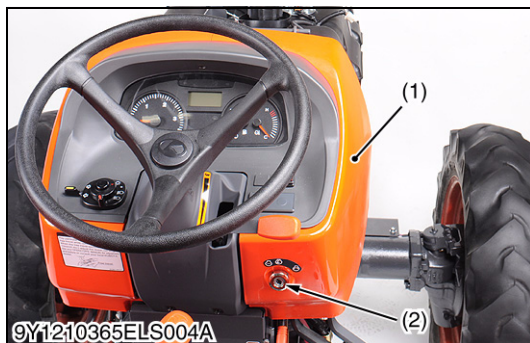
1. When inspect the circuit line, check the related connectors.
2. Disconnect the connectors and check their terminals for contamination and deformation.
3. Check to see that cable does not broken or terminals are not shelled off.
4. If any defective parts are found, repair or replace them.

### ■ IMPORTANT

- Connect connector surely after checked.

9Y1210365ELS0030US0

## [2] MAIN SWITCH



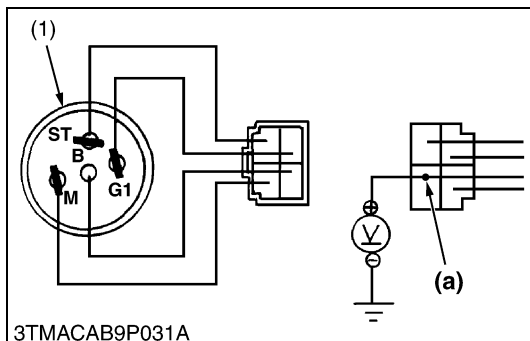
### Main Switch

1. Remove the rear bonnet (1), refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section.
2. Disconnect the meter panel and the main switch connectors after turning the main switch off.
3. Perform the following checking.

(1) Rear Bonnet

(2) Main Switch

9Y1210365ELS0031US0



### Connector Voltage

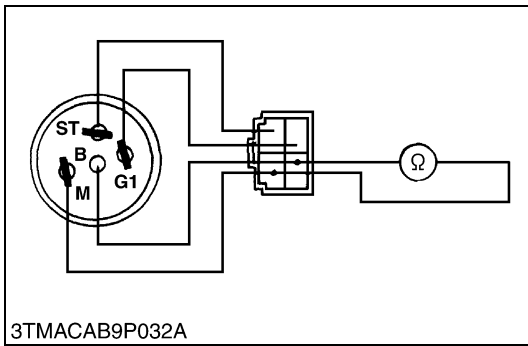
1. Measure the voltage with a voltmeter across the connector terminal **B** and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector terminal <b>B</b> – Chassis	Approx. battery voltage
---------	--	-------------------------

(1) Main Switch

(a) From Battery Positive Terminal

9Y1210365ELS0032US0

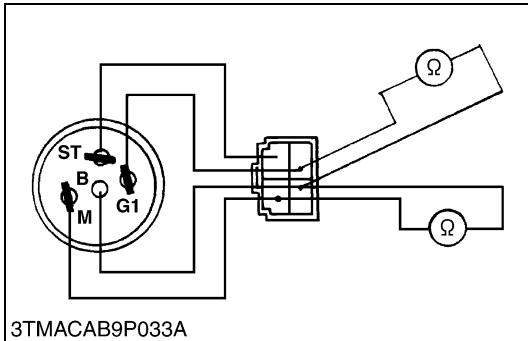


**Main Switch at ON Position**

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

Resistance	Terminal <b>B</b> – Terminal <b>M</b>	0 Ω
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9Y1210365ELS0033US0

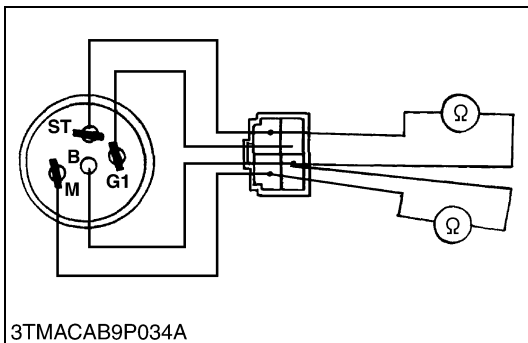


**Main Switch at PREHEAT Position**

1. Turn and hold the main switch at the **PREHEAT** position.
2. Measure the resistances with an ohmmeter across the terminal **B** and the terminal **G1** and across terminal **B** and terminal **M**.
3. If 0 ohm is not indicated, these contacts of the main switch are faulty.

Resistance	Terminal <b>B</b> – Terminal <b>G1</b>	0 Ω
	Terminal <b>B</b> – Terminal <b>M</b>	0 Ω

9Y1210365ELS0034US0



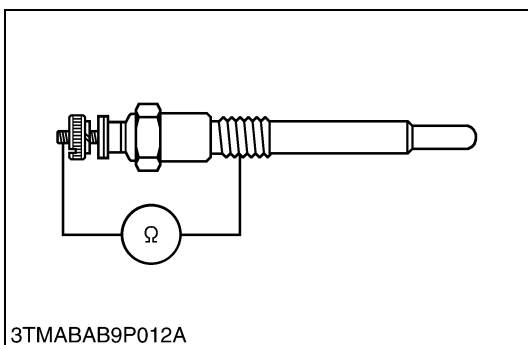
**Main Switch at START Position**

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

Resistance	Terminal <b>B</b> – Terminal <b>ST</b>	0 Ω
	Terminal <b>B</b> – Terminal <b>M</b>	0 Ω

9Y1210365ELS0035US0

**[3] GLOW PLUG**



**Glow Plug**

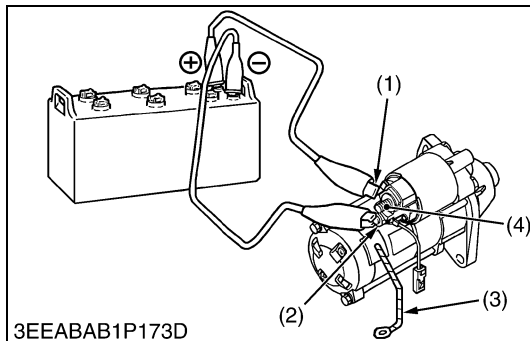
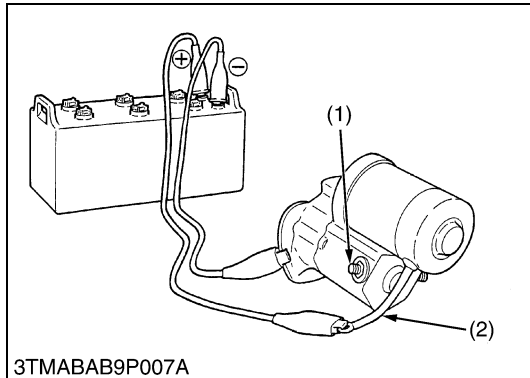
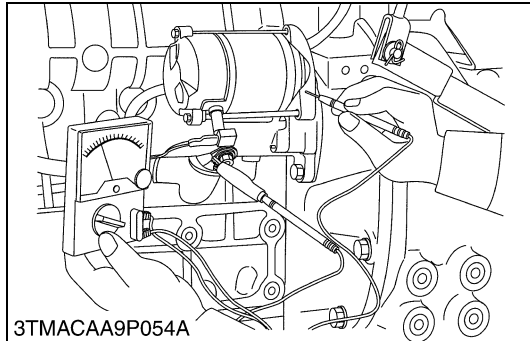
1. Disconnect the leads from the glow plugs.
2. Measure the resistance with an ohmmeter across the glow plug terminal and chassis.
3. If 0 ohm is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. If the factory specification is not indicated, renew the glow plug.

Glow plug resistance	Factory spec.	1.05 to 1.29 Ω
----------------------	---------------	----------------

9Y1210365ELS0011US0



## [4] STARTER



### Starter Motor B Terminal Voltage

1. Measure the voltage with a voltmeter 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
---------	---------------	-------------------------

9Y1210365ELS0012US0

### 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 negative terminal.
  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

9Y1210365ELS0013US0

### Magnet Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter terminal **B** (4).
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter terminal **C** (2).
5. Connect a jumper lead from the starter terminal **S** (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter terminal **C** (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) Terminal S

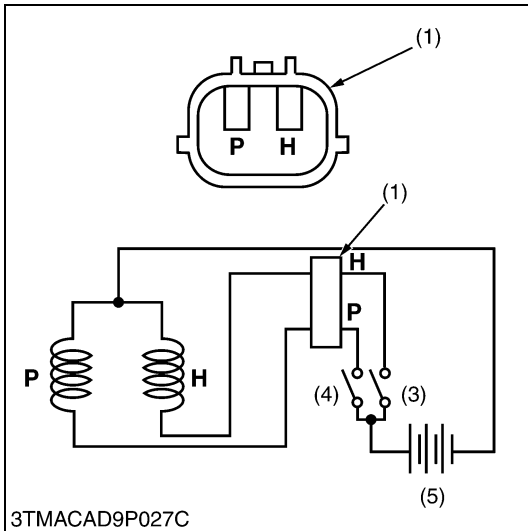
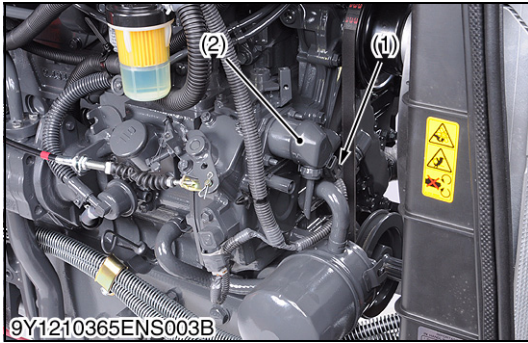
(3) Connecting Lead

(2) Terminal C

(4) Terminal B

9Y1210365ELS0036US0

## [5] ENGINE STOP SOLENOID



### Functional Check

1. Remove the engine stop solenoid (2) from the injection pump.
2. Connect the leads as shown in the figure.
  - Connect the jumper leads from terminal **P** through the switch (4) to the battery positive terminal.
  - Connect the jumper leads from terminal **H** through the switch (3) to the battery positive terminal.
  - Connect the jumper leads from the negative terminal to the engine stop solenoid body.
3. When switch (4) is turn **ON**, the plunger is pulled into the solenoid body and then turn **OFF** the switch (4), the plunger comes out.
4. Turn on the switch (3) then turn **ON** the switch (4), the plunger is pulled into the solenoid body and it is kept in **HOLDING** position after turning **OFF** the switch (4).
5. If the plunger is not attracted, the engine stop solenoid is faulty.

### ■ IMPORTANT

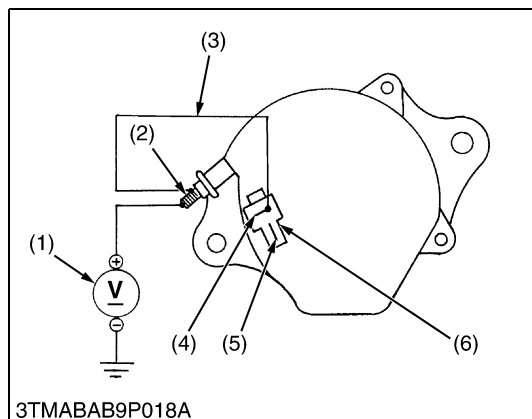
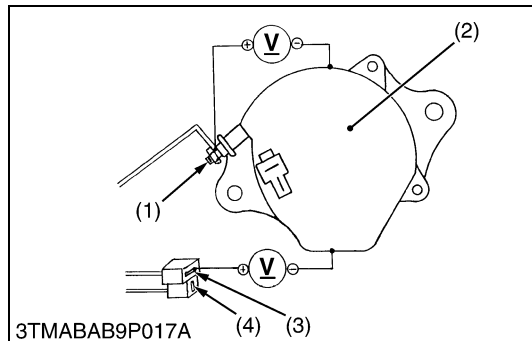
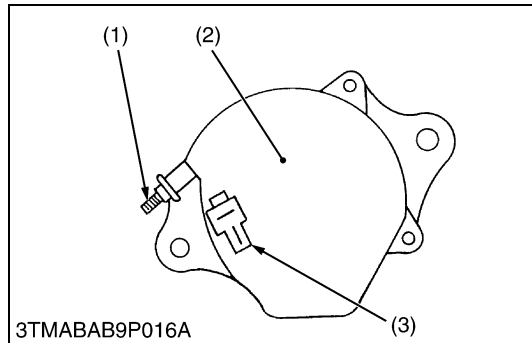
- **Never apply the current for pulling coil more than two seconds when inspecting.**

- (1) Connector  
 (2) Engine Stop Solenoid  
 (3) Switch for Holding Coil  
 (4) Switch for Pulling Coil  
 (5) Battery

**P : Terminal for Pulling Coil**  
**H : Terminal for Holding Coil**

9Y1210365ELS0037US0

## [6] ALTERNATOR



### Remove the Alternator

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

- |                       |                         |
|-----------------------|-------------------------|
| (1) <b>B</b> Terminal | (3) <b>2P</b> Connector |
| (2) Alternator        |                         |

9Y1210365ELS0014US0

### 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>B</b> Terminal | (3) <b>IG</b> Terminal |
| (2) Alternator        | (4) <b>L</b> Terminal  |

9Y1210365ELS0015US0

### 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 specification, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V
---------	---------------	----------------

### (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         | (4) <b>IG</b> Terminal |
| (2) <b>B</b> Terminal | (5) <b>L</b> Terminal  |
| (3) Jumper Lead       | (6) <b>2P</b> Terminal |

9Y1210365ELS0016US0

## [7] METER PANEL

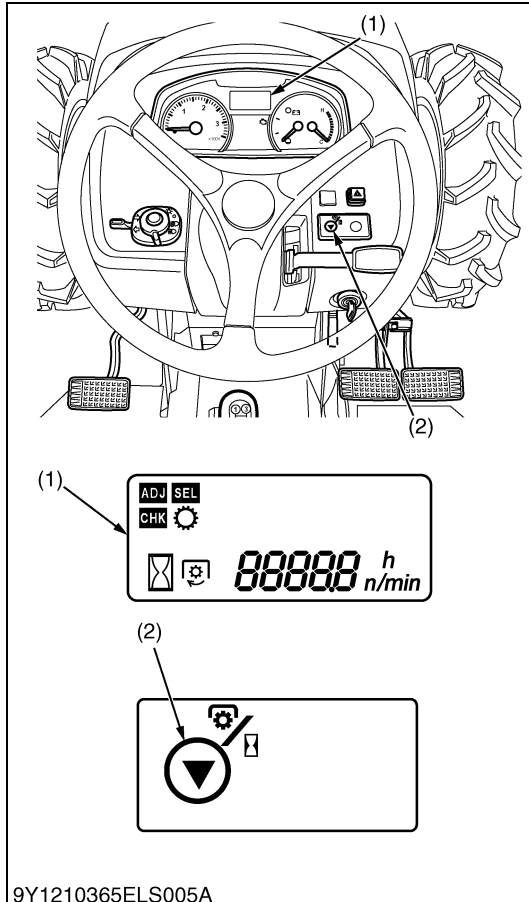
### (1) Setting Mode (Select the PTO Display Mode Switching and Tractor Model Select)



#### CAUTION

- To perform the meter panel, the operator must be seated on the tractor.

9Y1210365ELS0038US0



#### LCD Monitor Indication (Setting Mode)

The following settings and checking can be done by using the LCD monitor (1), PTO/Hour meter select switch (2).

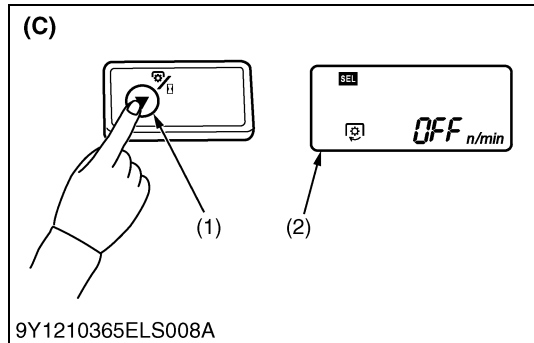
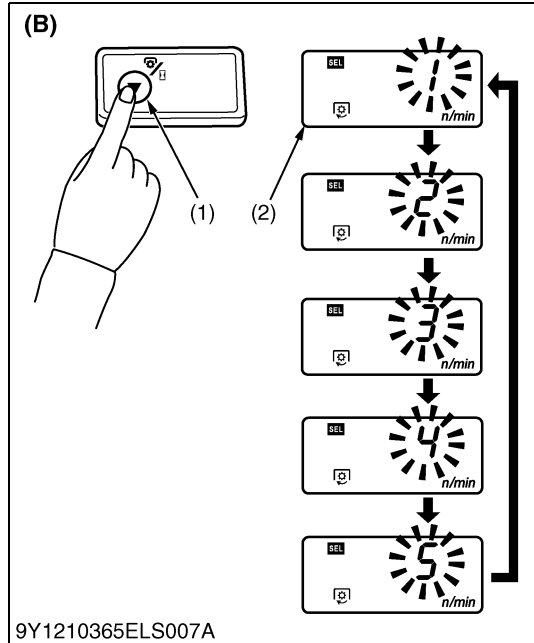
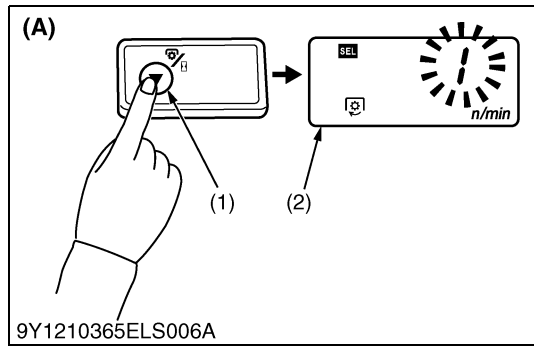
- Setting Mode :  
Input the various dates (PTO speed display mode switching, and model select) to the meter panel.
- Checking Mode :  
Check a voltage of various sensor (fuel unit sensor, coolant temperature sensor and monitor voltage (battery voltage)) or rotation of engine.

(1) LCD Monitor

(2) PTO/Hour Meter Select Switch

9Y1210365ELS0039US0

9Y1210365ELS005A



**PTO Speed Display Mode Switching (Setting Mode)**

1. While pressing the PTO/Hour meter select switch (1), turn the key switch to "ON" position.  
The current numerical code starts flashing.
2. Each time the PTO/Hour meter select switch (1) is pressed, the code changes in the order of [1] → [2] → [3] → [4] → [5] → [1]. Select the appropriate code according to the table below.
3. Press and hold the PTO/Hour meter select switch (1) longer than 2 seconds. The setting is put in memory, and the LCD monitor (2) goes back to the PTO speed display mode.
4. Turn the key switch to "OFF" position to exit.

■ **NOTE**

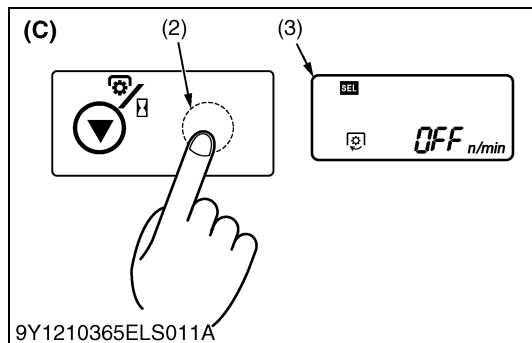
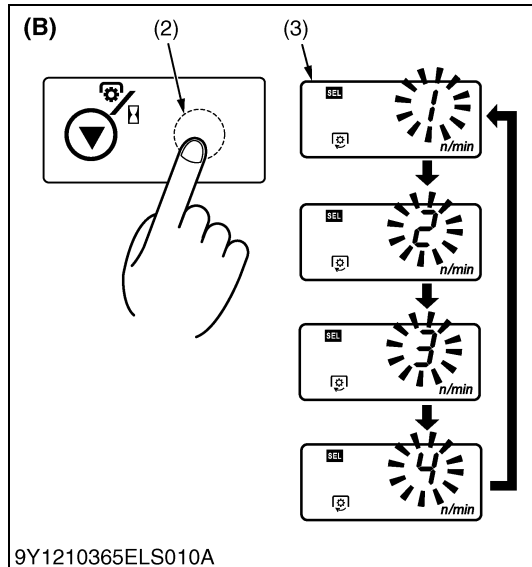
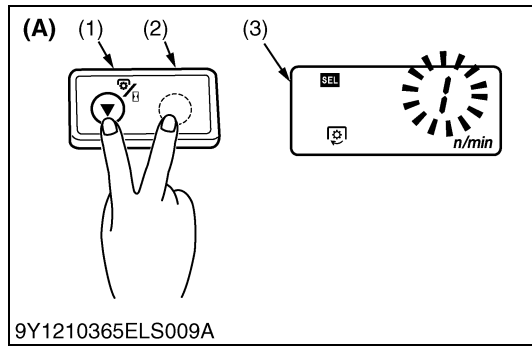
- The setting will be cancelled if the key switch is turned OFF halfway in the procedure.

Numerical code	PTO speed (min <sup>-1</sup> (rpm))
1	540 (Standard)
2	Void
3	Void
4	Void
5	Void

- (1) PTO/Hour Meter Select Switch
- (2) LCD Monitor

- (A) Procedure to enter the PTO speed display mode switching
- (B) Procedure to select numerical code
- (C) Procedure to put in memory

9Y1210365ELS0040US0



**Model Select (Setting Mode)**

1. While pressing the PTO/Hour meter select switch (1) and dummy switch (2), turn the key switch to "ON" position. The current numerical code starts flashing.
2. Each time the dummy switch (2) is pressed, the code changes in order of [1] → [2] → [3] → [4] → [1]. Select the appropriate code according to the table below.
3. Press and hold the dummy switch (2) longer than 2 seconds. The setting is put in memory, and the LCD monitor (3) goes back to the PTO speed display or hour meter display mode.
4. Turn the key switch to "OFF" position to exit.

■ **NOTE**

- The setting will be cancelled if the key switch is turned OFF halfway in the procedure.

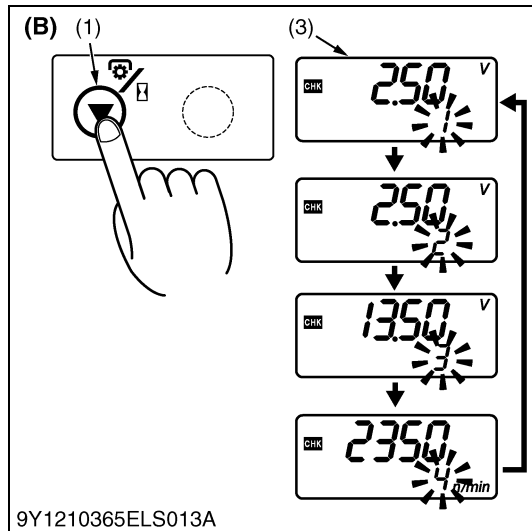
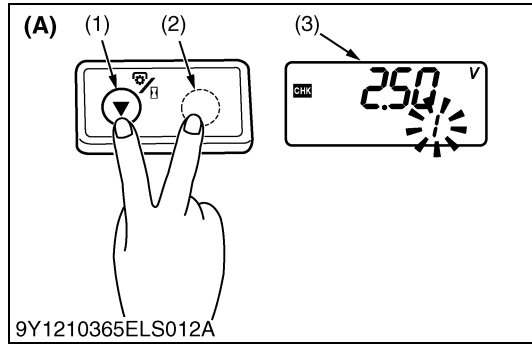
Numerical code	Tractor model
1	Void
2	Void
3	<b>M5640SU</b>
4	M7040SU

- (1) PTO/Hour Meter Select Switch
- (2) Dummy Switch
- (3) LCD Monitor

- (A) Procedure to enter model select mode
- (B) Procedure to select numerical code
- (C) Procedure to put in memory

9Y1210365ELS0041US0

## (2) Checking Mode



### Checking Mode

1. Turn the key switch to "ON" position.
2. Press the PTO/Hour meter select switch (1) and dummy switch (2) more than 2 seconds.
3. Each time the PTO/Hour meter select switch (1) is pressed, the code number changes in order of [1] → [2] → [3] → [4] → [1] with flashing. The code number display as a table below.
4. Turn the key switch to "OFF" position to exit.

#### NOTE

- To check the engine revolution, enter the checking mode under running the engine.
- When enter the checking mode under running the engine, code 3 display the generating voltage of alternator.

No.	Contents	Condition	Displayed unit
1	Fuel sensor voltage	F to E	V
2	Coolant temperature sensor voltage	-30 to 120 °C (-4 to 248 °F)	V
3	Battery voltage	-	V
4	Engine revolution	Idling to max.	n/min

- (1) PTO/Hour Meter Select Switch
- (2) Dummy Switch
- (3) LCD Monitor

**(A) Procedure to enter checking mode**

**(B) Procedure to select code number of checking contents**

9Y1210365ELS0042US0

### (3) Checking Meter Panel and PTO/Hour Meter Select Switch

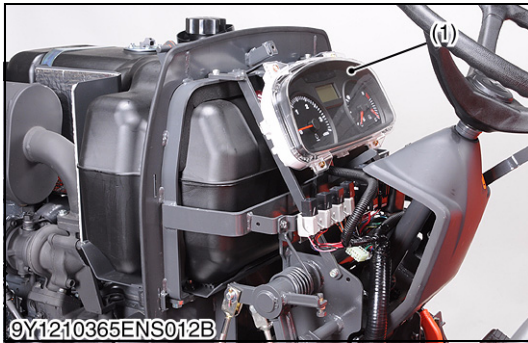
#### ⚠ CAUTION

- For checking of electric circuit, use the circuit tester.
- As for the checking of sensors and switches, do the following order; check the battery, fuse and grounding line first, check by the test function of meter panel next, and check the connectors of panel or related electronic switch or sensor. If any defect is found there, check individual sensors or switches to see whether the defect exists at the sensor and switch side or at the wire harness side.
- When any defect is not found for sensors, switches and harness, replace meter panel with new one.

#### ■ IMPORTANT

- When connecting or disconnecting the connector for the purpose of checking, be sure to turn OFF the main switch before hand. Moreover, pay attention not to allow the terminal to come in contact with other terminal or chassis while checking.
- When applying the test pin of the tester to the connector terminals, take care not to damage to the connector terminal.

9Y1210365ELS0043US0



9Y1210365ENS012B

#### Checking Connector Voltage, Sensor Resistance and Switch Continuity

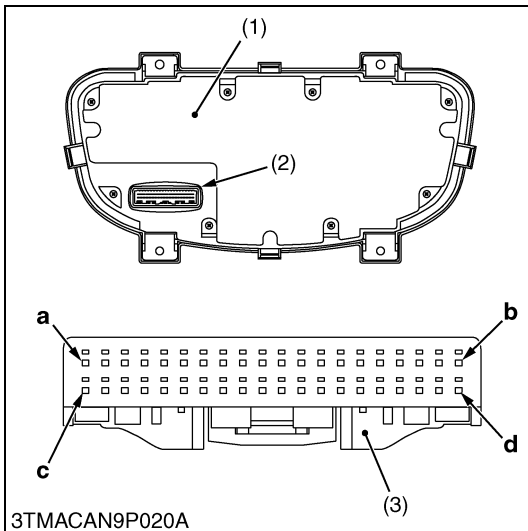
1. Remove the panel cover, refer to "[1] CLUTCH PEDAL" at "2. CLUTCH" section.
2. Remove the meter panel (1).
3. Disconnect the **40P** connector (2) from the meter panel.
4. Check the main voltage (battery voltage) first and check the connector voltage, sensor resistance or switch continuity which related for defective indication of meter panel as table below.

#### (When reassembling)

- Tighten the meter panel mounting screw evenly.

- |  |                       |
|--|-----------------------|
| (1) Meter Panel                            | a : Terminal 1 (T1)   |
| (2) <b>40P</b> Connector Meter Panel Side  | b : Terminal 20 (T20) |
| (3) <b>40P</b> Connector Wire Harness Side | c : Terminal 21 (T21) |
|  | d : Terminal 40 (T40) |

9Y1210365ELS0044US0



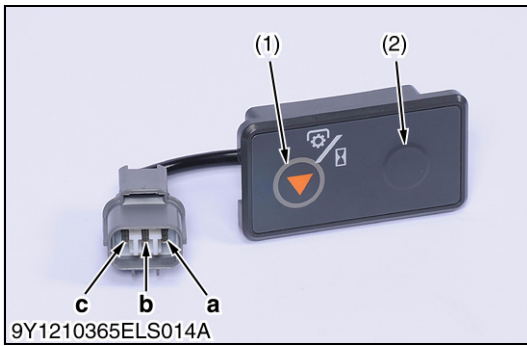
3TMACAN9P020A



**Connector (40P) of Wire Harness Side**

Terminal No.	Color of wiring	Terminal Name	Measuring across T40 (Ground)	Condition
T1	SB	Heater relay	Battery voltage	Main switch at ON
T2				
T3				
T4	L/B	OPC buzzer	Battery voltage	Main switch at ON
T5				
T6				
T7				
T8				
T9				
T10	LG/B	PTO/Hour meter select switch	Battery voltage	Main switch at ON and PTO/Hour meter select switch ON
T11	L	Traveling speed select switch	Battery voltage	Main switch at ON and traveling speed select switch ON
T12	R/B	Turn signal switch (R.H.)	Battery voltage and 0 V (alternately)	Main switch at ON and turn signal switch (R.H.) ON
T13	P/W	PTO switch	Battery voltage	Main switch at ON and PTO switch OFF
T14				
T15				
T16	G/B	Turn signal switch (L.H.)	Battery voltage and 0 V (alternately)	Main switch at ON and turn signal switch (L.H.) ON
T17	W/R	Coolant temperature switch	Approx. 117 $\Omega$ at 120 °C (248 °F) to 5.88 k $\Omega$ at 0 °C (32 °F)	Main switch at OFF
T18	Y	Fuel unit sensor	Approx. 3.0 (F) to 112 $\Omega$ (E)	Main switch at OFF
T19				
T20	B/W	GND (analogue)		
T21	G/W	Illumination light	Battery voltage	Head light switch ON
T22				
T23				
T24	B/Y	Main switch (start position)	Battery voltage	Main switch at START
T25	L/Y	Seat switch	Battery voltage	Main switch at ON
T26				
T27				
T28				
T29				
T30				
T31				
T32	W	Engine oil pressure switch	0 $\Omega$	4WD switch at ON
			Infinity	At engine run
T33	W/G	Alternator terminal L	Approx. 10 V	At engine run
T34				
T35				
T36	Y/L	Engine tachometer sensor	Battery voltage	Main switch at ON
T37	R/G	Main switch (ON position)	Battery voltage	Main switch at ON
T38	R/B	Main voltage (battery)	Battery voltage	
T39				
T40	B	GND		

9Y1210365ELS0045US0



9Y1210365ELS014A

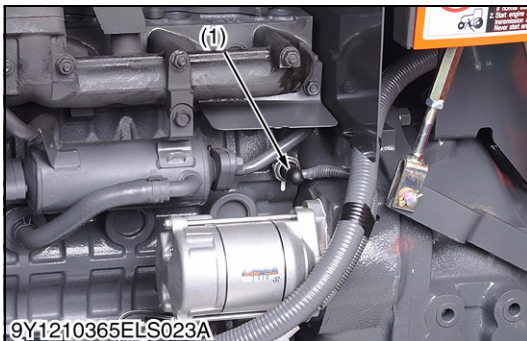
**PTO/Hour Meter Select Switch**

1. Check the resistance between terminal **a** and terminal **c** while pushing the PTO/Hour meter select switch (1).
2. It is OK if 0 ohm is indicated.
3. Check the resistance between terminal **b** and terminal **c** while pushing the dummy switch (2).
4. It is OK if 0 ohm is indicated.

- (1) PTO/Hour Meter Select Switch      (2) Dummy Switch

9Y1210365ELS0046US0

**(4) Switch and Sensor**



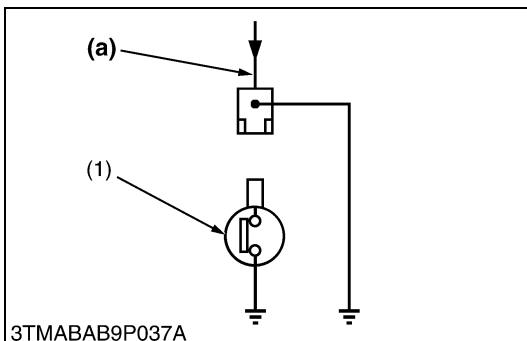
9Y1210365ELS023A

**Engine Oil Pressure Switch Panel Board and Wiring Harness**

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

- (1) Engine Oil Pressure Switch      (a) From Oil Pressure Lamp

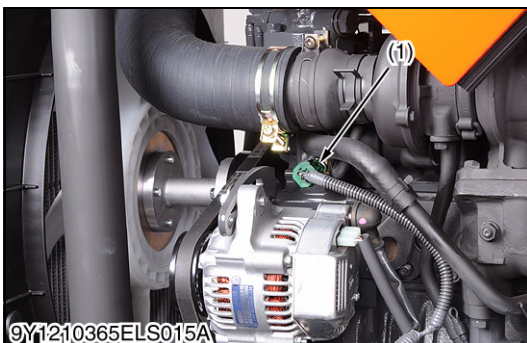
9Y1210365ELS0017US0



3TMABAB9P037A

**Checking Coolant Temperature Sensor**

1. Disconnect the connector from the coolant temperature sensor (1).
2. Measure the resistance with an ohmmeter across the terminal **1** and **2** of coolant temperature sensor (1).
3. If the measurement is not indicated, the sensor is faulty.

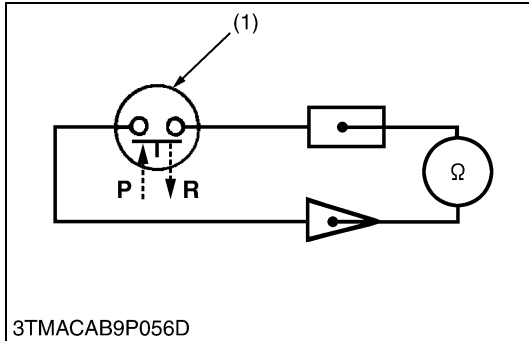
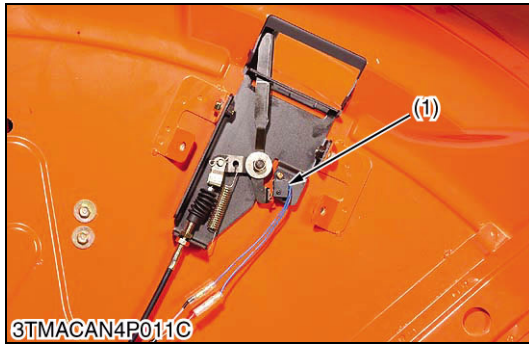


9Y1210365ELS015A

Resistance (Sensor terminal 1 – terminal 2)	Reference value	Approx. 117 Ω at 120 °C (248 °F) Approx. 189 Ω at 100 °C (212 °F) Approx. 290 to 354 Ω at 80 °C (176 °F) Approx. 808 Ω at 50 °C (122 °F) Approx. 2.21 to 2.69 kΩ at 20 °C (68 °F)
---	-----------------	---

- (1) Coolant Temperature Sensor

9Y1210365ELS0047US0



**PTO Switch**

**1) Wiring Harness**

1. Disconnect the leads from the PTO switch (1).
2. Connect the wiring harness lead terminals to each other and turn the main switch to "ON" position.
3. If the indicator do not light, the fuse, wiring harness or bulb is faulty.

**2) PTO Switch Continuity**

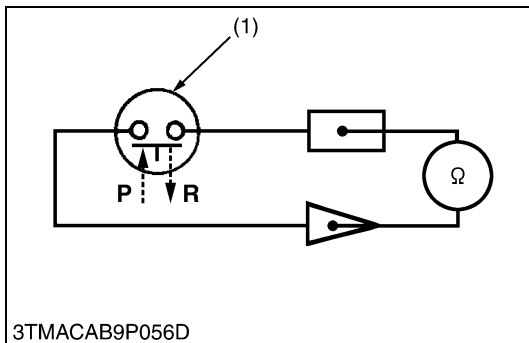
1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

(1) PTO Switch

**P : Pushed**  
**R : Released**

9Y1210365ELS0048US0



**Neutral Switch**

**1) Neutral Switch Continuity**

1. Check the continuity with an ohmmeter across the switch terminals.
2. Adjust the continuity condition, using a different thickness of gasket (2).
3. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
4. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

**(Reference)**

- Thickness of gasket (2)  
1.0 mm (0.039 in.) : 6A320-42750  
1.5 mm (0.059 in.) : 17105-33680

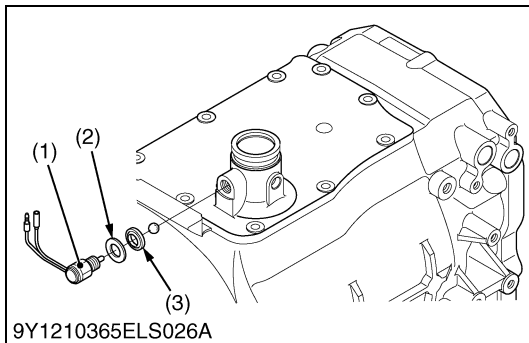
(1) Neutral Switch

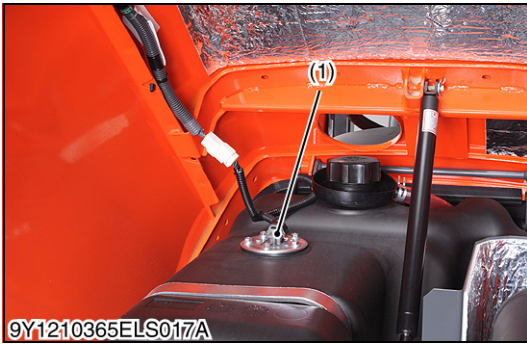
**P : Pushed**  
**R : Released**

(2) Gasket

(3) Rubber Washer

9Y1210365ELS0049US0





**Checking Fuel Level Sensor**

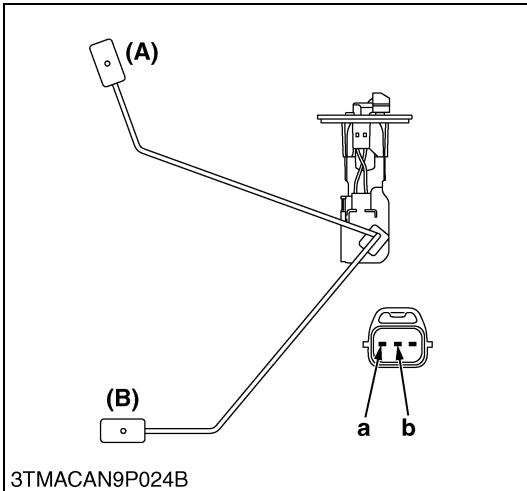
1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the terminal **a** and terminal **b**.
3. If the measurement is not indicated, the sensor is faulty.

Resistance (Sensor terminal <b>a</b> – terminal <b>b</b> )	Factory spec.	Float at uppermost position	3.0 to 5.0 Ω
		Float at lowermost position	107.5 to 112.5 Ω

(1) Fuel Unit

- (A) Float at Uppermost Position**
- (B) Float at Lowermost Position**
- a : Terminal 1**
- b : Terminal 2**

9Y1210365ELSO050US0



3TMACAN9P024B



**Engine Rotation Sensor**

1. Check the engine speed meter.
2. It is OK if engine speed is displayed in the meter panel.

■ **NOTE**

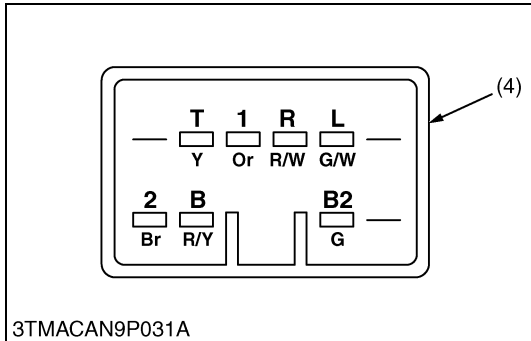
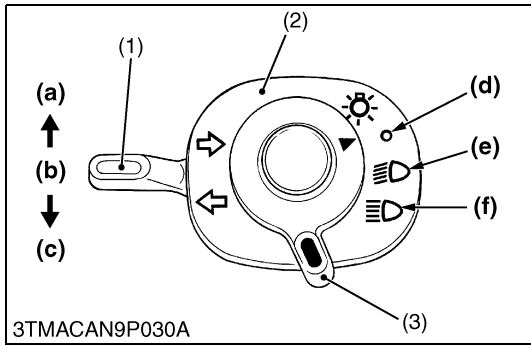
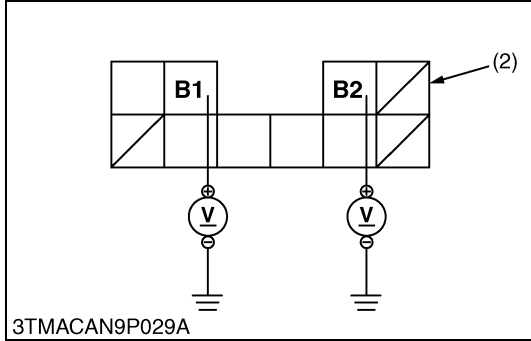
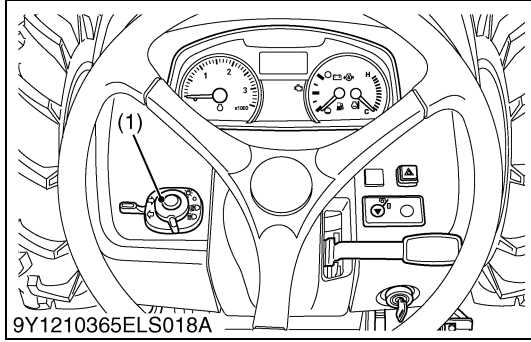
- **As for engine speed sensor is not checking with circuit tester.**

(1) Engine Rotation Sensor

9Y1210365ELSO051US0

# [8] LIGHTING SWITCHES AND FLASHER UNIT

## (1) Combination Switch



### Checking Connector Voltage

1. Disconnect the combination switch connector.
2. Measure the voltage with voltmeter across the connector terminal **B1** and chassis, across the terminal **B2** and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuses or main switch faulty

Voltage	Main switch at "ON"	Terminal <b>B1</b> – Chassis	Approx. battery voltage
	Main switch at "OFF"	Terminal <b>B2</b> – Chassis	

- (1) Combination Switch  
 (2) Combination Switch Connector (Wire Harness Side)  
 9Y1210365ELS0052US0

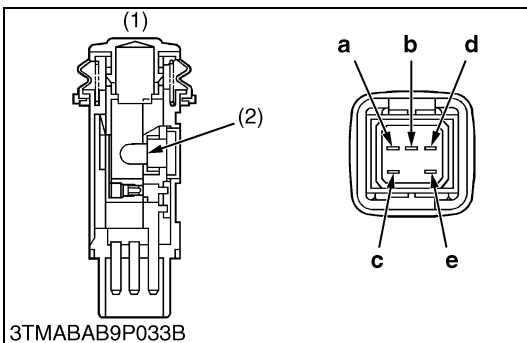
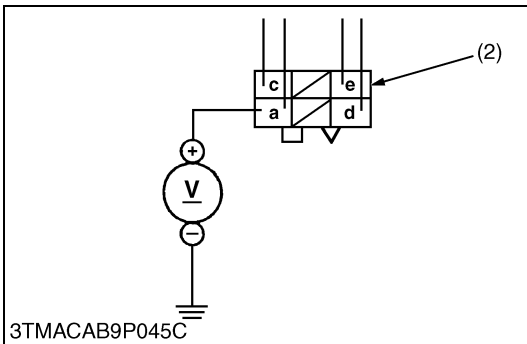
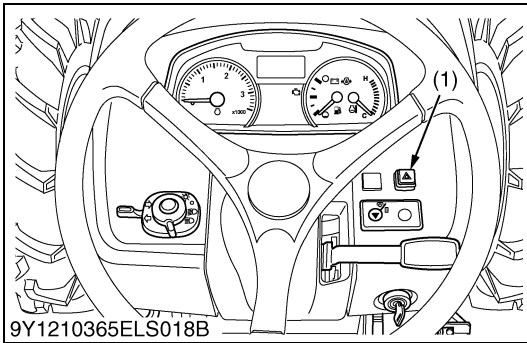
### Checking Light Switch and Turn Signal Switch

1. Test the continuity through the switch with an ohmmeter.

Continuity	Position	Terminal						
		B1	T	1	2	B2	R	L
Turn signal switch	R.H. (a)					●	●	
	OFF (b)							
	L.H. (c)					●		●
Light switch	OFF (d)							
	Lo (e)	●	●	●				
	Hi (f)	●	●		●			

- (1) Turn Signal Switch  
 (2) Combination Switch  
 (3) Light Switch  
 (4) Combination Switch Connector (Switch Side)
- (a) Right Turn  
 (b) OFF  
 (c) Left Turn  
 (d) OFF  
 (e) Head Light (Lo)  
 (f) Head Light (Hi)
- 9Y1210365ELS0053US0

## (2) Hazard Switch



### Checking Connector Voltage

1. Connect the battery negative code, then measure the voltage with a voltmeter across the terminal **a** and chassis.
2. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	Terminal <b>a</b> – Chassis	Approx. battery voltage
---------	-----------------------------	-------------------------

(1) Hazard Switch

(2) **6P** Connector (Wire Harness Side)

9Y1210365ELS0054US0

### Checking Hazard Switch Continuity

1. Measure the resistance with ohmmeter across the terminal **a** and terminal **c**, and across the terminal **d** and terminal **e**.
2. If the measurement is not following below, the hazard switch or the bulb are faulty.

Resistance (Switch at <b>OFF</b> )	Terminal <b>a</b> – Terminal <b>c</b>	Infinity
Resistance (Switch at <b>ON</b> )	Terminal <b>a</b> – Terminal <b>c</b>	0 Ω
Resistance (Bulb)	Terminal <b>d</b> – Terminal <b>e</b>	Approx. 13 Ω

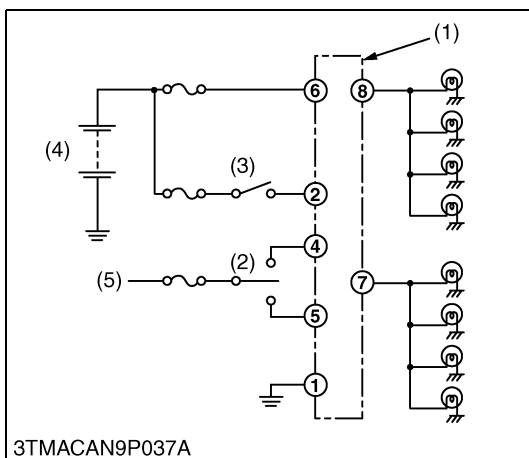
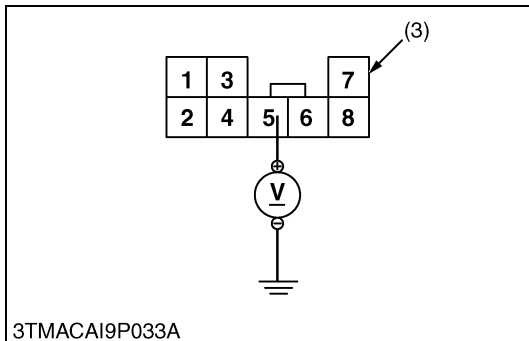
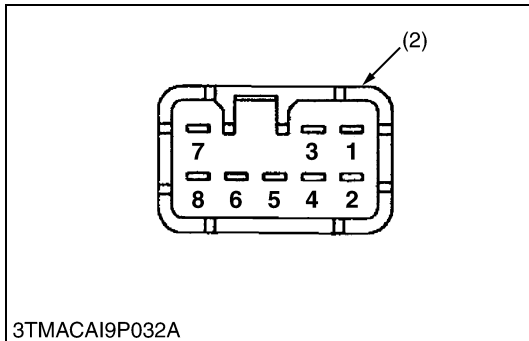
(1) Hazard Switch

(2) Bulb

9Y1210365ELS0055US0



### (3) Flasher Unit



#### Connector Voltage

1. Disconnect the flasher unit connector.
2. Measure the voltage with voltmeter across the wiring harness connector's terminal 5 and chassis.
3. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Voltage	Terminal 5 – Chassis	Approx. battery voltage
---------	----------------------	-------------------------

#### (Reference)

Terminal	Color	Terminal Connector
1 (a)	0.5 B	GND
2 (b)	0.85 G/R	Hazard (Input)
3 (c)	–	Vacancy
4 (d)	0.5 G/L	Turning signal L.H. (Input)
5 (j)	0.5 G/Y	Turning signal R.H. (Input)
6 (h)	0.85 G	Battery Voltage
7 (i)	0.5 G/B	Turning signal L.H. (Output)
8 (f)	0.5 R/B	Turning Signal R.H. (Output)

- (1) Flasher Unit (3) Wire Harness Connector  
 (2) Flasher Unit Connector

9Y1210365ELS0056US0

#### Functional Check

1. Turn on the turn signal switch (2) or hazard switch (3).
2. Count the number of blinking.
3. If the factory specification is not indicated, replace the flasher unit.

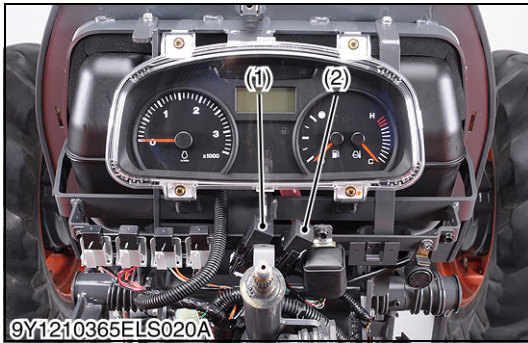
Times of blinking light	Factory spec.	60 to 80 times / minutes
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- (1) Flasher Unit (4) Battery  
 (2) Turn Signal Switch (5) ACC  
 (3) Hazard Switch

9Y1210365ELS0057US0

# [9] RELAYS

## (1) Starter Relay and Glow Relay



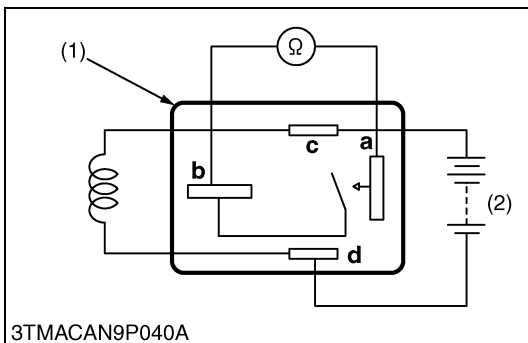
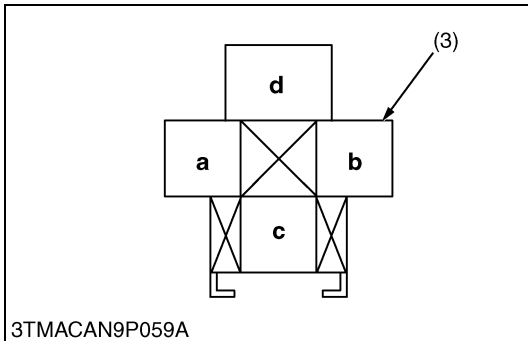
### Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Starter relay	Terminal <b>d</b> – Chassis	Approx. battery voltage
Glow relay	Terminal <b>c</b> – Chassis	Approx. battery voltage

- (1) Glow Relay (3) Connector (Wire Harness)  
 (2) Starter Relay

9Y1210365ELIS0058US0



### Functional Check

■ **NOTE**

- The relays described here are used same ones so that these are interchangeable.

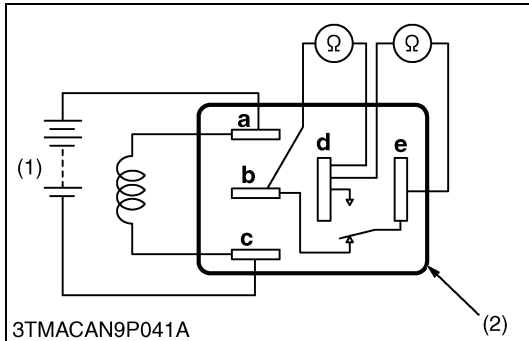
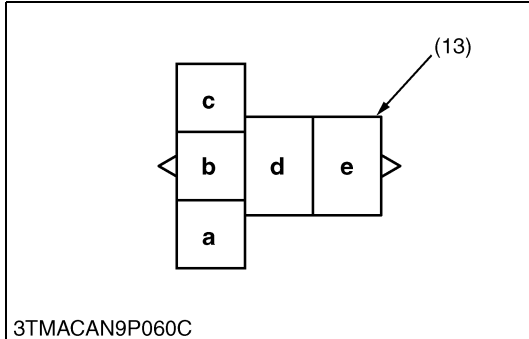
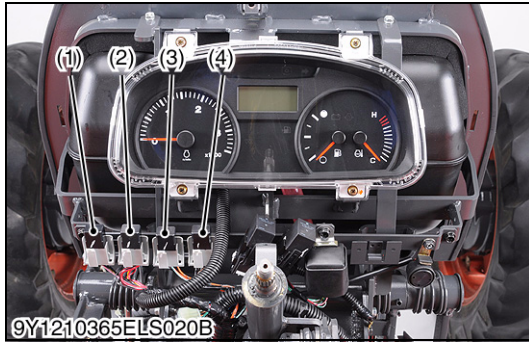
1. Apply battery voltage across the terminals **c** and **d**, and check for continuity across the terminals **a** and **b**.
2. If continuity is not established across the terminals **a** and **b**, replace it.

- (1) Connector (Relay) (2) Battery

9Y1210365ELIS0059US0



## (2) Relays (PTO Safety, Key Stop, Work Light)



### Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

PTO safety relay (main switch at <b>ON</b> position and PTO lever <b>OFF</b> position)	Terminal <b>c</b> – Chassis	Approx. battery voltage
Key stop relay (main switch at <b>OFF</b> position)	Terminal <b>e</b> – Chassis	Approx. battery voltage
Head light relay (low) (main switch at <b>OFF</b> position)	Terminal <b>d</b> – Chassis	Approx. battery voltage
Head light relay (high) (main switch at <b>OFF</b> position)	Terminal <b>d</b> – Chassis	Approx. battery voltage

- |                      |                             |
|----------------------|-----------------------------|
| (1) PTO Safety Relay | (3) Head Light Relay (Low)  |
| (2) Key Stop Relay   | (4) Head Light Relay (High) |

9Y1210365ELS0060US0

### Functional Check

#### NOTE

- The relays described here are used same ones so that these are interchangeable.

1. Apply battery voltage across the terminals **a** and **c**, and check for continuity across the terminals **d** and **e**.
2. If continuity is not established across terminals **d** and **e**, replace it.

	<b>b</b>	<b>d</b>	<b>e</b>
At 0 voltage between terminal <b>a</b> and <b>c</b>	●	—	●
At battery voltage between terminal <b>a</b> and <b>c</b>		●	●

9Y1210365ELS025A

- |             |                       |
|-------------|-----------------------|
| (1) Battery | (2) Connector (Relay) |
|-------------|-----------------------|

9Y1210365ELS0061US0

### (3) OPC (Operator Presence Control) System



#### Checking OPC System

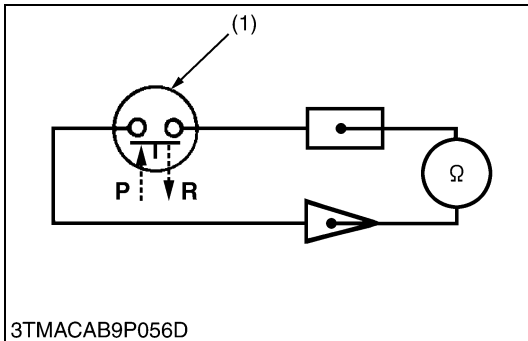
##### ⚠ WARNING

- Disconnect the implement drive universal joint from the PTO shaft, if the implement has mounted.

1. Sit on the seat.
2. Run the engine.
3. Shift the PTO clutch control switch to "ON". Make sure the warning buzzer does not whistle.
4. Stand up from the seat.
5. The warning buzzer whistles about one second after standing up. It whistles for 10 seconds.

(1) Seat Switch

9Y1210365ELS0062US0



#### Checking Seat Switch

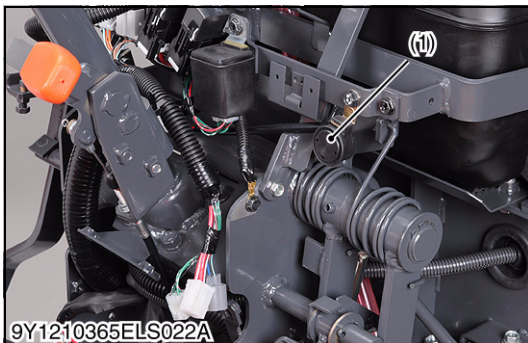
1. Disconnect the connector from the wire harness.
2. Check the continuity with an ohmmeter across the switch terminals.
3. If it does not conduct or any value is indicated when the switch is pushed (ON seat), the switch is faulty.
4. If infinity is not indicated when the switch is released (OFF seat), the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (P)	0 Ω
		When switch is released (R)	Infinity

(1) Seat Switch

**P : Pushed**  
**R : Released**

9Y1210365ELS0063US0

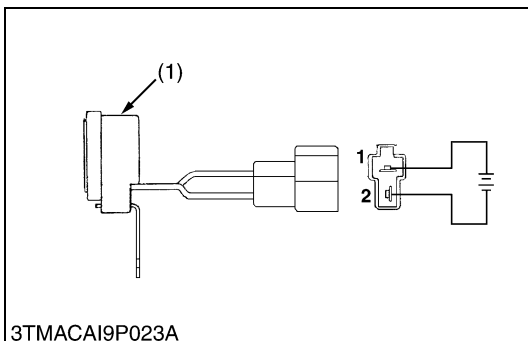


#### Buzzer

1. Remove the buzzer (1).
2. Connect the jumper lead across the battery positive terminal and terminal 1 of connector.
3. Connect the jumper lead across the battery negative terminal and terminal 2 of connector.
4. If the buzzer does not whistle, replace it.

(1) Buzzer

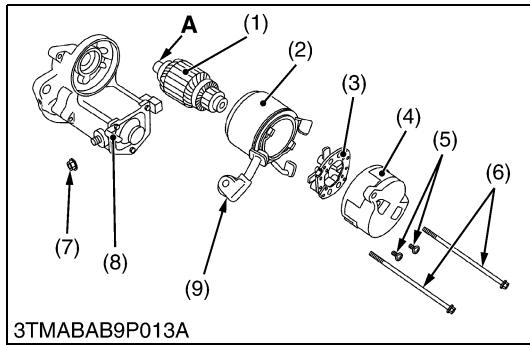
9Y1210365ELS0064US0



3TMACAI9P023A

# 5. DISASSEMBLING AND ASSEMBLING

## [1] STARTER MOTOR



### Disassembling Motor

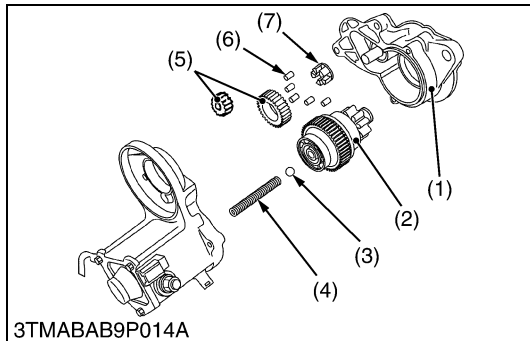
1. Disconnect the connecting lead (9) from the magnet switch (8).
2. Remove the screws (6), and then separate the end frame (4), yoke (2) and armature (1).
3. Remove the two screws (5), and then take out the brush holder (3) from the end frame (4).

### (When reassembling)

- Apply grease to the spline teeth "A" of the armature (1).
- Apply liquid gasket (Three Bond 1211 or equivalent) to joint face of the starter and clutch housing.

- |                  |                         |
|------------------|-------------------------|
| (1) Armature     | (7) Nut                 |
| (2) Yoke         | (8) Magnet Switch       |
| (3) Brush Holder | (9) Connecting Lead     |
| (4) End Frame    |                         |
| (5) Screw        | <b>A : Spline Teeth</b> |
| (6) Screw        |                         |

9Y1210365ELS0018US0



### Disassembling Magnet Switch

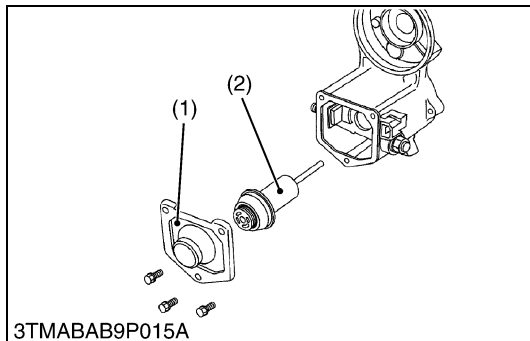
1. Remove the drive end frame (1) mounting screws.
2. Take out the overrunning clutch (2), ball (3), spring (4), gears (5), rollers (6) and retainer (7).

### (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             |              |

WSM000001ELS0021US0



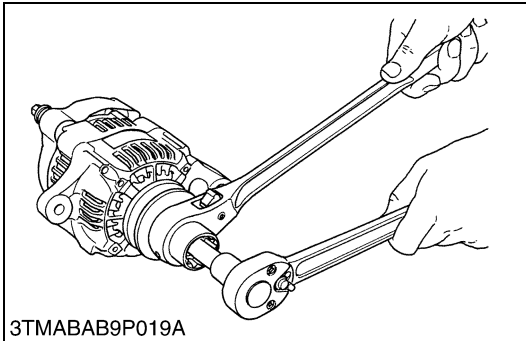
### Plunger

1. Remove the end cover (1).
2. Take out the plunger (2).

- |               |             |
|---------------|-------------|
| (1) End Cover | (2) Plunger |
|---------------|-------------|

WSM000001ELS0022US0

## [2] ALTERNATOR



3TMABAB9P019A

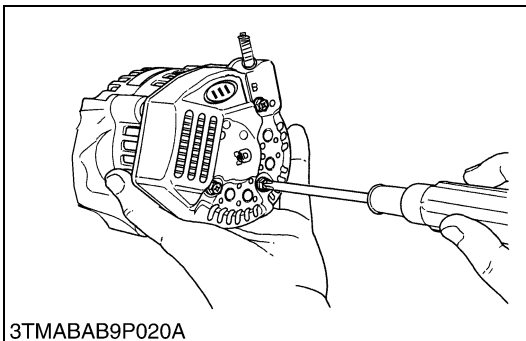
### Pulley

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	58.4 to 78.9 N·m 5.95 to 8.05 kgf·m 43.1 to 58.2 lbf·ft
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9Y1210365ELS0019US0

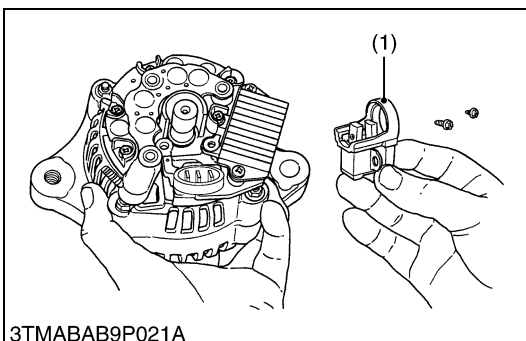


3TMABAB9P020A

### Rear End Cover

1. Unscrew the three rear end cover screws and the **B** terminal nut, and remove the rear end cover.

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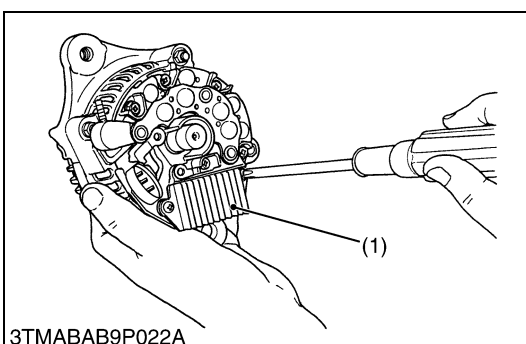
3TMABAB9P021A

### Brush Holder

1. Unscrew the two screws holding the brush holder, and remove the brush holder (1).

(1) Brush Holder

WSM000001ELS0025US0



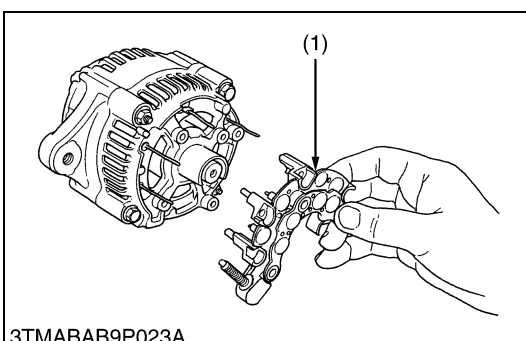
3TMABAB9P022A

### IC Regulator

1. Unscrew the three screws holding the IC regulator, and remove the IC regulator (1).

(1) IC Regulator

WSM000001ELS0026US0



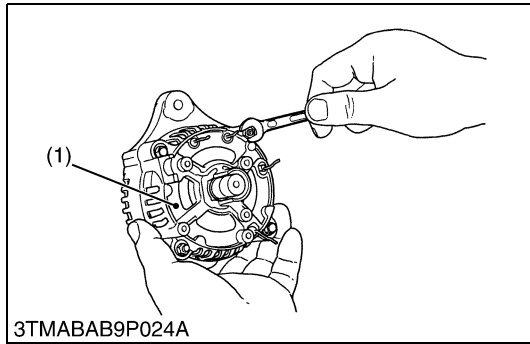
3TMABAB9P023A

### Rectifier

1. Remove the four screws holding the rectifier and the stator lead wires.
2. Remove the rectifier (1).

(1) Rectifier

WSM000001ELS0027US0

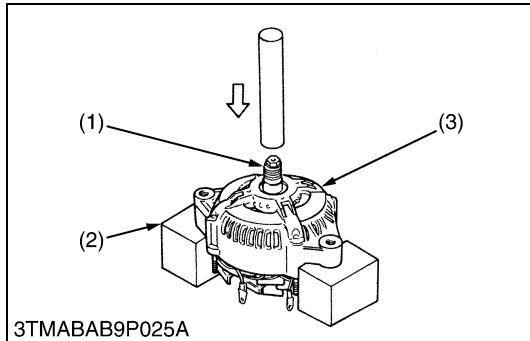


### Rear End Frame

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

WSM000001ELS0028US0



### Rotor

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

#### ■ IMPORTANT

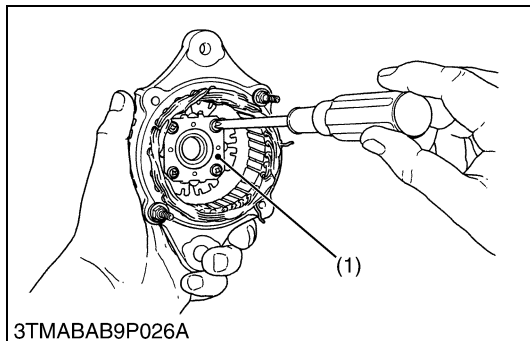
- Take special care not to drop the rotor and damage the slip ring or fan, etc..

(1) Rotor

(3) Drive End Frame

(2) Block

WSM000001ELS0029US0

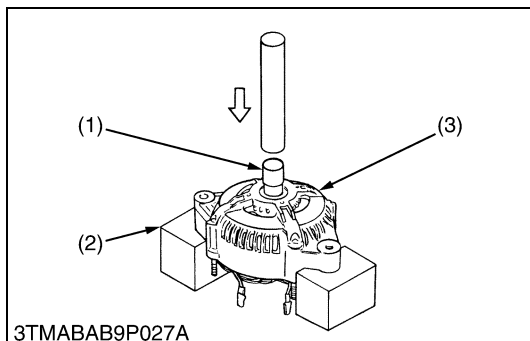


### Retainer Plate

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

(1) Retainer Plate

WSM000001ELS0030US0



### Bearing on Drive End Side

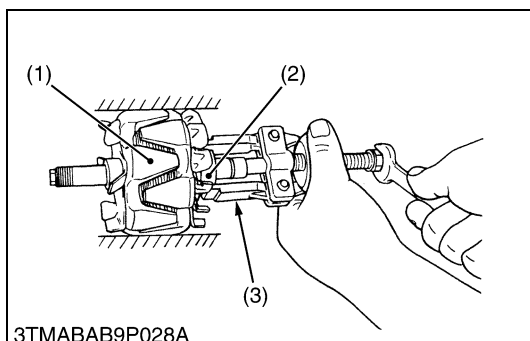
1. Press out the bearing from drive end frame (3) with a press and jig (1).

(1) Jig

(3) Drive End Frame

(2) Block

WSM000001ELS0031US0



### 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

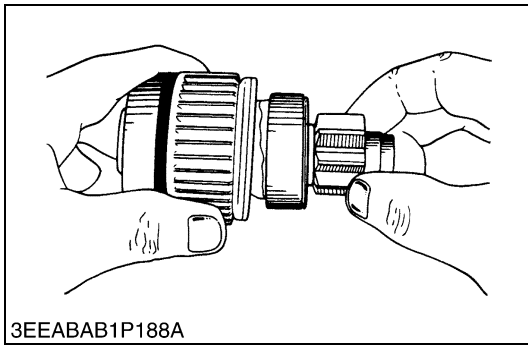
(3) Puller

(2) Bearing

WSM000001ELS0032US0

# 6. SERVICING

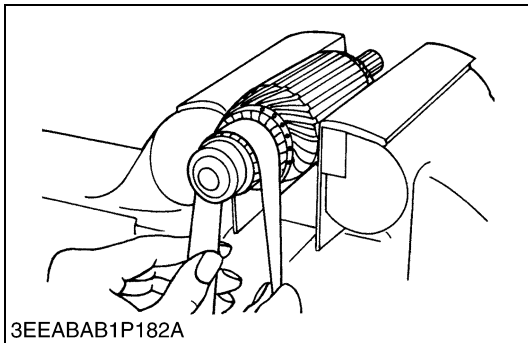
## [1] STARTER MOTOR



### Overrunning Clutch

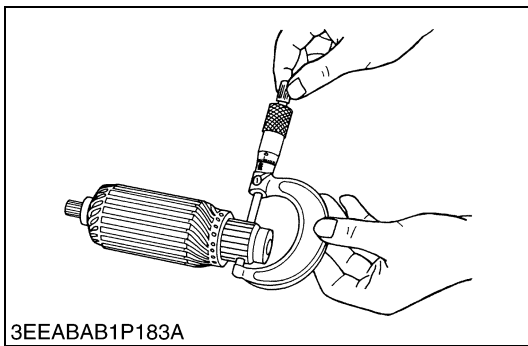
1. Inspect the pinion for wear or damage.
2. If there is any defect, replace the overrunning clutch assembly.
3. Check that the pinion turns freely and smoothly in the overrunning direction and does not slip in the cranking direction.
4. If the pinion slips or does not rotate in the both directions,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

WSM000001ELS0033US0



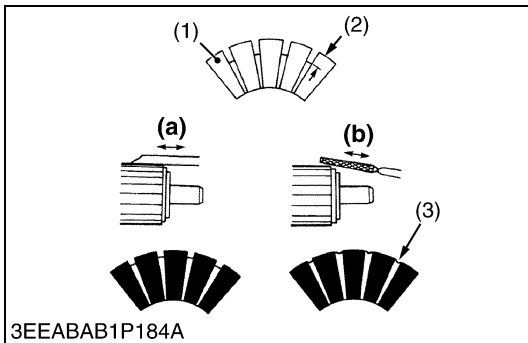
### Commutator and Mica

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 1.18 in.
	Allowable limit	29.0 mm 1.14 in.

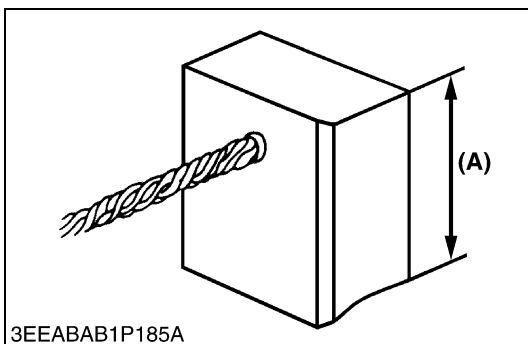
Difference of O.D.'s	Factory spec.	Less than 0.02 mm 0.0008 in.
	Allowable limit	0.05 mm 0.0020 in.



Mica undercut	Factory spec.	0.50 to 0.80 mm 0.020 to 0.031 in.
	Allowable limit	0.2 mm 0.008 in.

- (1) Segment
  - (2) Undercut
  - (3) Mica
- (a) Correct
  - (b) Incorrect

9Y1210365ELS0020US0

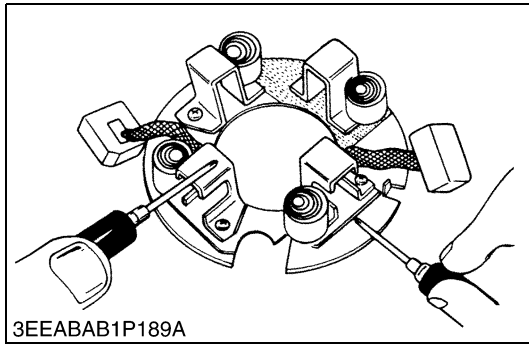


### Brush Wear

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.

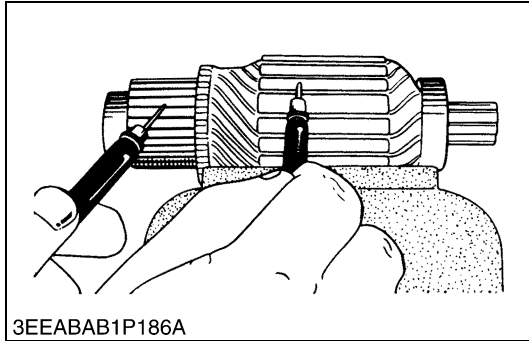
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**Brush Holder**

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

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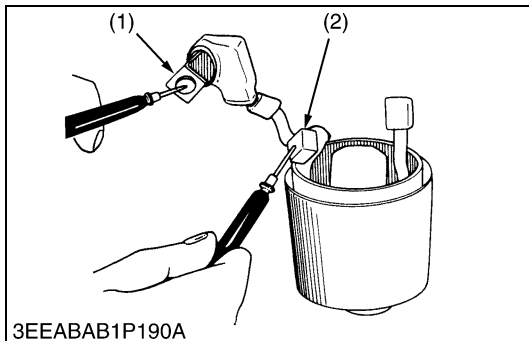
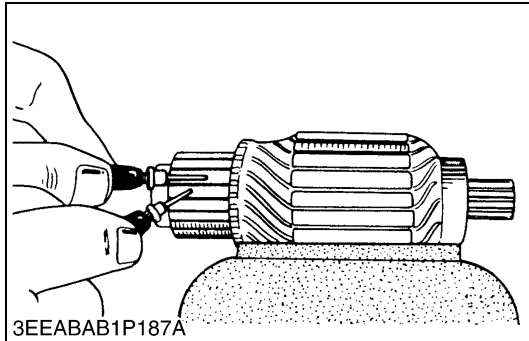


**Armature Coil**

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.

Resistance	Commutator – Armature coil core	Infinity
	Commutator segment	0 Ω

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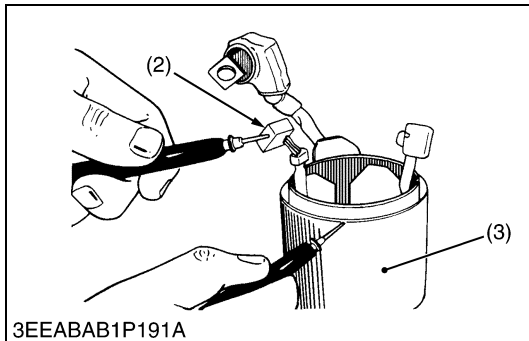
**Field Coil**

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.

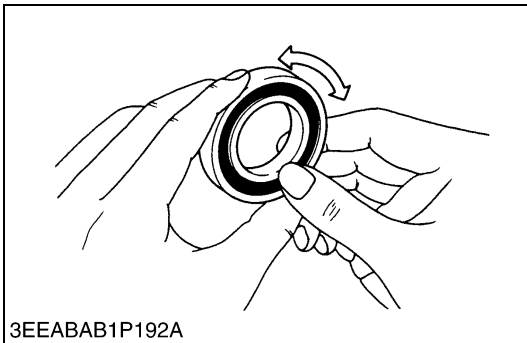
Resistance	Lead (1) – brush (2)	0 Ω
	Brush (2) – Yoke (3)	Infinity

- (1) Lead (3) Yoke  
(2) Brush

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## [2] ALTERNATOR

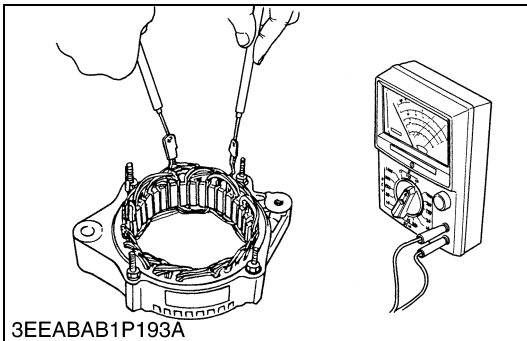


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### Bearing

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

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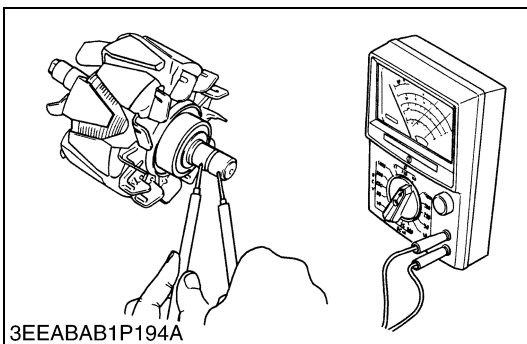
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### Stator

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 Ω
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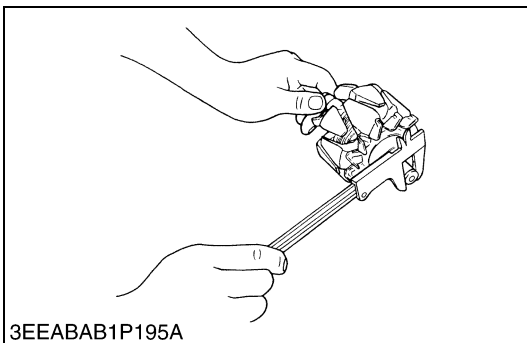
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### Rotor

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 Ω
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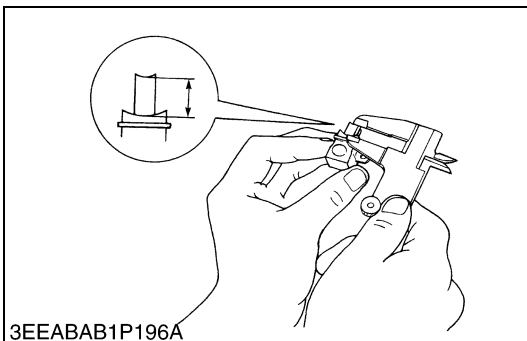
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### Slip Ring

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	12.8 mm 0.504 in.

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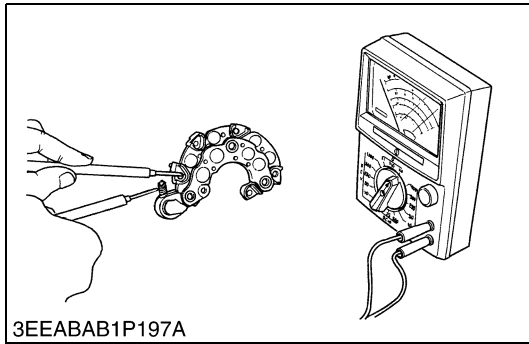
### Brush Wear

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 0.33 in.

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### 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.

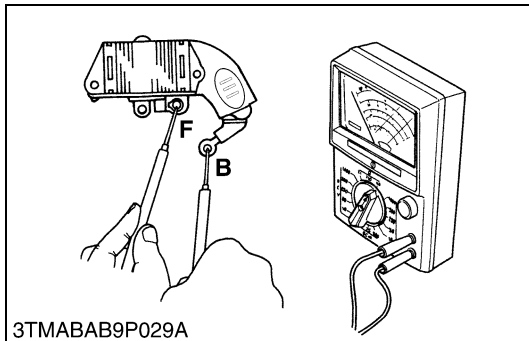
#### ■ IMPORTANT

- 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 is very hard to check the continuity of IC regulator by using it.

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