WSM

WORKSHOP MANUAL
TRACTOR

B2650HSDC,B3350HSDC

Kubota

KiSC issued 05, 2014 A

TO THE READER

This Workshop Manual tells the servicing personnel about the mechanism, servicing and maintenance of the B2650HSDC and B3350HSDC. It contains 4 parts: **"Information"**, **"General"**, **"Mechanism"** and **"Servicing"**.

■ **Information**

This section primarily contains information below.

- Safety First
- Safety Decal
- Specifications
- Dimensions

■ **General**

This section primarily 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 primarily contains information below.

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

Regarding the servicing of Diesel Particulate Filter (DPF), refer to "DIAGNOSIS MANUAL" (9Y120-02490)

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.

December, 2012

Record of Revisions

For pdf, use search function {Search word} to find all the revised locations.

Last digit of the Code No.	Issue month	Main Revised Point and Corrective Measures {Search word}	Reference Page
1	2014.05	• Add Diagmaster	TO THE READER
		• Change the reforming mechanism	1-M5
		• Change the after treatment devices	1-M7
		• Change the indication pattern of DPF regeneration and add the regeneration Mode (Default Version)	1-M11
		• Deleted the electrical system of engine.	–
		• Add the electrical circuit of B3350 (Default Version)	8-M2
		• Change the ENGINE CONTROL SYSTEM	8-S31 to 8-S33
		• Add the accelerator sensor calibration	8-S55

I INFORMATION

INFORMATION

CONTENTS

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 try 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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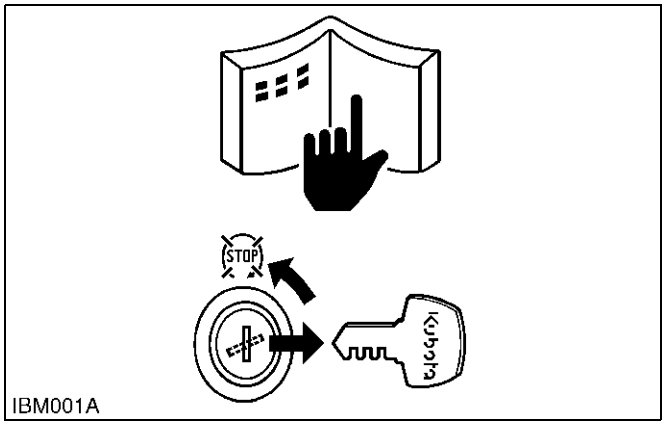

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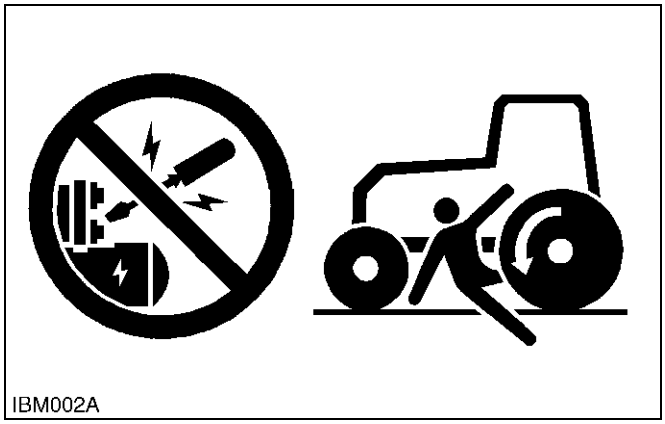
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BEFORE YOU START SERVICE

- 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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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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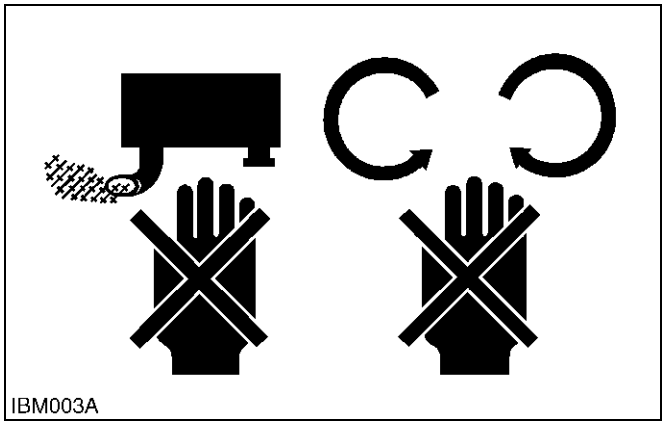
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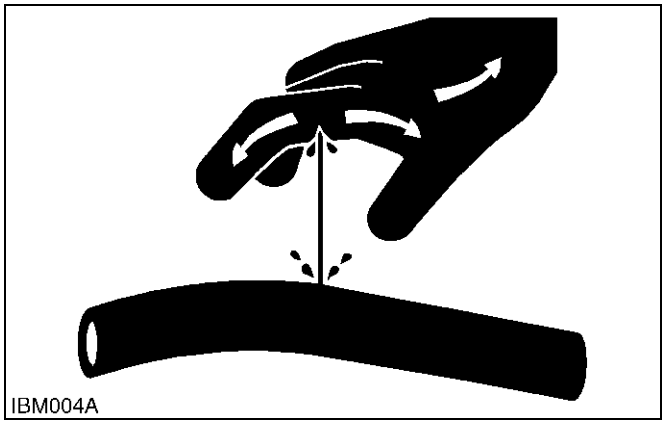
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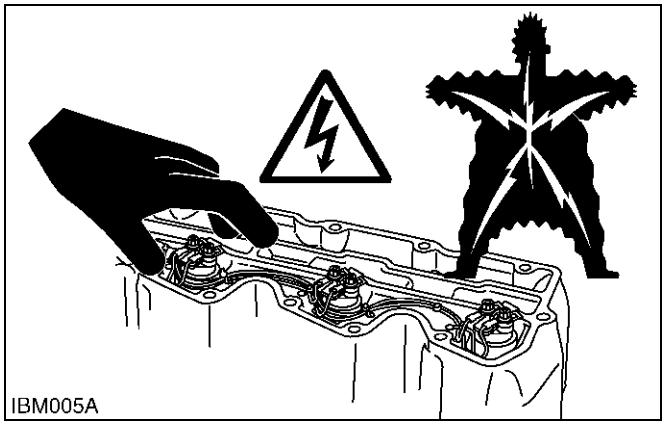
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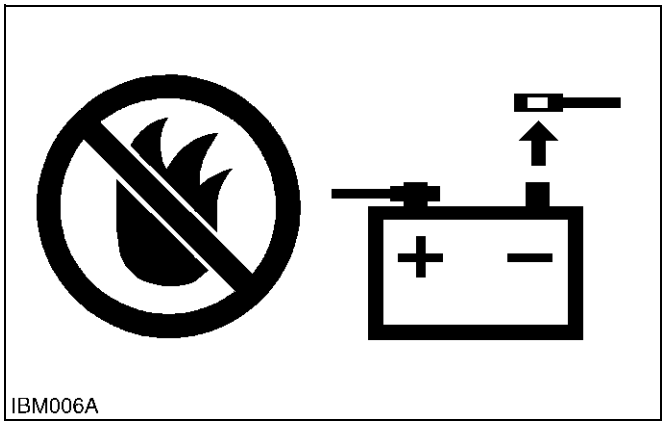
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OPERATE SAFELY

- 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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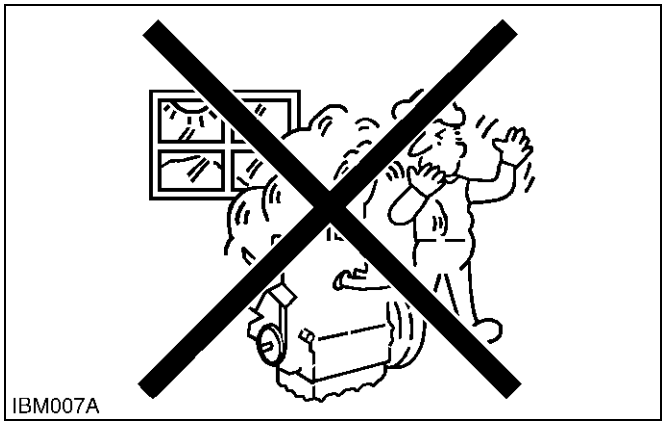
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KEEP A GOOD AIRFLOW IN THE WORK AREA

- 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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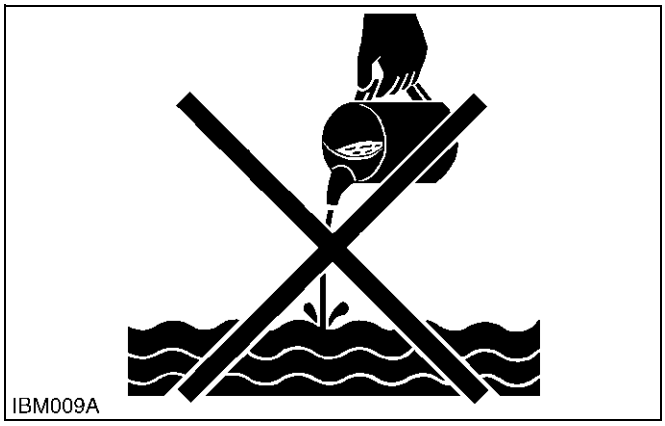
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DISCARD FLUIDS CORRECTLY

- 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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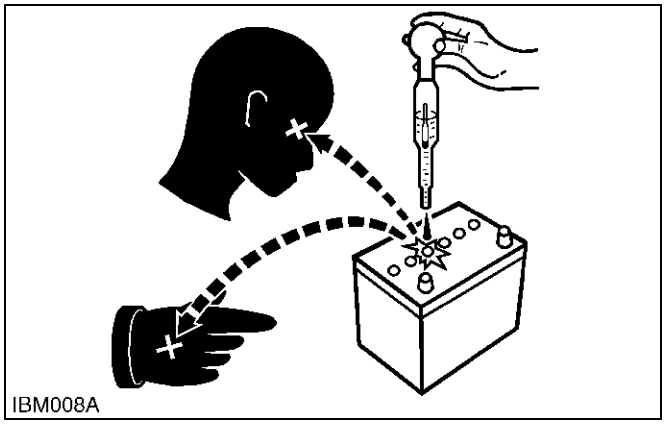
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PREVENT ACID BURNS

- 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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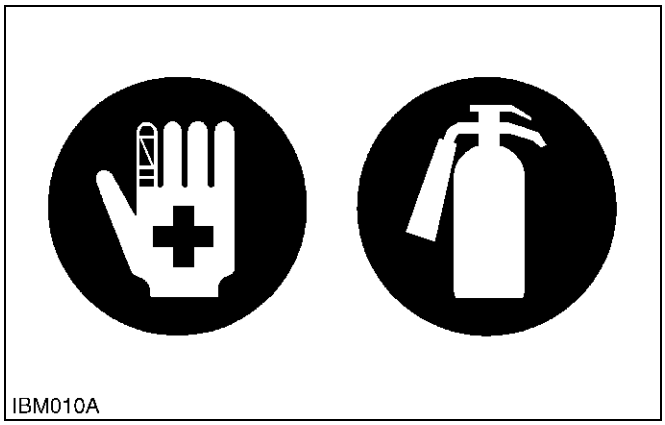
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PREPARE FOR EMERGENCIES

- 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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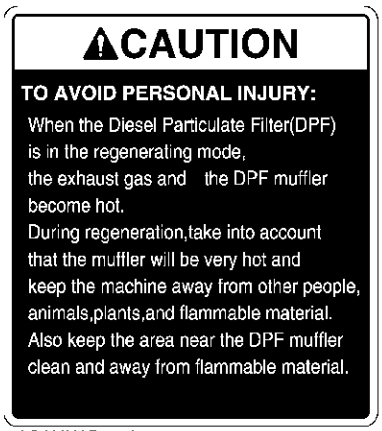
(1) Part No. 3Y205-9868-1
[B3350 Only]



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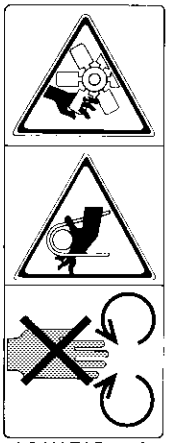
(2) Part No. 6C090-4958-2
Do not get your hands close to engine fan and fan belt.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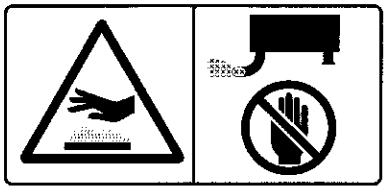
(3) Part No. 6C430-4959-1
[B3350 Only]
Do not touch hot surface like muffler, etc.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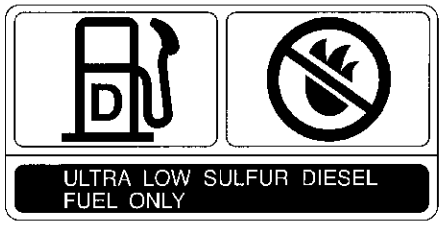
(4) Part No. TC420-4956-1
Diesel fuel only No fire



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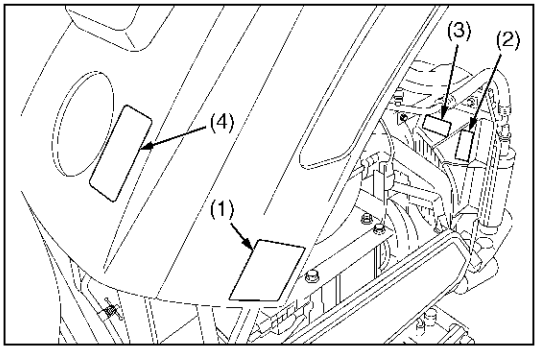

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9Y1210822INI0001US0

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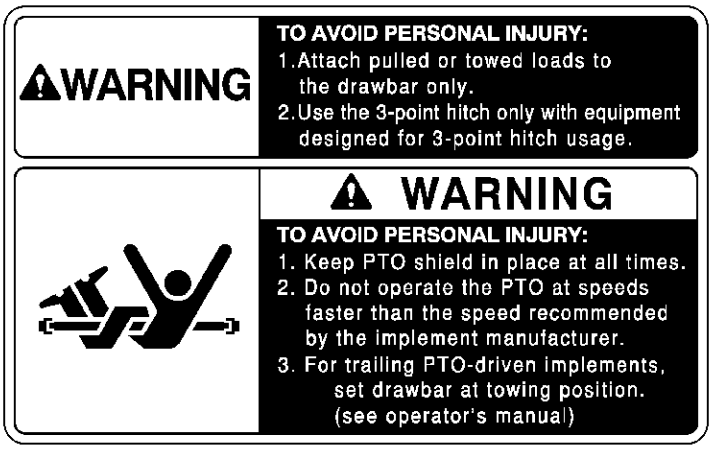

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(2) Part No. 6C090-4958-2
Do not get your hands close to engine fan and fan belt.

1AGAIAZAP110A

(3) Part No. 6C430-4965-1

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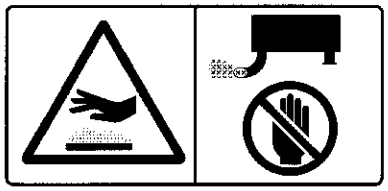
(4) Part No. 6C430-4959-1
[B2650 Only]
Do not touch hot surface like muffler, etc.



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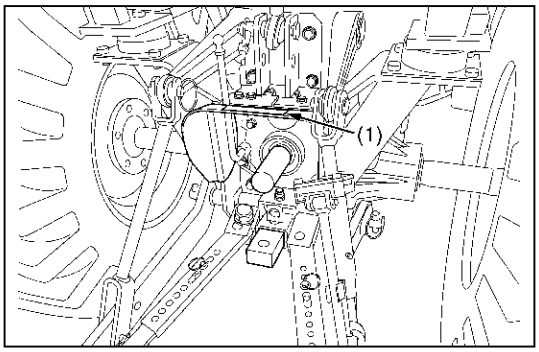

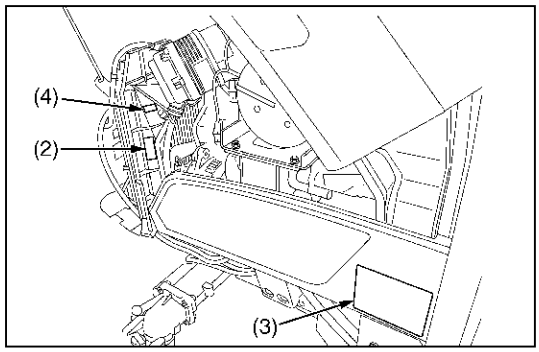

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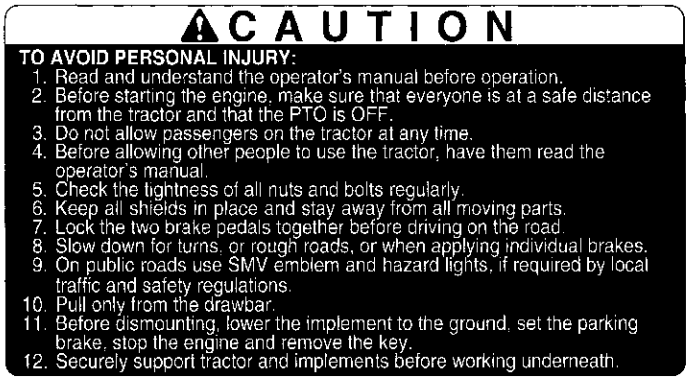

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[B2650 Only]

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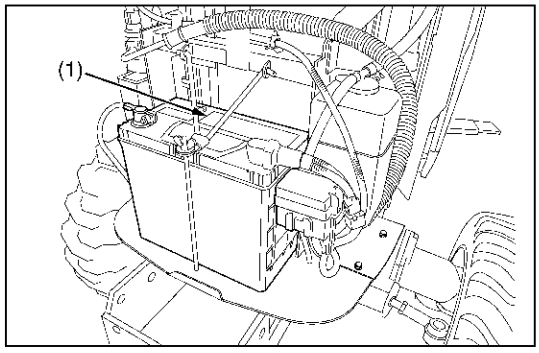

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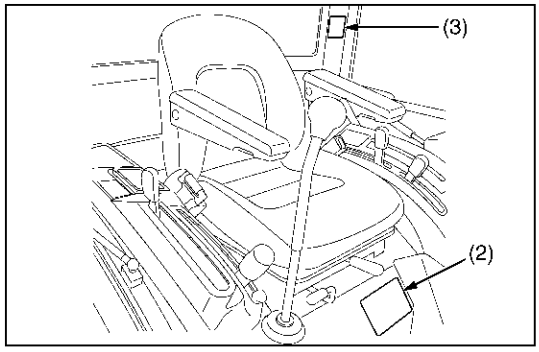

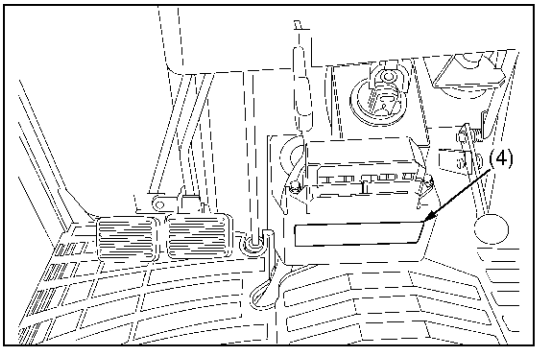

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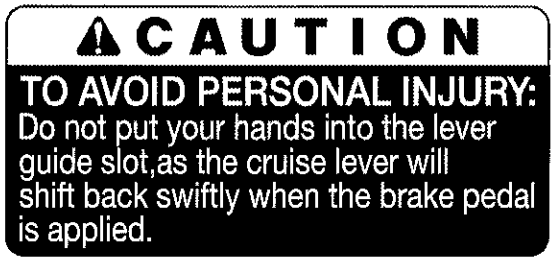

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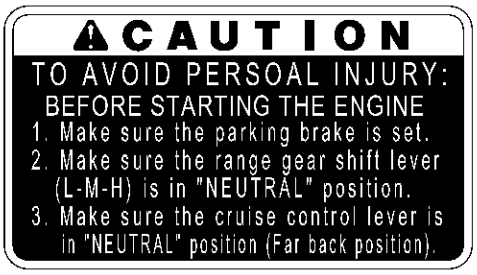

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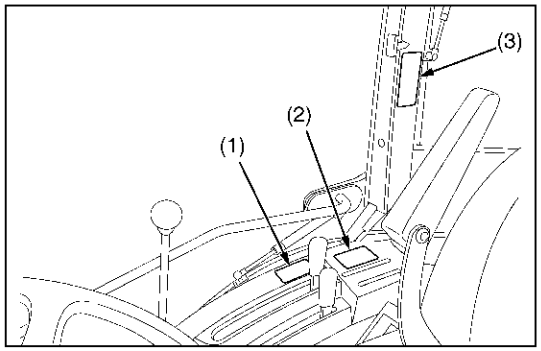

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CARE OF DANGER, WARNING AND CAUTION LABELS

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 replaced 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 pressing any bubbles to outside edge.

9Y1210822INI0005US0

3. SPECIFICATIONS

Model			B2650HSDC	B3050HSDC
PTO power*			14.5 kW (19.5 HP)*	20.1 kW (27.0 HP)*
Engine	Maker		KUBOTA	
	Model		D1305-E4-D26-Q	V1505-T-E4-D26-Q
	Type		Indirect Injection, Vertical, water-cooled, 4 cycle diesel	
	Number of cylinders		3	4
	Bore and stroke		78 × 78.4 mm (3.1 × 3.1 in.)	
	Total displacement		1261 cm^3 (77.0 cu.in.)	1498 cm^3 (91.5 cu.in.)
	Engine gross power*		19.4 kW (26.0 HP)*	24.6 kW (33.0 HP)*
	Rated revolution		2500 min^{-1} (rpm)	
	Low idling revolution		1100 min^{-1} (rpm)	
	Maximum torque		84.0 N·m (8.6 kgf·m, 62.0 lbf·ft)	105.4 N·m (10.75 kgf·m, 77.74 lbf·ft)
	Battery		12 V, RC: 80 min, CCA: 430 A	
Capacities	Fuel tank		27 L (7.1 U.S.gals, 5.9 Imp.gals)	
	Engine crankcase (with filter)		4.0 L (4.2 U.S.qts, 3.6 Imp.qts)	4.8 L (5.1 U.S.qts, 4.2 Imp.qts)
	Engine coolant		4.3 L (4.5 U.S.qts, 3.8 Imp.qts)	
	Transmission case		15 L (4.0 U.S.gals, 3.3 Imp.gals)	
Dimensions	Overall length (without 3P)		2900 mm (114.2 in.)	
	Overall width		1365 mm (53.7 in.)	
	Overall height		2150 mm (84.6 in.)	
	Wheel base		1666 mm (65.6 in.)	
	Min. ground clearance		370 mm (14.6 in.)	
	Tread	Front	935 mm (36.8 in.)	
		Rear	1050 mm (41.3 in.)	
Weight			1040 kg (2293 lbs)	1110 kg (2447 lbs)
Traveling system	Clutch		–	
	Tread	Front	7-12	
		Rear	12.4-16	
	Steering		Hydrostatic type power steering	
	Transmission		Main-hydrostatic transmission, 3 range gear shift (3 forward, 3 reverse)	
	Brake		Wet disc type	
	Min. turning radius (with brake)		2.1 m(6.9 feet)	
Hydraulic unit	Hydraulic control system		Position control	
	Pump capacity		33.1 L/min (8.7 U.S.gals/min, 7.3 Imp.gals/min)	
	3-point hitch		SAE Category 1	
	Max. lift force	At lift points	970 kg (2139 lbs)	
		24 in. behind lift point	760 kg (1676 lbs)	
PTO	Rear-PTO		SAE 1-3/8, 6 splines	
	PTO / Engine speed		1 speed 563 / 2500 min^{-1} (rpm)	
	Rear-PTO		USA No. 5 (KUBOTA 10-tooth) involve spline	
	PTO / Engine speed		1 speed 2500 / 2500 min^{-1} (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		B2650			
Tire size (Rear)		12.4-16 Farm		13.6-16 Turf	
	Range gear shift lever	km/h	mph	km/h	mph
Forward	Low	0 to 5.7	0 to 3.6	0 to 6.0	0 to 3.7
	Middle	0 to 8.5	0 to 5.3	0 to 8.9	0 to 5.5
	high	0 to 19.1	0 to 11.8	0 to 20.0	0 to 12.4
Reverse	Low	0 to 4.3	0 to 2.7	0 to 4.5	0 to 2.8
	Middle	0 to 6.4	0 to 3.9	0 to 6.7	0 to 4.1
	high	0 to 14.4	0 to 8.9	0 to 15.0	0 to 9.3

Model		B3350			
Tire size (Rear)		12.4-16 Farm		13.6-16 Turf	
	Range gear shift lever	km/h	mph	km/h	mph
Forward	Low	0 to 5.7	0 to 3.6	0 to 6.0	0 to 3.7
	Middle	0 to 9.3	0 to 5.8	0 to 9.8	0 to 6.1
	high	0 to 21.9	0 to 13.6	0 to 23.0	0 to 14.3
Reverse	Low	0 to 4.3	0 to 2.7	0 to 4.5	0 to 2.8
	Middle	0 to 7.0	0 to 4.3	0 to 7.3	0 to 4.5
	high	0 to 16.5	0 to 10.3	0 to 17.3	0 to 10.7

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

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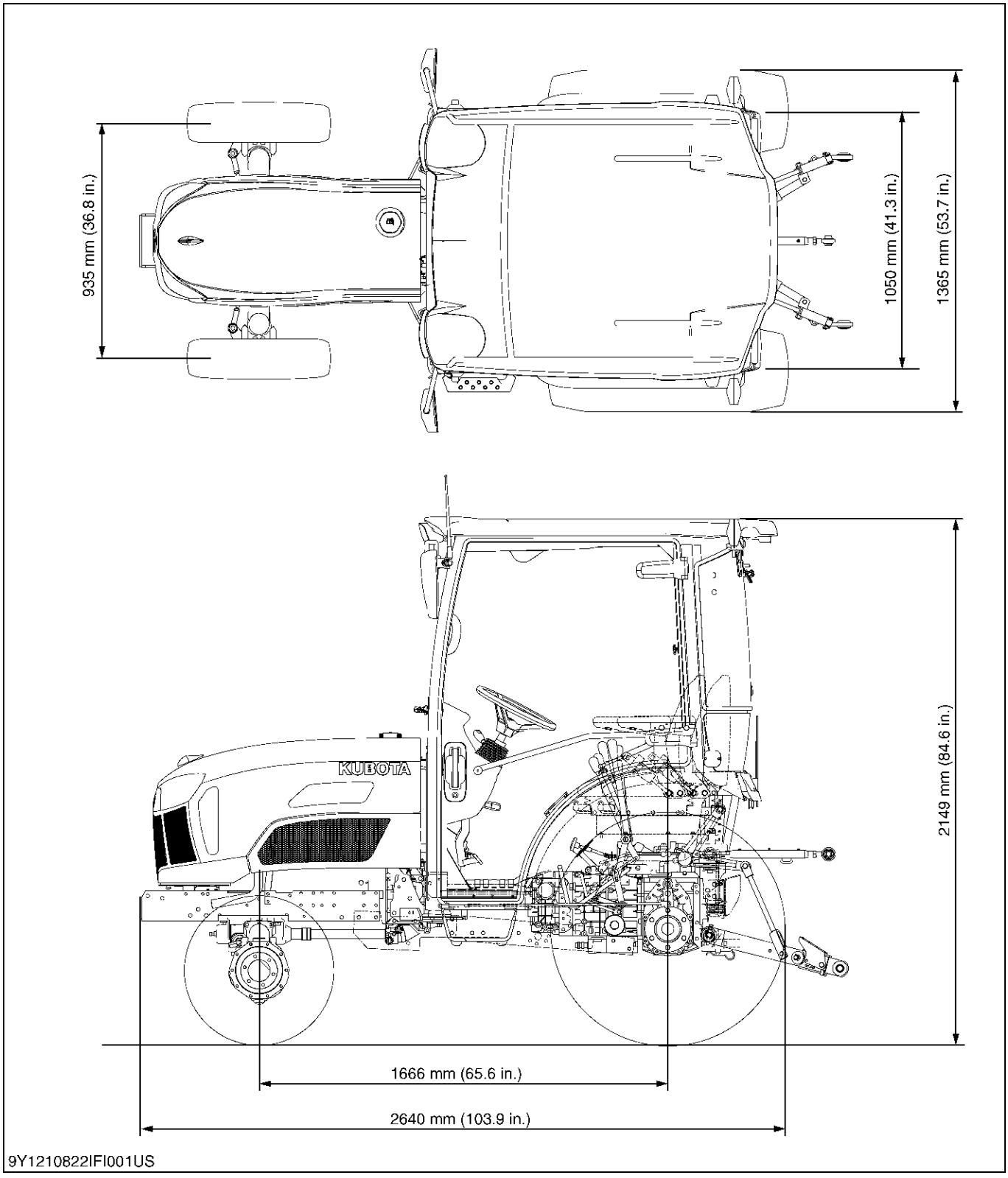
5. DIMENSIONS



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9Y1210822INI0008US0

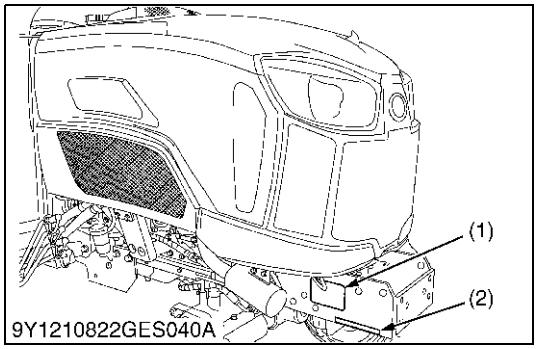
G GENERAL

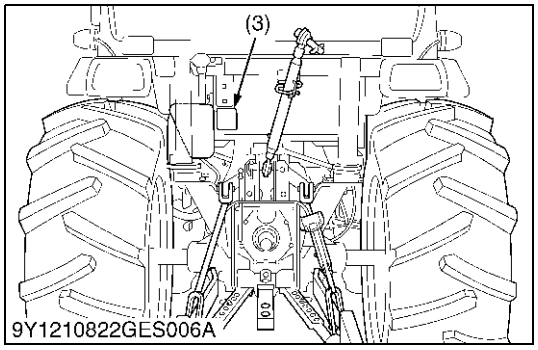
GENERAL

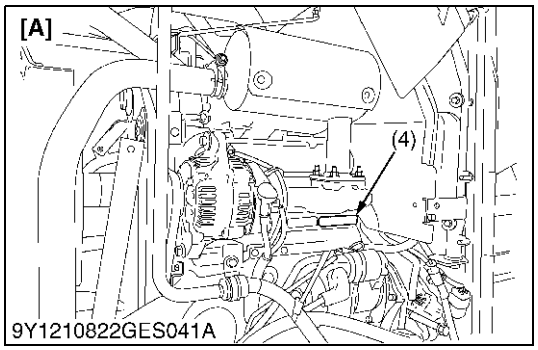
CONTENTS

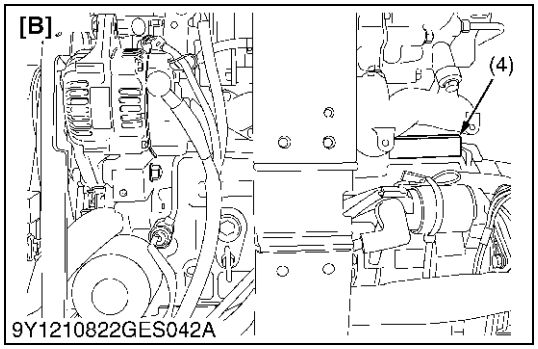
1. TRACTOR IDENTIFICATION

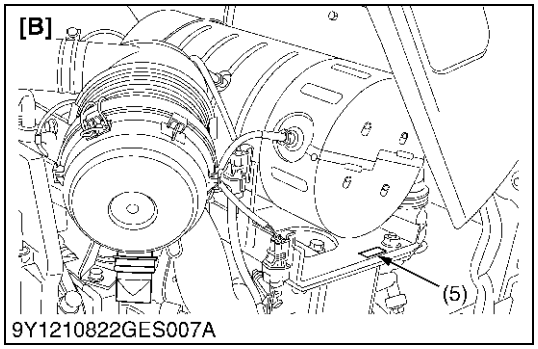
[1] MODEL NAME AND SERIAL NUMBER



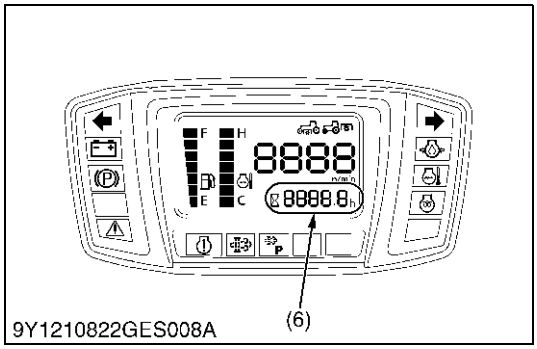








When contacting your local KUBOTA distributor, always specify engine serial number, tractor serial number, ROPS serial number and hour meter reading.

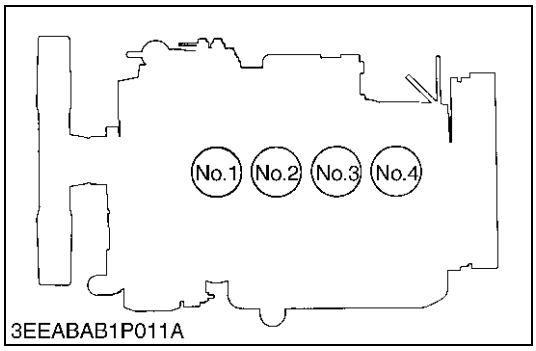


(1) Tractor Identification Plate
(2) Tractor Serial Number
(3) CABIN Identification Plate (CABIN Serial Number)
(4) Engine Serial Number
(5) Diesel Particulate Filter (DPF) Serial Number
(6) Hour Meter

[A] B2650
[B] B3350

9Y1210822GEG0001US0

[2] CYLINDER NUMBER



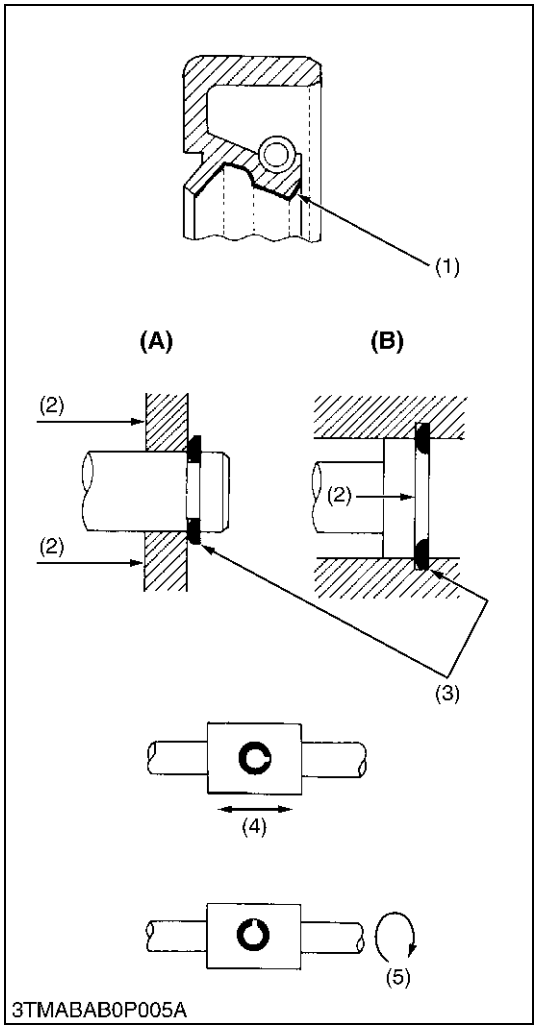
3EEABAB1P011A

The cylinder numbers of KUBOTA 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.

9Y1210822GEG0002US0

2. GENERAL PRECAUTIONS



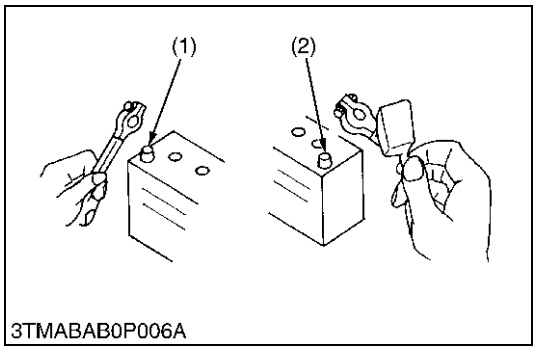
- When you disassemble, carefully put the parts in a clean area to make it easy to find the parts. You must install the screws, bolts and nuts in their initial position to prevent the reassembly errors.
- When it is necessary to use special tools, use KUBOTA special tools. Refer to the drawings when 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 fittings to the specified torque. Too much torque can cause damage to the hydraulic units or the fittings. 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 flared connectors and tapers of hoses are free of dust and scratches.
- After you tighten the fittings, 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 Circlip
(B) Internal Circlip

WSM000001GEG0106US0

3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



3TMABAB0P006A

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

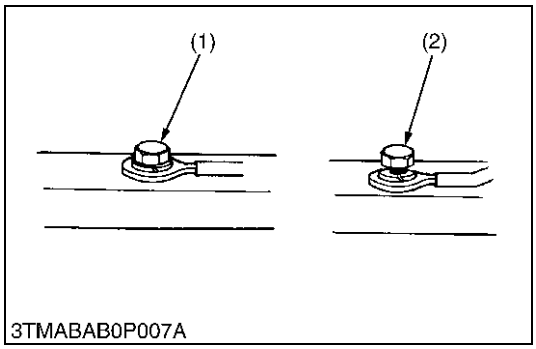
■ **IMPORTANT**

- **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 try 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

WSM000001GEG0062US0

[1] WIRING

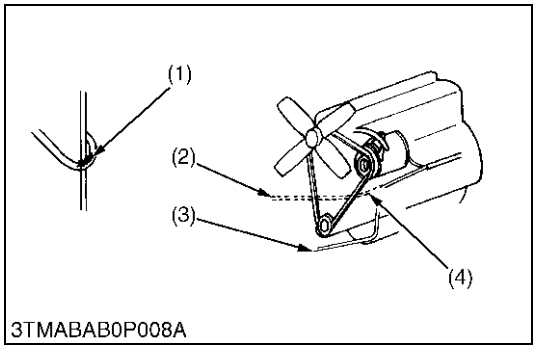


3TMABAB0P007A

- Securely tighten wiring terminals.

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

WSM000001GEG0063US0

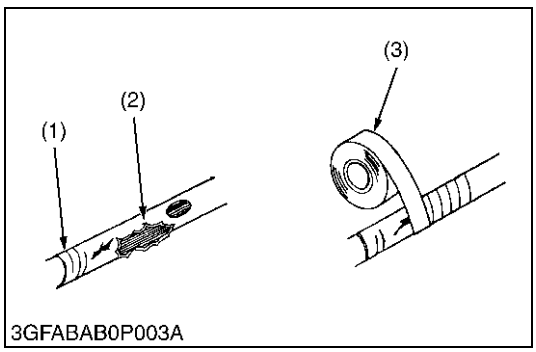


3TMABAB0P008A

- Do not let wiring contact dangerous part.

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

WSM000001GEG0064US0

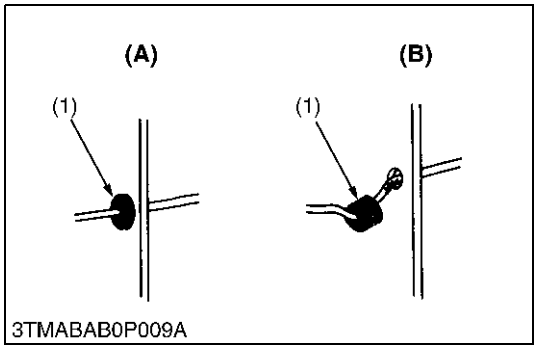


3GFABAB0P003A

- Repair or change torn or aged wiring immediately.

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

WSM000001GEG0065US0



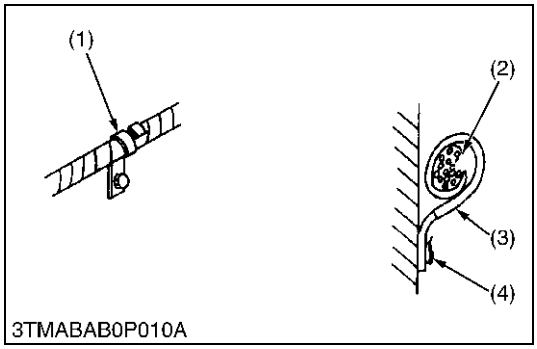
3TMABAB0P009A

- Securely insert grommet.

(1) Grommet

(A) Correct
(B) Incorrect

WSM000001GEG0066US0

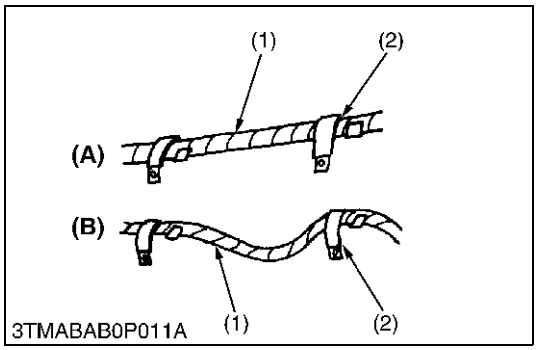


3TMABAB0P010A

- Securely clamp, being careful not to damage wiring.

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

WSM000001GEG0067US0



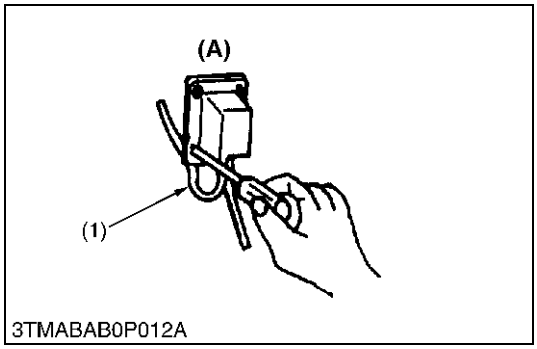
3TMABAB0P011A

- 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

WSM000001GEG0068US0



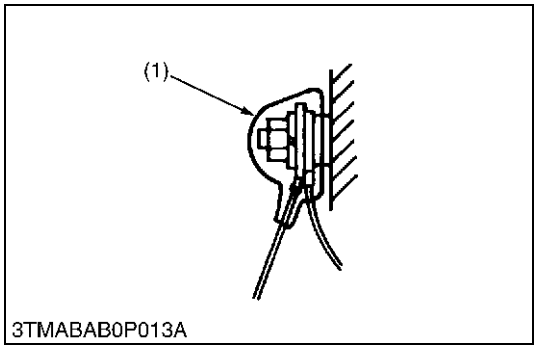
3TMABAB0P012A

- In installing a part, be careful not to get wiring caught by it.

(1) Wiring

(A) Incorrect

WSM000001GEG0069US0



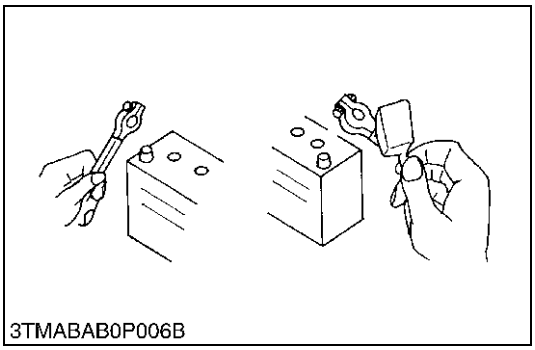
3TMABAB0P013A

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

(1) Cover
(Securely Install Cover)

WSM000001GEG0070US0

[2] BATTERY


3TMABAB0P006B

- Be careful not to confuse positive and negative terminal posts.
- When you remove battery cables, disconnect negative cable first. When you install battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After you connect 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.

DANGER

To avoid serious injury or death:

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

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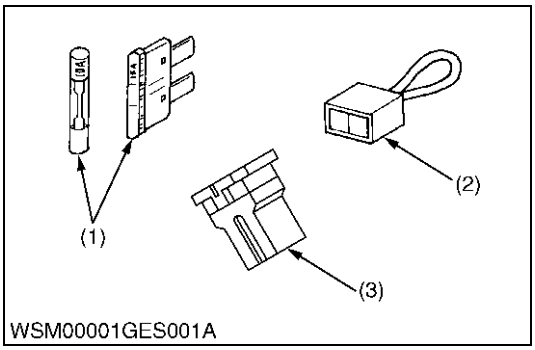
[3] FUSE



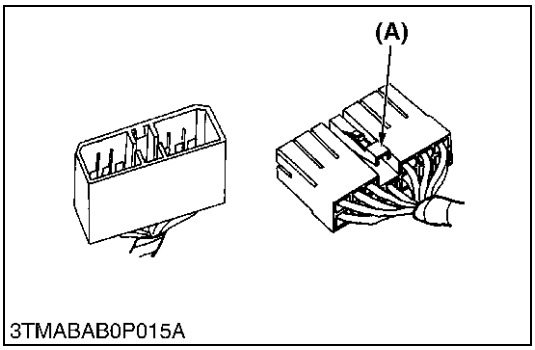
WSM00001GES001A

- Use fuses with specified capacity.
  Neither too large nor small capacity fuse is acceptable.
- Never use steel nor 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

WSM000001GEG0072US0

[4] CONNECTOR

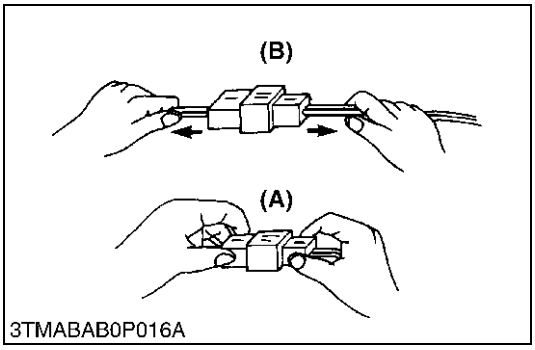


3TMABAB0P015A

- For connector with lock, push lock to separate.

(A) Push

WSM000001GEG0073US0

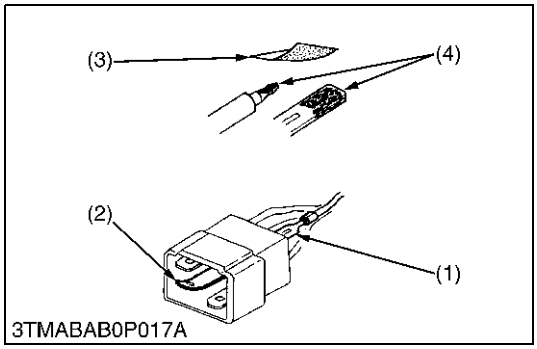


3TMABAB0P016A

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

(A) Correct
(B) Incorrect

WSM000001GEG0074US0

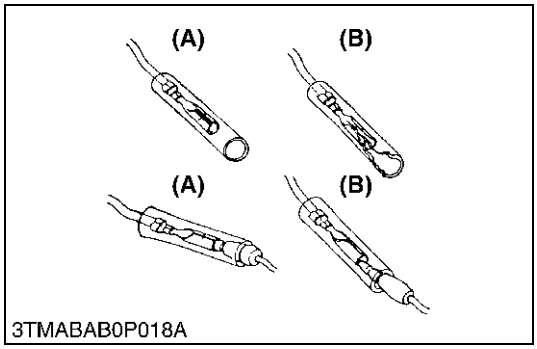


3TMABAB0P017A

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

(1) Exposed Terminal
(2) Deformed Terminal
(3) Sandpaper
(4) Rust

WSM000001GEG0075US0

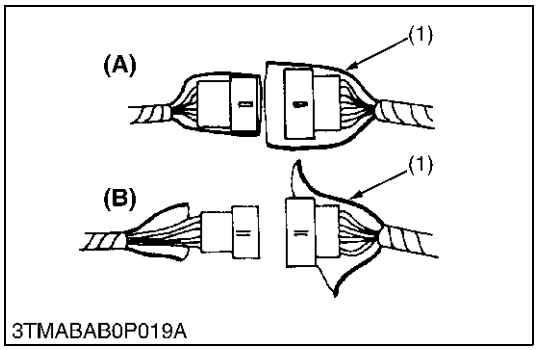


3TMABAB0P018A

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

(A) Correct
(B) Incorrect

WSM000001GEG0076US0



3TMABAB0P019A

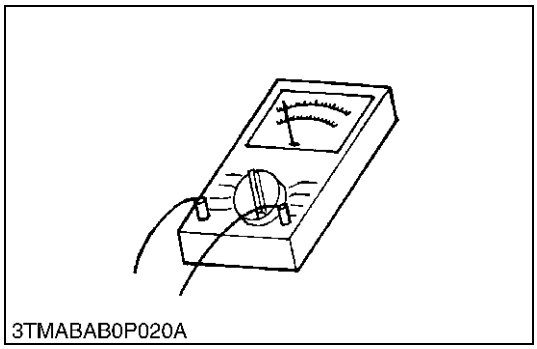
- Make sure that plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct
(B) Incorrect

WSM000001GEG0077US0

[5] HANDLING OF CIRCUIT TESTER


3TMABAB0P020A

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

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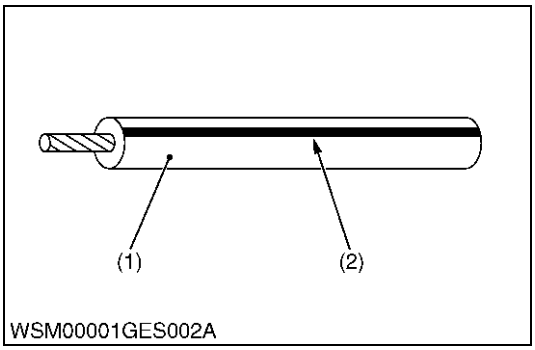
[6] COLOR OF WIRING



WSM00001GES002A

- 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

No.	Locations	Capacities		Lubricants	
		B2650	B3350		
1	Fuel	27 L 7.1 U.S.gals 5.9 Imp.gals		No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below −10 °C (14 °F)	
2	Coolant (with recovery tank)	4.3 L 4.5 U.S.qts 3.8 Imp.qts		Fresh clean water with anti-freeze	
3	Washer liquid tank	1.5 L 0.4 U.S.gals 0.33 Imp.gals		Automobile washer liquid	
4	Engine crankcase (with filter)	4.0 L 4.2 U.S.qts 3.6 Imp.qts	4.8 L 5.1 U.S.qts 4.2 Imp.qts	Engine oil: API Service Classification	CJ-4 [DPF type engine]
				Above 25 °C (77 °F)	SAE30, SAE10W-30 or 15W-40
				0 to 25 °C (32 to 77 °F)	SAE20, SAE10W-30 or 15W-40
				Below 0 °C (32 °F)	SAE10W, SAE10W-30 or 15W-40
5	Transmission case	15 L 4.0 U.S.gals 3.3 Imp.gals		KUBOTA SUPER UDT-2 fluid	
6	Front axle case	4.7 L 5.0 U.S.qts 4.1 Imp.qts		KUBOTA SUPER UDT-2 fluid, SAE 80- SAE 90 gear oil	

Grease				
	Greasing	No. of greasing points	Capacity	Type of grease
7	Top link	1	Until grease overflow.	Multipurpose grease NLGI-2 or NLGI-1 (GC-LB)
	Lifting rod (RH)	1		
	Speed control pedal	1		
	Battery terminal	2	Moderate amount	

■ **NOTE**

- **The product name of KUBOTA genuine UDT fluid may be different from that in the Operator's Manual depending on countries or territories.**

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■ **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.**
- **Refer to the following table for the suitable API classification engine oil according to the engine type (with DPF (Diesel Particulate FIlter) type engines) and the fuel.**
- **The CJ-4 engine oil is intended for DPF (Diesel Particulate Filter) type engine.**

Fuel used	Engine oil classification (API classification)	
	Oil class of engines except DPF (B2650)	Oil class of engines with DPF (B3350)
Ultra Low Sulfur Fuel [< 0.0015 % (15 ppm)]	CF, CF-4, CG-4, CH-4 or CI-4	CJ-4

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).**
- **Diesel fuels specified to EN 590 or ASTM D975 are recommended.**
- **No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87).**

Transmission Oil:

*KUBOTA Super UDT-2: For an enhanced ownership experience, we highly recommend Super UDT-2 to be used instead of standard hydraulic/transmission fluid.
Super UDT-2 is a proprietary KUBOTA formulation that deliveries superior performance and protection in all operating conditions.
Regular UDT is also permitted for use in this machine.

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

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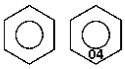
5. TIGHTENING TORQUES

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Tighten screws, bolts and nuts whose tightening torques are not specified in this Workshop Manual according to the table below.

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

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[2] STUD BOLTS

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

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[3] METRIC SCREWS, BOLTS AND NUTS

Grade	8.8 Property class 8.8			10.9 Property class 10.9		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8	24 to 27	2.4 to 2.8	18 to 20	30 to 34	3.0 to 3.5	22 to 25
M10	48 to 55	4.9 to 5.7	36 to 41	61 to 70	6.2 to 7.2	45 to 52
M12	78 to 90	7.9 to 9.2	58 to 66	103 to 117	10.5 to 12.0	76.0 to 86.7
M14	124 to 147	12.6 to 15.0	91.2 to 108	167 to 196	17.0 to 20.0	123 to 144
M16	197 to 225	20.0 to 23.0	145 to 166	260 to 304	26.5 to 31.0	192 to 224

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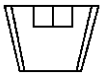
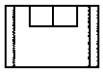
[4] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS

Grade	SAE GR.5			SAE GR.8		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
1/4	11.7 to 15.7	1.20 to 1.60	8.63 to 11.5	16.3 to 19.7	1.67 to 2.00	12.0 to 14.6
5/16	23.1 to 27.7	2.36 to 2.82	17.0 to 20.5	33 to 39	3.4 to 3.9	25 to 28
3/8	48 to 56	4.9 to 5.7	36 to 41	61 to 73	6.3 to 7.4	45 to 53
1/2	110 to 130	11.3 to 13.2	81.2 to 95.8	150 to 178	15.3 to 18.1	111 to 131
9/16	150 to 178	15.3 to 18.1	111 to 131	217 to 260	22.2 to 26.5	160 to 191
5/8	204 to 244	20.8 to 24.8	151 to 179	299 to 357	30.5 to 36.4	221 to 263

WSM000001GEG0008US0

[5] PLUGS

Shape	Size	Material of opponent part					
		Ordinariness			Aluminum		
		N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
Tapered screw 	R1/8	13 to 21	1.3 to 2.2	9.4 to 15	13 to 19	1.3 to 2.0	9.4 to 14
	R1/4	25 to 44	2.5 to 4.5	18 to 32	25 to 34	2.5 to 3.5	18 to 25
	R3/8	49 to 88	5.0 to 9.0	37 to 65	49 to 58	5.0 to 6.0	37 to 43
	R1/2	58.9 to 107	6.00 to 11.0	43.4 to 79.5	59 to 78	6.0 to 8.0	44 to 57
Straight screw 	G1/4	25 to 34	2.5 to 3.5	18 to 25	–	–	–
	G3/8	62 to 82	6.3 to 8.4	46 to 60	–	–	–
	G1/2	49 to 88	5.0 to 9.0	37 to 65	–	–	–

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6. MAINTENANCE CHECK LIST

No.	Item		Indication on hour meter														After since	Reference page		
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	800				
1	Clogging of air conditioner condenser screen	Clean																Daily	G-16		
2	Engine oil	Change	★	☆		☆		☆		☆		☆		☆		☆	☆	every 100 Hr	G-22		
3	Engine oil filter	Replace	★			☆				☆				☆			☆	every 200 Hr	G-27		
4	Transmission oil filters	Replace	★					☆						☆				every 300 Hr	G-31		
5	Transmission fluid	Change	★					☆						☆				every 300 Hr	G-30		
6	Front axle case oil	Change						☆						☆				every 300 Hr	G-32		
7	Front axle pivot	Adjust								☆							☆	every 400 Hr	G-32		
8	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-21		
9	Greasing	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-22		
10	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-22		
11	Battery condition	Check		☆		☆		☆		☆		☆		☆		☆	☆	every 100Hr	G-23	*4	
12	Air cleaner element (Double element type) Primary element	Check		☆		☆		☆		☆		☆		☆		☆	☆	every 100 Hr	G-25	*1	@
		Replace																every 1 year	G-33	*2	
	Air cleaner element (Double element type) Secondary element	Replace																every 1 year	G-33		
13	Fuel filter element	Clean		☆		☆		☆		☆		☆		☆		☆	☆	every 100 Hr	G-25		@
		Replace								☆							☆	every 400 Hr	G-32		
14	Fan belt	Adjust		☆		☆		☆		☆		☆		☆		☆	☆	every 100 Hr	G-26		
15	Brake	Adjust		☆		☆		☆		☆		☆		☆		☆	☆	every 100 Hr	G-26		
16	Tension of air conditioner drive belt	Adjust				☆				☆				☆			☆	every 200 Hr	G-29		
17	Clogging of inner air filter	Clean				☆				☆				☆			☆	every 200 Hr	G-29		
18	Clogging of fresh air filter	Clean				☆				☆				☆			☆	every 200 Hr	G-30		
19	Clogging of air conditioner condenser	Check				☆				☆				☆			☆	every 200 Hr	G-30		
20	Radiator hose and clamp	Check				☆				☆				☆			☆	every 200 Hr	G-28		
		Replace																every 2 years	G-36		
21	Fuel line	Check		☆		☆		☆		☆		☆		☆		☆	☆	every 100 Hr	G-27		@
		Replace																every 2 years	G-36	*3	
22	Intake air line	Check				☆				☆				☆			☆	every 200 Hr	G-27		
		Replace																every 2 years	G-36	*3	
23	Toe-in	Adjust				☆				☆				☆			☆	every 200 Hr	G-28		

No.	Item		Indication on hour meter															After since	Reference page		
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	800				
24	Engine valve clearance	Adjust															☆	every 800 Hr	G-32		
25	Fuel injection nozzle injection pressure	Check																every 1500 Hr	G-32		@
26	Injection pump	Check																every 3000 Hr	G-32		@
27	Exhaust manifold (B3350 only)	Check																every 1 year	G-33		@
28	Air conditioner pipes and hoses	Check																every 1 year	G-33		
		Replace																every 2 years	G-36		
29	CAB isolation cushion	Check																every 1 year	G-33		
30	Differential pressure sensor hose (B3350 only)	Replace																every 2 years	G-36		
31	Cooling system	Flush																every 2 years	G-34		
32	Coolant	Change																every 2 years	G-34		
33	Fuel system	Bleed																Service as required	G-36		
34	Clutch housing water	Drain																	G-37		
35	Fuse	Replace																	G-37		
36	Light bulb	Replace																	G-39		
37	Washer liquid	Check																	G-40		
38	Amount of refrigerant (gas)	Check																	G-40		

■ **IMPORTANT**

- **The jobs indicated by ★ must be done after the first 50 hours of operation.**
  ***1 Air cleaner should be cleaned more often in severe dusty conditions.**
  ***2 Every year of after 6 cleanings.**
  ***3 Replace only if necessary.**
  ***4 When the battery is used for less than 100 hours per year, check the fluid level annually.**
- **The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in the 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.

9Y1210822GEG0005US0

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.**

9Y1210822GEG0006US0

[1] DAILY CHECK

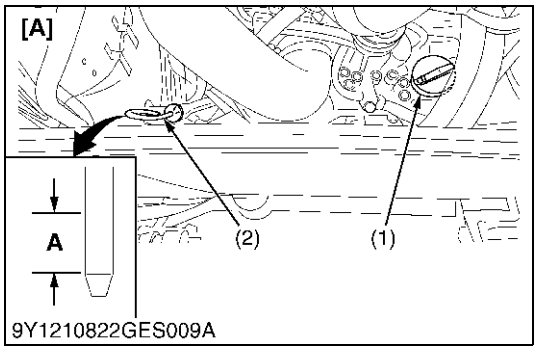
CAUTION
To avoid personal injury:
Take the following precautions when checking the tractor.
- **Park the machine on firm and level ground.**
- **Set the parking brake.**
- **Lower the implement to the ground.**
- **All residual pressure of the hydraulic system released.**
- **Stop the engine and remove the key.**

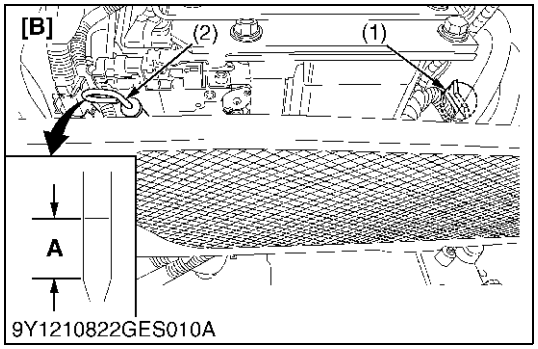
9Y1210822GEG0007US0

Walk Around Inspection

1. Look around and under the tractor for such items as loose bolts, trash build-up, oil or coolant leaks, broken or worn parts.

9Y1210822GEG0008US0





Checking Engine Oil Level

CAUTION
To avoid personal injury:
- **Be sure to stop the engine before checking the oil level.**

1. Park the machine on a flat surface.
2. Check engine oil before starting the engine or 5 minutes or more after the engine has stopped.
3. To check the oil level, draw out the dipstick, wipe it clean, replace it, and draw it out again. Check to see that the oil level lies between the two notches.
   If the level is too low, add new oil to the prescribed level at the oil inlet.

■ **IMPORTANT**
- **When using an oil of different maker or viscosity from the previous one, remove all of the old oil.**
  Never mix two different types of oil.
- **If oil level is low, do not run engine.**

(1) Oil Inlet
(2) Dipstick

A : Oil level is acceptable within this range.
[A] B2650
[B] B3350

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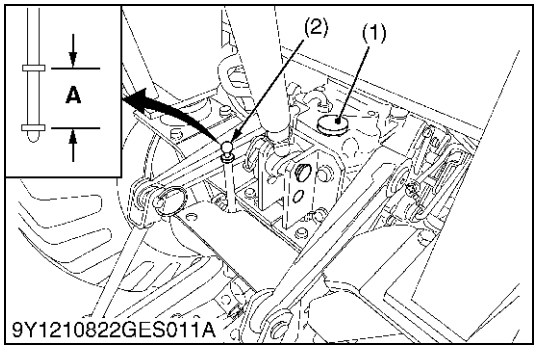


Checking Transmission Fluid Level

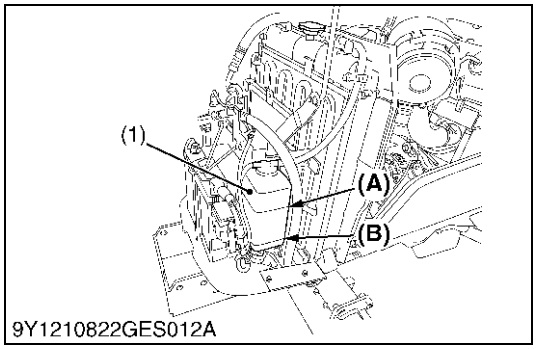
1. Park the machine on a flat surface, lower the implement and shut off engine.
2. To check the oil level, draw out the dipstick, wipe it clean, replace it, and draw it out again. check to see that the oil level lies between the two notches.
   If the level it too low, add new oil to the prescribed level at the oil inlet.

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

(1) Oil Inlet
(2) Dipstick

A : Oil level is acceptable within this range.

9Y1210822GEG0010US0



Checking Coolant Level

CAUTION

To avoid personal injury:

- **Do not remove radiator cap while coolant is hot. When cool, slowly rotate cap to the first stop and allow sufficient time for excess pressure to escape before removing the cap completely.**

1. Check to see that the coolant level is between the "FULL" and "LOW" makes of recovery tank.
2. When the coolant level drops due to evaporation, add soft water only up to the full level.
   In case of leakage, add anti-freeze and soft water in the specified mixing ratio up to the full level.

IMPORTANT

- **If the radiator cap has to be removed, follow the caution above and securely retighten the cap.**
- **Use clean, fresh soft water and anti-freeze to fill the recovery tank.**

(1) Recovery Tank
(A) "FULL"
(B) "LOW"

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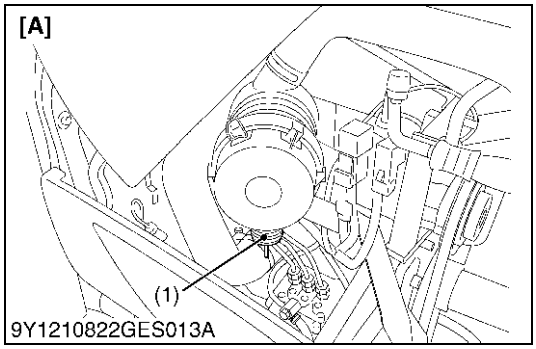
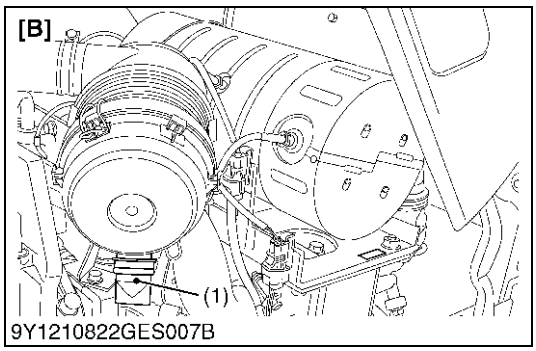


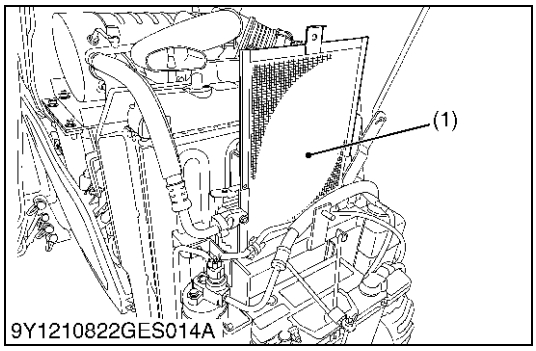


Cleaning Evacuator Valve

1. Open the evacuator valve to get rid of large particles of dust and dirt.

(1) Evacuator Valve
[A] B2650
[B] B3350

9Y1210822GEG0012US0



Cleaning Air Conditioner Condenser Screen

CAUTION

To avoid personal injury:

- **Be sure to stop the engine before removing the screen.**

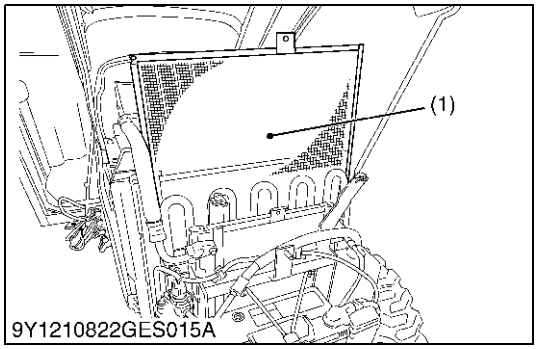
1. Detach the air conditioner condenser screen and remove all foreign materials.

IMPORTANT

- **Grill and screen must be clean from debris to prevent engine from overheating and to allow good air intake for air cleaner.**

(1) Air Conditioner Condenser Screen

9Y1210822GEG0013US0



Cleaning Grill and Radiator Screen

CAUTION

To avoid personal injury:

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

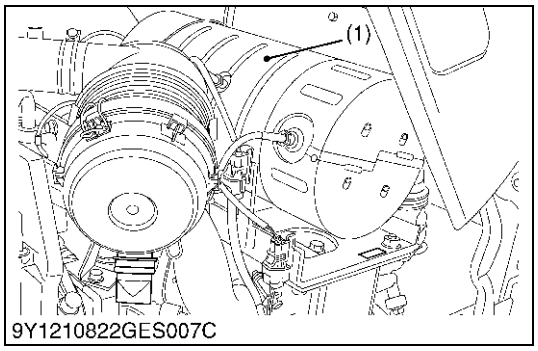
1. Check front grill and side screens to be sure they are clean of debris.
2. Detach the screen and remove all foreign material and clean the front of radiator completely.

IMPORTANT

- **Grill and screen must be clean from debris to prevent engine from overheating and to allow good air intake for the air cleaner.**

(1) Radiator Screen **(A) "DETACH"**

9Y1210822GEG0014US0



Checking DPF Muffler (M3350 Only)

CAUTION

To avoid personal injury:

- **Before checking or cleaning the DPF muffler, stop the engine and wait long enough until it is cooled down.**

1. Check the DPF muffler and its surroundings for build-up of anything flammable. Otherwise a fire may result.

(1) DPF Muffler

9Y1210822GEG0015US0

Checking Brake Pedal

1. Inspect the brake pedals for free travel, and smooth operation.
2. Adjust if incorrect measurement is found.

9Y1210822GEG0016US0

Checking Gauges, Meter and Easy Checker™

1. Inspect the instrument panel for broken gauge(s), meter(s) and Easy Checker™.
2. Replace if broken.

9Y1210822GEG0017US0

Checking Head Light, Hazard Light etc.

1. Inspect the light for broken bulbs and lenses.
2. Replace if broken.

9Y1210822GEG0018US0

Checking Seat Belt

1. Always check condition of seat belt attaching hardware before operating tractor.
2. Replace if damaged.

9Y1210822GEG0019US0

Checking and Cleaning of Electrical Wiring and Battery Cables

CAUTION

To avoid personal injury:

- **A loosened terminal or connector, or damaged wire may affect the performance of electrical components or cause short circuits. Leakage of electricity could result in a fire hazard, a dead battery or damage to electrical components.**
- **Replace damaged wires or connections promptly.**
- **If a fuse blows soon after replacement, DO NOT USE A LARGER THAN RECOMMENDED FUSE OR BYPASS THE FUSE SYSTEM.**
- **Many wiring connections are protected by waterproof plugs, plug and unplug these connections carefully and make sure thy are sealed correctly after assembly.**
- **Accumulation of dust, chaff and spilled fuel deposits around the battery, electrical wiring, engine or exhaust system are fire hazards.**
  CLEAN THESE AREAS BEFORE STARTING WORK.
  To avoid premature electrical malfunctions DO NOT APPLY high pressure water directly to battery, wiring, connectors, electrical components or instrument panel.

Inspect the following regularly:

1. Check wiring for chafed or cracked insulation.
2. Check wiring harness clamps. Replace if necessary.
3. Check connectors and terminals for looseness, contamination or overheated (discolored) connectors.
4. Check instrument panel for correct operation of switches and gauges.

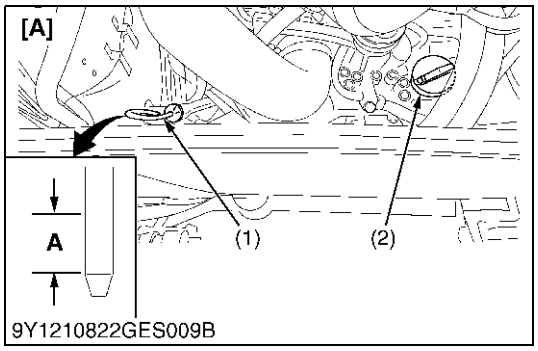
9Y1210822GEG0020US0

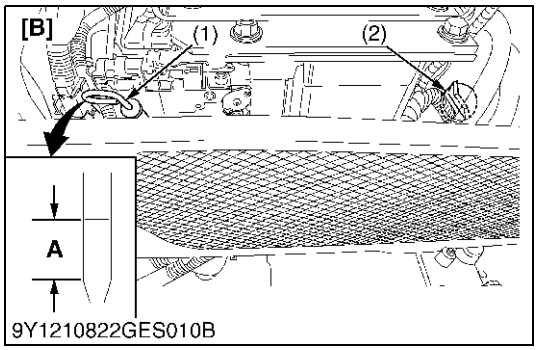
Checking Movable Parts

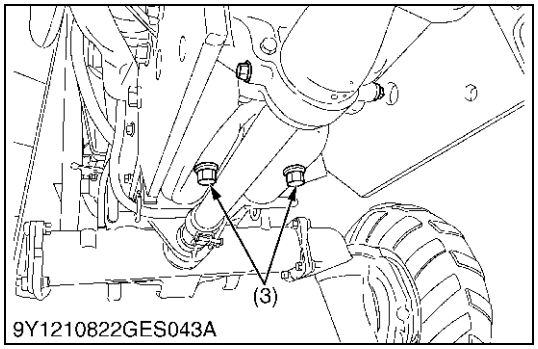
1. If any of the movable parts, such as levers and pedals, is not smoothly moved because of rust or anything sticky, do not attempt to force it into motion.
   In the above case, remove the rust or sticky thing, and apply oil lor grease on the relevant spot.
   Otherwise, the machine may get damaged.

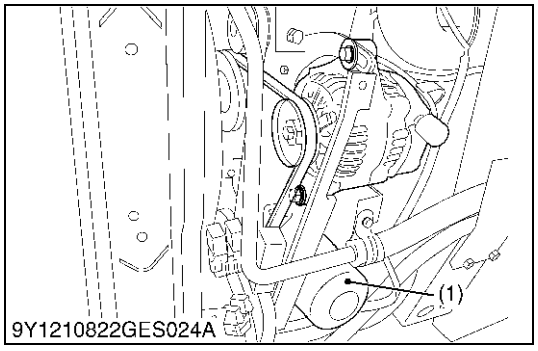
9Y1210822GEG0021US0

[2] CHECK POINTS OF INITIAL 50 HOURS









Changing Engine Oil

CAUTION

To avoid personal injury:

- **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 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.
3. Fill with the new oil up to the upper notch on the dipstick.

IMPORTANT

- **Use DPF-compatible oil (CJ-4) for the engine.**

Engine oil	Capacity	B2650	4.0 L 4.2 U.S.qts 3.6 Imp.qts
		B3350	4.8 L 5.1 U.S.qts 4.2 Imp.qts

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

A : Oil level is acceptable within this range.
[A] B2650
[B] B3350

9Y1210822GEG0022US0

Replacing Engine Oil Filter

CAUTION

To avoid personal injury:

- **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.**

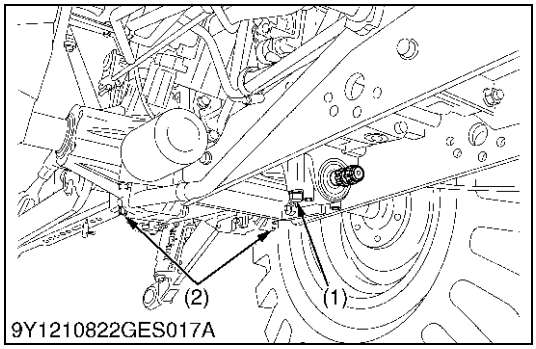
1. Remove the oil filter.
2. Put a film of clean engine oil on the rubber seal of the new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand and additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases a little.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

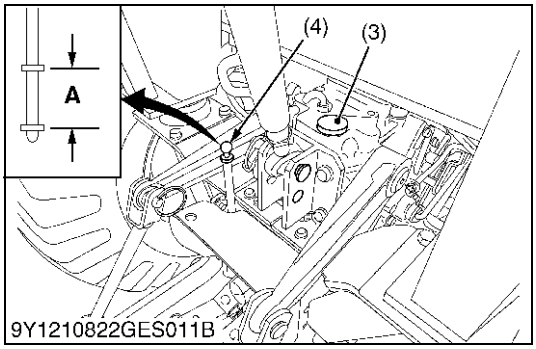
IMPORTANT

- **To prevent serious damage to the engine, use only a KUBOTA genuine filter.**

(1) Engine Oil Filter

9Y1210822GEG0023US0





Changing Transmission Fluid

CAUTION

To avoid personal injury:

- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

1. To drain the used oil, remove the drain plug at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plug.
3. Fill with new KUBOTA SUPER UDT fluid up to the upper notch the dipstick.
4. After running the engine for a few minutes, stop it and check the oil level again; add oil to prescribed level.
5. Properly dispose of used oil.

Oil capacity	15 L 4.0 U.S.gals 3.3 Imp.gals

IMPORTANT

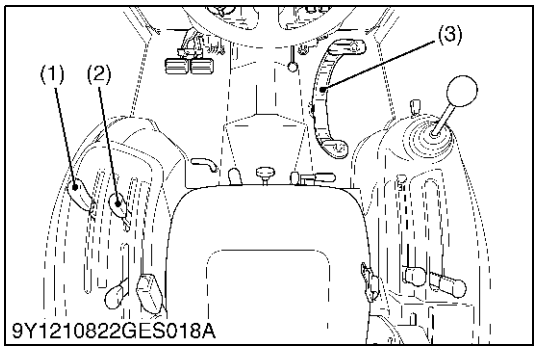
- **If the 3-point hitch can not raised by setting the hydraulic control lever to the UP position after long term storage or when changing the transmission oil, turn steering wheel to the right and left several times to bleed air from the system.**
- **Do not operate the tractor immediately after changing the transmission fluid.**

(1) Drain Plug
(2) Drain Plug (Both Sides)
(3) Oil Inlet
(4) Dipstick

A : Oil level is acceptable within this range.

9Y1210822GEG0024US0

[3] CHECK POINTS OF EVERY 50 HOURS



Checking Engine Start System

CAUTION

To avoid personal injury:

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

■ **Preparation before testing.**

1. Sit on operator's seat.
2. Set the parking brake and stop the engine.
3. Shift the range gear shift lever to **"NEUTRAL"** position.
4. Place the speed control pedal in **"NEUTRAL"** position.
5. Shift the PTO clutch lever to **"OFF"** position.

■ **Test : Switch for the speed control pedal.**

1. Depress the speed control pedal.
2. Turn the key to **"START"** position.
3. The engine must not crank.
4. If it cranks, check or replace the speed control pedal switch.

■ **Test : Switch for the PTO clutch lever**

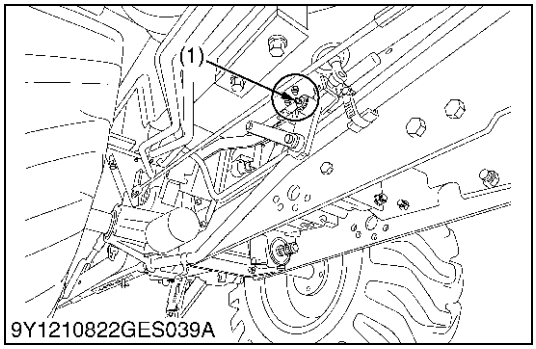
1. Place the speed control pedal in **"NEUTRAL"** position.
2. Shift the PTO clutch lever to **"ON"** position.
3. Turn the key to **"START"** position.
4. The engine must not crank.
5. If it cranks, check or replace the PTO clutch lever switch.

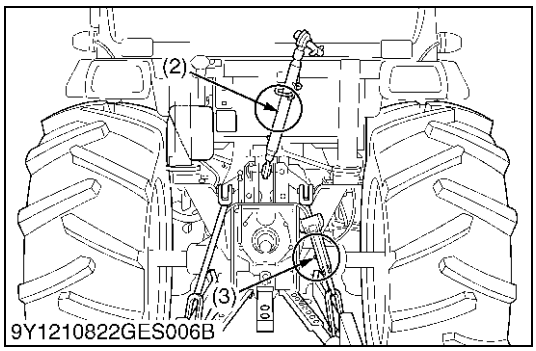
■ **Test : Switches for the operator's seat and the PTO clutch lever.**

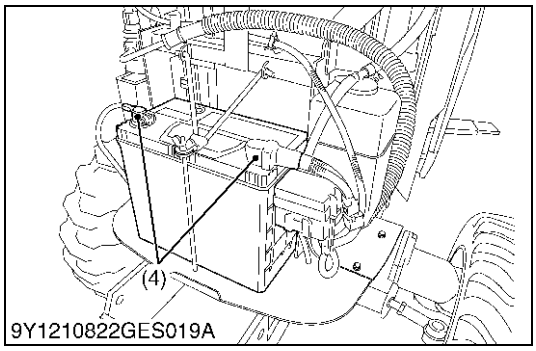
1. Sit on the operator's seat.
2. Start the engine.
3. Engage the PTO clutch lever.
4. Stand up. (Do not get off the machine.)
5. The engine must shut off after approximately 1 second.
6. If it does not stop, check or replace the operator's seat switch and PTO clutch lever switch.

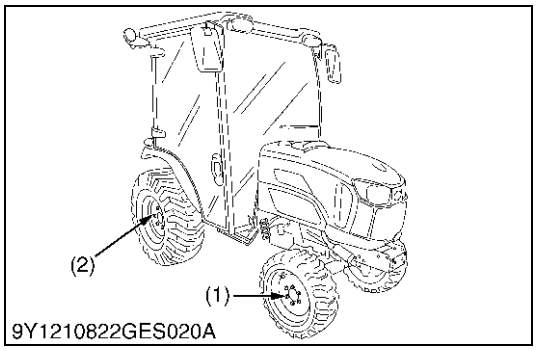
(1) Range Gear Shift Lever (**L**-**M**-**H**)
(2) PTO Clutch Lever
(3) Speed Control Pedal

9Y1210822GEG0025US0









Greasing

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

(1) Grease Fitting (HST Pedal)
(2) Grease Fitting (Top Link)
(3) Grease Fitting (Lifting Rod R.H.)
(4) Battery Terminal

9Y1210822GEG0026US0

Checking Wheel Mounting Nuts Tightening Torque

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

1. Check wheels nuts regularly especially when new. If there are loosened, tighten as follows.

Tightening torque	Front wheel mounting nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
	Rear wheel mounting nut	167 to 191 N·m 17.0 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting bolt	200 to 220 N·m 20 to 23 kgf·m 150 to 160 lbf·ft

(1) Front Wheel Mounting Nut
(2) Rear Wheel Mounting Nut

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[4] CHECK POINTS OF EVERY 100 HOURS

Changing Engine Oil

• See page G-19.

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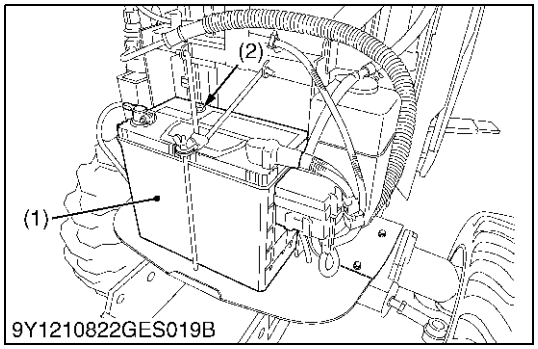

Checking Battery Condition

DANGER

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

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

CAUTION

To avoid personal injury

- **Never remove the vent caps 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 the battery.**

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, but needs some servicing.
3. If the battery is weak, the engine will be difficult to start and the lights will be dim. It is important to check the battery periodically.

■ **How to read the indicator**

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

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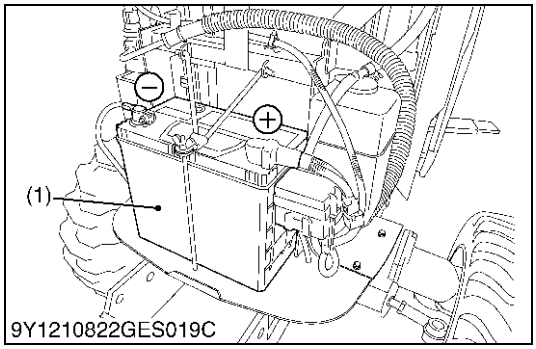

Battery Charging

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, remove battery vent plugs.**
- **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 1.

Table 1

Battery Type	Volt (V)	Capacity at 5 H.R.	Reserve at (min.)	Cold Cranking Amps	Normal Charging Rate (A)
55B24L (S)-MF	12	36	80	430	4.5

■ Direction for Storage

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

(1) Battery

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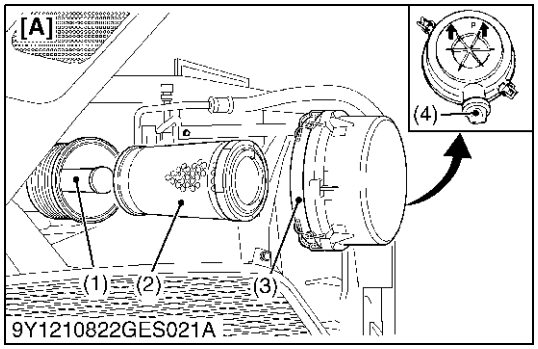

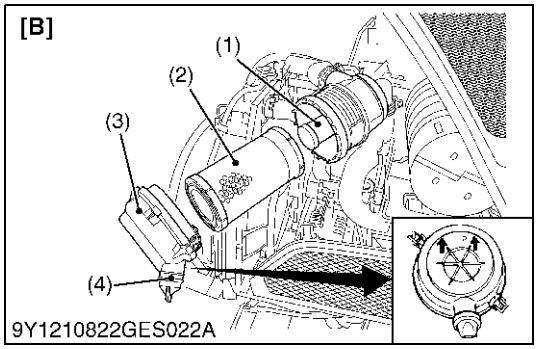

Cleaning Air Cleaner Element

1. Remove the air cleaner cover (3) and primary element (2).
2. Clean the primary element if:
   - When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 210 kPa (2.1 kgf/cm^2, 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 (2).
   Once yearly of after every sixth cleaning, whichever comes first.

■ **NOTE**
- **Check to see if the evacuator valve (4) 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 (4) 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
(2) Primary Element
(3) Air Cleaner Cover
(4) Evacuator Valve

[A] B2650
[B] B3350

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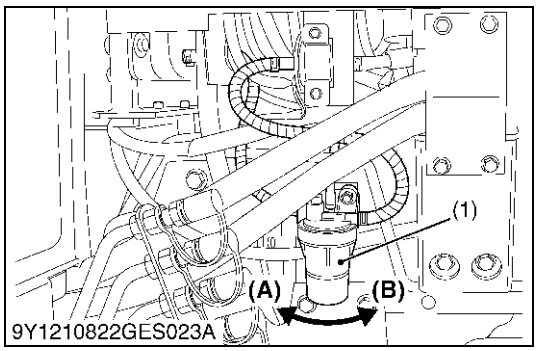

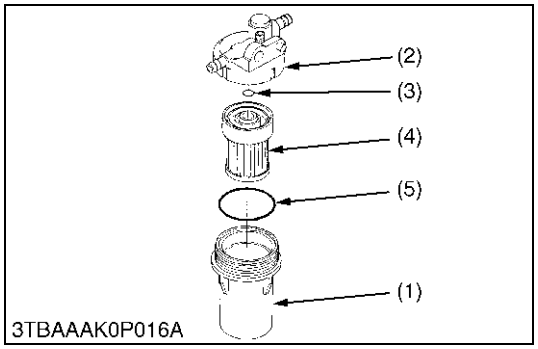

Cleaning Fuel Filter

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

1. Loosen and remove the fuel filter bowl (1), and rinse the inside with kerosene.
2. Take out the filter element (4) 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.

■ **NOTE**
- **When the fuel filter bowl has been removed, fuel stops flowing from the fuel tank. If the fuel tank is almost full, however, the fuel will flow back from the fuel return pipe to the fuel filter. Before the above checking, make sure the fuel tank is less than half-full.**

■ **IMPORTANT**
- **If dust, dirt or water 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 and element periodically.**

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

(A) Loosen
(B) Tighten

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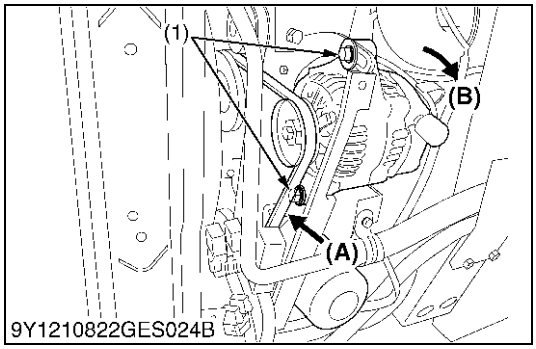

Adjusting Fan Belt Tension

CAUTION

- **Be sure to stop 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 in incorrect, loosen the alternator mounting bolts 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.

Fan belt tension	Factory specification	A deflection of between 7.0 to 9.0 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span.

(1) Bolt

(A) Check the belt tension
(B) To Tighten

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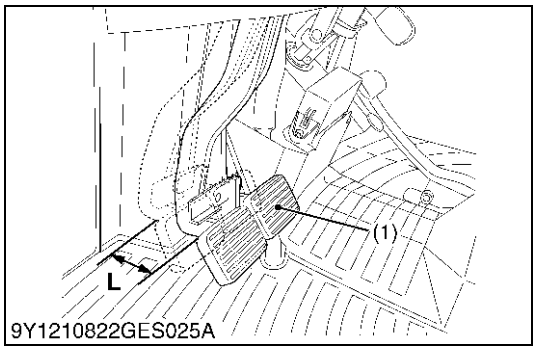

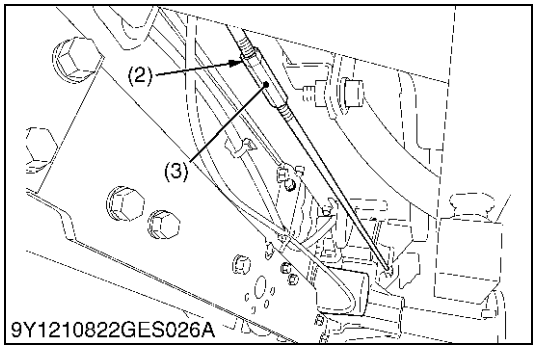

Adjusting Brake Pedal Free Travel

CAUTION

- **Stop the engine and chock the wheels before checking brake pedal.**
- **The difference between the right and left pedal free travel must be less than 5.0 mm (0.20 in.).**

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut and turn the turnbuckle to adjust the brake rod length.
4. Retighten the lock nut securely.
5. Keep the free travel in the right and left brake pedals equal.

Brake pedal free travel (**L**)	Factory specification	30 to 40 mm 1.2 to 1.5 in.

(1) Brake Pedal
(2) Lock Nut
(3) Turnbuckle

L: Free Travel

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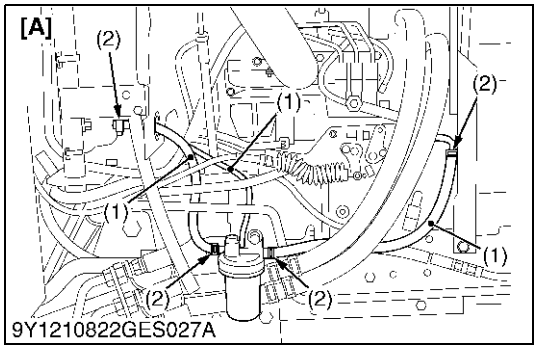

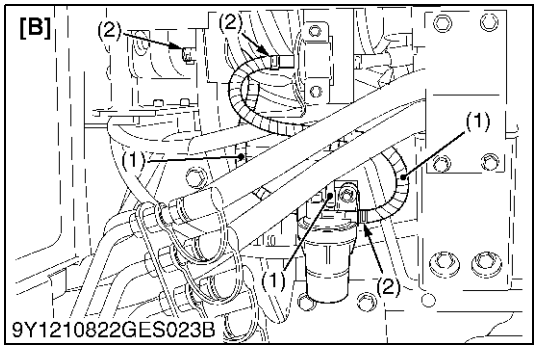

Checking Fuel Line

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

■ **NOTE**

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

(1) Fuel Hoses **[A] B2650**
(2) Hose Clamps **[B] B3350**

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[5] CHECK POINTS OF EVERY 200 HOURS

Replacing Engine Oil Filter

- See page G-19.

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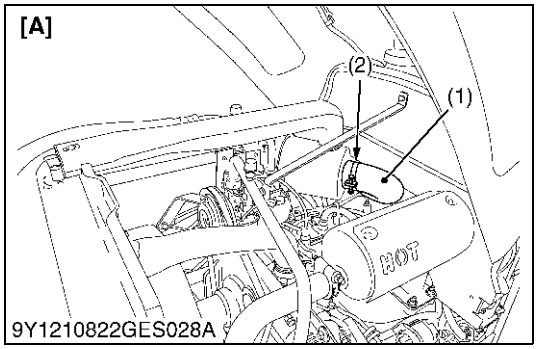

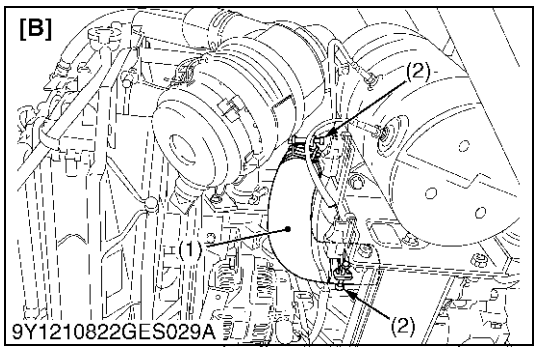

Checking Intake Air Line

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 Clamp **[A] B2650**
(2) Hose **[B] B3350**

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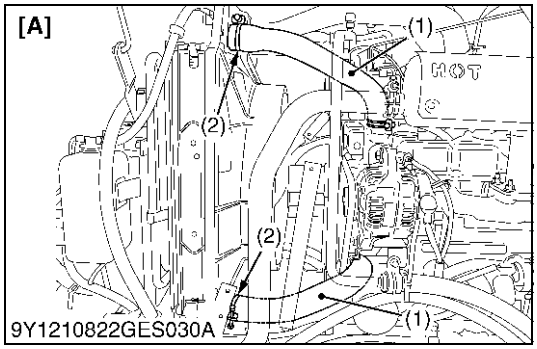

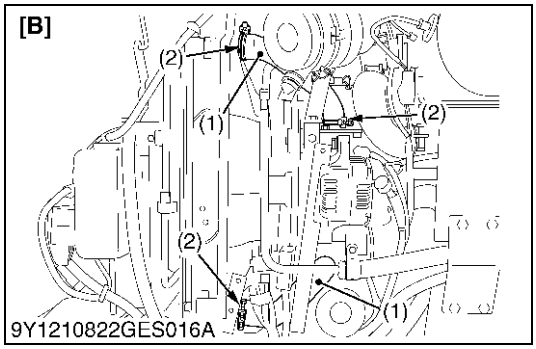

Checking Radiator Hose and Hose Clamp

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

1. If hose clamps are loose or water leaks, tighten bands securely.
2. Replace hoses and tighten hose clamps securely, if radiator hoses 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 on danger such as burn, get rid of the causes of overheating according to the manual, see "Troubleshooting" section, and then, start again the engine.

(1) Radiator Hose
(2) Clamp
[A] B2650
[B] B3350

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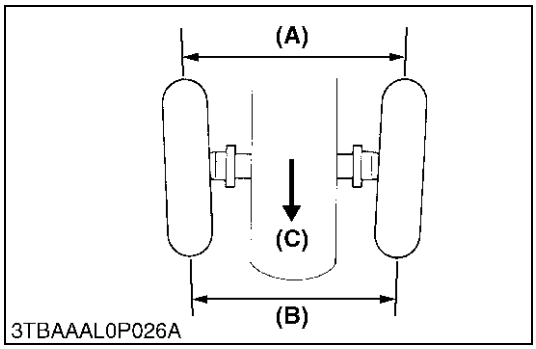

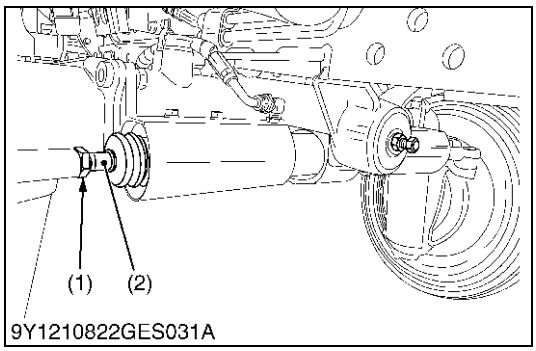

Adjusting Toe-in

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 0 to 10 mm (0 to 3/8 in.) less than rear distance. If not, adjust tie-rod length.

■ Adjusting procedures

1. Loosen the tie-rod nut.
2. Turn the tie-rod to adjust the rod length until the proper toe-in measurement is obtained.
3. Retighten the tie-rod nut.

(1) Tie-rod Nut
(2) Tie-rod
(A) Wheel-to-wheel distance at rear
(B) Wheel-to-wheel distance at front
(C) "FRONT"

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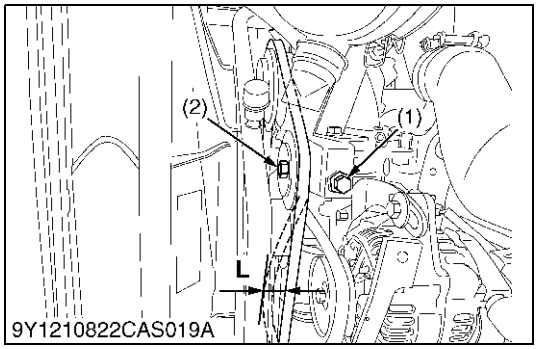

Adjusting Air Conditioner Belt Tension

CAUTION

- **Be sure to stop the engine before checking air conditioner belt tension.**

1. Stop the engine and remove the key.
2. Apply 98 N (10 kgf, 22 lbf) pressure to the belt between the pulleys.
3. If tension is incorrect, loosen the tension pulley mounting nut (2) and turn the adjusting bolt (1) to adjust the bolt tension within acceptable limit.
4. If belt is damaged, replace it.

Air conditioner belt tension	Factory specification	A deflection of between 10 to 12 mm (0.39 to 0.47 in.) when the belt is pressed in the middle of the span

(1) Adjusting Bolt
(2) Nut
L: Deflection

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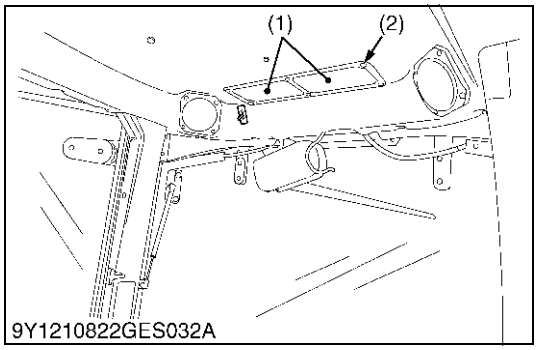
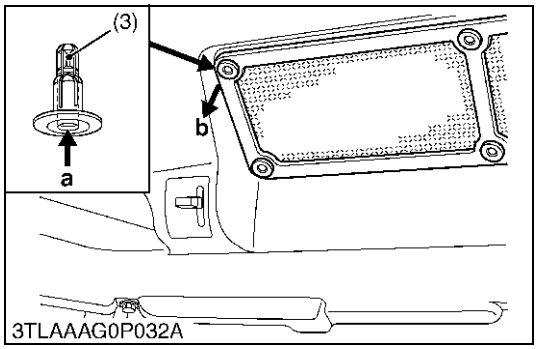


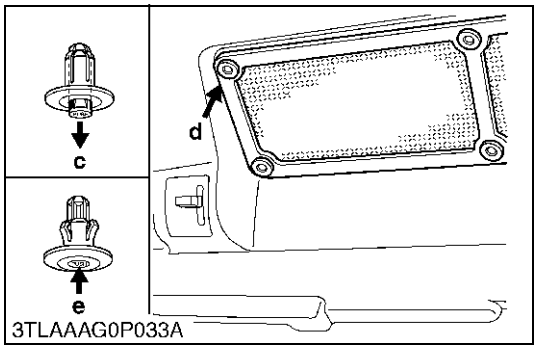
Cleaning Inner Air Filter

1. Press the inner air filter (1) in the arrow-marked directions to unlock it and remove the inner air filter (1), and blow air from the direction opposite to the filter's normal air flow.
2. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).

(Reference)

- Detach and attach the push-rivet (2) as follows.
  - Detaching procedure **(A)**
    Push in the center rivet (**a**) and pull out the push-rivet assembly (**b**).
  - Attaching procedure **(B)**
    Pull out the center rivet (**c**), attach the push-rivet assembly (**d**) and push up the center-rivet (**e**).





(1) Inner Air Filter
(2) Push-rivet
(3) Center-rivet

a: Push in center-rivet
b: Pull out push-rivet assembly
c: Pull out center-rivet
d: Attach push-rivet assembly
e: Push up center-rivet

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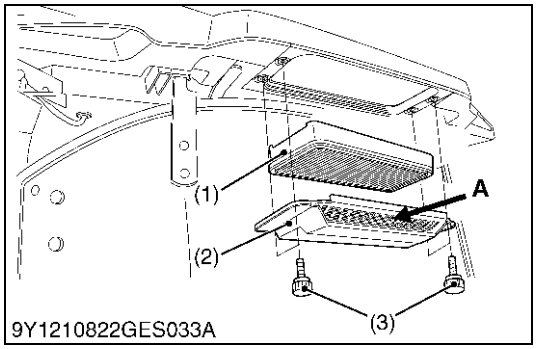

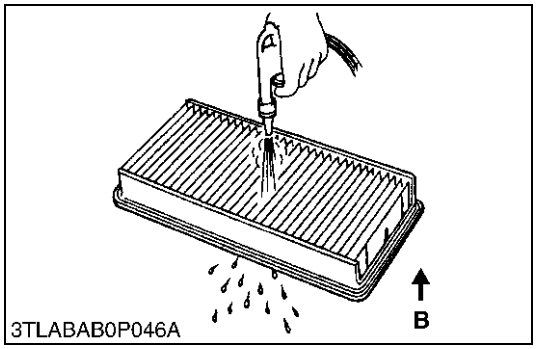

Cleaning Air Filter

■ **Fresh Air Filter**

1. Remove the knob bolts (3) and pull out the fresh air filter (1).
2. Blow air from the opposite direction to the filter's normal air flow. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).

■ **NOTE**

- **If the filter is very dirty:**
  Dip the filter in lukewarm water with mild dish washing detergent.
  Move it up and down as well as left and right to loosen dirt.
  Rinse the filter with clean water and let it air-dry.

■ **IMPORTANT**

- **Do not use gasoline, thinner or similar chemicals to clean the filter as damage to the filter may occur.**
- **If may also cause an unpleasant odor in the CABIN when the system is used next.**
- **Do not hit the filter. If the filter becomes deformed, dust may enter into the air-conditioner, which may cause damage and malfunction.**

(1) Fresh Air Filter
(2) Cover
(3) Knob Bolt

A: Air Inlet Port
B: Air Conditioner Air Flow

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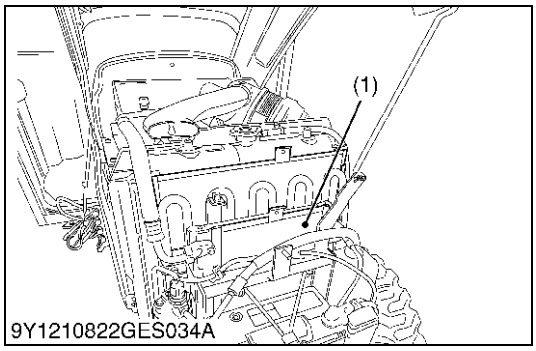

Checking Air Conditioner Condenser

1. Check the air conditioner condenser (1) to be sure that it is clean of debris.

(1) Air Conditioner Condenser

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[6] CHECK POINTS OF EVERY 300 HOURS

Changing Transmission Fluid

- See page G-20.

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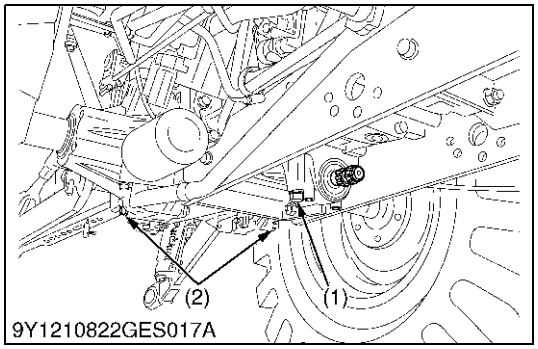
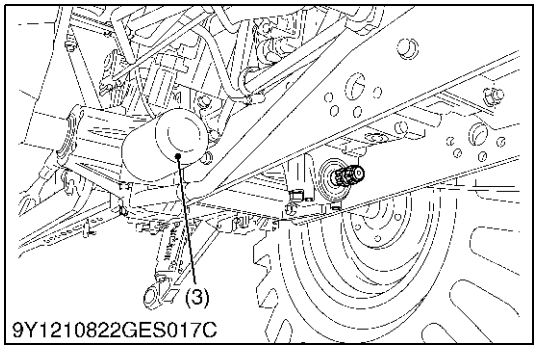
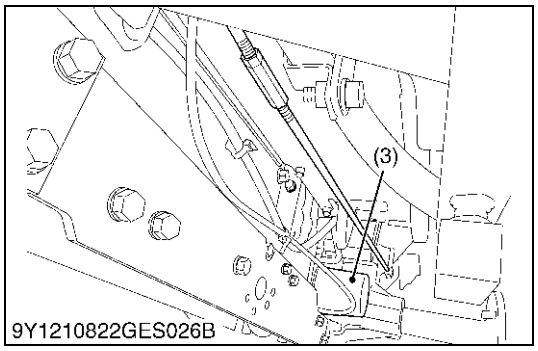
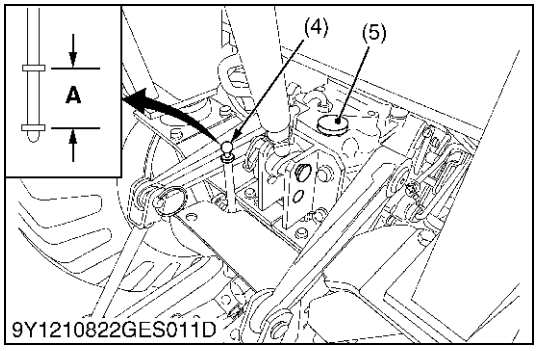








Replacing Transmission Oil Filter

CAUTION

To avoid personal injury:

- **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 plugs at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs.
3. Remove the oil filter.
4. Put a film of clean transmission oil on the rubber seal of the new filter.
5. Quickly tighten the filter until it contacts the mounting surface, then tighten it by hand an additional 1/2 turn only.
6. After the new filters have been replaced, fill the transmission oil up to the upper notch on the dipstick.
7. After running the engine for a few minutes, stop the engine and check the oil level again, add oil to the prescribed level.
8. Make sure that the transmission fluid does not leak past the seal on the filter.

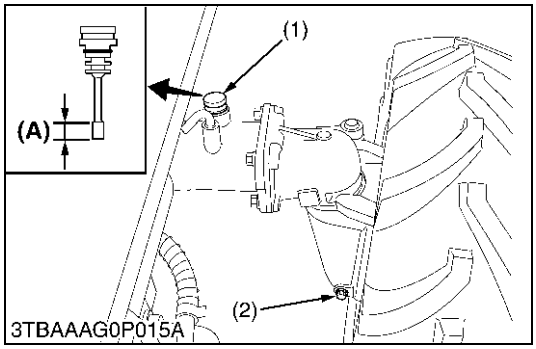
IMPORTANT

- **To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.**

(1) Drain Plug
(2) Drain Plug (Both Sides)
(3) Transmission Oil Filter
(4) Oil Inlet
(5) Dipstick

A : Oil level is acceptable within this range.

9Y1210822GEG0045US0



Changing Front Axle Case Oil

1. Park the tractor on a firm, flat and level surface.
2. To drain the used oil, remove the right and left drain plugs and filling plug at the front axle case and drain the oil completely into the oil pan.
3. After draining, reinstall the drain plugs.
4. Fill with new oil up to the upper notch on the dipstick. Refer to G-9.

■ **IMPORTANT**

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

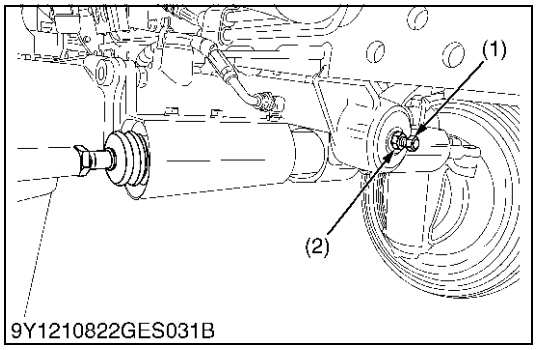
5. After filling, reinstall the filling plug.
6. Properly dispose of used oil.

Front axle case oil	Capacity	4.7 L 5.0 U.S.qts 4.1 Imp.qts

(1) Filling Plug with Dipstick
(2) Drain Plug
(A) Oil level is acceptable within this range.

9Y1210822GEG0046US0

[7] CHECK POINTS OF EVERY 400 HOURS



Adjusting Front Axle Pivot

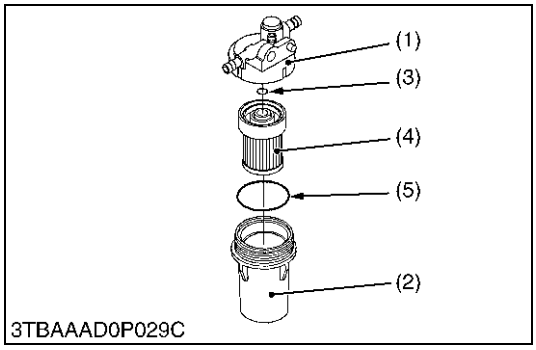
1. If the front axle pivot pin adjustment is not correct, front wheel vibration can occur causing vibration in the steering wheel.

■ **Adjusting procedure**

1. Loosen the lock nut, and tighten the adjusting screw so that the oscillating load is 50 to 100 N (5.1 to 10.2 kgf, 11.2 to 22.5 lbf). (If the adjusting screw is tightened, loosened and retightened, apply liquid gasket to its tip.)
2. Retighten the lock nut.

(1) Adjusting Screw
(2) Lock Nut

9Y1210822GEG0047US0



Replacing Fuel Filter Element

1. The fuel filter element should be replaced every 400 hours. See page G-25.

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

9Y1210822GEG0048US0

[8] CHECK POINT OF EVERY 800 HOURS

Adjusting Engine Valve Clearance

- See page 1-S13.

9Y1210822GEG0049US0

[9] CHECK POINT OF EVERY 1500 HOURS

Checking Fuel Injection Nozzle Injection Pressure

- See page 1-S19.

9Y1210822GEG0050US0

[10] CHECK POINT OF EVERY 3000 HOURS

Checking Injection Pump

- See page 1-S18.

9Y1210822GEG0051US0

[11] CHECK POINTS OF EVERY 1 YEAR

Replacing Air Cleaner Primary Element and Secondary Element

- See page G-25.

■ **IMPORTANT**

- **To prevent serious damage to the engine, use only a KUBOTA genuine filter.**

9Y1210822GEG0052US0

Checking the Air Conditioner Pipe and Hose

1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn, replace it.

9Y1210822GEG0053US0

Checking the CAB Isolation Cushion

1. Check the cushion for any breakage or fatigue. Replace them if they have deteriorated.

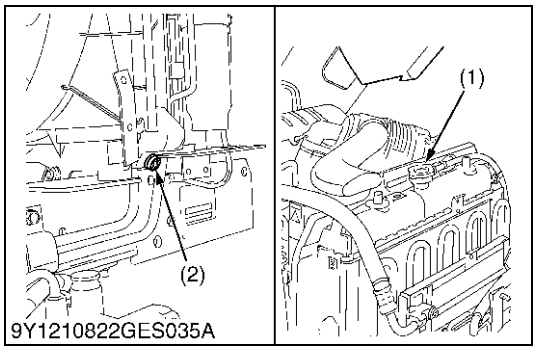
9Y1210822GEG0054US0

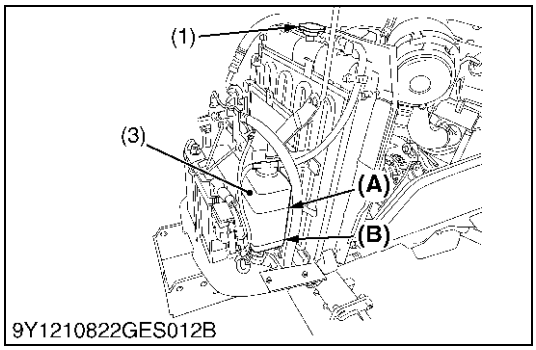
Checking Exhaust Manifold

- See page 1-S20.

9Y1210822GEG0097US0

[12] CHECK POINTS OF EVERY 2 YEARS





Flushing Cooling System and Changing Coolant

CAUTION

- **Do not remove the radiator cap while coolant is hot. When cool, slowly rotate cap to the first stop and allow sufficient time for excess pressure to escape before removing the cap completely.**

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

IMPORTANT

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

Coolant capacity (with recover tank)	4.3 L 4.5 U.S.qts 3.8 Imp.qts

(1) Radiator Cap
(2) Drain Plug
(3) Recovery Tank

A: FULL
B: LOW

(To be continued)

(Continued)

■ **Anti-Freeze**

CAUTION

- **When using antifreeze, put on some protection such as rubber gloves (Antifreeze contains position.).**
- **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 type of antifreeze.**
  The mixture can produce chemical reaction causing harmful substances.
- **Antifreeze is extremely flammable and explosive under certain conditions. Keep fire and children away from antifreeze.**
- **When draining fluids from the engine, place some container underneath the engine body.**
- **Do not pour waste onto the grounds, down a drain, or into any water source.**
- **Also, observe the relevant environmental protection regulations when disposing of antifreeze.**

If it freezes, coolant can damage the cylinders and radiator. If the ambient temperature falls below 0 °C (32 °F) or before a long-term storage, let out cooling water completely, or mix fresh water with long-life coolant and fill the radiator and reserve tank with the mixture.

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

■ **IMPORTANT**

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

Vol % Anti-freeze	Freezing Point		Boiling Point*	
	°C	°F	°C	°F
40	−24	−11	106	223
50	−37	−35	108	226

*At 1.013 × 10^5 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
   - Add only water if the mixture reduces in amount by evaporation.
   - If there is a mixture leak, add the LLC of the same manufacture and type in the same mixture percentage.
     *Never add any long-life coolant of different manufacture. (Different brands may have different additive components, and the engine may fail to perform as specified.
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 data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.**
- **When the coolant level drops due to evaporation, add water only to keep the antifreeze mixing ratio less than 50 %. In case of leakage, add antifreeze and water in the specified mixing ratio before filling in to the radiator.**

9Y1210822GEG0055US0

Replacing Radiator Hoses (Water Pipes)

- See page G-28.

9Y1210822GEG0056US0

Replacing Fuel Hoses

- See page G-27.

9Y1210822GEG0057US0

Replacing Intake Air Hoses

- See page G-27.

9Y1210822GEG0058US0

Replacing Differential Pressure Sensor Hose

- See page 8-S28.

9Y1210822GEG0059US0

Replacing Air Conditioner Hose

- See page 9-S40.

9Y1210822GEG0060US0

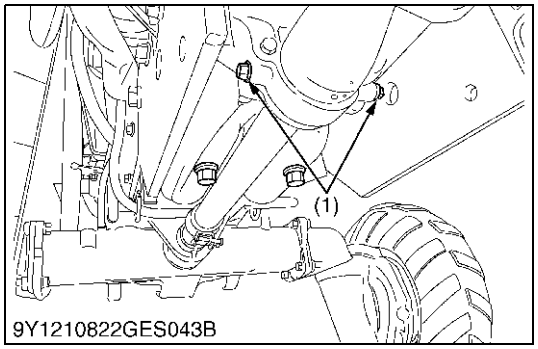
[13] OTHERS

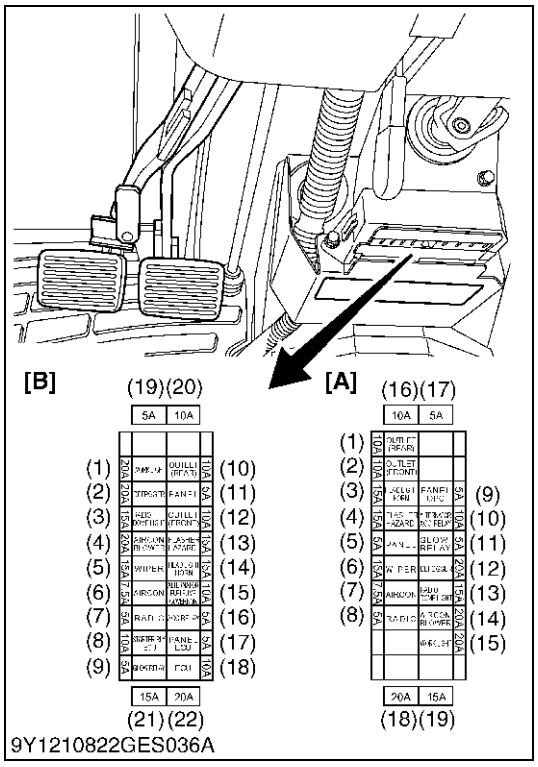
Bleeding Fuel System

Air must be removed:
1. When the fuel filter or lines are removed.
2. When the 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. Start the engine and run for about 30 seconds, and then stop the engine.

9Y1210822GEG0061US0





Draining Clutch Housing Water

■ **NOTE**

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

1. Remove the drain plug and drain the water, then install the plug again.

(1) Water Drain Plug

9Y1210822GEG0062US0

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.**

[B2650]

Fuse No.	Capacity (A)	Protected circuit
(1)	10	Outlet (Rear)
(2)	10	Outlet (Front)
(3)	15	Head Light / Horn
(4)	15	Flasher / Hazard
(5)	5	Panel
(6)	15	Wiper
(7)	7.5	Aircon
(8)	5	Radio
(9)	5	Panel / OPC
(10)	10	Alternator / ACC Relay
(11)	5	Glow Relay
(12)	20	Defogger
(13)	15	Radio / Dome Light
(14)	20	Aircon Blower
(15)	20	Work Light
(16)	10	Spare Fuse
(17)	5	Spare Fuse
(18)	20	Spare Fuse
(19)	15	Spare Fuse
(25)	Slow blow fuse	Check circuit against wrong battery connection

[A] B2650 **[B] B3350**

(To be continued)

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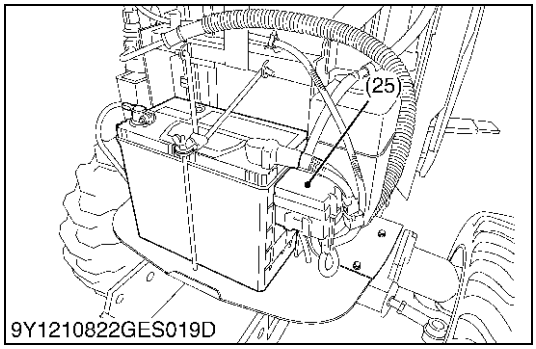

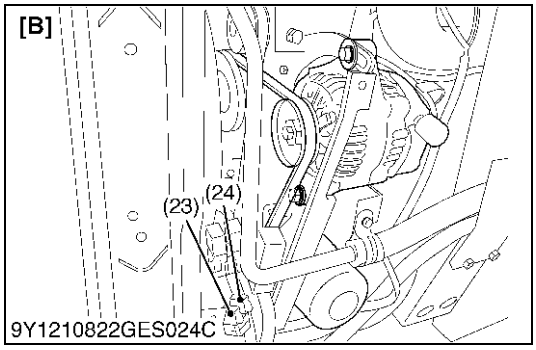

[B3350]

Fuse No.	Capacity (A)	Protected circuit
(1)	20	Work Light
(2)	20	Defogger
(3)	15	Radio / Dome Light
(4)	20	Aircon Blower
(5)	15	Wiper
(6)	7.5	Aircon
(7)	5	Radio
(8)	5	Starter Relay / ECU
(9)	5	Glow Relay
(10)	10	Outlet (Rear)
(11)	5	Panel
(12)	10	Outlet (Front)
(13)	15	Flasher / Hazard
(14)	15	Head Light / Horn
(15)	10	Alternator / Fuel Pump / Governor
(16)	5	ACC Relay
(17)	5	Panel / ECU
(18)	10	ECU
(19)	5	Spare Fuse
(20)	10	Spare Fuse
(21)	15	Spare Fuse
(22)	20	Spare Fuse
(23)	30	Starter Relay
(24)	15	Reforming Glow
(25)	Slow blow fuse	Check circuit against wrong battery connection

[B] B3350

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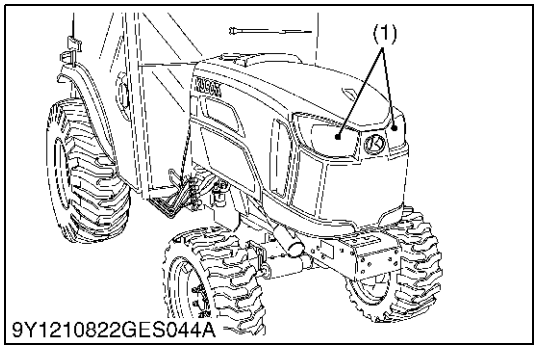

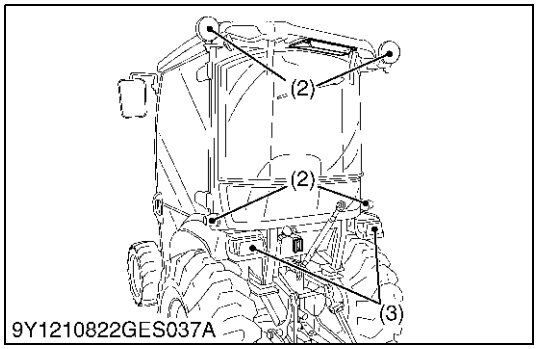

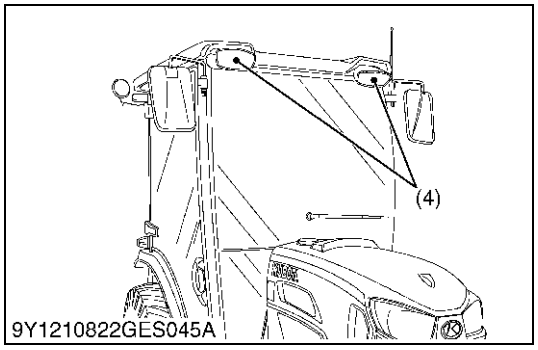

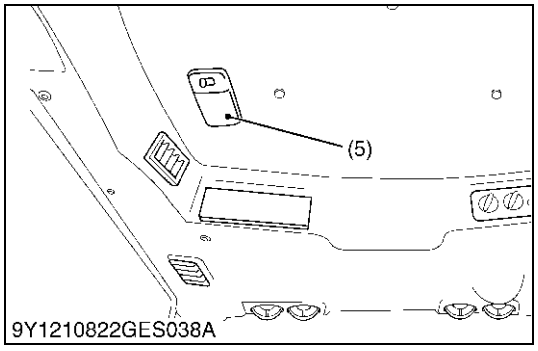

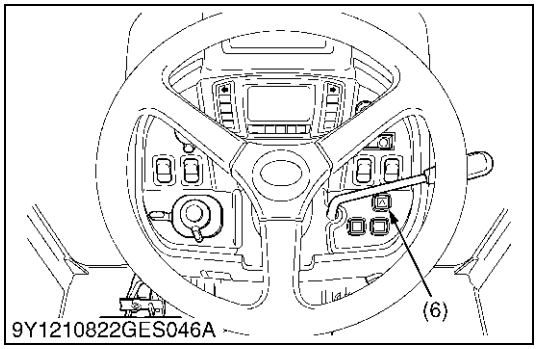

Replacing Light Bulb

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	23 W
Tail light	8 W
Turn signal / Hazard light	20 W and 32 CP
Front work light	35 W
Dome light (Room lamp)	5 W

(1) Head Light
(2) Turn Signal and Hazard Light (23W)
(3) Tail Lamp
(4) Front Work Light
(5) Dome Light
(6) Hazard Light Switch

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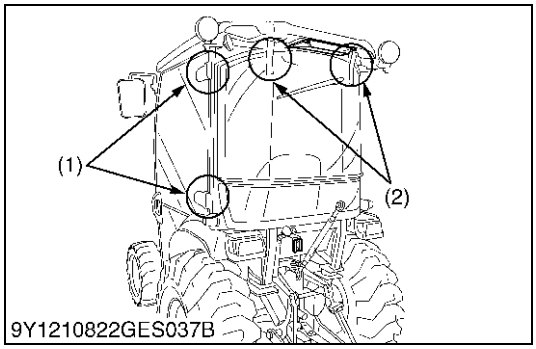

Lubricating Points

1. Lubricate the door hinges (1) and the rear window hinges (2) with a proper amount of grease.

(1) Door Hinge
(2) Rear Window Hinge

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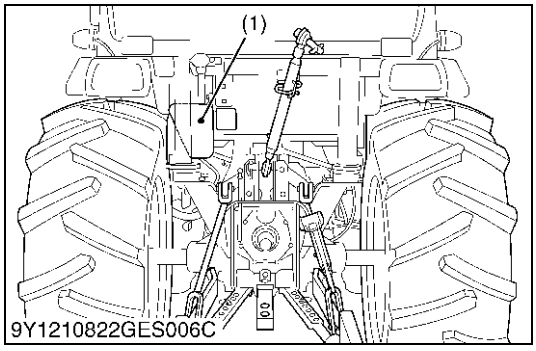


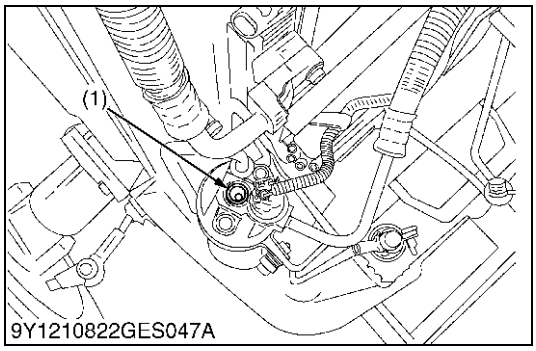
Adding Washer Liquid

1. Add a proper amount of automobile washer liquid.

Washer liquid tank	Capacity	1.5 L 0.40 U.S.gals 0.33 Imp.gals

(1) Washer Liquid Tank

9Y1210822GEG0066US0



Checking Amount of Refrigerant (Gas)

WARNING

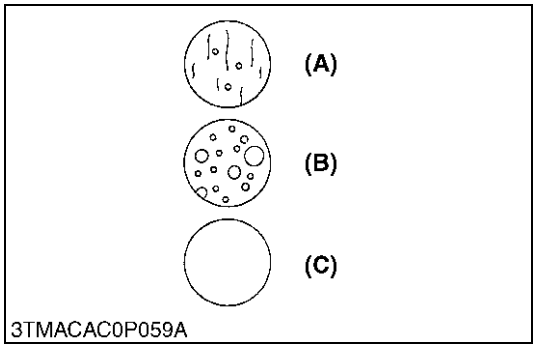
To avoid personal injury:

- **Liquid contact with eyes or skin may cause frostbite.**
- **In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes.**
- **In contact with a flame, R134a refrigerant gives a toxic gas.**
- **Do not disconnect any part of the refrigeration circuit of the air conditioning system.**

A shortage of refrigerant impairs the air-conditioner performance. Check the following points. If it is indicated that the amount of refrigerant is extremely low, inspect and charge.

■ Checking Procedure

1. Run the air-conditioner in the following conditions.
   - Engine speed: About 1500 min^{-1} (rpm)
   - Temperature control lever: Maximum cooling position (leftmost)
   - Fan switch: Highest blow (**HI**)
   - Air-conditioner switch: **ON**
2. Look into the sight glass to see if the refrigerant is flowing through its circuit.



■ IMPORTANT

- **Charge only with R134a not R12 refrigerant (gas).**

(1) Sight Glass

(A) Proper: Little or no air bubbles in the refrigerant flow.
(B) Low: Lots of air bubbles in the refrigerant flow (air bubbles or foam passing continuously).
(C) Overfull or no refrigerant: Colorless and transparent.

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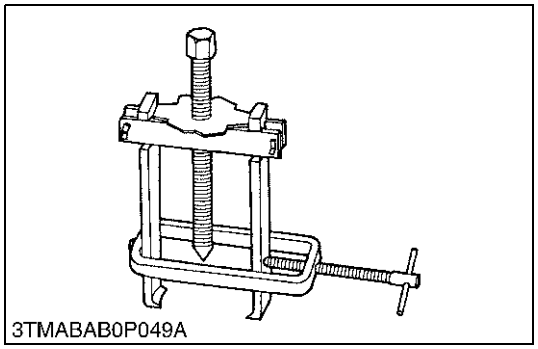
8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE

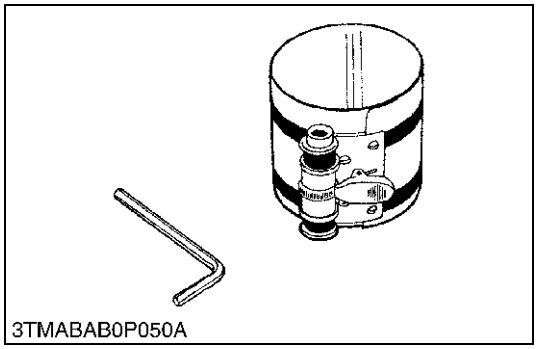

3TMABAB0P049A

Special Use Puller Set

Code No.
- 07916-09032

Application
- Use exclusively to pull out bearing, gears and other parts with ease.

WSM000001GEG0011US0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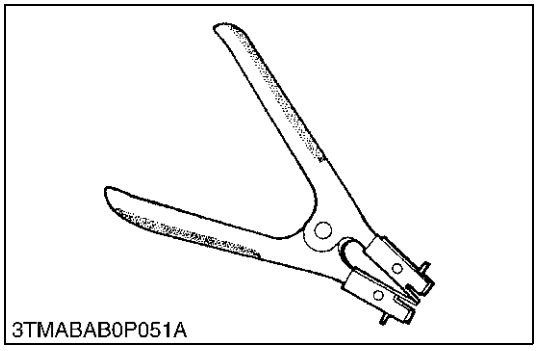
Piston Ring Compressor

Code No.
- 07909-32111

Application
- Use exclusively to push in the piston with piston rings into the cylinder.

WSM000001GEG0012US0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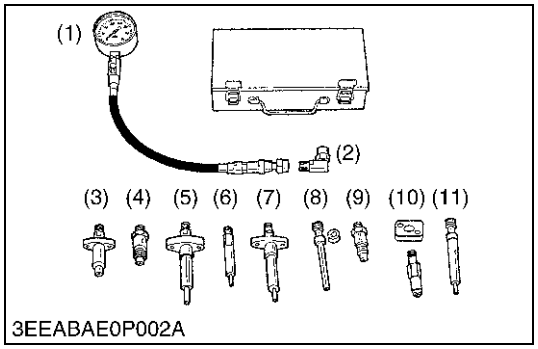
Piston Ring Tool

Code No.
- 07909-32121

Application
- Use exclusively to remove or install the piston ring with ease.

WSM000001GEG0013US0



3EEABAE0P002A

Diesel Engine Compression Tester (for Injection Nozzle)

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

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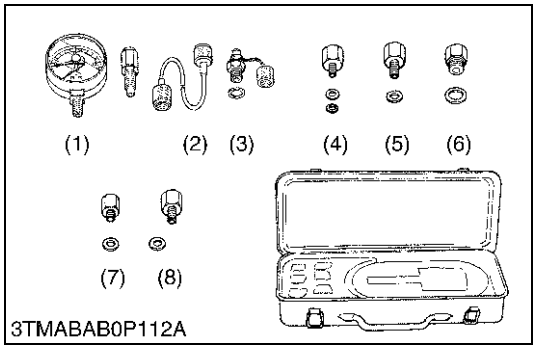


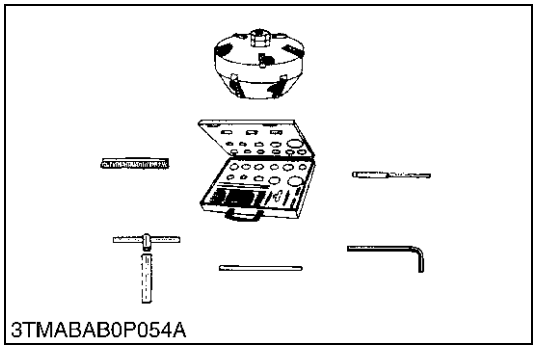
Oil Pressure Tester

Code No.
- 07916-32032

Application
- Use to measure lubricating oil pressure.

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

WSM000001GEG0015US0



Valve Seat Cutter

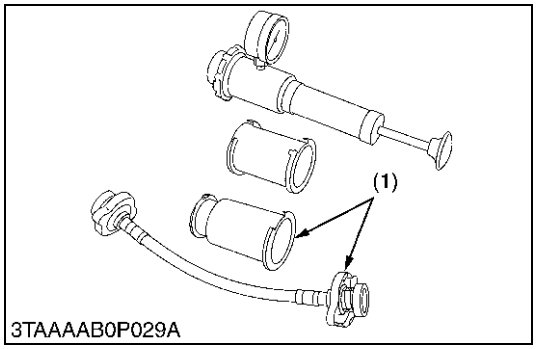
Code No.
- 07909-33102

Application
- Use to reseat 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 (1.63 in.)
- 50.8 mm (2.00 in.)

WSM000001GEG0016US0



Radiator Tester

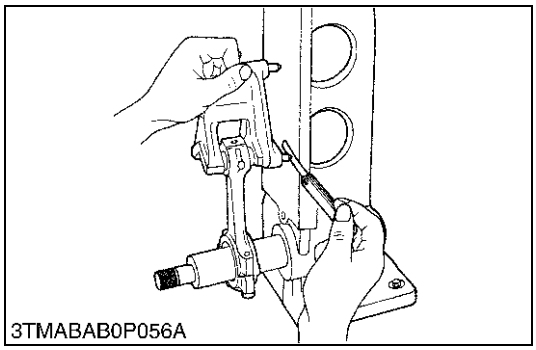
Code No.
- 07909-31551

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



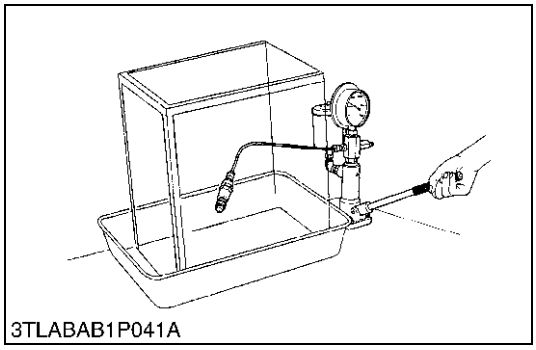
Connecting Rod Alignment Tool

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. (1.2 to 2.9 in. dia.)
- Connecting rod length
  65.0 to 300 mm (2.56 to 11.8 in.)

WSM000001GEG0020US0



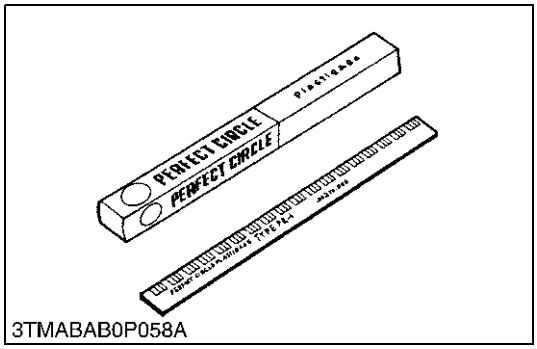
Nozzle Tester

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^2, 0 to 7200 psi)

WSM000001GEG0021US0



3TMABAB0P058A

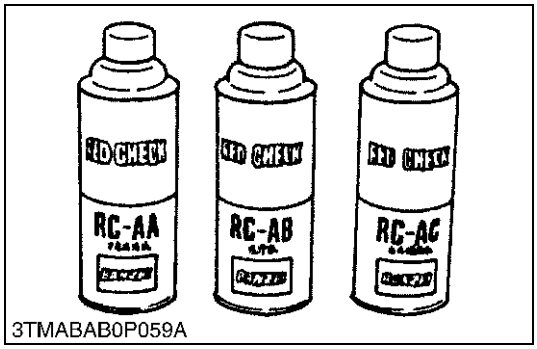
Plastigauge

Code No.
- 07909-30241

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

Measuring range
- Green: 0.03 to 0.07 mm (0.001 to 0.003 in.)
- Red: 0.05 to 0.1 mm (0.002 to 0.006 in.)
- Blue: 0.1 to 0.2 mm (0.004 to 0.009 in.)

WSM000001GEG0022US0



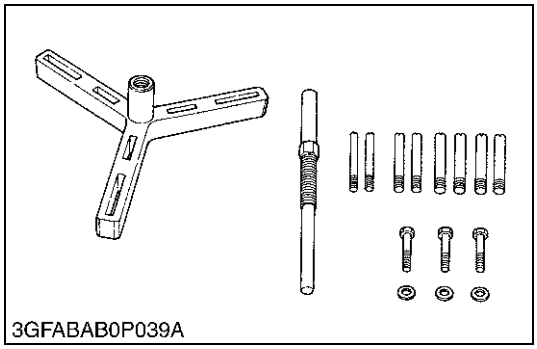
3TMABAB0P059A

Red Check

Code No.
- 07909-31371

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

WSM000001GEG0023US0


3GFABAB0P039A

Flywheel Puller

Code No.
- 07916-32011

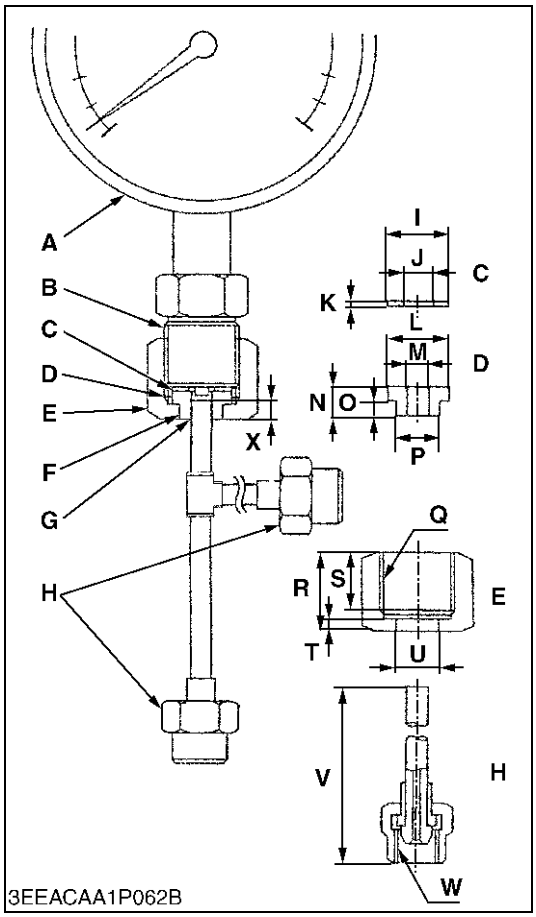
Application
- Use exclusively to remove the flywheel with ease.

WSM000001GEG0018US0

■ **NOTE**

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

9Y1210822GEG0068US0



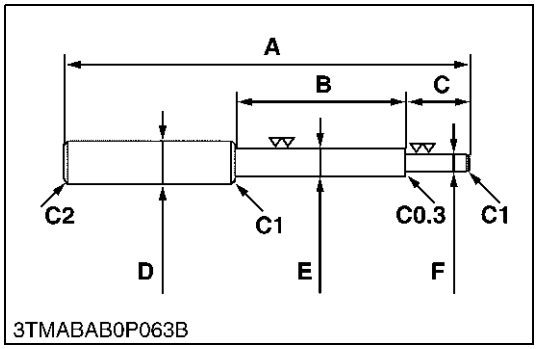
Injection Pump Pressure Tester

Application

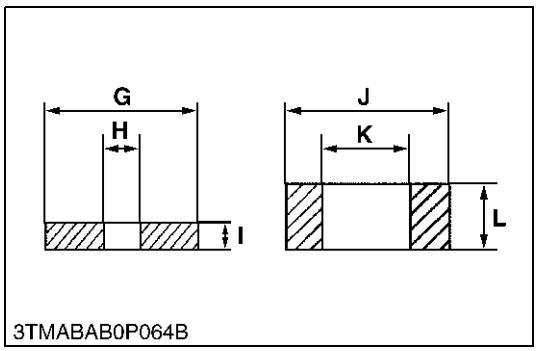
- Use to check fuel tightness of injection pumps.

A	Pressure gauge full scale: More than 29.4 MPa (300 kgf/cm^2, 4267 psi)
B	PF 1/2
C	Copper gasket
D	Flange (Material: Steel)
E	Hex. nut 27 mm (1.1 in.) across the plat
F	Adhesive application
G	Fillet welding on the enter circumference
H	Retaining nut
I	17 mm dia. (0.67 in. dia.)
J	8.0 mm dia. (0.31 in. dia.)
K	1.0 mm (0.039 in.)
L	17 mm dia. (0.67 in. dia.)
M	6.10 to 6.20 mm dia. (0.241 to 0.244 in. dia.)
N	8.0 mm (0.31 in.)
O	4.0 mm (0.16 in.)
P	11.97 to 11.99 mm dia. (0.4713 to 0.4720 in. dia.)
Q	PF 1/2
R	23 mm (0.91 in.)
S	17 mm (0.67 in.)
T	4.0 mm (0.16 in.)
U	12.00 to 12.02 mm dia. (0.472 to 0.4732 in. dia.)
V	100 mm (3.94 in.)
W	M12 × P1.5
X	5.0 mm (0.20 in.)

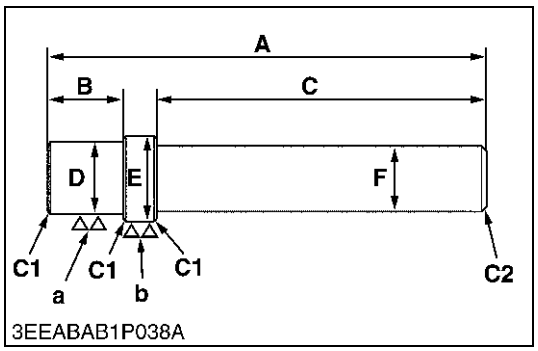
9Y1210822GEG0069US0



3TMABAB0P063B



3TMABAB0P064B



3EEABAB1P038A

Valve Guide Replacing Tool

Application

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

A	225 mm (8.86 in.)
B	70 mm (2.8 in.)
C	45 mm (1.8 in.)
D	20 mm dia. (0.79 in. dia.)
E	11.7 to 11.9 mm dia. (0.461 to 0.468 in. dia.)
F	6.50 to 6.60 mm dia. (0.256 to 0.259 in. dia.)
G	25 mm (0.98 in.)
H	6.70 to 7.00 mm dia. (0.264 to 0.275 in. dia.)
I	5.0 mm (0.20 in.)
J	20 mm dia. (0.79 in. dia.)
K	12.5 to 12.8 mm dia. (0.493 to 0.503 in. dia.)
L	8.90 to 9.10 mm (0.351 to 358 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

9Y1210822GEG0070US0

Bushing Replacing Tool

Application

- Use to press out and press in the bushing.

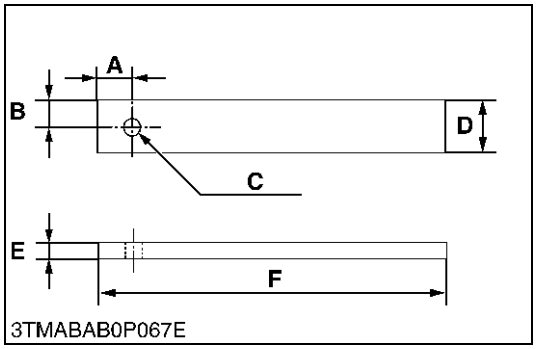
1. For small end bushing

A	157 mm (6.18 in.)
B	24 mm (0.94 in.)
C	120 mm (4.72 in.)
D	21.8 to 21.9 mm dia. (0.859 to 0.862 in. dia.)
E	24.8 to 24.9 mm dia. (0.977 to 0.980 in. dia.)
F	20 mm dia. (0.79 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)

2. For idle gear bushing

A	196 mm (7.72 in.)
B	26 mm (1.0 in.)
C	150 mm (5.91 in.)
D	25.80 to 25.90 mm dia. (1.016 to 1.019 in. dia.)
E	28.80 to 28.90 mm dia. (1.134 to 1.137 in. dia.)
F	20 mm dia. (0.79 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)

9Y1210822GEG0071US0



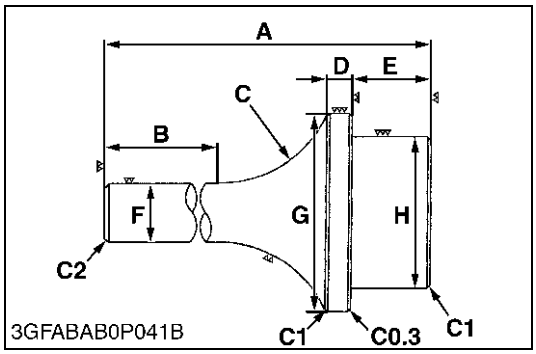
Flywheel Stopper

Application

- Use to loosen and tighten the flywheel screw.

A	20 mm (0.79 in.)
B	15 mm (0.59 in.)
C	10 mm dia. (0.39 in. dia.)
D	30 mm (1.2 in.)
E	8.0 mm (0.31 in.)
F	200 mm (7.87 in.)

9Y1210822GEG0072US0



Crankshaft Bearing 1 Replacing Tool

Application

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

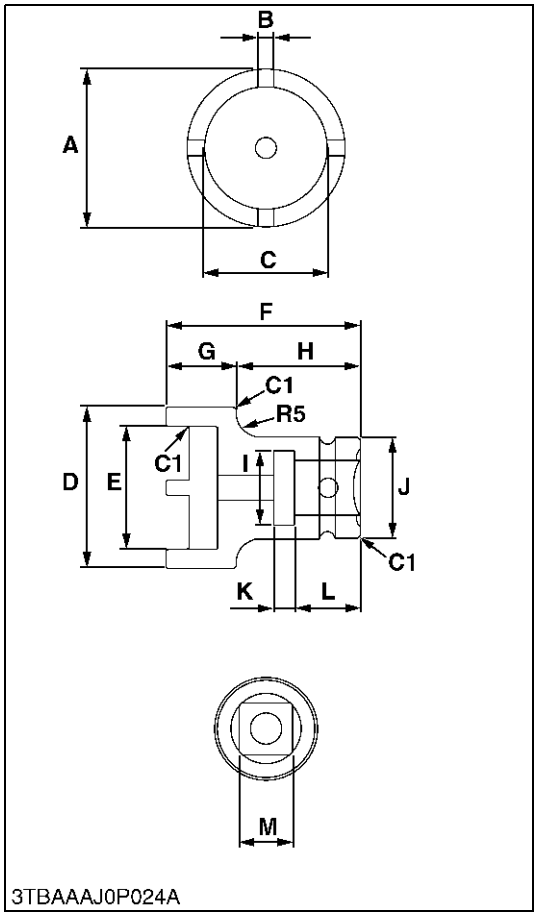
[Press Out]

A	135 mm (5.31 in.)
B	72 mm (2.8 in.)
C	40 mm radius (1.6 in. radius)
D	10 mm (0.39 in.)
E	24 mm (0.94 in.)
F	20 mm dia. (0.79 in. dia.)
G	51.20 to 51.40 mm dia. (2.016 to 2.023 in. dia.)
H	47.30 to 47.50 mm dia. (1.863 to 1.870 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

[Press In]

A	135 mm (5.31 in.)
B	72 mm (2.8 in.)
C	40 mm radius (1.6 in. radius)
D	10 mm (0.39 in.)
E	24 mm (0.94 in.)
F	20 mm dia. (0.79 in. dia.)
G	68 mm dia. (2.7 in. dia.)
H	47.30 to 47.50 mm dia. (1.863 to 1.870 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

9Y1210822GEG0073US0



3TBAAAJ0P024A

Socket

Application

- Use to loosen and tighten the idle gear 2 bearing lock nut.

A	28.5 to 28.8 mm (1.12 to 1.13 in.)
B	3.5 to 3.7 mm (0.14 to 0.15 in.)
C	28.5 to 28.8 mm (0.12 to 1.13 in.)
D	38 mm dia. (1.50 in. dia.)
E	28.5 to 29.0 mm dia. (1.12 to 1.14 in. dia.)
F	47.5 mm (1.87 in.)
G	17.5 mm (0.69 in.)
H	30 mm (1.18 in.)
I	18 mm dia. (0.71 in. dia.)
J	24.5 mm dia. (0.96 in. dia.)
K	5.0 mm (0.21 in.)
L	16 mm (0.63 in.)
M	12.8 to 13.0 mm (0.50 to 0.51 in.)
C1	Chamfer 1.0 mm (0.039 in.)
R5	5.0 mm radius (0.20 in. radius)

9Y1210822GEG0074US0

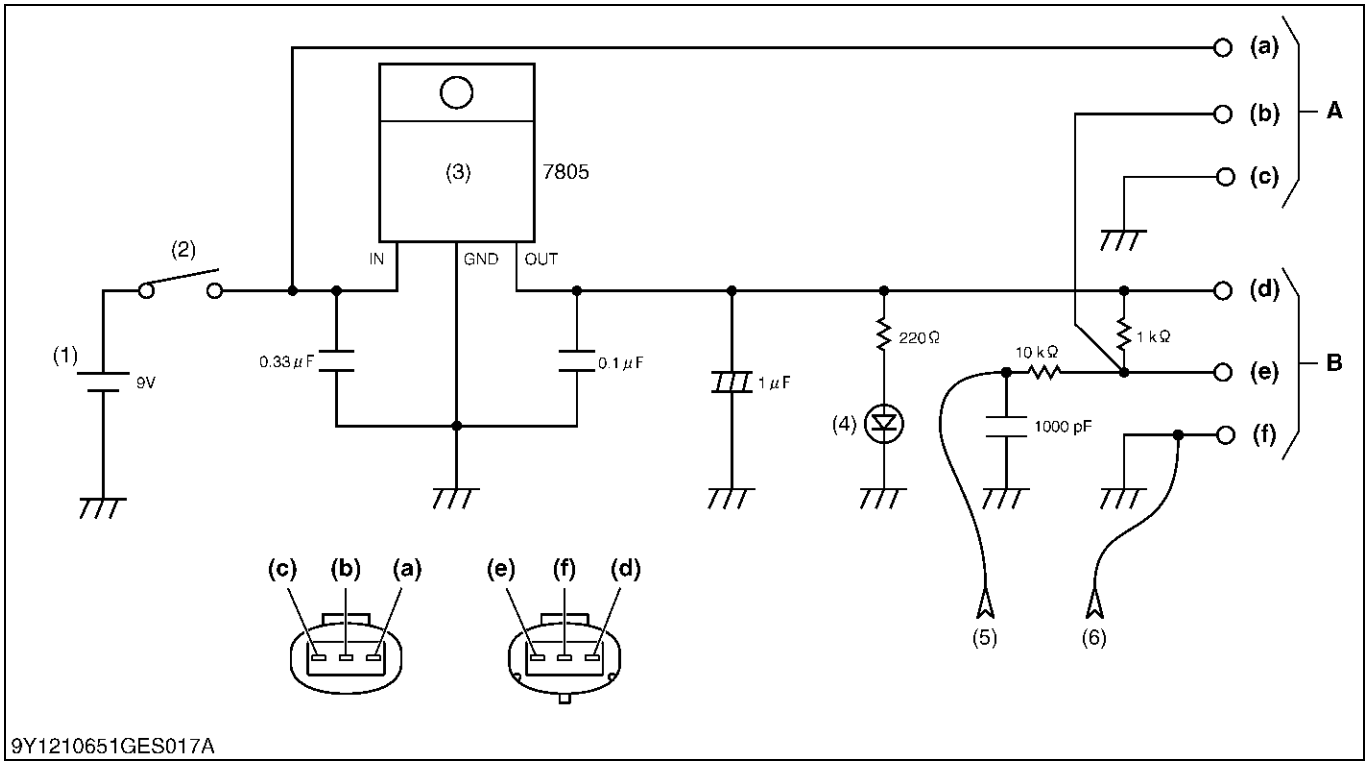
Rotation Sensor Signal Interface Unit

Application

- Use for reading rotation sensor signal.

■ **NOTE**

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



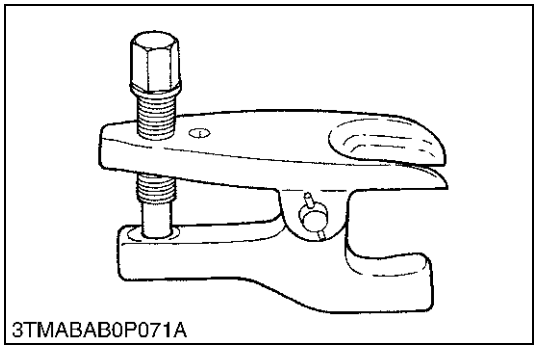
(1) 9V Battery
(2) Switch
(3) 3-Terminal Regulator
(4) LED
(5) Clip (Red)
(6) Clip (Black)

A: for Panasonic
B: for DENSO

(a) +9 V
(b) Signal
(c) GND
(d) +5 V
(e) Signal
(f) GND

9Y1210822GEG0096US0

[2] SPECIAL TOOLS FOR TRACTOR

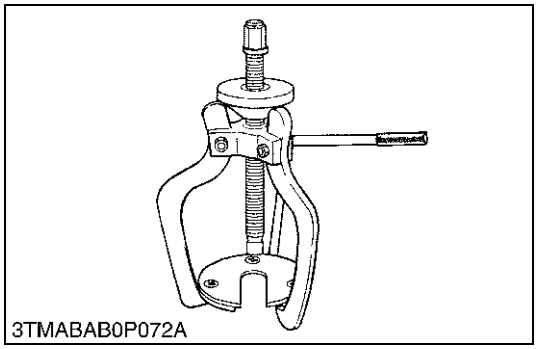

3TMABAB0P071A

Tie-rod End Lifter

Code No.
- 07909-39051

Application
- Use to remove the tie-rod end with ease.

WSM000001GEG0029US0

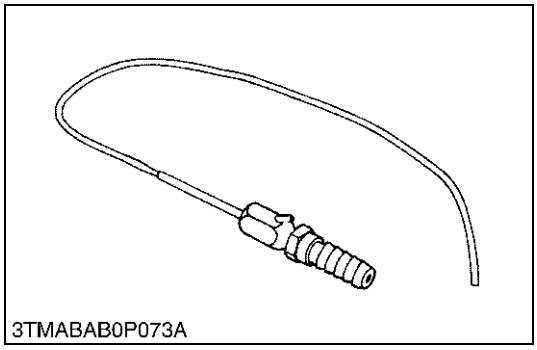

3TMABAB0P072A

Steering Wheel Puller

Code No.
- 07916-51090

Application
- Use to remove the steering wheel without damage to the steering shaft.

WSM000001GEG0030US0

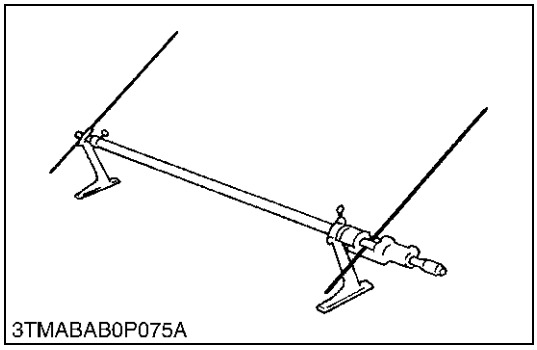

3TMABAB0P073A

Injector CH3

Code No.
- 07916-52501

Application
- Use to put calcium chloride solution into a rear wheel and to remove it.

WSM000001GEG0031US0

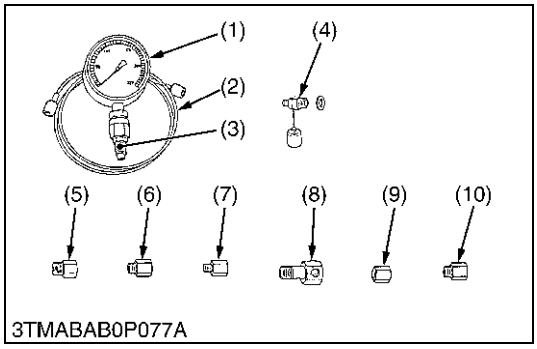

3TMABAB0P075A

Toe-in Gauge

Code No.
- 07909-31681

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

WSM000001GEG0034US0



3TMABAB0P077A

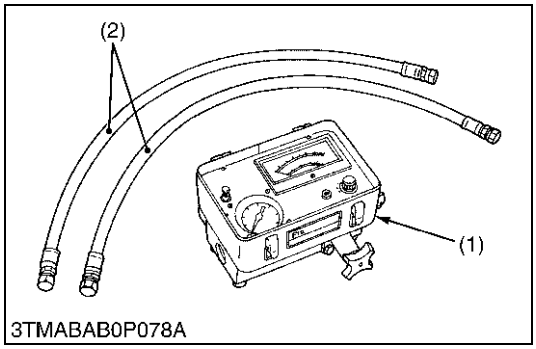
Relief Valve Pressure Tester

Code No.
- 07916-50045

Application
- This allows easy measurement of relief set pressure.

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

WSM000001GEG0027US0



3TMABAB0P078A

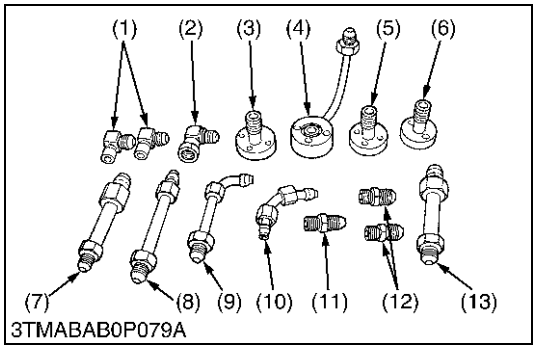
Flow Meter

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

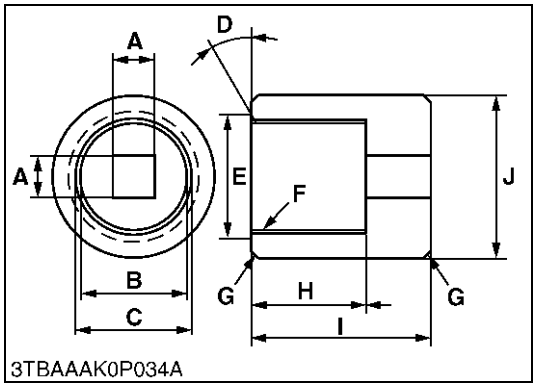
Adaptor Set for Flow Meter

Code No.
- 07916-54031

Application
- Use for test of the hydraulic system.

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

WSM000001GEG0037US0



3TBAAAK0P034A

Bevel Gear Shaft (10T) Tool

Application
- Use for measuring and tightening the bevel gear shaft.

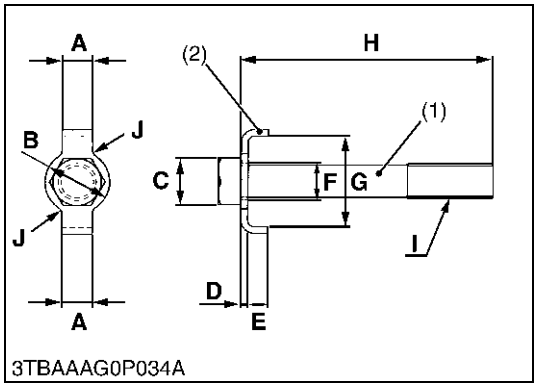
A	6.4 to 6.6 mm square (0.25 to 0.26 in. square)
B	17.5 mm dia. (0.689 in. dia.)
C	20 mm dia. (0.79 in. dia.)
D	0.52 rad (30 °)
E	21 mm dia. (0.83 in. dia.)
F	Involute spline (refer to below)
G	Chamfer 1.0 mm (0.039 in.)
H	25 mm (0.98 in.)
I	35 mm dia. (1.4 in. dia.)
J	28 mm dia. (1.1 in. dia.)

(Involute Spline)
- INTERNAL 20 x 14 x 1.25

Coefficient of profile shifting		+0.800
Tool	Tooth form	Stub tooth
	Module	1.250
	Pressure angle	0.35 rad (20 °)
Number of teeth		14
Diameter of basic pitch circle		17.5 mm (0.689 in.)
Tooth thickness	Between pin diameter	15.084 to 15.155 mm (0.59386 to 0.59665 in.) (Pin diameter = 2.50 mm (0.0984 in.))

(Reference)
- This tool can be made by welding the coupling (6C050-14520) and socket wrench.

9Y1210822GEG0075US0



3TBAAAG0P034A

Independent PTO Clutch Spring Compression Tool

Application

- Use for compressing the spring into the spline boss.

A	12 mm (0.47 in.)
B	25.4 mm (1.00 in.)
C	19 mm (0.75 in.) Hex.
D	2.7 mm (0.11 in.)
E	8 mm (0.31 in.)
F	15 mm dia. (0.59 in. dia.)
G	37 mm (1.46 in.)
H	100 mm (3.94 in.)
I	M14 ×1.5
J	R 3.0 mm (0.12 in.)

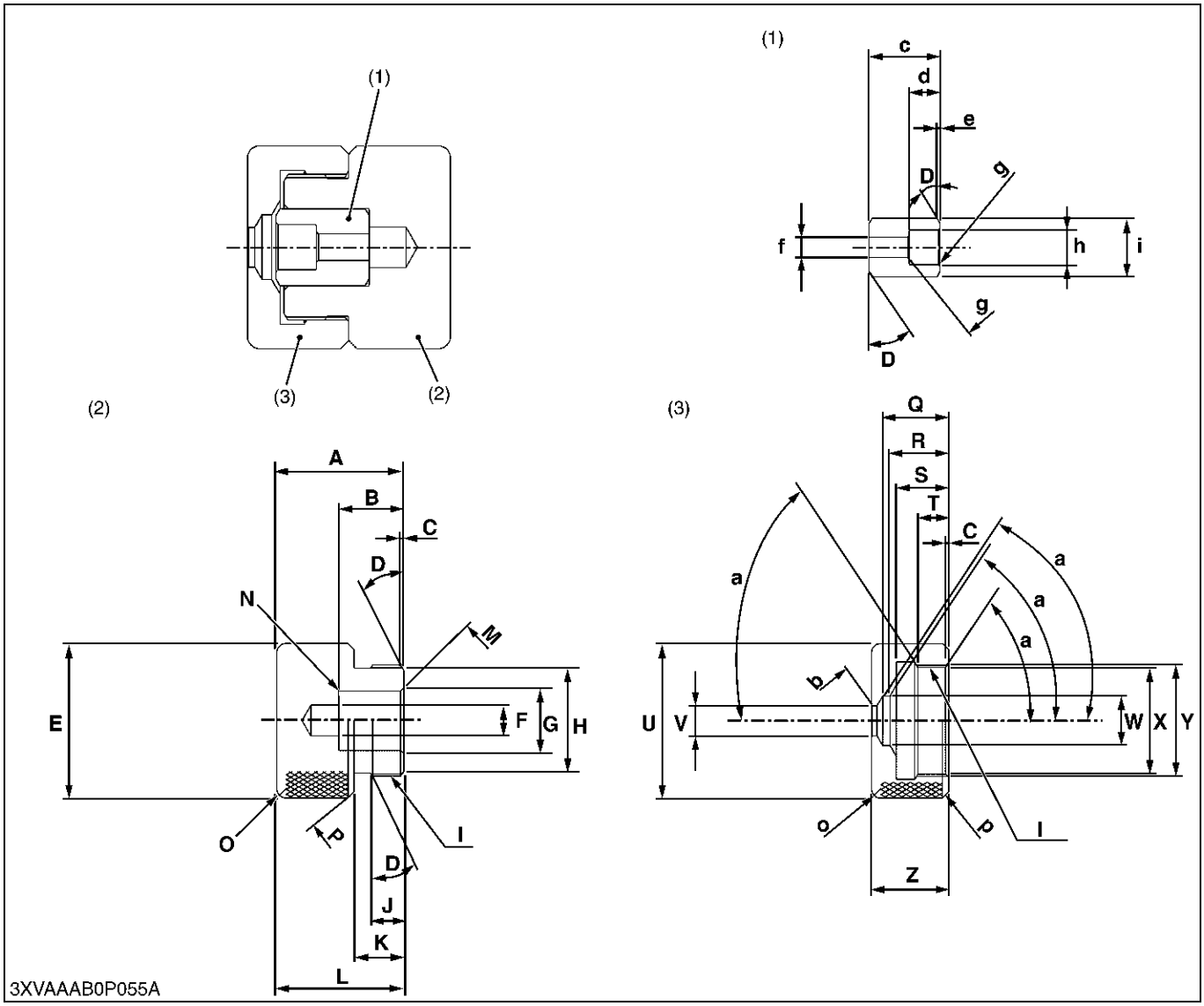
(1) Hex. Bolt (01173-51400) (2) Steel Plate

9Y1210822GEG0076US0

Check and High Pressure Relief Valve Assembly Tool

Application

- Use for readjusting relief valve pressure.



A	30 mm (1.2 in.)	**N**	Chamfer 0.4 mm (0.02 in.)	**a**	0.17 rad (10 °)
B	21 mm (0.83 in.)	**O**	Chamfer 3 mm (0.1 in.)	**b**	Chamfer 0.3 mm (0.01 in.)
C	1 mm (0.04 in.)	**P**	Chamfer 2 mm (0.08 in.)	**c**	23 mm (0.91 in.)
D	0.52 rad (30 °)	**Q**	21.4 mm (0.843 in.)	**d**	10 mm (0.39 in.)
E	50 mm dia. (2.0 in. dia.)	**R**	19 mm (0.75 in.)	**e**	1 mm (0.04 in.)
F	10 mm dia. (0.39 in. dia.)	**S**	17 mm (0.67 in.)	**f**	6.5 mm (0.26 in.)
G	9.10 to 9.30 mm dia. (0.359 to 0.366 in. dia.)	**T**	10 mm (0.39 in.)	**g**	Chamfer 0.5 mm (0.02 in.)
H	34 mm dia. (1.3 in. dia.)	**U**	50 mm dia. (2.0 in. dia.)	**h**	11.1 to 11.3 mm (0.437 to 0.444 in.)
I	M36 × 1.5 mm Pitch	**V**	9.8 mm dia. (0.39 in. dia.)	**j**	18.8 to 19.0 mm (0.741 to 0.748 in.)
J	10 mm (0.39 in.)	**W**	16 mm dia. (0.63 in. dia.)		
K	16 mm (0.63 in.)	**X**	34.5 mm dia. (1.36 in. dia.)	(1)	Spacer
L	41 mm (1.6 in.)	**Y**	38 mm dia. (1.5 in. dia.)	(2)	Block
M	Chamfer 1 mm (0.04 in.)	**Z**	25 mm (0.98 in.)	(3)	Cap

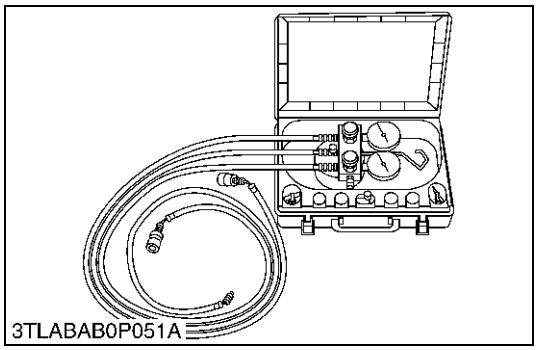
9Y1210822GEG0077US0

[3] SPECIAL TOOLS FOR CABIN

■ **NOTE**

- **Special tools for R134a refrigerant air conditioning system below are available from DENSO CO. LTD.**

M00000002GEG0111US1


3TLABAB0P051A

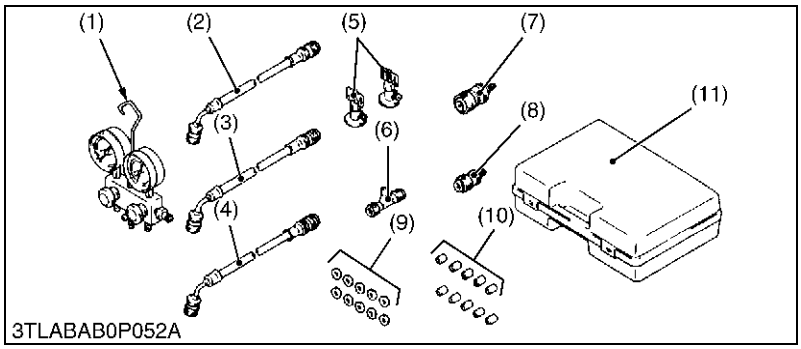
Air Conditioner Service Tool

Code No.

- DENSO 95048-00063

Application

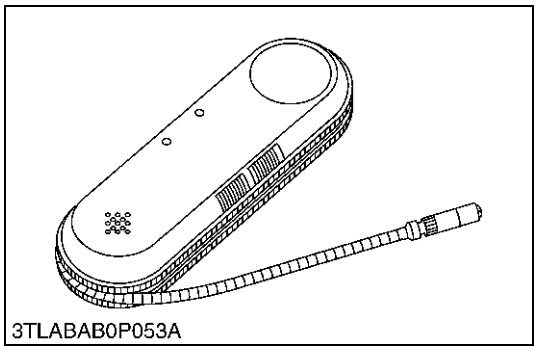
- Use for charge, test or discharge of the air conditioning system.



3TLABAB0P052A

(1) Manifold Gauge Assembly (95048-10090)
(2) Charging Hose (Red: HI) (95948-10270)
(3) Charging Hose (Blue: LO) (95948-10280)
(4) Charging Hose (Green) (95948-10260)
(5) Can Tap Valve (95048-10150)
(6) T Joint (95048-10160)
(7) Quick Coupler (HI) (95048-10130)
(8) Quick Coupler (LO) (95048-10140)
(9) Service Valve Packing (95906-10310)
(10) Charging Hose Packing (95906-10300)
(11) Tool Case (95949-10610)

WSM000001GEG0042US0


3TLABAB0P053A

Electric Gas Leak Tester

Code No.

- DENSO 95146-00060

Application

- Use for gas leak test of the air conditioning system.

WSM000001GEG0043US0

9Y1210369GES042A

Vacuum Pump

Code No.

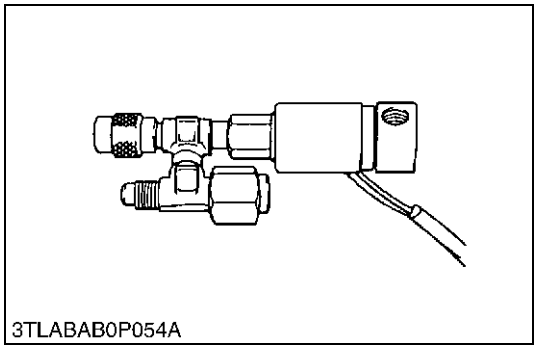
- DENSO 95046-00130 (AC220V)
- DENSO 95046-00140 (AC240V)

Application

- Use to evacuate the air conditioning system.

(1) Adaptor (For 134a) (2) Vacuum Pump

WSM000001GEG0044US0


3TLABAB0P054A

Adaptor (For R134a)

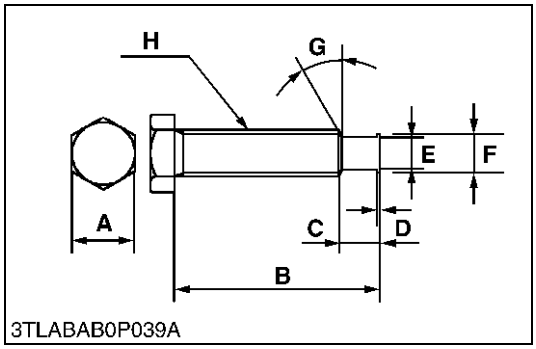
Code No.

- DENSO 95048-10190 (AC220V)
- DENSO 95048-10200 (AC240V)

Application

- Use to evacuate the air conditioning system.

WSM000001GEG0045US0



3TLABAB0P039A

Stopper Bolt (for A/C Compressor)

Application

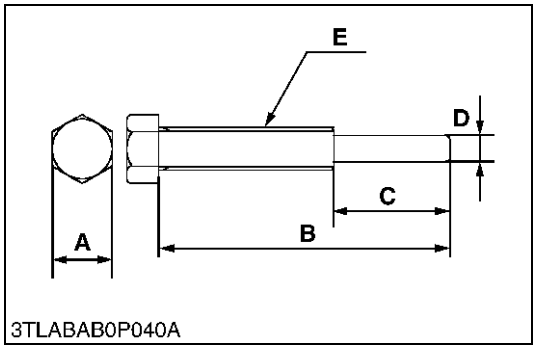
- Use with the stopper magnetic clutch.

■ **NOTE**

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

A	12 mm (0.47 in.)
B	35 mm (1.38 in.)
C	7 mm (0.28 in.)
D	0.4 mm (0.016 in.)
E	5.5 mm dia. (0.22 in. dia.)
F	6.5 mm dia. (0.26 in. dia.)
G	0.52 rad (30 °)
H	M8 × P1.25

9Y1210822GEG0078US0



3TLABAB0P040A

Remover Magnetic Clutch (for A/C Compressor)

Application

- Use to remove the hub plate or center piece.

■ **NOTE**

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

A	12 mm (0.47 in.)
B	55 mm (2.16 in.)
C	20 mm (0.79 in.)
D	5 mm dia. (0.20 in. dia.)
E	M8 × P1.25

9Y1210822GEG0079US0

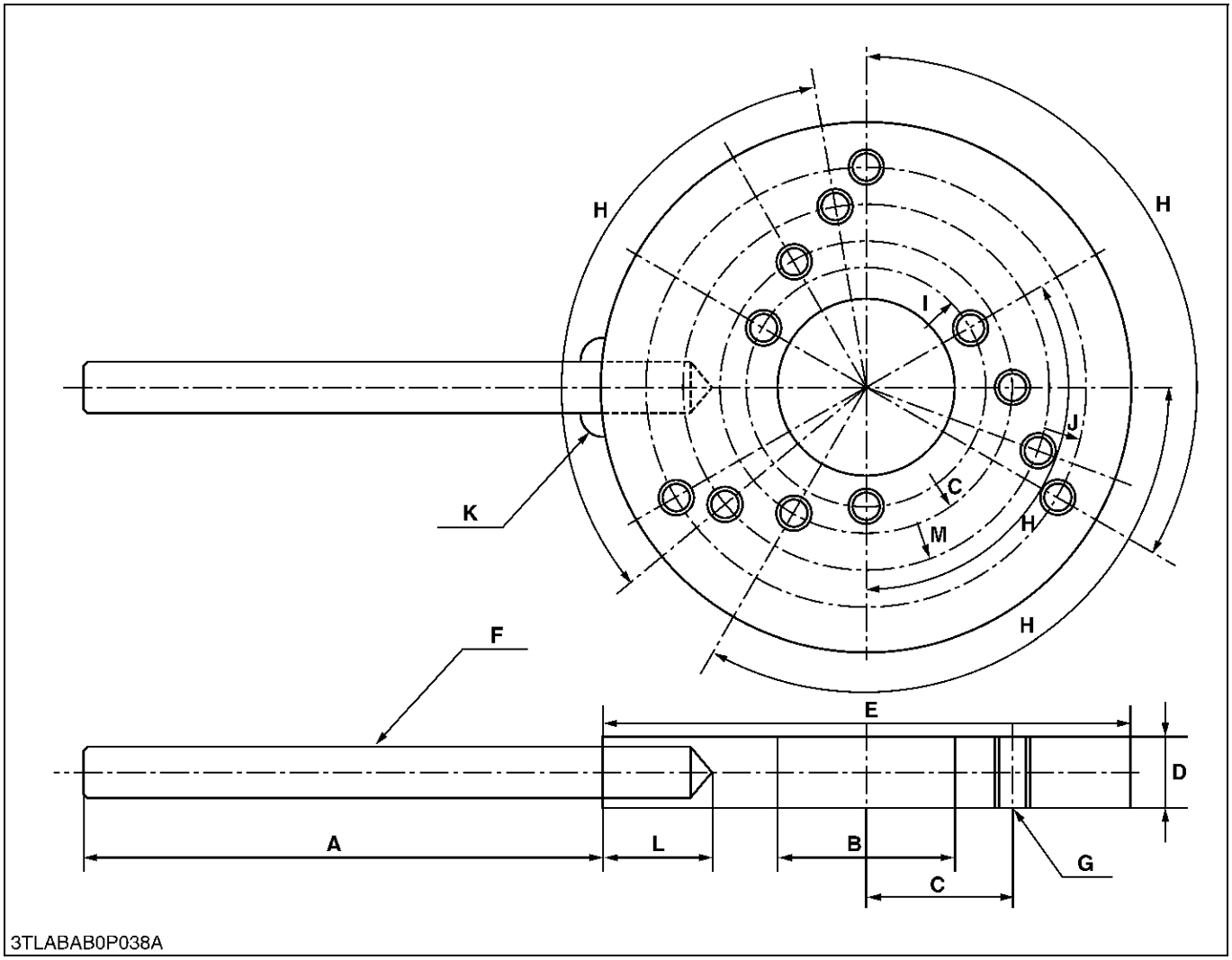
Stopper Magnetic Clutch (For A/C Compressor)

Application

- Use for loosening and tightening the magnetic clutch mounting nut. (Use radius C)

■ **NOTE**

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



3TLABAB0P038A

A	125 mm (4.92 in.)	**H**	4.52 rad (120 °)
B	40 mm dia. (1.57 in. dia.)	**I**	Radius 27 mm (Radius 1.06 in.)
C	Radius 33 mm (Radius 1.30 in.)	**J**	Radius 50 mm (Radius 1.97 in.)
D	16 mm (0.63 in.)	**K**	Weld all around
E	120 mm dia. (4.72 in. dia.)	**L**	20 mm (0.78 in.)
F	12 mm dia. (0.47 in. dia.)	**M**	Radius 41 mm (Radius 1.61 in.)
G	3 × M8 × 1.25 All screws		

9Y1210822GEG0080US0

9. TIRES

[1] TIRE PRESSURE

WARNING

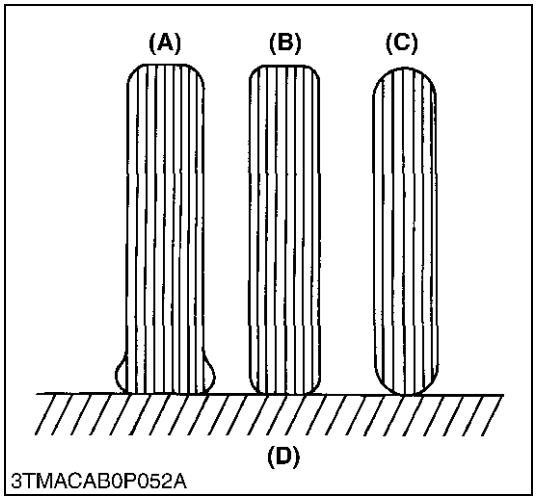
To avoid personal injury:

- **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.**

9Y1210822GEG0081US0



Inflation Pressure

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

	Tire sizes	Inflation pressure
Rear	12.4-16, 4PR	110 kPa (1.1 kgf/cm^2, 16 psi)
	13.6-16, 4PR	100 kPa (1.0 kgf/cm^2, 14 psi)
	12.4-16 Ind., 4PR	138 kPa (1.4 kgf/cm^2, 20 psi)
Front	7-12, 4PR	170 kPa (1.7 kgf/cm^2, 24 psi)
	24 × 8.50-14, 4PR	150 kPa (1.5 kgf/cm^2, 22 psi)
	23 × 8.50-14 Ind., 4PR	241 kPa (2.5 kgf/cm^2, 35 psi)

NOTE

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

Dual Tires

- Dual tires are not approved.

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

9Y1210822GEG0082US0

[2] TREAD ADJUSTMENT

CAUTION
- **Support tractor securely on stands before removing a wheel.**
- **Never operate tractor with a loose rim, wheel or axle.**

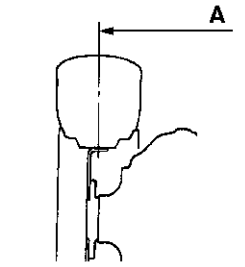
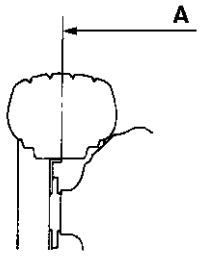
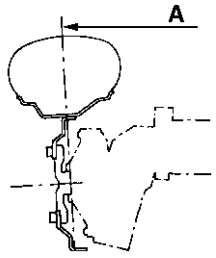
IMPORTANT
- **Always attach tires as shown in the figure.**
- **If not attached as the figure, transmission parts may be damaged.**
- **Do not use tires larger than specified.**

9Y1210822GEG0083US0

(1) Front Wheels

Front wheel can not be adjusted.

IMPORTANT
- **Do not turn front discs to obtain wider tread. In setting up the front wheels, make sure that the inflation valve stem of the tires face outward.**

7-12 Farm	24 × 8.50-14 Turf	23 × 8.50-14 Ind.
 9Y1210428GES010A	 9Y1210428GES011A	 9Y1210428GES008A
935 mm (36.8 in.)	930 mm (36.6 in.)	905 mm (35.6 in.)

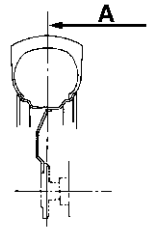
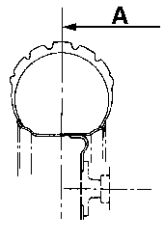
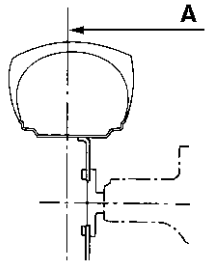
A: Tread

9Y1210822GEG0084US0

(2) Rear Wheels

Rear tread width can not be adjusted.

IMPORTANT
- **Always attach tires as shown in the drawings.**
- **If not attached as illustrated, transmission parts may be damaged.**

12.4-16 Farm	13.6-16 Turf	12.4-16 Ind.
 3TBAAAK0P024A	 3TBAAAK0P025A	 9Y1210428GES009A
1050 mm (41.3 in.)	1050 mm (41.3 in.)	1050 mm (41.3 in.)

A: Tread

9Y1210822GEG0085US0

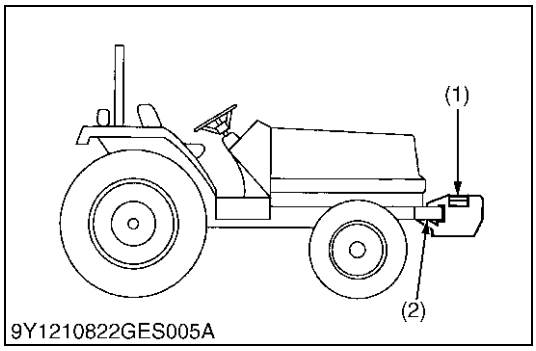
[3] BALLAST

CAUTION

To avoid personal injury:

- **Additional ballast will be needed for transporting heavy implements. When the implement is raised, drive slowly over rough ground, regardless of how much ballast is used.**
- **Do not fill the front wheels with liquid.**

9Y1210822GEG0086US0



9Y1210822GES005A

Front Ballast

Add weights if needed for stability and improving traction. Heavy pulling and heavy rear mounted implements tend to lift front wheels. Add enough ballast to maintain steering control and prevent tip over.

Remove weight when no longer needed.

■ **Front End Weights (Option)**

The front end weights can be attached to the bumper.

■ **NOTE**

- **[For installation of up to three weights]**
  Besides the weight, mounting bolt kit(s) are required for mounting the weight.
- **[For installation of up to five weights]**
  Besides the weight, a front weight bracket and mounting bolt kit(s) are required for mounting the weight.

■ **IMPORTANT**

- **Do not overload tires.**
- **Add no more weight than indicated in chart.**

Maximum weight	25 kg × 5 pieces (275 lbs)

(1) Front End Weight (2) Front Weight Bracket (Option)

9Y1210822GEG0087US0

Rear Ballast

Add weight to rear wheels if needed to improve traction or for stability. The amount of rear ballast should be matched to job and the ballast should be removed when it is not needed.

The weight should be added to the tractor in the form of liquid ballast.

■ **Liquid Ballast in Rear Tires**

Water and calcium chloride solution provides safe economical ballast. Used properly, it will not damage tires, tubes or rims. The addition of calcium chloride is recommended to prevent the water from freezing. Use of this method of weighting the wheels has the full approval of the tire companies.

Liquid weight per tire (75 Percent filled)

Tire sizes	12.4-16
Slush free at −10 °C (14 °F) Solid at −30 °C (−22 °F) [Approx. 1 kg (2 lbs) $CaCl_2$ per 4 L (1 gal) of water]	85 kg (187 lbs)
Slush free at −24 °C (−11 °F) Solid at −47 °C (−53 °F) [Approx. 1.5 kg (3.3 lbs) $CaCl_2$ per 4 L (1 gal) of water]	89 kg (196 lbs)
Slush free at −47 °C (−53 °F) Solid at −52 °C (−62 °F) [Approx. 2.25 kg (4.96 lbs) $CaCl_2$ per 4 L (1 gal) of water]	94 kg (207 lbs)

9Y1210822GEG0088US0

[4] TIRE LIQUID INJECTION

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

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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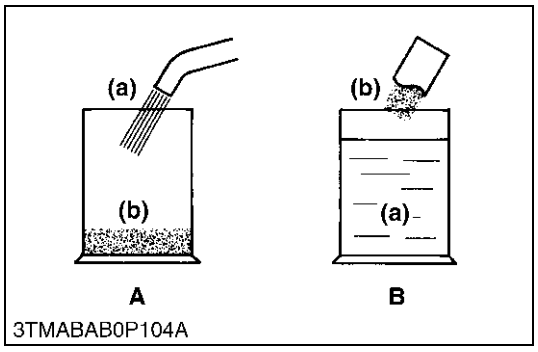

3TMABAB0P104A

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 $CaCl_2$ to be dissolved in 100 L (26.4 U.S.gals, 22.0 Imp.gals) of water
−5 °C (23 °F)	12 kg (26 lbs)
−10 °C (14 °F)	21 kg (46 lbs)
−15 °C (5 °F)	28 kg (62 lbs)
−20 °C (−4 °F)	34 kg (75 lbs)
−25 °C (−13 °F)	40 kg (88 lbs)
−30 °C (−22 °F)	44 kg (97 lbs)
−35 °C (−31 °F)	49 kg (110 lbs)
−40 °C (−40 °F)	52 kg (115 lbs)
−45 °C (−49 °F)	56 kg (120 lbs)
−50 °C (−58 °F)	61 kg (130 lbs)

(a) Water **(b) $CaCl_2$ (Calcium Chloride)**

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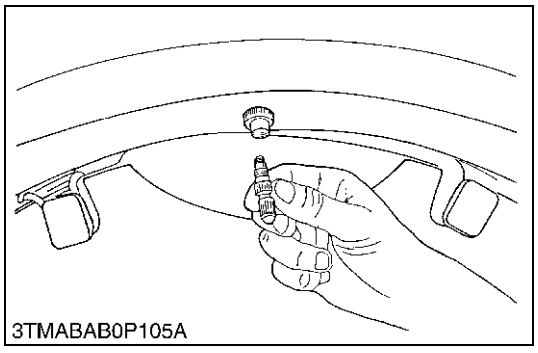
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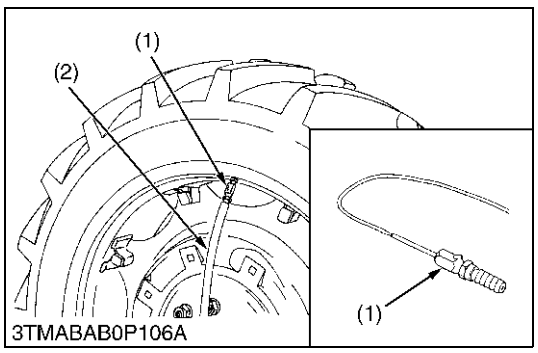
Attaching Injector

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

9Y1210822GEG0091US0



3TMABAB0P106A

Fig. 1

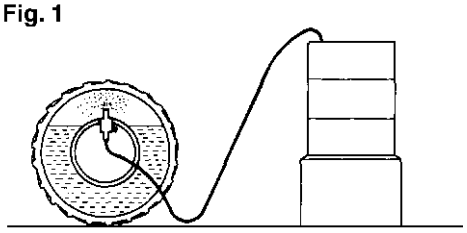


Fig. 2

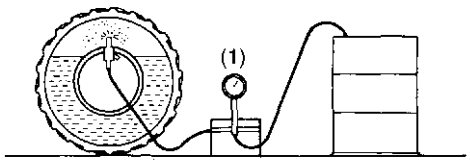
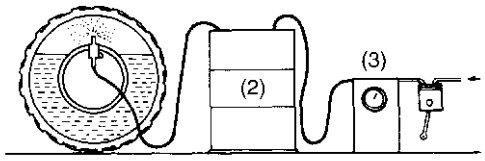


Fig. 3



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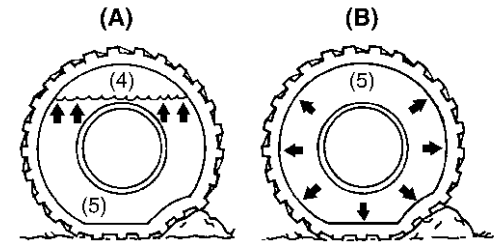


3TMABAB0P107A

Injection

CAUTION

- **When a calcium chloride solution is used, cool it before pouring it into the tire.**
- **Do not fill tires with water or solution more than 75 % of full capacity (to the valve stem level).**
- **To avoid damage of transmission, do not use rear wheel weights and liquid ballast at the same time.**

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.

IMPORTANT

- **Do not fill tires with water or solution more than 75 % of full capacity (to the level of valve stem at 12 o'clock position).**

(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

9Y1210822GEG0092US0

10. IMPLEMENT LIMITATIONS

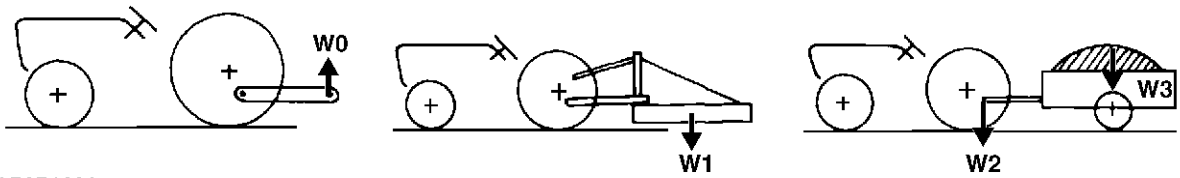
The KUBOTA Tractor has been thoroughly tested for proper performance with implements sold or approved by KUBOTA. Use with implements which are not sold or approved by KUBOTA and which exceed the maximum specifications listed below, or which are otherwise unfit for use with the KUBOTA Tractor may result 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.]

9Y1210822GEG0093US0

Tread (max. width) with farm tires		Lower link end max. loading weight W0
Front	Rear	
935 mm (36.8 in.)	1050 mm (41.34 in.)	360 kg (800 lbs)

Actual figures		
Implement weight W1 and / or size	Max. Drawbar Load W2	Trailer loading weight W3 Max. capacity
As in the following list (Shown on the next page)	500 kg (1100 lbs)	1500 kg (3300 lbs)

Lower link end max. loading capacity **W0**: The max. allowable load which can be put on the lower link end
Implement weight **W1**: The implement's weight which can be put on the lower link
Max. drawbar load **W2**
Trailer loading weight **W3**: The max. loading weight for trailer (without trailer's weight)



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■ **NOTE**

- **Implement size may vary depending on soil operating conditions.**
- **Strictly follow the instructions outlined in the operator's manual of the mounted or trailed machinery or trailer, and do not operate the combination tractor - machine or tractor - trailer unless all instructions have been followed.**
- **Forestry Application**
  Following hazards exist;
  a) topping trees, primarily in case a rear-mounted tree grab-crane is mounted at the rear of the tractor;
  b) penetrating objects in the operator's enclosure, primarily in case a winch is mounted at the rear of the tractor.
  Optional equipments such as OPS (Operator Protective Structure), FOPS (Falling Object Protective Structure), etc. to deal with these hazards and other related hazards are not available for this tractor. Without such optional equipment use is limited to tractor specific applications like transport and stationary work.

9Y1210822GEG0094US0

No.	Implement		Remarks	B2650 / B3350
1	Mower	Mid-mount	Max. cutting width	1830 mm (72 in.)
			Max. weight	205 kg (451 lbs)
		Rotary-cutter (1 Blade)	Max. cutting width	1220 mm (48 in.)
			Max. weight	227 kg (500 lbs)
		Rear-mount (2 or 3 Blade)	Max. cutting width	1830 mm (72 in.)
			Max. weight	227 kg (500 lbs)
		Flail-mower	Max. cutting width	1220 mm (48 in.)
		Sickle bar	Max. cutting width	1524 mm (60 in.)
2	Rotary tiller		Max. cutting width	1270 mm (50 in.)
			Max. weight	250 kg (550 lbs)
			Slip clutch	Necessary
3	Bottom plow		Max. size	305 mm (12 in.) × 2
4	Disc plow		Max. size	559 mm (22 in.) × 2
5	Cultivator		Max. size	1524 mm (60 in.) 1 Row
6	Disc harrow		Max. harrowing width	1676 mm (66 in.)
			Max. weight	250 kg (550 lbs)
7	Sprayer		Max. tank capacity	246 L (65 U.S.gals)
8	Front blade		Max. cutting width	1676 mm (66 in.)
			Sub frame	Necessary
9	Rear blade		Max. cutting width	1676 mm (66 in.)
			Max. weight	250 kg (550 lbs)
10	Front loader		Max. lifting capacity	420 kg (926 lbs)
			Max. width	1524 mm (60 in.)
11	Box blade		Max. cutting width	1372 mm (54 in.)
			Max. weight	227 kg (500 lbs)
12	Back hoe		Max. digging depth	2295 mm (90 in.)
			Max. weight	400 kg (880 lbs)
			Sub frame	Necessary
13	Snow blower		Max. working width	1542 mm (60 in.)
			Max. weight	227 kg (500 lbs)
14	Trailer		Max. load capacity	1500 kg (3300 lbs)
			Max. drawbar load	500 kg (1100 lbs)

■ **NOTE**

- **Implement size may vary depending on soil operating conditions.**

9Y1210822GEG0095US0

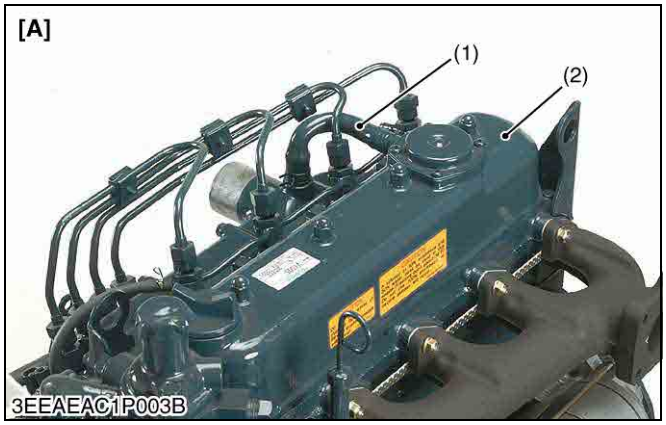
1 ENGINE

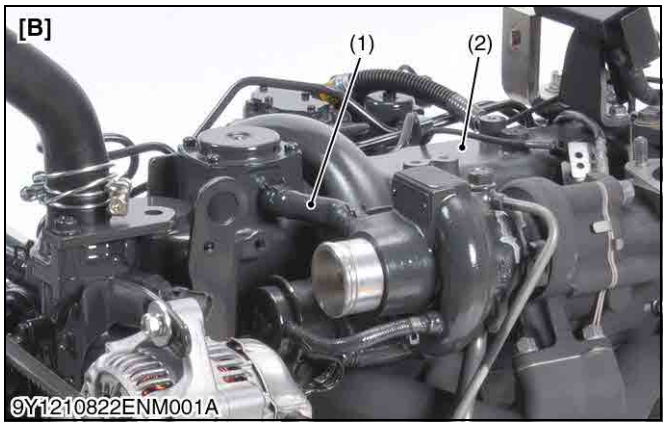
MECHANISM

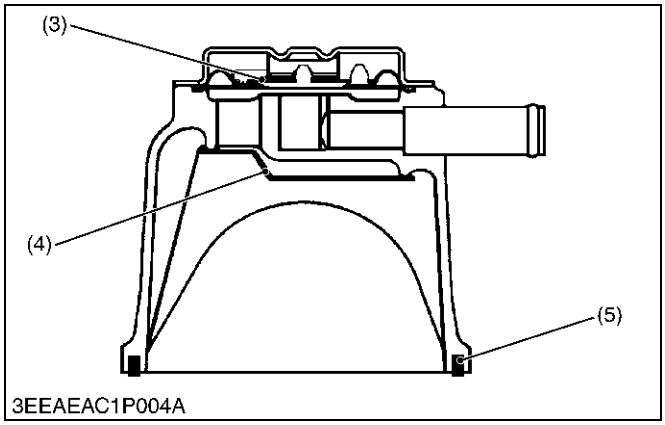
CONTENTS

1. ENGINE BODY

[1] CLOSED BREATHER







Closed breather system has been adopted to prevent the release of blow-by gas into the atmosphere.

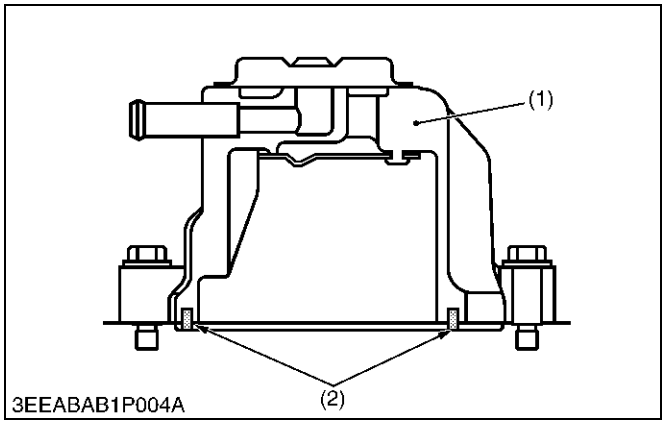
After its oil content is filtered by oil shield (4), the blow by gas in fed back to the intake manifold through breather valve (3) to be used for re-combustion.

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

[A] D1305-E4
[B] V1505-T-E4

9Y1210822ENM0001US0

[2] HALF-FLOATING HEAD COVER



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

(1) Cylinder Head Cover (2) Rubber Packing

9Y1210822ENM0002US0

[3] ENGINE CONTROL SYSTEM [V1505-T-E4]

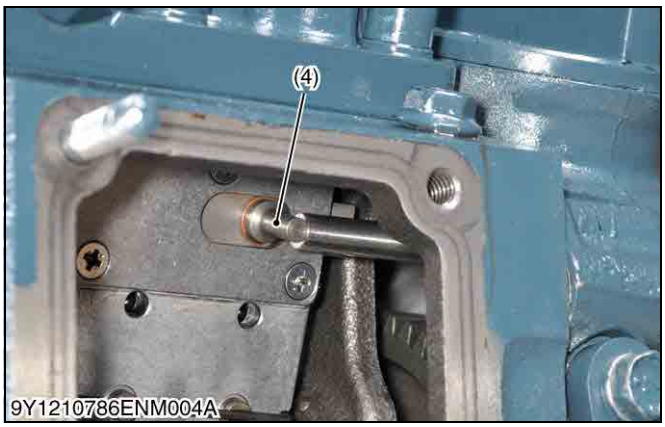

9Y1210786ENM002A

The ECU will use signal inputs, from the engine sensors, to control the fuel metering and speed control, while the engine is running. As well, the ECU will provide diagnostic control.

9Y1210822ENM0003US0

[4] ELECTRONIC GOVERNOR [V1505-T-E4]

9Y1210786ENM003A



9Y1210786ENM004A


9Y1210786ENM005A

Electronic Governor

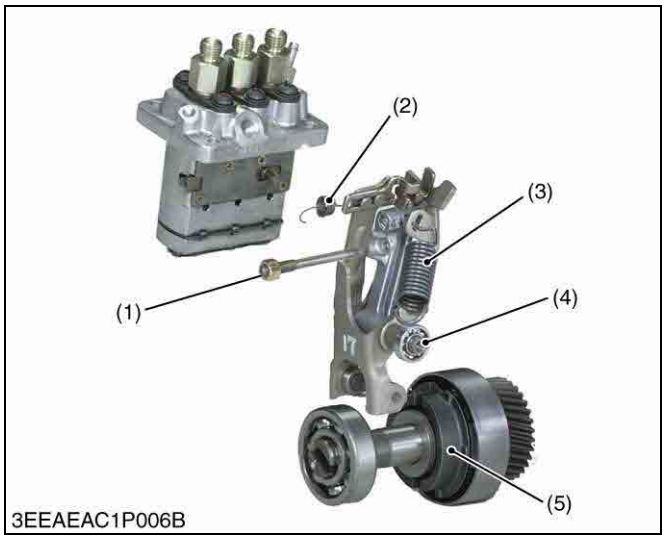
The actuator (1) and rack sensor (2) are set on either side of the injection pump (3) control rack. Here, the rack sensor (2) is continually pushing on the control rack pin (4). Therefore, the amount of change of the actuator (1) is expressed as the signal output of the rack sensor (2).

The ECU regulates the amount of fuel injected through controlling the actuator (1). Also, the ECU monitors the amount of fuel injected using the signal from the rack sensor (2) to estimate the amount of Particulate Matter (PM) deposited in the DPF.

(1) Actuator
(2) Rack Sensor
(3) Injection Pump
(4) Control Rack Pin

9Y1210822ENM0004US0

[5] GOVERNOR [D1305-E4]



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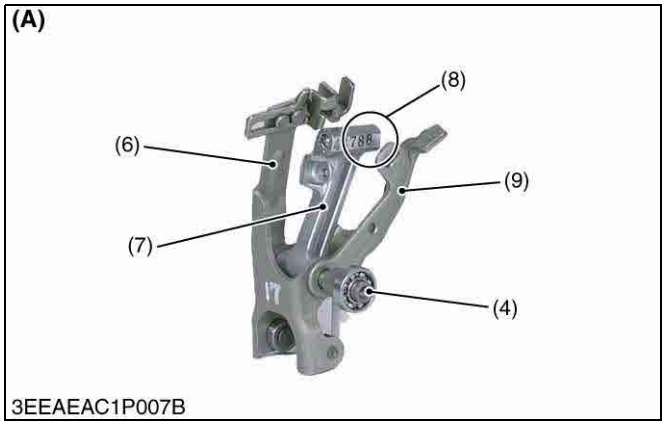

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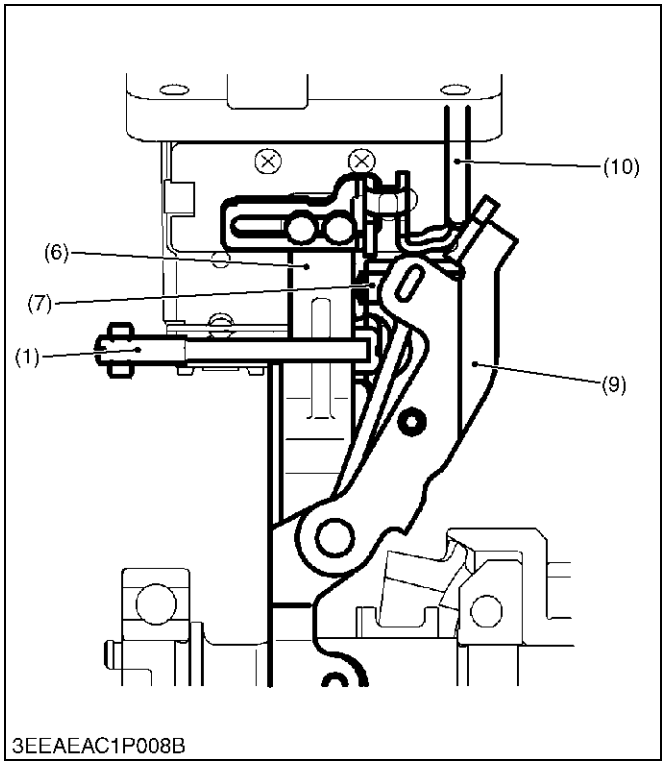

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Three Lever Type Fork Lever

The governor system is a mechanical governor that used the flyweight (5).

The flyweight (5) is mounted on the governor shaft that rotates at the same speed as the crankshaft.

Because the feature of this mechanism takes out the engine speed directly as a centrifugal force of weight, the speed control that the change in the engine rotational speed is sensitively transmitted to fork lever assembly **(A)** and accuracy is high is enabled.

The fork lever assembly of this engine consists of fork lever 1 (6), for lever 2 (9), and the floating lever (7). A slide plate is installed in fork lever 1. The governor spring (3) is hooked to fork lever 2 (9).

The floating lever (7) installs the torque pin (8) of the output drop prevention at the overload. The start spring (2) is hooked to a slide plate, and holds the control rack in the direction of the full fuel position.

Fork lever 2 (9) and the floating lever are installed in fork lever 1 (6) with the fork lever shaft (4). The max torque limitation (1) device limits the amount of the fuel injection at the overload with the torque pin.

(1) Max Torque Limiter
(2) Start Spring
(3) Governor Spring
(4) Fork Lever Shaft
(5) Flyweight
(6) Fork Lever 1
(7) Floating Lever
(8) Torque Pin
(9) Fork Lever 2
(A) Fork Lever Assembly

9Y1210822ENM0005US0

(At Rated Operation)

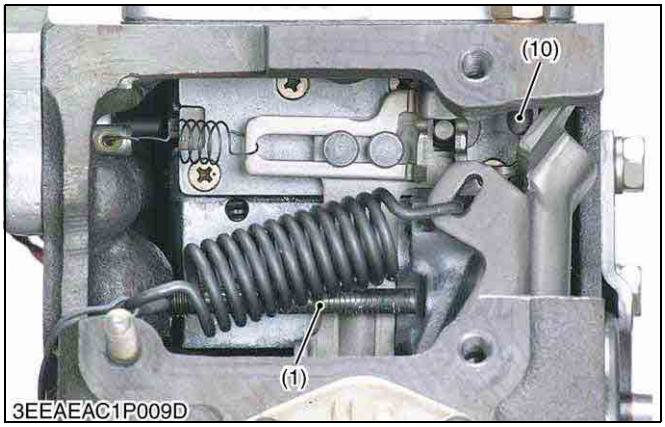
When the engine is running, the fork lever 2 (9) and the floating lever (7) are moving with the fork lever 1 (6) due to the tension of the governor spring (3).

During the time, the torque pin (8) is pressed into the floating lever by centrifugal force of the governor weight (5).

The fork lever 2 (9) comes in contact with the fuel limitation bolt (10), and the fuel injection pump supplies a fuel necessary for rated operation.

(1) Max Torque Limiter
(6) Fork Lever 1
(7) Floating Lever
(9) Fork Lever 2
(10) Fuel Limitation Bolt

9Y1210822ENM0006US0



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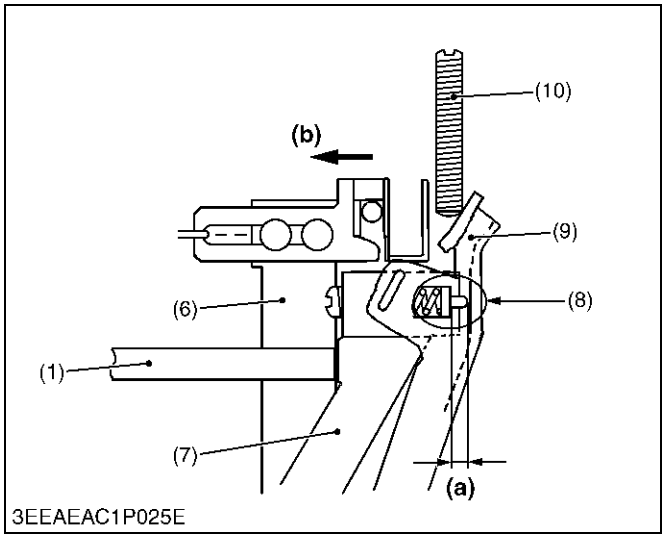


3EEAEAC1P025E

(Overloaded Operation)

The amount of the movement of the fork lever assembly is limited with the fuel limitation bolt (10) and can not be moved in the direction of the fuel increase.

As overload reduces the centrifugal force of the governor weight, which is pressing the torque pin (8) into the floating lever (7), the floating lever pushes the fork lever 1 (6) in the way to increase the fuel supply with the help of the torque spring tension.

The fuel supply increases **(b)** in relation to the degree of the torque pin motion, thus preventing the engine speed from dropping.

At the time, the maximum torque limiter (1) prevents superfluous fuel supply and suppresses the generation of black smoke.

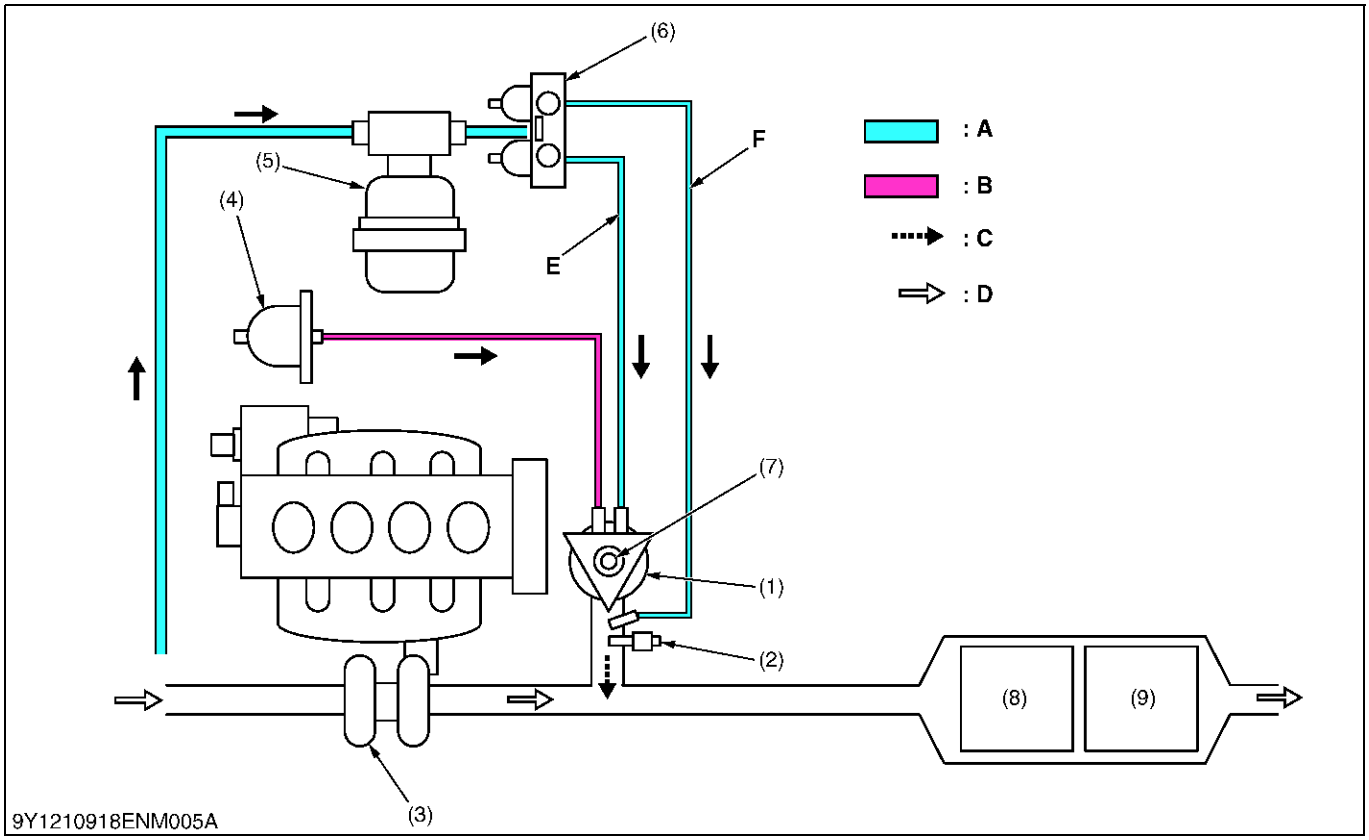
(1) Max Torque Limiter
(6) Fork Lever 1
(7) Floating Lever
(8) Torque Pin
(9) Fork Lever 2
(10) Fuel Limitation Bolt

(a) Distance to which torque pin (8) pushes fork lever 1 (6) out
(b) Increase of fuel

9Y1210822ENM0007US0

2. REFORMER AND AFTER TREATMENT DEVICES

[1] REFORMING MECHANISM



(1)	Reformer	(6)	Air Valve	**A:**	**Air**	**D:**	**Exhaust Gas**
(2)	Burner Glow	(7)	Heater Glow	**B:**	**Fuel**	**E:**	**Primary Air**
(3)	Turbocharger	(8)	Diesel Oxidation Catalyst (DOC)	**C:**	**Reformed Gas**	**F:**	**Secondary Air**
(4)	Doser Fuel Pump						
(5)	Air Blower	(9)	Diesel Particulate Filter (DPF)				

The reformer (1) is a Diesel Particulate Filter (DPF) regeneration device that is not dependent on the combustion method.

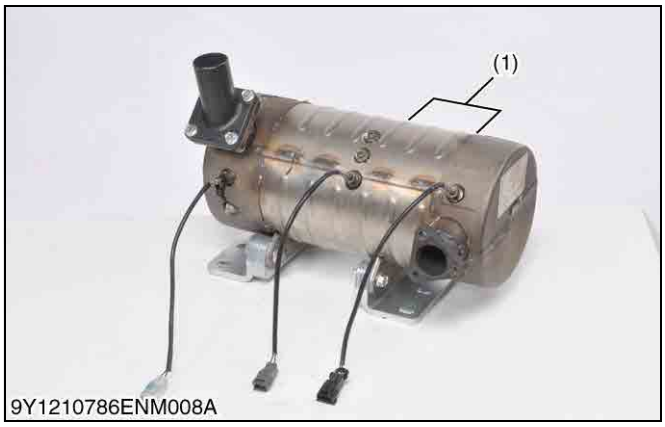
Fuel **"B"** and air (primary air **"E"**) are supplied to the reformer (1) which has reforming catalyst. Fuel **"B"** and primary air **"E"** reacts and generate reformed gas through reforming catalyst and heat from the heater glow (7). The reformed gas **"C"** generated in this manner is mixed with exhaust gas **"D"** and reaches the Diesel Oxidation Catalyst (DOC).

If the exhaust temperature (DOC In) is higher than 250 °C (482 °F), the reformed gas **"C"** makes exothermic reaction with the DOC, raises the exhaust temperature (DPF In) above 550 °C (1022 °F) so that the Particulate Matter (PM) can be removed through combustion.

If the exhaust temperature (DOC In) is lower than 250 °C (482 °F), reformed gas is ignited by using burner glow (2) ("Low Temperature Ignition") so that the exhaust temperature (DOC In) is above 250 °C (482 °F). In this situation the secondary air **"F"** is supplied to the reformed gas **"C"** in order to increase the amount of oxygen to assist ignition.

9Y1210822ENM0021US0

[2] AFTER TREATMENT DEVICES



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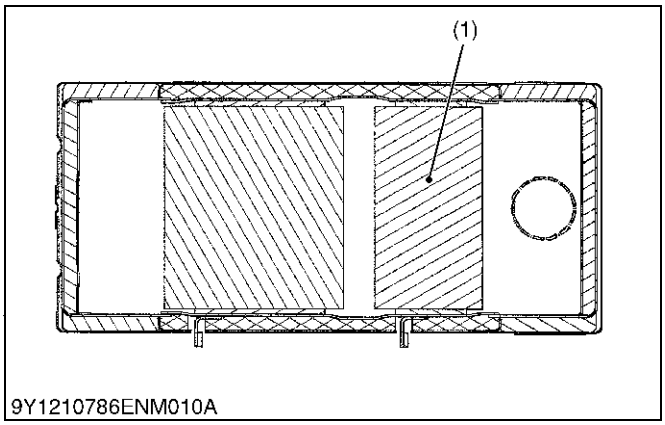


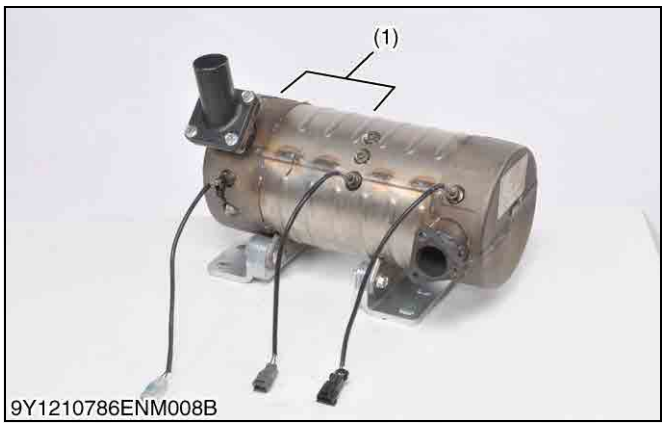
9Y1210786ENM010A

Diesel Oxidation Catalyst (DOC)

An oxidizing catalyst positioned in front of the Diesel Particulate Filter (DPF) step that uses reformer gas to actively regenerate the DPF.

(1) Diesel Oxidation Catalyst (DOC)

9Y1210822ENM0010US0



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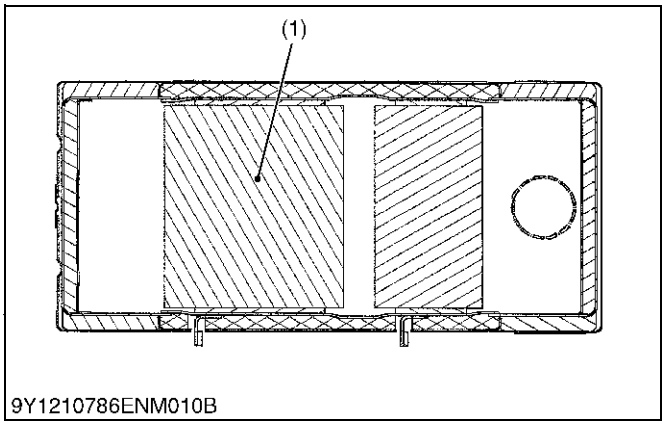

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Diesel Particulate Filter (DPF)

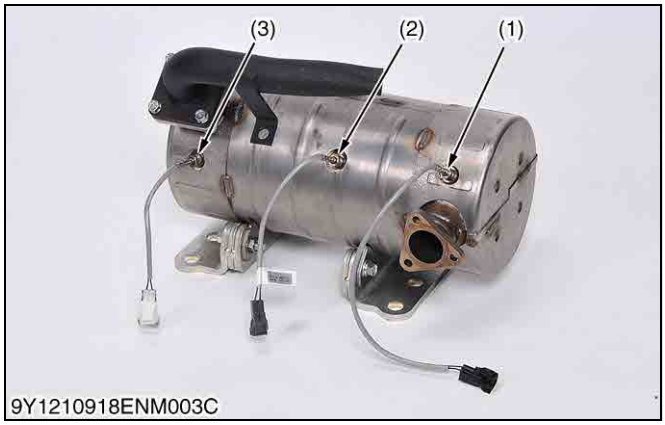
The Diesel Particulate Filter (DPF) is a device that captures and combusts PM in the exhaust gas.

Physically captures the PM using a filter which spontaneously combusts when exhaust gas temperature is high.

However, while exhaust gas temperature is low PM does not spontaneously combust the pressure differential between the inlet and outlet of the DPF is detected and the PM is combusted using a heat source generated using DOC to regenerate the filter.

(1) Diesel Particulate Filter (DPF))

9Y1210822ENM0011US0



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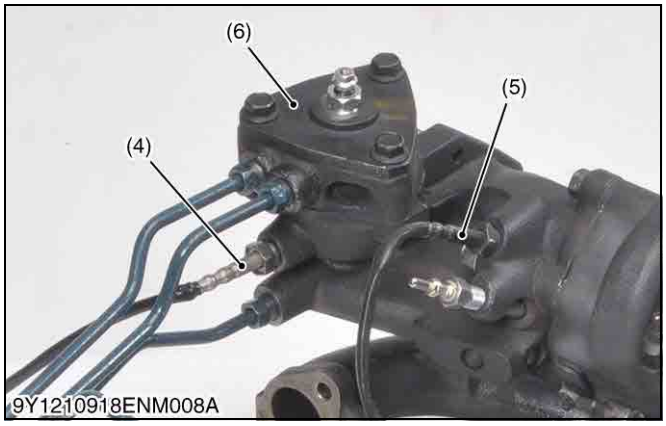

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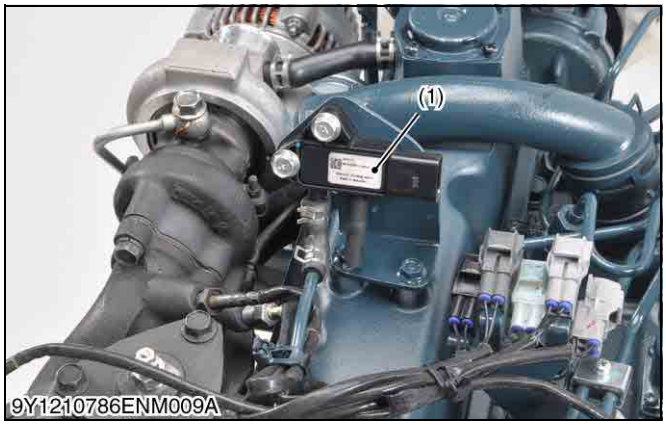

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Temperature Sensor

Three temperature sensors are located on the DPF muffler and detects the DOC inlet exhaust temperature, DPF inlet exhaust temperature and DPF outlet exhaust temperature that is required for the after treatment system.

And two temperature sensors are also located at the reformer housing. Temperature sensor (fuel reform catalytic) detects the temperature at the reforming catalyst and temperature sensor (low temperature ignition) detects the reformed gas temperature before it is mixed with the exhaust gas.

(1) Temperature Sensor (DOC In)
(2) Temperature Sensor (DPF In)
(3) Temperature Sensor (DPF Out)
(4) Temperature Sensor (Fuel Reform Catalytic)
(5) Temperature Sensor (Low Temperature Ignition)
(6) Reformer

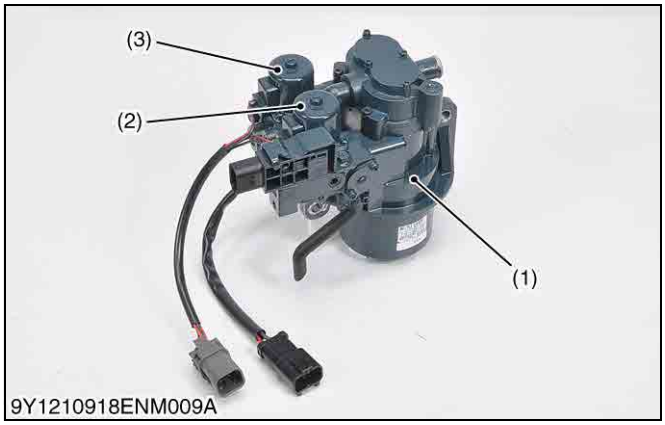
9Y1210822ENM0022US0

Differential Pressure Sensor

The differential pressure sensor is a sensor that detects the pressure differential between the atmosphere and the exhaust gas.

(1) Differential Pressure Sensor

9Y1210822ENM0023US0



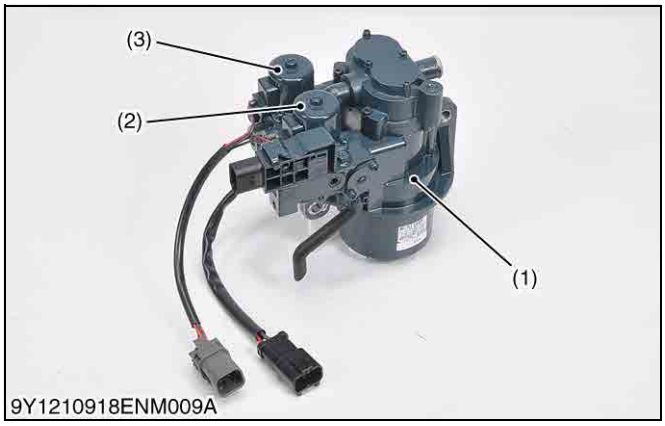
9Y1210918ENM009A

Air Blower

Air blower is a motor drive type. Air blower is a device that supplies the primary air to the reforming catalyst through the air valve 1 when the DPF regeneration is conducted. And also air blower supplies the secondary air to the reformed gas through the air valve 2 when the exhaust temperature (DOC In) is lower than 250 °C (182 °F) and "Low Temperature Ignition" is conducted.

(1) Air Blower
(2) Air Valve 1
(3) Air Valve 2

9Y1210822ENM0025US0



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Air Valve

The reformer system has two solenoid valve, air valve 1 (2) and air valve 2 (3). Air valve 1 controls the air flow from the air blower to the reforming catalyst according to the fuel amount supplied to the reforming catalyst. Air valve 2 controls the air supply from the air blower to the reformed gas when "Low Temperature Ignition" is conducted.

(1) Air Blower
(2) Air Valve 1
(3) Air Valve 2

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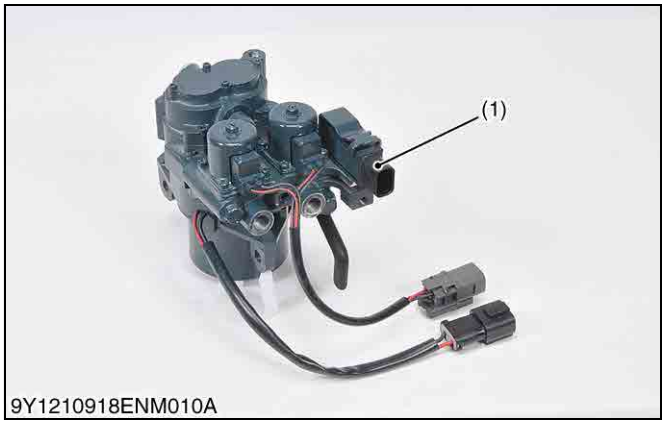

9Y1210918ENM010A

Blower Flow Pressure Sensor

The blower flow pressure sensor detects the air pressure at the downstream side of the air valve 1 in order to calculate the air flow to the reforming catalyst.

(1) Blower Flow Pressure Sensor

9Y1210822ENM0027US0

Doser Fuel Pump

Doser fuel pump is a device that supplies the fuel to the reforming catalyst when the DPF regeneration is conducted. And also the doser fuel pump controls the fuel amount supplied to the reforming catalyst according to the engine operating condition.

(1) Doser Fuel Pump

9Y1210822ENM0028US0

Heater Glow

The heater glow is actuated to supply the heat to the reforming catalyst at the beginning stage of the DPF regeneration so that the reforming catalyst is active. Since the reforming catalyst is activated at once, enough heat is generated for the continuous chemical reaction. So the heater glow is actuated only at the beginning stage of the DPF regeneration.

(1) Heater Glow

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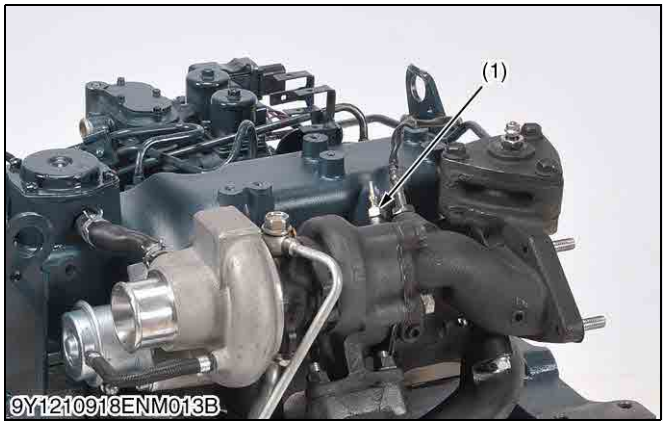

Burner Glow

The burner glow is actuated to conduct the "Low Temperature Ignition".

If the exhaust temperature (DOC In) is lower than 250 °C (482 °F), reformed gas is ignited by using burner glow ("Low Temperature Ignition") so that the exhaust temperature (DOC In) is above 250 °C (482 °F). In this situation the secondary air is supplied to the reformed gas through air valve 2 in order to increase the amount of oxygen to assist ignition.

(1) Burner Glow

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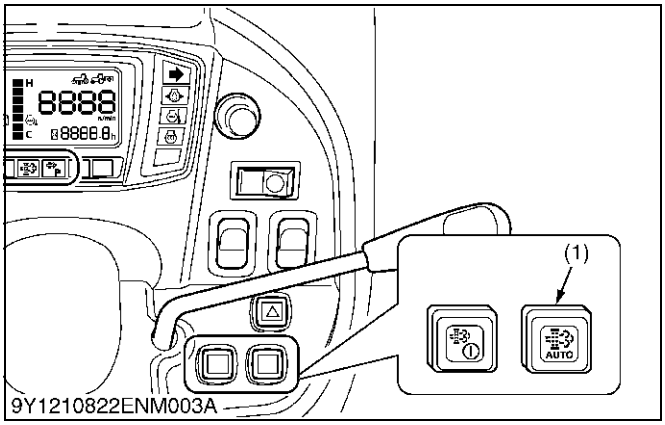
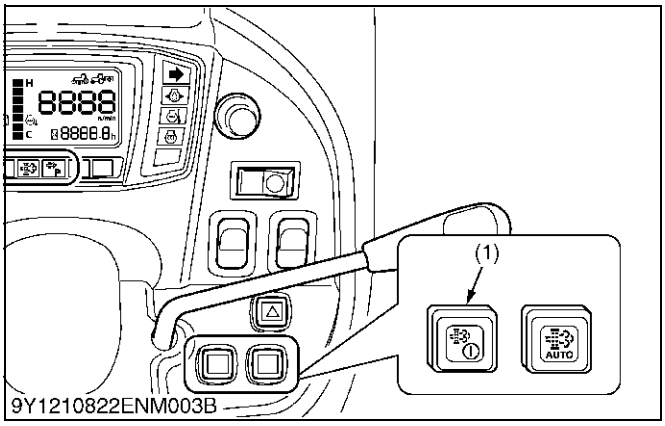


Auto Regeneration Switch

Press the auto regeneration switch, and the Auto Mode and Inhibit Mode changes alternately. The tractor has been set to Inhibit Mode by default. When the main key switch is turned **ON**, the tractor will be in the Inhibit Mode. By pressing the auto regeneration switch, the mode can be switched to the Auto Regeneration Mode.

(1) Auto Regeneration Switch

9Y1210822ENM0014US0



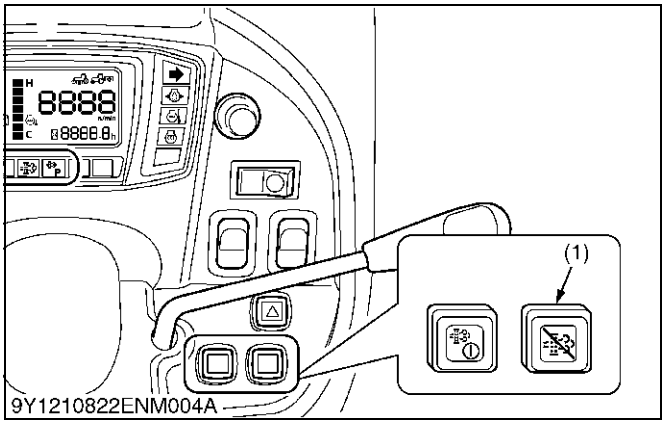
Parked Regeneration Switch

Press the parked regeneration switch under the specified condition, and the parked regeneration starts.

When an amount of PM more than specified has built up in the DPF, it is possible to do the parked regeneration.

(1) Parked Regeneration Switch

9Y1210822ENM0015US0



DPF Inhibit Switch

When the engine is started, the Auto regeneration mode is automatically activated.

When the DPF Inhibit switch is pushed after the engine is started, Regeneration Inhibit mode is activated.

(1) DPF Inhibit Switch

9Y1210822ENM0024US0

[3] DPF REGENERATION SYSTEM

(1) Regeneration Mode (Inhibit Version)

This system has "Auto Regeneration Mode" in which the DPF can regenerate automatically while working, "Inhibit Mode" in which the auto regeneration is inhibited and "Parked Regeneration Mode" in which the DPF regenerates while the tractor is parked.

■ Auto Regeneration Mode

Press the auto regeneration switch, and the Auto Mode is activated. The tractor has been set to Inhibit Mode by default. When the main key switch is turned **ON**, the tractor will be in the Inhibit Mode. By pressing the auto regeneration switch, the mode can be switched to the Auto Regeneration Mode.

When an amount of PM more than specified has built up in the DPF muffler, the DPF is automatically regenerated under the specified condition through the heat generated by the chemical reaction of between DOC (Diesel Oxidation Catalyst) and post injection fuel whether the tractor is in motion or parked.

For jobs not affected by hot gases emitted out of the DPF muffler during regeneration, the Auto Regeneration Mode is advisable.

■ Inhibit Mode

The tractor has been set to Inhibit Mode by default.

Even if an amount of PM more than specified has built up in the DPF muffler, the DPF does not regenerate. When the regeneration is needed, the indicator starts flashing to notify the operator to active Auto Regeneration Mode or conduct a Parked Regeneration Mode, at once in a safe area.

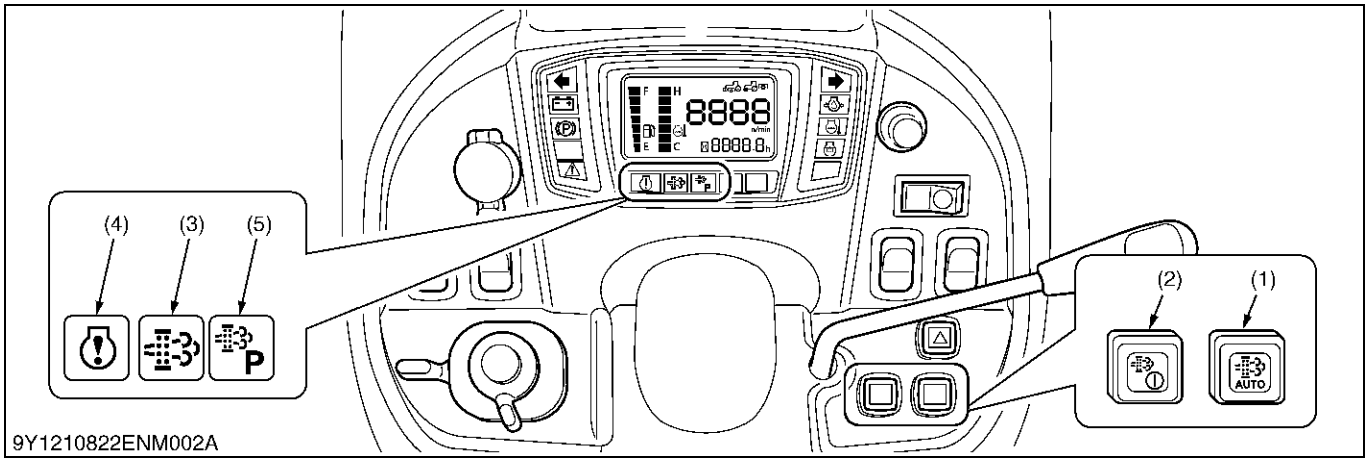
For jobs that are done in poorly ventilated area or in area that may affect plants and animals because of hot gases that will be emitted, the Inhibit Mode is recommended.

■ Parked Regeneration Mode

When an amount of PM more than specified has built up in the DPF, the indicator starts flashing to notify the operator that Regeneration is required and it is possible to do the parked regeneration under the specified condition. Therefore, park the tractor in a safe place and do the regeneration. In the Parked Regeneration Mode, the DPF regeneration is conducted under the condition controlled by the ECU in which the accumulated PM is burned off slowly and steadily for the safety.

9Y1210822ENM0016US0

(2) Indicator and Switch Lamp (Inhibit Version)



(1) Auto Regeneration Switch
(2) Parked Regeneration Switch
(3) Regeneration Indicator
(4) DPF Warning Indicator
(5) Parked Regeneration Indicator

Indicator and switch lamp	Lamp state	Engine condition
AUTO	OFF	Inhibit Mode activated.
	Blink	–
	ON	Auto Regeneration Mode activated.
	OFF	Condition for Parked Regeneration is not satisfied.
	Blink	Condition for Parked Regeneration is satisfied. (Press the switch to start the Parked Regeneration)
	ON	Under the Parked Regeneration.
	OFF	Except for the condition for Blink nor ON.
	Blink	Condition for Auto Regeneration is not satisfied in level 1 or 2
	ON	Under the Auto Regeneration or Parked Regeneration
	OFF	Engine operation is normal.
	Blink	PM warning level is 3. (Do the Parked Regeneration as soon as possible)
	ON	PM warning level is 4 or 5. (Parked Regeneration can be conduct only by using diagmaster in level 4) (Parked Regeneration is not possible, then DPF replacement is necessary in level 5.)
P	OFF	Parked Regeneration is not possible.
	Blink	PM warning level is 2 or 3. When using the diagmaster in level 4. (Parked Regeneration is possible when the specified condition is satisfied)
	ON	Under the preparation for Parked Regeneration

■ Condition for Parked Regeneration

Speed control pedal	Neutral
Cruise control lever	Neutral
Parking brake	ON
PTO Clutch	OFF
Engine speed	Idle speed

9Y1210822ENM0017US0

(3) PM Warning Level (Inhibit Version)

PM warning level 0 to 5 as shown below is programmed according to the amount of accumulated PM to prompt the operator to perform the required procedure in each level.

- Level 0: Normal operation. Regeneration is not required.
- Level 1: Auto Regeneration is possible in the Auto Regeneration Mode.
- Level 2: Auto Regeneration is possible in the Auto Regeneration Mode. Parked Regeneration is possible in both of the Auto Regeneration Mode and Inhibit Mode.
- Level 3: Auto Regeneration is not possible in above level 3. Parked Regeneration is required as soon as possible.
- Level 4: Only by using diagmaster, Parked Regeneration is possible. Parked Regeneration is required as soon as possible.
- Level 5: Replacement is required. Regeneration is not possible.

9Y1210822ENM0031US0

Auto Regeneration Mode

Warning level	Buzzer	Engine output limitation	AUTO			P		Remark
0	No	No limitation	●	❍	❍	❍	❍	Normal operation, Regeneration is not required.
1	No	No limitation	●	●	❍	❍	❍	Under the Auto Regeneration or preparation for Auto Regeneration.
			●	★	❍	❍	❍	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.) Keep on working and increase the engine rpm until regeneration indicator stops flashing and remains constant **"ON"**.
2-1	Every 5 seconds	No limitation	●	●	❍	❍	❍	Under the Auto Regeneration or preparation for Auto Regeneration.
2-2	Every 3 seconds		●	★	❍	❍	❍	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.) Keep on working and increase the engine rpm until regeneration indicator stops flashing and remains constant **"ON"**.
3	Every second	50 %	❍	❍	❍	★	★	Condition for Parked Regeneration is not satisfied.
			❍	❍	★	★	★	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	★	Under the preparation for Parked Regeneration.
			❍	❍	●	★	★	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	★	Under the Parked Regeneration.
4	Every second	50 %	❍	❍	❍	❍	●	Without diagmaster.
			❍	❍	❍	★	●	Condition for Parked Regeneration is not satisfied.
			❍	❍	★	★	●	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	●	Under the preparation for Parked Regeneration.
			❍	❍	●	★	●	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	●	Under the Parked Regeneration.
5	Every second	50 %	❍	❍	❍	❍	●	Even when using diagmaster, it is not possible to do Parked Regeneration.

❍ : OFF, ★ : Blink, ● : ON

9Y1210822ENM0032US0

Inhibit Mode

Warning level	Buzzer	Engine output limitation	AUTO			P		Remark
0	No	No limitation	❍	❍	❍	❍	❍	Normal operation, Regeneration is not required.
1	No	No limitation	❍	★	❍	❍	❍	Regeneration is required, but Auto Regeneration is not possible.
2-1	Every 5 seconds	No limitation	❍	★	❍	★	❍	Regeneration is required, but Auto Regeneration is not possible. Condition for Parked Regeneration is not satisfied.
			❍	★	★	★	❍	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
2-2	Every 3 seconds		❍	❍	●	●	❍	Under the preparation for Parked Regeneration.
			❍	❍	●	★	❍	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	❍	Under the Parked Regeneration.
3	Every second	50 %	❍	❍	❍	★	★	Condition for Parked Regeneration is not satisfied.
			❍	❍	★	★	★	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	★	Under the preparation for Parked Regeneration.
			❍	❍	●	★	★	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	★	Under the Parked Regeneration.
4	Every second	50 %	❍	❍	❍	❍	●	Without diagmaster.
			❍	❍	❍	★	●	Condition for Parked Regeneration is not satisfied.
			❍	❍	★	★	●	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	●	Under the preparation for Parked Regeneration.
			❍	❍	●	★	●	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	●	Under the Parked Regeneration.
5	Every second	50 %	❍	❍	❍	❍	●	Even when using diagmaster, it is not possible to do Parked Regeneration.

❍ : OFF, ★ : Blink, ● : ON

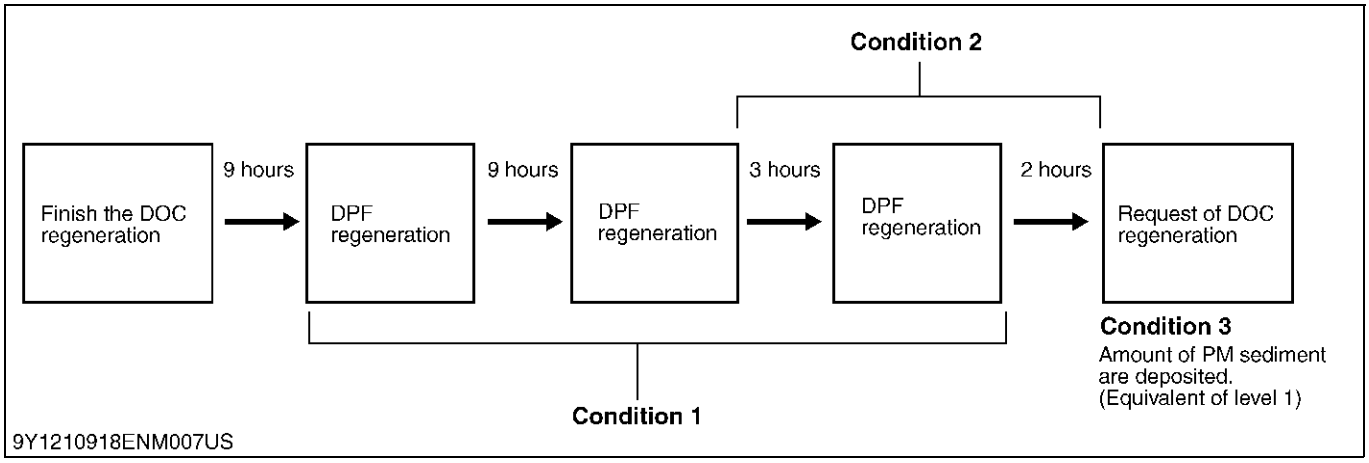
9Y1210822ENM0033US0

DOC Mode

Occurrence condition of DOC regeneration	AUTO			P		Remark
Condition 1 Three times DPF regeneration are completed from last time DOC regeneration. **Condition 2** DPF regeneration interval is under four hours at second consecutive. **Condition 3** Amount of PM sediment are deposited equivalent of level 1 after two hours from finish the DPF regeneration. DOC regeneration occur when meet the above all conditions.	❍	❍	❍	★	❍	DOC Regeneration is required.
	❍	❍	★	★	❍	Condition for DOC Regeneration is satisfied.
	❍	❍	●	●	❍	Under the preparation for DOC Regeneration.
	❍	❍	●	★	❍	Initiation condition for DOC Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
	❍	●	●	❍	❍	Under the DOC Regeneration.

❍ : OFF, ★ : Blink, ● : ON

[Occurring case of DOC regeneration]



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(4) Regeneration Mode (Default Version)

DPF regeneration process can be performed by choosing from "Auto Regeneration" or "Regeneration inhibit" mode according to your job conditions. For jobs not affected by hot gases emitted during regeneration, the "Auto Regeneration" is advisable.

■ **Auto Regeneration Mode**

When starting the engine (switch operation is unnecessary), the "Auto Regeneration" mode is automatically activated.

With the auto regeneration mode on, when a specific amount of PM has accumulated, and the regeneration conditions are satisfied (See the "Tips on Diesel Particulate Filter [DPF] Regeneration"), the DPF will be automatically regenerated whether the tractor is in motion or parked.

By this way, work efficiency is improved. For details of auto regeneration, refer to "Operating Procedure for Auto Regeneration Mode" section.

■ **Inhibit Mode**

After starting the engine, if the "DPF INHIBIT switch" is pressed to turn on the switch lamp, the "Regeneration inhibit" mode will be activated.

With "Regeneration Inhibit" mode on, the PM which has accumulated inside the DPF will not be burnt, unless the operator performs the regeneration work manually.

The "Regeneration Inhibit" mode is effective for work in poorly ventilated work spaces.

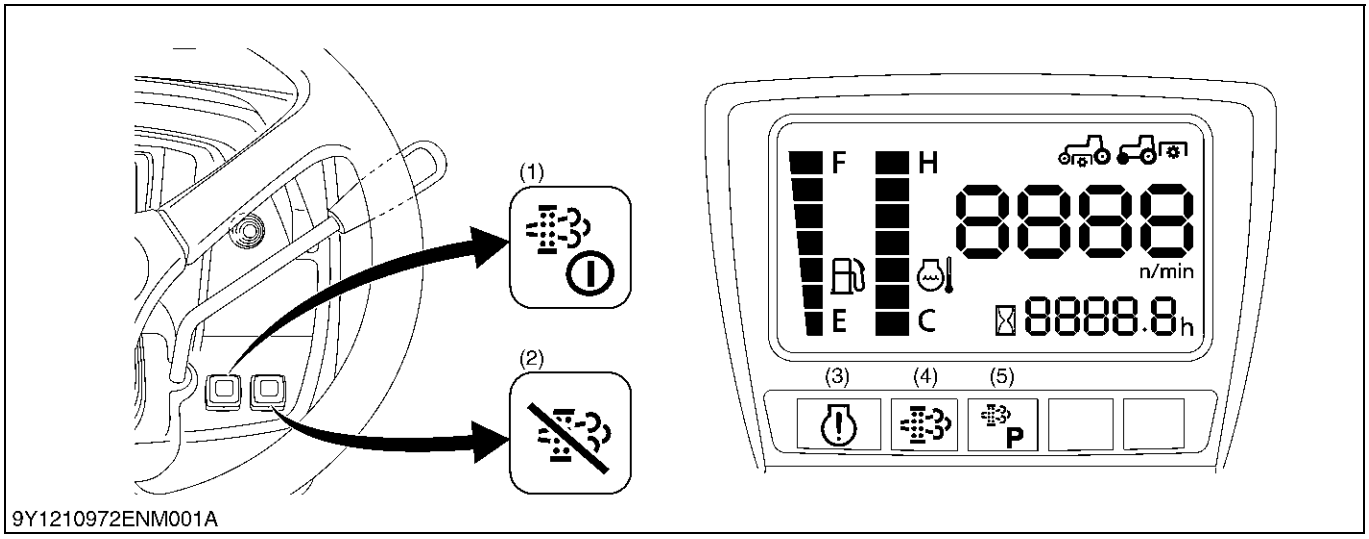
For details of regeneration prohibition, refer to "Operating Procedure for Regeneration Inhibit Mode" section.

■ **NOTE**

- **If stop the engine once, the "Auto Regeneration " mode will be activated.**

9Y1210822ENM0035US0

(5) Indicator and Switch Lamp (Default Version)



9Y1210972ENM001A

(1) Parked Regeneration Switch
(2) DPF INHIBIT Switch
(3) Engine Warming Indicator
(4) Regeneration Indicator
(5) Parked Regeneration Indicator

Indicator and switch lamp	Lamp state	Engine condition
	OFF	Auto Regeneration Mode activated.
	Blink	–
	ON	Regeneration Inhibit Move activated.
	OFF	Condition for Parked Regeneration is not satisfied.
	Blink	Condition for Parked Regeneration is satisfied. (Press the switch to start the Parked Regeneration)
	ON	Under the Parked Regeneration.
	OFF	Except for the condition for Blink nor ON.
	Blink	Condition for Auto Regeneration is not satisfied in level 1 or 2
	ON	Under the Auto Regeneration or Parked Regeneration
	OFF	Engine operation is normal.
	Blink	PM warning level is 3. (Do the Parked Regeneration as soon as possible)
	ON	PM warning level is 4 or 5. (Parked Regeneration can be conduct only by using diagmaster in level 4) (Parked Regeneration is not possible, then DPF replacement is necessary in level 5.)
	OFF	Parked Regeneration is not possible.
	Blink	PM warning level is 2 or 3. When using the diagmaster in level 4. (Parked Regeneration is possible when the specified condition is satisfied)
	ON	Under the preparation for Parked Regeneration.

■ Condition for Parked Regeneration

Speed control pedal	Neutral
Speed set lever	Neutral
Parking brake	ON
PTO Clutch	OFF
Engine speed	Idle speed

9Y1210822ENM0036US0

(6) Warning Level (Default Version)

PM warning level 0 to 5 as shown below is programmed according to the amount of accumulated PM to prompt the operator to perform the required procedure in each level.

- Level 0: Normal operation. Regeneration is not required.
- Level 1: Auto Regeneration is possible in the Auto Regeneration Mode.
- Level 2: Auto Regeneration is possible in the Auto Regeneration Mode. Parked Regeneration is possible in both of the Auto Regeneration Mode and Inhibit Mode.
- Level 3: Auto Regeneration is not possible in above level 3. Parked Regeneration is required as soon as possible.
- Level 4: Only by using diagmaster, Parked Regeneration is possible. Parked Regeneration is required as soon as possible.
- Level 5: Replacement is required. Regeneration is not possible.

9Y1210822ENM0037US0

Auto Regeneration Mode

Warning level	Buzzer	Engine output limitation						Remark
0	No	No limitation	❍	❍	❍	❍	❍	Normal operation, Regeneration is not required.
1	No	No limitation	❍	●	❍	❍	❍	Under the Auto Regeneration or preparation for Auto Regeneration.
			❍	★	❍	❍	❍	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.) Keep on working and increase the engine rpm until regeneration indicator stops flashing and remains constant **"ON"**.
2-1	Every 5 seconds	No limitation	❍	●	❍	❍	❍	Under the Auto Regeneration or preparation for Auto Regeneration.
2-2	Every 3 seconds		❍	★	❍	❍	❍	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.) Keep on working and increase the engine rpm until regeneration indicator stops flashing and remains constant **"ON"**.
3	Every second	50 %	❍	❍	❍	★	★	Condition for Parked Regeneration is not satisfied.
			❍	❍	★	★	★	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	★	Under the preparation for Parked Regeneration.
			❍	❍	●	★	★	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	★	Under the Parked Regeneration.
4	Every second	50 %	❍	❍	❍	❍	●	Without diagmaster.
			❍	❍	❍	★	●	Condition for Parked Regeneration is not satisfied.
			❍	❍	★	★	●	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	●	Under the preparation for Parked Regeneration.
			❍	❍	●	★	●	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	●	Under the Parked Regeneration.
5	Every second	50 %	❍	❍	❍	❍	●	Even when using diagmaster, it is not possible to do Parked Regeneration.

❍ : OFF, ★ : Blink, ● : ON

9Y1210822ENM0038US0

Inhibit Mode

Warning level	Buzzer	Engine output limitation						Remark
0	No	No limitation	●	❍	❍	❍	❍	Normal operation, Regeneration is not required.
1	No	No limitation	●	★	❍	❍	❍	Regeneration is required, but Auto Regeneration is not permitted. Parking Regeneration is not possible.
2-1	Every 5 seconds	No limitation	●	★	❍	★	❍	This indication switch to the following if release the DPF inhibit switch in the state of condition for Parked Regeneration is satisfied. Shift to the Auto Regeneration if release the DPF inhibit switch in the state of condition for Parked Regeneration is not satisfied.
			❍	★	★	★	❍	Condition for Parked Regeneration is satisfied (*). When pressing the parked regeneration switch, Parked Regeneration will start. *Auto Regeneration is not start in the state of condition for Parked Regeneration is satisfied.
2-2	Every 3 seconds		❍	❍	●	●	❍	Under the preparation for Parked Regeneration.
			❍	❍	●	★	❍	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	❍	Under the Parked Regeneration.
3	Every second	50 %	●	❍	❍	★	★	This indication switch to the following if release the DPF inhibit switch in the state of condition for Parked Regeneration is satisfied.
			❍	❍	★	★	★	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	★	Under the preparation for Parked Regeneration.
			❍	❍	●	★	★	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	★	Under the Parked Regeneration.
4	Every second	50 %	●	❍	❍	❍	●	Without diagmaster.
			●	❍	❍	★	●	This indication switch to the following if release the DPF inhibit switch in the state of condition for Parked Regeneration is satisfied.
			❍	❍	★	★	●	Condition for Parked Regeneration is satisfied. When pressing the parked regeneration switch, Parked Regeneration will start.
			❍	❍	●	●	●	Under the preparation for Parked Regeneration.
			❍	❍	●	★	●	Initiation condition for Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
			❍	●	●	❍	●	Under the Parked Regeneration.
5	Every second	50 %	●	❍	❍	❍	●	Even when using diagmaster, it is not possible to do Parked Regeneration.

❍ : OFF, ★ : Blink, ● : ON

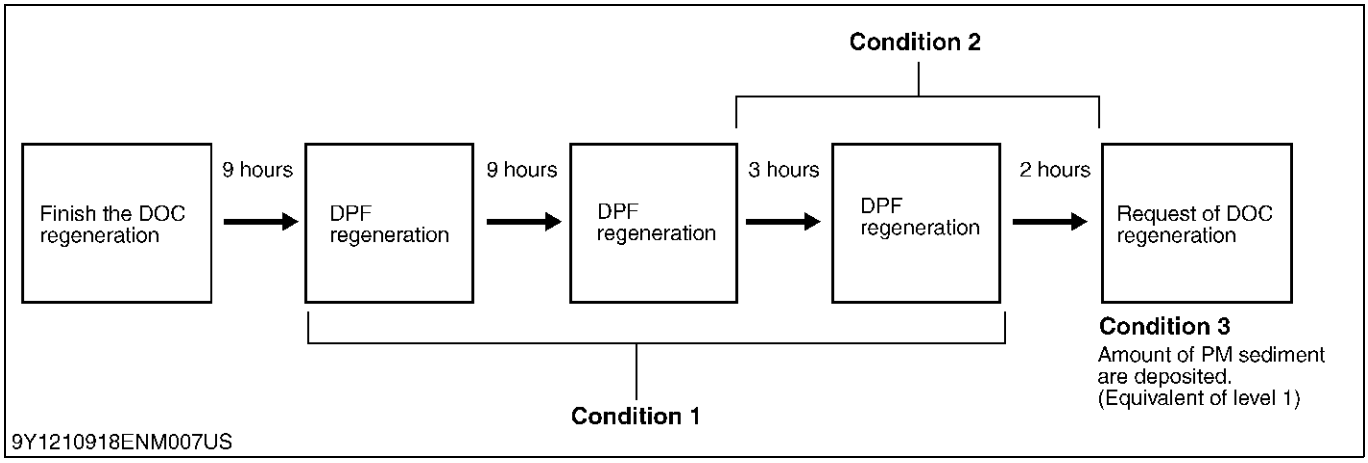
9Y1210822ENM0039US0

DOC Mode

Occurrence condition of DOC regeneration						Remark
Condition 1 Three times DPF regeneration are completed from last time DOC regeneration. **Condition 2** DPF regeneration interval is under four hours at second consecutive. **Condition 3** Amount of PM sediment are deposited equivalent of level 1 after two hours from finish the DPF regeneration. DOC regeneration occur when meet the above all conditions.	●	❍	❍	★	❍	DOC Regeneration is required. This indication switch to the following if release the DPF inhibit switch in the state of condition for Parked Regeneration is satisfied.
	❍	❍	★	★	❍	Condition for DOC Regeneration is satisfied. When pressing the parked regeneration switch, DOC Regeneration will start.
	❍	❍	●	●	❍	Under the preparation for DOC Regeneration.
	❍	❍	●	★	❍	Initiation condition for DOC Regeneration is not satisfied. (Coolant temperature and Voltage are below threshold.)
	❍	●	●	❍	❍	Under the DOC Regeneration.

❍ : OFF, ★ : Blink, ● : ON

[Occurring case of DOC regeneration]



9Y1210822ENM0040US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Fill fuel	–
	Air in the fuel system	Bleed	G-36
	Water in the fuel system	Change fuel and repair or replace fuel system	–
	Fuel hose clogged	Clean or replace	G-27
	Fuel filter clogged	Replace	G-32
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-9
	Fuel with low cetane number	Use specified fuel	G-9
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	–
	Incorrect injection timing	Adjust	1-S17
	Fuel camshaft worn	Replace	1-S36
	Injection nozzle clogged	Clean or replace	1-S20
	Injection pump malfunctioning	Repair or replace	1-S34
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S30, 1-S32
	Improper valve timing	Correct or replace timing gear	1-S36
	Piston ring and cylinder worn	Replace	1-S39
	Excessive valve clearance	Adjust	1-S13
	Stop solenoid malfunctioning	Replace	8-S24
	Solenoid malfunctioning	Replace	8-S24
	Rack sensor malfunctioning	Replace	8-S39
Starter Does Not Run	Battery discharged	Charge	G-24
	Starter malfunctioning	Repair or replace	8-S56, 8-S59
	Key switch malfunctioning	Replace	8-S16
	Wiring disconnected	Connect	–

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Symptom	Probable Cause	Solution	Reference Page
Engine Revolution Is Not Smooth	Fuel filter clogged or dirty	Replace	G-32
	Air cleaner clogged	Clean or replace	G-25
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	–
	Injection pump malfunctioning	Repair or replace	1-S34
	Incorrect nozzle injection pressure	Adjust	1-S19
	Injection nozzle stuck or clogged	Repair or replace	1-S20
	Governor malfunctioning	Repair	–
	Solenoid malfunctioning	Replace	8-S24
	Rack sensor malfunctioning	Replace	8-S39
	Turbocharger bearing worn out	Replace the turbocharger assembly	1-S20
	Turbocharger shaft bent	Replace the turbocharger assembly	1-S20
	Turbocharger fin or other part damaged due to foreign matters	Replace the turbocharger assembly	1-S20
Either White or Blue Exhaust Gas Is Observed	Excessive engine oil	Reduce to specified level	G-19
	Piston ring and cylinder worn or stuck	Repair or replace	1-S39
	Incorrect injection timing	Adjust	1-S17
	Deficient compression	Repair	1-S12, 1-S54, 1-S61
Oil Leak into Exhaust Pipe or Suction Pipe	Waste oil pipe clogged or deformed	Repair or replace	7-S11
	Piston ring seal faulty	Replace the turbocharger assembly	1-S39
Either Black or Dark Gray Exhaust Gas Is Observed	Overload	Decrease the load	–
	Low grade fuel used	Use specified fuel	G-9
	Fuel filter clogged	Replace	G-32
	Air cleaner clogged	Clean or replace	G-25
	Deficient nozzle injection	Repair or replace nozzle	1-S20

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Symptom	Probable Cause	Solution	Reference Page
Deficient Output	Incorrect injection timing	Adjust	1-S17
	Engine's moving parts seem to be seizing	Repair or replace	–
	Injection pump malfunctioning	Repair or replace	1-S34
	Uneven fuel injection	Replace injection pump	1-S34
	Deficient nozzle injection	Repair or replace nozzle	1-S20
	Compression leak	Check the compression pressure and repair	1-S30, 1-S32
	Gas leak from exhaust system	Repair or replace	1-S20, 1-S21
	Air leak from compressor discharge side	Repair or replace	1-S20, 1-S21
	Air cleaner dirty or clogged	Clean or replace	G-25
	Compressor wheel turning heavily	Replace the turbocharger assembly	1-S20
Excessive Lubricant Oil Consumption	Piston ring's gap facing the same direction	Shift ring gap direction	1-S39
	Oil ring worn or stuck	Replace	1-S39
	Piston ring groove worn	Replace piston	1-S39
	Valve stem and valve guide worn	Replace	1-S45
	Crankshaft bearing and crank pin bearing worn	Replace	1-S42, 1-S43
	Oil leaking due to damaged seals or packing	Replace	–
Fuel Mixed into Lubricant Oil	Injection pump's plunger worn	Repair or replace	1-S34
	Deficient nozzle injection	Repair or replace nozzle	1-S20
	Injection pump broken	Replace	1-S34
Water Mixed into Lubricant Oil	Head gasket damaged	Replace	1-S32
	Cylinder block or cylinder head flawed	Replace	1-S32
Low Oil Pressure	Engine oil insufficient	Fill	G-19
	Oil strainer clogged	Clean	1-S37
	Oil filter cartridge clogged	Replace	G-19
	Relief valve stuck with dirt	Clean	–
	Relief valve spring weaken or broken	Replace	–
	Excessive oil clearance of crankshaft bearing	Replace	1-S57
	Excessive oil clearance of crankpin bearing	Replace	1-S56
	Excessive oil clearance of rocker arm	Replace	1-S52
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-9
	Oil pump damaged	Replace	1-S62

Symptom	Probable Cause	Solution	Reference Page
High Oil Pressure	Different type of oil	Use specified type of oil	G-9
	Relief valve damaged	Replace	–
Engine Overheated	Engine oil insufficient	Fill	G-19
	Fan belt broken or elongated	Replace or adjust	1-S15
	Coolant insufficient	Fill	G-9
	Radiator net and radiator fin clogged with dust	Clean	G-17
	Inside of radiator corroded	Clean or replace	G-34
	Coolant flow route corroded	Clean or replace	G-34
	Radiator cap damaged	Replace	1-S16
	Radiator hose damaged	Replace	G-28
	Overload running	Reduce the load	–
	Head gasket damaged	Replace	1-S32
	Incorrect injection timing	Adjust	1-S17
	Unsuitable fuel used	Use specified fuel	G-9
Battery Quickly Discharged	Battery electrolyte insufficient	Fill distilled water and charge	G-23
	Fan belt slips	Adjust belt tension or replace	1-S15
	Wiring disconnected	Connect	–
	Rectifier damaged	Replace	–
	Alternator damaged	Replace	–
	Battery damaged	Replace	–

9Y1210822ENS0016US0

2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	–
Compression Pressure	D1305-E4	3.73 to 4.11 MPa 38.0 to 42.0 kgf/cm^2 541 to 597 psi	2.26 MPa 23.0 kgf/cm^2 327 psi
	V1505-T-E4	3.14 to 3.53 MPa 32.0 to 36.0 kgf/cm^2 456 to 512 psi	2.26 MPa 23.0 kgf/cm^2 327 psi
• Difference among Cylinders		–	10 % or less
Top Clearance	D1305-E4	0.80 to 1.0 mm 0.032 to 0.039 in.	–
	V1505-T-E4	0.55 to 0.75 mm 0.022 to 0.029 in.	–
Cylinder Head Surface	Flatness	–	0.05 mm 0.002 in.
Valve Recessing	Intake and Exhaust	0.050 (protrusion) to 0.25 (recessing) mm 0.0020 (protrusion) to 0.0098 (recessing) in.	(recessing) 0.40 mm 0.016 in.
Valve Stem to Valve Guide	Clearance	0.035 to 0.065 mm 0.0014 to 0.0025 in.	0.10 mm 0.0039 in.
• Valve Stem	O.D.	6.960 to 6.975 mm 0.2741 to 0.2746 in.	–
• Valve Guide	I.D.	7.010 to 7.025 mm 0.2760 to 0.2765 in.	–
Valve Face	Angle (IN.)	1.0 rad 60 °	–
	Angle (EX.)	0.79 rad 45 °	–
Valve Seat	Angle (IN.)	1.0 rad 60 °	–
	Angle (EX.)	0.79 rad 45 °	–
	Width	2.12 mm 0.0835 in.	–
Valve Spring	Free Length	37.0 to 37.5 mm 1.46 to 1.47 in.	36.5 mm 1.44 in.
	Tilt	–	1.0 mm 0.039 in.
	Setting Load / Setting Length	117.4 N / 31.0 mm 11.97 kgf / 31.0 mm 26.39 lbf / 1.22 in.	100.0 N / 31.0 mm 10.20 kgf / 31.0 mm 22.48 lbf / 1.22 in.

Item		Factory Specification	Allowable Limit
Rocker Arm Shaft to Rocker Arm	Oil Clearance	0.016 to 0.045 mm 0.00063 to 0.0017 in.	0.10 mm 0.0039 in.
• Rocker Arm Shaft	O.D.	11.973 to 11.984 mm 0.47138 to 0.47181 in.	–
• Rocker Arm	I.D.	12.000 to 12.018 mm 0.47244 to 0.47314 in.	–
Push Rod	Alignment	–	0.25 mm 0.0098 in.
Tappet to Tappet Guide Bore	Oil Clearance	0.020 to 0.062 mm 0.00079 to 0.0024 in.	0.07 mm 0.003 in.
• Tappet	O.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	–
• Tappet Guide Bore	I.D.	20.000 to 20.021 mm 0.78740 to 0.78822 in.	–
Idle Gear • Crank Gear to Idle Gear 1	Backlash	0.0320 to 0.115 mm 0.00126 to 0.00452 in.	0.15 mm 0.0059 in.
• Idle Gear 1 to Cam Gear	Backlash	0.0360 to 0.114 mm 0.00142 to 0.00448 in.	0.15 mm 0.0059 in.
• Idle Gear 1 to Fuel Cam Gear	Backlash	0.0340 to 0.116 mm 0.00134 to 0.00456 in.	0.15 mm 0.0059 in.
• Idle Gear 1 to Idle Gear 2	Backlash	0.0330 to 0.117 mm 0.00130 to 0.00460 in.	0.15 mm 0.0059 in.
• Idle Gear 2 to Governor Gear	Backlash	0.0300 to 0.117 mm 0.00119 to 0.00460 in.	0.15 mm 0.0059 in.
Governor Gear • Injection Pump Gear to Governor Gear	Backlash	0.0300 to 0.117 mm 0.00119 to 0.00460 in.	0.15 mm 0.0059 in.
Idle Gear Shaft to Idle Gear Bushing	Clearance	0.020 to 0.054 mm 0.00079 to 0.0021 in.	0.10 mm 0.0039 in.
• Idle Gear Shaft 1 and 2	O.D.	25.967 to 25.980 mm 1.0224 to 1.0228 in.	–
• Idle Gear Bushing 1 and 2	I.D.	26.000 to 26.021 mm 1.0237 to 1.0244 in.	–
Idle Gear • Idle Gear 1	Side Clearance	0.20 to 0.51 mm 0.0079 to 0.020 in.	0.80 mm 0.031 in.
• Idle Gear 2	Side Clearance	0.20 to 0.51 mm 0.0079 to 0.020 in.	0.80 mm 0.031 in.
Camshaft	Side Clearance	0.070 to 0.22 mm 0.0028 to 0.0086 in.	0.30 mm 0.012 in.
	Alignment	–	0.01 mm 0.0004 in.

Item		Factory Specification	Allowable Limit
Cam Height	Intake	28.80 mm 1.134 in.	28.75 mm 1.132 in.
	Exhaust	29.00 mm 1.142 in.	28.95 mm 1.140 in.
Camshaft Journal to Cylinder Block Bore	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
• Camshaft Journal	O.D.	35.934 to 35.950 mm 1.4148 to 1.4153 in.	–
• Cylinder Block Bore	I.D.	36.000 to 36.025 mm 1.4174 to 1.4183 in.	–
Piston Pin Bore	I.D.	22.000 to 22.013 mm 0.86615 to 0.86665 in.	22.03 mm 0.8673 in.
Piston Pin to Small End Bushing	Oil Clearance	0.014 to 0.038 mm 0.00055 to 0.0014 in.	0.15 mm 0.0059 in.
• Piston Pin	O.D.	22.002 to 22.011 mm 0.86622 to 0.86657 in.	–
• Small End Bushing	I.D.	22.025 to 22.040 mm 0.86713 to 0.86771 in.	–
Piston Ring Gap	Top Ring	0.15 to 0.25 mm 0.0059 to 0.0098 in.	1.20 mm 0.0472 in.
	Second Ring	0.40 to 0.55 mm 0.016 to 0.021 in.	1.20 mm 0.0472 in.
	Oil Ring	0.25 to 0.45 mm 0.0099 to 0.017 in.	1.25 mm 0.0492 in.
Piston Ring to Piston Ring Groove • Second Ring	Clearance	0.0850 to 0.122 mm 0.00335 to 0.00480 in.	0.2 mm 0.008 in.
• Oil Ring	Clearance	0.02 to 0.06 mm 0.0008 to 0.002 in.	0.15 mm 0.0059 in.
Connecting Rod	Alignment	–	0.05 mm 0.002 in.
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.012 in.	0.50 mm 0.020 in.
	Alignment	–	0.02 mm 0.0008 in.
Crankshaft Journal to Crankshaft Bearing 1 [D1305-E4]	Oil Clearance	0.0340 to 0.119 mm 0.00134 to 0.00468 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	51.921 to 51.940 mm 2.0442 to 2.0448 in.	–
• Crankshaft Bearing 1	I.D.	51.974 to 52.040 mm 2.0463 to 2.0488 in.	–

Item		Factory Specification	Allowable Limit
Crankshaft Journal to Crankshaft Bearing 1 [V1505-T-E4]	Oil Clearance	0.0340 to 0.114 mm 0.00134 to 0.00448 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	47.934 to 47.950 mm 1.8872 to 1.8877 in.	–
• Crankshaft Bearing 1	I.D.	47.984 to 48.048 mm 1.8892 to 1.8916 in.	–
Crankshaft Bearing 1	Dimension	0 to 0.3 mm 0 to 0.01 in.	–
Crankshaft Journal to Crankshaft Bearing 2 [D1305-E4]	Oil Clearance	0.0340 to 0.103 mm 0.00134 to 0.00405 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	51.921 to 51.940 mm 2.0442 to 2.0448 in.	–
• Crankshaft Bearing 2	I.D.	51.974 to 52.024 mm 2.0463 to 2.0481 in.	–
Crankshaft Journal to Crankshaft Bearing 2 [V1505-T-E4]	Oil Clearance	0.034 to 0.095 mm 0.0014 to 0.0037 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	47.934 to 47.950 mm 1.8872 to 1.8877 in.	–
• Crankshaft Bearing 2	I.D.	47.984 to 48.029 mm 1.8892 to 1.8909 in.	–
Crankshaft Journal to Crankshaft Bearing 3	Oil Clearance	0.0340 to 0.103 mm 0.00134 to 0.00405 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	51.921 to 51.940 mm 2.0442 to 2.0448 in.	–
• Crankshaft Bearing 3	I.D.	51.974 to 52.024 mm 2.0463 to 2.0481 in.	–
Crank Pin and Crank Pin Bearing	Oil Clearance	0.029 to 0.091 mm 0.0011 to 0.0036 in.	0.20 mm 0.0079 in.
• Crank Pin	O.D.	39.959 to 39.975 mm 1.5732 to 1.5738 in.	–
• Crank Pin Bearing	I.D.	40.040 to 40.050 mm 1.5764 to 1.5767 in.	–
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.012 in.	0.50 mm 0.020 in.
Cylinder Liner	I.D.	78.000 to 78.019 mm 3.0709 to 3.0716 in.	78.15 mm 3.077 in.
Cylinder	Oversized	78.500 to 78.519 mm 3.0906 to 3.0912 in.	78.65 mm 3.096 in.

LUBRICATING SYSTEM

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	49 kPa 0.50 kgf/cm^2 7.1 psi	–
	At Rated Speed	197 to 441 kPa 2.00 to 4.50 kgf/cm^2 28.57 to 64.0 psi	147 kPa 1.50 kgf/cm^2 21.3 psi
Inner Rotor to Outer Rotor	Clearance	0.060 to 0.18 mm 0.0024 to 0.0071 in.	–
Outer Rotor to Pump Body	Clearance	0.100 to 0.180 mm 0.00394 to 0.00708 in.	–
Inner Rotor to Cover	Clearance	0.025 to 0.075 mm 0.00099 to 0.0029 in.	–

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7.0 to 9.0 mm / 98 N 0.28 to 0.35 in. / 98 N (10 kgf, 22 lbf)	–
Thermostat	Valve Opening Temperature (At Beginning)	69.5 to 72.5 °C 157.1 to 162.5 °F	–
	Valve Opening Temperature (Opened Completely)	85 °C 185 °F	–
Radiator Cap	Pressure Falling Time	10 seconds or more 88 → 59 kPa 0.89 → 0.61 kgf/cm^2 13 → 9 psi	–
Radiator	Water Leakage Test Pressure	No leak at specified pressure	–

FUEL SYSTEM

Item		Factory Specification	Allowable Limit
Injection Pump [D1305-E4]	Injection Timing [2600 min^{-1} (rpm)]	0.2662 to 0.2923 rad (15.25 to 16.75 °) before T.D.C.	–
[V1505-T-E4]	Injection Timing [3000 min^{-1} (rpm)]	0.2837 to 0.3097 rad (16.25 to 17.75 °) before T.D.C.	–
Pump Element	Fuel Tightness	–	13.73 MPa 140.0 kgf/cm^2 1991 psi
Delivery Valve	Fuel Tightness	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi
Injection Nozzle	Injection Pressure	13.73 to 14.70 MPa 140 to 150 kgf/cm^2 1992 to 2133 psi	–
Injection Nozzle Valve Seat	Valve Seat Tightness	When the pressure is 12.75 MPa (130.0 kgf/cm^2, 1849 psi), the valve seat must be fuel tightness.	–

ELECTRICAL SYSTEM

Item		Factory Specification	Allowable Limit
Glow Plug [D1305-E4]	Resistance	Approx. 0.9 Ω	–
[V1505-T-E4]	Resistance	Approx. 1.1 Ω	–
Glow Plug (Burner) [V1505-T-E4]	Resistance	Approx. 0.8 Ω	–
Glow Plug (Heater) [V1505-T-E4]	Resistance	Approx. 3.0 Ω	–
Solenoid [V1505-T-E4]	Resistance	2.52 to 3.08 Ω at 20 °C (68 °F)	–
Rack Sensor [V1505-T-E4]	Resistance	470 kΩ	–
Temperature Sensor [V1505-T-E4]	Resistance	100 kΩ at 20 °C (68 °F)	–
Doser Fuel Pump [V1505-T-E4]	Resistance	2.38 to 2.62 Ω at 20 °C (68 °F)	–

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3. TIGHTENING TORQUES

[1] TRACTOR SECTION

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

Item	N·m	kgf·m	lbf·ft
Muffler mounting nut	23.5 to 30.0	2.40 to 3.05	17.4 to 22.1
Power steering hose (left and right side)	24 to 28	2.5 to 2.8	18 to 20
Power steering delivery hose retaining nut	34 to 39	3.5 to 3.9	25 to 28
Sub frame mounting bolt (M12)	80 to 90	8.2 to 9.1	59 to 66
Sub frame mounting bolt (M14)	126 to 150	12.9 to 15.2	93.0 to 110
Engine mounting screw	59 to 69	6.1 to 7.0	44 to 50

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[2] ENGINE SECTION

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Glow plug	M8 × 1.0	7.9 to 14	0.80 to 1.5	5.8 to 10
Oil pressure switch	PT1/8	15 to 19	1.5 to 2.0	11 to 14
Nozzle holder	–	35 to 39	3.5 to 4.0	26 to 28
Overflow pipe retaining nut (Serial No.: below BTZ999)	M12 × 1.5	20 to 24	2.0 to 2.5	15 to 18
Overflow pipe retaining nut (Serial No.: above BU0001)	M12 × 1.5	35 to 39	3.5 to 4.0	26 to 28
Nozzle holder assembly	M20 × 1.5	49 to 68	5.0 to 7.0	36 to 50
Cylinder head cover screw	M6 × 1.0	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Injection pipe retaining nut	M12 × 1.5	25 to 34	2.5 to 3.5	18 to 25
*Rocker arm bracket screw	M7 × 1.0	22 to 26	2.2 to 2.7	16 to 19
Cylinder head screw	M10 × 1.25	64 to 68	6.5 to 7.0	47 to 50
*Fan drive pulley screw	M14 × 1.5	236 to 245	24.0 to 25.0	174 to 180
Idle gear 2 lock nut	–	25 to 29	2.5 to 3.0	18 to 21
Idle gear 2 bearing nut	–	35 to 39	3.5 to 4.0	26 to 28
*Connecting rod screw	M8 × 1.0	42 to 46	4.2 to 4.7	31 to 33
*Flywheel screw	M10 × 1.25	54 to 58	5.5 to 6.0	40 to 43
Bearing case cover mounting screw	M6 × 1.0	10.8 to 12.2	1.10 to 1.25	7.96 to 9.04
*Main bearing case screw 2	M9 × 1.25	49 to 53	5.0 to 5.5	37 to 39
*Main bearing case screw 1	M8 × 1.25	30 to 34	3.0 to 3.5	22 to 25

■ **NOTE**

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

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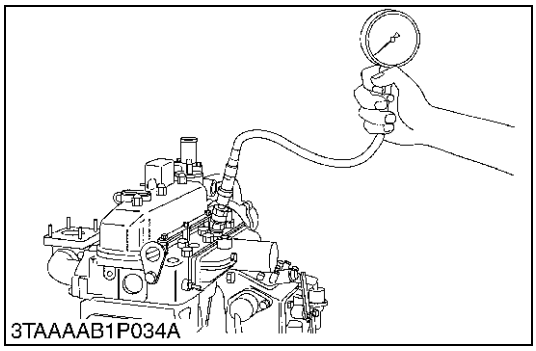
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

1. Run the engine until it is warmed up.
2. Stop the engine.
3. Remove the air cleaner, the muffler, DPF and all glow plugs (or nozzles).
4. Set a compression tester with the adaptor to the glow plug hole (or nozzle hole).
   Nozzle Hole : Adaptor **H**
   Glow Plug Hole : Adaptor **L**
5. After making sure that coupler of stop solenoid has separated (non-injection), run the engine with the starter and measure the compression pressure.
6. Repeat steps 4 and 5 for each cylinder.
7. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the glow plug hole and measure the compression pressure again.
8. If the compression pressure is still less than the allowable limit, check the top clearance, valve clearance and cylinder head.
9. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

■ **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 %.**

[D1305-E4]

Compression pressure	Factory specification	3.73 to 4.11 MPa 38.0 to 42.0 kgf/cm^2 541 to 597 psi
	Allowable limit	2.26 MPa 23.0 kgf/cm^2 327 psi

[V1505-T-E4]

Compression pressure	Factory specification	3.14 to 3.53 MPa 32.0 to 36.0 kgf/cm^2 456 to 512 psi
	Allowable limit	2.26 MPa 23.0 kgf/cm^2 327 psi

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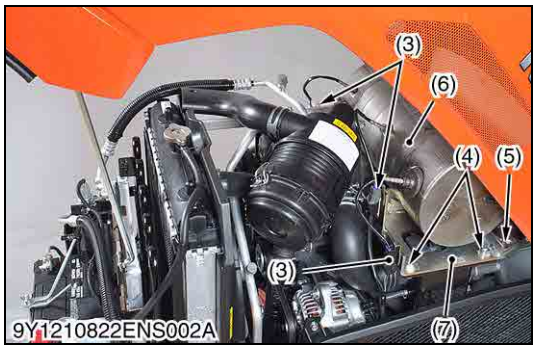

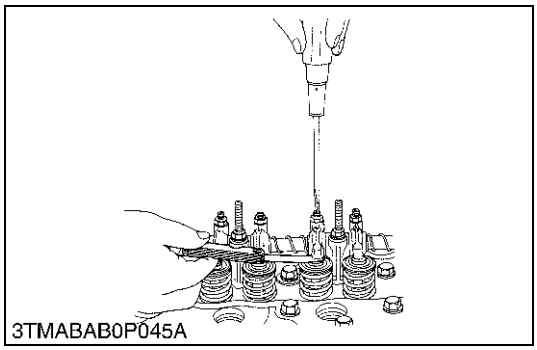

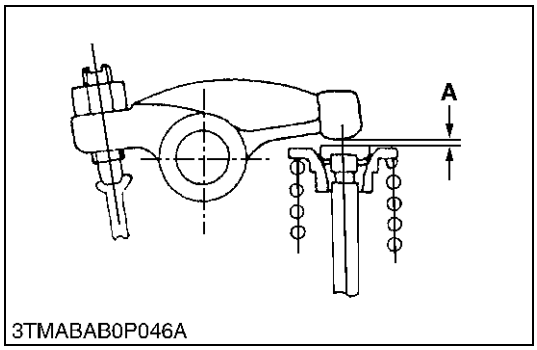

Valve Clearance

■ **IMPORTANT**

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

1. Open the bonnet and disconnect the battery negative cable.
2. Remove the hose clamp (2). Disconnect the inlet hose (2).
3. Disconnect the connectors (3).
4. Remove the mounting bolts (4) and muffler mounting nuts (5).
5. Remove the DPF muffler (6) and muffler mount bracket (7).
6. Remove the head cover and the glow plugs.
7. See the No. 1 piston to the compression top dead center or overlap position.
8. Check the following valve clearance marked with "☆" using a feeler gauge.
9. If the clearance is not within the factory specifications, adjust with the adjusting screw.

Valve clearance	Factory specification	0.145 to 0.185 mm 0.00571 to 0.00728 in.

(When reassembling)

- After checking the valve clearance, tighten the glow plugs to the specified torque.
- Refer to 1-S22 regarding the details of DPF muffler.

Tightening torque	Glow plug	7.9 to 14 N·m 0.80 to 1.5 kgf·m 5.8 to 10 lbf·ft

(1) Clamp
(2) Inlet Hose
(3) Compressor
(4) Bolt
(5) Nut
(6) DPF Muffler
(7) Muffler Mount Bracket

(To be continued)

(Continued)

■ **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 line is aligned with center of timing window on front case. 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.**

Adjusting cylinder Location of piston		Number of cylinders Valve arrangement			
		3-cylinder		4-cylinder	
		IN.	EX.	IN.	EX.
When No. 1 piston comes to compression top dead center	No. 1	☆	☆	☆	☆
	No. 2		☆	☆	
	No. 3	☆			☆
	No. 4				
WHen No. 1 piston comes to overlap position	No. 1				
	No. 2	☆			☆
	No. 3		☆	☆	
	No. 4			☆	☆

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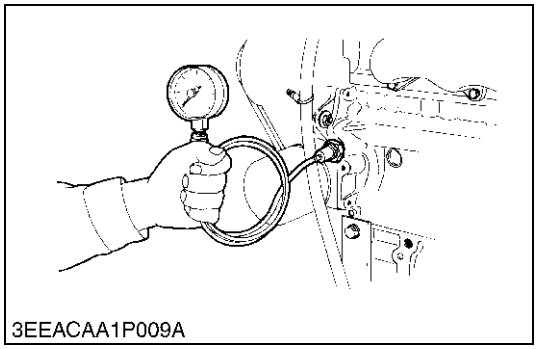
(2) Lubricating System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Engine Oil Pressure

1. Remove the engine oil pressure switch, and set an oil pressure tester.
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 damaged
   - 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 specification	49 kPa 0.50 kgf/cm^2 7.1 psi
	At rated speed	Factory specification	197 to 441 kPa 2.00 to 4.50 kgf/cm^2 28.5 to 64.0 psi
		Allowable limit	147 kPa 1.50 kgf/cm^2 21.3 psi

(When reassembling)

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

Tightening torque	Oil pressure switch	15 to 19 N·m 1.5 to 2.0 kgf·m 11 to 14 lbf·ft

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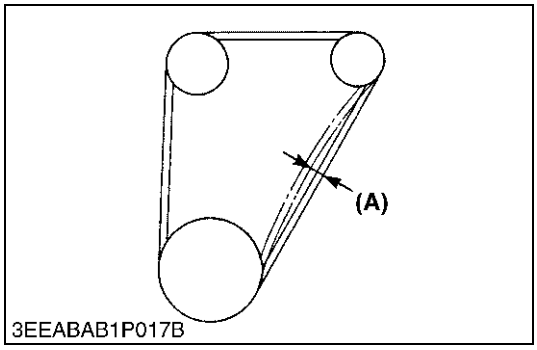
(3) Cooling System



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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 **(A)**	Factory specification	7.0 to 9.0 mm 0.28 to 0.35 in.

(A) Deflection

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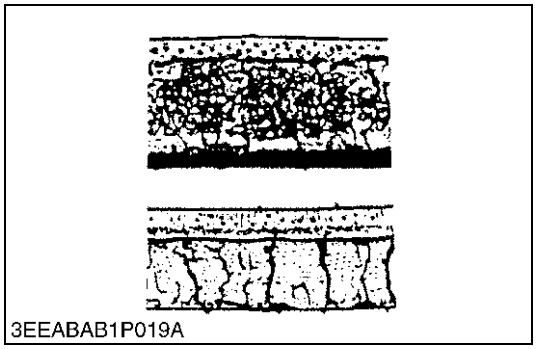
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Fan Belt Damage and Wear

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.

(A) Good **(B) Bad**

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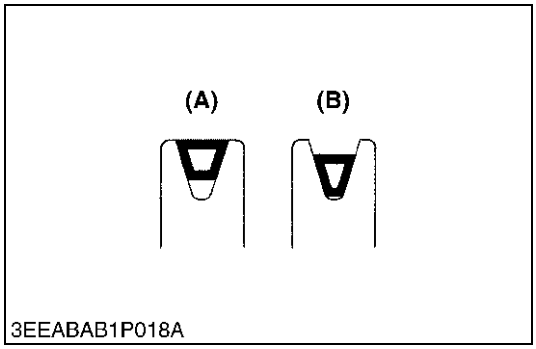

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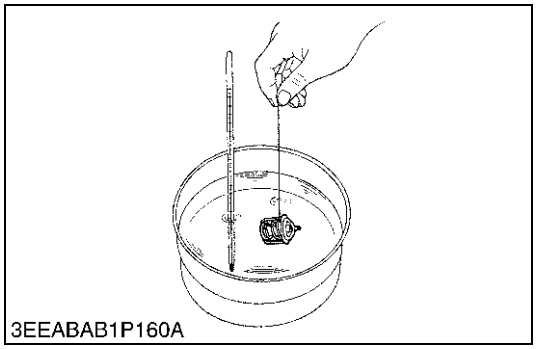
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Thermostat Valve Opening Temperature

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. 8 mm (0.315 in.).
4. If the measurement is not within the factory specifications, replace the thermostat.

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

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CAUTION

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

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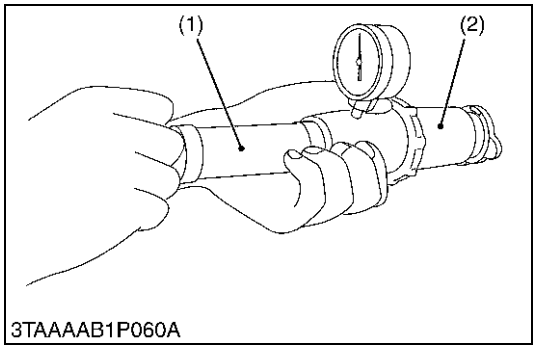

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Radiator Cap Air Leakage

1. Set a radiator tester (1) and adaptor (2) on the radiator cap.
2. Apply the specified pressure 88 kPa (0.9 kgf/cm^2, 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm^2, 9 psi).
3. If the measurement is less than the factory specification, replace the radiator cap.

Pressure falling time	Factory specification	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm^2 from 13 to 9 psi)

(1) Radiator Tester (2) Adaptor

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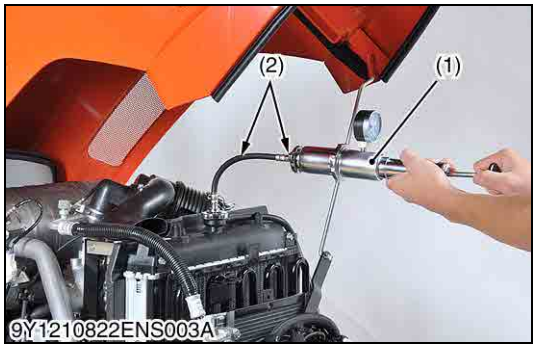

Radiator Water Leakage

1. Pour a specified amount of water into the radiator.
2. Set a radiator tester (1) and an adaptor (2) and raise the water pressure to the specified pressure.
3. Check the radiator for water leaks.
4. For water leak from the pinhole, repair with the radiator cement. When water leak is excessive, replace the radiator.

Radiator water leakage test pressure	Factory specification	No leak at specified pressure.

(1) Radiator Tester (2) Adaptor

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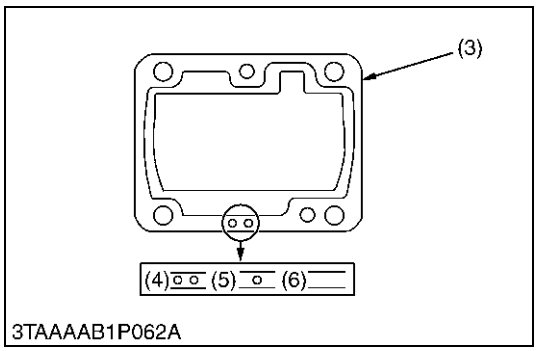
(4) Fuel System



Injection Timing

1. Remove the injection pipes.
2. Remove the engine stop solenoid.
3. Turn the flywheel counterclockwise (facing the flywheel) until fuel flows from the delivery valve holder (3) for No. 1 cylinder.
4. Continue to turn the flywheel slowly, and stop it as soon as the fuel level at the tip of the delivery valve holder (3) begins to increase.
5. Check to see if the timing angle lines on the flywheel is aligned with the alignment mark (2).
6. If the injection timing is out of adjustment, readjust the timing with shims.

[D1305-E4]

Injection timing [2600 min^{-1} (rpm)]	Factory specification	0.2662 to 0.2923 rad (13.25 to 16.75 °) before T.D.C.

[V1505-T-E4]

Injection timing [3000 min^{-1} (rpm)]	Factory specification	0.2837 to 0.3097 rad (16.25 to 17.75 °) before T.D.C.

■ **NOTE**

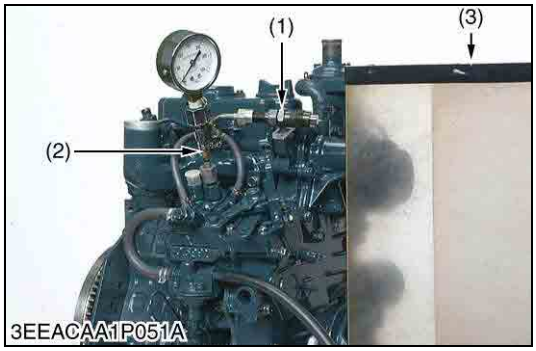
- **The liquid gasket is not required for assembling.**
- **Shims are available in thickness of 0.20 mm (0.0079 in.), 0.25 mm (0.0098 in.), 0.30 mm (0.012 in.), 0.35 mm (0.014 in.) and 0.175 mm (0.00689 in.). Combine these shims for adjustments.**
- **Addition or reduction of shim (0.025 mm, 0.00098 in.) delays or advances the injection timing by approx. 0.0044 rad (0.25 °).**
- **In disassembling and replacing the injection pump, be sure to use the same number of new shims with the same thickness.**

■ **IMPORTANT**

- **The 0.175 mm thick shim is coated only on the lower face. Therefore, do not use the 0.175 mm thick shim as the top shim of the combination (injection pump side), because this can cause oil leakage.**

(1) Timing Line
(2) Alignment Mark
(3) Delivery Valve Holder
(4) Shim (Soft Metal Gasket Shim)
(5) Two-holes : 0.20 mm (0.0079 in.)
Two-holes : 0.175 mm (0.00689 in.)
(6) One-hole : 0.25 mm (0.0098 in.)
(7) Without hole : 0.30 mm (0.012 in.)
(8) Three-holes : 0.35 mm (0.014 in.)
(A) Engine mounted on the tractor
(B) Engine only

9Y1210822ENS0029US0



Fuel Tightness of Pump Element

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Install the injection pump pressure tester to the injection pump.
4. Install the injection nozzle (1) jetted with the proper injection pressure to the injection pump pressure tester (2). (Refer to the photo.)
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.

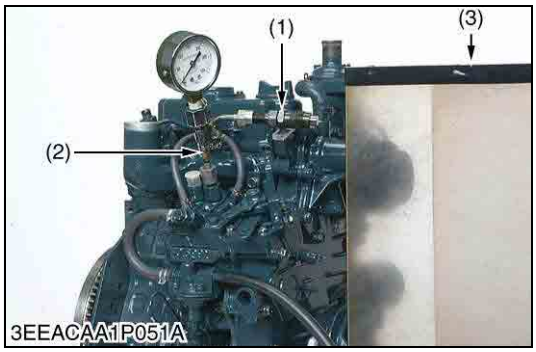
Fuel tightness of pump element	Allowable limit	13.73 MPa 140 kgf/cm^2 1991 psi

■ **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 Nozzle
(2) Injection Pump Pressure Tester
(3) Protection Cover for Jetted Fuel

9Y1210822ENS0030US0



Fuel Tightness of Delivery Valve

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

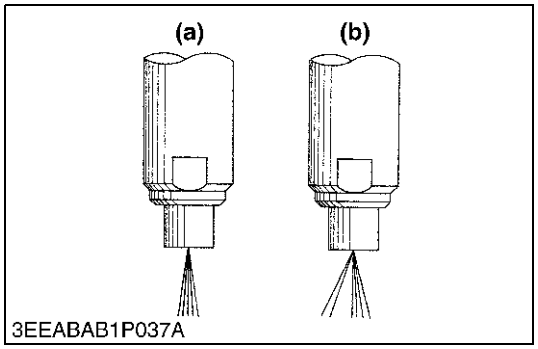
Fuel tightness of delivery valve	Factory specification	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi
	Allowable limit	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi

■ **NOTE**

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

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

9Y1210822ENS0031US0



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Nozzle Spraying Condition

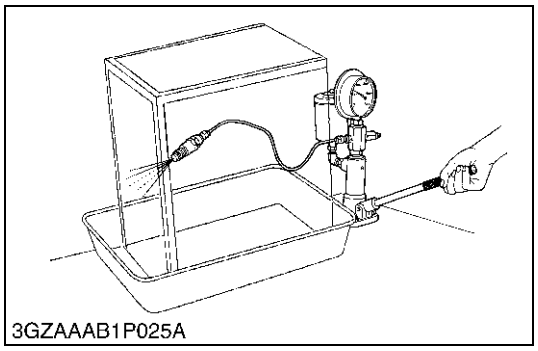
CAUTION

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

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

(a) Good **(b) Bad**

9Y1210822ENS0032US0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Fuel Injection Pressure

1. Set the injection nozzle to a nozzle tester.
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, replace the adjusting washer (1) in the nozzle holder to adjust it.

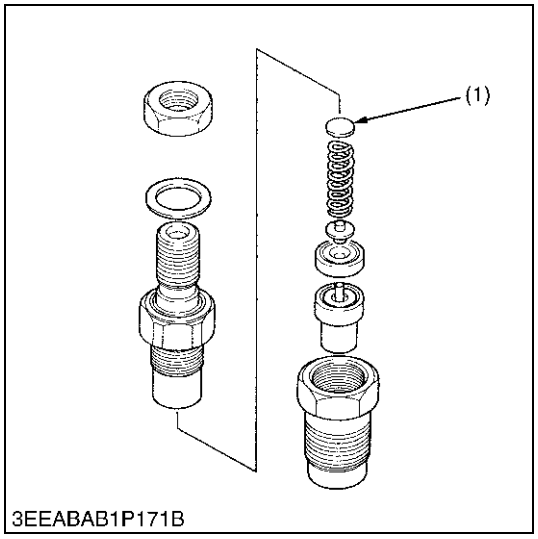
Fuel injection pressure	Factory specification	13.73 to 14.70 MPa 140 to 150 kgf/cm^2 1992 to 2133 psi

(Reference)

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

(1) Adjusting Washer

9Y1210822ENS0033US0



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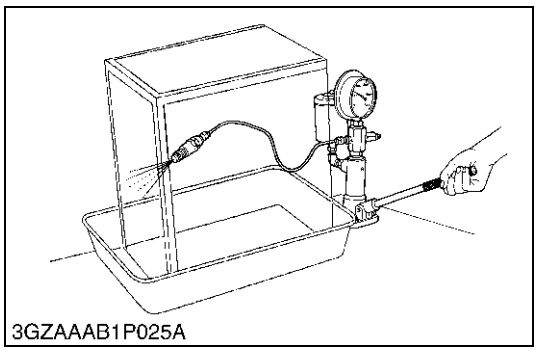
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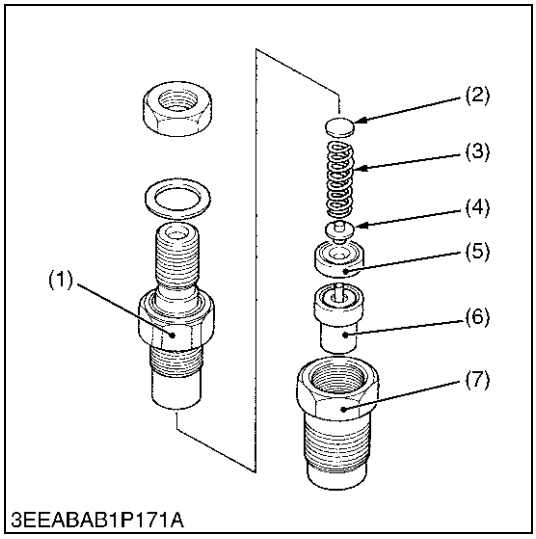
Valve Seat Tightness

1. Set the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 12.75 MPa (130 kgf/cm^2, 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

Valve seat tightness	Factory specification	No fuel leak at 12.75 MPa 130.0 kgf/cm^2 1849 psi

9Y1210822ENS0034US0



Nozzle Holder

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

(When reassembling)

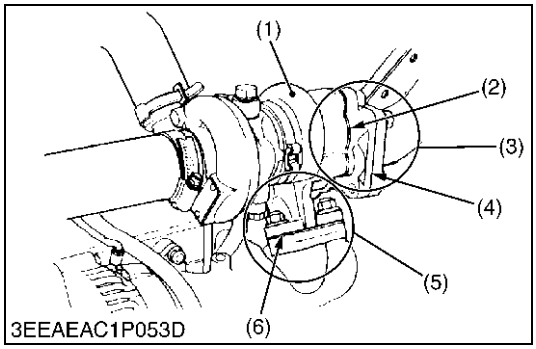
- Assemble the nozzle in clean fuel oil.
- Install the push rod (4), noting its direction.
- After assembling the nozzle, be sure to adjust the fuel injection pressure.

Tightening torque	Nozzle holder	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
	Overflow pipe retaining nut (Serial No.: below BTZ999)	20 to 24 N·m 2.0 to 2.5 kgf·m 15 to 18 lbf·ft
	Overflow pipe retaining nut (Serial No.: above BU0001)	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
	Nozzle holder assembly	49 to 68 N·m 5.0 to 7.0 kgf·m 36 to 50 lbf·ft

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

9Y1210822ENS0035US0

(5) Turbocharger (V1505-T-E4)

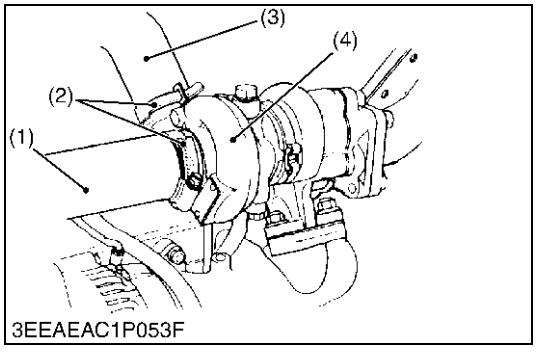


Turbine Side

1. Check the exhaust port (3) and inlet port (5) side of turbine housing (1) 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) / (4) / (6) with new one.

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

9Y1210822ENS0049US0

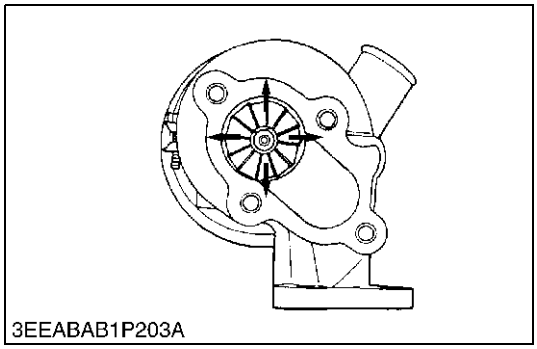


Compressor Side

1. Check the inlet hose (3) of the compressor cover (4) to see if there is no air leak.
2. If any air leak is found, change the clamp (2) and / or inlet hoses.
3. Check the intake hose (1) and the clamp to see if there is no loose or crack.
4. If any loose or crack is found, tighten the clamp or change the hose to prevent dust from entry.

(1) Intake Hose
(2) Clamp
(3) Inlet Hose
(4) Compressor Cover

9Y1210822ENS0050US0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Radial Clearance

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

9Y1210822ENS0051US0

[2] DISASSEMBLING AND ASSEMBLING

(1) DPF Muffler

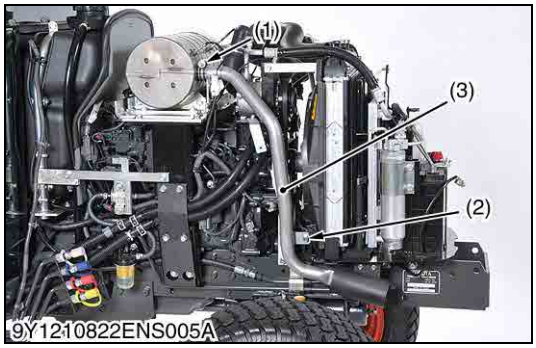
9Y1210822ENS004A

Bonnet

1. Open the bonnet (1) and disconnect the battery negative cable.
2. Disconnect the connector for head light and remove the clamp (2).
3. Remove the snap pin (3).
4. Remove the bonnet (1).

(1) Bonnet
(2) Clamp
(3) Snap Pin

9Y1210822ENS0001US0



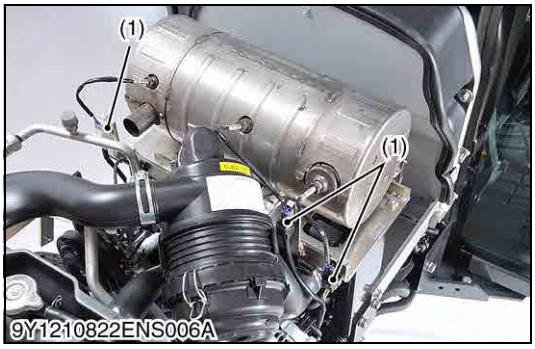
9Y1210822ENS005A

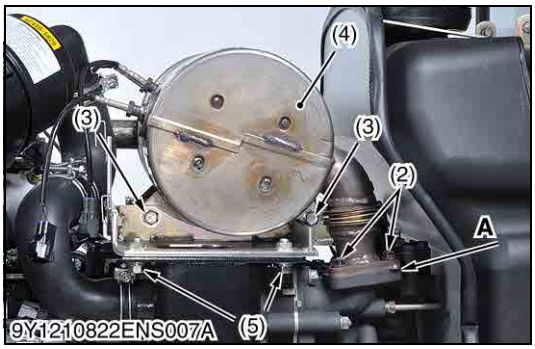
Muffler Pipe

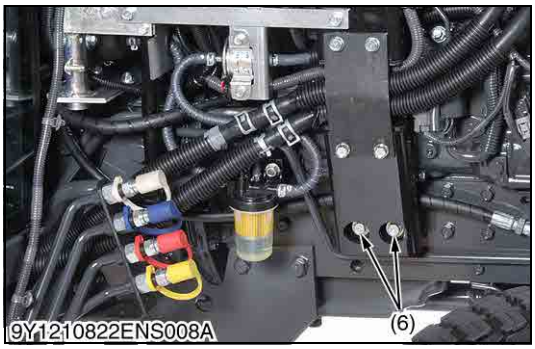
1. Loosen the pipe joint (1).
2. Remove the muffler mounting bolts (2).
3. Remove the muffler pipe (3).

(1) Pipe Joint
(2) Muffler Mounting Bolt
(3) Muffler Pipe

9Y1210822ENS0002US0







DPF Muffler

1. Disconnect the connectors (1).
2. Remove the muffler mounting nuts (2).
3. Remove the muffler mounting bolts (3) to muffler mount bracket.
4. Remove the DPF muffler (4).

(When reassembling)

■ **IMPORTANT**

- **When assembling DPF muffler to muffler mount bracket, be sure the following procedure.**
  1. **Loosen the bracket mounting bolts (5) and the pillar mounting bolts (6) until the muffler mount bracket can move.**
  2. **Temporarily (do not tighten firmly) assemble the DPF muffler to the muffler mount bracket.**
  3. **Temporarily (do not tighten firmly) assemble the DPF muffler to the exhaust flange.**
  4. **Tighten evenly and properly all bolts (3), (5) and nuts (2).**

■ **NOTE**

- **Be sure there is the gasket between the DPF muffler and turbocharger.**
- **Record the serial number of tractor and engine.**
- **Record the serial number and parts number of DPF muffler.**

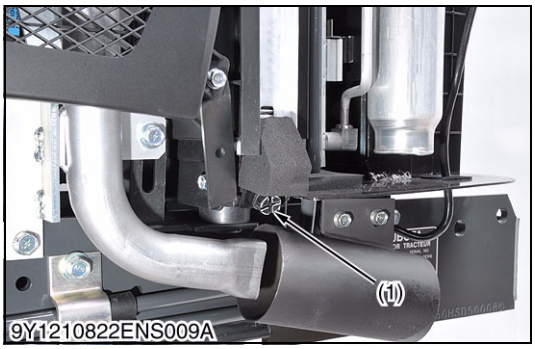
Tightening torque	Muffler mounting nut	23.5 to 30.0 N·m 2.40 to 3.05 kgf·m 17.4 to 22.1 lbf·ft

Clearance **"A"**	Factory specification	Less than 2 mm 0.08 in.

(1) Connector
(2) Muffler Mounting Nut
(3) Muffler Mounting Bolt
(4) DPF Muffler
(5) Bracket Mounting Bolt
(6) Pillar Mounting Bolt

9Y1210822ENS0003US0

(2) Separating Engine from Clutch Housing



Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

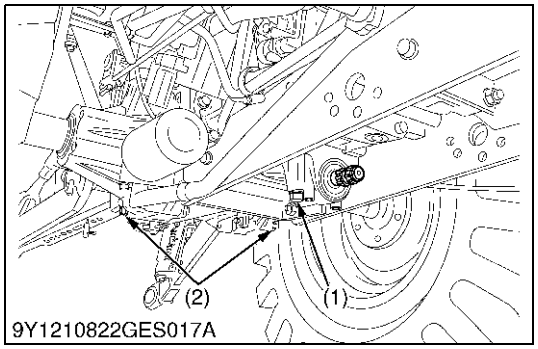
1. Stop the engine and let cool down.
2. To drain the coolant, turn the drain plug (1) counterclockwise.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator drain plug.

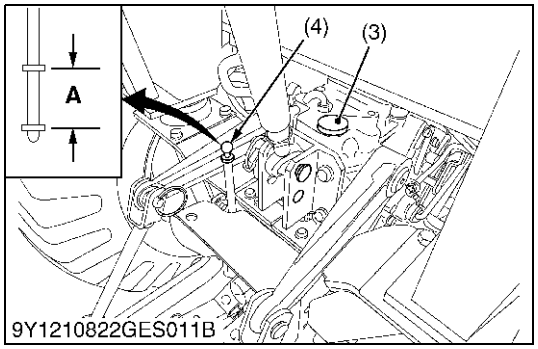
(When reassembling)

Coolant	Capacity	4.3 L 4.5 U.S.qts 3.8 Imp.qts

(1) Drain Plug

9Y1210822ENS0004US0





Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1) and (2).
2. Drain the transmission fluid.
3. Reinstall the drain plugs (1) and (2).

(When refilling)

- Fill new oil from filling port after removing the filling plug (4) up to the upper notch on the dipstick (3).
- After running the engine for a few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

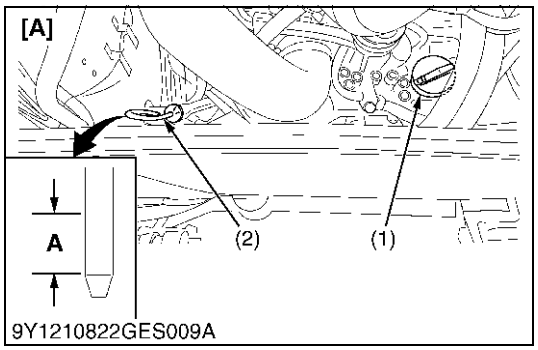
- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

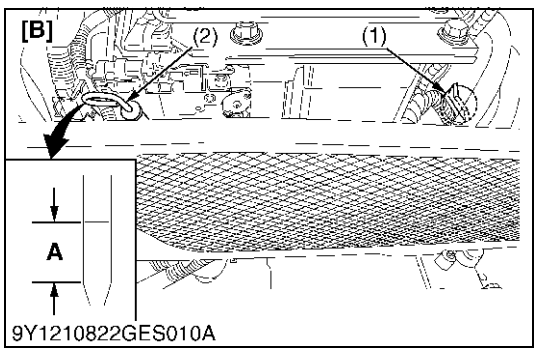
Transmission fluid capacity	15 L 4.0 U.S.gals 3.3 Imp.gals

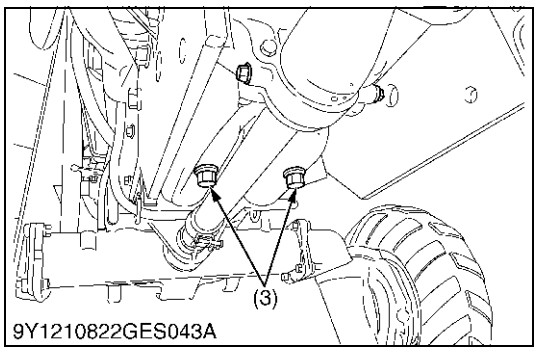
(1) Drain Plug
(2) Drain Plug (Both Sides)
(3) Dipstick
(4) Filling Plug

A: Proper Oil Level

9Y1210822RAS0003US0







Draining Engine Oil

CAUTION

To avoid personal injury:

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

1. Place an oil pan underneath the engine.
2. Remove the drain plugs (3) to drain oil.
3. After draining, screw in the drain plugs (3).

(When reassembling)

- Fill the engine oil up to the upper line on the dipstick (2).

Engine oil	Capacity	B2650	4.0 L 4.3 U.S.qts 3.6 Imp.qts
		B3350	4.8 L 5.0 U.S.qts 4.2 Imp.qts

■ **IMPORTANT**

- **Never mix two different type of oil.**
- **Use the proper SAE Engine Oil according to ambient temperature and DPF compatible oil (CJ-4) for the engine. (See page G-9.)**

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

[A] B2650
[B] B3350
A : Proper Oil Level

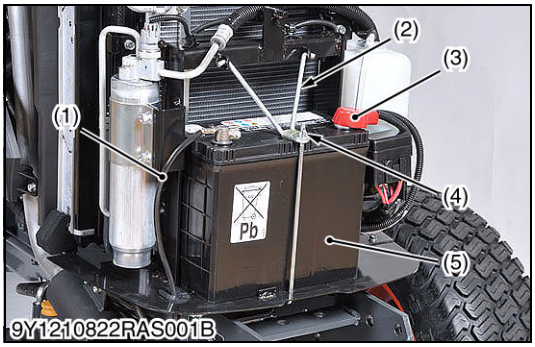
9Y1210822ENS0005US0

Bonnet

1. Open the bonnet (1) and disconnect the battery negative cable.
2. Disconnect the connector for head light and remove the clamp (2).
3. Remove the snap pin (3).
4. Remove the bonnet (1).

(1) Bonnet
(2) Clamp
(3) Snap Pin

9Y1210822ENS0001US0



Removing Battery

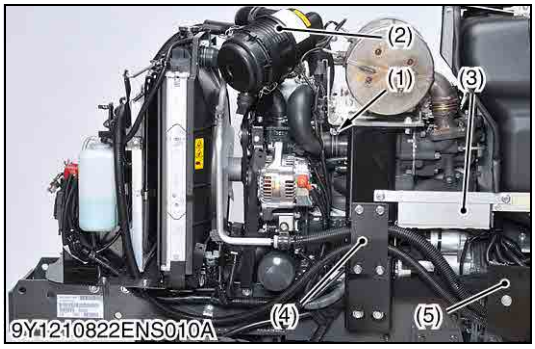
1. Removing the wing nut (4).
2. Remove the battery retainer (2).
3. Disconnect the battery negative cable (1) from the battery (5).
4. Disconnect the battery positive cable (3) from the battery (5).
5. Remove the battery (5).

(When reassembling)

- Connect the battery positive cable first.
- Connect the battery negative cable second.

(1) Battery Negative Cable
(2) Battery Retainer
(3) Battery Positive Cable
(4) Wing Nut
(5) Battery

9Y1210822ENS0006US0



Air Cleaner and Others

1. Loosen the hose joint (1) then remove the air cleaner (2).
2. Remove the plate A (3) and plates B (4).
3. Remove the protection cover (5).

(1) Hose Joint
(2) Air Cleaner
(3) Plate A
(4) Plate B
(5) Protection Cover

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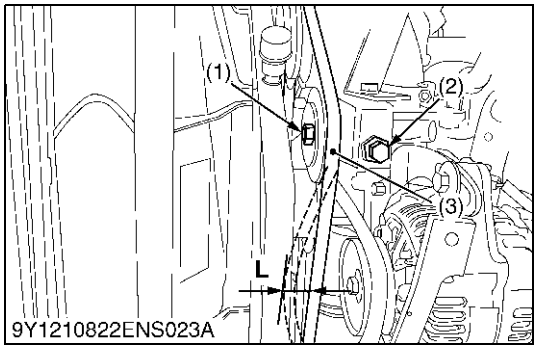
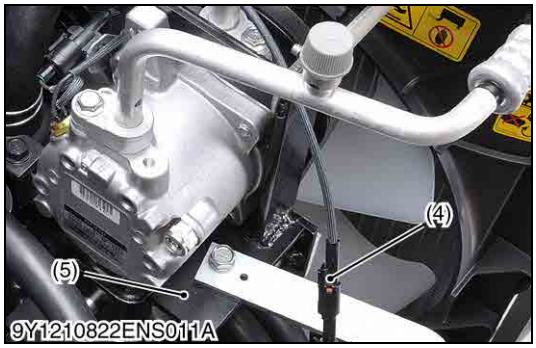
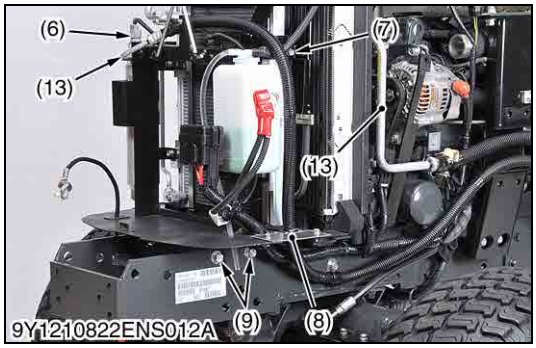
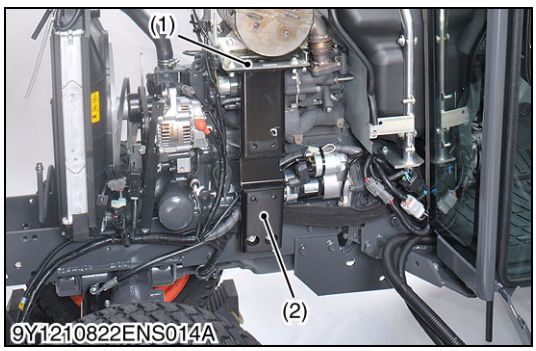








Compressor, Condenser and Receiver

1. Loosen the tension pulley mounting nut (1) and turn the adjusting bolt (2) counterclockwise then remove the air conditioner belt (3).
2. Disconnect the **1P** connector (4) from the compressor.
3. Remove the compressor mounting bracket (5) with compressor.
4. Disconnect the connector (6) from the receiver.
5. Remove the condenser mounting bolts (7).
6. Remove the battery bracket mounting bolts (8) and plate (9).
7. Remove the condenser (10) and receiver (12) with battery bracket to the left (viewed from the back of tractor).
8. Remove the compressor (10) and the condenser (11) with the receiver (12) connecting with air-conditioner hose together.

(When reassembling)

- Be careful not to damage the condenser fin.
- After reassembling the compressor, be sure to adjust the air-conditioner belt tension. (See page G-29.)

Proper deflection: Air-conditioner belt tension	10 to 12 mm (0.40 to 0.47 in.) when the belt is pressed (98 N (10 kgf, 22 lbf)) in the middle of the span.

■ **NOTE**

- **When remove the compressor, condenser and receiver, be careful not to damage the hose bind (13).**

(1) Tension Pulley Mounting Nut
(2) Adjusting Bolt
(3) Air Conditioner Belt
(4) **1P** Connector
(5) Compressor Mounting Bracket
(6) Connector
(7) Condenser Mounting Bolt
(8) Battery Bracket Mounting Bolt
(9) Plate
(10) Compressor
(11) Condenser
(12) Receiver
(13) Hose Bind

9Y1210822ENS0008US0

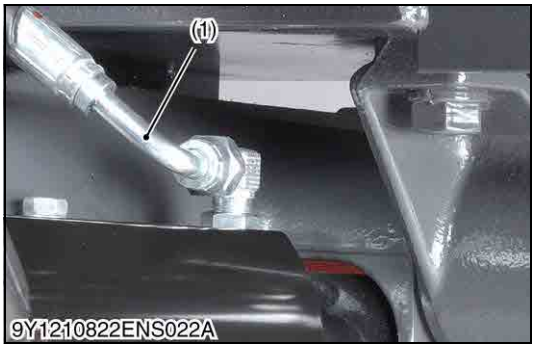
DPF Muffler, DPF Muffler Mount Bracket and Others (If Equipped)

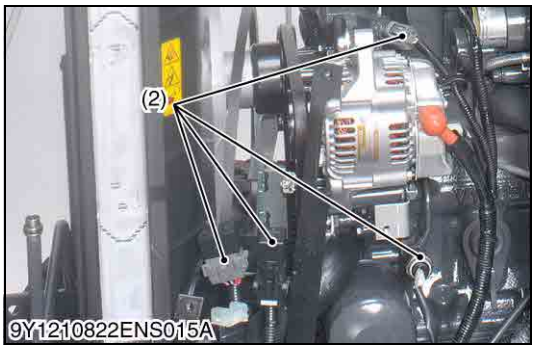
- Removing DPF muffler. (See page 1-S22.)

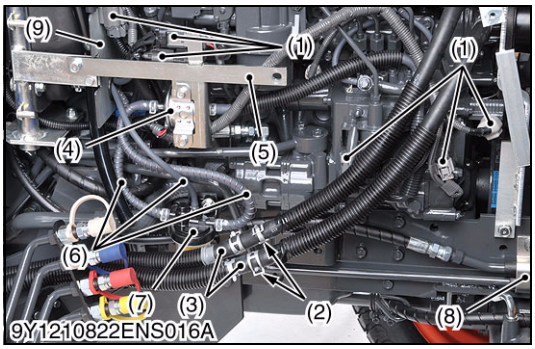
1. Remove the DPF muffler mount bracket (1).
2. Remove the pillars (2).

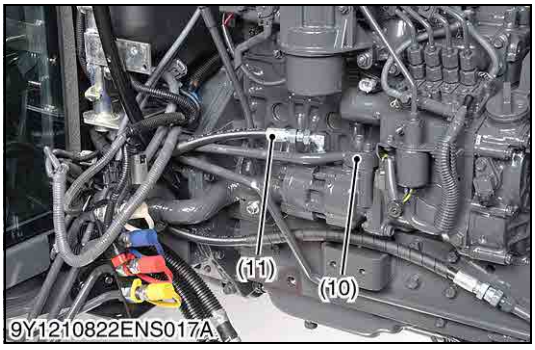
(1) DPF Muffler Mount Bracket
(2) Pillar

9Y1210822ENS0009US0









Hoses and Wire Harness (Left Side)

1. Disconnect the power steering hose (both side) (1) from power steering cylinder.
2. Disconnect the connector (2).

(When reassembling)

Tightening torque	Power steering hose (left and right side)	24 to 28 N·m 2.5 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Steering Hose
(2) Connector

9Y1210822ENS0010US0

Hoses and Wire Harness (Right Side)

1. Disconnect the connectors (1).
2. Loosen the water hose joints (2) then separate the water hoses (3).
3. Remove the fuel pump (4) and plate (5).
4. Disconnect the fuel hoses (6).
5. Remove the fuel filter (7).
6. Remove the clamp (8).
7. Remove the shutter plate (9) slide to the left (viewed from the back of tractor).
8. Disconnect the hydraulic delivery pipe (10).
9. Disconnect the power steering delivery hose (11).

(When reassembling)

- When connecting the water hose (3), connect hose with gray tape upper side hose (inflow side).

Tightening torque	Power steering delivery hose retaining nut	34 to 39 N·m 3.5 to 3.9 kgf·m 25 to 28 lbf·ft

(1) Connector
(2) Water Hose Joint
(3) Water Hose
(4) Fuel Pump
(5) Plate
(6) Fuel Hose
(7) Fuel Filter
(8) Clamp
(9) Shutter Plate
(10) Hydraulic Delivery Pipe
(11) Power Steering Delivery Hose

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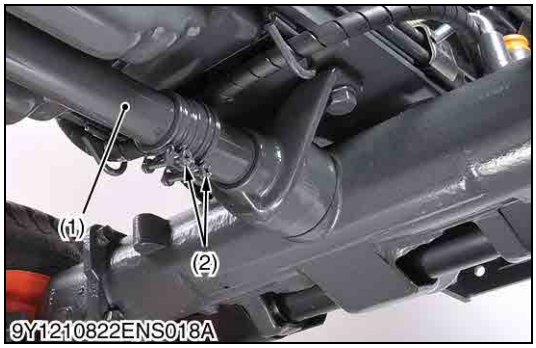

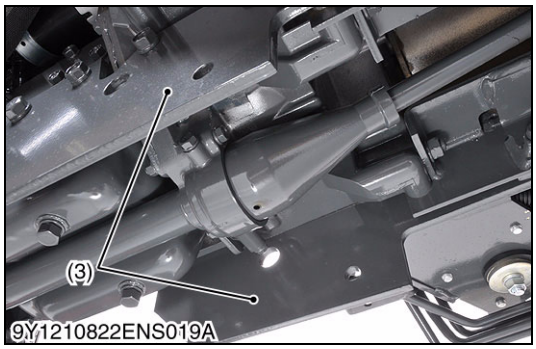

Propeller Shaft and Sub Frame

1. Slide the propeller shaft cover (1) after loosen joints (2).
2. Remove the sub frame (3).

(When reassembling)

■ **NOTE**

- **Apply grease to the coupling and splines.**

Tightening torque	Sub frame mounting bolt (M12)	80 to 90 N·m 8.2 to 9.1 kgf·m 59 to 66 lbf·ft
	Sub frame mounting bolt (M14)	126 to 150 N·m 12.9 to 15.2 kgf·m 93.0 to 110 lbf·ft

(1) Propeller Shaft Cover
(2) Joint
(3) Sub Frame

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Separating Engine from Clutch Housing

1. Remove the engine screws and nuts, and separate the engine from clutch housing.

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the splines of the plate boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing, after eliminating the water, oil and stuck liquid gasket.

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(3) Separating Engine from Front Axle Frame

Separating Engine from Front Axle Frame

■ **NOTE**

- **When you replace the engine with new one, please record the serial number of new engine and the parts number and serial number of "DPF Full Assembly" which is incorporate with its new engine.**

1. Disconnect the radiator hose A (1) and radiator hose B (2).
2. Remove the engine and front axle frame mounting screw and separate the engine from the front axle frame.

Tightening torque	Engine mounting screw	59 to 69 N·m 6.1 to 7.0 kgf·m 44 to 50 lbf·ft

(1) Radiator Hose A
(2) Radiator Hose B

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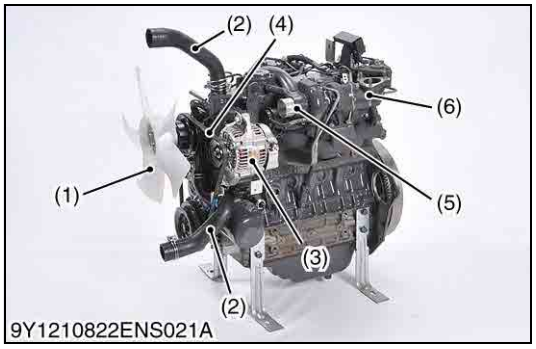
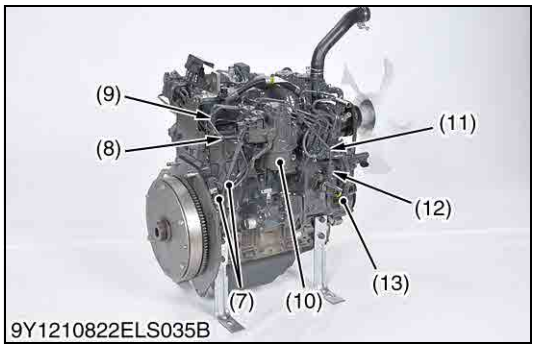
(4) External Components





Outer Components

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

■ **NOTE**
- **When removing and attaching the turbocharger assembly, be very careful not to allow dust, dirt and other foreign matters in the oil pipes.**
- **When the turbocharger assembly has been replaced, pour fresh engine oil through the oil filter port of the turbocharger.**
- **Before starting the engine, make sure that the air cleaner position.**

1. Remove the fan (1).
2. Remove the radiator hoses (2).
3. Remove the alternator (3).
4. Remove the fan belt (4).

[If equipped]

5. Remove the double flare pipe 1-1 (8), the double flare pipe 1-2 (9), and the double flare pipe 2 (11) from the doser flange (6).
6. Remove the pressure pipe 1 from the doser flange (6).
7. Remove each connector on the temperature sensor 3 and 4 from the connector bracket.
8. Remove the exhaust manifold with turbocharger (5) and doser flange (6).
9. Remove the air blower connectors (7) from the connector bracket.
10. Remove the double flare pipe 1-1 (8) and 1-2 (9) from the air blower (10).
11. Remove the air blower (10).
12. Remove the double flare pipe 2 (11) from the doser fuel pump (12).
13. Remove the fuel hose (13).
14. Remove the doser fuel pump (12).

(When reassembling)
- Check for cracks on the belt surface.

■ **IMPORTANT**
- **After you assemble the fan belt, adjust the fan belt tension. (See page 1-S15.)**

(1) Fan
(2) Radiator Hose
(3) Alternator
(4) Fan Belt
(5) Turbocharger
(6) Doser Flange
(7) Connector
(8) Double Flare Pipe 1-1
(9) Double Flare Pipe 1-2
(10) Air Blower
(11) Double Flare Pipe 2
(12) Doser Fuel Pump
(13) Fuel Hose

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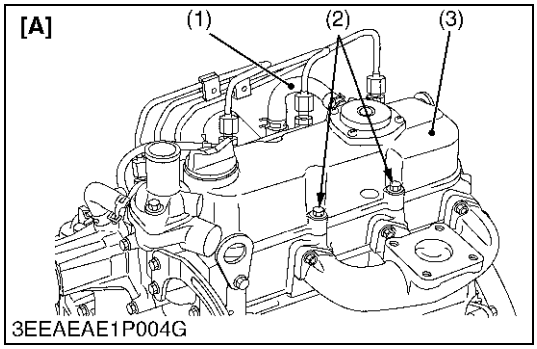
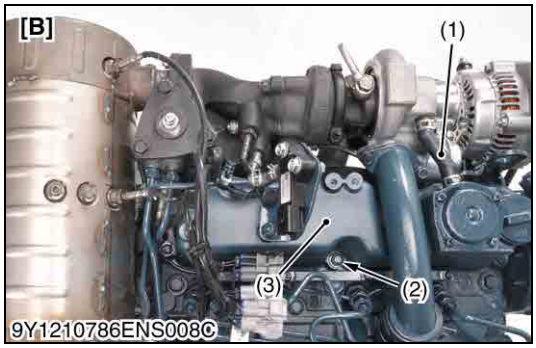
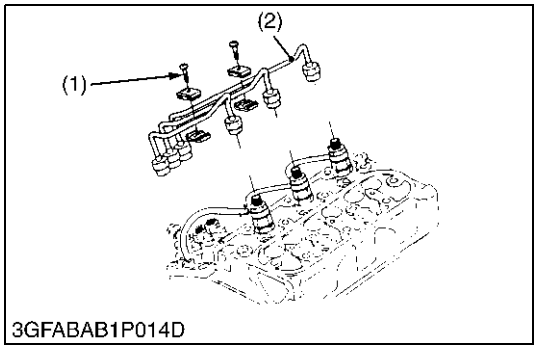
(5) Cylinder Head and Valve







Cylinder Head Cover

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

(When reassembling)

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

Tightening torque	Cylinder head cover screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft

(1) Breather Hose
(2) Cylinder Head Cover Screw
(3) Cylinder Head Cover

[A] D1305-E4
[B] V1505-T-E4

9Y1210822ENS0052US0

Injection Pipes

1. Loosen the screws to the pipe clamp (1).
2. Remove the injection pipes (2).

(When reassembling)

- Send 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) Pipe Clamp
(2) Injection Pipe

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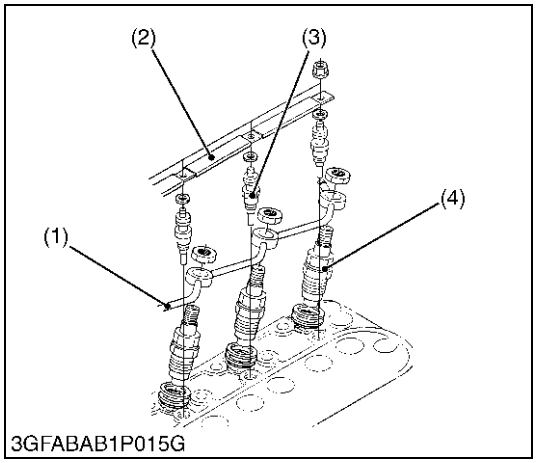

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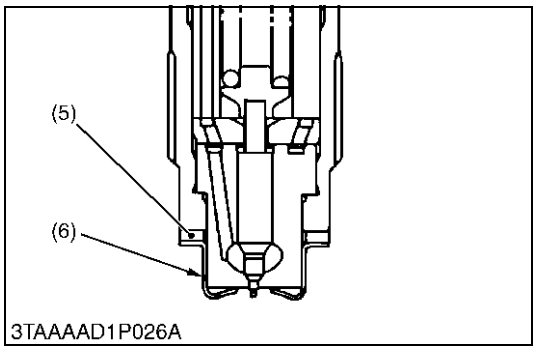

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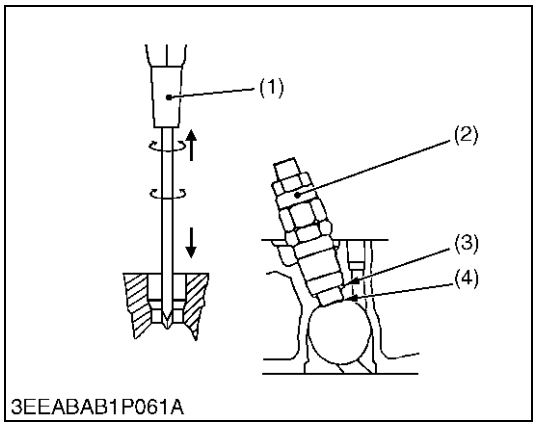

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Nozzle Holder Assembly and Glow Plug

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

(When reassembling)

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

Tightening torque	Overflow pipe retaining nut (Serial No.: below BTZ999)	20 to 24 N·m 2.0 to 2.5 kgf·m 15 to 18 lbf·ft
	Overflow pipe retaining nut (Serial No.: above BU0001)	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
	Nozzle holder assembly	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft
	Glow plug	7.9 to 14 N·m 0.80 to 1.5 kgf·m 5.8 to 10 lbf·ft

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

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Nozzle Heat Seal Service Removal Procedure

■ **IMPORTANT**

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

1. Drive 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 injection nozzle gasket (3).
4. If the heat seal drops, repeat the above procedure.

(When reassembling)

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

(1) Plus Screw Driver
(2) Nozzle Holder
(3) Injection Nozzle Gasket
(4) Heat Seal

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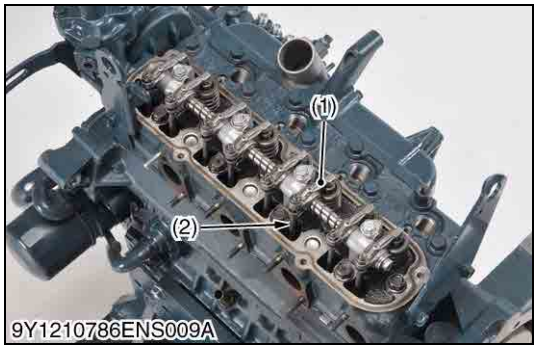

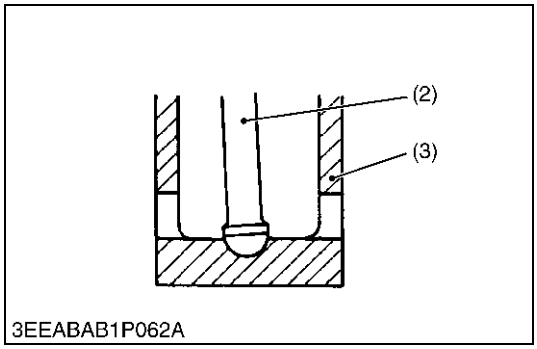

Rocker Arm and Push Rod

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

(When reassembling)

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

■ **IMPORTANT**

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

Tightening torque	Rocker arm bracket screw	22 to 26 N·m 2.2 to 2.7 kgf·m 16 to 19 lbf·ft

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

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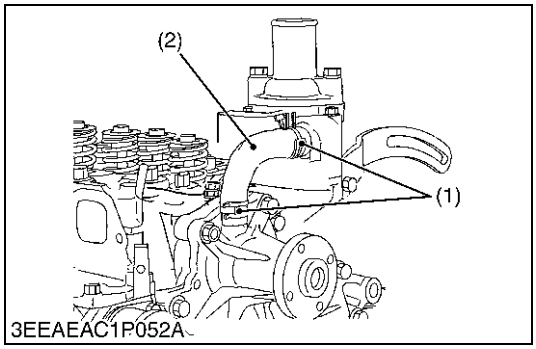

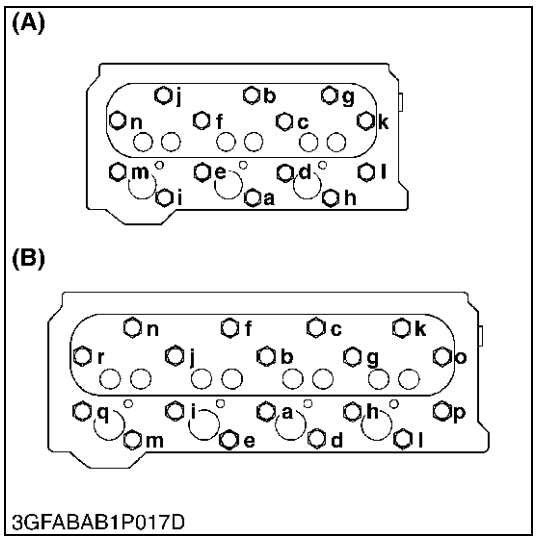

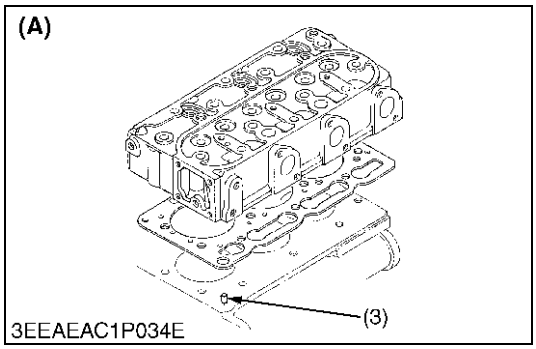

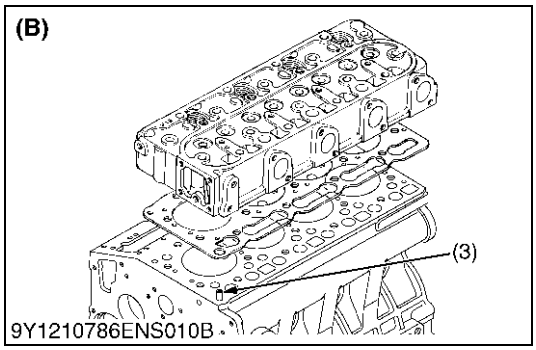

Cylinder Head and Cylinder Head Gasket

1. Loosen the pipe clamps (1), and remove the water return pipe (2).
2. Remove the cylinder head screw in the order of (**n** or **r**) to (**a**) and remove the cylinder head.
3. Remove the cylinder head gasket.

(When reassembling)

- Replace the cylinder head gasket with new one.
- When mounting the gasket, set it to the pin pipe holes. Be careful not to mount it reversely.
- The cylinder head should be free of scratches and dust.
- Install the cylinder head, using care not to damage the gasket.
- After applying engine oil to the thread of screws, tighten them in several steps and specified sequence **(a)** to (**n** or **r**).

■ **NOTE**

- **Do not use O-ring on the pin pipe.**
- **It is not necessary to retighten the cylinder head screw and to readjust valve clearance after engine warmed up.**

Tightening torque	Cylinder head screw	64 to 68 N·m 6.5 to 7.0 kgf·m 47 to 50 lbf·ft

(1) Clamp
(2) Return Pipe
(3) Pin Pipe

(A) 3 Cylinder
(B) 4 Cylinder
a to n or r: To Tighten
n or r to a:To Loosen

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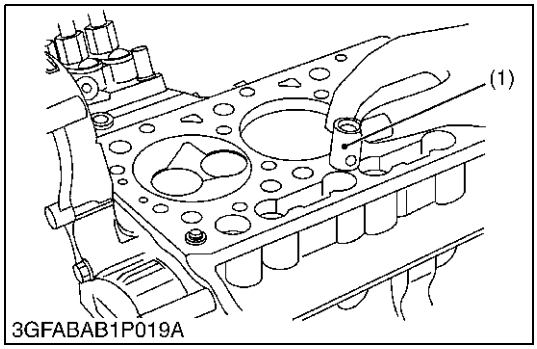

Tappets

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

(When reassembling)

- Visually check the contact between tappets and cams for proper rotation. If problem 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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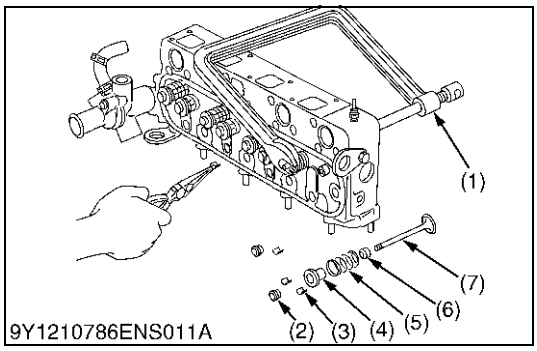

Valves

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
(2) Valve Cap
(3) Valve Spring Collet
(4) Valve Spring Retainer
(5) Valve Spring
(6) Valve Stem Seal
(7) Valve

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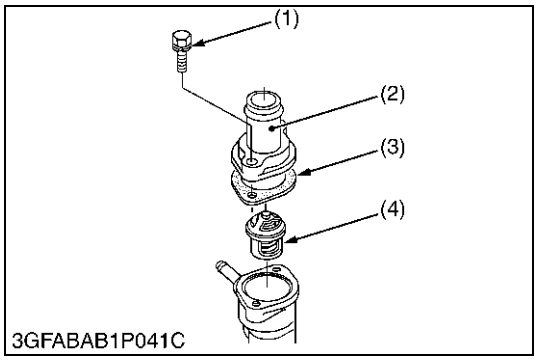

Thermostat Assembly

1. Remove the thermostat cover mounting screws (1), and remove the thermostat cover (2).
2. Remove the thermostat assembly (4).

(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the gasket (3).

(1) Thermostat Cover Mounting Screw
(2) Thermostat Cover
(3) Thermostat Cover Gasket
(4) Thermostat Assembly

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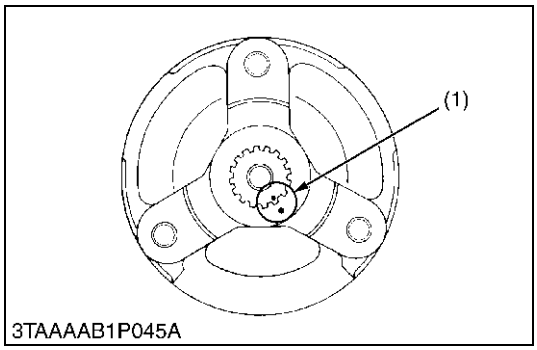
(6) Gear Case and Timing Gears



Fan Drive Pulley

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

(When reassembling)

- Install the pulley to crankshaft, aligning the mark (1) on them (3-cylinder engine).
- Apply engine oil to the fan drive pulley retaining screw. And tighten it.

Tightening torque	Fan drive pulley screw	236 to 245 N·m 24.0 to 25.0 kgf·m 174 to 180 lbf·ft

(1) Aligning Mark

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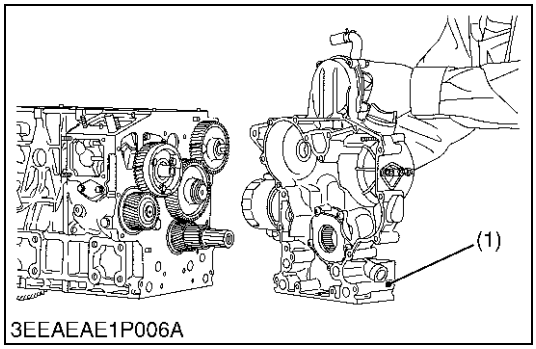

Gear Case

1. Remove the fuel feed pump.
2. Remove the gear case.

(When reassembling)

- Grease thinly to the oil seal, and install it, ensuring the lip does not come off.

(1) Gear Case

a: Bolt Length = 45 mm (1.8 in.)
b: Bolt Length = 50 mm (2.0 in.)
c: Bolt Length = 55 mm (2.2 in.)
d: Bolt Length = 65 mm (2.6 in.)
e: Bolt Length = 68 mm (2.7 in.)
f: Bolt Length = 70 mm (2.8 in.)
g: Bolt Length = 85 mm (3.3 in.)
h: Nut

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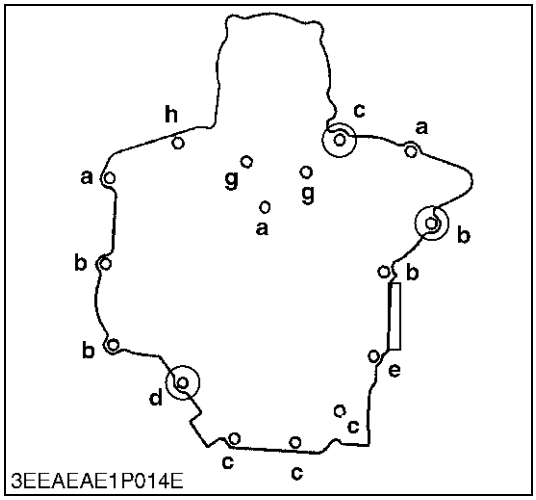

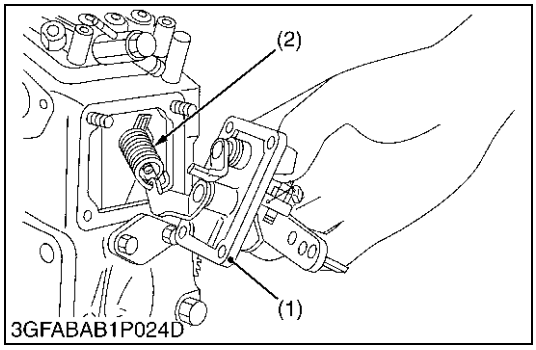

Speed Control Plate [D1305-E4]

1. Remove the engine stop solenoid.
2. Remove the speed control plate (1).

(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) to both sides of the solenoid cover gasket and control plate gasket.
- Be careful not to drop the governor spring (2) into the crankcase.

(1) Plate
(2) Governor Spring

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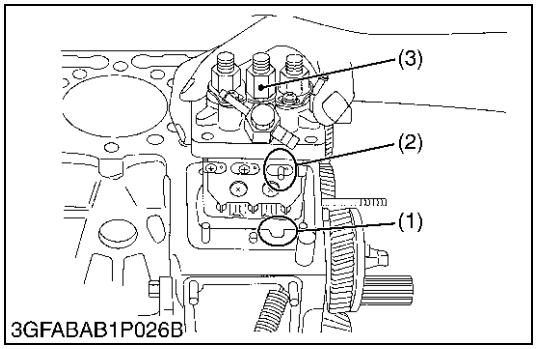

Injection Pump [D1305-E4]

1. Disconnect the start spring (4) on the thrust lever side (5).
2. Align the control rack pin (2) with the notch (1) on the crankcase, and remove the injection pump (3).
3. Remove the injection pump shims.
4. In principle, the injection pump should not be disassembled.

(When reassembling)

- When installing the injection pump, insert the control rack pin (2) firmly into the groove (7) of the thrust lever of fork lever.

■ **NOTE**

- **Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad (0.5 °).**
- **In disassembling and replacing, be sure to use the same number or new gasket shims with the same thickness.**

(1) Notch
(2) Control Rack Pin
(3) Injection Pump
(4) Start Spring
(5) Thrust Lever
(6) Governor Spring
(7) Groove

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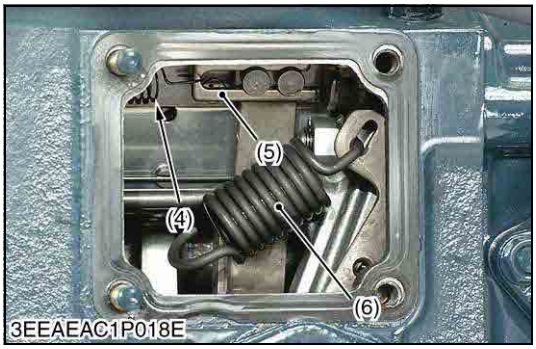

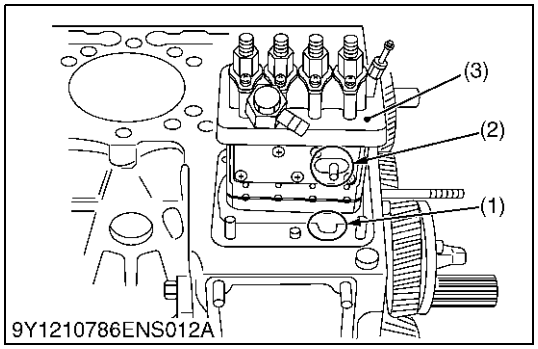

Injection Pump [V1505-T-E4]

1. Remove the solenoid and rack sensor.
2. Align the control rack pin (2) with the notch (1) on the crankcase, and remove the injection pump (3).
3. Remove the injection pump shims.
4. In principle, the injection pump should not be disassembled.

■ **NOTE**

- **Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad (0.5 °).**
- **In disassembling and replacing, be sure to use the same number or new gasket shims with the same thickness.**

(1) Notch
(2) Control Rack Pin
(3) Injection Pump

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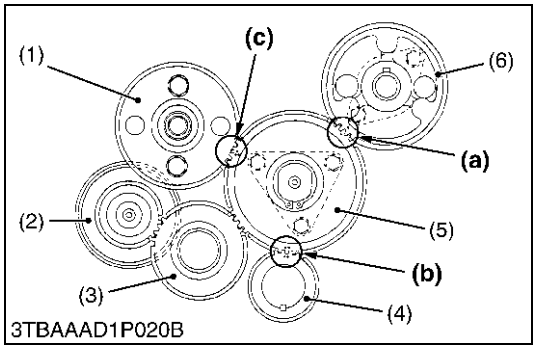

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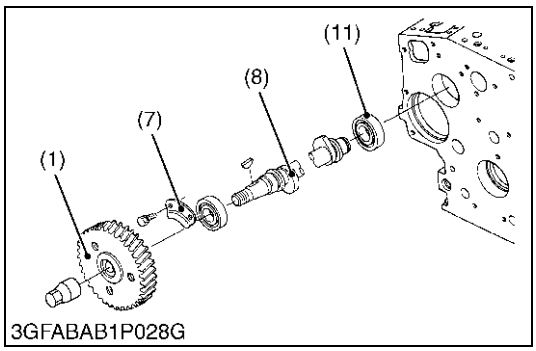

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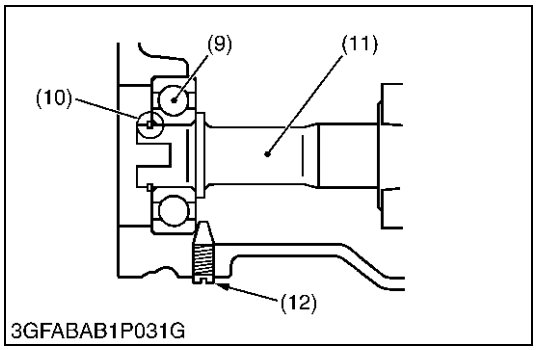

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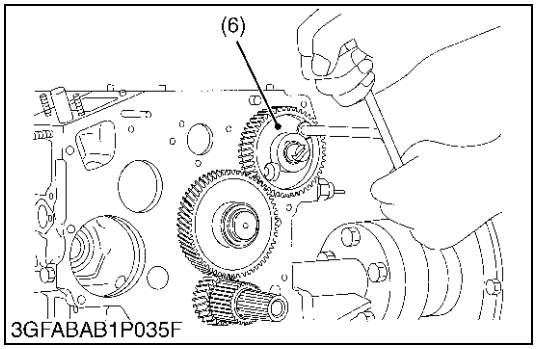

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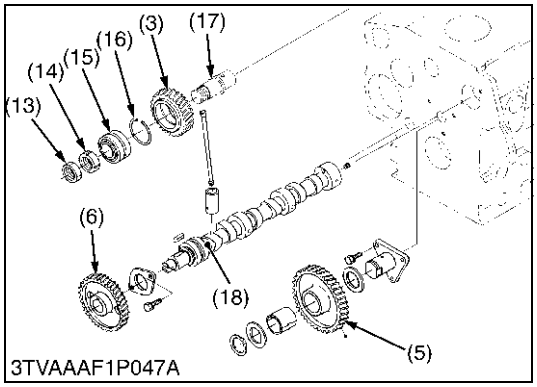

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Cam Gear, Idle Gear 1, 2 and Governor Gear

1. Remove the lock nut (13) and the bearing nut (14). (See page G-47.)
2. Remove the idle gear 2 (3) and the Idle gear 1 (5).
3. Remove the fuel camshaft stopper (7).
4. Draw out the fuel cam gear (1) with fuel camshaft (8).
5. Remove the camshaft stopper bolt.
6. Remove the cam gear (6) with camshaft (18).
7. Remove the cir-clip (10) from the governor shaft (11).
8. Remove the governor gear (2) with governor shaft (11).

(When reassembling)

- Apply engine oil thinly to the fuel camshaft before installation.
- Make sure to assemble the external snap ring of the governor shaft.
- Check the governor shaft for smooth rotation.

Tightening torque	Idle gear 2 lock nut	25 to 29 N·m 2.5 to 3.0 kgf·m 18 to 21 lbf·ft
	Idle gear 2 bearing nut	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft

■ **IMPORTANT**

- **When replacing the ball bearing (9) of governor shaft, securely fit the ball bearing (9) to the crankcase, apply an adhesive (Three Bond 1375N or equivalent) to the set screw (12), and fasten the screw until its tapered part contacts the circumferential end of the ball bearing.**

(1) Fuel Cam Gear
(2) Governor Gear
(3) Idle Gear 2
(4) Crank Gear
(5) Idle Gear 1
(6) Cam Gear
(7) Fuel Camshaft Stopper
(8) Fuel Camshaft
(9) Ball Bearing
(10) Cir-clip
(11) Governor Shaft
(12) Set Screw
(13) Lock Nut
(14) Bearing Nut
(15) Taper Roller Bearing
(16) Cir-clip
(17) Idle Gear Shaft
(18) Camshaft

(a) Alignment Mark: Idle Gear 1 and Cam Gear 1
(b) Alignment Mark: Idle Gear 1 and Crank Gear
(c) Alignment Mark: Idle Gear 1 and Fuel Cam Gear

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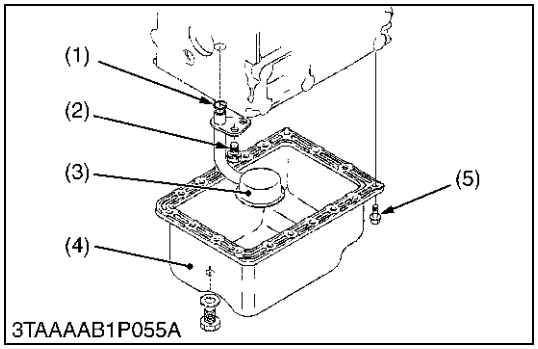
(7) Piston and Connecting Rod



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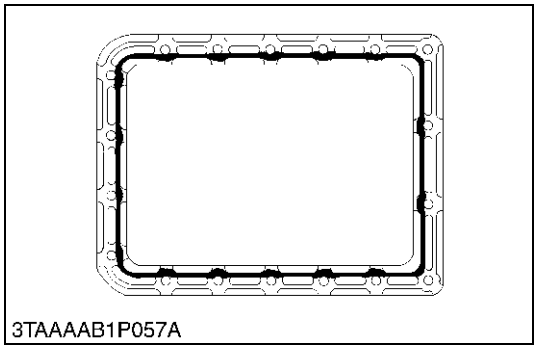
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Oil Pan and Oil Strainer (for Standard Oil Pan)

1. Remove the oil pan mounting screws (5).
2. Remove the oil pan (4).
3. Remove the oil strainer (3).

(When reassembling)

- After cleaning the oil strainer, check to see that the filter mesh in clean, and install it.
- Visually check the O-ring (1), apply engine oil, and install it.
- Securely fit the O-ring to the oil strainer.
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order form the center.

■ **IMPORTANT**

- **Scrape off the old adhesive completely. Wipe the sealing surface clean using waste cloth soaked with gasoline.**
- **Apply "liquid gasket" (Three Bond 1207D or equivalent) about 3.0 to 5.0 mm (0.12 to 0.19 in.) thick. Within 20 minutes after the application of liquid gasket, reassemble the components.**

(1) O-ring
(2) Screw
(3) Oil Strainer
(4) Oil Pan
(5) Oil Pan Mounting Screw

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9Y1210661ENS011B

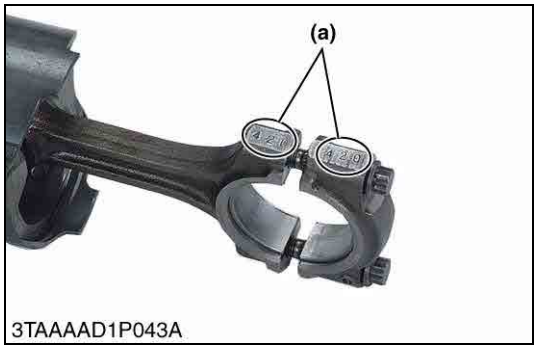
Connecting Rod

1. Remove the connecting rod cap.

(When reassembling)

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

Tightening torque	Connecting rod screw	42 to 46 N·m 4.2 to 4.7 kgf·m 31 to 33 lbf·ft



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(a) Mark

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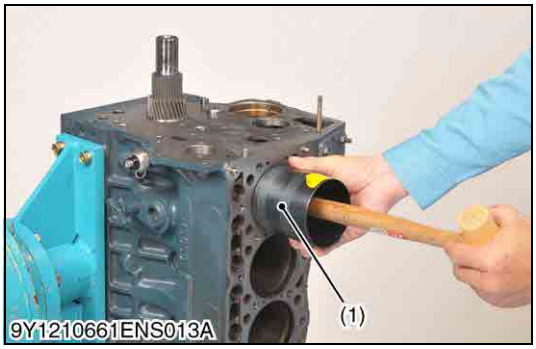

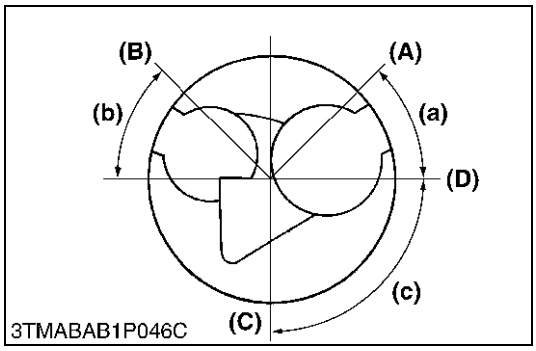

Pistons

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

(When reassembling)

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

■ IMPORTANT

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

(1) Piston Ring Compressor

(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole

(a) 0.79 rad (45 °)
(b) 0.79 rad (45 °)
(c) 1.6 rad (90 °)

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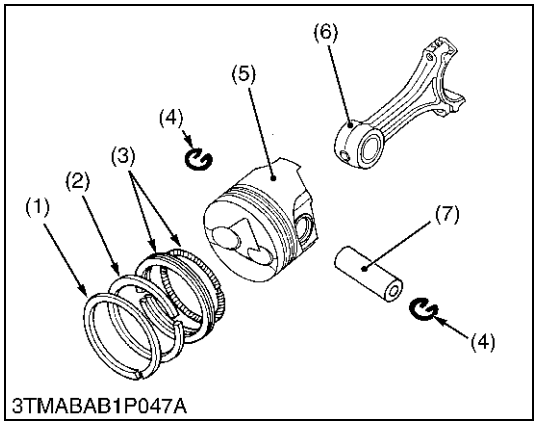

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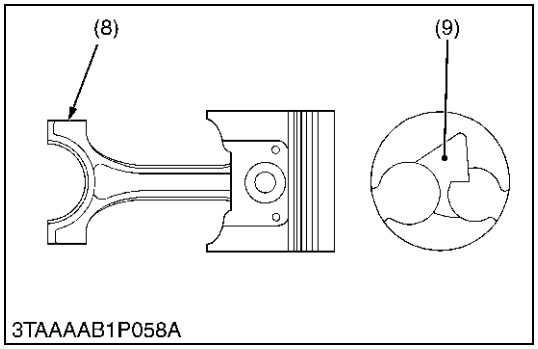

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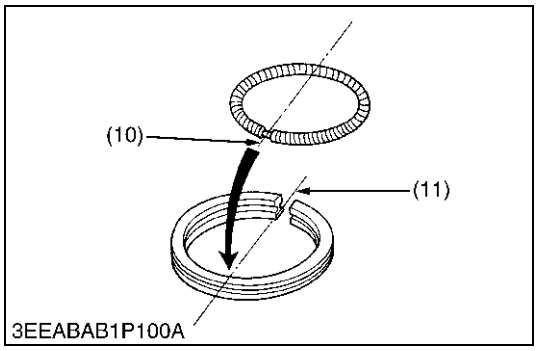

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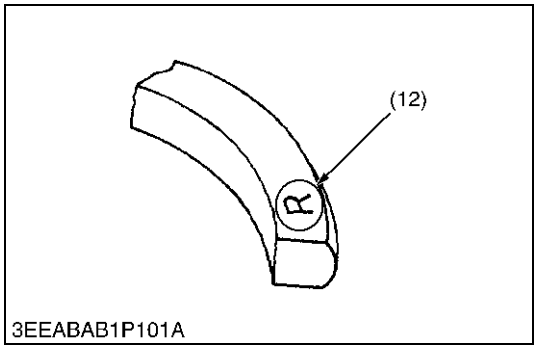

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Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Remove the piston pin (7), and separate the connecting rod (6) from the piston (5).

(When reassembling)

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

■ **NOTE**

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

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

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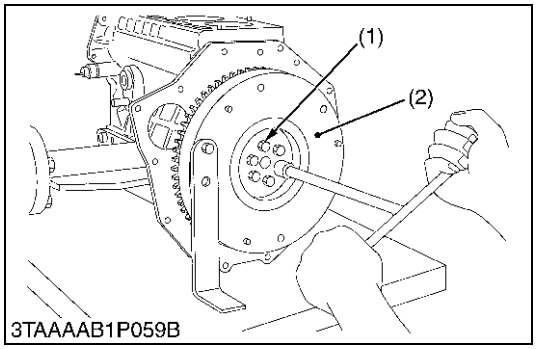
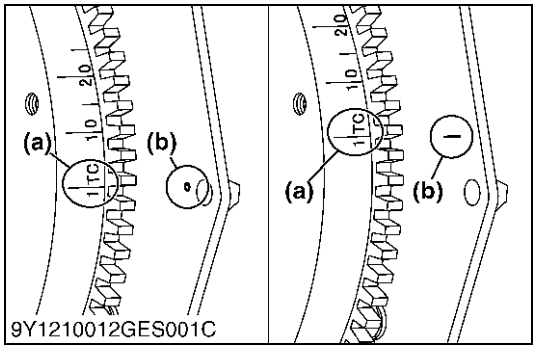
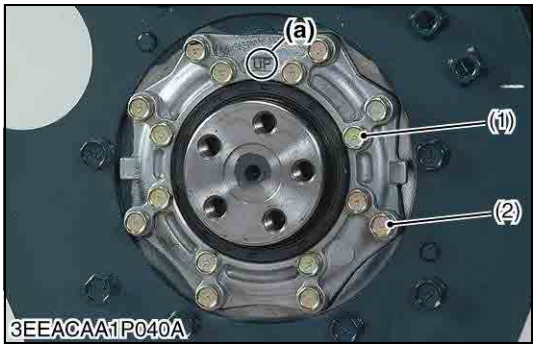
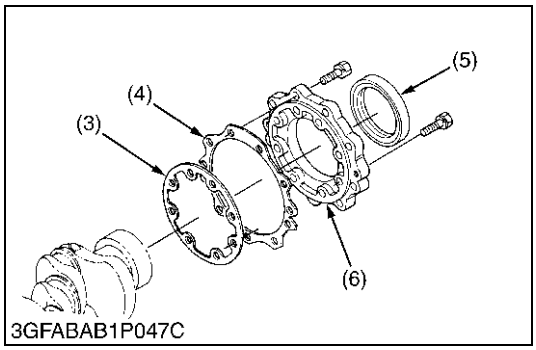
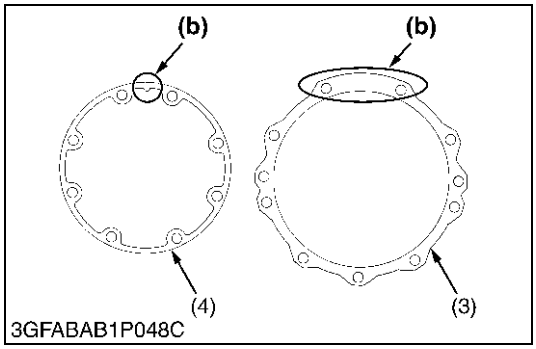
(8) Flywheel and Crankshaft











Flywheel

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

(When reassembling)

- Align the **"1TC"** mark **(a)** on the outer surface of the flywheel horizontally with the alignment mark **(b)** on the rear end plate. Now fit the flywheel in position.
- Apply engine oil to the threads and the undercut surface of the flywheel screw and fit the screw.

Tightening torque	Flywheel screw	54 to 58 N·m 5.5 to 6.0 kgf·m 40 to 43 lbf·ft

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

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Bearing Case Cover

1. Remove the bearing case cover mounting screws.
2. Remove the bearing case cover (6).

■ **IMPORTANT**

- **The length of inside screws (1) and outside screws (2) are different. Do not take a mistake using inside screws and outside screws.**

(When reassembling)

- Fit the bearing case gasket (3) and the bearing case cover gasket (4) with correct directions.
- Install the bearing case cover (6) to position the casting mark **"UP"** on it upward.
- Apply engine oil to the oil seal (5) lip and be careful 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	10.8 to 12.2 N·m 1.10 to 1.25 kgf·m 7.96 to 9.04 lbf·ft

(1) Bearing Case Cover Mounting Screw (Inside) (Long)
(2) Bearing Case Cover Mounting Screw (Outside) (Short)
(3) Bearing Case Gasket
(4) Bearing Case Cover Gasket
(5) Oil Seal
(6) Bearing Case Cover
(a) Top Mark "UP"
(b) Upside

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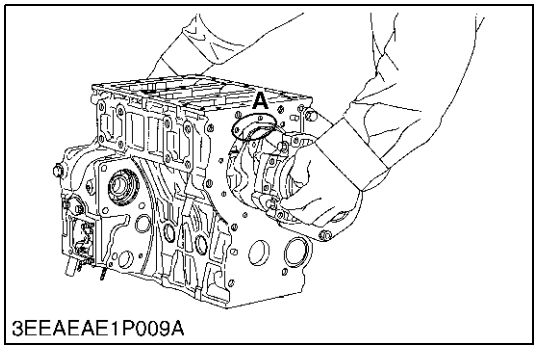

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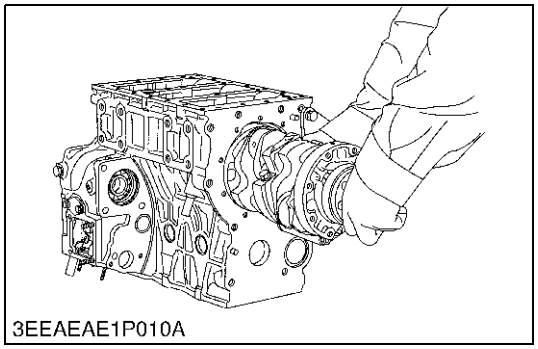
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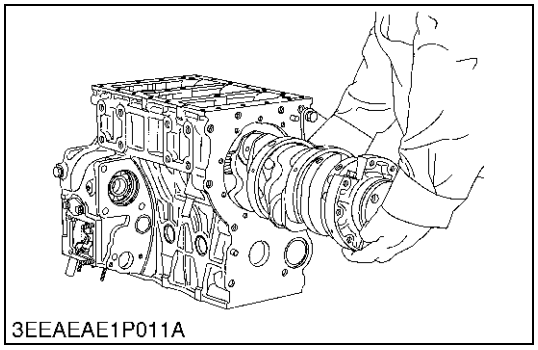
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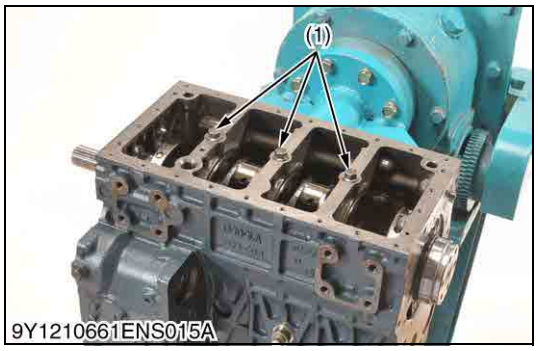

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Crankshaft Assembly [D1305-E4]

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

(When reassembling)

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

Tightening torque	Main bearing case screw 2	49 to 53 N·m 5.0 to 5.5 kgf·m 37 to 39 lbf·ft

A: Cut place for removing and installing the crankshaft

9Y1210822ENS0073US0

Crankshaft Assembly [V1505-T-E4]

1. Remove the main bearing case screw 2 (1).
2. Pull out the crankshaft assembly.

■ **IMPORTANT**

- **Be careful to protect crankshaft bearing 1 from scratches, caused by the crank gear, etc.. (Wrap the gear in vinyl tape, etc.)**

(When reassembling)

- Clean the oil passage of the crankshaft with compressed air.
- Apply oil to the main bearing case screw 2 (1).
- Install the crankshaft assembly, aligning the screw hole of main bearing case with the screw hole of crankcase.

Tightening torque	Main bearing case screw 2	49 to 53 N·m 5.0 to 5.5 kgf·m 37 to 39 lbf·ft

(1) Main Bearing Case Screw 2

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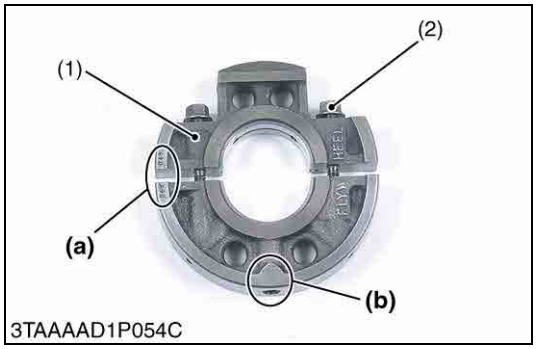

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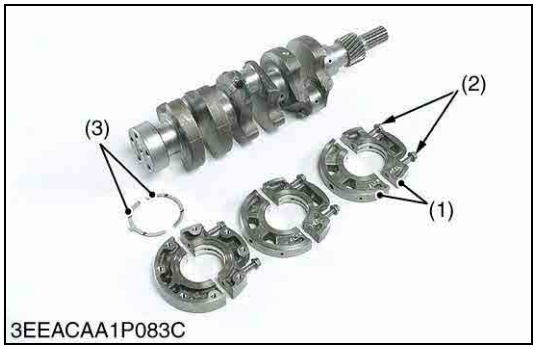

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Main Bearing Case Assembly [D1305-E4]

1. Remove the two main bearing case screws 1 (2) of each main bearing cases.
2. Remove the main bearing case from crankshaft.

(When reassembling)

- Clean the oil passage in the main bearing cases.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in the original positions. Since diameters of main bearing cases vary, install them in order of makings **(b)** (**A**, **B**, **C**) from the gear case side.
- Match the alignment numbers **(a)** on the main bearing case assembly 1.
- When installing the main bearing case 1 and 2, face the mark **"FLYWHEEL"** to the flywheel.
- Install the thrust bearing (3) with its oil groove facing outward.
- Make sure that the main bearing case moves smoothly after tightening the main bearing case screw 1 to the specified torque.

Tightening torque	Main bearing case screw 1	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft

(1) Main Bearing Case Assembly 1
(2) Main Bearing Case Screw 1
(3) Thrust Bearing
(a) Alignment Number
(b) Marking (A, B, C)

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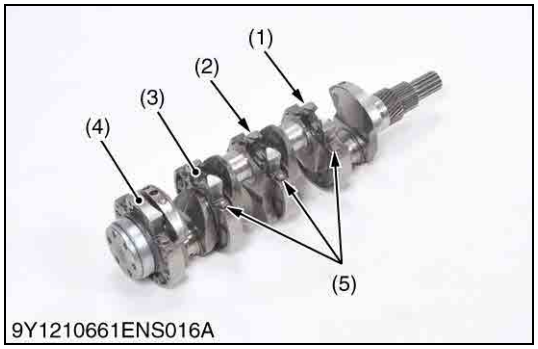

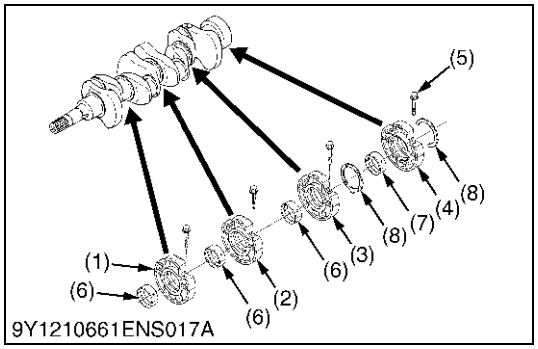

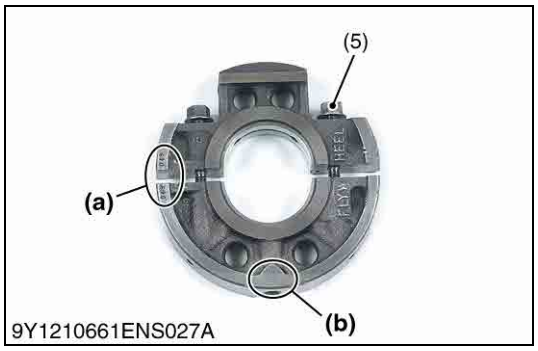

Main Bearing Case Assembly [V1505-T-E4]

1. Remove the two main bearing case screws 1 (5), and remove the main bearing case assembly 1 (1), being careful with crankshaft bearing 3 (7).
2. Remove the main bearing case assembly 2 (2), the main bearing case assembly 3 (3) and the main bearing case assembly (4) as above. Keep in mind, however, that the thrust bearing (8) is installed in the main bearing case assembly (4).

(When reassembling)

- Clean the oil passage in the main bearing cases.
- Apply clean engine oil to the bearings.
- Install the main bearing case assemblies in original positions. Since diameters of main bearing cases vary, install them in order of marking **(b)** from the gear case side. (Refer to the figure.)
- Be careful not to confuse the top and bottom of the crankshaft bearing 3 (7). (Install the bearing with the oil groove **(c)** up.).
- Match the alignment numbers **(a)** on the main bearing case assembly 1.
- Do the same for the main bearing case assembly 2 (2), the main bearing case assembly 3 (3) and the main bearing case assembly (4) too.
- When installing the main bearing case 1, 2 and 3, face the mark **"FLYWHEEL"** to the flywheel.
- Install the thrust bearing (8) with its oil groove facing outward.
- Make sure that the main bearing case moves smoothly after tightening the main bearing case screw 1 (5) to the specified torque.

Tightening torque	Main bearing case screw 1	30 to 34 N·m 3.0 to 3.4 kgf·m 22 to 25 lbf·ft

(1) Main Bearing Case Assembly 1
(2) Main Bearing Case Assembly 2
(3) Main Bearing Case Assembly 3
(4) Main Bearing Case Assembly
(5) Main Bearing Case Screw 1
(6) Crankshaft Bearing 2
(7) Crankshaft Bearing 3
(8) Thrust Bearing

(a) Alignment Number
(b) Marking (A, B, C)
(c) Oil Groove

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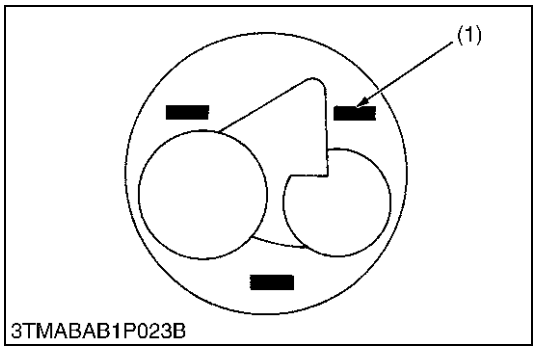
[3] SERVICING
(1) Cylinder Head and Valve



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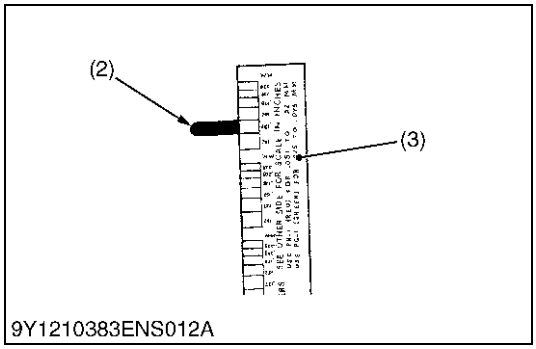

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Top Clearance

1. Remove the cylinder head.
2. With the piston at TDC, use grease to affix three or four plastigauges (1) of a diameter 1.5 mm (0.059 in.) × 5.0 to 7.0 mm (0.20 to 0.27 in.) long to the crown of the piston; keep the gauges away from the intake valve and combustion chamber fittings.
3. Take the piston to an intermediate position, install the cylinder head and tighten the head bolts to the specified torque.
4. Turn the crankshaft so the piston goes through TDC.
5. Remove the cylinder head and compare the width of the crushed plastigauges (2) with the scale.
6. If they are out of spec, check the oil clearance of the crankpin, journals and piston pins.

■ **NOTE**
- **Top clearance = Width of the crushed plastigauge (2).**

[D1305-E4]

Top clearance	Factory specification	0.80 to 1.0 mm 0.032 to 0.039 in.

[V1505-T-E4]

Top clearance	Factory specification	0.55 to 0.75 mm 0.022 to 0.029 in.

Tightening torque	Cylinder head screw	64 to 68 N·m 6.5 to 7.0 kgf·m 47 to 50 lbf·ft

(1) Plastigauge
(2) Crushed Plastigauge
(3) Scale

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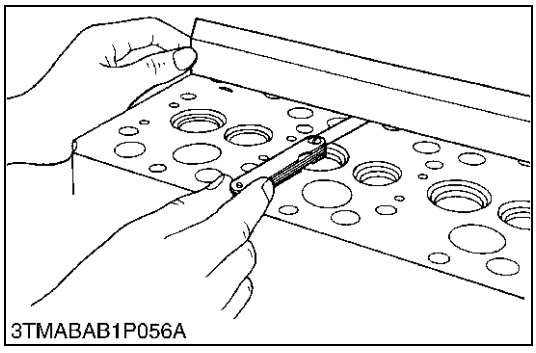
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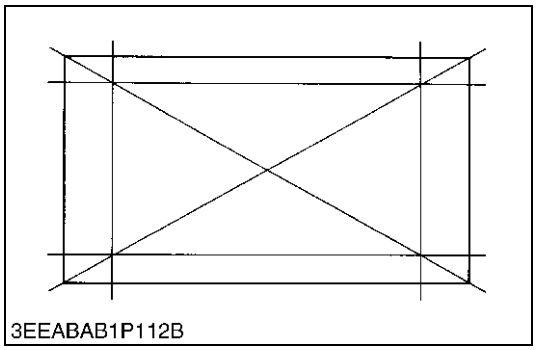
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Cylinder Head Surface Flatness

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

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

Cylinder head surface flatness	Allowable limit	0.05 mm 0.002 in.

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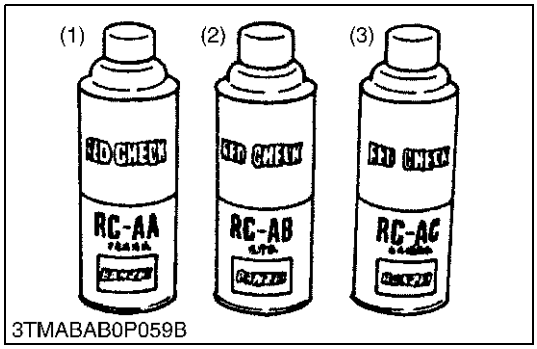

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Cylinder Head Flaw

1. Prepare an air spray red check.
2. Clean the surface of the cylinder head with detergent (2).
3. Spray the cylinder head surface with the red permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the 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
(2) Detergent
(3) White Developer

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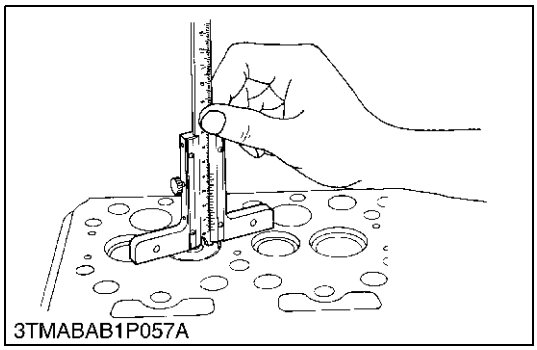
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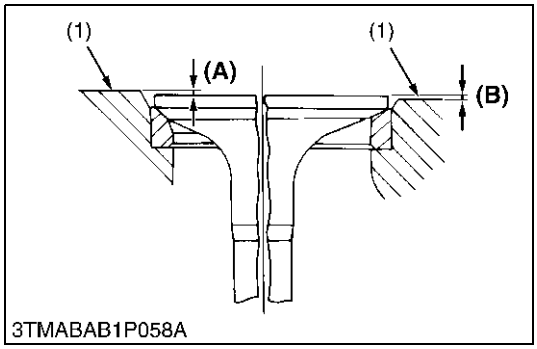
Valve Recessing

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

Valve recessing	Factory specification	0.050 (protrusion) to 0.25 (recessing) mm 0.0020 (protrusion) to 0.0098 (recessing) in.
	Allowable limit	0.40 (recessing) mm 0.016 (recessing) in.



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

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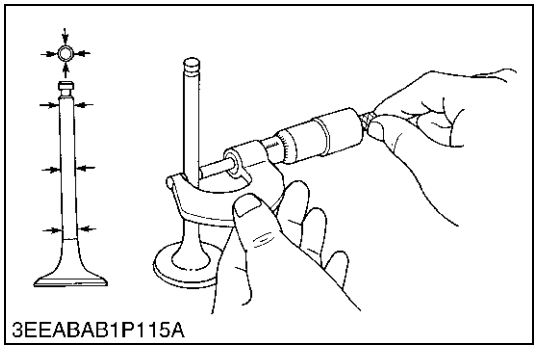
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Clearance between Valve Stem and Valve Guide

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

Clearance between valve stem and valve guide	Factory specification	0.035 to 0.065 mm 0.0014 to 0.0025 in.
	Allowable limit	0.10 mm 0.0039 in.

Valve stem O.D.	Factory specification	6.960 to 6.975 mm 0.2741 to 0.2746 in.
Valve guide I.D.	Factory specification	7.010 to 7.025 mm 0.2760 to 0.2765 in.

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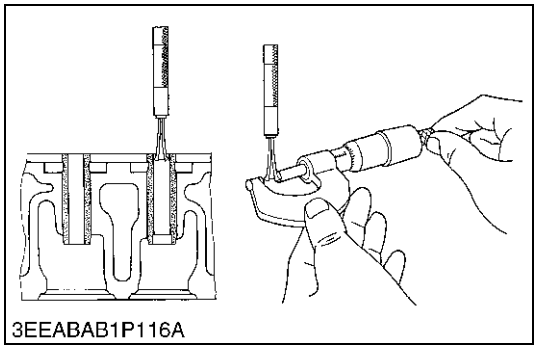
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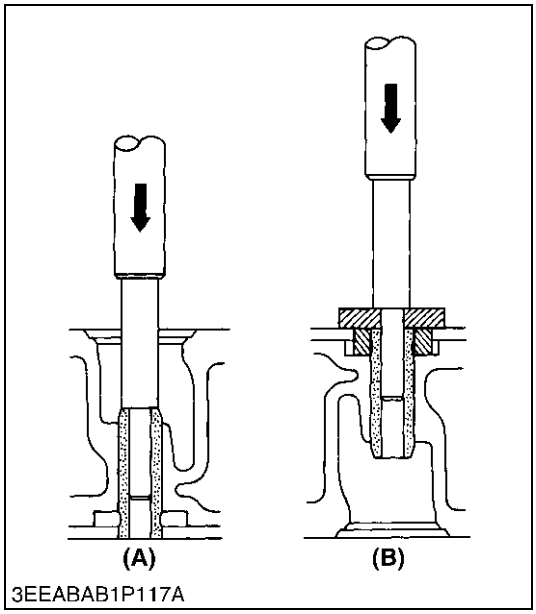

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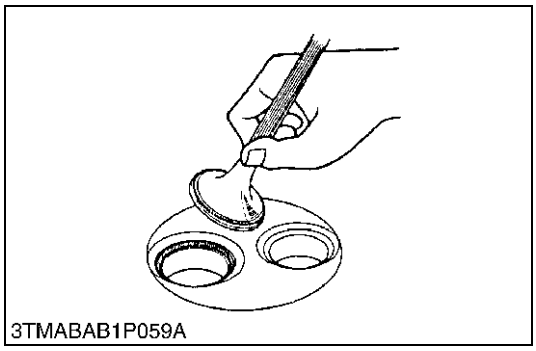
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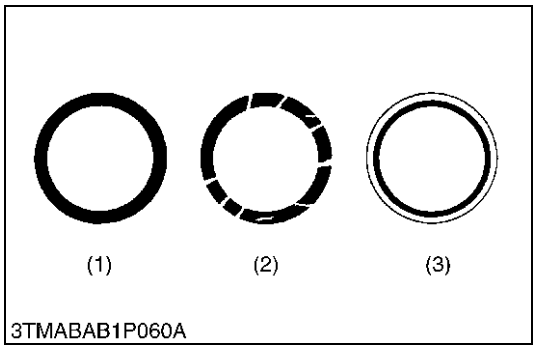

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Replacing Valve Guide

(When removing)

1. Press out the used valve guide using a valve guide replacing tool. (See page G-45.)

(When installing)

1. Clean a new valve guide and valve guide bore, and apply engine oil to them.
2. Press fit 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 specification	7.010 to 7.025 mm 0.2760 to 0.2765 in.

■ **NOTE**

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

(A) When Removing **(B) When Installing**

9Y1210822ENS0082US0

Valve Seating

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

Valve seat width	Factory specification	2.12 mm 0.0835 in.

(1) Correct
(2) Incorrect
(3) Incorrect

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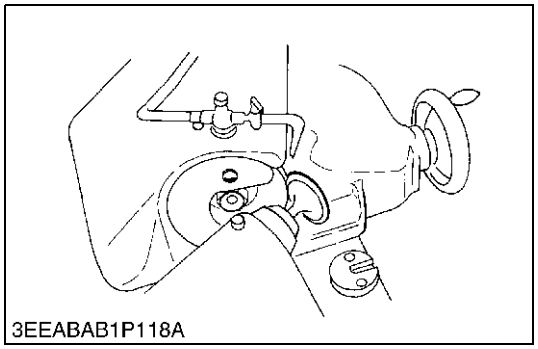
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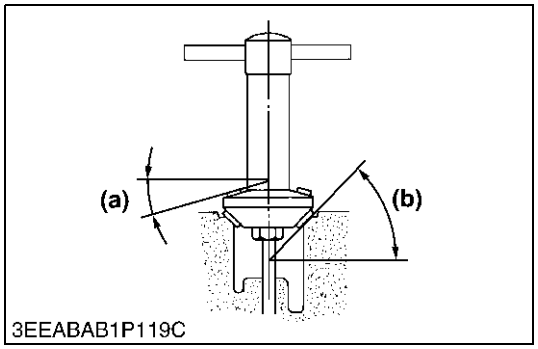

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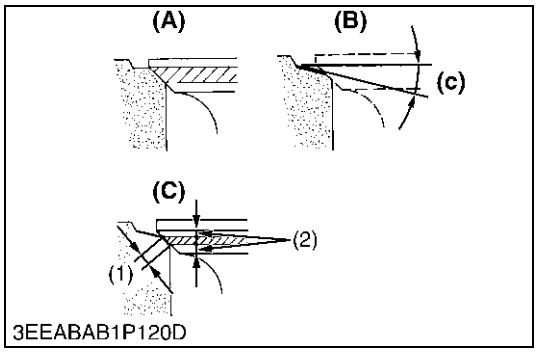

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Correcting Valve and Valve Seat

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

(1) Correcting Valve

1. Correct the valve with a valve refacer.

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

(1) Valve Seat Width
(2) Identical Dimensions

(A) Check Contact
(B) Correct Seat Width
(C) Check Contact
(a) 0.26 rad (15 °) or 0.52 rad (30 °)
(b) 0.79 rad (45 °) or 1.0 rad (60 °)
(c) 0.52 rad (30 °) or 0.26 rad (15 °)

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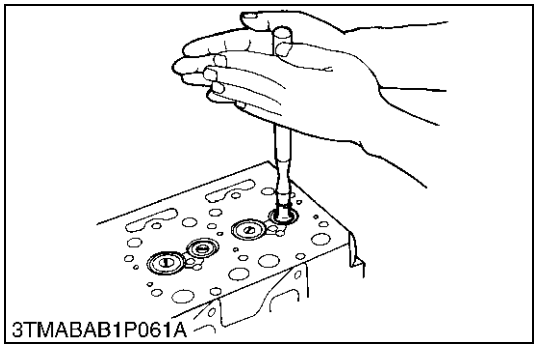
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Valve Lapping

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

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

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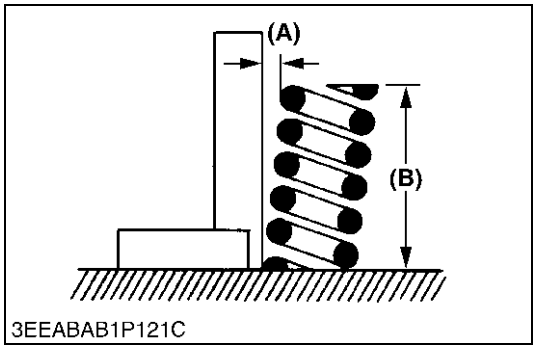

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Free Length and Tilt of Valve Spring

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)**. If the measurement exceeds the allowable limit, replace it.
4. Check the entire surface of the valve spring for scratches. If there is any problem, replace it.

Tilt **(A)**	Allowable limit	1.0 mm 0.039 in.

Free length **(B)**	Factory specification	37.0 to 37.5 mm 1.46 to 1.47 in.
	Allowable limit	36.5 mm 1.44 in.

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

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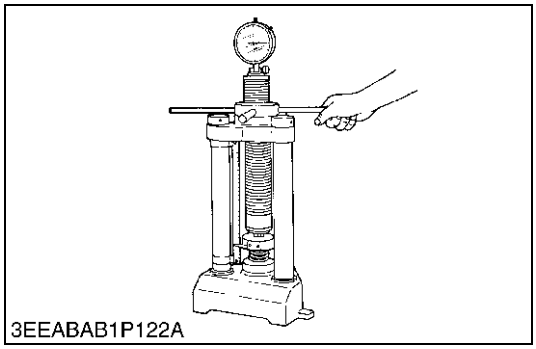
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Valve Spring Setting Load

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 specification	117.4 N / 31.0 mm 11.97 kgf / 31.0 mm 26.39 lbf / 1.22 in.
	Allowable limit	100.0 N / 31.0 mm 10.20 kgf / 31.0 mm 22.48 lbf / 1.22 in.

9Y1210822ENS0087US0


3TAAAAD1P060A

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 specification	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 specification	11.973 to 11.984 mm 0.47138 to 0.47181 in.
Rocker arm I.D.	Factory specification	12.000 to 12.018 mm 0.47244 to 0.47314 in.

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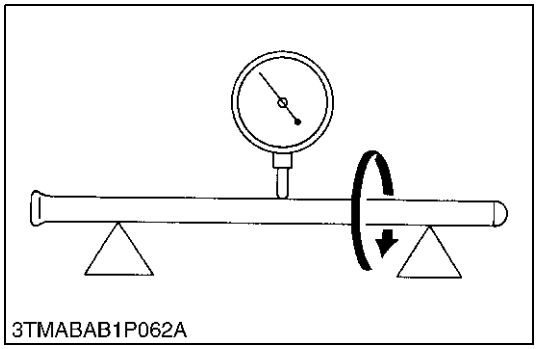
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Push Rod Alignment

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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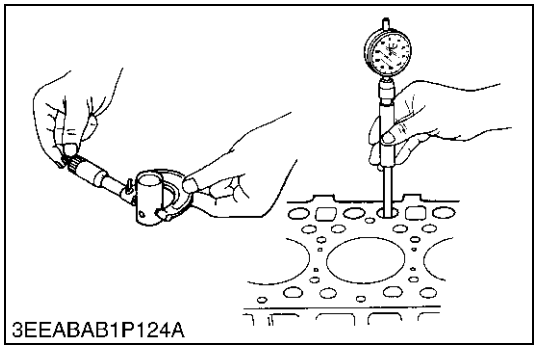
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Oil Clearance between Tappet and Tappet Guide Bore

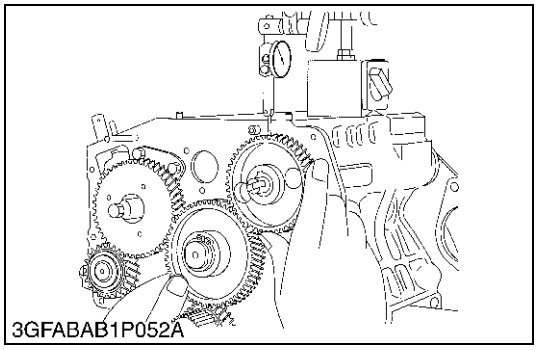
1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

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

Tappet O.D.	Factory specification	19.959 to 19.980 mm 0.78579 to 0.78661 in.
Tappet guide bore I.D.	Factory specification	20.000 to 20.021 mm 0.78740 to 0.78822 in.

9Y1210822ENS0090US0

(2) Timing Gears, Camshaft and Governor Gear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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 1 and crank gear	Factory specification	0.0320 to 0.115 mm 0.00126 to 0.00452 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear 1 and cam gear	Factory specification	0.0360 to 0.114 mm 0.00142 to 0.00448 in.
	Allowable limit	0.15 mm 0.0059 in.

Backlash between idle gear 1 and injection pump gear	Factory specification	0.0340 to 0.116 mm 0.00134 to 0.00456 in.
	Allowable limit	0.15 mm 0.0059 in.

(equipped with idle gear 2) Backlash between idle gear 1 and idle gear 2	Factory specification	0.0330 to 0.117 mm 0.00130 to 0.00460 in.
	Allowable limit	0.15 mm 0.0059 in.

9Y1210822ENS0091US0

Governor Gear Backlash

Backlash between injection pump gear and governor gear	Factory specification	0.0300 to 0.117 mm 0.00119 to 0.00460 in.
	Allowable limit	0.15 mm 0.0059 in.
(equipped with idle gear 2) idle gear 2 and governor gear	Factory specification	0.030 to 0.117 mm 0.0012 to 0.00460 in.
	Allowable limit	0.15 mm 0.0059 in.

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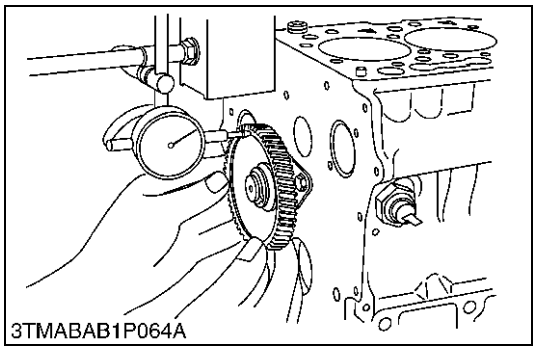
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Idle Gear 1 and 2 Side Clearance

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 1 and 2 side clearance	Factory specification	0.20 to 0.51 mm 0.0079 to 0.020 in.
	Allowable limit	0.80 mm 0.031 in.

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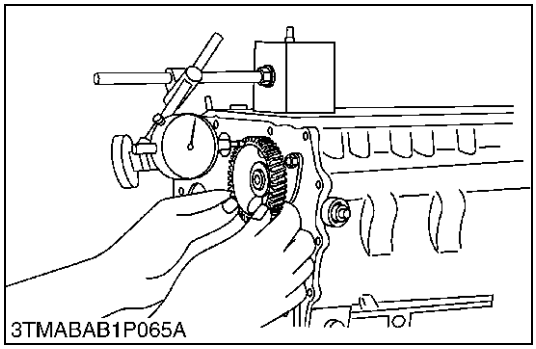
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Camshaft Side Clearance

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

Camshaft side clearance	Factory specification	0.070 to 0.22 mm 0.0028 to 0.0086 in.
	Allowable limit	0.30 mm 0.012 in.

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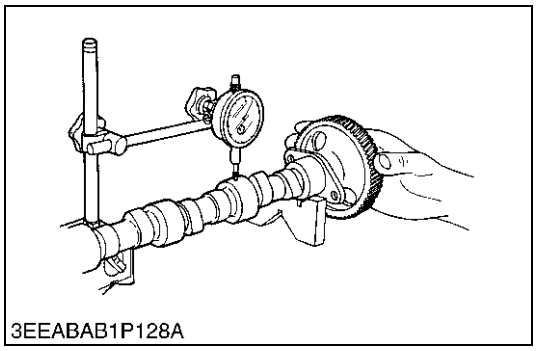
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Camshaft Alignment

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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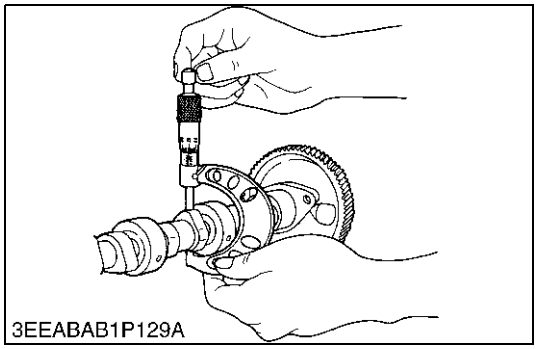
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Cam Height

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 specification	28.80 mm 1.134 in.
	Allowable limit	28.75 mm 1.132 in.

Cam height of exhaust	Factory specification	29.00 mm 1.142 in.
	Allowable limit	28.95 mm 1.140 in.

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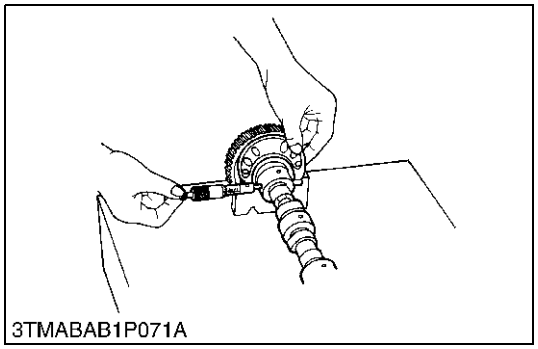
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Oil Clearance of Camshaft Journal

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 specification	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 specification	35.934 to 35.950 mm 1.4147 to 1.4153 in.
Camshaft bearing I.D. (Cylinder block bore I.D.)	Factory specification	36.000 to 36.025 mm 1.4173 to 1.4183 in.

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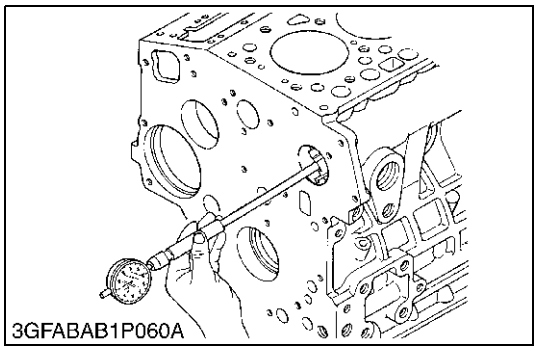
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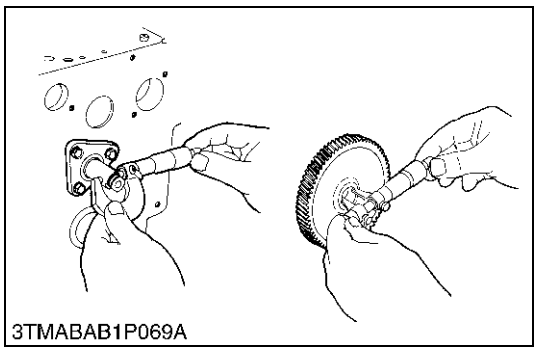
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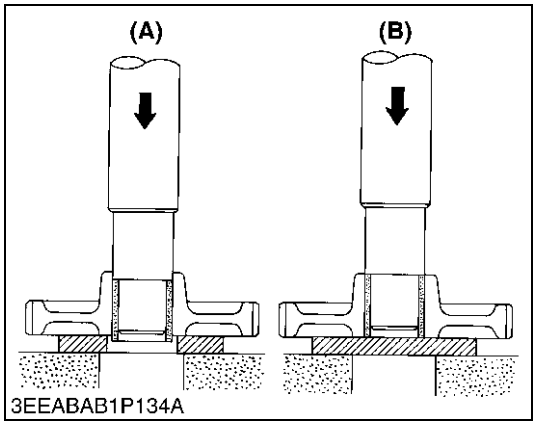
Oil Clearance between Idle Gear Shaft 1 and 2 and Idle Gear Bushing

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.
   If it still exceeds the allowable limit, replace the idle gear shaft.

Oil clearance between idle gear shaft (1 and 2) and idle gear bushing	Factory specification	0.020 to 0.054 mm 0.00079 to 0.0021 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear shaft 1 and 2 O.D.	Factory specification	25.967 to 25.980 mm 1.0223 to 1.0228 in.
Idle gear bushing 1 and 2 I.D.	Factory specification	26.000 to 26.021 mm 1.0237 to 1.0244 in.

9Y1210822ENS0098US0



Replacing Idle Gear Bushing

(When removing)

1. Press out the used idle gear bushing using an idle gear bushing replacing tool. (See page G-45.)

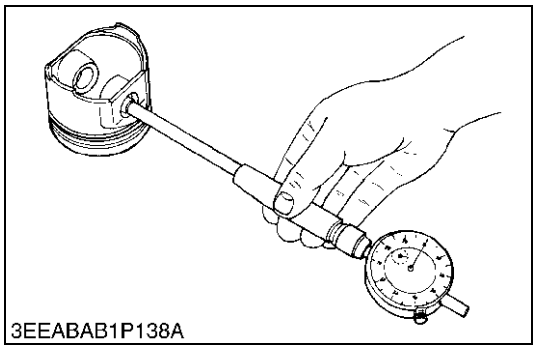
(When installing)

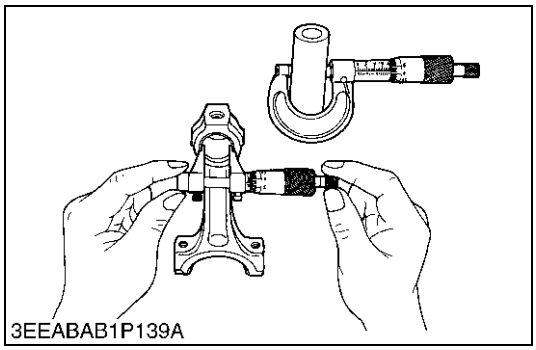
1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Press fit a new bushing using an idle gear bushing replacing tool, until it is flush with the end of the idle gear.

(A) When Removing **(B) When Installing**

9Y1210822ENS0099US0

(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 specification	22.000 to 22.013 mm 0.86615 to 0.86665 in.
	Allowable limit	22.03 mm 0.8673 in.

9Y1210822ENS0100US0

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 specification	0.014 to 0.038 mm 0.00055 to 0.0014 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory specification	22.002 to 22.011 mm 0.86622 to 0.86657 in.
Small end bushing I.D.	Factory specification	22.025 to 22.040 mm 0.86713 to 0.86771 in.

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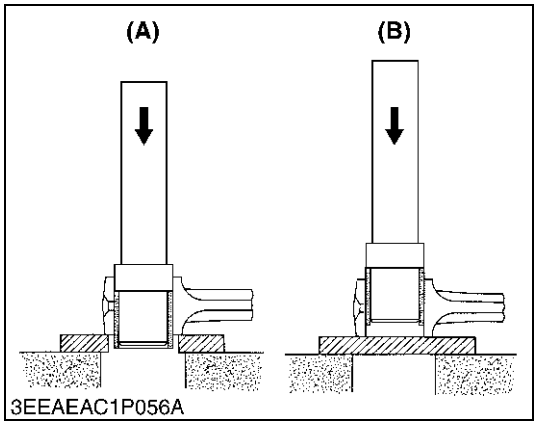

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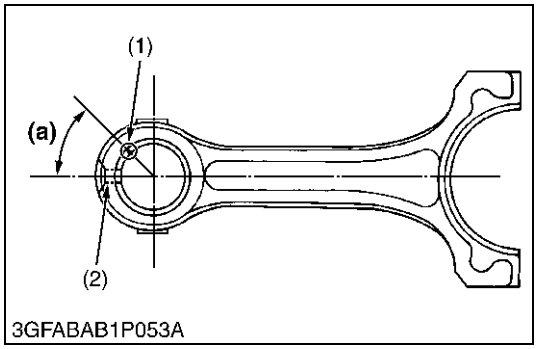

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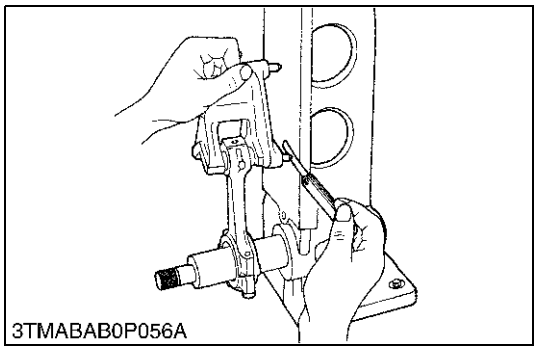
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Replacing Small End Bushing

(When removing)

1. Press out the used bushing using a small end bushing replacing tool. (See page G-45.)

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Using a small end bushing replacing tool, press fit a new bushing (service parts) taking due care to see that the connecting rod oil hole matches the bushing hole.

Oil clearance between piston pin and small end bushing (Spare parts)	Factory specification	0.014 to 0.038 mm 0.00056 to 0.0014 in.
	Allowable limit	0.15 mm 0.0059 in.

Small end bushing I.D. (Spare parts)	Factory specification	22.025 to 22.040 mm 0.86713 to 0.86771 in.

(1) Seam
(2) Oil Hole

(A) When Removing
(B) When Installing
(a) 0.79 rad (45 °)

9Y1210822ENS0102US0

Connecting Rod Alignment

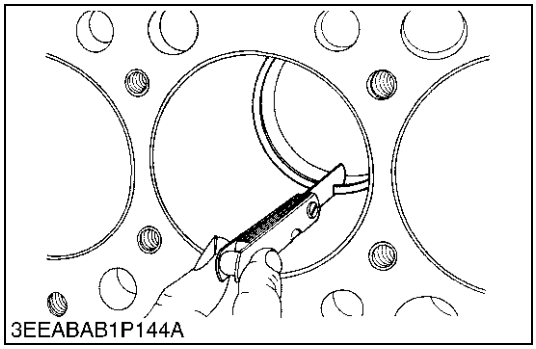
■ **NOTE**

- **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 0.002 in.

9Y1210822ENS0103US0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Piston Ring Gap

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

Piston ring gap	Top ring	Factory specification	0.15 to 0.25 mm 0.0059 to 0.0098 in.
		Allowable limit	1.20 mm 0.0472 in.
	Second ring	Factory specification	0.40 to 0.55 mm 0.016 to 0.021 in.
		Allowable limit	1.20 mm 0.0472 in.
	Oil ring	Factory specification	0.25 to 0.45 mm 0.0099 to 0.017 in.
		Allowable limit	1.25 mm 0.0492 in.

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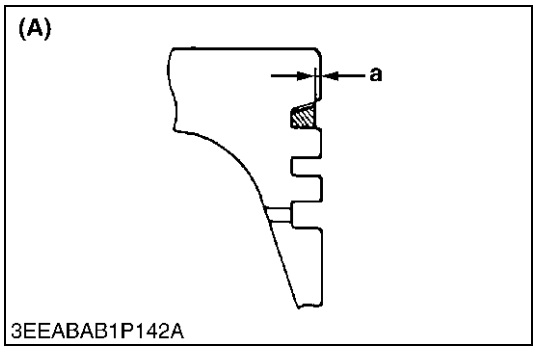

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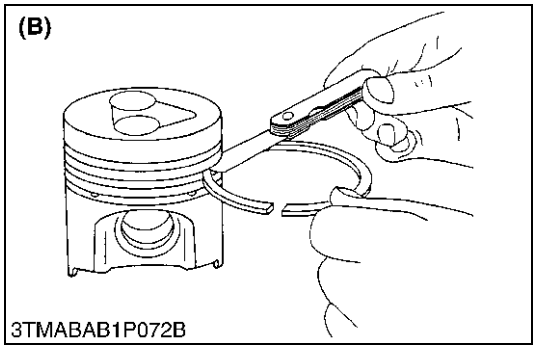

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Clearance between Piston ring and Piston Ring Groove

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

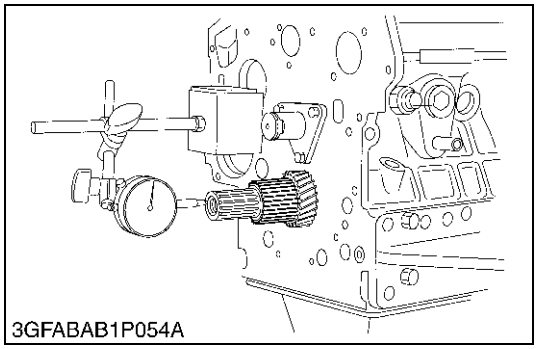
Clearance between piston ring and piston ring groove	Second ring	Factory specification	0.0850 to 0.122 mm 0.00335 to 0.00480 in.
		Allowable limit	0.2 mm 0.008 in.
	Oil ring	Factory specification	0.02 to 0.06 mm 0.0008 to 0.002 in.
		Allowable limit	0.15 mm 0.0059 in.

Factory specification: **a**	More than 0.2 mm 0.008 in.

(A) Top Ring (Key Stone Type) **(B) 2nd, Oil Ring**

9Y1210822ENS0105US0

(4) Crankshaft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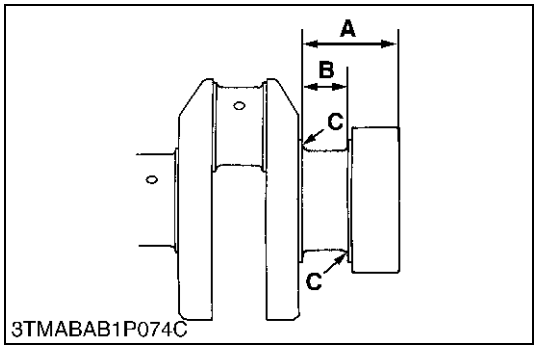

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Crankshaft Side Clearance

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

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

(Reference)

- Oversize dimensions of crankshaft journal

Oversize	0.2 mm 0.0079 in.	0.4 mm 0.016 in.
Dimension **A**	51.50 to 51.70 mm 2.028 to 2.035 in.	51.60 to 51.80 mm 2.032 to 2.039 in.
Dimension **B**	28.20 to 28.25 mm 1.111 to 1.112 in.	28.40 to 28.45 mm 1.119 to 1.120 in.
Dimension **C**	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S		

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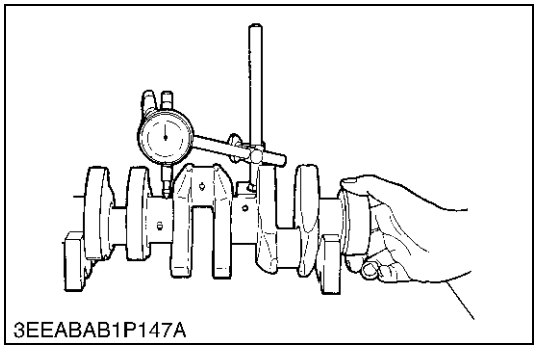
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Crankshaft Alignment

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

Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.

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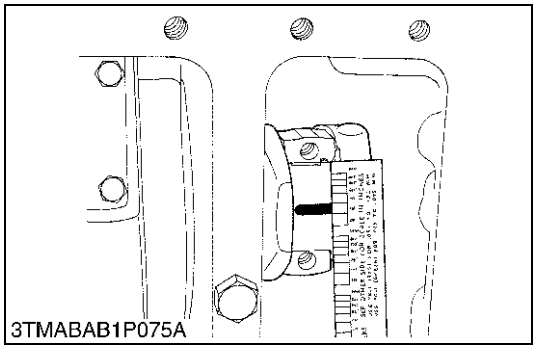
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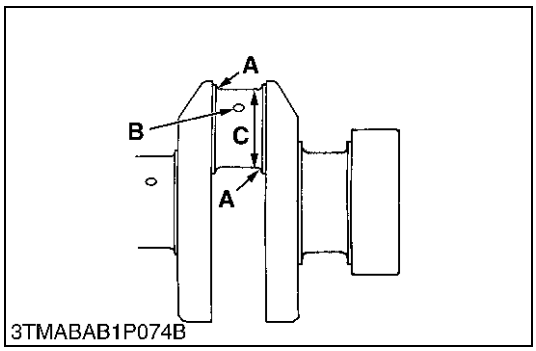

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Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigauge on the center of the crankpin.
3. Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.
4. Measure the amount of the flattening with the scale, and get the oil clearance.
5. If the oil clearance exceeds the allowable limit, replace the crankpin bearing.
6. If the same size bearing is useless because of the crankpin wear, replace it with an undersize one referring to the table and figure.

■ **NOTE**
- **Never insert the plastigauge 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 specification	0.029 to 0.091 mm 0.0011 to 0.0036 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankpin O.D.	Factory specification	39.959 to 39.975 mm 1.5732 to 1.5738 in.
Crankpin bearing I.D.	Factory specification	40.040 to 40.050 mm 1.5764 to 1.5767 in.

(Reference)
- Undersize dimensions of crankpin

Undersize	**0.20 mm 0.0079 in.**	**0.40 mm 0.016 in.**
Dimension **A**	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	39.759 to 39.775 mm dia. 1.5654 to 1.5659 in. dia.	39.559 to 39.575 mm dia. 1.5575 to 1.5580 in. dia.
The crankpin must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

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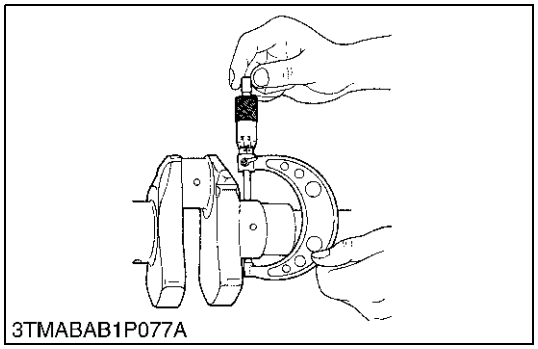
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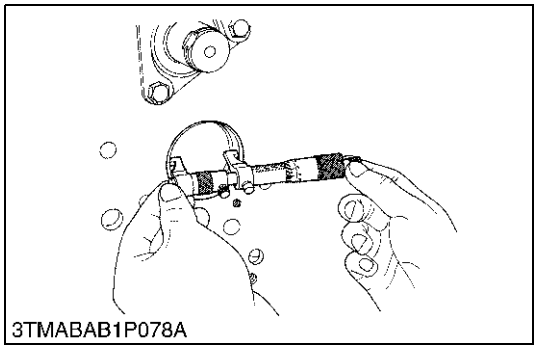
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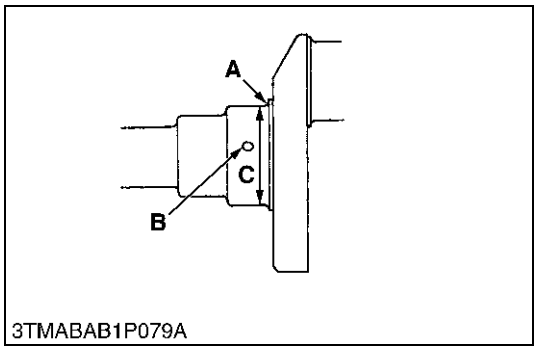

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Oil Clearance between Crankshaft Journal and Crankshaft Bearing 1

1. Measure the O.D. of the crankshaft front journal with an outside micrometer.
2. Measure the I.D. of the crankshaft bearing 1 with an inside micrometer, and calculate the oil clearance.
3. If the 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.

[D1305-E4]

Oil clearance between crankshaft journal and crankshaft bearing 1	Factory specification	0.0340 to 0.119 mm 0.00134 to 0.00468 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D.	Factory specification	51.921 to 51.940 mm 2.0442 to 2.0448 in.
Crankshaft bearing 1 I.D.	Factory specification	51.974 to 52.040 mm 2.0463 to 2.0488 in.

[V1505-T-E4]

Oil clearance between crankshaft journal and crankshaft bearing 1	Factory specification	0.0340 to 0.114 mm 0.00134 to 0.00448 in.
	Allowable limit	0.20 mm 0.0079 in.

Crankshaft journal O.D.	Factory specification	47.934 to 47.950 mm 1.8872 to 1.8877 in.
Crankshaft bearing 1 I.D.	Factory specification	47.984 to 48.048 mm 1.8892 to 1.8916 in.

(Reference)

- Undersize dimensions of crankshaft journal

[D1305-E4]

Undersize	**0.20 mm 0.0079 in.**	**0.40 mm 0.016 in.**
Dimension **A**	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	51.721 to 51.740 mm dia. 2.0363 to 2.0370 in. dia.	51.521 to 51.540 mm dia. 2.0284 to 2.0291 in. dia.
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

[V1505-T-E4]

Undersize	**0.20 mm 0.0079 in.**	**0.40 mm 0.016 in.**
Dimension **A**	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	47.734 to 47.750 mm dia. 1.8793 to 1.8799 in. dia.	47.534 to 47.550 mm dia. 1.8715 to 1.8720 in. dia.
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

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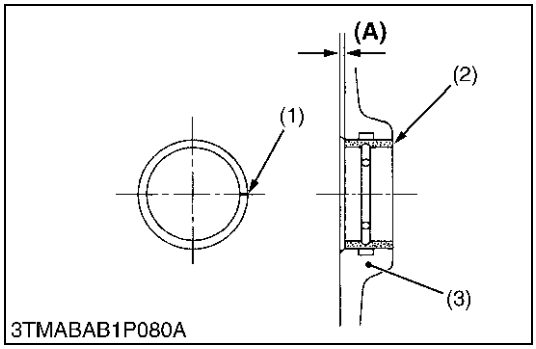

Replacing Crankshaft Bearing 1

(When removing)

1. Press out the used crankshaft bearing 1 using a crankshaft bearing 1 replacing tool. (See page G-46.)

(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 fit a new bearing 1 (2) so that its seam (1) directs toward the exhaust manifold side. (See figure.)

Dimension **(A)**	Factory specification	0 to 0.3 mm 0 to 0.01 in.

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

(A) Dimension

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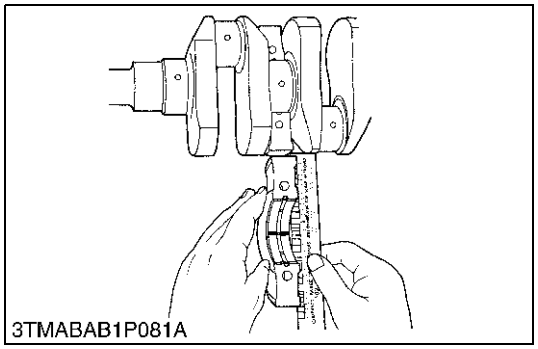


Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2 (Crankshaft Bearing 3)

1. Put a strip of plastigauge 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 and crankshaft bearing.
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.**

[D1305-E4]

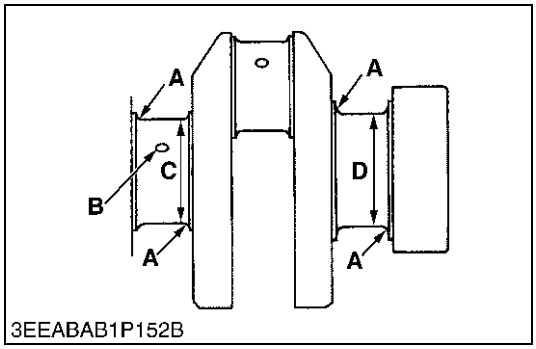
Oil clearance between crankshaft journal and crankshaft bearing 2	Factory specification	0.0340 to 0.103 mm 0.00134 to 0.00405 in.
	Allowable limit	0.20 mm 0.0079 in.
Crankshaft journal O.D. (Intermediate)	Factory specification	51.921 to 51.940 mm 2.0442 to 2.0448 in.
Crankshaft bearing 2 I.D.	Factory specification	51.974 to 52.024 mm 2.0463 to 2.0481 in.
Oil clearance between crankshaft journal and crankshaft bearing 3	Factory specification	0.0340 to 0.103 mm 0.00134 to 0.00405 in.
	Allowable limit	0.20 mm 0.0079 in.
Crankshaft journal O.D. (Flywheel side)	Factory specification	51.921 to 51.940 mm 2.0442 to 2.0448 in.
Crankshaft bearing 3 I.D.	Factory specification	51.974 to 52.024 mm 2.0463 to 2.0481 in.

[V1505-T-E4]

Oil clearance between crankshaft journal and crankshaft bearing 2	Factory specification	0.034 to 0.095 mm 0.0014 to 0.0037 in.
	Allowable limit	0.20 mm 0.0079 in.
Crankshaft journal O.D. (Intermediate)	Factory specification	47.934 to 47.950 mm 1.8872 to 1.8877 in.
Crankshaft bearing 2 I.D.	Factory specification	47.984 to 48.029 mm 1.8892 to 1.8909 in.
Oil clearance between crankshaft journal and crankshaft bearing 3	Factory specification	0.0340 to 0.103 mm 0.00134 to 0.00405 in.
	Allowable limit	0.20 mm 0.0079 in.
Crankshaft journal O.D. (Flywheel side)	Factory specification	51.921 to 51.940 mm 2.0442 to 2.0448 in.
Crankshaft bearing 3 I.D.	Factory specification	51.974 to 52.024 mm 2.0463 to 2.0481 in.

(To be continued)

(Continued)



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(Reference)

- Undersize dimensions of crankshaft journal

[D1305-E4]

Undersize	0.20 mm 0.0079 in.	0.40 mm 0.016 in.
Dimension **A**	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	51.721 to 51.740 mm dia. 2.0363 to 2.0370 in. dia.	51.521 to 51.540 mm dia. 2.0284 to 2.0291 in. dia.
The crankshaft must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

[V1505-T-E4]

Undersize	0.20 mm 0.0079 in.	0.40 mm 0.016 in.
Dimension **A**	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius	2.3 to 2.7 mm radius 0.091 to 0.10 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	47.734 to 47.750 mm dia. 1.8793 to 1.8799 in. dia.	47.534 to 47.550 mm dia. 1.8715 to 1.8720 in. dia.
Dimension **D**	51.721 to 51.740 mm dia. 2.0362 to 2.0370 in. dia.	51.521 to 51.540 mm dia. 2.0284 to 2.0291 in. dia.
The crankshaft must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

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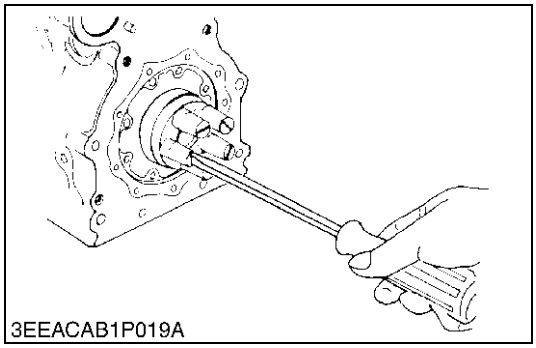
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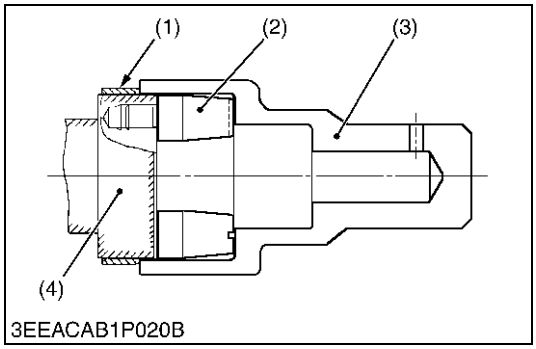

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Replacing Crankshaft Sleeve

1. Remove the used crankshaft sleeve.
2. Set the sleeve guide (2) to the crankshaft.
3. Heat a new sleeve to a temperature between 150 and 200 °C (302 and 392 °F), and fix the sleeve to the crankshaft as shown in figure.
4. Press fit the sleeve using the auxiliary socket for pushing (3).

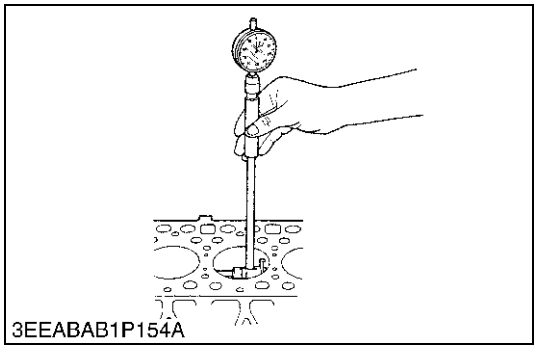
■ **NOTE**

- **Mount the sleeve with its largely chamfered surface facing outward.**
- **Should heating is not enough, a sleeve might stop halfway, so careful.**

(1) Crankshaft Sleeve
(2) Sleeve Guide
(3) Auxiliary Socket for Pushing
(4) Crankshaft

9Y1210822ENS0112US0

(5) Cylinder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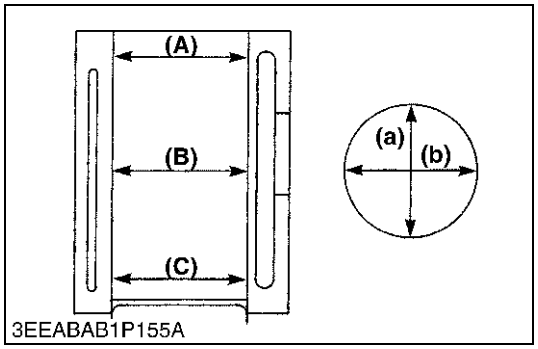

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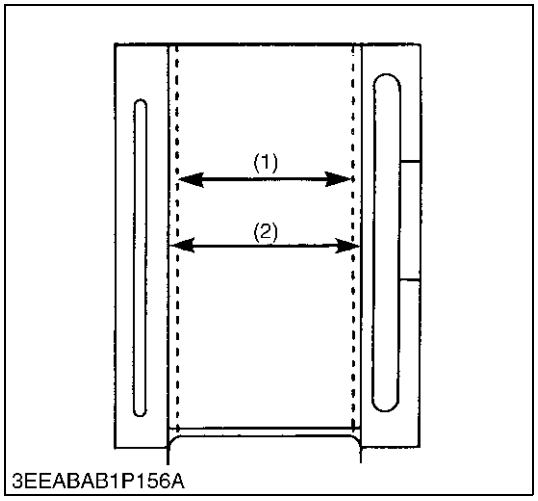

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Cylinder Wear

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

Cylinder I.D.	Factory specification	78.000 to 78.019 mm 3.0709 to 3.0716 in.
	Allowable limit	78.15 mm 3.077 in.

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

9Y1210822ENS0113US0

Correcting Cylinder

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

Oversized cylinder liner I.D.	Factory specification	78.500 to 78.519 mm 3.0906 to 3.0912 in.
	Allowable limit	78.65 mm 3.096 in.
Finishing	Hone to 1.2 to 2.0 µm R max. (48 to 78 µin. R max.)	

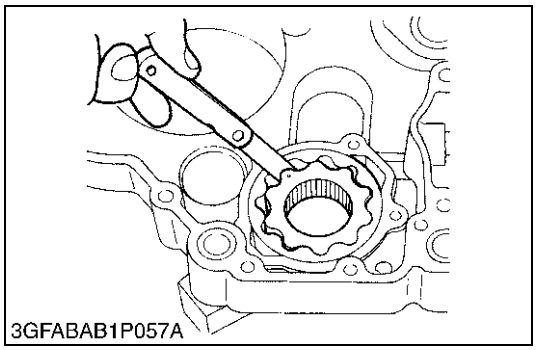
2. Replace the piston and piston rings with oversize one.
   Oversize : 0.5 mm (0.02 in.)

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

(1) Cylinder I.D. (Before Correction) (2) Cylinder I.D. (Oversize)

9Y1210822ENS0114US0

(6) Oil Pump


3GFABAB1P057A

Rotor Lobe Clearance

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

Rotor lobe clearance	Factory specification	0.060 to 0.18 mm 0.0024 to 0.0071 in.

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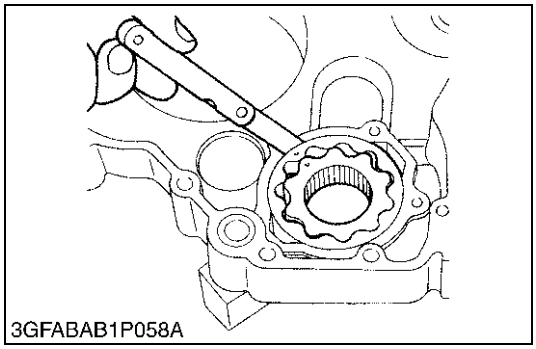
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Clearance between Outer Rotor and Pump Body

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

Clearance between outer rotor and pump body	Factory specification	0.100 to 0.180 mm 0.00394 to 0.00708 in.

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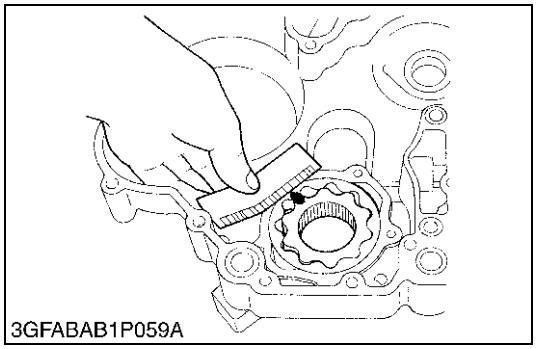
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Clearance between Rotor and Cover

1. Put a strip of plastigauge onto the rotor face with grease.
2. Install the cover and tighten the screws.
3. Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.
4. If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between rotor and cover	Factory specification	0.025 to 0.075 mm 0.00099 to 0.0029 in.

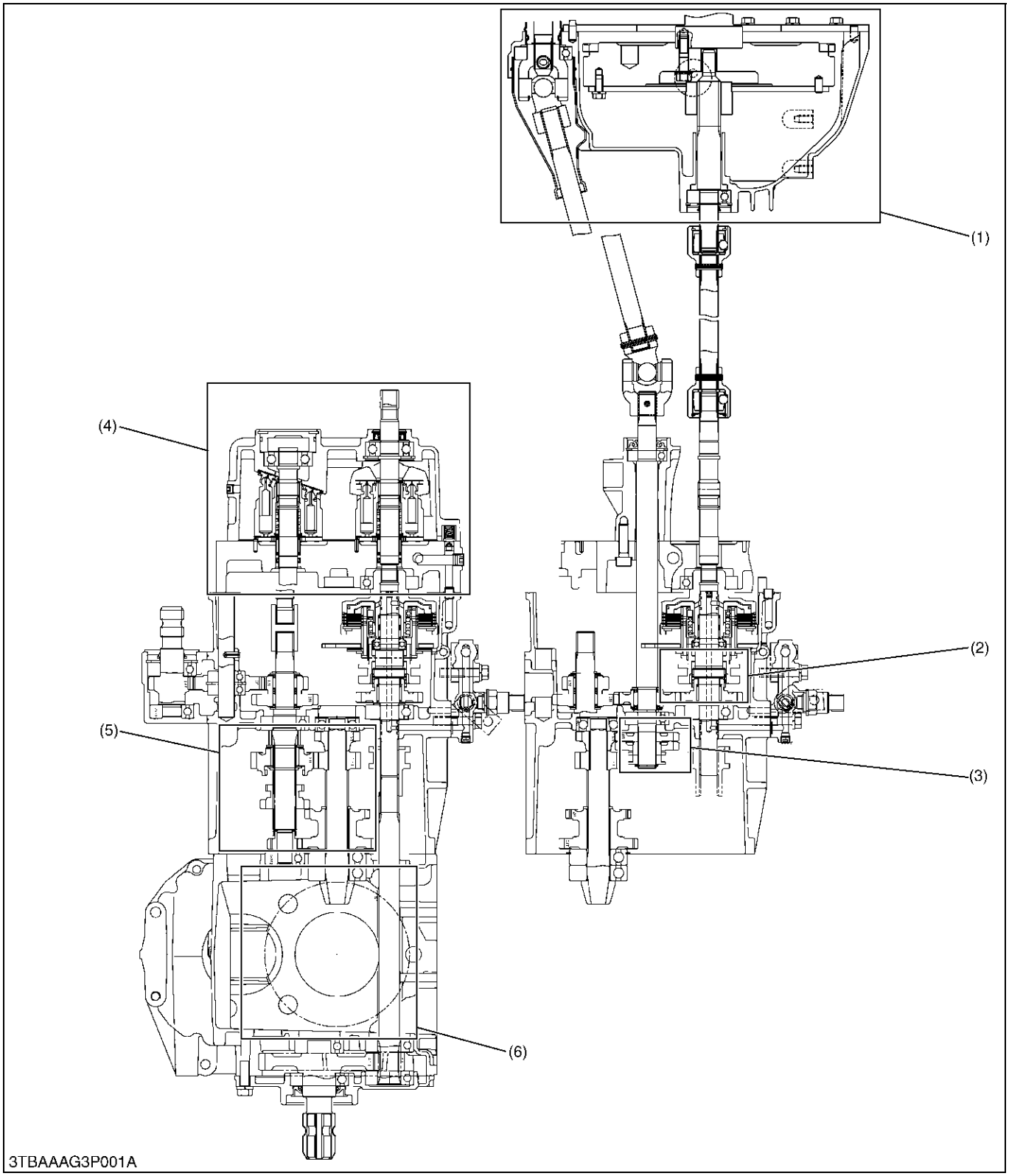
9Y1210822ENS0117US0

2 TRANSMISSION

MECHANISM

CONTENTS

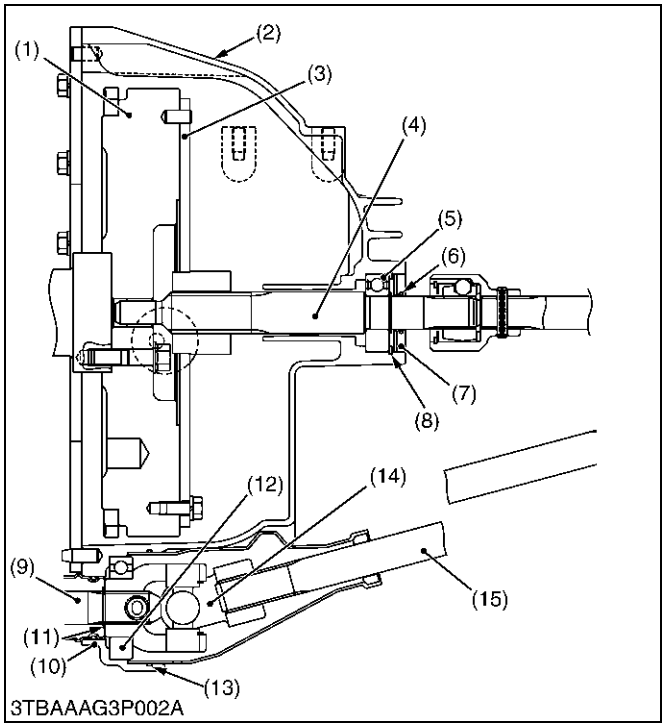
1. STRUCTURE



(1) Front Case Section
(2) Rear PTO and Mid PTO Shift Section
(3) Front Wheel Drive Section
(4) Hydrostatic Transmission Section
(5) Range Gear Shift Section
(6) Differential Gear Section

9Y1210822TRM0001US0

2. FRONT CASE



In this tractor, clutch disc is not installed.

The steel plate (3) is installed on the flywheel (1).

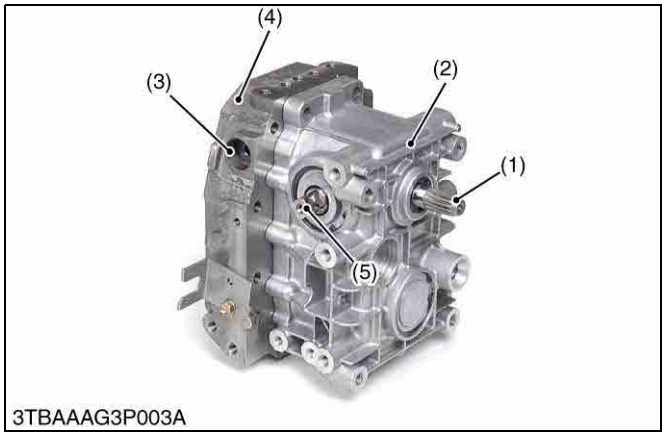
Power from the engine is transmitted through the steel plate (3) to the clutch shaft (4) and HST pump shaft.

(1) Flywheel
(2) Clutch Housing
(3) Steel Plate
(4) Clutch Shaft
(5) Ball Bearing
(6) External Cir-clip
(7) Oil Seal
(8) Internal Cir-clip
(9) Front Drive Shaft
(10) O-Ring
(11) External Cir-clip
(12) Ball Bearing
(13) O-Ring
(14) Universal Joint
(15) Rear Drive Shaft

9Y1210822TRM0002US0

3. HYDROSTATIC TRANSMISSION

[1] STRUCTURE



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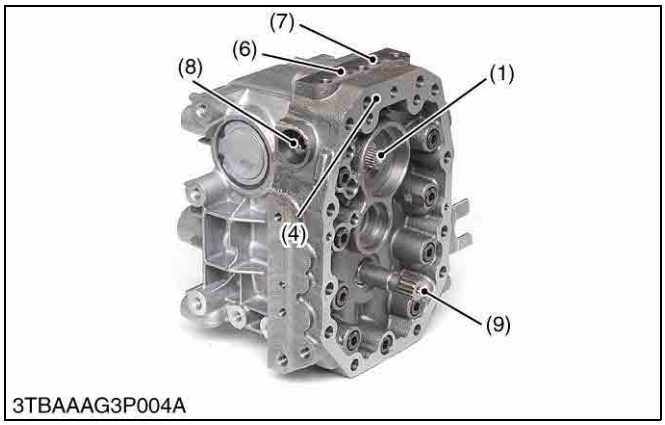

3TBAAAG3P004A

Hydrostatic transmission consists of variable displacement piston pump, fixed displacement piston motor and valve system.

(1) Input Shaft (Pump Shaft)
(2) Housing
(3) Check and High Pressure Relief Valve (Reverse)
(4) Center Section
(5) Trunnion Shaft
(6) Check Port
(7) Check Port
(8) Check and High Pressure Relief Valve (Forward)
(9) Output Shaft (Motor Shaft)

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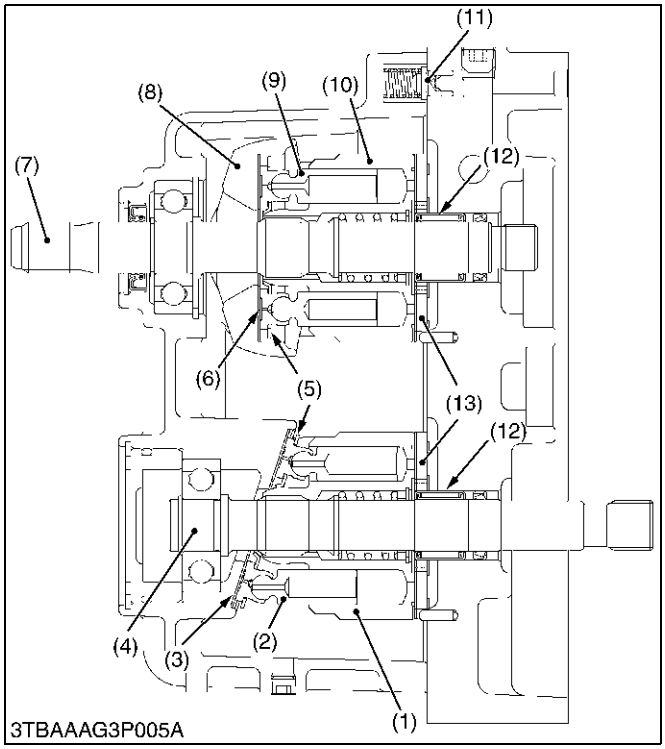

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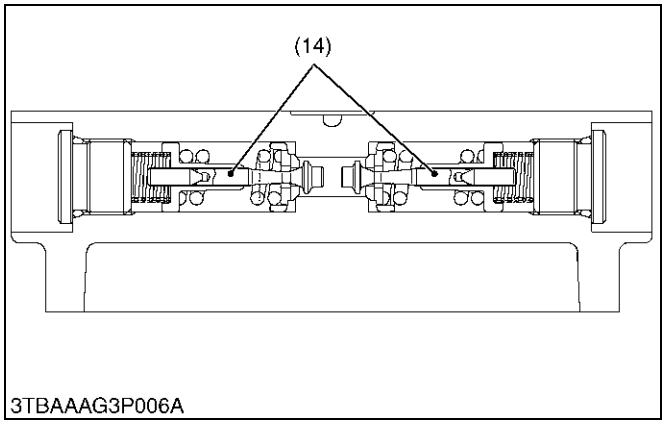

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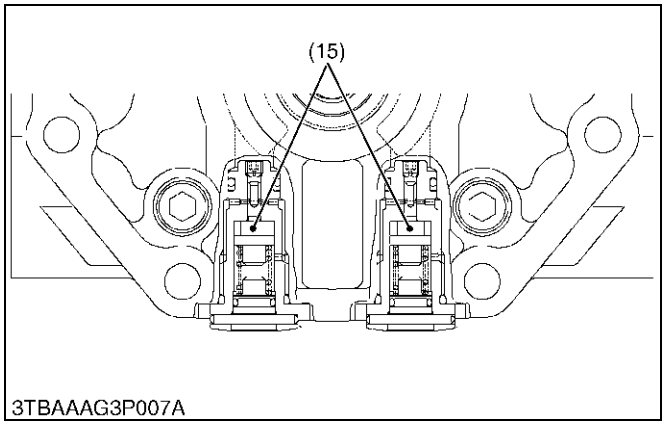

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(1) Cylinder Block (Motor)
(2) Piston
(3) Thrust Collar
(4) Motor Shaft
(5) Retainer Plate
(6) Thrust Collar
(7) Pump Shaft
(8) Variable Swashplate
(9) Piston
(10) Cylinder Block (Pump)
(11) Charge Relief Valve
(12) Needle Bearing
(13) Valve Plate
(14) Check and High Pressure Relief Valve
(15) Neutral Valve

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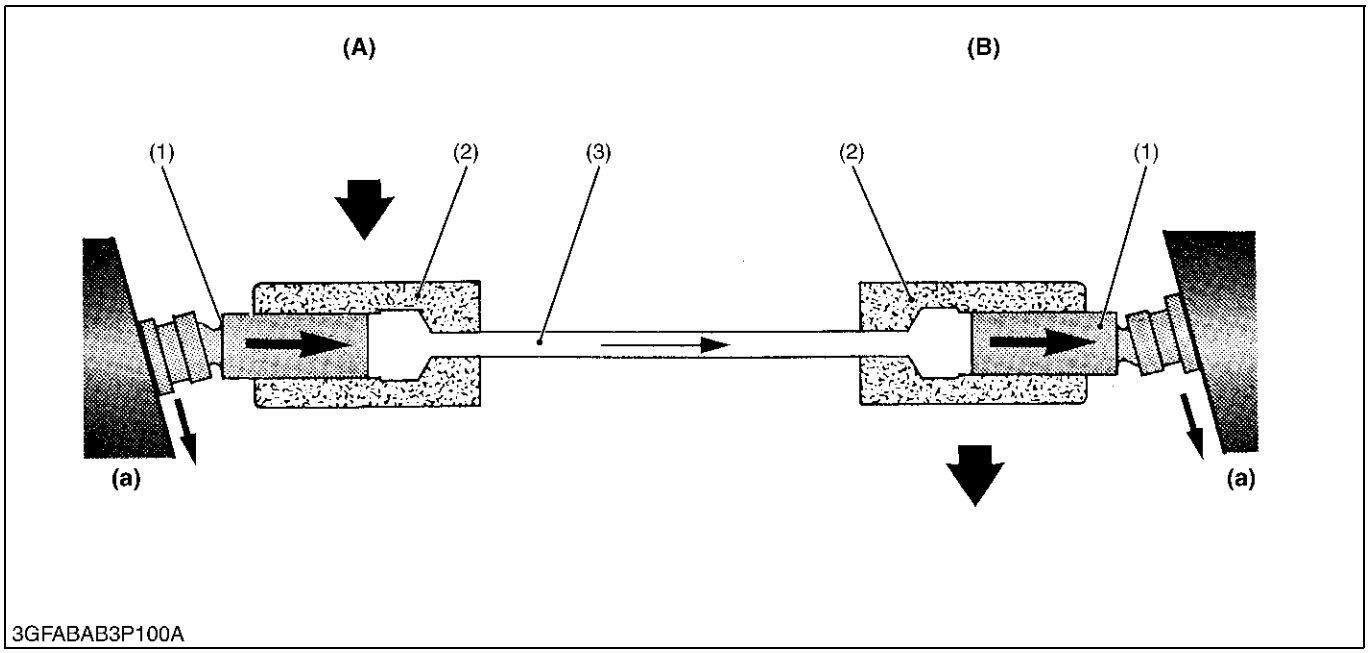
[2] PUMP AND MOTOR



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(1) Piston
(2) Cylinder
(3) Oil
(A) Pump
(B) Motor
(a) Swashplate

Pump and motor cylinder, each containing pistons, are connected by lines. Cylinders and lines are filled with oil Piston ride against swashplates located in pump and motor.

In the pump, as the cylinder rotates, pistons move across the sloping face of swashplate and slide in or out of their cylinder bores. The oil forced out by the pump pistons, causes the motor pistons to slide out of their cylinder bores.

In the motor, sliding out of the cylinder and moving across the sloping face of swashplate, the pistons rotate the cylinder.

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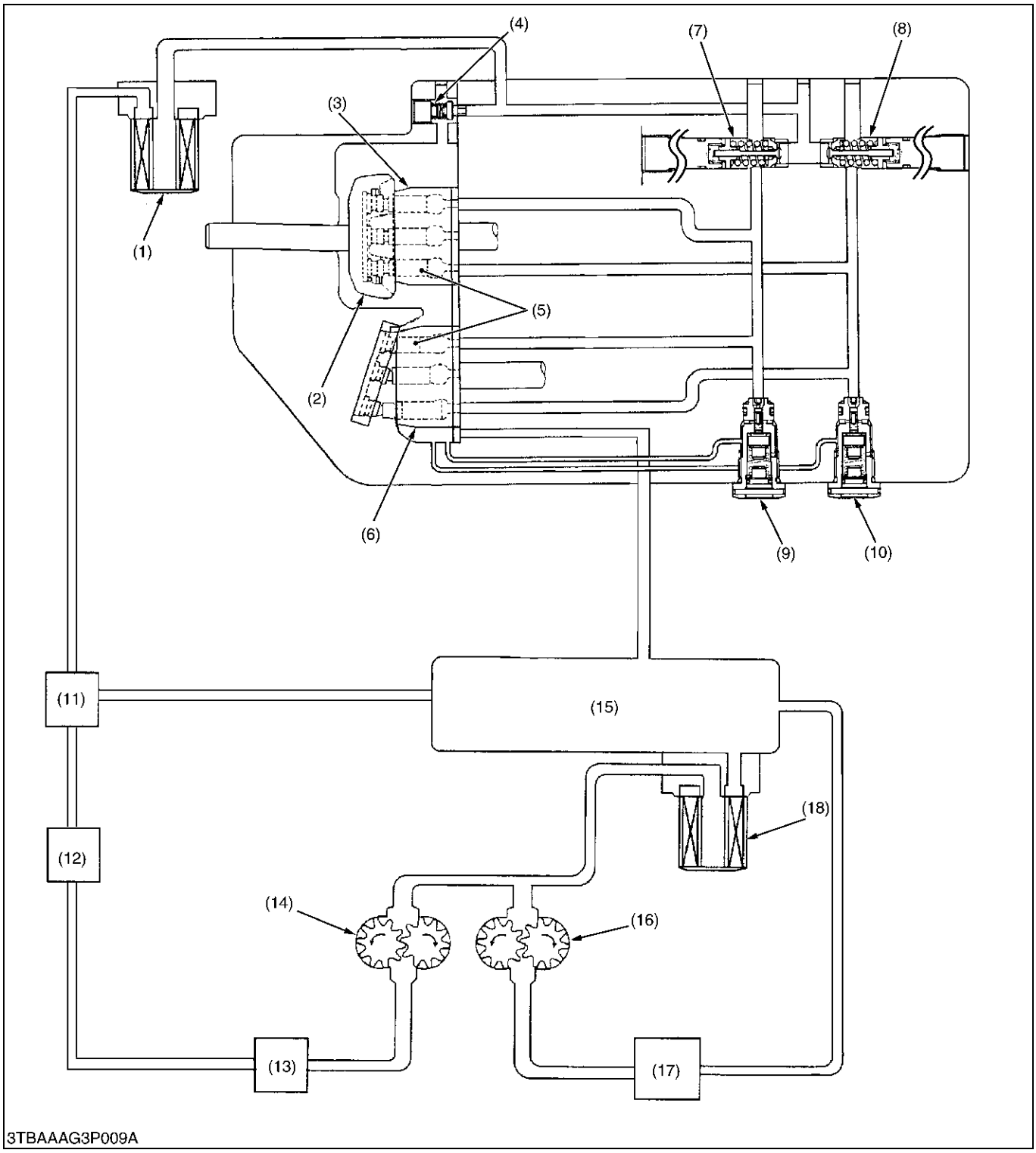
[3] OIL FLOW AND VALVES



(1) Oil Filter Cartridge (for HST)
(2) Swashplate
(3) Cylinder Block (for Pump)
(4) Charge Relief Valve
(5) Piston
(6) Cylinder Block (for Motor)
(7) Check and High Pressure Relief Valve (for Forward)
(8) Check and High Pressure Relief Valve (for Reverse)
(9) Neutral Valve (for Forward)
(10) Neutral Valve (for Reverse)
(11) Independent PTO Control Valve
(12) Oil Cooler
(13) Power Steering
(14) Hydraulic Pump (for Power Steering, Independent PTO, HST)
(15) Oil Tank
(16) Hydraulic Pump (for 3-points Hitch)
(17) Hydraulic Control Valve (for 3-points Hitch)
(18) Oil Filter Cartridge

(To be continued)

(Continued)

The pump and the motor are joined in a closed hydraulic circuit. Most of oil circulates with in the main oil circuit. A little oil lubricates and oozes out from the clearance between the moving parts in the case. Then oil in the main oil circuit of the HST needs to be supplied a want.

So all of oil fed from hydraulic pump flow to hydraulic transmission for charging and cooling.

The charge oil aids smooth operation of pistons for pump and motor. The charge oil passed to charge relief valve port. The rest of oil passed through the charge relief valve into the HST housing. And overflow oil from HST housing return to the transmission case.

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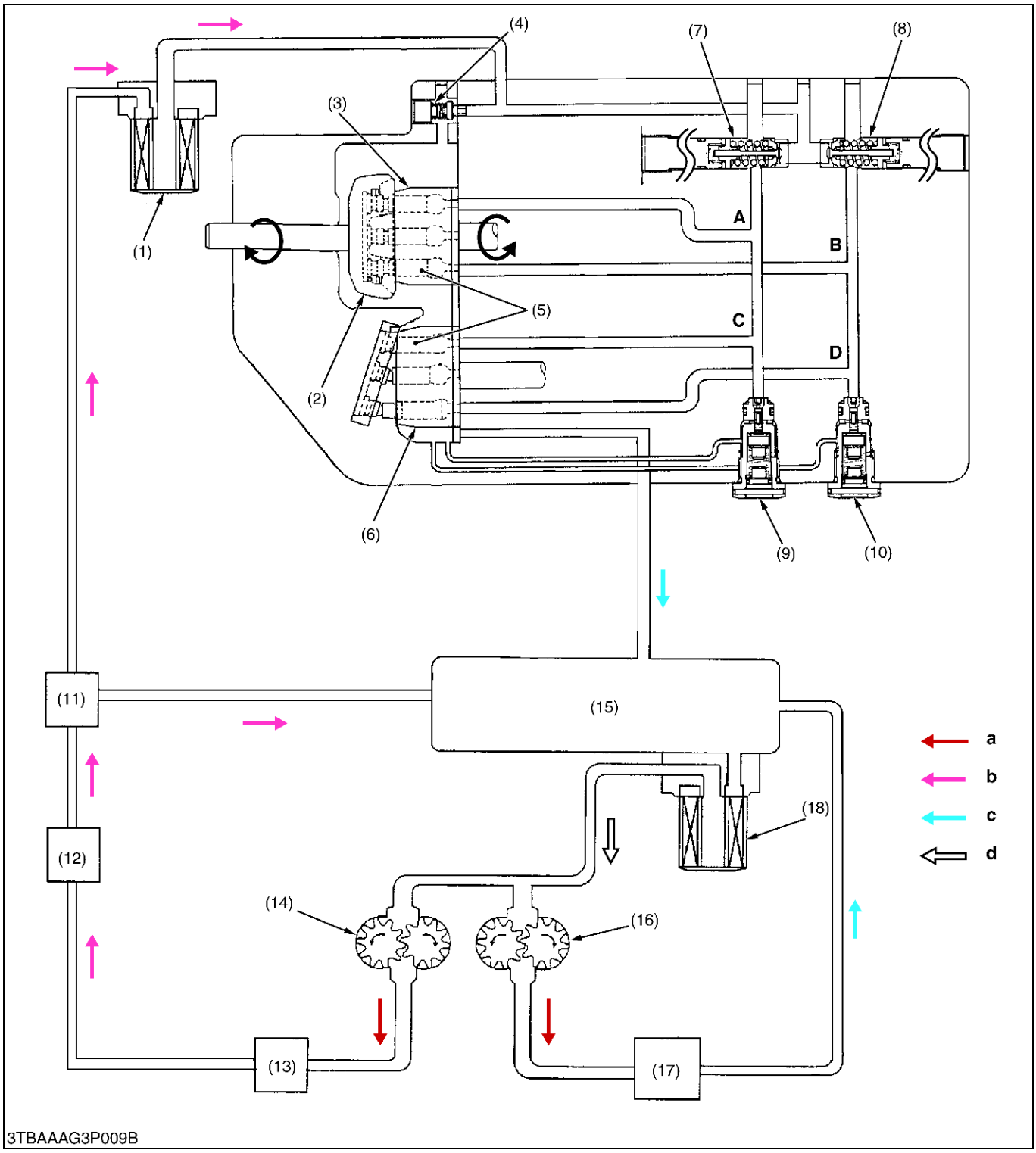
Neutral



(1) Oil Filter Cartridge (for HST)
(2) Swashplate
(3) Cylinder Block (for Pump)
(4) Charge Relief Valve
(5) Piston
(6) Cylinder Block (for Motor)
(7) Check and High Pressure Relief Valve (for Forward)
(8) Check and High Pressure Relief Valve (for Reverse)
(9) Neutral Valve (for Forward)
(10) Neutral Valve (for Reverse)
(11) Independent PTO Control Valve
(12) Oil Cooler
(13) Power Steering
(14) Hydraulic Pump (for Power Steering, Independent PTO, HST)
(15) Oil Tank
(16) Hydraulic Pump (for 3-points Hitch)
(17) Hydraulic Control Valve (for 3-points Hitch)
(18) Oil Filter Cartridge

A : Pump A Port
B : Pump B Port
C : Motor C Port
D : Motor D Port

a : High Pressure Oil
b : Low Pressure Oil
c : Free Oil
d : Suction Oil

(To be continued)

(Continued)

When the speed control pedal is in **"NEUTRAL"**, the variable swashplate is right-angles to the pump pistons. And the pump pistons only rotate with cylinder block (pump) without reciprocating.

Since the oil is not being pumped to the motor, the cylinder block (motor) is stationary. And the output shaft does not rotate.

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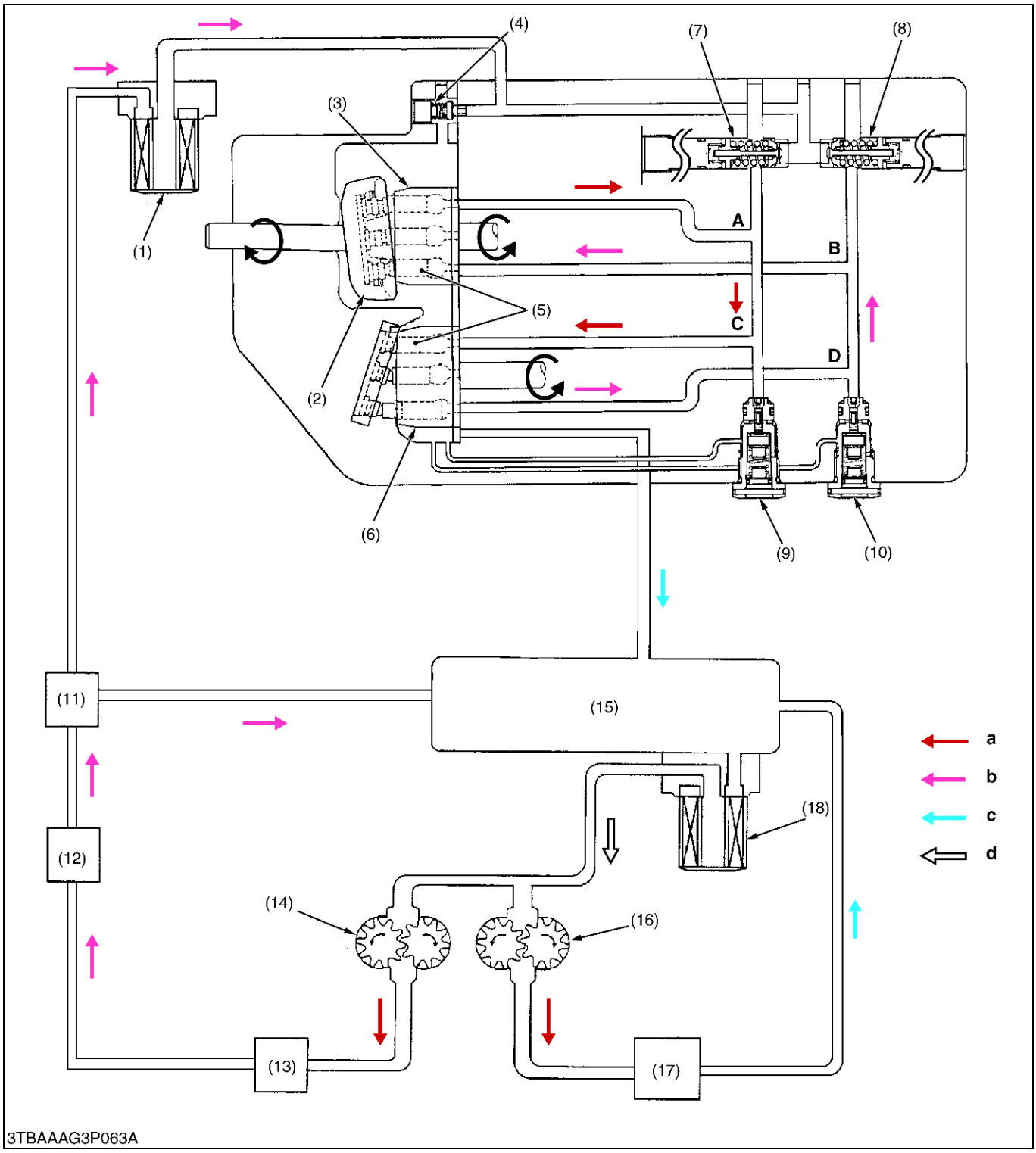
Forward



(1) Oil Filter Cartridge (for HST)
(2) Swashplate
(3) Cylinder Block (for Pump)
(4) Charge Relief Valve
(5) Piston
(6) Cylinder Block (for Motor)
(7) Check and High Pressure Relief Valve (for Forward)
(8) Check and High Pressure Relief Valve (for Reverse)
(9) Neutral Valve (for Forward)
(10) Neutral Valve (for Reverse)
(11) Independent PTO Control Valve
(12) Oil Cooler
(13) Power Steering
(14) Hydraulic Pump (for Power Steering, Independent PTO, HST)
(15) Oil Tank
(16) Hydraulic Pump (for 3-points Hitch)
(17) Hydraulic Control Valve (for 3-points Hitch)
(18) Oil Filter Cartridge

A : Pump A Port
B : Pump B Port
C : Motor C Port
D : Motor D Port

a : High Pressure Oil
b : Low Pressure Oil
c : Free Oil
d : Suction Oil

(To be continued)

(Continued)

When the speed control pedal is stepped on and set to **"FORWARD"**, the variable swashplate is tilted as shown in figure above.

As the pump cylinder block rotates with the input shaft, oil is forced out of pump port **A** at high pressure. As pressure oil from the pump cylinder block enters to motor port **C**, the pistons, which align with port **C**, are pushed against the swashplate and slide down the inclined surface.

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

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

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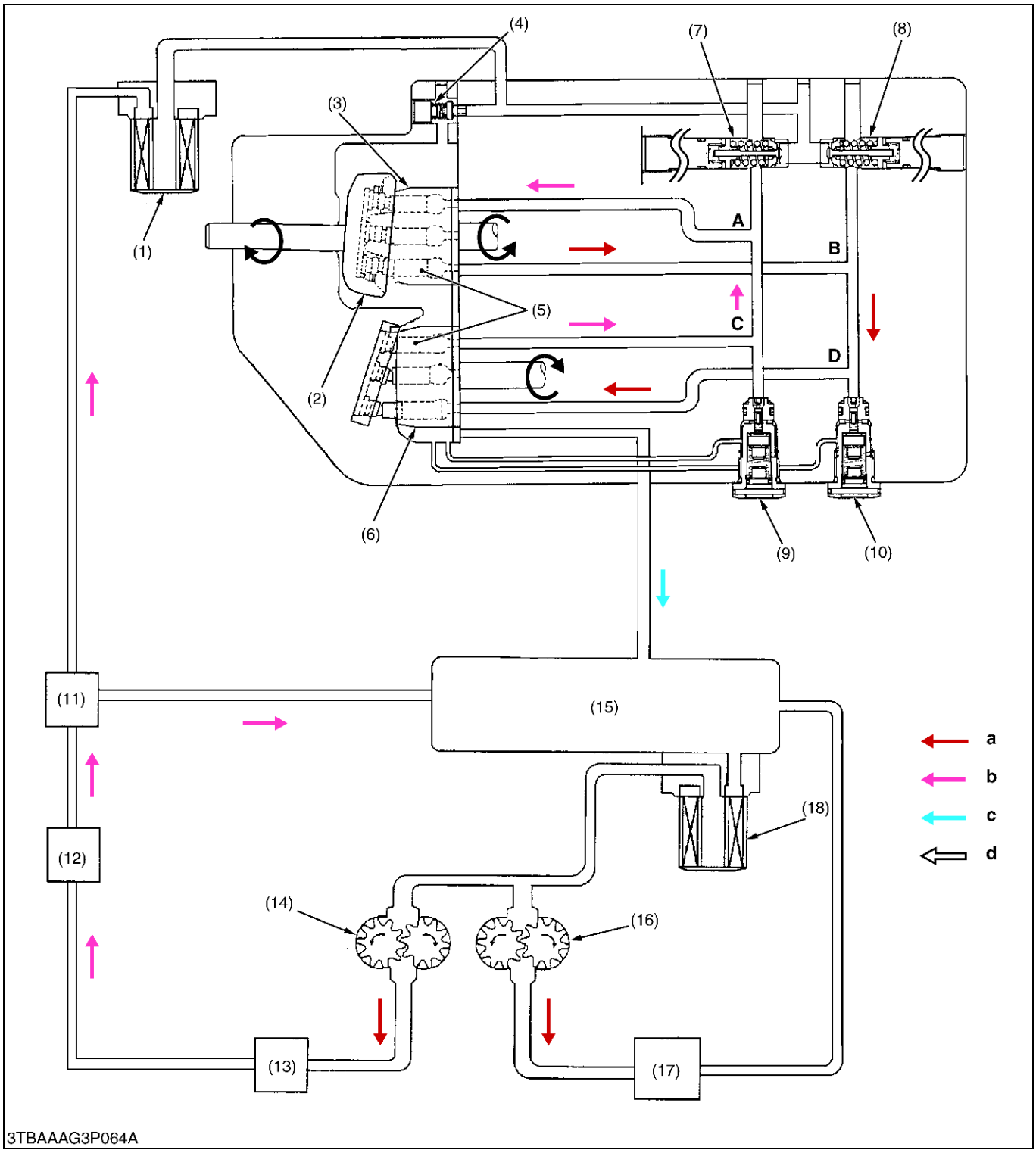
Reverse



(1) Oil Filter Cartridge (for HST)
(2) Swashplate
(3) Cylinder Block (for Pump)
(4) Charge Relief Valve
(5) Piston
(6) Cylinder Block (for Motor)
(7) Check and High Pressure Relief Valve (for Forward)
(8) Check and High Pressure Relief Valve (for Reverse)
(9) Neutral Valve (for Forward)
(10) Neutral Valve (for Reverse)
(11) Independent PTO Control Valve
(12) Oil Cooler
(13) Power Steering
(14) Hydraulic Pump (for Power Steering, Independent PTO, HST)
(15) Oil Tank
(16) Hydraulic Pump (for 3-points Hitch)
(17) Hydraulic Control Valve (for 3-points Hitch)
(18) Oil Filter Cartridge

A : Pump A Port
B : Pump B Port
C Motor C Port
D : Motor D Port

a : High Pressure Oil
b : Low Pressure Oil
c : Free Oil
d : Suction Oil

(To be continued)

(Continued)

When the speed control pedal is stepped on and set to **"REVERSE"**, the variable swashplate is tilted as shown in figure above.

As the pump cylinder block rotates with the input shaft, oil is forced out of pump port **B** at high pressure. As pressure oil from the pump cylinder block enters to motor port **D**, the pistons, which align with port **D**, are pushed against the swashplate and slide down the inclined surface.

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

As the motor cylinder block continues to rotate, oil is forced out of motor port **C** at low pressure and retunes to the pump port **A**.

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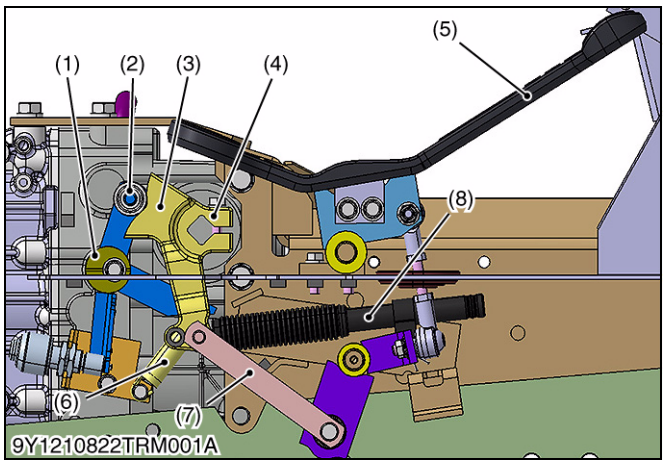
[4] CONTROL LINKAGE



The HST pedal (5) and trunnion shaft (4) of variable swashplate are linked with the HST plate (7) and the neutral holder (3). As the front footrest of the pedal is depressed, the swashplate rotates and forward traveling speed increases. Depressing the rear footrest increases reverse traveling speed.

The roller (2) on the neutral holder arm (1) is held with spring seats and the detent of the neutral holder (3) so that the neutral holder (3) returns to neutral. When the pedal is releases, the swashplate is returned to neutral with the neutral holder (3). The damper (8) connected to the HST pedal (5) restricts the movement of the linkage to prevent abrupt operation or reversing.

(1) Neutral Arm
(2) Roller
(3) Neutral Holder
(4) Trunnion Shaft
(5) HST Pedal
(6) Spring
(7) HST Plate
(8) Damper

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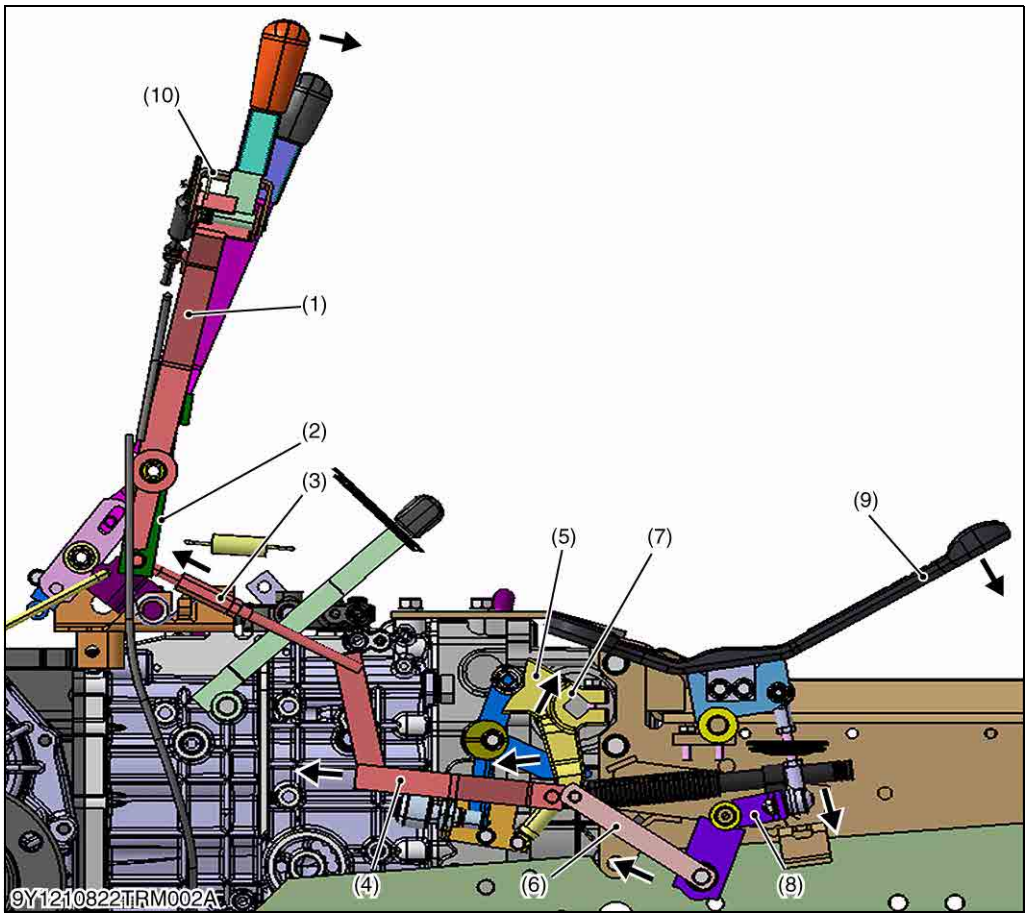
4. CRUISE CONTROL

[1] CRUISE CONTROL LINKAGE

(1) Cruise Control



(1) Cruise Control Lever
(2) Cruise Link Lever
(3) Cruise Rear Rod
(4) Cruise Front Rod
(5) Neutral Holder
(6) HST Plate
(7) Trunnion Shaft
(8) HST Lever
(9) HST Pedal
(10) Release Lever

Cruise control system mainly consists of cruise control lever holding section and cruise control releasing section.

When the cruise control lever (1) is set to the desired position, the bottom end of the cruise link lever (2) turns clockwise.

The control lever (1) pulls the cruise rear rod (3). The cruise rear rod (3) pulls the cruise front rod (4). The cruise front rod (4) pulls the neutral holder (5). The HST plate (6) is pulled by the cruise front rod (4).

Since the neutral holder (5) turns clockwise, the trunnion shaft (7) directly attached to the neutral holder (5) turns clockwise. On the other hand, since the HST plate (6) pulls the HST lever (8) and the HST pedal (9). The HST pedal (9) is turned to the front side.

On the other hand, since release lever (10) engage with tooth of lever guide RH, the cruise control lever (1) is held at the desired cruise position until the brake pedals will be depressed by an operator.

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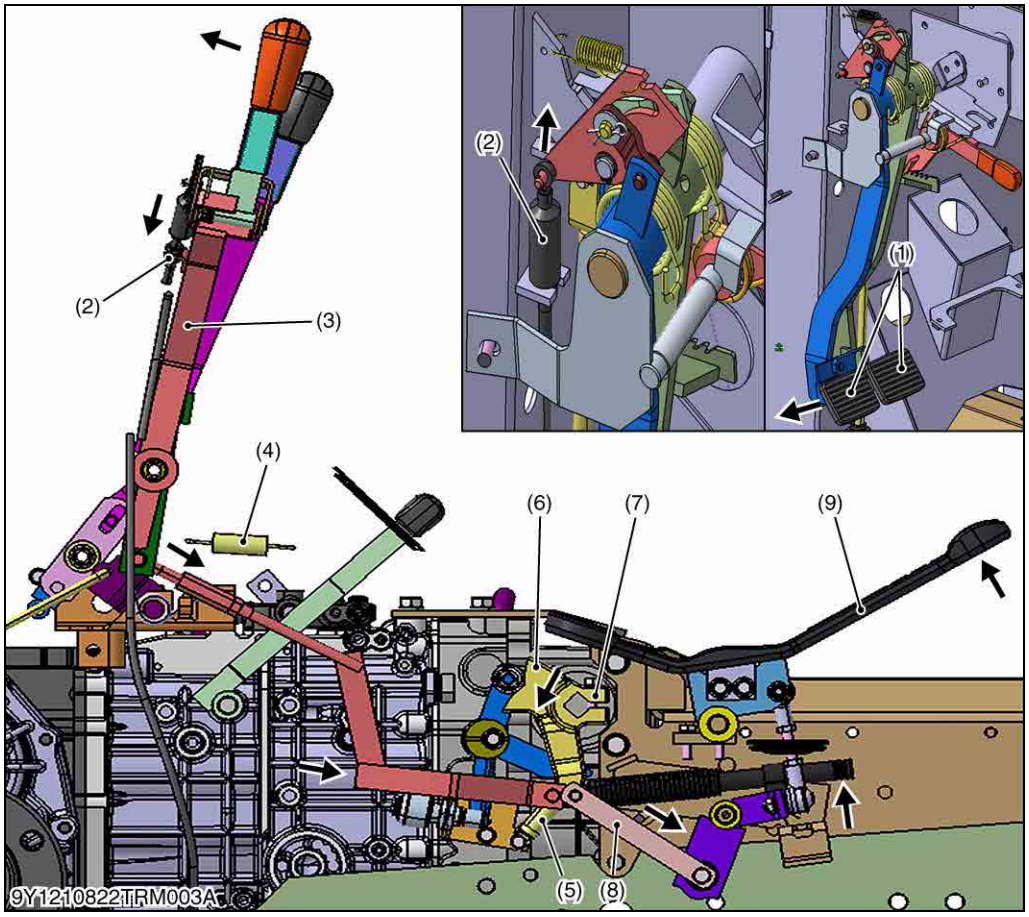
(2) Cruise Control Release



(1) Brake Pedal
(2) Cruise Cable
(3) Cruise Control Lever
(4) Return Spring
(5) Return Spring
(6) Neutral Holder
(7) Trunnion Shaft
(8) HST Plate
(9) HST Pedal

Cruise control release is done by depressing the brake pedals (1).

When an operator depresses the brake pedal (1), the cruise cable (2) is pulled by the brake pedals (1).

At the time, the cruise control lever (3) is free. The cruise control lever (3) is returned to **"NEUTRAL"** position by the return spring (4).

On the other hand, the return spring (5) pulls the neutral holder (6). The neutral holder (6) and the trunnion shaft (7) turns counterclockwise. Since the neutral holder (6) is connected to the HST plate (8), the HST plate (8) is pushed to the front side. The HST plate (8) pushes the HST pedal (9) to return to **"NEUTRAL"** position.

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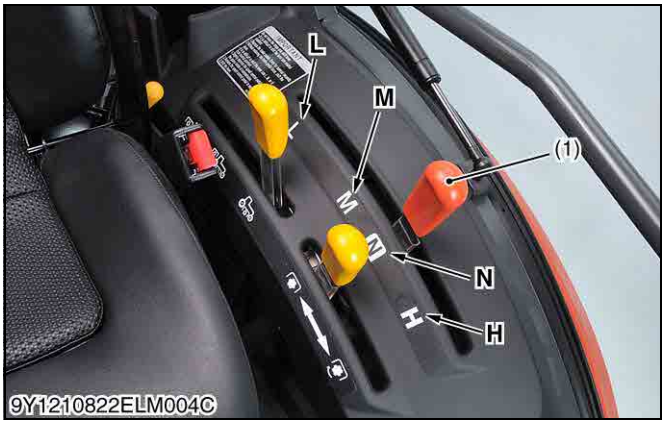
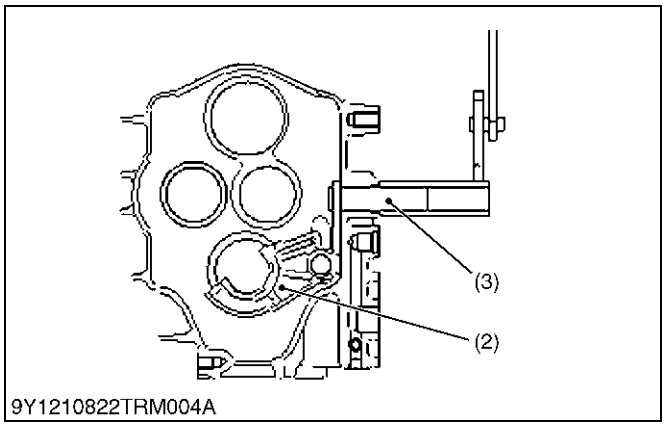
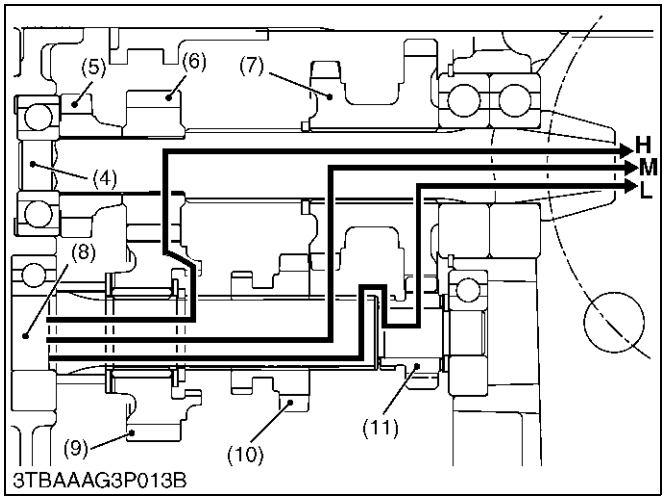
5. RANGE GEAR SHIFT SECTION







Range gear shift lever (1) is located at left side fender.

Range gear shift lever (1) can select three speed range, low speed, mid speed and high speed.

Range gear shift lever (1) and 19T shifter gear (10) are linked with range shift arm (3) and range shift fork (2) etc..

Three range gear shifts are selected by shifting the 19T shifter gear (10) on the sub shaft (8) to 15T gear (6) and 24T-29T gear (7) on 6T bevel pinion shaft (4).

■ **Low Speed Position**

Sub Shaft (8) → 19T Shifter Gear (10) → 14T Gear (11) → 24T of 24-29T Gear (7) → 6T Bevel Pinion Shaft (4)

■ **Middle Speed Position**

Sub Shaft (8) → 19T Shifter Gear (10) → 24T of 24T-29T Gear (7) → 6T Bevel Pinion Shaft (4)

■ **High Speed Position**

Sub Shaft (8) → 19T Shifter Gear (10) → 28T Gear (9) → 15T Gear (6) → 6T Bevel Pinion Shaft (4)

(1) Range Gear Shift Lever
(2) Range Shift Fork
(3) Range Shift Arm
(4) 6T Bevel Pinion Shaft
(5) 14T Gear (for Front Wheel Drive)
(6) 17T Gear (B2650)
15T Gear (B3350)
(7) 25T-29T Gear (B2650)
24T-29T Gear (B3350)
(8) Sub Shaft
(9) 26T Gear (B2650)
28T Gear (B3350)
(10) 18T Shifter Gear (B2650)
19T Shifter Gear (B3350)
(11) 14T Gear

L : "LOW" range
M : "MID" range
N : "NEUTRAL" position
H : "HIGH" range

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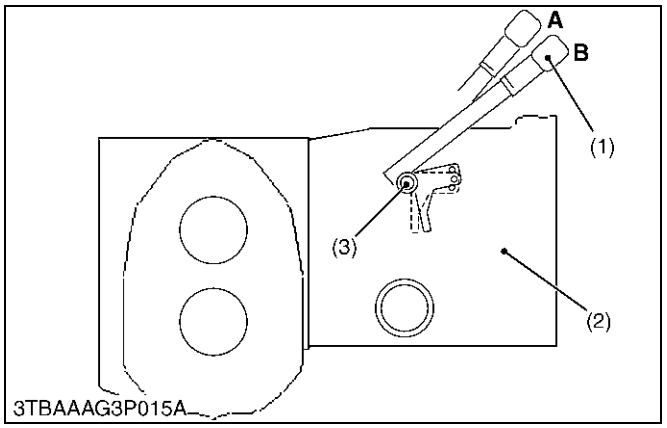
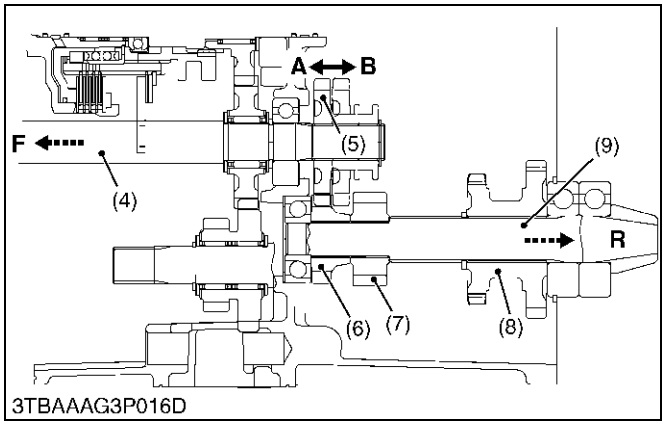
6. FRONT WHEEL DRIVE SECTION





Front wheel drive lever (1) is located at the front floor cover.

Front wheel drive lever (1) and shifter (3) are linked.

19T shifter gear (5) is located on the front wheel drive shifter (4).

2-wheel drive or 4-wheel drive is selected by changing the position of 19T shifter gear (5) reverse or forward.

When the font wheel drive lever (1) is set to **"4 Wheel Drive"** position, 19T shifter gear (5) slides forward, meshes the 14T gear (6) on the 6T bevel pinion shaft (9).

In this state, power from the 6T bevel pinion shaft (9) is transmitted through 19T shifter gear (5) to the front wheel drive shaft (4) and the front wheels.

(1) Front Wheel Drive Lever
(2) Transmission Case
(3) Shifter
(4) Front Wheel Drive Shaft
(5) 19T Shifter Gear
(6) 14T Gear
(7) 17T Gear (B2650)
15T Gear (B3350)
(8) 25T-29T Gear (B2650)
24T-29T Gear (B3350)
(9) 6T Bevel Pinion Shaft

A : "4 Wheel Drive" Position
B : "2 Wheel Drive" Position
F : Power to Front Wheels
R : Power to Rear Wheels

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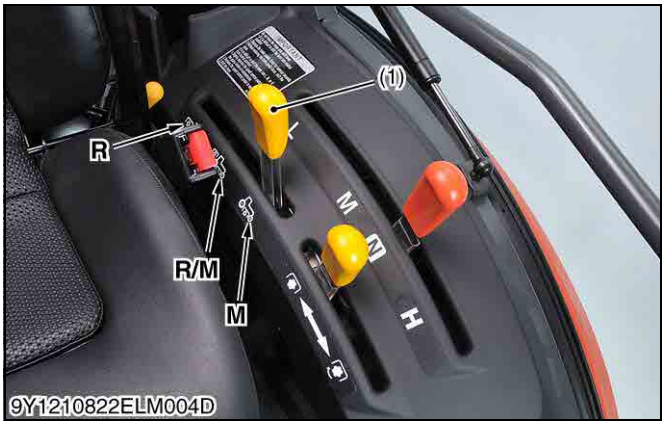
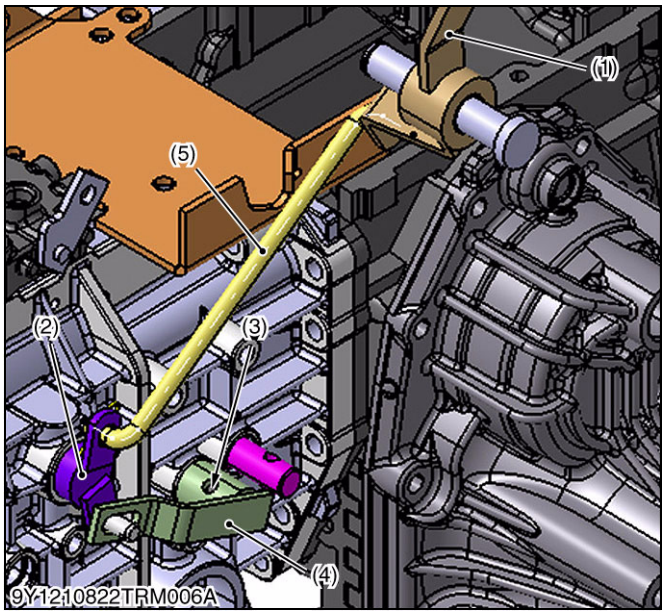
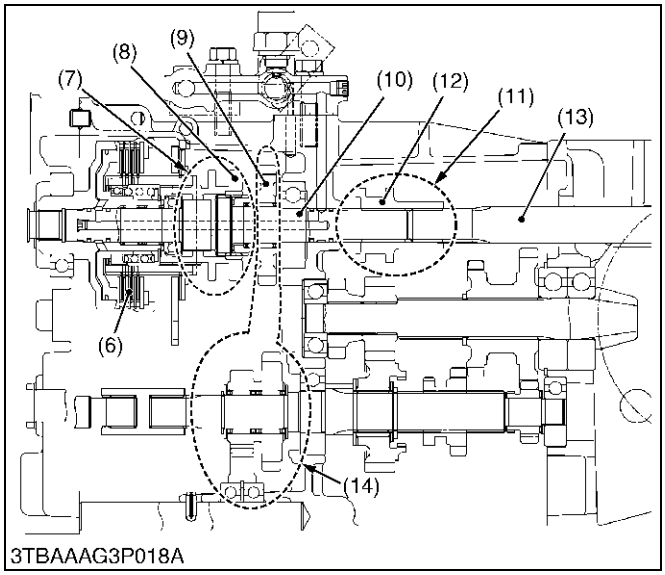
7. PTO SYSTEM

[1] STRUCTURE







The PTO shift lever (1) is located at left side fender. The PTO shift lever (1) and the PTO shift arm (2) are linked with the control rod (5).

The PTO shift arm (2) and the rear PTO arm (3) linked with the rear PTO control plate (4).

The PTO shift arm (2) shifts the PTO shifter (8).

The rear PTO arm (3) shifts the rear PTO shifter (12).

PTO gear section consists of four sections.

The first section is independent PTO section.

The second section is PTO position selection section.

The third section is mid-PTO selection section.

The fourth section is rear PTO rotation prevention section.

In this section, when the PTO shift lever is set to **"Mid-PTO"** shifter slides to the front side and shifter meshes to the housing.

The rear PTO shift does not rotate at this **"Mid-PTO"** position.

(1) PTO Shift Lever
(2) PTO Shift Arm
(3) Rear PTO Arm
(4) Rear PTO Control Plate
(5) Control Rod
(6) Independent PTO Clutch
(7) PTO Position Selection Section
(8) PTO shifter
(9) 26T Mid Gear
(10) PTO Clutch Shaft
(11) Rear PTO Rotation Prevention Section
(12) Rear PTO shifter
(13) 9T Rear PTO Shaft
(14) Mid PTO Selection Section

R : "REAR PTO" Position
R/M :"REAR PTO / MID PTO" Position
M : "MID PTO" Position

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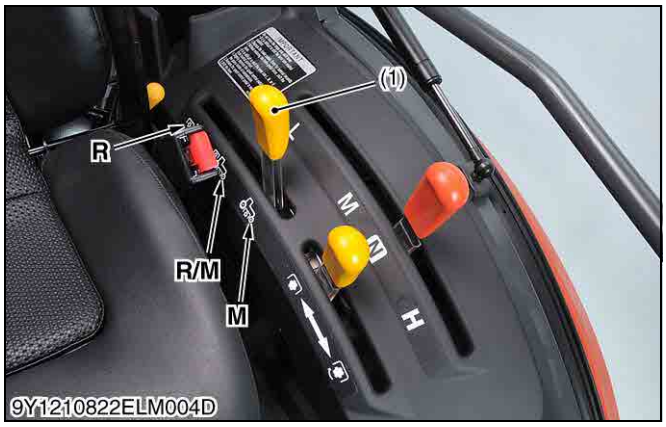
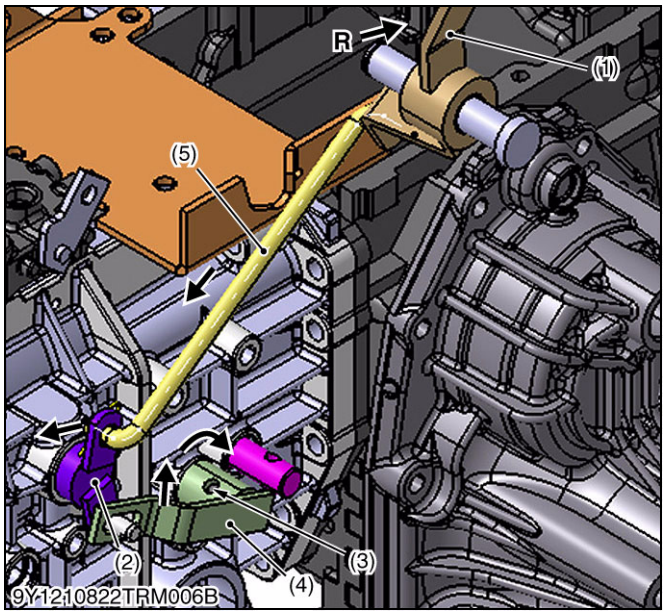
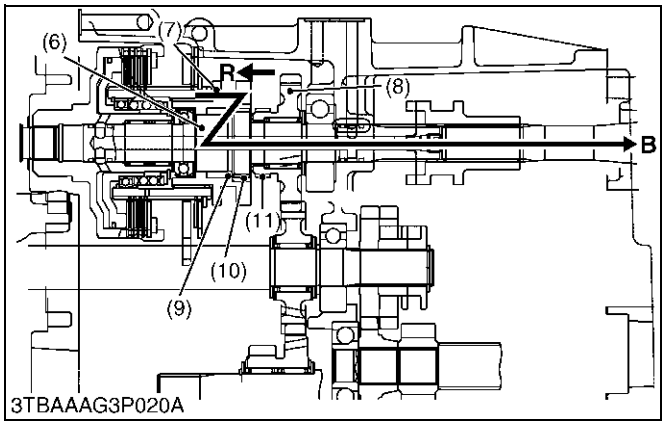
[2] REAR PTO SECTION







When the PTO shift lever (1) is set to **"REAR PTO"** (**R**) position, the PTO shift lever (1) pushes the control rod (5).

The control rod (5) pushes the range gear shifter arm (2).In this state, the PTO shift arm (2) shifts the PTO shifter (7) forward. The inner spline (10) of the PTO shifter (7) meshes the independent PTO shaft spline (9).

Power is transmitted from the independent PTO clutch to the rear PTO shaft as follows.

Independent PTO Clutch → PTO Shifter (7) → Independent PTO Shaft (6) → Rear PTO Shifter → Rear PTO Shaft

(1) PTO Shift Lever
(2) PTO Shift Arm
(3) Rear PTO Arm
(4) Rear PTO Control Plate
(5) Control Rod
(6) Independent PTO Shaft
(7) PTO Shifter
(8) 26T Mid Gear
(9) Independent PTO Shaft Spline
(10) Inner Spline
(11) 26T Mid Gear Spline

R : "REAR PTO" Position
R/M :"REAR PTO / MID PTO" Position
M : "MID PTO" Position

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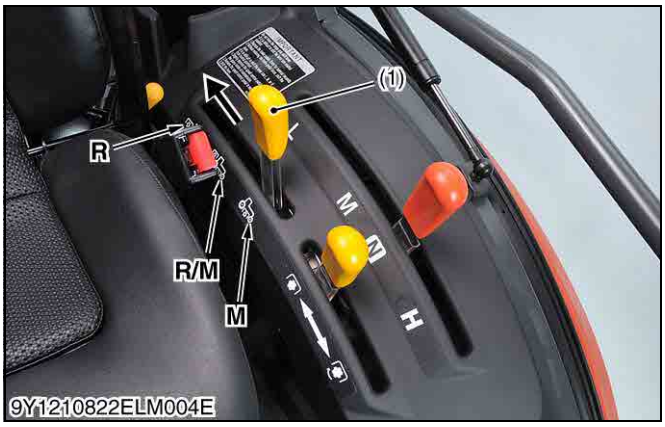
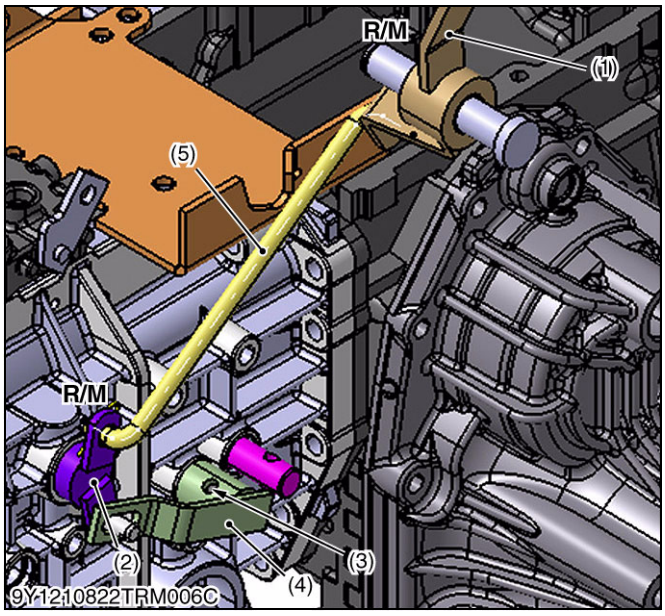
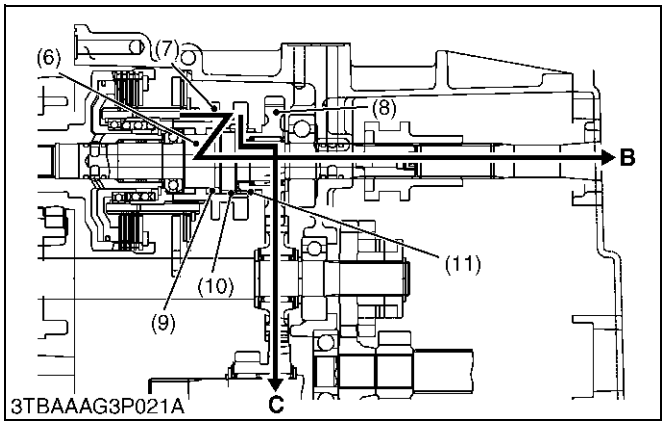
[3] REAR PTO / MID-PTO SECTION







When the PTO shift lever (1) is set to **"REAR PTO / MID PTO"** (**R/M**) position, the PTO shift lever (1) pulls the control rod.

The control rod (5) pulls the PTO shift arm (2).

In this state, the PTO shifter (7) keeps its position between the independent PTO shaft spline (9) and the 26T mid gear spline (11).

In this position, the inner spline (10) of the PTO shifter (7) meshes both independent PTO shaft spline (9) and the 26T mid gear spline (11).

Power is transmitted from the independent PTO clutch to both the rear PTO shaft and the mid PTO shaft as follows.

■ **Rear PTO Section**

Independent PTO Clutch → PTO Shifter (7) → Independent PTO Shaft (6) → Rear PTO Shifter → Rear PTO Shaft

■ **Mid PTO Section**

Independent PTO Clutch → PTO Shifter (7) → 26T Mid Gear → 25T Gear on Front Wheel Drive Shaft → 17T-26T Mid Gear → 30T Gear → 17T Mid PTO Shaft

(1) PTO Shift Lever
(2) PTO Shift Arm
(3) Rear PTO Arm
(4) Rear PTO Control Plate
(5) Control Rod
(6) Independent PTO Shaft
(7) PTO Shifter
(8) 26T Mid Gear
(9) Independent PTO Shaft Spline
(10) Inner Spline
(11) 26T Mid Gear Spline

B : To Rear PTO Shaft
C : To Mid PTO Shaft
R : REAR PTO" Position
R/M:"REAR PTO / MID PTO" Position
M : "MID PTO" Position

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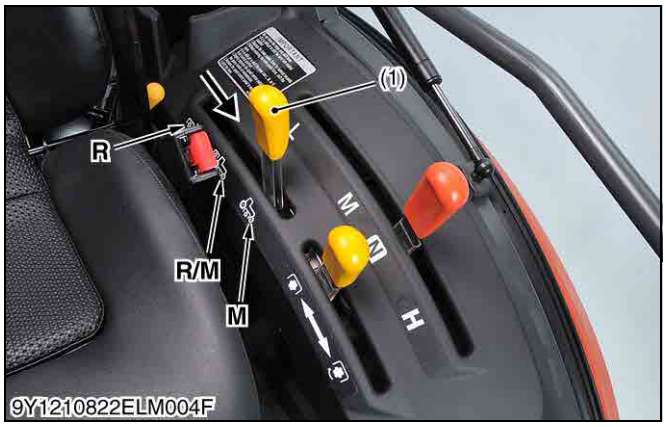
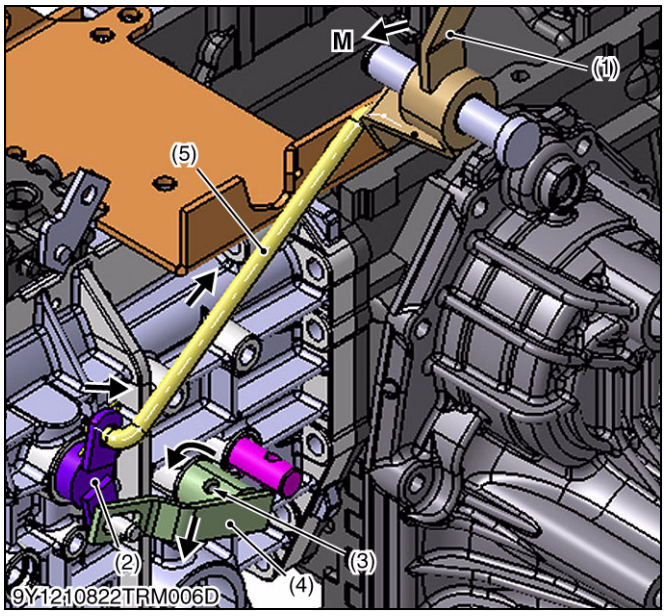
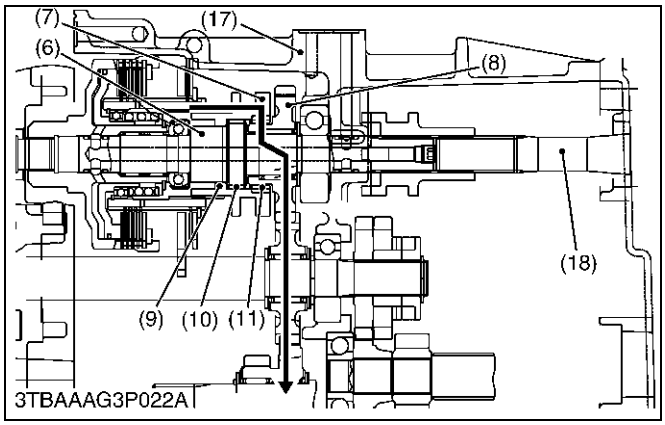
[4] MID-PTO SECTION







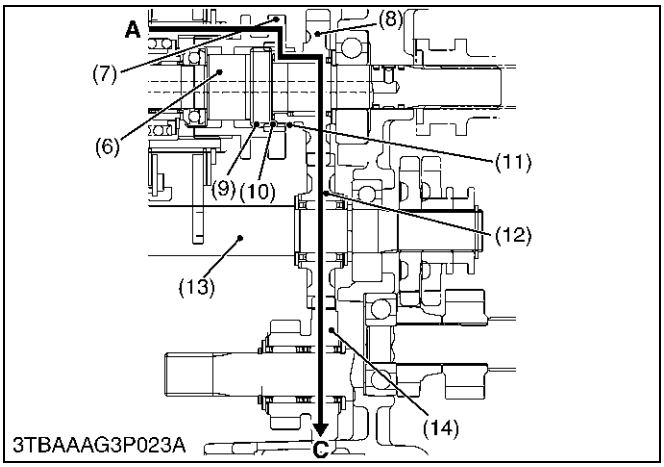
When the PTO shift lever (1) is set to **"MID-PTO"** (**M**) position, the PTO shift lever pulls the control rod (5). The control rod (5) pulls the PTO shift arm (2).

In this state, the PTO shift arm (2) shifts the PTO shifter (7) reverse. The inner spline of the PTO shifter (7) meshes the 26T Mid PTO gear spline (11).On the other hand, the PTO shift arm (2) turns the rear PTO control plate counterclockwise and turns the rear PTO arm counterclockwise.

Since the rear PTO arm is turned counter clockwise, the rear PTO shifter is pushed forward.

Then, the rear PTO shifter meshes the rib of the transmission case.

In this state, the rear PTO brake shifter prevents the independent PTO shaft from rotating itself.

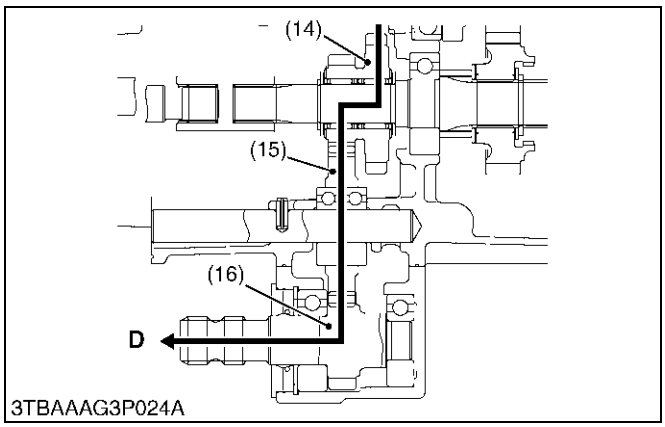


(1) PTO Shift Lever
(2) PTO Shift Arm
(3) Rear PTO Arm
(4) Rear PTO Control Plate
(5) Control Rod
(6) Independent PTO Shaft
(7) PTO shifter
(8) 26T Mid Gear
(9) Independent PTO Shaft Spline
(10) Inner Spline
(11) 26T Mid Gear Spline
(12) 26T Gear
(13) Front Wheel Drive Shaft
(14) 17T-26T Mid Gear
(15) 30T Gear
(16) 17T Mid PTO Shaft
(17) Transmission Case
(18) Rear PTO Shaft

A : From Independent PTO Clutch
C : To Mid PTO Shaft
R : Rear PTO
R/M :Rear PTO / Mid PTO
M : MID PTO

(To be continued)

(Continued)



Power is transmitted from the independent PTO clutch to the Mid PTO shaft as follows.

Independent PTO Clutch → PTO Shifter (7) → 26T Mid Gear (8) → 26T Gear (12) → 17T-26T Mid Gear (14) → 30T Gear (15) → Mid PTO Shaft (16)

(14) 17T-26T Mid Gear
(15) 30T Gear
(16) 17T Mid Gear Shaft

D : Mid Mount Mower or Front Implement

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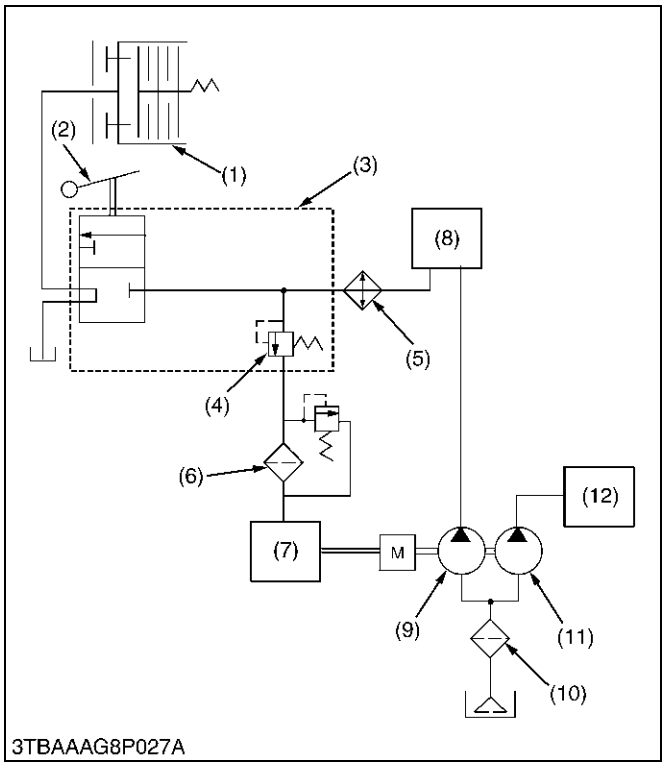
[5] INDEPENDENT PTO

(1) Hydraulic Circuit



(1) PTO Clutch
(2) Independent PTO Lever
(3) Independent PTO Control Valve
(4) Relief Valve
(5) Oil Cooler
(6) Oil Filter Cartridge (for HST)
(7) HST
(8) Power Steering
(9) Hydraulic Pump (for HST, Power Steering and Independent PTO)
(10) Oil Filter Cartridge
(11) Hydraulic Pump (3-Points Hitch)
(12) 3-Points Hitch

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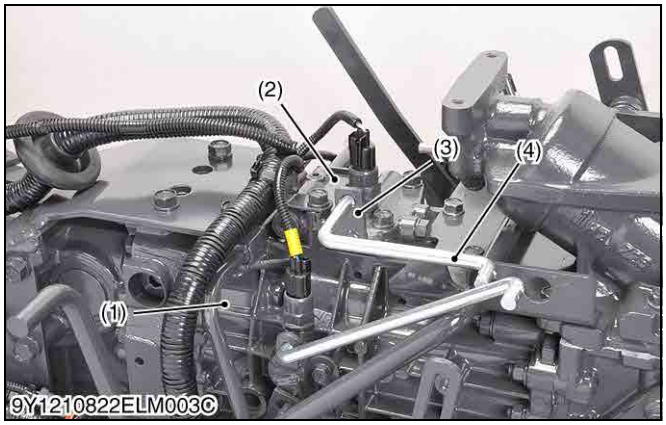
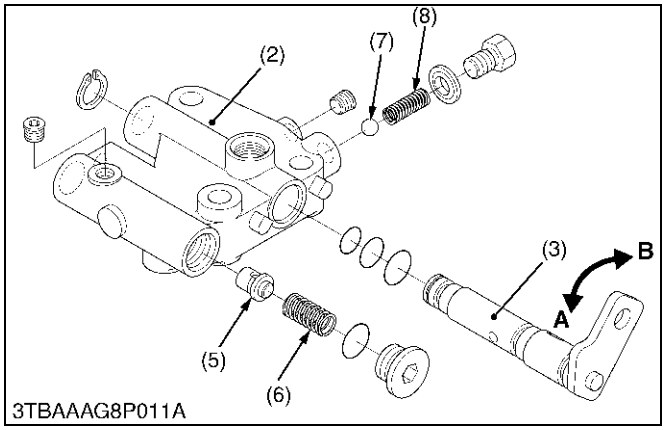
(2) Independent PTO Control Valve





Independent PTO control valve (2) is located at transmission case (1).

The independent PTO control valve (2) consists of PTO arm (3), poppet (5), ball (7) and etc..

The PTO arm (3) is connected to control rod (4) and the independent PTO lever.

The PTO arm (3) is moved to **"OFF"** or **"ON"** position by the independent PTO lever.

Oil passage in the PTO arm (3) is turned by the independent PTO lever.

When the PTO arm (3) is moved to **"OFF"** position, oil in the independent PTO control valve does not flow to the oil passage.

When the PTO arm (3) is moved to **"ON"** position, oil in the independent PTO control valve flow to the oil passage.

Poppet (5) and spring (6) operate as a relief valve.

(1) Transmission Case
(2) Independent PTO Control Valve
(3) PTO Arm
(4) Control Rod
(5) Poppet
(6) Spring
(7) Ball
(8) Spring

A : PTO arm "OFF" position
B : PTO arm "ON" position

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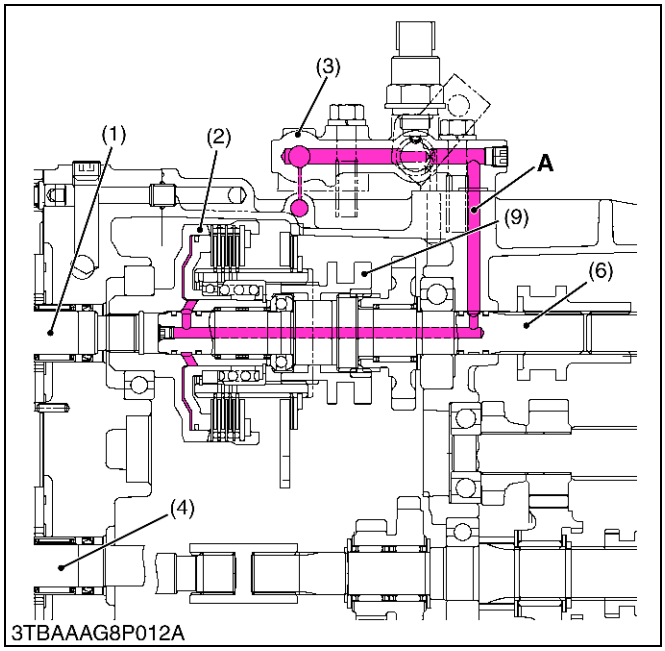
(3) Independent PTO Clutch



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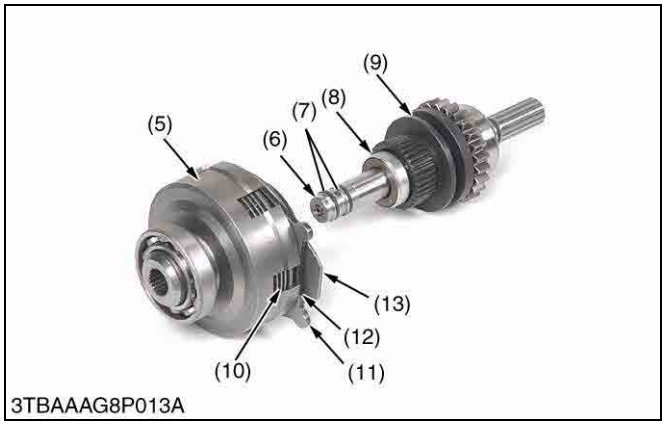

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Independent PTO clutch (2) is located behind the HST pump shaft (1) in the transmission case.

Independent PTO clutch (2) is operated with pressured hydraulic oil forced from the independent PTO control valve (3).

When independent PTO lever is shifted to **"ENGAGED"** position, hydraulic oil is forced through the transmission case inner passage (**A**) and PTO clutch shaft (6) to PTO clutch. In this state, power from HST pump shaft is transmitted through independent PTO clutch (2) to independent PTO clutch shaft (6).

When independent PTO lever is shifted to **"DISENGAGED"** position, hydraulic oil is not forced to the PTO clutch. In this state, power from HST pump shaft (1) is not transmitted to independent PTO clutch shaft (6).

(1) HST Pump Shaft
(2) Independent PTO Clutch
(3) Independent PTO Control Valve
(4) HST Motor Shaft
(5) Case
(6) PTO Clutch Shaft
(7) Seal
(8) Bearing
(9) Shifter
(10) Clutch Discs and Plates
(11) Brake Plate 4
(12) Brake Disc
(13) Brake Plate 2

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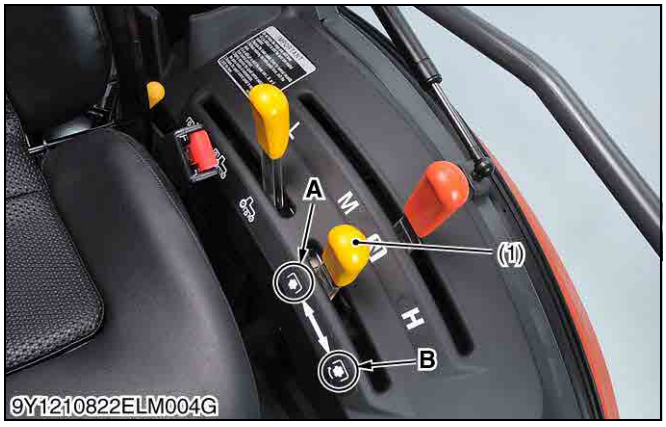
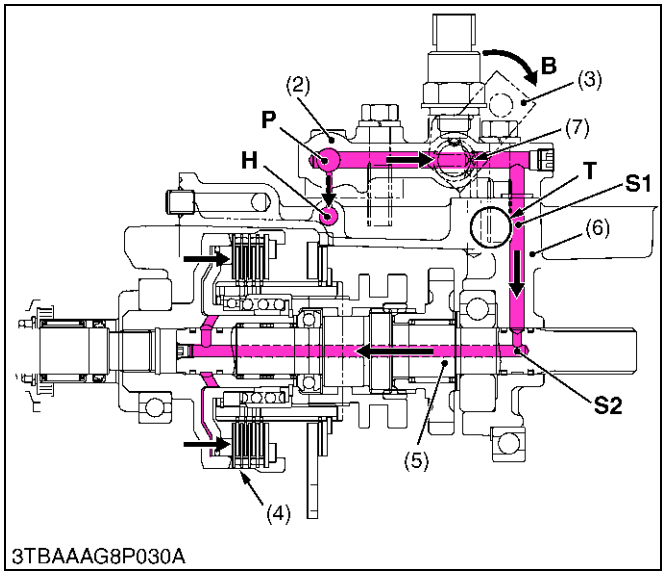
(4) Independent PTO Lever "Engaged"





When the independent PTO lever (1) is shifted to the **"ENGAGED"** position, the PTO arm (3) is turned to **"ON"** position.

Hydraulic oil from **P** port flows through oil passage (7) of the PTO arm (3), oil passage **S1** in the transmission case (6) and oil passage **S2** in the PTO clutch shaft (5) to the PTO clutch (4).

Since the piston of the PTO clutch (4) is pushed by pressurized oil, clutch discs and clutch plates are pushed, and the PTO clutch (4) is engaged.

(1) Independent PTO Lever
(2) Independent PTO Control Valve
(3) PTO Arm
(4) PTO Clutch
(5) PTO Clutch Shaft
(6) Transmission Case
(7) Oil Passage (in the PTO Arm)

A : "DISENGAGED" Position
B : "ENGAGED" Position
P : Pump Port
H : HST Port
T : Tank Port
S1 : Oil Passage (in the Transmission Case)
S2 : Oil Passage (in the PTO Clutch Shaft)

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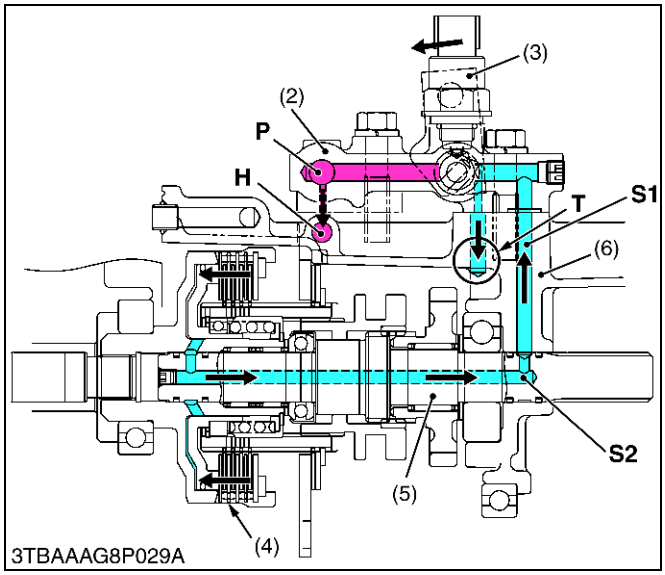
(5) Independent PTO Lever "Disengaged"



When the independent PTO lever (1) is shifted to the **"DISENGAGED"** position, the PTO arm (3) is turned to **"OFF"** position.

Hydraulic oil is stopped at the PTO arm (3).

This oil flows to the HST port.

Oil in the PTO clutch (4) and the PTO clutch shaft (5) drains through oil passage **S2**, **S1** and **T** port to the transmission case.

(1) Independent PTO Lever
(2) Independent PTO Control Valve
(3) PTO Arm
(4) PTO Clutch
(5) PTO Clutch Shaft
(6) Transmission Case

A : "DISENGAGED" Position
B : "ENGAGED" Position
P : Pump Port
H : HST Port
T : Tank Port
S1 : Oil Passage (in the Transmission Case)
S2 : Oil Passage (in the PTO Clutch Shaft)

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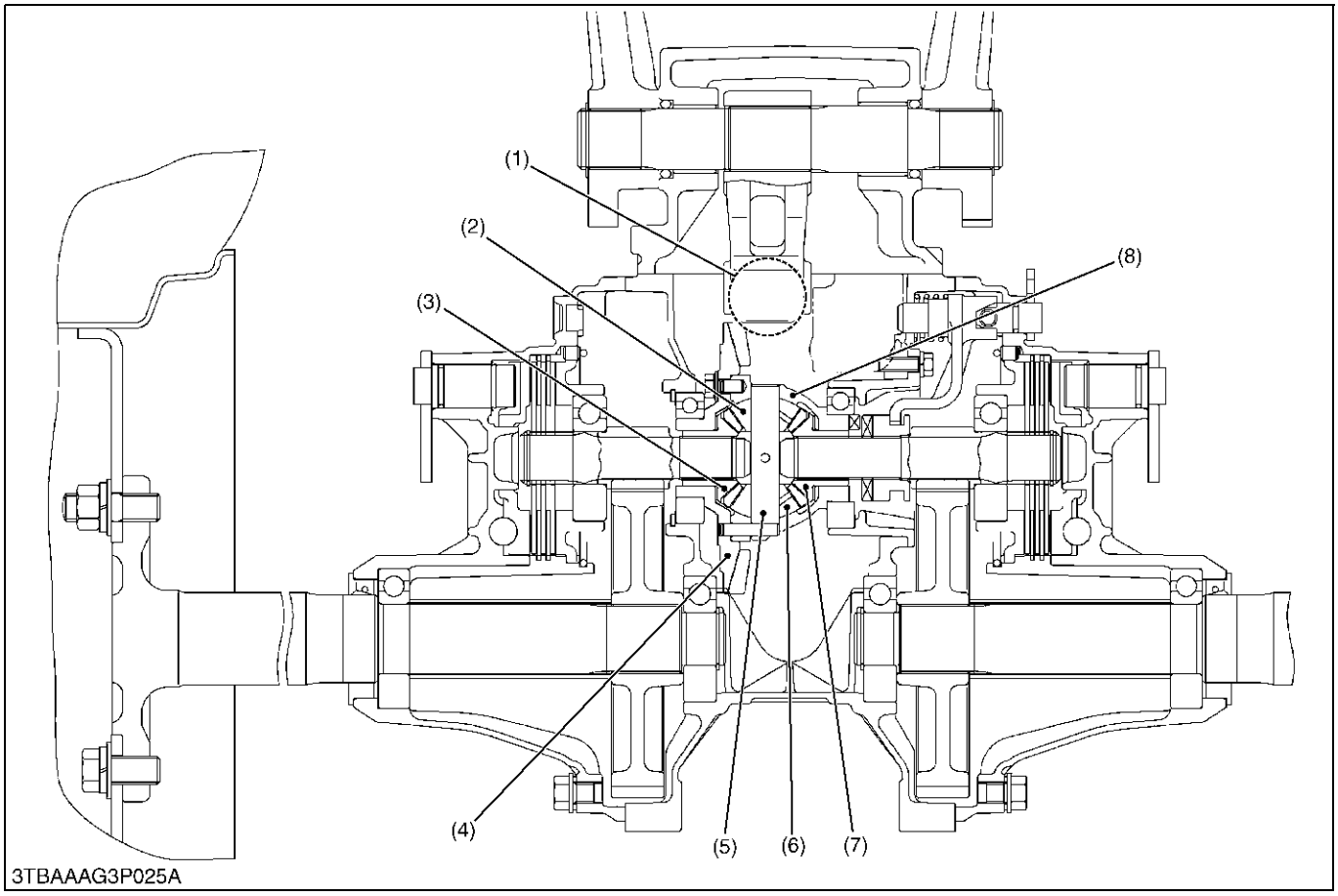
8. DIFFERENTIAL GEAR SYSTEM

[1] DIFFERENTIAL FUNCTION



(1) Spiral Bevel Pinion
(2) Differential Pinion
(3) Differential Side Gear
(4) Spiral Bevel Gear
(5) Differential Pinion Shaft
(6) Differential Pinion
(7) Differential Side Gear
(8) Differential Case

■ **During Straight Running**

Rotation of the spiral bevel pinion (1) is transmitted to the spiral bevel gear (4) and differential case (8). When road resistance to the right and left wheels are equal, differential pinions (2), (6) and differential side gears (3), (7) are all rotate as a unit. Both rear axles received equal input, and both wheels turn at the same speed, allowing the tractor to straight ahead. At this time, differential pinions (2), (6) does not rotate around the differential pinion shaft (5).

■ **During Turning**

When the tractor turns, the road resistance to the inside tire increases (as if braking is applied to that side only).

In other words, if one of tires slows down, revolution difference is generated in the differential side gears (3), (7). When rotation of one differential side gear becomes lower than the other, differential pinions (2), (6) begin rotating around differential pinion shaft (5). The other differential side gear is increased in speed by the speed increment of differential pinion shaft (5). This means that rotation of one rear axle is slowed down and that of the other rear axle is increased. Thus, the tractor turns smoothly without power loss.

The combined number of revolutions of the right and left differential side gears is always twice that of the spiral bevel gear (4). When spiral bevel gear revolution is 100 min^{-1} (rpm), and if one of the differential side gears stops moving, the revolution of the other differential side gear becomes 200 min^{-1} (rpm) and if one rotates at 50 min^{-1} (rpm), the other rotates at 150 min^{-1} (rpm).

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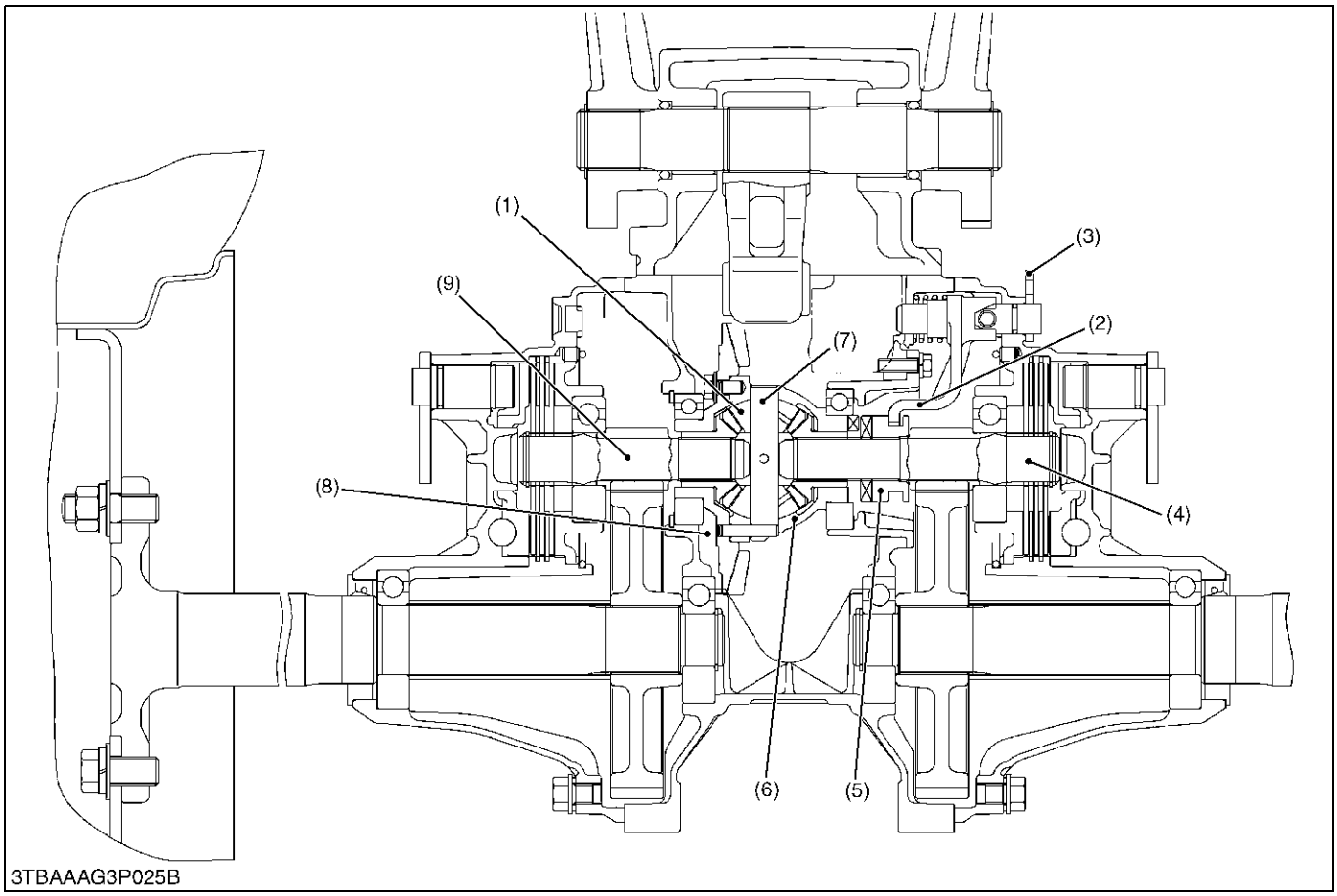
[2] DIFFERENTIAL LOCK



(1) Differential Pinion
(2) Shift Fork
(3) Differential Lock Lever
(4) Differential Gear Shaft (Right)
(5) Differential Lock Clutch
(6) Differential Case
(7) Differential Pinion Shaft
(8) Spiral Bevel Pinion
(9) Differential Gear Shaft (Left)

When resistance to the right and the left tires are greatly different due to ground conditions or type of work, the tire with less resistance slips and prevents the tractor from moving ahead. To compensate for this drawback, the differential lock restricts the differential action and causes both rear axles to rotate as a unit.

When the differential lock pedal is stepped on, it causes the differential lock lever (3) to rotate. The differential lock lever (3) will move the shift fork (2) and the differential lock clutch (5) toward the spiral bevel pinion (8). The differential lock clutch (5) engages with the teeth of the differential case (6) to make the differential case (6) and the differential lock clutch (5) to rotate together as a unit.

Therefore, the differential pinions (1) are unable to rotate around the differential pinion shaft (7) and differential revolutions are transmitted to the right and the left differential gear shaft (4), (9).

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SERVICING

CONTENTS

1. TROUBLESHOOTING

HYDROSTATIC TRANSMISSION

Symptom	Probable Cause	Solution	Reference Page
System Will Not Operate in Either Direction	Oil level is low	Check oil level or fill oil to proper level	2-S14
	Speed control pedal linkage damaged	Repair linkage	2-M13, 2-M15
	Charge pressure is too low	Solution order 1. Replace oil filter cartridge	G-31
		2. Check charge pressure	2-S8
		3. Inspect or flush charge relief valve	2-S47
	Check and high pressure relief valve does not move smoothly	Inspect or replace check and high pressure relief valve	2-S46
	Neutral valve damaged	Inspect or replace neutral valve	2-S47
	Component parts damaged	Replace hydrostatic transmission assembly	2-S20
Vibration and Noise	Oil level is too low	Check oil level or fill oil to proper level	2-S14
	Speed control pedal linkage damaged	Repair linkage	2-M13, 2-M15
	Charge pressure is too low	Solution order 1. Replace oil filter cartridge	G-31
		2. Check charge pressure	2-S8
		3. Inspect or flush charge relief valve	2-S47
	Check and high pressure relief valve does not move smoothly	Inspect or replace check and high pressure relief valve	2-S46
	Neutral valve damaged	Inspect or replace neutral valve	2-S47
	Component part is damaged	Replace hydrostatic transmission assembly	2-S20

Symptom	Probable Cause	Solution	Reference Page
Loss of Power	Oil level is low	Check oil level or fill oil to proper level	2-S14
	Speed control pedal linkage damaged	Repair linkage	2-M13, 2-M15
	Charge pressure is too low	1. Replace oil filter cartridge	G-31
		2. Check charge pressure	2-S8
		3. Inspect or flush charge relief valve	2-S47
	Check and high pressure relief valve does not move smoothly	Inspect or replace check and high pressure relief valve	2-S46
	Neutral valve is damaged	Inspect or replace neutral valve	2-S47
	Component parts damaged	Replace hydrostatic transmission assembly	2-S20
Transmission Oil Over Heats	Low transmission oil level	Fill transmission oil level up to proper level	2-S14
	Radiator net clogged	Clean radiator net	–
	Excessive machine load	Reduce machine load	–
	Improper charge pressure	1. Check high relief pressure	2-S10
		2. Replace transmission oil filter cartridge	G-31
		3. Replace check and high pressure relief valve	2-S46
		4. Inspect and replace charge relief valve	2-S47
Machine Will Not Stop in Neutral Position	Speed control linkage is out of adjustment or sticking	Repair or replace linkage	2-M13, 2-M15
		Adjust neutral adjuster	–
	Neutral valve damaged	Inspect or replace neutral valve	2-S47
System Operates in One Direction Only	Speed control linkage damaged	Repair or replace linkage	2-M13, 2-M15
	Check and high pressure relief valve damaged	Replace check and high pressure relief valve	2-S46

FRONT CASE

Symptom	Probable Cause	Solution	Reference Page
Noise From Front Case	Clutch shaft spline worn	Replace	2-S19
	Bearing Worn	Replace	2-S19

TRANSMISSION CASE SECTION

Symptom	Probable Cause	Solution	Reference Page
Noise From Front Transmission	Transmission oil insufficient	Refill	2-S14
	Gear worn or broken	Replace	2-S20
	Improper backlash between spiral bevel pinon and bevel gear	Adjust	2-S51
	Improper backlash between differential pinion and differential side gear	Adjust	2-S50
	Bearings worn	Replace	–
	PTO clutch damaged	Repair or replace	2-S36

INDEPENDENT PTO

Symptom	Probable Cause	Solution	Reference Page
PTO Clutch Slip	Operating pressure is low	Adjust	2-S12
	Independent PTO control valve malfunctioning	Repair or replace	2-S12
	Clutch disc or drive plate excessively worn	Replace	2-S37
	Deformation of piston or return plate	Replace	2-S37
PTO Shaft Does Not Rotate	PTO clutch malfunctioning	Repair or replace	2-S30, 2-S36
	PTO propeller shaft coupling disengaged	Engage	–
PTO Clutch Operating Pressure is Low	Transmission oil improper or insufficient	Fill or change	G-20
	Relief valve malfunctioning	Adjust or replace	2-S12
PTO Clutch Drags	Brake plate excessively worn	Replace	2-S37
	Return spring weaken or broken	Replace	2-S37
	Accumulator valve malfunctioning	Repair or replace	2-S37
	Deformation or return plate or steel plate	Replace	2-S37

DIFFERENTIAL CASE SECTION

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	Improper backlash between spiral bevel pinion and bevel gear	Adjust	2-S51
	Improper backlash between differential pinion and differential side gear	Adjust	2-S50
	Bearing worn	Replace	–
	Insufficient or improper type of transmission fluid used	Fill or replace	G-9
Noise while Turning	Differential pinions or differential side gears worn or damaged	Replace	2-S51
	Differential lock binding (does not disengage)	Replace	3-S5
	Bearing worn	Replace	2-S51
Differential Lock Can Not Be Set	Differential lock shift fork damaged	Replace	3-S5
	Differential lock shifter mounting pin damaged	Replace	3-S5
	Differential lock clutch damaged	Replace	3-S5
Differential Lock Pedal Does Not Return	Differential lock pedal return spring weakened or damaged	Replace	3-S5
	Differential lock fork shaft rusted	Repair	3-S5

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2. SERVICING SPECIFICATIONS

HYDROSTATIC TRANSMISSION (HST)

Item		Factory Specification	Allowable Limit
Charge Relief Valve	Setting Pressure	0.4 to 0.6 MPa 4 to 6 kgf/cm^2 60 to 80 psi	–
Check and High Pressure Relief Valve	Setting Pressure [Relief Valve]	33 to 35 MPa 340 to 350 kgf/cm^2 4800 to 5000 psi	–
Relief Valve	Readjusting Pressure	31.4 to 35.3 MPa 320 to 360 kgf/cm^2 4551 to 5120 psi	–
Piston Slipper	Thickness	3.00 mm 0.118 in.	2.90 mm 0.1142 in.
Piston to Cylinder Block Bore (HST)	Clearance	0.02 mm 0.0008 in.	0.04 mm 0.0016 in.

INDEPENDENT PTO CLUTCH

Item		Factory Specification	Allowable Limit
Clutch Disc	Thickness	1.70 to 1.90 mm 0.067 to 0.075 in.	1.55 mm 0.061 in.
Clutch Plate	Thickness	1.15 to 1.25 mm 0.045 to 0.049 in.	1.10 mm 0.043 in.
Pressure Plate	Thickness	1.95 to 2.05 mm 0.0768 to 0.0807 in.	1.8 mm 0.071 in.
Piston Return Spring	Free Length	44.0 mm 1.73 in.	–
	Load / Length	638.7 N / 26 mm 65.13 kgf / 26 mm 143.6 lbf / 1.02 in.	539.4 N / 26 mm 55 kgf / 26 mm 121.3 lbf / 1.02 in.

TRANSMISSION CASE AND DIFFERENTIAL GEAR

Item		Factory Specification	Allowable Limit
Shift Fork to Shifter Groove	Clearance	0.1 to 0.35 mm 0.004 to 0.014 in.	0.5 mm 0.02 in.
Differential case to Differential Side Gear	Clearance	0.025 to 0.066 mm 0.0010 to 0.0026 in.	0.30 mm 0.0118 in.
• Differential Case (Spiral Bevel Gear)	I.D.	32.000 to 32.025 mm 1.2598 to 1.2608 in.	–
• Differential Side Gear Boss	O.D.	31.959 to 31.975 mm 1.2582 to 1.2589 in.	–
Differential Pinion to Differential Pinion Shaft	Clearance	0.048 to 0.084 mm 0.0019 to 0.0033 in.	0.30 mm 0.0118 in.
• Differential Pinion	I.D.	16.032 to 16.050 mm 0.63119 to 0.63188 in.	–
• Differential Pinion Shaft	O.D.	15.966 to 15.984 mm 0.62859 to 0.62929 in.	–
Differential Pinion to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	0.4 mm 0.016 in.
Spiral Bevel Pinion Shaft	Movements at shaft directions	Approximately 0 mm 0 in.	–
Spiral Bevel Pinion to Spiral Bevel Gear	Backlash	0.1 to 0.30 mm 0.0039 to 0.012 in.	–

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3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Checking port plug	29 to 44	3.0 to 4.5	21.7 to 32.5
Hex. socket head screw	24.5 to 29.5	2.5 to 3.0	18.1 to 21.7
Rear wheel mounting nut	167 to 191	17 to 19.5	123 to 141
Rear wheel mounting bolt	196 to 225	20 to 23	145 to 166
Universal joint mounting bolt	24 to 28	2.5 to 2.8	18 to 20
Cabin mounting bolt and nut	124 to 150	12.7 to 15.2	91.5 to 110
Front loader valve pipe joint bolt	48 to 70	4.9 to 7.1	36 to 51
3-point hitch delivery pipe 1 joint bolt	48 to 70	4.9 to 7.1	36 to 51
3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 70	4.9 to 7.1	36 to 51
3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60	5.1 to 6.1	37 to 44
Sub frame mounting bolt (M12)	80 to 90	8.2 to 9.1	59 to 66
Sub frame mounting bolt (M14)	126 to 150	12.9 to 15.2	93.0 to 110
Sub frame mounting bolt (M10)	40 to 46	4.1 to 4.6	30 to 33
Cabin mount rear frame bolt	90 to 95	9.2 to 9.6	67 to 70
Front case mounting nut for aluminum material (M8)	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1
Front case mounting bolt for aluminum material (M10)	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Steel plate mounting bolt (M8)	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
HST assembly mounting bolt (M10, aluminum)	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Center section mounting hex. bolt (M10, aluminum)	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Check and high pressure relief valve plug	59 to 78	6.1 to 7.9	44 to 57
Neutral valve body	59 to 78	6.1 to 7.9	44 to 57
Transmission case mounting bolt (M10) and nut	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Hydraulic cylinder mounting bolt (M10) and nut	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Rear axle case (LH and RH) mounting bolt for aluminum material (M10)	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Rear PTO cover mounting bolt for aluminum material (M10)	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Differential bearing holder mounting bolt for aluminum material (M8)	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1
Spiral bevel gear UBS screw	30 to 34	3.0 to 3.5	22 to 25

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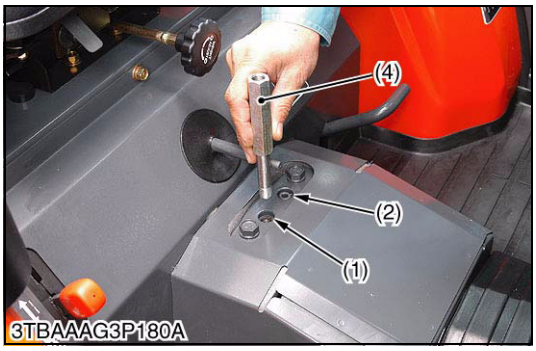
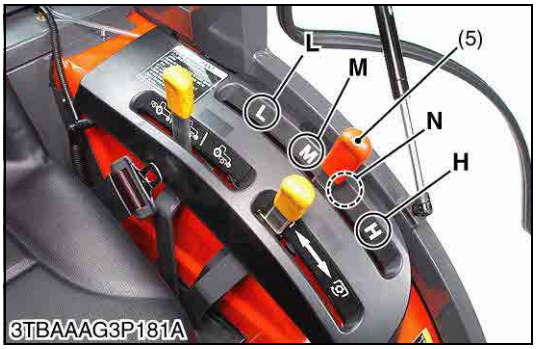
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) HST





Charge Relief Pressure

CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Remove the seat under cover and the floor mat.
2. Remove the plug from **P1** port (reverse) or **P2** port (forward).

NOTE

- **If the plug is tight to remove, warm up the plug by a hair drier etc..**

3. Install the adaptor (4) to **P1** port (1) or **P2** port (2).
4. Install the cable (3) and low pressure gauge to the adaptor (4).

Engine speed	Rated speed
Range gear shift position	Neutral
HST pedal	Neutral

5. Start the engine and warm the oil before testing.
6. Change the range gear shift lever (5) to **"NEUTRAL"** position.
7. Run the engine at the rated speed.
8. Release the foot from the HST pedal (6).
9. Read the low pressure gauge to measure the charge relief pressure.
10. If the measurement is not same as factory specification, check the charge relief valve and the related hydraulic components.

Charge pressure	Factory specification	0.4 to 0.6 MPa 4 to 6 kgf/cm^2 60 to 80 psi

NOTE

- **Low pressure gauge is 2.9 MPa (30 kgf/cm^2, 427 psi) full scale.**

(When reassembling)

- Apply liquid lock (Three Bond 1324B or its equivalent) to the plug.

Tightening torque	Checking port plug	29 to 44 N·m 3.0 to 4.5 kgf·m 21.7 to 32.5 lbf·ft

(1) **P1** port (reverse)
(2) **P2** port (forward)
(3) Cable
(4) Adaptor
(5) Range Gear Shift Lever
(6) HST Pedal

L : Low speed position
M : Medium speed position
N : Neutral position
H : High speed position

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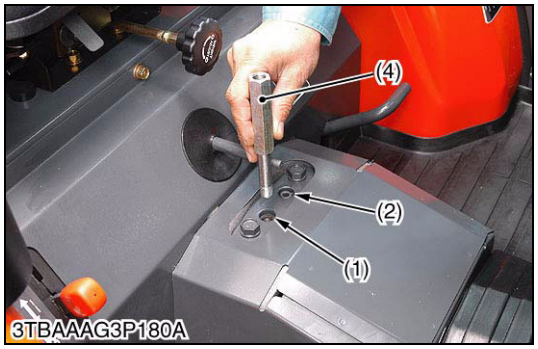

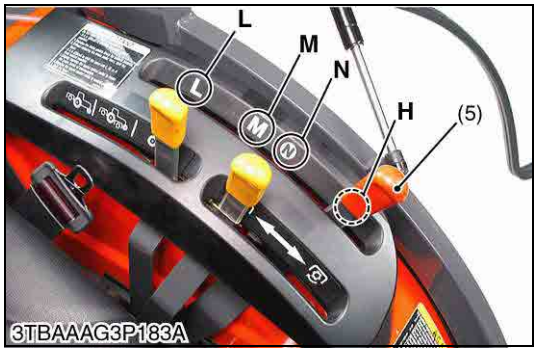

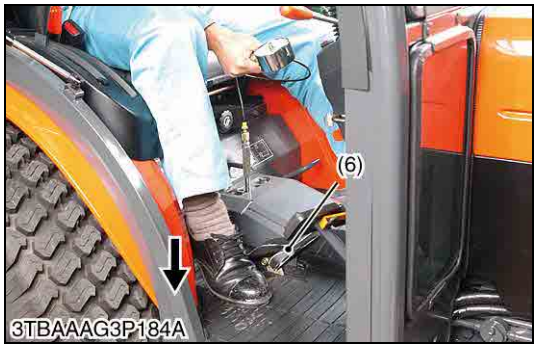

High Pressure Relief Valve (Reverse)

CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Remove the seat under cover and the floor mat.
2. Remove the plug from **P1** port (reverse) (1).

NOTE

- **If the plug is tight to remove, warm up the plug by a hair drier etc..**

3. Install the adaptor (4) to **P1** port (1).
4. Install the cable (3) and high pressure gauge.

Engine speed	Rated speed
Range gear shift position	High
HST pedal	Reverse
Brake pedal	Depressed

5. Start the engine and warm the oil before testing. Check to see that parking brake is applied.
6. Place the range gear shift lever (4) to **"HIGH"** position.
7. Run the engine at the rated speed.
8. Depress the rear side pedal of the HST pedal (5).
9. Read the high pressure gauge to measure the high pressure relief valve pressure.
10. If the measurement is not the same as factory specification, check the check and high pressure relief valve assembly.

Check and high relief pressure (Oil temperature at 40 to 60 °C (104 to 140 °F))	Factory specification	33 to 35 MPa 340 to 350 kgf/cm^2 4800 to 5000 psi

IMPORTANT

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

NOTE

- **High pressure gauge is 40 MPa (400 kgf/cm^2, 5800 psi) full scale.**
- **Engine speed : Rated speed**
- **Oil temperature : 45 to 55 °C (113 to 131 °F)**

(When reassembling)

- Apply liquid lock (Three Bond 1324B or its equivalent) to the plug.

Tightening torque	Checking port plug	29 to 44 N·m 3.0 to 4.5 kgf·m 21.7 to 32.5 lbf·ft

(1) **P1** port (reverse)
(2) **P2** port (forward)
(3) Cable
(4) Adaptor
(5) Range Gear Shift Lever
(6) HST Pedal

L : Low speed position
M : Medium speed position
N : Neutral position
H : High speed position

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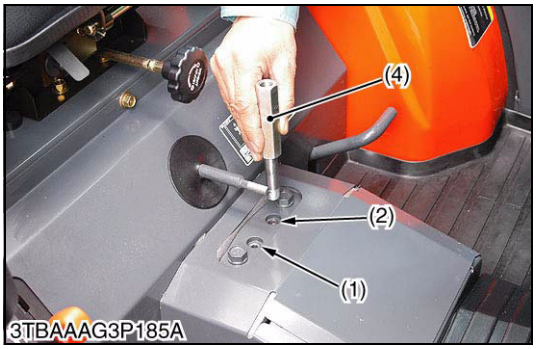

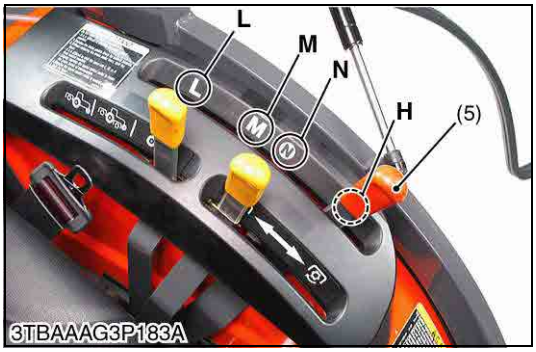

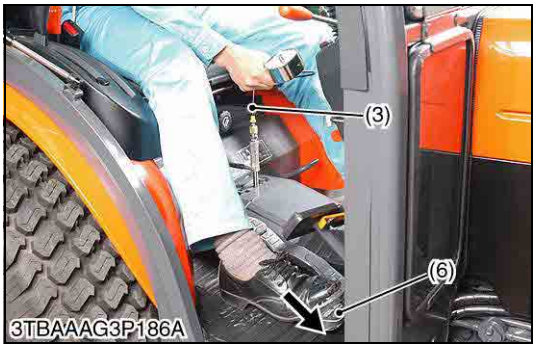

High Pressure Relief Valve (Forward)

CAUTION

- **When checking, park the tractor on flat ground and fully engage the parking brake.**

1. Remove the seat under cover and the floor mat.
2. Remove the plug from **P2** port (forward).

NOTE

- **If the plug is tight to remove, warm up the plug by a hair drier etc..**

3. Install the adaptor (4) to **P2** port (2).
4. Install the cable (3) and high pressure gauge.

Engine speed	Rated speed
Range gear shift position	High
HST pedal	Forward
Brake pedal	Depressed

5. Start the engine and warm the oil before testing. Check to see that parking brake is applied.
6. Place the range gear shift lever (5) to **"HIGH"** position.
7. Run the engine at the rated speed.
8. Depress the front side pedal of the HST pedal (6).
9. Read the high pressure gauge to measure the high pressure relief valve pressure.
10. If the measurement is not same as factory specification, check the check and high pressure relief valve assembly.

Check and high relief pressure (Oil temperature at 40 to 60 °C (104 to 140 °F))	Factory specification	33 to 35 MPa 340 to 350 kgf/cm^2 4800 to 5000 psi

IMPORTANT

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

NOTE

- **High pressure gauge is 40 MPa (400 kgf/cm^2, 5800 psi) full scale.**
- **Engine speed : Rated speed**
- **Oil temperature : 45 to 55 °C (113 to 131 °F)**

(When reassembling)

- Apply liquid lock (Three Bond 1324B or its equivalent) to the plug.

Tightening torque	Checking port plug	29 to 44 N·m 3.0 to 4.5 kgf·m 21.7 to 32.5 lbf·ft

(1) **P1** port (reverse)
(2) **P2** port (forward)
(3) Cable
(4) Adaptor
(5) Range Gear Shift Lever
(6) HST Pedal

L : Low speed position
M : Medium speed position
N : Neutral position
H : High speed position

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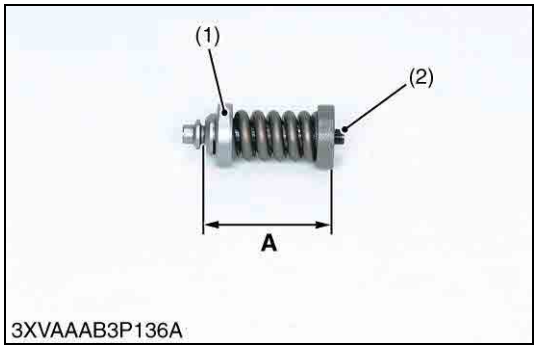

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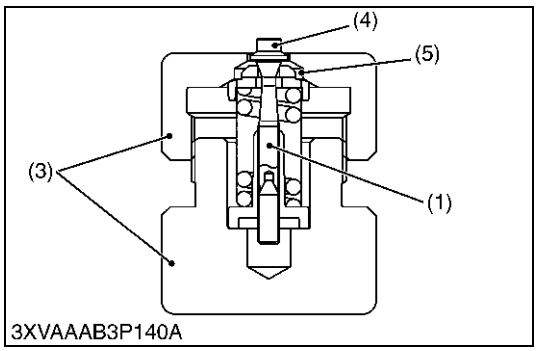

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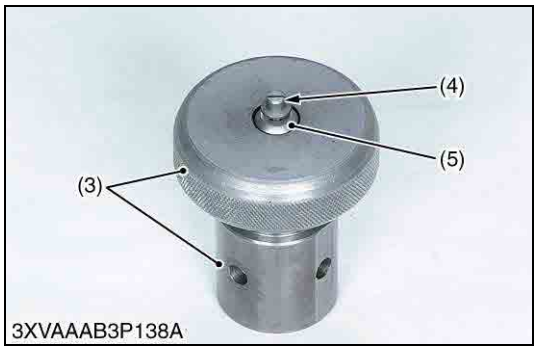

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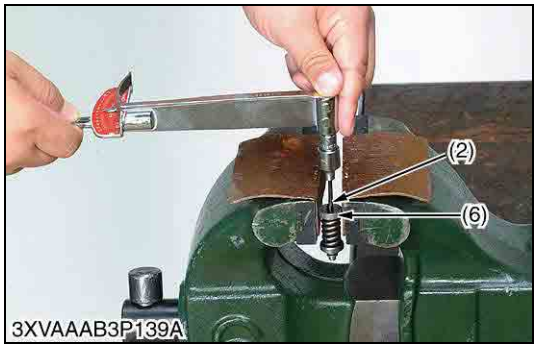

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Readjustment of Relief Valve (When the HST does not work due to its loose hexagon socket head screw)

■ **IMPORTANT**

- **The KUBOTA does not recommend the readjustment of relief valve. And KUBOTA will recommend to replace with genuine parts.**
- **As the HST may be damaged if the pressure is set to higher by mistake, be careful when adjusting it.**

■ **NOTE**

- **The relief pressure is set in between 33.3 to 36.3 MPa (340 to 370 kgf/cm^2, 4836 to 5262 psi) when shipped from the factory. But, for the purpose of after-sales services, as it is impossible to reset the pressure precisely as set in the factory, its setting range is defined as a slightly wider range between 31.4 to 35.3 MPa (320 to 360 kgf/cm^2, 4551 to 5120 psi).**

1. Measure the pre-adjustment distance **"A"**.
2. Compress the spring of the relief valve with a relief valve assembling tool (3).
3. Then, find the distance **"A"** by turning the poppet (4) with a screwdriver.
   Reference: The distance **"A"** changes by about 0.5 mm (0.0197 in.) per one turn of the poppet (4).
4. Repeat the same operation a few times to find the distance **"A"** as it is difficult to acquire at the first time.
5. After finding the distance **"A"**, hold the setscrew (6) to a vice and fasten the hexagon socket head screw (2) with specified torque.
   On this occasion, use a copper plate, etc. for the vice jaws not to damage the setscrew (6).
6. Install the relief valve in the HST.
7. Check the relief pressure as indicated in page 2-S8.
   The distance **"A"** is for refresh only. Make sure to check the relief pressure after readjustment.
8. If the relief pressure does not fall within the readjustment pressure range, repeat the processes of the above item 1 onward.
   Reference: The pressure changes by 1.47 MPa (15 kgf/cm^2, 213.3 psi) per 0.1 mm (0.0039 in.) in distance **"A"**.

Tightening torque	Hex. socket head screw	24.5 to 29.5 N·m 2.5 to 3.0 kgf·m 18.1 to 21.7 lbf·ft

Relief valve readjusting pressure	Factory specification	31.4 to 35.3 MPa 320 to 360 kgf/cm^2 4551 to 5120 psi

Distance **"A"**	Reference value	37.9 to 38.0 mm 1.4921 to 1.4960 in.

(1) Relief Valve Assembly
(2) Hexagon Socket Head Screw
(3) Relief Valve Assembling Tool
(4) Poppet
(5) Valve Seat
(6) Setscrew

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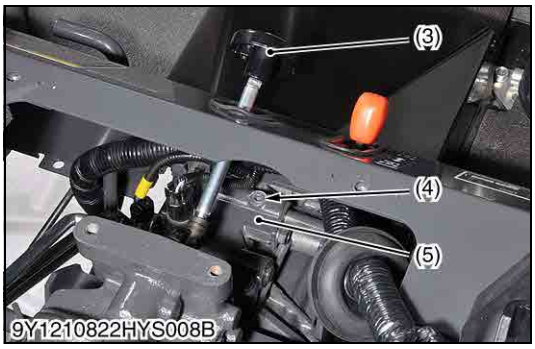
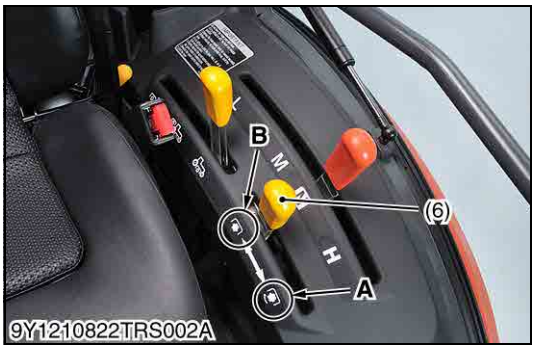
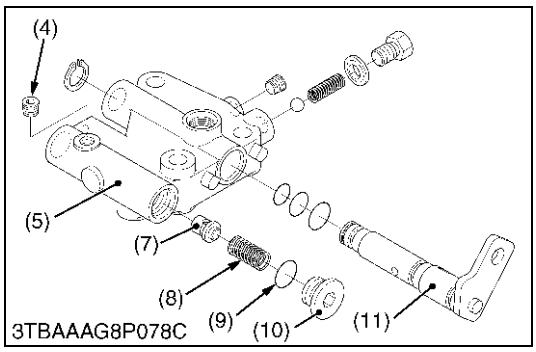
(2) Independent PTO Control Valve







Independent PTO Control Valve Setting Pressure

1. Disconnect the OPC switch connector and remove the seat.
2. Disconnect the ECU connector and remove the plate (2) with ECU (1).
3. Remove the 3-point hitch lowering speed knob (3).
4. Remove the plug (4) with a hexagon wrench.
5. Install the adapter to the independent PTO control valve (5).
6. Connect the cable and the pressure gauge to the adapter (3).
7. Reassemble the plate (2), ECU connector, seat and ECU connector.
8. Start the engine and set at the maximum speed. (Pressure at **"ENGAGED"** position)
9. Move the independent PTO lever (6) to **"ENGAGED"** position **A**.
10. Measure the pressure. (Pressure at **"DISENGAGED"** position)
11. Move the independent PTO lever (6) to position **B**.
12. Measure the pressure.
13. If the pressure is not the factory specifications, adjust setting pressure with (the adjusting) shims.

Independent PTO valve setting pressure	Independent PTO lever **"ENGAGED"** position	1.1 to 1.5 MPa 11.2 to 15.3 kgf/cm^2 160 to 218 psi
	Independent PTO lever **"DISENGAGED"** position	0 MPa 0 kgf/cm^2 0 psi

Condition

- Engine speed : Maximum
- Oil temperature : 50 °C (122 °F)

(1) ECU
(2) Plate
(3) 3-Point Hitch Lowering Speed Knob
(4) Plug
(5) Independent PTO Control Valve
(6) Independent PTO Lever
(7) Poppet
(8) Spring
(9) O-ring
(10) Plug
(11) PTO Arm

A : ENGAGED Position
B : DISENGAGED Position

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[2] PREPARATION

(1) Separating Cabin From Tractor

Battery Cable

1. Open the bonnet and remove the side cover.
2. Disconnect the battery negative cable (1).

■ **NOTE**

- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, the positive cable first.**

(1) Battery Negative Cable

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Rear Wheel and 3-Point Linkage

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (1).
3. Remove the top link, lower links and lift rods.

Tightening torque	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting screw	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Rear Wheel

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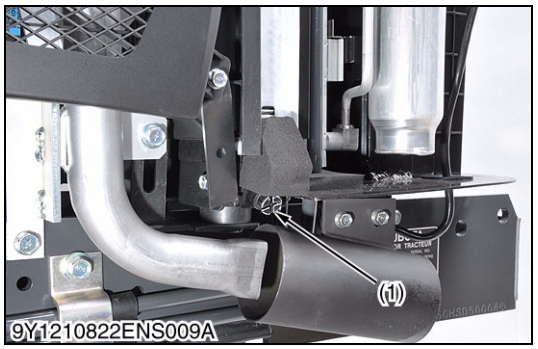

Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. To drain the coolant, turn the drain plug (1) counterclockwise.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator drain plug.

(When reassembling)

Coolant	Capacity	4.3 L 4.5 U.S.qts 3.8 Imp.qts

(1) Drain Plug

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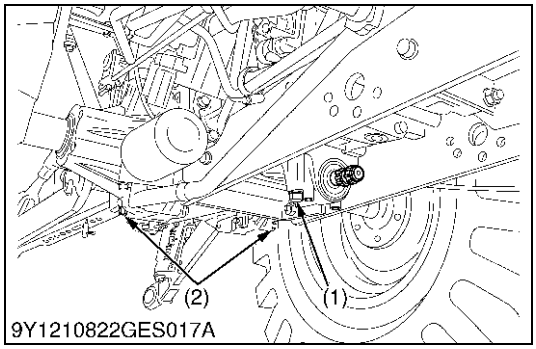
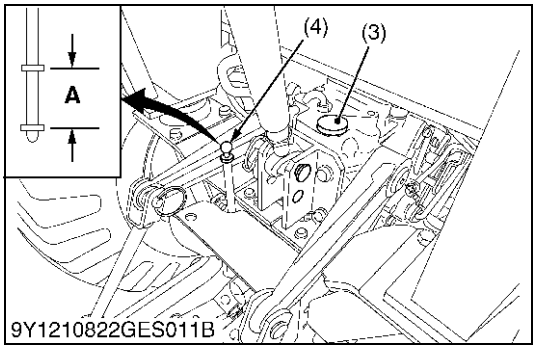




Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1) and (2).
2. Drain the transmission fluid.
3. Reinstall the drain plugs (1) and (2).

(When refilling)

- Fill new oil from filling port after removing the filling plug (4) up to the upper notch on the dipstick (3).
- After running the engine for a few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

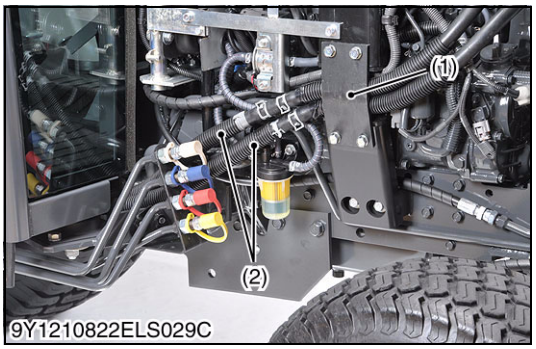
- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	15 L 4.0 U.S.gals 3.3 Imp.gals

(1) Drain Plug
(2) Drain Plug (Both Sides)
(3) Dipstick
(4) Filling Plug

A: Proper Oil Level

9Y1210822RAS0003US0



Heater Hose

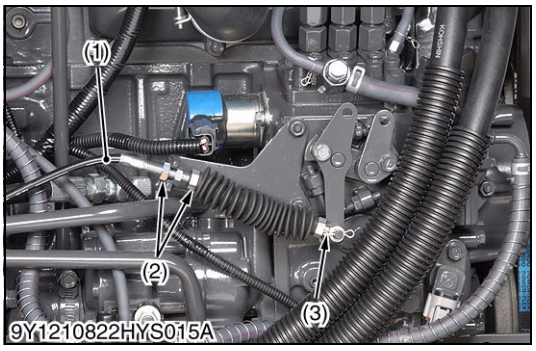
1. Remove the plate (1) from pillar.
2. Disconnect the heater hoses (2), and then reconnect their hoses to make loop.

■ **NOTE**

- **Put a mark to the each heater hoses before disconnecting.**

(1) Plate
(2) Heater Hose

9Y1210822HYS0011US0



Accelerator Wire (B2650)

1. Disconnect the accelerator wire (1).

(When reassembling)

- Set the end of wire inner (3) first. Then adjust the length of the wire outer section so that the wire inner section has no play, and tighten the lock nut (2).

(1) Accelerator Wire
(2) Lock Nut
(3) Accelerator Inner

9Y1210822HYS0021US0

Seat and Lever Guide

1. Disconnect the OPC switch connector and remove the seat (1).
2. Remove the each lever grips (2).
3. Remove the lever guides (3).

(1) Seat
(2) Lever Grip
(3) Lever Guide

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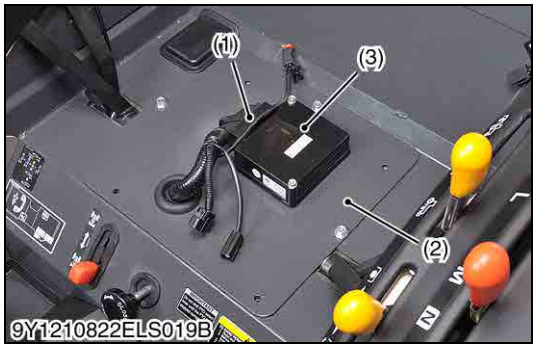

Seat Under Cover

1. Disconnect the ECU connector (1) and seat under cover (2) with ECU (3).

(1) ECU Connector
(2) Seat Under Cover
(3) ECU

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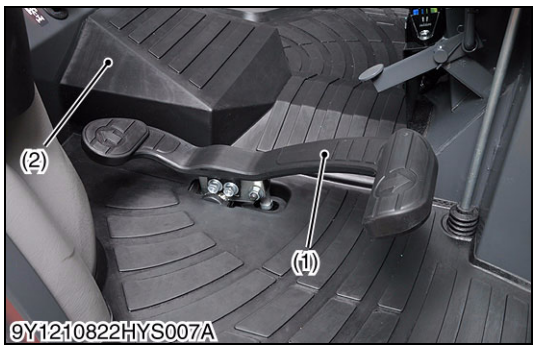


HST Pedal and Floor Mat

1. Remove the HST pedal (1) and floor mat (2).

(1) HST Pedal
(2) Floor Mat

9Y1210822HYS0014US0

Lowering Speed Adjusting Shaft and Front Wheel Drive Lever Knob

1. Tap out the spring pin and remove the lowering speed adjusting shaft (1).
2. Remove the front wheel drive lever knob (2).

(1) Lowering Speed Adjusting Shaft
(2) Front Wheel Drive Lever Knob

9Y1210822HYS0015US0

Position Control Lever and Cruise Control Lever

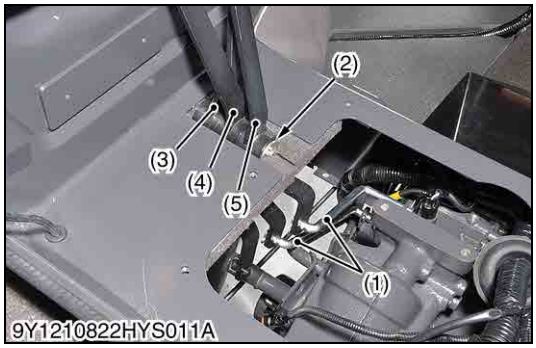
1. Remove the cruise control cable (2) from cruise control lever (4).
2. Remove the lever mounting nut (5), cruise control lever (4) and position control lever (6).

(When reassembling)

- Set the end of cable inner first. Then adjust the length of the cruise control cable outer section so that the cable inner section (1) has no play, and tighten the lock nut (3). (Due to a force of the spring in cruise control lever (4), the lever is set to the right side (outside) from the operator's seat.)

(1) Cable Inner Section
(2) Cruise Control Cable
(3) Lock Nut
(4) Cruise Control Lever
(5) Lever Mounting Nut
(6) Position Control Lever

9Y1210822HYS0016US0

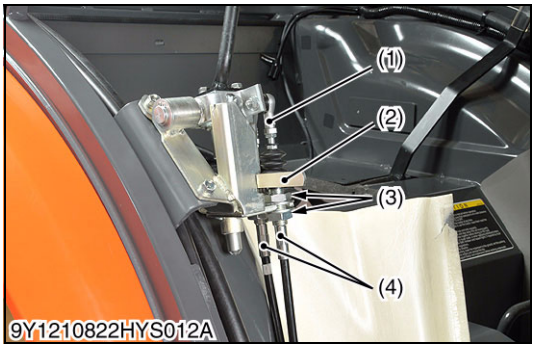


Range Gear Shift Lever, PTO Clutch Lever and PTO Select Lever

1. Remove the spring lock pins from shift rods (1).
2. Remove the external circlip (2), range gear shift lever (3), PTO clutch lever (5), and PTO select lever (4).

(1) Shift Rod
(2) External Circlip
(3) Range Gear Shift Lever
(4) PTO Select Lever
(5) PTO Clutch Lever

9Y1210822HYS0017US0



Front Loader Cables

1. Loosen the lock nuts (3) and remove the front loader cables (4).

(When reassembling)

- Set the lock lever (2) to lock position.
- Fix the ball joint (1) first.
- Adjust the length of the front loader cable (4) outer section so that the cable inner section has no play, and tighten the lock nut (3).

(1) Ball Joint
(2) Lock Lever
(3) Lock Nut
(4) Front Loader Cable

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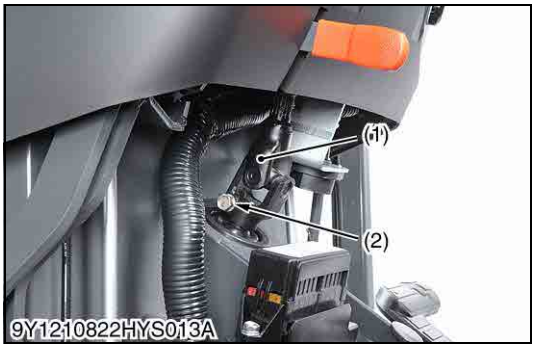

Universal Joint Mounting Bolt

1. Remove the universal joint mounting bolt (2).

(When reassembling)

Tightening torque	Universal joint mounting bolt	24 to 28 N·m 2.5 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Universal Joint
(2) Bolt

9Y1210822HYS0019US0

Electric Wiring

1. Disconnect the wiring connectors (1).

(1) Wiring Connector

9Y1210822HYS0020US0

Brake Pedal Rods

1. Disconnect the both left and right sides brake pedal rods (1).

(1) Brake Pedal Rod

9Y1210822HYS0022US0

Cabin Mounting Bolts

1. Remove the bolts and nuts (1).

(When reassembling)

Tightening torque	Cabin mounting bolt and nut	124 to 150 N·m 12.7 to 15.2 kgf·m 91.5 to 110 lbf·ft

(1) Bolt and Nut

9Y1210822HYS0023US0

Cabin Assembly

1. Remove the outer roof of cabin.
2. Hook the cabin with nylon slings not to damage the cabin.
3. Dismount the cabin from the tractor body.
4. Support the cabin with a stand.

■ **NOTE**

- **Lift and turn the cabin while making sure it does not catch on anything.**

(When reassembling)

- Be sure to install the washer and mount rubbers, etc, in their original position.

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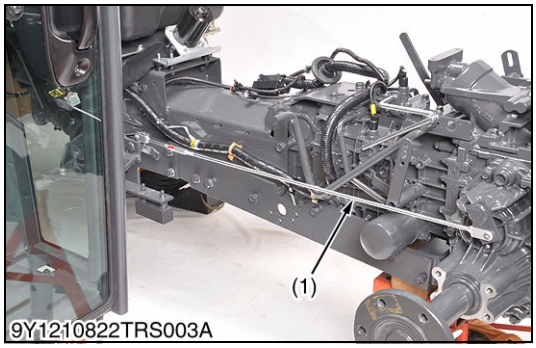

Brake Rods

1. Remove the both side brake rods.

(1) Brake Rod

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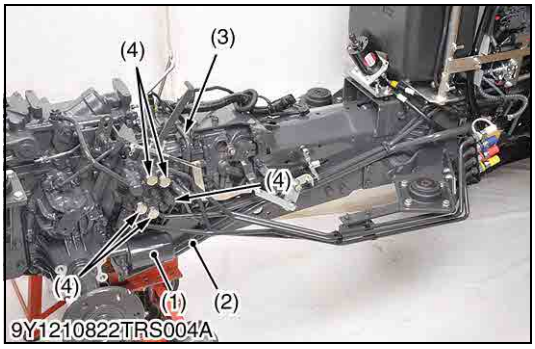

Hydraulic Pipes and Others

1. Remove the transmission oil filter cartridge (1).
2. Disconnect the suction pipe (2) and delivery pipe (3).
3. Disconnect the loader valve pipes (4).

(When reassembling)

- Do not damage the O-rings of front loader valve pipes and delivery pipes.

Tightening torque	Front loader valve pipe joint bolt	48 to 70 N·m 4.9 to 7.1 kgf·m 36 to 51 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 70 N·m 4.9 to 7.1 kgf·m 36 to 51 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 70 N·m 4.9 to 7.1 kgf·m 36 to 51 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft

(1) Transmission Oil Filter Cartridge
(2) Suction Pipe
(3) Delivery Pipe
(4) Loader Valve Pipe

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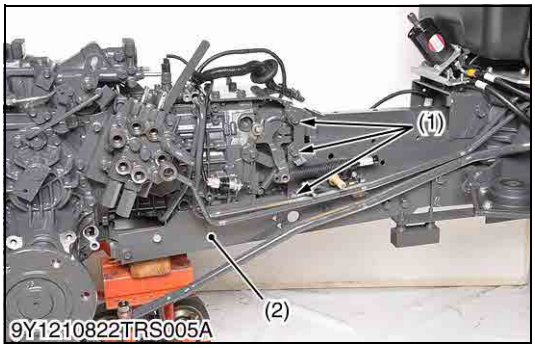


Main Frame, Sub Frame and Cabin Mount Rear Frame

1. Remove the main frame bolts (1).
2. Remove the both side sub frames (2).
3. Remove the Cabin mount rear frame (3).

(When reassembling)

Tightening torque	Sub frame mounting bolt (M12)	80 to 90 N·m 8.2 to 9.1 kgf·m 59 to 66 lbf·ft
	Sub frame mounting bolt (M14)	126 to 150 N·m 12.9 to 15.2 kgf·m 93.0 to 110 lbf·ft
	Sub frame mounting bolt (M10)	40 to 46 N·m 4.1 to 4.6 kgf·m 30 to 33 lbf·ft
	Cabin mount rear frame bolt	90 to 95 N·m 9.2 to 9.6 kgf·m 67 to 70 lbf·ft

(1) Bolt
(2) Sub Frame
(3) Cabin Mounting Rear Frame

9Y1210822TRS0011US0

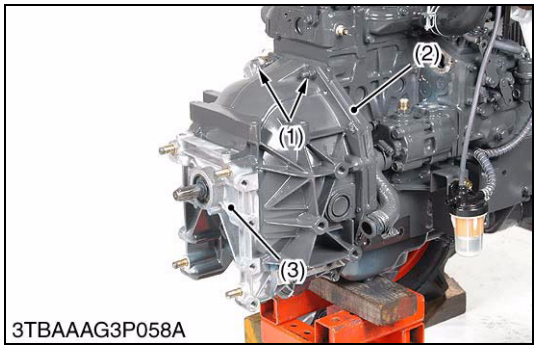
[3] DISASSEMBLING AND ASSEMBLING

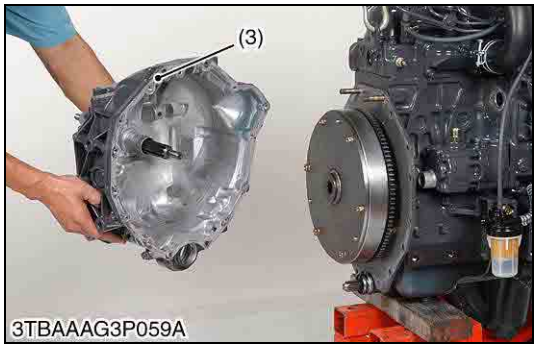
(1) Separating Engine and Clutch Housing

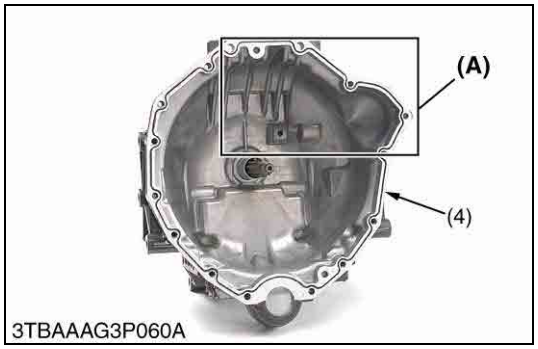
- See page 1-S22.

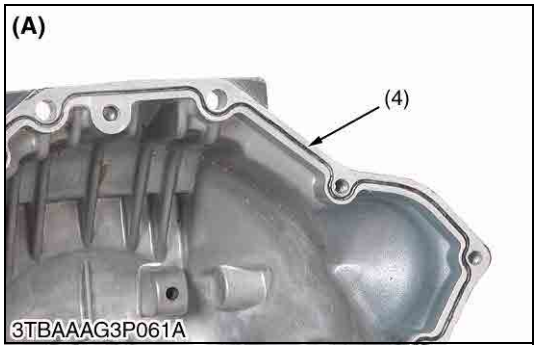
9Y1210822TRS0012US0

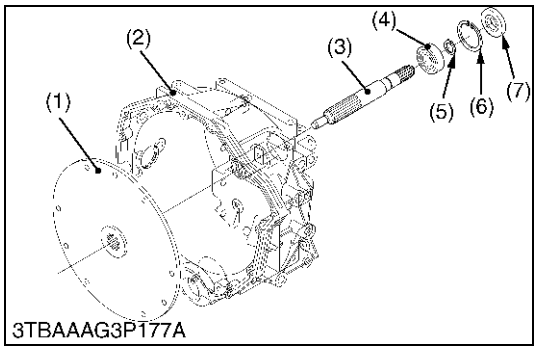
(2) Front Case











Clutch Housing

1. Support the engine securely.
2. Remove the front case mounting bolts (1).
3. Remove the front case (3) from the engine.

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to the joint face of the engine and the front case.

Tightening torque	Front case mounting nut for aluminum material (M8)	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 lbf·ft
	Front case mounting bolt for aluminum material (M10)	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft

(1) Bolt
(2) Engine Rear-End Plate
(3) Front Case
(4) Groove (for liquid gasket)

A : Front Case Corner

9Y1210822TRS0013US0

Clutch Shaft and Ball Bearing

1. Remove the oil seal (7).
2. Remove the circlip (5), (6).
3. Remove the clutch shaft (3) from the front case (2).

(1) Steal Plate
(2) Front Case
(3) Clutch Shaft
(4) Ball Bearing
(5) External Circlip
(6) Internal Circlip
(7) Oil Seal

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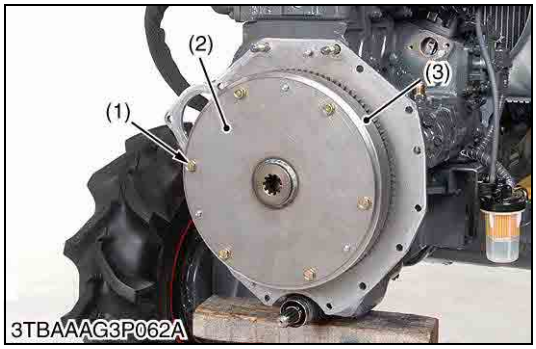


Steel Plate

1. Remove the steel plate mounting bolts (1).
2. Remove the steel plate (2) from the flywheel.

(When reassembling)

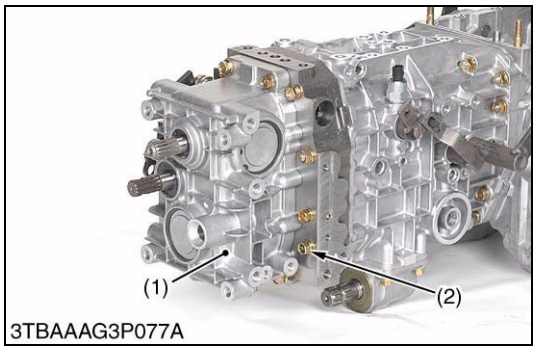
- Apply liquid gasket (Three Bond 1206D or equivalent) to the joint face of the engine and the front case.

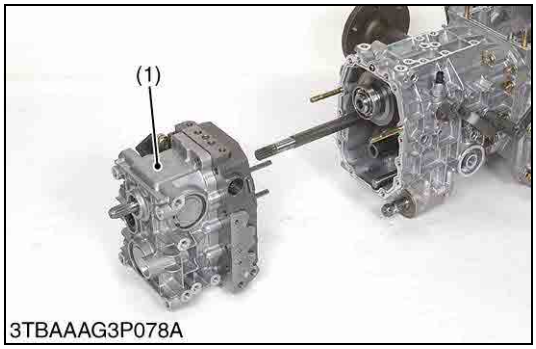
Tightening torque	Steel plate mounting bolt (M8)	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

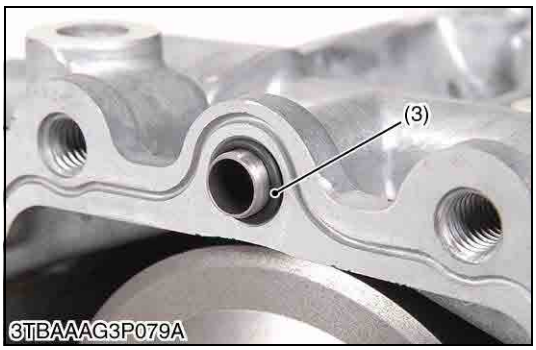
(1) Steel Plate Mounting Bolt
(2) Steel Plate
(3) Flywheel

9Y1210822TRS0015US0

(3) Hydraulic Transmission (HST)







HST Assembly

1. Remove the HST mounting bolts (2).
2. Separate the HST assembly (1) from the transmission.

(When reassembling)

- Install the O-ring (3) to the transmission case.
- Apply liquid gasket (Three Bond 1206D or equivalent) to the groove (4) of the transmission case.

Tightening torque	HST assembly mounting bolt (M10, aluminum)	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft

(1) HST Assembly
(2) HST Assembly Mounting Bolt
(3) O-ring
(4) Groove (for Liquid Gasket)

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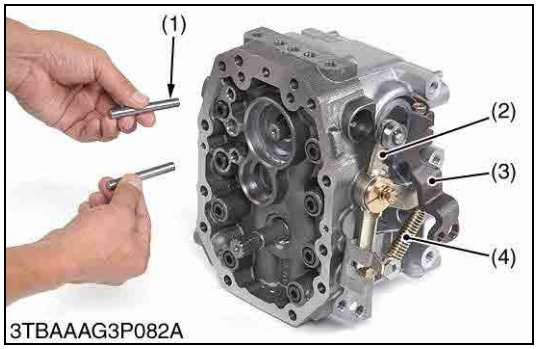

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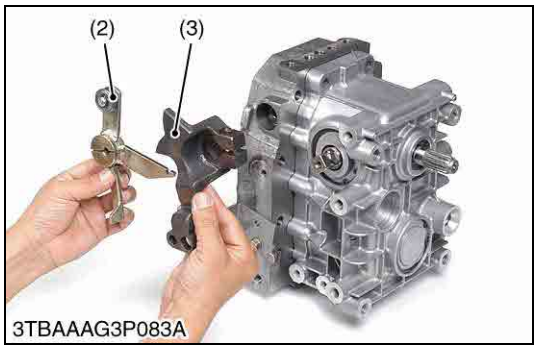

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Plate Push Rod, Neutral Arm and Neutral Holder

1. Remove the plate push rod (1).
2. Remove the spring (4).
3. Remove the neutral arm mounting bolt.
4. Loosen the bolt of the neutral holder (3).
5. Remove the neutral holder (3).

(1) Plate Push Rod
(2) Neutral Arm
(3) Neutral Holder
(4) Spring

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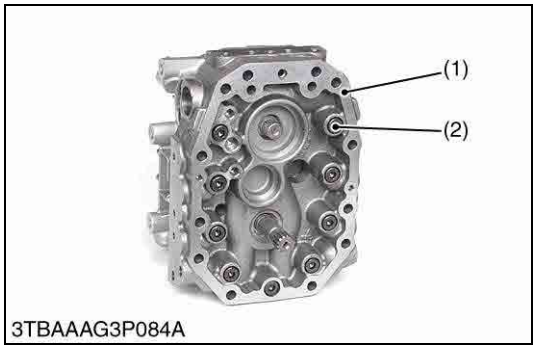

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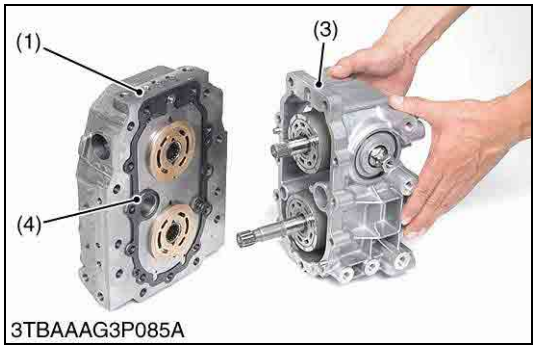

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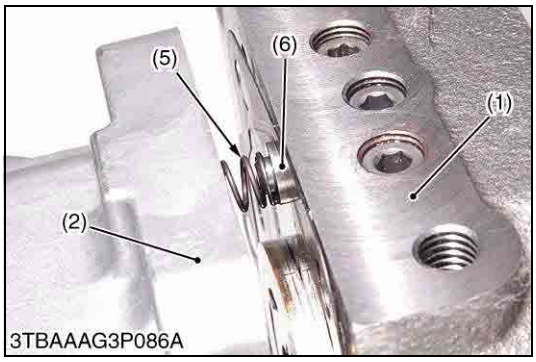

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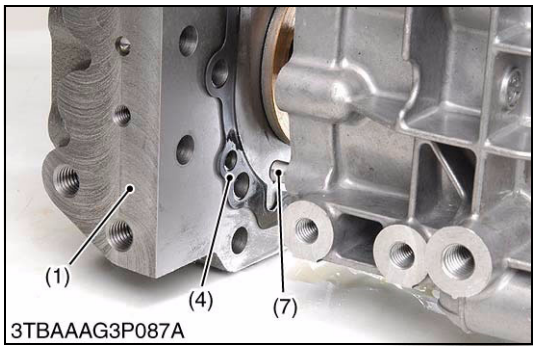

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Center Section 1

1. Remove the center section mounting hex. bolts (2).
2. Separate the HST housing (3) from the center section (1).

(When reassembling)

- Use a new gasket.
- Install the poppet to the center section (1). Do not drop the spring (5).
- Check the knock pin.
- Hold the gasket with the hex. bolts (2) not to drop the gasket (4).

Tightening torque	Center section mounting hex. bolt (M10, aluminum)	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft

(1) Center Section
(2) Hex. Bolt
(3) HST Housing
(4) Gasket
(5) Spring
(6) Poppet
(7) Knock Pin

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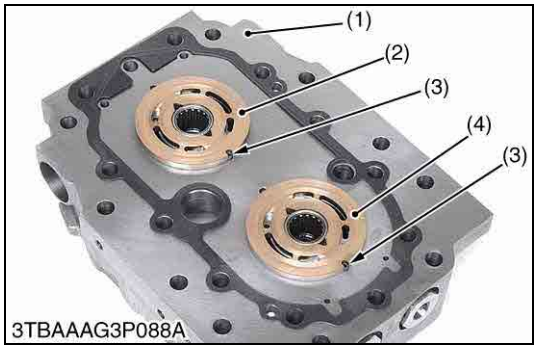

Valve Plates

1. Pushing the valve plate (2) against the anchor pin (3), lift the valve plate (2) to remove.
2. Remove the valve plate (2).
3. Remove the valve plate (4).

(When reassembling)

- Install the groove (5) the valve plates (2), (4) to the anchor pins (3) securely.

(1) Center Section
(2) Valve Plate (Pump Shaft)
(3) Anchor Pin
(4) Valve Plate (Motor Shaft)
(5) Groove

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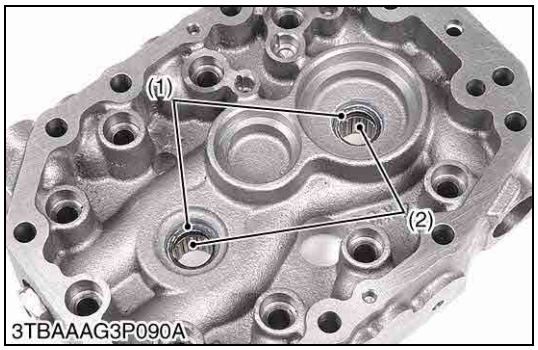

Oil Seals and Needle Bearings

1. Remove the needle bearing (2).
2. Remove the oil seals (1).

(When reassembling)

- After checking or changing the oil seals, apply the bearing with hydrostatic transmission oil and the oil seal with grease.

(1) Oil Seal
(2) Needle Bearing

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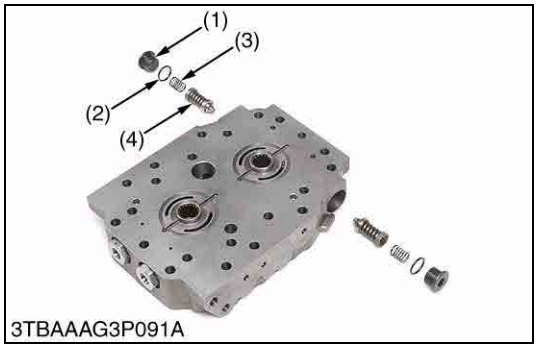


Check and High Pressure Relief Valve

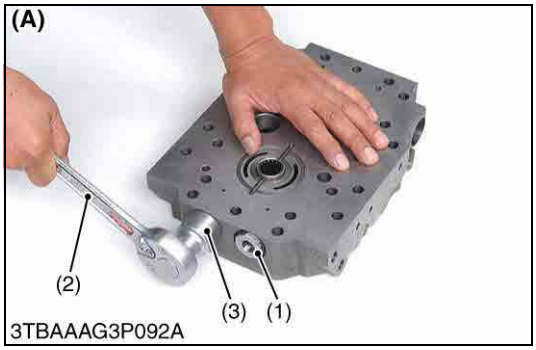
1. Remove the valve plug (1) with a hex. wrench.
2. Remove the spring (3) and the valve (4).

(When reassembling)

Tightening torque	Check and high pressure relief valve plug	59 to 78 N·m 6.1 to 7.9 kgf·m 44 to 57 lbf·ft

(1) Valve Plug
(2) O-ring
(3) Spring
(4) Valve

9Y1210822TRS0021US0



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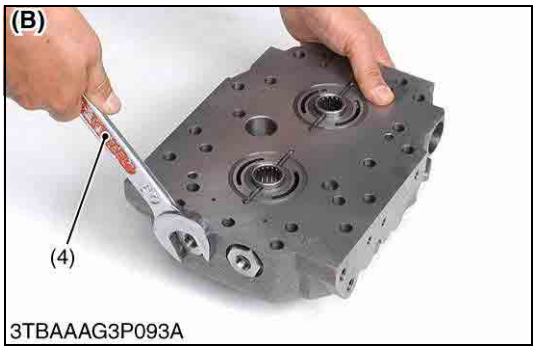

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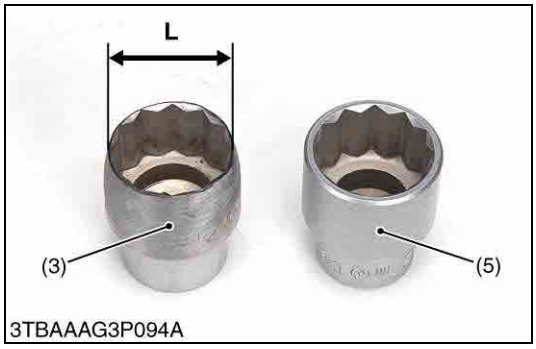

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Removing Neutral Valve

1. Remove the neutral valve (1) with the ratchet handle and the thin socket (27 mm).

(When reassembling)

Tightening torque	Neutral valve body	59 to 78 N·m 6.1 to 7.9 kgf·m 44 to 57 lbf·ft

(1) Neutral Valve
(2) Ratchet Handle
(3) Thin Socket (27 mm)
(4) Spanner (27 mm)
(5) Common Socket (27 mm)

(A) Using correct tools
(B) Using wrong tools
L : Outside diameter (Approx. 27 mm, 1.06 in.)

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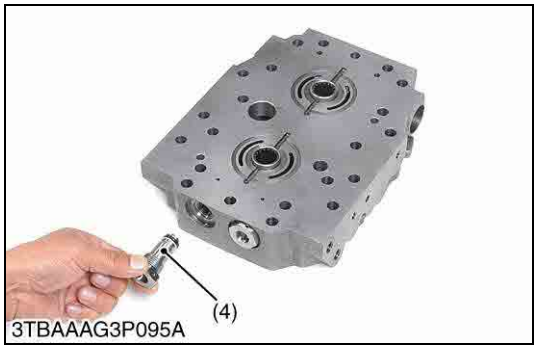

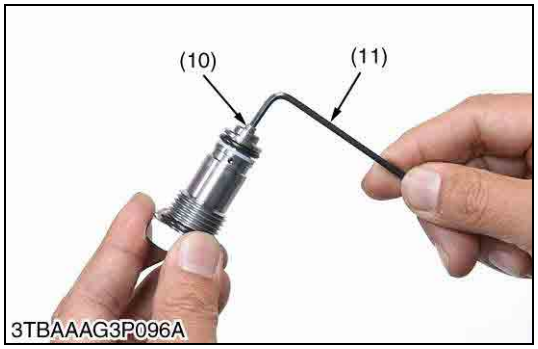

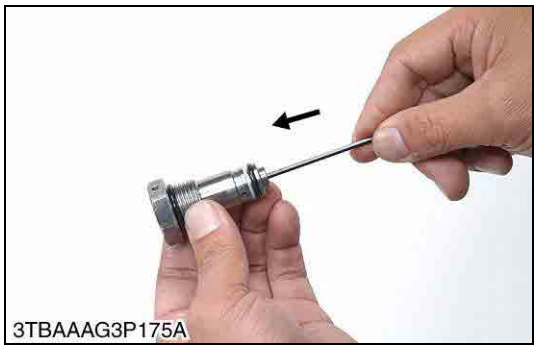

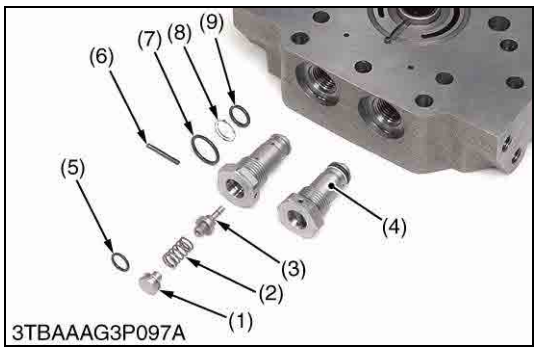

Neutral Valve

1. Remove the pin (6) from the neutral valve body (4).
2. Remove the plug (10) with 2.5 mm hex. wrench (11).
3. Push the neutral valve (3) with 2.5 mm hex. wrench (11) not to damage it.
4. Remove the inner parts from the neutral valve body (4).

(1) Plug
(2) Spring
(3) Neutral Valve
(4) Neutral Valve Body
(5) O-ring
(6) Pin
(7) Pin
(8) Back-up Ring
(9) O-ring
(10) Plug
(11) 2.5 mm Hex. Wrench

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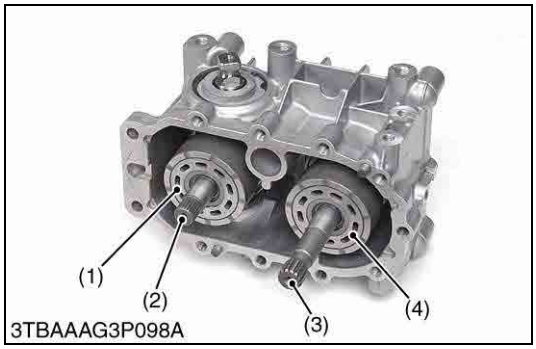

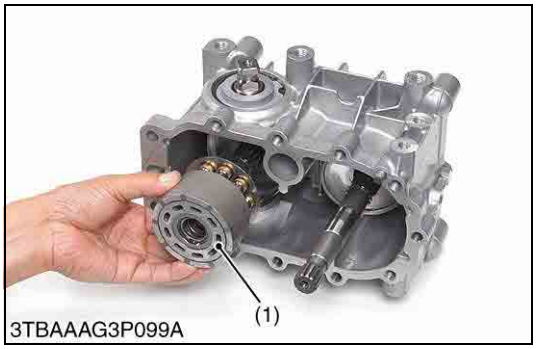

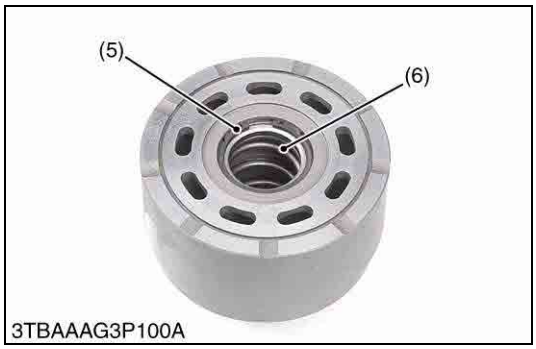

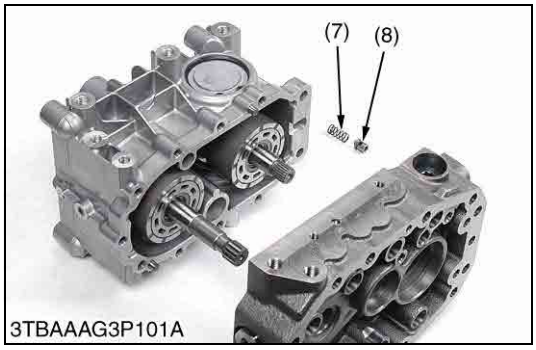

HST Housing Case Cylinder Blocks

1. Remove the cylinder blocks (1) (4) from the pump shaft (2) and the motor shaft (3).
2. Remove the circlip (5) and spring (6) from the cylinder block.

(When reassembling)

- Install the poppet (8) to the center section, not to drop it.
- Install the spring (7) to the HST housing side.

(1) Cylinder Block (Pump)
(2) Pump Shaft
(3) Motor Shaft
(4) Cylinder Block (Motor)
(5) Circlip
(6) Spring
(7) Spring
(8) Poppet

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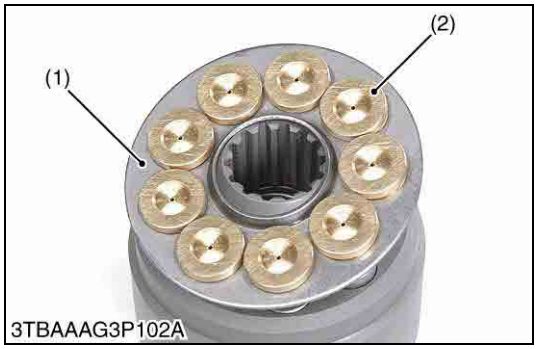

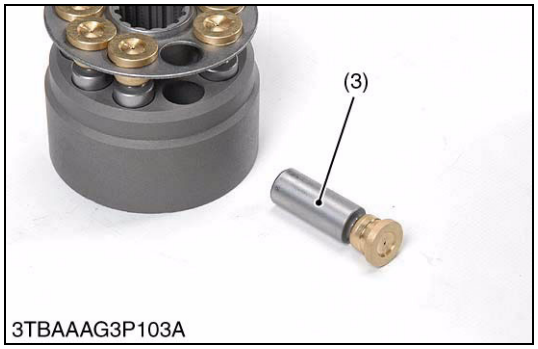

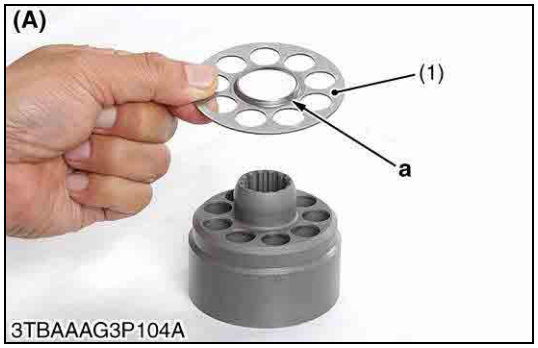

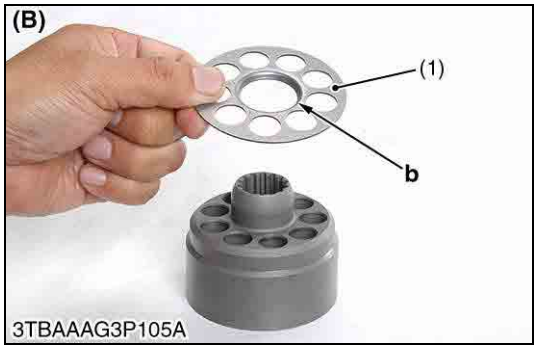

Piston and Retainer Plate

1. Remove the pistons (3) with the retainer plates (1).

(When reassembling)

- Install the piston to its original position of the cylinder block.
- Check the direction of the retainer plate (1) as shown in the picture.
- If the direction of the retainer plate is wrong, HST will not be operated properly.

(1) Retainer Plate
(2) Piston Slipper
(3) Piston

(A) Retainer Plate Correct Direction
(B) Retainer Plate Wrong Direction
a : Correct Direction
b : Wrong Direction

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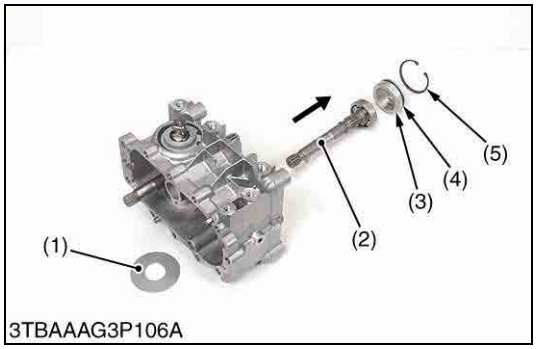

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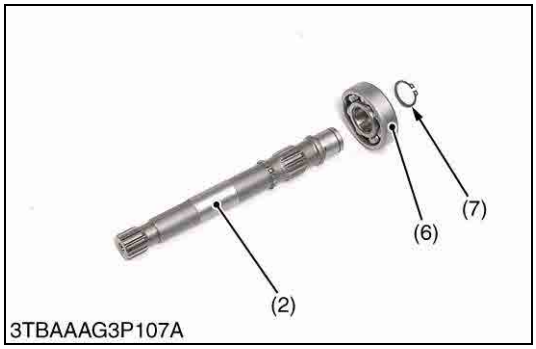

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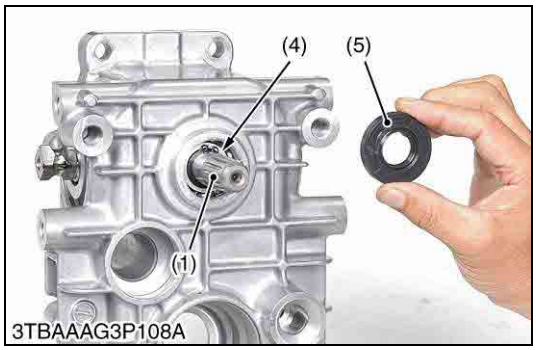

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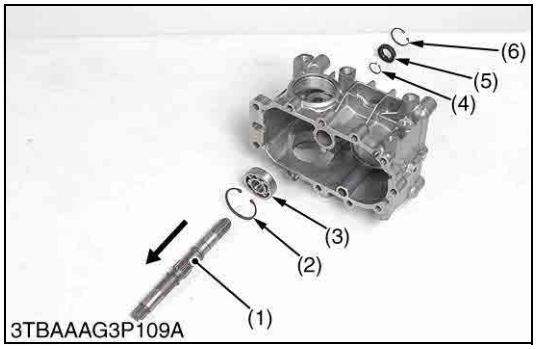

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Motor Shaft

1. Remove the internal circlip (5) from the HST housing.
2. Remove the cover with an O-ring.
3. Remove the motor shaft (2) with the ball bearing (6) from the HST housing.
4. Remove the external circlip from the motor shaft (2).
5. Remove the ball bearing (6) from the motor shaft (2).

(1) Thrust Collar
(2) Motor Shaft
(3) Cover
(4) O-ring
(5) Internal Circlip
(6) Ball Bearing
(7) External Circlip

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Pump Shaft

1. Remove the internal circlip (6) from the HST housing.
2. Remove the oil seal (5) from the HST housing.
3. Remove the external circlip (4) from the pump shaft (1).
4. Remove the internal circlip (2) from the HST housing.
5. Remove the pump shaft (1) to the cylinder block side.

(When reassembling)

- Replace the used oil seal with a new one.

(1) Pump Shaft
(2) Internal Circlip
(3) Ball Bearing
(4) External Circlip
(5) Oil Seal
(6) Internal Circlip

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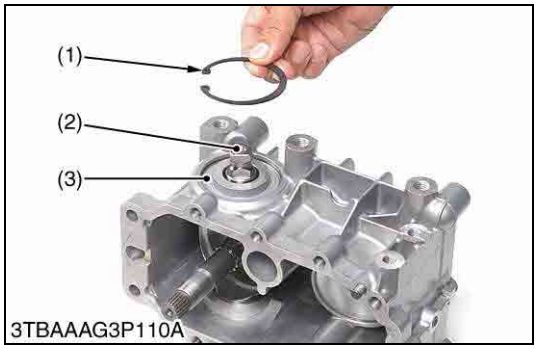

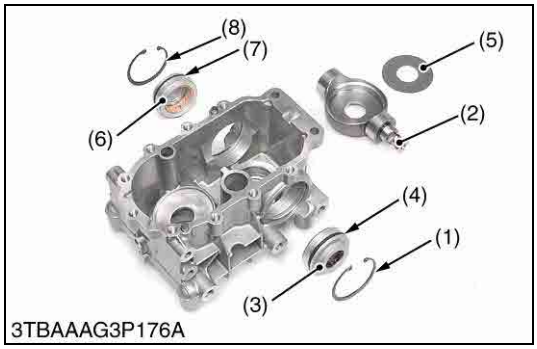

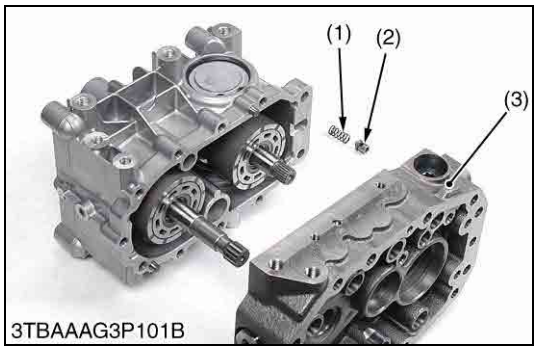

Trunnion Shaft

1. Remove the internal circlip (1) from the HST housing.
2. Remove the internal circlip (8) from the HST housing.
3. Strike out the trunnion shaft (2) slightly with a plastic hammer to the left side not to damage the O-rings (7) (4).
4. Remove the cover (3) with O-ring.
5. Remove the thrust collar using air blower.

(When reassembling)

- Check the O-rings for damage.

(1) Internal Circlip
(2) Trunnion Shaft
(3) Cover (RH)
(4) O-ring
(5) Thrust Collar
(6) Cover (LH)
(7) O-ring
(8) Internal Circlip

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Charge Relief Valve

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

(When reassembling)

- Check the spring for breakage and wear.

(1) Spring
(2) Poppet
(3) Center Section

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(4) PTO Clutch Case


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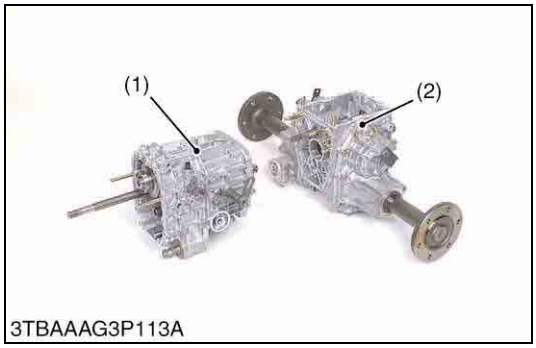

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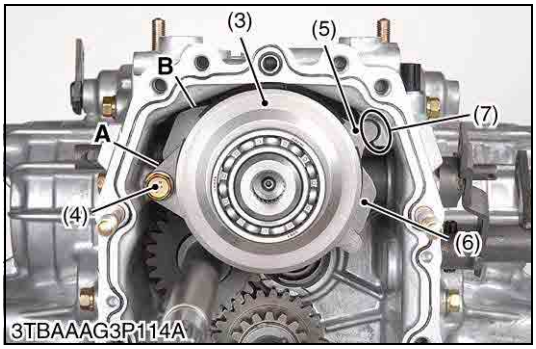

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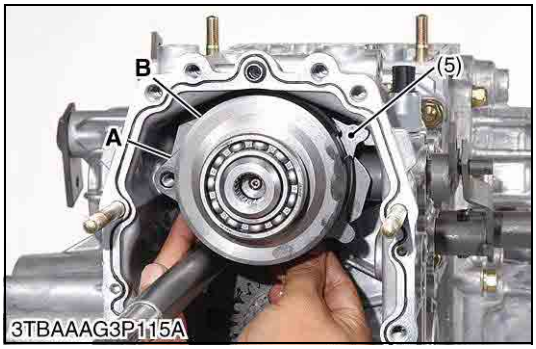

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Separating Transmission Case and PTO Clutch Case

1. Remove the transmission case mounting bolts.
2. Separate the transmission case (1) from the differential case (2).
3. Remove the PTO brake plate 4 mounting bolt (4).

(When reassembling)

- Install the PTO brake plate 4 (5) to the transmission case groove (7) securely as shown in the picture.
- Place the PTO brake plate 2 (6) between **A** and **B**.

Tightening torque	Transmission case mounting bolt (M10) and nut	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft
	Hydraulic cylinder mounting bolt (M10) and nut	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft

(1) Transmission Case
(2) Differential Case
(3) PTO Clutch Case
(4) PTO Brake Plate 4 Mounting Bolt
(5) PTO Brake Plate 4
(6) PTO Brake Plate 2
(7) Transmission Case Groove
A : Position
B : Position

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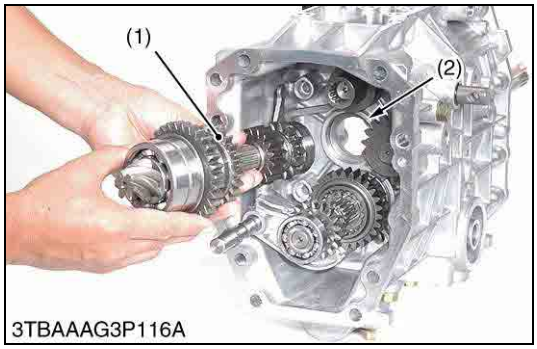
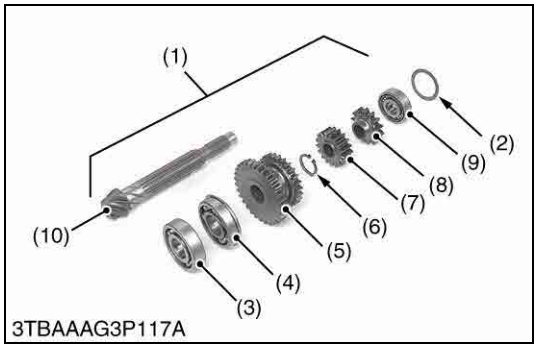
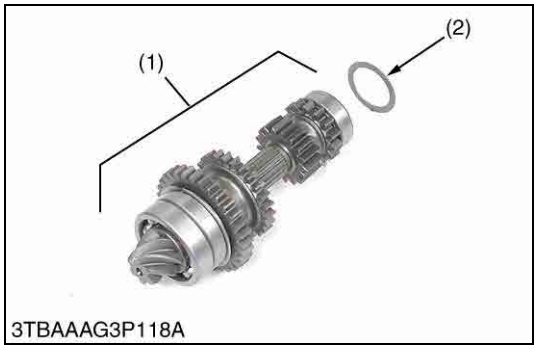
(5) Bevel Pinion Shaft







Bevel Pinion Shaft

1. Remove the bevel pinion shaft assembly (1) from the transmission case.
2. Remove the spacer (2).

(When reassembling)

- Install the spacer (2) to the transmission case.
- Install the bevel pinion shaft assembly (1).

(1) Bevel Pinion Shaft Assembly
(2) Spacer
(3) Ball Bearing
(4) Ball Bearing
(5) Gear (B2650: 25-29T, B3350: 24-29T)
(6) Circlip
(7) Gear (B2650: 17T, B3350: 15T)
(8) Gear (14T)
(9) Ball Bearing
(10) Bevel Pinion Shaft

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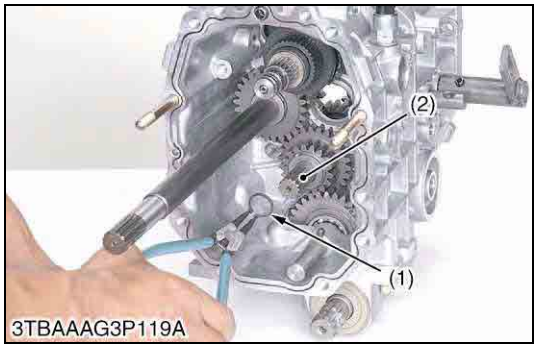
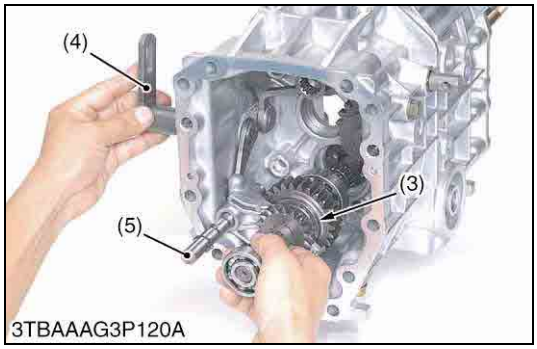
(6) Range Gear Shaft





Range Gear Shaft Assembly

1. Remove the circlip (1) from the range gear shaft (2).
2. Remove the spring pin from the shift arm lever (4).
3. Remove the range gear shaft assembly (3) and the fork rod (5) from the transmission case.

(1) Circlip
(2) Range Gear Shaft
(3) Range Gear Shaft Assembly
(4) Shift Arm Lever
(5) Fork Rod

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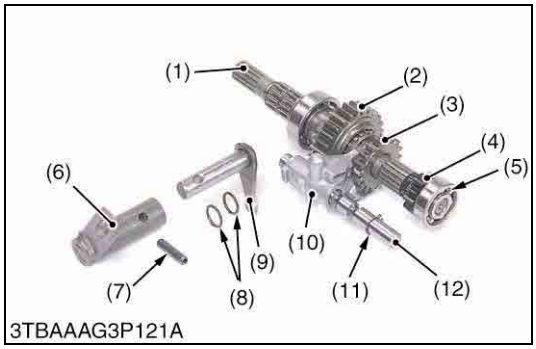

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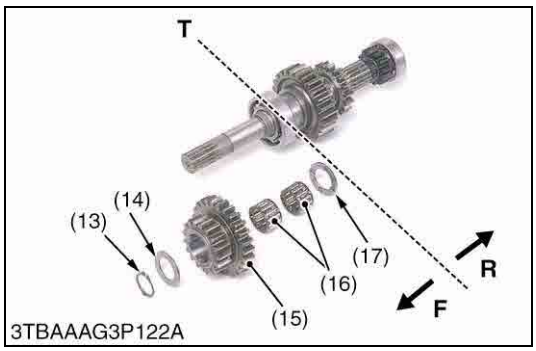

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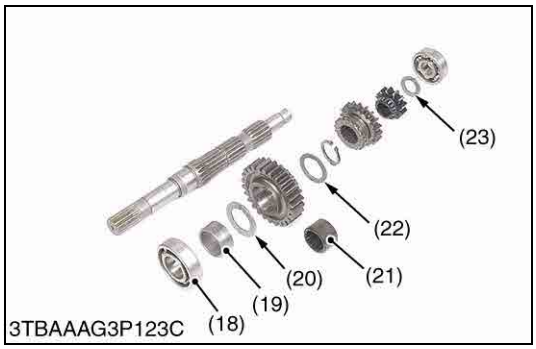

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Range Gear Shaft and Gears

1. Remove the ball bearing (5) from the range gear shaft (1).
2. Remove the 14T gear (4), the 18T (19T) gear (3) and the 26T (28T) gear (2).

(When reassembling)

- Install the range shift arm (9) to the range shift fork (10) securely.
- Install the O-rings (8) to the range shift arm (9).

(1) Range Gear Shaft
(2) Gear (B2650: 26T, B3350: 28T)
(3) Gear (B2650: 18T, B3350: 19T)
(4) Gear (14T)
(5) Ball Bearing
(6) Shift Arm Lever
(7) Spring Pin
(8) O-ring
(9) Range Shift Arm
(10) Range Shift Fork
(11) Circlip
(12) Fork Rod
(13) Circlip
(14) Collar
(15) Gear (17T-26T)
(16) Needle Bearing
(17) Collar
(18) Ball Bearing
(19) Collar
(20) Collar
(21) Inner Ring
(22) Collar
(23) Collar

T : Transmission Case
F : Front Case
R : Rear Side

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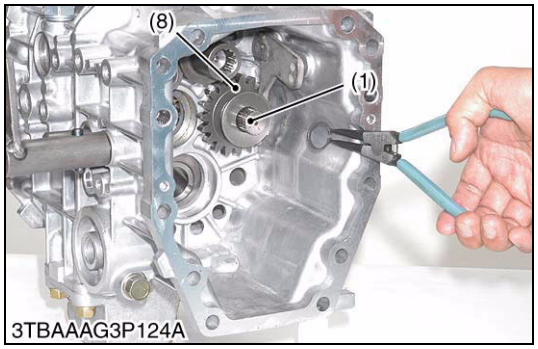
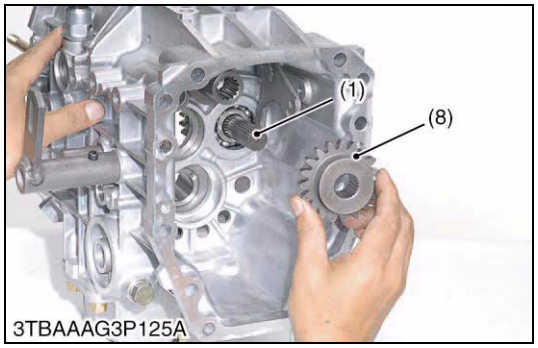
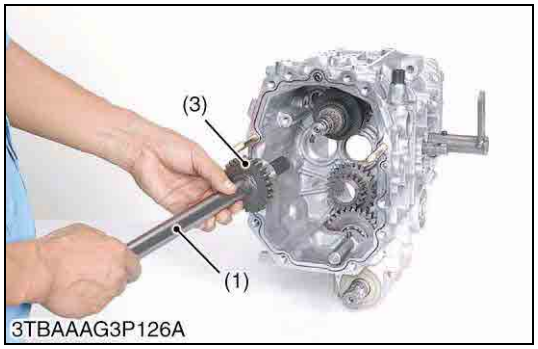
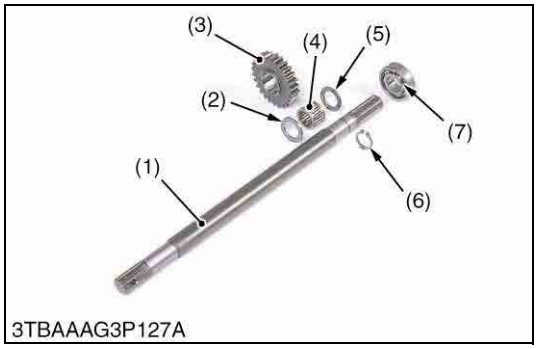
(7) Front Wheel Drive Shaft









4WD Shaft

1. Remove the circlip from the 4WD shaft (1).
2. Remove the 4WD gear (8) from the 4WD shaft (1).
3. Remove the 4WD shaft (1) with the 25T gear (3).
4. Remove the 25T gear (3) and the ball bearing (7).

(1) 4WD Shaft
(2) Collar
(3) 25T Gear
(4) Needle Bearing
(5) Collar
(6) Circlip
(7) Ball Bearing
(8) 4WD Gear (19T)

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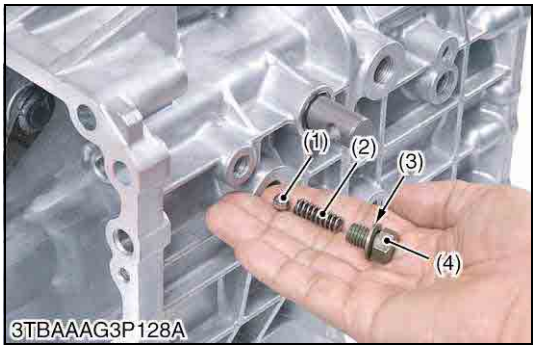

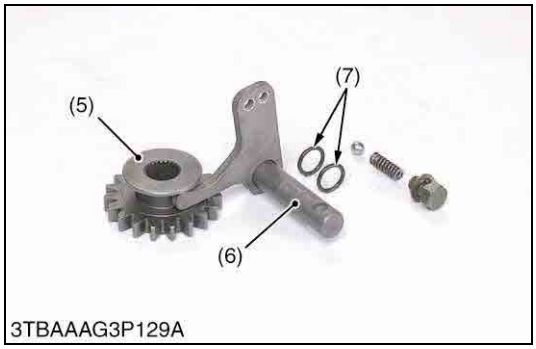

4WD Shift Lever

1. Remove the bolt (4) and the washer with rubber (3).

(When reassembling)

- Install the 4WD gear (5) to the 4WD shaft.
- Install the 4WD shaft arm (6) to the 4WD gear (5).
- Install the O-rings to the 4WD shift arm (6).

(1) Ball
(2) Spring
(3) Washer with Rubber
(4) Bolt
(5) 4WD Gear (19T)
(6) 4WD Shift Arm
(7) O-ring

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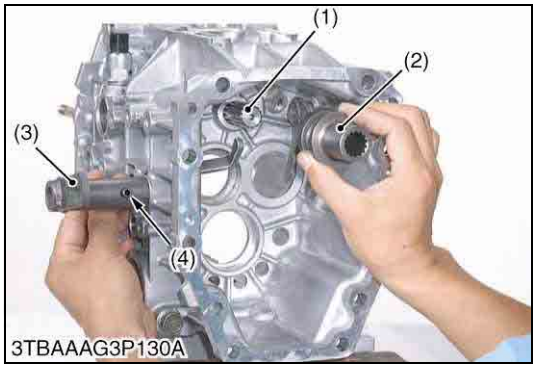
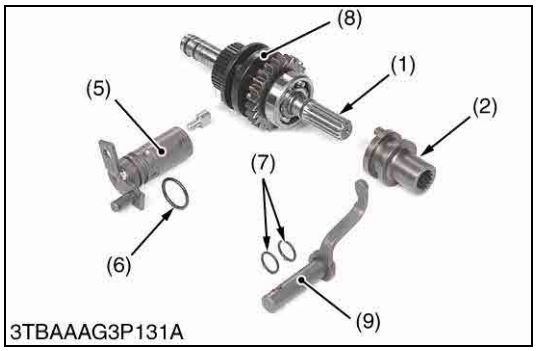
(8) Independent PTO Clutch Shifter





Rear PTO Shifter and Rear PTO Arm

1. Remove the rear PTO shifter (2) from the PTO clutch shaft (1).
2. Remove the spring pin (4) from the rear PTO arm (9).
3. Remove the PTO clutch shaft (1) and the PTO shifter as an assembly.

(When reassembling)

- Install the rear PTO arm (9) to the transmission case.
- After installing the PTO shifter (8) to the PTO clutch shaft (1), install the rear PTO arm (9) to the rear PTO shifter (2).
- Install the O-rings (7) to the rear PTO arm (9).
- Install the PTO lever (3) to the rear PTO arm (9).
- Install the spring pin (4) to the rear PTO arm (9).

(1) PTO Clutch Shaft
(2) Rear PTO Shifter
(3) PTO Lever
(4) Spring Pin
(5) PTO Shift Arm
(6) O-ring
(7) O-ring
(8) PTO Shifter
(9) Rear PTO Arm

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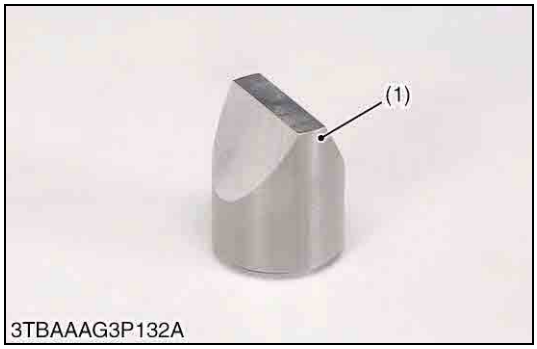

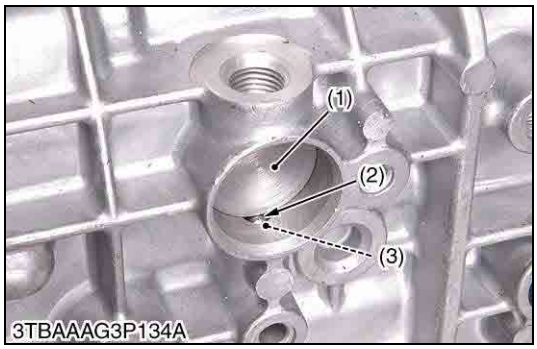

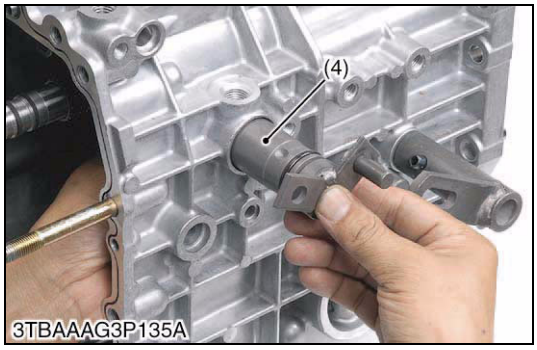

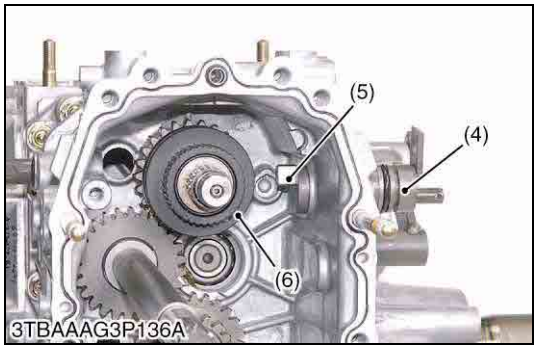

Installing PTO Shifter

1. Install the spring (3) and the ball (2) to the transmission.
2. Push the ball (2) by finger from the inside of the transmission case.
3. Push the PTO shift arm ball guide (1) into the transmission case as shown in the picture.
4. Push the PTO shift arm ball guide (1) with the PTO shift arm (4).
5. Install the PTO cotter (5) to the PTO shift arm (4).
6. Align the PTO cotter to the groove of the PTO shifter (6).

(1) PTO Shift Arm Ball Guide
(2) Ball
(3) Spring
(4) PTO Shift Arm
(5) PTO Cotter
(6) PTO Shifter

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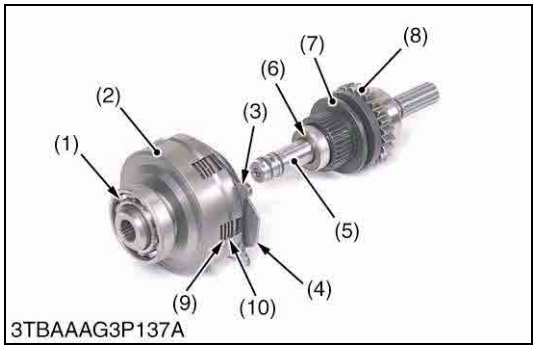
(9) Independent PTO Clutch



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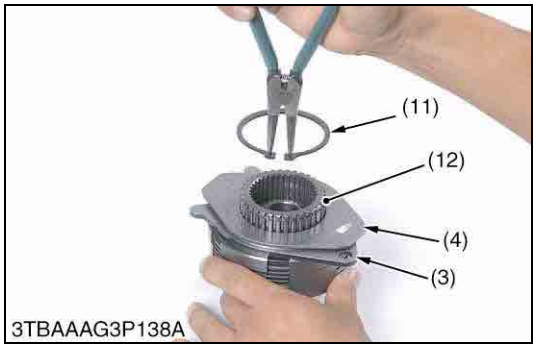

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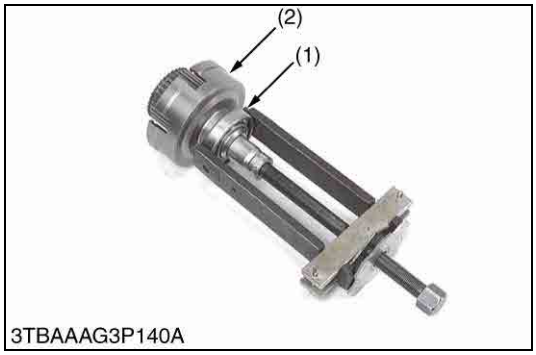

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PTO Clutch Case

1. Remove the external circlip (11) from the spline boss (12).
2. Remove the internal circlip (13) from the PTO clutch case (2).
3. Remove the clutch discs (9) and the clutch plates (10) from the PTO clutch case (2).
4. Remove the ball bearing (1) from the PTO clutch case (2) with a puller.

■ **NOTE**

- **When removing the circlip, use an adequate size circlip pliers.**

(1) Ball Bearing
(2) PTO Clutch Case
(3) Brake Plate 4
(4) Brake Plate 2
(5) PTO Clutch Shaft
(6) Thrust Bearing
(7) PTO Shifter
(8) 25T Mid PTO-gear
(9) Clutch Disc
(10) Clutch Plate
(11) External Circlip
(12) Spline Boss
(13) Internal Circlip

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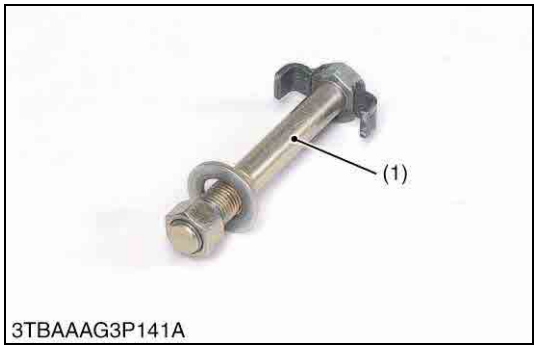

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PTO Clutch Spring

1. Set the PTO clutch spring compressor (1) to the PTO clutch case (2). (See page G-51)
2. Tighten the nut and remove the external circlip (3).
3. Remove the spring collar (4) and the PTO clutch spring (5).

(1) PTO Clutch Spring Compressor
(2) PTO Clutch Case
(3) External Circlip
(4) Spring Collar
(5) PTO Clutch Spring

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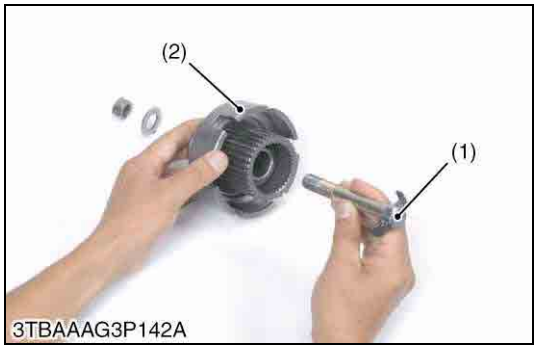

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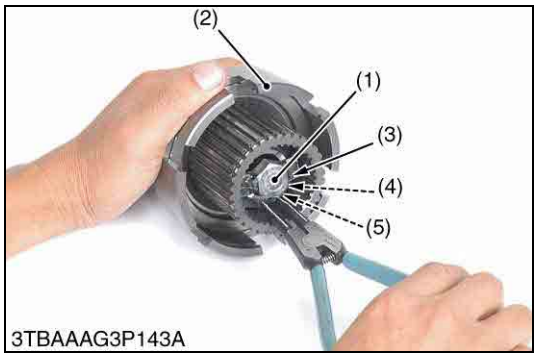

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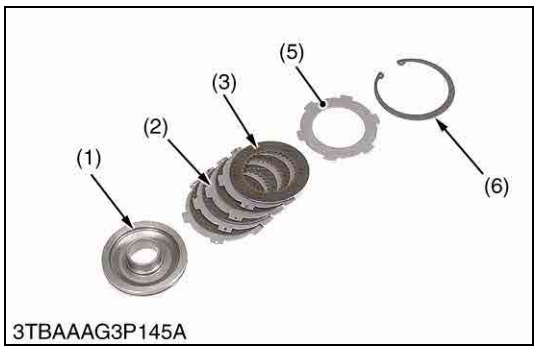


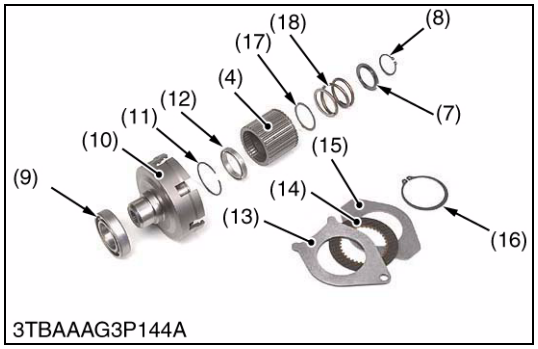
3TBAAAG3P145A

PTO Clutch Discs and Brake

1. After removing the inner circlip (6) from the PTO clutch case (10), remove the pressure plate (5).
2. Remove the clutch discs (3) and clutch plates (2).
3. Remove the external circlip (16) from the spline boss (4).
4. Remove the brake plate (15), the brake discs (14) and the brake plate (13).
5. After removing the external circlip (8) and the spring (18).

(When reassembling)

- Install the parts to the original positions.



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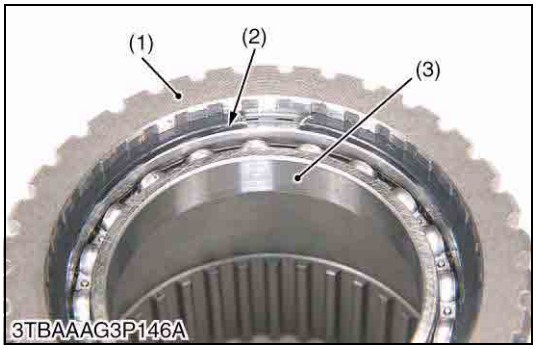
(1) Clutch Piston
(2) Clutch Plate
(3) Clutch Disc
(4) Spline Boss
(5) Pressure Plate
(6) Internal Circlip
(7) Spring Collar
(8) External Circlip
(9) Ball Bearing
(10) PTO Clutch Case
(11) Circlip
(12) Ball Bearing
(13) Brake Plate
(14) PTO Brake Disc
(15) Brake Plate
(16) External Circlip
(17) Bearing Collar
(18) Spring

9Y1210822TRS0040US0



Spline Boss Circlip

1. Push the circlip with a small screw driver through the small hole of the spline boss (1).
2. Lift the circlip (2) with a screw driver not to damage it.

(When reassembling)

- Install the circlip (2) holding it by hands.

(1) Spline Boss
(2) Circlip
(3) Ball Bearing

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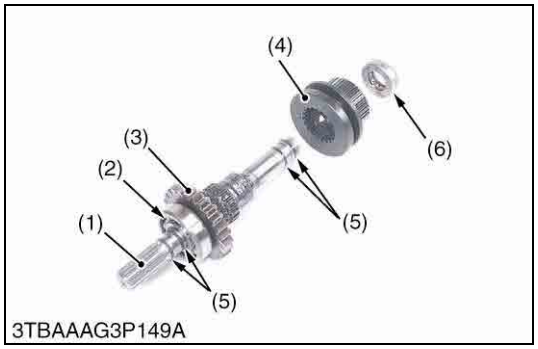

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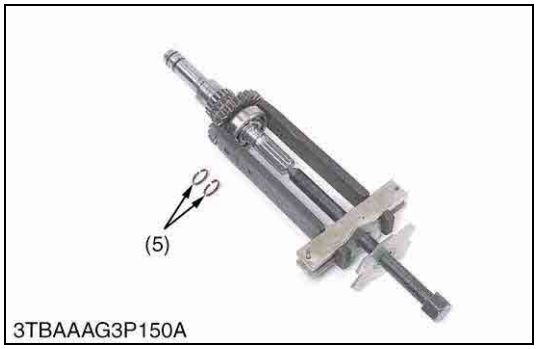

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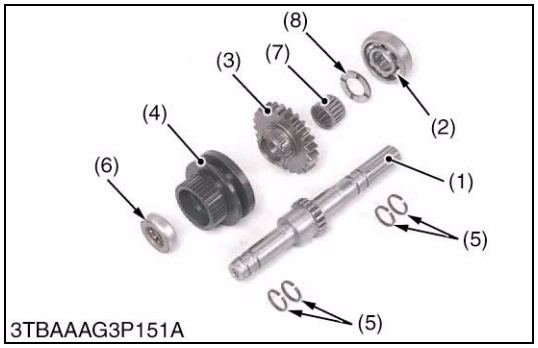

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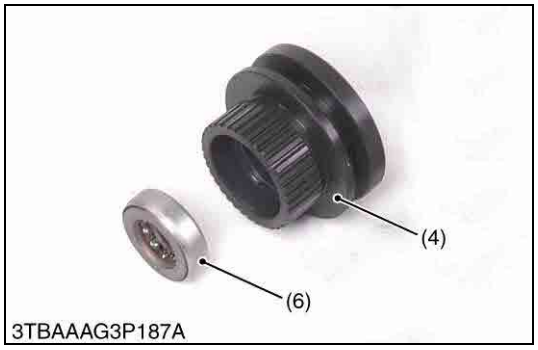

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PTO Shaft

1. Remove the thrust bearing (6) and the PTO shifter (4) not to damage the seal rings (5) located at the PTO shaft front side.
2. Remove the seal rings (5) located at the PTO shaft rear side.
3. Remove the ball bearing (2) with a puller.

(When reassembling)

- Check all seal rings (5).
- If the seal ring (5) is damaged, replace it.
- Check the direction of the thrust bearing (6) and install the thrust bearing (6) as shown in the picture.

(1) PTO Clutch Shaft
(2) Ball Bearing
(3) 26T Mid-gear
(4) PTO Shifter
(5) Seal Ring
(6) Thrust Bearing
(7) Needle Bearing
(8) Collar

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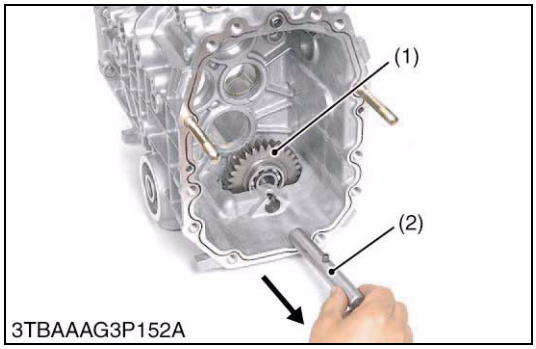
(10) Mid-PTO Section



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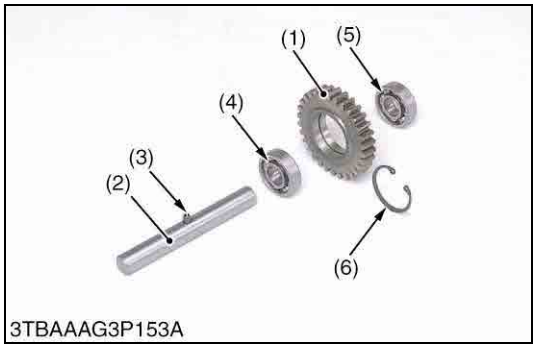

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Mid-Gear and Idle Shaft

1. Remove the idle shaft (2) from the transmission case using a screw driver.
2. Remove the mid-gear (1) from the transmission case.
3. Remove the ball bearings (4) (5) and the internal circlip (6) from the mid-gear (1).

(When reassembling)

- Install the internal circlip (6) to the inner groove of the mid-gear (1) securely.

(1) 30T Mid-Gear
(2) Idle Shaft
(3) Spring Pin
(4) Ball Bearing
(5) Ball Bearing
(6) Internal Circlip

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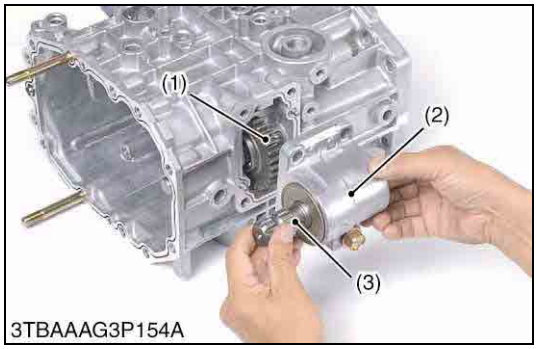

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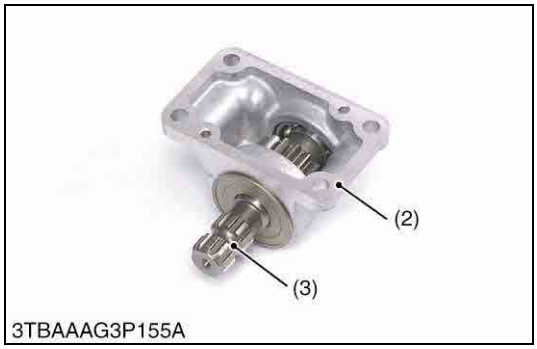

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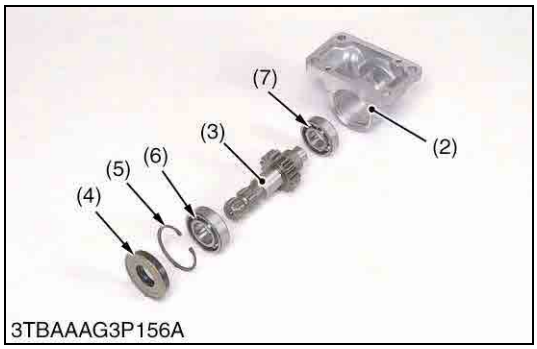

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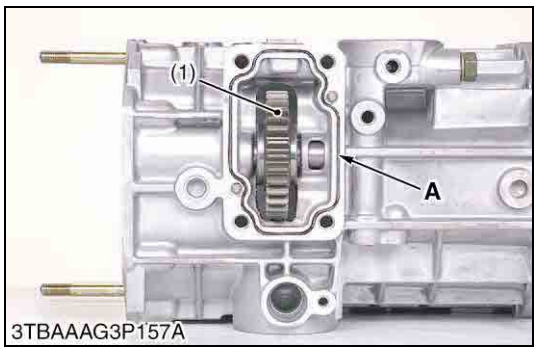

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Mid-PTO Case and Mid-Gear Shaft

1. Remove the mid-PTO case mounting bolts.
2. Remove the mid-PTO case from the transmission case.
3. Remove the mid-PTO oil seal (4) from the mid-PTO case (2) using a screw driver not to damage it.
4. Remove the internal circlip (5).
5. Remove the mid-gear shaft (3) with the ball bearings (6) (7).
6. Remove the bearing (6) (7) from the mid-gear shaft (3).

(When reassembling)

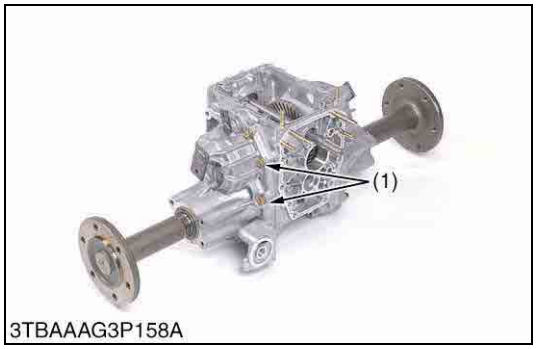
- If the mid-PTO oil seal (4) is damaged, worn or scratched, replace it.
- Apply grease to the lip and the outer of the mid-PTO oil seal (4).
- After installing the mid-gear (1), apply liquid gasket (Three Bond 1206D or equivalent) to the joint surface of transmission case and the mid-PTO case (2).

(1) 30T Mid-Gear
(2) Mid-PTO Case
(3) Mid-Gear Shaft (17T)
(4) Mid-PTO Oil Seal
(5) Internal Circlip
(6) Ball Bearing
(7) Ball Bearing

A : Joint Surface, Apply liquid gasket

9Y1210822TRS0044US0

(11) Differential Gear Section



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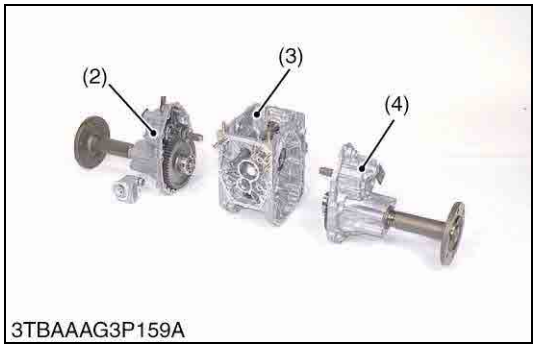

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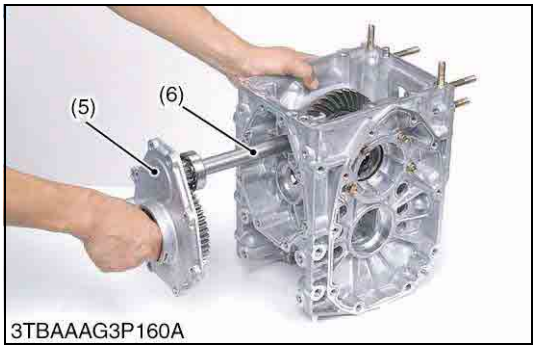

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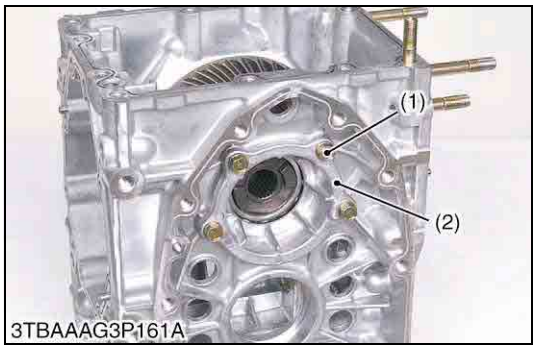

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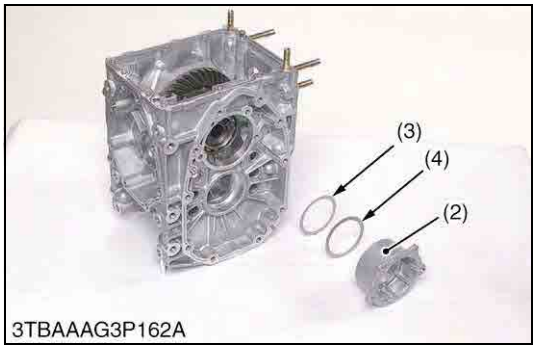

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Rear Axle Case and Rear PTO Cover

1. Remove the rear axle mounting bolts.
2. Remove the left rear axle case (4) and the right rear axle case (2) from the differential case (3).
3. Remove the rear PTO cover mounting bolts and the rear PTO cover (5).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to the joint surface of the rear axles cases and the rear PTO cover.

Tightening torque	Rear axle case (LH and RH) mounting bolt for aluminum material (M10)	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft
	Rear PTO cover mounting bolt for aluminum material (M10)	39.3 to 44.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft

(1) Rear Axle Case Mounting Bolt
(2) Right Rear Axle Case
(3) Differential Case
(4) Left Rear Axle Case
(5) Rear PTO Cover
(6) PTO Drive Shaft

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Differential Bearing Holder (RH)

1. Remove the differential holder mounting bolts (1).
2. Remove the differential holder (2) and shims (3) (4).

(When reassembling)

- 0.2 mm (0.008 in.) shim
- 0.5 mm (0.020 in.) shim

Tightening torque	Differential bearing holder mounting bolt for aluminum material (M8)	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 lbf·ft

(1) Differential Bearing Holder Mounting Bolt
(2) Differential Bearing Holder
(3) Shim
(4) Shim

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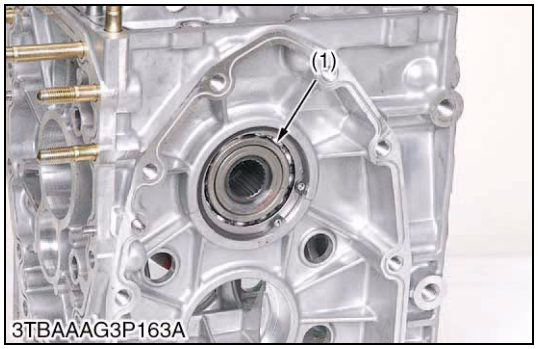

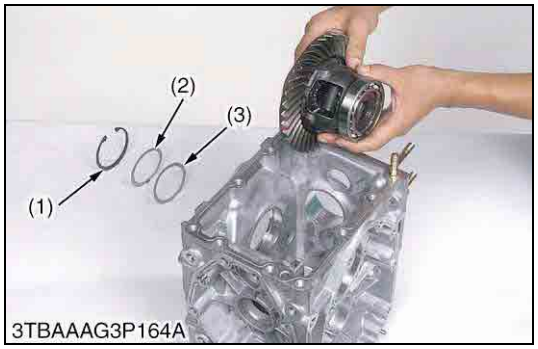

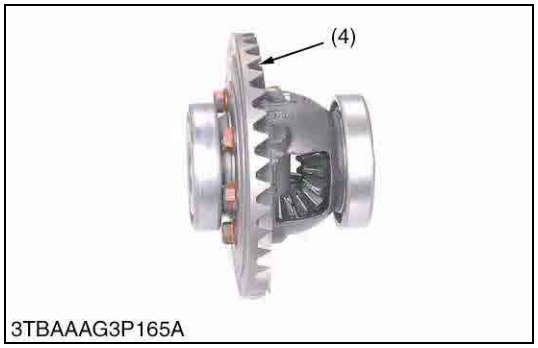

Differential Gear Assembly

1. Remove the internal circlip (1) from the differential case.
2. Remove the shims (2), (3).
3. Remove the differential gear assembly (4) from the differential case.

(When reassembling)

- 0.2 mm (0.008 in.) shim
- 0.5 mm (0.020 in.) shim

(1) Internal Circlip
(2) Shim
(3) Shim
(4) Differential Gear Assembly

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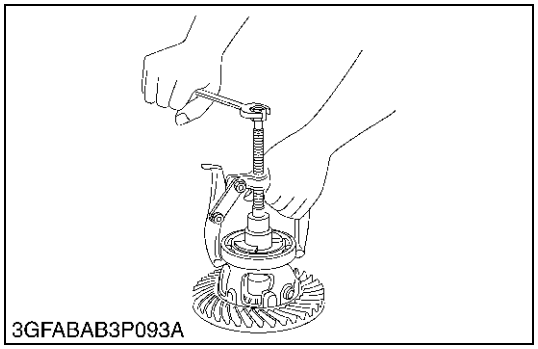

Bearings

1. Remove the right and left bearings from the differential case.

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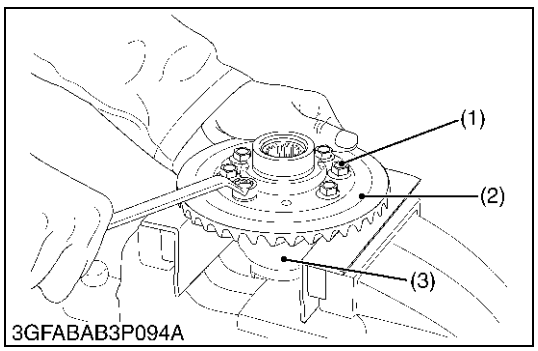

Spiral Bevel Gear

1. Remove the spiral bevel gear UBS screws (1).
2. Remove the spiral bevel gear (2) from differential case (3).

(When reassembling)

- Apply liquid lock (Three Bond 1324B or its equivalent) to the spiral bevel gear UBS screws.

Tightening torque	Spiral bevel gear UBS screw	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft

(1) Spiral Bevel Gear UBS Screw
(2) Spiral Bevel Gear
(3) Differential Case

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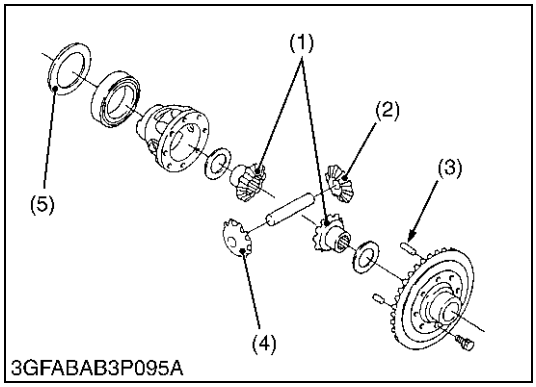


Differential Side Gear and Differential Pinion

1. Put parting marks on the differential pinion (1) and the differential side gear (2).
2. Tap out the dowel pin (3).
3. Remove the differential pinion shaft.
4. Remove the differential pinion (4), differential side gear (2) and shim (5).

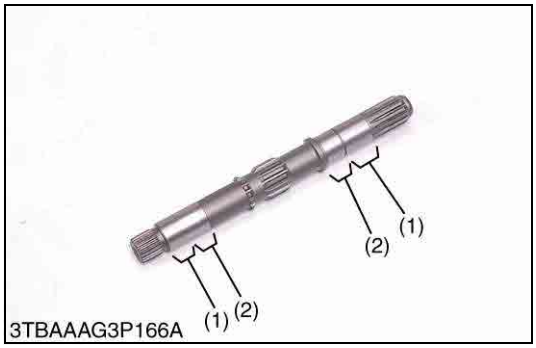
(When reassembling)

- Install the differential pinion and differential side gear, aligning the parting marks.

(1) Differential Pinion
(2) Differential Side Gear
(3) Dowel Pin
(4) Differential Pinion
(5) Shim

9Y1210822TRS0050US0

[4] SERVICING
(1) HST

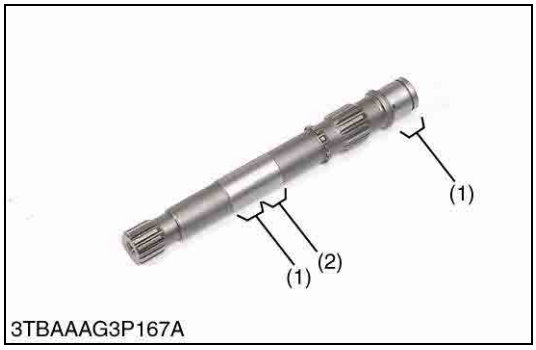


Pump Shaft

1. Pull out the pump shaft from the HST housing case.
2. Check the oil seal surface (1), the bearing surface (2) and the bearing.
3. If the shaft is rough or grooved, replace it.
4. If the bearing is worn, replace it.

(1) Oil Seal Surface
(2) Bearing Surface

9Y1210822TRS0051US0

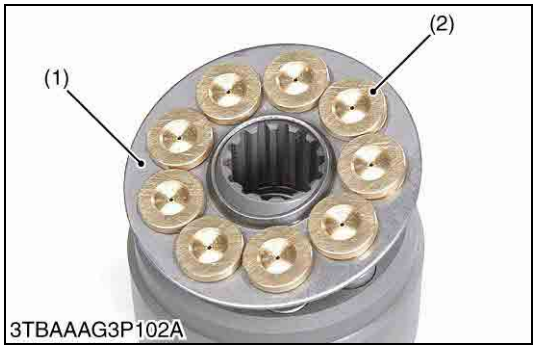


Motor Shaft

1. Pull out the motor shaft from the HST housing case.
2. Check the oil seal surface (1), the bearing surface (2) and the bearing.
3. If the shaft is rough or grooved, replace it.
4. If the bearing is worn, replace it.

(1) Oil Seal Surface
(2) Bearing Surface

9Y1210822TRS0052US0



Cylinder Block Bore and Pistons

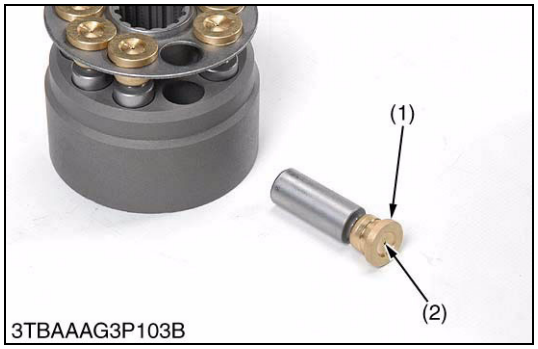
1. Lift all the pistons gently with the retainer plate (1).
2. Check the pistons for their free movement in the cylinder block bores.
3. If the piston or the cylinder block bore is scored, replace cylinder block assembly.

■ **IMPORTANT**

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

(1) Retainer Plate
(2) Piston Slipper

9Y1210822TRS0053US0



Piston Slipper and Retainer Plate

1. Check the slipper (1) for flatness.
2. If rounded, replace piston.
3. Measure the thickness of piston slipper.
4. If the measurement is less than the allowable limit, replace the piston.
5. Check the lubricant hole (2) for clogging.

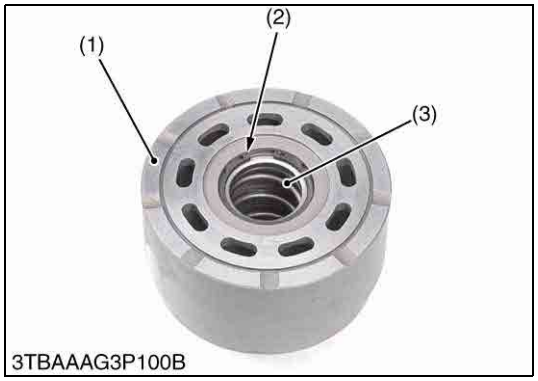
■ **IMPORTANT**

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

Thickness of slipper	Factory specification	3.00 mm 0.118 in.
	Allowable limit	2.90 mm 0.114 in.

(1) Piston Slipper
(2) Lubricant Hole

9Y1210822TRS0054US0

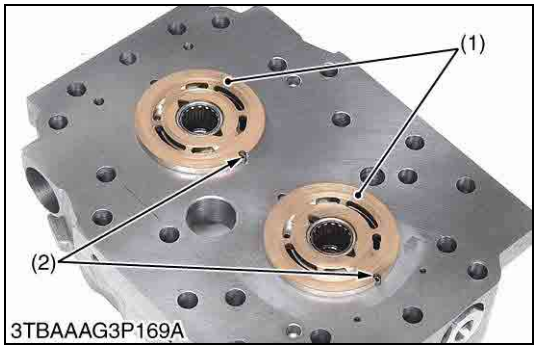


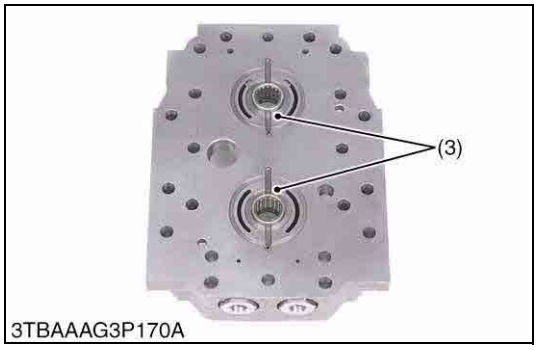
Cylinder Block Face

1. Check the polished face (1) of cylinder block for scoring.
2. If scored, replace cylinder block assembly.
3. Check the spring (3) for breakage.
4. If broken, replace cylinder block assembly.

(1) Polished Face
(2) Circlip
(3) Spring

9Y1210822TRS0055US0





Valve Plate and Center Section Face

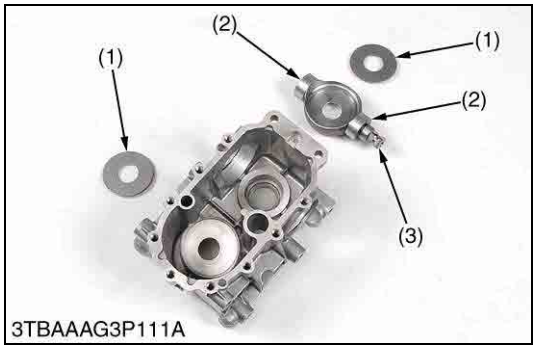
1. Check the engagement of the valve plate (1) and the anchor pin (2).
2. Pushing the valve plate (1) against the anchor pin (2), lift it to remove.
3. Check the valve plate (1) for foreign particles.
4. Clean the valve plate (1) and dry with compressed air.
5. Check the valve plate (1) for scratches, wear and erosion. (Run a finger nail across the valve plate surface. If worn, it will be felt.)
6. If worn or scored, replace it.

■ **NOTE**

- **After checking, coat them with hydrostatic transmission oil.**

(1) Valve Plate
(2) Anchor Pin
(3) Center Section Face

9Y1210822TRS0056US0

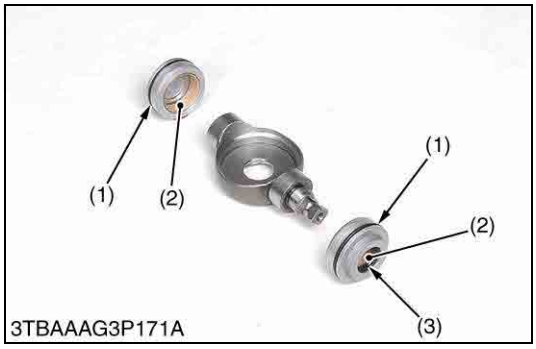


Thrust Plates and Bearing Surface

1. Check the thrust plate (1) for scratches and excessive wear.
2. If worn or scored, replace it.
3. Check the bearing surface (2) of trunnion shaft (swashplate) (3) for scratches and excessive wear.
4. If worn or scored, replace it.

(1) Thrust Plate
(2) Bearing Surface
(3) Trunnion Shaft

9Y1210822TRS0057US0



Trunnion Shaft Cover

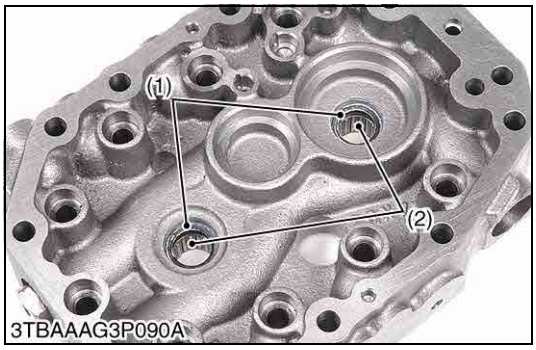
1. Check the bearing (2) for scratches and excessive wear.
2. If worn or scored, replace it.
3. Check the oil seal (3) and the O-rings (1) for damage.

■ **NOTE**

- **After checking, coat the bearings with hydrostatic transmission oil, and the oil seal lip and the O-rings (1) with grease.**

(1) O-ring
(2) Bearing
(3) Oil Seal

9Y1210822TRS0058US0



Center Section Oil Seals and Bearings

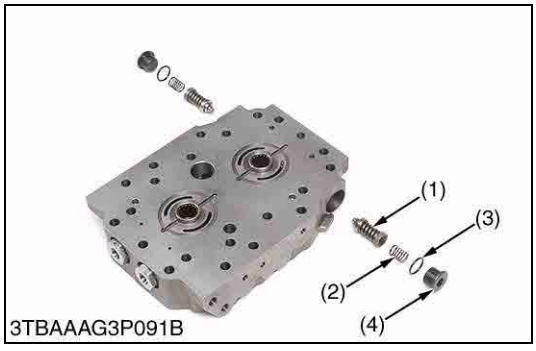
1. Check the oil seals (1) for damage.
2. Check the needle bearings (2) for wear.
3. If the needle bearings (2) and oil seals (1) are worn, replace all seals and needle bearings.

■ **NOTE**

- **After checking, coat the bearing with hydrostatic transmission oil and the oil seal lip with grease.**

(1) Oil Seal
(2) Needle Bearing

9Y1210822TRS0059US0



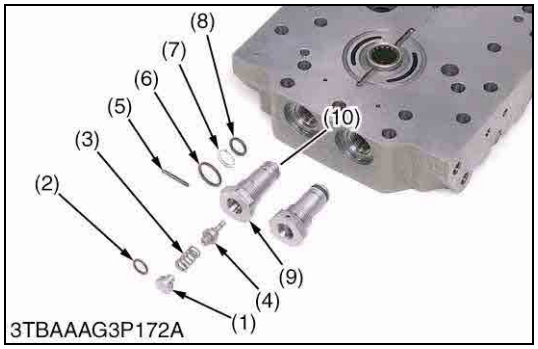
Check and High Pressure Relief Valve

1. Check the valve plug (4) and valve (1) for scratches and damage.
2. Check the valve seat in the port block for damage.
3. Check the spring (2) for breakage and wear.
4. If anything unusual, replace the check and high pressure relief valve assembly.

Tightening torque	Valve plug	59 to 78 N·m 6.1 to 7.9 kgf·m 44 to 57 lbf·ft

(1) Valve
(2) Spring
(3) O-ring
(4) Valve Plug

9Y1210822TRS0060US0



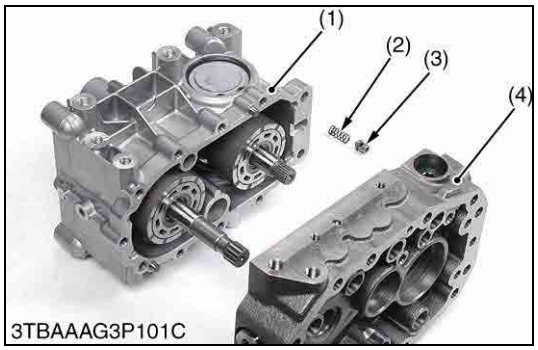
Neutral Valve

1. Check the holes of the valve body (9) and the neutral valve (4) for clogging.
2. If clogged, open hole with compressed air.
3. Replace the O-rings (2), (6), (8) and the backup ring (7) for scratches and damage.
4. Check the springs for breakage and wear.
5. If the valve surface is scored, replace it.
6. If anything is unusual, replace it.

Tightening torque	Neutral valve body	59 to 78 N·m 6.1 to 7.9 kgf·m 44 to 57 lbf·ft

(1) Plug
(2) O-ring
(3) Spring
(4) Neutral Valve
(5) Pin
(6) O-ring
(7) Backup Ring
(8) O-ring
(9) Valve Body
(10) Plug

9Y1210822TRS0061US0

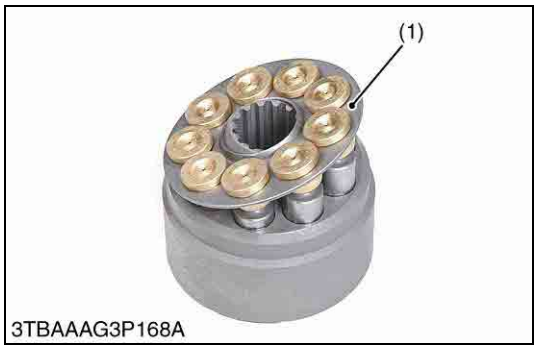


Charge Relief Valve

1. Check the spring (2) for breakage and wear.
2. If it is unusual, replace it.

(1) HST Housing
(2) Spring
(3) Poppet
(4) Center Section

9Y1210822TRS0062US0



Cylinder Block Bore and Pistons

1. Lift all the pistons gently with the retainer plate (1).
2. Check the pistons for their free movement in the cylinder block bores.
3. If the piston or the cylinder block bore is scored, replace cylinder block assembly.

■ **IMPORTANT**

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

Clearance between piston and bore	Factory specification	0.02 mm 0.0008 in.
	Allowable limit	0.04 mm 0.0016 in.

(1) Retainer Plate

9Y1210822TRS0063US0

(2) Independent PTO Clutch

Checking Bearing

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

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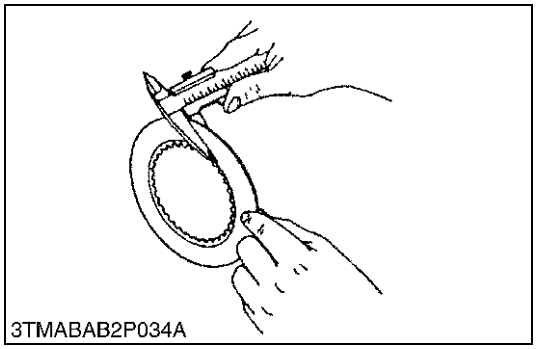
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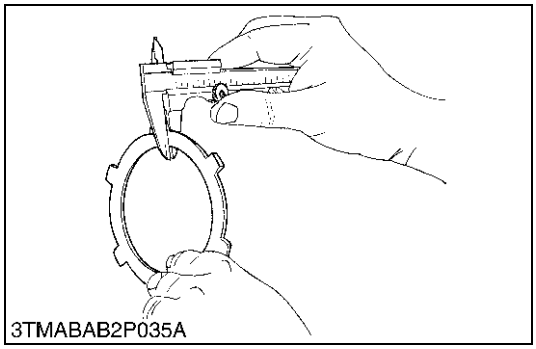
Clutch Disc Wear

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

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

9Y1210822TRS0065US0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Steel Plate and Pressure Plate Wear

1. Measure the steel plate thickness with vernier calipers.
2. Measure the pressure plate thickness with vernier calipers.
3. If the thickness is less than the allowable limit, replace.

Steel plate wear	Factory specification	1.15 to 1.25 mm 0.045 to 0.049 in.
	Allowable limit	1.10 mm 0.043 in.

Pressure plate wear	Factory specification	1.95 to 2.05 mm 0.0768 to 0.0807 in.
	Allowable limit	1.8 mm 0.071 in.

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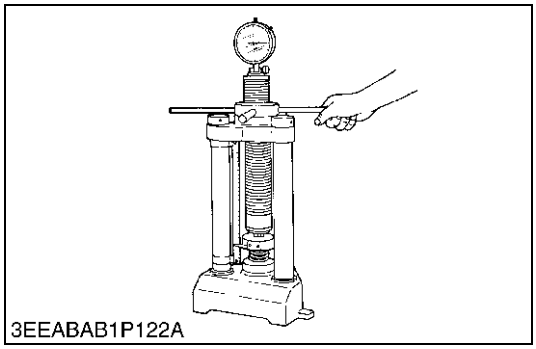
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Piston Return Spring Free Length and Tension

1. Measure the free length of the piston return spring with vernier calipers.
2. Place the piston return spring on a spring compression tester and compress to the specified length, and read the gauge.
3. If the measurement is less than the allowable limit, replace.

Piston / return spring free length	Factory specification	44.0 mm 1.73 in.

Piston return spring tension	Factory specification	638.7 N / 26 mm 65.13 kgf / 26 mm 143.6 lbf / 1.02 in.
	Allowable limit	539.4 N / 26 mm 55 kgf / 26 mm 121.3 lbf / 1.02 in.

9Y1210822TRS0067US0

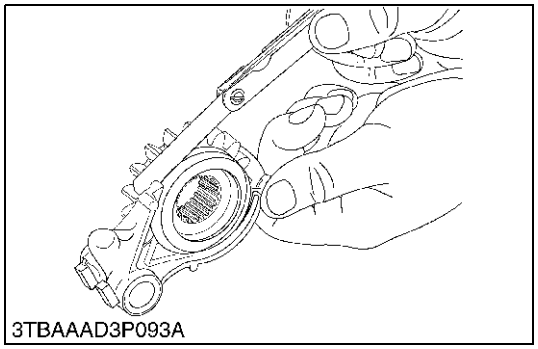
(3) Transmission Case


3TBAAAG3P174A

Checking Bearing

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

9Y1210822TRS0068US0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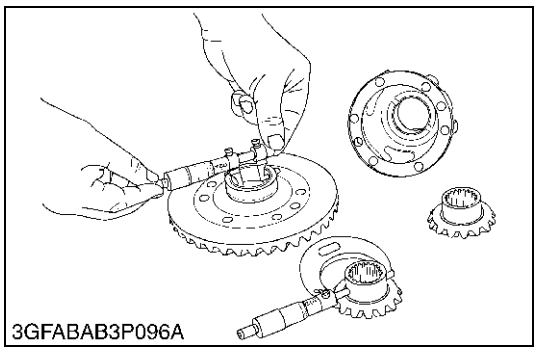
Clearance between Shift Fork and Shift Gear Groove

1. Insert the fork into the shift gear groove and measure the clearance with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace it.

Clearance between shift fork and shift gear groove	Factory specification	0.10 to 0.35 mm 0.004 to 0.014 in.
	Allowable limit	0.5 mm 0.020 in.

9Y1210822TRS0069US0

(4) Differential Gear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Clearance between Differential Case (Spiral Bevel Gear) and Differential Side Gear

1. Measure the differential side gear boss O.D. with an outside micrometer.
2. Measure the differential case I.D. and the spiral bevel gear I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case (spiral bevel gear) and differential side gear	Factory specification	0.025 to 0.066 mm 0.0010 to 0.0026 in.
	Allowable limit	0.30 mm 0.0118 in.

Differential case I.D.	Factory specification	32.000 to 32.025 mm 1.2598 to 1.2608 in.
Spiral bevel gear I.D.	Factory specification	32.000 to 32.025 mm 1.2598 to 1.2608 in.
Differential side gear O.D.	Factory specification	31.959 to 31.975 mm 1.2582 to 1.2589 in.

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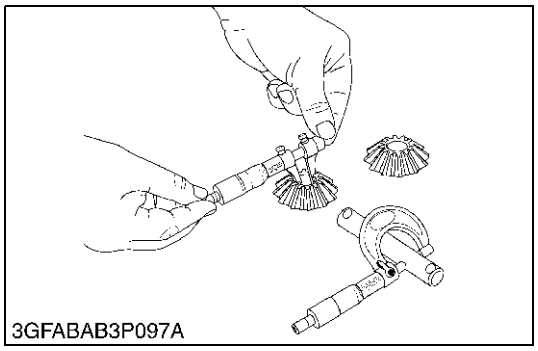
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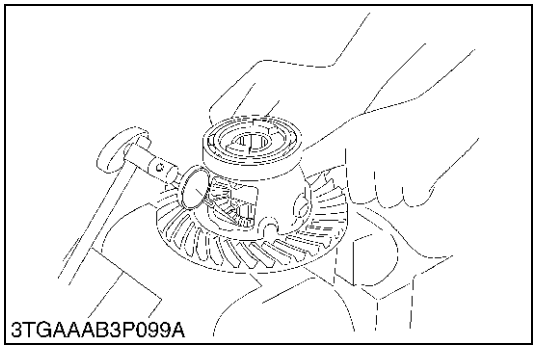
Clearance between Differential Pinion Shaft and Differential Pinion

1. Measure the differential pinion shaft O.D. with an outside micrometer.
2. Measure the differential pinion I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential pinion shaft and differential pinion	Factory specification	0.048 to 0.084 mm 0.0019 to 0.0033 in.
	Allowable limit	0.30 mm 0.0118 in.

Differential pinion I.D.	Factory specification	16.032 to 16.050 mm 0.63119 to 0.63188 in.
Differential pinion shaft O.D.	Factory specification	15.966 to 15.984 mm 0.62859 to 0.62929 in.

9Y1210822TRS0071US0



Backlash between Differential Pinion and Differential Side Gear

1. Secure the differential case with a vise.
2. Set the dial indicator (lever type) with its finger on the tooth of the differential side gear.
3. Press differential pinion and side gear against the differential case.
4. Hold the differential pinion and move the differential side gear to measure the backlash.
5. If the backlash exceeds the allowable limit, adjust with differential side gear shims.

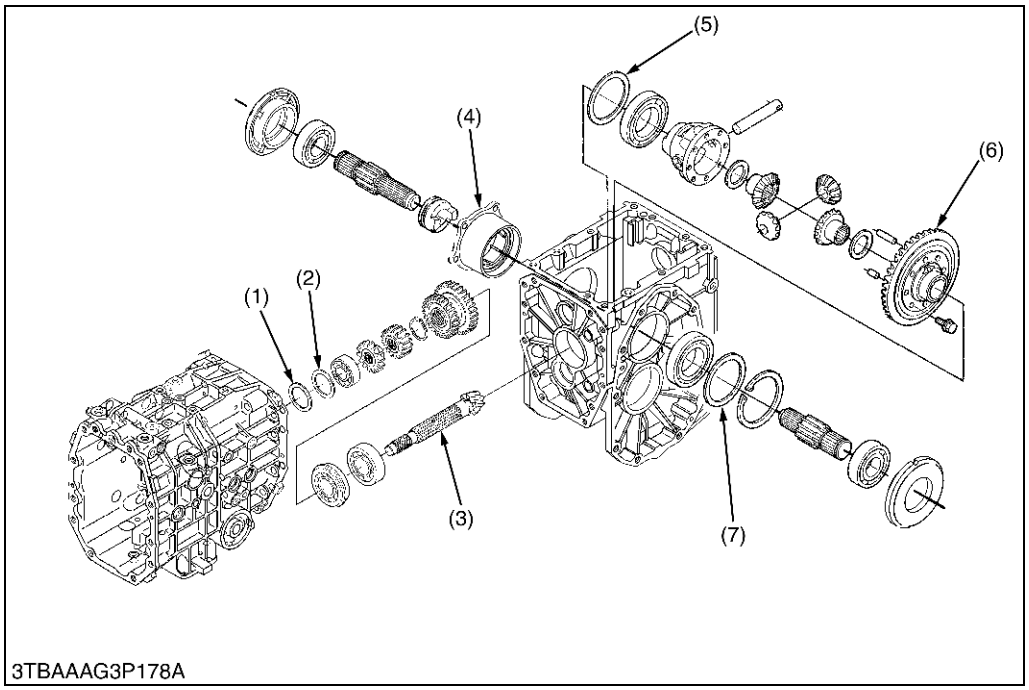
Backlash between differential pinion and differential side gear	Factory specification	0.1 to 0.3 mm 0.004 to 0.0012 in.
	Allowable limit	0.4 mm 0.016 in.

■ **NOTE**

- **Thickness of shims :**
  0.80 mm (0.0315 in.)
  1.00 mm (0.0394 in.)
  1.20 mm (0.0472 in.)

9Y1210822TRS0072US0

Backlash between Spiral Bevel Pinion and Spiral Bevel Gear



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(1) Shim
(2) Shim
(3) Spiral Bevel Pinion
(4) Bearing Holder
(5) Shim
(6) Spiral Bevel Gear
(7) Shim

1. Set the dial indicator (lever type) with its finger on the end of spiral bevel pinion (3).
2. Move the spiral bevel pinion back and forth to each end and measure the side clearance.
3. If the side clearance exceeds the factory specifications, adjust with the shims (2) at front end of spiral bevel pinion.
4. Set the dial indicator (lever type) with its finger on the tooth surface of bevel gear.
5. Measure the backlash by fixing the spiral bevel pinion (3) and moving bevel gear (6) by hand.
6. If the backlash exceeds the factory specifications, adjust with the shims (2), (5), (7) at bearing holder (4) and differential case.
7. Adjust the backlash properly by repeating the above procedure.

(When adjusting)

Movement of spiral bevel pinion shaft at shaft directions	Factory specification	Approx 0 mm 0 in.
Backlash between spiral bevel pinion and spiral bevel gear	Factory specification	0.10 to 0.30 mm 0.0039 to 0.0012 in.

(Reference)

- Thickness of shims (1), (2):
  0.2 mm (0.008 in.)
  1.4 mm (0.055 in.)
- Thickness of shims (5), (7) :
  0.2 mm (0.008 in.)
  0.5 mm (0.020 in.)

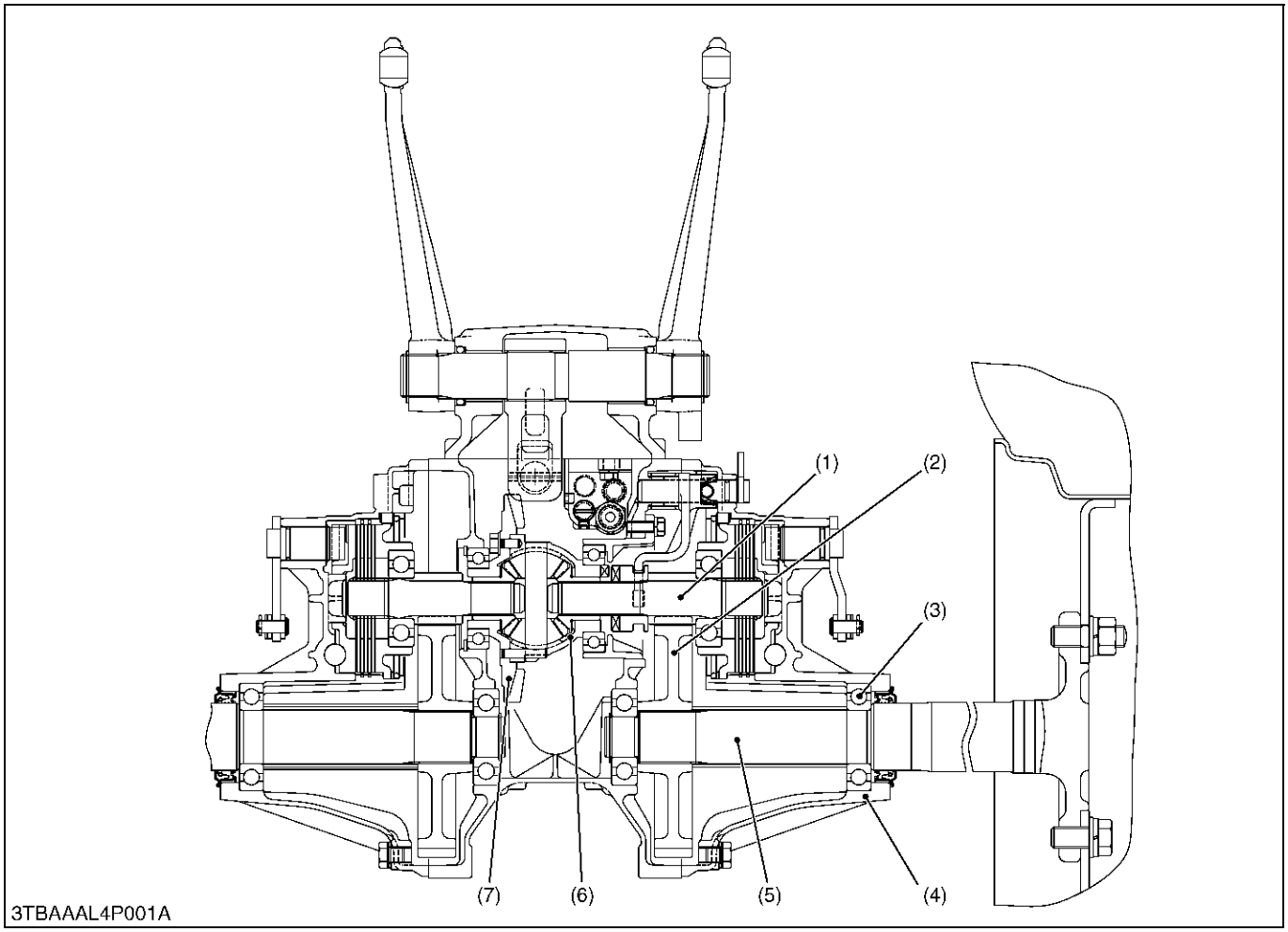
9Y1210822TRS0073US0

3 REAR AXLE

MECHANISM

CONTENTS

1. STRUCTURE



(1) Differential Gear Shaft
(2) 57T Spur Gear
(3) Ball Bearing
(4) Rear Axle Case
(5) Rear Axle
(6) Differential Gear
(7) Spiral Bevel Gear

The rear axles are the semifloating type with ball bearings (3) between the rear axle (5) and the rear axle case (4), which supports the rear wheel load as well as transmitting power to the rear wheels.

The differential gears (6) automatically controls the revolution of right and left wheels when the rear wheels encounter unequal road resistance during turning.

9Y1210822RAM0001US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	Improper backlash between differential gear shaft and final reduction gear	Replace	2-S50, 2-S51
	Bearing worn	Replace	3-S5, 4-S8
	Insufficient or improper type of transmission fluid used	Fill or change	G-9, G-20
Noise while Turning	Brake shaft and 57T gear and internal gear worn or damaged	Replace	3-S5, 4-S8

9Y1210822RAS0001US0

2. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	167 to 191	17 to 19.5	123 to 141
Rear wheel mounting bolt	196 to 225	20 to 23	145 to 166
Front loader valve pipe joint bolt	48 to 55	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 1 joint bolt	48 to 55	4.9 to 5.7	36 to 41
3-point hitch delivery pipe joint bolt	50 to 59	5.1 to 6.1	37 to 44
3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 55	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 59	5.1 to 6.1	37 to 44
Rear axle case mounting screw	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw (M10) for aluminum	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw	48 to 55	4.9 to 5.7	36 to 41
Sub frame mounting bolt (M12) and nut	78 to 90	7.9 to 9.2	58 to 66

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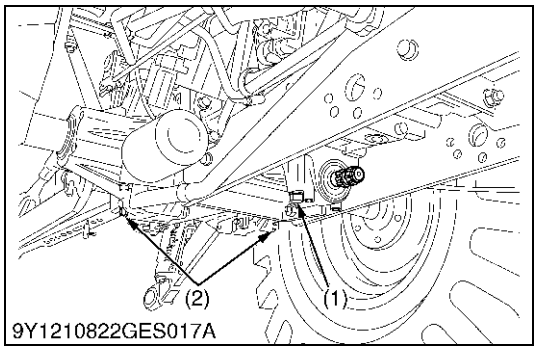
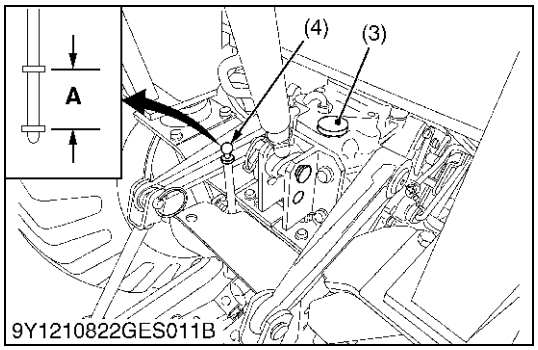
3. DISASSEMBLING AND SERVICING

[1] DISASSEMBLING AND ASSEMBLING

(1) Separating Rear Axle Case





Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1) and (2).
2. Drain the transmission fluid.
3. Reinstall the drain plugs (1) and (2).

(When refilling)

- Fill new oil from filling port after removing the filling plug (4) up to the upper notch on the dipstick (3).
- After running the engine for a few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	15 L 4.0 U.S.gals 3.3 Imp.gals

(1) Drain Plug
(2) Drain Plug (Both Sides)
(3) Dipstick
(4) Filling Plug

A: Proper Oil Level

9Y1210822RAS0003US0

Battery Cable

1. Open the bonnet and remove the side cover.
2. Disconnect the battery negative cable (1).

■ **NOTE**

- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, the positive cable first.**

(1) Battery Negative Cable

9Y1210822RAS0004US0

Rear Wheel

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (1).

Tightening torque	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting screw	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Rear Wheel

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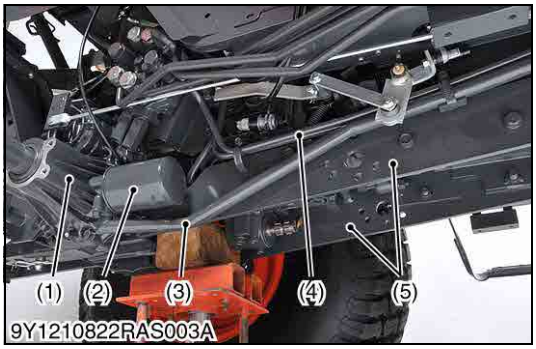
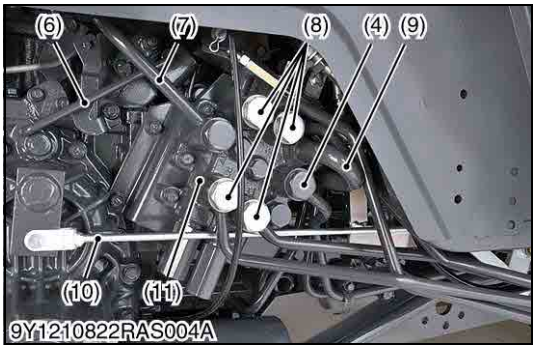




Rear Axle Case

1. Remove the brake rod (10).
2. Remove the front loader valve pipes (8), 3-point hitch delivery pipe 2 (7) and return hose (9).
3. Remove the pipe clamps, 3-point hitch delivery pipe 1 (4) and suction pipe (3).
4. Remove the oil filter bracket with oil filter (2).
5. Remove the sub frame (5).
6. Remove the loader valve assembly (11).
7. Remove the differential lock rod (6).
8. Remove the rear axle case (1).

(When reassembling)

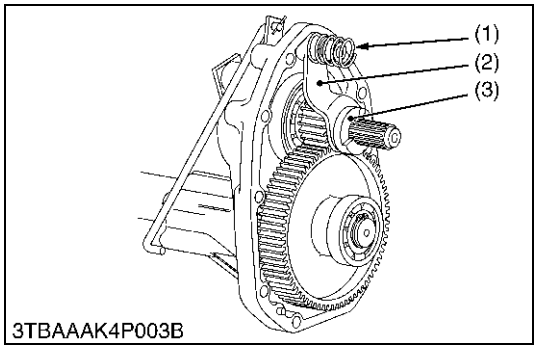
- Do not damage the O-rings of front loader valve pipes and delivery pipes.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the rear axle case and differential gear case after eliminating the water and oil.

Tightening torque	Front loader valve pipe joint bolt	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe joint bolt	50 to 59 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 59 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	Rear axle case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw (M10) for aluminum	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Sub frame mounting bolt (M12) and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Rear Axle Case
(2) Oil Filter
(3) Suction Pipe
(4) 3-Point Hitch Delivery Pipe 1
(5) Sub Frame
(6) Differential Lock Rod
(7) 3-Point Hitch Delivery Pipe 2
(8) Front Loader Valve Pipe
(9) Return Hose
(10) Brake Rod
(11) Loader Valve Assembly

9Y1210822RAS0006US0

(2) Disassembling Rear Axle Case



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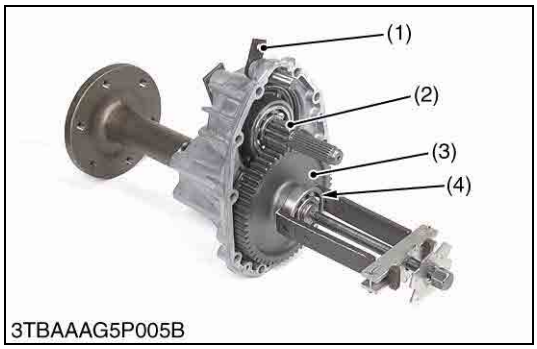

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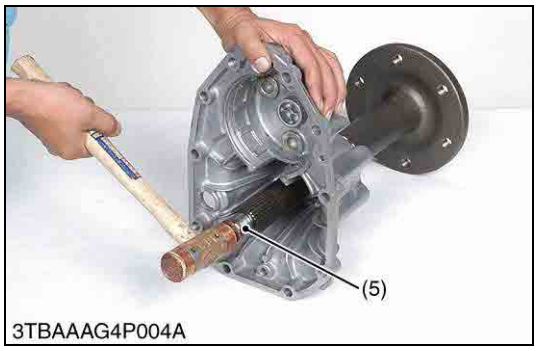

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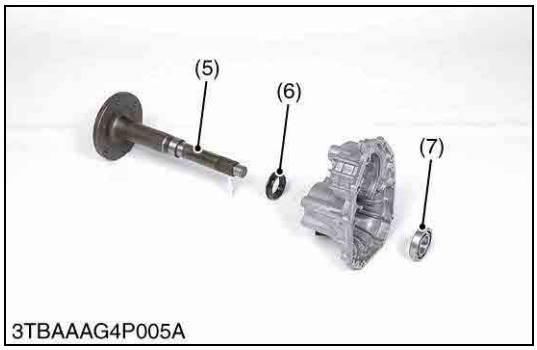

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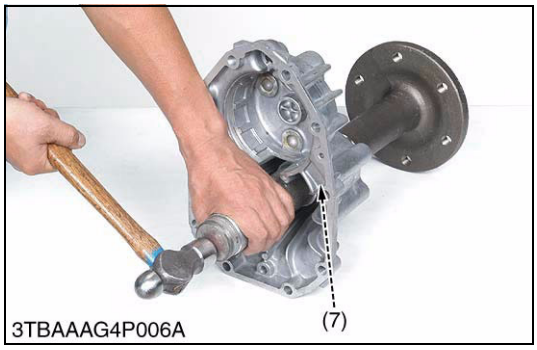

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Differential Lock Shift Fork, Differential Lock Clutch (Right Side Only)

1. Remove the spring (1).
2. Draw out the differential lock shift fork (2) and differential lock clutch (3).

(1) Spring
(2) Differential Lock Shift Fork
(3) Differential Lock Clutch

9Y1210822RAS0007US0

Rear Axle Shaft

1. Remove the fork rod (1).
2. Remove the ball bearing (4) with a puller.
3. Remove the gear (3).
4. Remove the brake shaft assembly (2).
5. Tap out the rear axle shaft (5) with a rubber hammer to the outside.

(When reassembling)

- Tap in the bearing to the rear axle case.

(1) Fork Rod
(2) Brake Shaft Assembly
(3) 57T Gear
(4) Ball Bearing
(5) Rear Axle Shaft
(6) Oil Seal
(7) Ball Bearing

9Y1210822RAS0008US0

[2] SERVICING

Checking 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 problem, replace it.

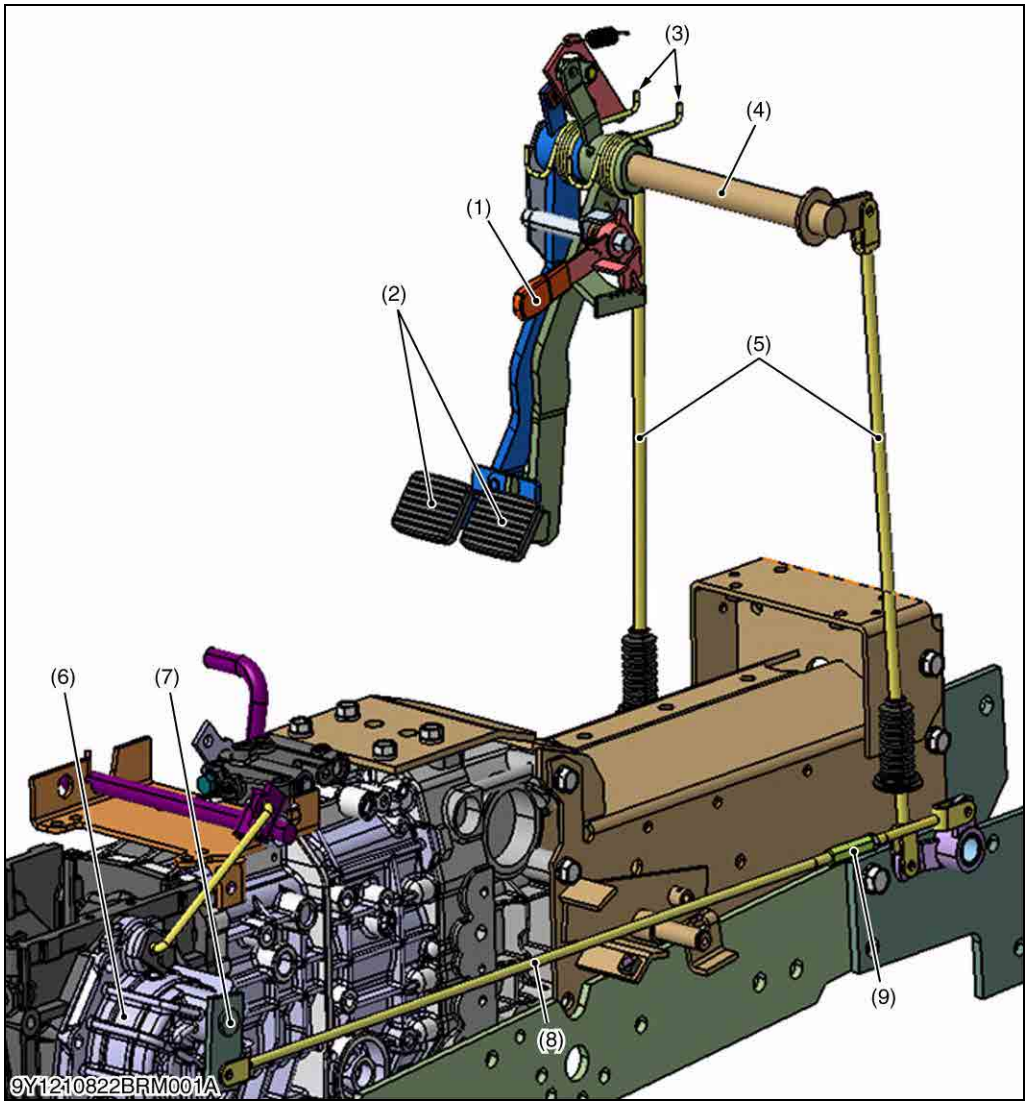
9Y1210822RAS0009US0

4 BRAKES

MECHANISM

CONTENTS

1. LINKAGE



(1) Parking Brake Lever
(2) Brake Pedal
(3) Spring
(4) Brake Pedal Shaft
(5) Brake Pedal Rod
(6) Rear Axle Case
(7) Brake Cam Lever
(8) Brake Rod
(9) Turnbuckle
(10) Brake Lever

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 and provide stable braking and require little adjustment.

The parking brake is a mechanical type which is designed to actuate the traveling brakes through the linkages. Pulling the parking brake lever (1) results in the same state as the obtained when the brake pedals are depressed.

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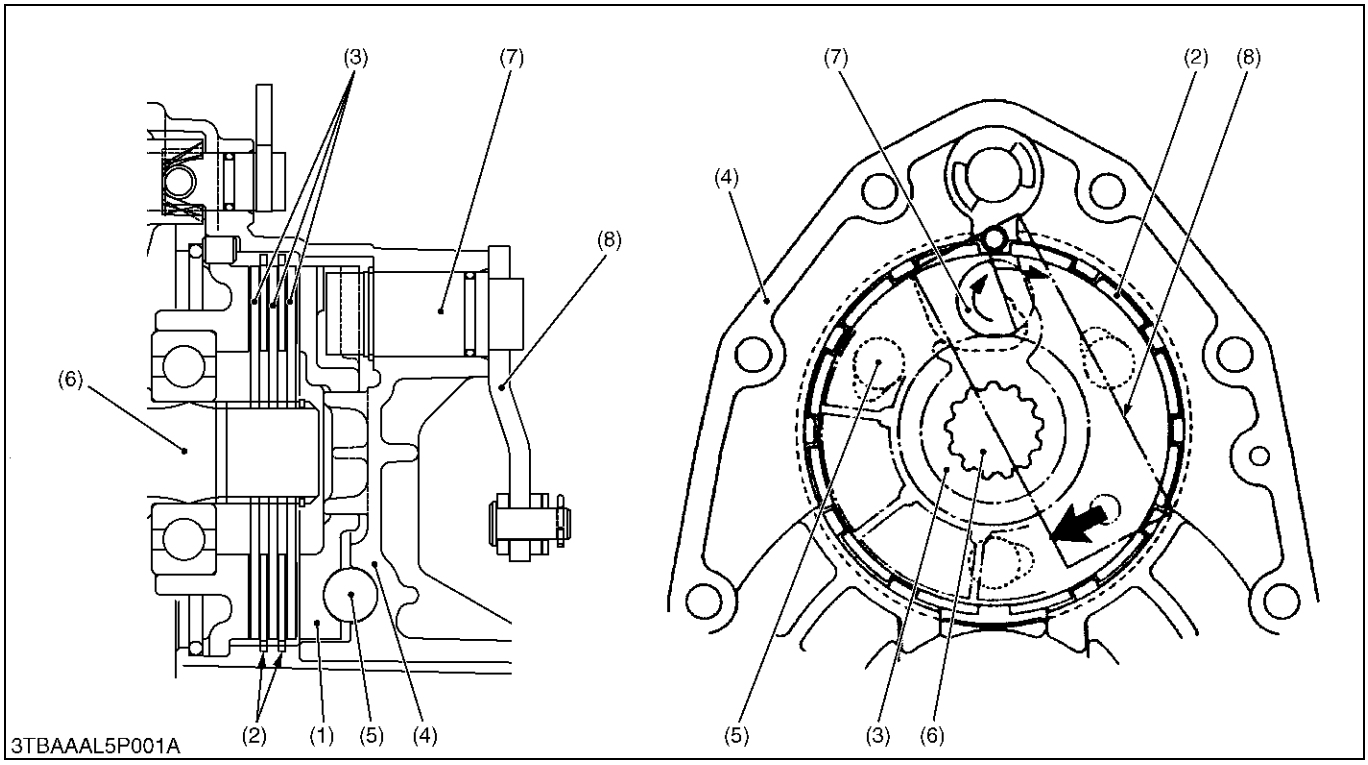
2. OPERATION



(1) Cam Plate
(2) Friction Plate
(3) Brake Disc
(4) Rear Axle Case
(5) Steel Ball
(6) Brake Shaft (Differential Gear Shaft)
(7) Brake Cam
(8) Brake Cam Lever

The brake body is incorporated in the rear axle case (4) filled with transmission oil and is designed to brake when the brake disc (3) splinted with the differential gear shaft (6) is pressed against the cam plate (1) by means of the cam mechanism incorporating steel balls (5).

For greater braking force, two brake discs are provided at the right and left sides respectively, and the friction plate (2) fixed to the rear axle case is arranged between the brake discs.

■ **During Braking**

When the brake pedal is pressed, the linage causes the brake cam lever (8) and brake cam (7) to turn into the direction of arrow shown in the above figure.

Therefore, the cam plate (1) also moves the direction of arrow. At this time, since the cam plate (1) rides on the steel balls (5) set in the grooves of the rear axle case to press the brake disc (3), the differential gear shaft (6) is braked by the frictional force generated by the cam plate (1) and brake disc (3).

9Y1210822BRM0002US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Uneven Braking Force	Brake pedal free travel unevenly adjusted	Adjust	4-S4
	Brake disc worn	Replace	4-S8
	Cam plate warped	Replace	4-S9
Brake Drags	Brake pedal free travel too small	Adjust	4-S4
	Ball holes of cam plate for uneven wear	Replace	4-S9
	Brake pedal return spring weaken or broken	Replace	–
	Brake cam rusted	Repair	4-S9
Poor Braking Force	Brake pedal free travel excessive	Adjust	4-S4
	Brake disc worn	Replace	4-S8
	Cam plate warped	Replace	4-S9
	Brake cam or lever damaged	Replace	4-S9
	Transmission fluid improper	Change	G-9

9Y1210822BRS0001US0

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	30 to 40 mm 1.2 to 1.5 in.	–
Cam Plate and Bearing Holder	Flatness	–	0.30 mm 0.012 in.
Cam Plate and Ball	Height	22.89 to 22.99 mm 0.9012 to 0.9051 in.	22.40 mm 0.8819 in.
Brake Disc	Thickness	3.30 to 3.50 mm 0.130 to 0.137 in.	3.0 mm 0.12 in.
Friction Plate	Thickness	1.92 to 2.08 mm 0.0756 to 0.0818 in.	1.52 mm 0.0598 in.

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3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Steering wheel mounting nut	30 to 49	3.0 to 5.0	22 to 36
Rear wheel mounting nut	167 to 191	17 to 19.5	123 to 141
Rear wheel mounting bolt	196 to 225	20 to 23	145 to 166
Front loader valve pipe joint bolt	48 to 55	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 1 joint bolt	48 to 55	4.9 to 5.7	36 to 41
3-point hitch delivery pipe joint bolt	50 to 59	5.1 to 6.1	37 to 44
3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 55	4.9 to 5.7	36 to 41
3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 59	5.1 to 6.1	37 to 44
Rear axle case mounting screw	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw (M10) for aluminum	40 to 44	4.0 to 4.5	29 to 32
Sub frame mounting screw	48 to 55	4.9 to 5.7	36 to 41
Sub frame mounting bolt (M12) and nut	78 to 90	7.9 to 9.2	58 to 66

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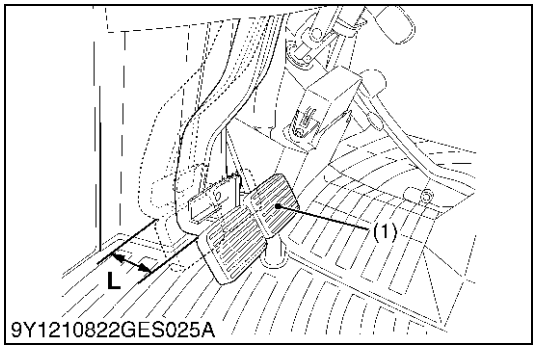
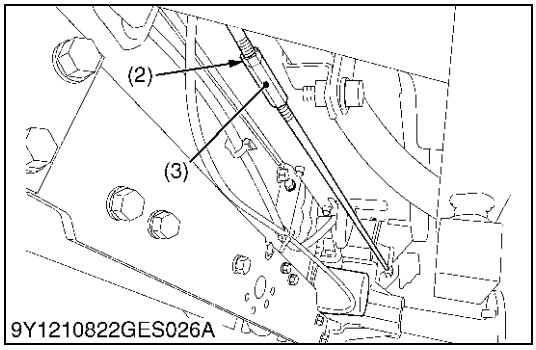
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING





Adjusting Brake Pedal Free Travel

CAUTION

- **Stop the engine and chock the wheels before checking brake pedal.**
- **The difference between the right and left pedal free travel must be less than 5 mm (0.2 in.).**

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at top of pedal stroke.
3. If the measurement is not within the factory specifications, loosen the lock nut and turn the turnbuckle to adjust the brake rod length.
4. Retighten the lock nut securely.
5. Keep the free travel in the right and left brake pedals equal.

Brake pedal free travel (**L**)	Factory specification	30 to 40 mm 1.2 to 1.5 in.

NOTE

- **After checking brake pedal free travel, be sure to engage the parking brake lever fully and check to see that the brake pedals are securely locked.**

(1) Brake Pedal
(2) Turnbuckle
(3) Lock Nut

L: Free Travel

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[2] DISASSEMBLING AND ASSEMBLING

(1) Brake Pedal

Battery Cable

1. Open the bonnet and remove the side cover.
2. Disconnect the battery negative cable (1).

NOTE

- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, the positive cable first.**

(1) Battery Negative Cable

9Y1210822RAS0004US0

Steering Wheel

1. Remove the steering wheel cap.
2. Remove the steering wheel mounting nut and steering wheel.

(When reassembling)

Tightening torque	Steering wheel mounting nut	30 to 49 N·m 3.0 to 5.0 kgf·m 22 to 36 lbf·ft

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Panel Lower Cover

1. Remove the panel lower cover (1).

(1) Panel Lower Cover
(2) Bolt

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Meter Panel

1. Remove the meter panel mounting bolts and disconnect the each connectors.
2. Remove the meter panel (1).

(1) Meter Panel

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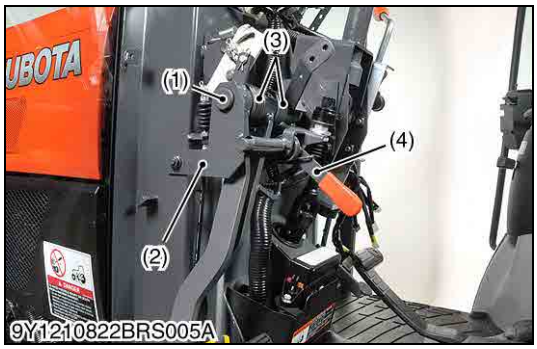

Brake Pedal and Brake Rod

1. Remove the brake pedal shaft support (2) and parking brake lever (4).
2. Remove the brake pedal rods (7), (8).
3. Tap out the spring pin and pull out the brake pedal shaft (1) to the right.
4. Remove the brake pedals (5), (6) and springs (3).

(1) Brake Pedal Shaft
(2) Brake Pedal Shaft Support
(3) Spring
(4) Parking Brake Lever
(5) Brake Pedal LH
(6) Brake Pedal RH
(7) Brake Pedal Rod LH
(8) Brake Pedal Rod RH

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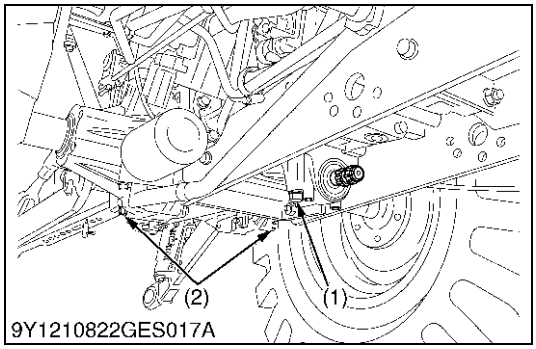
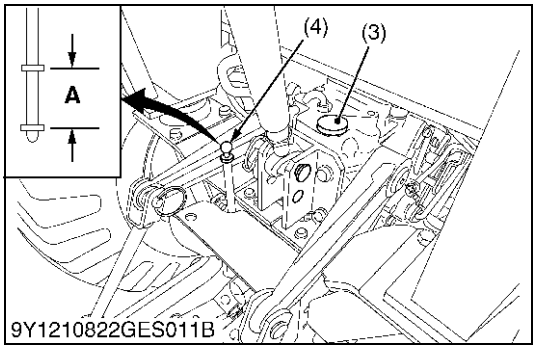
(2) Separating Rear Axle Case





Draining Transmission Fluid

1. Place an oil pan underneath the transmission case, and remove the drain plugs (1) and (2).
2. Drain the transmission fluid.
3. Reinstall the drain plugs (1) and (2).

(When refilling)

- Fill new oil from filling port after removing the filling plug (4) up to the upper notch on the dipstick (3).
- After running the engine for a few minutes, stop it and check the oil level again, if low, add oil prescribed level.

■ **IMPORTANT**

- **Use only multi-grade transmission oil. Use of other oils may damage the transmission or hydraulic system. (See page G-9).**
- **Never work the tractor immediately after changing the transmission oil. Keeping the engine at medium speed for a few minutes to prevent damage to the transmission.**
- **Do not mix different brands oil together.**

Transmission fluid capacity	15 L 4.0 U.S.gals 3.3 Imp.gals

(1) Drain Plug
(2) Drain Plug (Both Sides)
(3) Dipstick
(4) Filling Plug

A: Proper Oil Level

9Y1210822RAS0003US0

Rear Wheel

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (1).

Tightening torque	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting screw	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Rear Wheel

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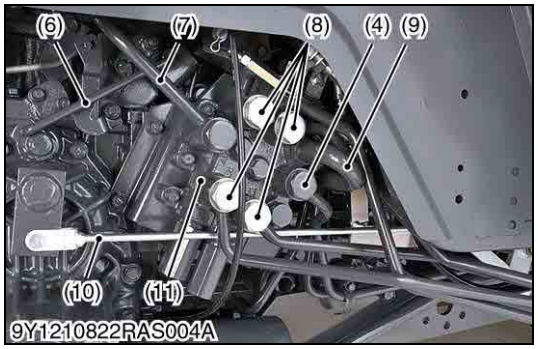

Rear Axle Case

1. Remove the brake rod (10).
2. Remove the front loader valve pipes (8), 3-point hitch delivery pipe 2 (7) and return hose (9).
3. Remove the pipe clamps, 3-point hitch delivery pipe 1 (4) and suction pipe (3).
4. Remove the oil filter bracket with oil filter (2).
5. Remove the sub frame (5).
6. Remove the loader valve assembly (11).
7. Remove the differential lock rod (6).
8. Remove the rear axle case (1).

(When reassembling)

- Do not damage the O-rings of front loader valve pipes and delivery pipes.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the rear axle case and differential gear case after eliminating the water and oil.

Tightening torque	Front loader valve pipe joint bolt	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe joint bolt	50 to 59 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 59 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft
	Rear axle case mounting screw	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw (M10) for aluminum	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft
	Sub frame mounting screw	48 to 55 N·m 4.9 to 5.7 kgf·m 36 to 41 lbf·ft
	Sub frame mounting bolt (M12) and nut	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Rear Axle Case
(2) Oil Filter
(3) Suction Pipe
(4) 3-Point Hitch Delivery Pipe 1
(5) Sub Frame
(6) Differential Lock Rod
(7) 3-Point Hitch Delivery Pipe 2
(8) Front Loader Valve Pipe
(9) Return Hose
(10) Brake Rod
(11) Loader Valve Assembly

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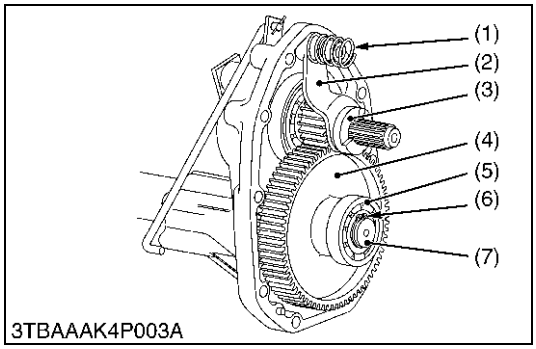
(3) Disassembling Rear Axle Case



Differential Lock Shift Fork, Differential Lock Clutch (Right Side Only), 57T Gear and Rear Axle

1. Remove the spring (1).
2. Draw out the differential lock shift fork (2) and differential lock clutch (3).
3. Remove the external snap ring (6) and remove the bearing (5).
4. Draw out the 57T gear (4) from the rear axle (7).
5. Tap out the rear axle (7) to the outside of the rear axle case.

(1) Spring
(2) Differential Lock Shift Fork
(3) Differential Lock Clutch
(4) 57T Gear
(5) Bearing
(6) External Snap Ring
(7) Rear Axle

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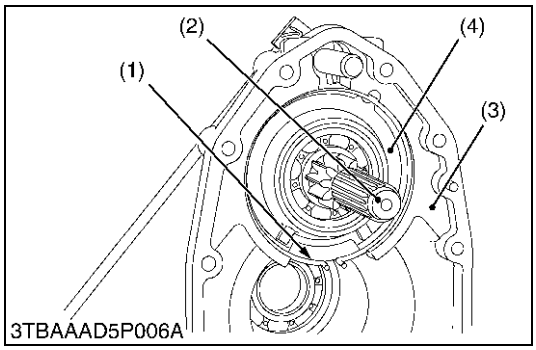

Brake Assembly

1. Remove the internal snap ring (1).
2. Remove the brake shaft (2) with brake discs.

(When reassembling)

- When installing the internal snap ring (1) to rear axle case (3) as shown in the figure.
- When installing the bearing holder (4) to the rear axle case (3), do not forget to install the straight pin (5).

(1) Internal Snap Ring
(2) Brake Shaft
(3) Rear Axle Case
(4) Bearing Holder
(5) Straight Pin

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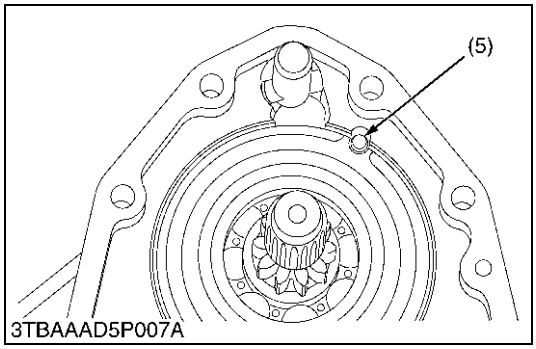

Brake Discs and Friction Plate

1. Remove the external snap ring (1), and remove the brake discs and friction plate.
2. Remove the cam plate and balls.
3. Remove the external snap ring and pull out the brake cam lever.

(When reassembling)

- Install the brake discs with their holes (2) deviation at less than 1/3 of the total hole area.

(1) External Snap Ring
(2) Hole

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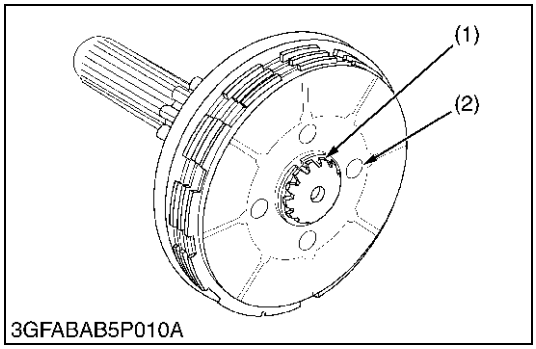
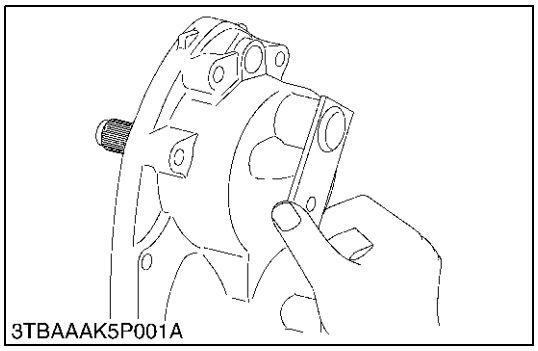


[3] SERVICING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Brake Cam Lever Movement

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.

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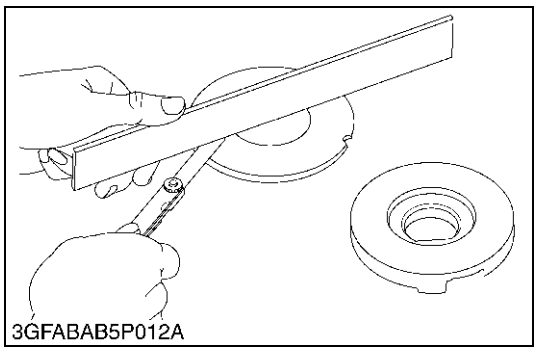
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Cam Plate Flatness and Bearing Holder Wear

1. Place a straightedge of 150 mm (5.91 in.) or more in length on the contacting surface of the cam plate and the bearing holder.
2. Inspect the friction surface of the cam plate and the bearing holder with the straightedge, and determine if a 0.30 mm (0.012 in.) feeler gauge will fit on the part of wear.
3. If it will fit, resurface.

Flatness of cam plate and bearing holder	Allowable limit	0.30 mm 0.012 in.

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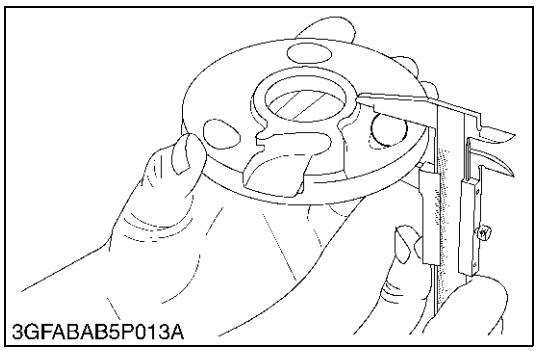
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Height of Cam Plate and Ball

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.
4. If the uneven wear is found, replace it.

Height of cam plate and ball	Factory specification	22.89 to 22.99 mm 0.9012 to 0.9051 in.
	Allowable limit	22.40 mm 0.8819 in.

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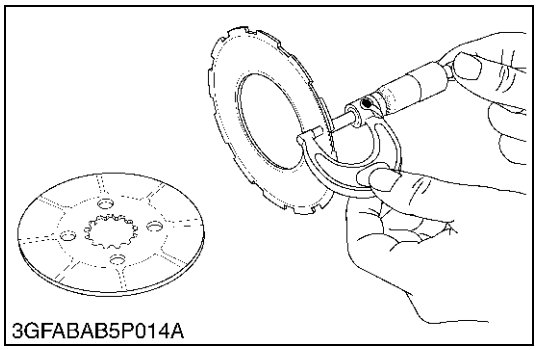
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Brake Disc and Friction Plate Wear

1. Measure the brake disc thickness and the friction plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Brake disc thickness	Factory specification	3.30 to 3.50 mm 0.130 to 0.137 in.
	Allowable limit	3.0 mm 0.12 in.

Friction plate thickness	Factory specification	1.92 to 2.08 mm 0.0756 to 0.0818 in.
	Allowable limit	1.52 mm 0.0598 in.

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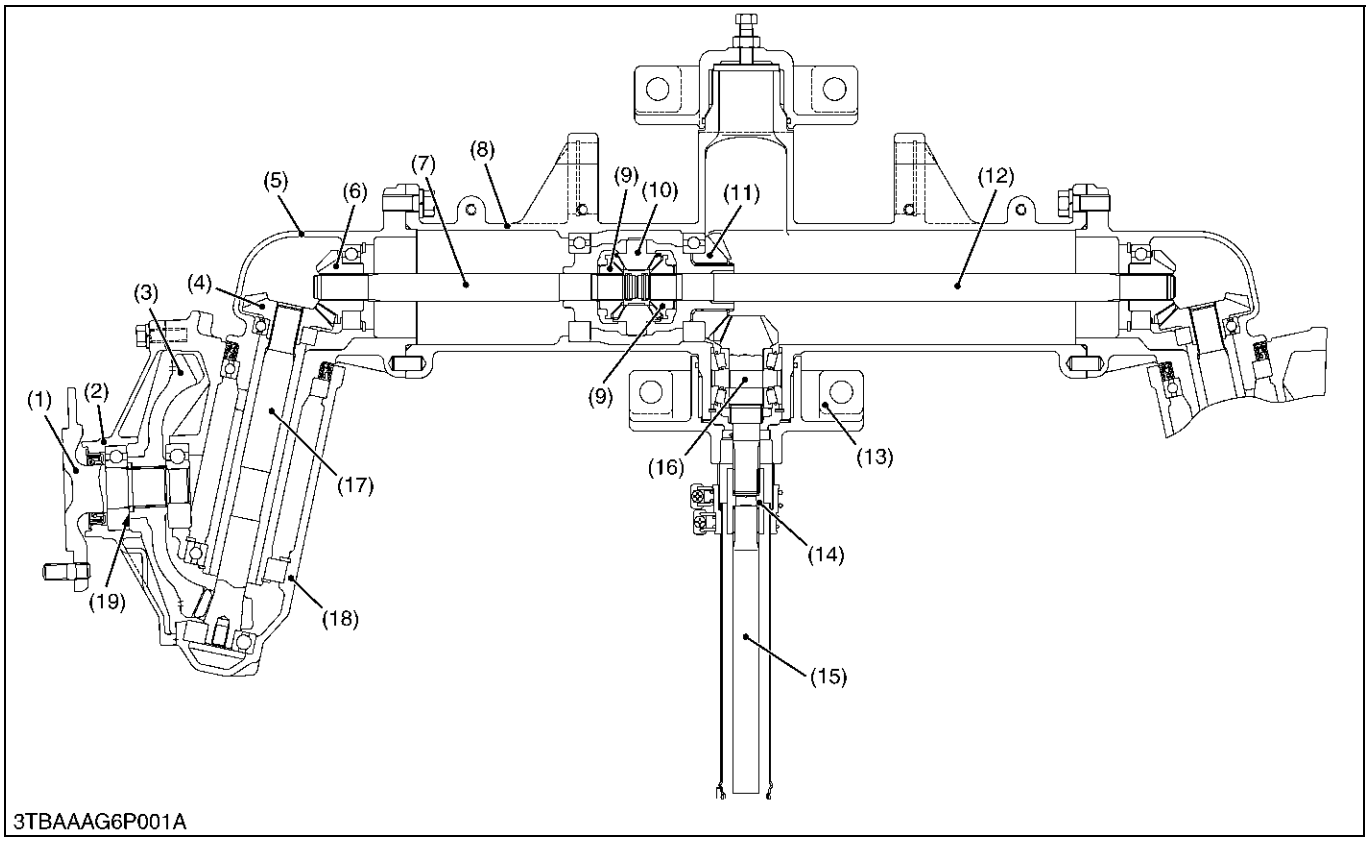
5 FRONT AXLE

MECHANISM

CONTENTS

1. STRUCTURE

[1] 4 WHEEL DRIVE MODEL



(1) Axle
(2) Axle Flange
(3) Bevel Gear (41T)
(4) Bevel Gear (16T)
(5) Bevel Gear Case
(6) Bevel Gear (11T)
(7) Differential Yoke Shaft, LH
(8) Front Axle Case
(9) Differential Side Gear (14T)
(10) Differential Pinion Gear (10T)
(11) Spiral Bevel Gear (20T)
(12) Differential Yoke Shaft, RH
(13) Front Axle Bracket, Rear
(14) Coupling
(15) Propeller Shaft
(16) Spiral Bevel Pinion Shaft (11T)
(17) Bevel Gear Shaft (7T)
(18) Front Gear Case
(19) Collar

The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission through the propeller shaft (15) to the spiral bevel pinion shaft (16), then to the spiral bevel gear (11) and to the differential side gear (9).

The power through the differential side gear (9) is transmitted to the differential yoke shaft (7) (12), and to the bevel gear shaft (17) through the bevel gears (4) (6) in the bevel gear case (5).

The revolution is greatly reduced by the bevel gears (3), then the power is transmitted to the axle (1).

The differential system allows each wheel to rotate at a different speed to make turning easier.

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SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	Tire pressure uneven	Adjust	G-56
	Improper toe-in adjustment	Adjust	G-28
	Clearance between front axle case boss and front axle bracket bushing (front, rear) excessive	Replace	5-S16
	Front axle rocking force too small	Adjust	5-S4
	Tie-rod end loose	Tighten	6-S8
	Air sucked in power steering circuit	Bleed	5-S5
Front Wheels Cam Not Be Driven	Front wheel driving gears in front axle gear case broken	Replace	5-S8
	Universal joint broken	Replace	–
	Front wheel drive gears in transmission broken	Replace	2-S33
	Front differential gear broken	Replace	5-S12
	Coupling displaced	Reassembling	–
Noise	Gear backlash excessive	Replace	5-S9, 5-S10
	Oil insufficient	Fill	5-S5
	Bearings damaged or broken	Replace	–
	Gears damaged or broken	Replace	–
	Spiral bevel pinion shaft turning force improper	Adjust	5-S13

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	0 to 10 mm 0 to 0.39 in.	–
Front Axle	Rocking Force	50.0 to 100 N 5.1 to 10.2 kgf 11.3 to 22.4 lbf	–
Differential Pinion to Deferential Case	Clearance	0.032 to 0.068 mm 0.0013 to 0.0026 in.	0.2 mm 0.008 in.
• Differential Case Bore	I.D.	15.000 to 15.018 mm 0.59056 to 0.59125 in.	–
• Differential Pinion	O.D.	14.950 to 14.968 mm 0.58859 to 0.58929 in.	–
Yoke Shaft to Differential Case	Clearance	0.020 to 0.051 mm 0.00079 to 0.0020 in.	0.2 mm 0.008 in.
• Differential Case Bore	I.D.	20.000 to 20.018 mm 0.78741 to 0.78811 in.	–
• Yoke Shaft	O.D.	19.967 to 19.980 mm 0.78611 to 0.78661 in.	–
Spiral Bevel Pinion Shaft	Turning Torque	0.8 to 1.0 N·m 0.08 to 0.10 kgf·m 0.59 to 0.73 lbf·ft	–
Spiral Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.10 to 0.30 mm 0.0039 to 0.0118 in.	–
11T Bevel Gear to 16T Bevel Gear	Backlash	0.10 to 0.30 mm 0.0039 to 0.0118 in.	–
Front Axle Case Boss to Bracket Bushing (Front)	Clearance	0.120 to 0.275 mm 0.00493 to 0.0108 in.	0.45 mm 0.018 in.
• Front Axle Case Boss	O.D.	49.950 to 49.975 mm 1.9666 to 1.9675 in.	–
• Bracket Bushing	I.D.	50.095 to 50.225 mm 1.9723 to 1.9773 in.	–
Front Axle Case Boss to Bracket Bushing (Rear)	Clearance	0.120 to 0.300 mm 0.00473 to 0.0108 in.	0.45 mm 0.018 in.
• Front Axle Case Boss	O.D.	65.005 to 65.035 mm 2.5593 to 2.5604 in.	–
• Bracket Bushing	I.D.	65.155 to 65.305 mm 2.5652 to 2.5710 in.	–

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3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Front wheel mounting nut	77 to 90	7.9 to 9.2	57 to 67
Front axle bracket mounting screw	200 to 230	20.4 to 23.4	148 to 169
Bevel gear case mounting screw	77.5 to 90.1	7.9 to 9.2	57.1 to 66.5
Axle flange mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Delivery hose retaining nut	24 to 28	2.5 to 2.9	17.7 to 20.7
Tie-rod slotted nut	18 to 35	1.9 to 3.5	14 to 25
Tie-rod joint	74 to 84	7.5 to 8.6	54.4 to 61.9

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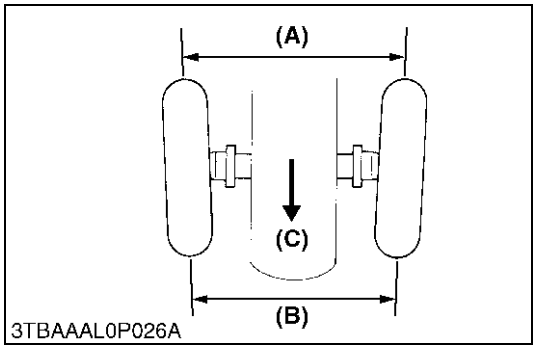
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



Toe-in

1. Inflate the tires to the specified pressure.
2. Turn the front wheels straight ahead.
3. Measure the toe-in **(A) - (B)**.
4. If the measurement is not within the factory specifications, adjust the tie-rod length.

Toe-in **(A) - (B)**	Factory specification	0 to 10 mm 0 to 0.39 in.

(A) Wheel to Wheel Distance at Rear (C) Front
(B) Wheel to Wheel Distance at Front

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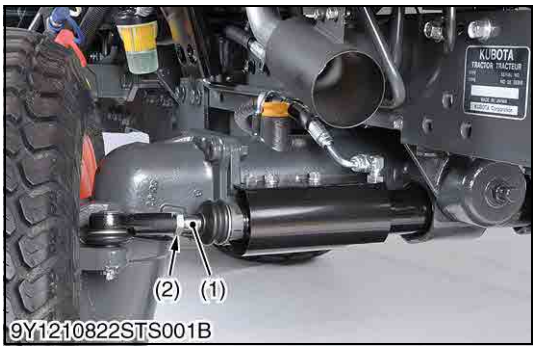

Toe-in Adjusting

1. Loosen the lock nut (2).
2. Turn the tie-rod joint (1) to adjust the rod length until the proper toe-in measurement is obtained.
3. Retighten the lock nut (2).

(1) Tie-rod Joint (2) Lock Nut

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Front Axle Rocking Force

1. Jack up the front side of tractor.
2. Set a spring balance to the front axle flange.
3. Measure the front axle rocking force.
4. If the measurement is not within the factory specifications, adjust with the adjusting screw (2).
5. Tighten the lock nut (1) firmly.

Front axle rocking force	Factory specification	50.0 to 100 N 5.1 to 10.2 kgf 11.3 to 22.4 lbf

(1) Lock Nut (2) Adjusting Screw

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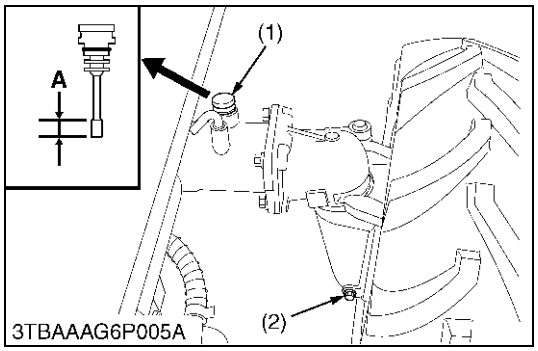
[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Front Axle Assembly



Draining Front Axle Case Oil

1. Place the oil pans underneath the front axle case.
2. Remove the both right and left hand side drain plugs (2) and filling plug (1) to drain the front axle case oil.
3. After draining, reinstall the drain plugs (2).
4. Fill with new oil up to the upper notch on the dipstick.

■ **NOTE**

- **After ten minutes, check the oil level again, add oil to prescribed level.**
- **Use KUBOTA SUPER UDT fluid or SAE 80, 90 gear oil. (See page G-9.)**

Front axle case oil	Capacity	4.7 L 5.0 U.S.qts 4.1 Imp.qts

(1) Filling Plug with Dipstick
(2) Drain Plug

A: Proper Oil Level

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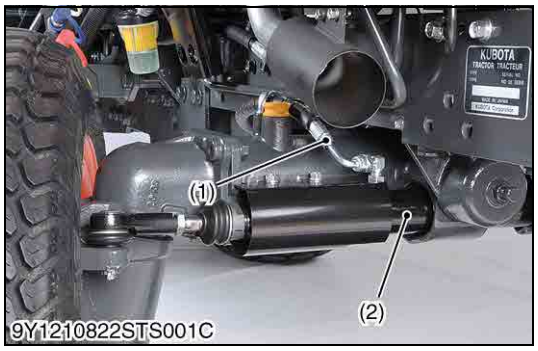

Front Wheels and Steering Cylinder Hoses

1. Disconnect the delivery hoses (1), (3).
2. Lift up the tractor front side.
3. Loosen the hose clamps (4) and slide the front cover (5).
4. Remove the front wheels.

■ **NOTE**

- **After disconnecting the delivery hoses, do not steer the front axle so that the steering oil may come out from the delivery hoses.**

■ **IMPORTANT**

- **Connect the delivery hoses to the original position.**

(When reassembling)

- Be sure to assemble the delivery hose RH and LH as shown in figure.

(Bleeding air in power steering circuit)

- Start the engine.
- Turn the steering wheel slowly in both directions all the way alternately several times, and stop the engine.

Tightening torque	Front wheel mounting nut	77 to 90 N·m 7.9 to 9.2 kgf·m 57 to 67 lbf·ft
	Delivery hose retaining nut	24 to 28 N·m 2.5 to 2.9 kgf·m 17.7 to 20.7 lbf·ft

(1) Delivery Hose (RH)
(2) Steering Cylinder
(3) Delivery Hose (LH)
(4) Hose Clamp
(5) Front Cover

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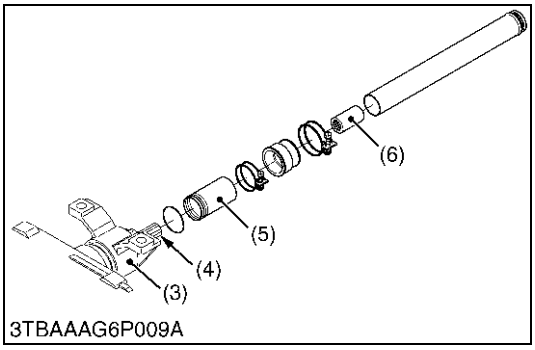

Front Axle Holder and Front Axle

1. Place the disassembling stand under the front axle.
2. Remove the front axle holder mounting bolts (1).
3. Separate the front axle holders (2), (3).
4. Separate the front axle from the front axle frame.

(When reassembling)

- Slide the coupling and the front cover to the front drive shaft.
- Align the front axle holders to the front axle frame, and align the coupling to the bevel pinion shaft spline.

Tightening torque	Front axle holder mounting bolt	200 to 230 N·m 20.4 to 23.4 kgf·m 148 to 169 lbf·ft

(1) Front Axle Holder Mounting Bolt
(2) Front Axle Holder (Front)
(3) Front Axle Holder (Rear)
(4) Bevel Pinion Shaft
(5) Front Cover
(6) Coupling

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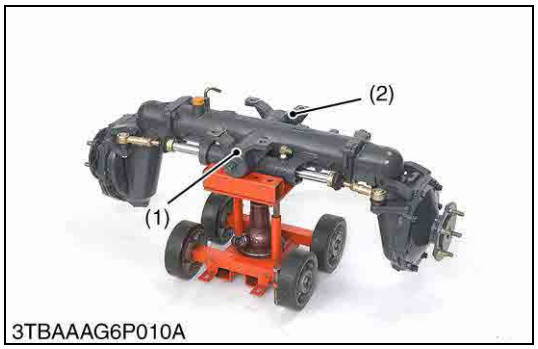
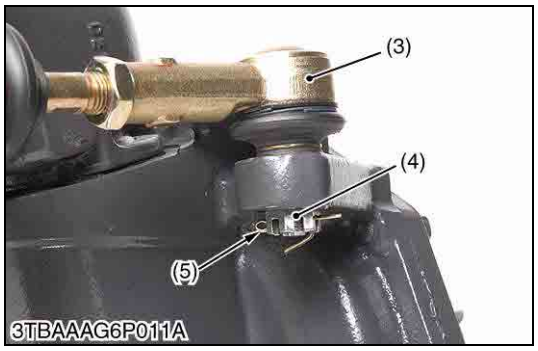
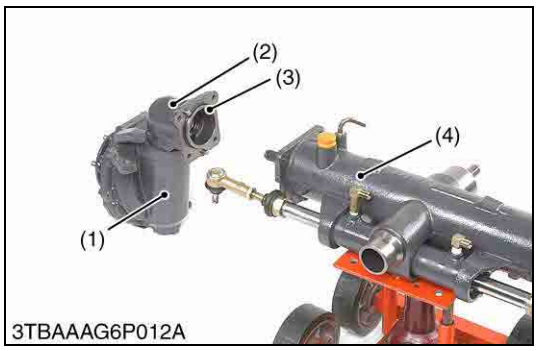
(2) Disassembling Front Assembly







Front Axle Brackets and Tie-rod Joints

1. Remove the slotted nut (4) and remove the tie-rod end (3).
2. Remove the front axle brackets (1), (2).

(When reassembling)

- Apply grease to the thrust collar of front axle bracket.
- Apply grease to the O-ring and be careful not to damage it.
- After tightening the slotted nut, install cotter pin as shown in the figure.

Tightening torque	Tie-rod slotted nut	18 to 35 N·m 1.8 to 3.5 kgf·m 14 to 25 lbf·ft
	Tie-rod joint	74 to 84 N·m 7.5 to 8.6 kgf·m 54.4 to 61.9 lbf·ft

(1) Front Axle Bracket (Front)
(2) Front Axle Bracket (Rear)
(3) Tie-rod End
(4) Slotted Nut
(5) Cotter Pin

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Bevel Gear Case

1. Remove the bevel gear case mounting screws.
2. Remove the bevel gear case (2) and front gear case (1) as a unit from the front axle case (4).

(When reassembling)

- Apply grease to the O-ring (3) and be careful not to damage it.
- Do not interchange right and left bevel gear case assemblies and right and left gear case assemblies.

Tightening torque	Bevel gear case mounting screw	77.5 to 90.1 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

(1) Front Gear Case
(2) Bevel Gear Case
(3) O-ring
(4) Front Axle Case

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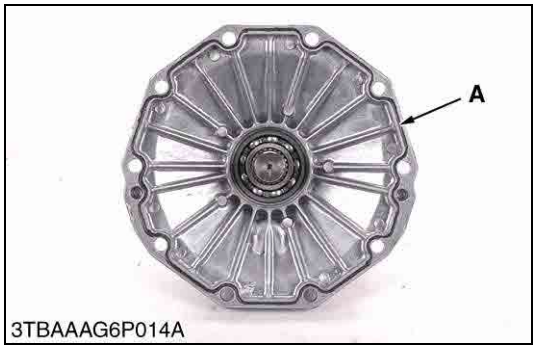

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Front Gear Case and Axle Flange

1. Remove the axle flange mounting bolts.
2. Remove the axle flange (2).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the axle flange (2) and the front gear case (1) after eliminating the water, oil and stuck liquid gasket.
- Tighten the axle flange bolts and nuts diagonally in several steps.

Tightening torque	Axle flange mounting bolt	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

(1) Front Gear Case
(2) Axle Flange

A: Portion to apply liquid gasket

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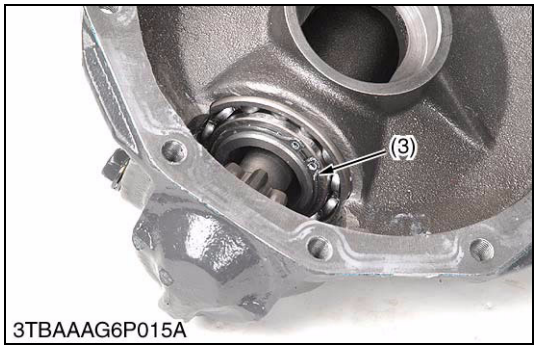

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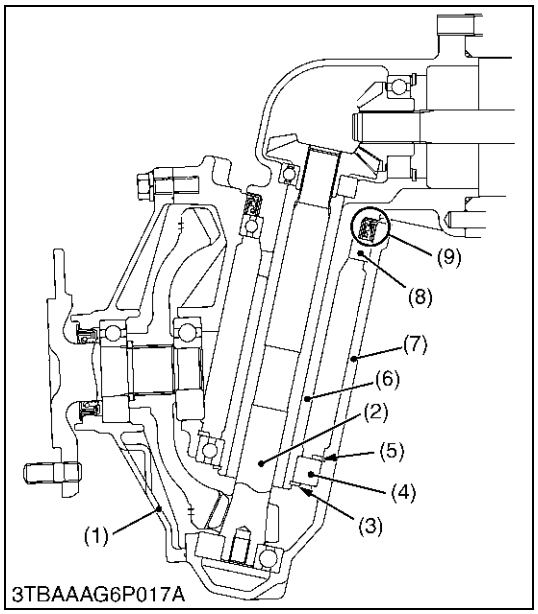

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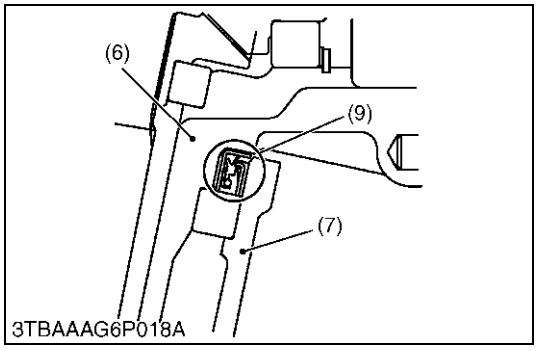

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Bevel Gear Shaft and Bevel Gear Case Oil Seal

1. Remove the external circlip (3).
2. Remove the bevel gear case (6) from the front gear case (7).
3. Remove the oil seal (9).
4. Remove the ball bearing (8).
5. Remove the internal circlip (5) and remove the ball bearing (4).
6. Remove the bevel gear shaft (2) with the bearing.

(When reassembling)

- Install the oil seal (9) of the bevel gear case, noting its direction as shown in the figure.

(1) Axle Flange
(2) Bevel Gear Shaft (7T)
(3) External Circlip
(4) Ball Bearing
(5) Internal Circlip
(6) Bevel Gear Case
(7) Front Gear Case
(8) Ball Bearing
(9) Bevel Gear Case Oil Seal

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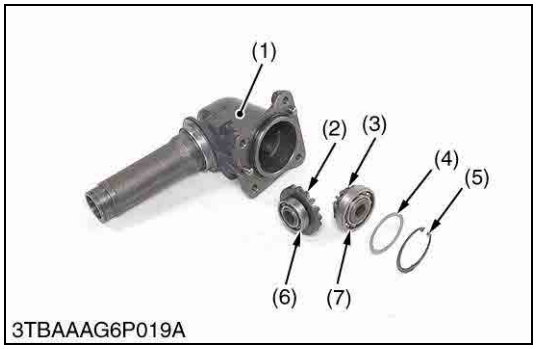

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Bevel Gear Case Gears

1. Remove the internal circlip (5).
2. Remove the bevel gears (3) (2) with ball bearings (7) (6) and shims (4).

(When reassembling)

- Install the shim (4) to their original position.

(Reference)

- Thickness of adjusting shims
  0.8 mm (0.031 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)
  1.4 mm (0.055 in.)

(1) Bevel Gear Case
(2) Bevel Gear (16T)
(3) Bevel Gear (11T)
(4) Shim
(5) Internal Circlip
(6) Ball Bearing
(7) Ball Bearing

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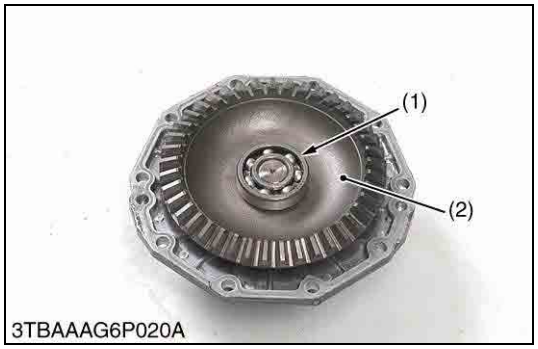

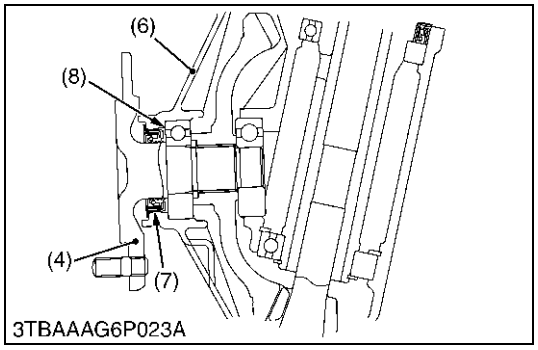

Axle

1. Remove the bearing (1).
2. Remove the bevel gear (2).
3. Remove the collar (3).
4. Tap out the axle (4).

(When reassembling)

- Install the oil seal (7) of axle flange (6), noting its direction as shown in the figure.
- Install the shims (8) to their original position.

(Reference)

- Thickness of adjusting shims
  0.2 mm (0.008 in.)
  0.3 mm (0.012 in.)

(1) Ball Bearing
(2) Bevel Gear (41T)
(3) Collar
(4) Axle
(5) Ball Bearing
(6) Axle Flange
(7) Oil Seal
(8) Shim

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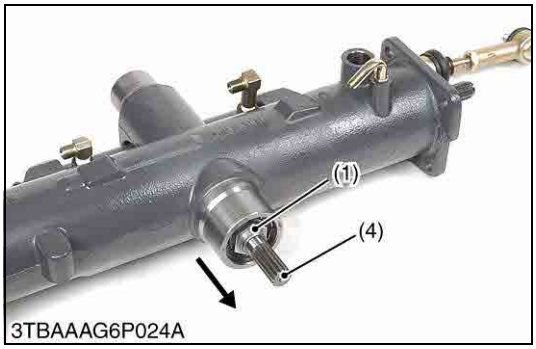

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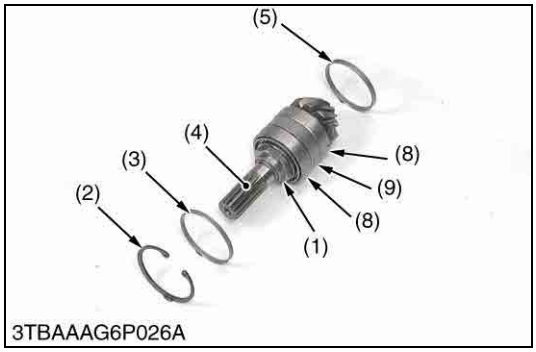

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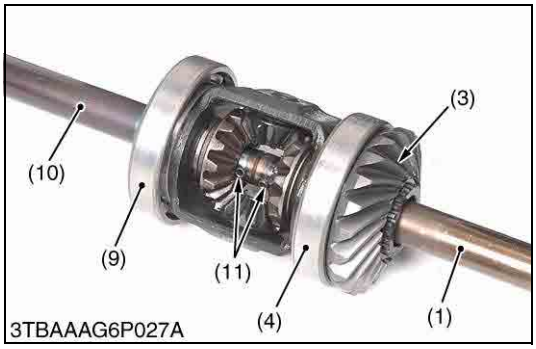

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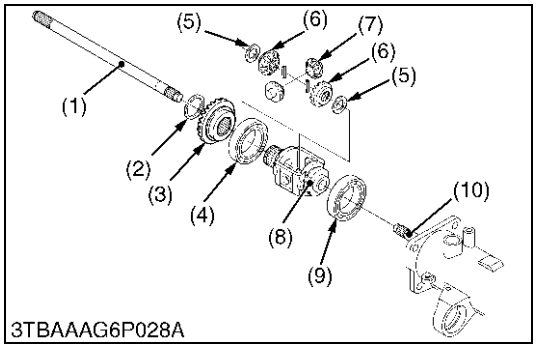

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Spiral Bevel Pinion Shaft and Differential Gear Assembly

1. Remove the oil seal from the front axle case.
2. Remove the internal circlip (2) and the collar (3).
3. Tap out the spiral bevel pinion shaft (4) to the rear side.
4. Remove the differential gear assembly (6) from the right side of the front axle case.
5. Remove the nut (1) from the spiral bevel pinion shaft (4).
6. Remove the taper roller bearings (8).

(When reassembling)

- Replace the oil seal and the nut (1) with new one.
- Apply grease to the oil seal.
- Tighten up the nut (1) until the turning torque of the spiral bevel pinion shaft reaches the factory specifications. (See page 5-S13).
- Install the same shims and collars before they are removed.
- Install the taper roller bearing correctly, noting their direction, and apply gear oil to them.
- Stake the lock nut firmly.

(1) Nut
(2) Internal Circlip
(3) Collar
(4) Spiral Bevel Pinion Shaft
(5) Collar
(6) Differential Gear Assembly
(7) Differential Yoke Shaft (LH)
(8) Taper Roller Bearing
(9) Collar
(10) Differential Yoke Shaft (RH)

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Differential Gear

1. Remove the external circlip (2) from the differential case (8).
2. Tap out the spring pins (11) from the differential yoke shafts (1) (10).
3. Remove the differential yoke shafts (1), (10) from the differential case (8).
4. Remove the bevel gears (6) and the collars (5) from the differential case (8).
5. Remove the spiral bevel gear (3) and the ball bearings (4) from the differential case (8).

■ **NOTE**

- **Arrange the parts to know their original position.**

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential bevel gears (6) and differential pinion (7).

(1) Differential Yoke Shaft (RH)
(2) External Circlip
(3) Spiral Bevel Gear
(4) Ball Bearing
(5) Collar
(6) Bevel Gear (14T)
(7) Differential Pinion (10T)
(8) Differential Case
(9) Ball Bearing
(10) Differential Yoke Shaft (LH)
(11) Spring Pin

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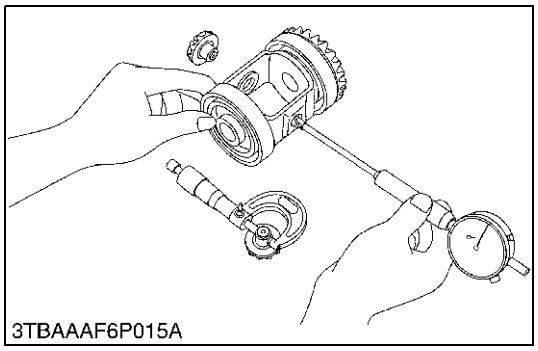
[3] SERVICING



Clearance between Differential Case and Differential Pinion

1. Measure the differential pinion boss O.D. with an outside micrometer.
2. Measure the differential case bore I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case and differential pinion	Factory specification	0.032 to 0.068 mm 0.0013 to 0.0026 in.
	Allowable limit	0.2 mm 0.008 in.

Differential case bore I.D.	Factory specification	15.000 to 15.018 mm 0.59056 to 0.59125 in.
Differential pinion O.D.	Factory specification	14.950 to 14.968 mm 0.58859 to 0.58829 in.

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Clearance between Differential Case and Yoke Shaft

1. Measure the yoke shaft O.D. with an outside micrometer.
2. Measure the differential case bore I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential case and yoke shaft	Factory specification	0.020 to 0.051 mm 0.00079 to 0.0020 in.
	Allowable limit	0.2 mm 0.008 in.

Differential pinion shaft I.D.	Factory specification	20.000 to 20.018 mm 0.78741 to 0.78811 in.
Yoke shaft O.D.	Factory specification	19.967 to 19.980 mm 0.78611 to 0.78661 in.

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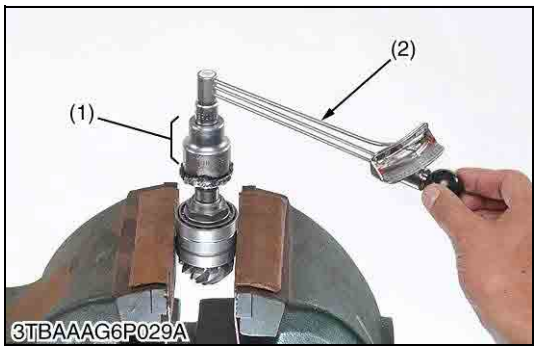

Turning Torque of Spiral Bevel Pinion Shaft

1. Cramp the spiral bevel pinion shaft assembly to the vise and tighten the staking nut.
2. Measure the turning torque of bevel pinion shaft.
3. If the turning torque is not within the factory specifications, adjust with the lock nut.

Turning torque	Factory specification	0.80 to 1.0 N·m 0.08 to 0.10 kgf·m 0.59 to 0.73 lbf·ft

■ **NOTE**

- **After turning force adjustment, be sure to stake the lock nut.**

(1) Adaptor (2) Torque Wrench

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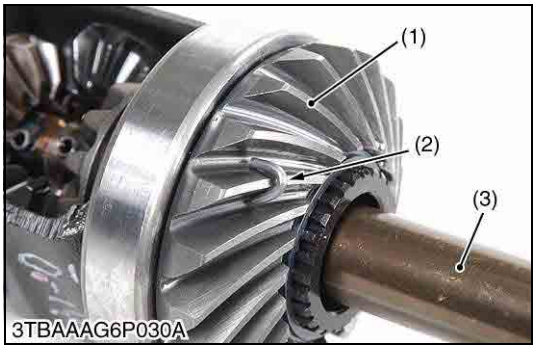

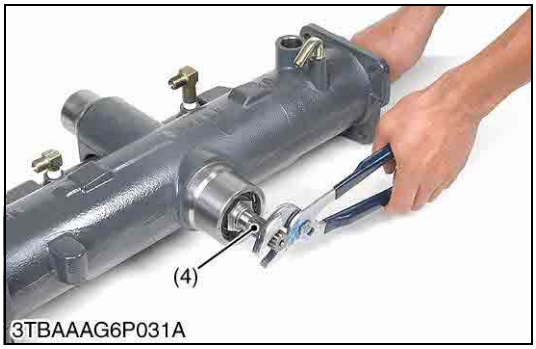

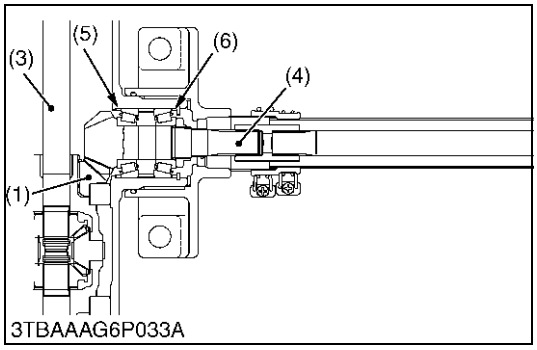

Backlash between Spiral Bevel Pinion Shaft and Spiral Bevel Gear

1. Place the wire of solder (2) on the gear tooth of the spiral bevel gear (1).
2. Install the spiral bevel gear (1) and the differential yoke shaft (3) into the front axle case.
3. Install the spiral bevel pinion shaft (4) to the front axle case. Install the internal circlip to the front axle case.
4. Turn the spiral bevel pinion shaft (4) holding the differential yoke shaft (3) by hand lightly.
5. Remove the wire of solder (2). And measure the wire of solder (2).
6. If the backlash is not within the factory specifications, change the adjusting collars (5) (6). For example change the adjusting collar (6) to 0.1 mm (0.004 in.) smaller size, and change the adjusting collar (5) to 0.1 mm (0.004 in.) larger size.
7. Adjust the backlash properly by repeating the above procedures.

Backlash between spiral bevel pinion shaft and spiral bevel gear	Factory specification	0.10 to 0.30 mm 0.0039 to 0.0118 in.

(Reference)

- Above factory specification should be measured on the tooth of spiral bevel pinion. When measuring the backlash on the spline of its shaft, factory specification will be 0.0571 to 0.1714 mm (0.00225 to 0.00675 in.).
- Thickness of adjusting collars (3), (4)
  3.4 mm (0.134 in.)
  3.6 mm (0.142 in.)
  3.8 mm (0.150 in.)
  4.0 mm (0.157 in.)
  4.1 mm (0.161 in.)
  4.2 mm (0.165 in.)
  4.4 mm (0.173 in.)
  4.6 mm (0.181 in.)

(1) Spiral Bevel Gear (20T)
(2) Wire of Solder
(3) Differential Yoke Shaft (RH)
(4) Spiral Bevel Pinion Shaft (11T)
(5) Adjusting Collar
(6) Adjusting Collar

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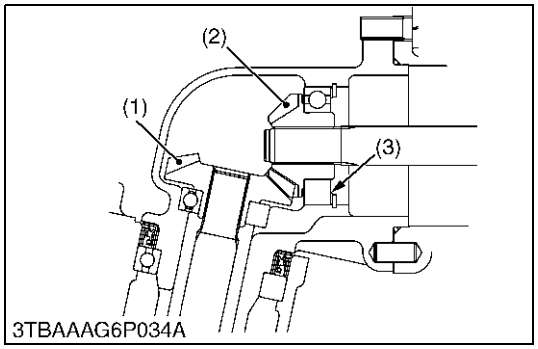

Backlash between 11T Bevel Gear and 16T Bevel Gear

1. Stick a strip of plastigauge or wire of solder to three spots on the 16T bevel gear (1) with grease.
2. Fix the front axle case, bevel gear case and front gear case.
3. Turn the axle.
4. Remove the bevel gear case from front axle case and measure the thickness of the plastigauge or wire of solder with an outside micrometer.
5. If the backlash is not within the factory specifications, adjust with shim (3).

Backlash between bevel gear (11T) and bevel gear (16T)	Factory specification	0.10 to 0.30 mm 0.0039 to 0.0118 in.

(Reference)

- Thickness of adjusting shims (3)
  0.8 mm (0.031 in.)
  1.0 mm (0.039 in.)
  1.2 mm (0.047 in.)
  1.4 mm (0.055 in.)
- Tooth contact: More than 35 %

(1) Bevel Gear (16T)
(2) Bevel Gear (11T)
(3) Shim

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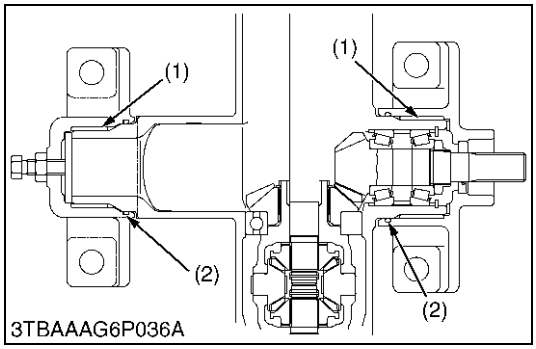

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Clearance between Front Axle Case Bosses and Bracket Bushing

1. Measure the front axle case bosses O.D. with an outside micrometer.
2. Measure the bracket bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bracket bushing.
4. If the clearance still exceeds the allowable limit, replace the front axle case.

Clearance between front axle case boss (front) and bracket bushing (front)	Factory specification	0.120 to 0.275 mm 0.00493 to 0.0108 in.
	Allowable limit	0.45 mm 0.018 in.

Front axle case boss (front) O.D.	Factory specification	49.950 to 49.975 mm 1.9666 to 1.9675 in.
Bracket bushing (front) I.D.	Factory specification	50.095 to 50.225 mm 1.9723 to 1.9773 in.

Clearance between front axle case boss (rear) and bracket bushing (rear)	Factory specification	0.120 to 0.300 mm 0.00473 to 0.0118 in.
	Allowable limit	0.45 mm 0.018 in.

Front axle case boss (rear) O.D.	Factory specification	65.005 to 65.035 mm 2.5593 to 2.5604 in.
Bracket bushing (rear) I.D.	Factory specification	65.155 to 65.305 mm 2.5652 to 2.5710 in.

■ **Press-fitting Bushing**

- When replacing the bushings (1), press-fit it until bushing contact to inside of front axle case.
- Apply grease to the O-rings (2) and be careful not to damage it.

■ **NOTE**

- **After replacing the bushing, be sure to adjust the front axle rocking force. (See page 5-S4.)**

(1) Bushing (2) O-ring

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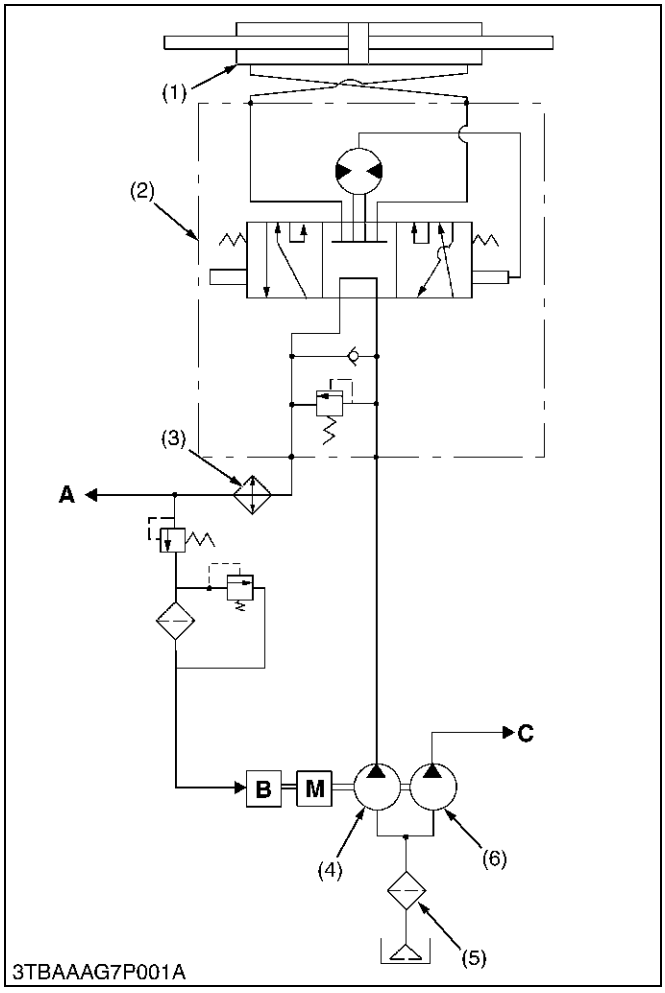
6 STEERING

MECHANISM

CONTENTS

1. HYDRAULIC CIRCUIT



The model is provided with a full hydrostatic power steering.

In the hydrostatic power steering, the steering control is connected to the steering cylinder with only the hydraulic piping. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc.. Therefore, it is simple in construction. This steering system consists of oil filter cartridge (5), hydraulic pump (4), steering controller (2), steering cylinder (1), etc..

By operating the power steering body, the required amount of oil is fed to the steering cylinder (1).

(1) Power Steering Cylinder
(2) Power Steering Controller
(3) Oil Cooler
(4) Hydraulic Pump (for Power Steering, Independent PTO and HST)
(5) Oil Filter Cartridge
(6) Hydraulic Pump (for 3-Points Hitch)

A : Independent PTO Control Valve
B : HST
C : To 3-Points Hitch

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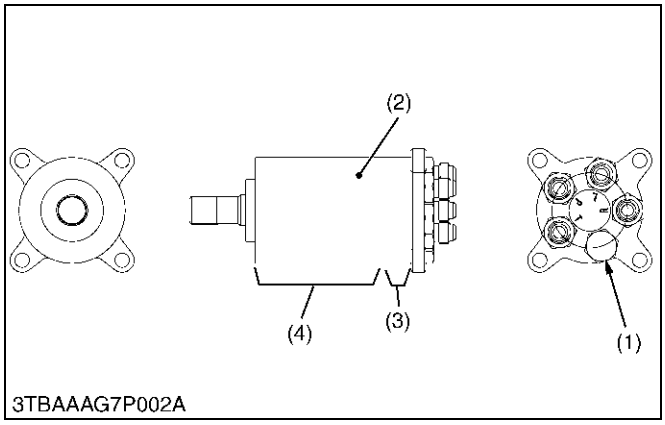
2. STEERING CONTROLLER



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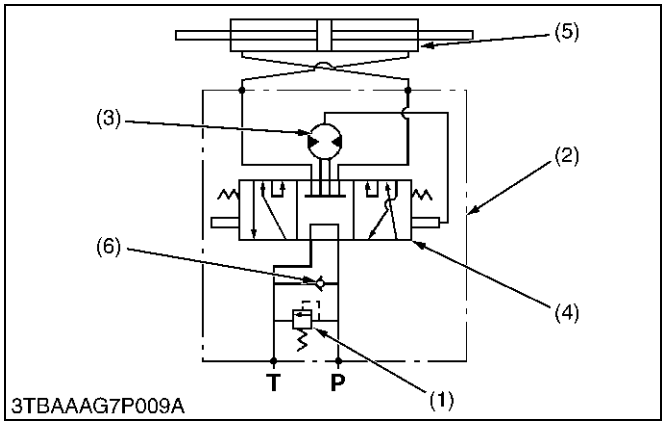

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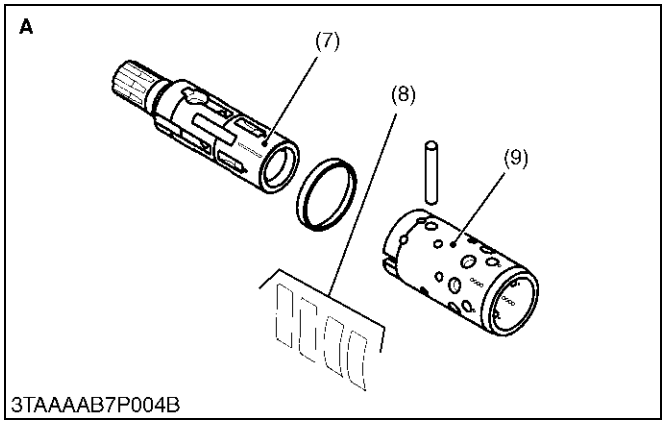

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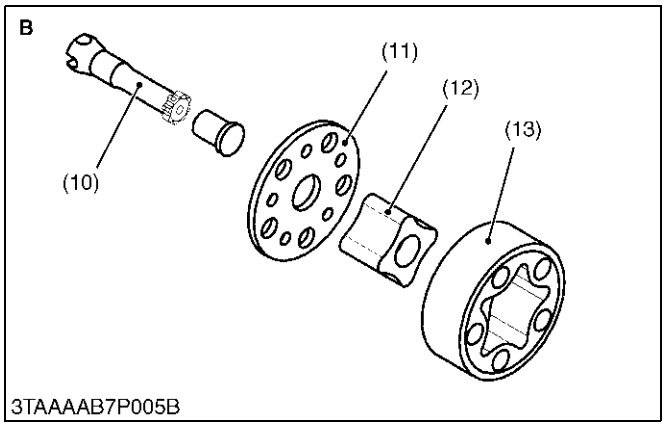

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The steering controller consists of a control valve (4) and a metering device (3).

■ **Control Valve**

The control valve is a rotating spool type. When the steering wheel is not turned, the position of the spool (7) and sleeve (9) is kept neutral by the centering spring (8). This causes the forming of a "Neutral" oil circuit. When the steering wheel is turned either clockwise or counterclockwise, the position of the spool and sleeve changes in relation to the centering spring. This allows the forming of a "Right Turning" or "Left Turning" oil circuit. At the same time, the gear pump (Metering device) rotates with the spool and sends the oil to the cylinder corresponding to the rotation of the steering wheel.

■ **Metering Device**

An oil, sent from the hydraulic pump to the steering cylinder, passes through the metering device (3). Namely, when the rotor is driven, two chambers suck in oil due to volumetric change in the pump chambers formed between the rotor (12) and the stator (13), while oil is discharged from other two chambers. On the other hand, rotation of the steering wheel is directly transmitted to the rotor through the spool (7), drive shaft (10), etc. Accordingly, the metering device serves to supply the steering cylinder with oil, amount of which corresponds to the rotation of the steering wheel. The wheels are thus turned by the angle corresponding to the rotation of the steering wheel. When the engine stops or the hydraulic pump malfunctions, the metering device functions as a manual trochoid pump, which makes manual steering possible.

■ **Relief Valve**

The relief valve (1) is located in the steering controller. It controls the maximum pressure of the power steering system.

Its setting pressure is as follows. (at 12 ± 0.5 L/min.)
10.8 to 11.3 MPa
111 to 115 kgf/cm^2
1570 to 1630 psi

(1) Relief Valve
(2) Steering Controller
(3) Metering Device
(4) Control Valve
(5) Steering Cylinder
(6) Check Valve
(7) Spool
(8) Centering Spring
(9) Sleeve
(10) Drive Shaft
(11) Distributor Plate
(12) Rotor
(13) Stator

A : Control Valve
B : Metering Device
P : P Port (From Hydraulic Pump)
T : T Port (To Independent PTO clutch Valve and HST circuit)

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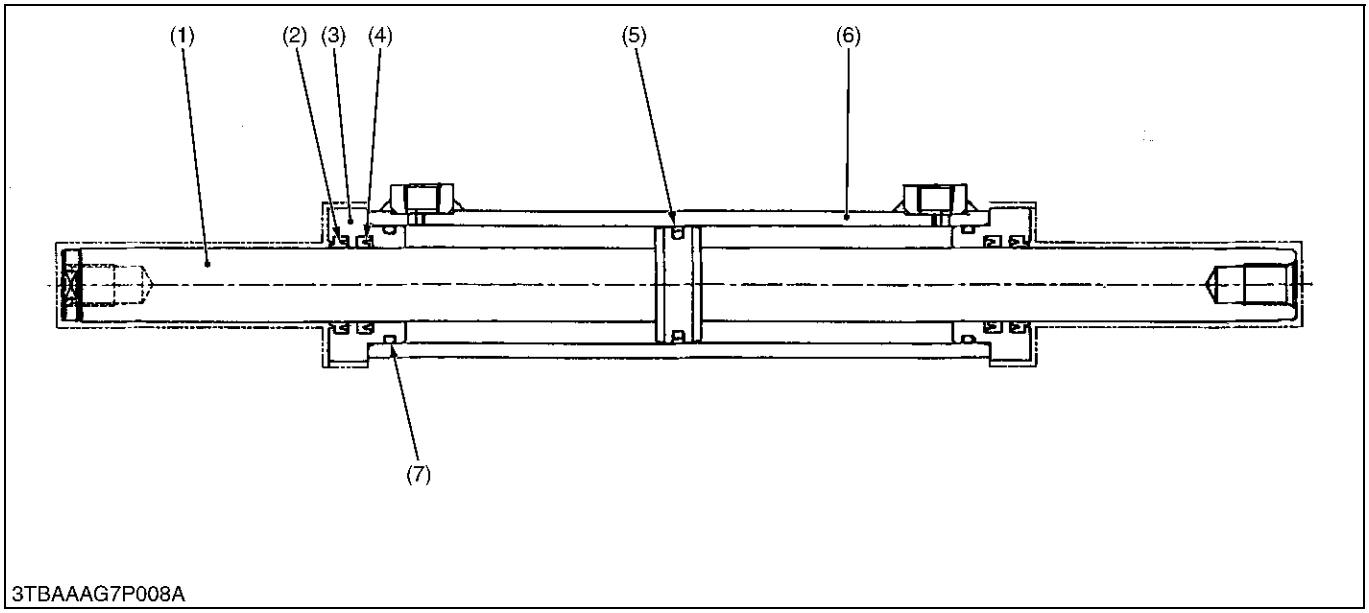
3. STEERING CYLINDER



(1) Rod
(2) Dust Seal
(3) Rod Cover
(4) U Gasket
(5) O-ring
(6) Cylinder Tube
(7) Gasket

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

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

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

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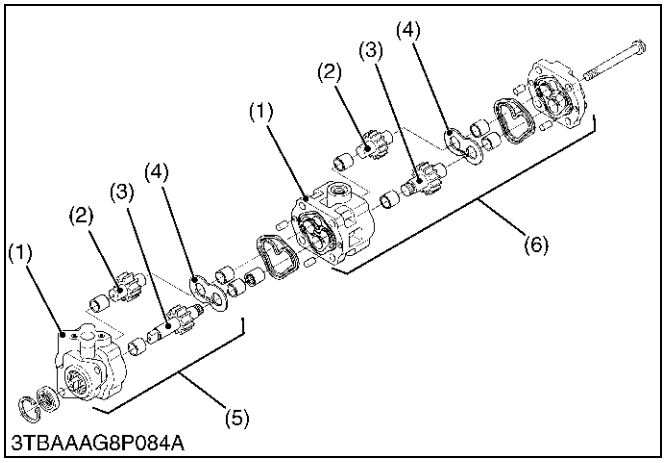
4. HYDRAULIC PUMP



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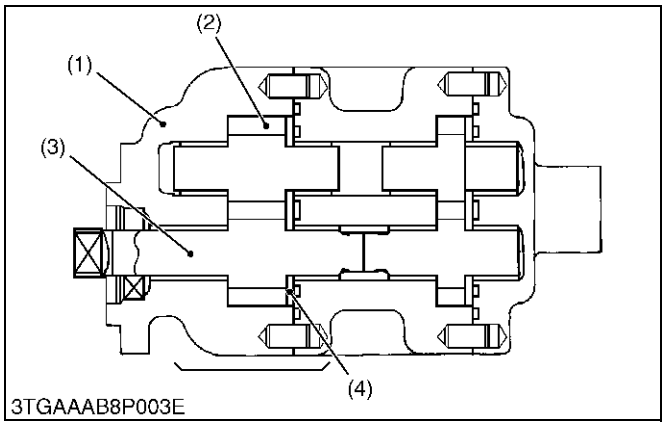

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The hydraulic pump consists of the casing (1), side plate (4), and two spur gears (drive gear (3) and driven gear (2)) that are in mesh.

Hydraulic pump is driven by the fuel camshaft.

Maximum displacement is as follows.

Hydraulic pump (for power steering)

Displacement	Engine speed	Condition
13.0 L/min. 3.43 U.S.gals./min. 2.86 Imp.gals./min.	At 2500 min^{-1} (rpm)	at no load

(1) Casing
(2) Driven Gear
(3) Drive Gear
(4) Side Plate
(5) Hydraulic Pump (for 3-Points Hitch)
(6) Hydraulic Pump (for Power Steering)

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SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Cannot Be Steered	Steering controller malfunctioning	Replace	6-S6
	Pipe broken	Replace	6-S4, 6-S6
Hard Steering	Power steering oil improper	Change with specified oil	G-9, G-20
	Hydraulic pump malfunctioning	Replace	7-S6
	Steering controller malfunctioning	Replace	6-S6
	Oil leak from pipe joint	Retighten pipe joint	6-S4, 6-S6
	Improper relief valve pressure	Check and replace	6-S4, 6-S6
	Relief valve malfunctioning	Replace power steering controller	6-S6
	Air in the hydraulic pipes	Bleed air	6-S4
Steering Force Fluctuates	Steering controller malfunctioning	Replace	6-S6
	Air sucked in pump due to lack of oil	Fill	G-20
	Air sucked in pump from suction circuit	Repair	–
Steering Wheel Turns Spontaneously When Released	Steering controller malfunctioning	Replace	6-S6
Front Wheels Wander to Right and Left	Steering controller malfunctioning	Replace	6-S6
	Air sucked in pump due to lack of oil	Fill	G-20
	Air sucked in pump from suction circuit	Repair	–
	Insufficient bleeding	Bleed air	6-S4
	Cylinder malfunctioning	Repair or replace	6-S8
	Improper toe-in adjustment	Adjust	5-S4
	Tire pressure uneven	Inflate	G-56
Wheels Are Turned to a Direction Opposite to Steering Direction	Cylinder piping connected in reverse	Repair	6-S4
Steering Wheel Turns Idle in Manual Steering	Insufficient bleeding	Bleed air	6-S4
	Air sucked in due to lack of oil	Fill	G-20
Noise	Air sucked in pump due to lack of oil	Fill	G-20
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	6-S4
Oil Temperature Increases Rapidly	Steering controller (relief valve) malfunctioning	Replace	6-S6

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2. SERVICING SPECIFICATIONS

POWER STEERING BODY

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure	10.8 to 11.3 MPa 111 to 115 kgf/cm^2 1570 to 1630 psi (at 12 ± 0.5 L/min.)	–

POWER STEERING CYLINDER

Item		Factory Specification	Allowable Limit
Steering Cylinder	I.D.	40.000 to 40.062 mm 1.5748 to 1.5772 in.	40.100 mm 1.5787 in.
Piston Rod to Guide	Clearance	0.020 to 0.070 mm 0.00079 to 0.0027 in.	0.200 mm 0.00787 in.

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3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Power steering hose for power steering cylinder	24 to 28	2.5 to 2.8	18 to 20
Power steering controller for hoses	24 to 28	2.5 to 2.8	18 to 20
Tie-rod slotted nut	18 to 35	1.9 to 3.5	14 to 25
Tie-rod joint	74 to 84	7.6 to 8.5	55 to 61

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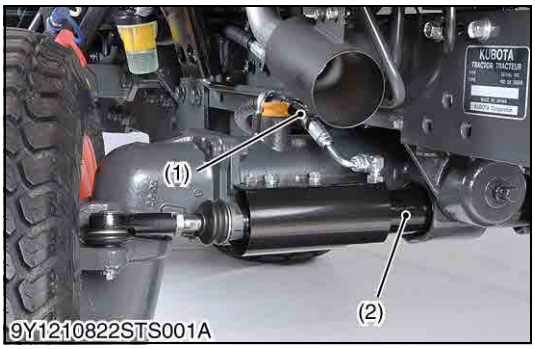
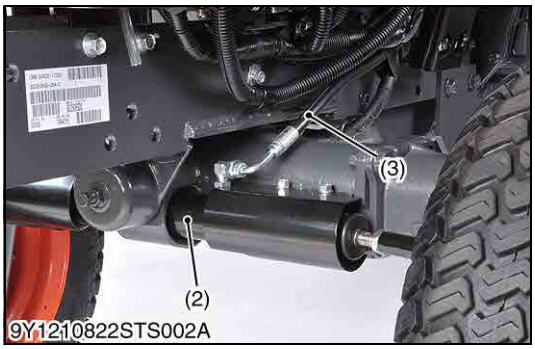
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Relief Valve





Relief Valve Operating Pressure

1. Disconnect the power steering hose LH (or RH) from steering the power steering cylinder, and set a pressure gauge and cable.

(Reference)

- Hose and adaptor size : 9/16-18UNF, 37 ° flare

2. Start the engine and set at maximum speed.
3. Fully turn the steering wheel to the left (or right) to check the feeling which the steering wheel lightly locks. Read the relief valve operating pressure when the steering wheel to the above-mentioned lock position by operation force at approximately 9.8 N (1 kgf, 2.2 lbf) of outer.

■ **NOTE**

- **After set a pressure gauge, be sure to bleed air.**
- **Note that the pressure value changes by the pump action of the power steering controller when the steering operation is continued after the steering wheel is lightly locked and accurate relief valve pressure cannot be measured.**

(Bleeding air in power steering circuit)

- Start the engine.
- Turn the steering wheel slowly in both directions all the way alternately several times, and stop the engine.

Relief valve operating pressure	Factory specification	10.8 to 11.3 MPa 111 to 115 kgf/cm^2 1570 to 1630 psi (at 12 ± 0.5 L/min.)

Tightening torque	Power steering hose for power steering cylinder	24 to 28 N·m 2.5 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Power Steering Hose (RH)
(2) Power Steering cylinder
(3) Power Steering Hose (LH)

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(2) Hydraulic Pump for Power Steering

Flowmeter Connection and Test Preparation

■ **IMPORTANT**
- **When using a flowmeter other than KUBOTA specified flowmeter (Code No. 07916-52792), be sure to use the instructions with that flowmeter.**
- **In this hook-up, there is no relief valve. Therefore while testing, do not close the flowmeter loading valve completely.**

1. Connect the hydraulic test hose to the power steering side hose (1) and flowmeter inlet port.
2. Connect the another hydraulic test hose to oil cooler side hose (2) and flowmeter outlet port.
3. Open the flowmeter loading valve completely. (Turn counterclockwise.)
4. Start the engine and set the engine speed at 2500 min^{-1} (rpm).
5. Slowly close the loading valve to generate the pressure approx. 14.4 MPa (146 kgf/cm^2, 2080 psi).
6. Hold in the condition until oil temperature reaches approx. 50 °C (122 °F).

(1) Power Steering Side Hose (2) Oil Cooler Side Hose

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[2] DISASSEMBLING

(1) Separating Power Steering Controller

Separating Cabin from Tractor Body

- See page 9-S32.

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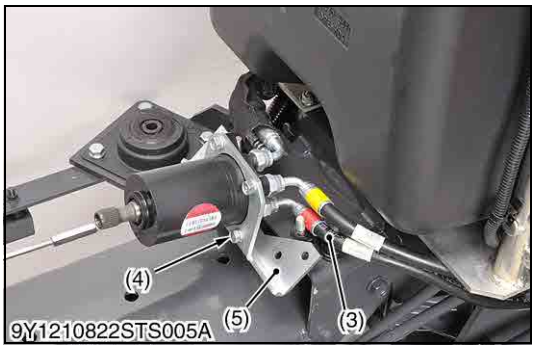

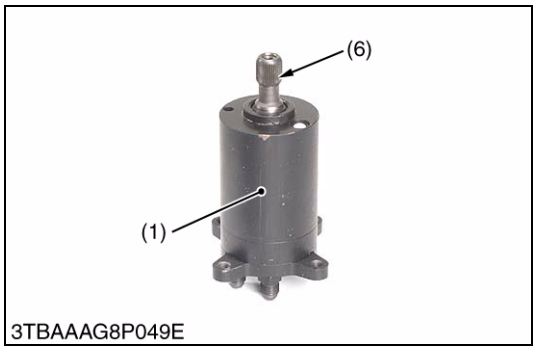

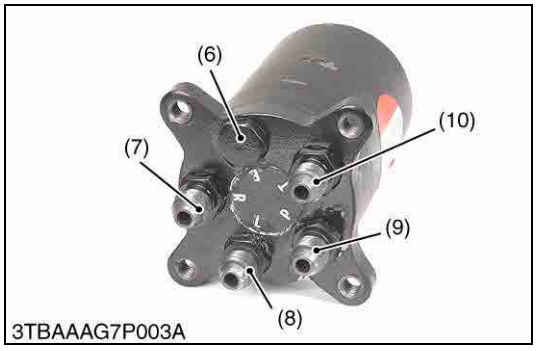

Power Steering Controller

1. Remove the nuts (2).
2. Disconnect the power steering hoses (3) from the power steering controller (1).
3. Remove the power steering controller mounting bolts (4) from the stay.

(When reassembling)

- Connect the power steering hoses (3) to the power steering controller (1) securely.
- If oil leaking from the power steering controller (1) is found, replace the power steering controller (1). O-ring in the power steering controller (1) is not supplied as a spare part.
- Align the power steering controller shaft (6) to the universal joint securely.

Tightening torque	Power steering controller for hoses	24 to 28 N·m 2.5 to 2.8 kgf·m 17 to 20 lbf·ft

(1) Power Steering Controller
(2) Nut
(3) Power Steering Hose
(4) Power Steering Mounting Bolt
(5) Stay
(6) Power Steering Shaft
(7) Relief Valve
(8) Adaptor (to Right Cylinder)
(9) Adaptor (to Left Cylinder)
(10) Adaptor (to Hydraulic Pump)
(11) Adaptor (to Oil Cooler)

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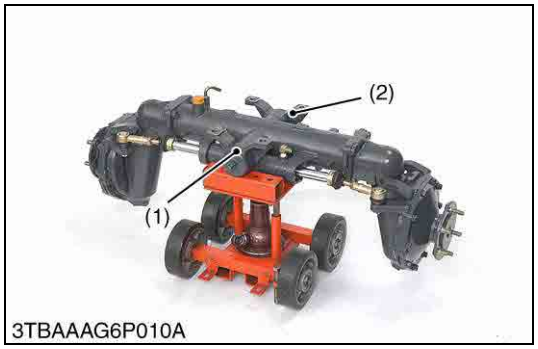
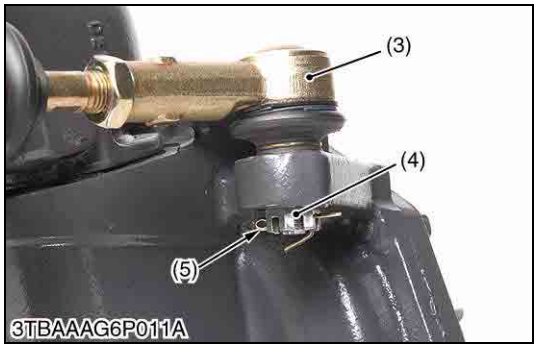
(2) Power Steering Cylinder





Front Wheels

- See page 5-S5.

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Tie-rod Joint

1. Remove the slotted nut (4) and remove the tie-rod end (3).
2. Remove the front axle brackets (1), (2).

(When reassembling)

- Apply grease to the thrust collar of front axle bracket.
- Apply grease to the O-ring and be careful not to damage it.
- After tightening the slotted nut, install cotter pin as shown in the figure.

(Bleeding air in power steering circuit)

- Start the engine.
- Turn the steering wheel slowly in both directions all the way alternately several times, and stop the engine.

Tightening torque	Tie-rod slotted nut	18 to 35 N·m 1.9 to 3.5 kgf·m 14 to 25 lbf·ft
	Tie-rod joint	74 to 84 N·m 7.6 to 8.5 kgf·m 55 to 61 lbf·ft

(1) Front Axle Bracket (Front)
(2) Front Axle Bracket (Rear)
(3) Tie-rod End
(4) Slotted Nut
(5) Cotter Pin

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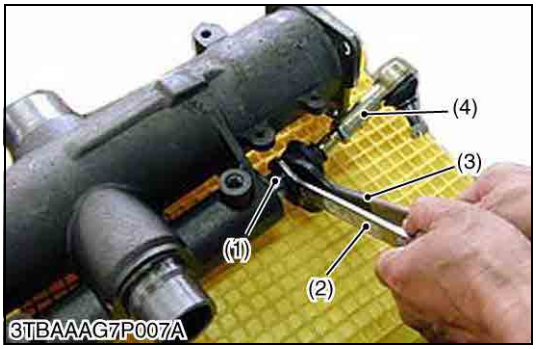

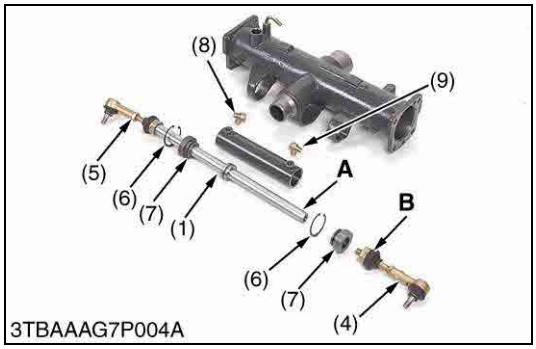

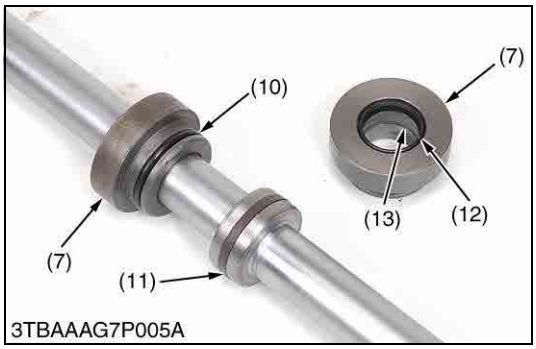

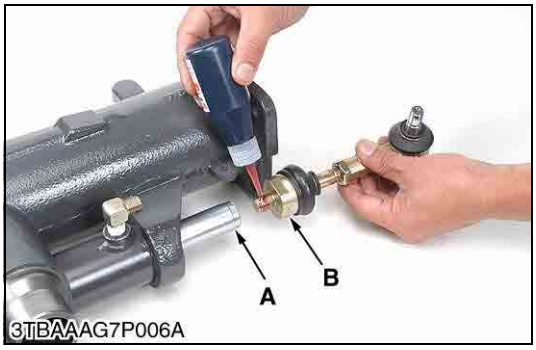

Power Steering Cylinder

CAUTION

- **Since power steering cylinder is full of high-pressured steering oil, high-pressured oil is injected out from hose adopters by pushing piston rods.**
- **This injected oil can penetrate the skin or eyes causing serious injury.**
- **Use appropriate protective wear to prevent serious injury.**
- **Use waste to cover the adopters.**
- **Before disassembling drain steering oil from power steering cylinder.**

1. Remove the tie-rod joint (4) from the rod (1) using spanners (2) (3).
2. Remove the adaptors (8) (9).
3. Remove the rod cover (7).
4. Tap out the rod (1) to the right front wheel side.

(When reassembling)

- Apply the lock tight (Three Bond 1324B or equivalent) to the tie-rod joint (4).

Tightening torque	Tie-rod joint	74 to 84 N·m 7.6 to 8.5 kgf·m 55 to 61 lbf·ft

(1) Rod
(2) Thin Spanner
(3) Standard Spanner
(4) Tie-rod Joint (LH)
(5) Tie-rod Joint (RH)
(6) Internal Cir-clip
(7) Rod Cover
(8) Adaptor (RH)
(9) Adaptor (LH)
(10) O-ring
(11) Gasket
(12) Dust Seal
(13) U Gasket

A : Position for thin thickness spanner
B : Position for standard thickness spanner

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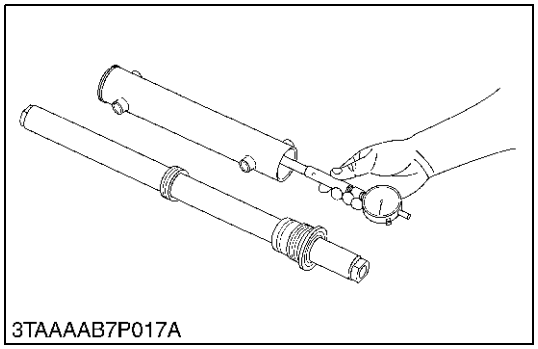
[3] SERVICING

(1) Power Steering Cylinder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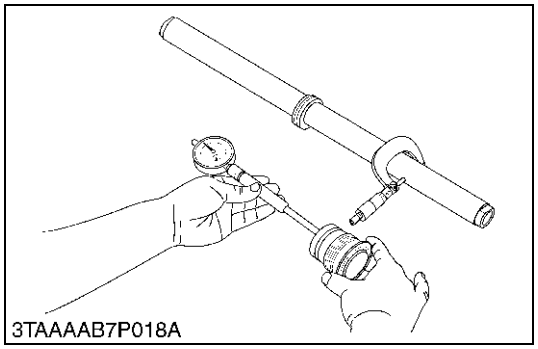
3TAAAAB7P018A

Steering Cylinder I.D.

1. Measure the steering cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceed the allowable limit, replace the cylinder barrel.

Steering cylinder I.D.	Factory specification	40.000 to 40.062 mm 1.5748 to 1.5772 in.
	Allowable limit	40.100 mm 1.5787 in.

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Clearance between Rod and Guide

1. Measure the rod guide I.D. with a cylinder gauge.
2. Measure the rod O.D. with an outside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace as a unit.

Clearance between rod and guide	Factory specification	0.020 to 0.070 mm 0.00079 to 0.0027 in.
	Allowable limit	0.200 mm 0.00787 in.

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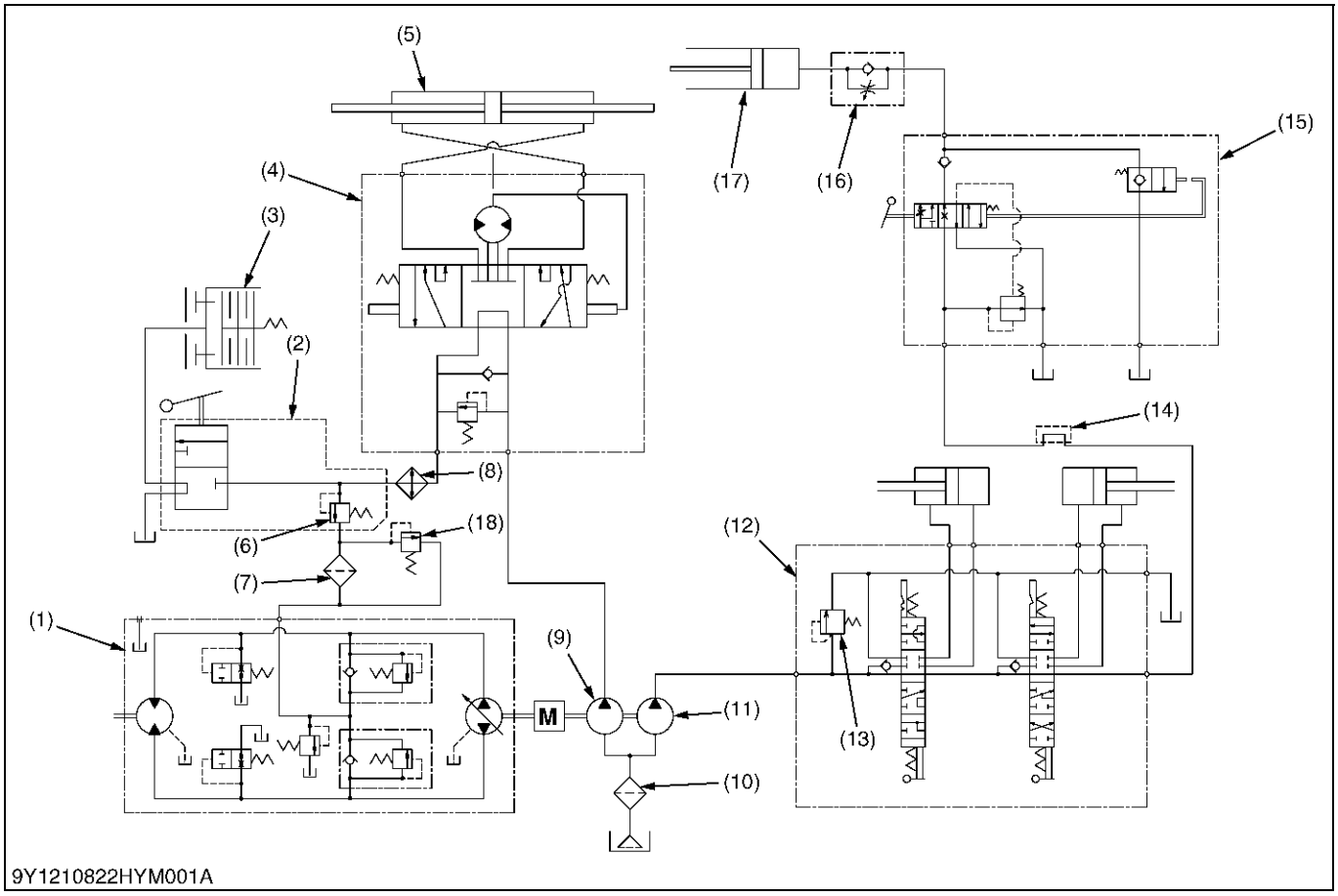
7 HYDRAULIC SYSTEM

MECHANISM

CONTENTS

1. HYDRAULIC CIRCUIT



(1) Hydrostatic Transmission (HST)
(2) Independent PTO Control Valve
(3) Independent PTO Clutch
(4) Power Steering Controller
(5) Power Steering Cylinder
(6) Relief Valve
(7) Oil Filter Cartridge
(8) Oil Cooler
(9) Hydraulic Pump (for Power Steering, Independent PTO and HST)
(10) Oil Filter Cartridge
(11) Hydraulic Pump (for 3-Points Hitch)
(12) Hydraulic Block (for Front Loader)
(13) Relief Valve
(14) Hydraulic Block
(15) Control Valve
(16) Lowering Speed Adjusting Valve
(17) Hydraulic Cylinder
(18) Relief Valve

(1) Hydraulic System

The hydraulic system consist of hydraulic pumps (9) (11), power steering, independent PTO, HST (1), and 3-points hitch and other components.

1. Hydraulic power take off from the hydraulic block type outlet to operate the implements such as a front loader, front blade, rear blade and etc..
2. Hydraulic oil operates power steering, independent PTO clutch, HST and 3-point hitch.

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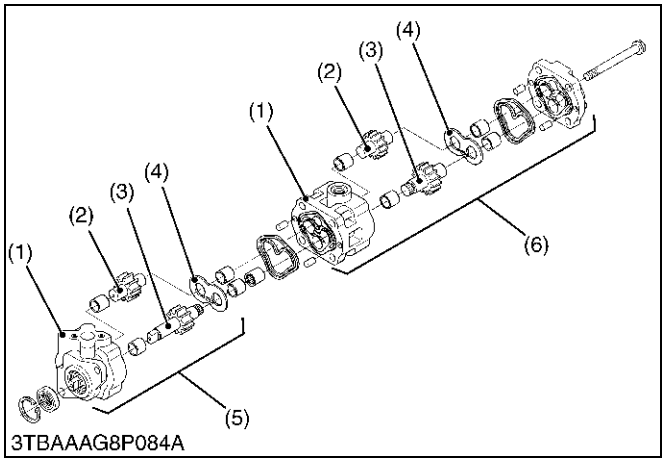
2. HYDRAULIC PUMP



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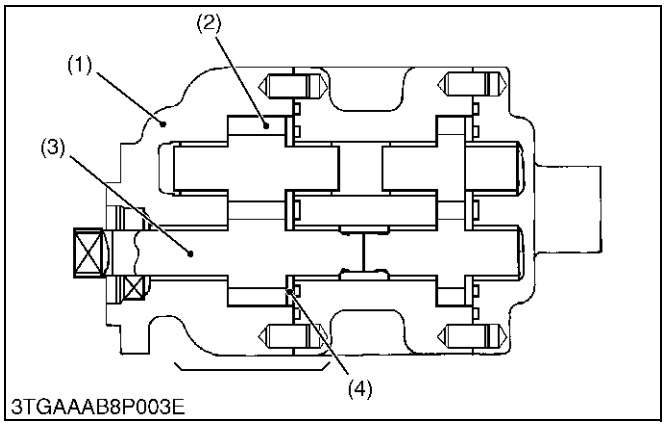

3TGAAAB8P003E

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

Hydraulic pump is driven by the fuel camshaft.

Maximum displacement is as follows.

Hydraulic pump (for 3-points hitch)

Displacement	Engine speed	Condition
Above 17.0 L/min. 4.49 U.S.gals./min. 3.74 Imp.gals./min.	At 2500 min^{-1} (rpm)	at no load

Hydraulic pump (for power steering)

Displacement	Engine speed	Condition
13.0 L/min. 3.43 U.S.gals./min. 2.86 Imp.gals./min.	At 2500 min^{-1} (rpm)	at no load

(1) Casing
(2) Driven Gear
(3) Drive Gear
(4) Side Plate
(5) Hydraulic Pump (for 3-Points Hitch)
(6) Hydraulic Pump (for Power Steering)

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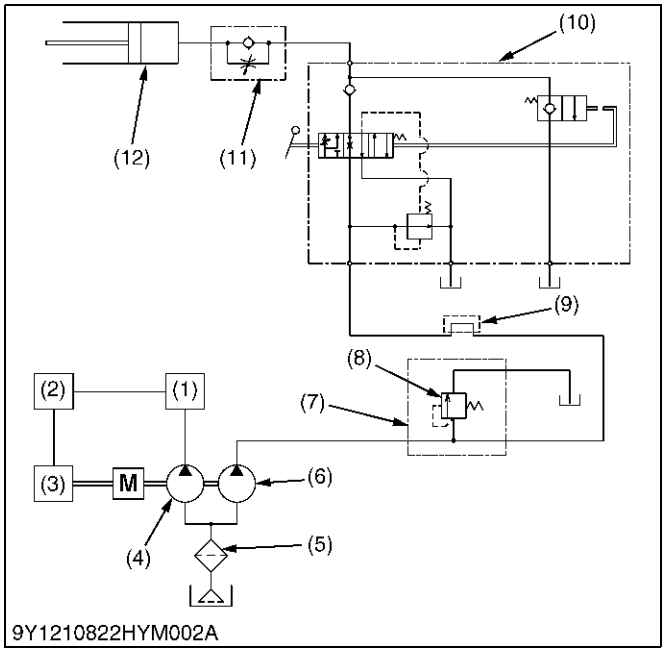
3. THREE POINTS HYDRAULIC SYSTEM

[1] HYDRAULIC CIRCUIT



Two hydraulic pumps (4) (6) are installed in the B2650 and B3350.

Hydraulic oil is forced from hydraulic pump (6) to the loader control valve (7), relief valve (8), hydraulic block (9) and position control valve (10).

Three point hydraulic oil pressure is controlled by the relief valve (8).

(1) Power Steering Controller
(2) Independent PTO
(3) HST
(4) Hydraulic Pump (for Power Steering, HST, and Independent PTO)
(5) Oil Filter Cartridge
(6) Hydraulic Pump (for 3-Points Hitch)
(7) Loader Control Valve
(8) Relief Valve
(9) Hydraulic Block (Hydraulic Cylinder Block)
(10) Position Control Valve
(11) Lowering Speed Adjusting Valve
(12) Hydraulic Cylinder

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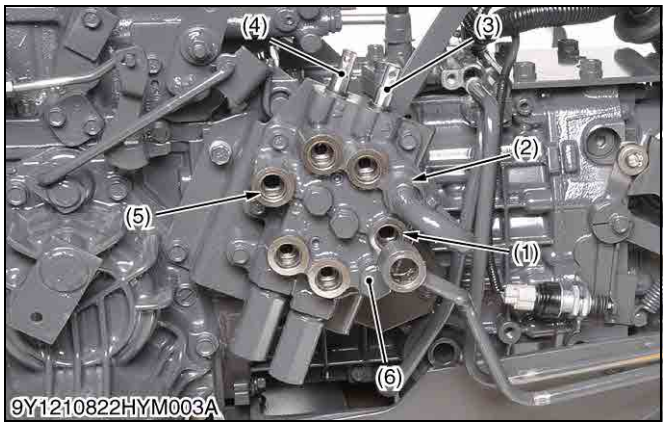
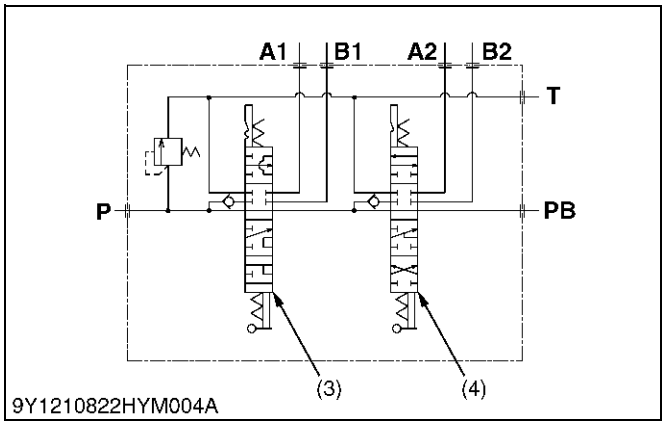
[2] FRONT LOADER CONTROL VALVE

(1) Structure





The control valve assembly consists of one casting block and four major section as shown above.

1) Inlet and Outlet Section

This section has **P** and **T** ports.

The **P** port is connected to the **OUTLET** port of hydraulic block by the hydraulic hose.

The **T** port is connected to the **TANK** port of hydraulic block by the hydraulic hose.

2) Boom Control Section

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

3) Bucket Control Section

The bucket control valve is consists of 4-position, 6-connection, no detent, spring center type, consisting of a mono block valve housing, spool, load check valve, etc. This valve has **A2** and **B2** ports and controls oil flow to the bucket cylinder.

4) Power Beyond

This section has **PB** port which is connected to the **INLET** port of hydraulic block by the hydraulic hose, and feeds oil to the 3-point hitch hydraulic control valve.

(1) Pump Port
(2) Tank Port
(3) Boom Control Spool
(4) Bucket Control Spool
(5) Power Beyond Port
(6) Loader Valve Assembly

P: P Port
T: T Port
A1: A1 Port
A2: A2 Port
B1: B1 Port
B2: B2 Port
PB: PB Port

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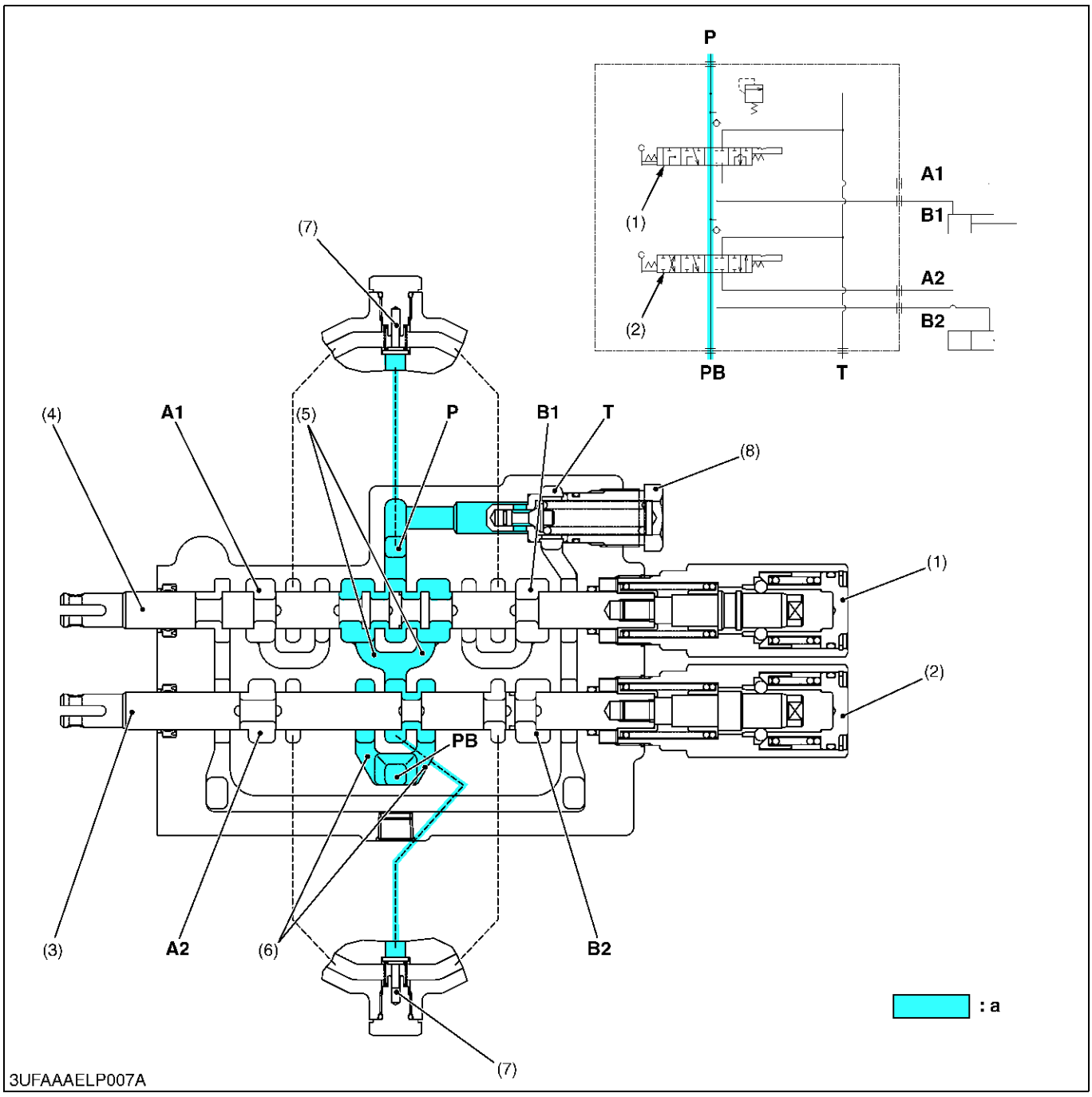
(2) Operation

Neutral



(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) Spool
(5) **PB** Passage 1
(6) **PB** Passage 2
(7) Load Check Valve
(8) Relief Valve

T: T Port
P: P Port
A1: A1 Port
A2: A2 Port
B1: B1 Port
B2: B2 Port
PB: PB Port

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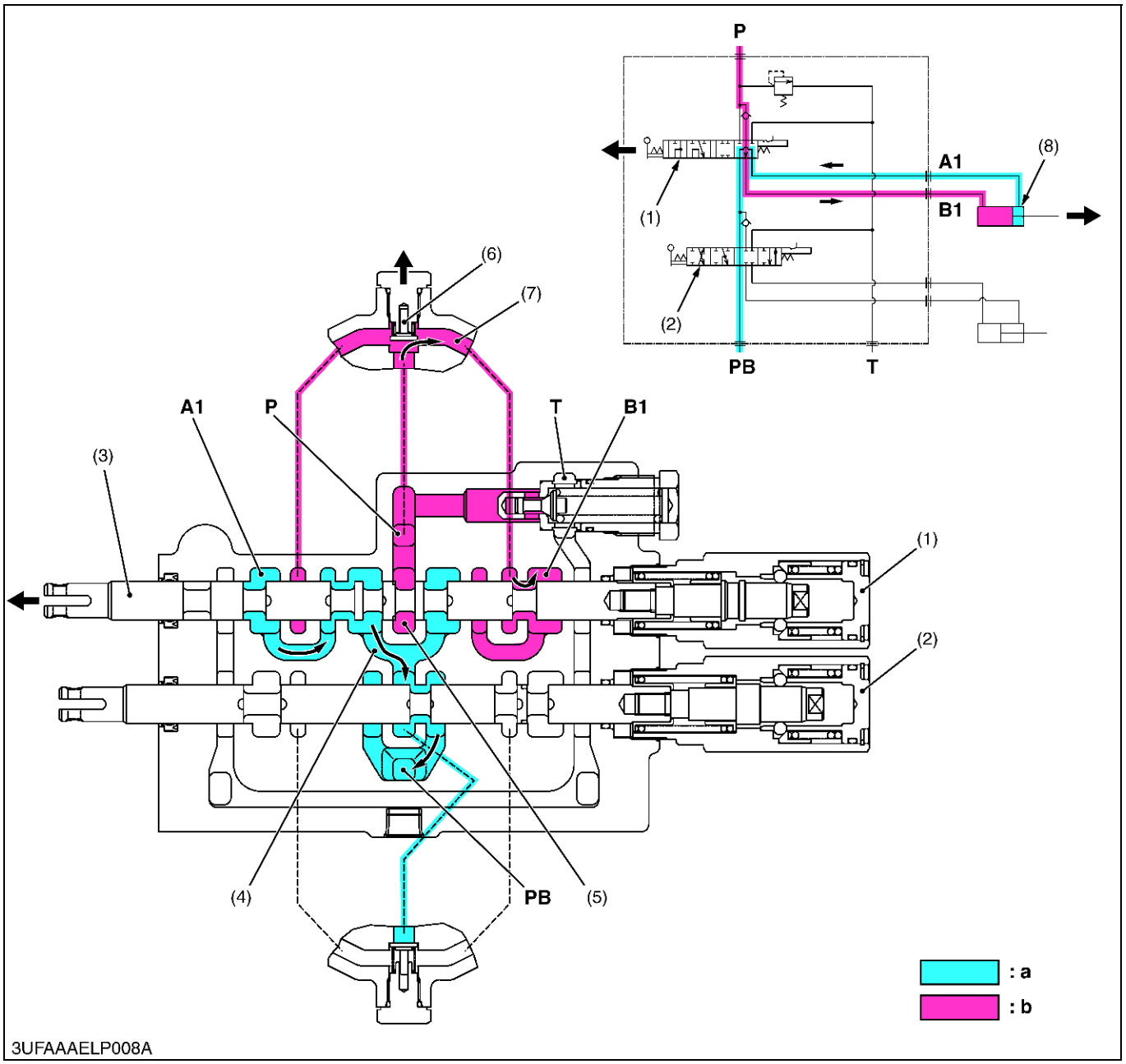
Up



(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) **PB** Passage 1
(5) Neutral Passage 1
(6) Load Check Valve
(7) Passage 1
(8) Boom Cylinder

P: P Port
T: T Port

A1: A1 Port (From Boom Cylinder)
B1: B1 Port (To Boom Cylinder)
PB: PB Port
a: Low Pressure
b: High Pressure

1. When the hydraulic control lever is set to the **"UP"** position, the spool (3) of the boom control section (1) moves to the left, which forms oil passages between passage 1 (7) and **B1** port, and between **A1** port and **PB** passage 1 (4).
2. As the oil passage from the neutral passage 1 (5) to the **PB** passage 1 (4) is closed by the spool (3), the pressure-fed oil from the **P** port opens the load check valve (6) and flows through the notched section of the spool (3) and **B1** port to extend the boom cylinder (8).
3. Return oil from the boom cylinder (8) flows from the **A1** port through the passage in the spool (3) and **PB** passage 1 (4) to the bucket control section (2).

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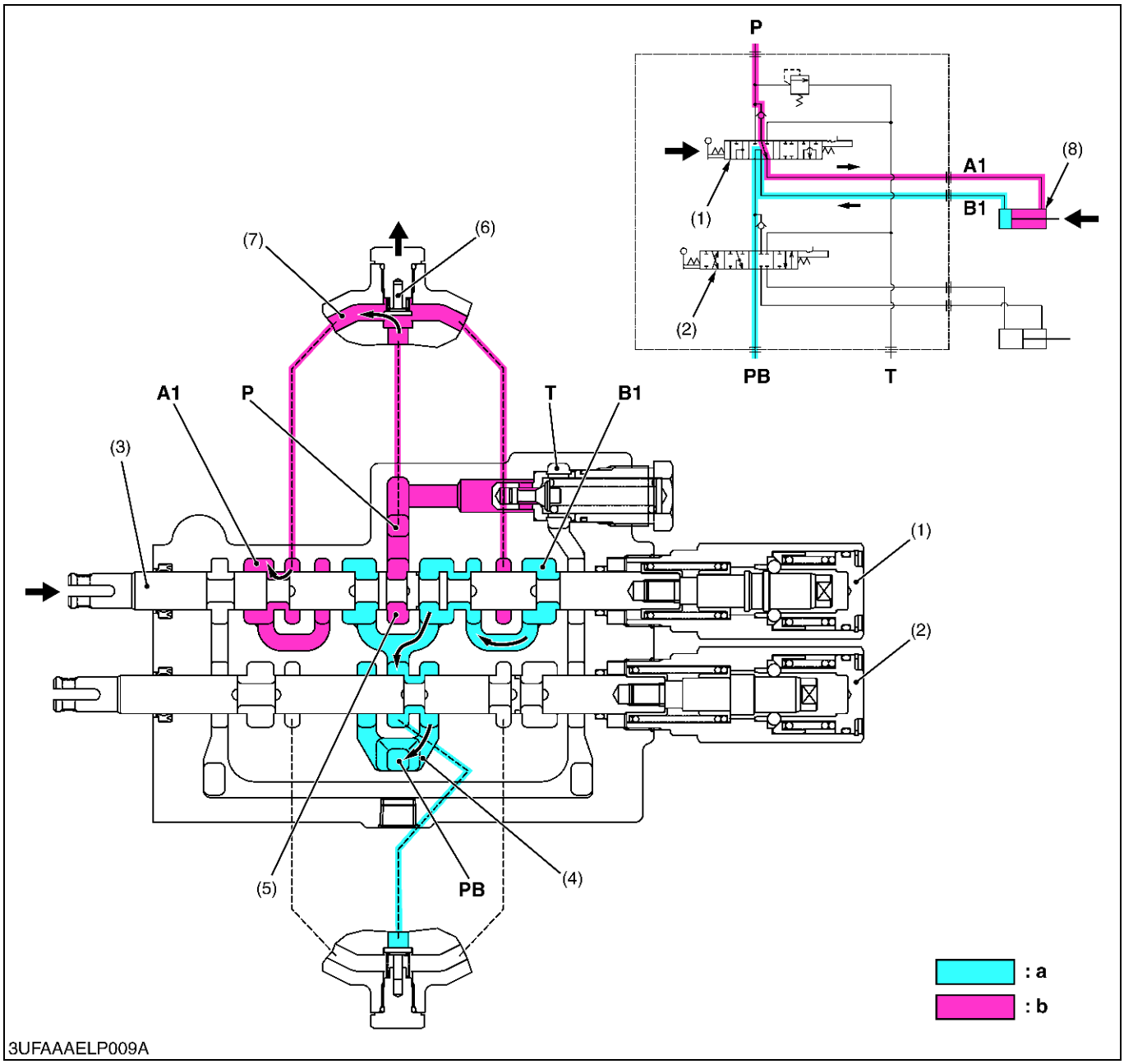
Down



(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) **PB** Passage 1
(5) Neutral Passage 1
(6) Load Check Valve
(7) Passage 1
(8) Boom Cylinder

P: P Port
T: T Port

A1: A1 Port (To Boom Cylinder)
B1: B1 Port (From Boom Cylinder)
PB: PB Port
a: Low Pressure
b: High Pressure

1. When the hydraulic control lever is set to the **"DOWN"** position, the spool (3) moves to the right, which forms oil passages between passage 1 (7) and **A1** port, and between **B1** port and **PB** passage 1 (4).
2. As the oil passage from the neutral passage 1 (5) to the **PB** passage 1 (4) is closed by the spool (3), the pressure-fed oil from the **P** port opens the load check valve (6) and flows through the notched section of the spool (3) and **A1** port to retract the boom cylinder (8).
3. Return oil from the boom cylinder (8) flows from the **B1** port through the passage in the spool (3) and **PB** passage 1 (4) to the bucket control section (2).

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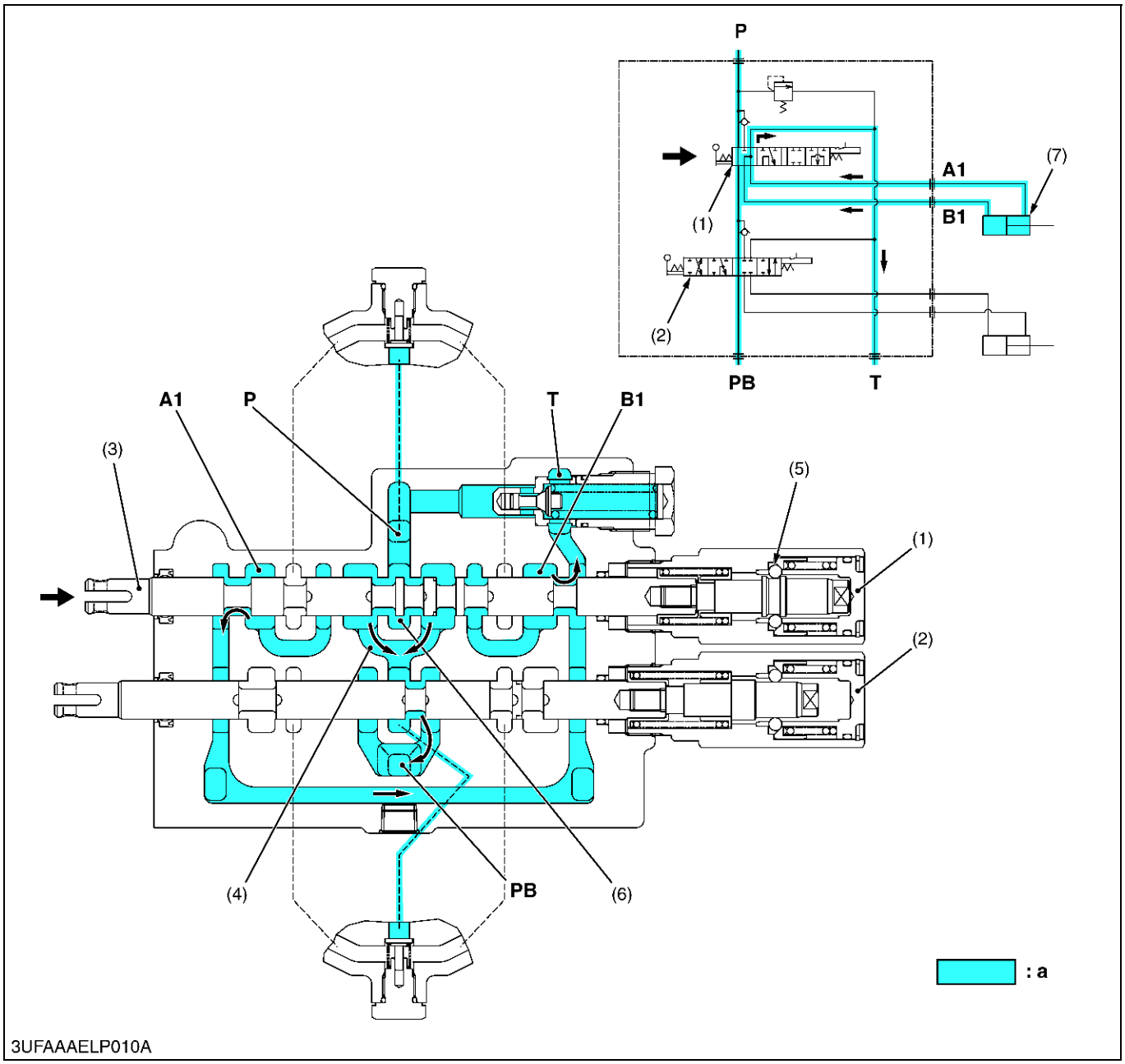
Floating



(1) Boom Control Section
(2) Bucket Control Section
(3) Spool
(4) **PB** Passage 1
(5) Detent Mechanism
(6) Neutral Passage 1
(7) Boom Cylinder

P: P Port
T: T Port

A1: A1 Port
B1: B1 Port
PB: PB Port
a: Low Pressure

1. When the hydraulic control lever is set to the **"FLOAT"** position, the spool (3) moves further to the right from the **"DOWN"** position and is retained by the detent mechanism (5).
2. This forms oil passages among the **A1** port, **B1** port and **T** port. As a result, oil in the boom cylinder (7) flows freely from the **A1** port and **B1** port through the **T** port to the transmission case.
3. Oil entering the **P** port flows to the bucket control section (2) through the neutral passage 1 (6) and **PB** passage 1 (4).

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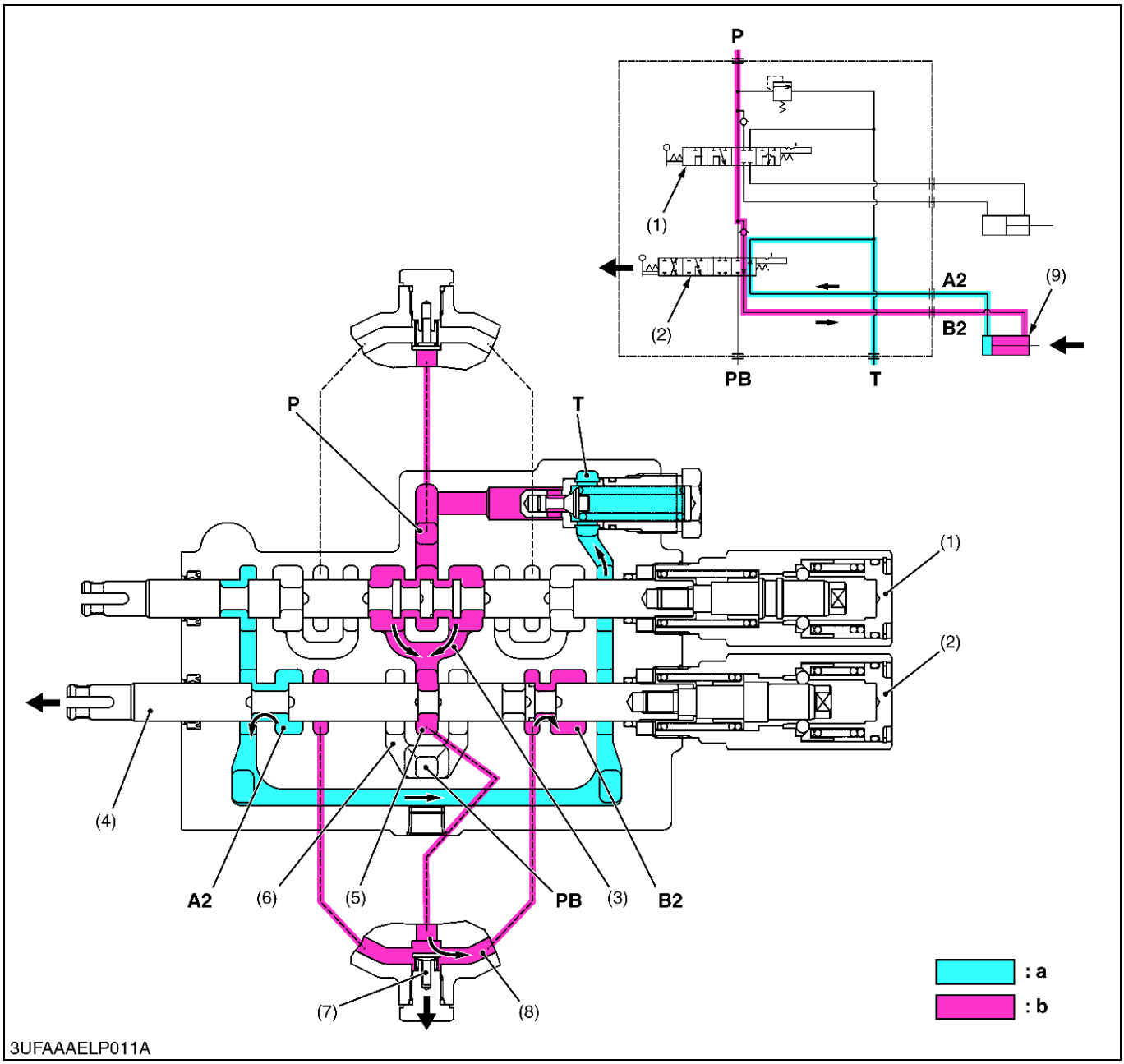
Roll-back



(1) Boom Control Section
(2) Bucket Control Section
(3) **PB** Passage 1
(4) Spool
(5) Neutral Passage 2
(6) **PB** Passage 2
(7) Load Check Valve
(8) Passage 2
(9) Bucket Cylinder

P: P Port
T: T Port
PB: PB Port
A2: A2 Port (From Bucket Cylinder)
B2: B2 Port (To Bucket Cylinder)
a: Low Pressure
b: High Pressure

1. When the hydraulic control lever is set to the **"ROLL-BACK"** position, the spool (4) of the bucket control section (2) moves to the left, which forms oil passages between passage 2 (8) and **B2** port, and between **A2** port and **T** port.
2. The pressure-fed oil from the **P** port flows to the neutral passage 2 (5) through the boom control section (1) and **PB** passage 1 (3). As the oil passage from the neutral passage 2 (5) to the **PB** passage 2 (6) is closed by the spool (4), this oil opens the load check valve (7), and flows through the notched section of the spool (4) and **B2** port to retract the bucket cylinder (9).
3. Return oil from the bucket cylinder (9) flows to the transmission case through the **A2** port and **T** port.

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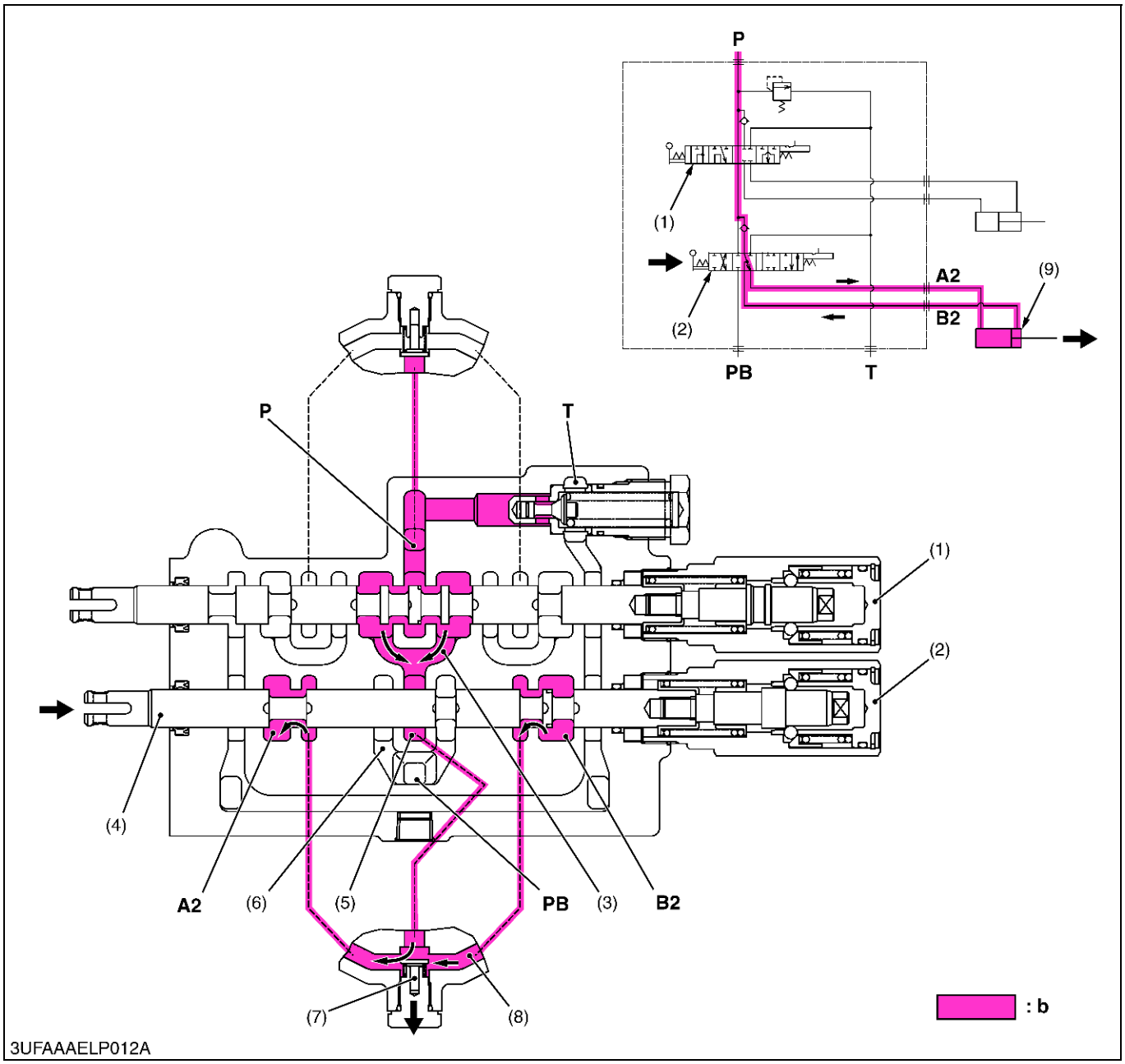
Dump 1



(1) Boom Control Section
(2) Bucket Control Section
(3) **PB** Passage 1
(4) Spool
(5) Neutral Passage 2
(6) **PB** Passage 2
(7) Load Check Valve
(8) Passage 2
(9) Bucket Cylinder

P: **P Port**
T: **T Port**
PB: **PB Port**

A2: **A2 Port (To Bucket Cylinder)**
B2: **B2 Port (From Bucket Cylinder)**
b: **High Pressure**

1. When the hydraulic control lever is set to the **"DUMP 1"** position, the spool (4), which forms oil passages among passage 2 (8), **A2** port and **B2** port.
2. The pressure-fed oil from the **P** port flows through the boom control valve, opens the load check valve, and flows to the bucket cylinder to extend the cylinder through the notched section of the spool and **A2** port.
3. Return oil from the bucket cylinder (9) flows from the **B2** port to the passage 2 (8), and flows to the **A2** port together with the pressure-fed oil from the **P** port.
   As a result, the dump speed is increased.

(Reference)

- The oil pressure of the **A2** port and **B2** port is identical, but the bucket cylinder extend by the difference of received pressure area (cylinder rod part).

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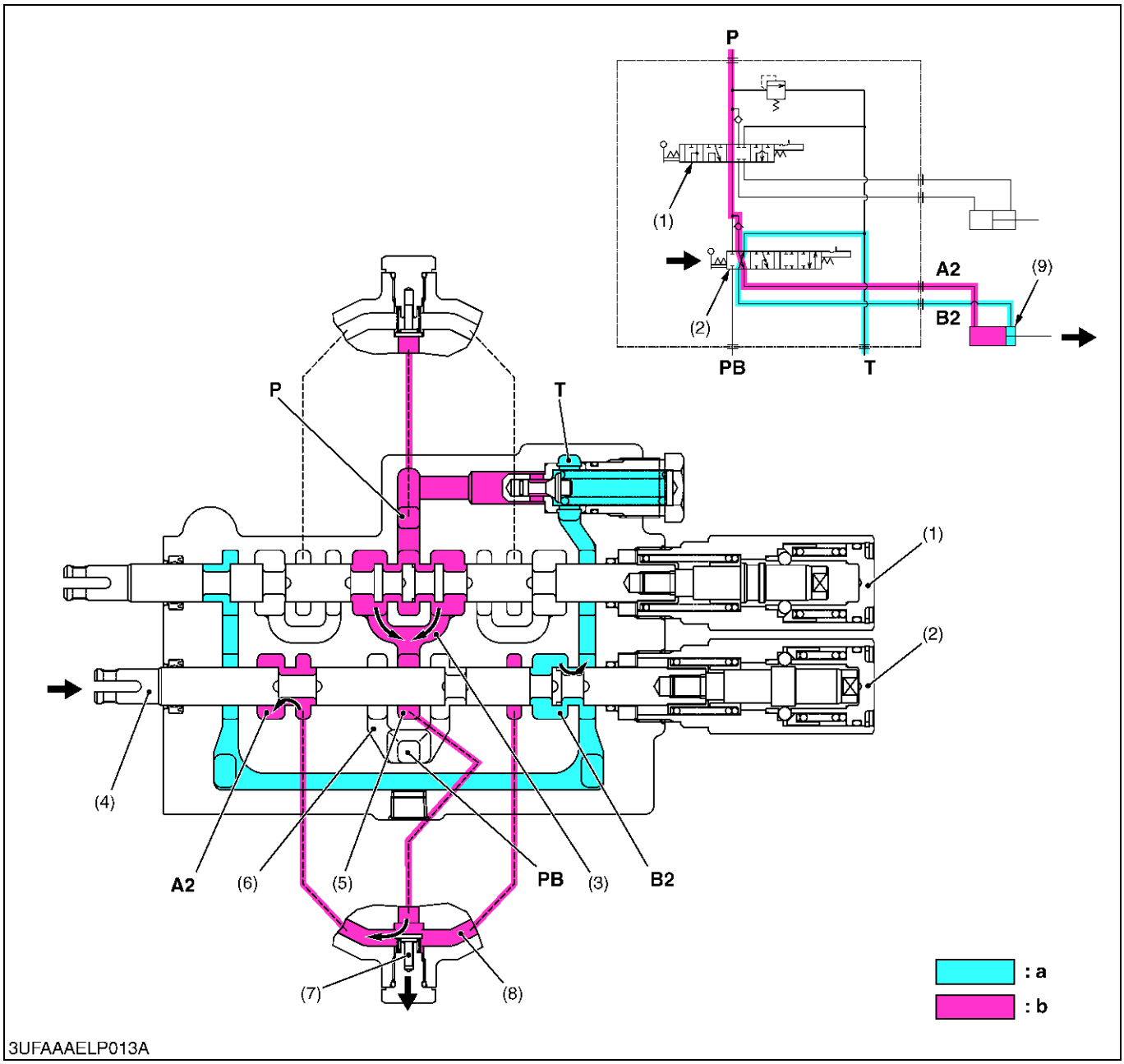
Dump 2



(1) Boom Control Section
(2) Bucket Control Section
(3) **PB** Passage 1
(4) Spool
(5) Neutral Passage 2
(6) **PB** Passage 2
(7) Load Check Valve
(8) Passage 2
(9) Bucket Cylinder

P: P Port
T: T Port
PB: PB Port

A2: A2 Port (To Bucket Cylinder)
B2: B2 Port (From Bucket Cylinder)
a: Low Pressure
b: High Pressure

1. When the hydraulic control lever is set to the **"DUMP 2"** position, the spool (4) of the bucket control section (2) moves to the right of the bucket control section (2) moves further to the right from the **"DUMP 1"** position, which forms oil passages between passage 2 (8) and **A2** port, and between **B2** port and **T** port.
2. The pressure-fed oil from the **P** port flows to the neutral passage 2 (5) through the boom control section (1) and **PB** passage 1 (3). As the oil passage from the neutral passage 2 (5) to the **PB** passage 2 (6) is closed by the spool (4), this oil opens the load check valve (7) and flows through the notched section of the spool (4) and **B2** port to extend the bucket cylinder (9).
3. Return oil from the bucket cylinder (9) flows to the transmission case through the **B2** port and **T** port.

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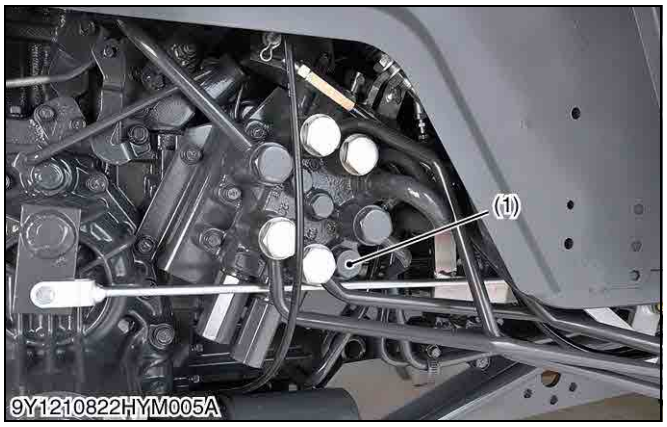
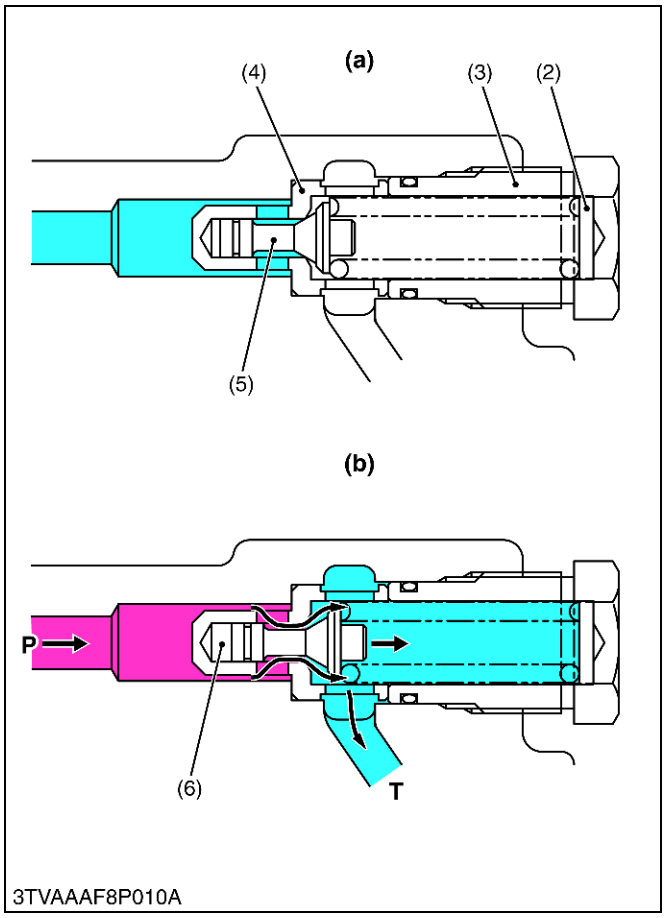
[3] RELIEF VALVE





The hydraulic raising and lowering circuit is fitted with a relief valve to control the maximum pressure.

This is a guide piston relief valve with damper, a direct acting relief valve suitable for relatively high pressure and capacity, and constructed so as to prevent chattering and other unstableness associated with direct acting relief valves. As shown in the diagram, poppet (5) has a guide, and there is a valve chamber called a damping chamber (6) in the base of this guide piston. The valve inlet is connected to this chamber through the clearance between the guide surface and the seat so that the chamber provides a damping effect, controlling valve vibration.

When the pressure in the circuit rises, the pressure in the damping chamber also rises, and when it exceeds the relief pressure setting the spring is compressed, making a clearance between the poppet and the seat. The hydraulic oil can escape to the transmission case through this clearance, controlling the pressure rise.

- Relief valve setting pressure for loader valve
  16.5 to 16.9 MPa
  169 to 172 kgf/cm^2
  2400 to 2450 psi

Condition

- Engine speed
  Approx. 2500 min^{-1} (rpm)
- Oil temperature
  50 °C (122 °F)

(1) Relief Valve
(2) Shim
(3) Plug
(4) Seat
(5) Poppet
(6) Damping Chamber

(a) Normal State
(b) Active State
T: T Port (To Transmission Case)
P: P Port (From Pump)

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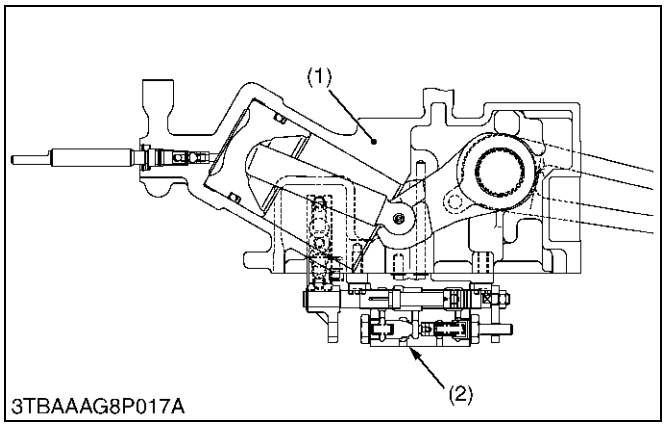
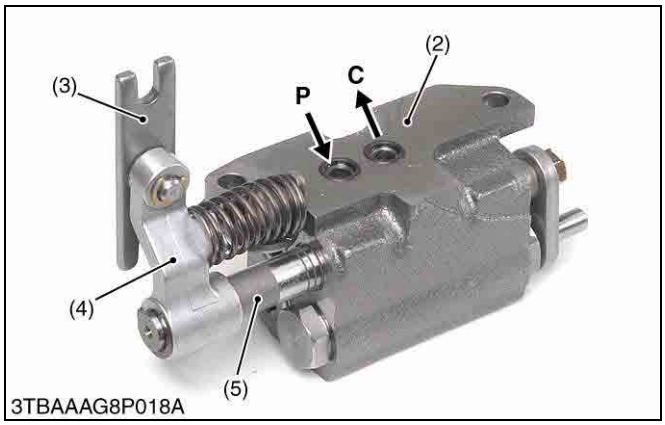
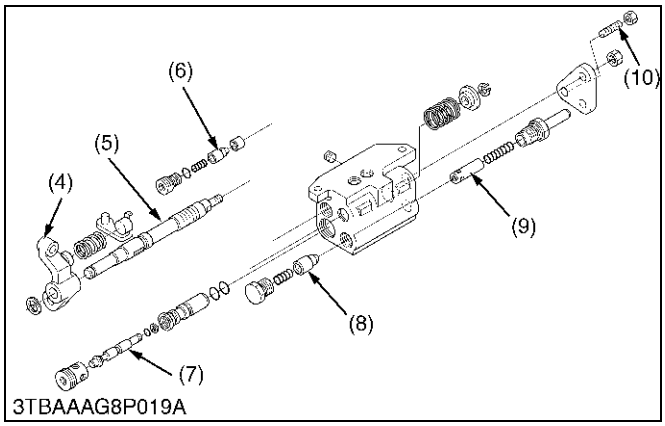
[4] POSITION CONTROL VALVE







This position control valve (2) is located under the hydraulic cylinder block (1).

This control valve is mechanically connected to the position control lever with linkage.

This control valve is also mechanically connected to the lift arm with a feedback rod.

This control valve controls the oil flow forced from hydraulic pump and the oil returned back from the hydraulic cylinder.

(1) Hydraulic Cylinder Block
(2) Position Control Valve
(3) Link
(4) Lever
(5) Spool
(6) Poppet
(7) Poppet
(8) Poppet
(9) Poppet
(10) Set Screw

P : Pump Port
C : Cylinder Port

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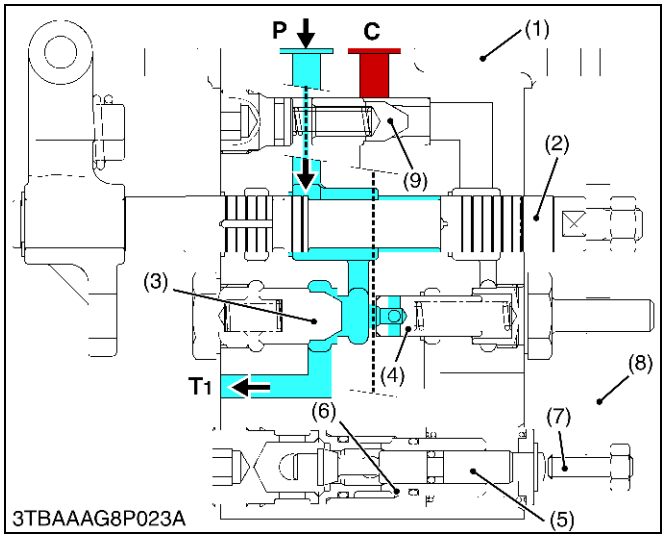
(1) Neutral



Neutral

Oil forced into the control valve through **P** port pushes and opens the unload valve (3), and opens the unload valve (3), and then returns to the transmission case through **T1** port.

Oil behind the unload valve (3) returns to the transmission case through the groove of the spool (2).

Since the check valve (9) and the poppet 2 (5) are closed, oil in the hydraulic cylinder does not flow to the transmission case. Thus, the implement remains at its fixed position.

(1) Valve Body
(2) Spool
(3) Unload Valve
(4) Unload Poppet
(5) Poppet 2
(6) Sleeve
(7) Adjusting Bolt
(8) Connecting Plate
(9) Check Valve

P : Pump Port
C : Cylinder Port
T1 : Tank Port

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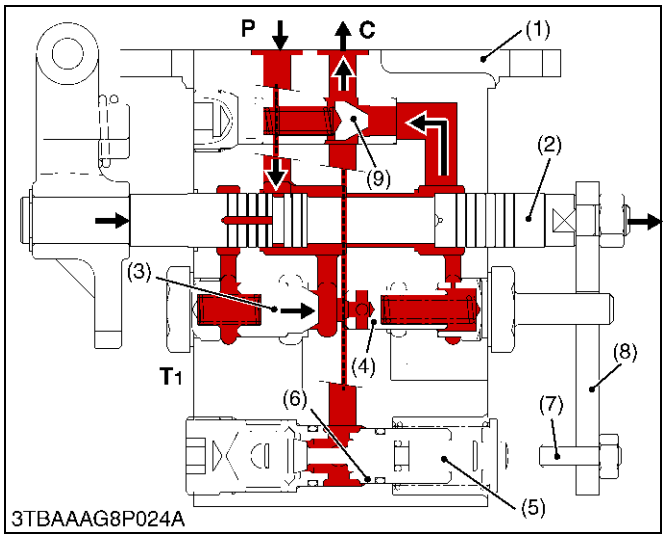
(2) Lift



Lift

When the position control lever is set to **"LIFT"** position, the spool (2) is pushed into the valve body (1).

The oil forced into the control valve body (1) through **P** port flows to two oil circuits.

The first circuit is oil flowing to the back of the unload valve (3) to close it.

The second oil circuit is oil flowing to the check valve (9) and the hydraulic cylinder through **C** port to lift the implement.

(1) Valve Body
(2) Spool
(3) Unload Valve
(4) Unload Poppet
(5) Poppet 2
(6) Sleeve
(7) Adjusting Bolt
(8) Connecting Plate
(9) Check Valve

P : Pump Port
C : Cylinder Port
T1 : Tank Port

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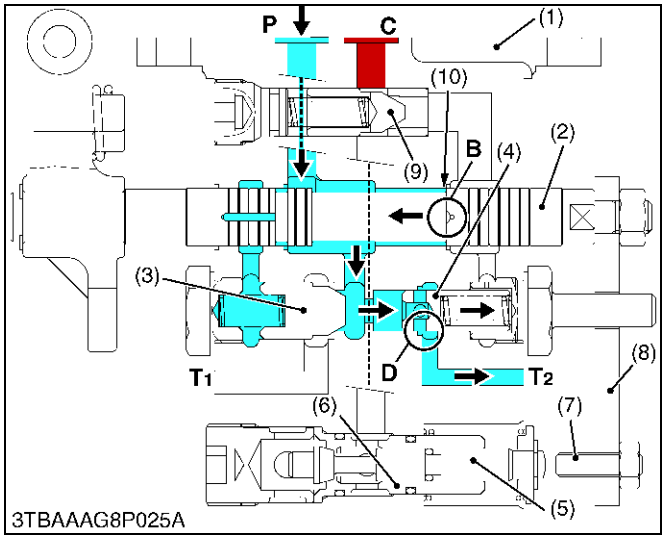
(3) Shockless Mechanism Operating (Lift to Neutral)



Shockless Mechanism Operating (Lift to Neutral)

When the implement begins to lift up, the feedback rod connected to the lift arm pushes back the spool (2) to near **"NEUTRAL"** position.

When the implement lifts up near the **"NEUTRAL"** position, quantity of oil passing through the orifice (10) is reduced.

It causes oil pressure difference between portion **B** and unload poppet (4).

Since oil pressure at unload poppet (4) is higher than oil pressure at portion **D**, oil forced from **P** port pushes and opens unload poppet (4), and oil drains through **T2** port to transmission case.

Quantity of oil flowing through portion **B** is less.

Quantity of oil flowing to unload poppet (4) is greater.

It causes oil pressure increase at portion **D** of the unload poppet (4).

While the implement is coming to **"NEUTRAL"** position, quantity of oil flowing to spool (2) is reduced at portion **B**. And then, oil drains through unload poppet (4) to transmission case.

It causes implement's smooth stopping at **"NEUTRAL"** position without shock.

(1) Valve Body
(2) Spool
(3) Unload Valve
(4) Unload Poppet
(5) Poppet 2
(6) Sleeve
(7) Adjusting Bolt
(8) Connecting Plate
(9) Check Valve
(10) Orifice

P : Pump Port
B : Portion B
C : Cylinder Port
D : Portion D
T1 : Tank Port

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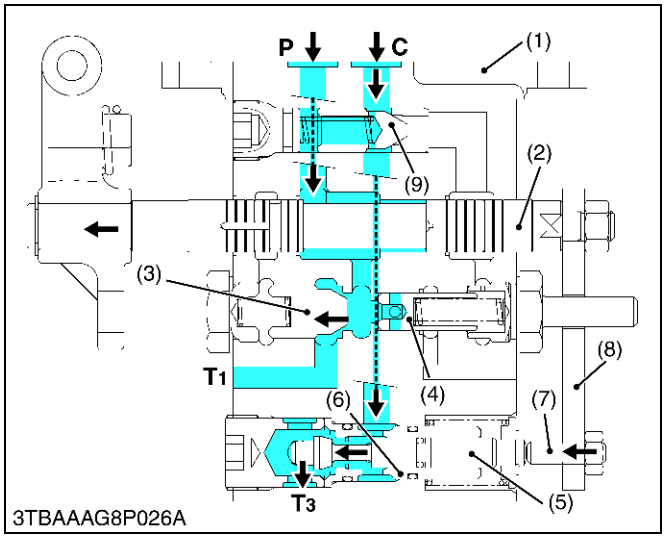
(4) Down



Down

When the position control lever is set to **"DOWN"** position, the spool (2) is pulled out from the control valve body (1).

At the same time, the adjust bolt (7) connected to the connecting plate (8) pushes the poppet (5) into the control valve body (1). And then the poppet (5) is opened.

Oil in the hydraulic cylinder is forced out through **T3** port and **T4** port to transmission case by the weight of the implement, causing the implement to lower.

Oil forced into the control valve through **P** port pushes and opens the unload valve (3) and returns to the transmission case through **T1** port.

(1) Valve Body
(2) Spool
(3) Unload Valve
(4) Unload Poppet
(5) Poppet 2
(6) Sleeve
(7) Adjusting Bolt
(8) Connecting Plate
(9) Check Valve

P : Pump Port
C : Cylinder Port
T1 : Tank Port
T3 : Tank Port
T4 : Tank Port

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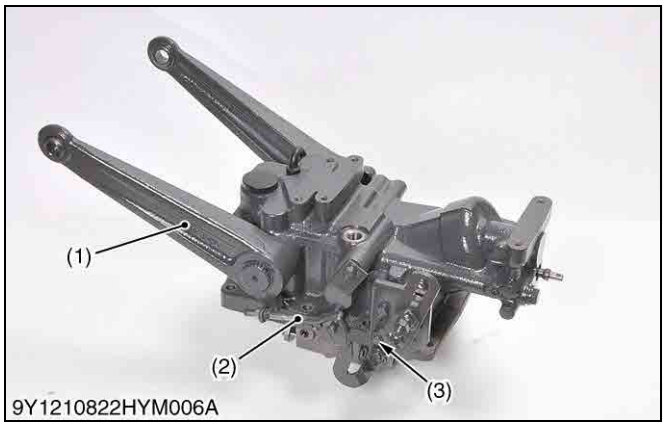
[5] FEEDBACK LINKAGE FOR POSITION CONTROL



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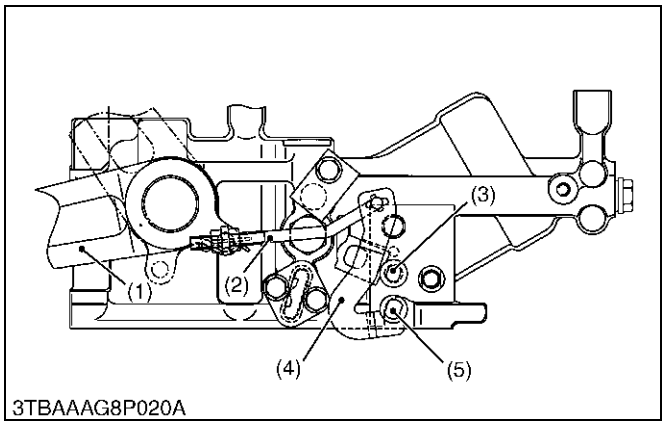

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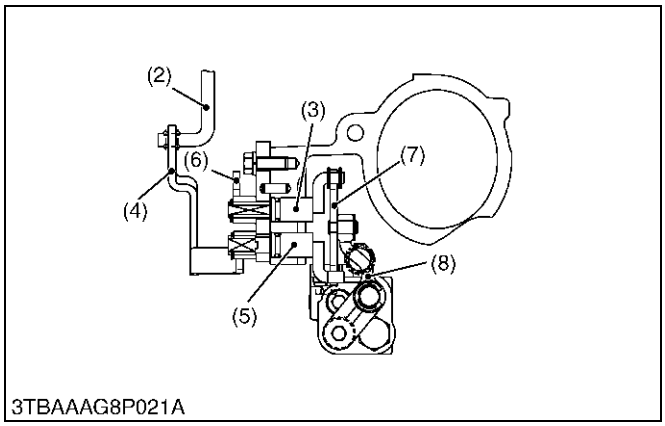

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When the position control lever is moved to rearward to lift the implement, the spool of the position control valve is pushed in to form a lifting circuit by the motions of the control lever arm, the control lever shaft (3), the connecting arm (7) and the lever (8). After the lift arm (1) moves upward, the spool is pulled out and returns to form a neutral circuit by the motions of the feedback rod (2), the feedback arm (4), the feedback, the arm shaft (5), the connecting arm (7) and the lever (8).

As a result, the implement height can be easily determined in proportion to the set position of the position control lever.

(1) Lift Arm
(2) Feedback Rod
(3) Control Lever Shaft
(4) Feedback Arm
(5) Feedback Arm Shaft
(6) Control Lever Arm
(7) Connecting Arm
(8) Lever

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SERVICING

CONTENTS

1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Rise (No Noise)	Control valve broken	Replace	7-S13
	Control valve improperly adjusted	Adjust	7-S15
	Control valve improperly assembled	Repair	7-S15
	Relief valve improperly assembled	Replace	7-S5
	Piston O-ring or cylinder damaged	Replace	7-S14
Implement Does Not Rise (Noise)	Oil filter cartridge clogged	Clean or Replace	G-31
	Suction pipe loosen or broken	Repair or Replace	2-S18
	Suction pipe connecting hose loosen or broken	Repair or Replace	2-S18
	Suction pipe O-ring broken	Replace	2-S18
	Insufficient transmission oil	Refill	G-20
	Relief valve setting pressure too low	Adjust or Replace	7-S5
	Hydraulic pump broken	Replace	7-S6
Implement Does Not Reach Maximum Height	Feedback rod improperly adjusted	Adjust	7-S5
Implement Does Not Lower	Control valve malfunctioning	Repair or Replace	7-S13, 7-S15
Implement Drops by Its Weight	Hydraulic cylinder worn or damaged	Replace	7-S17
	Piston O-ring worn or damaged	Replace	7-S14
	Control valve malfunctioning	Replace	7-S13, 7-S15

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2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP FOR 3-POINT HITCH HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Pump Delivery **Condition** • Engine Speed 2500 min^{-1} (rpm) • Oil Temperature 50 °C (122 °F)	At no pressure	Above 17.0 L/min. 4.49 U.S.gals/min. 3.74 Imp.gals/min.	–
Gear to Casing	Clearance	–	0.15 mm 0.0059 in.
Gear Shaft to Bushing	Clearance	0.020 to 0.091 mm 0.00079 to 0.0035 in.	0.12 mm 0.0047 in.
• Gear Shaft	O.D.	14.970 to 14.980 mm 0.58937 to 0.58976 in.	–
• Bushing	I.D.	15.000 to 15.061 mm 0.59056 to 0.59295 in.	–
Side Plate	Thickness	2.48 to 2.50 mm 0.0977 to 0.0984 in.	2.40 mm 0.0945 in.

3-POINT HITCH HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Lift Arm	Free Play	10 to 15 mm 0.40 to 0.59 in.	–
Hydraulic Cylinder	I.D.	75.05 to 75.10 mm 2.955 to 2.956 in.	75.15 mm 2.959 in.
Hydraulic Arm Shaft to Bushing	Clearance	0.020 to 0.11 mm 0.00079 to 0.0043 in.	0.30 mm 0.012 in.
• Hydraulic Arm Shaft, Right	O.D.	37.925 to 37.950 mm 1.4932 to 1.4940 in.	–
• Hydraulic Arm Shaft, Left	O.D.	34.925 to 34.950 mm 1.3750 to 1.3759 in.	–
• Bushing, Right	I.D.	37.970 to 38.035 mm 1.4949 to 1.4974 in.	–
• Bushing, Left	I.D.	34.970 to 35.035 mm 1.3768 to 1.3793 in.	–

FRONT LOADER HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Relief Valve **Condition** • Engine Speed 2500 min^{-1} (rpm) • Oil Temperature 50 °C (122 °F)	Setting Pressure	16.5 to 16.9 MPa 169 to 172 kgf/cm^2 2400 to 2450 psi	–

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3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Power steering delivery hose nut	24 to 28	2.5 to 2.8	18 to 20
Rear wheel mounting nut	167 to 191	17 to 19.5	123 to 141
Rear wheel mounting bolt	196 to 225	20 to 23	145 to 166
Universal joint mounting bolt	24 to 28	2.5 to 2.8	18 to 20
Cabin mounting bolt and nut	124 to 150	12.7 to 15.2	91.5 to 110
Front loader valve pipe joint bolt	48 to 70	4.9 to 7.1	36 to 51
3-point hitch delivery pipe 1 joint bolt	48 to 70	4.9 to 7.1	36 to 51
3-point hitch delivery pipe 2 joint bolt (front loader control valve side)	48 to 70	4.9 to 7.1	36 to 51
3-point hitch delivery pipe 2 joint bolt (hydraulic cylinder case side)	50 to 60	5.1 to 6.1	37 to 44
Hydraulic pump cover mounting screw	35 to 39	3.5 to 4.0	26 to 28

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Hydraulic Pump for 3-Point Hitch Hydraulic System

Flowmeter Connection and Test Preparation

■ **IMPORTANT**

- **When using a flowmeter other than KUBOTA specified flowmeter (Code No. 07916-52792), be sure to use the instructions with that flowmeter.**
- **In this hook-up, there is no relief valve. Therefore while testing, do not close the flowmeter loading valve completely.**

1. Connect the hydraulic test hose to the adaptor and flowmeter inlet port.
2. Put the another hydraulic test hose to flowmeter outlet port and transmission oil filling port.
3. Open the flowmeter loading valve completely. (Turn counterclockwise)
4. Start the engine and set the engine speed at 2500 min^{-1} (rpm).
5. Slowly close the loading valve to generate the pressure approx. 14.4 MPa (146 kgf/cm^2, 2080 psi).
6. Hold in this condition until oil temperature reaches approx. 50 °C (122 °F).

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Pump Test

■ **NOTE**

- **Before pump testing, perform the flowmeter connecting and test preparation.**

1. Open the loading valve completely.
2. Start the engine and set at 2500 min^{-1} (rpm).
3. Read and note the pump delivery at no pressure.
4. Stop the engine.

(Reference)

Hydraulic pump delivery at no pressure	Factory specification	Above 17.0 L/min. 4.49 U.S.gals/min. 3.74 Imp.gals/min.

Condition

- Engine speed
  2500 min^{-1} (rpm)
- Rated pressure
  4.4 MPa (146 kgf/cm^2, 2080 psi)
- Oil temperature
  50 °C (122 °F)

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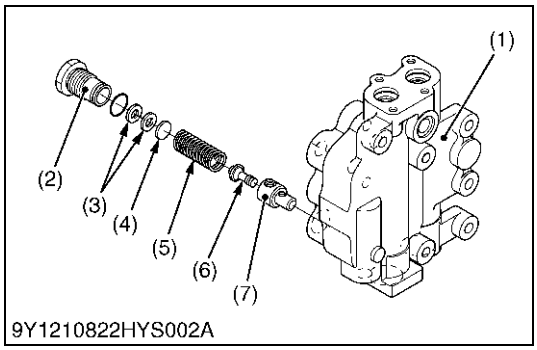
(2) Relief Valve



3-Point Hitch Relief Valve (Loader Relief Valve) Setting Pressure

1. Install the adaptor. Then connect the cable and the pressure gauge to the adaptor (Size 1/4).
2. Start the engine and set the engine speed at 2500 min^{-1} (rpm).
3. Set the front loader valve lever to the down ward position and read the pressure gauge when the relief valve is actuated.
4. If the pressure is not factory specifications, adjust the relief valve setting pressure with the adjusting shims (4).

Condition

- Engine speed
  2500 min^{-1} (rpm)
- Oil temperature
  50 °C (122 °F)

(Reference)

- Thickness of shims (4)
  0.10 mm (0.0039 in.)
  0.20 mm (0.0079 in.)
  0.40 mm (0.016 in.)
  0.60 mm (0.024 in.)

Relief valve setting pressure	Factory specification	16.5 to 16.9 MPa 169 to 172 kgf/cm^2 2400 to 2450 psi

(1) Loader Valve Assembly
(2) Plug
(3) Plain Washer
(4) Shim
(5) Spring
(6) Poppet
(7) Valve Seat

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(3) Lift Arm

Lift Arm Free Play

1. Set the position control lever (1) to the lowest position.
2. Start the engine, and set at the idling speed.
3. Move the position control lever (1) to the uppermost position.
4. Move the lift arm (2) to the upper end by hand and measure the free play.
5. If the measurement is not within the factory specifications, adjust the free play by changing the position control feedback rod setting length.

Lift arm free play	Factory specification	10 to 15 mm 0.40 to 0.59 in.

(1) Position Control Lever
(2) Lift Arm
L : Lowest Position
H : Uppermost Position

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[2] PREPARATION

(1) Hydraulic Pump

■ **IMPORTANT**

- **The hydraulic pump is precision machined and assembled : If disassemble once, it may be unable to keep its original performance. Therefore, when the hydraulic pump fails, replacement should be done with the hydraulic pump assembled except when emergency repair is unavoidable.**
- **When repair is required, follow the disassembly and servicing procedures shown below with utmost care.**
- **Be sure to test the hydraulic pump with a flowmeter before disassembling.**
- **After reassembly, be sure to perform break-in operation and ensure that there is nothing abnormal with the hydraulic pump.**

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Battery Cable

1. Open the bonnet and remove the side cover.
2. Disconnect the battery negative cable (1).

■ **NOTE**

- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, the positive cable first.**

(1) Battery Negative Cable

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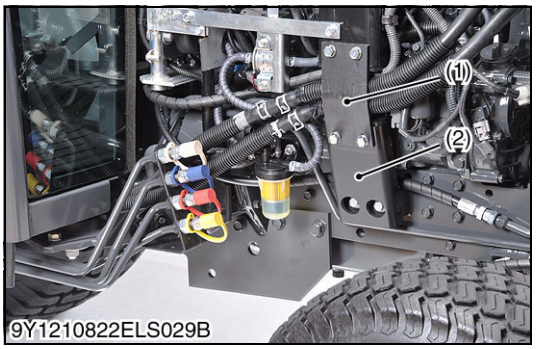
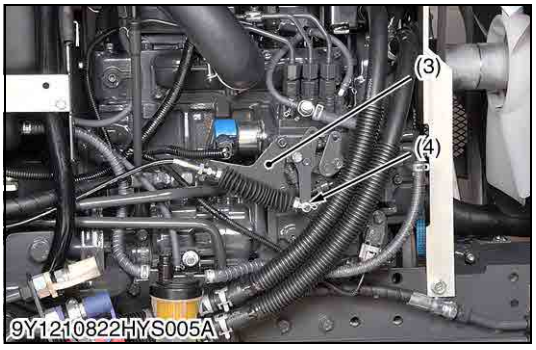


Hydraulic Pump

1. Remove the plate (1) and pillar (2). (B3350)
2. Disconnect the accelerator wire (4) and remove the bracket (3) with accelerator. (B2650)
3. Disconnect the power steering delivery hose (5) and 3-point hitch delivery pipe (6).
4. Disconnect the suction hose (7) and remove the hydraulic pump (8).

(When reassembling)

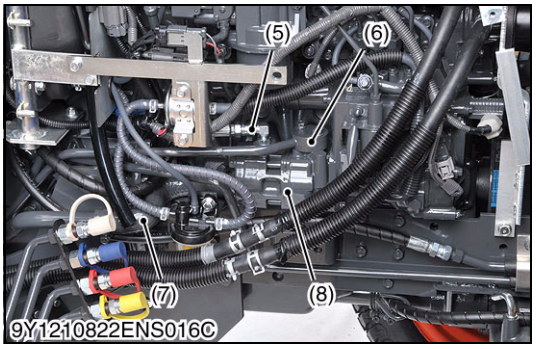
- Apply liquid gasket (Three Bond 1206D or equivalent) to engine stop solenoid.



■ **NOTE**

- **For fastening hydraulic pipe nut, use two wrenches. Hold the fitting with a wrench, turn the pipe nut another wrench to avoid damage at fitting installed part.**

Tightening torque	Power steering delivery hose nut	24 to 28 N·m 2.5 to 2.8 kgf·m 18 to 20 lbf·ft



(1) Plate
(2) Pillar
(3) Bracket
(4) Accelerator Wire
(5) Power Steering Delivery Hose
(6) 3-Point Hitch Delivery Pipe
(7) Suction Hose
(8) Hydraulic Pump

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(2) Hydraulic Cylinder and Control Valve

Rear Wheel and 3-Point Linkage

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (1).
3. Remove the top link, lower links and lift rods.

Tightening torque	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting screw	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Rear Wheel

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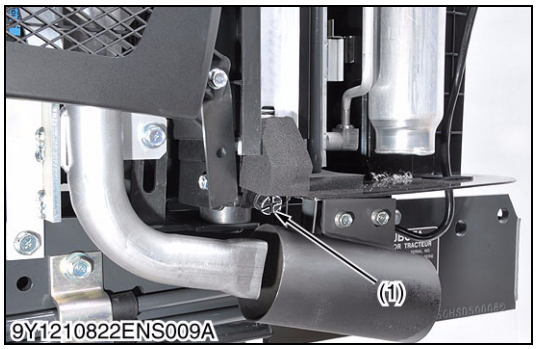

Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. To drain the coolant, turn the drain plug (1) counterclockwise.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator drain plug.

(When reassembling)

Coolant	Capacity	4.3 L 4.5 U.S.qts 3.8 Imp.qts

(1) Drain Plug

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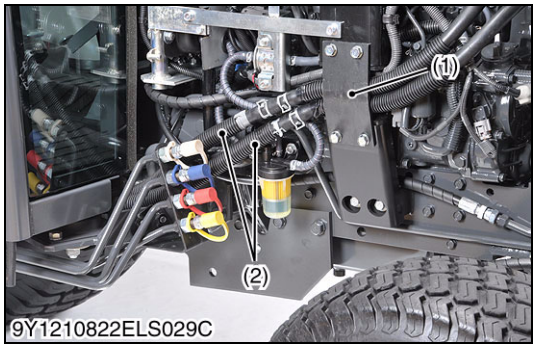

Heater Hose

1. Remove the plate (1) from pillar.
2. Disconnect the heater hoses (2), and then reconnect their hoses to make loop.

■ **NOTE**

- **Put a mark to the each heater hoses before disconnecting.**

(1) Plate (2) Heater Hose

9Y1210822HYS0011US0

Seat and Lever Guide

1. Disconnect the OPC switch connector and remove the seat (1).
2. Remove the each lever grips (2).
3. Remove the lever guides (3).

(1) Seat (3) Lever Guide
(2) Lever Grip

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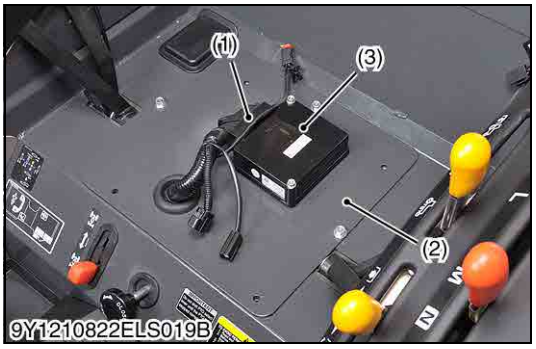

Seat Under Cover

1. Disconnect the ECU connector (1) and seat under cover (2) with ECU (3).

(1) ECU Connector
(2) Seat Under Cover
(3) ECU

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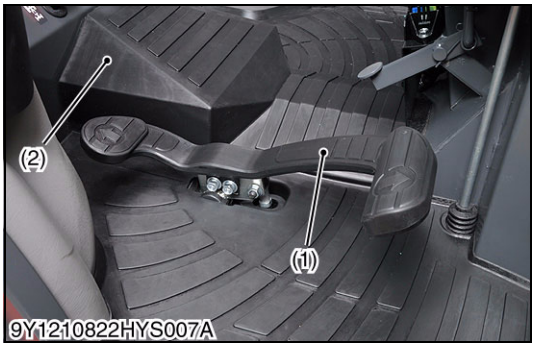

HST Pedal and Floor Mat

1. Remove the HST pedal (1) and floor mat (2).

(1) HST Pedal
(2) Floor Mat

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Lowering Speed Adjusting Shaft and Front Wheel Drive Lever Knob

1. Tap out the spring pin and remove the lowering speed adjusting shaft (1).
2. Remove the front wheel drive lever knob (2).

(1) Lowering Speed Adjusting Shaft
(2) Front Wheel Drive Lever Knob

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Position Control Lever and Cruise Control Lever

1. Remove the cruise control cable (2) from cruise control lever (4).
2. Remove the lever mounting nut (5), cruise control lever (4) and position control lever (6).

(When reassembling)

- Set the end of cable inner first. Then adjust the length of the cruise control cable outer section so that the cable inner section (1) has no play, and tighten the lock nut (3). (Due to a force of the spring in cruise control lever (4), the lever is set to the right side (outside) from the operator's seat.)

(1) Cable Inner Section
(2) Cruise Control Cable
(3) Lock Nut
(4) Cruise Control Lever
(5) Lever Mounting Nut
(6) Position Control Lever

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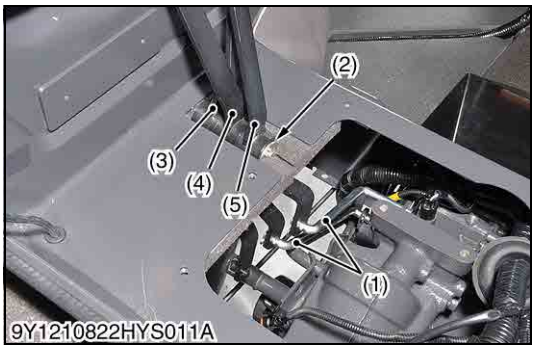

Range Gear Shift Lever, PTO Clutch Lever and PTO Select Lever

1. Remove the spring lock pins from shift rods (1).
2. Remove the external circlip (2), range gear shift lever (3), PTO clutch lever (5), and PTO select lever (4).

(1) Shift Rod
(2) External Circlip
(3) Range Gear Shift Lever
(4) PTO Select Lever
(5) PTO Clutch Lever

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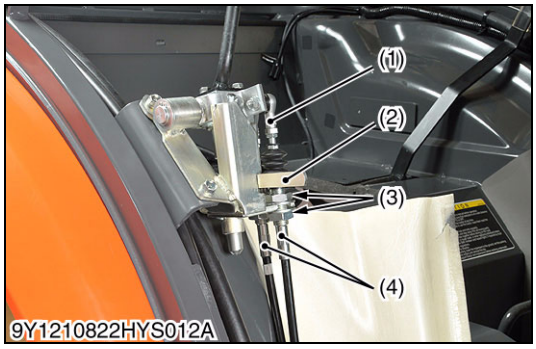

Front Loader Cables

1. Loosen the lock nuts (3) and remove the front loader cables (4).

(When reassembling)

- Set the lock lever (2) to lock position.
- Fix the ball joint (1) first.
- Adjust the length of the front loader cable (4) outer section so that the cable inner section has no play, and tighten the lock nut (3).

(1) Ball Joint
(2) Lock Lever
(3) Lock Nut
(4) Front Loader Cable

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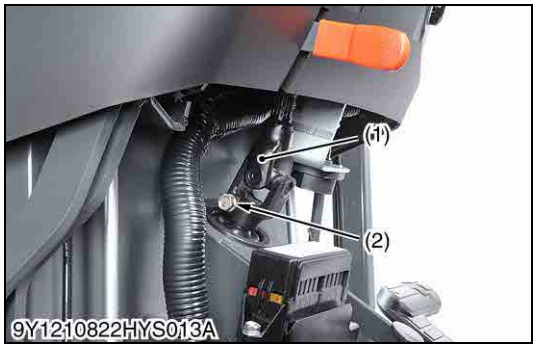

Universal Joint Mounting Bolt

1. Remove the universal joint mounting bolt (2).

(When reassembling)

Tightening torque	Universal joint mounting bolt	24 to 28 N·m 2.5 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Universal Joint
(2) Bolt

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Electric Wiring

1. Disconnect the wiring connectors (1).

(1) Wiring Connector

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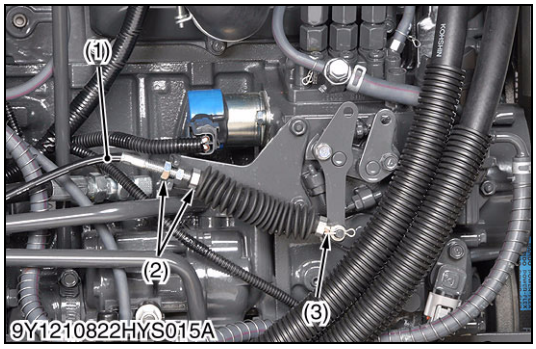

Accelerator Wire (B2650)

1. Disconnect the accelerator wire (1).

(When reassembling)

- Set the end of wire inner (3) first. Then adjust the length of the wire outer section so that the wire inner section has no play, and tighten the lock nut (2).

(1) Accelerator Wire
(2) Lock Nut
(3) Accelerator Inner

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Brake Pedal Rods

1. Disconnect the both left and right sides brake pedal rods (1).

(1) Brake Pedal Rod

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Cabin Mounting Bolts

1. Remove the bolts and nuts (1).

(When reassembling)

Tightening torque	Cabin mounting bolt and nut	124 to 150 N·m 12.7 to 15.2 kgf·m 91.5 to 110 lbf·ft

(1) Bolt and Nut

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Cabin Assembly

1. Remove the outer roof of cabin.
2. Hook the cabin with nylon slings not to damage the cabin.
3. Dismount the cabin from the tractor body.
4. Support the cabin with a stand.

■ **NOTE**

- **Lift and turn the cabin while making sure it does not catch on anything.**

(When reassembling)

- Be sure to install the washer and mount rubbers, etc, in their original position.

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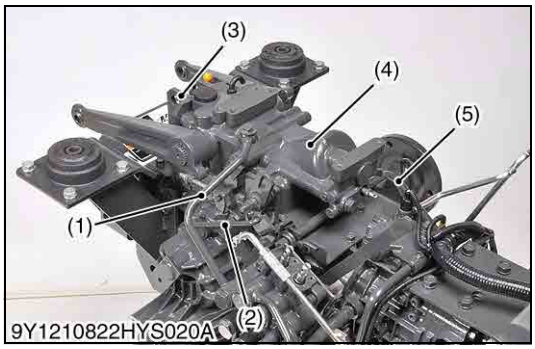
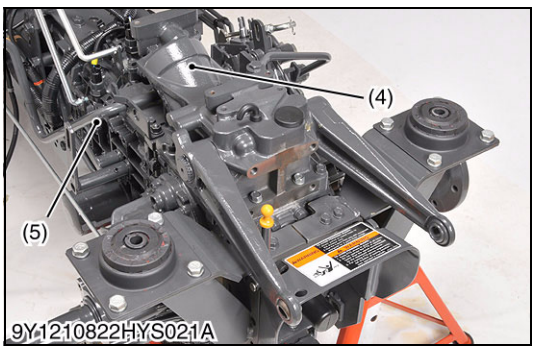




Hydraulic Cylinder Assembly

1. Remove the delivery pipe (1) and top link bracket (3).
2. Disconnect the differential lock rod and remove the differential lock pedal (5) with bracket.
3. Remove the hydraulic cylinder (4).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the hydraulic cylinder assembly (4) and transmission case.

(1) Delivery Pipe
(2) Differential Lock Rod
(3) Top Link Bracket
(4) Hydraulic Cylinder Assembly
(5) Differential Lock Pedal

9Y1210822HYS0025US0

(3) Removing Front Loader Control Valve Assembly

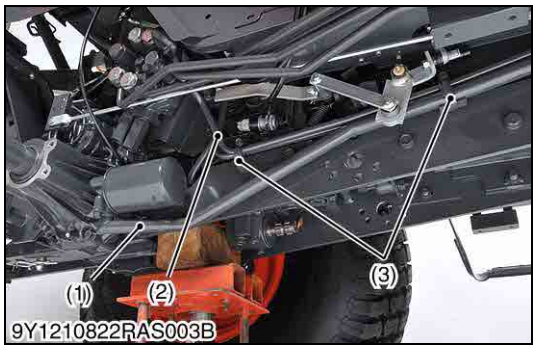
Rear Wheel

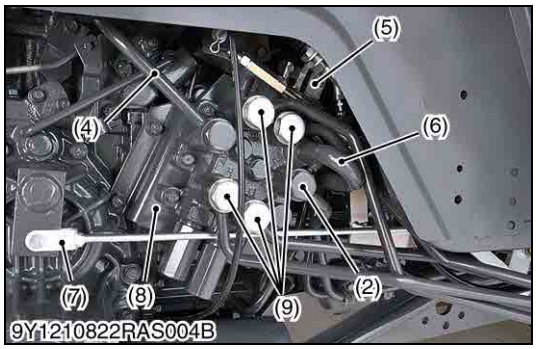
1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (1).

Tightening torque	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting screw	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Rear Wheel

9Y1210822RAS0005US0





Front Loader Valve Assembly

1. Remove the brake rod (7).
2. Remove the front loader valve pipes (9), 3-point hitch delivery pipe 2 (4) and return hose (6).
3. Remove the pipe clamps (3), 3-point hitch delivery pipe 1 (2) and suction pipe (1).
4. Remove the loader valve assembly (8).
5. Remove the cable stay (5) with cables.

(When reassembling)

- Do not damage the O-rings of front loader valve pipes and delivery pipes.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the rear axle case and differential gear case after eliminating the water and oil.

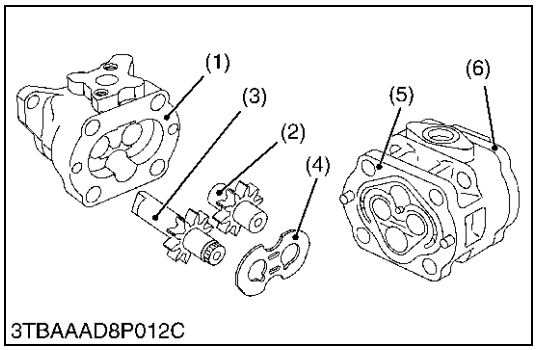
Tightening torque	Front loader valve pipe joint bolt	48 to 70 N·m 4.9 to 7.1 kgf·m 36 to 51 lbf·ft
	3-point hitch delivery pipe 1 joint bolt	48 to 70 N·m 4.9 to 7.1 kgf·m 36 to 51 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Front loader valve side)	48 to 70 N·m 4.9 to 7.1 kgf·m 36 to 51 lbf·ft
	3-point hitch delivery pipe 2 joint bolt (Hydraulic cylinder case side)	50 to 60 N·m 5.1 to 6.1 kgf·m 37 to 44 lbf·ft

(1) Suction Pipe
(2) 3-Point Hitch Delivery Pipe 1
(3) Clamp
(4) 3-Point Hitch Delivery Pipe 2
(5) Cable Stay
(6) Return Hose
(7) Brake Rod
(8) Loader Valve Assembly
(9) Front Loader Valve Pipe

9Y1210822HYS0026US0

[3] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Pump



3TBAAAD8P012C

Hydraulic Pump Cover, Side Plate and Gear

1. Secure the hydraulic pump with a vise, and remove the hydraulic pump cover (6) with casing (5).
2. Remove the side plate (4).
3. Remove the drive gear (3) and driven gear (2) from the casing (1).

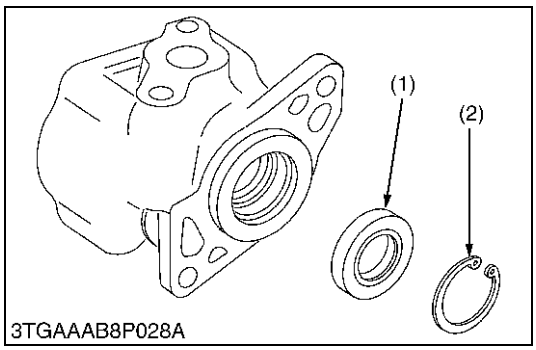
(When reassembling)

- Be careful not to damage the O-ring.
- Align the holes of the cover and casing (1).
- Install the side plate (4), noting its location and direction.
- Install the gears (2), (3), noting its direction.

Tightening torque	Hydraulic pump cover mounting screw	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft

(1) Casing
(2) Driven Gear
(3) Drive Gear
(4) Side Plate
(5) Casing
(6) Hydraulic Pump Cover

9Y1210822HYS0027US0



3TGAAAB8P028A

Oil Seal

1. Remove the internal circlip (2), and remove the oil seal (1).

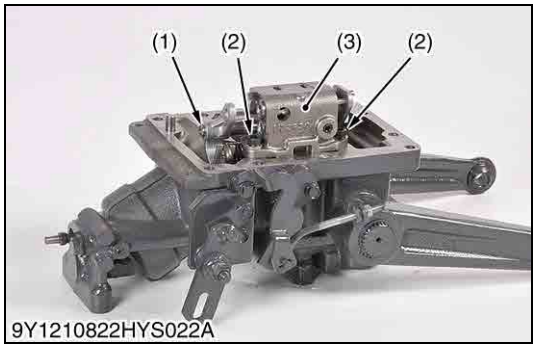
(When reassembling)

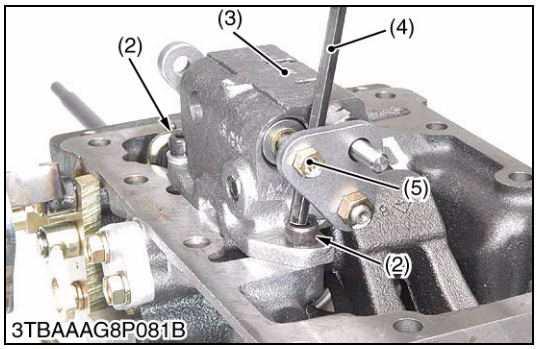
- If the oil seal (1) is damaged, worn or scratched, replace it.

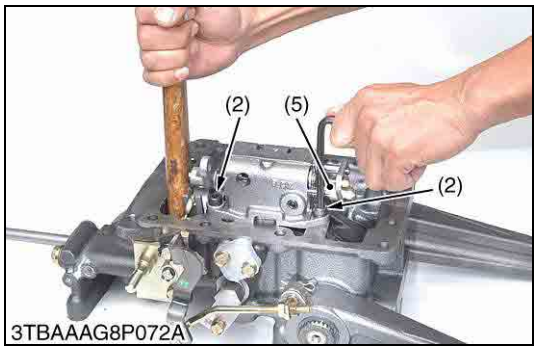
(1) Oil Seal
(2) Internal Circlip

9Y1210822HYS0028US0

(2) Hydraulic Cylinder







Control Valve

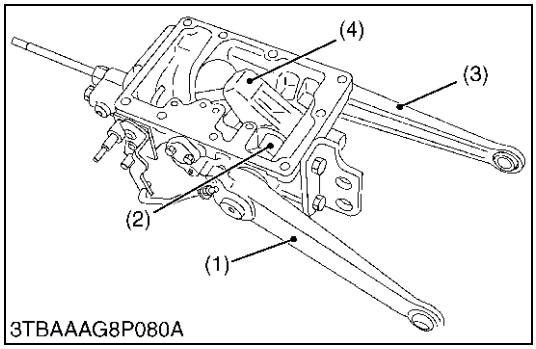
■ **NOTE**

- **When the control valve is installed in the hydraulic cylinder, the hexagon wrench is not aligned straight to the hexagon bolt without pushing the spool as shown in the picture.**

1. Push the spool (1) into the control valve (3).
2. Remove the hexagon bolts (2) with a hexagon wrench (4).

(1) Spool
(2) Hexagon Bolt
(3) Control Valve
(4) Hexagon Wrench
(5) Adjusting Bolt

9Y1210822HYS0029US0



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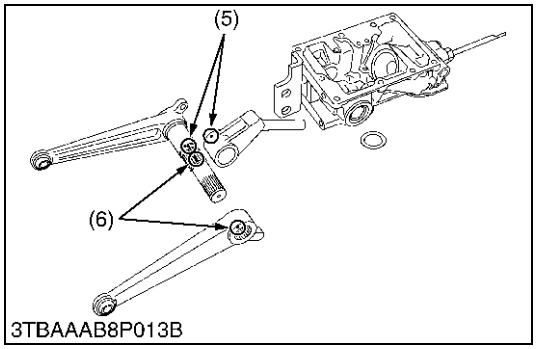

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Lift Arm, Hydraulic Arm Shaft and Hydraulic Arm

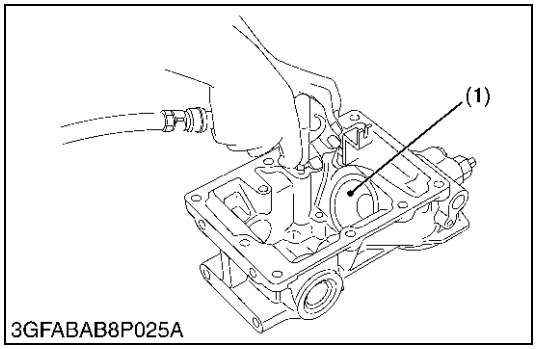
1. Remove the external circlip, and remove the lift arm LH (3).
2. Draw out the hydraulic arm shaft (2) and lift arm RH (1) as a unit.

(When reassembling)

- Align the alignment marks (5) of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks (6) of the lift arm LH and hydraulic arm shaft.
- Apply grease to the right and left bushings and O-rings.
- Be careful not to damage the O-rings.

(1) Lift Arm RH
(2) Hydraulic Arm Shaft
(3) Lift Arm LH
(4) Hydraulic Arm
(5) Alignment Marks
(6) Alignment Marks

9Y1210822HYS0030US0



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Hydraulic Piston

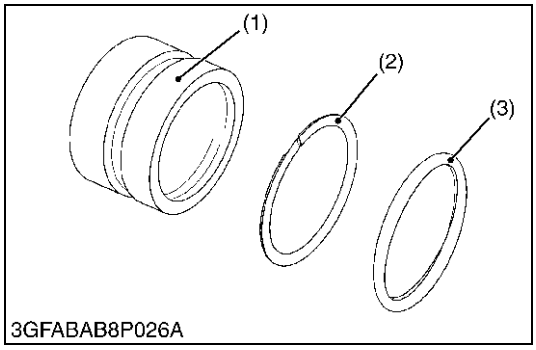
1. Inject the compressed air into the hydraulic cylinder, and remove the hydraulic piston (1).

(When reassembling)

- Be careful not to damage the O-ring (3) and backup ring (2).
- Apply transmission fluid to the O-ring.
- Replace the O-ring if it is damaged, worn or scratched, which may cause oil leakage.

(1) Hydraulic Piston
(2) Backup Ring
(3) O-ring

9Y1210822HYS0031US0



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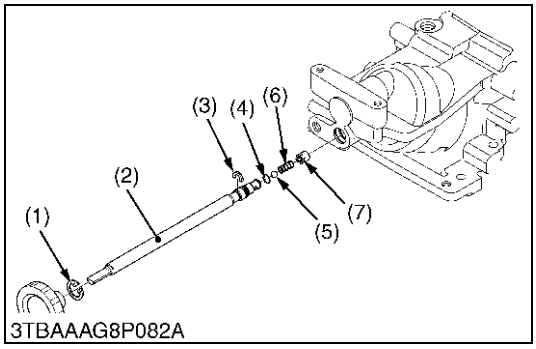


3TBAAAG8P082A

Hydraulic Adjust Shaft

1. Remove the internal circlip (1) and the hydraulic adjusting shaft (2).
2. Draw out the ball (5), the spring (6) and the collar (7).

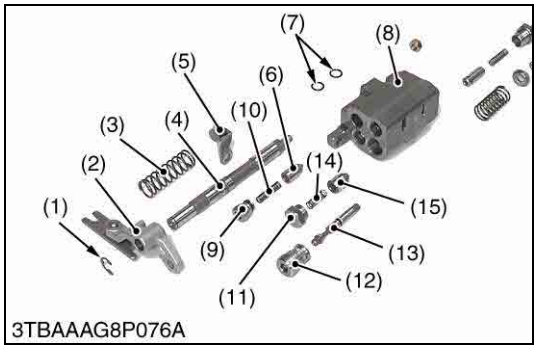
(When reassembling)

- Be careful not to damage the O-rings.

(1) Internal Circlip
(2) Hydraulic Adjust Shaft
(3) Stopper
(4) O-ring
(5) Ball
(6) Spring
(7) Collar

9Y1210822HYS0032US0

(3) Hydraulic Control Valve



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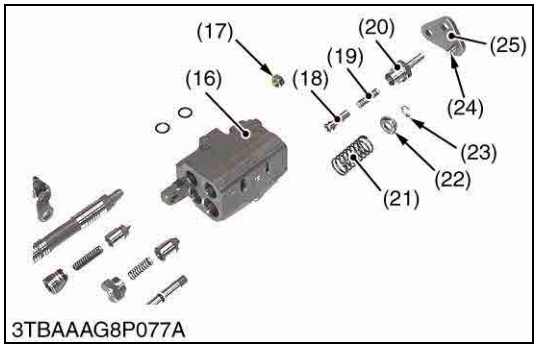


3TBAAAG8P077A

3TBAAAG8P070B

Disassembling Position Control Valve

1. After removing the control valve, disassemble the component parts as shown in the picture.

(When reassembling)

- Readjust the length **"L"** of the adjusting bolt.

(Reference)

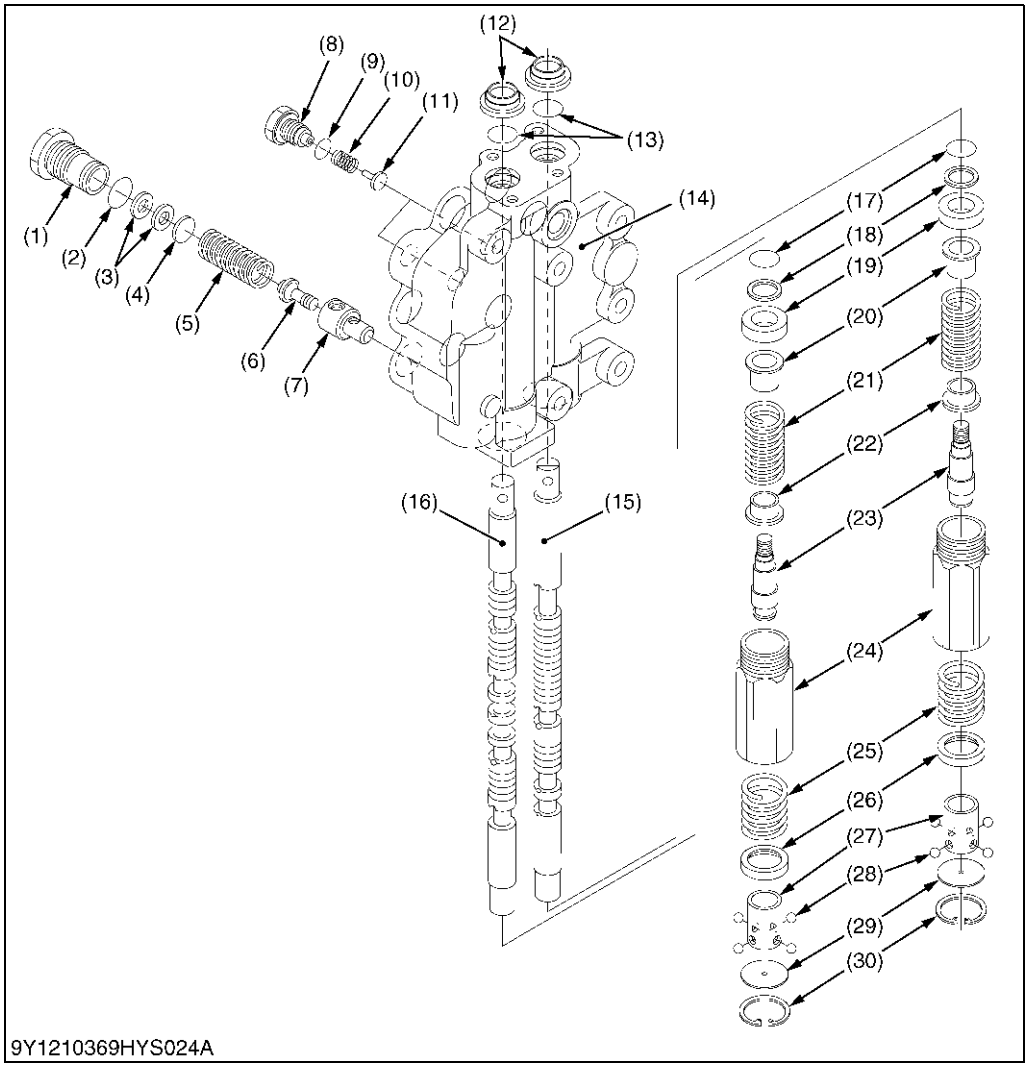
- Length **"L"**: approximately 10.70 mm (0.4213 in.)

(1) External Circlip
(2) Lever
(3) Spring
(4) Spool
(5) Spring Holder
(6) Poppet
(7) O-ring
(8) Control Valve Body
(9) Plug
(10) Spring
(11) Unload Plug
(12) Plug
(13) Poppet
(14) Spring
(15) Unload Poppet
(16) Control Valve Body
(17) Nut
(18) Poppet
(19) Spring
(20) Plug
(21) Spring
(22) Spring Holder
(23) External Circlip
(24) Adjusting Bolt
(25) Connecting Plate

L: Length of adjusting bolt

9Y1210822HYS0033US0

(4) Disassembling Front Loader Control Valve and Relief Valve



(1) Plug
(2) O-ring
(3) Washer
(4) Shim
(5) Spring
(6) Poppet 2
(7) Poppet 1
(8) Plug
(9) O-ring
(10) Spring
(11) Check Valve
(12) Dust Seal
(13) O-ring
(14) Valve Body
(15) Spool for Boom
(16) Spool for Bucket
(17) O-ring
(18) Backup Ring
(19) Collar
(20) Spring Holder 1
(21) Spring
(22) Spring Holder 2
(23) Detent Bolt 1
(24) Plug
(25) Detent Spring
(26) Detent Ring
(27) Stopper
(28) Ball
(29) Plate
(30) Internal Circlip

■ **Boom Control Section and Bucket Control Section**

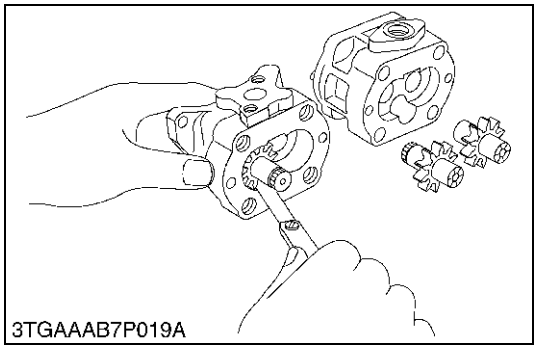
1. Remove the plug (8), the spring (10) and load check valve (11).
2. Remove the plug (24) from valve body (14).
3. Remove the internal circlip (30), the stopper (27), detent spring (25), detent ring (26), and ball (28).
4. Draw out the spool (15), (16) with other component parts from valve body (14).

■ **Relief Valve**

1. Remove the plug (1), the spring (5) and poppet (6), (7).

9Y1210822HYS0034US0

[4] SERVICING

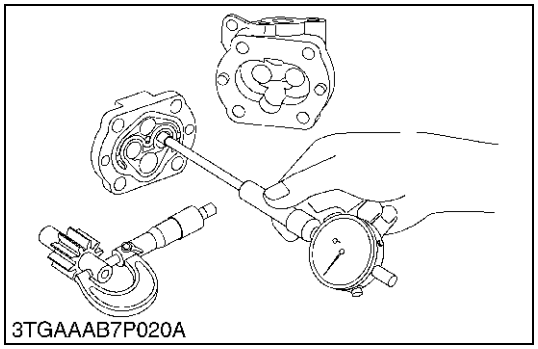

3TGAAAB7P019A

Clearance between Tip of Gear Tooth and Casing

1. Measure the clearance between gear and casing at several points with feeler gauge.
2. If the clearance exceeds the allowable limit, replace the assembly.

Clearance between tip of gear tooth and casing	Allowable limit	0.15 mm 0.0059 in.

9Y1210822HYS0035US0


3TGAAAB7P020A

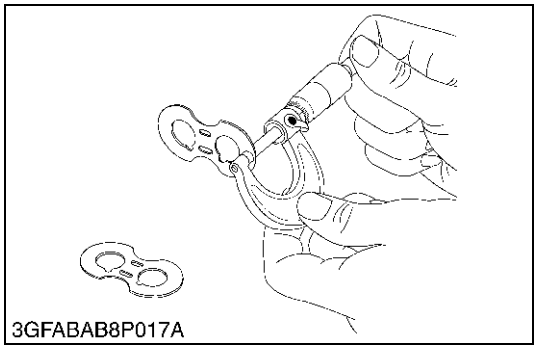
Clearance between Bushing and Shaft

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

Clearance between bushing and shaft	Factory specification	0.020 to 0.091 mm 0.00079 to 0.0035 in.
	Allowable limit	0.12 mm 0.0047 in.

Shaft O.D.	Factory specification	14.970 to 14.980 mm 0.58937 to 0.58976 in.
Bushing I.D.	Factory specification	15.000 to 15.061 mm 0.59056 to 0.59295 in.

9Y1210822HYS0036US0

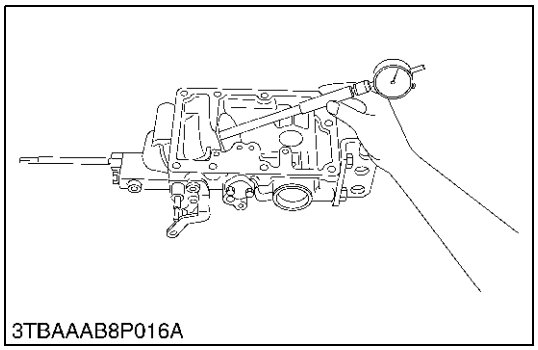

3GFABAB8P017A

Side Plate Thickness

1. Measure the side plate thickness with an outside micrometer.
2. If the thickness is less than the allowable limit, replace it.

Side plate thickness	Factory specification	2.48 to 2.50 mm 0.0977 to 0.0984 in.
	Allowable limit	2.40 mm 0.0945 in.

9Y1210822HYS0037US0

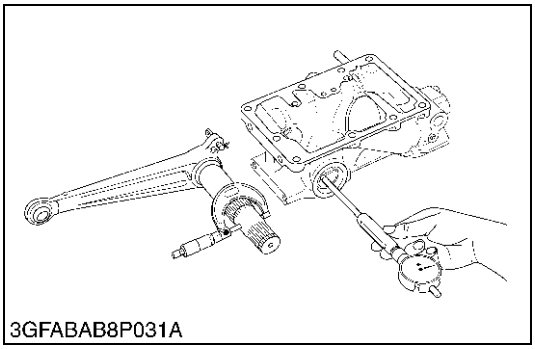

3TBAAAB8P016A

Hydraulic Cylinder Bore

1. Check the cylinder internal surface for scoring or damage.
2. Measure the cylinder I.D. with a cylinder gauge.
3. If the measurement exceeds the allowable limit, replace the hydraulic cylinder block.

Cylinder I.D.	Factory specification	75.05 to 75.10 mm 2.955 to 2.956 in.
	Allowable limit	75.15 mm 2.959 in.

9Y1210822HYS0038US0


3GFABAB8P031A

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 shaft and bushing	Factory specification	0.020 to 0.11 mm 0.00079 to 0.0043 in.
	Allowable limit	0.30 mm 0.012 in.

Hydraulic arm shaft O.D.	Factory specification	Right	37.925 to 37.950 mm 1.4932 to 1.4940 in.
		Left	34.925 to 34.950 mm 1.3750 to 1.3759 in.

Bushing I.D. (after press filed)	Factory specification	Right	37.970 to 38.035 mm 1.4949 to 1.4974 in.
		Left	34.970 to 35.035 mm 1.3768 to 1.3793 in.

9Y1210822HYS0039US0

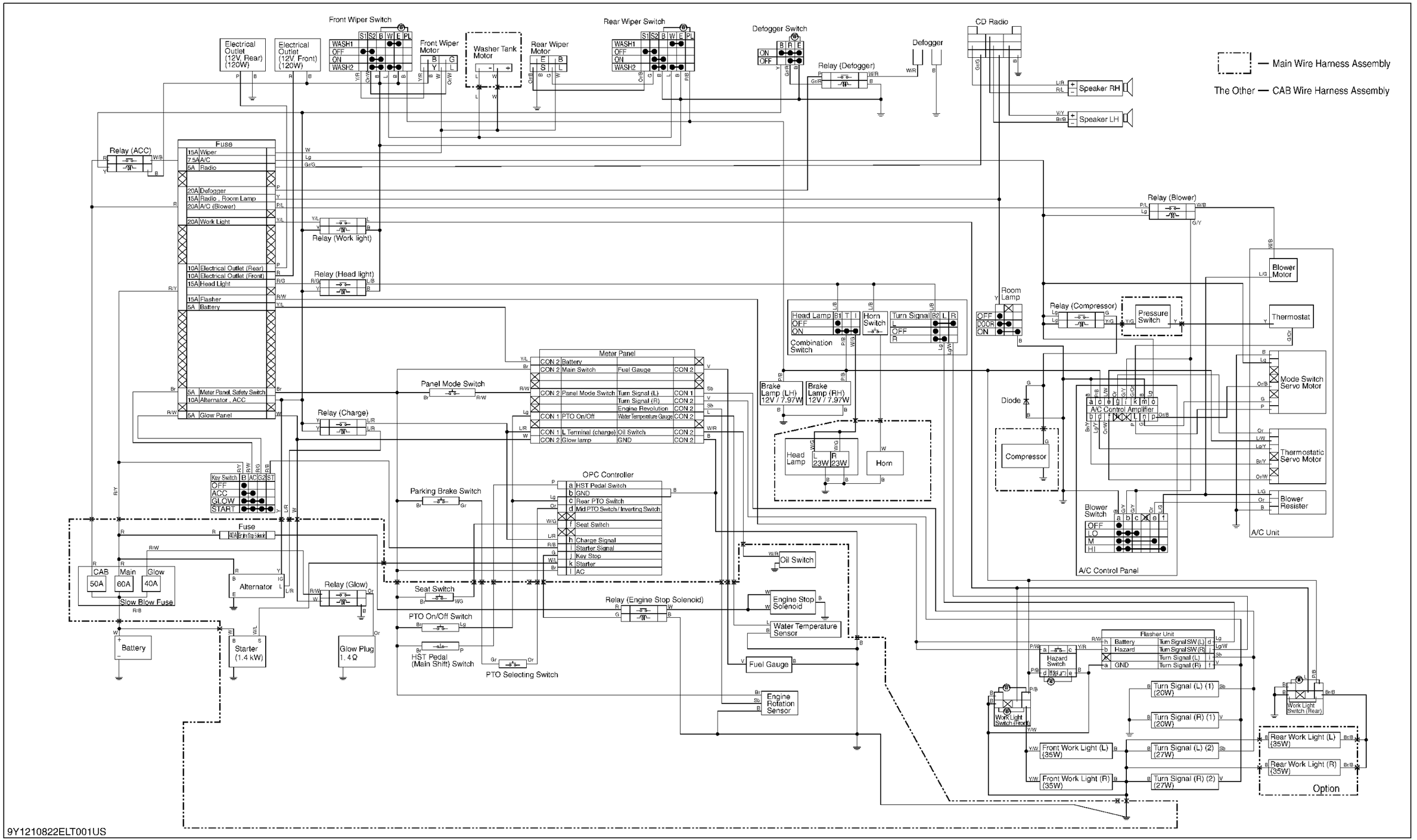
8 ELECTRICAL SYSTEM

MECHANISM

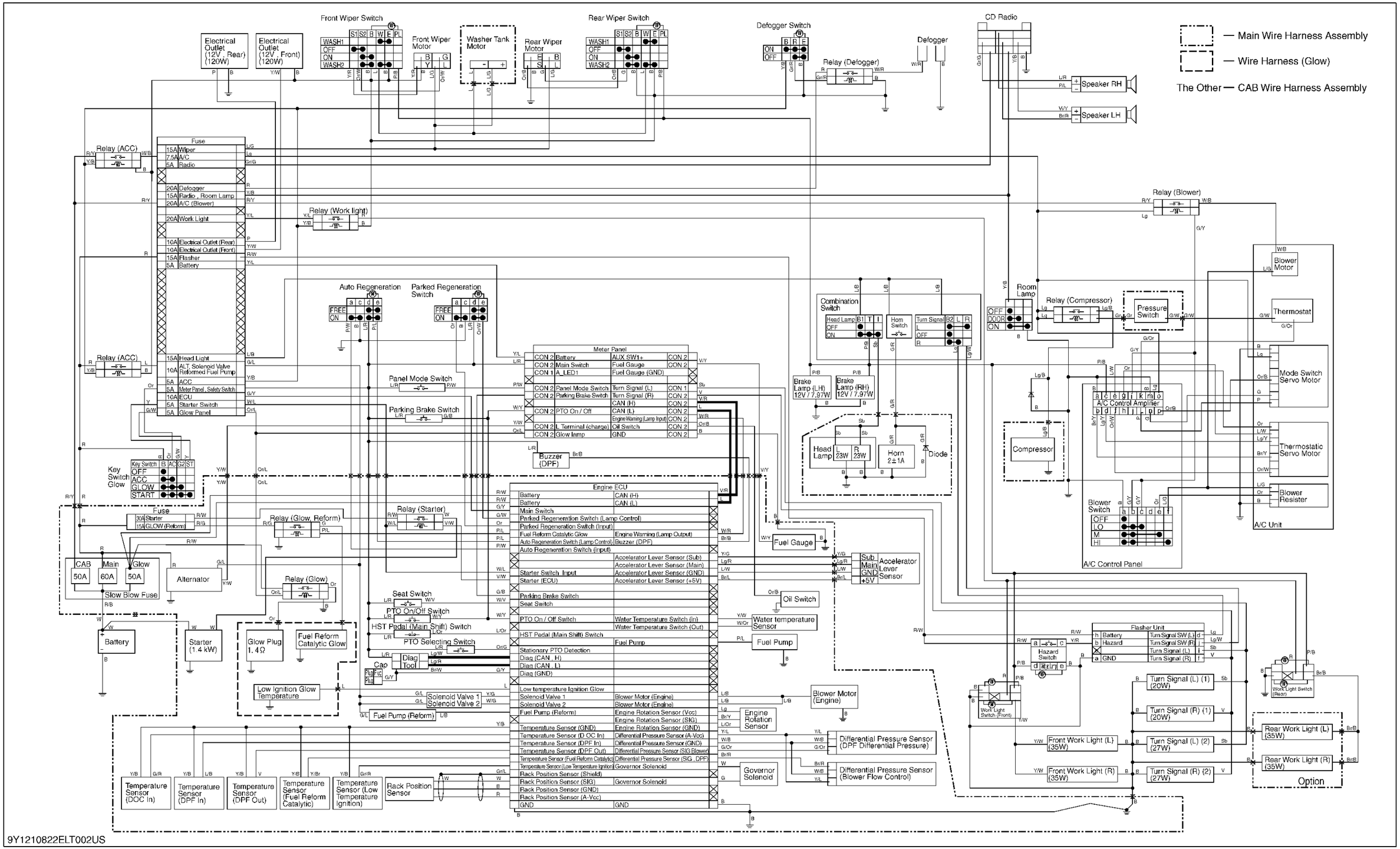
CONTENTS

1. ELECTRICAL CIRCUIT

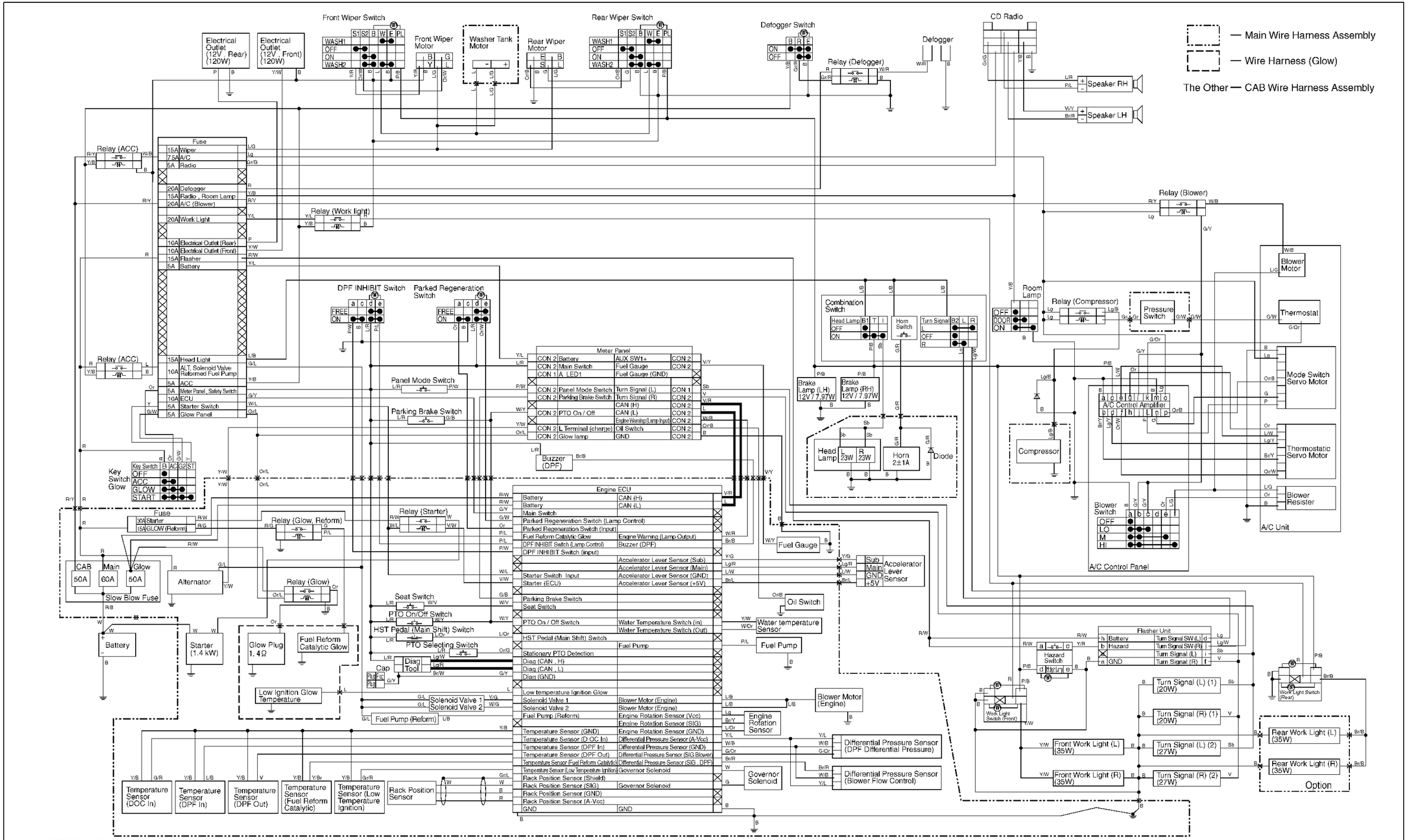
[1] B2650



[2] B3350 (Inhibit Version)



[3] B3350 (Default Version)



2. ENGINE STARTING SYSTEM AND STOPPING SYSTEM

Operator presence control (OPC) system which B2650 and B3350 tractor are equipped with will automatically stop the engine when operator stands up from the seat while shifting the PTO lever, the independent PTO shift lever or the HST pedal.

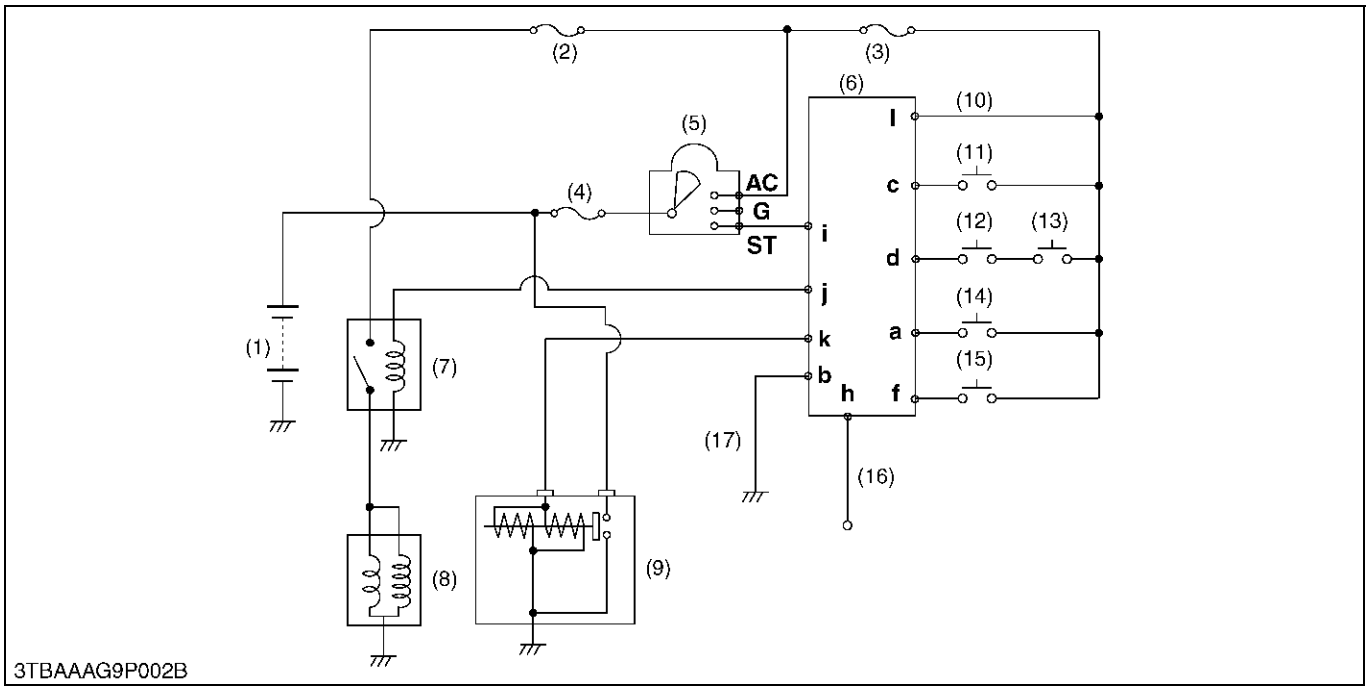
This system is controlled by five safety switches, (independent PTO lever switch, PTO shift lever switch, parking brake switch, HST pedal switch, seat switch) and controller.

Engine starting is operated with starter motor after current flowing from controller to starter motor.

Engine stopping is operated with key stop solenoid after current flowing from controller through key stop solenoid relay to key stop solenoid.

9Y1210822ELM0001US0

[1] OPC SYSTEM CIRCUIT (B2650)

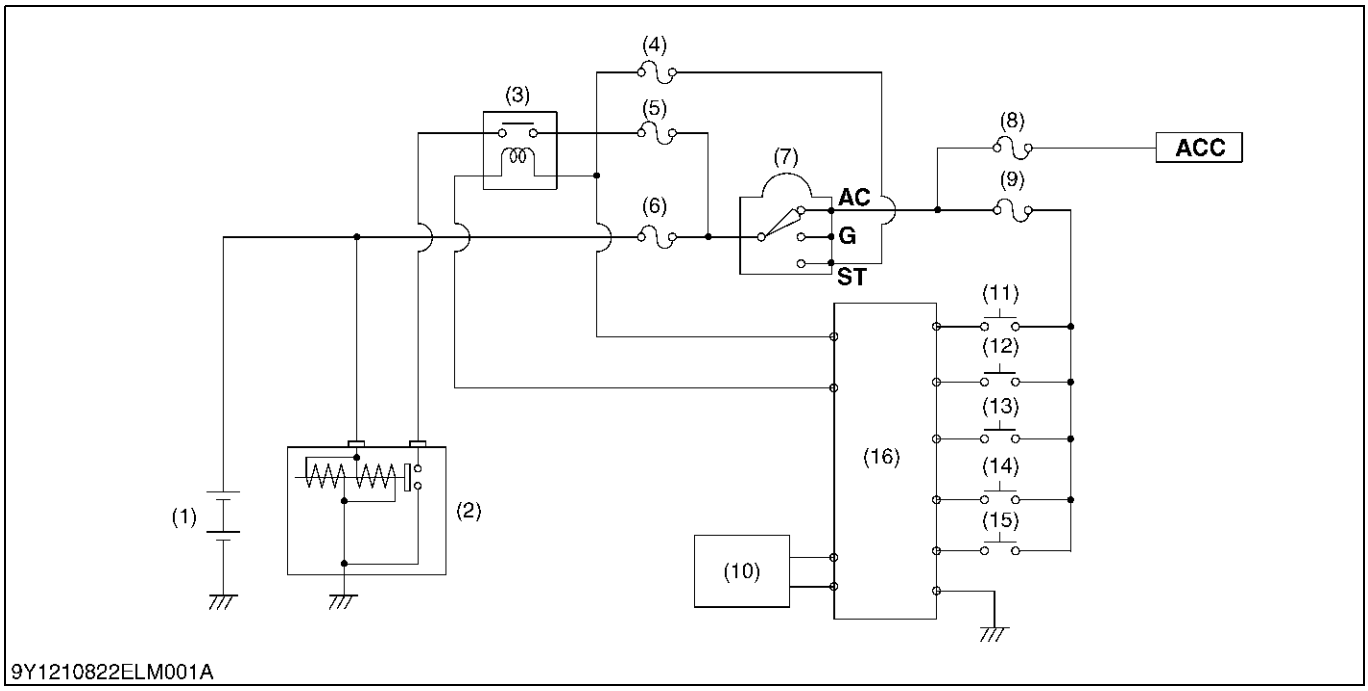


(1) Battery
(2) Fuse (30 A)
(3) Fuse (5 A)
(4) Slow Blow Fuse (60 A)
(5) Main Switch
(6) Controller
(7) Key Stop Solenoid Relay
(8) Key Stop Solenoid
(9) Starter Motor
(10) **AC** Terminal Lead
(11) Independent PTO Lever Switch
(12) PTO Shift Lever Switch
(13) Parking Brake Switch
(14) HST Pedal Switch
(15) Seat Switch
(16) Regulator **L** Terminal Lead
(17) Frame Earth

a to l :Controller Terminal
AC :AC Terminal
G : G Terminal
ST : ST Terminal

9Y1210822ELM0002US0

[2] OPC SYSTEM CIRCUIT (B3350)

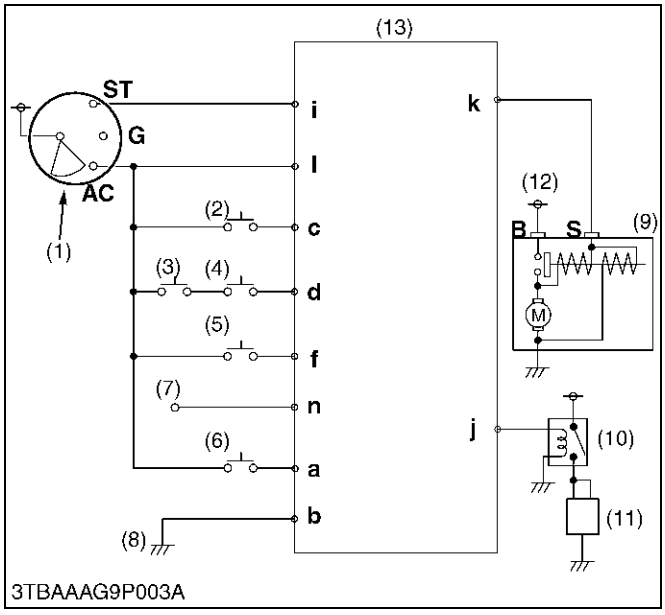


(1) Battery
(2) Starter Motor
(3) Relay Stator
(4) Fuse (5 A)
(5) Fuse (30 A)
(6) Slow Blow Fuse (60 A)
(7) Main Switch
(8) Fuse (5 A)
(9) Fuse (5 A)
(10) Governor Solenoid
(11) Parking Brake Switch
(12) Seat Switch
(13) Independent PTO Lever Switch
(14) HST Pedal Switch
(15) PTO Shift Lever Switch
(16) ECU

AC : AC Terminal
G : G Terminal
ST : ST Terminal

9Y1210822ELM0003US0

[3] CONTROLLER (B2650)



Operator Presence Control (OPC) System

B2650 is configured with an "Operator Presence Control (OPC)" system to control engine starting and engine automatically stopping.

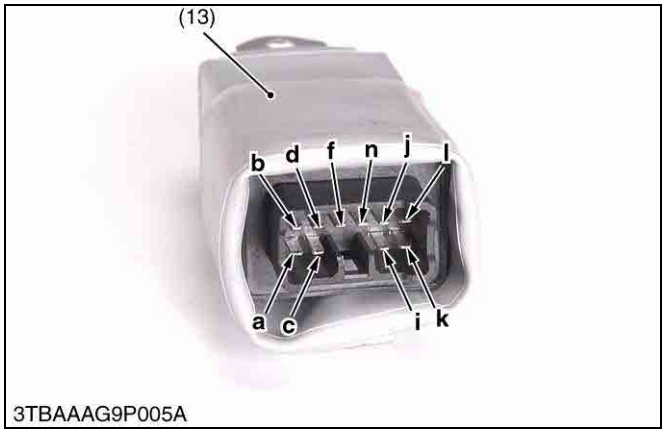
This OPC system mainly consists of controller and engine starting / stopping control switches such as HST pedal switch, independent PTO lever switch, seat switch, parking brake switch and PTO lever switch.

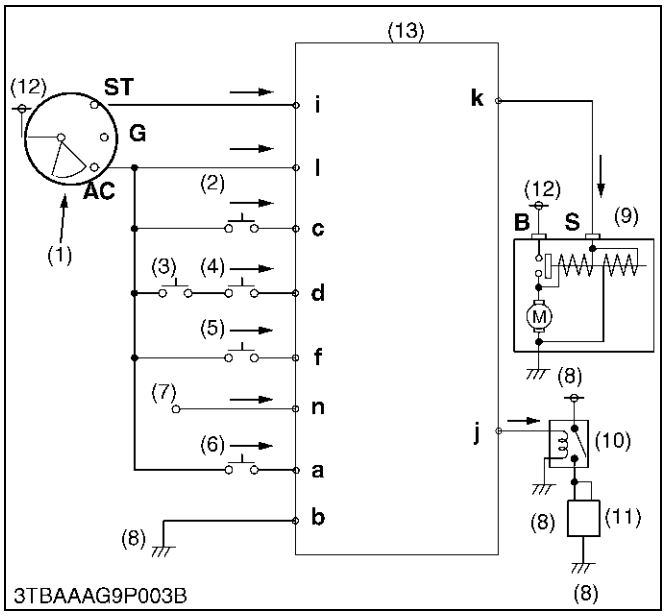
Main parts regarding OPC system are laid out as shown in the electrical circuit.

(1) Main Switch
(2) Independent PTO Lever Switch
(3) Parking Brake Switch
(4) PTO Lever Switch
(5) Seat Switch
(6) HST Pedal Switch
(7) Regulator **L** Terminal
(8) Body Earth
(9) Starter Motor
(10) Key Stop Solenoid Relay
(11) Key Stop Solenoid
(12) Battery
(13) OPC Controller

a to l : Controller Terminal
ST : Main Switch ST Terminal
G : Main Switch G Terminal
AC : Main Switch AC Terminal
B : Starter Motor B Terminal
S : Starter Motor S Terminal

9Y1210822ELM0004US0





Controller Mechanism

Controller is located inside the panel board.

Current from the main switch, safety switches and regulator **L** terminal flows to controller.

Controller receives current as data, processes the data, and sends out current computing results to starter motor, key stop solenoid relay, and key stop solenoid.

OPC controller (13) controls engine starting and engine stopping.

Current flows from battery to controller.

Current from switches such as independent PTO lever switch (2), parking brake switch (3), PTO lever switch (4), seat switch (5) and HST pedal switch (6), flows to the controller.

Current from regulator **L** terminal (7) flows to the controller.

After starting the engine, the controller (13) supplies current to starter motor **S** terminal or key stop solenoid relay (10).

Controller (13) receives data, processes the data, and sends out the computing results.

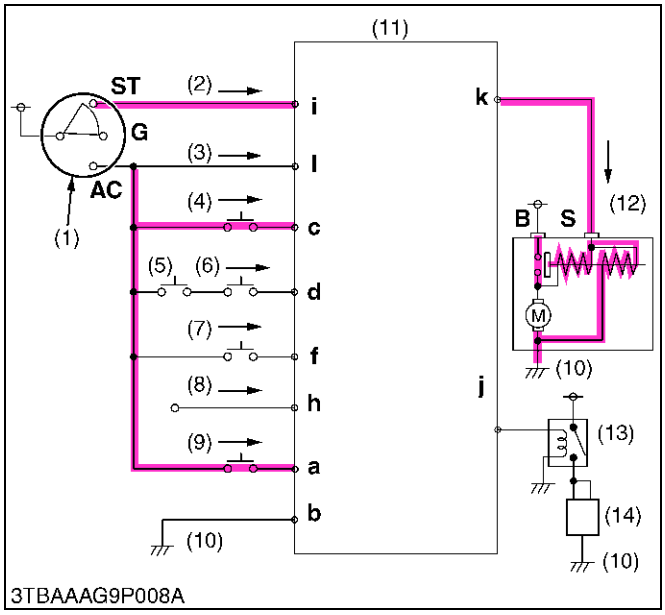
Controller (13) receives data from safety switches, processes the data inside the controller itself, and sends out the computing results to starter motor (9) for engine starting, and key stop solenoid relay (10) for engine stopping.

Controller (13) is configured with a delay timer in the controller unit to hold fuel cut signal from the controller unit to key stop solenoid (11) for about 1 second.

(1) Main Switch
(2) Independent PTO Lever Switch
(3) Parking Brake Switch
(4) PTO Lever Switch
(5) Seat Switch
(6) HST Pedal Switch
(7) Regulator **L** Terminal
(8) Body Earth
(9) Starter Motor
(10) Key Stop Solenoid Relay
(11) Key Stop Solenoid
(12) Battery
(13) OPC Controller

a to l :Controller Terminal
ST : Main Switch ST Terminal
G : Main Switch G Terminal
A : Main Switch AC Terminal
B : Starter Motor B Terminal
S : Starter Motor S Terminal
→ : Current Flow

9Y1210822ELM0005US0



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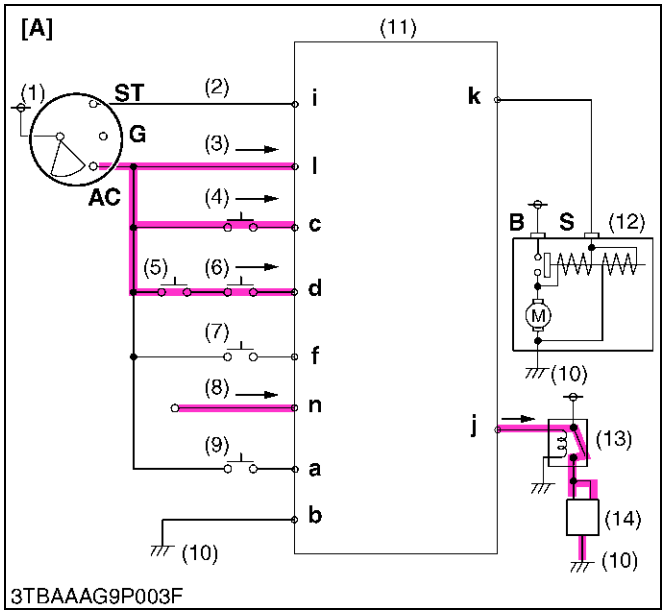

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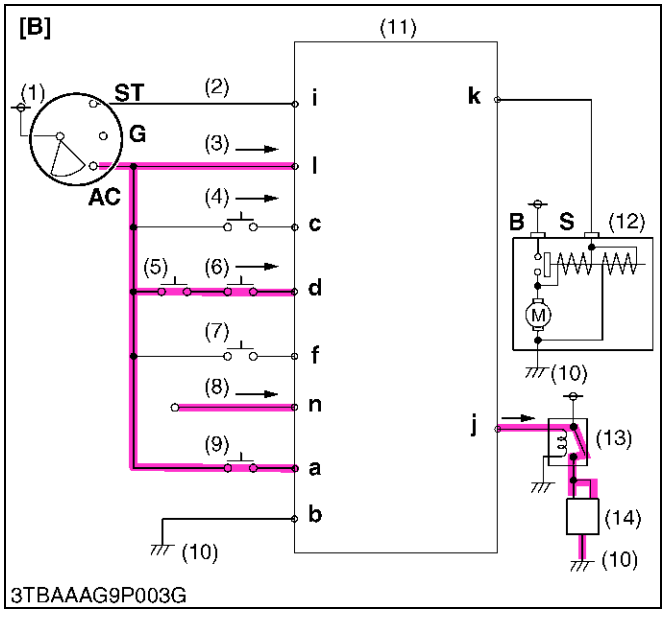


3TBAAAG9P003G

Engine Starting

When the following conditions become complete, output voltage (12 V) reaches coil terminal of the starter motor from controller **K** terminal, the engine can be started.

Independent PTO Lever Switch (Disengaged : ON, Engaged : OFF)	ON
HST Pedal Switch (Neutral : ON, Forward and Reverse : OFF)	ON

(1) Main Switch
(2) **ST** Terminal Lead
(3) **AC** Terminal Lead
(4) Independent PTO Lever Switch
(5) Parking Brake Switch
(6) PTO Lever Switch
(7) Seat Switch
(8) Regulator **L** Terminal Lead
(9) HST Pedal Switch
(10) Frame Earth
(11) Controller
(12) Starter Motor
(13) Key Stop Solenoid Relay
(14) Key Stop Solenoid

ST, G, AC : Main Switch Terminals
a to l :Controller Terminals
B : Starter Motor B Terminals
S : Starter Motor S Terminal
→ : Current Flow

9Y1210822ELM0006US0

One Second Delay Engine Shutting Off

When one condition of the three patterns becomes complete, output voltage (12 V) reaches the key stop solenoid relay and key stop solenoid from controller **j** terminal, the engine can be shut off in one second delay.

Pattern 1

Seat Switch (Occupied : ON, Vacant : OFF)	OFF
HST Pedal Switch (Neutral : ON, Forward and Reverse : OFF)	OFF

Pattern 2

Seat Switch (Occupied : ON, Vacant : OFF)	OFF
Independent PTO Lever Switch (Disengaged : ON, Engaged : OFF)	OFF
Parking Brake Switch (Parking Lock : ON, Free : OFF)	OFF

Pattern 3

Seat Switch (Occupied : ON, Vacant : OFF)	OFF
Independent PTO Lever Switch (Disengaged : ON, Engaged : OFF)	OFF
PTO Shift Lever Switch (Rear PTO : ON, Rear/Mid or Mid PTO : OFF)	OFF

(1) Main Switch
(2) **ST** Terminal Lead
(3) **AC** Terminal Lead
(4) Independent PTO Lever Switch
(5) Parking Brake Switch
(6) PTO Lever Switch
(7) Seat Switch
(8) Regulator **L** Terminal Lead
(9) HST Pedal Switch
(10) Frame Earth
(11) Controller
(12) Starter Motor
(13) Key Stop Solenoid Relay
(14) Key Stop Solenoid

[A] Pattern 1
[B] Pattern 2 and 3
ST, G, AC : Main Switch Terminals
B : Starter Motor B Terminal
S : Starter Motor S Terminal
a to l :Controller Terminals
→ : Current Flow

9Y1210822ELM0007US0

[4] SAFETY SWITCH

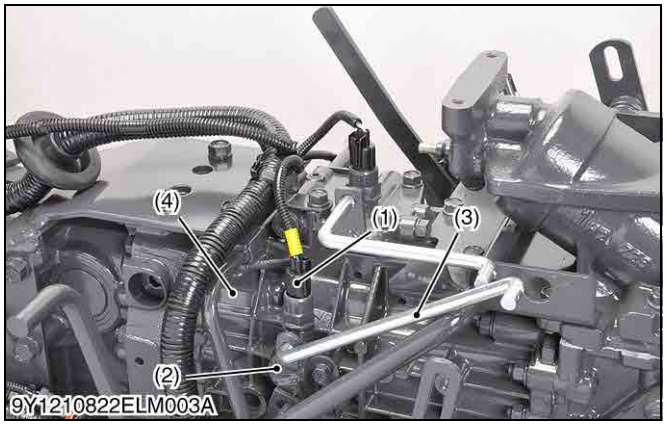
■ **Type of Safety Switch**

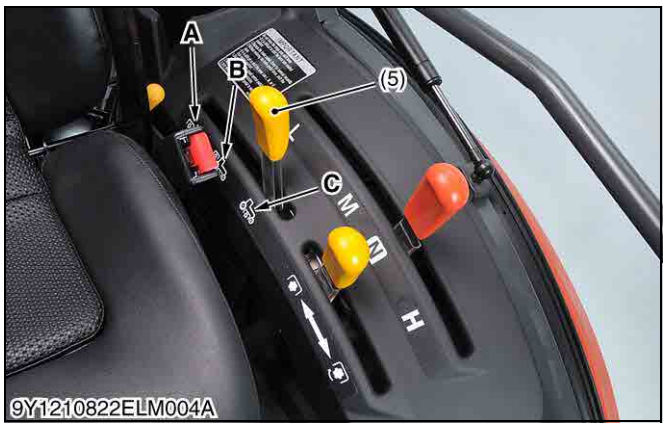
There are two types of safety switches, normally closed type and normally open type.
Normally closed type switch is electrically closed in normal condition.
Normally open type switch is electrically opened in normal condition.
Safety switches adopted in B2650 and B3350 tractor operate as sensor detecting and transmitting the position of HST pedal, PTO lever, independent PTO lever, seat and parking brake to controller ECU.

Normally Closed Type	Normally Open Type
PTO Shift Lever Switch	HST Pedal Switch
Independent PTO Lever Switch	Seat Switch
	Parking Brake Switch

9Y1210822ELM0008US0

(1) PTO Shift Lever Switch





PTO Shift Lever Switch

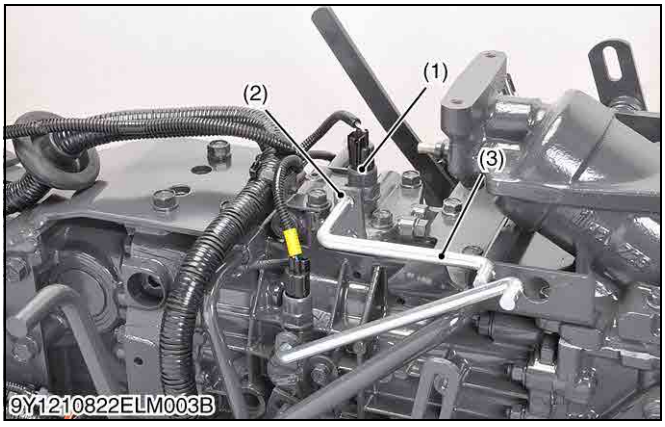
This switch locates at transmission case (4).
This switch is a push type.
This switch detects the position of the PTO shift lever.
When the PTO shift lever is at **"REAR PTO"** position, this switch is turned to **"ON"**.
When the PTO shift lever is at **"Rear/Mid, Mid PTO"** position, this switch is turned to **"OFF"**.

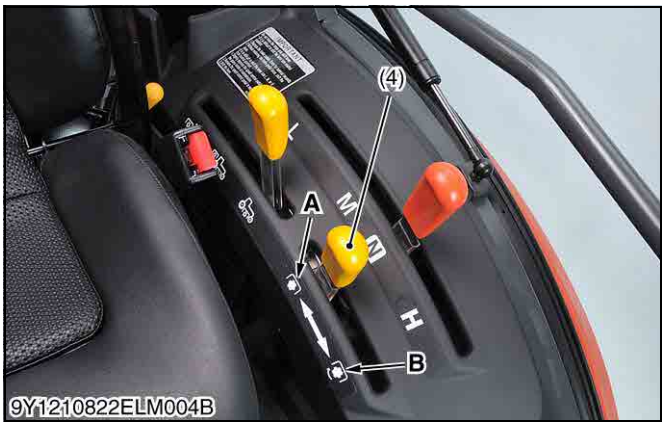
(1) PTO Shift Lever Switch
(2) PTO Shift Arm
(3) PTO Shift Rod
(4) Transmission Case
(5) PTO Shift Lever

A : Rear PTO Position
B : Rear PTO / Mid PTO Position
C : Mid PTO Position

9Y1210822ELM0009US0

(2) Independent PTO Lever Switch





Independent PTO Lever Switch

This switch locations at the top of the independent PTO control valve.

This switch is a push type.

This switch detects the independent PTO valve operating.

When the independent PTO lever is set to **"DISENGAGED"** position, this switch is turned to **"ON"**.

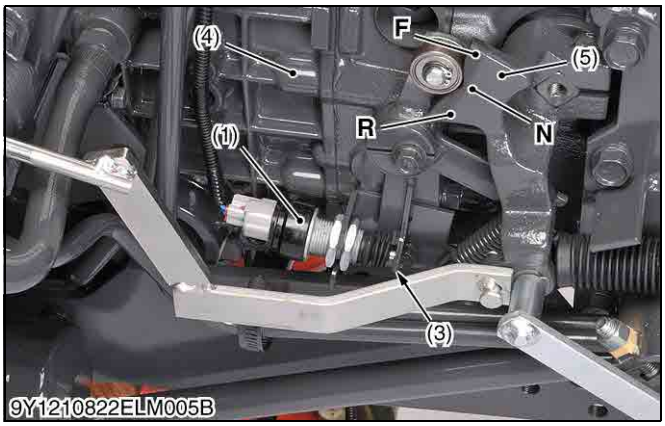
When the independent PTO lever is set to **"ENGAGED"** position, this switch is turned to **"OFF"**.

(1) Independent PTO Lever Switch
(2) Independent PTO Valve
(3) Control Rod
(4) Independent PTO Lever

A : "DISENGAGED" Position
B : "ENGAGED" Position

9Y1210822ELM0010US0

(3) HST Pedal Switch



HST Pedal Switch

This switch located at the neutral switch stay.

This switch is a push type.

This switch detects the position of the HST pedal.

When HST pedal is at **"NEUTRAL"** position, this switch is turned to **"ON"**.

When HST pedal is at **"FORWARD"** or **"REVERSE"** position, this switch is turned to **"OFF"**.

(1) HST Pedal Switch
(2) Neutral Switch Stay
(3) Neutral Arm
(4) Transmission Case
(5) Neutral Holder

F : FORWARD
N : NEUTRAL
R : REVERSE
A : Current from Battery
B : Current to Controller

9Y1210822ELM0011US0

(4) Seat Switch

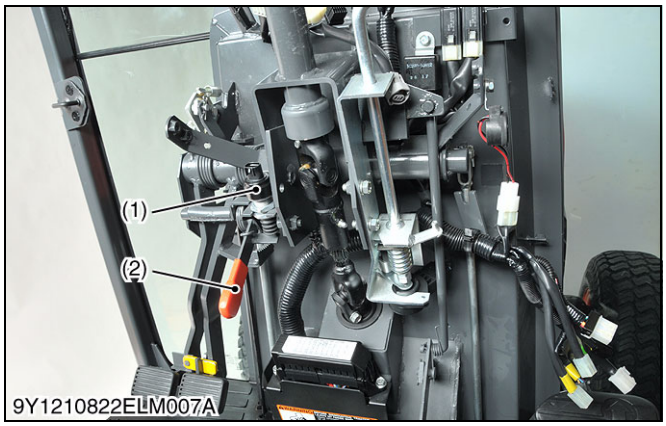
Seat Switch

This switch locates under the seat (2).
This switch is a push type.
This switch detects the operator's sitting on the swat or not.
When the operator sits on the seat, this switch is turned to **"ON"**.
When the operator stand up from the seat, this switch is turned to **"OFF"**.

(1) Seat Switch (2) Seat

9Y1210822ELM0012US0

(5) Parking Brake Switch



Parking Brake Switch

This switch locates under the meter panel.
This switch is a push type.
This switch detects the parking brake lock or not.
When the parking brake is locked, this switch is turned to **"ON"**.
When the parking brake is not locked, this switch is turned to **"OFF"**.

(1) Parking Brake Switch (2) Parking Brake Lever

9Y1210822ELM0013US0

[5] SAFETY SWITCH POSITION AND ENGINE CONDITION

Safety Switch Position and Engine Condition.

No.	Independent PTO Lever	Parking Brake Switch	PTO Shift Lever Switch	Seat Switch	HST Pedal Switch	Engine Condition	
						Engine Starting	Engine Stopping
	Disengaged : ON Engaged : OFF	**Parking Lock : ON Free : OFF**	**Rear PTO : ON Rear/Mid PTO or Mid PTO : OFF**	**Occupied : ON Vacant : OFF**	**Neutral : ON Forward and Reverse : OFF**	**Current to Starter : Can start No current to starter : Can not start**	**No current to key stop solenoid relay : engine running Current to key stop solenoid : one second delay engine shut off**
1	ON	OFF	ON / OFF	ON	ON	Can Start	Running
2	OFF	OFF	ON / OFF	ON	ON	Can not Start	Running
3	ON	OFF	ON / OFF	ON	OFF	Can not Start	Running
4	OFF	OFF	ON / OFF	ON	OFF	Can not Start	Running
5	ON	OFF	ON / OFF	OFF	ON	Can Start	Running
6	OFF	OFF	ON / OFF	OFF	ON	Can not Start	One second delay engine shut off
7	ON	OFF	ON / OFF	OFF	OFF	Can not Start	One second delay engine shut off
8	OFF	OFF	ON / OFF	OFF	OFF	Can not Start	One second delay engine shut off
9	ON	ON	ON / OFF	OFF	ON	Can Start	Running
10	OFF	ON	ON	OFF	ON	Can not Start	Running
11	OFF	ON	OFF	OFF	ON	Can not Start	One second delay engine shut off
12	ON	ON	ON / OFF	OFF	OFF	Can not Start	One second delay engine shut off
13	OFF	ON	ON / OFF	OFF	OFF	Can not Start	One second delay engine shut off

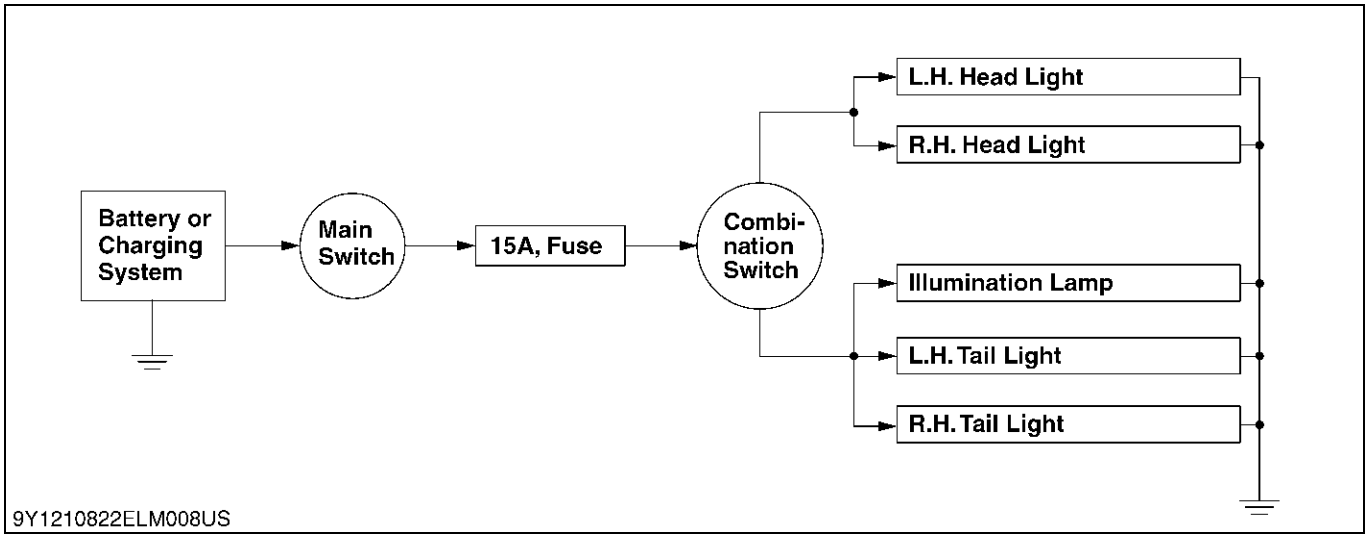
9Y1210822ELM0014US0

3. LIGHTING SYSTEM

The lighting system consists of combination switch for head light, illumination lamp, tail light and hazard switches for tail lights etc..

9Y1210822ELM0015US0

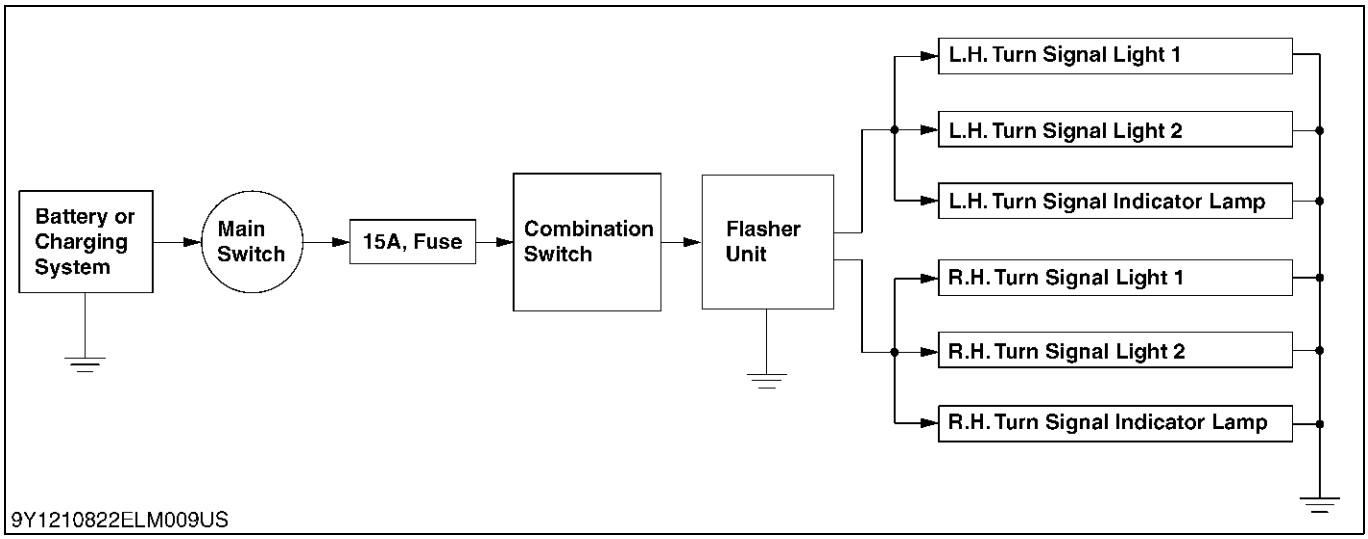
[1] LIGHT AND TAIL LIGHT



Combination switch has three types of switches for head lights, illumination lamps and tail lights.
Current passes through the light circuit as shown in the figure above.

9Y1210822ELM0016US0

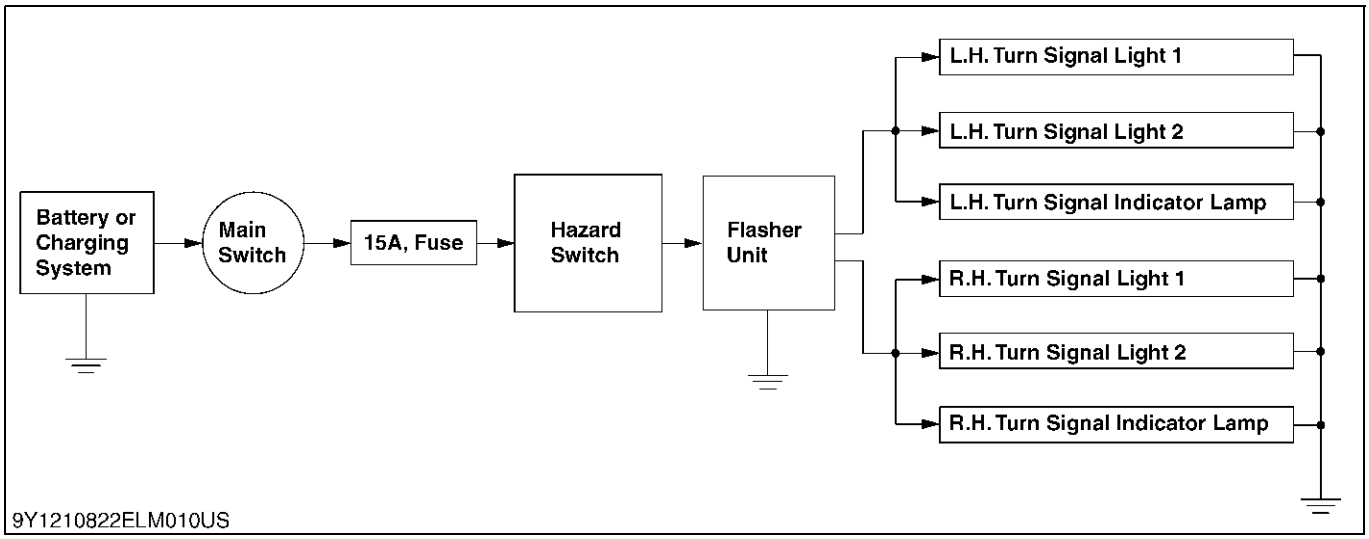
[2] TURNING LIGHT



The turning light which, switch forms a combination switch with the light switch, has three positions; **OFF**, **1**., **2**.. When turning, only one side light blinks and other one stays on. Priority is given to the turning light when the hazard switch and the turn signal light switch are turned on at the same time.

9Y1210822ELM0017US0

[3] HAZARD LIGHT



Hazard switch has two positions : **ON** and **OFF**. Turn signal lights 1 and 2 are used as hazard lights. Turn signal lights 1 and 2 and indicator lamps are shown in the figure above. The hazard light is operative when the key switch is in either the **ON** or **OFF** position.

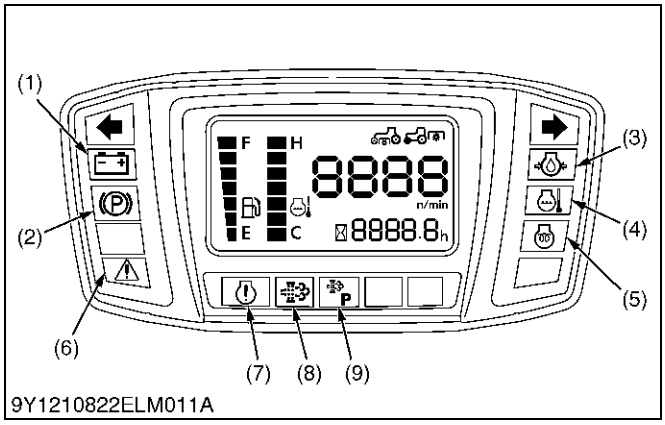
9Y1210822ELM0018US0

4. EASY CHECKER™

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

9Y1210822ELM0019US0

[1] INDICATION ITEMS



9Y1210822ELM011A

■ **Master Warning**

When trouble should occur at the engine, transmission or other control parts, this lamp illuminates.

■ **Engine Overheat Lamp**

When the water temperature gauge reads an unusual level, this lamp illuminates.

■ **DPF Warning Lamp**

When the regeneration of the DPF has problem, this lamp illuminates.

■ **Parking Brake Lamp**

When the parking brake is set, this lamp illuminates.

■ **Oil Pressure Lamp**

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

■ **Charge Lamp**

When the charging system does not function properly, this lamp illuminates.

■ **Glow Plug Indicator Lamp**

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

(1) Electrical Charge Warning Indicator
(2) Parking Brake Warning Indicator
(3) Engine Oil Pressure Warning Indicator
(4) Engine Overheat Warning Indicator
(5) Glow Plug Indicator
(6) Master Warning Indicator
(7) DPF Warning Indicator (B3350 Only)
(8) Regeneration Indicator (B3350 Only)
(9) Parked Regeneration Indicator (B3350 Only)

9Y1210822ELM0020US0

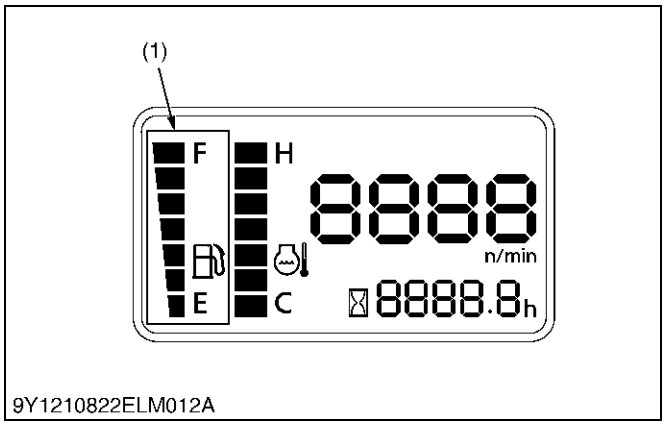
5. DIGITAL DISPLAY

This display shows the following information

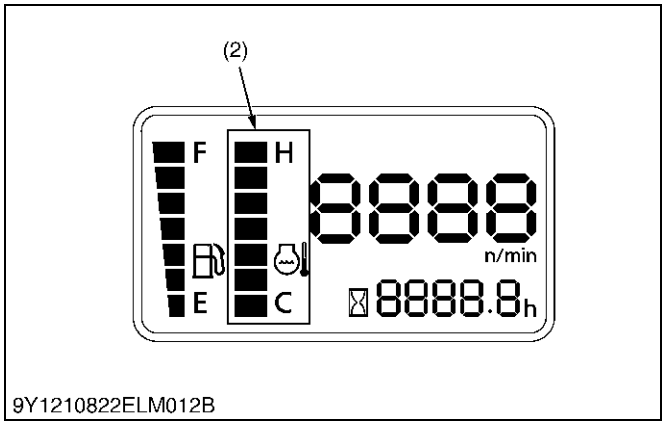
- Tractor information, such as engine speed, PTO rpm, hours the tractor has been operated and error code can be displayed.

9Y1210822ELM0021US0

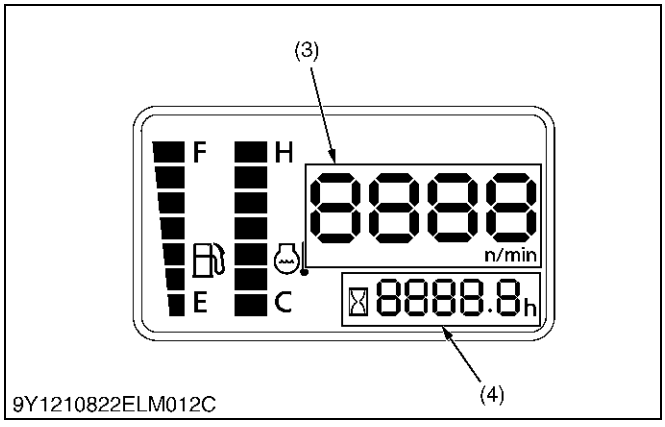
[1] LCD MONITOR INDICATOR



9Y1210822ELM012A



9Y1210822ELM012B



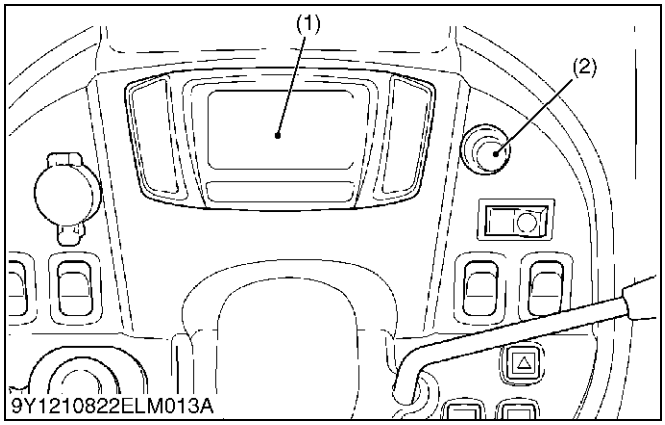
9Y1210822ELM012C

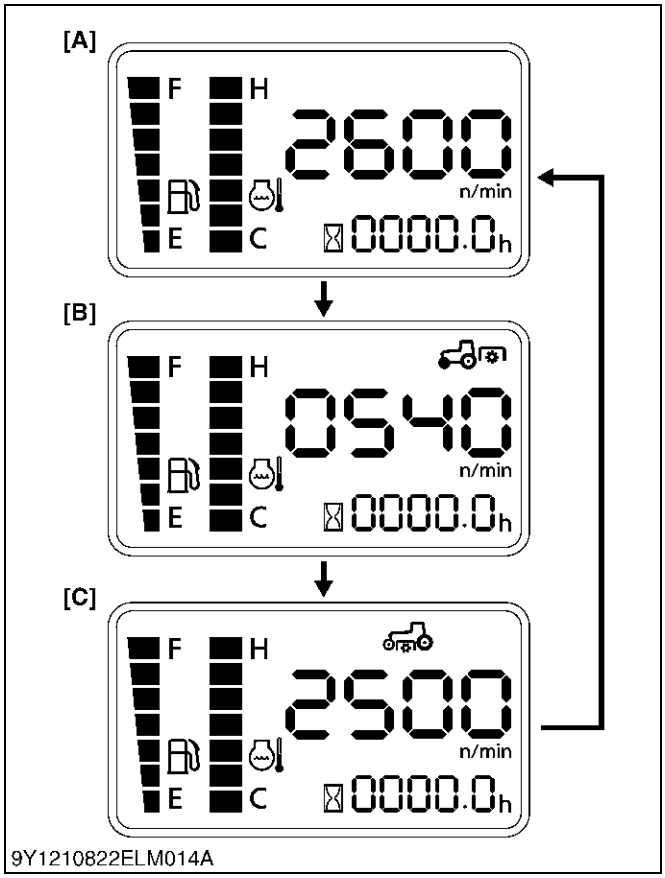
Fuel Gauge, Coolant Temperature Gauge, Hourmeter and Tachometer

- With key switch at **"ON"**, the fuel gauge and coolant temperature gauge indicate the fuel level and temperature of the coolant.
- The tachometer indicates the engine speed and the PTO shift speed location on the dial.
- The hourmeter indicates in five digits the hours. The tractor has been used; the last digit indicates 1/10 of an hour.

(1) Fuel Gauge
(2) Coolant Temperature Gauge
(3) Engine Revolution / PTO Speed Indictor
(4) Hours Used Indicator

9Y1210822ELM0022US0





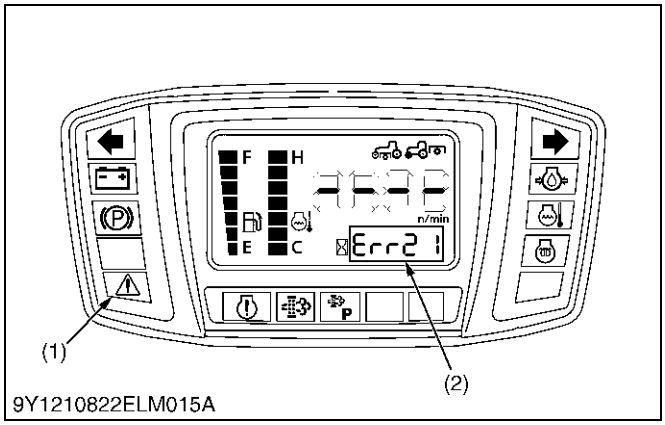
Engine Revolution and PTO Speed

1. The LCD monitor (1) gives several different displays.
2. The LCD monitor (1) displays "Engine rpm" normally.
3. The display switch (2) is pressed, the display is switched to "Rear PTO Speed", "Mid PTO Speed", "Engine rpm".

(1) LCD Monitor
(2) Display Switch

[A] Engine rpm
[B] Rear PTO Speed
[C] Mid PTO Speed

9Y1210822ELM0023US0



9Y1210822ELM015A

Power Train Error Code

1. If something is wrong with the power train, the master warning indicator (1) starts blinking and the error code is displayed on the LCD (2), indicating the location of the trouble.

[B2650]

Displayed error code	Trouble
ERROR-1	Water temperature sensor trouble
ERROR-2	Fuel sensor trouble
ERROR-3	Meter panel memory reading trouble

[B3350]

Displayed error code	Trouble
ERROR-2	Fuel sensor trouble
ERROR-3	Meter panel memory reading trouble
ERROR-21	CAN communication trouble

(1) Master Warning Indicator (2) LCD

9Y1210822ELM0024US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

FUSE AND WIRING

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipment Do Not Operate	Battery discharged or damaged	Recharge or Replace	8-S8
	Battery positive cable disconnected or improperly connected	Repair or Replace	8-S8
	Battery negative cable disconnected or improperly connected	Repair or Replace	8-S8
	Slow blow fuse blown	Replace	8-S10
Fuse Blown Frequently	Short-circuited	Repair or Replace	–

BATTERY

Symptom	Probable Cause	Solution	Reference Page
Battery Discharges Too Quickly	Battery damaged	Recharge or Replace	8-S8
	Regulator damaged	Replace	8-S57
	Alternator damaged	Repair or Replace	8-S56
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1
	Cooling fan belt slipping	Adjust tension	G-29

STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Operate	Battery discharged or damaged	Recharge or Replace	8-S8
	Slow blow fuse blown	Replace	8-S10
	Safety switch improperly adjusted or damaged	Repair or Replace	8-S19
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-M4
	Operator presence controller damaged	Replace	8-S23
	Starter relay damaged	Replace	8-S51
	Starter motor damaged	Repair or Replace	8-S22, 8-S56
	Main switch damaged	Replace	8-S16
Pre-heat indicator Lamp Does Not Light When Main Switch Is in Pre-heat Position	Battery discharged or damaged	Recharge or Replace	8-S8
	Slow blow fuse blown	Replace	8-S10
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S17
	Main switch damaged	Replace	8-S16
	Pre-heat indicator damaged	Replace meter panel	8-S13

OPERATOR PRESENCE CONTROL (OPC)

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Stop	Solenoid fuse blown (30A)	Replace	8-S10
	Engine stop solenoid relay damaged	Replace	8-S49
	Engine stop solenoid damaged	Replace	8-S24
	Operator presence controller damaged	Replace	8-S23
	PTO shift lever switch damaged	Adjust or Replace	8-S21
	Independent PTO lever switch damaged	Adjust or Replace	8-S21
	HST pedal switch damaged	Adjust or Replace	8-S20
	Wiring harness disconnected or improperly connected (between key stop solenoid relay and key stop solenoid, between key stop solenoid relay and battery positive terminal)	Repair or Replace	8-S24, 8-S39, 8-S49
	Wiring harness disconnected or improperly connected (between operator presence controller and key stop solenoid relay)	Repair or Replace	8-S49, 8-S23
Starter Motor Does Not Operate	Solenoid fuse blown	Replace	8-S10
	Engine stop solenoid damaged	Replace	8-S24
	Key stop solenoid relay damaged	Replace	8-S49
	Seat switch switch damaged	Adjust or Replace	8-S19
	PTO shift lever switch damaged	Adjust or Replace	8-S21
	Independent PTO lever switch damaged	Adjust or Replace	8-S21
	HST pedal switch damaged	Adjust or Replace	8-S20
	Operator presence controller damaged	Replace	8-S23
	Wiring harness disconnected or improperly connected (between key stop solenoid relay and key stop solenoid, between key stop solenoid relay and battery positive terminal)	Repair or Replace	8-S24, 8-S39, 8-S49
	Wiring harness disconnected or improperly connected (between operator presence controller and key stop solenoid relay)	Repair or Replace	8-S49, 8-S23
Engine Stops When Step on the HST Pedal to Forward or Reverse	Wrong wiring of seat switch	Proper Wiring	8-M4, 8-M10, 8-S20

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light When Main Switch Is Turned ON	Fuse blown (10A)	Replace	8-S10
	Wiring harness disconnected or improperly connected	Replace meter panel	8-M1, 8-S13
	Regulator damaged	Replace	8-S57
	Alternator damaged	Repair or Replace	8-S56
Charging Lamp Does Not Go Off When Engine Is Running	Wiring harness disconnected or improperly connected	Replace meter panel	8-M1, 8-S13
	Regulator damaged	Replace	8-S57
	Alternator damaged	Repair or Replace	8-S56

LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Head light Does Not Light	Fuse blown (10 A)	Replace	8-S10
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S16, 8-S41
Tail Light Does Not Light	Fuse blown (10 A)	Replace	8-S10
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S16, 8-S41
Illumination Light Does Not Light	Fuse blown (10 A)	Replace	8-S10
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S16, 8-S41
Hazard Light (Tail Light) Does Not Light	Fuse blown (10 A)	Replace	8-S10
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1
	Flasher unit damaged	Replace	8-S44
	Hazard switch damaged	Replace	8-S43
Hazard Indicator Lamp (Turn Signal Lamp) Does Not Light	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Replace	8-M1
Hazard Light (Tail Light) Does Not Flicker	Flasher unit damaged	Repair or Replace	8-S44
Turn Signal Light Does Not Light	Fuse blown (10 A)	Replace	8-S10
	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1
	Flasher unit damaged	Replace	8-S44
	Combination switch damaged	Replace	8-S41
Turn Signal Light Indicator Lamp Does Not Light	Bulb blown	Replace	G-39
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S41, 8-S13
Turn Signal Light Does Not Flicker	Flasher unit damaged	Replace	8-S44
	Combination switch damaged	Replace	8-S41

EASY CHECKER™

Symptom	Probable Cause	Solution	Reference Page
Oil Pressure Lamp Lights Up When Engine Is Running	Engine oil pressure too low	Repair engine	–
	Engine oil insufficient	Fill	G-19
	Oil pressure switch damaged	Replace	8-S47
	Short circuit between oil pressure switch lead and chassis	Repair	8-S47
	Circuit in panel board damaged	Replace	8-S13
Oil Pressure Lamp Does Not Light When Main Switch Is Turned On and Engine Is Not Running	Bulb blown	Replace	G-39
	Oil pressure switch damaged	Replace	8-S47
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S13
	Circuit in panel board damaged	Replace	8-S13

GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	Fuel gauge damaged	Repair	8-S48
	Fuel level sensor damaged	Replace	8-S48
	Wiring harness disconnected or improperly connected (between panel board and fuel level sensor)	Repair or Replace	8-M1, 8-S13, 8-S48
	Circuit in panel board damaged	Replace	8-S13
Coolant Temperature Gauge Does Not Function	Coolant temperature gauge damaged	Replace	8-S47
	Coolant temperature sensor damaged	Replace	8-S47
	Wiring harness disconnected or improperly connected	Repair or Replace	8-M1, 8-S13, 8-S47
	Circuit in panel board damaged	Replace	8-S13

9Y1210822ELS0107US0

2. SERVICING SPECIFICATIONS

STARTER

Item		Factory Specification	Allowable Limit
Commutator	O.D.	28.0 mm 1.102 in.	27.0 mm 1.063 in.
	Difference of O.D.'s	Less than 0.02 mm 0.0008 in.	0.05 mm 0.0020 in.
Mica	Undercut	0.60 mm 0.0236 in.	0.20 mm 0.0079 in.
Brush	Length	14.0 mm 0.551 in.	9.0 mm 0.354 in.

GLOW PLUG

Item		Factory Specification	Allowable Limit
Glow Plug	Resistance	Approx. 1.1 Ω	–
Glow Plug (Burner)	Resistance	Approx. 0.8 Ω	–
Glow Plug (Heater)	Resistance	3.2 to 4.4 Ω	–

ALTERNATOR

Item		Factory Specification	Allowable Limit
Stator	Resistance	Less than 1.0 Ω	–
Rotor	Resistance	2.9 Ω	–

9Y1210822ELS0108US0

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Coolant temperature sensor	Less than 19.6	Less than 2.00	Less than 14.5
Pulley nut	58.4 to 78.9	5.95 to 8.05	43.1 to 58.2

9Y1210822ELS0109US0

4. CHECKING AND ADJUSTING

CAUTION

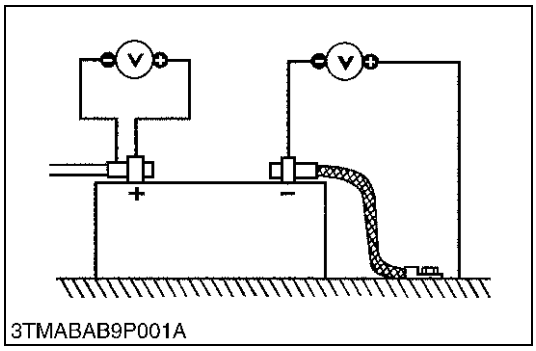
- **To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.**
- **Never remove the battery cap while the engine is running.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered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

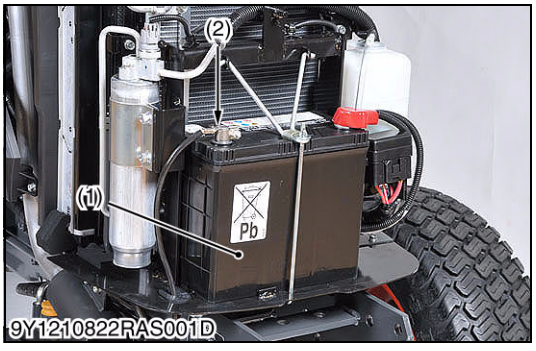
■ IMPORTANT

- **If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.**
- **When checking the electrical parts, must disconnect the battery negative cable.**
- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, the positive cable first.**

9Y1210822ELS0001US0

[1] BATTERY





Battery Voltage

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

Battery voltage	Factory specification	More than 12 V

9Y1210822ELS0002US0

Battery Terminal Connection

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

Potential difference	Factory specification	Less than 0.1 V

9Y1210822ELS0003US0

Battery Condition Indicator

1. Check the battery condition by reading the indicator (2).

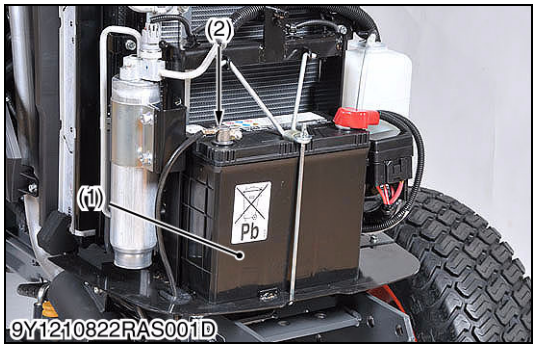
State of indicator display	
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery
White	Needs replacing battery

■ IMPORTANT

- **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) Battery (2) Indicator

9Y1210822ELS0004US0



Recharging

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 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 (1), connect the battery positive terminal to the charge 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 charge if the indicator display turns green from black.
4. When exchanging an old battery for a new one, use battery of equal specification shown in table.

Table

Battery Type	Volt (V)	Capacity at 5 H.R.	Reserve at (min.)	Cold Cranking Amps	Normal Charging Rate (A)
55B24L (S)-MF	12	36	80	430	4.5

(1) Battery (2) Indicator

9Y1210822ELS0005US0

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.

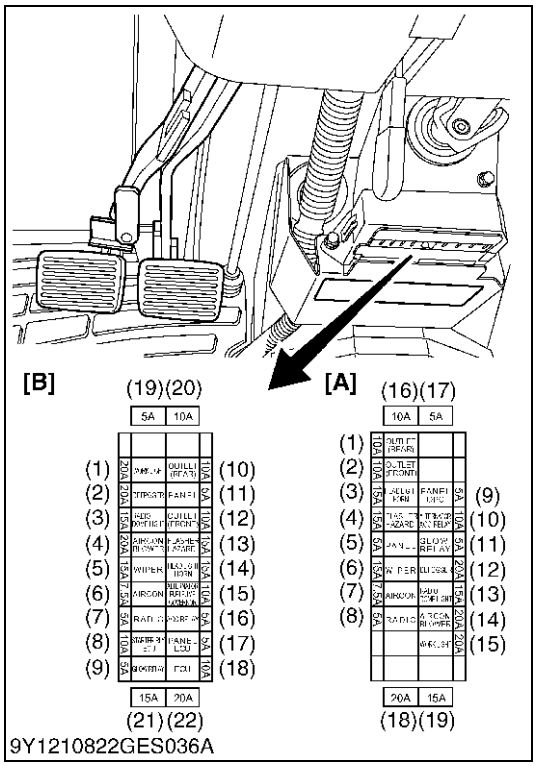
(Reference)

- 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

9Y1210822ELS0006US0

[2] FUSE



Checking Fuse

1. Check the fuse.
2. If any of the fuses is blown, replace it with the one having same capacity.

■ **IMPORTANT**

- **If a fuse is blown, check the cause and be sure to replace it with the one having same capacity.**

[B2650]

Fuse No.	Capacity (A)	Protected circuit
(1)	10	Outlet (Rear)
(2)	10	Outlet (Front)
(3)	15	Head Light / Horn
(4)	15	Flasher / Hazard
(5)	5	Panel
(6)	15	Wiper
(7)	7.5	Aircon
(8)	5	Radio
(9)	5	Panel / OPC
(10)	10	Alternator / ACC Relay
(11)	5	Glow Relay
(12)	20	Defogger
(13)	15	Radio / Dome Light
(14)	20	Aircon Blower
(15)	20	Work Light
(16)	10	Spare Fuse
(17)	5	Spare Fuse
(18)	20	Spare Fuse
(19)	15	Spare Fuse
(25)	Slow blow fuse	Check circuit against wrong battery connection

[A] B2650 **[B] B3350**

(To be continued)

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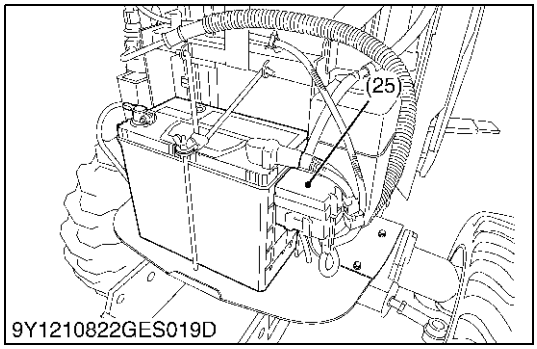
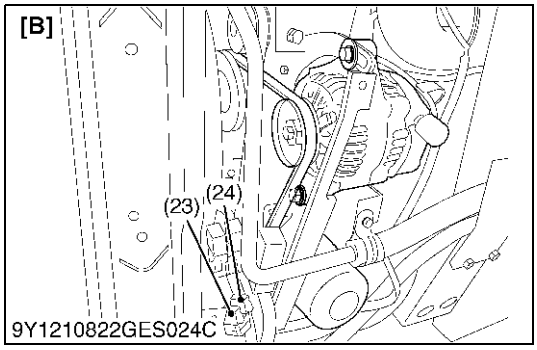




[B3350]

Fuse No.	Capacity (A)	Protected circuit
(1)	20	Work Light
(2)	20	Defogger
(3)	15	Radio / Dome Light
(4)	20	Aircon Blower
(5)	15	Wiper
(6)	7.5	Aircon
(7)	5	Radio
(8)	5	Starter Relay / ECU
(9)	5	Glow Relay
(10)	10	Outlet (Rear)
(11)	5	Panel
(12)	10	Outlet (Front)
(13)	15	Flasher / Hazard
(14)	15	Head Light / Horn
(15)	10	Alternator / Fuel Pump / Governor
(16)	5	ACC Relay
(17)	5	Panel / ECU
(18)	10	ECU
(19)	5	Spare Fuse
(20)	10	Spare Fuse
(21)	15	Spare Fuse
(22)	20	Spare Fuse
(23)	30	Starter Relay
(24)	15	Reforming Glow
(25)	Slow blow fuse	Check circuit against wrong battery connection

[B] B3350

9Y1210822ELS0055US0

[3] ECU AND METER PANEL

(1) Engine ECU (B3350)

Checking ECU Connector

1. Disconnect the connector (1), and check their terminals for contamination and deformation.
2. Check to see that cable does not broken or terminals are not shelled off.
3. If any damaged parts are found, repair or replace them.

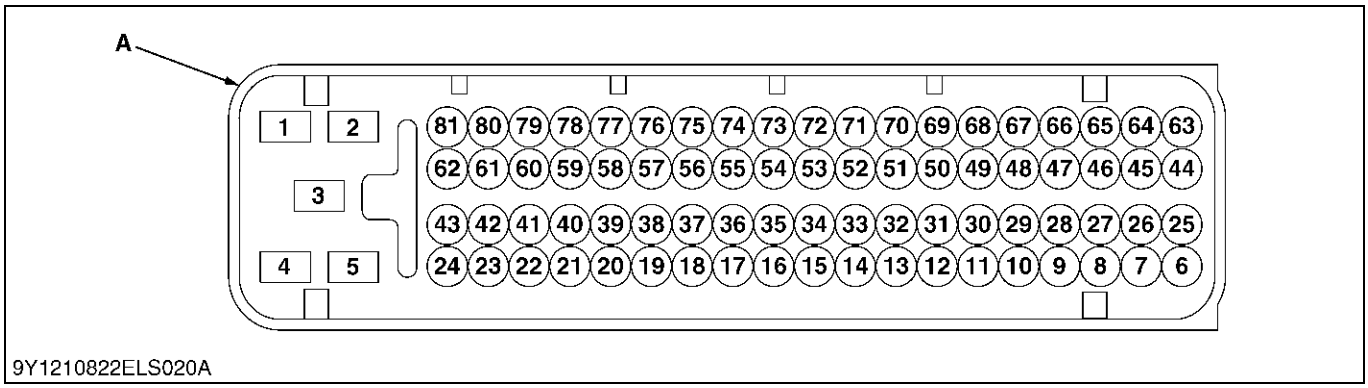
■ **IMPORTANT**

- **Connect connectors surely after checked.**

(1) ECU Connector (2) ECU

9Y1210822ELS0052US0

Checking the Electric Control Unit (ECU)

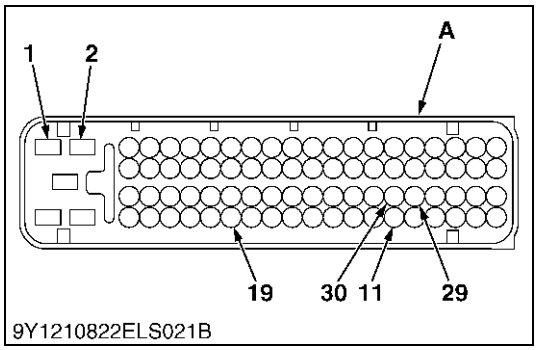


9Y1210822ELS020A

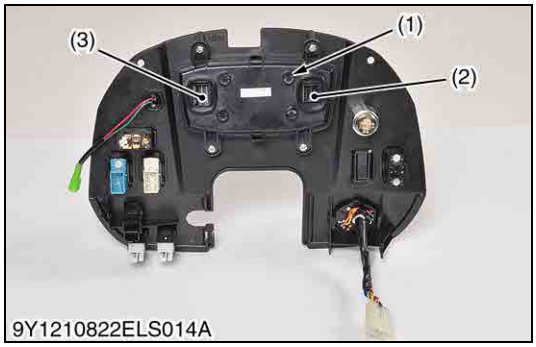
1	Battery (+B)	**28**	Analog GND	**55**	Analog Input 1-5
2	Battery (+B)	**29**	5 V Supply (Signal)	**56**	Analog Input 1-6
3	Motor Output 1	**30**	5 V Supply (Signal)	**57**	Analog Input 1-1
4	Motor Output 1	**31**	GND	**58**	Analog Input 1-3
5	Motor Output 2	**32**	GND	**59**	Switch Input 7 (High Active)
6	Analog Input 2-3	**33**	GND	**60**	Switch Input 9 (High Active)
7	Analog Input 2-5	**34**	Lamp Output 5 (Low Side)	**61**	Solenoid Output
8	Analog Input 2-7	**35**	Lamp Output 2 (Low Side)	**62**	Solenoid Output
9	Analog GND	**36**	Lamp Output 3 (Low Side)	**63**	CAN 1 (L)
10	Analog GND	**37**	Lamp Output 4 (Low Side)	**64**	CAN 1 (L)
11	5 V Supply (Signal)	**38**	GND	**65**	CAN 1 (H)
12	Solenoid Current Feedback Input	**39**	Switch Input B (High Active)	**66**	CAN 1 (H)
13	Solenoid Current Feedback Input	**40**	Key Switch Terminal (START)	**67**	Key Switch Terminal (ACC)
14	GND (Engine Speed Sensor)	**41**	Key Switch Terminal (ACC)	**68**	Key Switch Terminal (GLOW)
15	Lamp Output (Low Side)	**42**	Key Switch Terminal (ACC)	**69**	Switch Input 1 (High Active)
16	12 V Supply (Engine Speed Sensor)	**43**	Key Switch Terminal (ACC)	**70**	Switch Input 5 (Low Active)
17	PWN Output 1 (Low Side)	**44**	CAN 2 (H)	**71**	Switch Input 4 (Low Active)
18	PWN Output 1 (Low Side)	**45**	CAN 2 (H)	**72**	Switch Input 6 (High Active)
19	GND	**46**	CAN 2 (L)	**73**	Switch Input 3 (Low Active)
20	PWN Output 2 (Low Side)	**47**	CAN 2 (L)	**74**	Switch Input 2 (Low Active)
21	PWN Output 3 (Low Side)	**48**	Key Switch Terminal (ACC)	**75**	Analog Input 1-7
22	Relay Output 2 (Low Side)	**49**	Not Connect (System Reserve)	**76**	Analog Input 1-4
23	Relay Output 1 (High Side)	**50**	Not Connect (System Reserve)	**77**	Analog Input 1-2
24	Relay Output 1 (High Side)	**51**	Analog GND	**78**	Analog Input 2-1
25	Analog input 2-2	**52**	Not Connect (System Reserve)	**79**	Relay Output 4 (Low Side)
26	Analog input 2-4	**53**	Analog GND	**80**	Relay Output 5 (High Side)
27	Analog input 2-6	**54**	Engine Speed Sensor Input	**81**	Relay Output 3 (High Side)

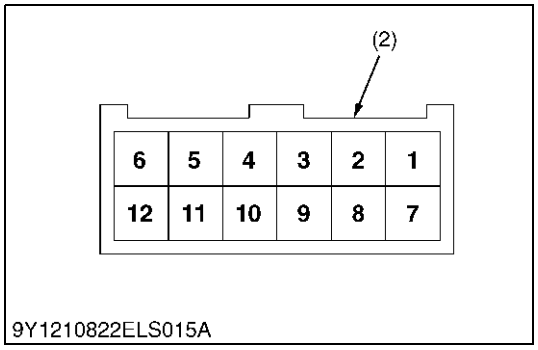
A : ECU Connector of Wire Harness Side

9Y1210822ELS0053US0



(2) Meter Panel





Connector Voltage

(Main Circuit)

1. Turn on the main switch. (Do not start engine.)
2. Measure the voltage between terminal **1** or **2** (+) and terminal **19** (−).
3. It is OK if the voltage equals to the battery voltage.

(Voltage)

1. Turn on the main switch. (Do not start engine.)
2. Measure the voltage between terminal **11** or **29** or **30** (+) and terminal **19** (−).
3. It is OK if the voltage is approx. 5 V.

Voltage	Terminal **1** or **2** to **19**	Approx. battery voltage
	Terminal **11** or **29** or **30** to **19**	Approx. 5 V

(1) ECU Connector
(2) ECU

A : ECU Connector of Wire Harness Side

9Y1210822ELS0054US0

Arrangement of Digital Display Connector Pin

■ **B2650**

[Connector 1]

Terminal No.	Item	Color of wiring
1 to 5	Blank	–
6	**L** Terminal	L/R
7 to 10	Blank	–
11	PTO ON/OFF	Lg
12	Turn Signal (L)	Sb

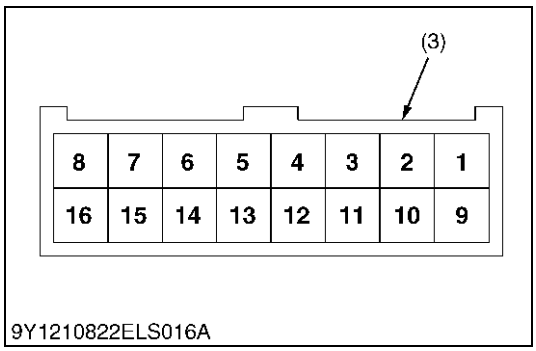
[Connector 2]

Terminal No.	Item	Color of wiring
1	Turn Signal (R)	V
2	Glow Plug	W
3	Oil Switch	W/R
4 to 8	Blank	–
9	Fuel Gauge	V
10	Water Temperature Gauge	L
11	GND	B
12	Panel Meter Switch	P/W
13	Engine Revolution	Sb
14	Blank	–
15	Battery	Y/L
16	Main Switch	Br

(1) Digital Display
(2) Connector 1 (Display Side)
(3) Connector 2 (Display Side)

(To be continued)

(Continued)



■ B3350

[Connector 1]

Terminal No.	Item	Color of wiring
1 to 5	Blank	–
6	Turn Signal (L)	Sb
7 to 12	Blank	–

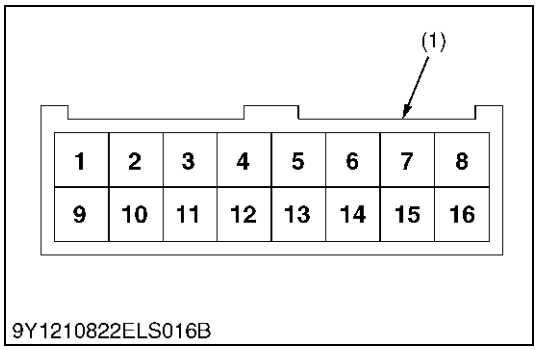
[Connector 2]

Terminal No.	Item	Color of wiring
1	PTO ON/OFF	W/Y
2	Panel Mode Switch	P/W
3	Parking Brake Switch	G/B
4	Turn Signal (R)	V
5	Glow Lamp	Or/L
6	Oil Switch	Or/B
7	Blank	–
8	Engine Warning	W/R
9	CAN (L)	L
10	CAN (R)	V/R
11	Blank	–
12	GND	B
13	Fuel Gauge	V/Y
14	**L** Terminal	Y/W
15	Battery	Y/L
16	Main Switch	L/R

(3) Connector 2 (Display Side)

9Y1210822ELS0046US0

9Y1210822ELS014B



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Battery Voltage

■ B2650

1. Disconnect the connector of connector 2 side.
2. Measure the voltage between terminal **15** (+) (Yellow/Blue) and terminal **11** (−) (Black).
3. Turn the main key switch **ON**.
4. Measure the voltage between terminal **16** (+) (Brown) and terminal **11** (−) (Black).
5. If the measure is not approximately battery voltage, check the relating electric circuit.

Voltage	Terminal **15** – **11**	Approx. battery voltage
	Terminal **16** – **11**	Approx. battery voltage

■ B3350

1. Disconnect the connector of connector 2 side.
2. Measure the voltage between terminal **15** (+) (Yellow/Blue) and terminal **12** (−) (Black).
3. Turn the main key switch **ON**.
4. Measure the voltage between terminal **16** (+) (Blue/Red) and terminal **12** (−) (Black).
5. If the measure is not approximately battery voltage, check the relating electric circuit.

Voltage	Terminal **15** – **12**	Approx. battery voltage
	Terminal **16** – **12**	Approx. battery voltage

(1) Connector (Harness Side)

A : Connector 1
B : Connector 2

9Y1210822ELS0047US0

[4] STARTING SYSTEM
(1) Main Switch

Main Switch

1. Remove the steering wheel and the panel lower cover (1).
2. Disconnect the **4P** connector and remove the main switch (2).
3. Perform the following checks.

(1) Panel Lower Cover
(2) Main Switch

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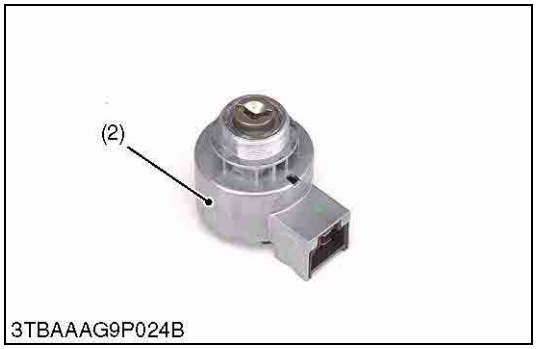
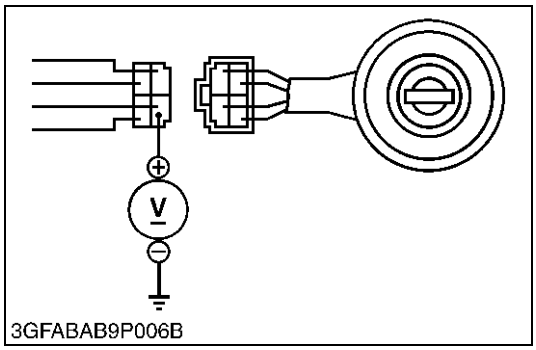


Connector Voltage

1. Measure the voltage with a voltmeter across the connector **B** terminal (2) and chassis.
2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector **B** terminal – Chassis	Approx. battery voltage



(1) Main Switch
(2) **B** Terminal
(3) **AC** Terminal
(4) **50** Terminal
(5) **19** Terminal

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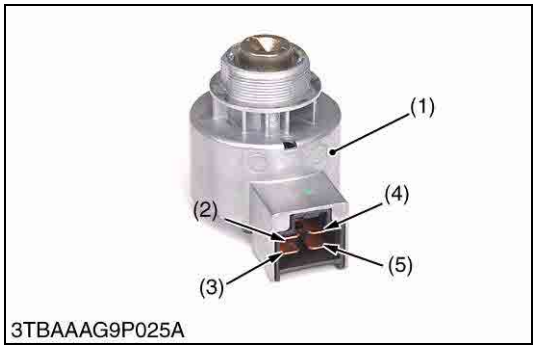

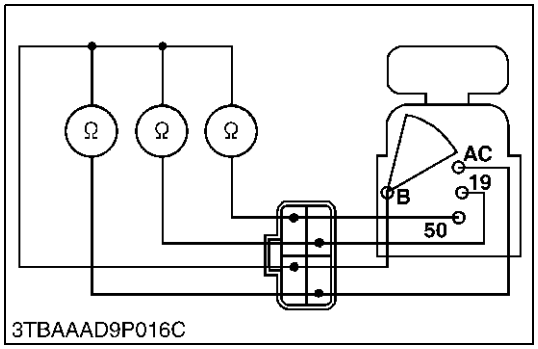

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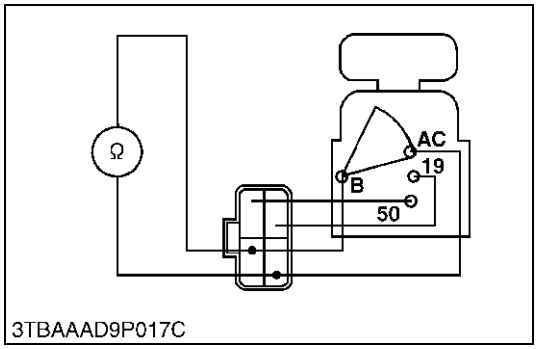
Main Switch Continuity

1) Main Switch Key at OFF Position

1. Set the main switch **OFF** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **AC** terminal, **B** terminal and **50** terminal, **B** terminal and **19** terminal.
3. If infinity is not indicated, the contacts of the main switch are faulty.

Resistance	**B** terminal – **AC** terminal	Infinity
	B terminal – **50** terminal	Infinity
	B terminal – **19** terminal	Infinity

9Y1210822ELS0009US0



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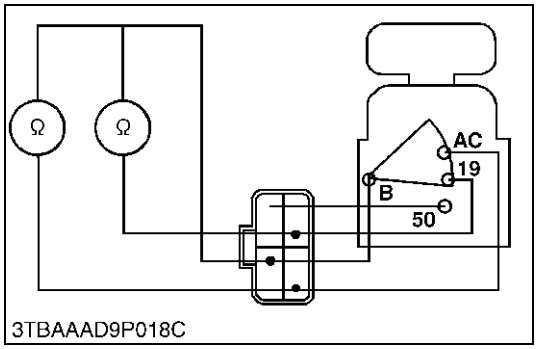
2) Main Switch Key at ON Position

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

Resistance	**B** terminal – **AC** terminal	0 Ω

9Y1210822ELS0010US0



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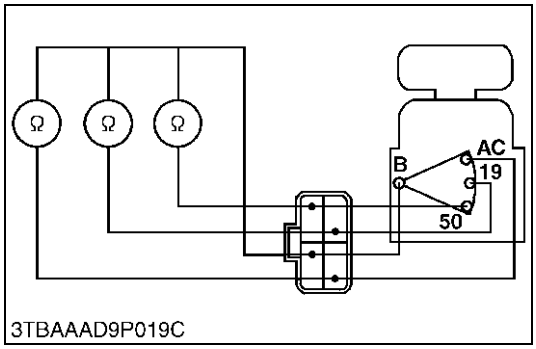
3) Main Switch Key at PREHEAT Position

1. Set and hold the main switch key at the **PREHEAT** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **19** terminal, and measure the resistance across the **B** terminal and the **AC** terminal.
3. If 0 Ω is not indicated, these contacts of the main switch are faulty.

Resistance	**B** terminal – **19** terminal	0 Ω
	B terminal – **AC** terminal	0 Ω

9Y1210822ELS0011US0



3TBAAAD9P019C

4) Main Switch Key at START Position

1. Set and hold the main switch key at the **START** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **19** terminal, across the **B** terminal an the **50** terminal, and across the **B** terminal and the **AC** terminal.
3. If 0 Ω is not indicated, these contacts of the main switch are faulty.

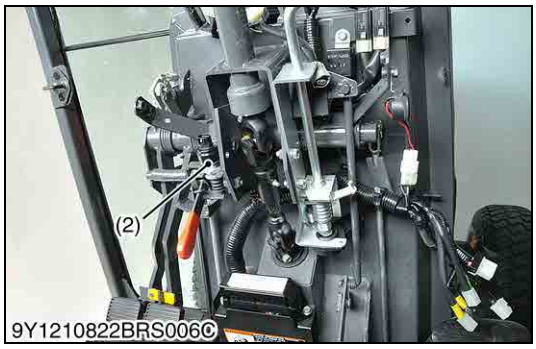
Resistance	**B** terminal – **19** terminal	0 Ω
	B terminal – **50** terminal	0 Ω
	B terminal – **AC** terminal	0 Ω

Key Position	Terminal			
	B	AC	19	50
OFF	●			
ON	●	●		
PREHEAT	●	●	●	
START	●	●	●	●

9Y1210822ELS025US

9Y1210822ELS0012US0

(2) Safety Switches



Safety Switch Continuity

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

Safety Switch	State	Resistance
Seat switch	Operator on the seat	0 Ω
	Vacant	Infinity
Parking brake switch	Parking lock	0 Ω
	Free	Infinity
HST pedal switch	HST pedal in neutral (pushed in)	0 Ω
	HST pedal in forward or reverse	Infinity
PTO ON/OFF switch	Independent PTO lever in neutral	Infinity
	Independent PTO lever engaged	0 Ω
PTO selecting switch	PTO shift lever in Rear PTO / Mid PTO or Mid PTO position	Infinity
	PTO shift lever in Rear PTO position	0 Ω

(1) Seat Switch
(2) Parking Brake Switch
(3) HST Pedal Switch
(4) PTO ON/OFF Switch
(5) PTO Selecting Switch

9Y1210822ELS0020US0

Seat Switch Continuity Check

1. Disconnect the seat switch connector (1).
2. Connect the circuit tester leads to the seat switch connector.

(When switch is not pushed)

1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

(When switch is pushed)

1. Measure the resistance between terminals.
2. If continuity is not 0 Ω, the switch is faulty. Replace it.

Resistance	When seat switch is not pushed	Infinity
	When seat switch is pushed	0 Ω

(1) Seat Switch Connector

9Y1210822ELS0021US0

Parking Brake Switch Check

1. Disconnect the parking brake switch connector (1).
2. Connect the circuit tester leads to the parking brake switch terminals.

(When switch is not pushed)

1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

(When switch is pushed)

1. Measure the resistance between terminals.
2. If continuity is not 0 Ω, the switch is faulty. Replace it.

Resistance	When seat switch is not pushed	Infinity
	When seat switch is pushed	0 Ω

(1) Parking Brake Switch Connector

9Y1210822ELS0022US0

HST Pedal Switch Check

1. Disconnect the HST pedal switch connector (1).
2. Connect the circuit tester leads to the HST **2P** connector.

(When the HST pedal is in "NEUTRAL" position)

1. Measure the resistance between terminals.
2. If continuity is not 0 Ω, the switch is faulty. Replace it.

(When the HST pedal is in "FORWARD" position)

1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

(When the HST pedal is in "REVERSE" position)

1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

Resistance	When the HST pedal is in **"NEUTRAL"** position	0 Ω
	When the HST pedal is in **"FORWARD"** position	Infinity
	When the HST pedal is in **"REVERSE"** position	Infinity

(1) HST Pedal Switch Connector

9Y1210822ELS0023US0

Independent PTO Lever Switch Check

1. Disconnect the **2P** connector from the independent PTO lever switch (1).
2. Connect the circuit tester leads to the independent PTO lever switch terminals.

(When independent PTO lever is in "DISENGAGED" position)

1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

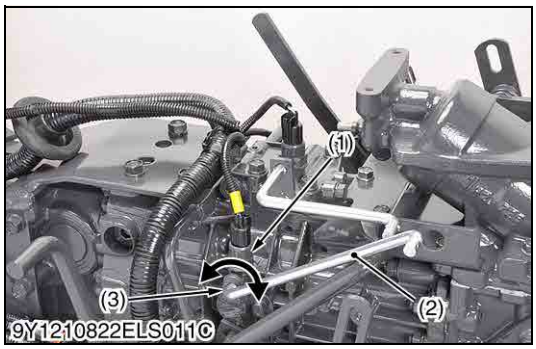
(When independent PTO lever is in "ENGAGED" position)

1. Measure the resistance between terminals.
2. If continuity is not 0 Ω, the switch is faulty. Replace it.

Resistance	When independent PTO lever is in **"DISENGAGED"** position	Infinity
	When independent PTO lever is in **"ENGAGED"** position	0 Ω

(1) Independent PTO Lever Switch (2) Control Rod

9Y1210822ELS0024US0



PTO Shift Lever Switch Check

1. Disconnect the **2P** connector from the PTO shift lever switch (1).
2. Connect the circuit tester leads to the PTO shift lever switch terminals.

(When the PTO shift lever is in "REAR PTO" position)

1. Measure the resistance between terminals.
2. If continuity is not 0 Ω, the switch is faulty. Replace it.

(When the PTO shift lever is in "REAR PTO / MID PTO" position)

1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

(When the PTO shift lever is in "MID PTO" position)

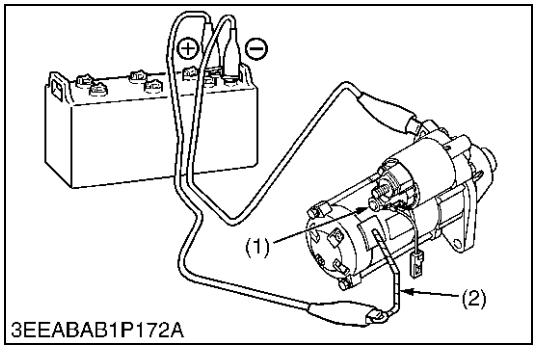
1. Measure the resistance between terminals.
2. If continuity is not infinity, the switch is faulty. Replace it.

Resistance	When the PTO shift lever is in **"REAR PTO"** position	0 Ω
	When the PTO shift lever is in **"REAR PTO / MID PTO"** position	Infinity
	When the PTO shift lever is in **"MID PTO"** position	Infinity

(1) PTO Shift Lever Switch (3) Control Rod
(2) PTO Shift Arm

9Y1210822ELS0025US0

(3) Starter



Motor Test

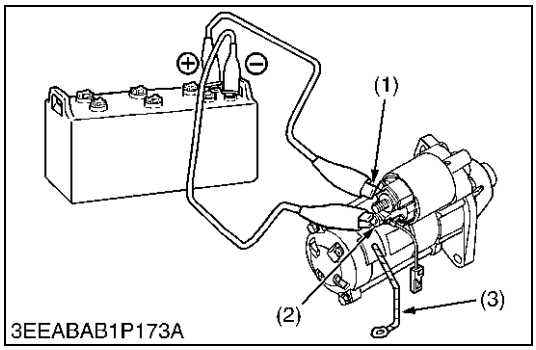
CAUTION

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

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter **M** terminal.
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

9Y1210822ELS0026US0



Magnetic Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter **M** terminal.
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter **C** terminal (2).
5. Connect a jumper lead from the starter **S** terminal (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter **C** terminal (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

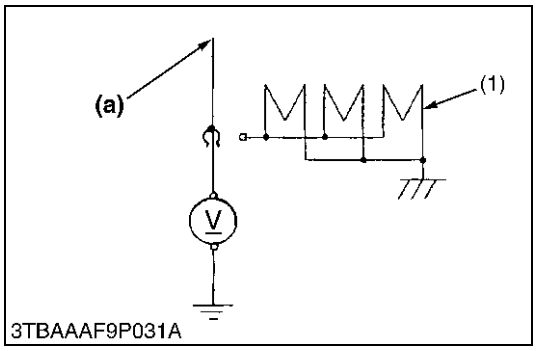
■ **NOTE**

- **This test should be done for a short time, about 3 to 5 seconds.**

(1) **S** Terminal
(2) **C** Terminal
(3) Connecting Lead

9Y1210822ELS0027US0

(4) Glow Plug

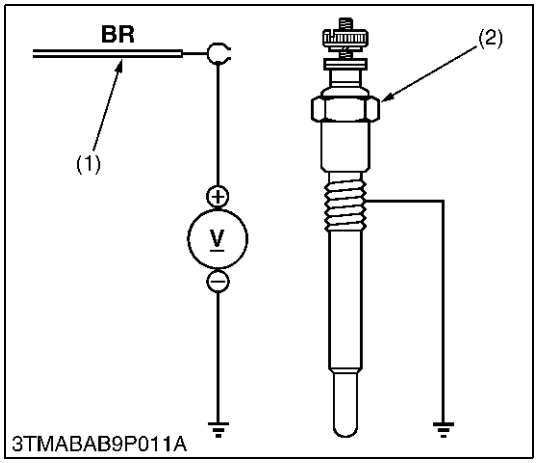


Glow Plug

1. Disconnect the lead from the glow plug.
2. Connect the tester positive cable to the glow plug lead and negative one to the chassis.
3. Measure its voltage with a voltmeter, after turning the main switch to the preheating or starting position.
4. If its voltage is not approximately the battery one, check the main switch or wiring harness.

(1) Glow Plug
(a) From Main Switch 19 and Pre-heat Indicator Lamp

9Y1210822ELS0057US0



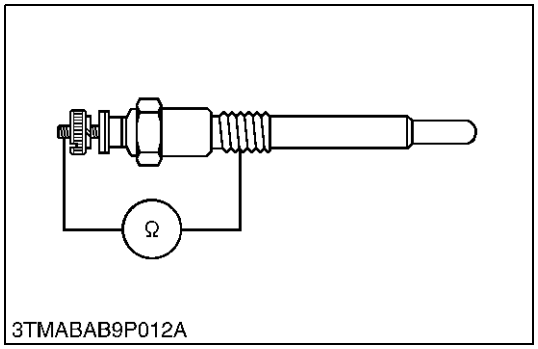
Lead Terminal Voltage

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

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

(1) Wiring Lead (2) Glow Plug

9Y1210822ELS0016US0



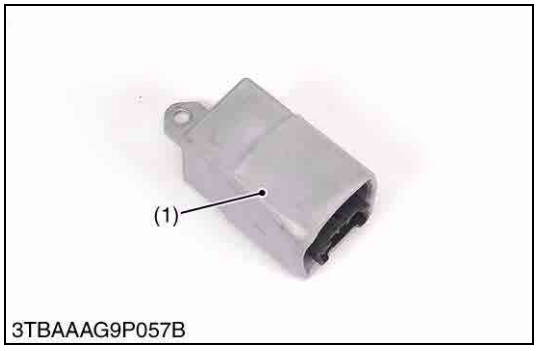
Glow Plug Continuity

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

Glow plug resistance	Factory specification	Approx. 1.1 Ω

9Y1210822ELS0017US0

(5) OPC Controller (B2650)



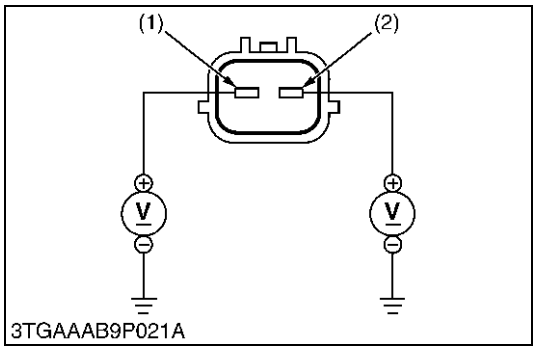
OPC Controller

1. Check the "Engine Starting Conditions" and "Automatic Engine Stop Conditions" (See page 8-M10).
2. If the tractor does not operate appropriately, check all parts according to the "1. TROUBLESHOOTING" section.
3. If all parts except the OPC controller (1) is not damaged, replace the OPC controller (1).

(1) OPC Controller

9Y1210822ELS0028US0

(6) Key Stop Solenoid



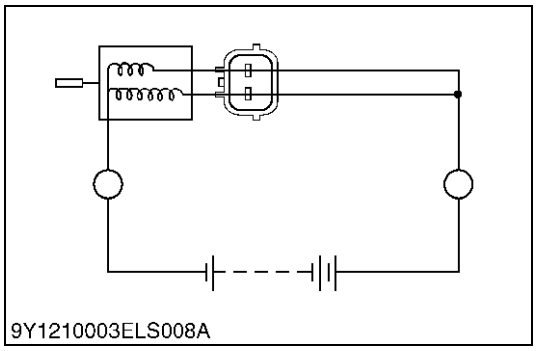
Connector Voltage

1. Disconnect the **2P** connector from key stop solenoid.
2. Turn the main switch key to the **"ON"** position.
3. Measure the voltage with voltmeter between the terminal **1**, terminal **2** of wiring harness side and body.
4. If the voltage differs from the battery voltage, the wiring harness or main switch is damaged.

Voltage	Terminal **1** – Body	Approx. battery voltage
	Terminal **2** – Body	Approx. battery voltage

(1) Terminal **2** (2) Terminal **1**

9Y1210822ELS0110US0



Key Stop Solenoid Test

1. Disconnect the lead from the engine stop solenoid after turning the main switch off.
2. Connect jumper leads from the battery positive terminal to the key stop solenoid terminal **1** and **2**, then from the battery negative terminal to the key stop solenoid body.
3. If the solenoid plunger is not attracted, the key stop solenoid is damaged.

(1) Battery

9Y1210822ELS0111US0

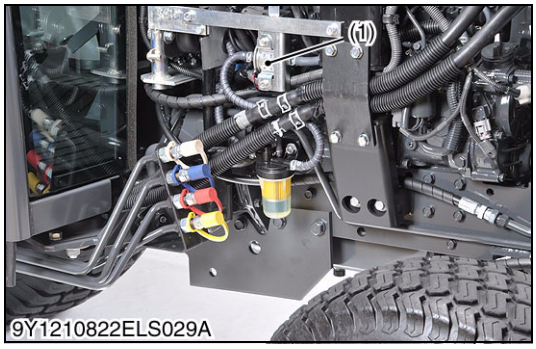
[5] ENGINE CONTROL SYSTEM

(1) Fuel Pump (B3350)

■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the pump resistance.**

9Y1210822ELS0066US0

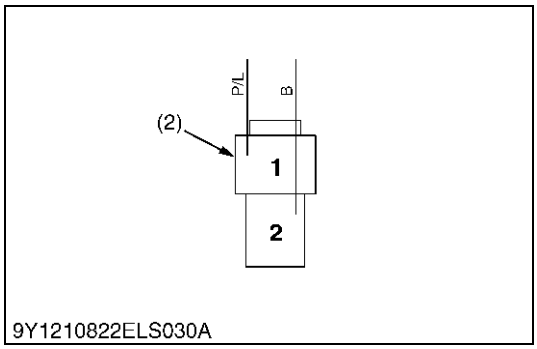


9Y1210822ELS029A

Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

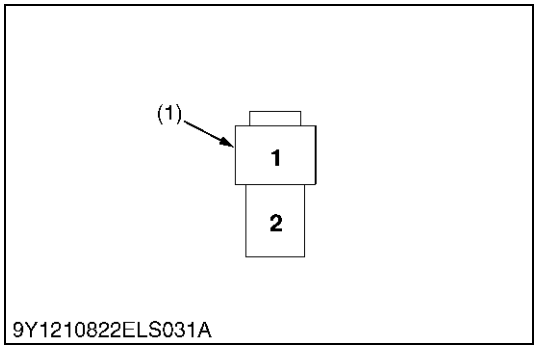
Voltage	Main switch at **"ON"**	Terminal **1** – chassis	Approx. battery voltage



9Y1210822ELS030A

(1) Fuel Pump (2) Connector (Harness Side)

9Y1210822ELS0067US0



9Y1210822ELS031A

Pump Actuation Test

1. Connect a jumper lead from the terminal **1** to the battery positive terminal post.
2. Connect a jumper lead from the terminal **2** to the battery negative terminal post.
3. If the pump does not work, pump is faulty.

(1) Connector (Pump Side)

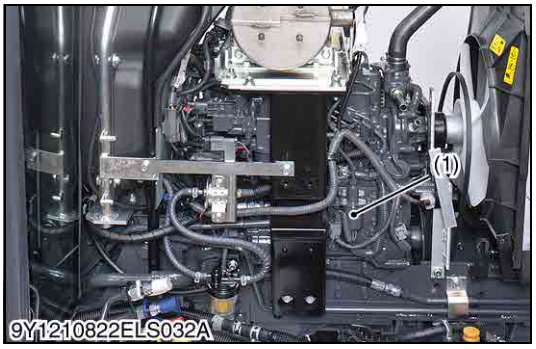
9Y1210822ELS0068US0

(2) Fuel Pump (for Reformer)

■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the pump resistance.**

9Y1210822ELS0066US0



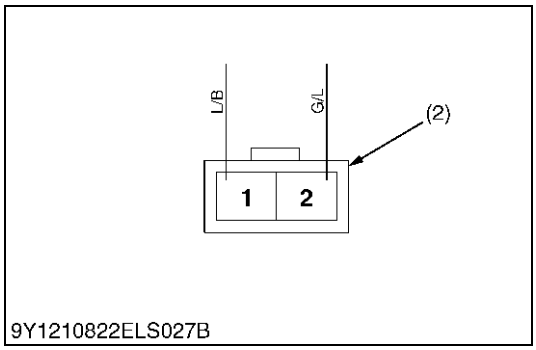
Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **2** – chassis	Approx. battery voltage

(1) Fuel Pump (2) Connector (Harness Side)

9Y1210822ELS0069US0



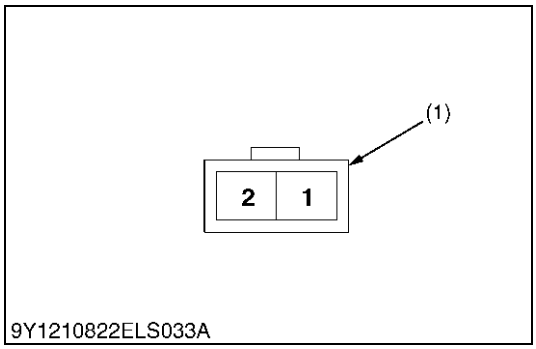
Sensor Resistance

1. Measure the resistance with an ohmmeter across the terminals shown in the table below.
2. If the reference value is not indicated, the fuel pump (for reformer) is faulty.

Resistance	at 20 °C (68 °F)	Terminal **1** – **2**	Approx. 2.5 Ω

(1) Connector (Sensor Side)

9Y1210822ELS0070US0

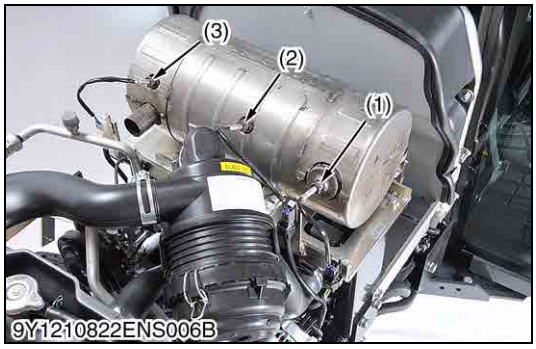


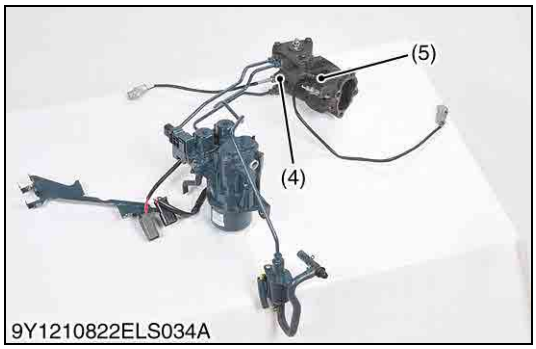
(3) Exhaust Temperature Sensor (B3350)

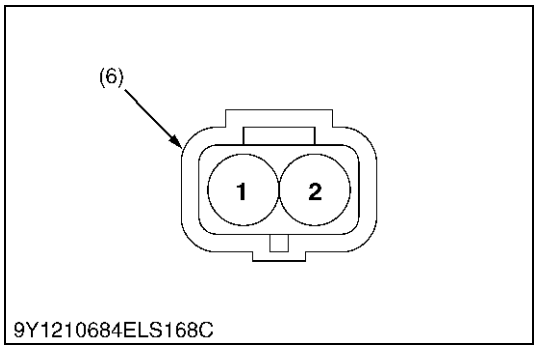
■ **NOTE**

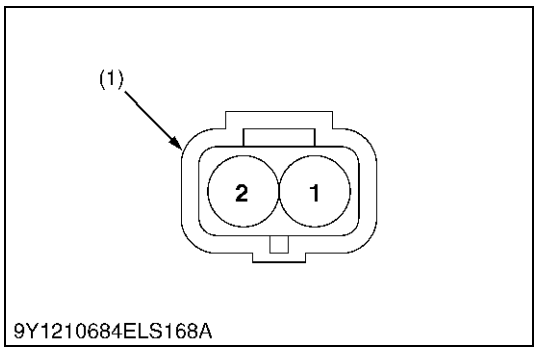
- **Since it is not possible to do unit checking for this sensor, judge the sensor is faulty if the relating electric circuit is normal.**

9Y1210822ELS0064US0









Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Item	Terminal	Color of wiring
Exhaust temperature sensor T0	Terminal **1**	Y/B
	Terminal **2**	G/R
Exhaust temperature sensor T1	Terminal **1**	Y/B
	Terminal **2**	L/B
Exhaust temperature sensor T2	Terminal **1**	Y/B
	Terminal **2**	V
Exhaust temperature sensor T3	Terminal **1**	Y/B
	Terminal **2**	Y/Br
Exhaust temperature sensor T4	Terminal **1**	Y/B
	Terminal **2**	Gr/R

Voltage	Main switch at **"ON"**	Terminal **2** – chassis	Approx. 5 V

(1) Exhaust Temperature Sensor T0
(2) Exhaust Temperature Sensor T1
(3) Exhaust Temperature Sensor T2
(4) Exhaust Temperature Sensor T3
(5) Exhaust Temperature Sensor T4
(6) Connector (Harness Side)

9Y1210822ELS0071US0

Sensor Resistance (for Reference)

1. Measure the resistance with an ohmmeter across the terminals shown in the table below.
2. If the reference value is not indicated, the exhaust temperature sensor is faulty.

Resistance	at 200 °C (140 °F)	Approx. 4.00 kΩ
	at 650 °C (212 °F)	Approx. 205.6 Ω

(1) Connector (Sensor Side)

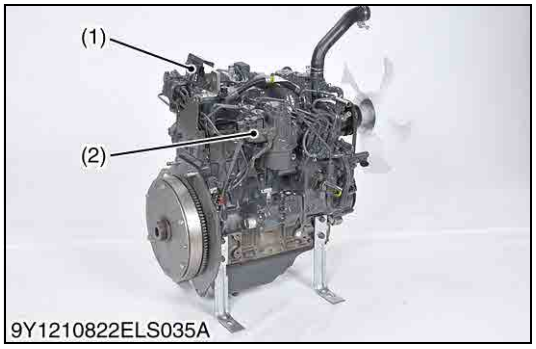
9Y1210822ELS0072US0

(4) Differential Pressure Sensor

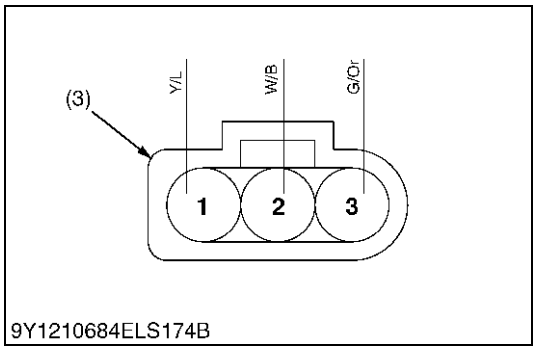
■ **NOTE**

- **Since it is not possible to do unit checking for this sensor, judge the sensor is faulty if the relating electric circuit is normal.**

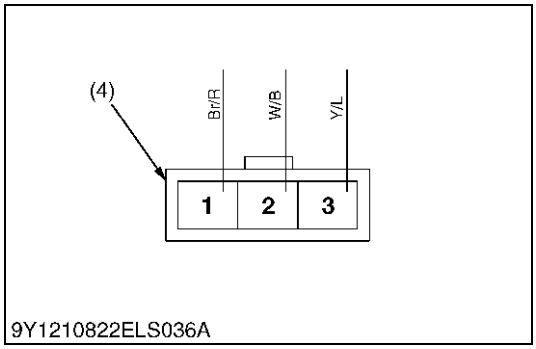
9Y1210822ELS0064US0



9Y1210822ELS035A



9Y1210684ELS174B



9Y1210822ELS036A

Connector Voltage

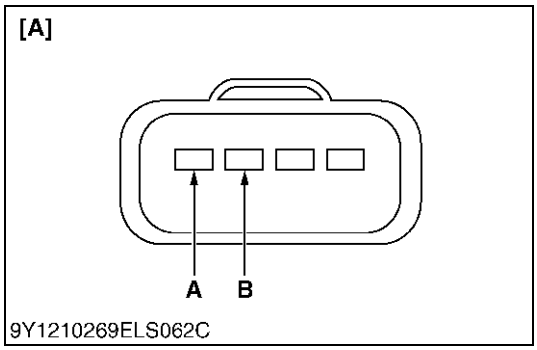
1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

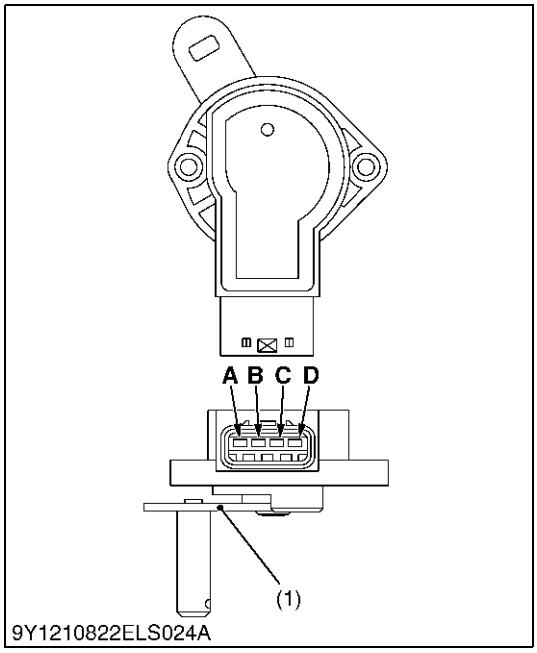
Voltage	Main switch at **"ON"**	Terminal **1** – chassis	Approx. 5 V
		Terminal **3** – chassis	

(1) Differential Pressure Sensor (DPF)
(2) Differential Pressure Sensor (Blower Motor)
(3) Connector (Harness Side-DPF)
(4) Connector (Harness Side-Blower Motor)

9Y1210822ELS0074US0

(5) Accelerator Lever Sensor





Accelerator Lever Sensor Input Voltage

1. Remove the accelerator lever sensor connector (1).
2. Turn the main key switch **ON**.
3. Check the voltage between terminal **A** (+) and terminal **B** (−) of the wire harness side.

Voltage	Terminal **A** – Terminal **B**	5 V

(1) Accelerator Lever Sensor Connector
(2) Accelerator Lever Sensor

[A] Connector (Harness)
A : Terminal A
B : Terminal B

9Y1210822ELS0061US0

Accelerator Lever Sensor Resistance

1. Measure the resistance between terminal **A** and **C** while slowly turning the sensor lever (1).
2. Then, check resistance between terminal **B** and **C** while slowly turning the sensor lever (1).
3. It is OK if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checking easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	0 to 1 kΩ
	Terminal **B** – Terminal **C**	0 to 1 kΩ

(1) Sensor Lever

A : Terminal A
B : Terminal B
C : Terminal C
D : Terminal D

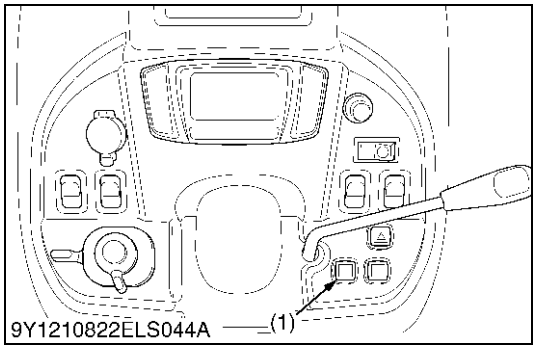
9Y1210822ELS0062US0

(6) Parked Regeneration Switch

■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the switch continuity.**

9Y1210822ELS0049US0



9Y1210822ELS044A

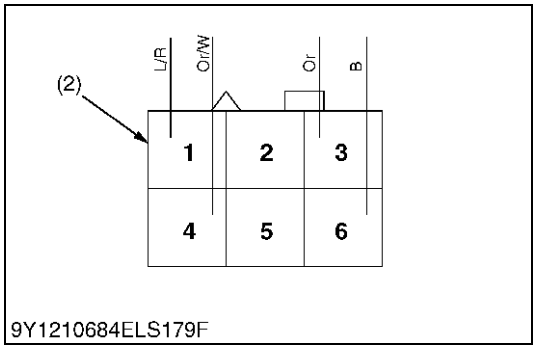
Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **1** – chassis	Approx. battery voltage
		Terminal **3** – chassis	

(1) Parked Regeneration Switch (2) Connector (Harness Side)

9Y1210822ELS0075US0



9Y1210684ELS179F

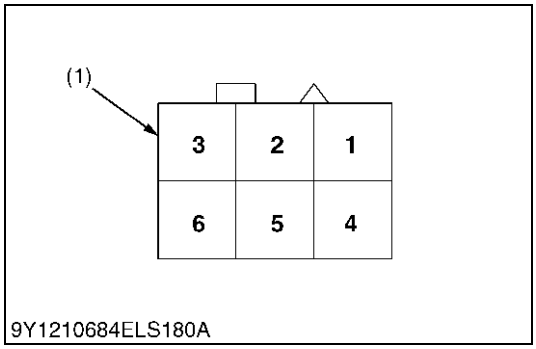
Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity specified below is not indicated, the parked regeneration switch is faulty.

Continuity Check	Terminal **1** – **4**	Continuity
	Terminal **3** – **6**	

(1) Connector (Switch Side)

9Y1210822ELS0076US0



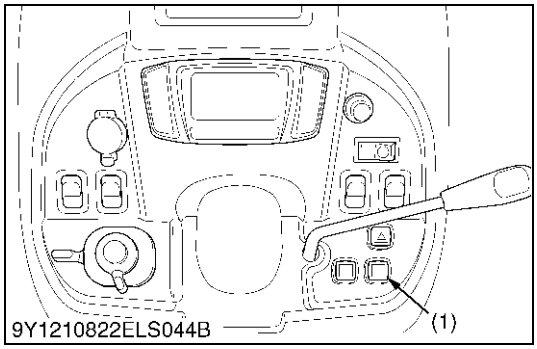
9Y1210684ELS180A

(7) Auto Regeneration Switch (Inhibit Version)

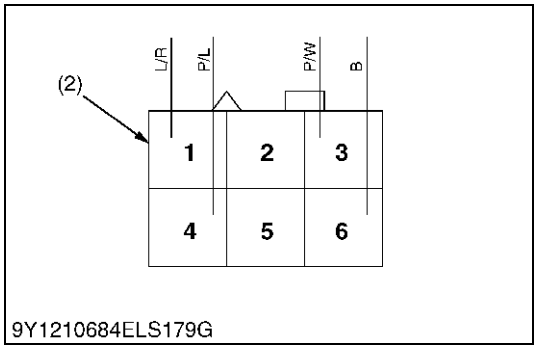
■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the switch continuity.**

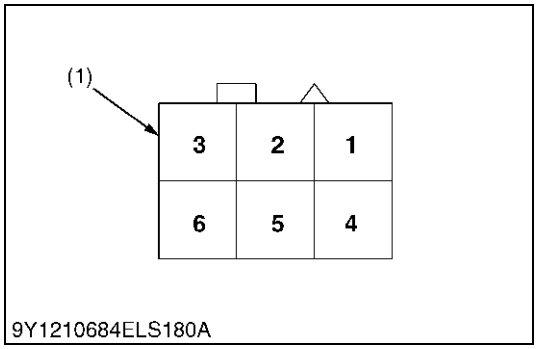
9Y1210822ELS0049US0



9Y1210822ELS044B



9Y1210684ELS179G



9Y1210684ELS180A

Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **1** – chassis	Approx. battery voltage
		Terminal **3** – chassis	

(1) Auto Regeneration Switch (2) Connector (Harness Side)

9Y1210822ELS0077US0

Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity specified below is not indicated, the auto regeneration switch is faulty.

Continuity Check	Terminal **1** – **4**	Continuity
	Terminal **3** – **6**	

(1) Connector (Switch Side)

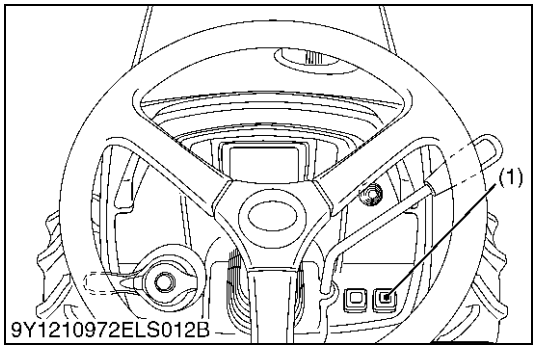
9Y1210822ELS0078US0

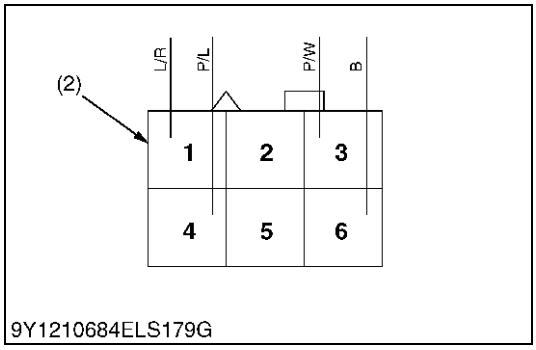
(8) DPF INHIBIT Switch (Default Version)

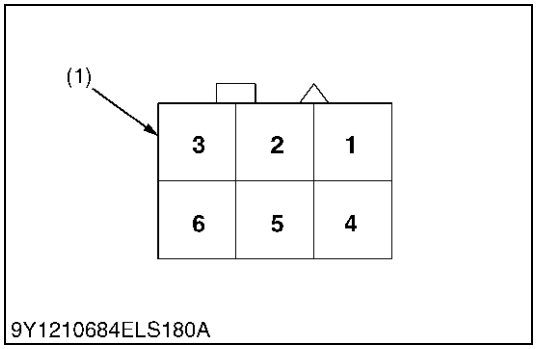
■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the switch continuity.**

9Y1210822ELS0112US0







Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **1** – chassis	Approx. battery voltage
		Terminal **3** – chassis	

(1) DPF INHIBIT Switch (2) Connector (Harness Side)

9Y1210822ELS0113US0

Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity specified below is not indicated, the auto regeneration switch is faulty.

Continuity Check	Terminal **1** – **4**	Continuity
	Terminal **3** – **6**	

(1) Connector (Switch Side)

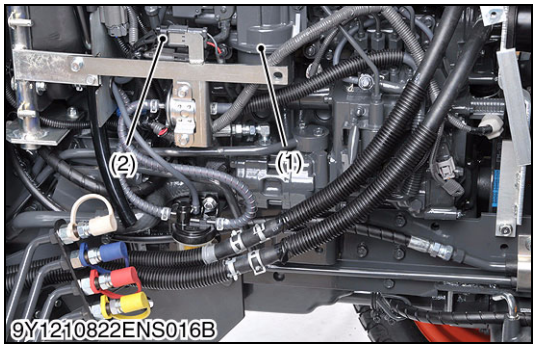
9Y1210822ELS0114US0

(9) Blower Motor

■ **NOTE**

- **Do active test "Air Blower for Fuel Reformer ON / OFF Function" by using diagmaster before following checking (Refer to "Diagnosis Manual V1505-T-E4 (9Y120-02490)").**

9Y1210822ELS0115US0



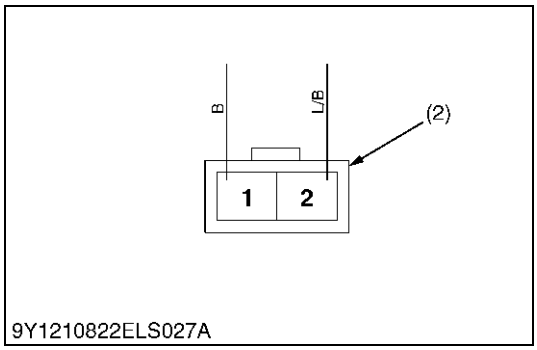
Connector Voltage

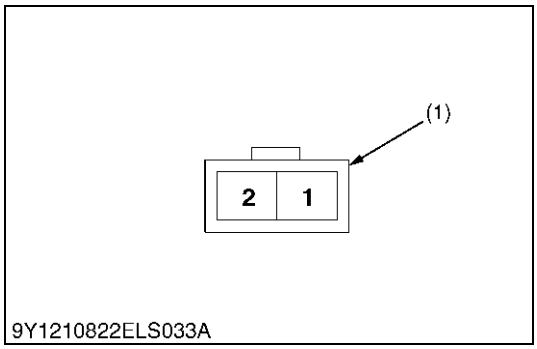
1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **2** – chassis	Approx. 7.8 V

(1) Blower Motor (2) Connector (Harness Side)

9Y1210822ELS0116US0





Motor Resistance (for Reference)

1. Measure the resistance with an ohmmeter across the terminals shown in the table below.
2. If the reference value is not indicated, the blower motor is faulty.

Resistance	at 20 °C (68 °F)	Terminal **1** – **2**	Approx. 4.0 Ω

(1) Connector (Motor Side)

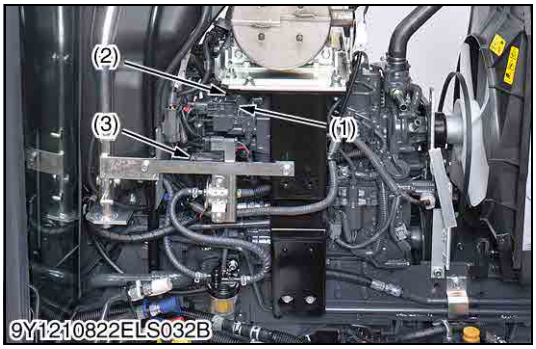
9Y1210822ELS0117US0

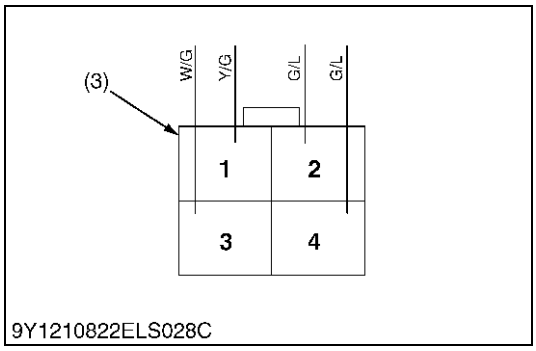
(10) Air Valve

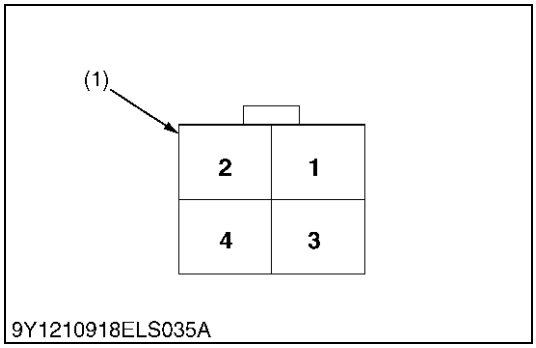
■ **NOTE**

- **Check the actuation of air valve 1 and 2 before following checking.**
  1. **Remove the double flare pipes from air valve 1 and 2 outlet.**
  2. **Do active test "All Devices for Fuel Reformer Operate Function" by using diagmaster, then check if the air comes out from air valve outlet (Refer to "Diagnosis Manual V1505-T-E4 (9Y120-02490)").**
- **It is possible to check the continuity of Yellow / Green wire by using active test "Air Valve 1 for Fuel Reformer Operate Function".**
- **It is possible to check the continuity of White / Green wire by using active test "Air Valve 2 for Fuel Reformer Operate Function".**

9Y1210822ELS0118US0







Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Air valve 1	Main switch at **"ON"**	Terminal **2** – chassis	Approx. battery voltage
Air valve 2	Main switch at **"ON"**	Terminal **4** – chassis	Approx. battery voltage

(1) Air Valve 1
(2) Air Valve 2
(3) Connector (Harness Side)

9Y1210822ELS0119US0

Solenoid Resistance (for Reference)

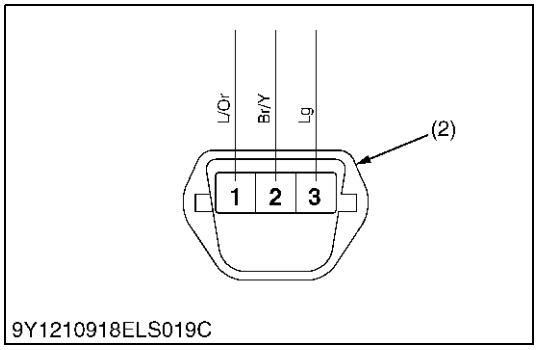
1. Measure the resistance with an ohmmeter across the terminals shown in the table below.
2. If the reference value is not indicated, the air valve is faulty.

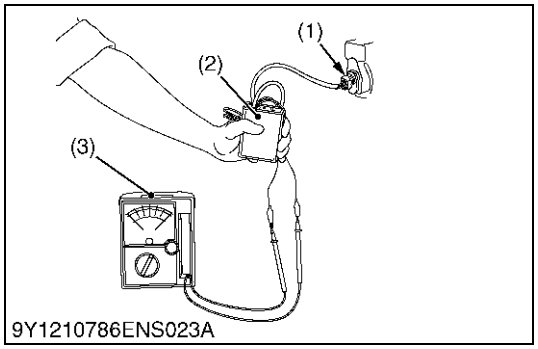
Resistance (Air valve 1)	at 20 °C (68 °F)	Terminal **1** – **2**	Approx. 12 Ω
Resistance (Air valve 2)	at 20 °C (68 °F)	Terminal **3** – **4**	Approx. 12 Ω

(1) Connector (Air Valve Side)

9Y1210822ELS0120US0

(11) Engine Speed Sensor (B3350)





Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **3** – chassis	Approx. 10.6 V
		Terminal **1** – chassis	Approx. 4.3 V

(1) Engine Speed Sensor
(2) Connector (Harness Side)

9Y1210822ELS0121US0

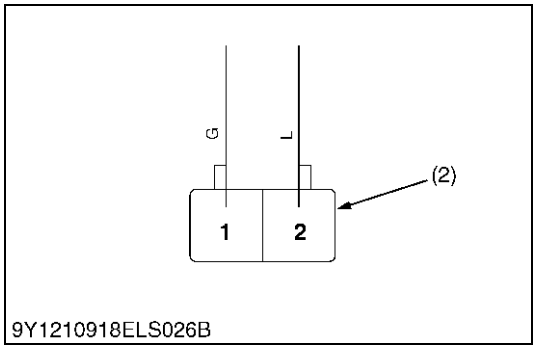
Sensor Actuation Test

1. Disconnect the connector of the engine speed sensor.
2. Connect a connector of the rotation sensor signal interface unit (2) (see page G-48) to the engine speed sensor (1).
3. Connect each clip of the rotation sensor signal interface unit (2) to the same test lead color of the circuit tester (3).
4. Switch on the rotation sensor signal interface unit (2).
5. Turn the flywheel and make sure that the voltage of the engine speed sensor goes from 0 → 5 V or 5 → 0 V.
6. If there is no change in the voltage, replace the engine speed sensor.

(1) Engine Speed Sensor
(2) Rotation Sensor Signal Interface Unit
(3) Circuit Tester

9Y1210822ELS0122US0

(12) Heater Glow (V1505)



Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Do active test "Catalyst Heater for Fuel Reformer ON / OFF Function" by using diagmaster before following checking (Refer to "Diagnosis Manual V1505-T-E4 (9Y120-02490)").
3. Measure the voltage with a voltmeter across the terminals shown in the table below.
4. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Terminal **1** – chassis	Approx. battery voltage

(1) Heater Glow (2) Connector (Harness Side)

9Y1210822ELS0123US0

Heater Glow Continuity

■ **IMPORTANT**

- **Since reformer is emission related critical parts, do not remove the glow plug.**

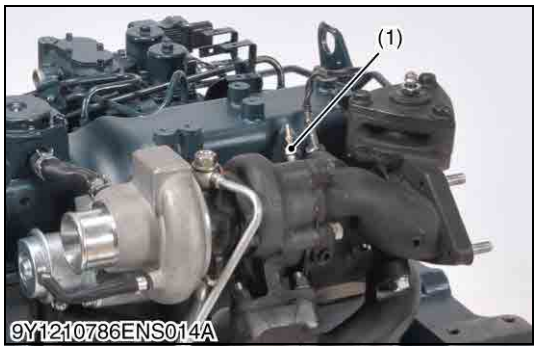
1. Remove the wiring harness.
2. Measure the resistance with a circuit tester between the glow plug terminal and the engine body.
3. If the factory specification is not indicated, glow plug is faulty.

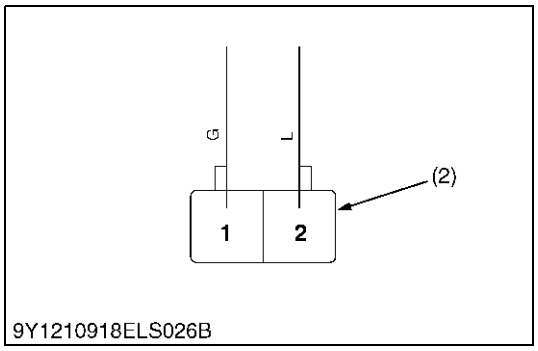
Resistance	Factory specification	3.2 to 4.4 Ω

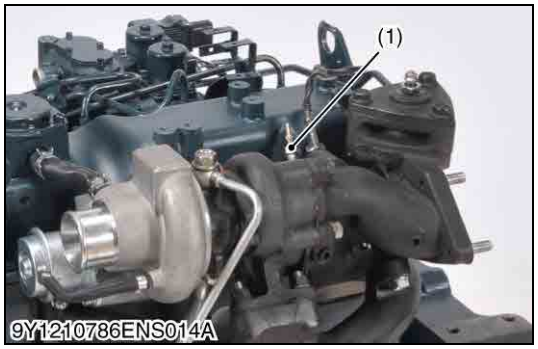
(1) Heater Glow

9Y1210822ELS0124US0

(13) Burner Glow (V1505)







Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Do active test "Regen Gas Glow for Fuel Reformer ON / OFF Function" by using diagmaster before following checking (Refer to "Diagnosis Manual V1505-T-E4 (9Y120-02490)").
3. Measure the voltage with a voltmeter across the terminals shown in the table below.
4. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Terminal **2** – chassis	Approx. battery voltage

(1) Burner Glow (2) Connector (Harness Side)

9Y1210822ELS0125US0

Burner Glow Continuity

■ **IMPORTANT**

- **Since reformer is emission related critical parts, do not remove the glow plug.**

1. Remove the wiring harness.
2. Measure the resistance with a circuit tester between the glow plug terminal and the engine body.
3. If the factory specification is not indicated, glow plug is faulty.

Resistance	Factory specification	Approx. 0.8 Ω

(1) Burner Glow

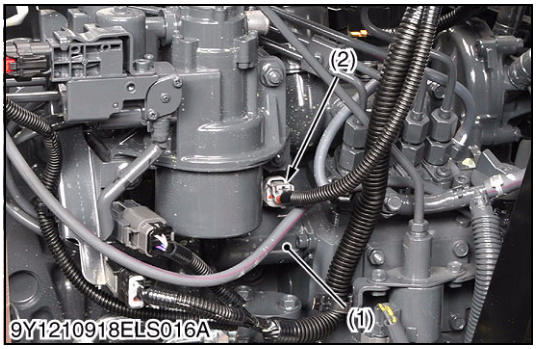
9Y1210822ELS0126US0

(14) Governor Solenoid (V1505)

■ **NOTE**

- **Do active test "EGV Solenoid Check Function" by using diagmaster before following checking (Refer to "Diagnosis Manual V1505-T-E4 (9Y120-02490)").**

9Y1210822ELS0127US0



9Y1210918ELS016A

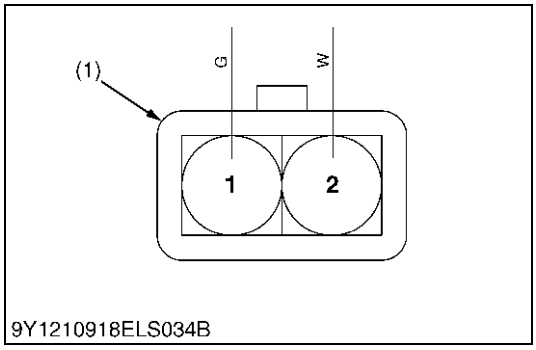
Connector Voltage

1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **2** – chassis	Approx. 7.85 V

(1) Governor Solenoid (2) Connector (Harness Side)

9Y1210822ELS0128US0



9Y1210918ELS034B

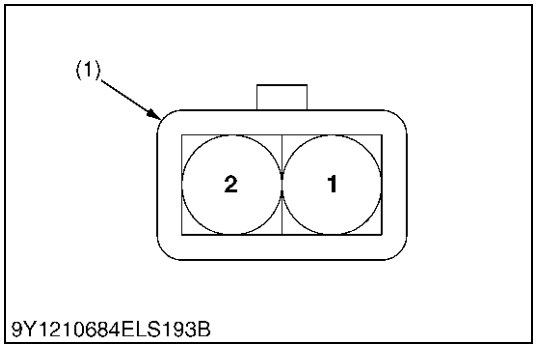
Solenoid Resistance

1. Measure the resistance with an ohmmeter across the terminals shown in the table below.
2. If the reference value is not indicated, the governor solenoid is faulty.

Resistance	Factory specification	2.52 to 3.08 Ω at 20 °C (68 °F)

(1) Connector (Solenoid Side)

9Y1210822ELS0129US0



9Y1210684ELS193B

(15) Rack Sensor

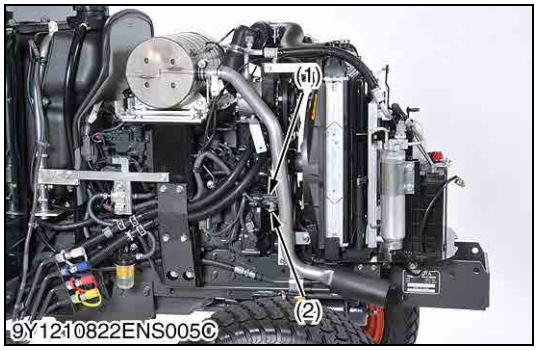
■ **IMPORTANT**

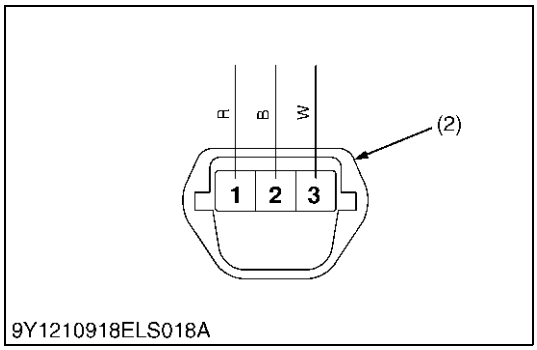
- **When exchanging the rack position sensor, be sure to do following procedure before removing the rack position sensor (Refer to "Diagnosis Manual V1505-T-E4 (9Y120-02490)" for the detail).**
  1. **Do Utility "Gear Case or Gear Case Gasket or Rack Position Sensor Exchange" by using diagmaster and get "Actual Rack Position Before Exchange".**
  2. **Exchange the rack position sensor.**
  3. **Get "Actual Rack Position After Exchange".**
  4. **Rack Position Offset Correction is calculated automatically.**
  5. **Register the offset data to ECU.**

■ **NOTE**

- **Since it is not possible to do unit checking for this sensor, judge the sensor is faulty if the relating electric circuit is normal.**

9Y1210822ELS0130US0





Connector Voltage

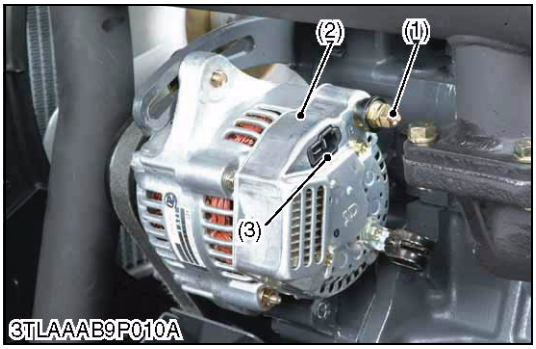
1. Disconnect the connector, and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **1** – chassis	Approx. 5 V
		Terminal **3** – chassis	Approx. 4.75 V

(1) Rack Position Sensor (2) Connector (Harness Side)

9Y1210822ELS0131US0

[6] CHARGING SYSTEM
(1) Alternator

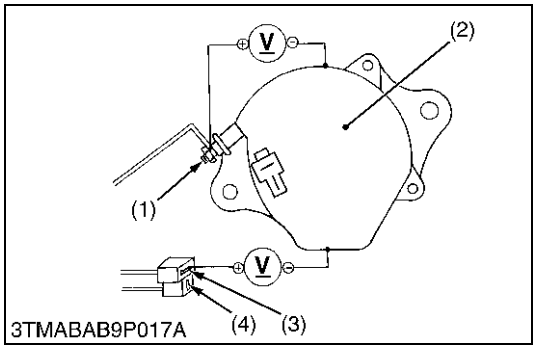


Alternator

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checks.

(1) **B** Terminal
(2) Alternator
(3) **2P** Connector

9Y1210822ELS0029US0



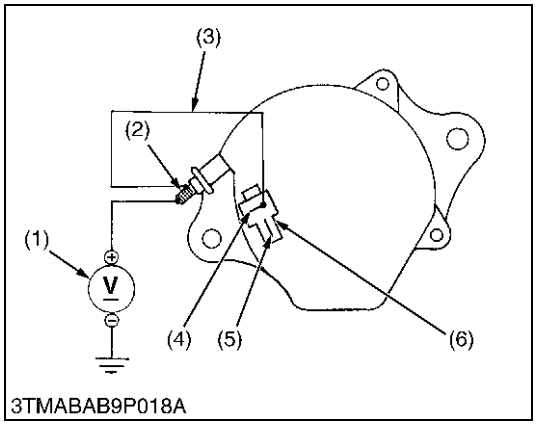
Connector Voltage

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 **OFF**)	**B** terminal – Chassis	Approx. battery voltage
Voltage (Main switch at **ON**)	**B** terminal – Chassis	Approx. battery voltage

(1) **B** Terminal
(2) Alternator
(3) **IG** Terminal
(4) **L** Terminal

9Y1210822ELS0030US0



No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning the main switch **OFF**.
2. Connect the jumper lead (3) between **IG** terminal (4) and **B** terminal (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the **B** terminal (2) and the chassis.
6. If the measurement is less than the factory specifications, disassemble the alternator and check the IC regulator.

Voltage	Factory specification	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
(2) **B** Terminal
(3) Jumper Lead
(4) **IG** Terminal
(5) **L** Terminal
(6) **2P** Connector

9Y1210822ELS0031US0

[7] LIGHTING SYSTEM

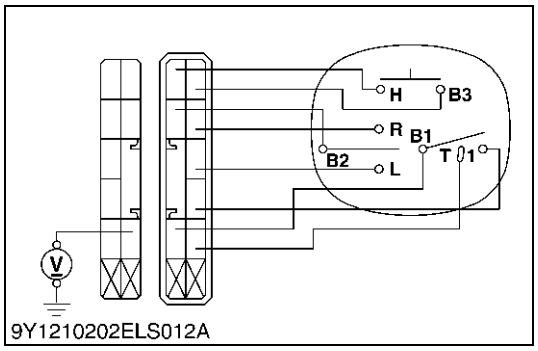
(1) Combination Switch

Combination Switch

1. Remove the steering wheel and panel lower cover.
2. Disconnect the combination switch connector.
3. Remove the combination switch (1) and perform the following checks **1)** to **8)**.

(1) Combination Switch

9Y1210822ELS0032US0

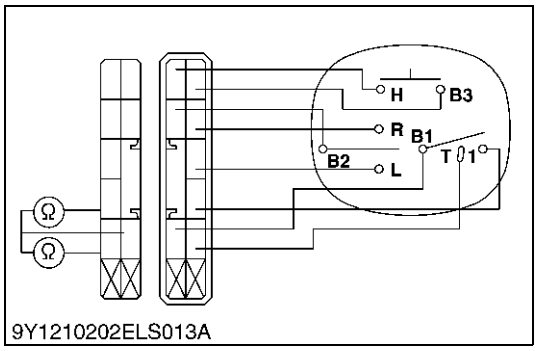


1) Connector Voltage

1. Measure the voltage with a voltmeter across the connector **B1** terminal and chassis when the main switch is **"ON"** position.
2. If the voltage differs from the battery voltage, the wiring harness and main switch is faulty.

Voltage	Main switch at **"ON"** position	**B1** terminal – Chassis	Battery voltage

9Y1210822ELS0033US0

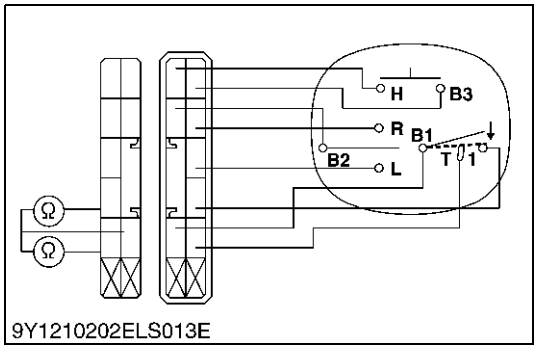


2) Head Light Switch Continuity when Setting Switch at OFF Position

1. Set the light switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal, the **B1** terminal to the terminal **1**.
3. If infinity is not indicated, the head light switch is faulty.

Resistance (Switch at **OFF** position)	**B1** terminal – **T** terminal	Infinity
	B1 terminal – **1** terminal	

9Y1210822ELS0034US0

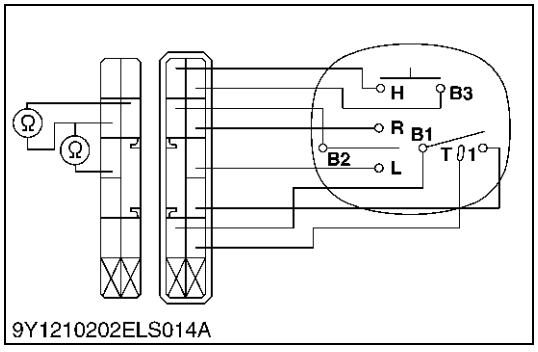


3) Head Light Switch Continuity when Setting Switch at ON Position

1. Set the light switch to the **ON** position.
2. Measure the resistance with an ohmmeter across the **B1** terminal to the **T** terminal and the **B1** terminal to the terminal **1**.
3. If 0 Ω is not indicated, the head light switch is faulty.

Resistance (Switch at **ON** position)	**B1** terminal – **T** terminal	0 Ω
	B1 terminal – **1** terminal	

9Y1210822ELS0035US0

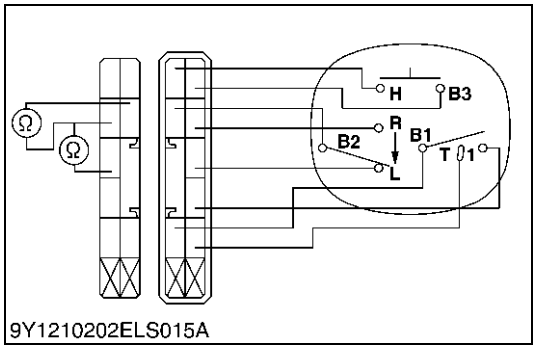


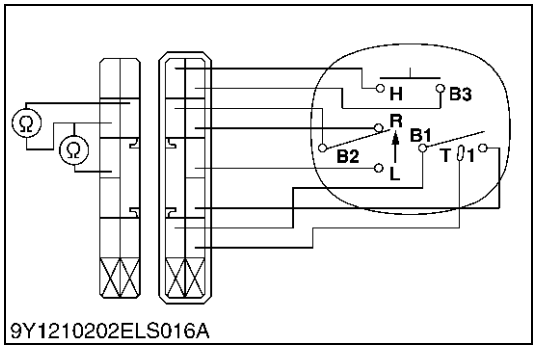
4) Turn Signal Light Switch Continuity When Setting Switch Knob OFF Position

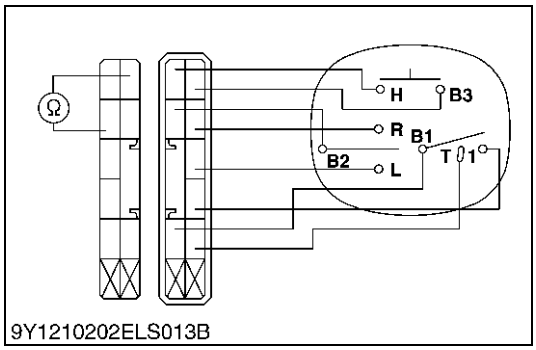
1. Set the turn signal light switch to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **L** terminal, the **B2** terminal and **R** terminal.
3. If infinity is not indicated, the combination switch is faulty.

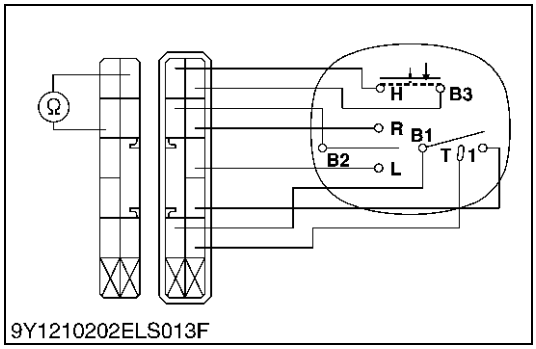
Resistance (Switch knob at **OFF** position)	**B2** terminal – **L** terminal	Infinity
	B2 terminal – **R** terminal	

9Y1210822ELS0036US0









5) Turn Signal Light Switch Continuity When Setting Switch Knob at L Position

1. Set the turn signal light switch to the **L** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **L** terminal.
3. If 0 Ω is not indicated, the combination switch is faulty.

Resistance (Switch knob at **1** position)	**B2** terminal – **L** terminal	0 Ω
	B2 terminal – **R** terminal	Infinity

9Y1210822ELS0037US0

6) Turn Signal Light Switch Continuity When Setting Switch Knob at R Position

1. Set the turn signal light switch to the **R** position.
2. Measure the resistance with an ohmmeter across the **B2** terminal and **R** terminal.
3. If 0 Ω is not indicated, the combination switch is faulty.

Resistance (Switch knob at **2** position)	**B2** terminal – **L** terminal	0 Ω
	B2 terminal – **R** terminal	Infinity

9Y1210822ELS0038US0

7) Horn Button Continuity when Not Pushing Button

1. Set the horn button to the **OFF** position.
2. Measure the resistance with an ohmmeter across the **B3** terminal and the **H** terminal.
3. If infinity is not indicated, the combination switch is faulty.

Resistance (Horn button at **OFF** position)	**B3** terminal – **H** terminal	Infinity

9Y1210822ELS0039US0

8) Horn Button at "ON" Position

1. Set the horn button to the **ON** position.
2. Measure the resistance with an ohmmeter across the **B3** terminal and the **H** terminal.
3. If infinity is not indicated, the combination switch is faulty.

Resistance (Horn button at **ON** position)	**B3** terminal – **H** terminal	0 Ω

9Y1210822ELS0040US0

(2) Hazard Switch

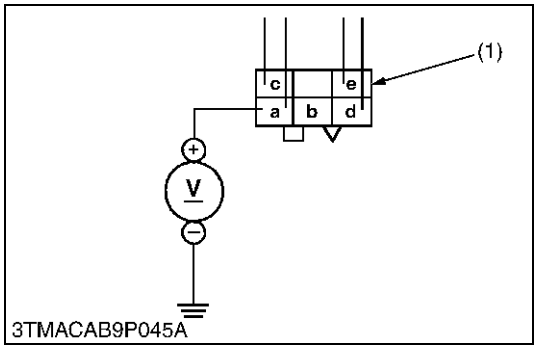
3TBAAAG9P062A

Hazard Switch

1. Remove the meter panel and disconnect the **4P** connector from hazard switch after disconnecting the battery negative code.
2. Remove the hazard switch.
3. Perform the following check.

(1) Hazard Switch

9Y1210822ELS0041US0



3TMACAB9P045A

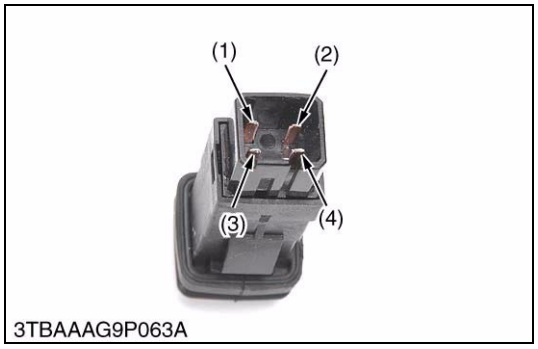
Connector Voltage

1. Connect the battery negative code, then measure the voltage with a voltmeter across the a terminal and chassis.
2. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	**a** terminal – Chassis	Approx. battery voltage

(1) **4P** Connector (for Hazard Switch)

9Y1210822ELS0042US0



3TBAAAG9P063A

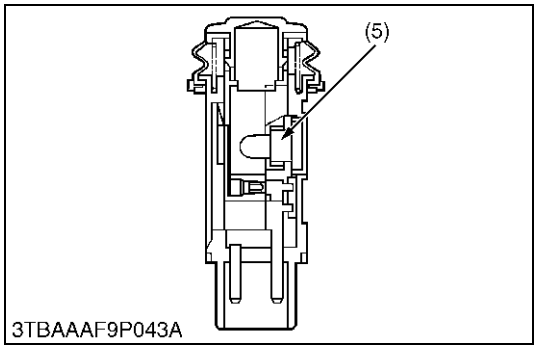
Hazard Switch Continuity

1. Measure the resistance with ohmmeter across the a terminal (1) and **c** terminal (3), and across the **d** terminal (2) and **e** terminal (4).
2. If the measurement is not following below, the hazard switch or the bulb are faulty.

Resistance (Switch at **OFF**)	**a** terminal – **c** terminal	Infinity
Resistance (Switch at **ON**)	**a** terminal – **c** terminal	0 Ω
Resistance (Bulb)	**d** terminal – **e** terminal	Approx. 13 Ω

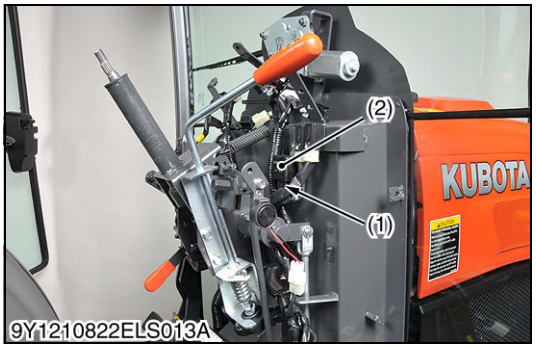
(1) **a** Terminal
(2) **d** Terminal
(3) **c** Terminal
(4) **e** Terminal
(5) Bulb

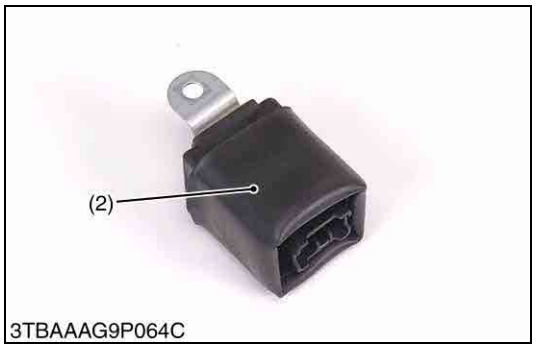
9Y1210822ELS0043US0

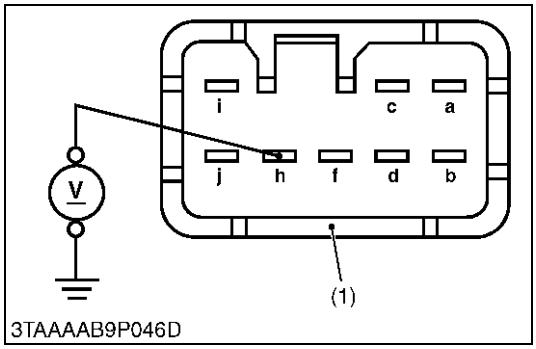


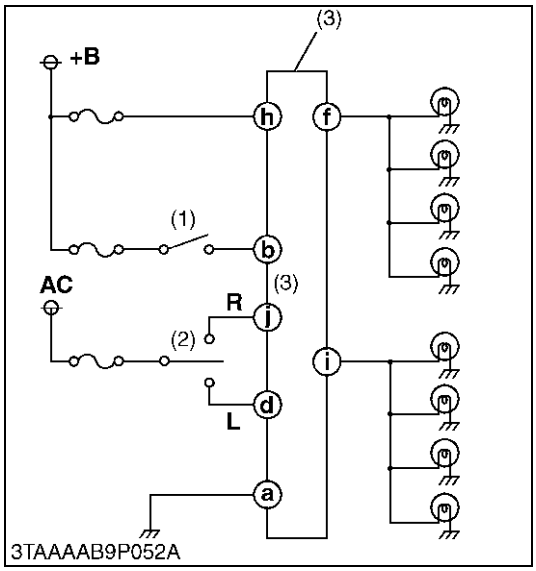
3TBAAAF9P043A

(3) Flasher Unit









Flasher Unit Connector Voltage

1. Remove the instrument panel.
2. Disconnect the connector (1) from the flasher unit (2).
3. Measure the voltage with a voltmeter across the h terminal and chassis.
4. If the voltage differ from the battery voltage, the wiring harness is faulty.

Voltage	**h** terminal – Chassis	Approx. battery voltage

(1) Connector
(2) Flasher Unit

a : Frame Earth
b : Hazard Input
c : Vacant
d : Turn Signal (Left) Input
f : Turn Signal (Right) Output
h : Battery
i : Turn Signal (Left) Output
j : Turn Signal (Right) Input

9Y1210822ELS0044US0

Flasher Unit Actuation Test

1. Set the hazard switch to the **ON** position, and make sure the hazard light gives 60 to 85 flashes for a minute.
2. With the main switch and the hazard switch respectively at the **ON** positions, move the turn signal switch to the left. Make sure that the right-hand light stays on and the left-hand light gives flashes earlier (by about 20 flashes) than when the hazard lamp is activated. Then move the turn signal switch to the right and make sure the corresponding actions take place.
3. Now set the main switch to the **ON** position and move the turn signal switch. Make sure the same action is as above.
4. If both the hazard switch and the turn signal switch function but the above actions do not take place, replace the flasher unit with new one.

(1) Hazard Switch
(2) Turn Signal Switch
(3) Flasher Unit

9Y1210822ELS0045US0

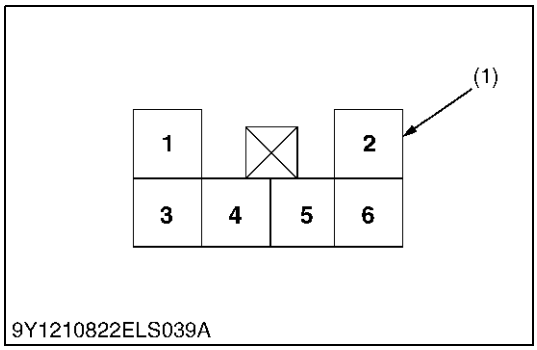
(4) Work Light Switch

Work Light Switch

1. Remove the meter panel lower cover and disconnect the **5P** connector from work light switch (1).
2. Remove the work light switch (1).
3. Perform the following check.

(1) Work Light Switch

9Y1210822ELS0086US0



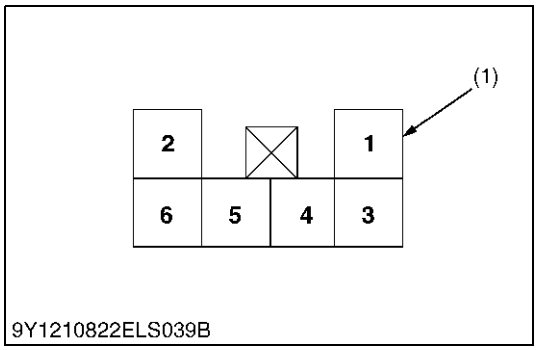
1) Connector Voltage

1. Turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value as shown in the table below is not indicated, check the relating electric circuit.

Voltage	Key switch at **"ON"**	Terminal **5** – Chassis	Approx. battery voltage
	Key switch and head light switch at **"ON"**	Terminal **2** – Chassis	Approx. battery voltage

(1) Connector (Harness Side)

9Y1210822ELS0087US0

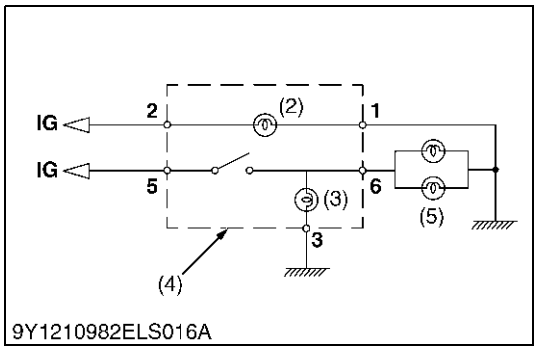


2) Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity shown below is not indicated, the switch is faulty.

Position	Terminal				
	5	6	3	1	2
OFF				○	○
ON	●	●	●		

9Y1210822ELS043US



(1) Connector (Switch Side)
(2) Night Light
(3) Indicator
(4) Work Light Switch
(5) Work Light

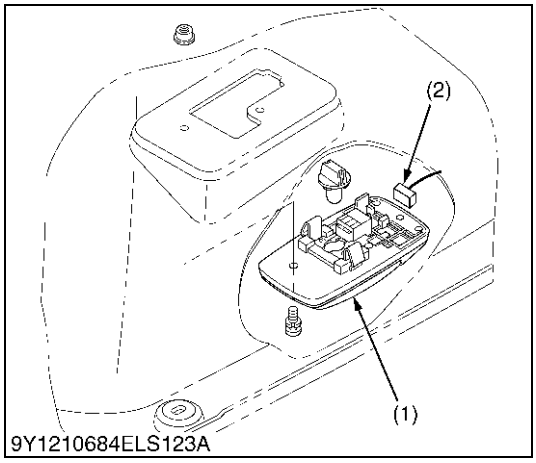
9Y1210822ELS0088US0

(5) Room Lamp

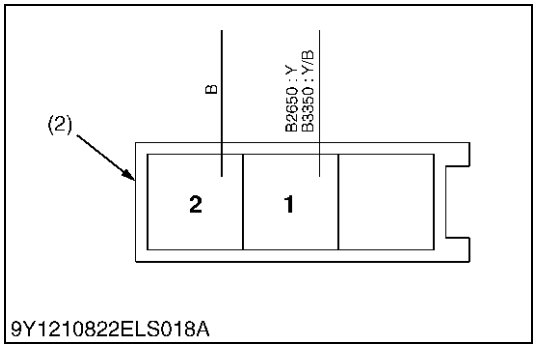
■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the switch continuity.**

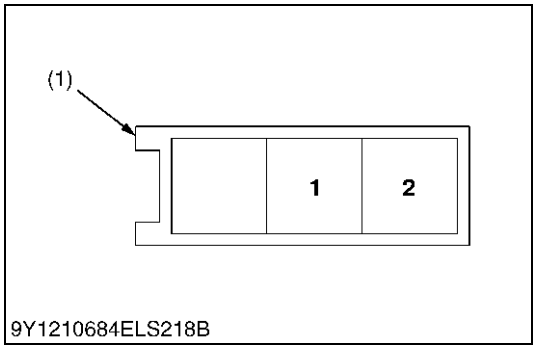
9Y1210822ELS0049US0



9Y1210684ELS123A



9Y1210822ELS018A



9Y1210684ELS218B

Connector Voltage

1. Disconnect the connector.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

Voltage	Terminal **1** – chassis	Approx. battery voltage

(1) Room Lamp Switch (2) Connector (Harness Side)

9Y1210822ELS0050US0

Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity shown below is not indicated, the switch is faulty.

Position		Terminal	
		1	2
Room Lamp	OFF	●	
	ON	●	●

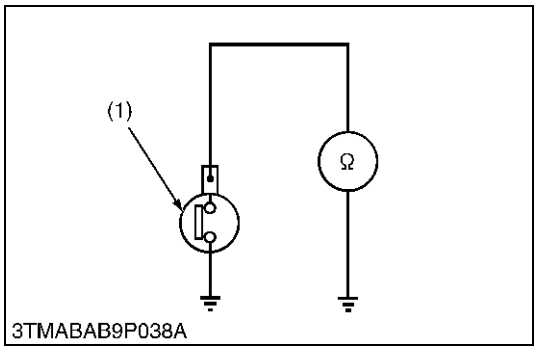
9Y1210822ELS026US

(1) Connector (Switch Side)

9Y1210822ELS0051US0

[8] WARNING LAMP, INDICATOR LAMP AND GAUGE

(1) Engine Oil Pressure Switch



Engine Oil Pressure Switch Continuity

1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 Ω is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 49 kPa (0.50 kgf/cm^2, 7.1 psi), the switch is faulty.

Resistance (Switch terminal – Chassis)	In normal state	0 Ω
	At pressure over approx. 49 kPa (0.50 kgf/cm^2, 7.1 psi)	Infinity

(1) Engine Oil Pressure Switch

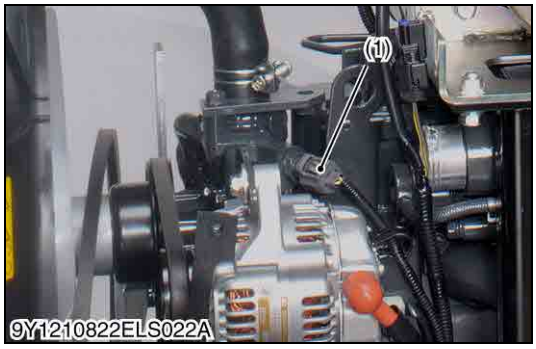
9Y1210822ELS0056US0

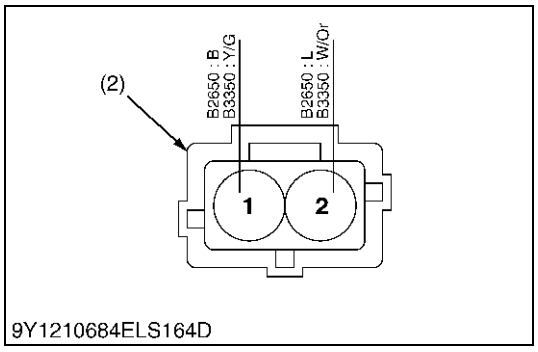
(2) Coolant Temperature Sensor

■ **NOTE**

- **Firstly check the connector voltage, secondly check the other wires continuity, then finally check the sensor resistance.**

9Y1210822ELS0058US0





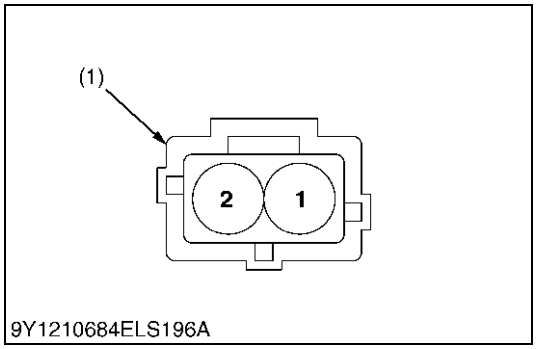
Connector Voltage

1. Disconnect the connector and turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value is not indicated as shown in the table below, check the relating electric circuit.

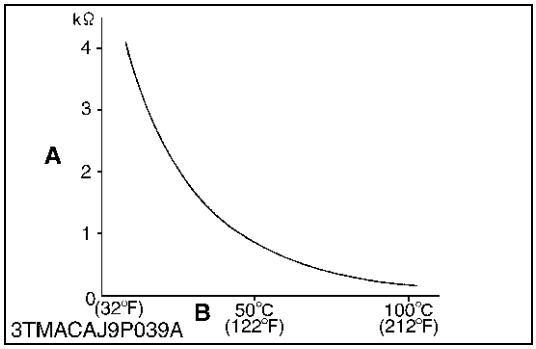
Voltage	Main switch at **"ON"**	Terminal **2** – chassis	Approx. 5 V

(1) Coolant Temperature Sensor (2) Connector (Harness Side)

9Y1210822ELS0059US0



9Y1210684ELS196A



3TMACAJ9P039A

Sensor Resistance

1. Measure the resistance with an ohmmeter across the terminals shown in the table below.
2. If the reference value is not indicated, the intake air temperature sensor is faulty.

Resistance	at −20 °C (−4 °F)	Terminal **1** – **2**	Approx. 15.0 kΩ
	at 20 °C (68 °F)		Approx. 2.45 kΩ
	at 80 °C (176 °F)		Approx. 0.318 kΩ

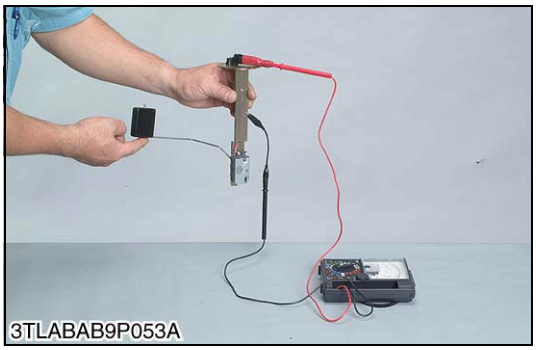
Tightening torque	Coolant temperature sensor	Less than 19.6 N·m 2.00 kgf·m 14.5 lbf·ft

(1) Connector (Sensor Side)

A: Resistance
B: Temperature

9Y1210822ELS0060US0

(3) Fuel Sensor


3TLABAB9P053A

Fuel Level Sensor

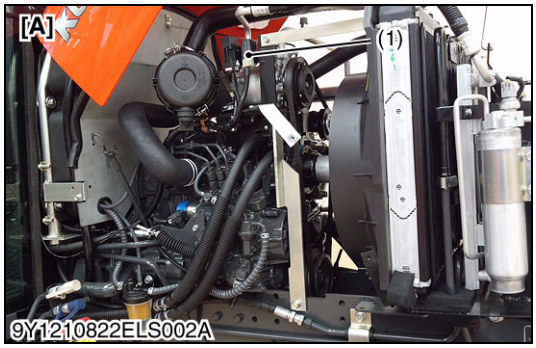
1) Sensor Continuity

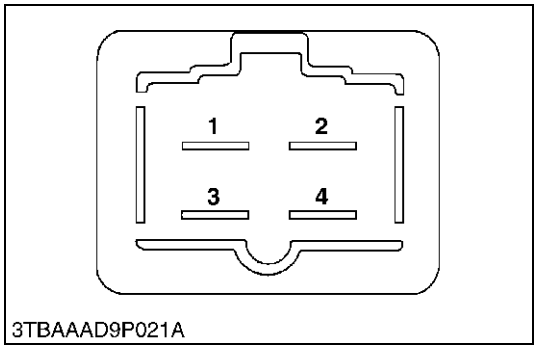
1. Remove the fuel lever sensor from the fuel tank.
2. Measure the resistance across the sensor terminal and its body.
3. If the reference value are not indicated, the sensor is faulty.

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

9Y1210822ELS0063US0

[9] RELAY





Engine Stop Solenoid Relay and ACC Relay

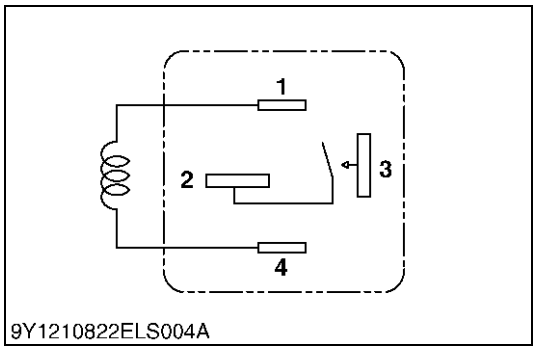
1. Open the bonnet and remove the engine stop solenoid relay (1). (B2650 Only)
2. Remove the panel lower cover and remove the ACC relay (2).
3. Apply battery voltage across **2** terminal and **4** terminal, and check for continuity across **1** terminal and **3** terminal.
4. If 0 Ω is not indicated, renew the relay (1), (2).

Resistance	**1** terminal – **3** terminal	Battery voltage is applied across **2** terminal and **4** terminal	0 Ω

(1) Engine Stop Solenoid Relay
(2) ACC Relay

[A] B2650
[B] B3350

9Y1210822ELS0013US0



Glow Relay

1. Open the bonnet and remove the glow relay (1).
2. Check for continuity across **1** terminal and **4** terminal, and across **2** terminal and **3** terminal.

Resistance	**1** terminal – **4** terminal	93 to 113 Ω
	2 terminal – **3** terminal	Not continuity

(1) Glow Relay

[A] B2650
[B] B3350

9Y1210822ELS0014US0

Other Relays

1. Remove the relays (1).
2. Apply battery voltage across **1** terminal and **2** terminal, and check for continuity across the **3** terminal and **4** terminal.
3. If 0 Ω is not indicated, renew the relays (1).

Resistance	**3** terminal – **4** terminal	Battery voltage is applied across **1** terminal and **2** terminal	0 Ω

■ Color of wiring

[B2650]

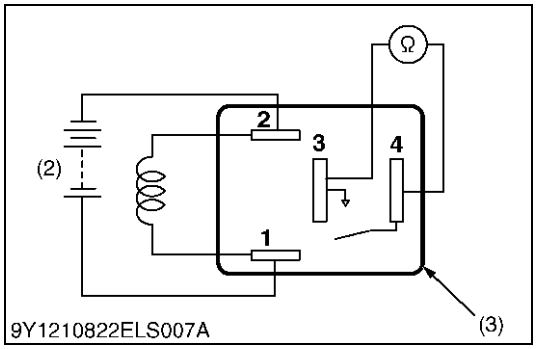
Item	Terminal No.	Color of Wiring
Work Light Relay	1	Y
	2	B
	3	L
	4	Y/L
Head Light Relay	1	Y
	2	B
	3	L/B
	4	R/G
Charge Relay	1	Y
	2	L/R
	3	L/R
	4	Y
Defogger Relay	1	Gr/R
	2	B
	3	W/R
	4	P
Blower Relay	1	Lg
	2	G/Y
	3	W/B
	4	P/L
Compressor Relay	1	Lg
	2	Y/G
	3	G
	4	Lg

(1) Relay
(2) Battery
(3) Connector (Relay)
(4) Connector (Wire Harness)

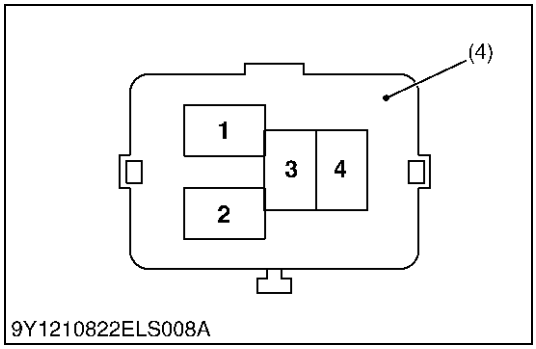
[A] B2650
[B] B3350

(To be continued)

(Continued)



9Y1210822ELS007A



9Y1210822ELS008A

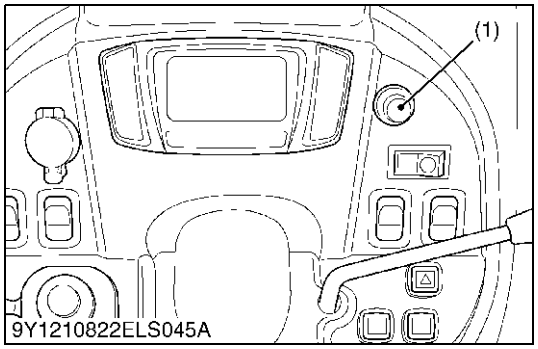
[B3350]

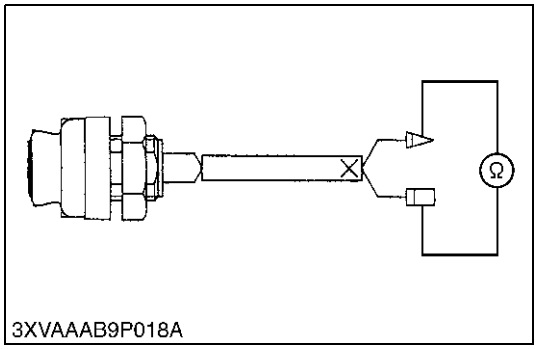
Item	Terminal No.	Color of Wiring
Reform and Glow Relay	1	P/L
	2	B
	3	G
	4	R/G
Starter Relay	1	W/L
	2	V/W
	3	W
	4	R/W
Work Light Relay	1	Y/B
	2	B
	3	R
	4	Y/L
Defogger Relay	1	Gr/R
	2	B
	3	W/R
	4	R
Blower Relay	1	Lg
	2	G/Y
	3	W/B
	4	R/Y
Compressor Relay	1	Lg
	2	Gr
	3	Lg/B
	4	Lg

9Y1210822ELS0015US0

[10] OTHER SWITCHES

(1) Panel Mode Switch





Panel Mode Switch Continuity

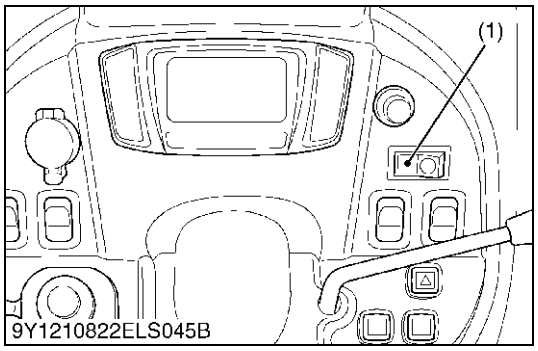
1. Disconnect the wiring leads from panel mode switch and remove it.
2. Measure the resistance with an ohmmeter across the panel mode switch terminals in each position.
3. If the resistance differs from the factory specifications, the panel mode switch is faulty.

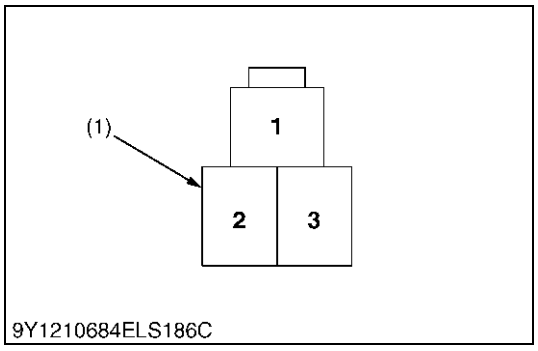
Resistance	Factory specification	**OFF**	Infinity
		ON	0 Ω

(1) Panel Mode Switch

9Y1210822ELS0079US0

(2) Defogger Switch





Defogger Switch

1. Remove the meter panel lower cover and disconnect the **3P** connector from defogger switch (1).
2. Remove the defogger switch (1).
3. Perform the following checking.

(1) Defogger Switch

9Y1210822ELS0080US0

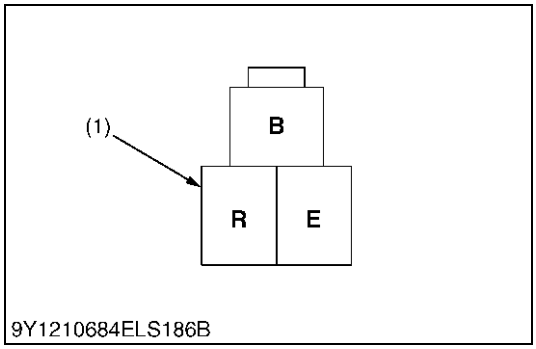
1) Connector Voltage

1. Turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value as shown in the table below is not indicated, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **1** – Chassis	Approx. battery voltage

(1) Connector (Harness Side)

9Y1210822ELS0081US0



9Y1210684ELS186B

2) Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity specified below is not indicated, the switch is faulty.

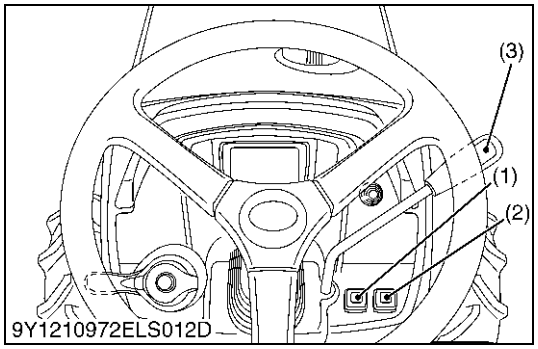
Position		Terminal		
		B	R	E
Defogger switch	OFF		● —	— ●
	ON	● —	— ●	— ●

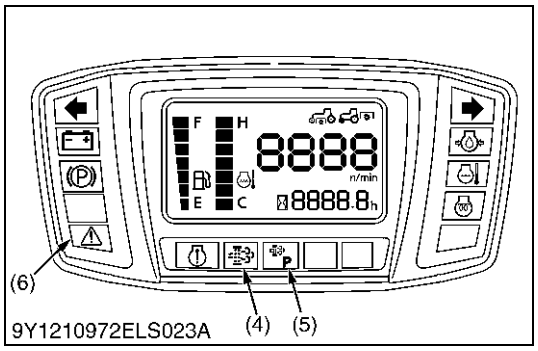
9Y1210822ELS041US

(1) Connector (Switch Side)

9Y1210822ELS0082US0

[11] ACCELERATOR SENSOR CALIBRATION (for B3350)





■ **NOTE**
- **When the engine ECU or throttle sensor is replaced, this calibration is required.**

(Tractor condition)
- Parking Brake: Engaged position (Parking brake switch **ON**)
- HST Pedal: Neutral position
- Range Gear Shift Lever: Neutral position
- Accelerator Lever: idling position

1. While pressing both the parked regeneration switch (1) and auto regeneration switch or DPF INHIBIT switch (2), turn the key switch to **ON** position.
2. Release the both switches.
3. Parked regeneration switch (1) and regeneration indicator flashes (4).
4. Press and hold the parked regeneration switch longer than 1 second.

■ **NOTE**
- **If the voltage is not within 2.4 V to 3.0 V while the parked regeneration switch is being pushed, accelerator sensor calibration will not be performed.**

5. Buzzer sounds for 0.5 seconds, regeneration indicator (4) turns **ON**, parked regeneration indicator (5) flashes and parked regeneration switch (1) flashes.
6. Set the accelerator lever (3) maximum position.
7. Press and hold the Parked regeneration switch longer than 1 second.

■ **NOTE**
- **If the voltage is not within 4.0 V to 4.6 V while the DPF INHIBIT switch is being pushed, accelerator sensor calibration will not be performed.**

8. Buzzer sounds for 0.5 seconds, regeneration indicator (4) turns **ON**, parked regeneration indicator (5) turns **ON** and parked regeneration switch (1) turns **OFF**.

■ **NOTE**
- **If the ECU reading fails, the buzzer sound intermittently for 5 seconds, regeneration indicator (4) flashes, parked regeneration indicator (5) flashes and master warning indicator (6) flashes. In this case, try the calibration again. If trying the calibration sometimes and still ECU reading fails, replace the engine ECU.**

9. Turn the key switch to **OFF** position to exit.

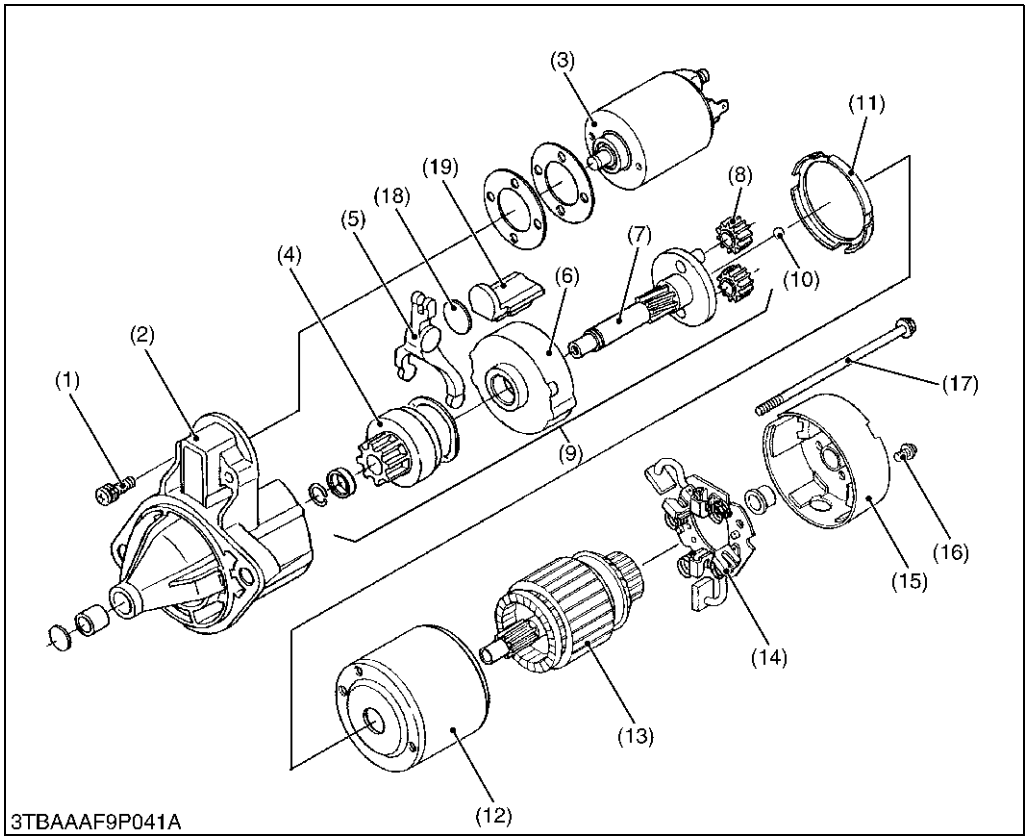
■ **NOTE**
- **If the parking brake is released while in accelerator sensor calibration mode, processing exits the accelerator sensor calibration mode and returns to normal key ON status.**

(1) Parked Regeneration Switch
(2) Auto Regeneration Switch or DPF INHIBIT Switch
(3) Accelerator Lever
(4) Regeneration Indicator
(5) Parked Regeneration Indicator
(6) Master Warning Indicator

9Y1210822ELS0132US0

5. DISASSEMBLING AND ASSEMBLING

[1] STARTER



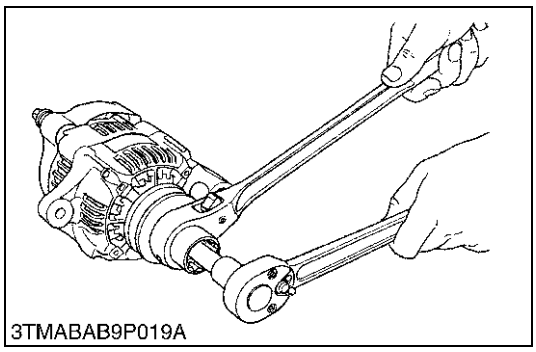
(1) Screw
(2) Front Bracket
(3) Magnetic Switch
(4) Overrunning Clutch
(5) Drive Lever
(6) Internal Gear
(7) Shaft
(8) Planetary Gear
(9) Shaft Assembly
(10) Ball
(11) Gasket
(12) Yoke
(13) Armature
(14) Brush Holder
(15) Rear End Frame
(16) Screw
(17) Through Bolt
(18) Plate
(19) Gasket

1. Disconnect the connecting lead from the magnetic switch (3).
2. Remove the screw (1) and remove the magnetic switch (3).
3. Remove the screw (16) and through bolt (17), and separate the rear end frame (15).
4. Remove the brush holder (14).
5. Draw out the armature (13) and yoke (12).
6. Remove the gasket (11), gasket (19) and plate (18).
7. Draw out the shaft assembly (9) with the drive lever (5).

■ **NOTE**
- **Do not damage the brush and commutator.**
- **Do not miss the ball (10).**

9Y1210822ELS0089US0

[2] ALTERNATOR



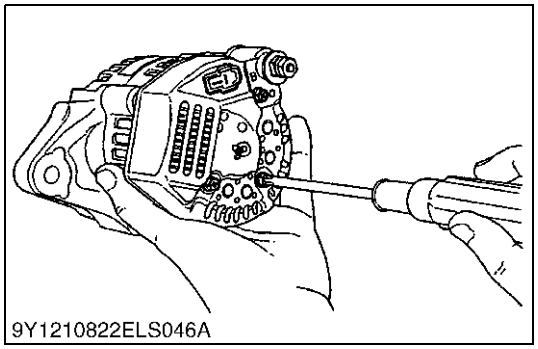
Pulley

1. Secure the hexagonal end of the pulley shaft with a double-ended ratchet wrench as shown in the figure, loosen the pulley nut with a socket wrench and remove it.

(When reassembling)

Tightening torque	Pulley nut	58.4 to 78.9 N·m 5.95 to 8.05 kgf·m 43.1 to 58.2 lbf·ft

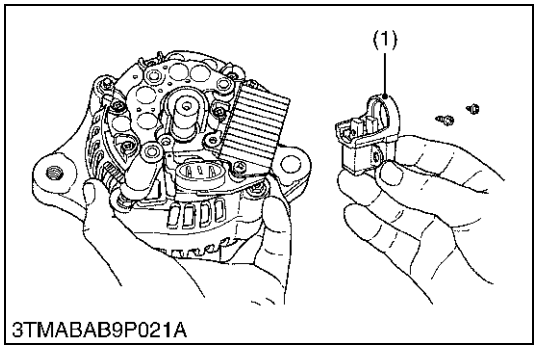
9Y1210822ELS0090US0


9Y1210822ELS046A

Rear End Cover

1. Remove the three rear end cover screws and the **B** terminal nut, and remove the rear end cover.

9Y1210822ELS0091US0



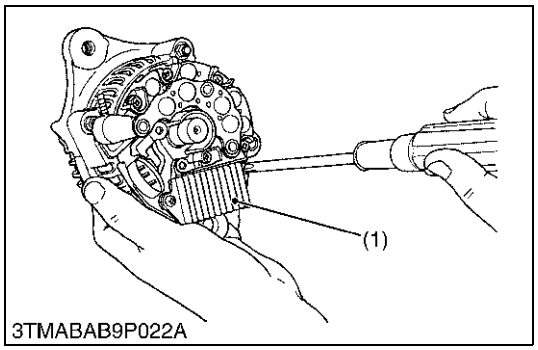
3TMABAB9P021A

Brush Holder

1. Remove the two screws holding the brush holder, and remove the brush holder (1).

(1) Brush Holder

9Y1210822ELS0092US0



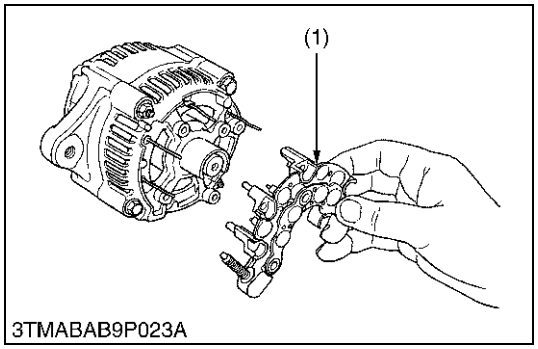
3TMABAB9P022A

IC Regulator

1. Remove the three screws holding the IC regulator, and remove the IC regulator (1).

(1) IC Regulator

9Y1210822ELS0093US0



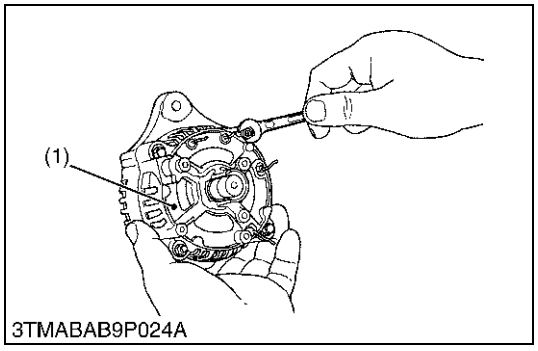
3TMABAB9P023A

Rectifier

1. Remove the four screws holding the rectifier and the stator lead wires.
2. Remove the rectifier (1).

(1) Rectifier

9Y1210822ELS0094US0



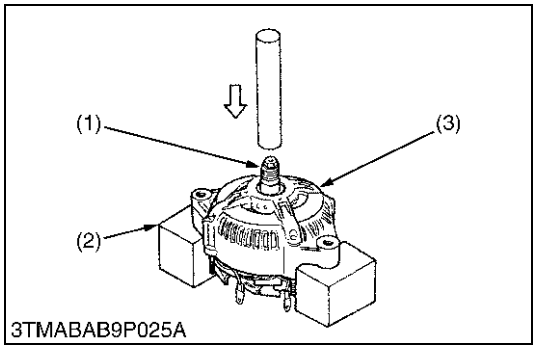
3TMABAB9P024A

Rear End Frame

1. Remove 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

9Y1210822ELS0095US0



3TMABAB9P025A

Rotor

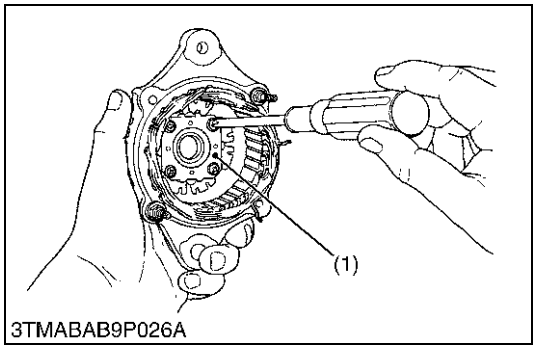
1. Press out the rotor (1) from drive end frame (3).

■ **IMPORTANT**

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

(1) Rotor
(2) Block
(3) Drive End Frame

9Y1210822ELS0096US0



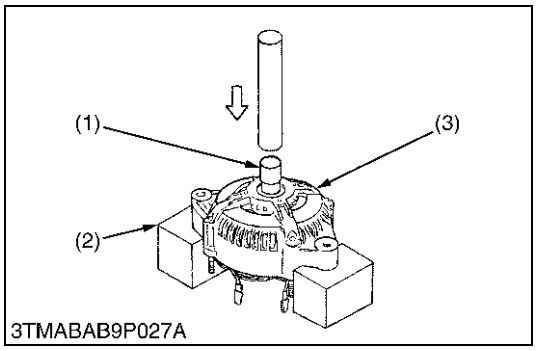
3TMABAB9P026A

Retainer Plate

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

(1) Retainer Plate

9Y1210822ELS0097US0



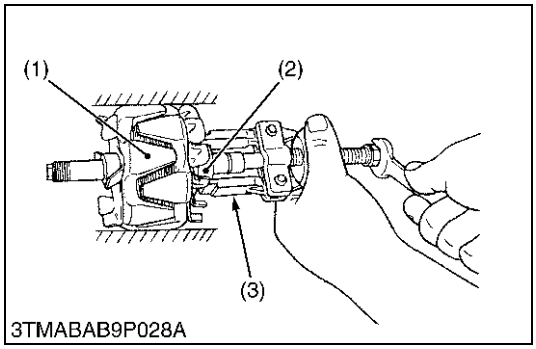
3TMABAB9P027A

Bearing on Drive End Side

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

(1) Jig
(2) Block
(3) Drive End Frame

9Y1210822ELS0098US0



3TMABAB9P028A

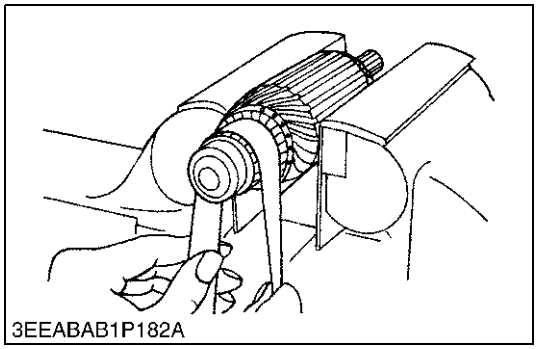
Bearing at Slip Ring Side

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

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

9Y1210822ELS0099US0

6. SERVICING
[1] STARTER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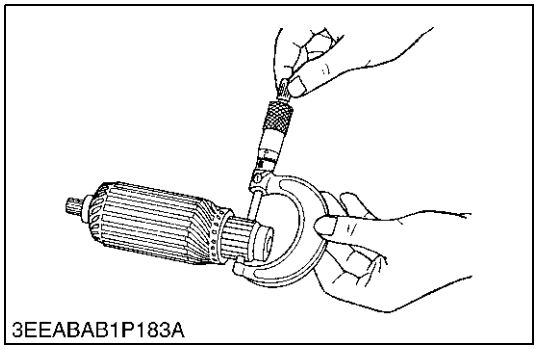
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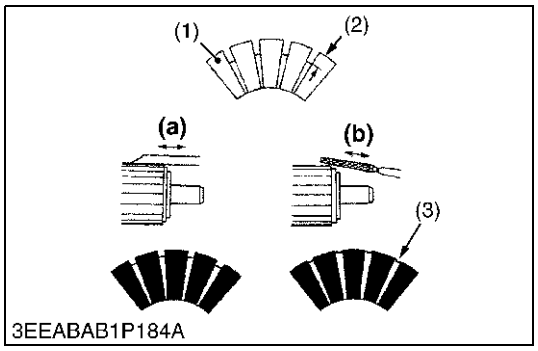

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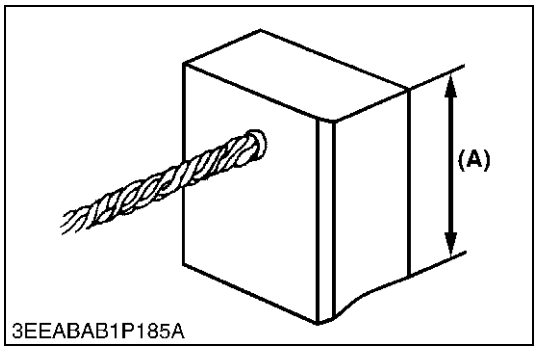

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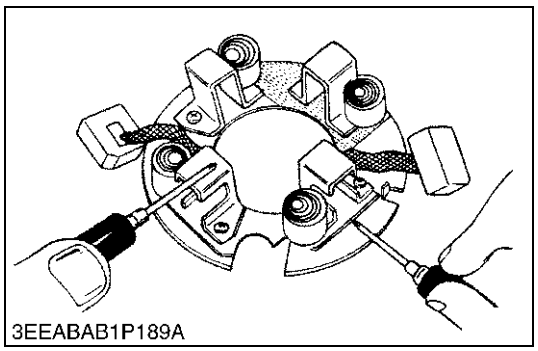

3EEABAB1P189A

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, correct the commutator on a lathe to the factory specification.
4. Measure the mica undercut.
5. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D.	Factory specification	28.0 mm 1.102 in.
	Allowable limit	27.0 mm 1.063 in.

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

Mica undercut	Factory specification	0.60 mm 0.0236 in.
	Allowable limit	0.20 mm 0.0079 in.

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

(a) Correct
(b) Incorrect

9Y1210822ELS0100US0

Brush Wear

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

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

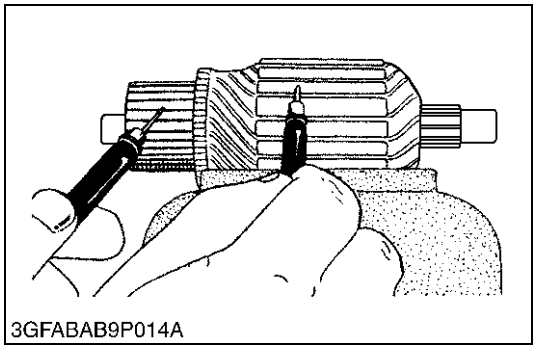
9Y1210822ELS0101US0

Brush Holder

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

Resistance	Brush holder - Holder support	Infinity

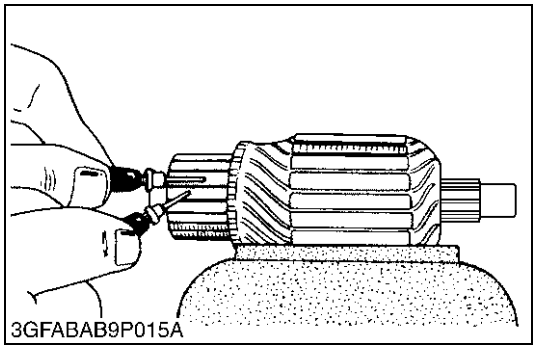
9Y1210822ELS0102US0


3GFABAB9P014A

Armature Coil

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

9Y1210822ELS0103US0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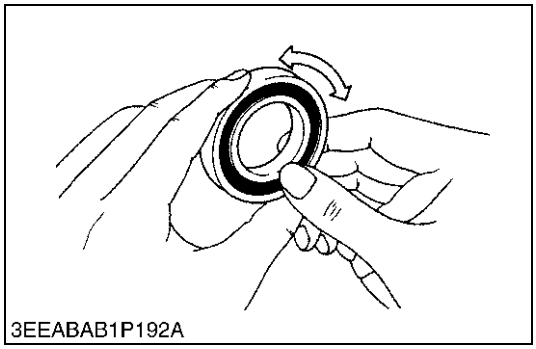
[2] ALTERNATOR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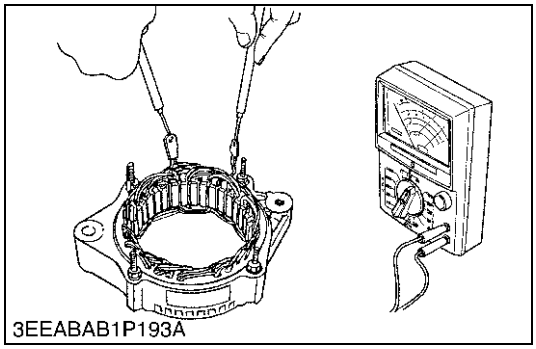
Bearing

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

9Y1210822ELS0104US0

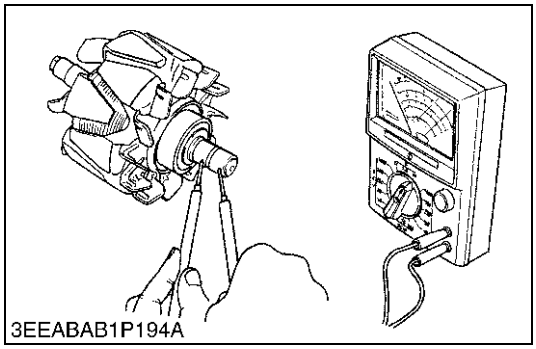

3EEABAB1P193A

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 the measurement is not within the factory specifications, replace it.

Resistance	Factory specification	Less than 1.0 Ω

9Y1210822ELS0105US0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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 the measurement is not within the factory specifications, replace it.

Resistance	Factory specification	2.9 Ω

9Y1210822ELS0106US0

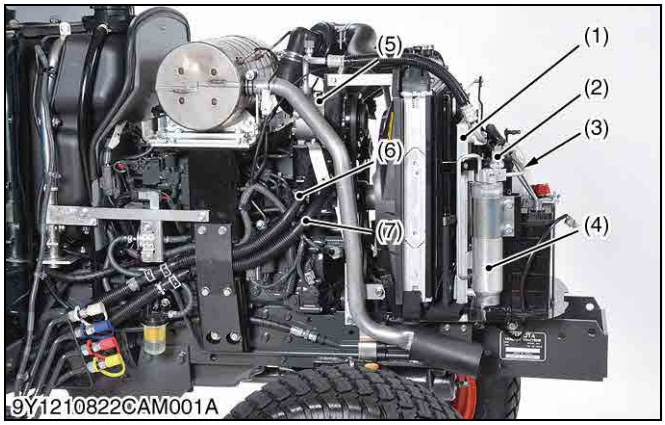
9 CABIN

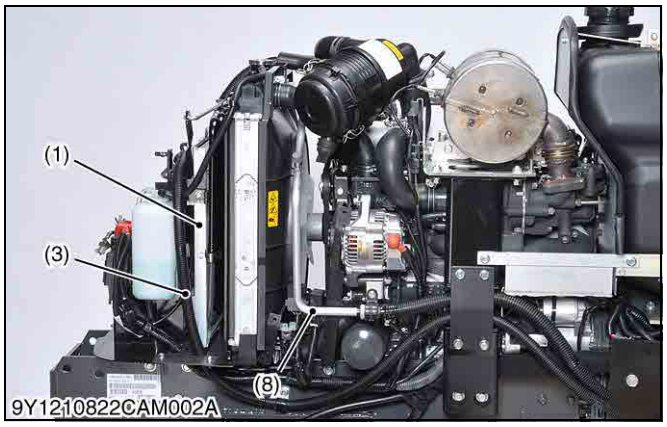
MECHANISM

CONTENTS

1. AIR CONDITIONER SYSTEM

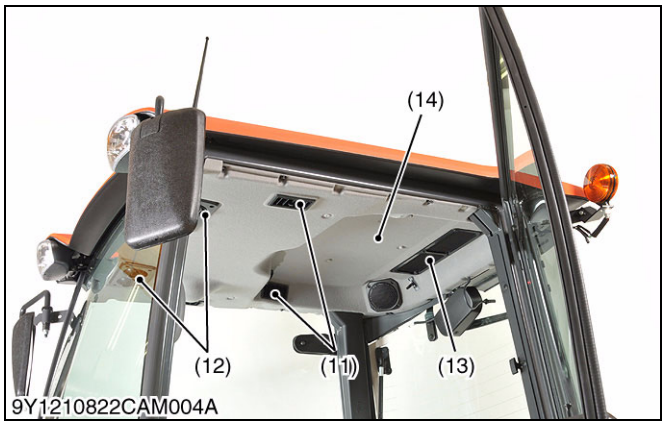
[1] OUTLINE OF AIR CONDITIONING SYSTEM





(1) Condenser
(2) Pressure Switch
(3) High Pressure Pipe
(4) Receiver
(5) Compressor
(6) Heater Hose (Inlet Side)
(7) Heater Hose (Outlet Side)
(8) Low Pressure Pipe
(9) Outside Air Filter
(10) Control Panel
(11) Side Air Outlet
(12) Front Air Outlet
(13) Inside Air Filter
(14) Inner Roof
(15) Water Valve
(16) Air Conditioner Unit

(To be continued)



(Continued)

The machine is equipped with a thin large-capacity air conditioner with outside air intake. Through the inside air filter (13) as well as the outside air filter (9), the inner roof (14) and reaches the air conditioner unit (16). The air is then cooled and dehumidified by this unit.

The resulting air is heated to a comfortable level. In this way, the air being blown via the blow port can be kept at comfortable temperature and humidity.

The front air outlet (12) can be opened and closed using the center knob of each port. The side air outlet (11) are opened and closed using the mode lever on the control panel (10). With these ports open or closed, you can feel your head cool and your feet warm.

Capacity (Cooling)	Factory specification		2.8 to 3.4 kW
Capacity (Warming)	Factory specifi-cation	Water	3.8 to 4.7 kW
		LLC* 50 %	3.6 to 4.4 kW
Kinds of refrigerant (Charge amount)	Factory specification		R134a 650 to 710 g 1.44 to 1.56 lbs
Pressure sensor (Low)	Factory specification		0.196 MPa 2.0 kgf/cm^2 28.4 psi
Pressure sensor (High)	Factory specification		3.14 MPa 32.0 kgf/cm^2 455 psi

*LLC: Anti-freeze

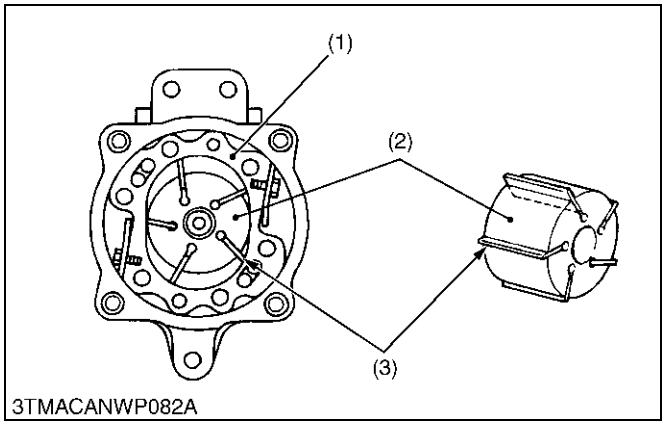
■ **NOTE**

- **As for the mechanism and function of each component part, refer to Workshop Manual of "MECHANISM".**

9Y1210822CAM0001US0

2. REFRIGERATION SYSTEM

[1] COMPRESSOR



3TMACANWP082A

The vane type compressor installed on this cabin consists of a cylinder (1) with an oval cross section and a rotor (2) with five vanes (3). The vane type compressor is provided with two suction ports and two discharge ports respectively.

The five vanes (3) mounted on the rotor (2), rotating along the inner wall of the cylinder (1), keeps air-tightness using the centrifugal force of the rotor (2) and the back pressure of the vanes (3) that grow in proportion to the rotating speed of the rotor (2).

As a result, the volumes of the five cylinder chambers separated with the cylinder (1) and the five vanes (3) change.

For each rotation of the rotor (2), each of the cylinder chambers performs two cycles of inhalation, compression, and discharge.

(1) Cylinder
(2) Rotor
(3) Vane

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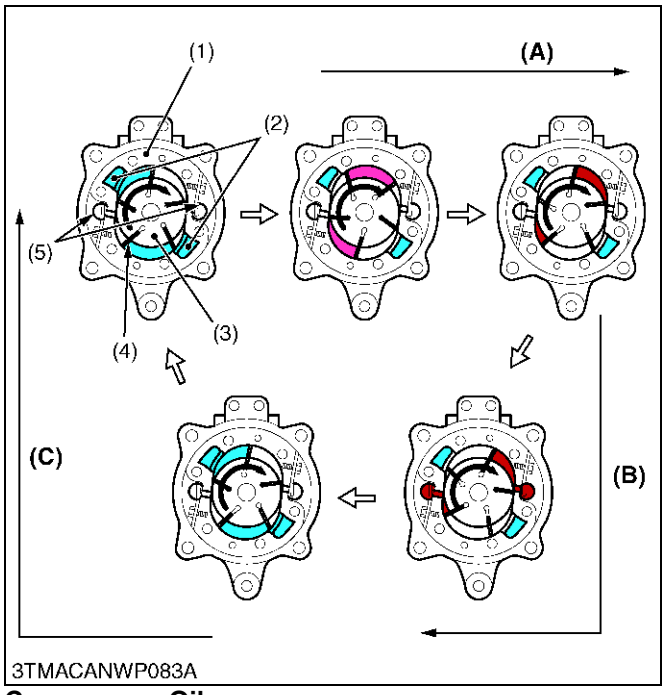

3TMACANWP083A

Operation

In proportion to the rotation of the rotor (3), a volume of a cylinder chamber separated with the cylinder (1) and the vanes (4) increases. The cylinder chamber inhales refrigerant gas from the suction port (2).

As the rotor (3) rotates further, a volume of the cylinder chamber separated with the cylinder (1) and the vanes (4) decreases, and the refrigerant gas is compressed. As the rotor (3) rotates even further, the refrigerant gas is highly compressed and then presses the discharge valve to open. The refrigerant gas is discharged from the discharge port (5).

(1) Cylinder
(2) Suction Port
(3) Rotor
(4) Vane
(5) Discharge Port
(A) Compression Process
(B) Discharge Process
(C) Suction Process

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Compressor Oil

The compressor oil dissolves in the refrigerant, circulates through the air-conditioning cycle, and functions to lubricate the compressor. But the conventional compressor oil for R12 does not dissolve in R134a, so it does not circulate through the cycle, and the lifespan of the compressor is considerably shortened.

It is still essential to ensure that the correct refrigerant oil is used. R12 systems were lubricated with mineral oil, which is totally unsuitable for R134a systems. The letter require PAG oil, which mixes very well with the refrigerant and provides ideal lubrication throughout the system.

Quantity (Total)	Brand Name
110 to 120 cc 0.116 to 0.126 U.S.qts 0.0968 to 0.105 Imp.qts	ND-OIL 8 <PAG* oil>

*PAG: Polyalkyleneglycol (Synthetic oil)

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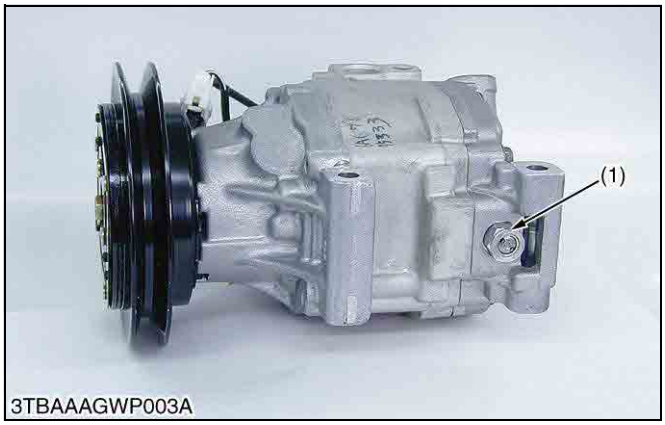
(1) Pressure Relief Valve



If the high pressure is abnormally high, the pressure relief valve (1) opens to protect the circuit.

Even in the worst case, the outflow of refrigerant is stopped at the minimum limit.

(Reference)

- In normal operation, the high pressure switch is triggered first and the compressor stops, so the pressure relief valve is not triggered so easily.

(1) Pressure Relief Valve (2) Compressor

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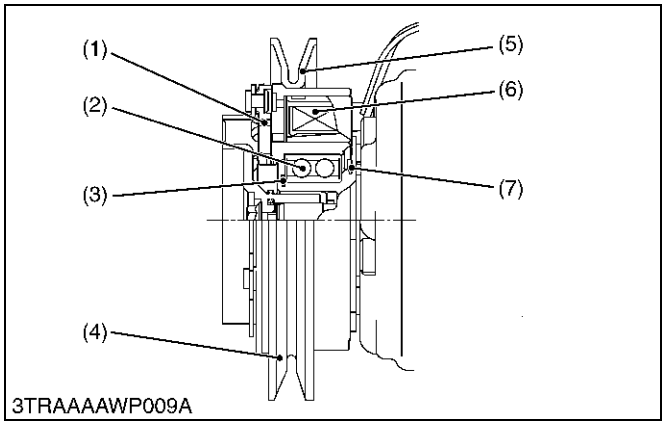
(2) Magnetic Clutch



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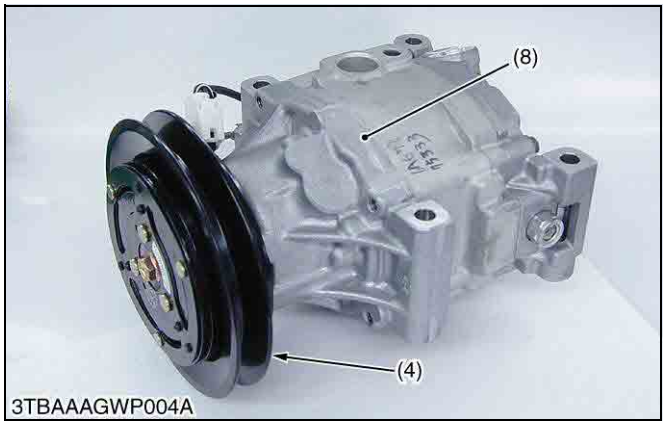

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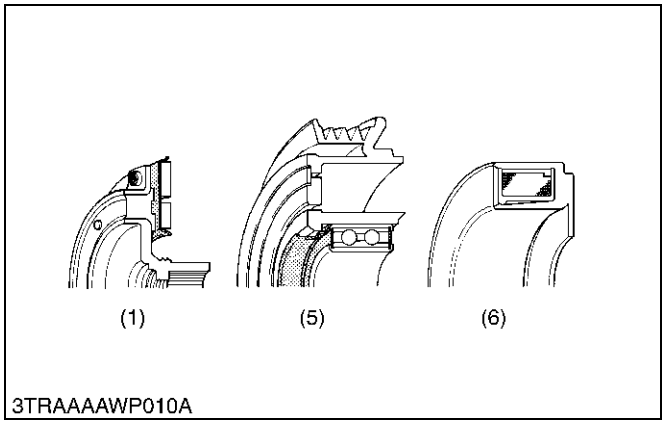

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A magnetic clutch is used to engage and disengage the compressor from the engine. Main components are stator (6), rotor with pulley (5), and pressure plate (1) to engage the drive pulley (4) and compressor (8) magnetically.

The stator is fixed on the compressor housing, and the pressure plate (1) is attached to the compressor shaft. Two ball bearings (2) are used between the inner surface of the rotor and the front housing of the compressor.

(1) Pressure Plate
(2) Ball Bearing
(3) Circlip
(4) Pulley
(5) Rotor with Pulley
(6) Stator
(7) Circlip
(8) Compressor

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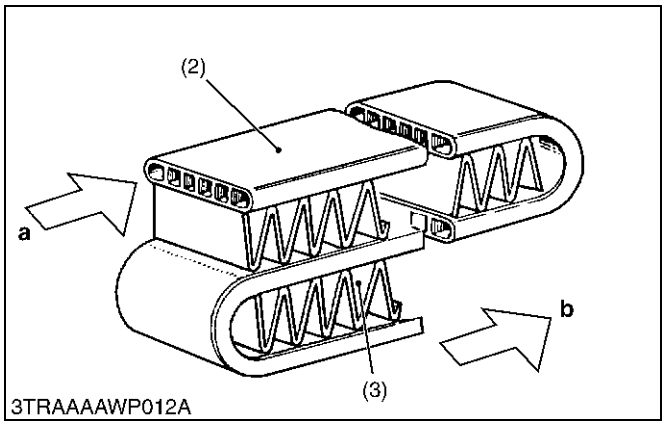
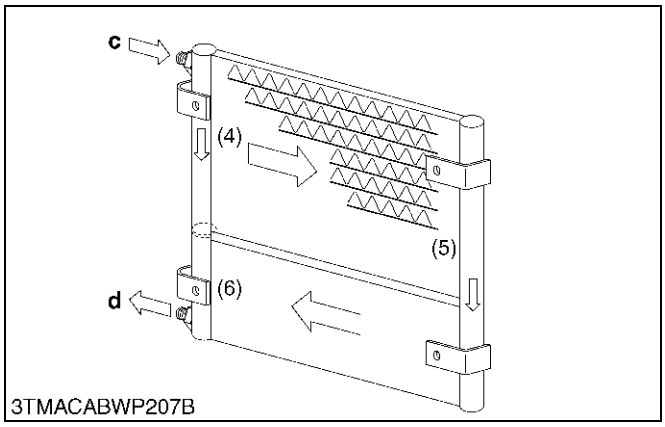
[2] CONDENSER





The condenser (1) is installed in the front of the radiator to enable forced cooling by the air drawn in by the engine radiator fan.

The condenser is used for the purpose of cooling by robbing the heat from the refrigerant gas, which has been compressed by the compressor into high temperature, high pressure gas, and change this gas into liquid refrigerant.

The heat given off by the gaseous refrigerant in the condenser is the sum of the heat absorbed at the evaporator and the heat of work required by the compressor to compress the refrigerant. The greater the amount of heat is given off in the condenser, the greater the cooling effect attainable by the evaporator in the cabin.

(1) Condenser
(2) Tube
(3) Fin
(4) Vapor
(5) Liquefying
(6) Liquefied

a: Gaseous Refrigerant
b: Liquid Refrigerant
c: Heated Vapor from Compressor (70 °C, 158 °F)
d: Cooled Liquid to Receiver (50 °C, 122 °F)

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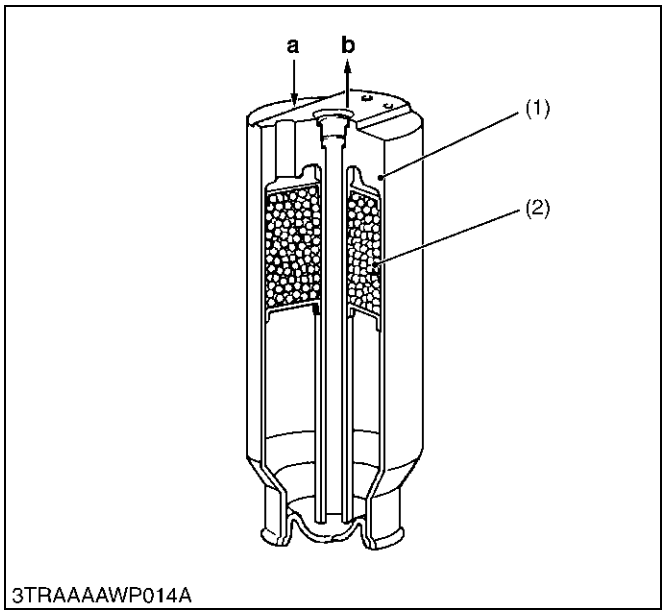
[3] RECEIVER



The receiver serves the purpose of storing the liquid refrigerant. The amount of liquid refrigerant flowing through the system varies with the operating condition of the air conditioner. To be accurate, the receiver stores excess refrigerant when the heat load is lowered. It also releases stored refrigerant when additional cooling is needed, thus, keeping the optimum flow of refrigerant within the system.

The receiver includes a desiccant (2). It has the job of removing moisture as the refrigerant circulates within the system.

The sight glass is installed on the top of the receiver. The amount of refrigerant that is charged has a direct effect on the efficiency of the air conditioner. The sight glass is used to check the amount of refrigerant. If a large flow of bubbles can be seen in the sight glass, there is insufficient refrigerant charged. If so, fill the refrigerant to the proper level.

(1)	Receiver Body	**a:**	**IN**
(2)	Desiccant	**b:**	**OUT**

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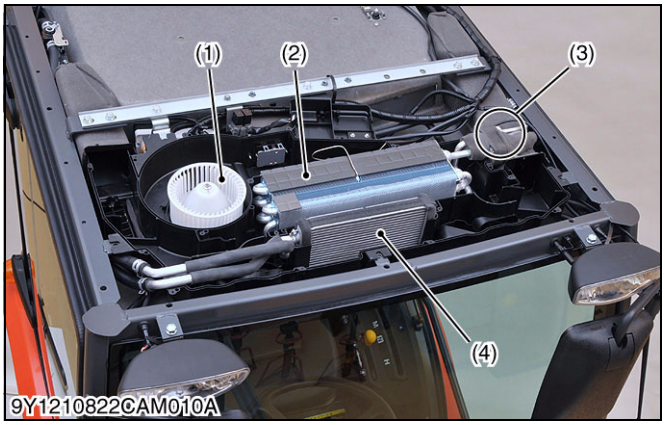
[4] AIR CONDITIONER UNIT



The air conditioner unit consists of evaporator (2), expansion valve (3), heater core (4), blower (1). etc..

(1) Blower
(2) Evaporator
(3) Expansion Valve
(4) Heater Core

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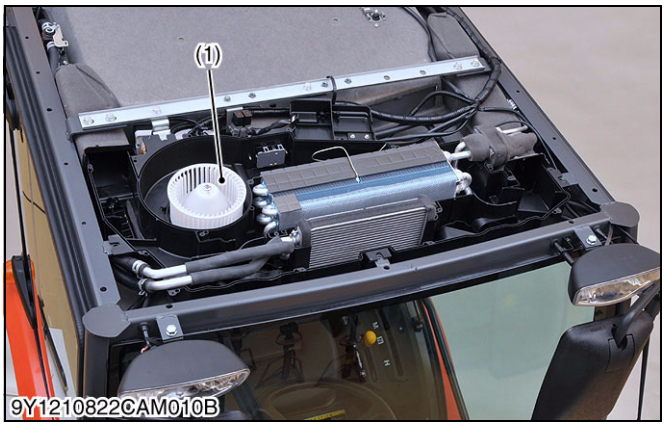

A/C Blower

The blower is incorporated in the left-hand space of the air conditioner unit. It blows cool, warm of fresh air via the dashboard and defroster blow ports into the cabin.

The speed of the blower motor (2) can be adjusted in 4 steps by the resistor (3).

The blower fan (1) is centrifugal type. The air being sucked in parallel with the rotary shaft is blown in the centrifugal direction; in other words, perpendicular to the rotary shaft.

(1) Blower Fan
(2) Blower Motor
(3) Resistor

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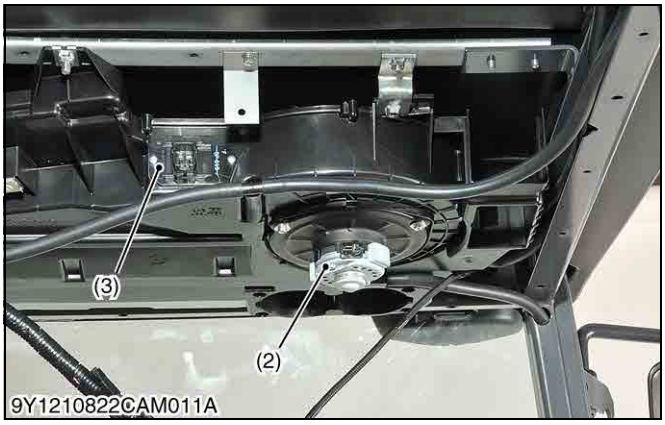

■ **NOTE**

- **As for the mechanism and function of each component part, refer to "10. CABIN" section in the Workshop Manual of tractor mechanism (Code No. 9Y021-18200).**

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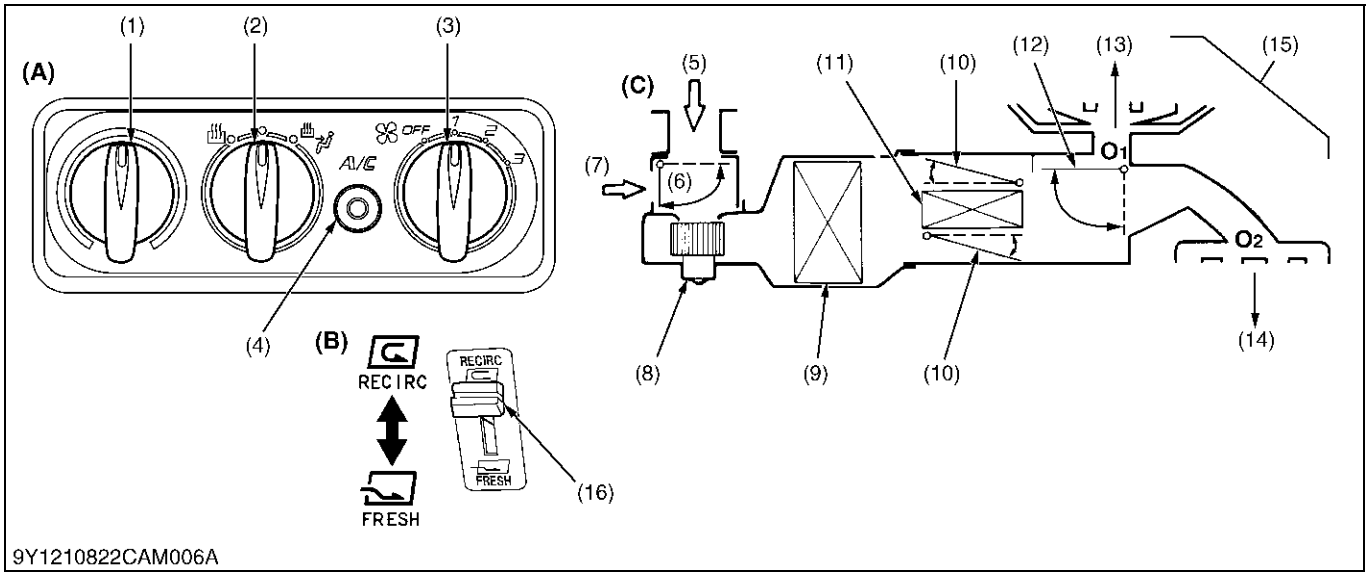
3. SYSTEM CONTROL



9Y1210822CAM006A

(1) Temperature Control Dial
(2) Mode Switch
(3) Blow Switch
(4) Air Conditioner Switch with Indicator Light
(5) Fresh Air
(6) Air Intake Door D1
(7) Recirculated Air
(8) Blower
(9) Evaporator
(10) Temperature Door D2 (Air Mixed Door)
(11) Heater
(12) Air Outlet Door D3 (Mode Door)
(13) DEFOGGER
(14) FACE
(15) DEF and FACE
(16) Air Selection Lever

(A) Control Plate
(B) Air Selection Lever
(C) Block Diagram of Air Flow Passage
O1: Front air outlet
O2: Side air outlet

1) Selection of recirculated air (7) or fresh air (5) is done with door D1.

■ **RECIRC**

By setting the air selection lever (16) in rear control panel to **RECIRC** position, door **D1** (6) shuts the flesh air inlet port. Air inside the cabin is recirculated.

■ **FRESH**

By moving the air selection lever (16) to **FRESH** position, door **D1** opens the flesh air inlet port. Outside air comes into cabin.

2) Temperature control of outlet air is done with door D2.

■ **COOL**

By setting the temperature control dial (1) in control panel to **COOL** position, door **D2** (10) is moved to close water valve. The air flows to door **D3** (12) side without passing the heater core.

■ **WARM**

By moving the temperature lever to **WARM** position door **D2** is moved to open water valve. The air flows to door **D3** (12) side passing through the heater core.

3) Outlet air flow is controlled by door D3.

Moving the mode switch (2) opens and shuts door **D3** and establishes the air passage according to the lever position.

■ **DEF + FACE**

By moving the mode lever to **DEF + FACE** position, the door **D3** is moved to establish the air passages to outlets **"O1"** and **"O2"**. Air comes out from both outlets.

■ **DEF**

Moving the mode lever to **DEF** position, door **D3** is moved to set up the air passage to outlet **O1**. Air comes out from outlet **O1**.

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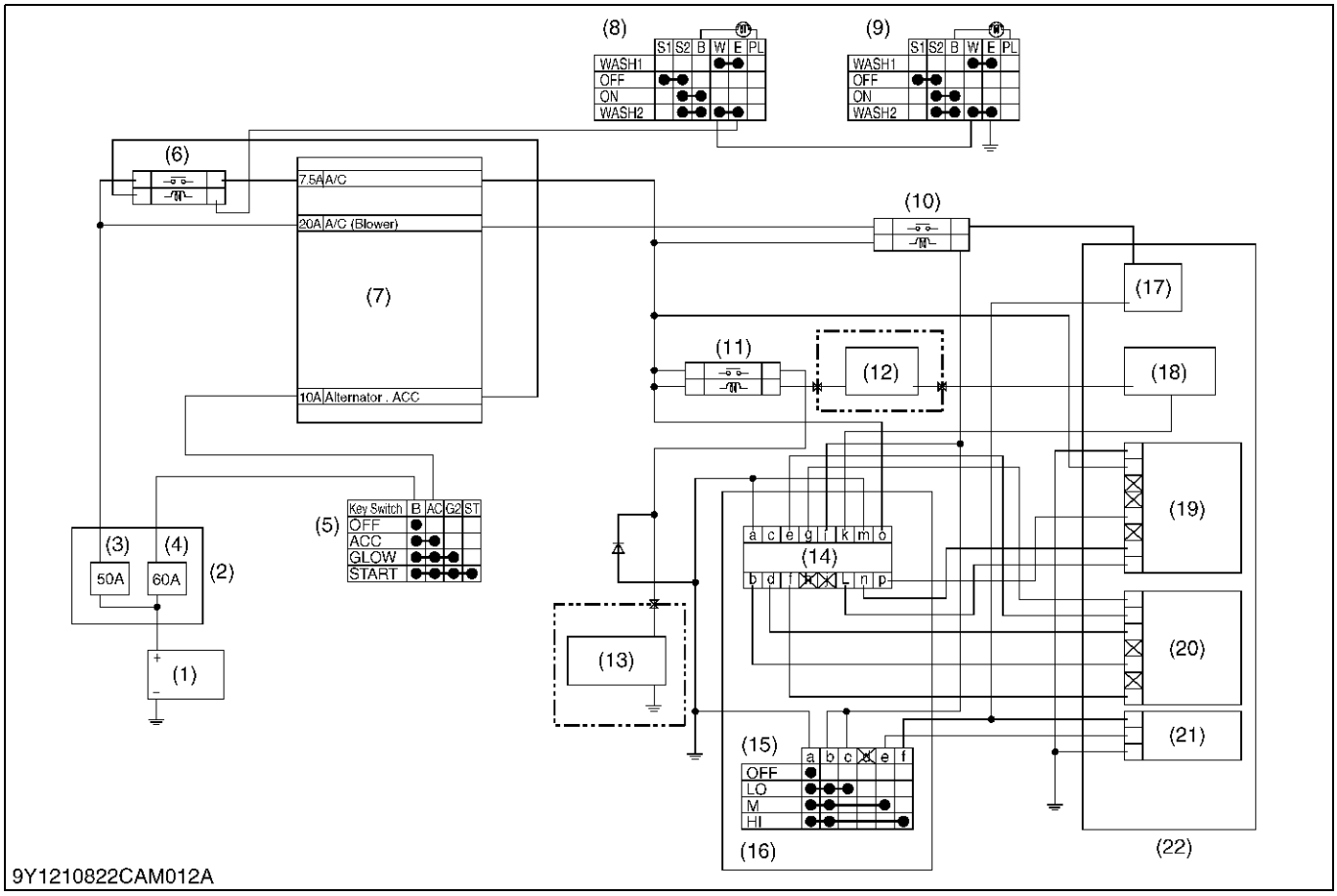
4. ELECTRICAL SYSTEM

[1] ELECTRICAL CIRCUIT



(1) Battery
(2) Slow Blow Fuse
(3) For CABIN Line
(4) For Main Line
(5) Main Switch
(6) ACC Relay
(7) Fuse
(8) Front Wiper Switch
(9) Rear Wiper Switch
(10) Blower Relay
(11) Compressor Relay
(12) Pressure Switch
(13) Compressor
(14) A/C Control Amplifter
(15) Blower Switch
(16) A/C Control Panel
(17) Blower Motor
(18) Thermostat
(19) Mode Switch Servo Motor
(20) Thermostatic Servo Motor
(21) Blower Resistor
(22) A/C Unit

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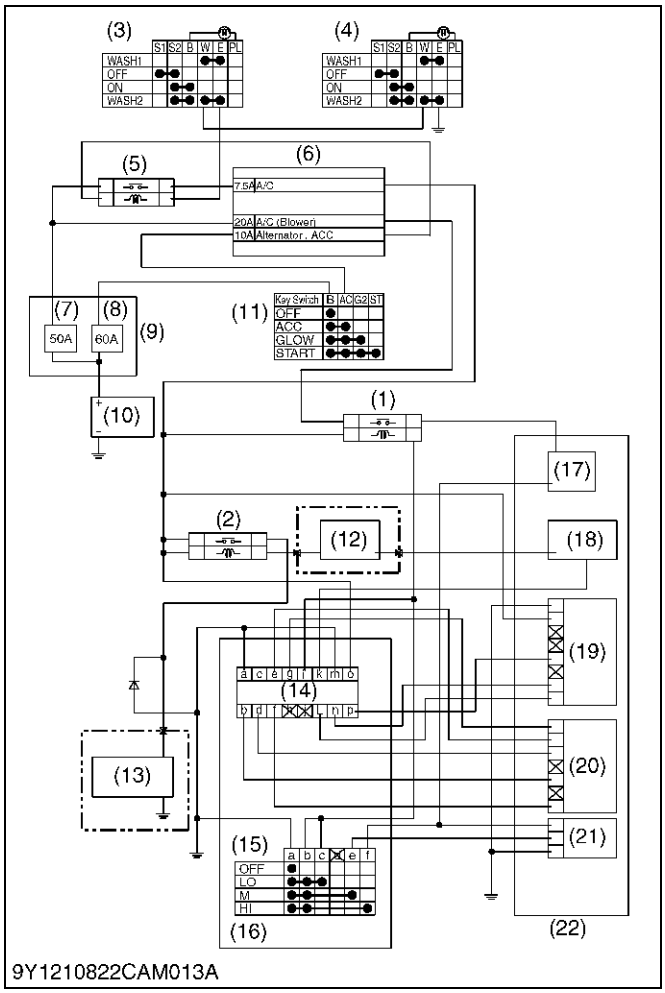
[2] RELAY



Remove the outer roof and the relays are visible at the ceiling rear of the cabin: blower relay (1) and compressor relay (2). When the blower fan is adjusted for the air flow rate, the blower relay (1) is activated by a signal from the fan switch on the control panel.

Among the air conditioner components, current flows to the blower motor (17) and magnetic clutch. If all of these current were to be passed through the main switch (11) and supplied, the current would be too large for the main switch (11) so that there will be danger or burning out the main switch contact. If the current were to be passed directly from the battery (3), forgetting to turn off the blower motor (7) could result in a discharged battery (10).

To protect against such trouble, relays have been provided. These relays have been made so that when current flows through its coil, the contact close to supply the power from the battery (10). By employing these relays, the current flowing through the main switch (11) has been decreased as only a small current is required to actuate the relay. Thus there will be no danger of burning out the switch contact, and when the main switch (11) is opened, the relay contact will open at the same time. This action stops the current flow in the air conditioner circuit so that there will also be no chance of the battery discharging.

(1) Blower Relay
(2) Compressor Relay
(3) Front Wiper Switch
(4) Rear Wiper Switch
(5) ACC Relay
(6) Fuse
(7) For CABIN Line
(8) For Main Line
(9) Slow Blow Fuse
(10) Battery
(11) Main Switch
(12) Pressure Switch
(13) Compressor
(14) A/C Control Amplifter
(15) Blower Switch
(16) A/C Control Panel
(17) Blower Motor
(19) Mode Switch Servo Motor
(18) Thermostat
(20) Thermostatic Servo Motor
(21) Blower Resistor
(22) A/C Unit

[A] B2650
[B] B3350

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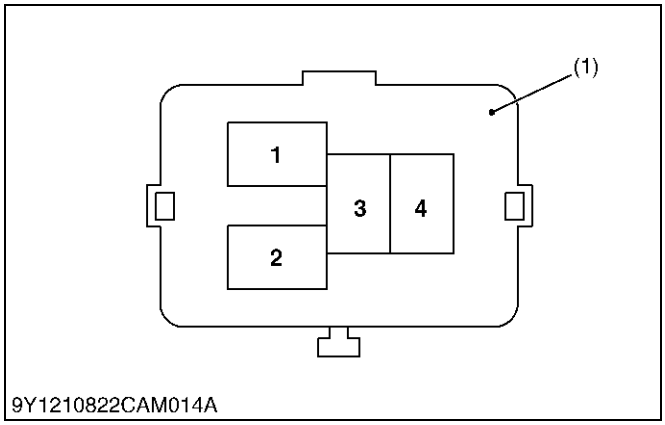

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■ Color of wiring

[B2650]

Item	Terminal No.	Color of Wiring
Blower Relay	1	Lg
	2	G/Y
	3	W/B
	4	P/L
Compressor Relay	1	Lg
	2	Y/G
	3	G
	4	Lg

[B3350]

Item	Terminal No.	Color of Wiring
Blower Relay	1	Lg
	2	G/Y
	3	W/B
	4	R/Y
Compressor Relay	1	Lg
	2	Gr
	3	Lg/B
	4	Lg

(1) Connector (Wire Harness)

9Y1210822CAM0015US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

COMPRESSOR

Symptom	Probable Cause	Solution	Reference Page
Noisy (Compressor ON)	Bearing of compressor worn or damaged	Replace	9-S36
	Valves in compressor damaged	Replace	9-S36
	Belt slipping	Adjust or replace	9-S22
	Compressor bracket mounting screws loosen	Tighten	9-S36
	Piping resonant	Tighten or add clamp	9-S36
Noisy (Compressor OFF)	Blower damaged	Repair or replace	9-S38
	Bearings of magnetic clutch, idle pulley or crank pulley worn or damaged	Replace	9-S36

AIR CONDITIONING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Does Not Cool (No Air Flow)	Fuse blown	Replace	8-S10
	A/C compressor relay damaged	Replace	9-M11
	A/C blower motor damaged	Replace	9-S26
	A/C blower switch damaged	Replace	9-S23
	Wiring harness disconnected or improperly connected	Repair	–
Does Not Cool (Compressor Does Not Rotate)	Fuse blown	Replace	8-S10
	Magnetic clutch damaged	Repair or replace	9-S36
	A/C switch damaged	Replace	9-S23
	Pressure switch damaged	Replace	9-S28
	Belt slipping	Adjust or replace	9-S22
Does Not Cool (Others)	Insufficient refrigerant	Check with manifold gauge	9-S13
	Expansion valve damaged	Replace	9-M8
	Compressor damaged	Replace	9-S36
Insufficient Cooling (Insufficient Air Flow)	Air filter clogged	Clean or replace	G-29, G-30
	Evaporator frosted	Clean	9-S39
	A/C blower motor damaged	Replace	9-S26
	A/C blower resistor damaged	Replace	9-S25
Insufficient Cooling (Many Bubbles in Sight Glass)	Insufficient refrigerant	Check with manifold gauge	9-S13
	Gas leaking from some place in refrigerating cycle	Repair and charge refrigerant	–
	Air mixed in	Check with manifold gauge	9-S13
Insufficient Cooling (No Bubbles in Sight Glass)	Too much refrigerant	Check with manifold gauge	9-S13

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Compressor Does Not Rotate Properly)	Belt slipping	Adjust or replace	9-S22
	Magnetic clutch damaged	Repair or replace	9-S36
	Compressor damaged	Replace	9-S36
Insufficient Cooling (Others)	Temperature motor damaged	Replace	9-S26
	Water valve damaged	Replace	9-M1
	Condenser fin clogged with dust	Clean	G-16
	Expansion valve damaged	Replace	9-M8
Insufficient Heating	Water valve damaged	Replace	9-M1
	Temperature motor damaged	Check and repair	9-S26
	Insufficient coolant	Fill	G-34
Too Low Air Flow Rate (Blower Motor Does Not Run)	Blower switch damaged	Check and repair	9-S23
	A/C compressor relay damaged	Replace	9-M11
	Brush in poor contact	Replace	9-S26
	Fuse blown out	Replace	8-S10
	Wrong wiring or loose connections	Check and repair	–
Too Low Air Flow Rate (Flow Rate Does Not Change in 4 Steps)	Blower resistor damaged	Replace	9-S25
	Relay damaged	Replace	9-S27, 9-S31
	Blower switch damaged	Replace	9-S23
Too Low Air Flow Rate (Others)	Blower is not tightened enough	Check and repair	9-S26
	Blower deformed	Replace	9-S38
	Blower in contact with casing	Check and repair	9-S38
	Obstacle at or near suction port	Check and repair	G-29, G-30
	Evaporator frosted	Clean or replace	9-S39
	Filter clogged	Clean or replace	G-29, G-30
	Blow duct clogged or missing	Check and repair	9-S38
Insufficient Cooling (Compressor Magnetic Clutch Does Not Work)	Low battery voltage	Charge	G-24
	Rotor in contact with stator	Replace	9-S37
	Wrong wiring loose connections	Check and repair	–
	Relay damaged	Replace	9-S27, 9-S31
	Coil shortage	Replace	9-S37
	Ground malfunction	Check and repair	9-S22
	Coil burst out	Replace	9-S22
Insufficient Cooling (Hi-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	9-S13
	Condenser clogged with dust and dirt	Clean	G-16
	Air mixed	Check with manifold gauge	9-S13

Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Hi-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	9-S13
	Compressor discharge valve damaged	Replace	9-S36
	Compressor gasket damaged	Replace	9-S36
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	9-S36
Insufficient Cooling (Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	9-S13
	Expansion valve too open	Replace	9-M8
Insufficient Cooling (Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	9-S13
	Evaporator frosted	Clean or replace	9-S39
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	9-S36
	Expansion valve clogged	Replace	9-M8
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	9-S13
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	9-S13
Temperature Cannot be Controlled (Temperature Motor and / or Temperature Control Dial Malfunction)	Temperature motor damaged	Replace	9-S26
	Temperature control dial damaged	Replace	9-S25
	Wiring harness connector disconnected	Repair or replace	–
Temperature Cannot be Controlled (Water Valve Does Not Open Properly)	Cable wrongly set	Repair	9-S38
	Cable disconnected	Repair	9-S38
Temperature Cannot be Controlled (Mode Motor and / or Mode Switch Malfunction)	Mode motor damaged	Replace	9-S27
	Mode switch damaged	Replace	9-S27
	Wiring harness controller disconnected	Repair or replace	–
Temperature Cannot be Controlled (Heater Hoses Laid is Bad)	Heater hose caught	Repair	9-S42
	Heater hose twisted or bent	Repair or replace	9-S42

WINDSHIELD WIPER

Symptom	Probable Cause	Solution	Reference Page
Windshield Wiper Does Not Operate	Fuse blown (Short-circuit, burnt component inside motor or other part for operation)	Correct cause and replace	G-37
	Wiper motor damaged (Broken armature, worn motor brush or seized motor shaft)	Replace	9-S30
	Wiper switch damaged	Replace	9-S29
	Foreign material interrupts movement of link mechanism	Repair	–
	Wiper arm seized or rusted	Lubricate or replace	9-S29, 9-S30
Windshield Wiper Operating Speed Is Too Low	Wiper motor damaged (Short-circuit of motor armature, worn motor brush or seized motor shaft)	Replace	9-S30
	Low battery voltage	Recharge or replace	G-24
	Humming occurs on motor in arm operating cycle due to seized arm shaft	Lubricate or replace	9-S29, 9-S30
	Wiper switch contact improper	Replace	9-S29
Windshield Wiper Does Not Stop Correctly	Wiper motor damaged (Contaminated auto-return contacts or improper contact due to foreign matter)	Replace	9-S30

9Y1210822CAS0001US0

2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Kinds of refrigerant	Charge Amount	R134a 650 to 710 g 1.44 to 1.56 lbs	–
Refrigerating Cycle (Refrigerating Cycle is Normal Operating)	Pressure (**LO** Pressure Side)	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm^2 21 to 28 psi	–
	Pressure (**HI** Pressure Side)	1.27 to 1.66 MPa 13 to 17 kgf/cm^2 185 to 242 psi	–
A/C Compressor Magnetic Clutch	Air-gap	0.30 to 0.65 mm 0.012 to 0.025 in.	–
Air Conditioner Drive Belt	Tension	10 to 12 mm (0.39 to 0.47 in.) deflection at 98 N (10 kgf, 22 lbf) of force	–
Pressure Switch (Dual Type) (When pressure switch is turned **OFF**)	Setting Pressure (**LO** Pressure Side)	Less than approx. 0.196 MPa 2.0 kgf/cm^2 28.4 psi	–
	Setting Pressure (**HI** Pressure Side)	More than approx. 3.14 MPa 32 kgf/cm^2 455 psi	–
Number of Wiper Arm Swing Frequency	At No Load	33 to 43 times/min.	–
Wiper Blade	Position	Approx. 150 mm 5.91 in.	–

9Y1210822CAS0002US0

3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	167 to 191	17 to 19.5	123 to 141
Rear wheel mounting bolt	196 to 225	20 to 23	145 to 166
Universal joint mounting bolt	24 to 28	2.5 to 2.8	18 to 20
Cabin mounting bolt and nut	124 to 150	12.7 to 15.2	91.5 to 110
High pressure pipe and low pressure pipe mounting screw	7.90 to 11.8	0.806 to 1.20	5.83 to 8.70
Compressor mounting screws	24.5 to 29.4	2.50 to 2.99	18.1 to 21.6
Magnetic clutch mounting screw	15 to 21	1.5 to 2.1	11 to 15
Outer roof mounting bolt	3.5 to 4.0	0.36 to 0.40	2.6 to 2.9
A/C unit mounting screw (M6)	4.0 to 6.8	0.40 to 0.70	2.9 to 5.0
A/C unit mounting screw (M8)	9.81 to 11.6	1.00 to 1.19	7.24 to 8.60
Low pressure pipe (Cooler pipe (suction)) retaining nut	7.90 to 11.8	0.806 to 1.20	5.83 to 8.70
High pressure pipe (Cooler pipe (liquid)) retaining nut	11.8 to 14.7	1.21 to 1.49	8.71 to 10.8
Low pressure hose mounting screw (compressor side)	7.9 to 11	0.80 to 1.2	5.8 to 8.6
High pressure hose 1 mounting screw (compressor side)	7.9 to 11	0.80 to 1.2	5.8 to 8.6
High pressure hose 1 mounting screw (condenser side)	7.9 to 11	0.80 to 1.2	5.8 to 8.6
High pressure hose 2 retaining nut (receiver side)	12 to 14	1.2 to 1.5	8.7 to 10
High pressure pipe 2 retaining nut	11.8 to 14.7	1.21 to 1.49	8.71 to 10.8
Low pressure pipe retaining nut	7.90 to 11.8	0.806 to 1.20	5.83 to 8.70
Wiper motor mounting nut	6.4 to 9.3	0.65 to 0.95	4.7 to 6.8
Wiper arm mounting nut	7.9 to 9.8	0.80 to 1.0	5.8 to 7.2
Wiper motor mounting screw	7.9 to 9.8	0.80 to 1.0	5.8 to 7.2

9Y1210822CAS0003US0

4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE

When checking or repairing the air conditioning system, the following precautions and rules must be observed. And it is of first importance that no other personnel than a well-trained serviceman should be allow to handle the refrigerant.

⚠ CAUTION

- **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
- **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never heat the refrigerant container above 40 °C (104 °F) or drop it from a high height.**
- **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**
- **If you improperly connect the hose between the service valve of compressor and gauge manifold, or incorrectly handle the valves, the refrigerant service container or charging hose will explode. When connecting the hose or handling the valve, be sure to check the high pressure side or low pressure side.**
- **In case the refrigerant is charged while the compressor is operated, do not open the high pressure valve of the gauge manifold.**
- **Be careful of the toxicity of the gas. The gas is harmless and nontoxic in its original state, however it produces a toxic substance when it comes in contact with high temperature parts and decomposes.**
- **Do not heat the service can unless necessary. When it has to be heated, use warm water of 40 °C (104 °F) or lower. Do not heat using boiling water.**

■ IMPORTANT

- **If the refrigerant, O-rings, etc. for R12 are used in the R134a air conditioner system, problems such as refrigerant leakage or cloudiness in the sight glass may occur. Therefore, in order to prevent charging of refrigerant or erroneous connections, the shapes of the piping joint as well as the shapes of the service valve and the service tools have been changed.**
- **Always keep the working place clean and dry and free from dirt and dust. Wipe off water from the line fittings with a clean cloth before disconnecting.**
- **Use only for R134a refrigerant service tool.**
- **Use for R134a refrigerant recovery and recycling machine when discharging the refrigerant.**
- **Before attaching the charging hose to the can tap valve of the refrigerant container, check each packing for clogging.**
- **When disconnecting the charging hose from the charging valve of compressor and receiver, remove it as quick as possible so that gas leakage can be minimized.**
- **Be sure to charge the specified amount of refrigerant, but not excessively. Over-charging of the refrigerant in particular may cause insufficient cooling, etc..**
- **Since the charging hose can be connected to can tap valve by hand, do not use a pliers for tightening it.**
- **Keep refrigerant containers in a cool and dark place avoiding such place which are subject to strong sunlight or high temperature.**
- **R134a compressor oil absorbs moisture easily, so that be sure to seal after disconnecting the each parts.**
- **Do not use old-type refrigerant R12 or compressor oil for old-type refrigerant.**
- **When replacing the condenser, evaporator and receiver, etc., fill the compressor oil to compressor according to the table below.**

(To be continued)

(Continued)
(Refrigerant)

Kinds of refrigerant (Charge amount)	Factory specification	R134a 650 to 710 g 1.44 to 1.56 lbs

(Compressor Oil)

Quantity (Total)	Brand Name
110 to 120 cc 0.116 to 0.126 U.S.qts 0.0968 to 0.105 Imp.qts	ND-OIL 8 <PAG* oil>

*PAG: Polyalkyleneglycol (Synthetic oil)

(Reference)

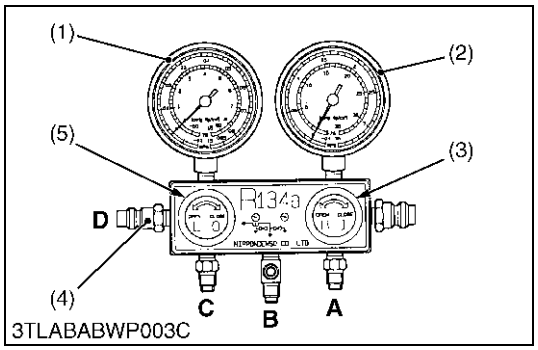
Replacing Parts	Fill Quantity	Brand Name
Condenser	20 cc 0.021 U.S.qts 0.018 Imp.qts	ND-OIL 8 <PAG* oil>
Evaporator	10 cc 0.011 U.S.qts 0.0088 Imp.qts	
Receiver	10 cc 0.011 U.S.qts 0.0088 Imp.qts	
Hose	10 cc 0.011 U.S.qts 0.0088 Imp.qts	

*PAG: Polyalkyleneglycol (Synthetic oil)

9Y1210822CAS0004US0

[1] HANDLING OF SERVICE TOOLS

(1) Manifold Gauge Set

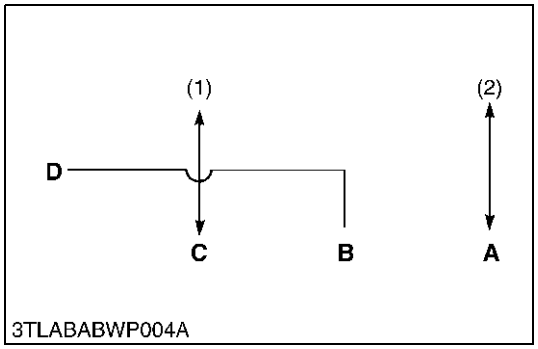


3TLABABWP003C

The hand valves on the manifold gauge set are used to open and close the valve. The hand valve inscribed **LO** is for the low pressure side valve (5) and **HI** is for the high pressure side valve (3). By opening or closing the high and low pressure hand valves, the following circuits are established.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **HI** Pressure Side Valve
(4) Schrader Valve
(5) **LO** Pressure Side Valve

9Y1210822CAS0005US0



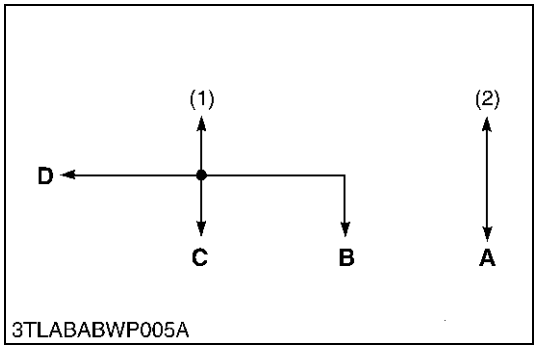
3TLABABWP004A

When LO Pressure Side Valve and HI Pressure Side Valve are Closed

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve (D) must be opened.**

9Y1210822CAS0006US0



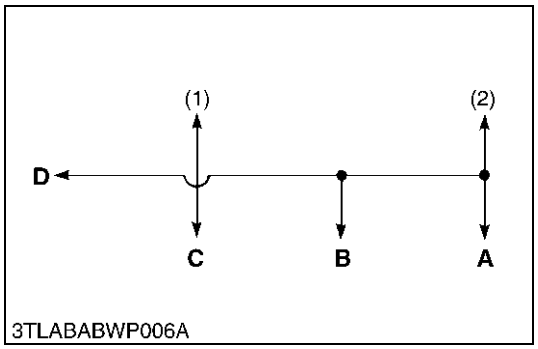
3TLABABWP005A

When LO Valve is Opened and HI Valve is Closed

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
Port (**C**) → Port (**B**)
Port (**C**) → Port (**D**)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve (D) must be opened.**

9Y1210822CAS0007US0



3TLABABWP006A

When LO Valve is Closed and HI Valve is Opened

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
Port (**C**) → Port (**B**)
Port (**C**) → Port (**D**) (Schrader valve must be opened)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve (D) must be opened.**

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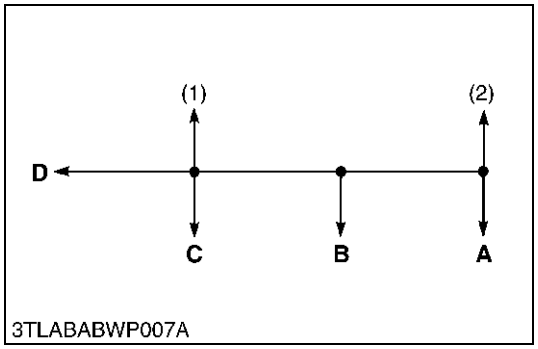


3TLABABWP007A

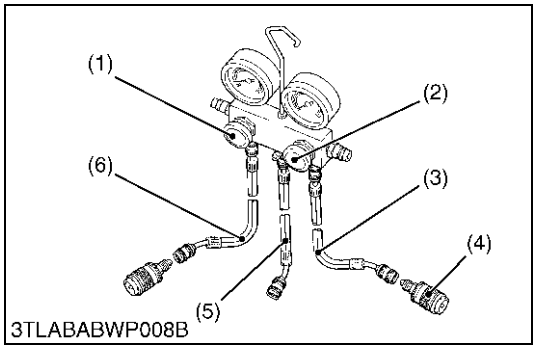
When LO and HI Valve are Opened

Circuits are established.
Port (**A**) → **HI** pressure gauge (2)
Port (**A**) → **LO** pressure gauge (1)
Port (**A**) → Port (**B**)
Port (**A**) → Port (**C**)
Port (**A**) → Port (**D**) (Schrader valve must be opened)

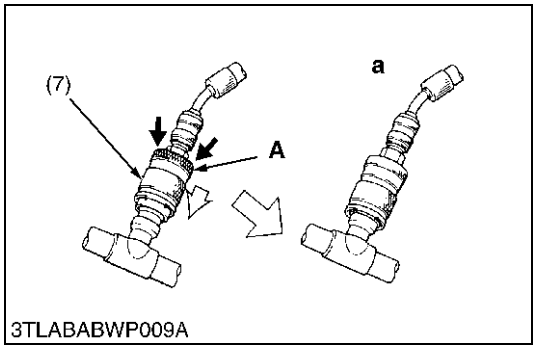
■ **NOTE**
- **Schrader valve (D) must be opened.**

9Y1210822CAS0009US0

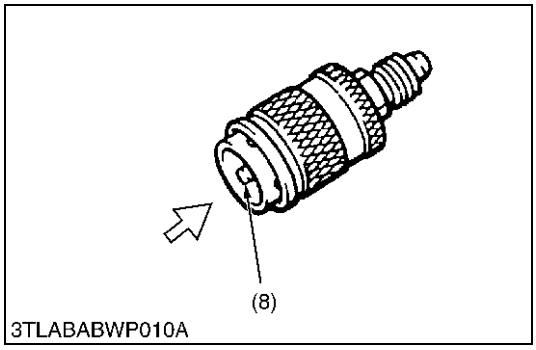
(2) Refrigerant Charging Hose



3TLABABWP008B



3TLABABWP009A



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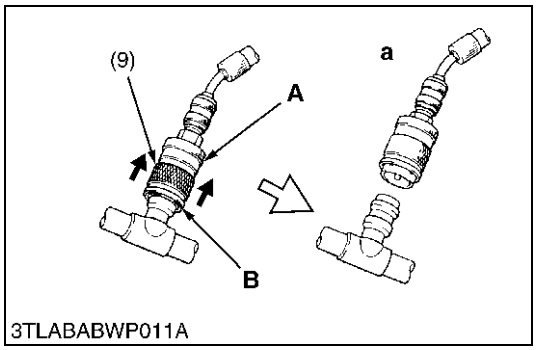


3TLABABWP011A

The charging hoses are classified into three colors. Each charging hose must be handled as follows:

- The air conditioner manufacture recommends that the blue hose (6) is used for the **LO** pressure side (suction side), the green hose (5) for refrigeration side (center connecting port) and the red hose (3) for **HI** pressure side (discharged side).

(When connecting)

- Push the quick disconnect adaptor (4) into the charging valve, and push on part **"A"** until a click is heard.

■ **NOTE**

- **When connecting, push carefully so the pipe does not bend.**
- **When connecting the quick disconnect connector, should the sleeve (7) move before the quick link connector can be connected to the charging valve, move the quick sleeve to its original position and try again.**
- **When some refrigerant remains in the charging hose at the time of connections, it may be difficult to connect the quick link connector. In this case, perform the operation after removing any residual pressure in the hose. (Remove the residual pressure by pushing the pusher (8).)**

(When reassembling)

- While holding on to part **"A"** of the quick disconnect adaptor, slide part **"B"** up.

■ **NOTE**

- **After removing the adaptor, ensure to cap the quick disconnect adaptor service valve.**

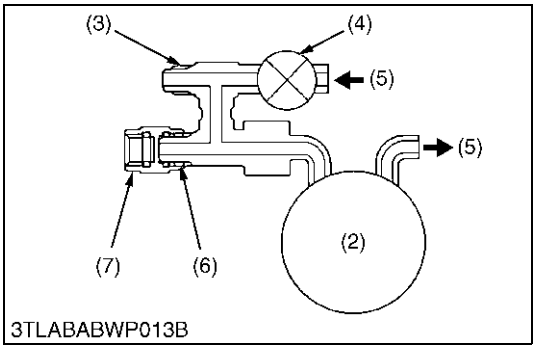
(1) **LO** Pressure Side Valve
(2) **HI** Pressure Side Valve
(3) Red Hose
(4) Quick Disconnect Adaptor
(5) Green Hose
(6) Blue Hose
(7) Sleeve
(8) Pusher
(9) Sleeve

a: CLICK

9Y1210822CAS0010US0

(3) Vacuum Pump Adaptor

9Y1210369GES042A



3TLABABWP013B

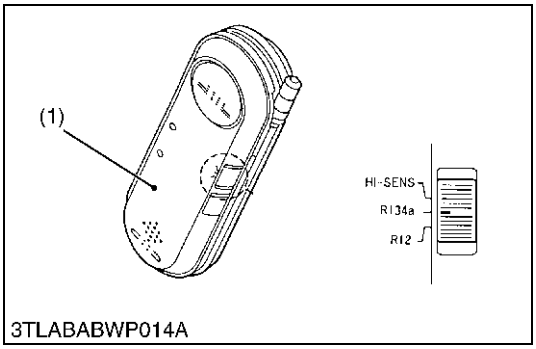
Objective of the Vacuum Pump Adaptor

1. After vacuum has been created in the air conditioning cycle, when the vacuum pump is stopped, since there is vacuum in hoses within the gauge manifold, the vacuum pump oil flows back into the charging hose. If the refrigerant is refilled with the system still in this state, the vacuum pump oil left in the charging hose enters the air conditioner cycle together with the refrigerant. Vacuum pump adaptor with a solenoid valve is used to prevent this back-flow of oil from the vacuum pump. The role of the solenoid valve is that when the current passes through the solenoid valve, the valve closes to keep out the outside air and allow the vacuum to build up, but when the current stops, the valve opens to allow in air and end the vacuum.
2. Attaching this adaptor to the R12 vacuum pump currently being used allows the pump to be used with both R134a and R12.

(1) Vacuum Pump Adaptor
(2) Vacuum Pump
(3) For R134a
(4) Magnetic Valve
(5) Air
(6) For R12
(7) Blind Cap

9Y1210822CAS0011US0

(4) Electric Gas Leak Tester



3TLABABWP014A

The current R12 gas leak tester has poor sensitivity for R134a and cannot be used. Therefore, a new electric gas leak tester with greater sensitivity has been designed and can be used with both R134a and R12.

(Reference)

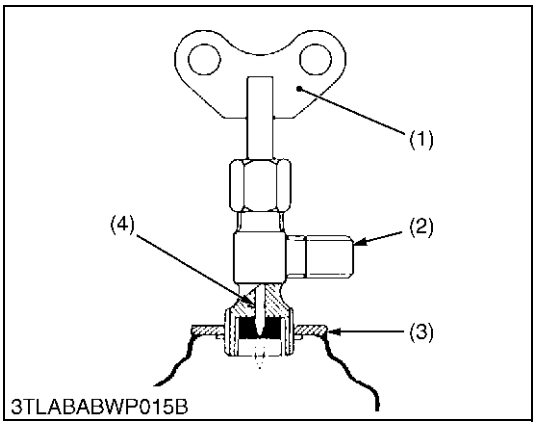
Leak tester with halide torch

- Since the reaction with chlorine within the refrigerant is used to detect gas leaks, R134a, which contains no chlorine, cannot be detected.

(1) Electric Gas Leak Tester

9Y1210822CAS0012US0

(5) Can Tap Valve



3TLABABWP015B

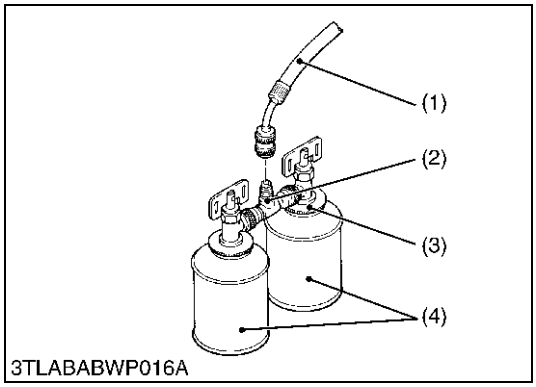
The can tap valve that is used to charge the refrigerant into the air conditioning system, should be used as follows:

1. Before putting the can tap valve on the refrigerant container, turn the handle (1) counterclockwise till the valve needle is fully retracted.
2. Turn the plate nut (disc) (3) counterclockwise till it reaches its highest position, then screw down the can tap valve into the sealed tap.
3. Turn the place nut clockwise fully, and fix the center charging hose to the valve.
4. Tighten the place nut firmly by hand.
5. Turn the handle (1) clockwise, thus making a hole in the sealed tap.
6. To charge the refrigerant into the system, turn the handle (1) counterclockwise. To stop charging, turn it clockwise.

(1) Butterfly Handle
(2) Connection
(3) Disc
(4) Needle

9Y1210822CAS0013US0

(6) T-joint



T-joint (2) is used to increase efficiency of gas charging using two refrigerant containers (4) at a time.

1. Install two refrigerant container service valves to T-joint (2) sides and connect the charging hose (1) to it.

(1) Charging Hose (Green)
(2) T-joint
(3) Can Tap Valve
(4) Refrigerant Container

9Y1210822CAS0014US0

(7) R134a Refrigerant Recovery and Recycling Machine

When there is necessity of discharging the refrigerant on repairing the tractor, it should use recovery and recycling machine. (Do not release the refrigerant into the atmosphere.)

■ **IMPORTANT**

- **Use only R134a refrigerant recovery and recycling machine, eliminate mixing R134a equipment, refrigerant and refrigerant oils with R12 systems to prevent compressor damage.**

9Y1210822CAS0015US0

5. CHECKING AND CHARGING REFRIGERANT CYCLE

[1] CHECKING WITH MANIFOLD GAUGE

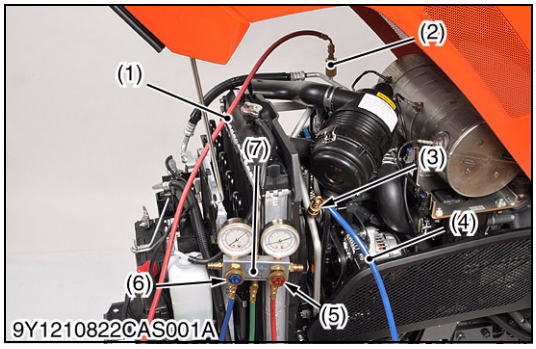
■ **IMPORTANT**

- **The gauge indications described in the following testing are those taken under the same condition, so it should be noted that the gauge readings will differs somewhat with the ambient conditions.**

Condition

- Ambient temperature: 30 to 35 °C (86 to 95 °F)
- Engine speed: Approx. 1500 min^{-1} (rpm)
- Temperature control lever: Maximum cooling position
- Air-Conditioner switch: **ON**
- Blower switch: **HI** position

9Y1210822CAS0016US0



Manifold Gauge Connecting and Test Preparation

1. Close the manifold gauge **HI** and **LO** pressure side valve (5), (6) tightly.
2. Connect the charging hose (1) (red) to the **HI** pressure side charging valve (2) and connect the charging hose (4) (blue) to the **LO** pressure side charging valve (3).

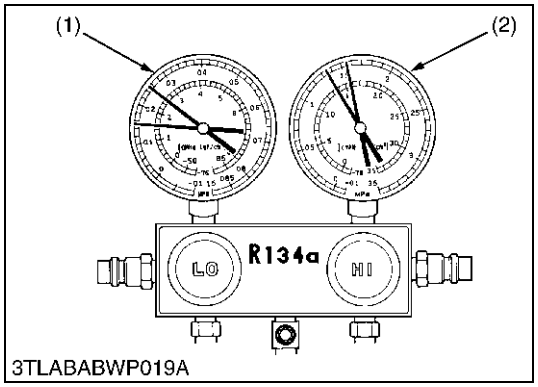
■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerating cycle.**

3. Start the engine and set at approx. 1500 min^{-1} (rpm).
4. Turn on the A/C switch and set the temperature control lever to **maximum cooling** position.
5. Set the blower switch to **HI** position.

(1) Charging Hose (Red)
(2) **HI** Pressure Side Charging Valve
(3) **LO** Pressure Side Charging Valve
(4) Charging Hose (Blue)
(5) **HI** Pressure Side Valve
(6) **LO** Pressure Side Valve
(7) Manifold Gauge

9Y1210822CAS0017US0



Normal Operating

If the refrigerating cycle is operating normally, the reading at the **LO** pressure side (1) should be generally by around 0.15 to 0.2 MPa (1.5 to 2.0 kgf/cm^2, 21 to 28 psi) and that at the **HI** pressure side (2) around 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi).

Gas pressure	Factory specification	Low pressure side	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm^2 21 to 28 psi
		High pressure side	1.27 to 1.66 MPa 13 to 17 kgf/cm^2 185 to 242 psi

(1) **LO** Pressure Side
(2) **HI** Pressure Side

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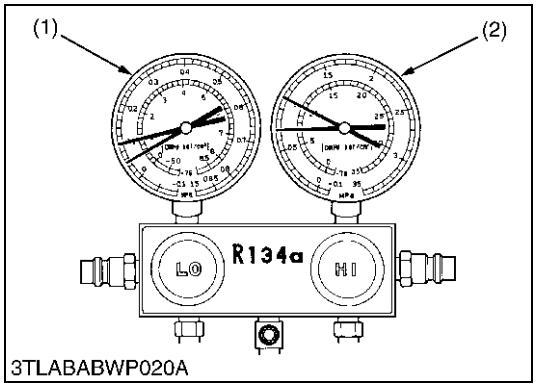


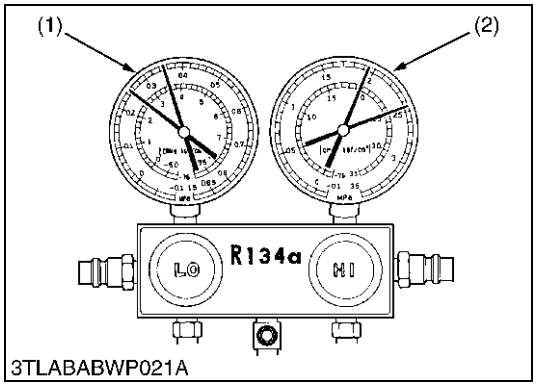
3TLABABWP020A

Insufficient Refrigerant

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too low.
     LO pressure side (1)
     0.05 to 0.10 MPa (0.5 to 1.0 kgf/cm^2, 7.1 to 14.2 psi)
     HI pressure side (2)
     0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
   - Bubbles seen in sight glass.
   - Air discharged from air conditioner sightly cold.
2. Probable cause
   - Gas leaking from some place in refrigerant cycle.
3. Solution
   - Check for leakage with electric gas leak tester (see page 9-S11) and repair.
   - Recharge refrigerant to the proper level. (See page 9-S19.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210822CAS0019US0



3TLABABWP021A

Excessive Refrigerant or Insufficient Condenser Cooling

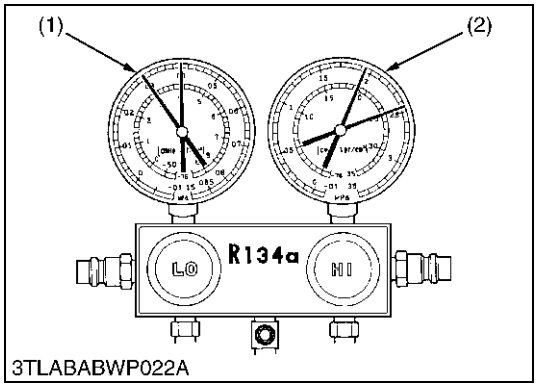
1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1)
     0.20 to 0.35 MPa (2.0 to 3.5 kgf/cm^2, 28.4 to 49.8 psi)
     HI pressure side (2)
     1.96 to 2.45 MPa (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
2. Probable cause
   - Overcharging refrigerant into cycle.
   - Condenser cooling faulty.
3. Solution
   - Clean condenser. (See page G-30.)
   - Adjust air conditioner belt to proper tension. (See page 9-S22.)
   - If the above two items are in normal condition, check refrigerant quantity. (See page G-40.)

■ **NOTE**

- **If excessive refrigerant is to be discharged, loosen manifold gauge LO pressure side valve and vent out slowly.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210822CAS0020US0



3TLABABWP022A

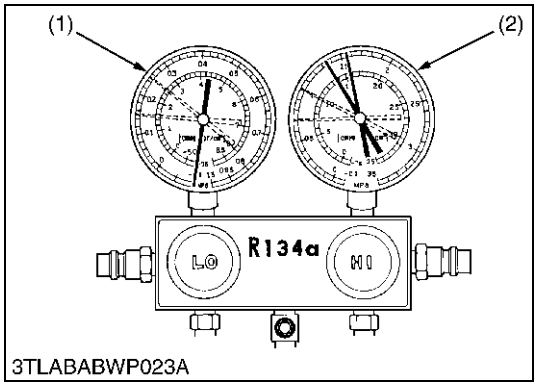
Air Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1)
     0.20 to 0.35 MPa (2.0 to 3.5 kgf/cm^2, 28.4 to 49.8 psi)
     HI pressure side (2)
     1.96 to 2.45 MPa (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
   - **LO** pressure side (1) piping not cold when touched.
2. Probable cause
   - Air entered in refrigerating cycle.
3. Solution
   - Replace receiver.
   - Check compressor oil contamination and quantity.
   - Evacuate and recharge new refrigerant. (See page 9-S19.)

■ **NOTE**
- **The above cycle can be seen when the cycle is charged without evacuation.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210822CAS0021US0



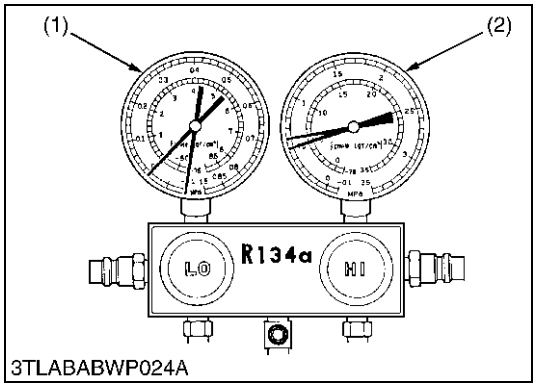
3TLABABWP023A

Moisture Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   - The air conditioner operates normally at the beginning, but over time, **LO** pressure side (1) pressure is **vacuum** and **HI** pressure side (2) is low pressure.
     LO pressure side (1)
     Vacuum
     HI pressure side (2)
     0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
2. Probable cause
   - The moisture in the refrigerating cycle freezes in the expansion valve orifice and causes temporary blocking. After a time, the ice melts and condition returns to normal.
3. Solution
   - Replace receiver.
   - Remove moisture in cycle by means of repeated evacuation. (See page 9-S17.)
   - Recharge new refrigerant to the proper level. (See page 9-S19.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210822CAS0022US0



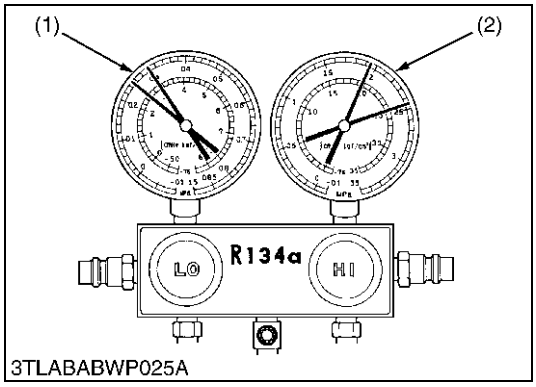
3TLABABWP024A

Refrigerant Fails to Circulate

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1) pressure is vacuum and, **HI** pressure side (2) is low pressure.
     LO pressure side (1)
     Vacuum
     HI pressure side (2)
     0.49 to 0.59 MPa (5 to 6 kgf/cm^2, 71.2 to 85.3 psi)
2. Probable cause
   - Refrigerant flow obstructed by moisture or dirt in the refrigerating cycle freezing or sticking on the expansion valve orifice.
3. Solution
   Allow to stand for same time and then resume operation to decide whether the plugging is due to moisture or dirt.
   - If caused by moisture, correct by referring to instructions in previous.
   - If caused by dirt, remove the expansion valve and blow out the dirt with compressed air.
   - If unable to remove the dirt, replace the expansion valve. Replace the receiver. Evacuate and charge in proper amount of new refrigerant. (See page 9-S19.)
   - If caused by gas leakage in heat sensitizing tube, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210822CAS0023US0



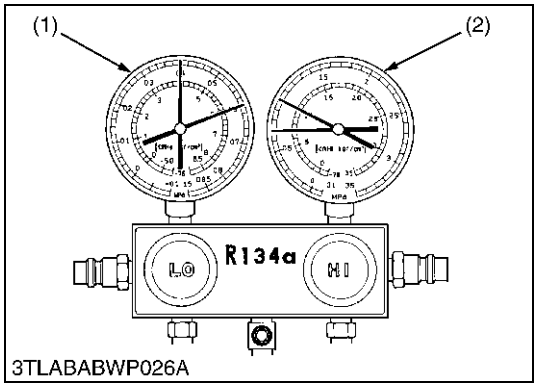
3TLABABWP025A

Expansion Valve Opens Too Far or Improper Installation of Heat Sensitizing Tube

1. Symptoms seen in refrigerating cycle
   - Both **LO** and **HI** pressure side (1), (2) pressures too high.
     LO pressure side (1)
     0.29 to 0.39 MPa (3 to 4 kgf/cm^2, 42.7 to 56.9 psi)
     HI pressure side (2)
     1.96 to 2.45 MPa (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
   - Frost or heavy dew on low pressure side piping.
2. Probable cause
   - Expansion valve trouble or heat sensitizing tube improperly installed.
   - Flow adjustment not properly done.
3. Solution
   - Check installed condition of heat sensitizing tube.
   - If installation of heat sensitizing tube is correct, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

9Y1210822CAS0024US0



Faulty Compression of Compressor

1. Symptoms seen in refrigerating cycle
   - **LO** pressure side (1)
     0.39 to 0.59 MPa (4 to 6 kgf/cm^2, 56.9 to 85.3 psi)
   - **HI** pressure side (2)
     0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
2. Probable cause
   - Leak in compressor.
3. Solution
   - Replace compressor. (See page 9-S36.)

■ **NOTE**
- **Manifold gauge indications (left side figure) at faulty compressing by compressor.**

(1) **LO** Pressure Side
(2) **HI** Pressure Side

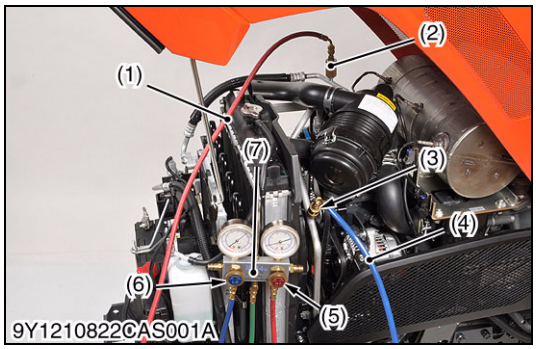
9Y1210822CAS0025US0

[2] DISCHARGING, EVACUATING AND CHARGING

■ **IMPORTANT**
- **When discharging, evacuating or charging the refrigerating system, be sure to observe the "4. PRECAUTION AT REPAIRING REFRIGERANT CYCLE". (See page 9-S7.)**

9Y1210822CAS0026US0

(1) Discharging the Refrigerant



Prepare for the R134a refrigerant recovery and recycling machine.

1. Connect low pressure side hose (blue) (4) from the recovery and recycling machine to **LO** pressure side charging valve (3). Connect high pressure side hose (red) (1) to **HI** pressure side charging valve (2).
2. Follow the manufacturers instructions and discharge the system.

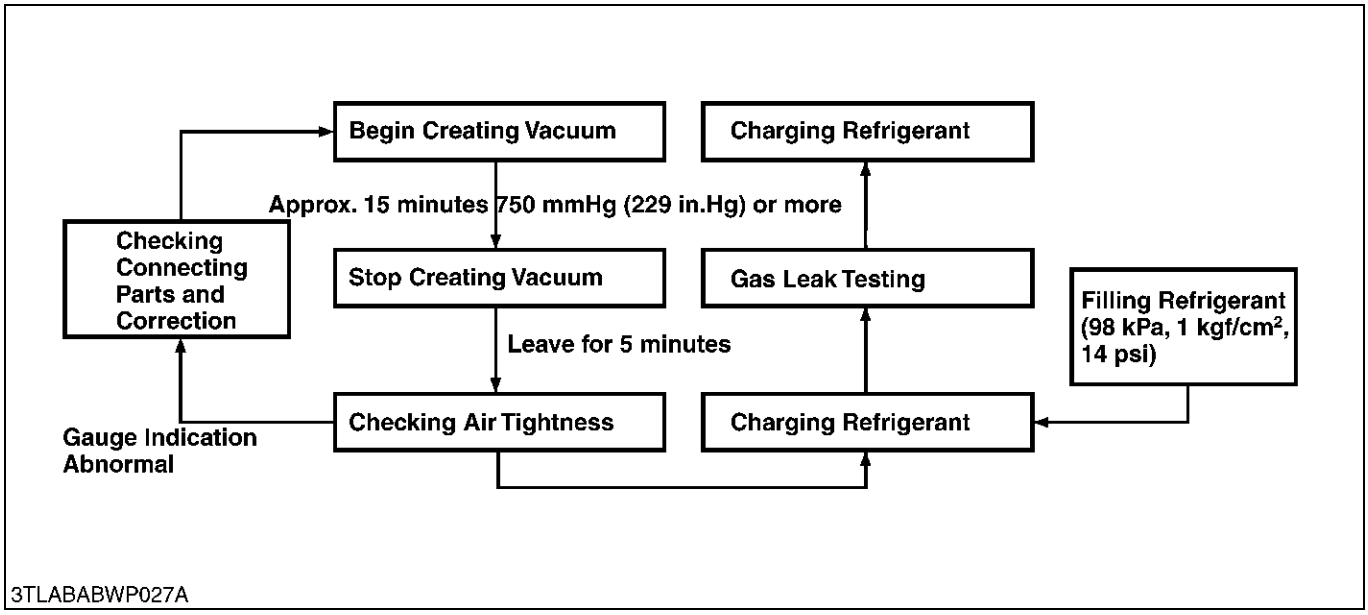
■ **IMPORTANT**
- **Use only R134a refrigerant recovery and recycling machine. Eliminate mixing R134a equipment, refrigerant, and refrigerant oils with R12 system to prevent compressor damage.**

CAUTION
- **Protect fingers and eyes with cloth against frostbite by refrigerant when disconnecting the hose to the charging valve.**

(1) Charging Hose (Red)
(2) **HI** Pressure Side Charging Valve
(3) **LO** Pressure Side Charging Valve
(4) Charging Hose (Blue)
(5) **HI** Pressure Side Valve
(6) **LO** Pressure Side Valve
(7) Manifold Gauge

9Y1210822CAS0027US0

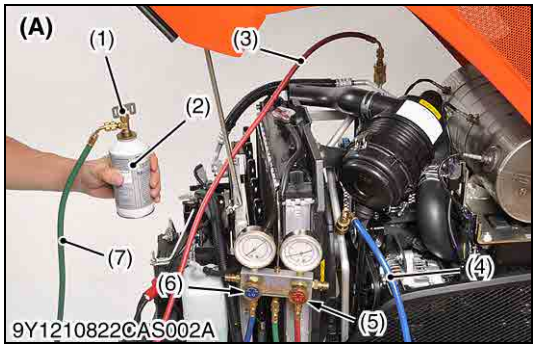
(2) Evacuating the System



1. Discharge refrigerant from the system by R134a refrigerant recovery and recycling machine. (See page 9-S12.)
2. Connect the charging hose (red) to the **HI** pressure side charging valve and connect the charging hose (blue) to the **LO** pressure side charging valve.
3. Connect the center charging hose (green) to a vacuum pump inlet.
4. Open both valves of manifold gauge fully. Then run the vacuum pump to evacuate the refrigerant cycle. (For approx. 15 minutes.)
5. When **LO** pressure gaugereading is more than 750 mmHg (299 in.Hg), stop the vacuum pump and close both valves of manifold gauge fully.
6. Wait for over 5 minutes with the **HI** and **LO** pressure side valves of gauge manifold closed, and then check that gauge indicator does not return to 0.
7. If the gauge indicator is going to approach to 0, check whether there is a leaking point and repair if it is, and then evacuate it again.

9Y1210822CAS0028US0

(3) Charging the Refrigerant



Charging an Empty System (Liquid)

This procedure is for charging an empty system through the **HI** pressure side with the refrigerant in the liquid state.

CAUTION

- **Never run the engine when charging the system through the HI pressure side.**
- **Do not open the LO pressure valve when refrigerant R134a is being charged in the liquid state (refrigerant container is set upside-down).**

IMPORTANT

- **After charging the refrigerant in the liquid state with approx. 500 g (1.1 lbs) through the HI pressure side, be sure to recharge the refrigerant in the vapor state to specified amount through the LO pressure side.**

1. Close the **HI** and **LO** pressure side valves (5) and (6) of manifold gauge after the system is evacuated completely.
2. Connect the center charging hose (green) (7) to the can tap valve (1) fitting, and then loosen the center charging hose (green) (7) at the center fitting of manifold gauge until hiss can be heard.
   Allow the air to escape for few seconds and tighten the nut.
3. Open the **HI** pressure side valve (5) fully, and keep the container upside-down to charge the refrigerant in the liquid state from the **HI** pressure side.
4. Charge the refrigerant in the liquid state with approx. 500 g (1.1 lbs) from the **HI** pressure side.

NOTE

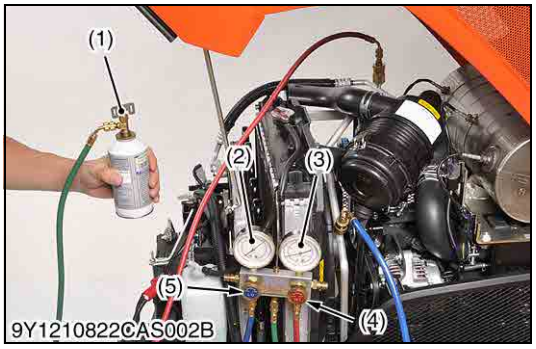
- **If LO pressure gauge does not show a reading, the system is clogged and must be repaired.**

5. Close the **HI** pressure side valve (5) of manifold gauge and can tap valve of refrigerant container.

(1) Can Tap Valve
(2) Refrigerant Container (R134a)
(3) Charging Hose (Red)
(4) Charging Hose (Blue)
(5) **HI** Pressure Side Valve
(6) **LO** Pressure Side Valve
(7) Charging Hose (Green)

(A) Refrigerant Container "Upside"
(B) Refrigerant Container "Down Side"

9Y1210822CAS0029US0



Charging an Empty or Partially Charged System (Vapor)

This procedure is to charge the system through the **LO** pressure side with refrigerant in the vapor state. When the refrigerant container is set right side up, refrigerant will enter the system as a vapor.

CAUTION

- **Never open the HI pressure side valve of manifold gauge while the engine is running.**

NOTE

- **Do not turn the refrigerant container upside-down when charging the system by running the engine.**
- **Put refrigerant container into a pan of warm water (maximum temperature 40 °C (104 °F)) to keep the vapor pressure in the container slightly higher than vapor pressure in the system.**

1. Check that the **HI** pressure side valve (4) is closed.
2. Start the engine and set an approx. 1500 min^{-1} (rpm).
3. Turn on the A/C switch.
   Set the temperature control lever to **maximum cooling** position and the blower switch to **HI** position.
4. Open the **LO** pressure side valve (5) of manifold gauge and the can tap valve (1) on refrigerant container and charge the refrigerant until air bubbles in the sight glass of the receiver vanish.
5. After charging the specified amount of refrigerant into the system, close the **LO** pressure side valve (5) of manifold gauge and can tap valve (1), then stop the engine.
6. Check for gas leak with an electric gas leak tester. (See page 9-S11.)

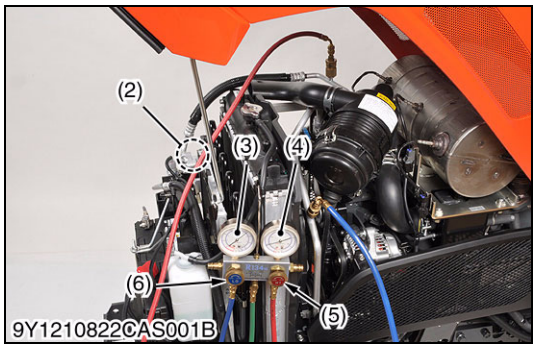
(Reference)

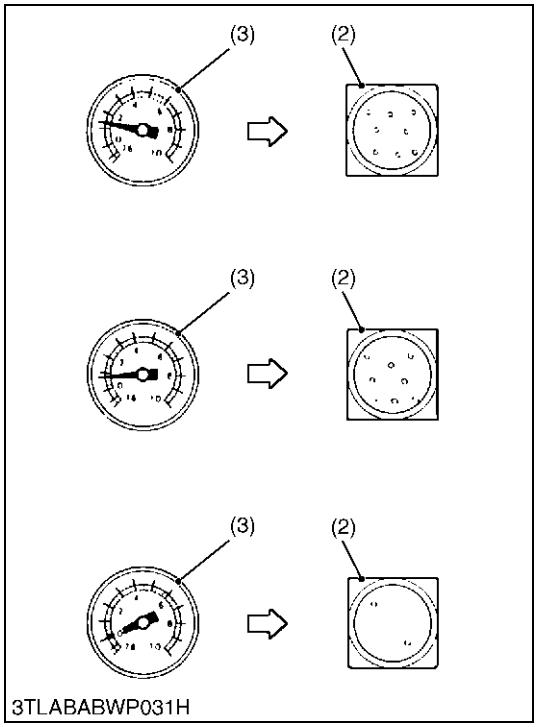
- Specified amount of refrigerant (total)
  770 to 870 g (1.70 to 1.90 lbs) [Refrigerant R134a]
- Manifold gauge indication at fully charged system (at ambient temperature: 30 °C (86 °F))
  HI pressure side
  1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi)
  LO pressure side
  0.15 to 0.20 MPa (1.5 to 2.0 kgf/cm^2, 21 to 28 psi)

(1) Can Tap Valve
(2) **LO** Pressure Gauge
(3) **HI** Pressure Gauge
(4) **HI** Pressure Side Valve
(5) **LO** Pressure Side Valve

9Y1210822CAS0030US0

(4) Checking Charge Refrigerant Amount





After charging the refrigerant, check for amount of charging refrigerant as follows.

■ **NOTE**

- **The pressure on the following checking is the gauge indications at ambient temperature 30 °C (86 °F), so it should be noted that the pressure will differ some what with the ambient temperature.**

1. Disconnect the **1P** connector (1) of magnetic clutch.
2. Start the engine and set a approx. 1500 min^{-1} (rpm).
3. Connect the **1P** connector of magnetic clutch to battery directly, and then set the blower switch to **HI** position.
4. Leave the system for approx. 5 minutes until the refrigerant cycle becomes stable, keeping pressure on the **HI** pressure side from 1.3 to 1.6 MPa (13 to 17 kgf/cm^2, 190 to 240 psi).
5. When the refrigerant cycle is stabilizer, turn off the blower switch and let the compressor alone to run. Then pressure on the **LO** pressure side gradually drops. At this time, if pressure on the **HI** pressure side is kept from 1.3 to 1.6 MPa (13 to 17 kgf/cm^2, 190 to 240 psi), air bubbles which pass through the sight glass (2) becomes as stated below depending on refrigerant charged amount.

■ **Insufficient refrigerant charge**

Air bubbles pass continuously the sight glass when pressure on the **LO** pressure side is over 98 kPa (1.0 kgf/cm^2, 14 psi). In this case, charge the refrigerant from the **LO** pressure side.

■ **Properly refrigerant charge**

Air bubbles pass through the sight glass continuously when pressure on the **LO** pressure side is within 59 to 98 kPa (0.60 to 1.0 kgf/cm^2, 8.6 to 14 psi).

If the charge refrigerant amount is proper, no air bubble is observed on the sight glass at pressure on the **LO** pressure side over 98 kPa (1.0 kgf/cm^2, 14 psi) when the blower switch is turned on. When the blower switch is turned off, bubbles pass through the sight glass in case pressure on the **LO** pressure side is within 59 to 98 kPa (0.60 to 1.0 kgf/cm^2, 8.6 to 14 psi).

■ **Excessive refrigerant charge**

Air bubbles pass through the sight glass time to time or no air bubble is observed when pressure on the **LO** pressure side is under 60 kPa (0.6 kgf/cm^2, 9 psi).

In this case, discharge excessive refrigerant gradually from the **LO** pressure side.

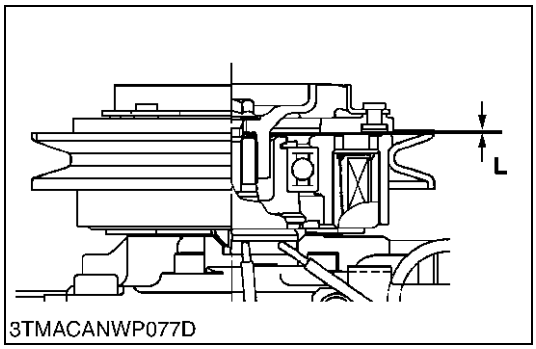
(1) **1P** Connector
(2) Sight Glass
(3) **LO** Pressure Gauge
(4) **HI** Pressure Gauge
(5) **HI** Pressure Side Valve
(6) **LO** Pressure Side Valve

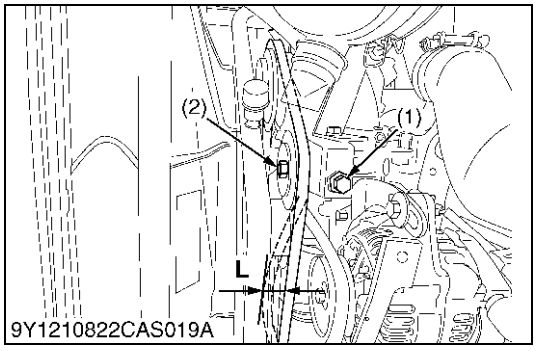
9Y1210822CAS0031US0

6. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Compressor





Operation of Magnetic Clutch

1. Turn off the A/C switch after starting the engine.
2. Check whether abrasion or abnormal noise is heard when only the magnetic clutch pulley is running.
3. Check that the magnetic clutch (1) does not slip when the A/C switch and blower switch are turned **"ON"** (when the air conditioner is in operation).
4. If anything abnormal is found, repair or replace.

(1) Magnetic Clutch

9Y1210822CAS0032US0

Stator Coil

1. Measure the resistance of the stator coil with an ohmmeter across the **1P** connector (1) of magnetic clutch and compressor body.
2. If the measurement is not within the factory specifications, replace the stator coil.

Stator coil resistance	Factory specification	3.0 to 4.0 Ω

(1) **1P** Connector

9Y1210822CAS0033US0

Air Gap

1. Check the air gap with feeler gauge.
2. If the measurement is not within the factory specifications, adjust it. (See page 9-S47.)

Air gap **"L"**	Factory specification	0.30 to 0.65 mm 0.012 to 0.025 in.

L: Air Gap

9Y1210822CAS0034US0

Adjusting Air Conditioner Belt Tension

CAUTION

- **Be sure to stop the engine before checking air conditioner belt tension.**

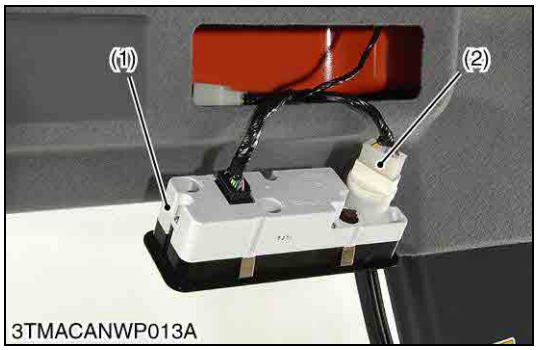
1. Stop the engine and remove the key.
2. Apply 98 N (10 kgf, 22 lbf) pressure to the belt between the pulleys.
3. If tension is incorrect, adjust the belt tension.
4. If belt is damaged, replace it.

Air conditioner belt tension	Factory specification	A deflection of between 10 to 12 mm (0.39 to 0.47 in.) when the belt is pressed in the middle of the span

(1) Adjusting Bolt
(2) Nut
L: Deflection

9Y1210822CAS0035US0

(2) Control Panel (Blower Switch, A/C Switch, Mode Control Dial and Temperature Control Dial)



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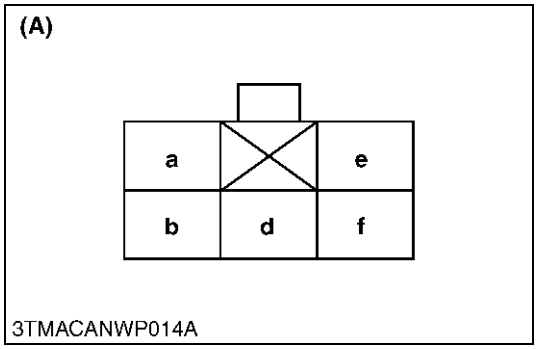

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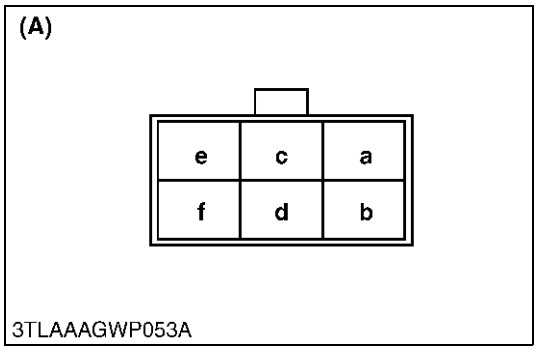

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Blower Switch Connector Voltage

1. Disconnect the **6P** connector (2) from blower switch.
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the connector terminal **a** and terminal **b**.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay, fuse or main switch is faulty.

Voltage	Terminal **a** – Terminal **b**	Approx. battery voltage

(1) Control Panel
(2) **6P** Connector

(A) 6P Connector (Wire Harness Side)

9Y1210822CAS0036US0

Blower Switch Test

1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below are not indicated, the switch is faulty.

Position		Terminal					
		a	b	c	e	f	d
A/C blower switch	OFF						
	1 (Low)	●	●	●			
	2 (Medium)	●			●		
	3 (High)	●	●			●	

9Y1210822CAS016US

(A) 6P Connector (Blower Switch Side)

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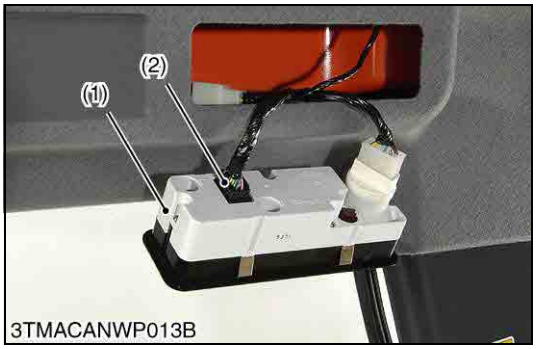


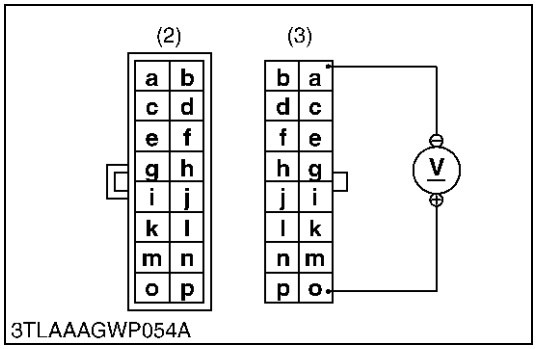
Connector Voltage

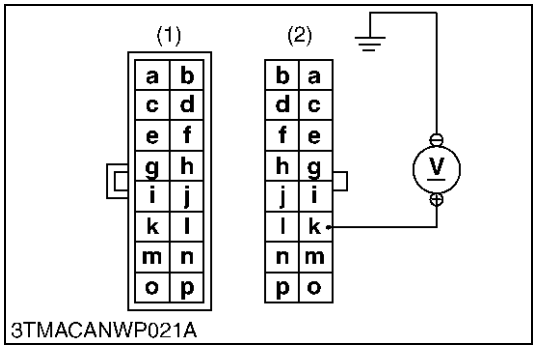
1. Disconnect the **16P** connector (2) from control panel switch.
2. Turn the main switch to **"ON"** position.
3. Measure the voltage with a voltmeter across the terminal **o** and terminal **a**.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay or fuse is faulty.

Voltage	Terminal **o** -Terminal **a**	Approx. battery voltage

(1) Control Panel
(2) **16P** Connector (Switch Side)
(3) **16P** Connector (Wire Harness Side)

9Y1210822CAS0038US0





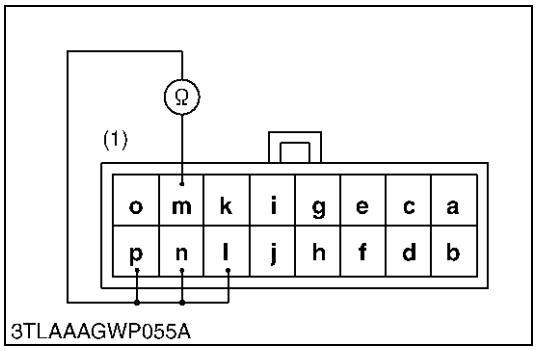
A/C Switch Checking

1. Measure the voltage with a voltmeter across the terminal **k** and chassis.
2. Turn the main switch to **"ON"** position.
3. Turn the blower switch to **"ON"** position.
4. Press the air conditioner switch to set it to **"OFF"** position (indicator: OFF), and then measure a voltage using a circuit tester.
5. Press the air conditioner switch to set it at **"ON"** position (indicator: ON), and then measure a voltage using a circuit tester.
6. If a measured voltage does not comply with the values in the table below, the control panel, wiring harness or fuse is faulty.

Voltage	Terminal **k** – Chassis	A/C switch at **ON**	Approx. battery voltage
		A/C switch at **OFF**	Approx. 1 V

(1) **16P** Connector (Switch Side)
(2) **16P** Connector (Wire Harness Side)

9Y1210822CAS0039US0



Mode Control Dial Checking

1. Disconnect the **16P** connector from control panel switch.
2. Check the continuity through the switch with an ohmmeter.
3. If the continuity specified below is not indicated, the switch is faulty.

Position		Terminal			
		l	n	p	m
Mode switch	FRONT	●			●
	FULL		●		●
	DEF			●	●

9Y1210822CAS017US

(1) **16P** Connector (Switch Side)

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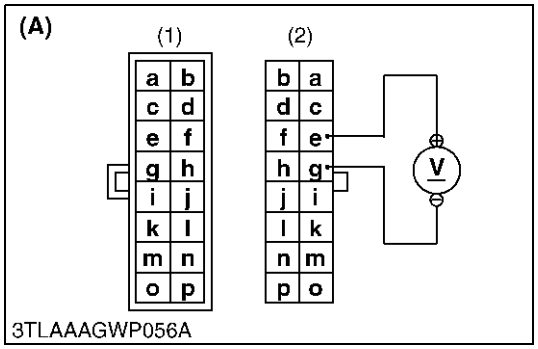
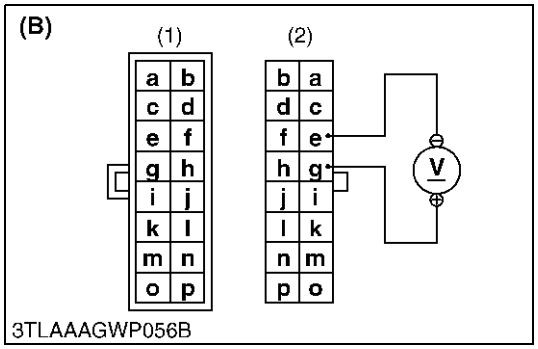




Temperature Control Dial Checking

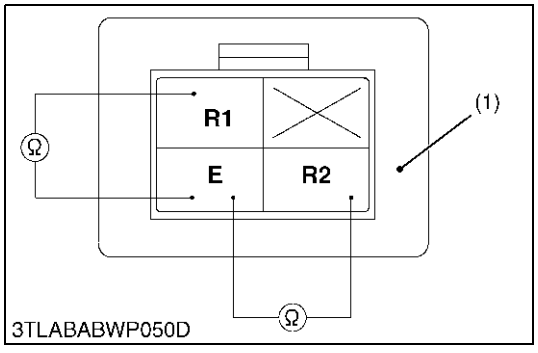
1. Turn the temperature control dial counterclockwise till it stops (at **"COOL"** position).
2. Measure the voltage with a voltmeter across the terminal **b** and terminal **d**. Make the following measurement with the terminals connected.
3. Turn the main switch to **"ON"** position.
4. Check that an output voltage is approximately 10 V when turning the temperature control dial clockwise till it stops (**"WARM"** position).
5. Turn the main switch back to **"OFF"** position.
6. Turn the temperature control dial clockwise till it stops (**"WARM"** position).
7. Measure the voltage with a voltmeter across the terminal **d** and terminal **b**. Make the following measurement with the terminals connected.
8. Turn the main switch to **"ON"** position.
9. Check that an output voltage is approximately 10 V, when turning the temperature control dial counterclockwise till it stops (**"COOL"** position).
10. If an output voltage differs from approximately 10 V, the control panel, wiring harness of fuse is faulty.

(1) **16P** Connector (Switch Side)
(2) **16P** Connector (Wire Harness Side)

(A) "COOL" position to "WARM" position
(B) "WARM" position to "COOL" position

9Y1210822CAS0041US0

(3) Blower Resistor



A/C Blower Resistor

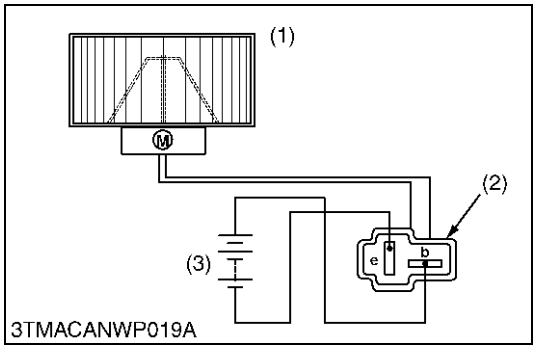
1. Remove the inner roof.
2. Disconnect the **4P** connector for A/C blower resistor (1).
3. Measure the resistance with an ohmmeter across the **R1** terminal and **E** terminal, and across the **R2** terminal and **E** terminal.
4. If the factory specifications are not indicated, A/C blower resistor is faulty.

Resistance	Factory specification	**R1** terminal – **E** terminal	Approx. 0.56 Ω
		R2 terminal – **E** terminal	Approx. 1.56 Ω

(1) A/C Blower Resistor

9Y1210822CAS0042US0

(4) Blower Motor



Blower Motor Test

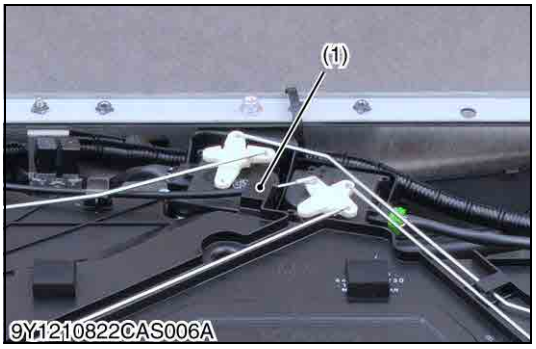
1. Remove the outer roof.
2. Turn the blower motor (1) by hand and check whether it turns smoothly.
3. Disconnect the **2P** connector (2) of blower motor (1).
4. Connect a jumper lead from battery (3) positive terminal to connector terminal **b**.
5. Connect a jumper lead from battery negative terminal to connector terminal **e** momentarily.
6. If the blower motor does not run, check the motor.

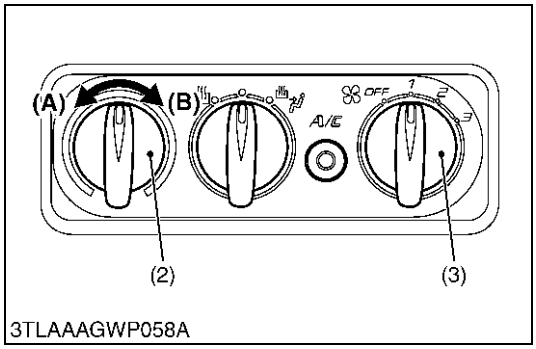
(1) Blower Motor
(2) **2P** Connector (Blower Motor Side)
(3) Battery (12 V)

b: Terminal b
e: Terminal e

9Y1210822CAS0043US0

(5) Temperature Motor





Temperature Motor Checking

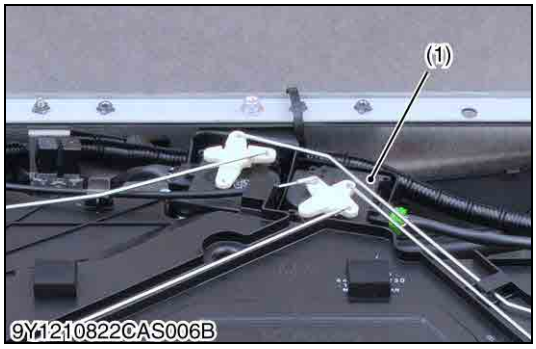
1. Make sure whether the temperature control dial (2) is damaged. (See page 9-S25.)
2. Turn the main switch to **"ON"** position.
3. Turn the blower switch (3) at **1** position.
4. Turn the temperature control dial from **"COOL"** position **(A)** to **"WARM"** position **(B)**. At the time, make sure the motor is operating.
5. If the motor does not operate, replace it.

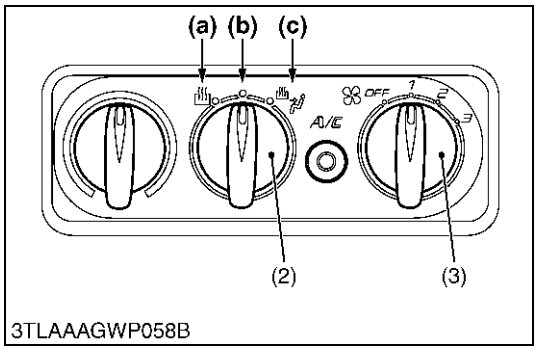
(1) Temperature Motor
(2) Temperature Control Dial
(3) Blower Switch

(A) COOL
(B) WARM

9Y1210822CAS0044US0

(6) Mode Motor





Mode Motor Checking

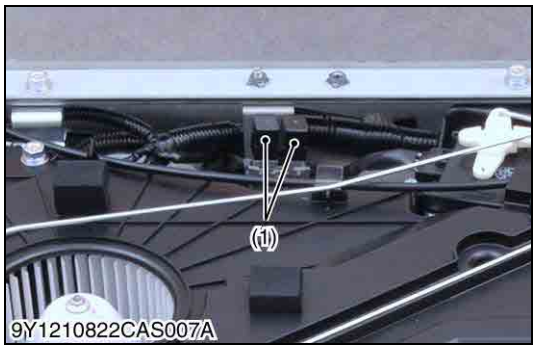
1. Make sure whether the mode switch (2) is damaged.
2. Turn the main switch to **"ON"** position.
3. Turn the blower switch at **1** position.
4. Turn the mode switch each **(a)**, **(b)** and **(c)**.
5. Make sure whether the position where the mode motor (1) is stopped synchronize with mode switch (2).
6. If the motor does not move, replace it.

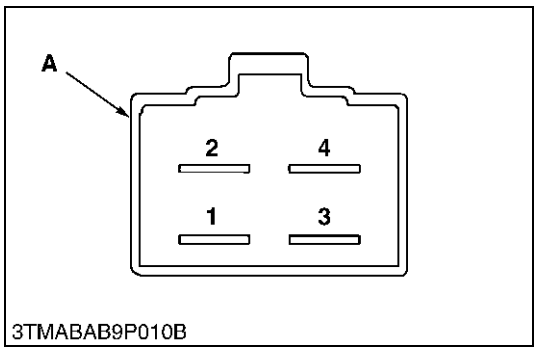
(1) Mode Motor
(2) Mode Switch
(3) Blower Switch

(a) Air is blown from only the defroster air outlet
(b) Air is blown weaken from the side air outlets (head) and stronger from the front air outlets
(c) Air is blown from the front and side air outlets

9Y1210822CAS0045US0

(7) Air Conditioner Relay and Blower Relay





Checking Air Conditioner Relay and Blower Relay

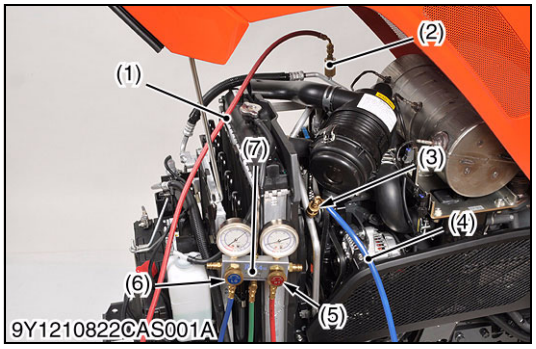
1. Remove the air conditioner relay and blower relay.
2. Apply battery voltage across terminals **3** and **4**, and check for continuity across terminals **1** and **2**.
3. If continuity is not established, renew the relay.

(1) Relay

A: Connector of Relay

9Y1210822CAS0046US0

(8) Pressure Switch



Pressure Switch

1) HI Pressure Side

1. Connect the manifold gauge (7) to compressor as following procedure.
   Close the **HI** and **LO** pressure valves (2), (3) of manifold gauge tightly, and connect the charging hoses (1), (4) (red and blue) to the respective compressor service valves.

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerant cycle.**

2. Start the engine and set at approx. 1500 min^{-1} (rpm). Turn on the A/C switch, then set the blower switch to **HI** position.
3. Raise pressure on the **HI** pressure side of the refrigerant cycle by covering the condenser front with a corrugated carboard, and the pressure switch is activated and the compressor magnetic clutch is turned off. At this time, read the **HI** pressure gauge of the manifold gauge. If this pressure reading differs largely with the setting pressure, replace the pressure switch with a new one.

Setting pressure	Factory specification	Pressure switch **OFF**	More than approx. 3.14 MPa (32 kgf/cm^2, 455 psi)

2) LO Pressure Side

1. Disconnect **2P** connector of pressure switch (8).
2. Measure the resistance with an ohmmeter across the connector terminals.
3. If 0 ohm is not indicated at normal condition, there is no refrigerant in the refrigerating cycle because gas leaks or pressure switch is damaged.

(Reference)

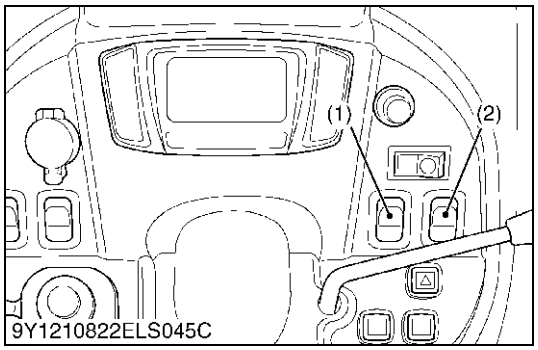
Setting pressure	Factory specification	Pressure switch **OFF**	Less than approx. 0.196 MPa (2.0 kgf/cm^2, 28.4 psi)

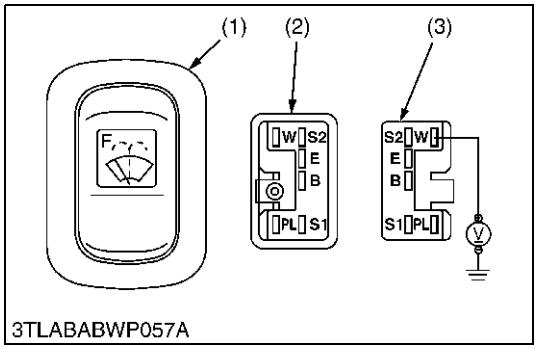
- The resistance of pressure switch is 0 ohm in normal condition, but it becomes infinity if the pressure is out of factory specifcation. Because the pressure switch starts to work.

(1) Charging Hose (Red)
(2) **HI** Pressure Side Charging Valve
(3) **LO** Pressure Side Charging Valve
(4) Charging Hose (Blue)
(5) **HI** Pressure Side Valve
(6) **LO** Pressure Side Valve
(7) Manifold Gauge
(8) Pressure Switch

9Y1210822CAS0047US0

(9) Wiper Switch





Front and Rear Wiper Switch

1. Remove the panel under cover and meter panel.
2. Disconnect the front switch connector.
3. Perform the following checkings **1)** and **2)**.

(1) Front Wiper Switch
(2) Rear Wiper Switch

9Y1210822CAS0048US0

1) Connector Voltage

1. Turn the main switch **"ON"**.
2. Measure the voltage with a voltmeter across the connector **W** terminal and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	**W** terminal – Chassis	Approx. battery voltage

2) Front and Rear Wiper Switch

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position	Terminal					
	S1	S2	B	W	E	PL
WASH I				●	●	
OFF	●	●				
ON		●	●			
WASH II		●	●	●	●	

9Y1210822CAS020US

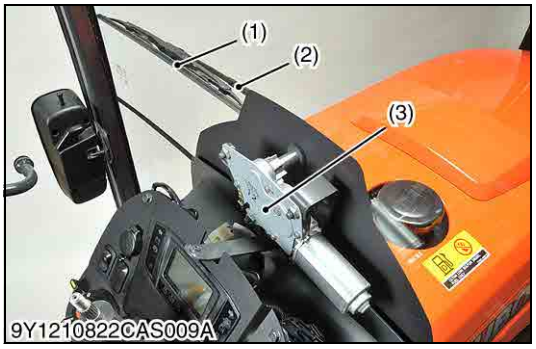
(Reference)

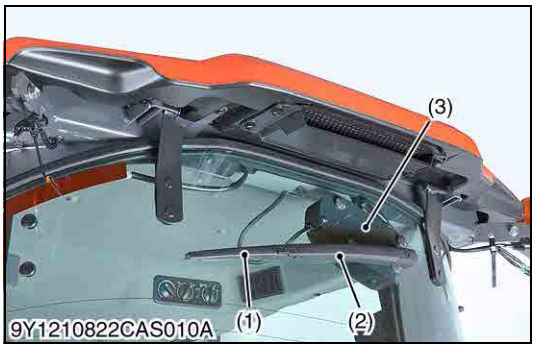
- **WASH I**: **"OFF"** side of the wiper switch remains pushed in.
- **WASH II**: **"ON"** side remains pushed in after the wiper switch is switched **"ON"** and remains switched **"ON"**.
- **B**: Earth teminal
- **PL**: To combination switch

(1) Front and Rear Wiper Switch
(2) Wiper Switch Connector (Switch Side)
(3) Wiper Switch Connector (Wiring Harness Side)

9Y1210822CAS0049US0

(10) Wiper Motor





Front and Rear Wiper Motor

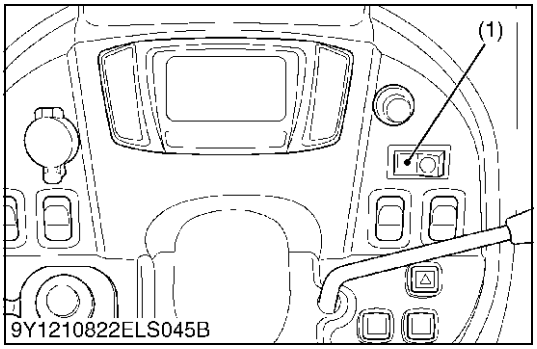
1. Raise up the wiper arm (2).
2. Turn the main switch to **"ON"** position.
3. Push the front wiper switch to **"ON"** position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

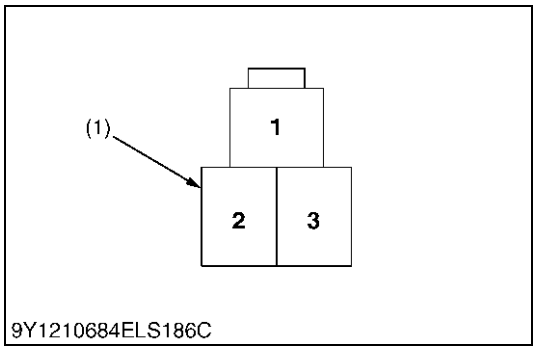
No. of wiper arm swing frequency at no load	Factory specification	33 to 43 times/min.

(1) Wiper Blade
(2) Wiper Arm
(3) Wiper Motor

9Y1210822CAS0050US0

(11) Defogger





Defogger Switch

1. Remove the meter panel lower cover and disconnect the **3P** connector from defogger switch (1).
2. Remove the defogger switch (1).
3. Perform the following checking.

(1) Defogger Switch

9Y1210822ELS0080US0

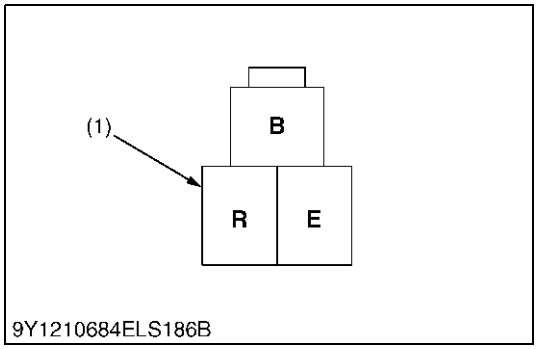
1) Connector Voltage

1. Turn the main key switch **"ON"** position.
2. Measure the voltage with a voltmeter across the terminals shown in the table below.
3. If the reference value as shown in the table below is not indicated, check the relating electric circuit.

Voltage	Main switch at **"ON"**	Terminal **1** – Chassis	Approx. battery voltage

(1) Connector (Harness Side)

9Y1210822ELS0081US0



9Y1210684ELS186B

2) Switch Continuity

1. Check the continuity across the terminals shown in the table below.
2. If the continuity specified below is not indicated, the switch is faulty.

Position		Terminal		
		B	R	E
Defogger switch	OFF		●	●
	ON	●	●	●

9Y1210822ELS041US

(1) Connector (Switch Side)

9Y1210822ELS0082US0

9Y1210822ELS003D

9Y1210822ELS005B

Other Relays

1. Remove the relays (1).
2. Apply battery voltage across **1** terminal and **2** terminal, and check for continuity across the **3** terminal and **4** terminal.
3. If 0 Ω is not indicated, renew the relays (1).

Resistance	**3** terminal – **4** terminal	Battery voltage is applied across **1** terminal and **2** terminal	0 Ω

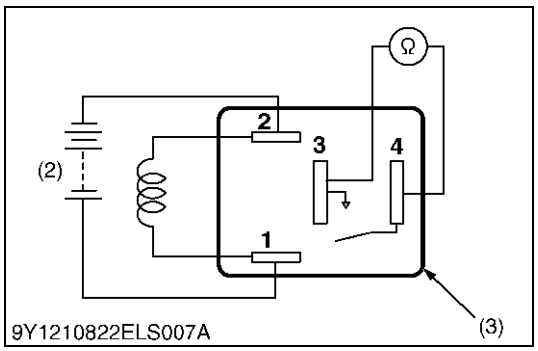
■ Color of wiring

[B2650]

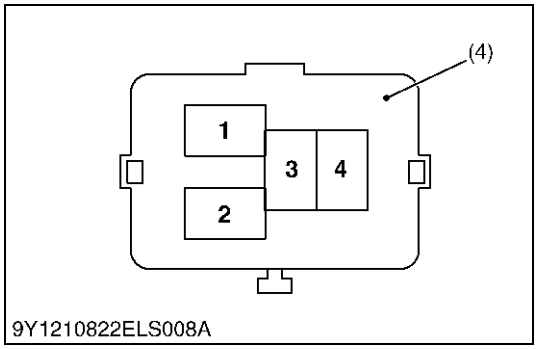
Item	Terminal No.	Color of Wiring
Defogger Relay	1	Gr/R
	2	B
	3	W/R
	4	P

[B3350]

Item	Terminal No.	Color of Wiring
Defogger Relay	1	Gr/R
	2	B
	3	W/R
	4	R



9Y1210822ELS007A



9Y1210822ELS008A

(1) Relay
(2) Battery
(3) Connector (Relay)
(4) Connector (Wire Harness)

[A] B2650
[B] B3350

9Y1210822CAS0051US0

[2] DISASSEMBLING AND ASSEMBLING

(1) Separating Cabin from Tractor Body

■ **NOTE**
- **Without discharging the refrigerant from system.**

9Y1210822CAS0052US0

Battery Cable

1. Open the bonnet and remove the side cover.
2. Disconnect the battery negative cable (1).

■ **NOTE**
- **When disconnecting the battery cables, disconnect the grounding cable first. When connecting, the positive cable first.**

(1) Battery Negative Cable

9Y1210822RAS0004US0

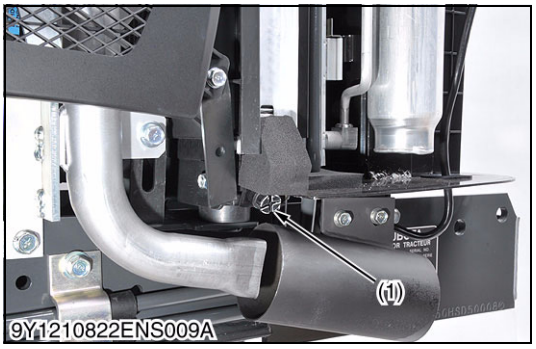
Rear Wheel and 3-Point Linkage

1. Place the disassembling stand under the transmission case.
2. Remove the rear wheel (1).
3. Remove the top link, lower links and lift rods.

Tightening torque	Rear wheel mounting nut	167 to 191 N·m 17 to 19.5 kgf·m 123 to 141 lbf·ft
	Rear wheel mounting screw	196 to 225 N·m 20 to 23 kgf·m 145 to 166 lbf·ft

(1) Rear Wheel

9Y1210822HYS0010US0



Draining Coolant

⚠ CAUTION
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

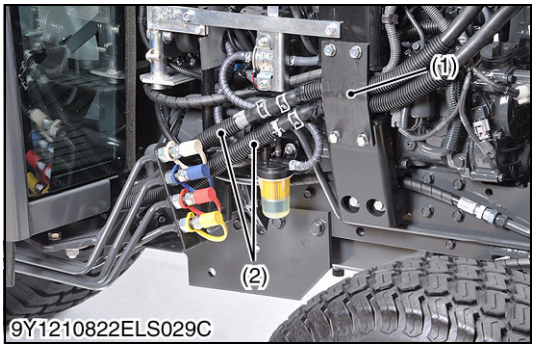
1. Stop the engine and let cool down.
2. To drain the coolant, turn the drain plug (1) counterclockwise.
3. Remove the radiator cap to completely drain the coolant.
4. After all coolant is drained, reinstall the radiator drain plug.

(When reassembling)

Coolant	Capacity	4.3 L 4.5 U.S.qts 3.8 Imp.qts

(1) Drain Plug

9Y1210822ENS0004US0



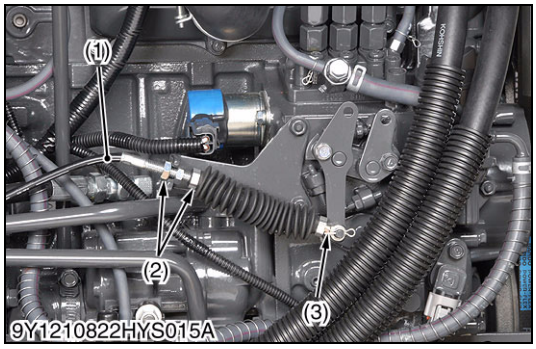
Heater Hose

1. Remove the plate (1) from pillar.
2. Disconnect the heater hoses (2), and then reconnect their hoses to make loop.

■ **NOTE**
- **Put a mark to the each heater hoses before disconnecting.**

(1) Plate (2) Heater Hose

9Y1210822HYS0011US0



Accelerator Wire (B2650)

1. Disconnect the accelerator wire (1).

(When reassembling)

- Set the end of wire inner (3) first. Then adjust the length of the wire outer section so that the wire inner section has no play, and tighten the lock nut (2).

(1) Accelerator Wire
(2) Lock Nut
(3) Accelerator Inner

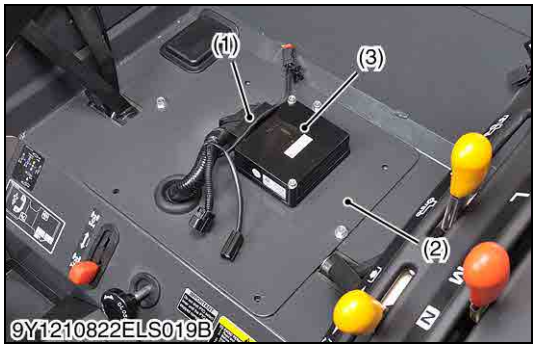
9Y1210822HYS0021US0

Seat and Lever Guide

1. Disconnect the OPC switch connector and remove the seat (1).
2. Remove the each lever grips (2).
3. Remove the lever guides (3).

(1) Seat
(2) Lever Grip
(3) Lever Guide

9Y1210822HYS0012US0

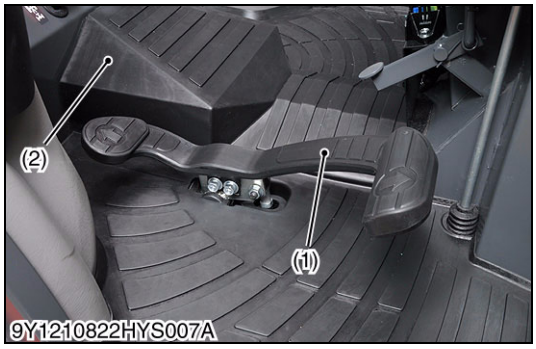


Seat Under Cover

1. Disconnect the ECU connector (1) and seat under cover (2) with ECU (3).

(1) ECU Connector
(2) Seat Under Cover
(3) ECU

9Y1210822HYS0013US0



HST Pedal and Floor Mat

1. Remove the HST pedal (1) and floor mat (2).

(1) HST Pedal
(2) Floor Mat

9Y1210822HYS0014US0

Lowering Speed Adjusting Shaft and Front Wheel Drive Lever Knob

1. Tap out the spring pin and remove the lowering speed adjusting shaft (1).
2. Remove the front wheel drive lever knob (2).

(1) Lowering Speed Adjusting Shaft
(2) Front Wheel Drive Lever Knob

9Y1210822HYS0015US0

Position Control Lever and Cruise Control Lever

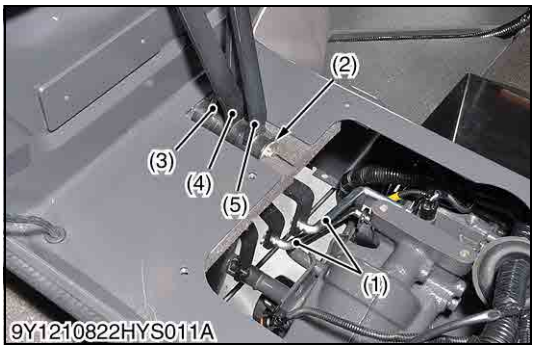
1. Remove the cruise control cable (2) from cruise control lever (4).
2. Remove the lever mounting nut (5), cruise control lever (4) and position control lever (6).

(When reassembling)

- Set the end of cable inner first. Then adjust the length of the cruise control cable outer section so that the cable inner section (1) has no play, and tighten the lock nut (3). (Due to a force of the spring in cruise control lever (4), the lever is set to the right side (outside) from the operator's seat.)

(1) Cable Inner Section
(2) Cruise Control Cable
(3) Lock Nut
(4) Cruise Control Lever
(5) Lever Mounting Nut
(6) Position Control Lever

9Y1210822HYS0016US0

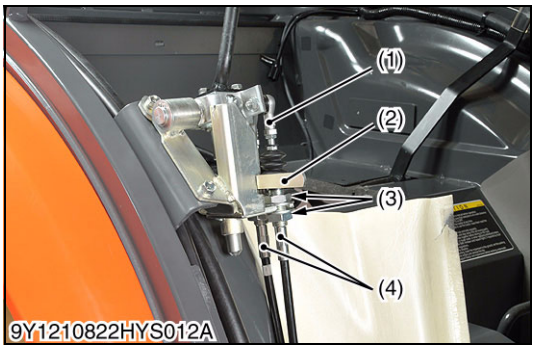


Range Gear Shift Lever, PTO Clutch Lever and PTO Select Lever

1. Remove the spring lock pins from shift rods (1).
2. Remove the external circlip (2), range gear shift lever (3), PTO clutch lever (5), and PTO select lever (4).

(1) Shift Rod
(2) External Circlip
(3) Range Gear Shift Lever
(4) PTO Select Lever
(5) PTO Clutch Lever

9Y1210822HYS0017US0



Front Loader Cables

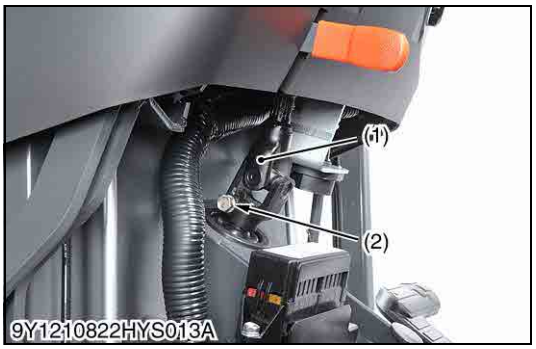
1. Loosen the lock nuts (3) and remove the front loader cables (4).

(When reassembling)

- Set the lock lever (2) to lock position.
- Fix the ball joint (1) first.
- Adjust the length of the front loader cable (4) outer section so that the cable inner section has no play, and tighten the lock nut (3).

(1) Ball Joint
(2) Lock Lever
(3) Lock Nut
(4) Front Loader Cable

9Y1210822HYS0018US0



Universal Joint Mounting Bolt

1. Remove the universal joint mounting bolt (2).

(When reassembling)

Tightening torque	Universal joint mounting bolt	24 to 28 N·m 2.5 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Universal Joint
(2) Bolt

9Y1210822HYS0019US0

Electric Wiring

1. Disconnect the wiring connectors (1).

(1) Wiring Connector

9Y1210822HYS0020US0

Brake Pedal Rods

1. Disconnect the both left and right sides brake pedal rods (1).

(1) Brake Pedal Rod

9Y1210822HYS0022US0

Cabin Mounting Bolts

1. Remove the bolts and nuts (1).

(When reassembling)

Tightening torque	Cabin mounting bolt and nut	124 to 150 N·m 12.7 to 15.2 kgf·m 91.5 to 110 lbf·ft

(1) Bolt and Nut

9Y1210822HYS0023US0

Cabin Assembly

1. Remove the outer roof of cabin.
2. Hook the cabin with nylon slings not to damage the cabin.
3. Dismount the cabin from the tractor body.
4. Support the cabin with a stand.

■ **NOTE**

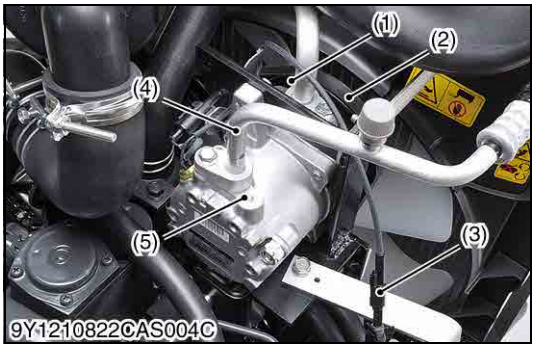
- **Lift and turn the cabin while making sure it does not catch on anything.**

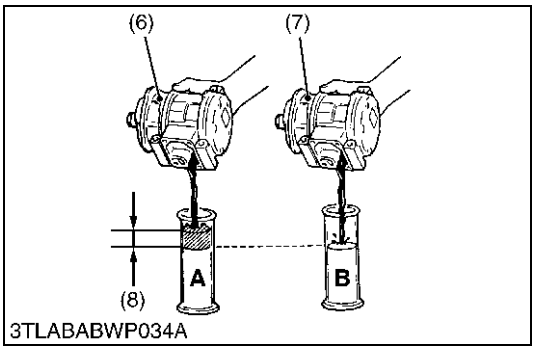
(When reassembling)

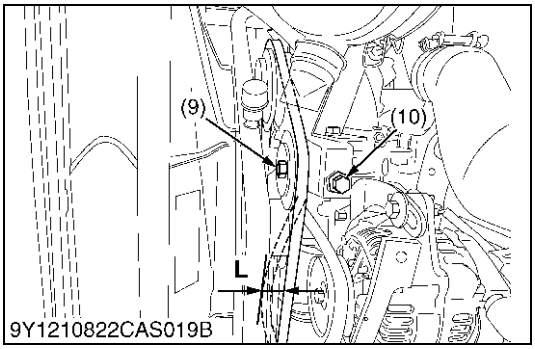
- Be sure to install the washer and mount rubbers, etc, in their original position.

9Y1210822HYS0024US0

(2) Removing Compressor Assembly







Compressor Assembly

1. Discharge the refrigerant from the system. (See page 9-S17.)
2. Disconnect the low pressure pipe (suction) (4) and high pressure pipe (discharge) (1) from the compressor, then cap the open fitting immediately to keep moisture out of the system.
3. Disconnect the **1P** connector (3) of magnetic clutch.
4. Remove the air conditioner belt (2) and remove the compressor (4) with stay.

(When reassembling)

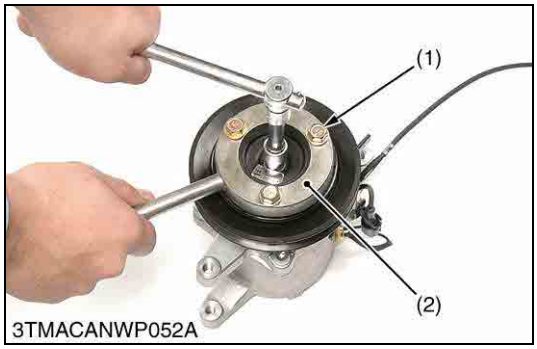
- After reassembling the compressor, be sure to adjust the air conditioner belt tension and recharge the refrigerant to the system. (See page 9-S19, 9-S22.)
- Apply compressor oil (DENSO CO. ND-OIL8 or equivalent) to the O-rings and be careful not to damage them.
- **"S"** letter is marked on the compressor for connecting the low pressure pipe (suction side).
- **"D"** letter is marked on the compressor for connecting the high pressure pipe (discharge side).
- When replacing the compressor with a new one, meet the oil amount with old one.
- Push on the belt between the pulleys with a finger. Deflection **"L"** of 10 to 12 mm (0.40 to 0.48 in.) under a 98 N (10 kgf, 22 lbf) load is appropriate.

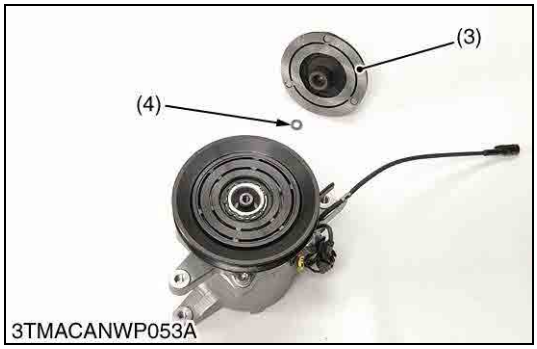
Tightening torque	High pressure pipe and low pressure pipe mounting screw	7.90 to 11.8 N·m 0.806 to 1.20 kgf·m 5.83 to 8.70 lbf·ft
	Compressor mounting screws	24.5 to 29.4 N·m 2.50 to 2.99 kgf·m 18.1 to 21.6 lbf·ft

(1) High Pressure Pipe 1
(2) Air Conditioner Belt
(3) **1P** Connector (Magnetic Clutch)
(4) Low Pressure Pipe
(5) Compressor
(6) New Compressor
(7) Old Compressor
(8) Remove the Excess Oil (**A-B**)
(9) Tension Pulley Bolt
(10) Adjusting Bolt

A: Oil Flow New Compressor
B: Oil Flow Replace Compressor
L: Deflection (10 to 12 mm (0.40 to 0.48 in.))

9Y1210822CAS0053US0





Hub Plate

1. Three stopper bolts (1) are set in stopper magnetic clutch (2) at the position corresponding to the shape of compressor.
2. The stopper magnetic clutch (2) is hung on hub plate (3) and it is fixed that the compressor rotates.
3. Remove the magnetic clutch mounting screw.
4. Remove the hub plate (3) and air gap adjustment shim (4).

(When reassembling)

- Do not apply grease or oil on the hub plate facing.
- Do not use the magnetic clutch mounting screw again.
- Make sure to turn rotor by hand after assembling and not contact with stator and hub plate.
- Check and adjust the air gap before tight the magnet clutch mounting screw to the specified torque.

Tightening torque	Magnetic clutch mounting screw	15 to 21 N·m 1.5 to 2.1 kgf·m 11 to 15 lbf·ft

(1) Stopper Bolt
(2) Stopper Magnetic Clutch
(3) Hub Plate
(4) Shim

9Y1210822CAS0054US0

Rotor

1. Remove the external circlip (1).
2. Remove the rotor (2).

(When reassembling)

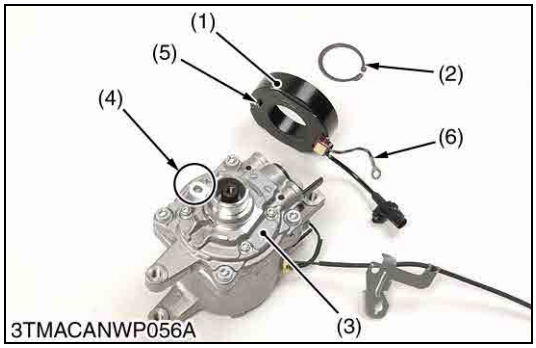
- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of rotor.
- The width of expanding of external circlip is set in boss of shaft as a minimum.

(Reference)

- Code No. for external circlip: T1065-87450

(1) External Circlip
(2) Rotor

9Y1210822CAS0055US0



Stator

1. Remove the lead wire (6) from compressor body.
2. Remove the external circlip (2).
3. Remove the stator (1).

(When reassembling)

- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of front housing.
- The width of expanding of external circlip is set is boss of shaft as a minimum.
- Match and assemble the concave part (4) of the front housing (3) and the pin (5) of stator.

(Reference)

- Code No. for external circlip: T1065-87440

(1) Stator
(2) External Circlip
(3) Front Housing
(4) Concave Part
(5) Pin
(6) Lead Wire

9Y1210822CAS0056US0

(3) Removing Air Conditioner Unit

Draining Coolant

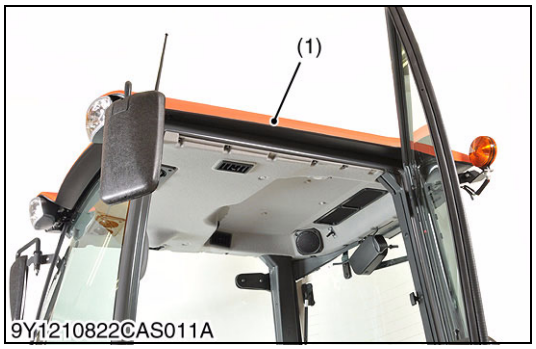
- See page 9-S32.

9Y1210822CAS0057US0

Discharging Refrigerant

- See page 9-S17.

9Y1210822CAS0058US0



Outer Roof and Stay

1. Remove the outer roof (1).
2. Remove the stay (2).

Tightening torque	Outer roof mounting bolt	3.5 to 4.0 N·m 0.36 to 0.40 kgf·m 2.6 to 2.9 lbf·ft

(1) Outer Roof
(2) Stay

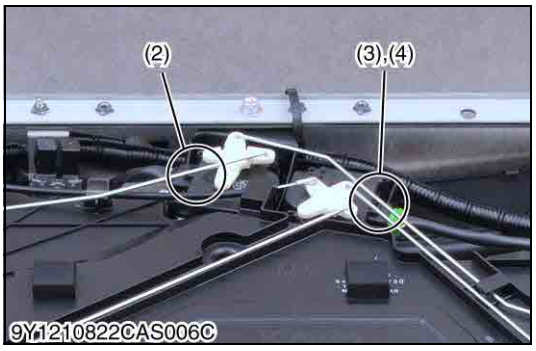
9Y1210822CAS0059US0

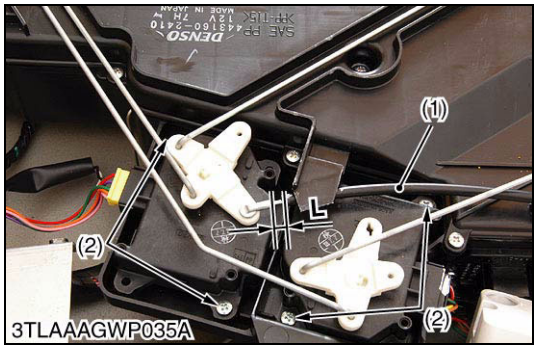
Wiring Harness

1. Remove the inner roof.
2. Disconnect the temperature motor connector (3), and thermostat connectors (4).
3. Disconnect the mode motor connector (2) and blower resister (1) connector.

(1) Blower Resister
(2) Mode Motor Connector
(3) Temperature Motor Connector
(4) Thermostat Connector

9Y1210822CAS0060US0





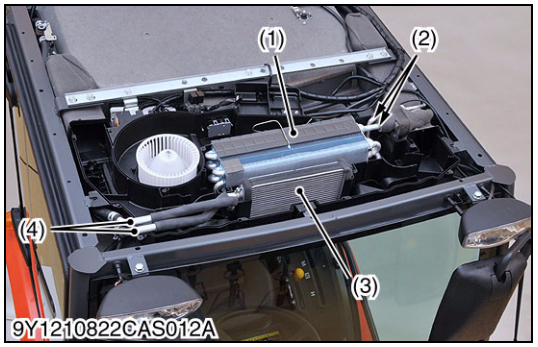
Water Cable, Temperature Motor and Mode Motor

1. Disconnect the water cable (1).
2. Remove the motor screws (2).

(1) Water Cable
(2) Motor Screw

L: 6 mm (0.2 in.)

9Y1210822CAS0061US0



Air Conditioning Unit

1. Remove the unit cover.
2. Disconnect the heater hoses (4).
3. Disconnect the air conditioner pipes (2).
4. Remove the screws and the unit.
5. Remove the duct hoses.

(When reassembling)

- When reconnecting the cooler pipes with the unit, apply compressor oil (DENSO CO. ND-OIL8 or equivalent) to O-rings.
- When remounting the unit, tighten five screws by hand and finally retighten them after aligning the inner roof duct with the unit duct.
- When connecting the heater hose with A/C unit, hose should be put into the A/C unit pipe more than 30 mm (1.2 in.)

Tightening torque	A/C unit mounting screw (M6)	4.0 to 6.8 N·m 0.40 to 0.70 kgf·m 2.9 to 5.0 lbf·ft
	A/C unit mounting screw (M8)	9.81 to 11.6 N·m 1.00 to 1.19 kgf·m 7.24 to 8.60 lbf·ft
	Low pressure pipe (Cooler pipe (suction)) retaining nut	7.90 to 11.8 N·m 0.806 to 1.20 kgf·m 5.83 to 8.70 lbf·ft
	High pressure pipe (Cooler pipe (liquid)) retaining nut	11.8 to 14.7 N·m 1.21 to 1.49 kgf·m 8.71 to 10.8 lbf·ft

(1) Evaporator
(2) Air Conditioner Pipe
(3) Heater Core
(4) Heater Hoses

9Y1210822CAS0062US0

(4) Removing Air Conditioner Pipes

Discharging Refrigerant

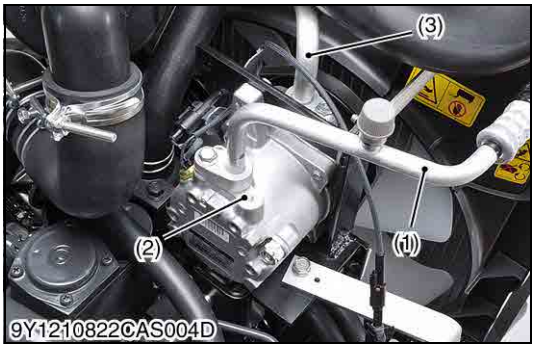
- See page 9-S17.

9Y1210822CAS0058US0

Bonnet

- See page 1-S21.

9Y1210822CAS0064US0



High Pressure Hose 1, 2 and Low Pressure Hose

1. Disconnect the low pressure hose (3) and high pressure hose 1 (1) from the compressor (2), then cap the open fittings immediately to keep moisture out of the system.
2. Slide the condenser (4).
3. Disconnect the high pressure hose 1 (1) from the condenser (4) and cap the place immediately which disconnected pressure hose to keep moisture out of the system.
4. Disconnect the high pressure hose 2 (6) from the receiver (5) and cap the place immediately which disconnected pressure hose to keep moisture out of the system.

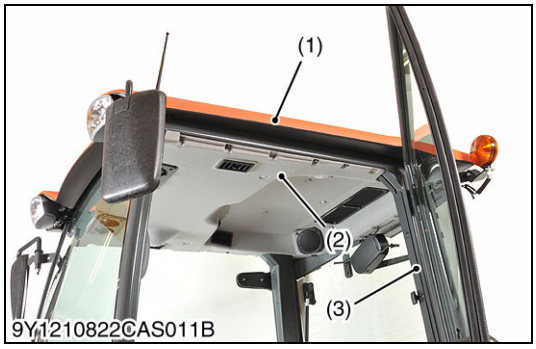
(When reassembling)

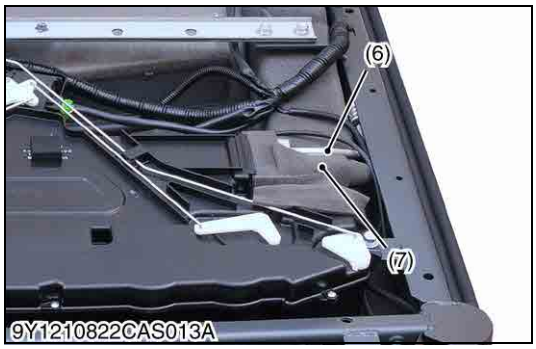
- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and be careful not to damage them.

Tightening torque	Low pressure hose mounting screw (compressor side)	7.9 to 11 N·m 0.80 to 1.2 kgf·m 5.8 to 8.6 lbf·ft
	High pressure hose 1 mounting screw (compressor side)	7.9 to 11 N·m 0.80 to 1.2 kgf·m 5.8 to 8.6 lbf·ft
	High pressure hose 1 mounting screw (condenser side)	7.9 to 11 N·m 0.80 to 1.2 kgf·m 5.8 to 8.6 lbf·ft
	High pressure hose 2 retaining nut (receiver side)	12 to 14 N·m 1.2 to 1.5 kgf·m 8.7 to 10 lbf·ft

(1) High Pressure Hose 1
(2) Compressor
(3) Low Pressure Hose
(4) Condenser
(5) Receiver
(6) High Pressure Hose 2

9Y1210822CAS0067US0





(5) Removing Heater Hoses

High Pressure and Low Pressure Pipes

1. Remove the outer roof (1), inner roof (2) and inner cover (3).
2. Remove the lever grips and lever guide (4).
3. Remove the floor mat (5).
4. Disconnect the high pressure pipe 2 (7), then cap the open fitting immediately to keep moisture out of the system.
5. Remove the rubber and disconnect the low pressure pipe (6), then cap the open fittings immediately to keep moisture out of the system.

(When reassembling)

- Replace the rubber with a new one.
- Apply compressor oil (DENSO ND-OIL 8 or equivalent) to the O-rings and be careful not to damage them.

Tightening torque	High pressure pipe 2 retaining nut	11.8 to 14.7 N·m 1.21 to 1.49 kgf·m 8.71 to 10.8 lbf·ft
	Low pressure pipe retaining nut	7.90 to 11.8 N·m 0.806 to 1.20 kgf·m 5.83 to 8.70 lbf·ft

(1) Outer Roof
(2) Inner Roof
(3) Inner Cover
(4) Lower Guide
(5) Floor Mat
(6) Low Pressure Pipe
(7) High Pressure Pipe 2

9Y1210822CAS0068US0

Battery Cable

- See page 9-S32.

9Y1210822CAS0069US0

Draining Coolant

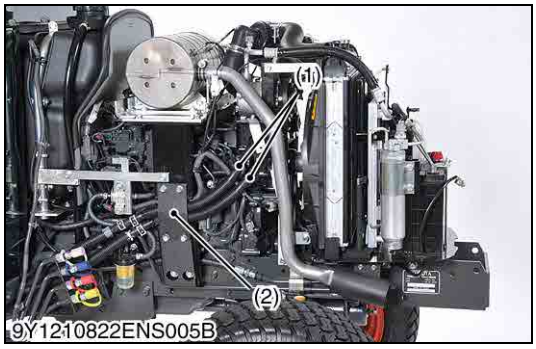
- See page 9-S32.

9Y1210822CAS0057US0

Bonnet

- See page 1-S21.

9Y1210822CAS0064US0



Hose Clamp

1. Remove the plate (2).
2. Disconnect the heater hoses (1), then remove them under the cabin.

■ **NOTE**

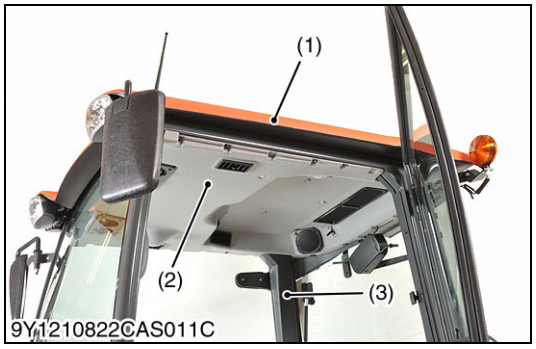
- **Before disconnecting the heater hoses (1), put the parting marks on the hoses for marking proper reconnecting.**

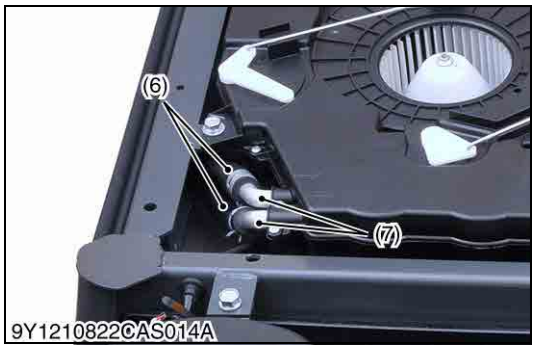
(When reassembling)

- Connecting the heater hoses at their original position.

(1) Heater Hoses
(2) Plate

9Y1210822CAS0072US0





(6) Cabin Windshields

Heater Hoses

1. Remove the outer roof (1), inner roof (2) and inner cover (3).
2. Remove the lever grips, lever guide (4) and floor mat (5).
3. Disconnect the heater hoses (6) from the hose pipes (7).
4. Pull out the heater hoses (6) from the bottom of the cabin.
5. Remove the heater hoses (6).

■ **NOTE**

- **Before disconnecting the heater hoses (6), put the parting marks on the hoses for marking proper reconnecting.**

(When reassembling)

- Connect the heater hoses at their original positions.
- In assembling the heater hose (6) to the pipe (7), connect the heater hose with identification mark (white paint) to upper side of the hose pipe.
- When connecting the heater hose with A/C unit, hose should be put into the A/C unit pipe more than 30 mm (1.2 in.).

(1) Outer Roof
(2) Inner Roof
(3) Inner Cover
(4) Lever Guide
(5) Floor Mat
(6) Heater Hose
(7) Heater Pipe

9Y1210822CAS0073US0

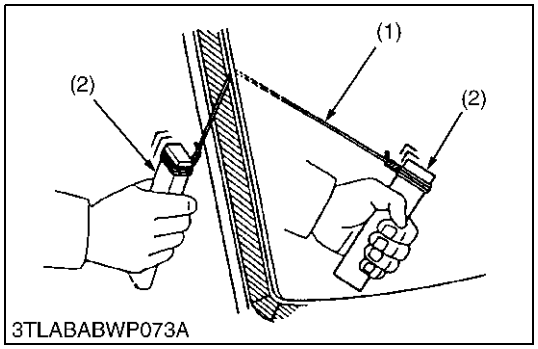
Preparation

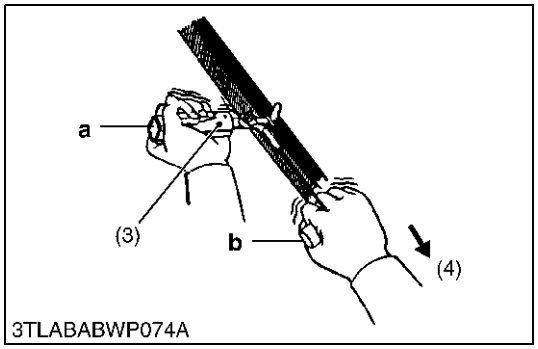
1. Prepare the followings.
   - Cutter knife :1 piece
   - Scraper : 1 piece
   - Gun for coating : 1 piece
   - Sika Flex 250P-JM-1 or equivalent
   - Gummed tape
   - Sika primer 260P-JM-1
   - Shin Etsu silicon KE420
   - Sika-cleaner 205

■ **NOTE**

- **Sika product are made by Sika Corporation.**
- **Shin Etsu silicon KE420 is made by Shin Etsu Polymer Corporation.**
- **These materials can't be provided by Kubota Corporation.**
- **Therefore, please find the local made equivalent materials in your country and use them when you need.**

9Y1210822CAS0074US0





Before Replacing Windshields (1)

[In case of using piano wire (When glass is clacked)]

1. Thread the piano wire from the inside of cabin. Tie its both ends to a wooden blocks or the like. (See the left figure.)
2. Pull the piano wire inward/outward alternately to cut the adhered part.

■ **NOTE**

- **Do not let the piano wire make sliding contact with the edge of glass plate forcibly.**

[In case of using cutter knife (When glass is totally crushed finely)]

1. Insert the knife (3) into the adhered part.
2. Keep the edge of knife blade square to the glass edge at the part **"a"**. Slide the knife blade along the glass surface and the edge. Pull the part **"b"** in the direction parallel to the glass edge to cut them off.

■ **NOTE**

- **Find a wider gap between the glass and body.**
- **Be careful of handling the cutter knife not to damage your hand.**

(1) Piano Wire
(2) Wood Peace
(3) Cutter Knife
(4) Pulling

9Y1210822CAS0075US0

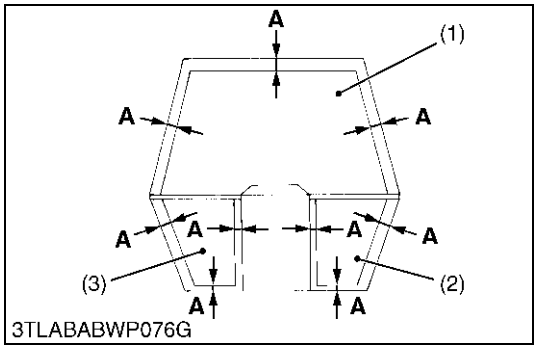
Before Replacing Windshields (2)

1. When the Sika Flex 250P-JM-1 or equivalent attached to the cabin frame and the glass are reused, remove the bond clearly.

■ **NOTE**

- **Remove the bond completely.**

9Y1210822CAS0076US0



Before Replacing Windshields (3)

1. Check that the glasses are not damaged and cracked.
2. The cleaning area of the rear surface is indicated **"A"** in the figure left.

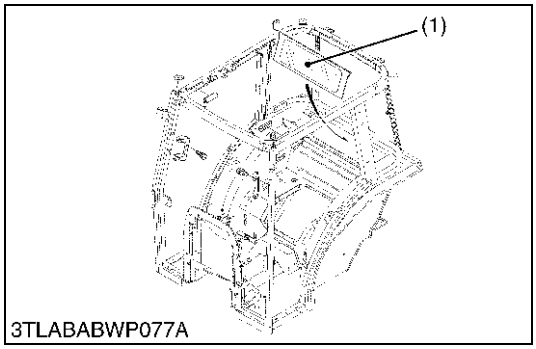
■ **NOTE**

- **If not cleaning the glass, it may result in adhesive failure.**

(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)

A: 18 to 22 mm (0.71 to 0.87 in.)

9Y1210822CAS0077US0



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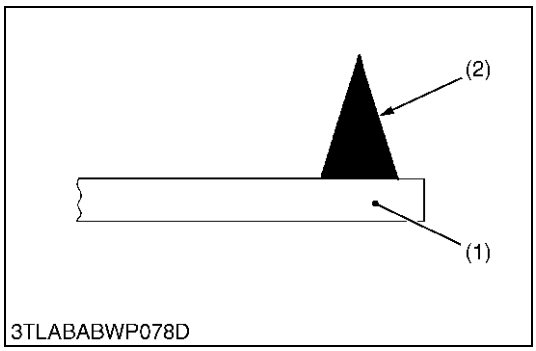

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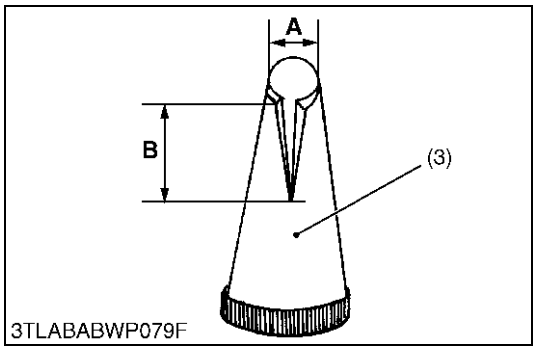


3TLABABWP079F

Rear Windshield

1. Apply a Sika primer 260P-JM-1 on the cabin frame.
2. Apply a Sika Flex 250P-JM-1 (2) (or equivalent) on the rear windshield (1) as shown in figure.
3. Install the rear windshield (1) to the cabin and fix tit with a gummed tape.
4. Leave it for one hour.

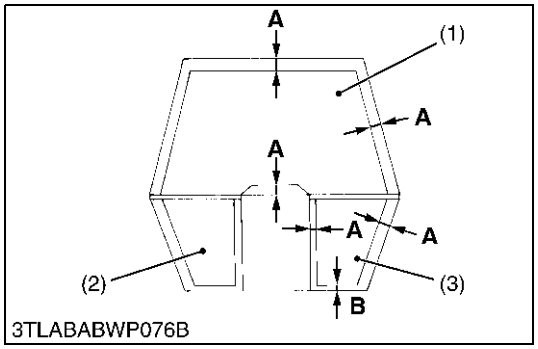
■ **NOTE**

- **Apply the Sika Flex 250P-JM-1 (or equivalent) with the jig having the specified tip shape as shown in the figure left.**
- **Apply it with a uniform speed to minimize unevenness.**
- **Follow the instruction manual of Sika Flex 250P-JM-1.**
- **When the gummed tape is removed the rear windshield may be displaced. In this case fix it again.**
- **Remove the gummed tape (adhesive tape) little by little to make sure the bonding condition.**

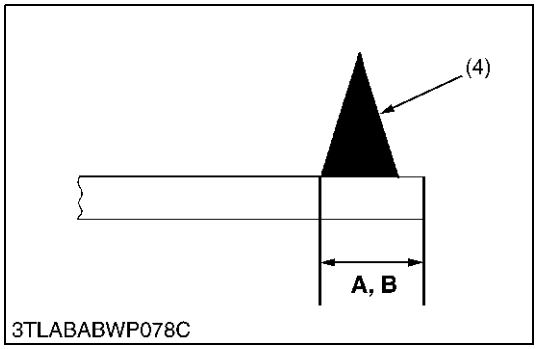
(1) Rear Windshield
(2) Sika Flex 250P-JM-1
(3) Jig

A: 8 mm dia. (0.31 in. dia.)
B: 12 mm (0.47 in.)

9Y1210822CAS0078US0



3TLABABWP076B



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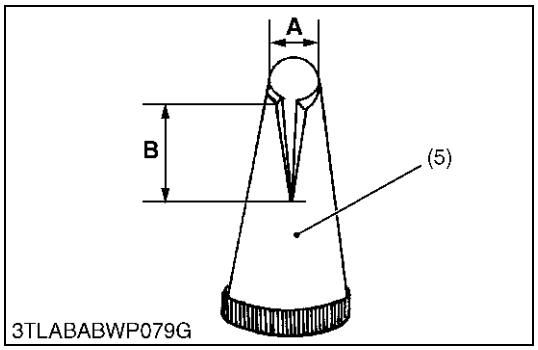
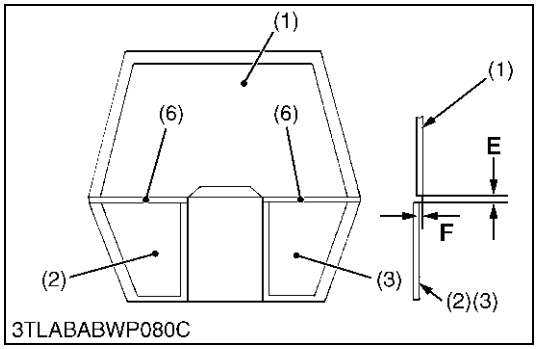


3TLABABWP079G



3TLABABWP080C

3TLABABWP081C

Front Windshield

■ **NOTE**
- **Apply the Sika Flex 250P-JM-1 (or equivalent) with the jig having the specified tip shape as shown in the figure left.**
- **Apply it with a uniform speed to minimize unevenness.**
- **Follow the instruction manual of Sika Flex 250P-JM-1.**

1. Apply the Sika Primer 260P-JM-1 on the cabin frame **"A"** and **"B"** in the figure.
2. Apply the Sika Flex 250P-JM-1 (4) on the windshield **"A"** and **"B"** in the figure.
3. Install the lower (left or right) windshield to the cabin and fix it with a gummed tape.
4. Set the upper windshield to the cabin and fix it with a gummed tape.

■ **NOTE**
- **Use a jig (7) shown in the figure to create even clearance "E" [approx. 5 mm (0.2 in.)] between the lower and upper windshield.**
- **The level unevenness between the upper and lower windshields should be −1 to +1 mm (−0.04 to +0.04 in.) or less at the windshield surface.**

5. Leave it for one hour.
6. Remove the jig (7).
7. Install the H rubber (6) between the lower and upper windshield (2), (3).
8. Apply the Shin Etsu silicon KE420 in H rubber (6).
9. Apply the Shin Etsu silicon KE420 on the edge of H rubber (6).

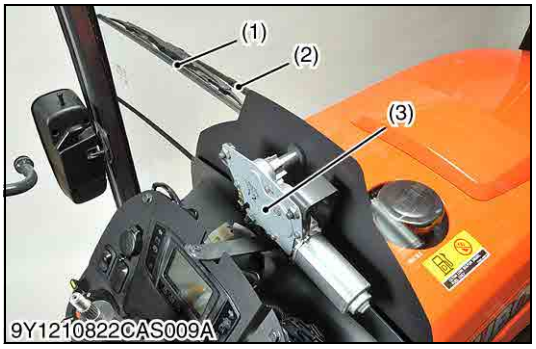
■ **NOTE**
- **When the gummed tape is removed, the glass may be displaced. In this case fix it again.**
- **Remove the gummed tape (adhesive tape) little by little to make sure the bonding condition.**

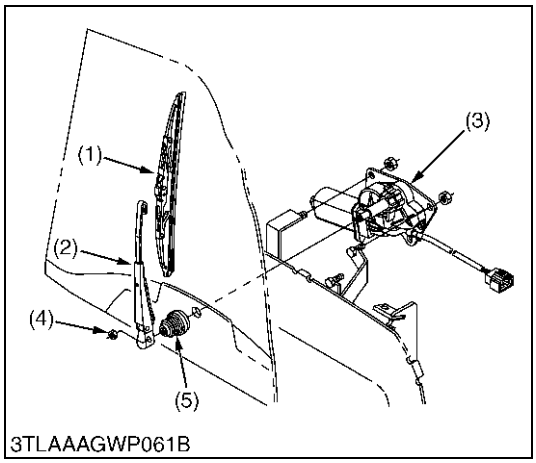
(1) Upper Windshield
(2) Lower Windshield (Right)
(3) Lower Windshield (Left)
(4) Sika Flex 250P-JM-1
(5) Jig
(6) H Rubber
(7) Jig

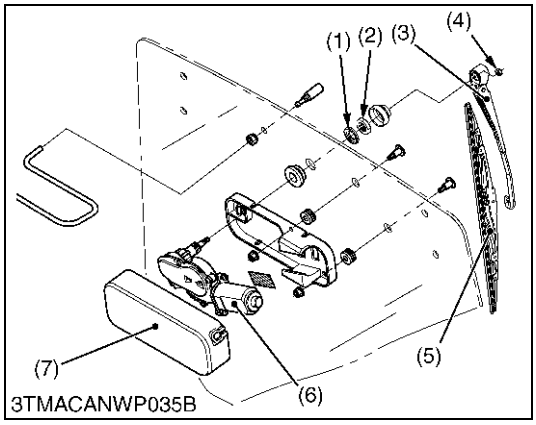
A: 10 mm (0.39 in.)
B: 12 mm (0.47 in.)
C: 8 mm dia. (0.31 in. dia.)
D: 12 mm (0.47 in.)
E: 5 mm (0.2 in.)
F: −1.0 to +1.0 mm (−0.04 to +0.04 in.)
G: 360 mm (14.2 in.)
H: 20 mm (0.8 in.)
I: 5 mm (0.2 in.)

9Y1210822CAS0079US0

(7) Wiper Motor







Front Wiper Motor

1. Remove the panel lower cover.
2. Disconnect the front wiper motor **4P** connector.
3. Remove the wiper arm mounting nut (4) and wiper arm (2).
4. Remove the wiper link cap (5).
5. Remove the front wiper motor (3).

(When reassembling)

- When attaching the wiper arm (2) to the wiper motor (3), assemble so that the dimensions are as given in the photo on the left. After doing so, check if the wiper wipes symmetrically on the left and right (bilateral symmetry).

Tightening torque	Wiper motor mounting nut	6.4 to 9.3 N·m 0.65 to 0.95 kgf·m 4.7 to 6.8 lbf·ft

Wiper blade position	Factory specification	Approx. 150 mm 5.91 in.

(1) Wiper Blade
(2) Wiper Arm
(3) Front Wiper Motor
(4) Nut
(5) Wiper Link Cap

9Y1210822CAS0080US0

Rear Wiper Motor (If equipped)

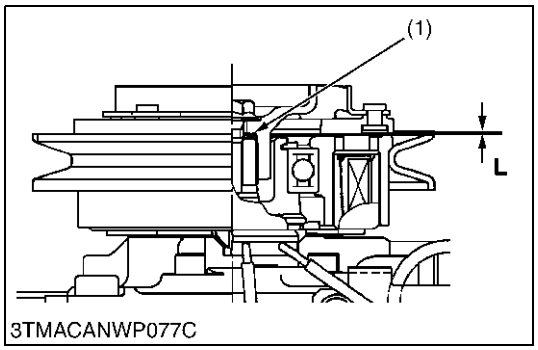
1. Remove the wiper motor cover (7).
2. Disconnect the **4P** connector from rear wiper motor (6).
3. Remove the wiper arm mounting nut (4) and wiper arm (3).
4. Remove the wiper link cap (1) and nut (2).
5. Remove the rear wiper motor mounting screws and the rear wiper motor (6).

Tightening torque	Wiper arm mounting nut	7.9 to 9.8 N·m 0.80 to 1.0 kgf·m 5.8 to 7.2 lbf·ft
	Wiper motor mounting screw	7.9 to 9.8 N·m 0.80 to 1.0 kgf·m 5.8 to 7.2 lbf·ft

(1) Wiper Link Cap
(2) Nut
(3) Wiper Arm
(4) Nut
(5) Wiper Blade
(6) Rear Wiper Motor
(7) Wiper Motor Cover

9Y1210822CAS0081US0

[3] SERVICING



Adjustment of Air Gap

1. Measure the air gap with a feeler gauge.
2. When the measurement value comes off from factory specification, adjustment shim (1) is added or deleted.

Air gap (**L**)	Factory specification	0.30 to 0.65 mm 0.012 to 0.025 in.

(Reference)

Adjusting Shim Size	Code No.
0.10 mm (0.0039 in.)	T1065-87340
0.15 mm (0.0059 in.)	T1065-87350
0.40 mm (0.016 in.)	T1065-87360
0.60 mm (0.024 in.)	T1065-87370
1.00 mm (0.0394 in.)	T1065-87380

(1) Shim **L: Air Gap**

9Y1210822CAS0082US0

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