

# WSM

---

## WORKSHOP MANUAL **UTILITY VEHICLE**

# RTV900

---

# Kubota

# TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of RTV900. It is divided into three parts, "General", "Mechanism" and "Servicing".

## ■ General

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

## ■ Mechanism

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

Refer to Diesel Engine Workshop Manual (Code No. 9Y021-01872) for the one which has not been described to this workshop manual.

## ■ Servicing

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

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

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

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

**January 2004**

**© KUBOTA Corporation 2004**



## SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.

It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.



### DANGER

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



### WARNING

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



### CAUTION

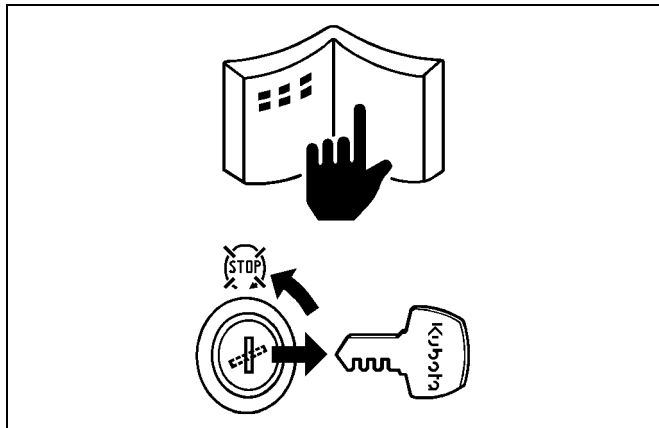
: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

### ■ IMPORTANT

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

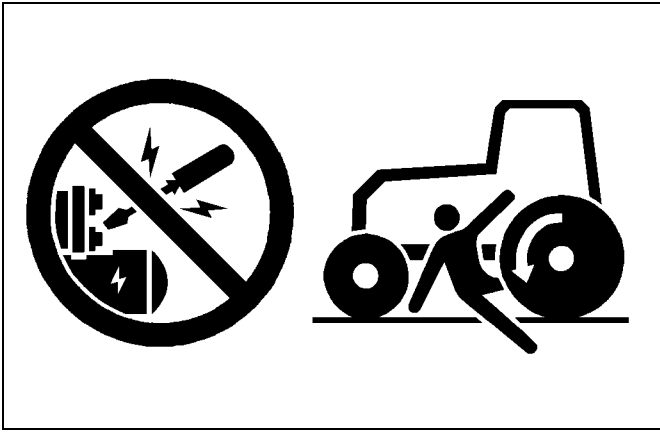
### ■ NOTE

: Gives helpful information.



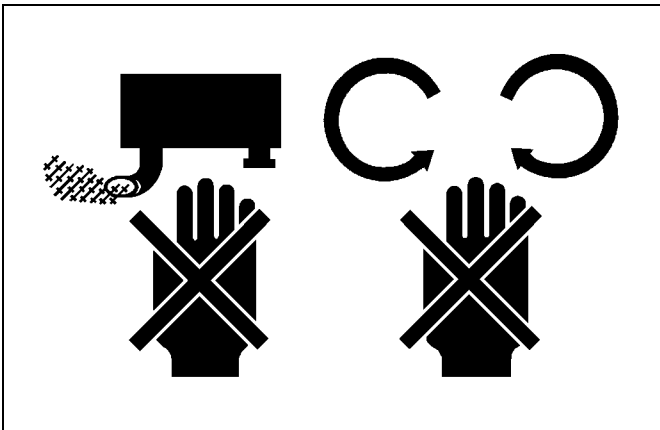
## BEFORE SERVICING AND REPAIRING

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



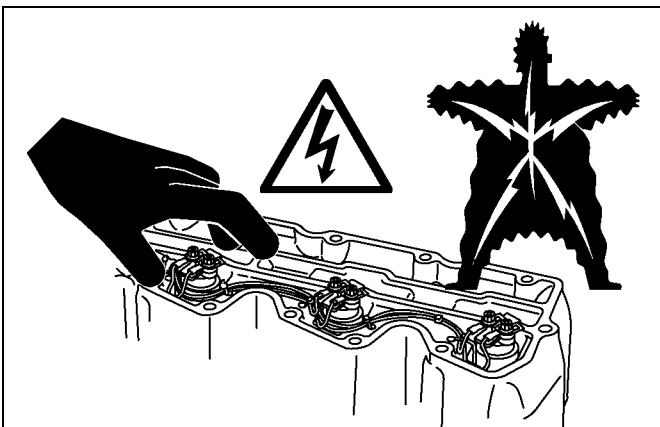
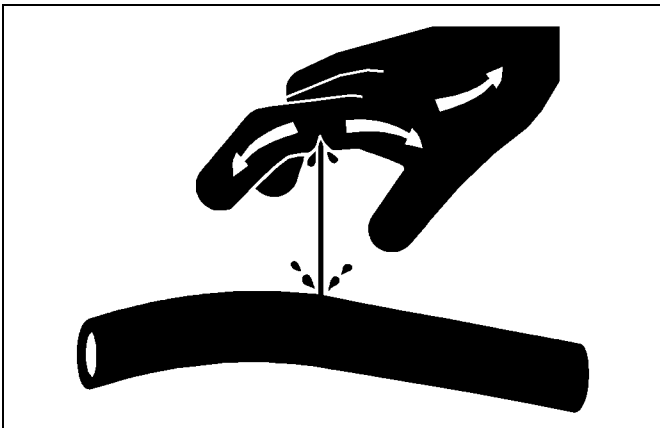
## SAFETY STARTING

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

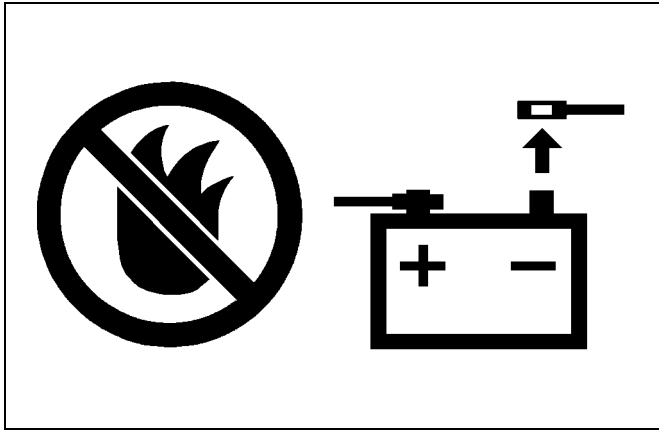


## SAFETY WORKING

- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Do not open high-pressure fuel system. High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair fuel lines, sensors, or any other components between the high-pressure fuel pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU, and is applied to the injector. Pay sufficient caution to electric shock when performing work activities.

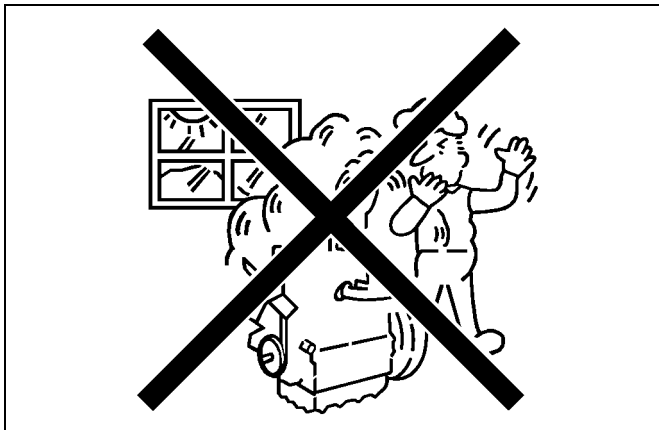






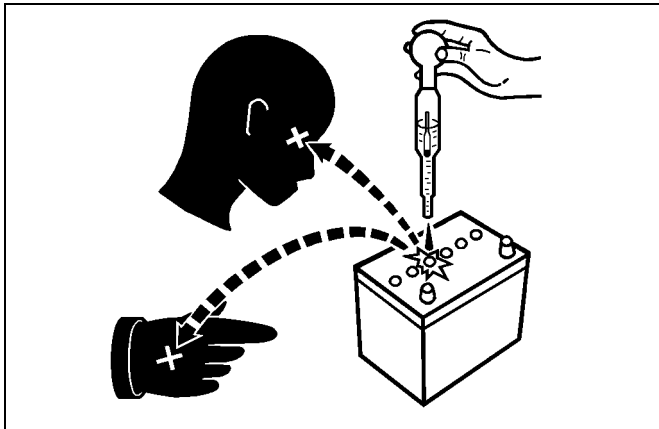
### AVOID FIRES

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



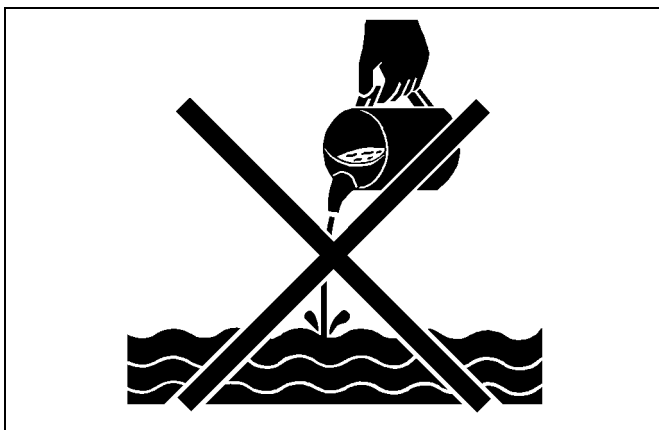
### VENTILATE WORK AREA

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



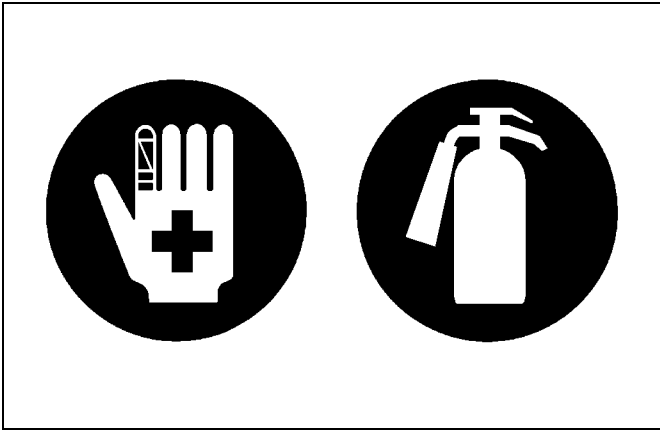
### PREVENT ACID BURNS

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



### DISPOSE OF FLUIDS PROPERLY

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

**PREPARE FOR EMERGENCIES**

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

## SAFETY DECALS

The following safety decals are installed on the machine.

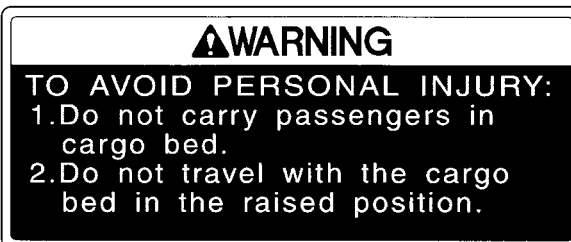
If a decal becomes damaged, illegible or is not on the machine, replace it. The decal parts number is listed in the parts list.

(1) Part No. K7561-6524-1



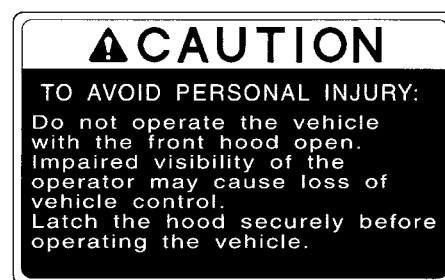
1AYAAAAAP104A

(2) Part No. K7561-6526-1



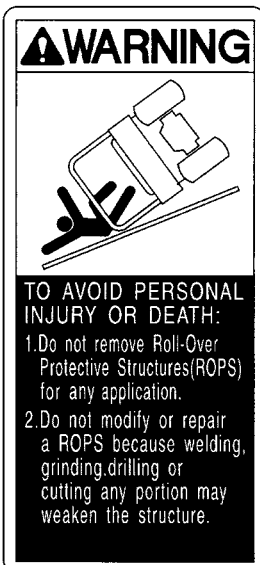
1AYAAAAAP105A

(4) Part No. K7561-6530-2



1AYAAAAAP106A

(3) Part No. K7561-6541-2



1AYAAAAAP109A

(5) Part No. K7561-6565-2

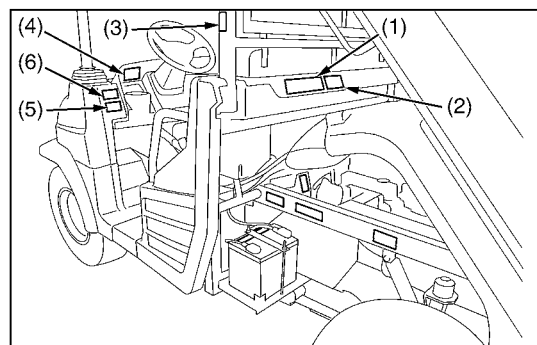


1AYAAAAAP117A

(6) Part No. K7561-6533-1



1AYAAAAAP107A



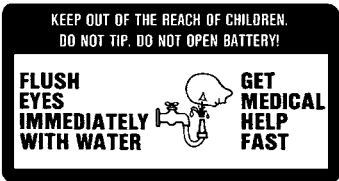
3XVAAABCP001A

(1) Part No. K1211-6115-1



1BDABARAP108A

(2) Part No. K1211-6116-1



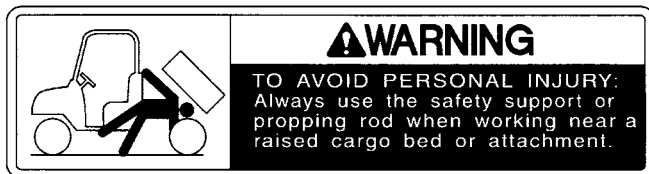
1BDABARAP109A

(4) Part No. K7561-6550-1



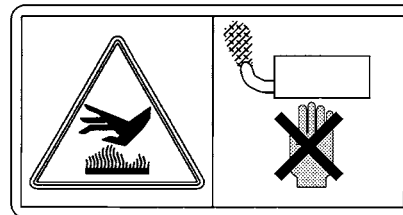
1AYAAAAAP112A

(3) Part No. K7561-6544-1

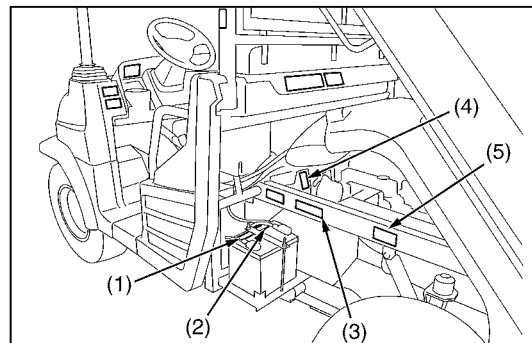


1AYAAAAAP110A

(5) Part No. K7561-6551-1



1AYAAAAAP113A



3XVAAABCP002A

(1) Part No. K7561-6522-2

<b>CAUTION</b>	
<b>TO AVOID PERSONAL INJURY:</b> 1. Read and understand the operator's manual before operation. 2. Never allow anyone without a valid driver's license to operate this vehicle. 3. Before allowing other people to use the vehicle, have them read the operator's manual. 4. This vehicle is for off road use only. Never operate on a public road. 5. Wear safety gear, including helmet and eye protection, as appropriate. 6. Check the tightness of all nuts and bolts regularly.	7. In addition to the driver, only one passenger can be carried. Minimum age for passenger is five years old. 8. Before starting the engine, make sure that everyone is at a safe distance from the vehicle and the hydraulic outlet is off (if equipped). 9. Do not operate the vehicle under the influence of drugs or alcohol. 10. Keep all shields in place and stay away from all moving parts. 11. Slow down for turns, or rough terrain. 12. Before getting off from the vehicle, apply the parking brake, stop the engine and remove the key.

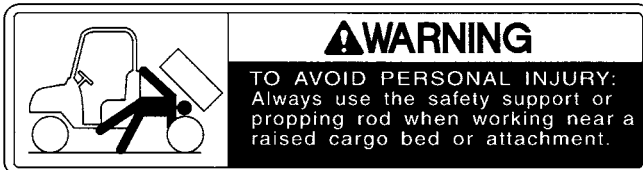
1AYAAAAAP103A

(2) Part No. K7561-6565-2



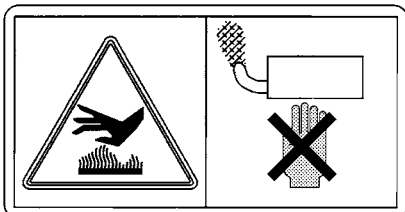
1AYAAAAAP117A

(3) Part No. K7561-6544-1



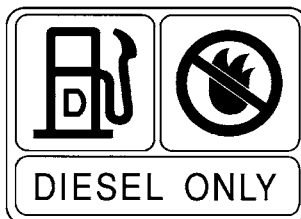
1AYAAAAAP110A

(4) Part No. K7561-6551-1



1AYAAAAAP113A

(5) Part No. K7561-6537-1



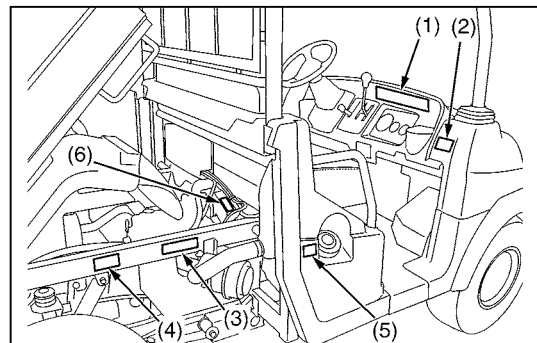
1AYAAAAAP108A

3XVAAAACP003A

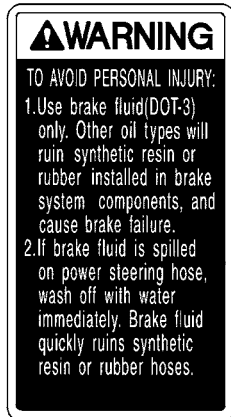
(6) Part No. K7561-6550-1



1AYAAAAAP112A



(1) Part No. K7561-6546-2



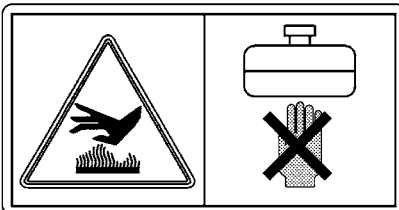
1AYAAAAAP111A

(2) Part No. K7561-6564-1

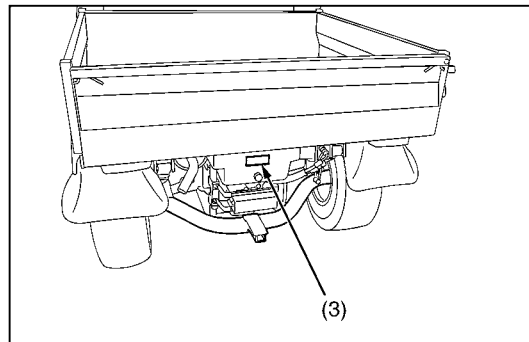
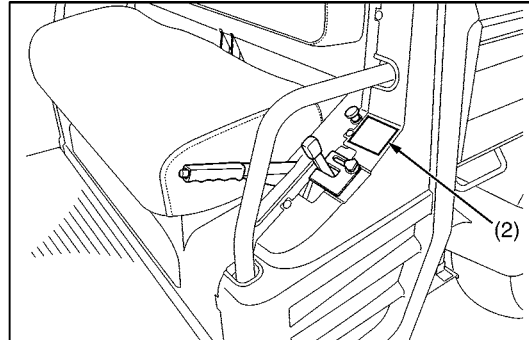
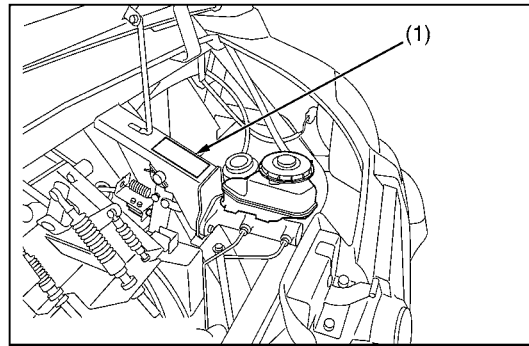


1AYAAAAAP116A

(3) Part No. K7561-6553-1 (for steel tank)  
 Part No. K7561-6563-1 (for resinous tank)



1AYAAAAAP114A



### 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 replaced component.
5. Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

3XVAAABCP004A

# SPECIFICATIONS

Model			General Purpose	Worksite	Turf	Recreational
Engine	Maker		KUBOTA			
	Model		D902-E-UV / D902-E2-UV			
	Type		Indirect Injection. Vertical, water-cooled, 4-cycle diesel			
	Number of cylinders		3			
	Bore and stroke		72 × 73.6 mm (2.83 × 2.90 in.)			
	Total displacement		898 cm <sup>3</sup> (54.8 cu.in.)			
	Engine gross power (DIN)		16.1 kW (21.6 HP)			
	Rated revolution		53.3 r/s [3200 min <sup>-1</sup> (rpm)]			
	Maximum torque		54.7 N·m (5.6 kgf-m, 40.5 lbf-ft) / 30.0 to 36.7 r/s [1800 to 2200 min <sup>-1</sup> (rpm)]			
	Battery		12 V, CCA : 535 A, RC : 80 min.			
	Starting system		Electric starting with cell starter, 12 V, 1.2 kW			
	Lubrication system		Forced lubrication by trochoidal pump			
	Cooling system		Pressurized radiator, forced circulation with water pump			
	Fuel		Diesel fuel No. 2-D [above -10 °C (14 °F)], Diesel fuel No. 1 [below -10 °C (14 °F)]			
Capacities	Fuel tank		28 L (7.4 U.S.gals, 6.2 Imp.gals)			
	Engine crankcase (with filter)		3.1 L (3.3 U.S.qts, 2.7 Imp.qts)			
	Engine coolant (with recovery tank)		4.0 L (4.2 U.S.qts, 3.5 Imp.qts)			
	Transmission case		10.0 L (2.6 U.S.gals, 2.2 Imp.gals)			
	Front axle case		0.6 L (0.63 U.S.qts, 0.52 Imp.qts)			
	Knuckle case		Ref. 0.1 L (0.10 U.S.qts, 0.09 Imp.qts)			
	Brake fluid (reservoir and lines)		0.4 L (0.42 U.S.qts, 0.35 Imp.qts)			
	Hydraulic lift oil (Hydraulic dumping system model)		8.0 L (2.1 U.S.gals, 1.8 Imp.gals)			
	Hydraulic lift oil (Hydraulic PTO model)		7.0 L (1.8 U.S.gals, 1.5 Imp.gals)			
	Power steering oil		5.9 L (1.6 U.S.gals, 1.3 Imp.gals)			
Travelling system	Tires	Front	25 × 10 – 12 Knobby, 6PLY	25 × 10 – 12 HDWS, 6PLY	23 × 10.5 – 12 Turf, 4PLY	25 × 10 – 12 ATV, 6PLY
		Rear	25 × 10 – 12 Knobby, 6PLY	25 × 10 – 12 HKDWS, 6PLY	23 × 10.5 – 12 Turf, 4PLY	25 × 11 – 12 ATV, 6PLY
	Steering		Hydrostatic power			
	Transmission		Continuously variable hydro transmission (VHT)			
	Wheels and drive		4 wheels, rear 2WD or 4WD			
	Gear selection		Hi-Med-Lo range, forward, neutral, reverse			
	Differential lock		Standard; foot operated with mechanical holder			
	Brake	Front / Rear	Wet disc type			
		Parking brake	Rear wheel, hand lever			
	Turning diameter		7.5 m (24.6 feet)			
Suspension	Front		Independent, macpherson strut-type			
	Rear		Semi-independent, devion axle with leaf springs and shock absorber			

NOTE: \* Manufacture's estimate

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

W1028103

Model			General Purpose	Worksite	Recreational	Recreational
Dimensions	Overall length		2990 mm (117.7 in.)	3030 mm (119.3 in.)		
	Overall width		1520 mm (59.8 in.)			
	Overall height		2015 mm (79.3 in.)		1989 mm (78.3 in.)	2015 mm (79.3 in.)
	Front tread center		1150 mm (45.3 in.)			
	Rear tread center		1180 mm (46.5 in.)			
	Wheel base		1965 mm (77.4 in.)			
	Ground clearance	Front axle	215 mm (8.5 in.)		180 mm (7.5 in.)	215 mm (8.5 in.)
		Rear axle	210 mm (8.3 in.)		185 mm (7.3 in.)	210 mm (8.3 in.)
Weight			805 kg (1775 lbs)	830 kg (1830 lbs)	850 kg (1874 lbs)	820 kg (1808 lbs)
Max. rolling weight (Towing capacity)			590 kg (1300 lbs)			
Payload capacity			740 kg (1630 lbs)			
Cargo bed	Width		1320 mm (52.0 in.)			
	Length		1180 mm (46.7 in.)			
	Depth		290 mm (11.4 in.)			
	Volume		0.455 m <sup>3</sup> (16 cu.ft.)			
	Bed height (unload)		800 mm (31.5 in.)			
	Cargo bed load		500 kg (1102 lbs)			
Sound level (operator ear)			87 db (A)			
Front deluxe guard			–	Standard		
Body color			Orange			Camo
Bed lift			–	Standard		–
Auxiliary control valve			–		Standard	–
Speedometer			–			Standard

NOTE: \* Manufacture's estimate

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

W1030858



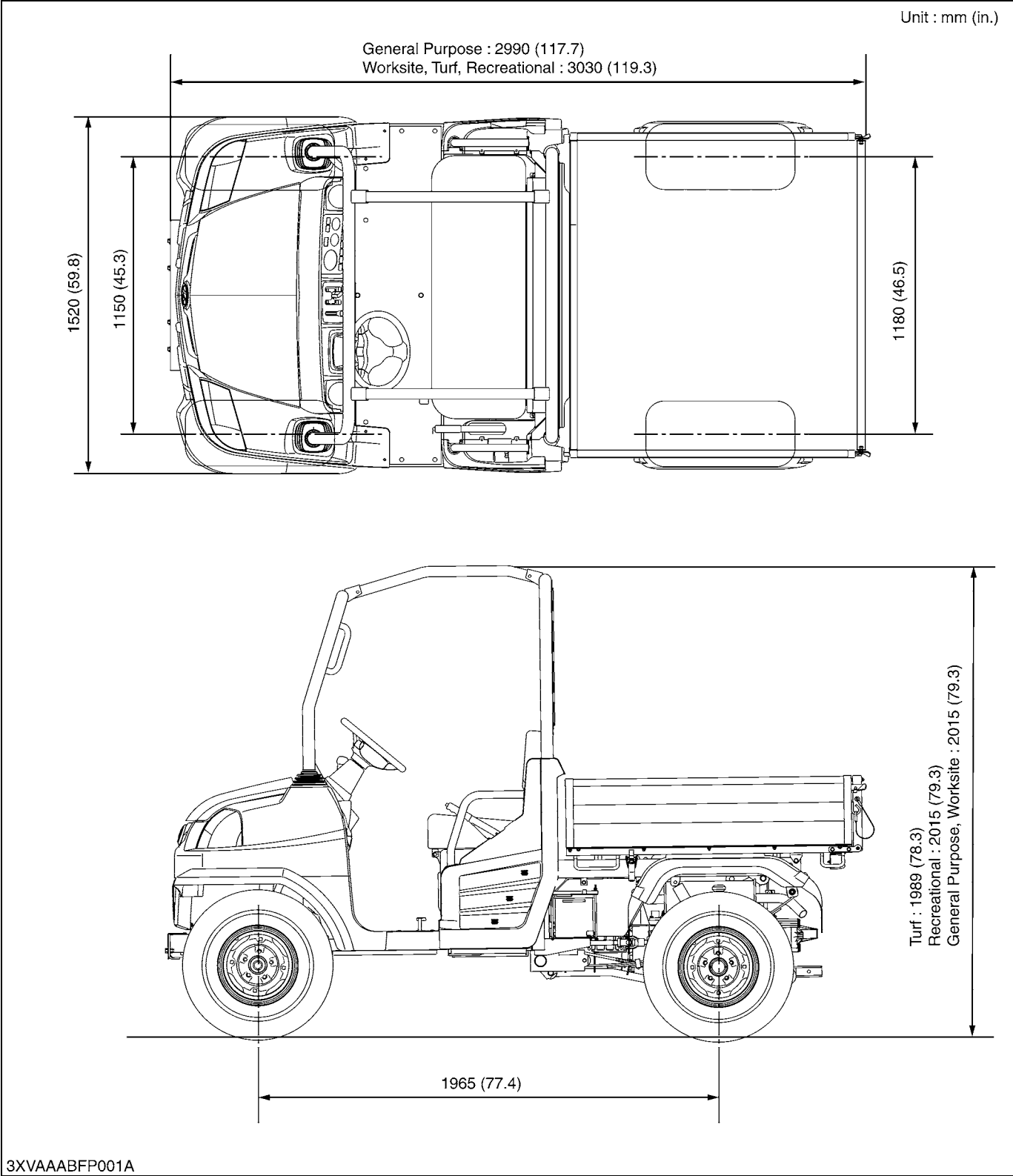
# TRAVELLING SPEEDS

Model	General Purpose			Worksite	Turf	Recreational
Tire size (Rear)	25 × 10 – 12 Knobby	25 × 10 – 12 HDWS	25 × 10.5 – 12 Turf	25 × 10 – 12 HDWS	23 × 10.5 – 12 Turf	25 × 11 – 12 ATV
Range gear shift lever	km/h (mph)			km/h (mph)	km/h (mph)	km/h (mph)
Low	16 (10)	16 (10)	14 (8)	16 (10)	14 (8)	15 (9)
Medium	29 (18)	29 (18)	26 (16)	29 (18)	26 (16)	29 (18)
High	40 (25)	40 (25)	36 (22)	40 (25)	36 (22)	40 (25)
Reverse	24 (15)	24 (15)	21 (13)	24 (15)	21 (13)	22 (14)

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

W1035065

DIMENSIONS



# **G GENERAL**

# GENERAL

## CONTENTS

1. PRODUCT IDENTIFICATION.....	G-1
2. GENERAL PRECAUTIONS.....	G-2
3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING..	G-3
[1] WIRING .....	G-3
[2] BATTERY.....	G-5
[3] FUSE.....	G-5
[4] CONNECTOR.....	G-5
[5] HANDLING OF CIRCUIT TESTER.....	G-7
4. LUBRICANTS, FUEL AND COOLANT .....	G-8
5. TIGHTENING TORQUES .....	G-11
[1] GENERAL USE SCREWS, BOLTS AND NUTS.....	G-11
[2] STUD BOLTS.....	G-11
[3] METRIC SCREWS, BOLTS AND NUTS .....	G-12
[4] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS .....	G-12
[5] PLUGS.....	G-12
6. MAINTENANCE CHECK LIST.....	G-13
[1] FROM FIRST 50 HOURS TO EVERY 550 HOURS.....	G-13
[2] FROM EVERY 600 HOURS TO EVERY 4 YEARS.....	G-15
7. CHECK AND MAINTENANCE .....	G-17
[1] DAILY CHECK .....	G-17
[2] CHECK POINTS OF INITIAL 50 HOURS.....	G-23
[3] CHECK POINTS OF EVERY 50 HOURS.....	G-30
[4] CHECK POINTS OF EVERY 100 HOURS.....	G-32
[5] CHECK POINTS OF EVERY 200 HOURS.....	G-38
[6] CHECK POINT OF EVERY 300 HOURS .....	G-41
[7] CHECK POINTS OF EVERY 400 HOURS.....	G-42
[8] CHECK POINT OF EVERY 500 HOURS .....	G-42
[9] CHECK POINT OF EVERY 800 HOURS .....	G-42
[10]CHECK POINT OF EVERY 1500 HOURS .....	G-42
[11]CHECK POINT OF EVERY 3000 HOURS .....	G-43
[12]CHECK POINT OF EVERY 1 YEAR.....	G-43
[13]CHECK POINTS OF EVERY 2 YEARS.....	G-43
[14]CHECK POINT OF EVERY 4 YEARS .....	G-46
[15]OTHERS .....	G-46
8. SPECIAL TOOLS.....	G-49
[1] SPECIAL TOOLS FOR ENGINE .....	G-49
[2] SPECIAL TOOLS FOR TRACTOR.....	G-53
9. TIRES.....	G-59
[1] TYPE OF TIRE.....	G-60
[2] TYPE PRESSURE .....	G-61
[3] VEHICLE LIMITATIONS .....	G-61
[4] CARGO BED.....	G-62

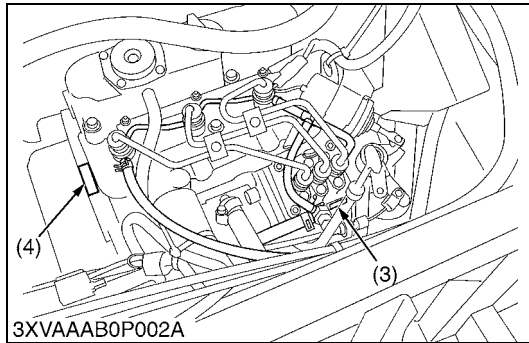
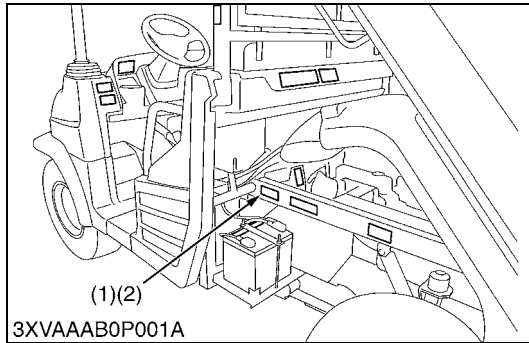
# 1. PRODUCT IDENTIFICATION

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

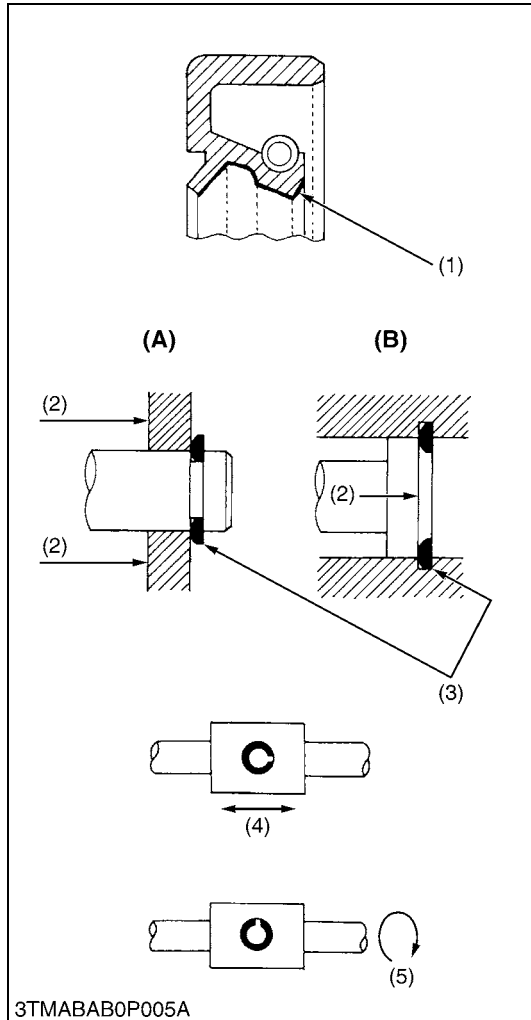
- (1) Vehicle Identification Plate
- (2) Product Identification Number

- (3) Engine Serial Number  
D902-E-UV : up tp 4Z9999  
D902-E2-UV : from 5A0001
- (4) Transmission Assembly Serial  
Number

W1011386



## 2. GENERAL PRECAUTIONS



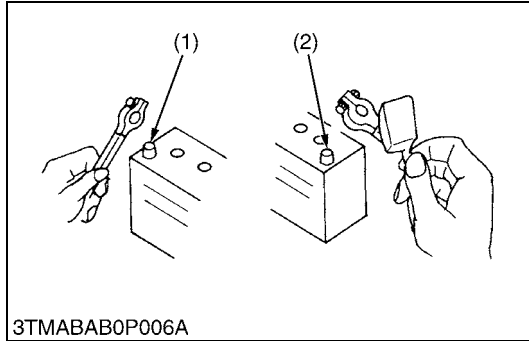
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently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

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

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

W1010794

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



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

#### ■ IMPORTANT

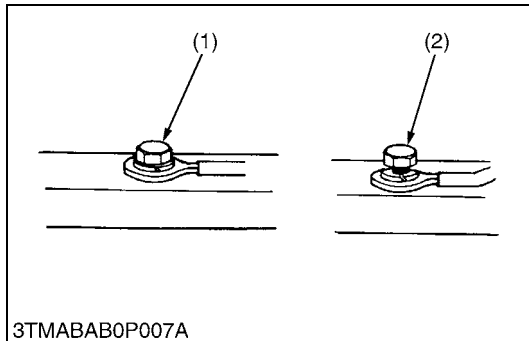
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
- Do not attempt to modify or remodel any electrical parts and wiring.
- When removing the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

(1) Negative Terminal

(2) Positive Terminal

W10111140

#### [1] WIRING

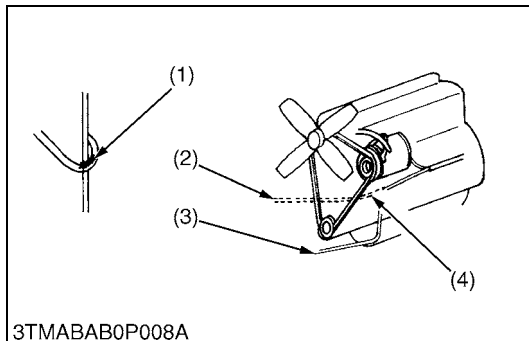


- Securely tighten wiring terminals.

(1) Correct  
(Securely Tighten)

(2) Incorrect  
(Loosening Leads to Faulty Contact)

W10112160

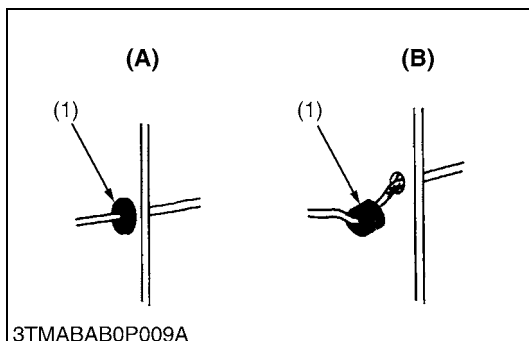


- Do not let wiring contact dangerous part.

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

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

W10113130

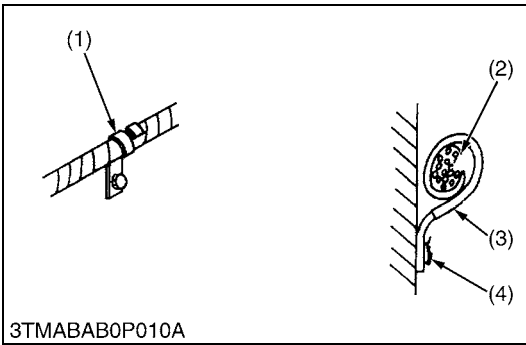


- Securely insert grommet.

(1) Grommet

(A) Correct  
(B) Incorrect

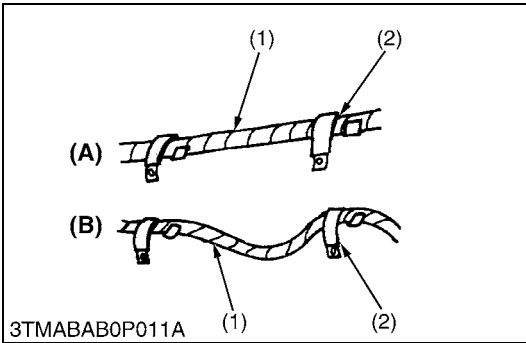
W10113880



- Securely clamp, being careful not to damage wiring.

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

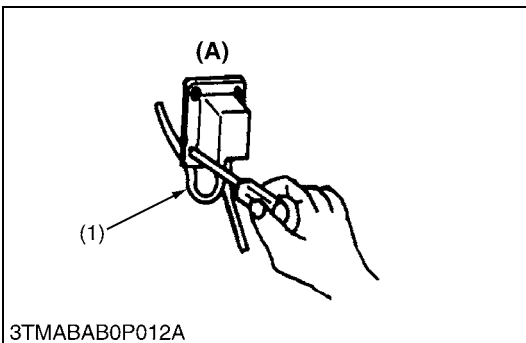
W10114580



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

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

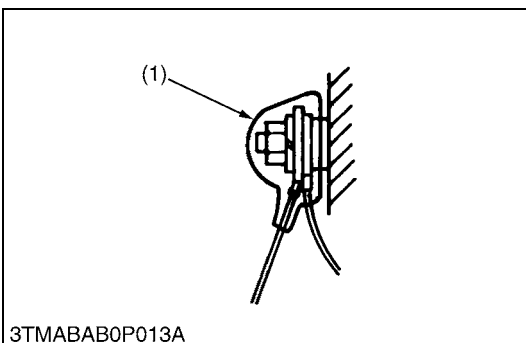
W10115870



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

- (1) Wiring
- (A) Incorrect

W10116700



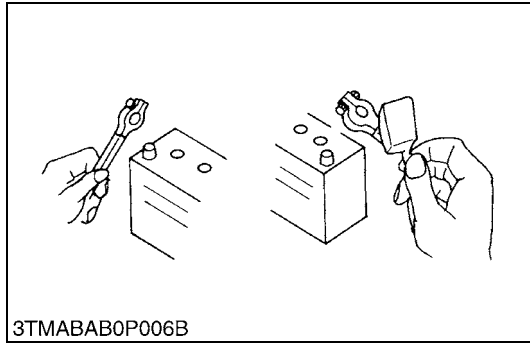
- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover
  - Securely Install Cover

W10117350



## [2] BATTERY



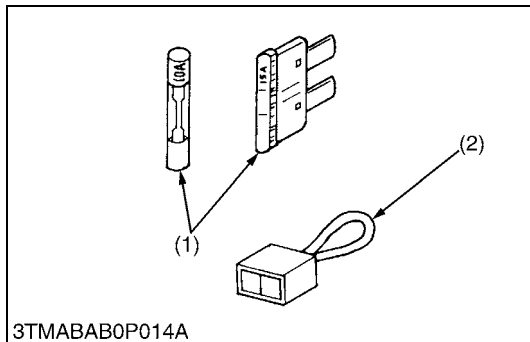
- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting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

### CAUTION

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

W10118160

## [3] FUSE



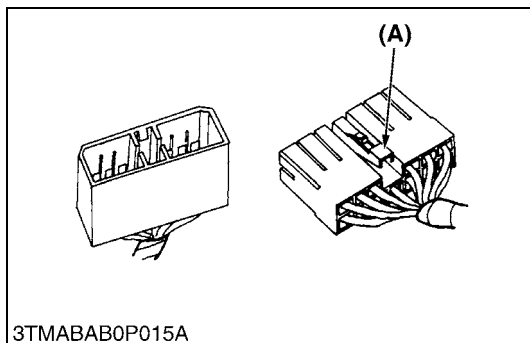
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Fusible Link

W10120920

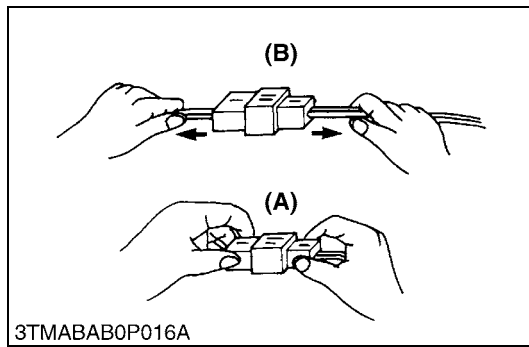
## [4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

W10122110

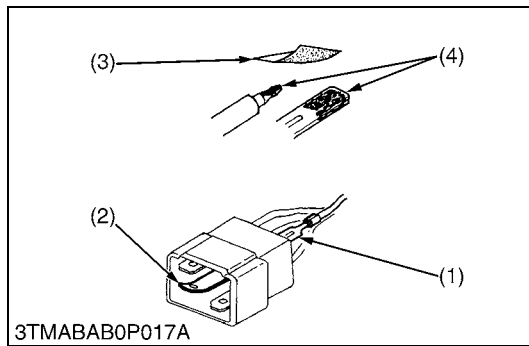


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

W10122720

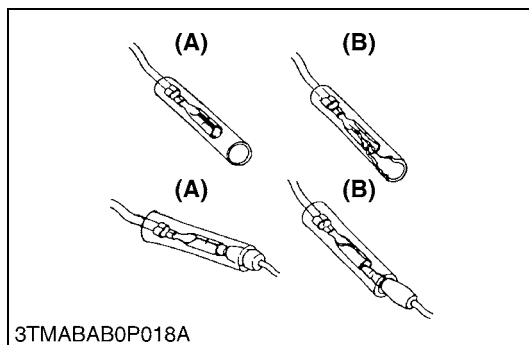


- Use sandpaper to remove rust from terminals.
- Repair deformed terminal. Make certain there is no terminal being exposed or displaced.

(1) Exposed Terminal  
(2) Deformed Terminal

(3) Sandpaper  
(4) Rust

W1012346

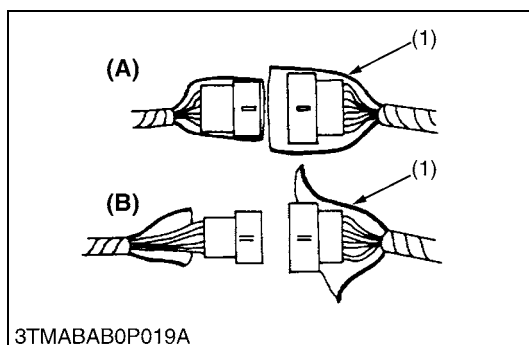


- Make certain that there is no female connector being too open.

(A) Correct

(B) Incorrect

W1012430



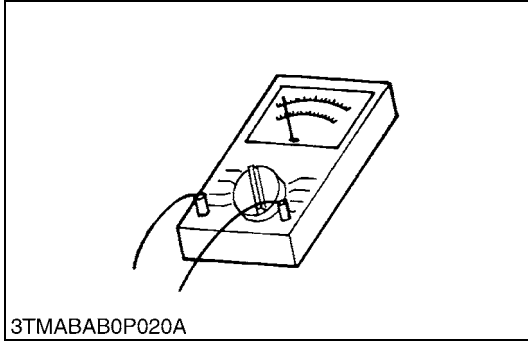
- Make certain plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct  
(B) Incorrect

W1012519

## [5] HANDLING OF CIRCUIT TESTER



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

W1012684

## 4. LUBRICANTS, FUEL AND COOLANT

No.	Place	Capacity	Lubricants, fuel and coolant
1	Fuel tank	28.0 L 7.4 U.S.gals 6.2 Imp.gals	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below -10 °C (14 °F)
2	Cooling system with recovery tank	4.0 L 4.2 U.S.qts 3.5 Imp.qts	Fresh clean water with anti-freeze
3	Engine crankcase with oil filter	(Oil filter exchanged) 3.1 L 3.3 U.S.qts 2.7 Imp.qts (Oil filter non-exchanged) 2.7 L 2.9 U.S.qts 2.4 Imp.qts	Engine oil : API Service CC, CD or CF Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40 0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 10W-40 Above 25 °C (77 °F): SAE30, 10W-30 or 10W-40
4	Transmission case	10.0 L 2.6 U.S.qts 2.2 Imp.qts	KUBOTA UDT or SUPER UDT fluid*
5	Front axle case	0.6 L 0.63 U.S.qts 0.52 Imp.qts	KUBOTA UDT or SUPER UDT fluid*
6	Knuckle case	Ref. 0.15 L Ref. 0.16 U.S.qts Ref. 0.13 Imp.qts	KUBOTA UDT or SUPER UDT fluid*
7	Brake fluid (reservoir and lines)	0.4 L 0.42 U.S.qts 0.35 Imp.qts	KUBOTA DOT3 GENUINE BRAKE FLUID
8	Hydraulic lift oil (Hydraulic dumping system model)	8.0 L 2.1 U.S.gals 1.8 Imp.gals	KUBOTA UDT or SUPER UDT fluid*
	Hydraulic lift oil (Hydraulic PTO model)	7.0 L 1.8 U.S.gals 1.5 Imp.gals	
9	Power steering oil	5.9 L 1.6 U.S.gals 1.3 Imp.gals	

\* KUBOTA original transmission hydraulic fluid.

Greasing				
	Place	No. of greasing point	Capacity	Type of grease
10	VHT link	2	Until grease overflows	Multipurpose type grease NLGI-2 or NLGI-1 (GC-LB)
11	Battery terminal	2	Moderate amount	
12	Cargo lift cylinder pivot	2		
13	Cargo bed pivot	2		
14	Parking brake linkage	4		
15	Range gear shift lever pivot	1		
16	4WD lever pivot	1		
17	Accelerator wire	—		Engine oil

■ **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.
- **Transmission oil :**  
The oil used to lubricate the transmission is also used as hydraulic fluid. To insure proper operation of the hydraulic system and complete lubrication of the transmission, it is important that a multi-grade transmission fluid be used in this system. We recommend the use of KUBOTA SUPER UDT fluid for optimum protection and performance.  
Do not mix different brands or grades.
- **Brake fluid :**  
Always use KUBOTA DOT3 GENUINE BRAKE FLUID from a sealed container. If it is not available, you should use only DOT3 fluid as a temporary replacement from a sealed container.  
However, the use of any non-KUBOTA brake fluid can cause corrosion and decrease the lift of the system. Have the brake system flushed and refilled with KUBOTA DOT3 GENUINE BRAKE FLUID as soon as possible.
- Indicated capacity of water and oil are manufacturer's estimate.

**(Continued)**

- **Lubricating Oil**

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.




Lubricating oil class	Fuel	Low sulfur (0.5 % $\geq$ )	High sulfur	Remarks
CF		○	○	TBN $\geq$ 10
CF-4		○	X	
CG-4		○	X	

○ : Recommendable X : Not recommendable

## 5. TIGHTENING TORQUES

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

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

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



W1034542

### [2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit Diameter	N-m	kgf-m	lbf-ft	N-m	kgf-m	lbf-ft
M8 (8 mm, 0.31 in.)	11.8 to 15.6	1.2 to 1.6	8.68 to 11.5	8.82 to 11.8	0.90 to 1.2	6.51 to 8.67
M10 (10 mm, 0.39 in.)	24.6 to 31.3	2.5 to 3.2	18.1 to 23.1	19.7 to 25.4	2.0 to 2.6	14.5 to 18.8
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1



W1048139

### [3] METRIC SCREWS, BOLTS AND NUTS

Grade	Property class 8.8 			Property class 10.9 		
Unit						
Nominal Diameter	N-m	kgf-m	lbf-ft	N-m	kgf-m	lbf-ft
M 8	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
M 10	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
M 12	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5	103.0 to 117.0	10.5 to 12.0	76.0 to 86.8
M 14	124.0 to 147.0	12.6 to 15.0	91.2 to 108.0	167.0 to 196.0	17.0 to 20.0	123.0 to 144.0
M 16	196.0 to 225.0	20.0 to 23.0	145.0 to 166.0	260.0 to 303.0	26.5 to 31.0	192.0 to 224.0



W1016172

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

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

W1022485

### [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	12.7 to 21.6	1.3 to 2.2	9.4 to 15.9	12.7 to 19.6	1.3 to 2.0	9.4 to 15.4
	R1/4	24.5 to 44.1	2.5 to 4.5	18.1 to 32.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.4
	R3/8	49.0 to 88.3	5.0 to 9.0	36.2 to 65.1	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
	R1/2	58.8 to 107.9	6.0 to 11.0	43.4 to 79.6	58.8 to 78.5	6.0 to 8.0	43.4 to 57.9
 Straight screw	G1/4	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3	—	—	—
	G3/8	61.8 to 82.4	6.3 to 8.4	45.1 to 60.8	—	—	—
	G1/2	49.0 to 88.3	5.0 to 9.0	36.2 to 65.1	—	—	—

0000001666E



## 6. MAINTENANCE CHECK LIST

### [1] FROM FIRST 50 HOURS TO EVERY 550 HOURS

#### ■ IMPORTANT

- The jobs indicated by ★ must be done after the first 50 hours of operation.

(To be continued)

No.	Item	Period	Indication on hour meter											Important	Reference page
			50	100	150	200	250	300	350	400	450	500	550		
1	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆		G-30
2	Greasing	Apply	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆		G-31
3	Engine oil	Change	★	☆		☆		☆		☆		☆			G-23
4	Muffler	Clean	★	☆		☆		☆		☆		☆			G-25
5	Wheel screw torque	Check	★	☆		☆		☆		☆		☆			G-25
6	Spark arrester	Clean		☆		☆		☆		☆		☆			G-33
7	Battery condition	Check		☆		☆		☆		☆		☆			G-35
8	Fan belt	Adjust		☆		☆		☆		☆		☆			G-36
9	VHT neutral spring	Check		☆		☆		☆		☆		☆			G-32
10	Toe-in	Adjust		☆		☆		☆		☆		☆			G-38
11	Fuel filter element	Check		☆		☆		☆		☆		☆			G-37
		Replace													—
12	Air cleaner element	Clean		☆		☆		☆		☆		☆			G-34
		Replace													—
13	Fuel line	Check		☆		☆		☆		☆		☆			G-37
		Replace													—
14	Engine oil filter	Replace	★			☆				☆					G-24
15	Transmission oil filter (HST) (Yellow color)	Replace	★			☆				☆					G-27
16	Transmission oil filter (Suction) (Orange color)	Replace	★			☆				☆					G-27
17	Transmission oil	Change	★			☆				☆					G-26
18	Brake pedal	Adjust	★			☆				☆					G-28
19	Parking brake lever	Adjust	★			☆				☆					G-28
20	Brake light switch	Check	★			☆				☆					G-28
21	Front brake case	Check	★			☆				☆					G-29
22	Power steering oil	Change				☆				☆					G-41
23	Hydraulic lift oil	Change				☆				☆					G-40
24	Radiator hose and clamp	Check				☆				☆					G-39
		Replace													—
25	Power steering oil line	Check				☆				☆					G-40
		Replace													—
26	Intake air line	Check				☆				☆					G-41
		Replace													—
27	Brake hose and pipe	Check	★			☆				☆					G-29
		Replace													—

W10214620

**(Continued)**

No.	Item	Period	Indication on hour meter											Important	Reference page
			50	100	150	200	250	300	350	400	450	500	550		
28	Tire wear	Check	★			☆				☆					G-30
29	Front axle case oil	Change				☆				☆					G-42
30	Knuckle axle case oil	Change								☆					G-42
31	Engine valve clearance	Adjust													—
32	Fuel injection nozzle injection pressure	Check													—
33	Injection pump	Check													—
34	Brake master cylinder inner parts	Replace													—
35	Brake fluid	Change													—
36	Remote hydraulic hose (if equipped)	Replace													—
37	Rear brake cylinder seal	Replace													—
38	Front brake seal	Replace													—
39	Cooling system	Flash													—
40	Coolant	Change													—
41	Fuel system	Bleed													—
42	Fuse	Replace													—
43	Light bulb	Replace													—

W10368570

## [2] FROM EVERY 600 HOURS TO EVERY 4 YEARS

### ■ IMPORTANT

- \*1 : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- \*2 : Every year or every 6 times of cleaning.
- \*3 : Replace only if necessary.
- \*4 : When the battery is used for less than 100 hours per year, check the fluid level annually.
- The items listed below (@ 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 following instruction.

(To be continued)

No.	Item	Period	Indication on hour meter							After purchase			Important	Reference page
			600	650	700	750	800	1500	3000	1 year	2 years	4 years		
1	Engine start system	Check	☆	☆	☆	☆	☆							G-30
2	Greasing	Apply	☆	☆	☆	☆	☆							G-31
3	Engine oil	Change	☆		☆		☆							G-23
4	Muffler	Clean	☆		☆		☆							G-25
5	Wheel screw torque	Check	☆		☆		☆							G-25
6	Spark arrester	Clean	☆		☆		☆							G-33
7	Battery condition	Check	☆		☆		☆						*4	G-35
8	Fan belt	Adjust	☆		☆		☆							G-36
9	VHT neutral spring	Check	☆		☆		☆							G-32
10	Toe-in	Adjust	☆		☆		☆							G-38
11	Fuel filter element	Check	☆		☆		☆						@	G-37
		Replace												—
12	Air cleaner element	Clean	☆		☆		☆			☆			*1	G-34
		Replace											*2	—
13	Fuel line	Check	☆		☆		☆						@	G-24
		Replace									☆		*3	—
14	Engine oil filter	Replace	☆				☆							G-24
15	Transmission oil filter (HST) (Yellow color)	Replace	☆				☆							G-27
16	Transmission oil filter (Suction) (Orange color)	Replace	☆				☆							G-27
17	Transmission oil	Change	☆				☆							G-26
18	Brake pedal	Adjust	☆				☆							G-28
19	Parking brake lever	Adjust	☆				☆							G-28
20	Brake light switch	Check	☆				☆							G-29
21	Front brake case	Check	☆				☆							G-29
22	Power steering oil	Change	☆				☆							G-41
23	Hydraulic lift oil	Change	☆				☆							G-40

W10402640

## (Continued)

No.	Item	Period	Service Interval							After purchase			Important	Reference page
			600	650	700	750	800	1500	3000	1 year	2 years	4 years		
24	Radiator hose and clamp	Check	☆				☆							G-39
		Replace									☆			—
25	Power steering oil line	Check	☆				☆							G-40
		Replace									☆			6-S8
26	Intake air line	Check	☆				☆							G-41
		Replace									☆		*3 @	—
27	Brake hose and pipe	Check	☆				☆							G-29
		Replace										☆		—
28	Tire wear	Check	☆											G-29
29	Front axle case oil	Change					☆							G-42
30	Knuckle axle case oil	Change					☆							G-42
31	Engine valve clearance	Adjust					☆							1-S12
32	Fuel injection nozzle injection pressure	Check						☆					@	1-S17
33	Injection pump	Check							☆				@	—
34	Brake master cylinder inner parts	Replace									☆			4-S15
35	Brake fluid	Change									☆			4-S5
36	Remote hydraulic hose (if equipped)	Replace									☆			7-S6
37	Rear brake cylinder seal	Replace									☆			4-S19
38	Front brake seal	Replace									☆			4-S13
39	Cooling system	Flash									☆			G-44
40	Coolant	Change									☆			G-44
41	Fuel system	Bleed								Service as required				G-46
42	Fuse	Replace												G-47
43	Light bulb	Replace												G-48

W10484820

## 7. CHECK AND MAINTENANCE

### [1] DAILY CHECK

To prevent trouble from occurring, it is important to know the condition of the vehicle well. Check it before starting.



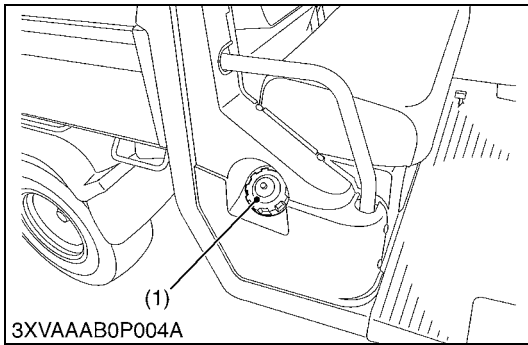
#### CAUTION

- Be sure to check and service the vehicle on a level surface with the engine shut off and the parking brake "ON" and implement lowered to the ground if equipped.

#### Walk Around Inspection

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

W10536540



### Checking and Refueling

#### ⚠ CAUTION

- Do not smoke while refueling.
  - Be sure to stop the engine before refueling.
1. Turn the key switch to "ON" check the amount of fuel by fuel gauge.
  2. Fill fuel tank when fuel gauge shows 1/4 or less fuel in tank.
  3. Use grade No. 2-Diesel fuel at temperatures above -10 °C (14 °F).  
Use grade No. 1-Diesel fuel at temperatures below -10 °C (14 °F).

Fuel tank capacity	28 L 7.4 U.S.gals 6.2 Imp.gals
--------------------	--------------------------------------

#### ■ IMPORTANT

- Do not permit dirt or trash to get into the fuel system.
- Be careful not to let the fuel tank become empty, otherwise air will enter the fuel system, necessitating bleeding before next engine start.
- Be careful not to spill during refueling. If should spill, wipe it off at once, or it may cause a fire.
- To prevent water condensation from accumulating in the fuel tank, fill the tank before parking overnight.

#### ■ NOTE

- No. 2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
- Grade of Diesel Fuel Oil According to ASTM D975.

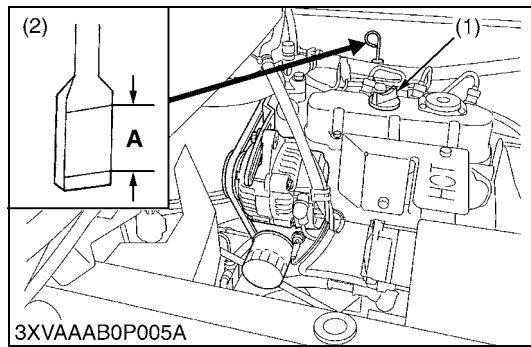
Flash point °C (°F)	Water and Sediment, volume %	Carbon Residue on, 10 percent Residuum, %	Ash, weight %
Min	Max	Min	Max
52 (125)	0.05	0.35	0.01

Distillation Temperatures, °C (°F) 90% Point		Viscosity Kinematics cSt or mm <sup>2</sup> /S at 40 °C		Viscosity Saybolt, SUS at 100 °F	
Min	Max	Min	Max	Min	Max
282 (540)	338 (640)	1.9	4.1	32.6	40.1

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

(1) Fuel Tank Cap

W10537280



### Checking Engine Oil Level

#### ⚠ CAUTION

- **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

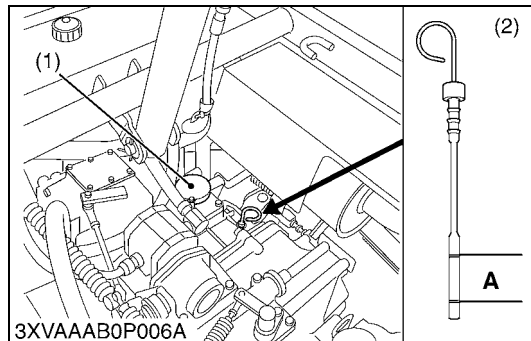
- **When using an oil of different maker or viscosity from the previous one, remove all of the old oil. Never mix two different types of oil.**
- **If oil level is low, do not run engine.**

Engine oil capacity	Oil filter exchanged	3.1 L 3.3 U.S.qts 2.7 Imp.qts
	Oil filter non-exchanged	2.7 L 2.9 U.S.qts 2.4 Imp.qts

- (1) Oil Inlet  
(2) Dipstick

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

W10544680



### 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 is too low, add new oil to the prescribed level at the oil inlet. (See page G-8, "LUBRICANT, FUEL AND COOLANT")

#### ■ IMPORTANT

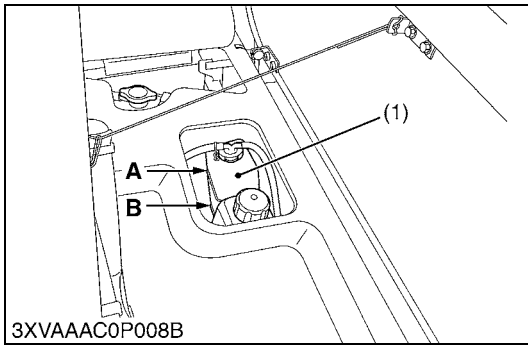
- **If oil level is low, do not run engine.**

Transmission oil capacity	10.0 L 2.6 U.S.gals 2.2 Imp.gals
---------------------------	--

- (1) Oil Inlet  
(2) Dipstick

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

W10548160



### Checking Coolant Level

#### ⚠ CAUTION

- **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**" marks of recovery tank.
2. When the coolant level drops due to evaporation, add water only up to the full level.

In case of leakage, add anti-freeze and water in the specified mixing ratio up to the full level.

See "Flush Cooling System and Changing Coolant" (see page G-44.).

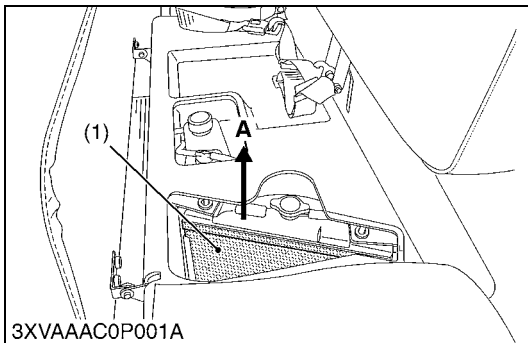
#### ■ IMPORTANT

- **If the radiator cap has to be removed, follow the caution above and securely retighten the cap.**
- **Use clean, fresh water and anti-freeze to fill the recovery tank.**
- **If water should leak, check the cooling system (see page 1-S18.)**

(1) Recovery Tank

A : FULL  
B : LOW

W1055128



### Cleaning Radiator Screen

#### ⚠ CAUTION

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

1. Detach the screen and remove all foreign materials.

#### ■ IMPORTANT

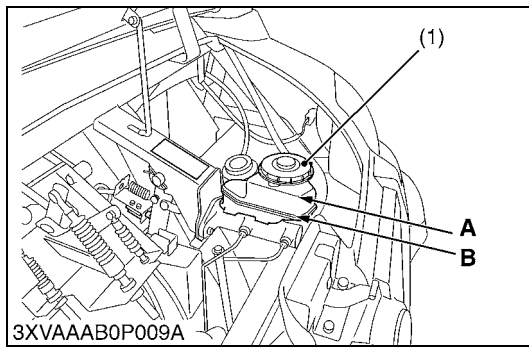
- **Radiator screen must be clean from debris to prevent engine from overheating.**

(1) Radiator Screen  
(2) Cover

A : DETACH

W1055616





### Checking Brake Fluid Level

#### ⚠ CAUTION

- Never operate the vehicle, if the brake fluid is below the "MIN" mark.
- Use only KUBOTA DOT3 GENUINE BRAKE FLUID from a sealed container. Using other type of oil ruins synthetic resin or rubber installed in brake system components, and may cause brake failure.
- Avoid contamination of the brake fluid. Thoroughly clean area around the filler cap before removing. Do not open the brake fluid reservoir cap unless absolutely necessary.
- Use extreme care when filling the reservoir. If brake fluid is spilled on power steering hose, wash off with water immediately. Brake fluid quickly ruins synthetic resin or rubber hoses.

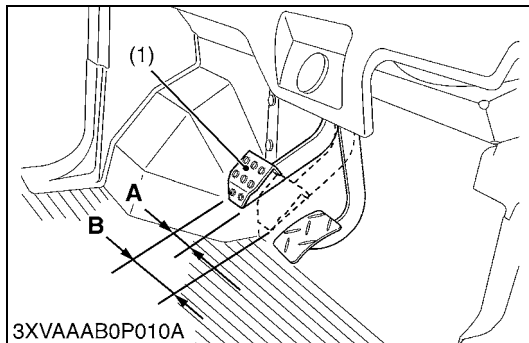
1. Park the vehicle on level ground and open hood.
2. Check to see that the brake fluid level is between the "MAX" and "MIN" marks.
3. If it is below the "MIN" mark, add brake fluid to the "MAX" mark.

(1) Oil Tank Cap

A : MAX

B : MIN

W1055884



### Checking Brake Pedal

#### ⚠ CAUTION

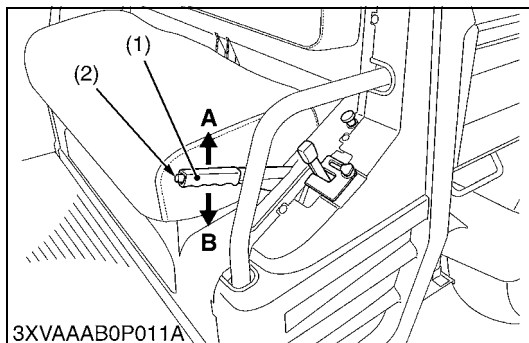
- Stop the engine and chock the wheels before checking brake pedal.
1. Inspect the brake pedals for free travel, and smooth operation.
  2. Adjust if incorrect measurement is found (see page 4-S4 "Adjusting Brake Pedal").

(1) Brake Pedal

A : Free Travel

B : Pedal Stroke

W1056293



### Checking Parking Brake

1. Pull the parking brake lever to apply the brakes. With the key switch at "ON" position, the parking brake indicator on the instrument panel lights up. To release the brakes, push in the button at the tip of the parking brake lever and tilt down the lever.

#### ■ NOTE

- Make sure the parking brake warning lamp on the Easy Checker (TM) goes off when parking brake lever is down.

(1) Parking Brake Lever

A : Pull

(2) Release Button

B : Release

W1056498

**Checking Gauges, Meter and Easy Checker (TM)**

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

W1056786

**Checking Head Light, Turn Signal Light etc.**

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

W1056880

**Checking Seat Belt and ROPS**

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

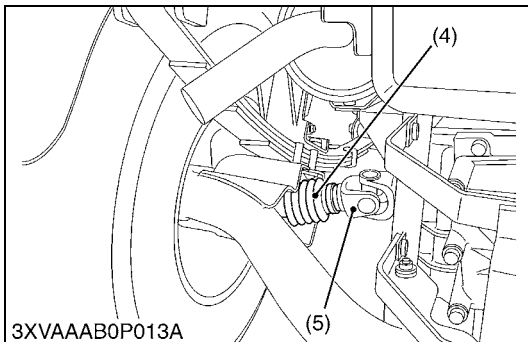
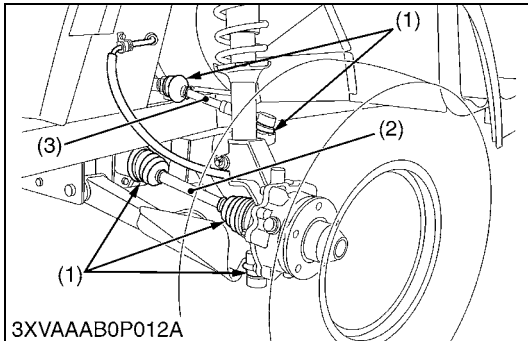
W1056955

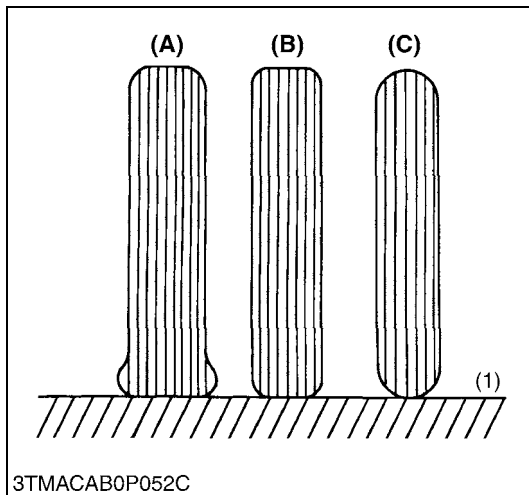
**Checking Joint Boot**

1. Check to see if the joint boots are not damaged.
2. If the boots are cuts, cracked or deterioration, replace the new one. (See page 3-S3, 5-S22.)

- |                        |                       |
|------------------------|-----------------------|
| (1) Joint Boot (Front) | (4) Joint Boot (Rear) |
| (2) Front Drive Shaft  | (5) Rear Drive Shaft  |
| (3) Tie-rod            |                       |

W1057102





### Checking Tire Inflation Pressure

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

Tire sizes	Inflation pressure
25 x 10 - 12 Knobby, Front and Rear	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
25 x 10 - 12 HDWS, Front and Rear	
25 x 10 - 12 Truf, Front and Rear	
25 x 10 - 12 ATV, Front 25 x 11 - 12 ATV, Rear	

(1) Ground

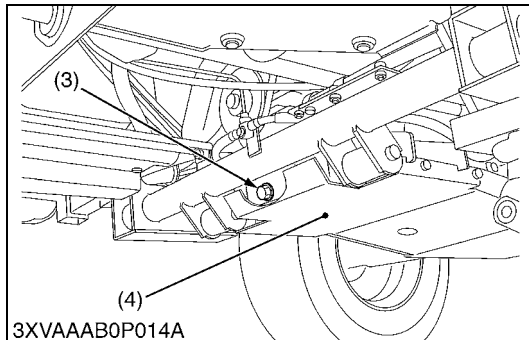
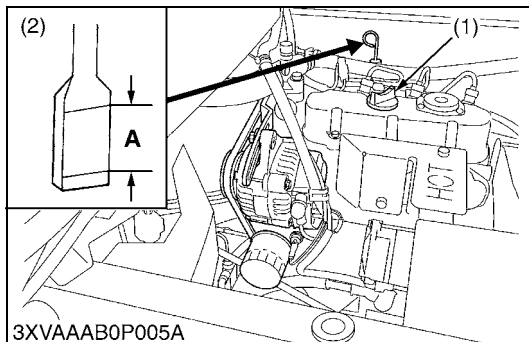
(A) Insufficient

(B) Normal

(C) Excessive

W1034256

## [2] CHECK POINTS OF INITIAL 50 HOURS



### Changing Engine Oil



#### CAUTION

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

1. To drain the used oil, remove the protect cover (4) and the drain plug (3) at the bottom of the engine and completely drain the oil into an 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).

3. Fill with the new oil up to the upper notch on the dipstick. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8.).

4. Attach the protect cover (4).

Engine oil capacity (with filter)	3.1 L 3.3 U.S.qts 2.7 Imp.qts
-----------------------------------	-------------------------------------

(1) Oil Inlet

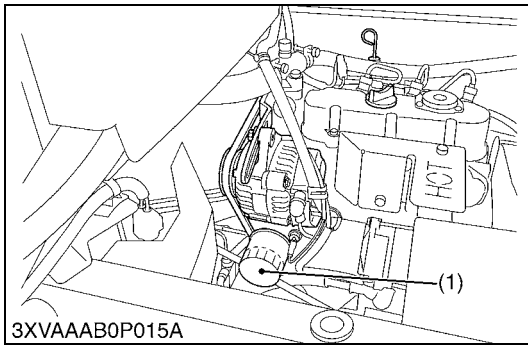
(2) Dipstick

(3) Drain Plug

(4) Protect Cover

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

W1057798



### Replacing Engine Oil Filter

#### **⚠ CAUTION**

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

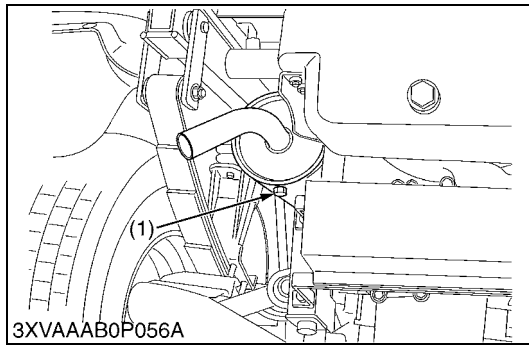
1. Remove the oil filter (1).
2. Put a film of clean engine oil on the rubber seal of the new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases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

#### **■ IMPORTANT**

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

(1) Engine Oil Filter

W1058183



### Cleaning Muffler

This vehicle is equipped with a spark arrester muffler approved by the U.S. Forest Service. It requires periodic maintenance to ensure its effectiveness.

#### **! CAUTION**

- Before touching any part of an exhaust system, be absolutely sure that it has sufficient time to cool.
- Always wear safety goggles and a (face) mask.
- Keep head and face away from possible drainage.
- The particulate matter contained in the muffler contains chemicals that are harmful to people, animals and marine life.
- Be sure to stop the engine before removing the drain plug.

#### **■ Cleaning Procedure**

The first interval for clean out will be after approx. 50 hours of operation.

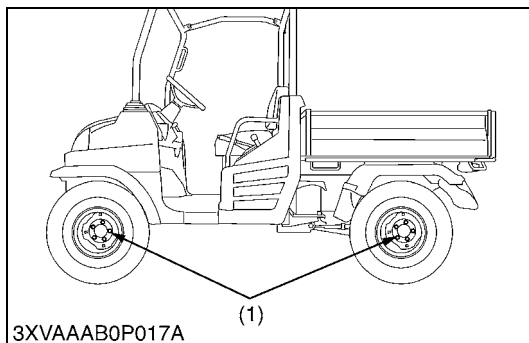
1. Shut the vehicle engine off and then remove the Spark Arrester.
2. The vehicle engine shall be restarted and run at 1/2 throttle for 1 minutes to pressurized the muffler and force the particulate to drain out the opening in the spark arrester.
3. After the 1 minutes time period, shut the engine down, reinstall the plug, and tighten the bolts 35 lbf-ft of torque.
4. Repeat this procedure every 100 hours (with every oil change) as part of a first echelon maintenance schedule for the life of the vehicle.

#### **■ IMPORTANT**

- Visually check the muffler for cracks or holes in the body, weldment or pipes at regular intervals.
- Replace the entire muffler if it is damaged.
- Do not operate the vehicle with a damaged muffler.

(1) Drain Plug

W1058476



### Checking Wheel Screw Torque

#### **! CAUTION**

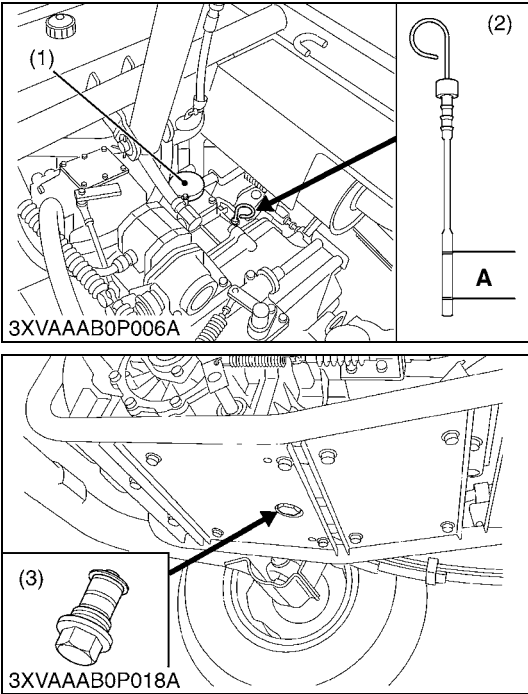
- Never operate vehicle with a loose wheel screw.
- Any time screws are loosened, retighten to the specified torque.
- Check all screw frequently and keep them tight.

1. Check wheel screws (1) regularly especially when new. If they are loose, tighten them as follows.

Tightening torque	Wheel mounting screw	75 to 90 N·m 7.6 to 9.2 kgf·m 55.3 to 66.4 lbf·ft
-------------------	----------------------	---

(1) Wheel Mounting Screw

W1059106



Changing Transmission Oil

**CAUTION**

- Allow engine to cool down sufficiently, oil can be hot and can burn.
1. To drain the used oil, remove the drain plug (3) at the bottom of the transmission case and drain the oil completely into the oil pan.
  2. Clean off metal fillings with clean rags at the drain plug with magnet (3).
  3. After draining reinstall the drain plug (3).
  4. Fill with the new KUBOTA SUPER UDT fluid up to the upper notch on the dipstick (2). Refer to "**LUBRICANTS, FUEL AND COOLANT**" (See page G-8).
  5. After running the engine for a few minutes, stop the engine and check the oil level again; add oil to prescribed level.

**IMPORTANT**

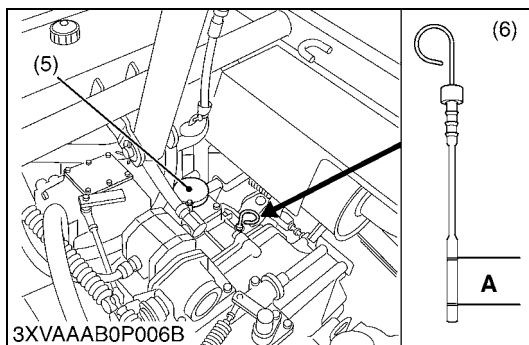
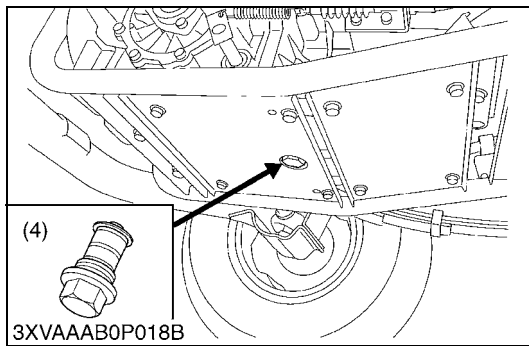
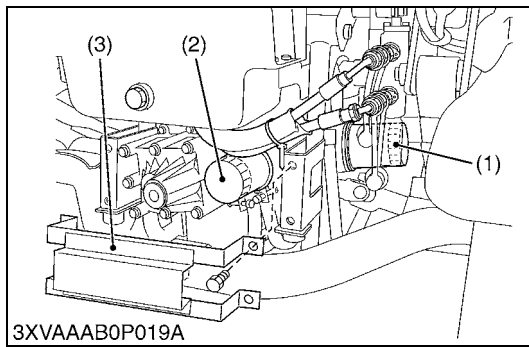
- Do not operate the vehicle immediately after changing the transmission fluid.  
Run the engine at medium speed for a few minutes to prevent damage to the transmission.

Transmission oil capacity	10.0 L 2.6 U.S.gals 2.2 Imp.gals
---------------------------	--

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

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

W1059382



## Replacing Transmission Oil Filter

### ⚠ CAUTION

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

1. Remove the drain plug (4) at the bottom of the transmission case and drain the oil completely into the oil pan.
2. Clean off metal fillings with clean rags at the drain plug with magnet (4).
3. After draining reinstall the drain plug (4).

Tightening torque	Drain plug with magnet	58 to 67 N·m 5.9 to 6.9 kgf·m 43 to 49 lbf·ft
-------------------	------------------------	---

4. Remove the rear guard.
5. Remove the oil filters.
6. Put a film of clean transmission oil on the rubber seal of the new filter.
7. Quickly tighten the filter until it contacts the mounting surface, then, with a filter wrench, tighten it an additional 1 turn only.
8. After the new filter has been replaced, fill the transmission oil up to the upper notch on the dipstick (6).
9. After running the engine for a few minutes, stop the engine and check the oil level again, add oil to the prescribed level.
10. Make sure that the transmission fluid does not leak past the seal on the filters.
11. Install the rear guard.

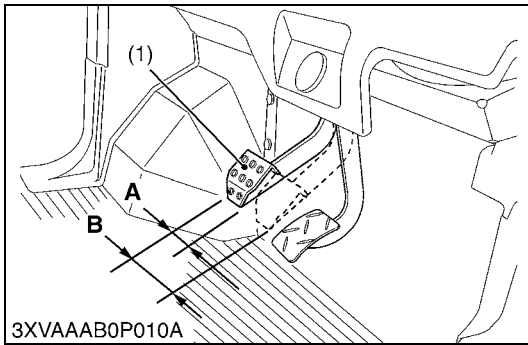
### ■ IMPORTANT

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

- (1) Transmission Oil Filter (HST) (Yellow Color)
- (2) Transmission Oil Filter (Suction) (Orange Color)
- (3) Rear Guard
- (4) Drain Plug with Magnet
- (5) Oil Inlet
- (6) Dipstick

A : Oil level is acceptable within this range.

W1059727



### Adjusting Brake Pedal

#### ⚠ CAUTION

- Stop the engine and chock the wheels before checking brake pedal.
- If movement is outside of the specifications, adjust the brake.

#### ■ Checking brake pedal free travel

1. Release the parking brake.
2. Slightly depress the brake pedal (1) and measure free travel at the top of the pedal stroke.
3. If brake pedal free travel is outside of the specifications, adjust the brake pedal free travel. (See page 4-S4.)

Proper brake pedal free travel on the pedal	Factory spec.	7 to 14 mm 0.3 to 0.6 in.
---	---------------	------------------------------

#### ■ Checking brake pedal stroke

1. Release the parking brake.
2. Step on the pedal (1) and measure the pedal stroke.
3. If brake pedal stroke is outside of the specifications, check the brake system. (See page 4-S4.)

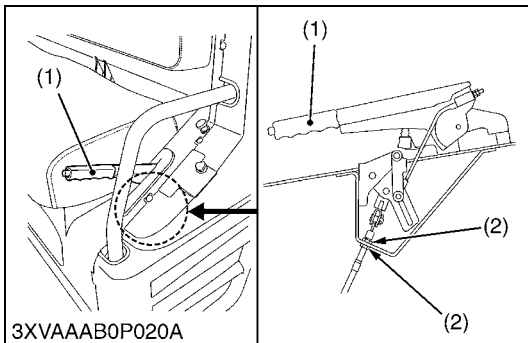
Pedal stroke on the pedal	Factory spec.	Less than 120 mm 4.7 in.
---------------------------	---------------	-----------------------------

(1) Brake Pedal

A : Free Travel

B : Pedal Stroke

W1060684



### Adjusting Parking Brake

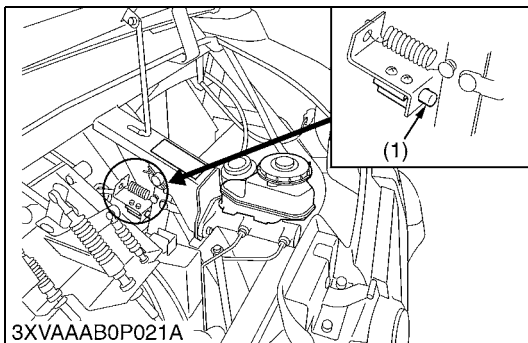
1. Release the parking brake.
2. Loosen the lock nut, and adjust the cable wire length.
3. Tighten the lock nut (2), and check the free play.

Proper parking brake lever free play range	Factory spec.	1 notch
--	---------------	---------

(1) Parking Brake Lever

(2) Lock Nut

W1061323



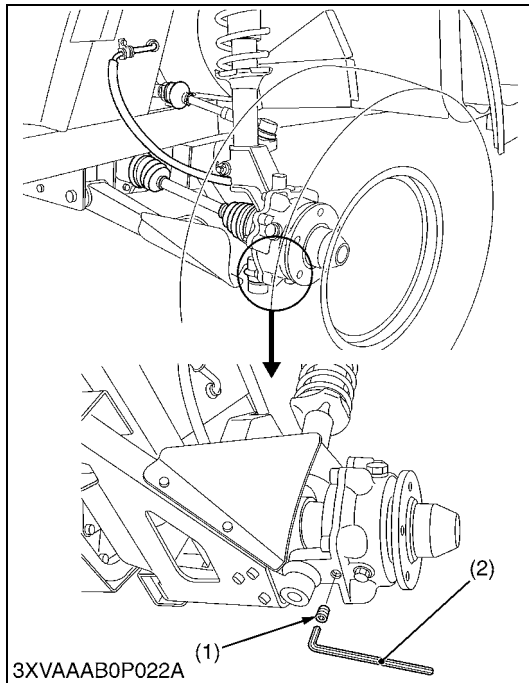
### Checking Brake Light Switch

1. Turn the key switch to the "ON" position.
2. Step on the brake pedal to check if the brake light comes on.
3. If it does not, check the bulb or brake light switch (1).

(1) Brake Light Switch

W1061550





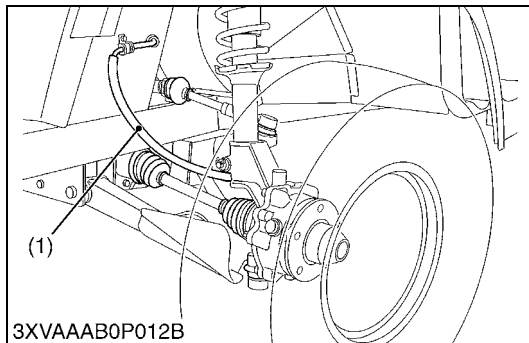
### Checking Front Brake Case

1. Remove the drain plug.
2. Check the brake case for brake fluid leak.
3. If there is brake fluid leak, check the brake seals. (See page 4-S13.)

(1) Drain Plug

(2) Allen Wrench

W1061972



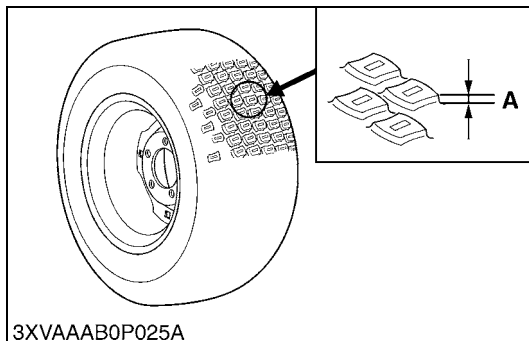
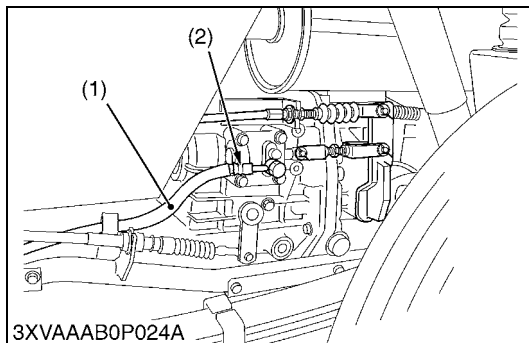
### Checking Brake Hose and Pipe

1. Check to see that brake hose and pipe are not swollen, hardened or cracked.
2. Check the brake hose (1) and pipe joints for oil leaks.
3. If there is any abnormality, replace the new one.

(1) Brake Hose

(2) Brake Pipe

W1062177



### Checking Tire

1. Check to see if tires are not damaged.
2. If the tires are cracked, bulged, or cut, or they are worn out, replace or repair them at once.

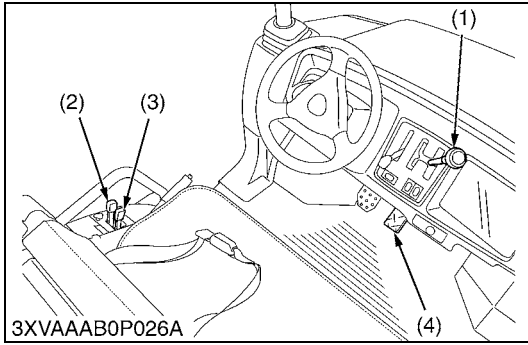
#### ■ Tire Tread Depth

Always replace the tires when the tread depth is worn to minimum allowable.

A : 3 mm (0.12 in.)

W1062371

### [3] CHECK POINTS OF EVERY 50 HOURS



#### Checking Engine Start System



#### **CAUTION**

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

#### ■ Preparation before testing

1. Place all control levers in the "NEUTRAL" position.
2. Set the parking brake and stop the engine.

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

1. Sit on the operator's seat.
2. Shift the range gear shift lever (1) to **H, M, L** or reverse position.
3. Return the speed control pedal (4) to the "NEUTRAL" position.
4. Shift the hydraulic outlet lever (2) to the "OFF" position (if equipped).
5. Shift the hydraulic lift cylinder lever (3) to the "NEUTRAL" position (if equipped).
6. Turn the key to "START" position.
7. The engine must not crank.
8. If it cranks, adjust or replace the required safety switch.

#### ■ Test : Switch the hydraulic outlet lever (if equipped)

1. Shift on the operator's seat.
2. Shift the hydraulic outlet lever (2) to "ON" position.
3. Return the speed control pedal (4) to the "NEUTRAL" position.
4. Shift the range gear shift lever (1) to the "NEUTRAL" position.
5. Shift the hydraulic lift cylinder lever (3) to the "NEUTRAL" position (if equipped).
6. Turn the key to "START" position.
7. The engine must not crank.
8. If it cranks, adjust or replace the required safety switch.

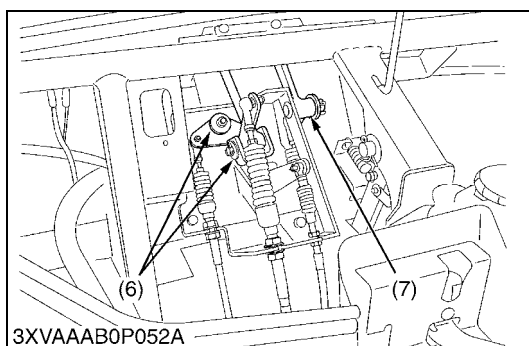
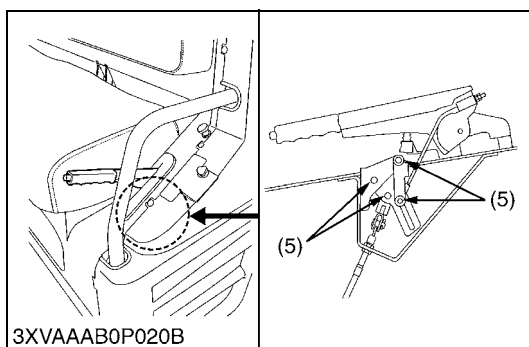
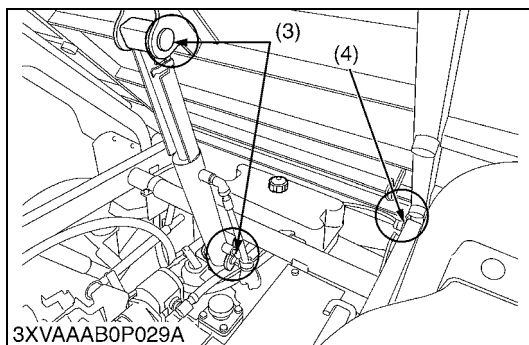
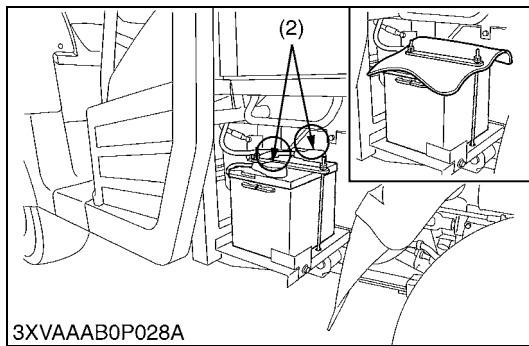
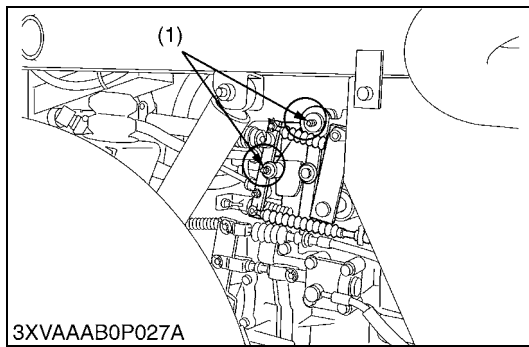
(1) Range Gear Shift Lever

(2) Hydraulic Outlet Lever  
(if equipped)

(3) Hydraulic Lift Cylinder Lever  
(if equipped)

(4) Speed Control Pedal

W1062701

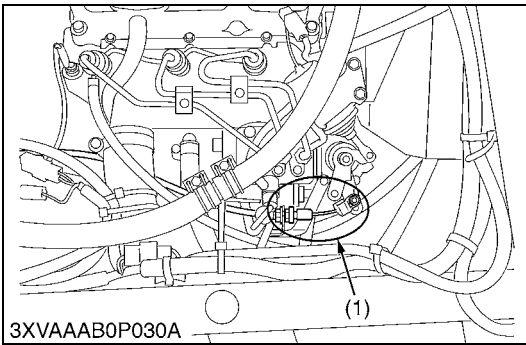


### Greasing

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

- |                                   |                                  |
|-----------------------------------|----------------------------------|
| (1) Grease Fitting (VHT Link)     | (5) Parking Brake Pivot          |
| (2) Battery Terminal              | (Spray Type Grease)              |
| (3) Cargo Lift Cylinder Pivot     | (6) Range Gear Shift Lever Pivot |
| (If equipped) (Spray Type Grease) | (Spray Type Grease)              |
| (4) Cargo Bed Pivot               | (7) 4WD Lever Pivot              |
| (Spray Type Grease)               | (Spray Type Grease)              |

W1063475

**Oiling**

1. Apply a small amount of engine oil to the accelerator wire (1) every 50 hours.

(1) Accelerator Wire

W1063874

**[4] CHECK POINTS OF EVERY 100 HOURS****Changing Engine Oil**

1. See page G-23.

W1065099

**Cleaning Muffler**

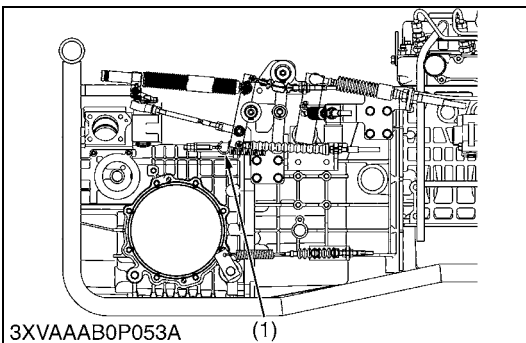
1. See page G-25.

W1065173

**Checking Wheel Screw Torque**

1. See page G-25.

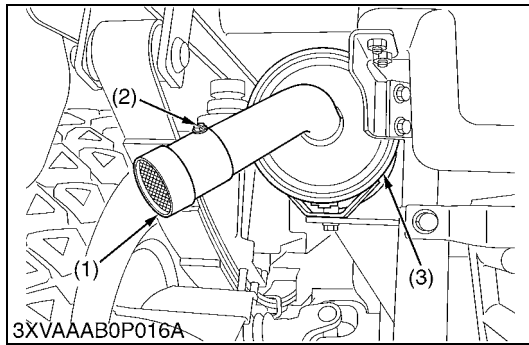
W1065230

**Adjusting VHT Neutral Spring**

1. Park the vehicle on a flat place.
2. Set the parking brake.
3. Shift the range gear shift lever to the neutral position.
4. Lock the hydraulic lift cylinder lever and hydraulic outlet lever to "NEUTRAL" position with restricting plate (if equipped).
5. Start the engine.
6. Make sure that the rotation speed of the engine returns to the idling rotation immediately when taking the foot off the pedal, after depressing the speed control pedal several times. If the above does not occur immediately, check the speed control cable, if cable movement is not smooth, replace the new one. If cable is OK, adjust the neutral spring tension (length of tension bolt).

(1) Neutral Spring

W1065299



### Cleaning Spark Arrester

#### **⚠ CAUTION**

- After operating the engine, do not touch the muffler, exhaust pipe, or spark arrester until they have had sufficient time to cool.

This screen type spark arrester was examined, tested, and qualified in accordance with the USDA Forest Service Standard 5100-1c, "Spark Arresters for Internal Combustion Engines" for the RTV900.

#### **■ Maintenance**

The screen type spark arrester should be removed, cleaned, and inspected after every 100 hours of use.

1. The spark arrester (1) is located inside the end of the exhaust pipe, and is fastened with one screw.
2. Unfasten the screw (2) and remove the spark arrester (1).
3. Shake loosened particles out of the screen assembly and lightly clean the screen with a wire brush. Soak in solvent and again clean with wire brush if necessary.
4. If any breaks in the screen or weldments are discovered, the assembly must be replaced.
5. Return the spark arrester (1) to the exhaust outlet, align the screw holes and refasten the screw (2).

#### **■ IMPORTANT**

- **USDA approval requires clearance between spark arrester sleeve and exhaust pipe to be no larger than 0.584 mm (0.023 in.).**

#### **■ Installation**

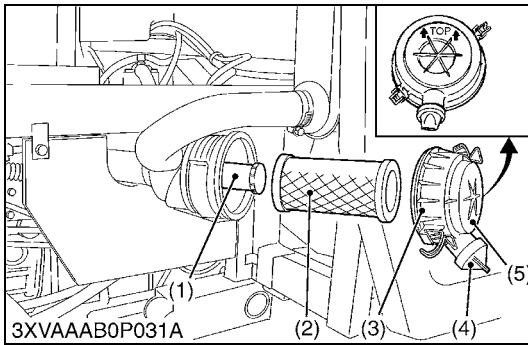
1. Insert provided spark arrester and align its screw mount hole with a pre-drilled hole (O.D. 3.2 mm (0.125 in.)) in the muffler tail pipe. If there is no mounting hole, drill a (3.2 mm (0.125 in.)) hole 15.2 mm (0.60 in.) from the end of muffler tail pipe.
2. Fasten the spark arrester (1) with provided tapping screw (2) (No.8 - 6.35 mm (0.25 in.) Long) firmly.
3. Check if the fit is correct by wiggling the spark arrester (1).

(1) Spark Arrester

(3) Muffler

(2) Tapping Screw

W1065626



### **Cleaning Air Cleaner Primary Element**

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

#### ■ NOTE

- Check to see if the evacuator valve is blocked with dust.
- Check rubber seal, if it is damaged, replace it.

#### ■ 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 cover with the arrow (on the rear of cover) upright. If the cover is improperly fitted, evacuator valve will not function and dust will adhere to the element.
- Do not touch the secondary element (1) except in cases where replacing is required.

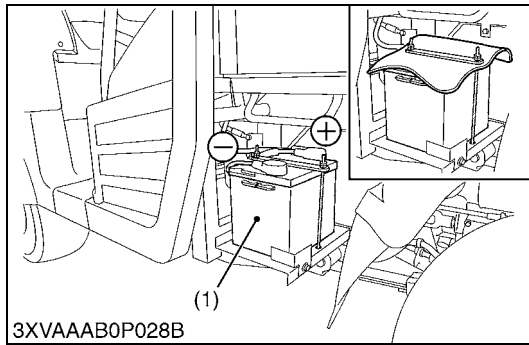
See "Replacing Air Cleaner Secondary Element" in Every 1 Year maintenance.

#### ■ Evacuator Valve

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

- |                                |                     |
|--------------------------------|---------------------|
| (1) Secondary (Safety) Element | (4) Evacuator Valve |
| (2) Primary Element            | (5) Cover           |
| (3) Rubber Seal                |                     |

W1066069



### Checking Battery Condition

To avoid the possibility of battery explosion:

For the refillable type battery, follow the instructions below.

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

#### ⚠ CAUTION

- Never remove the vent caps while the engine is running.
- Keep electrolyte away from eyes, hands and clothes. If you are splattered with it, wash it away completely with water immediately and get medical attention.
- Wear eye protection and rubber gloves when working around the battery.

The factory-installed battery is of non-refillable type. If the battery is weak, charge the battery or replace it with new one.

#### ■ Battery Charging

#### ⚠ CAUTION

- When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.
- When charging the battery, ensure the vent caps are securely in place (if equipped).
- When disconnecting the cable from the battery, start with the negative terminal first. When connecting the cable to the battery, start with the positive terminal first.
- Never check battery charge by placing a metal object across the posts.

**Use a voltmeter or hydrometer.**

1. To 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. When exchanging an old battery for a new one, use battery of equal specification shown in table 1.

Battery Type	Volts (V)	Reserve Capacity (min.)	Cold Cranking Amps	Normal Charging Rate (A)
526RA	12	80	535	6.5

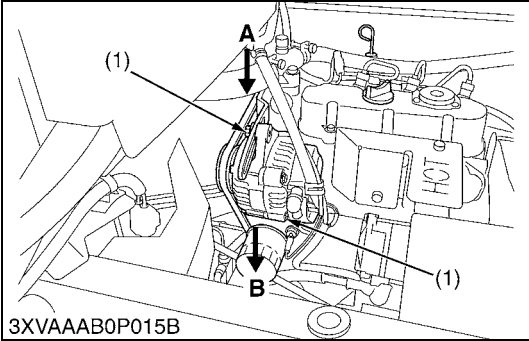
(1) Battery

W1066595

■ **Direction for Storage**

- 1. When storing the vehicle for a long period, remove the battery from vehicle, adjust the electrolyte to the proper level (refillable type only) 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.

W1067175



**Adjusting Fan Belt Tension**

**CAUTION**

- **Be sure to stop the engine before checking belt tension.**
- 1. Stop the engine and remove the key.
  - 2. Apply moderate thumb pressure to belt between pulleys.
  - 3. If tension is incorrect, loosen the alternator mounting 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.

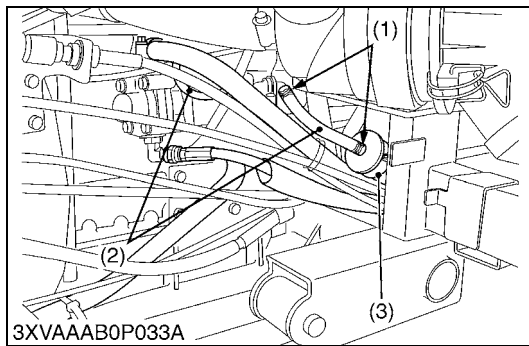
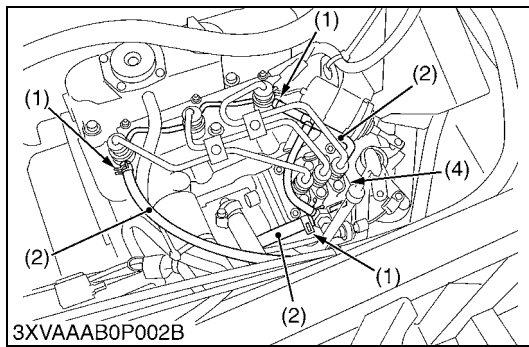
Proper fan belt tension	Factory spec.	A deflection of between 7 to 9 mm (0.28 to 0.34 in.) when the belt is pressed in the middle of the span.
-------------------------	---------------	--

(1) Bolt

**A : Check Belt Tension**  
**B : To Tighten**

W1067293





### Checking Fuel Line and Fuel Filter

#### ⚠ CAUTION

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

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

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

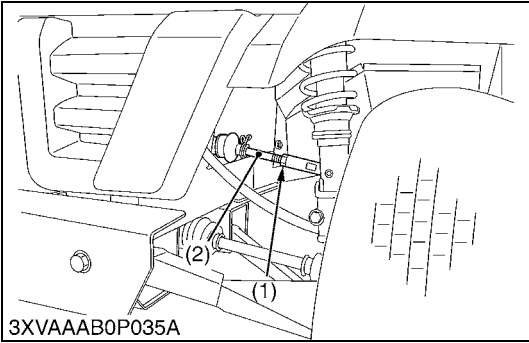
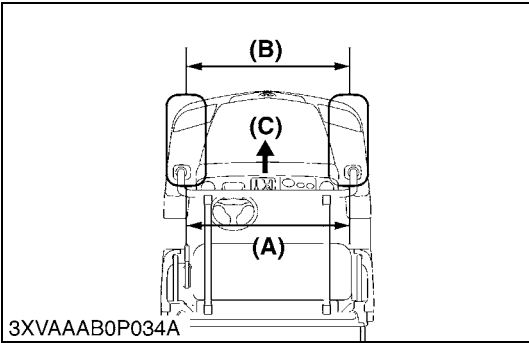
#### ■ IMPORTANT

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

- (1) Pipe Clamp  
(2) Fuel Line

- (3) Fuel Filter  
(4) Fuel Pump

W1067677



**Adjusting Toe-in**

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

Proper toe-in	Factory spec.	0 to 20 mm 0 to 0.79 in.
---------------	---------------	-----------------------------

**■ Adjusting procedure**

1. Loosen the lock nut (1) and turn the tie-rod (2) to adjust the rod length until the proper toe-in measurement is obtained.
2. Retighten the lock nut (1).

**■ IMPORTANT**

- Keep the length of the left and right tie-rod equal.

- (1) Lock Nut  
(2) Tie-rod

A : Wheel to Wheel Distance at Rear  
B : Wheel to Wheel Distance at Front  
C : Front

W1067991

**[5] CHECK POINTS OF EVERY 200 HOURS**

**Replacing Engine Oil Filter**

1. See page G-24.

W1068652

**Replacing Transmission Oil Filter**

1. See page G-27.

W1068726

**Changing Transmission Oil**

1. See page G-26.

W1068801

**Adjusting Brake Pedal**

1. See page G-28.

W1068873

**Adjusting Parking Brake**

1. See page G-28.

W1068945

**Checking Brake Light Switch**

1. See page G-28.

W1069017

**Checking Front Brake Case**

1. See page G-29.

W1069089

**Checking Brake Hose and Pipe**

1. See page G-29.

W1069157

**Checking Radiator Hose and Clamp**

Check to see if radiator hoses (1) are properly fixed every 200 hours of operation or six months, whichever comes first.

1. If hose clamps (2) are loose or water leaks, tighten bands 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**

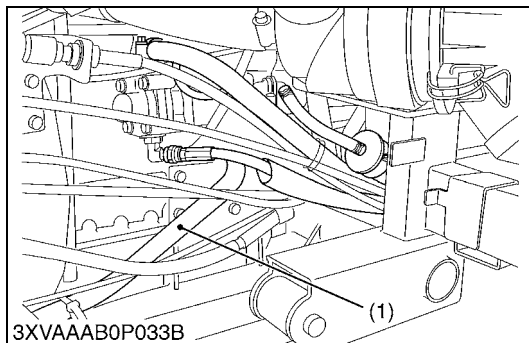
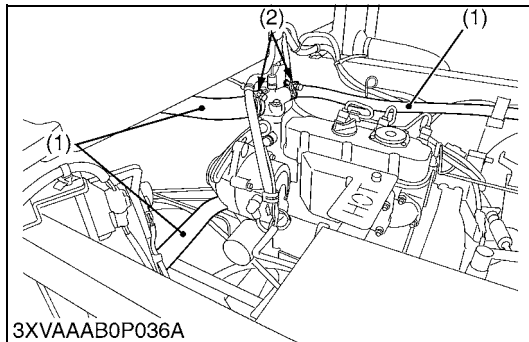
Take the following actions in the event the coolant temperature be nearly or more than the boiling points, what is called "Overheating".

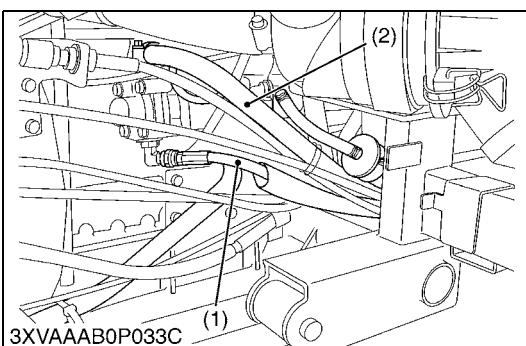
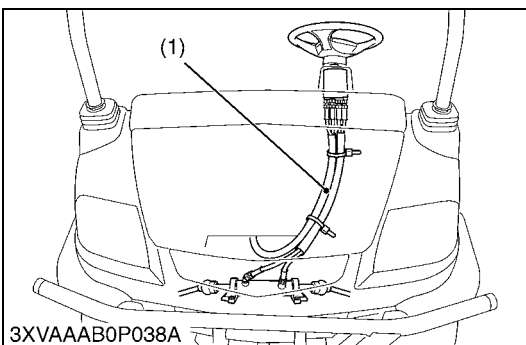
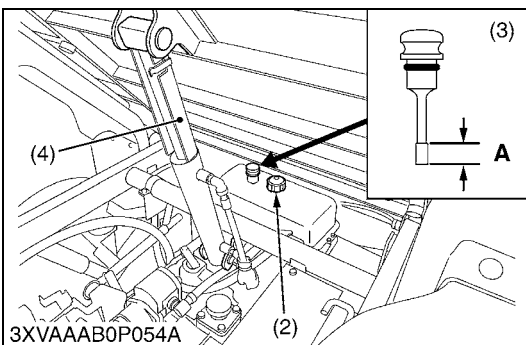
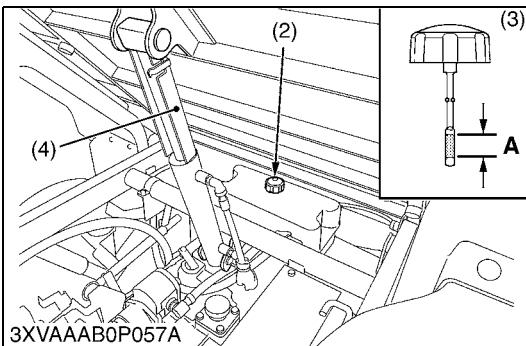
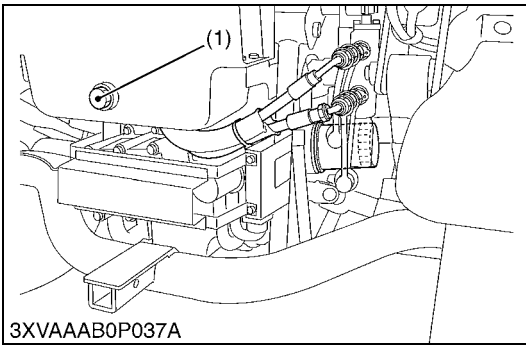
1. Stop the machine operation in a safe place and keep the engine unloaded idling.
2. Do not stop the engine suddenly, but stop it after about 5 minutes of unloaded idling.
3. Keep yourself well away from the machine for further 10 minutes or while the steam blown out.
4. Checking if there is no danger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

(1) Radiator Hose

(2) Clamp Band

W1069229





### Changing Hydraulic Lift Oil (Hydraulic Dumping System Model)

1. Park the vehicle on a firm, flat and level surface.
2. Raise the cargo bed and mount the safety support.
3. To drain the used oil, remove the drain plug (1) and filling plug (2) and drain the oil completely into the oil pan.
4. After draining reinstall the drain plug.
5. Fill with the new KUBOTA SUPER UDT fluid up to upper notch on the dipstick. Refer to "**LUBRICANTS, FUEL AND COOLANT**" (See page G-8.)

How to check:

Wipe dipstick clean with a rag and screw it into filling hole. Remove dipstick again to see if the oil level is between the upper and lower notch.

6. After filling reinstall the filling plug.

Oil capacity	Dumping model	8.0 L 2.1 U.S.gals 1.8 Imp.gals
	Dumping and PTO model	7.0 L 1.8 U.S.gals 1.5 Imp.gals

- (1) Drain Plug
- (2) Filling Plug
- (3) Dipstick
- (4) Safety Support

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

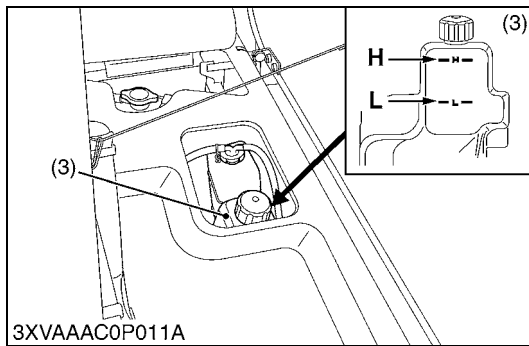
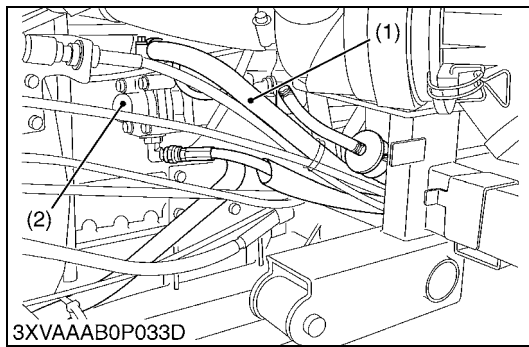
W1069560

### Checking Power Steering Line

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

- (1) Power Steering Pressure Hose
- (2) Power Steering Suction Hose

W1070133



### Changing Power Steering Oil

#### ⚠ CAUTION

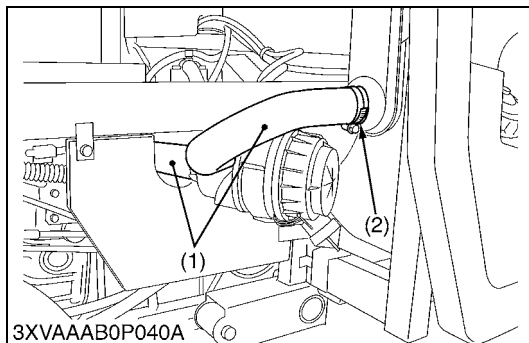
- Be sure to stop the engine before changing the oil.
  - Allow engine to cool down sufficiently, oil can be hot and can burn.
1. To drain the used oil, remove the suction hose (1) on the gear pump (2).
  2. Drain the oil completely into the oil pan.
  3. After draining reinstall suction hose.
  4. Fill with the new oil up to the "H" mark of the oil tank. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8.)
  5. Start the engine and then turn the steering wheel toward the right and left several times (this motion causes air in the hose to discharge).
  6. Check to see if the oil level is between the "H" and "L" marks on the oil tank.

Power steering oil	Capacity	5.9 L 1.6 U.S.gals 1.3 Imp.gals
--------------------	----------	---------------------------------------

- (1) Suction Hose  
(2) Gear Pump  
(3) Power Steering Oil Tank

H : HIGH  
L : LOW

W1070329



### Checking Intake Air Line

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

(1) Hose

(1) Hose Clamp

W1070990

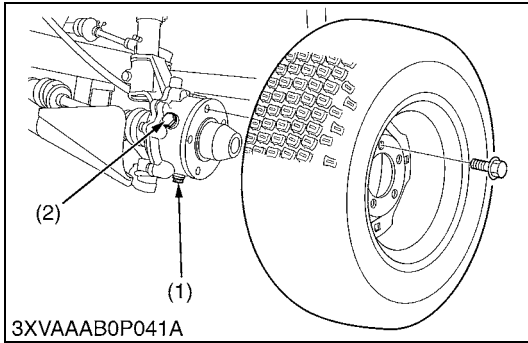
## [6] CHECK POINT OF EVERY 300 HOURS

### Checking Tire

1. See page G-29.

W1071226

## [7] CHECK POINTS OF EVERY 400 HOURS



### Changing Knuckle Case Oil

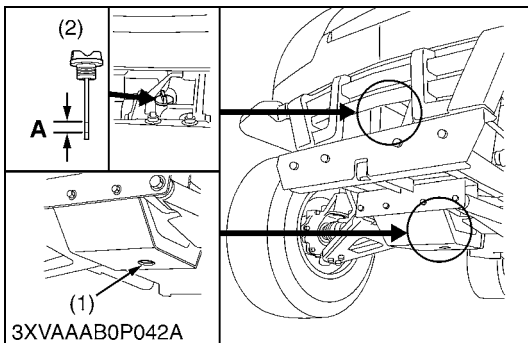
1. Remove the tire.
2. Park the vehicle on a firm, flat and level surface.
3. To drain the used oil, remove the drain and filling plugs at the LH knuckle case and drain the oil completely into the oil pan.
4. After draining, reinstall the drain plug (1).
5. Fill the new oil up to the filling port level. Refer to **"LUBRICANTS, FUEL AND COOLANT"**. (See page G-8.)
6. After filling, reinstall the filling plug (2).
7. Use the same procedure to change the RH knuckle case oil.

Knuckle case oil	Reference capacity (one side)	0.15 L 0.16 U.S.qts 0.13 Imp.qts
------------------	----------------------------------	--

(1) Drain Plug

(2) Filling Plug

W1071368



### Changing Front Axle Case Oil

1. Park the vehicle on a firm, flat and level surface.
2. To drain the used oil, remove the drain and filling plugs at the front axle case and drain the oil completely into the oil pan.
3. After draining, reinstall the drain plug.
4. Fill with new oil up to the upper notch on the dipstick. Refer to **"LUBRICANTS, FUEL AND COOLANT"**. (See page G-8.)
5. After filling, reinstall the filling plug.

Front axle case oil	Capacity	0.6 L 0.63 U.S.qts 0.52 Imp.qts
---------------------	----------	---------------------------------------

(1) Drain Plug

(2) Filling Plug with Dipstick

A : Oil level is acceptable within this range

W1071682

## [8] CHECK POINT OF EVERY 500 HOURS

### Replacing Fuel Filter

1. See page G-37.

W1072053

## [9] CHECK POINT OF EVERY 800 HOURS

### Adjusting Engine Valve Clearance

1. See page 1-S12.

W1072127

## [10] CHECK POINT OF EVERY 1500 HOURS

### Checking Fuel Injection Nozzle Injection Pressure

1. See page 1-S17.

W1072195

**[11] CHECK POINT OF EVERY 3000 HOURS****Checking Injection Pump**

1. See page 1-S15.

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

1. Replace the both primary and secondary elements.  
Refer to "Cleaning Air Cleaner Primary Element" (see page G-34).

**[13] CHECK POINTS OF EVERY 2 YEARS****Changing Brake Fluid**

1. See page 4-S5.

W1080235

**Replace Inner Parts of Brake Master Cylinder**

1. See page 4-S15.

W1080035

**Replace Remote Hydraulic Hose (If equipped)**

1. See page 7-S6.

W1080085

**Replace Rear Brake Cylinder Seal**

1. See page 4-S19.

W1080185

**Replace Front Brake Seal**

1. See page 4-S13.

W1080135

**Replacing Radiator Hose (Water Pipe)**

1. Replace the hoses and clamps.  
Refer to "Checking Radiator Hose and Clamp". (See page G-39.)

W1080299

**Replacing Power Steering Hose**

1. See page 6-S8.

W1080353

**Replacing Fuel Hose**

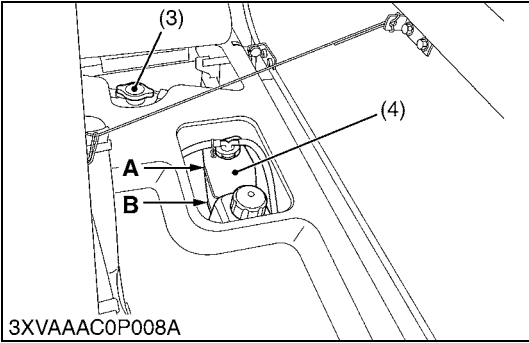
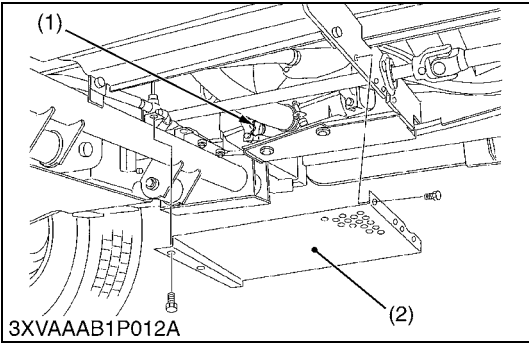
1. See page G-37.

W1080407

**Replacing Intake Air Line**

1. See page G-41.

W1080461



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

Coolant	Capacity	4.0 L 4.2 U.S.qts 3.5 Imp.qts
---------	----------	-------------------------------------

**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.**

- (1) Drain Plug

(2) Protective Cover

(3) Radiator Cap

(4) Recovery Tank
- A : FULL

B : LOW

W1080623



### Anti-Freeze



#### CAUTION

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

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

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed coolant, fill the radiator with fresh water and empty it again.

Repeat this procedure 2 or 3 times to clean up the inside.

3. Mixing the LLC

Put the LLC in coolant in the percentage (%) for a target temperature. When mixing, stir it up well, and then fill into the radiator.

4. The procedure for the mixing of water and antifreeze differs according to the make of the antifreeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.

#### ■ IMPORTANT

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

Vol % Anti-freeze	Freezing Point		Boiling Point *	
	°C	°F	°C	°F
40	-24	-12	106	222
50	-37	-34	108	226

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

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 manufacturer and type in the same mixture percentage.
  - Never add any long-life coolant of different manufacturer. (Different brands may have different additive components, and the engine may fail to perform as specified.)
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anticorrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

■ **NOTE**

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

W1081570

## [14] CHECK POINT OF EVERY 4 YEARS

### Replacing Brake Hose

1. See page G-29.

W1082618

## [15] OTHERS

### Bleeding Fuel System

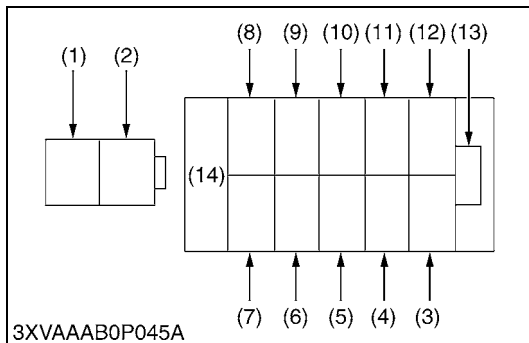
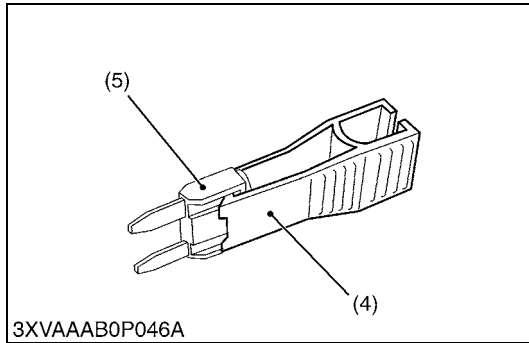
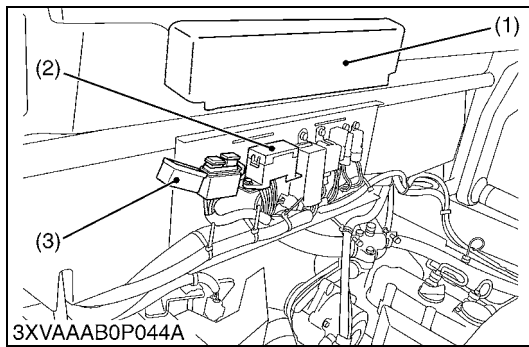
Air must be removed :

1. When the fuel filter or lines are removed.
2. When tank is completely empty.
3. After the vehicle 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.

W1082726



### Replacing Fuse

The vehicle 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.

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.

#### ■ Replacement procedure

1. Disconnect the negative cord of the battery.
2. Remove the cover (1) and the fuse box cover (2).
3. Pull out the blown fuse using fuse puller (4) in the fuse box.
4. Insert a new fuse into the fuse box.
5. Install the fuse box cover and the cover (1).
6. Connect the negative battery cord.

(1) Cover

(2) Fuse Box Cover

(3) Slow Blow Fuse Box Cover

(4) Fuse Puller

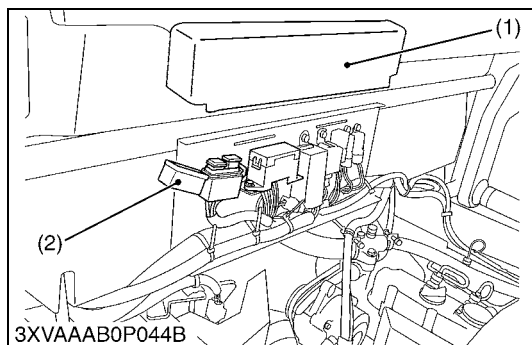
(5) Fuse

W1082949

### Protected Circuit

Fuse No.	Capacity (A)	Protected circuit
1	Slow blow fuse (50)	Key switch
2	Slow blow fuse (60)	Alternator
3	15	Head lamp, Tail lamp, Panel
4	5	Glow lamp
5	10	(Hazard)
6	20	Fan motor
7	15	Engine stop
8	15	Alternator, Brake lamp, Fan motor relay
9	5	Panel, Engine stop control
10	10	12 V DC output
11	10	Horn
12	15	(Work light)
13	–	Fuse puller
14	5, 10, 15, 20	Spare

W1083326



### **Replacing Slow Blow Fuses**

The slow blow fuses are intended to protect the electrical cabling. If any of them have blown out, be sure to pinpoint the causes. Never use any substitute, use only a KUBOTA genuine part.

#### **■ Replacement procedure**

1. Disconnect the negative cord of the battery.
2. Remove the cover (1) and the slow blow fuse box cover.
3. Pull out the slow blow fuse.
4. Insert a new slow blow fuse into the slow blow fuse box.
5. Install the slow blow fuse box cover and the cover (1).
6. Connect the negative battery cord.

(1) Cover

(2) Slow Blow Fuse Box Cover

W1085440

### **Replacing Light Bulb**

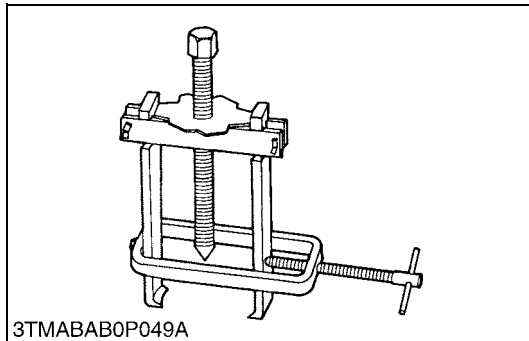
1. Head lights:  
Take the bulb out of the light body and replace with a new one.
2. Other lights:  
Detach the lens and replace the bulb.

Light	Capacity
Head lights	37.5 W
Tail light	5 W
Brake light	21 W
Easy Checker (TM)	3.8 W (14 V, 0.27 A)
Turn signal light (front)	20 W (if equipped)
Turn signal light (rear)	21 W (if equipped)
Work light	27 W (if equipped)
Instrument panel light	3.8 W (14 V, 0.27 A)

W1085960

## 8. SPECIAL TOOLS

### [1] SPECIAL TOOLS FOR ENGINE

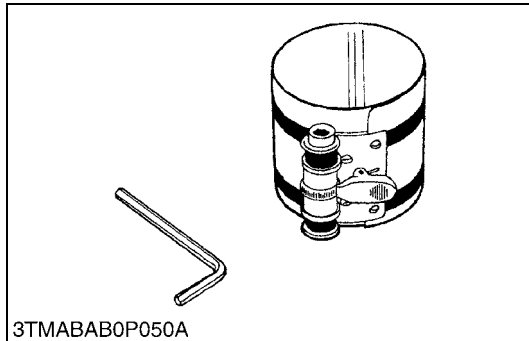


#### Special Use Puller Set

Code No.: 07916-09032

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

W1024050

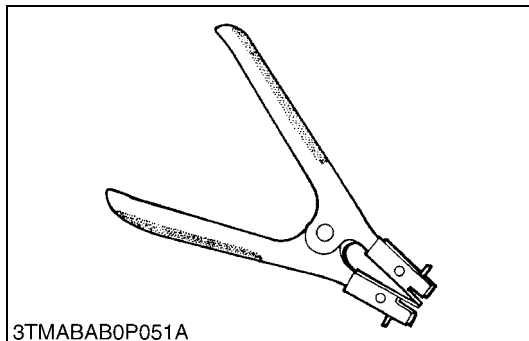


#### Piston Ring Compressor

Code No.: 07909-32111

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

W1024100

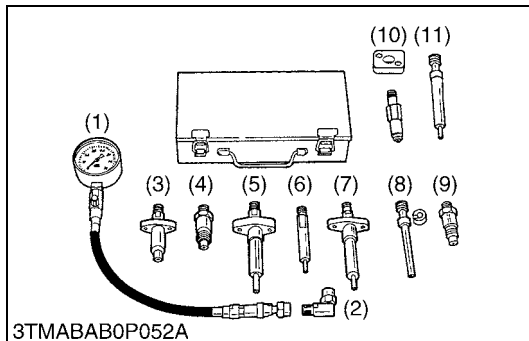


#### Piston Ring Tool

Code No.: 07909-32121

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

W1024150



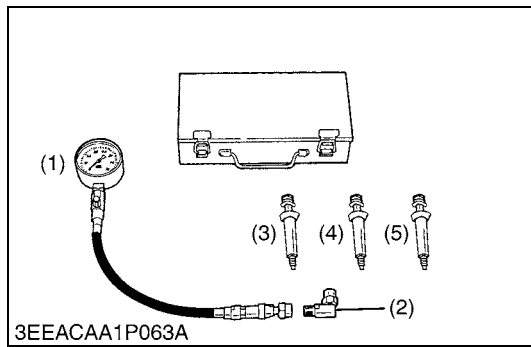
#### Diesel Engine Compression Tester (for Injection Nozzle)

Code No.: 07909-30208 (Assembly) 07909-31251 (G)  
07909-30934 (A to F) 07909-31271 (I)  
07909-31211 (E and F) 07909-31281 (J)  
07909-31231 (H)

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

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

W1024200



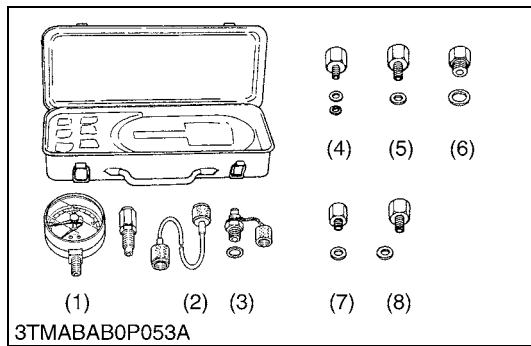
### **Diesel Engine Compression Tester (for Glow Plug)**

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

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

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

0000001398E



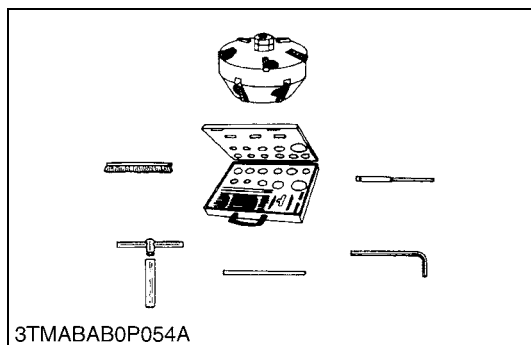
### **Oil Pressure Tester**

Code No.: 07916-32032

Application: Use to measure lubricating oil pressure.

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

W1024318



### **Valve Seat Cutter**

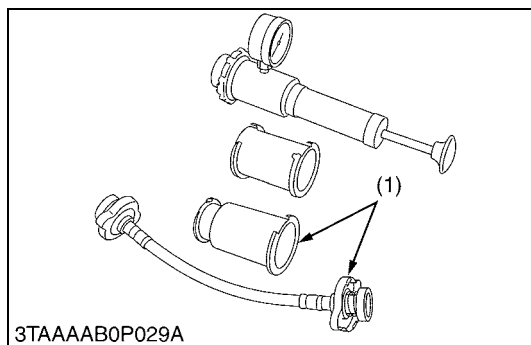
Code No.: 07909-33102

Application: Use to reseal valves.

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

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

W1024458



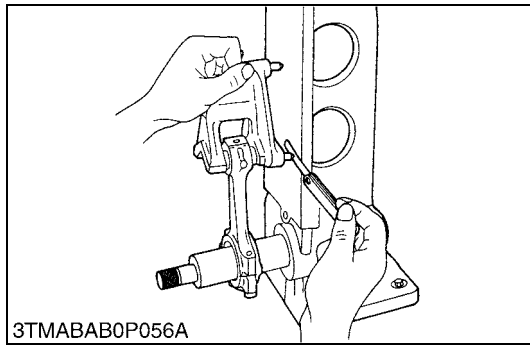
### **Radiator Tester**

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

W1024532



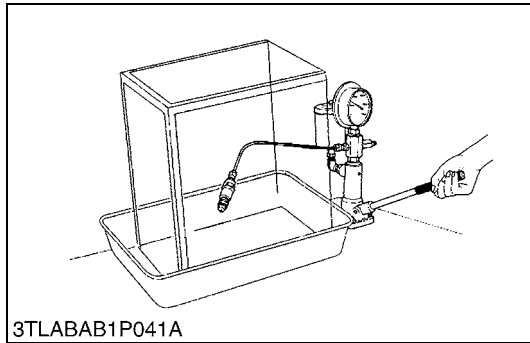
### **Connecting Rod Alignment Tool**

Code No.: 07909-31661

Application: Use to check the connecting rod alignment.

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

W1024583



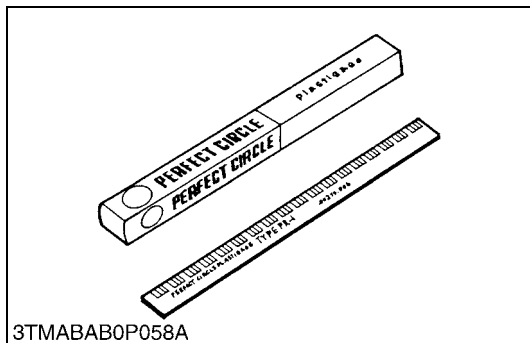
### **Nozzle Tester**

Code No.: 07909-31361

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

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

W1024653



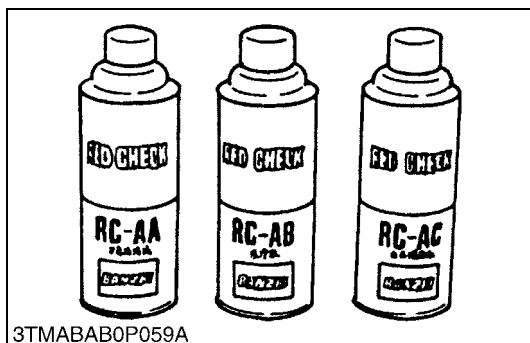
### **Plastigage**

Code No.: 07909-30241

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

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

W1024719

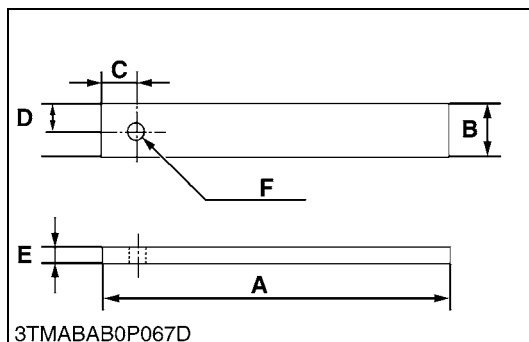
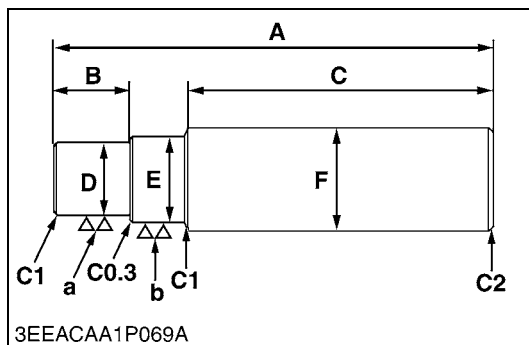
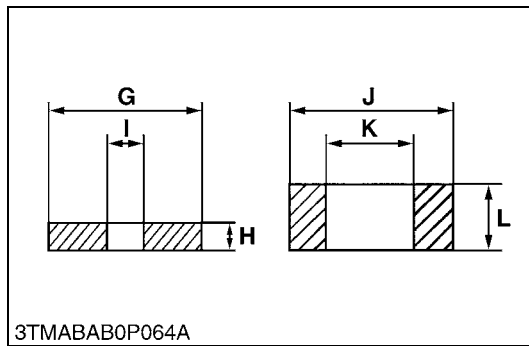
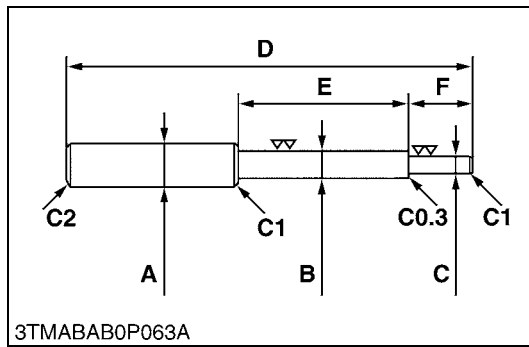


### **Red Check**

Code No.: 07909-31371

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

W1024909



### Valve Guide Replacing Tool

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

A	20 mm dia. (0.79 in. dia.)
B	9.96 to 9.98 mm dia. (0.3921 to 0.3929 in. dia.)
C	5.5 to 5.7 mm dia. (0.2165 to 0.2244 in. dia.)
D	200 mm (8.66 in.)
E	80 mm (3.15 in.)
F	40 mm (1.58 in.)
G	25 mm dia. (0.98 in. dia.)
H	5 mm (0.197 in.)
I	6.0 to 6.1 mm dia. (0.236 to 0.240 in. dia.)
J	18 mm dia. (0.71 in. dia.)
K	10.6 to 10.7 mm dia. (0.417 to 0.421 in. dia.)
L	6.9 to 7.1 mm (0.272 to 0.280 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)

W1234567

### Bushing Replacing Tools

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

For small end bushing

A	145 mm (5.71 in.)
B	20 mm (0.79 in.)
C	100 mm (3.94 in.)
D	19.90 to 19.95 mm dia. (0.7835 to 0.7854 in. dia.)
E	21.90 to 21.95 mm dia. (0.8622 to 0.8642 in. dia.)
F	25 mm dia. (0.79 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)
a	6.3 μm (250 μin.)
b	6.3 μm (250 μin.)

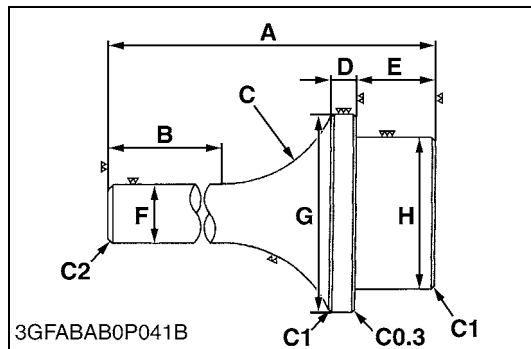
W12358870

### Flywheel Stopper

Application: Use to loosen and tighten the flywheel screw.

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





### **Crankshaft Bearing 1 Replacing Tool**

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

#### **[Press Out]**

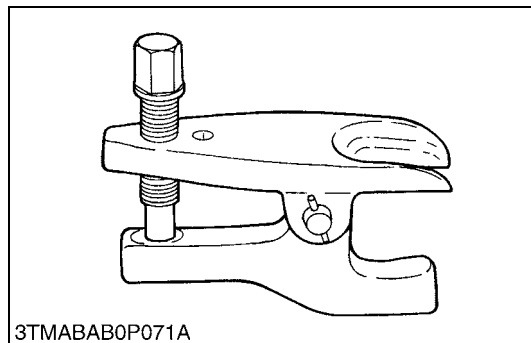
<b>A</b>	135 mm (5.31 in.)
<b>B</b>	72 mm (2.83 in.)
<b>C</b>	40 mm radius (1.57 in. radius)
<b>D</b>	10 mm (0.39 in.)
<b>E</b>	22 mm (0.87 in.)
<b>F</b>	20 mm dia. (0.79 in. dia.)
<b>G</b>	47.90 to 47.95 mm dia. (1.8858 to 1.8878 in. dia.)
<b>H</b>	43.90 to 43.95 mm dia. (1.7283 to 1.7303 in. dia.)
<b>C1</b>	Chamfer 1.0 mm (0.039 in.)
<b>C2</b>	Chamfer 2.0 mm (0.079 in.)
<b>C0.3</b>	Chamfer 0.3 mm (0.012 in.)

#### **[Press Fit]**

<b>A</b>	130 mm (5.12 in.)
<b>B</b>	72 mm (2.83 in.)
<b>C</b>	40 mm radius (1.57 in. radius)
<b>D</b>	9 mm (0.35 in.)
<b>E</b>	24 mm (0.95 in.)
<b>F</b>	20 mm dia. (0.79 in. dia.)
<b>G</b>	68 mm dia. (2.68 in. dia.)
<b>H</b>	43.90 to 43.95 mm dia. (1.7283 to 1.7303 in. dia.)
<b>C1</b>	Chamfer 1.0 mm (0.039 in.)
<b>C2</b>	Chamfer 2.0 mm (0.079 in.)
<b>C0.3</b>	Chamfer 0.3 mm (0.012 in.)

W9632587

## **[2] SPECIAL TOOLS FOR TRACTOR**

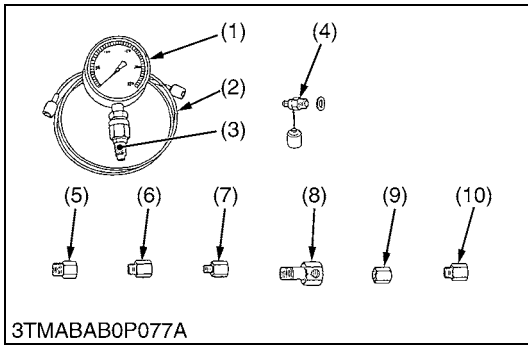


### **Tie-rod End Lifter**

Code No.: 07909-39051

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

W1026472



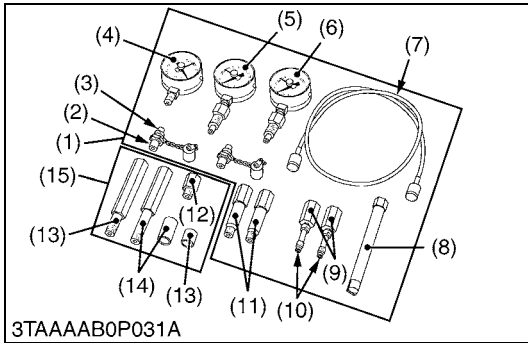
### **Relief Valve Pressure Tester**

Code No.: 07916-50045

Application: This allows easy measurement of relief set pressure.

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

W1026741



### **Hydrostatic Transmission Tester and HST Adaptor Set**

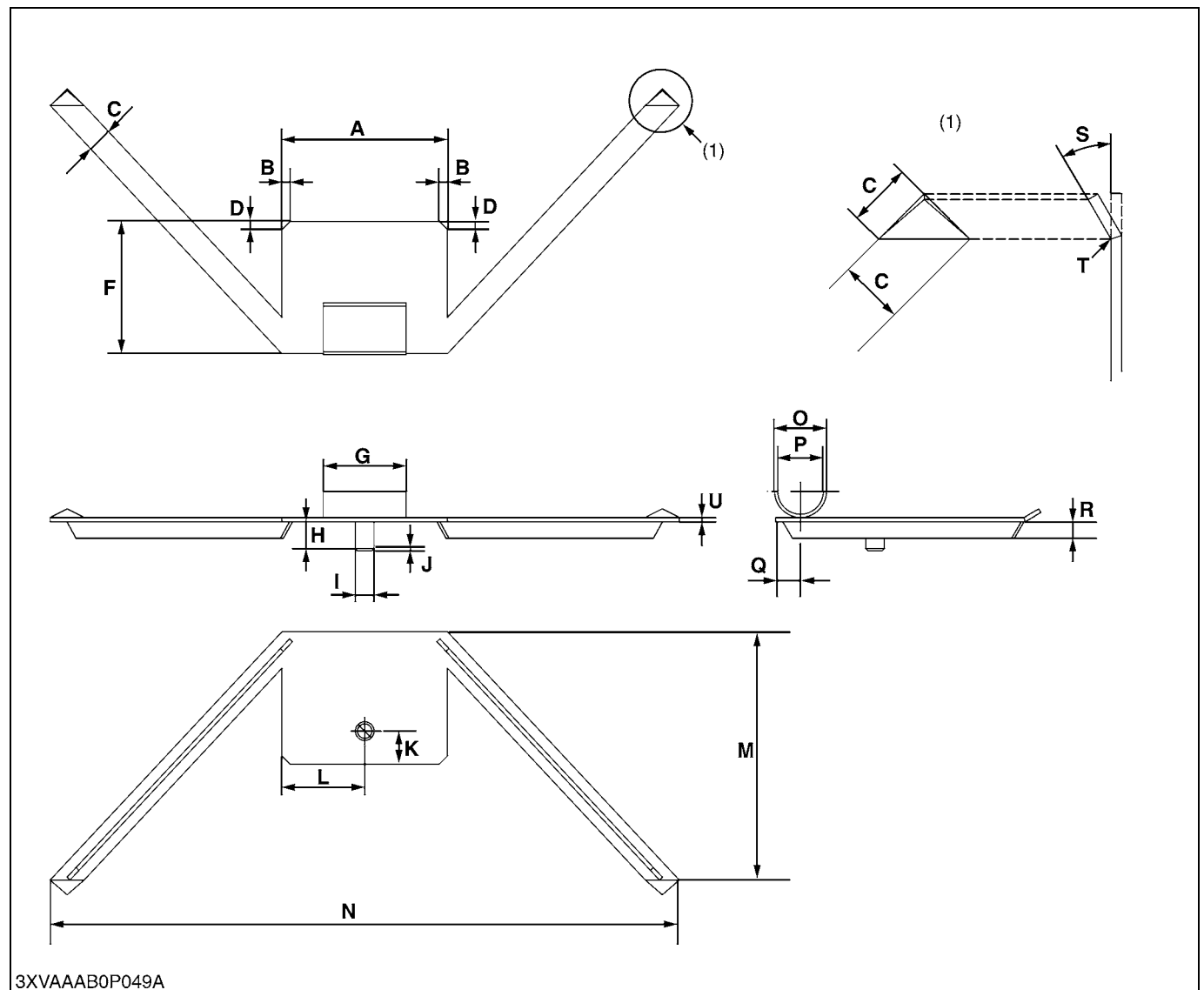
Code No.: 07916-52040 (Hydrostatic Transmission Tester)

07916-53072 (HST Adaptor Set)

Application: This allows easy measurement of hydrostatic transmission pressure.

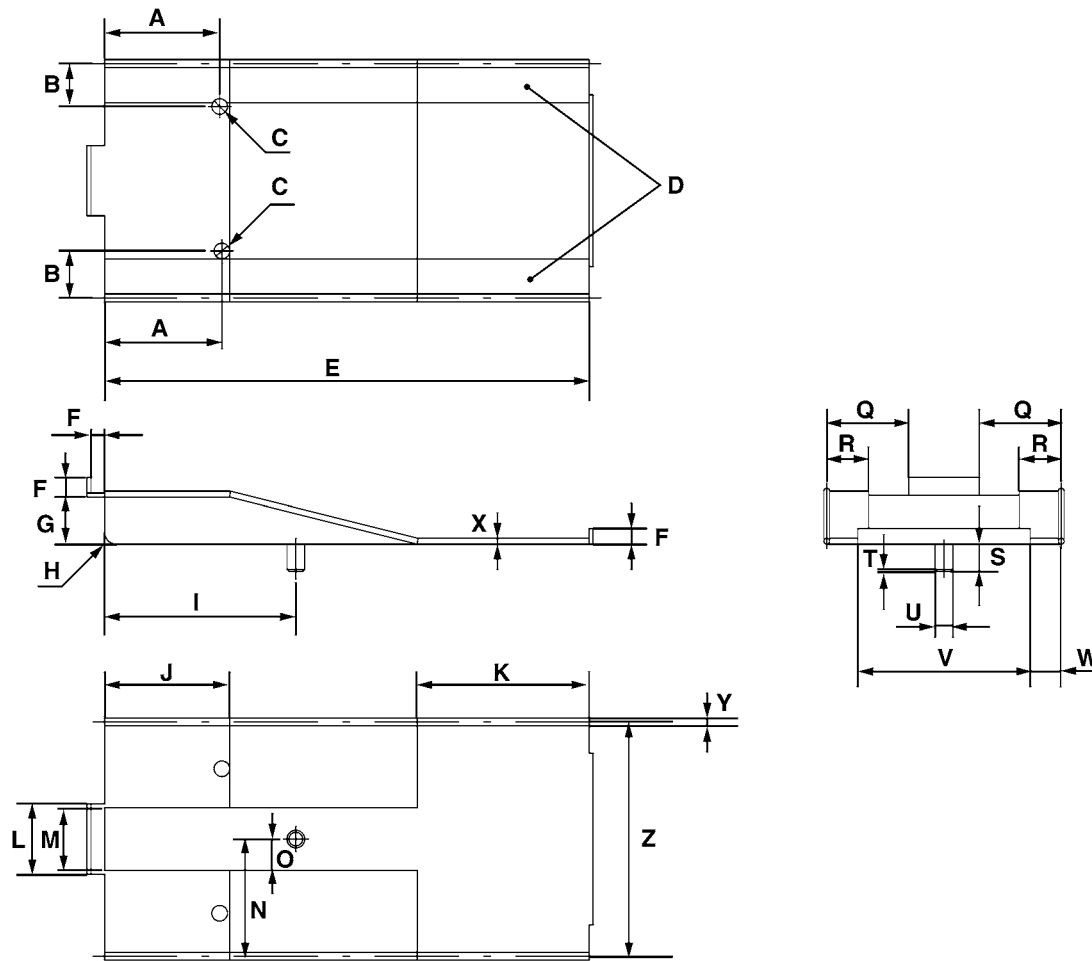
- |  |   |
|--|---|
| (1) Hydrostatic Transmission Tester (07916-52040)                                      | (8) Valve Seat Driver (07916-60841)             |
| (2) Gasket (04714-00200)   | (9) Connector <b>1</b> (07916-60811)            |
| (3) Connector 3 (07916-51331)  | (10) Connector <b>2</b>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

W1023682

**Axle Support**

Application: Use for removing and installing rear axle bracket.

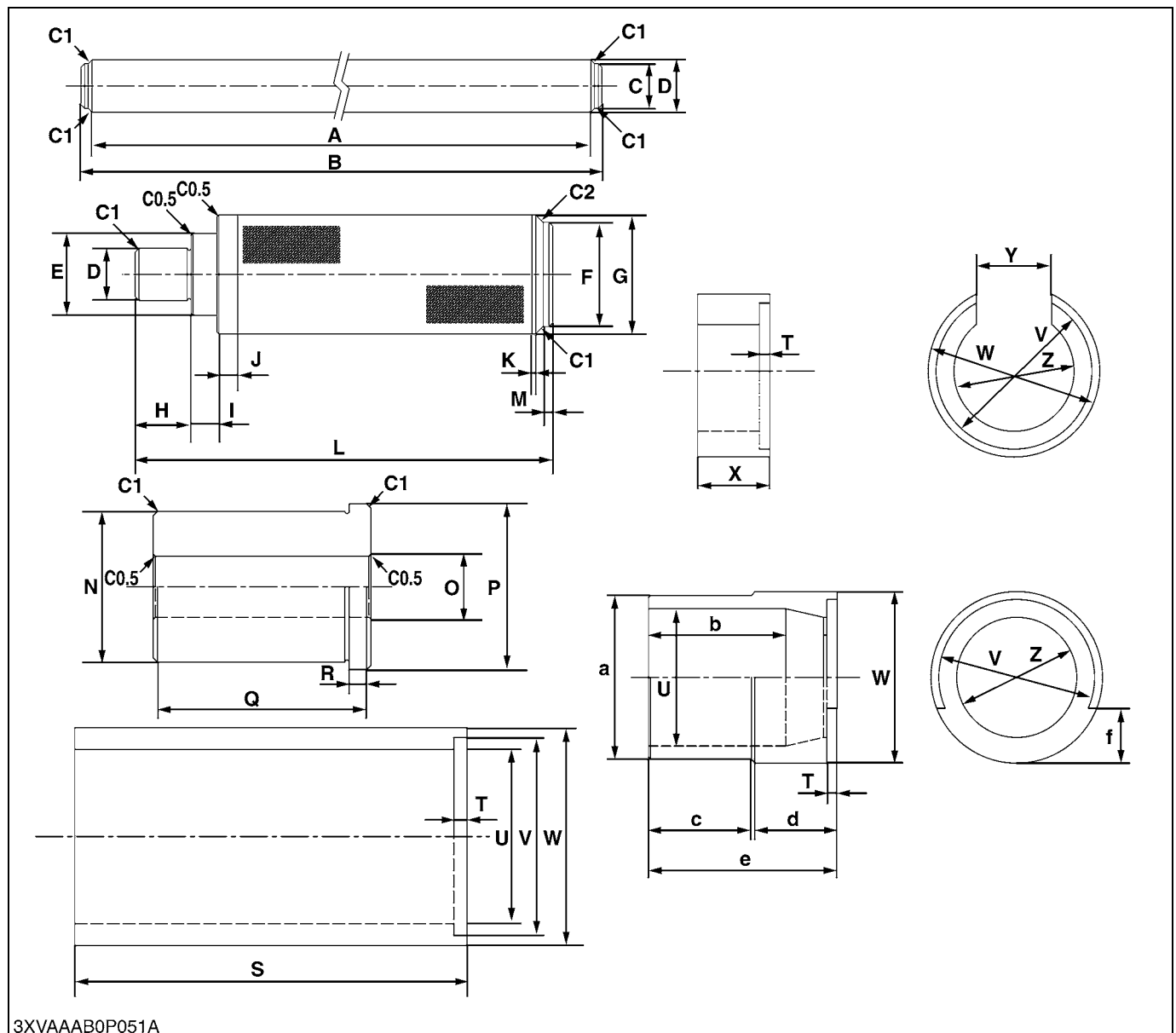
<b>A</b>	254.0 mm (10.0 in.)	<b>H</b>	44.5 mm (1.75 in.)	<b>O</b>	79.5 mm (3.13 in.)
<b>B</b>	12.7 mm (0.50 in.)	<b>I</b>	28.7 mm dia. (1.13 in. dia.)	<b>P</b>	69.9 mm (2.75 in.)
<b>C</b>	38.1 mm (1.50 in.)	<b>J</b>	3.3 mm dia. (0.13 in. dia.)	<b>Q</b>	3.81 mm (1.50 in.)
<b>D</b>	12.7 mm (0.50 in.)	<b>K</b>	50.8 mm (2.0 in.)	<b>R</b>	25.4 mm (1.0 in.)
<b>E</b>	63.5 mm (2.50 in.)	<b>L</b>	127.0 mm (5.0 in.)	<b>S</b>	0.52 rad (30 °)
<b>F</b>	203.2 mm (8.0 in.)	<b>M</b>	381.0 mm (15.0 in.)	<b>T</b>	R6.4 (R0.25)
<b>G</b>	152.4 mm (6.0 in.)	<b>N</b>	965.2 mm (38.0 in.)	<b>U</b>	6.35 mm (1/4 in.)

**Power Train Support**

3XVAAAB0P050A

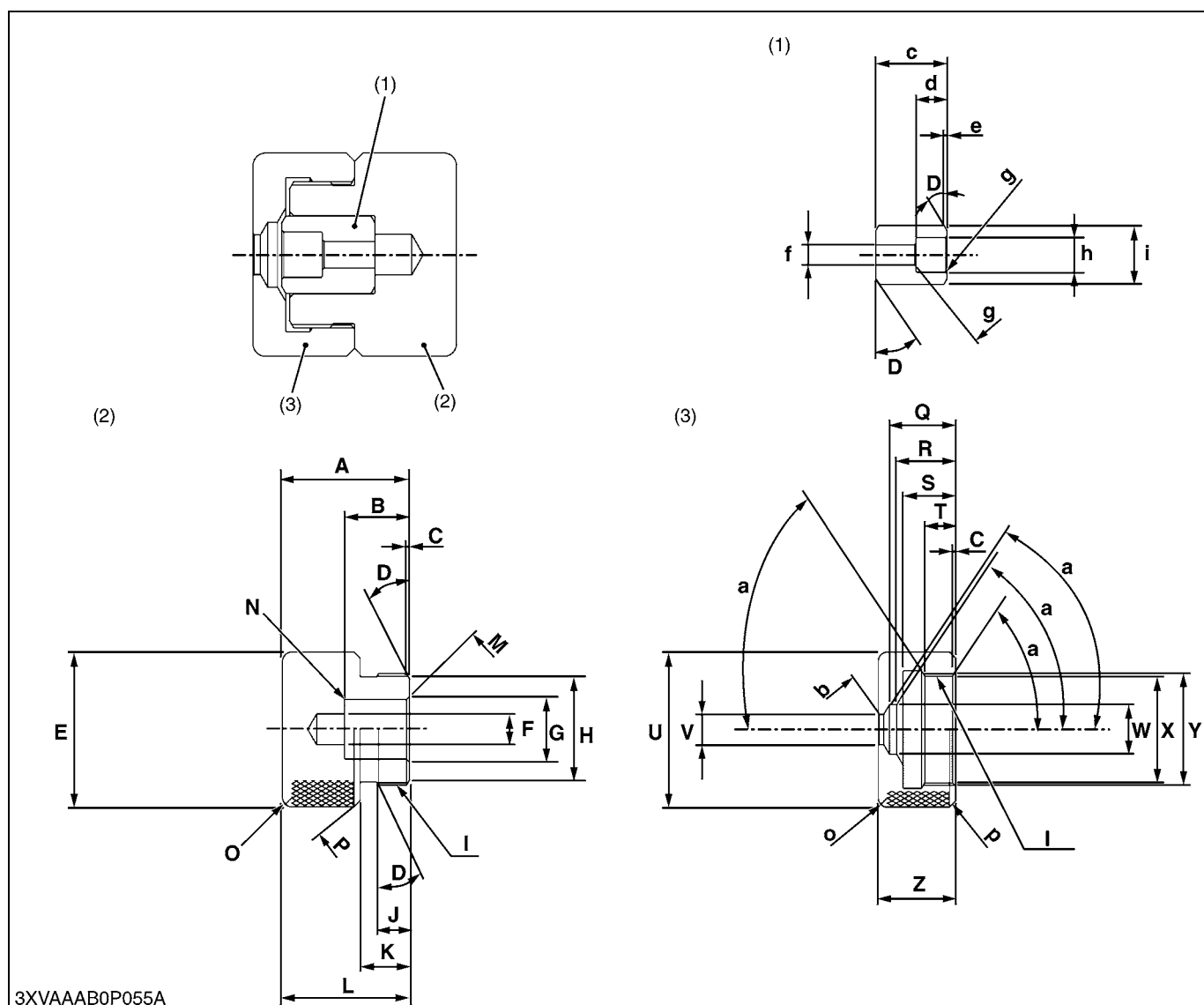
Application: Use for dismounting and mounting transmission and engine one piece assembly.

<b>A</b>	186.9 mm (7.36 in.)	<b>J</b>	203.2 mm (8.0 in.)	<b>S</b>	44.5 mm (1.75 in.)
<b>B</b>	69.9 mm (2.75 in.)	<b>K</b>	317.5 mm (12.5 in.)	<b>T</b>	3.3 mm (0.13 in.)
<b>C</b>	25.4 mm dia. (1.00 in. dia.)	<b>L</b>	114.3 mm (4.5 in.)	<b>U</b>	28.7 mm dia. (1.13 in. dia.)
<b>D</b>	1/4 in. thick rubber strip	<b>M</b>	101.6 mm (4.0 in.)	<b>V</b>	280.2 mm (11.03 in.)
<b>E</b>	825.5 mm (32.5 in.)	<b>N</b>	190.5 mm (7.5 in.)	<b>W</b>	50.8 mm (2.0 in.)
<b>F</b>	25.4 mm (1.0 in.)	<b>O</b>	50.8 mm (2.0 in.)	<b>X</b>	4.2 mm (1/6 in.)
<b>G</b>	76.2 mm (3.0 in.)	<b>P</b>	381.0 mm (15.0 in.)	<b>Y</b>	9.5 mm dia. (3/8 in. dia.)
<b>H</b>	19.1 mm (R0.75 in.)	<b>Q</b>	133.4 mm (5.25 in.)	<b>Z</b>	381.0 mm (15.0 in.)
<b>I</b>	313.2 mm (12.33 in.)	<b>R</b>	63.5 mm (2.5 in.)		

**Lower Arm Bush Tool**

Application: Use for removing and installing lower arm rubber bush.

<b>A</b>	256.5 mm (10.10 in.)	<b>M</b>	2.6 mm (0.102 in.)	<b>Y</b>	22 mm (0.866 in.)
<b>B</b>	262.5 mm (10.33 in.)	<b>N</b>	34.65 mm dia. (1.364 in. dia.)	<b>Z</b>	35 mm dia. (1.378 in. dia.)
<b>C</b>	12 mm dia. (0.472 in. dia.)	<b>O</b>	14.1 mm dia. (0.555 in. dia.)	<b>a</b>	47.6 mm dia. (1.874 in. dia.)
<b>D</b>	14 mm dia. (0.551 in. dia.)	<b>P</b>	38 mm dia. (1.496 in. dia.)	<b>b</b>	40 mm (1.575 in.)
<b>E</b>	22 mm dia. (0.866 in. dia.)	<b>Q</b>	50 mm (1.969 in.)	<b>c</b>	30 mm (1.181 in.)
<b>F</b>	28 mm dia. (1.102 in. dia.)	<b>R</b>	5 mm (0.197 in.)	<b>d</b>	24 mm (0.945 in.)
<b>G</b>	32 mm dia. (1.260 in. dia.)	<b>S</b>	90 mm (3.543 in.)	<b>e</b>	55 mm (2.165 in.)
<b>H</b>	15 mm (0.591 in.)	<b>T</b>	3 mm (0.118 in.)	<b>f</b>	16 mm (0.630 in.)
<b>I</b>	7 mm (0.276 in.)	<b>U</b>	40 mm dia. (1.575 in. dia.)	<b>C0.5</b>	Chamfer 0.5 mm (0.020 in.)
<b>J</b>	5.5 mm (0.217 in.)	<b>V</b>	45.4 mm dia. (1.787 in. dia.)	<b>C1</b>	Chamfer 1 mm (0.039 in.)
<b>K</b>	1 mm (0.0394 in.)	<b>W</b>	50 mm dia. (1.969 in. dia.)	<b>C2</b>	Chamfer 2 mm (0.079 in.)
<b>L</b>	112.6 mm (4.433 in.)	<b>X</b>	21 mm (0.827 in.)		

**Check and High Pressure Relief Valve Assembly Tool**

Application: Use for Readjusting relief valve pressure.

<b>A</b>	30 mm (1.181 in.)	<b>N</b>	Chamfer 0.4 mm (0.157 in.)	<b>a</b>	1.05 rad (10 °)
<b>B</b>	21 mm (0.827 in.)	<b>O</b>	Chamfer 3 mm (0.118 in.)	<b>b</b>	Chamfer 0.3 mm (0.012 in.)
<b>C</b>	1 mm (0.039 in.)	<b>P</b>	Chamfer 2 mm (0.079 in.)	<b>c</b>	23 mm (0.906 in.)
<b>D</b>	0.52 rad (30 °)	<b>Q</b>	21.4 mm (0.843 in.)	<b>d</b>	10 mm (0.394 in.)
<b>E</b>	50 mm dia. (1.969 in. dia.)	<b>R</b>	19 mm (0.748 in.)	<b>e</b>	1 mm (0.039 in.)
<b>F</b>	10 mm dia. (0.394 in. dia.)	<b>S</b>	17 mm (0.669 in.)	<b>f</b>	6.5 mm (0.256 in.)
<b>G</b>	9.1 to 9.3 mm dia. (0.359 to 0.366 in.)	<b>T</b>	10 mm (0.393 in.)	<b>g</b>	Chamfer 0.5 mm (0.020 in.)
<b>H</b>	34 mm dia. (1.336 in. dia.)	<b>U</b>	50 mm dia. (1.969 in. dia.)	<b>h</b>	11.1 to 11.3 mm (0.437 to 0.445 in.)
<b>I</b>	M36 x 1.5 mm Pitch	<b>V</b>	9.8 mm dia. (0.386 in. dia.)	<b>i</b>	18.8 to 19.0 mm (0.740 to 0.748 in.)
<b>J</b>	10 mm (0.394 in.)	<b>W</b>	16 mm dia. (0.629 in. dia.)		
<b>K</b>	16 mm (0.630 in.)	<b>X</b>	34.5 mm dia. (1.358 in. dia.)	<b>(1)</b>	Spacer (for ZD and ZG Series)
<b>L</b>	41 mm (1.614 in.)	<b>Y</b>	38 mm dia. (1.496 in. dia.)	<b>(2)</b>	Block
<b>M</b>	Chamfer 1 mm (0.039 in.)	<b>Z</b>	25 mm (0.984 in.)	<b>(3)</b>	Cap

## 9. TIRES



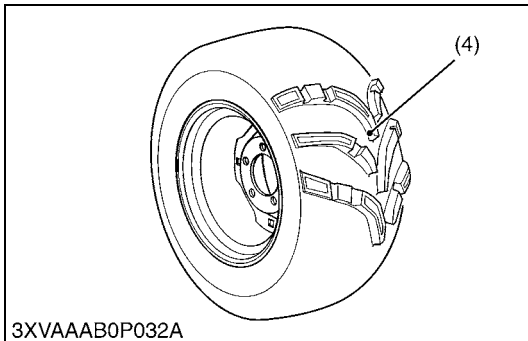
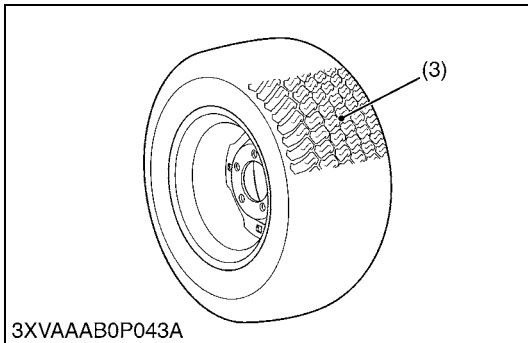
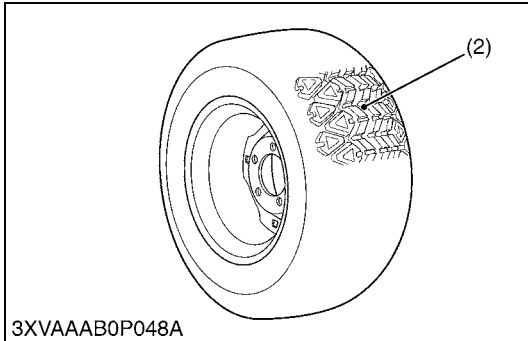
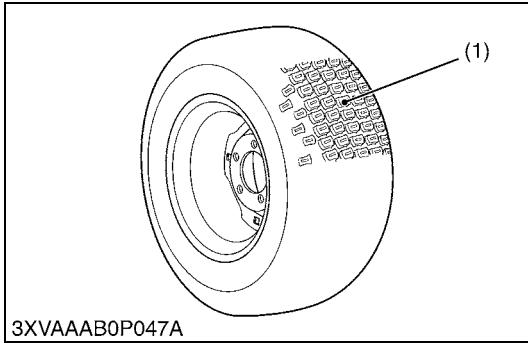
### CAUTION

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

### ■ IMPORTANT

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

## [1] TYPE OF TIRE

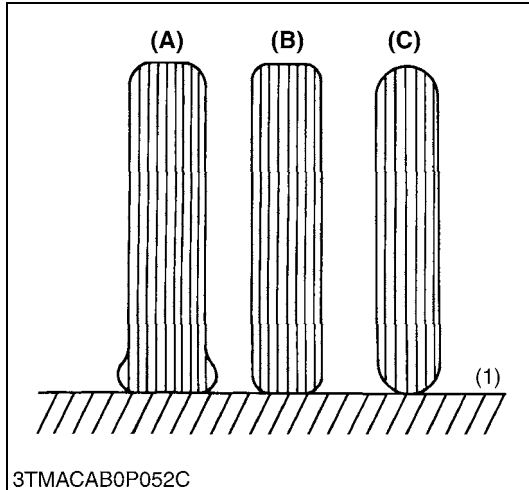


- (1) Knobby Tire (3) Turf Tire  
(2) Heavy Duty Work Site Tire (HDWS) (4) All Terrain Vehicle Tire (ATV)

W1092542



## [2] TYPE PRESSURE



### Checking Tire Inflation Pressure

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

Tire sizes	Inflation pressure
25 x 10 - 12 Knobby, Front and Rear	140 kPa, (1.4 kgf/cm <sup>2</sup> , 20 psi)
25 x 10 - 12 HDWS, Front and Rear	
23 x 10.5 - 12 Turf, Front and Rear	
25 x 10 - 12 ATV, Front 25 x 11 - 12 ATV, Rear	

(1) Ground

**A : Insufficient**

**B : Normal**

**C : Excessive**

W1092690

## [3] VEHICLE LIMITATIONS

The KUBOTA Vehicle 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 Vehicle may result in malfunctions or failures of the vehicle, damage to other property and injury to the operator or others. [Any malfunctions or failures of the vehicle resulting from use with improper implements are not covered by the warranty.]

Max. cargo loading weight (W1)	Rear trailer hitch	Rear trailer hitch
Max. cargo load should not exceed "500 kg (1100 lbs)" or cargo load.	Max. rolling weight (W2) 590 kg (1300 lbs)	Max. rolling weight (W4) 295 kg (650 lbs)
CL = 770 kg (1700 lbs) - (operator + passenger + option + accessory + cabin weight)	Max. tongue weight (W3) 50 kg (110 lbs)	Max. tongue weight (W3) 50 kg (110 lbs)

3XVAAAB0P023A

rolling weight : Trailer weight + Cargo load

W1093139

## [4] CARGO BED



### WARNING

- Never carry passengers in the cargo bed. They can be tossed about or even thrown off causing serious injury or death.
- Never raise the cargo bed when it is loaded. (If hydraulic dump is not equipped.)
- Driving with the cargo bed tilted may be hazardous.  
Always lower the bed and lock the hydraulic lift cylinder lever (if hydraulic dump is equipped) or latch the bed (if hydraulic dump is not equipped) before driving.
- Be careful not to put any part your body, such as hands or arms, between the bed and vehicle.
- Drive slowly when it is loaded.

### ■ Permissible Cargo Load

	Operator	Passenger	Implement	Permissible Cargo Load (PCL)
ROPS type	95 kg (209 lbs)	—	W : weight Blade Winch	500 kg (1100 lbs) -W
	95 kg (209 lbs)	95 kg (209 lbs)		500 kg (1100 lbs) -W
CAB type 120 kg (265 lbs)	95 kg (209 lbs)	—		500 kg (1100 lbs) -W
	95 kg (209 lbs)	95 kg (209 lbs)		460 kg (1014 lbs) -W

### ■ IMPORTANT

- Maximum Cargo Load (MCL) capacity is 500 kg (1100 lbs).
- Never carry loads exceeding the Permissible Cargo Load (PCL).

W1093139

# **1 ENGINE**

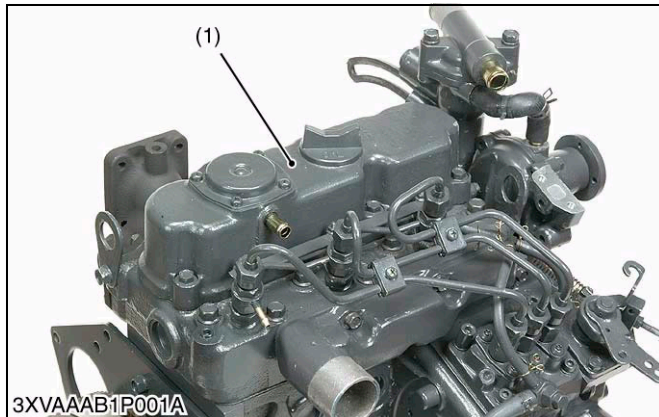
# MECHANISM

## CONTENTS

1. ENGINE BODY .....	1-M1
[1] HALF-FLOATING HEAD COVER .....	1-M1
[2] GEAR CASE .....	1-M1
[3] OIL PAN .....	1-M2
2. LUBRICATING SYSTEM .....	1-M3
3. COOLING SYSTEM .....	1-M4
4. FUEL SYSTEM .....	1-M5

# 1. ENGINE BODY

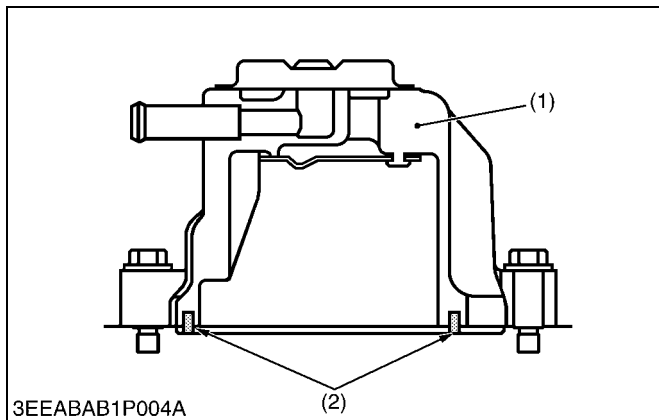
## [1] HALF-FLOATING HEAD COVER



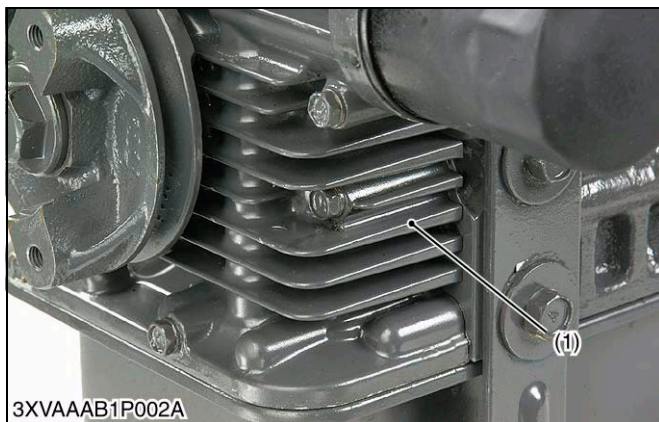
The rubber packing is fitting in to maintain the head cover 0.5 mm or so off the cylinder head. This arrangement helps reduce noise coming from the cylinder head.

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

W1012671



## [2] GEAR CASE

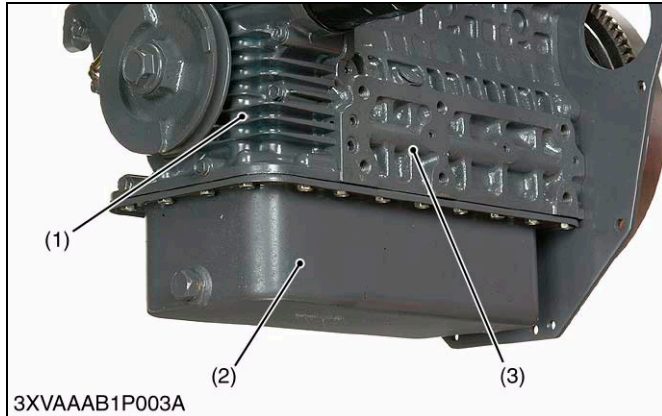


The engine has a gear case where the cooling fins are set up around the oil passage. Therefore, the temperature of engine is decreased by the wind generated by the cooling fan.

- (1) Cooling Fin

W1012841

### [3] OIL PAN



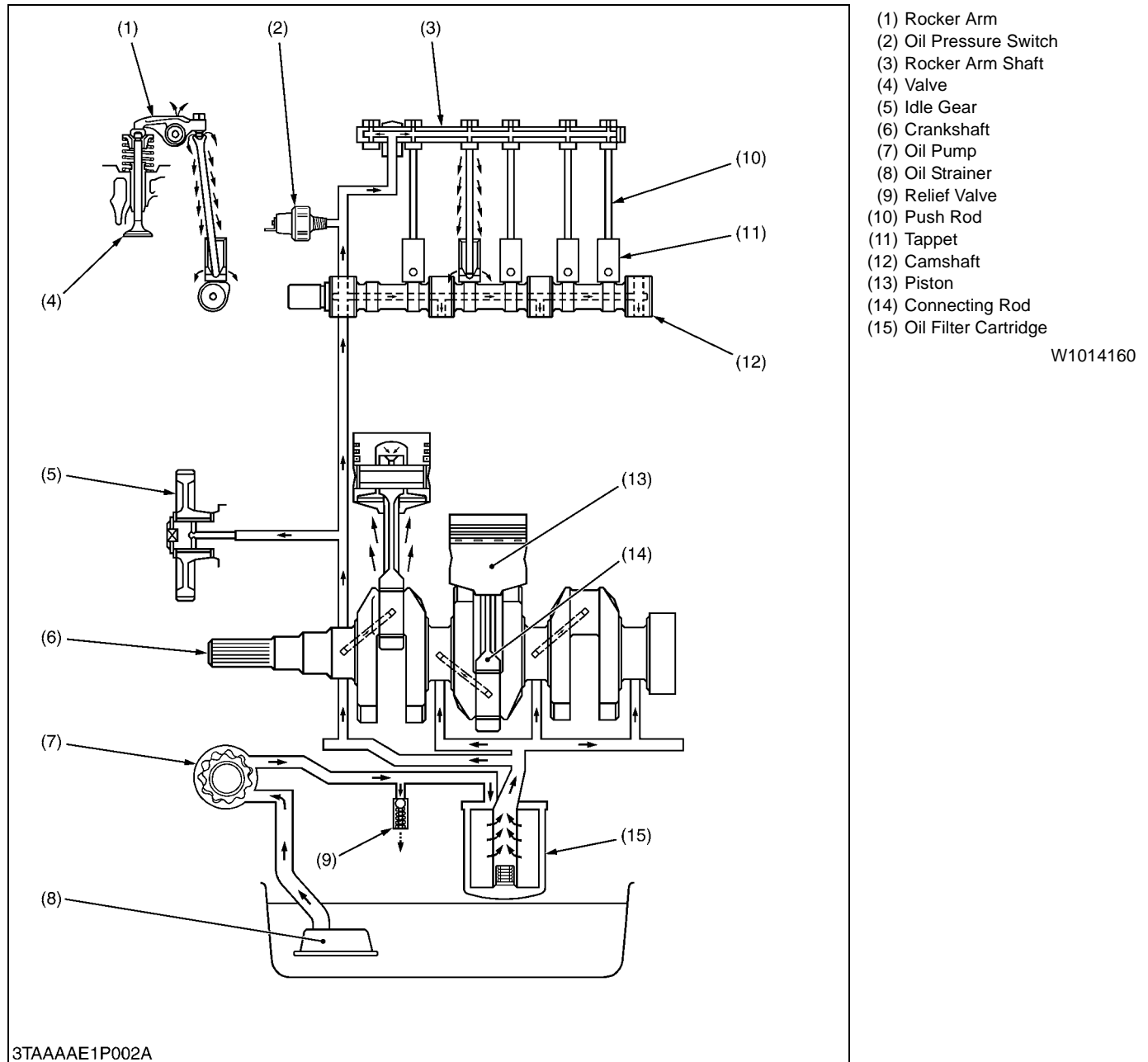
The oil pan is expanded under the gear case. Therefore, the height of the engine can be lowered more than so far while securing a necessary amount of oil.

- (1) Gear Case
- (2) Oil Pan

- (3) Crankcase

W1012963

## 2. LUBRICATING SYSTEM

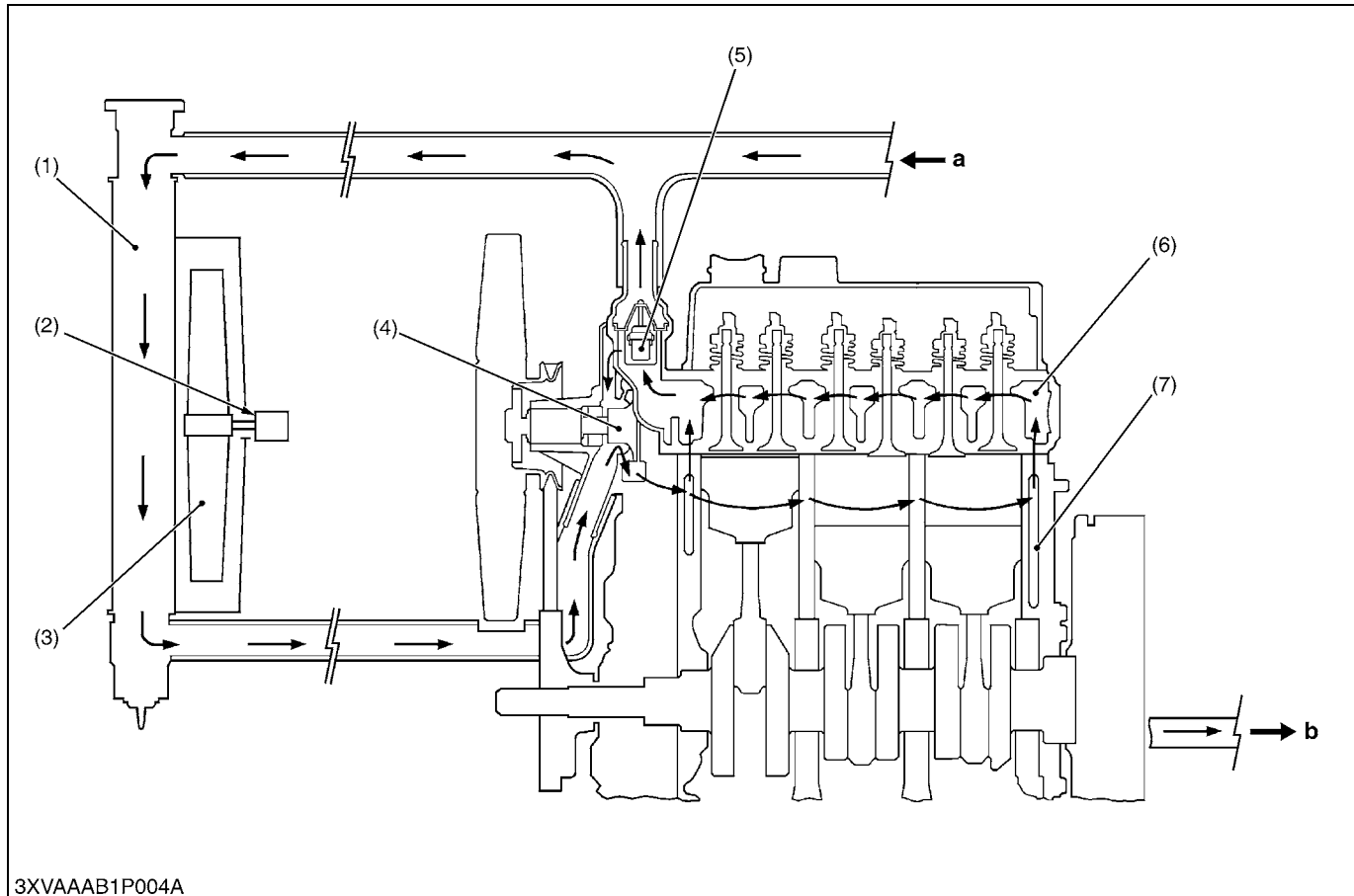


This engine's lubricating system consists of oil strainer (8), oil pump (7), relief valve (9), oil filter cartridge (15) and oil pressure switch (2).

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

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

### 3. COOLING SYSTEM



- (1) Radiator
- (2) Fan Drive Motor
- (3) Radiator Fan
- (4) Water Pump

- (5) Thermostat
- (6) Cylinder Head
- (7) Cylinder Block

**A : From Transmission Oil Cooler**

**B : To Transmission Oil Cooler**

The cooling system consists of a radiator (1), a radiator fan (3), a centrifugal water pump (4) and a thermostat (5). The coolant is cooled through the radiator core.

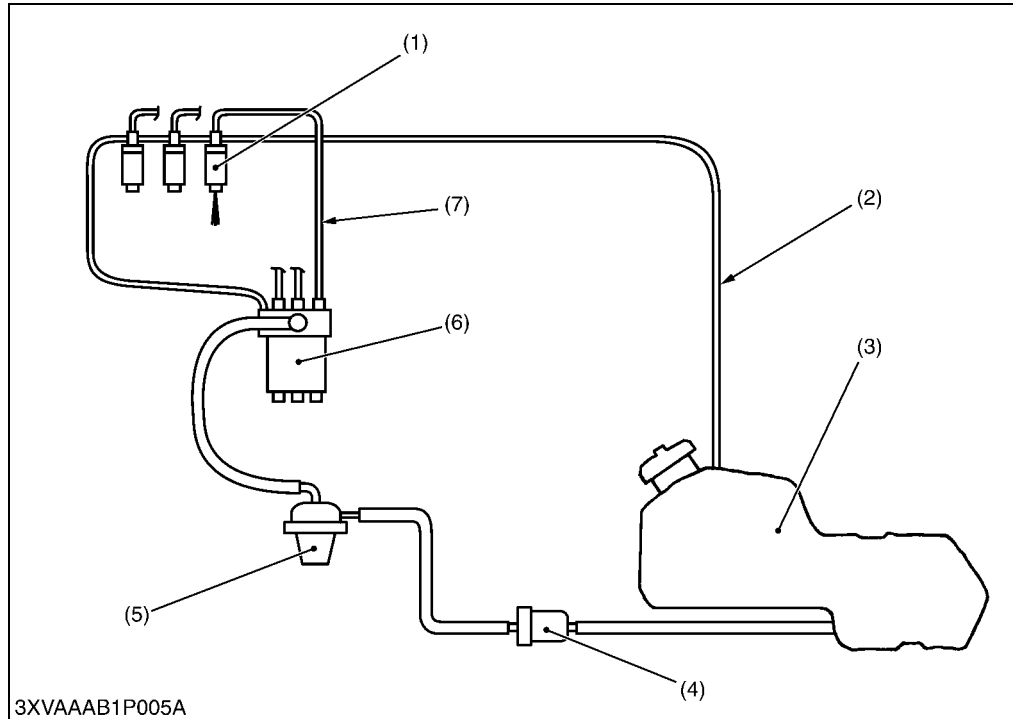
The radiator fan (3) is driven by the fan drive motor (2). The motor (2) moves or stops according to the coolant temperature. When the coolant temperature is high, the motor moves to pull cooling air to the radiator core. When the coolant temperature is low, the motor stops.

The water pump (4) receives coolant from the radiator or from the cylinder head, and forces it into the cylinder block (7). And the coolant flows to the transmission oil cooler through cylinder block (7).

The thermostat (5) opens or closes according to the coolant temperature. When the coolant temperature is high, the thermostat opens to allow the water to flow from the cylinder head to the radiator. When the coolant temperature is low, the thermostat closes to flow the coolant only to the water pump.



## 4. FUEL SYSTEM



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

W1013691

Fuel from the fuel tank (3) passes through the fuel filter (5), and then enters the injection pump (8) after impurities such as dirt, water, etc. are removed.

The fuel pressurized by the injection pump to the opening pressure (13.73 to 14.71 MPa, 140 to 150 kgf/cm<sup>2</sup>, 1990 to 2133 psi), of the injection nozzle (1) is injected into the combustion chamber.

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

# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	1-S1
2. SERVICING SPECIFICATIONS .....	1-S4
3. TIGHTENING TORQUES .....	1-S9
4. CHECKING, DISASSEMBLING AND SERVICING.....	1-S10
[1] CHECKING AND ADJUSTING .....	1-S10
(1) Engine Body.....	1-S10
(2) Lubricating System .....	1-S13
(3) Cooling System.....	1-S13
(4) Fuel System .....	1-S16
[2] PREPARATION .....	1-S18
(1) Removing Battery .....	1-S18
(2) Separating Radiator .....	1-S18
(3) Separating Fuel Tank.....	1-S19
(4) Separating Engine .....	1-S20
[3] DISASSEMBLING AND ASSEMBLING.....	1-S21
(1) Cylinder Head and Valves .....	1-S21
(2) Oil Pan, Timing Gears, Camshaft and Fuel Camshaft.....	1-S25
(3) Pistons and Connecting Rods.....	1-S29
(4) Crankshaft.....	1-S31
(5) Water Pump .....	1-S34
(6) Injection Nozzle.....	1-S35
[4] SERVICING .....	1-S35
(1) Cylinder Head and Valve .....	1-S35
(2) Oil Pan, Timing Gear and Camshaft .....	1-S42
(3) Piston and Connecting Rod .....	1-S43
(4) Crankshaft.....	1-S47
(5) Cylinder.....	1-S52
(6) Oil Pump .....	1-S53

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Engine Does Not Start</b>	No fuel	Replenish fuel	G-8
	Air in the fuel system	Bleed	G-46
	Water in the fuel system	Change fuel and repair or replace fuel system	—
	Fuel pipe clogged	Clean	G-37
	Fuel filter clogged	Change	G-37
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-8
	Fuel with low cetane number	Use specified fuel	G-8
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S21
	Incorrect injection timing	Adjust	1-S16
	Fuel camshaft worn	Replace	1-S28
	Injection nozzle clogged	Repair or replace	1-S35
	Injection pump malfunctioning	Replace	1-S26
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Replace	1-S27, S29, S32
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S23
	Improper valve timing	Correct or replace timing gear	1-S27
	Piston ring and cylinder worn	Replace	1-S30
	Excessive valve clearance	Adjust	1-S12
<b>(Starter Does Not Run)</b>	Battery discharged	Charge	G-35
	Starter malfunctioning	Repair or replace	8-S25
	Main switch malfunctioning	Repair or replace	8-S10
	Safety switches malfunctioning	Adjust or replace	8-S14
	Wiring disconnected	Connect	—

W1014322

Symptom	Probable Cause	Solution	Reference Page
<b>Engine Revolution Is Not Smooth</b>	Fuel filter clogged or dirty	Replace	G-37
	Air cleaner clogged	Clean or replace	G-34
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S21
	Injection pump malfunctioning	Replace	1-S26
	Incorrect nozzle injection pressure	Adjust	1-S17
	Injection nozzle stuck or clogged	Repair or replace	1-S35
	Governor malfunctioning	Repair	1-S28
<b>Either White or Blue Exhaust Gas Is Observed</b>	Excessive engine oil	Reduce to specified level	G-8
	Piston ring and cylinder worn or stuck	Repair or replace	1-S30
	Incorrect injection timing	Adjust	1-S16
	Deficient compression	Adjust top clearance	1-S11
<b>Either Black or Dark Gray Exhaust Gas Is Observed</b>	Overload	Reduce the load	–
	Low grade fuel used	Use specified fuel	G-8
	Fuel filter clogged	Replace	G-37
	Air cleaner clogged	Clean or replace	G-34
	Deficient nozzle injection	Repair or replace nozzle	1-S35
<b>Deficient Output</b>	Incorrect injection timing	Adjust	1-S16
	Engine's moving parts seem to be seizing	Repair or replace	–
	Uneven fuel injection	Replace injection pump	1-S26
	Deficient nozzle injection	Repair or replace nozzle	1-S35
	Compression leak	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S23
<b>Excessive Lubricant Oil Consumption</b>	Piston ring's gap facing the same direction	Shift ring gap direction	1-S29
	Oil ring worn or stuck	Replace	1-S30
	Piston ring groove worn	Replace piston	1-S30
	Valve stem and valve guide worn	Replace	1-S37
	Oil leaking due to defective seals or packing	Replace	–
<b>Fuel Mixed into Lubricant Oil</b>	Injection pump's plunger worn	Replace injection pump	1-S26
	Deficient nozzle injection	Repair or replace nozzle	1-S35
	Injection pump broken	Replace	1-S26

W1054066

Symptom	Probable Cause	Solution	Reference Page
<b>Water Mixed into Lubricant Oil</b>	Cylinder head gasket defective	Replace	1-S23
	Cylinder block or cylinder head flawed	Replace	–
<b>Low Oil Pressure</b>	Engine oil insufficient	Replenish	G-8
	Oil strainer clogged	Clean	1-S25
	Oil filter clogged	Replace	G-24
	Relief valve stuck with dirt	Clean	–
	Relief valve spring weaken or broken	Replace	–
	Excessive oil clearance of crankshaft bearing	Replace	1-S33
	Excessive oil clearance of crankpin bearing	Replace	1-S29
	Excessive oil clearance of rocker arm	Replace	1-S22
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-8
	Oil pump defective	Replace	1-S28
<b>High Oil Pressure</b>	Different type of oil	Use specified type of oil	G-8
	Relief valve defective	Replace	–
<b>Engine Overheated</b>	Engine oil insufficient	Replenish	G-8
	Fan belt broken or tensioned improperly	Replace or adjust	G-36
	Coolant insufficient	Replenish	G-8
	Radiator net and radiator fin clogged with dust	Clean	G-20
	Inside of radiator corroded	Clean or replace	G-44
	Coolant flow route corroded	Clean or replace	G-44
	Radiator cap defective	Replace	1-S18
	Radiator hose damaged	Replace	1-S19
	Electric parts of the cooling system broken	Replace	8-S21
	Overload running	Reduce the load	–
	Head gasket defective	Replace	1-S23
	Incorrect injection timing	Adjust	1-S16
	Unsuitable fuel used	Use specified fuel	G-8

W1056884

## 2. SERVICING SPECIFICATIONS

### ENGINE BODY

Item		Factory Specification	Allowable Limit
Compression Pressure		3.53 to 4.02 MPa 36.0 to 41.0 kgf/cm <sup>2</sup> 512 to 583 psi	2.55 MPa 26.0 kgf/cm <sup>2</sup> 370 psi
Variance among Cylinder		—	10 % or less
Top Clearance		0.50 to 0.70 mm 0.0197 to 0.0276 in.	—
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	—
Cylinder Head Surface	Flatness	—	0.05 mm 0.0020 in.
Valve Recessing	Intake and Exhaust	−0.10 to 0.10 mm −0.0039 to 0.0039 in.	0.30 mm 0.0118 in.
Valve Stem to Valve Guide	Clearance	0.030 to 0.057 mm 0.00118 to 0.00224 in.	0.10 mm 0.0039 in.
Valve Stem	O.D.	5.968 to 5.980 mm 0.23496 to 0.23543 in.	—
Valve Guide	I.D.	6.010 to 6.025 mm 0.23661 to 0.23720 in.	—
Valve Seat	Width	2.12 mm 0.0835 in.	—
	Angle	0.785 rad 45 °	—
Valve Face	Angle	0.785 rad 45 °	—
Valve Spring	Free Length	31.3 to 31.8 mm 1.232 to 1.252 in.	28.4 mm 1.118 in.
	Tilt	—	1.2 mm 0.047 in.
	Setting Load / Setting Length	64.7 N / 27.0 mm 6.6 kgf / 27.0 mm 14.6 lbs / 1.063 in.	54.9 N / 27.0 mm 5.6 kgf / 27.0 mm 12.3 lbs / 1.063 in.

W10138740

**ENGINE BODY (Continued)**

Item		Factory Specification	Allowable Limit
Rocker Arm Shaft to Rocker Arm	Oil Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.15 mm 0.0059 in.
Rocker Arm Shaft	O.D.	10.473 to 10.484 mm 0.41232 to 0.41276 in.	—
Rocker Arm	I.D.	10.500 to 10.518 mm 0.41339 to 0.41410 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.
Tappet to Tappet Guide	Clearance	0.016 to 0.052 mm 0.00063 to 0.00205 in.	0.10 mm 0.0039 in.
Tappet	O.D.	17.966 to 17.984 mm 0.70732 to 0.70803 in.	—
Tappet Guide Bore	I.D.	18.000 to 18.018 mm 0.70866 to 0.70937 in.	—
Timing Gear			
Idle Gear to Crank Gear	Backlash	0.043 to 0.124 mm 0.00169 to 0.00488 in.	0.15 mm 0.0059 in.
Idle Gear to Cam Gear	Backlash	0.047 to 0.123 mm 0.00185 to 0.00484 in.	0.15 mm 0.0059 in.
Idle Gear to Injection Pump Gear	Backlash	0.046 to 0.124 mm 0.00185 to 0.00488 in.	0.15 mm 0.0059 in.
Oil Pump Drive Gear to Crank Gear	Backlash	0.041 to 0.123 mm 0.00161 to 0.00484 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.20 to 0.51 mm 0.0079 to 0.0201 in.	0.80 mm 0.0315 in.
Camshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	—	0.01 mm 0.0004 in.
Cam Height	Intake and Exhaust	26.88 mm 1.0583 in.	26.83 mm 1.0563 in.
Camshaft Journal to Cylinder Block Bore	Oil Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.15 mm 0.0059 in.
Camshaft Journal	O.D.	32.934 to 32.950 mm 1.29661 to 1.29724 in.	—
Cylinder Block Bore	I.D.	33.000 to 33.025 mm 1.29921 to 1.30020 in.	—

W1013874

**ENGINE BODY (Continued)**

Item		Factory Specification	Allowable Limit
Piston Pin Bore	I.D.	20.000 to 20.013 mm 0.78740 to 0.78791 in.	20.05 mm 0.7894 in.
Piston Pin to Small End Bushing	Oil Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.10 mm 0.0039 in.
Piston Pin	O.D.	20.002 to 20.011 mm 0.78748 to 0.78783 in.	—
Small End Bushing	I.D.	20.025 to 20.040 mm 0.78839 to 0.78897 in.	—
Piston Pin to Small End Bushing (Spare Parts)	Oil Clearance	0.015 to 0.075 mm 0.00059 to 0.00295 in.	0.15 mm 0.0059 in.
Small End Bushing	I.D.	20.026 to 20.077 mm 0.78845 to 0.79043 in.	—
Piston Ring Gap	Top Ring	0.20 to 0.35 mm 0.0079 to 0.0138 in.	1.25 mm 0.0492 in.
	Second Ring	0.35 to 0.50 mm 0.0138 to 0.0197 in.	1.25 mm 0.0492 in.
	Oil Ring	0.20 to 0.35 mm 0.0079 to 0.0138 in.	1.25 mm 0.0492 in.
Piston Pin to Piston Ring Groove Second Ring	Clearance	0.090 to 0.120 mm 0.00354 to 0.00472 in.	0.15 mm 0.0059 in.
Oil Ring	Clearance	0.04 to 0.08 mm 0.0016 to 0.0031 in.	0.15 mm 0.0059 in.
Connecting Rod	Alignment	—	0.05 mm 0.0020 in.
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	—	0.02 mm 0.0008 in.

W10138740



**ENGINE BODY (Continued)**

Item		Factory Specification	Allowable Limit
Crankpin to Crankpin Bearing	Oil Clearance	0.020 to 0.051 mm 0.00079 to 0.00201 in.	0.15 mm 0.0059 in.
Crankpin	O.D.	33.959 to 33.975 mm 1.33697 to 1.33760 in.	—
Crankpin Bearing	I.D.	33.995 to 34.010 mm 1.33839 to 1.33898 in.	—
Crankshaft Journal to Crankshaft Bearing 1	Oil Clearance	0.034 to 0.106 mm 0.00134 to 0.00417 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Crankshaft Bearing 1	I.D.	43.984 to 44.040 mm 1.73165 to 1.73386 in.	—
Crankshaft Journal to Crankshaft Bearing 2 (Flywheel Side)	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Crankshaft Bearing 2	I.D.	43.978 to 43.993 mm 1.73142 to 1.73201 in.	—
Crankshaft Journal to Crankshaft Bearing 3 (Intermediate)	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Crankshaft Bearing 3	I.D.	43.978 to 43.993 mm 1.73142 to 1.73201 in.	—
Cylinder Liner	I.D.	72.000 to 72.019 mm 2.83464 to 2.83539 in.	72.150 mm 2.84055 in.
Cylinder Liner (Oversize)	I.D.	72.250 to 72.269 mm 2.84449 to 2.84524 in.	72.400 mm 2.85040 in.

W10138740

**LUBRICATING SYSTEM**

Engine Oil Pressure	At Idle Speed	–	More than 98 kPa 1.0 kgf/cm <sup>2</sup> 14 psi
	At Rated Speed	196 to 441 kPa 2.0 to 4.5 kgf/cm <sup>2</sup> 28 to 64 psi	147 kPa 1.5 kgf/cm <sup>2</sup> 21 psi
Oil Pump			
Inner Rotor to Outer Rotor	Clearance	0.03 to 0.14 mm 0.0012 to 0.0055 in.	–
Outer Rotor to Pump Body	O.D.	0.07 to 0.15 mm 0.0028 to 0.0059 in.	–
Inner Rotor to Cover	I.D.	0.075 to 0.135 mm 0.00295 to 0.00531 in.	–

W10139730

**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 lbs)	–
Thermostat			
Valve Opening Temperature	At Beginning	80.5 to 83.5 °C 176.9 to 182.3 °F	–
Valve Opening Temperature	Opened Completely	95 °C 203 °F	–
Radiator Cap	Pressure Falling Time	10 seconds or more 88 → 59 kPa 0.9 → 0.6 kgf/cm <sup>2</sup> 13 → 9 psi	–
Radiator	Water Leakage Test Pressure	No leak at specified pressure 157 kPa 1.6 kgf/cm <sup>2</sup> 23 psi	–

W10135990

**FUEL SYSTEM**

Item		Factory Specification	Allowable Limit
Injection Pump	Injection Timing	0.30 to 0.33 rad (17 to 19°) before T.D.C.	–
Fuel Injection Nozzle	Injection Pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm <sup>2</sup> 1991 to 2134 psi	–
	Valve Seat Tightness	When the pressure is 12.75 MPa (130 kgf/cm <sup>2</sup> , 1849 psi), the valve seat must be fuel tightness	–

W10139730

### 3. TIGHTENING TORQUES

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

Item	Size x Pitch	N-m	kgf-m	lbf-ft
Engine mounting screw	—	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1
Input flange	—	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Oil pressure switch	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
*Cylinder head cover screw	M6 x 1.0	6.89 to 11.3	0.7 to 1.15	5.1 to 8.3
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe retaining nut	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Glow plug	M8 x 1.0	7.8 to 14.7	0.8 to 1.5	5.8 to 10.8
*Rocker arm bracket screw	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Cylinder head screw	M8 x 1.25	37.3 to 42.1	3.8 to 4.3	27.5 to 31.1
*Fan drive pulley screw	M12 x 1.5	117.7 to 127.5	12.0 to 13.0	86.8 to 94.0
*Idle gear shaft mounting screw	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Idle gear retaining nut	M20 x 1.0	78.4 to 88.2	8.0 to 9.0	57.6 to 64.8
*Connecting rod screw	M7 x 0.75	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Flywheel screw	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
Bearing case cover mounting screw	M6 x 1.0	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Main bearing case screw 2	M7 x 1.0	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Main bearing case screw 1	M6 x 1.0	12.7 to 15.7	1.3 to 1.6	9.4 to 11.6
Nozzle holder		34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Seat belt mounting screw		48.1 to 55.8	4.9 to 5.7	35.5 to 41.2

#### ■ NOTE

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

W1013236

## 4. CHECKING, DISASSEMBLING AND SERVICING

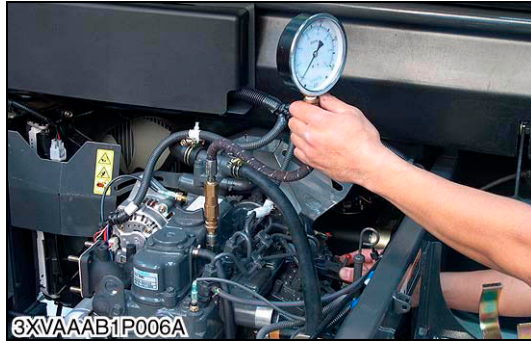
### [1] CHECKING AND ADJUSTING



#### CAUTION

- Be sure to check that the speed is neutrality before the following checks.
- When checking, park the machine on flat ground and apply the parking brake.

#### (1) Engine Body



#### Compression Pressure



#### CAUTION

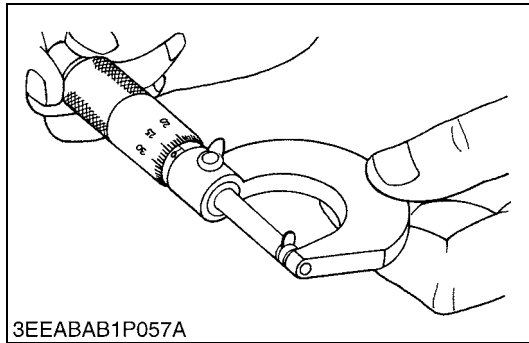
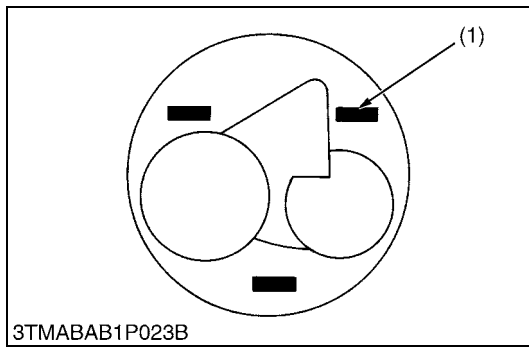
- **Work by two people when you measure pressure.**
1. Run the engine until it is warmed up.
  2. Stop the engine.
  3. Remove the air cleaner, the muffler and all glow plugs.
  4. Disconnect the accelerator wire.
  5. Engage the parking brake.
  6. Set a compression tester (Code No. 07909-30208) with the adaptor (Adaptor K, code No. 07909-31301) to the glow plug hole.
  7. After making sure that the stop lever is set at the stop position (non-injection), run the engine with the starter and measure the compression pressure.
  8. Repeat steps 6 and 7 for each cylinder.
  9. 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.
  10. If the compression pressure is still less than the allowable limit, check the top clearance, valve clearance and cylinder head.
  11. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

#### ■ NOTE

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

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

W1016194



### Top Clearance

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

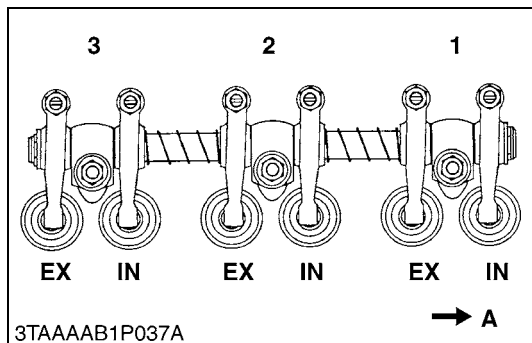
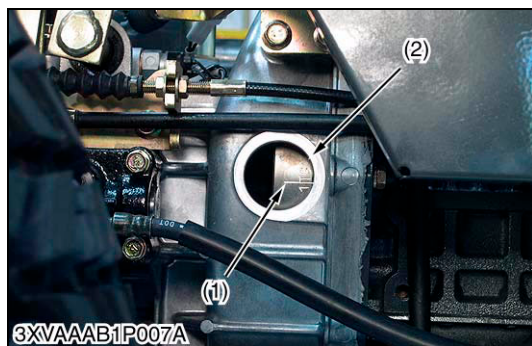
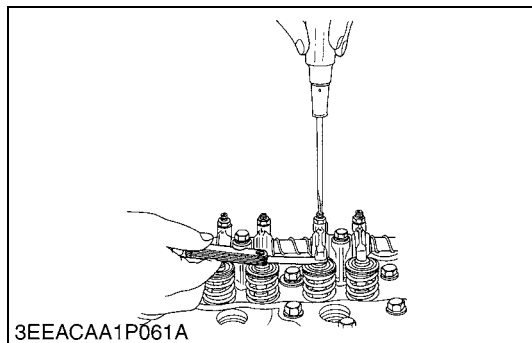
### NOTE

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

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

(1) Fuse

W1016714



### Valve Clearance

#### ■ IMPORTANT

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

- Remove the cylinder head cover, the glow plugs and the timing window cover.
- Align the "1TC" mark (1) on the flywheel and center of timing window (2) so that the No. 1 piston comes to the compression top dead center.
- Check the following valve clearance marked with "★" using a thickness gauge.

[When No. 1 piston is at the compression top dead center position]

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

- If the clearance is not within the factory specifications, adjust with the adjusting screw.
- Then turn the flywheel 6.28 rad (360 °), and align the "1TC" mark (1) on the flywheel and center of timing window (2) so that the No.1 piston comes to the overlap position.
- Check the following valve clearance marked with "☆" using a thickness gauge.

[When No.1 piston is at the overlap position]

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

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

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

#### ■ NOTE

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

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

A : Gear Case Side

W1017083

## (2) Lubricating System



### Engine Oil Pressure



#### CAUTION

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

Engine oil pressure	At idle speed	Allowable limit	More than 98 kPa 1.0 kgf/cm <sup>2</sup> 14 psi
	At rated speed	Factory spec.	196 to 441 kPa 2.0 to 4.5 kgf/cm <sup>2</sup> 28 to 64 psi
		Allowable limit	147 kPa 1.5 kgf/cm <sup>2</sup> 21 psi

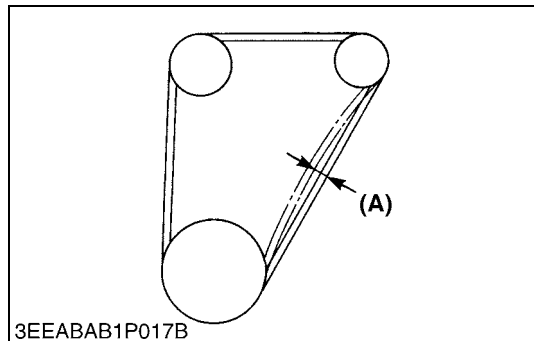
#### (When reassembling)

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

Tightening torque	Oil pressure switch	14.7 to 19.6 N·m 1.5 to 2.0 kgf·m 10.8 to 14.8 lbf·ft
-------------------	---------------------	---

W1017873

## (3) Cooling System



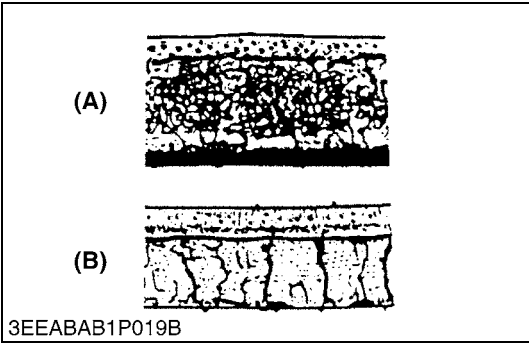
### Fan Belt Tension

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

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

#### (A) Deflection

W1018775



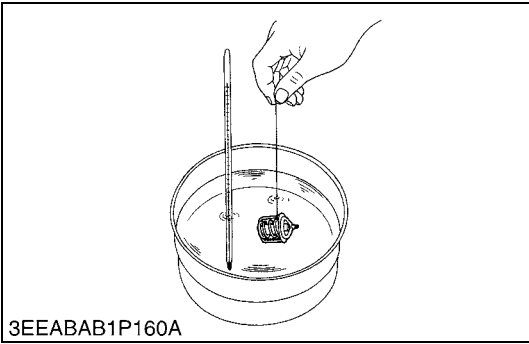
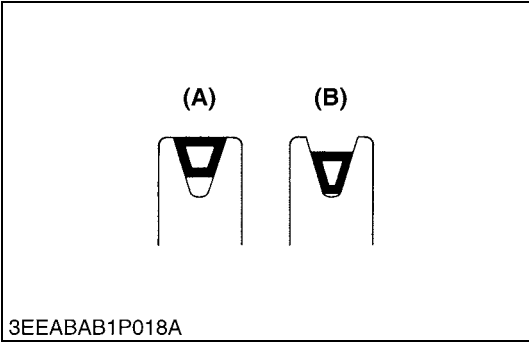
**Fan Belt Damage and Wear**

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

(A) Good

(B) Bad

W1016443



**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.

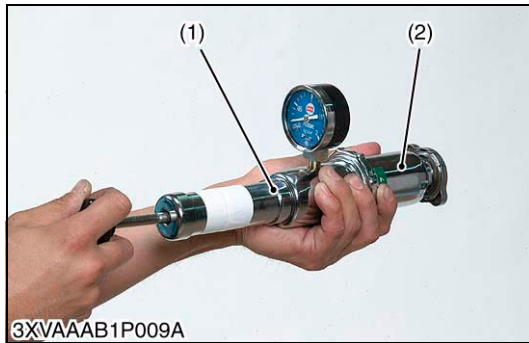
Thermostat's valve opening temperature	Factory spec.	80.5 to 83.5 °C 176.9 to 182.3 °F
Thermostat's at which thermostat completely opens	Factory spec.	95 °C 203 °F

W1019475



**CAUTION**

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

**Radiator Cap Air Leakage**

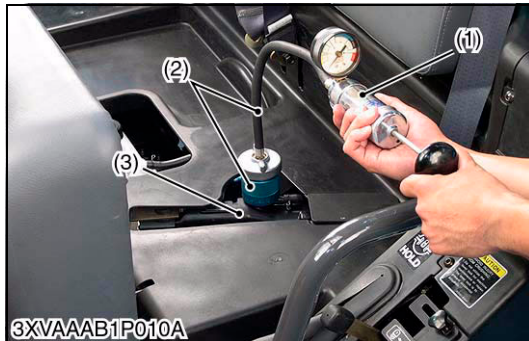
- Set a radiator tester (1) and an adaptor (2) on the radiator cap.
- Apply the specified pressure (88 kPa, 0.9 kgf/cm<sup>2</sup>, 13 psi), and measure the time for the pressure to fall to 59 kPa (0.6 kgf/cm<sup>2</sup>, 9 psi).
- If the measurement is less than the factory specification, replace the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

Pressure falling time	Factory spec.	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm <sup>2</sup> , from 13 to 9 psi)
-----------------------	---------------	---

(1) Radiator Tester

(2) Adaptor

W1054156

**Radiator Water Leakage**

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

Radiator water leakage test pressure	Factory spec.	157 kPa 1.6 kgf/cm <sup>2</sup> 23 psi
--------------------------------------	---------------	--

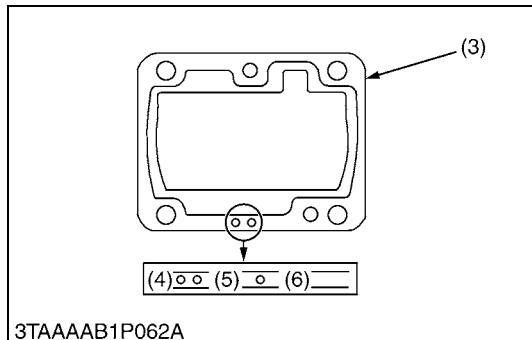
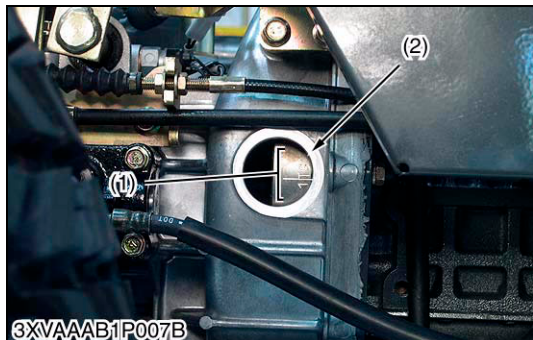
(1) Radiator Tester

(3) Radiator

(2) Adaptor

W1016903

## (4) Fuel System



### Injection Timing

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

Injection timing	Factory spec.	0.30 to 0.33 rad (17 to 19°) before T.D.C.
------------------	---------------	--

#### NOTE

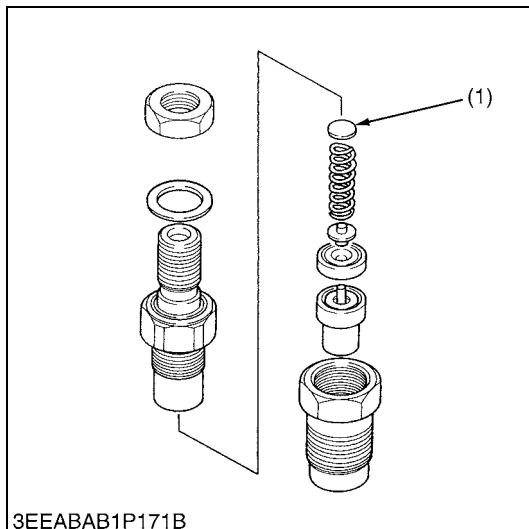
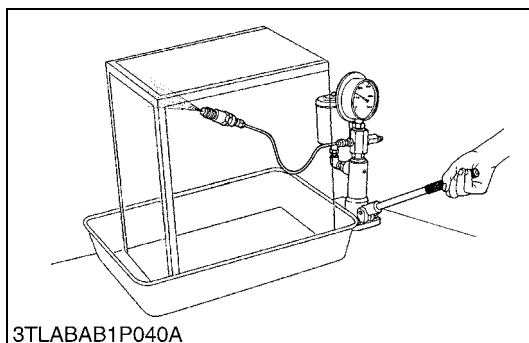
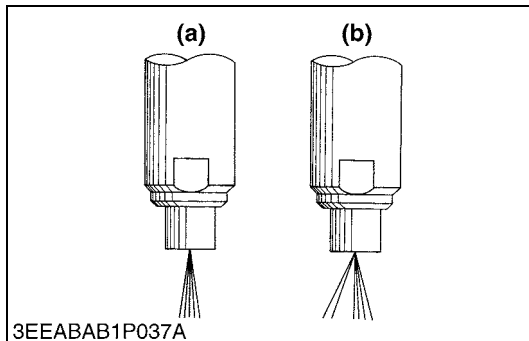
- The sealant is applied to both sides of the shim (soft metal gasket shim). The liquid gasket is not required for assembling.
- Shims are available in thickness of 0.20 mm (0.0079 in.), 0.25 mm (0.0098 in.) and 0.30 mm (0.0118 in.). Combine these shims for adjustments.
- Addition or reduction of shim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

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

W1019909

### CAUTION

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



### Nozzle Spraying Condition

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

(a) Good

(b) Bad

W10181310

### Fuel Injection Pressure

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

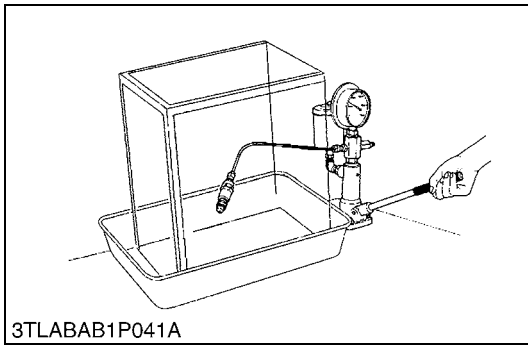
#### (Reference)

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

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

(1) Adjusting Washer

W10182100



### Valve Seat Tightness

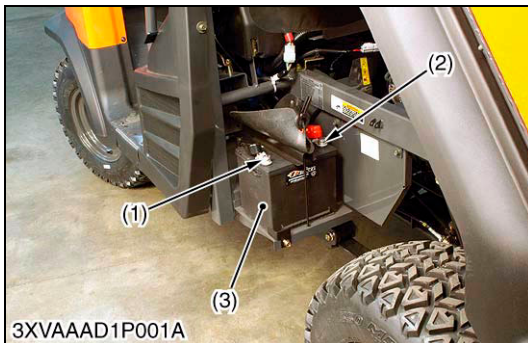
1. Set the injection nozzle to a nozzle tester (Code No. 07909-31361).
2. Raise the fuel pressure, and keep at 12.75 MPa (130 kgf/cm<sup>2</sup>, 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

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

W10183690

## [2] PREPARATION

### (1) Removing Battery



### Battery



#### CAUTION

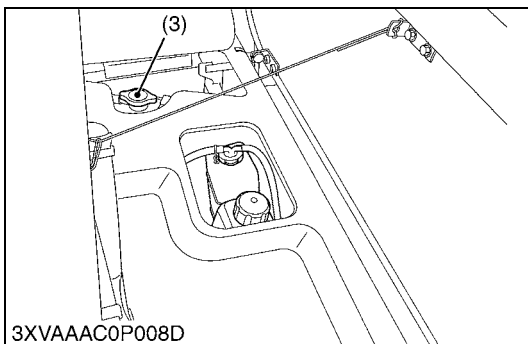
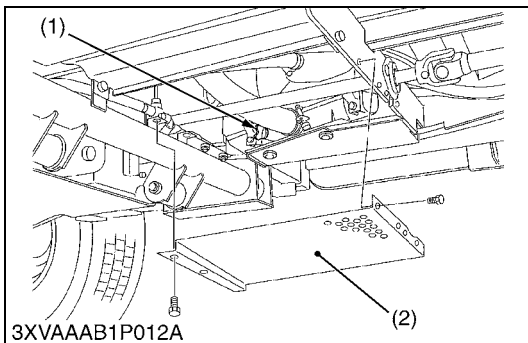
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.
1. Disconnect the negative cable (1) from the battery.
  2. Disconnect the positive cable (2) from the battery and remove the battery (3).

(1) Negative Cable  
(2) Positive Cable

(3) Battery

W1021125

### (2) Separating Radiator



### Draining Coolant



#### CAUTION

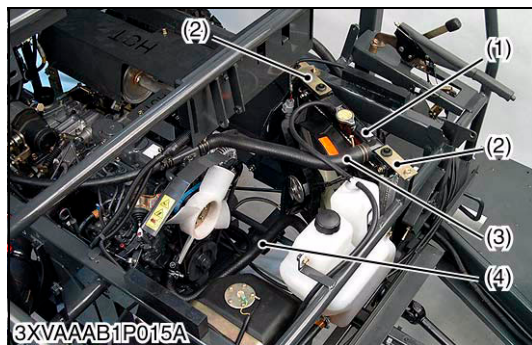
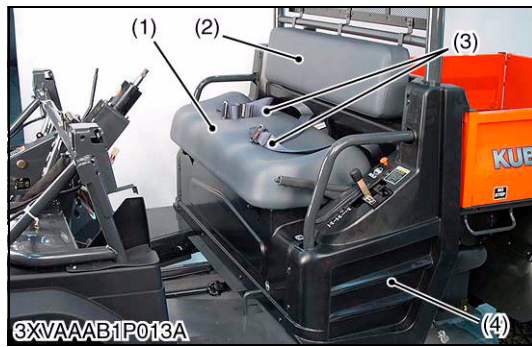
- Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.
1. Remove the protective cover (2).
  2. Open the radiator drain plug (1), and remove radiator cap (3) to completely drain the coolant.
  3. After all coolant is drained, close the drain plug.

Coolant	Capacity (with recovery tank)	4.0 L 4.2 U.S.qts 3.5 Imp.qts
---------	-------------------------------	-------------------------------------

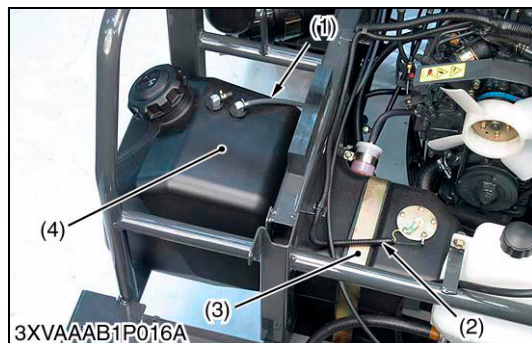
(1) Drain Plug  
(2) Protective Cover

(3) Radiator Cap

W1021413



### (3) Separating Fuel Tank



### Seat and Center Cover

1. Tilt up the cargo bed.
2. Remove the seat back (2) and seat assembly (1).
3. Remove the center cover LH (4) and center cover RH (6).
4. Remove the seat belts (3).
5. Disconnect the differential lock pedal holding wire, and remove the center cover (5).

Tightening torque	Seat belt mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 33.5 to 41.2 lbf·ft
-------------------	--------------------------	---

- (1) Seat Assembly  
(2) Seat Back  
(3) Seat Belt

- (5) Center Cover LH  
(6) Center Cover  
(7) Center Cover RH

W1021893

### Radiator Assembly

1. Disconnect the upper hose (3) and lower hose (4).
2. Disconnect the connector from the fan drive motor.
3. Remove the radiator holders (2).
4. Draw out the radiator (1) up.

- (1) Radiator  
(2) Holder

- (3) Upper Hose  
(4) Lower Hose

W1023393

### Seat and Center Cover

1. Refer to "Separating Radiator".

W1023690

### Fuel Tank Assembly

1. Disconnect the fuel hose from the fuel feed pump.
2. Drain the fuel from the fuel tank.
3. Disconnect the return hose and the wire harness (2) of fuel level sensor.
4. Remove the tank band (3) and the fuel tank assembly (4).

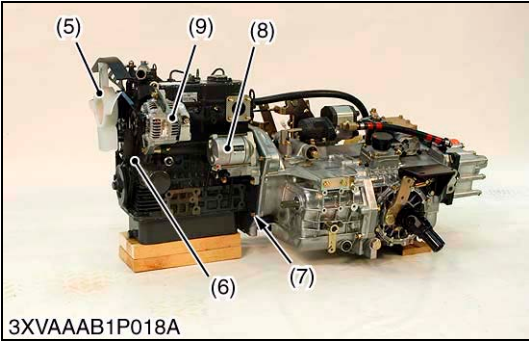
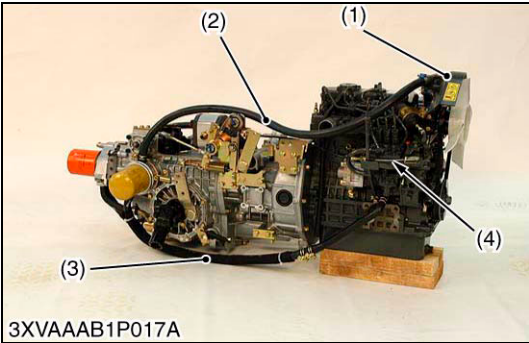
- (1) Return Hose  
(2) Wire Harness

- (3) Tank Band  
(4) Fuel Tank Assembly

W1023765



(4) Separating Engine



Separate Engine and Transmission Assembly

1. Refer to "DISMOUNTING TRANSAXLE" section.  
(See page 2-S29.)

W1024055

Engine Assembly

1. Remove the fan cover (1).  
2. Disconnect the water hoses (2), (3) and accelerator wire (4).  
3. Remove the alternator (9), fan belt (6) and cooling fan (5).  
4. Remove the starter (8).  
5. Remove the engine mounting screws (7) to separate the engine assembly from the transmission.

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the transmission to engine assembly.

Tightening torque	Engine mounting screw	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 lbf·ft
-------------------	-----------------------	---

- (1) Fan Cover

(2) Water Hose

(3) Water Hose

(4) Accelerator Wire

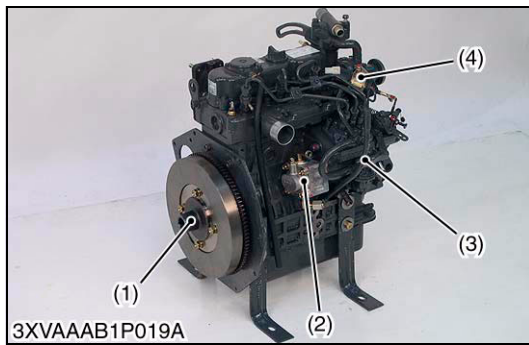
(5) Cooling Fan
- (6) Fan Belt

(7) Engine Mounting Screw

(8) Starter

(9) Alternator

W1024143



### Hydraulic Pump, Stop Solenoid and Others

1. Drain the engine oil.
2. Remove the input flange (1).
3. Remove the hydraulic pump (2), dipstick (3) and stop solenoid.

#### (When refilling engine oil)

- Fill the engine oil up to the upper line on the dipstick (3).

#### ■ IMPORTANT

- **Never mix two different type of oil.**
- **Use the proper SAE Engine Oil according to ambient temperature.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT" (See page G-8).**

Engine oil capacity	Oil filter exchanged	3.1 L 3.3 U.S.qts 2.7 Imp.qts
	Oil filter non-exchanged	2.7 L 2.9 U.S.qts 2.4 Imp.qts

#### (When reassembling)

Tightening torque	Input flange	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
-------------------	--------------	---

#### ■ NOTE

- **When reinstalling the input flange, be sure to set the O-ring inside the input flange.**

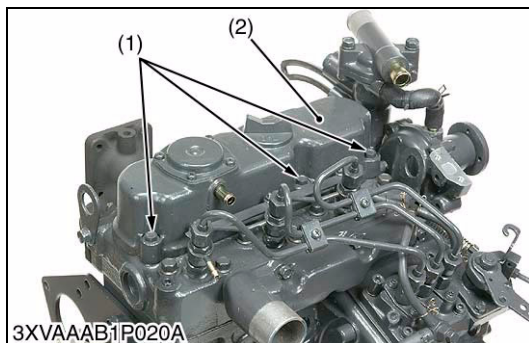
(1) Input Flange  
(2) Hydraulic Pump

(3) Dipstick  
(4) Stop Solenoid

W1024619

## [3] DISASSEMBLING AND ASSEMBLING

### (1) Cylinder Head and Valves



#### Cylinder Head Cover

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

#### (When reassembling)

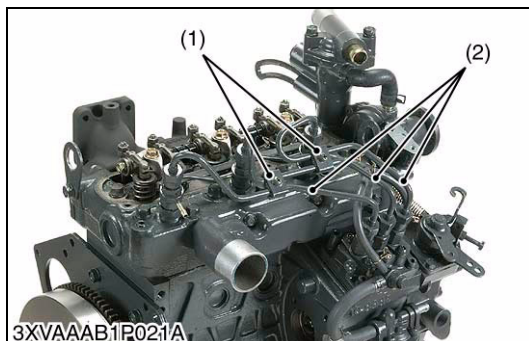
- Check to see if the cylinder head cover gasket is not defective.

Tightening torque	Cylinder head cover screw	6.86 to 11.3 N·m 0.7 to 1.15 kgf·m 5.1 to 8.3 lbf·ft
-------------------	---------------------------	--

(1) Head Cover Screws

(2) Cylinder Head Cover

W1025193



#### Injection Pipes

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

#### (When reassembling)

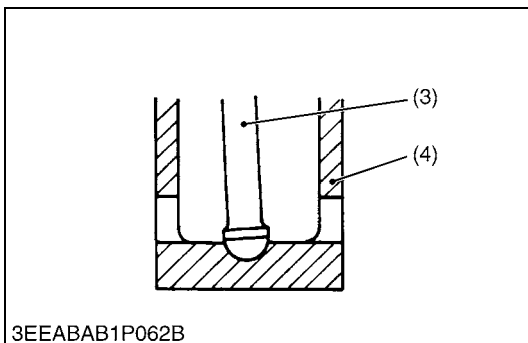
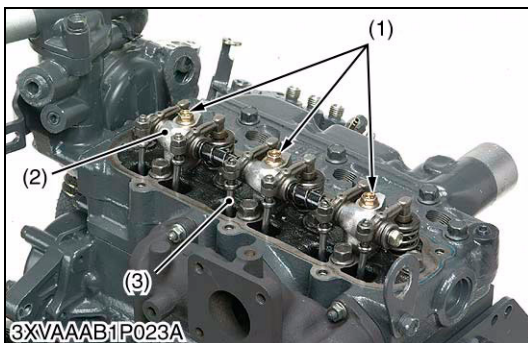
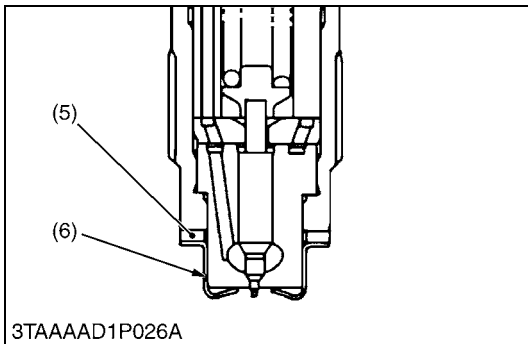
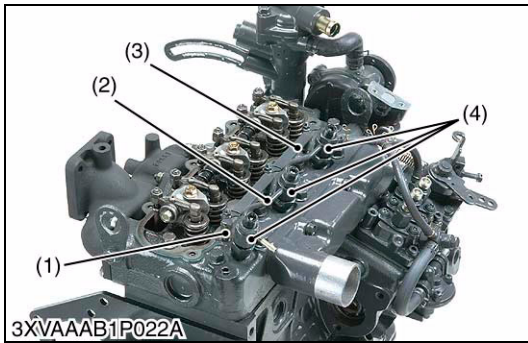
- Sent compressed air into the pipes to blow out dust. Then, reassemble the pipes in the reverse order.

Tightening torque	Injection pipe retaining nut	24.5 to 34.3 N·m 2.5 to 3.5 kgf·m 18.1 to 25.3 lbf·ft
-------------------	------------------------------	---

(1) Pipe Clamp

(2) Injection Pipe

W1025468



### Nozzle Holder Assembly and Glow Plug

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

#### (When reassembling)

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

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

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

W1025798

### Rocker Arm and Push Rod

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

#### (When reassembling)

- When putting the push rods (3) onto the tappets (4), check to see if their ends are properly engaged with the grooves.

#### ■ IMPORTANT

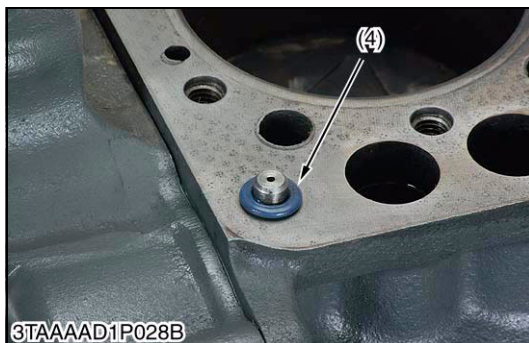
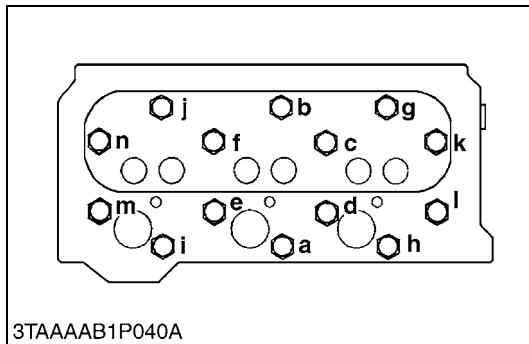
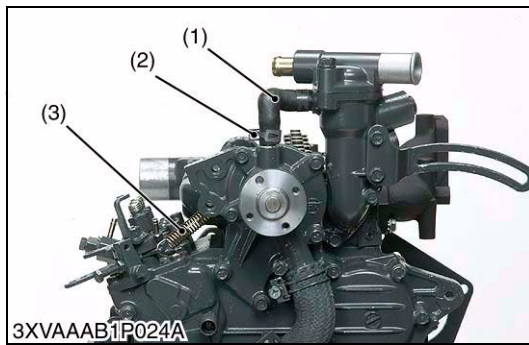
- After installing the rocker arm, be sure to adjust the valve clearance.

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

- |                               |              |
|-------------------------------|--------------|
| (1) Rocker Arm Bracket screws | (3) Push Rod |
| (2) Rocker Arm Assembly       | (4) Tappet   |

W1026181





### Cylinder Head

1. Loosen the pipe clamp (2), and remove the water return pipe (1).
2. Disconnect the spring (3) from the speed control lever.
3. Remove the cylinder head screws in order of (n) to (a).
4. Lift up the cylinder head to detach.
5. Remove the cylinder head gasket and O-ring (4).

#### (When reassembling)

- Replace the cylinder head gasket with a new one.
- Securely fit the O-ring (4) to the pipe pin.
- Tighten the cylinder head screws after applying sufficient oil.
- Tighten the cylinder head screws in order of (a) to (n).
- Tighten them uniformly, or the head may deform in the long run.
- Retighten the cylinder head screws after running the engine for 30 minutes.

Tightening torque	Cylinder head screw	37.3 to 42.1 N·m 3.8 to 4.3 kgf·m 27.5 to 31.1 lbf·ft
-------------------	---------------------	---

- (1) Water Return Pipe  
(2) Pipe Clamp  
(3) Spring  
(4) O-ring

(n) to (a) To Loosen  
(a) to (n) To Tighten

W1026648

### Tappets

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

#### (When reassembling)

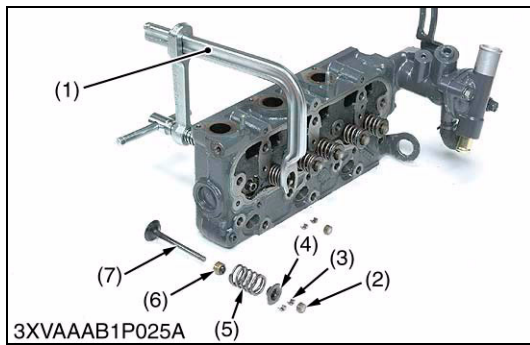
- Visually check the contact between tappets and cams for proper rotation. If defect is found, replace tappets.
- Before installing the tappets, apply engine oil thinly around them.

#### ■ IMPORTANT

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

- (1) Tappet

W1027265



### Valves

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

### (When reassembling)

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

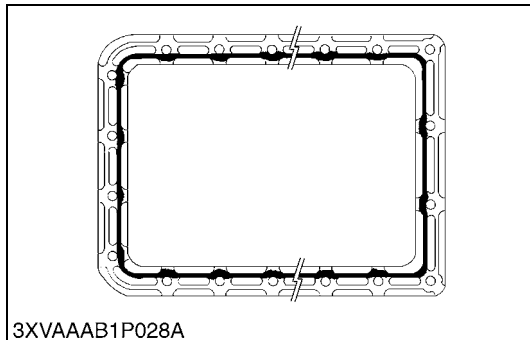
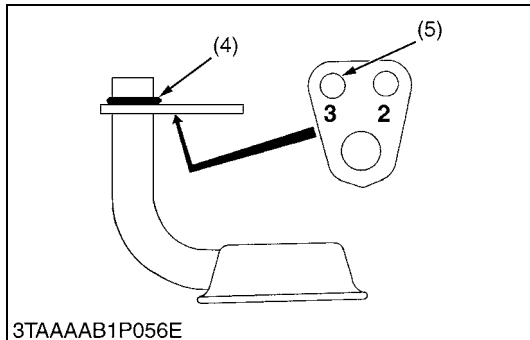
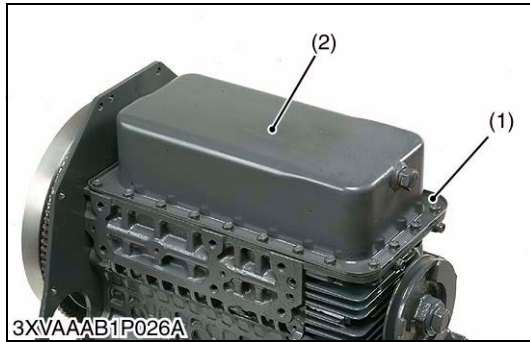
### ■ IMPORTANT

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

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

W1027618

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



### Oil Pan and Oil Strainer

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

### **(When reassembling)**

- After cleaning the oil strainer, check to see that the filter mesh is clean, and install it.
- Visually check the O-ring (4), apply engine oil, and install it.
- Securely fit the O-ring to the oil strainer.
- To avoid uneven tightening, tighten oil pan mounting screws in diagonal order from the center.
- Using the hole (5) numbered "3", install the oil strainer by mounting screw.

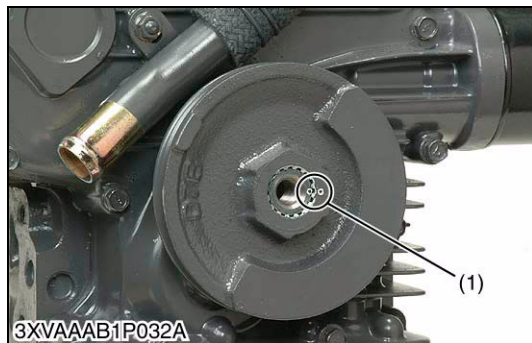
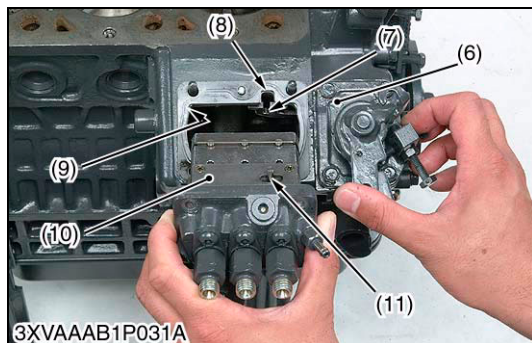
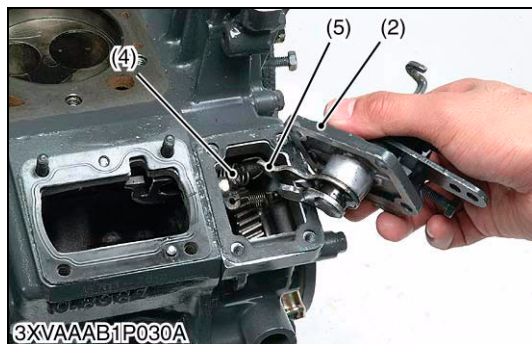
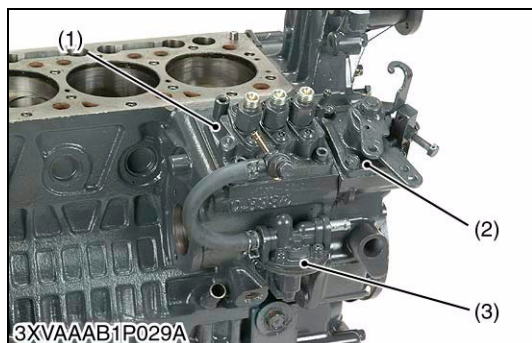
### ■ **IMPORTANT**

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

- (1) Oil Pan Mounting Screw  
(2) Oil Pan  
(3) Oil Strainer

- (4) O-ring  
(5) Hole

W1028046



### **Injection Pump, Fuel Feed Pump and Speed Control Plate**

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

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

- Hook the governor spring (4) to the governor lever (5) first and install the speed control plate (2).
- Be sure to place the copper washers underneath two screws (6). (Two screws (6) in the upper of the speed control plate (2).)
- Position the slot (7) on the fork lever just under the slot (8) on the crankcase.
- Insert the injection pump (1) so that the control rod (10) should be pushed by the idling adjusting spring (9) at its end and the pin (11) on the rod engages with the slot (7) on the fork lever (as shown in the photo).

#### **■ NOTE**

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

- |                             |                             |
|-----------------------------|-----------------------------|
| (1) Injection Pump          | (7) Slot (Fork Lever Side)  |
| (2) Speed Control Plate     | (8) Slot (Crankcase Side)   |
| (3) Fuel Feed Pump          | (9) Idling Adjusting Spring |
| (4) Governor Spring         | (10) Control Rod            |
| (5) Governor Lever          | (11) Pin                    |
| (6) Screw and Copper Washer |                             |

W1028847

### **Fan Drive Pulley**

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

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

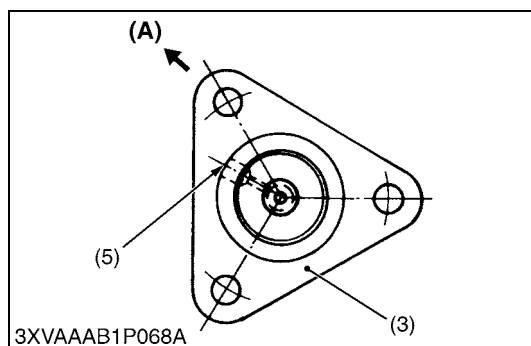
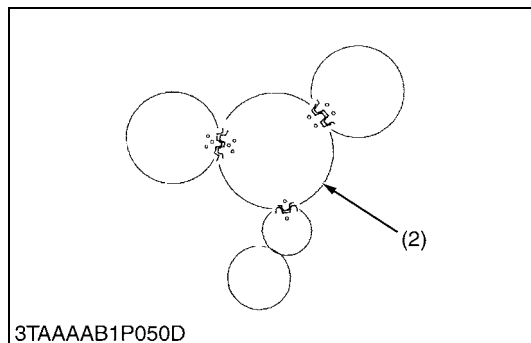
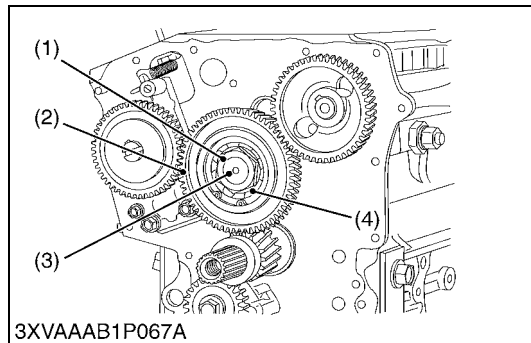
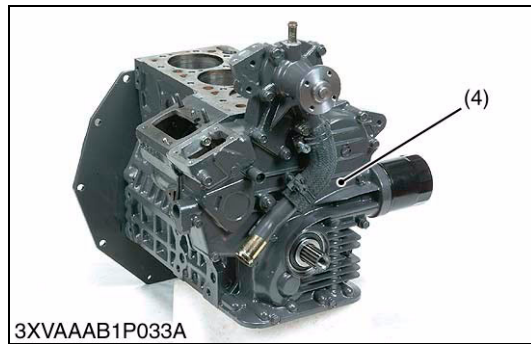
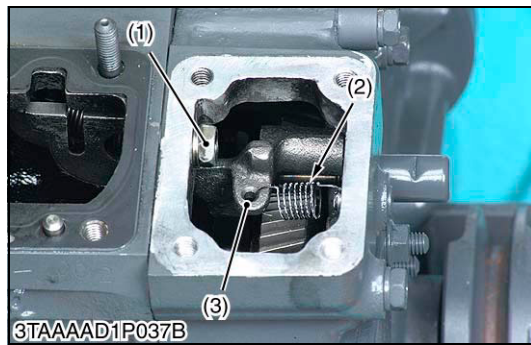
- Install the pulley to the crankshaft, aligning the mark (1) on them.
- Apply engine oil to the fan drive pulley retaining screws. And tighten them.

Tightening torque	Fan drive pulley screw	117.7 to 127.5 N·m 12.0 to 13.0 kgf·m 86.8 to 94.0 lbf·ft
-------------------	------------------------	---

- (1) Alignment Mark

W1029857





### Gear Case

1. Disconnect the start spring (2) from the fork lever 1 (3).
2. Remove the screw (1) of inside the gear case and outside screws.
3. Remove the gear case (4).

#### (When reassembling)

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

(1) Screw (Inside)

(2) Start Spring

(3) Fork Lever 1

(4) Gear Case

W1030251

### Idle Gear

1. Remove the nut (1) and the idle gear (2).
2. Remove the screws and the idle gear shaft (3).

#### (When reassembling)

- Install the idle gear, aligning the marks on the gears referring to the figure.

#### ■ NOTE

- **When installing the idle gear shaft (3), noting the lubricating hole position of shaft shown in the figure.**

Tightening torque	Idle gear shaft mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 lbf·ft
	Idle gear retaining nut	78.4 to 88.2 N·m 8.0 to 9.0 kgf·m 57.6 to 64.8 lbf·ft

(1) Idle Gear Retaining Nut

(2) Idle Gear

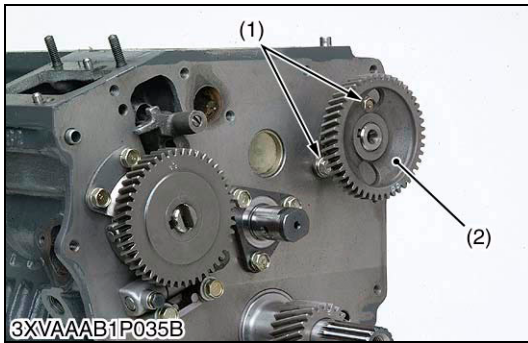
(3) Idle Gear Shaft

(4) Idle Gear Bearing

(5) Lubricating Hole

(A) Fuel Camshaft

W1030851



### **Camshaft**

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

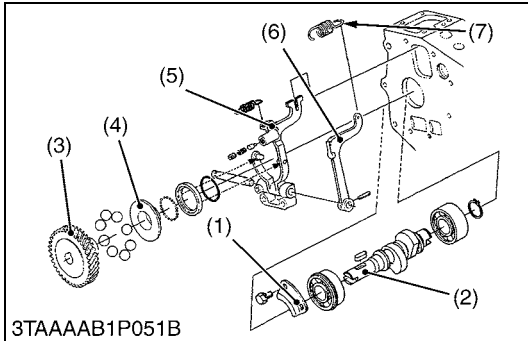
#### **(When reassembling)**

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

(1) Camshaft Mounting Screw

(2) Camshaft Gear

W1031261



### **Fuel Camshaft**

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

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

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

(1) Retaining Plate

(5) Fork Lever 1

(2) Fuel Camshaft

(6) Fork Lever 2

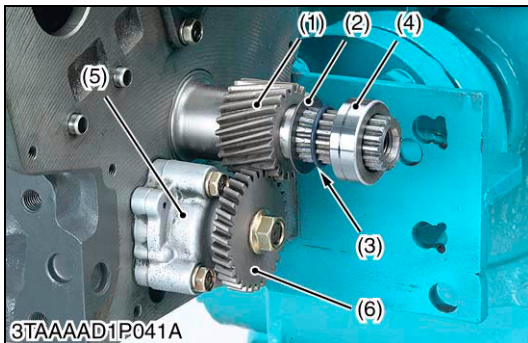
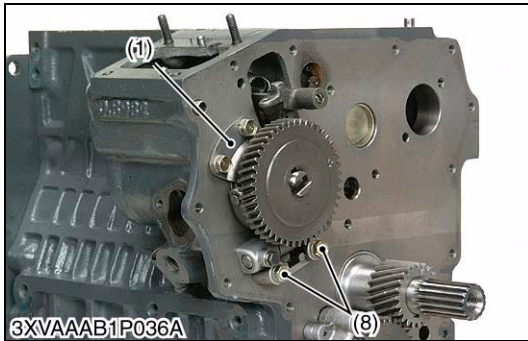
(3) Injection Pump Gear

(7) Governor Spring

(4) Governor Sleeve

(8) Fork Lever Holder Mounting Screw

W1031546



### **Oil Pump and Crankshaft Gear**

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

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

- Install the collar (4) after aligning the marks on the gear.

(1) Crankshaft Gear

(4) Crankshaft Collar

(2) Crankshaft Oil Slinger

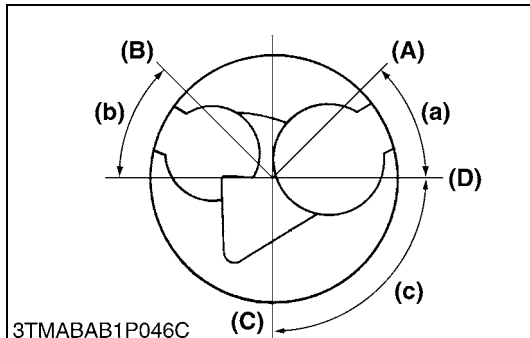
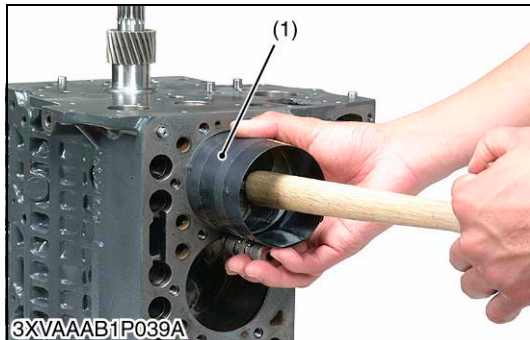
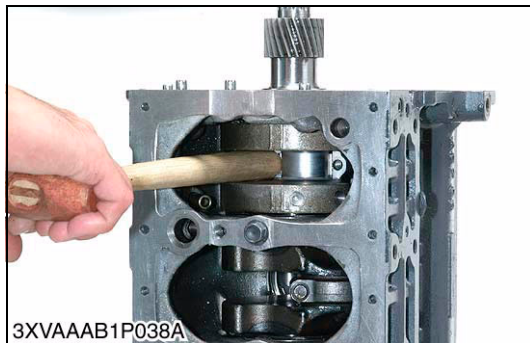
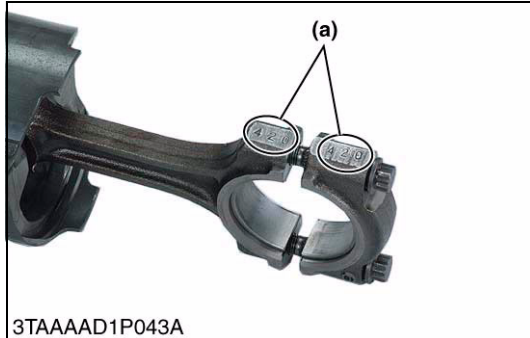
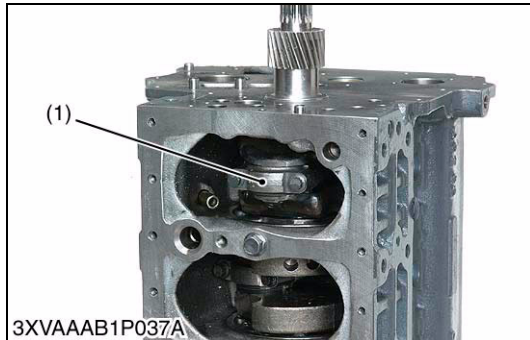
(5) Oil Pump

(3) O-ring

(6) Oil Pump Gear

W1031866

### (3) Pistons and Connecting Rods



#### Connecting Rod

1. Remove the connecting rod caps (1) using a bihexagonal 8 mm socket.

#### (When reassembling)

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

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

(1) Connecting Rod Cap

(a) Mark

W1032180

#### 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

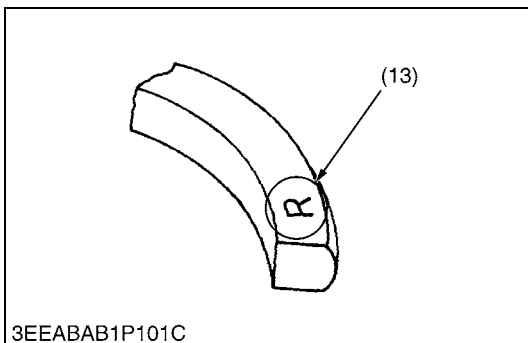
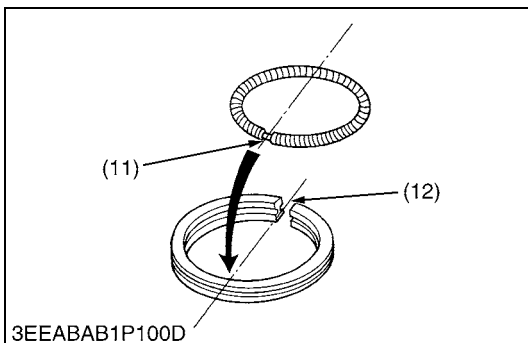
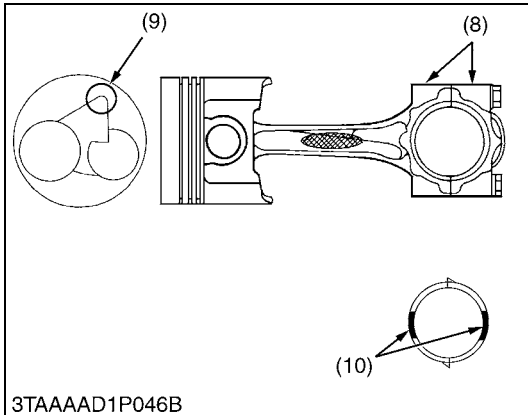
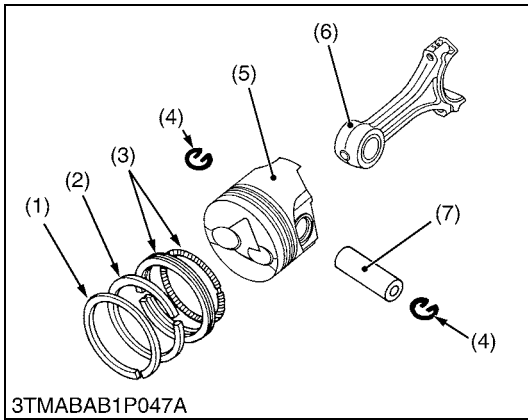
(D) Piston Pin Hole

(a) 0.785 rad (45 °)

(b) 0.785 rad (45 °)

(c) 1.57 rad (90 °)

W1032648



### 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 (13) near the gap faces the top of the piston.
- When installing the oil ring onto the piston, place the expander joint (11) on the opposite side of the oil ring gap (12).
- 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

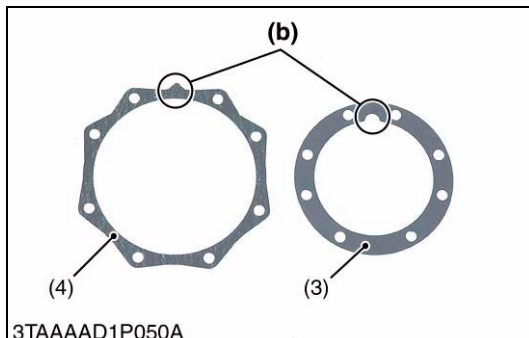
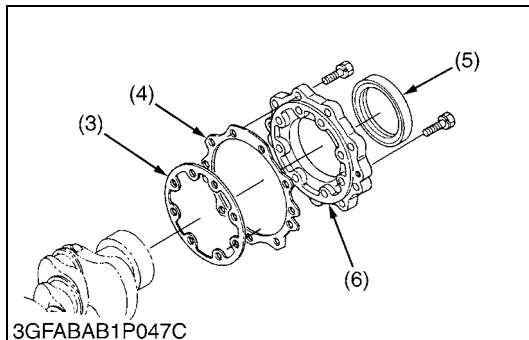
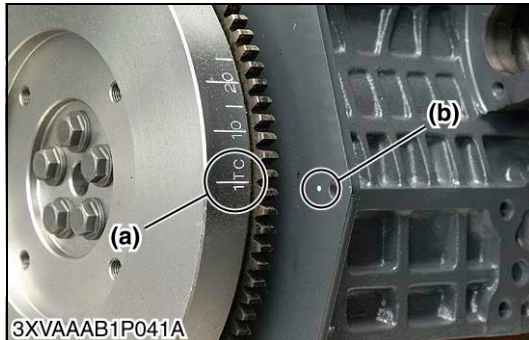
- **Mark the same number on the connecting rod and the piston so as not to change the combination.**

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

W1033290



#### (4) Crankshaft



#### Flywheel

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

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

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

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

- (1) Flywheel Screw  
(2) Flywheel

- (a) 1TC Mark  
(b) Punch Mark

W1034109

#### Bearing Case Cover

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

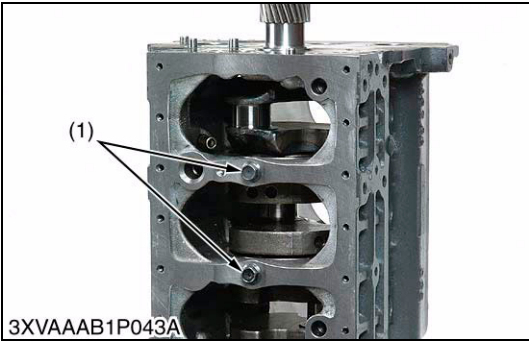
#### **(When reassembling)**

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

Tightening torque	Bearing case cover mounting screw	9.8 to 11.3 N·m 1.00 to 1.15 kgf·m 7.2 to 8.3 lbf·ft
-------------------	-----------------------------------	--

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

W1034808



**Crankshaft Assembly**

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

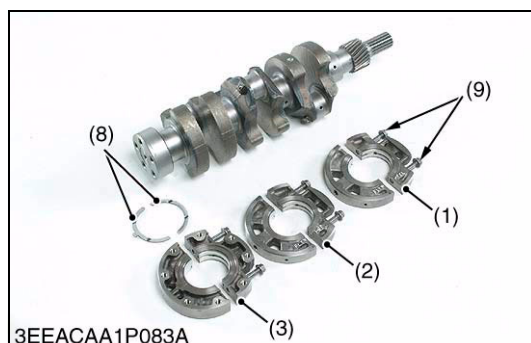
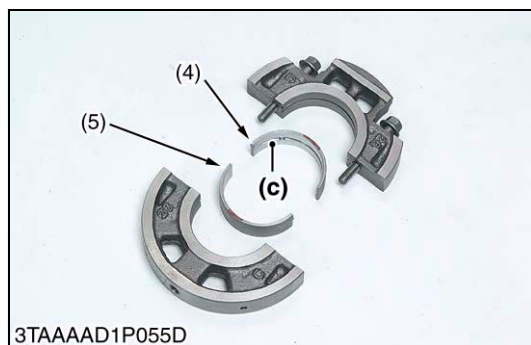
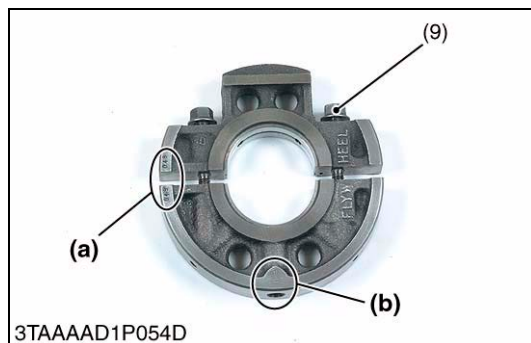
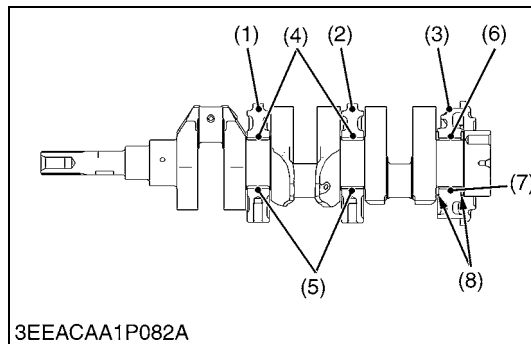
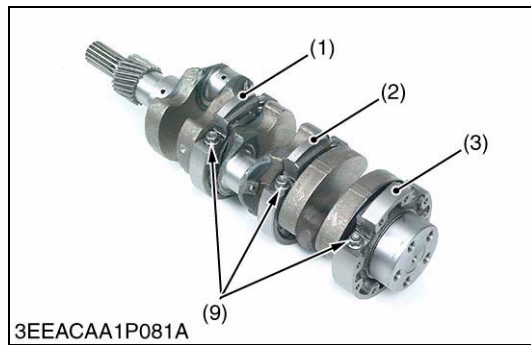
**(When reassembling)**

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

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

(1) Main Bearing Case Screw 2

W1035452



### Main Bearing Case Assembly

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

### (When reassembling)

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

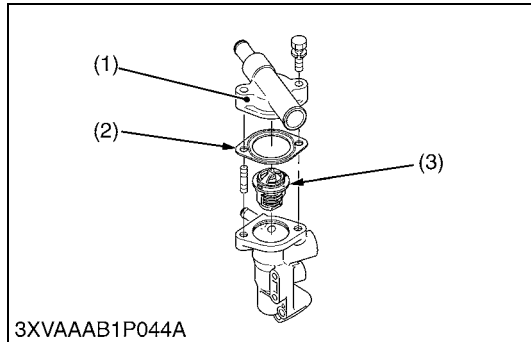
Tightening torque	Main bearing case screw 1	12.7 to 15.7 N·m 1.3 to 1.6 kgf·m 9.4 to 11.6 lbf·ft
-------------------	---------------------------	--

- (1) Main Bearing Case Assembly 1
- (2) Main Bearing Case Assembly 2
- (3) Main Bearing Case Assembly
- (4) Crankshaft Bearing 3  
(Upper, with oil groove)
- (5) Crankshaft Bearing 3 (Lower)
- (6) Crankshaft Bearing 2  
(Upper, with oil groove)
- (7) Crankshaft Bearing 2 (Lower)
- (8) Thrust Bearing
- (9) Main Bearing Case Screw 1

- (a) Alignment Number**
- (b) I.D. Mark**
- (c) I.D. Color**

W1035930

## (5) Water Pump



### Thermostat Assembly

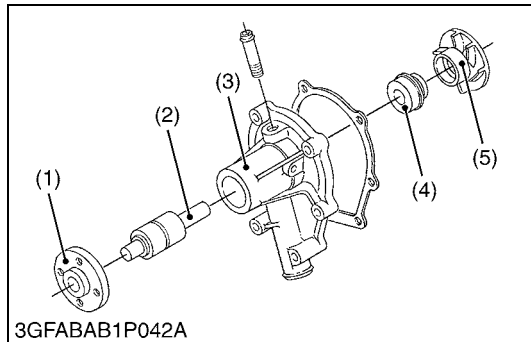
1. Remove the thermostat cover mounting screws, and remove the thermostat cover (1).
2. Remove the thermostat assembly (3).

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

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

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

W1037358



### Water Pump Assembly

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

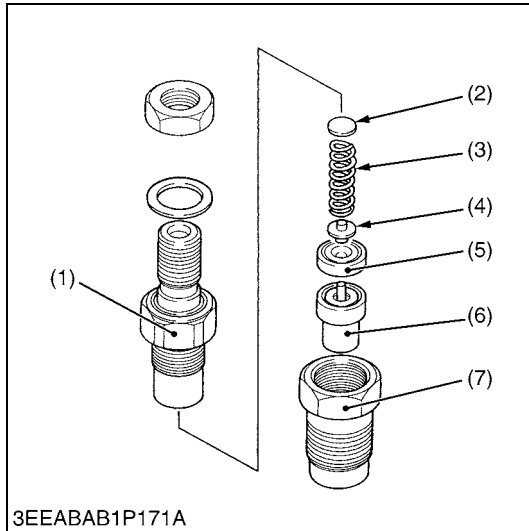
#### **(When reassembling)**

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

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

W1037543

## (6) Injection Nozzle



### Nozzle Holder

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

### (When reassembling)

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

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

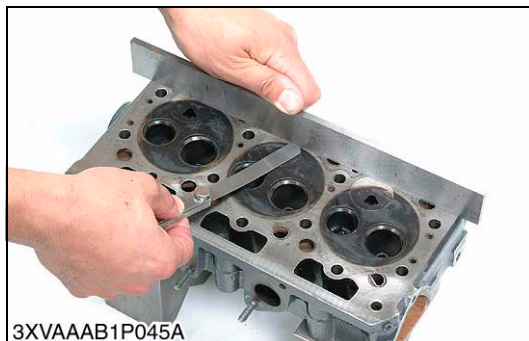
- (1) Nozzle Holder  
(2) Adjusting Washer  
(3) Nozzle Spring  
(4) Push Rod

- (5) Distance Piece  
(6) Nozzle Piece  
(7) Nozzle Retaining Nut

W1038321

## [4] SERVICING

### (1) Cylinder Head and Valve



### Cylinder Head Surface Flatness

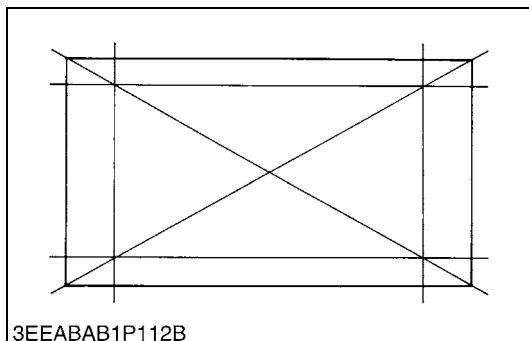
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides and two diagonal lines as shown in the figure.
3. Measure the clearance with a thickness gauge.
4. If the measurement exceeds the allowable limit, correct it with a surface grinder.

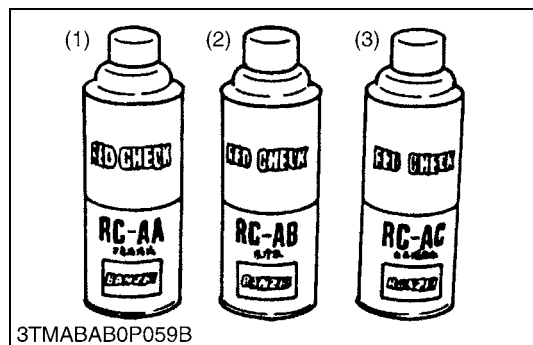
### ■ IMPORTANT

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

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.
--------------------------------	-----------------	-----------------------

W1038765





### Cylinder Head Flaw

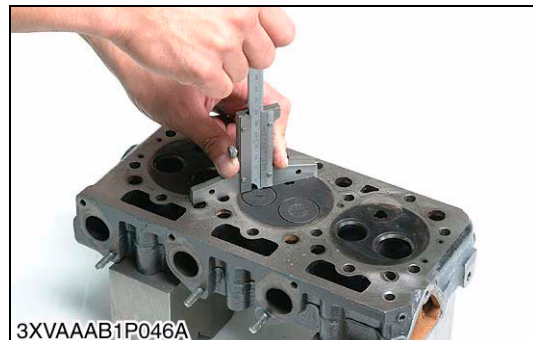
1. Prepare an air spray red check (Code No. 07909-31371).
2. Clean the surface of the cylinder head with the detergent (2).
3. Spray the cylinder head surface with the red permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface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

(1) Red Permetive Liquid

### (3) White Developer

(2) Detergent

W1039047



## Valve Recessing

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

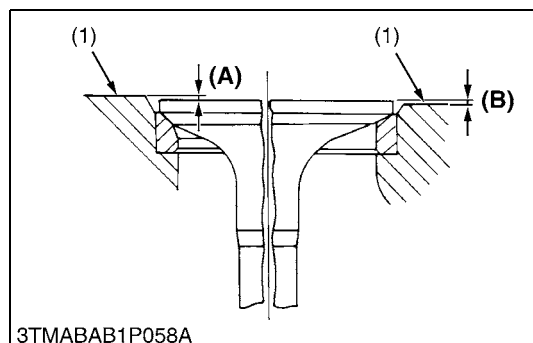
Valve recessing (Intake and Exhaust)	Factory spec.	0.10 (protrusion) to 0.10 (recessing) mm 0.0039 (protrusion) to 0.0039 (recessing) in.
	Allowable limit	0.30 (recessing) mm 0.0118 (recessing) in.

(1) Cylinder Head Surface

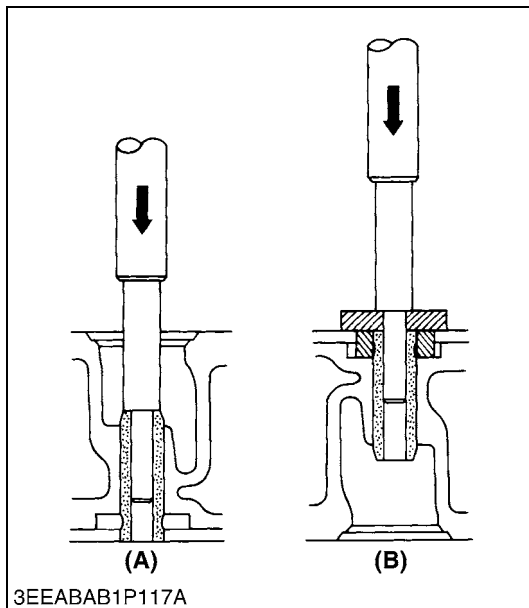
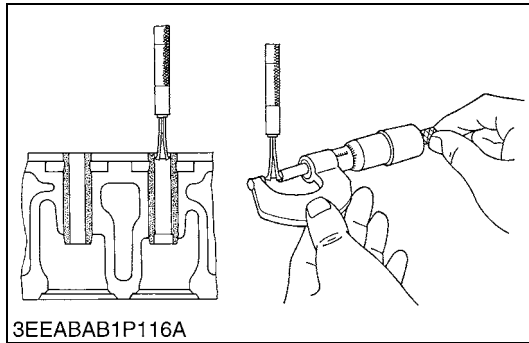
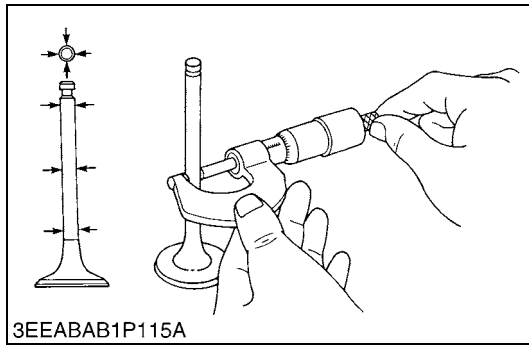
### (A) Recessing

(B) Protrusion

W1039332







### **Clearance between Valve Stem and Guide**

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

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

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

W1039704

### **Replacing Valve Guide**

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

1. Press out the used valve guide using a valve guide replacing tool.  
(See page G-49.)

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

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

Valve guide I.D. (Intake and Exhaust)	Factory spec.	6.010 to 6.025 mm 0.2361 to 0.2370 in.
---------------------------------------	---------------	---

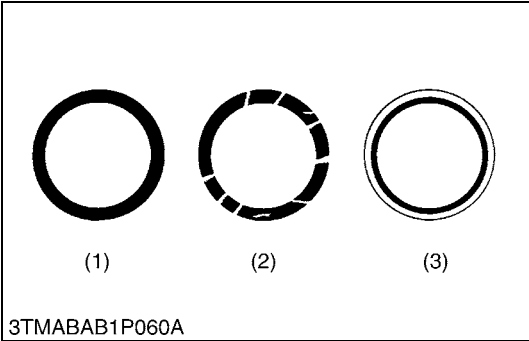
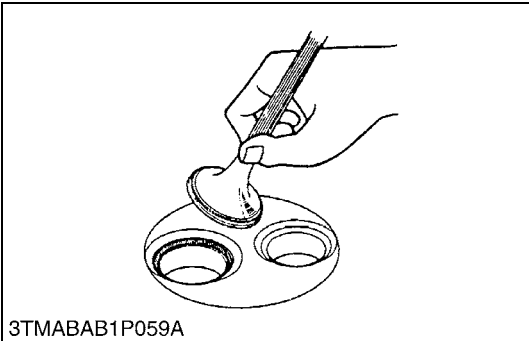
#### **■ IMPORTANT**

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

(A) When removing

(B) When installing

W1040065



**Valve Seating**

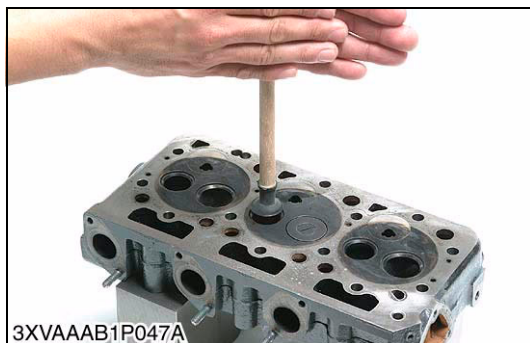
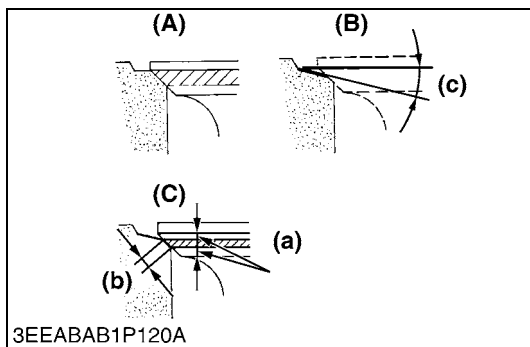
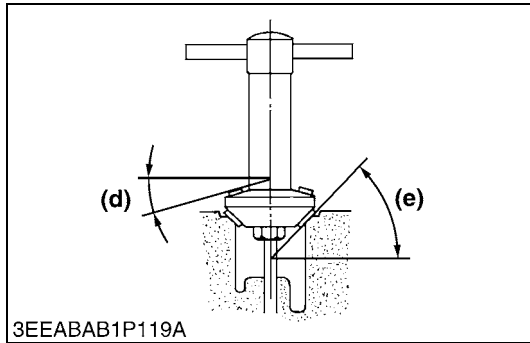
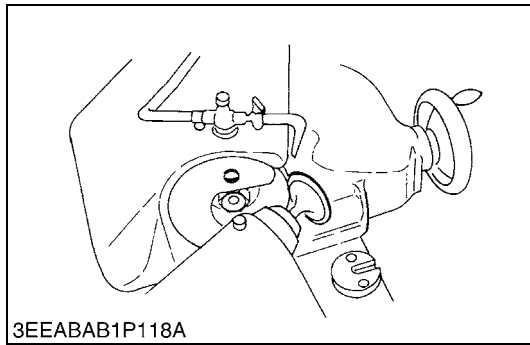
- 1. Coat the valve face lightly with prussian blue and put the valve on its seat to check the contact.
- 2. If the valve does not seat all the way around the valve seat or the valve contact is less than 70 %, correct the valve seating as follows.
- 3. If the valve contact does not comply with the reference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

Valve seat width	Factory spec.	2.12 mm 0.0835 in.
------------------	---------------	-----------------------

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

W1040378





## Correcting Valve and Valve Seat

### NOTE

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

### 1) Correcting Valve

1. Correct the valve with a valve refacer.

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

### 2) Correcting Valve Seat

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

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

- (a) Identical Dimensions  
 (b) Valve Seat Width  
 (c) 0.262 rad. (15 °)  
 (d) 0.262 rad. (15 °)  
 (e) 0.785 rad. (45 °)

- (A) Check Contact  
 (B) Correct Seat Width  
 (C) Check Contact

W1040717

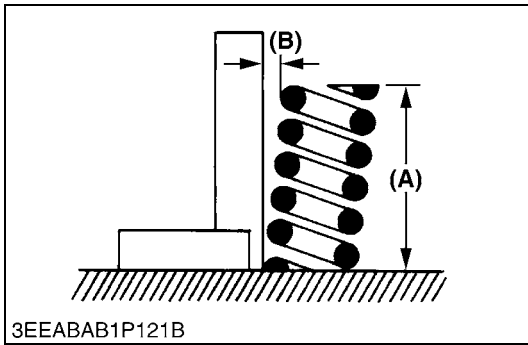
## Valve Lapping

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.

W1041326



### Free Length and Tilt of Valve Spring

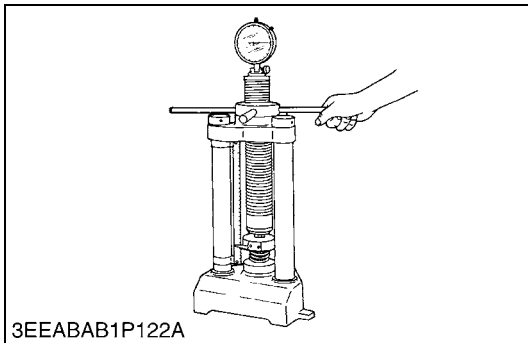
1. Measure the free length **(A)** of valve spring with vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Put the valve spring on a surface plate, place a square on the side of the valve spring.
3. Check to see if the entire side is in contact with the square. Rotate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

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

(A) Free Length

(B) Tilt

W1041772



### Valve Spring Setting Load

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

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

W1042087



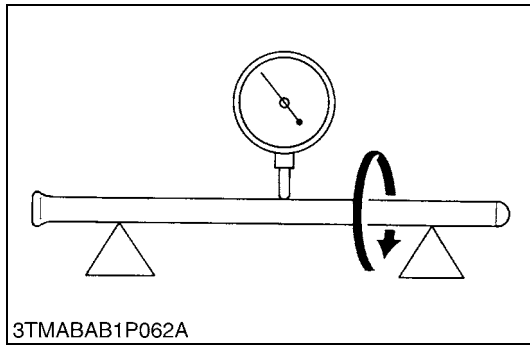
### Oil Clearance between Rocker Arm and Rocker Arm Shaft

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

Oil clearance between rocker arm and rocker arm shaft	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.00177 in.
	Allowable limit	0.15 mm 0.0059 in.

Rocker arm shaft O.D.	Factory spec.	10.473 to 10.484 mm 0.41232 to 0.41276 in.
Rocker arm I.D.	Factory spec.	10.500 to 10.518 mm 0.41339 to 0.41410 in.

W1042249



### **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.
--------------------	-----------------	-----------------------

W1042542



### **Oil Clearance between Tappet and Tappet Guide Bore**

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

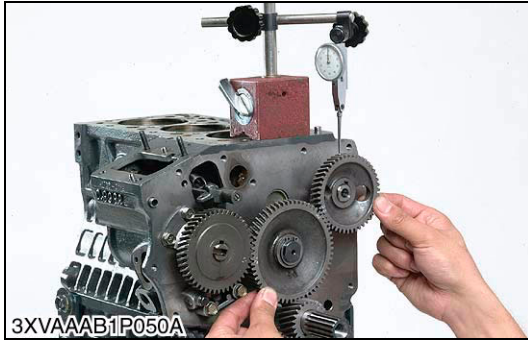
Oil clearance between tappet and tappet guide bore	Factory spec.	0.016 to 0.052 mm 0.00063 to 0.00205 in.
	Allowable limit	0.10 mm 0.0039 in.



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

W1042804

## (2) Oil Pan, Timing Gear and Camshaft



### Timing Gear Backlash

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

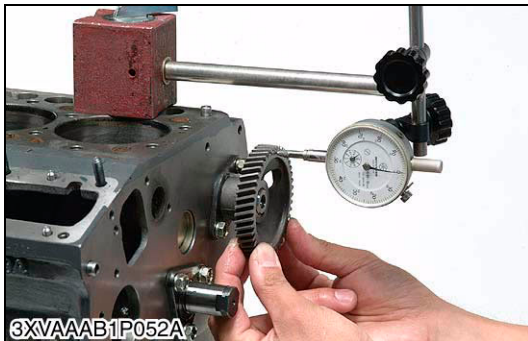
Backlash between idle gear and crank gear	Factory spec.	0.043 to 0.124 mm 0.00169 to 0.00488 in.
	Allowable limit	0.15 mm 0.0059 in.

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

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

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

W1043124

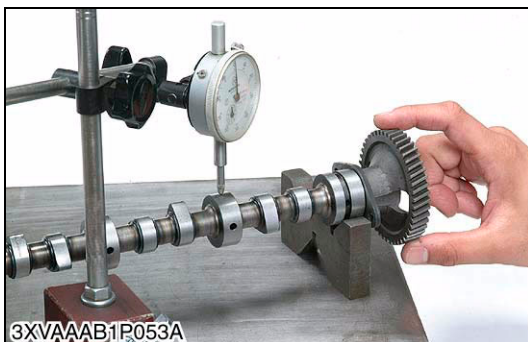


### Camshaft Side Clearance

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

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

W1043709

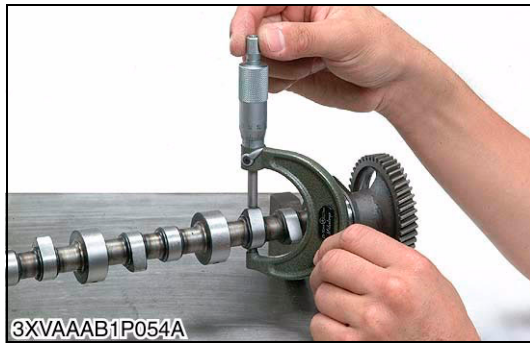


### Camshaft Alignment

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.
--------------------	-----------------	-----------------------

W1043914

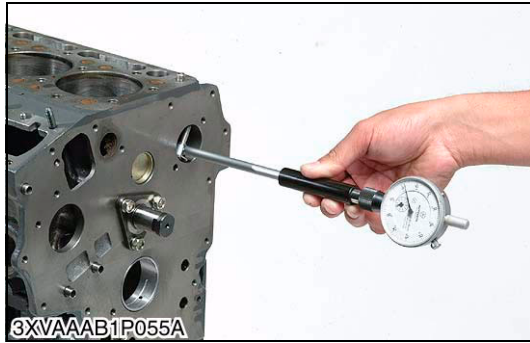


### **Cam Height**

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

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

W1044098



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

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

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



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

W1044346

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



### **Piston Pin Bore I.D.**

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

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

W1044640





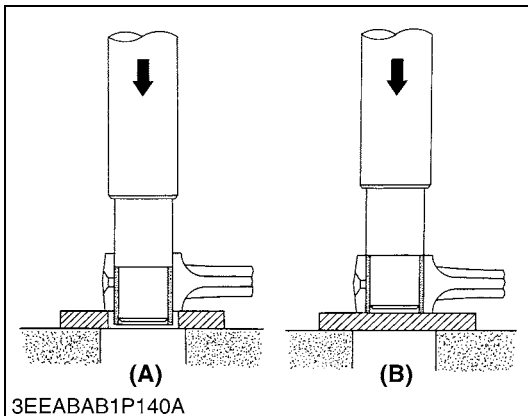
### **Oil Clearance between Piston Pin and Small End Bushing**

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

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

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

W1044830



### **Replacing Small End Bushing**

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

1. Press out the used bushing using a small end bushing replacing tool. (See page G-54.)

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

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

#### **[Servicing parts dimension]**

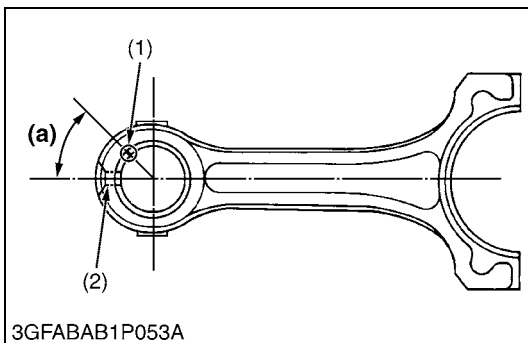
Oil clearance between piston pin and small end bushing (Spare parts)	Factory spec.	0.015 to 0.075 mm 0.00059 to 0.00295 in.
	Allowable limit	0.15 mm 0.0059 in.

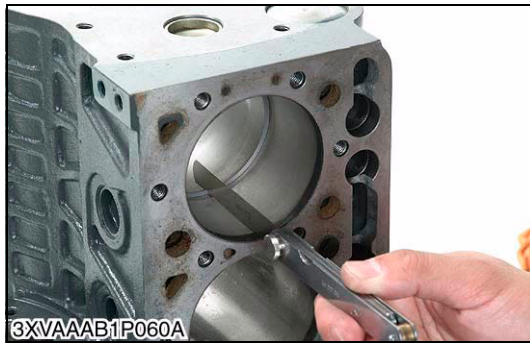
Small end bushing I.D. (Spare parts)	Factory spec.	20.026 to 20.077 mm 0.78843 to 0.79043 in.
--------------------------------------	---------------	---

- (1) Seam  
(2) Oil Hole

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

W1045055





### **Piston Ring Gap**

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

Piston ring gap	Top ring	Factory spec.	0.20 to 0.35 mm 0.0079 to 0.0138 in.
		Allowable limit	1.25 mm 0.0492 in.
	Second ring	Factory spec.	0.35 to 0.50 mm 0.0138 to 0.0197 in.
		Allowable limit	1.25 mm 0.0492 in.
	Oil ring	Factory spec.	0.20 to 0.35 mm 0.0079 to 0.0138 in.
		Allowable limit	1.25 mm 0.0492 in.

W1045599

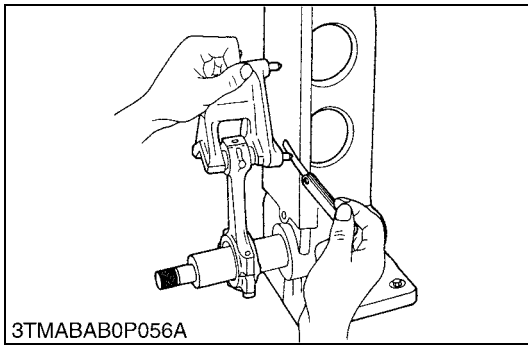


### **Clearance between Piston Ring and Piston Ring Groove**

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

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

W1046097

**Connecting Rod Alignment**

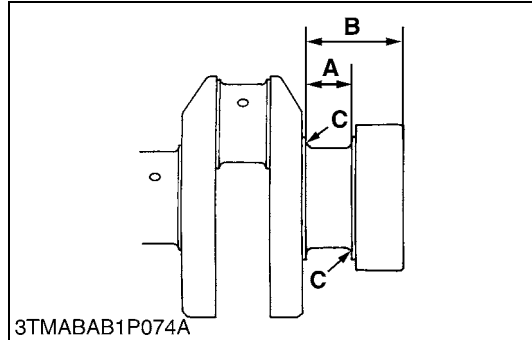
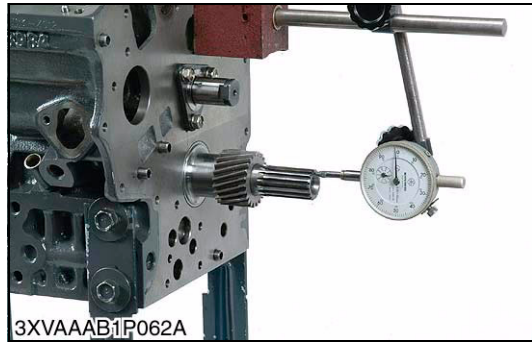
1. Remove the crankpin bearing, and install the connecting rod cap.
2. Install the piston pin in the connecting rod.
3. Install the connecting rod on the connecting rod alignment tool (Code No. 07909-31661).
4. Put a gauge over the piston pin, and move it against the face plate.
5. If the gauge does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

Space between gauge pin face plate	Allowable limit	0.05 mm 0.0020 in.
---------------------------------------	-----------------	-----------------------

W1046443



## (4) Crankshaft



### Crankshaft Side Clearance

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

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

### (Reference)

- Oversize thrust bearing.

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

- Oversize dimensions of crankshaft journal

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	23.40 to 23.45 mm 0.9213 to 0.9232 in.	23.80 to 23.85 mm 0.9370 to 0.9390 in.
Dimension B	46.1 to 46.3 mm 1.815 to 1.823 in.	46.3 to 46.5 mm 1.823 to 1.831 in.
Dimension C	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
(0.8S) The crankshaft journal must be fine-finished to higher than ∇∇∇∇.		

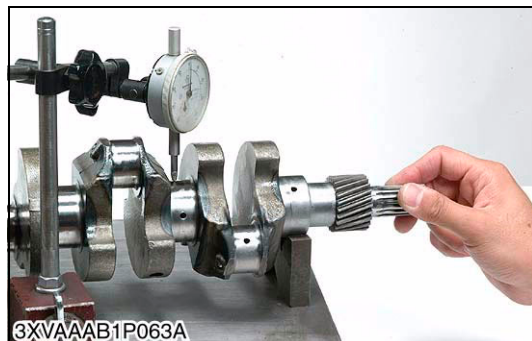
W1046680

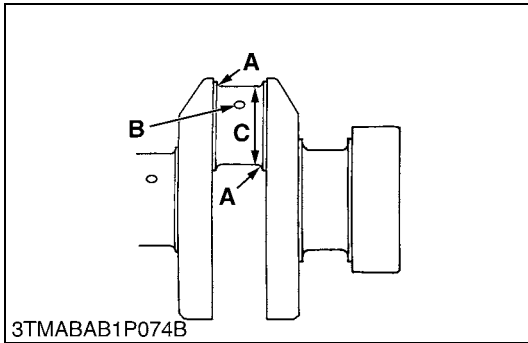
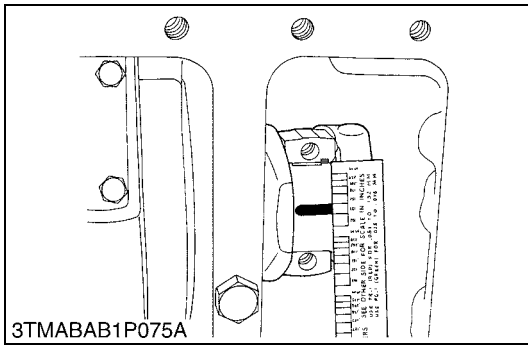
### Crankshaft Alignment

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.
----------------------	-----------------	-----------------------

W1047413





### Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage (Code No.: 07909-30241) on the 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 plastigage into the crankpin oil hole.**
- **Be sure not to move the crankshaft while the connecting rod screws are tightened.**

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

Crankpin O.D.	Factory spec.	33.959 to 33.975 mm 1.33697 to 1.33760 in.
Crankpin bearing I.D.	Factory spec.	33.995 to 34.010 mm 1.33840 to 1.33898 in.

#### (Reference)

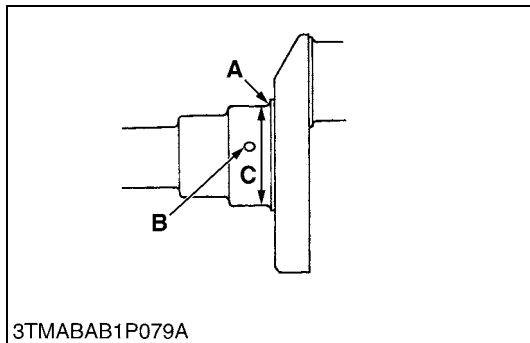
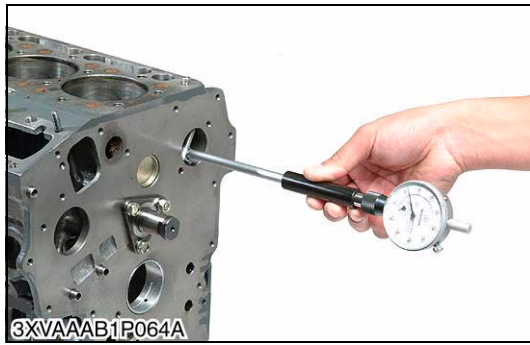
- Undersize crankpin bearing

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

- Undersize dimensions of crankpin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension <b>A</b>	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius	2.3 to 2.7 mm radius 0.091 to 0.106 in. radius
*Dimension <b>B</b>	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension <b>C</b>	33.759 to 33.775 mm dia. 1.32910 to 1.32973 in. dia.	33.559 to 33.575 mm dia. 1.32122 to 1.32185 in. dia.
(0.8S) The crankpin must be fine-finished to higher than ∇∇∇∇. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief		

W1047613



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

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

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

Crankshaft journal O.D.	Factory spec.	43.934 to 43.950 mm 1.72968 to 1.73031 in.
Crankshaft bearing 1 I.D.	Factory spec.	43.984 to 44.040 mm 1.73165 to 1.73386 in.

### (Reference)

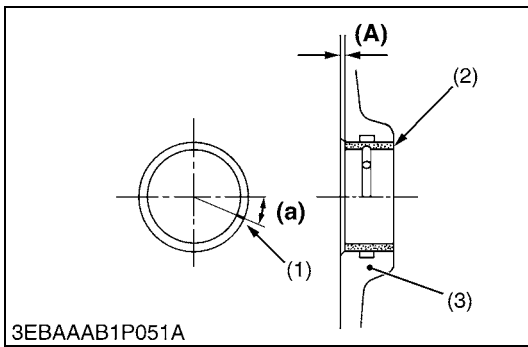
- Undersize crankshaft bearing 1

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 1 02	1G460-23910	020 US
0.4 mm 0.016 in.	Crankshaft bearing 1 04	1G460-23920	040 US

- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
*Dimension B	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension C	43.734 to 43.750 mm dia. 1.72181 to 1.72244 in. dia.	43.534 to 43.550 mm dia. 1.71394 to 1.7147 in. dia.
(0.8S) The crankpin must be fine-finished to higher than $\nabla\nabla\nabla\nabla$ . *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief		

W1048683



### Replacing Crankshaft Bearing 1

#### (When removing)

1. Press out the used crankshaft bearing 1 using a crankshaft bearing 1 replacing tool. (See page G-55.)

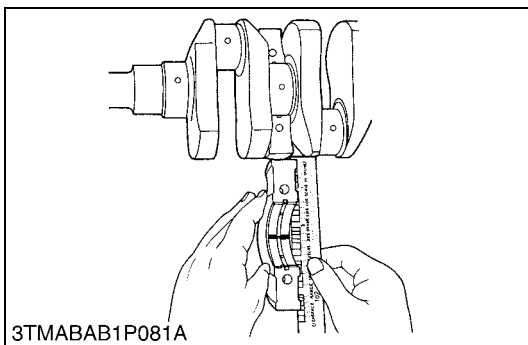
#### (When installing)

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

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

- (1) Seam (a) 0.366 rad (21 °)  
 (2) Crankshaft Bearing 1  
 (3) Cylinder Block

W10342000



### Oil Clearance between Crankshaft Journal and Crankshaft Bearing 2 (Crankshaft Bearing 3) (To be continued)

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

#### NOTE

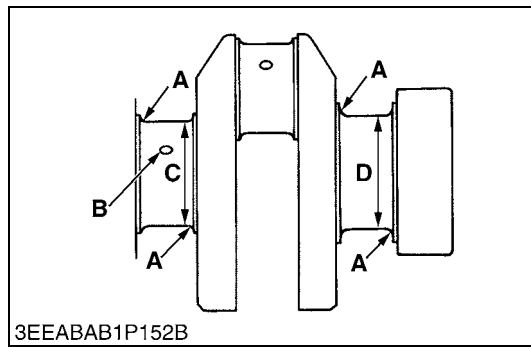
- Be sure not to move the crankshaft while the bearing case screws are tightened.

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

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

Crankshaft journal O.D. (Intermediate)	Factory spec.	43.934 to 43.950 mm 1.72968 to 1.73031 in.
Crankshaft bearing 3 I.D.	Factory spec.	43.978 to 43.993 mm 1.73142 to 1.73201 in.

W10344030



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

#### **(Reference)**

- Undersize crankshaft bearing 2 and 3.

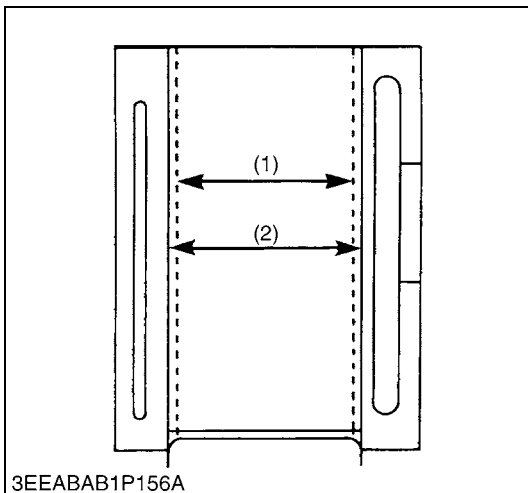
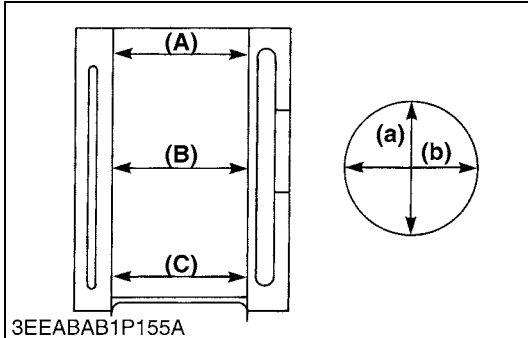
Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 2 02	1G460-23930	020 US
	Crankshaft bearing 3 02	1G460-23940	
0.4 mm 0.016 in.	Crankshaft bearing 2 04	1G460-23950	040 US
	Crankshaft bearing 3 04	1G460-23960	

- Undersize dimensions of crankshaft journal

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension <b>A</b>	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius	1.8 to 2.2 mm radius 0.071 to 0.087 in. radius
*Dimension <b>B</b>	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension <b>C</b>	43.734 to 43.750 mm dia. 1.72181 to 1.72244 in. dia.	43.534 to 43.550 mm dia. 1.71394 to 1.71457 in. dia.
Dimension <b>D</b>	43.734 to 43.750 mm dia. 1.72181 to 1.72244 in. dia.	43.534 to 43.550 mm dia. 1.71394 to 1.7147 in. dia.
(0.8S) The crankshaft journal must be fine-finished to higher than ∇∇∇∇. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief		

W1047088

## (5) Cylinder



### Cylinder Wear

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

Cylinder Liner I.D.	Factory spec.	72.000 to 72.019 mm 2.83464 to 2.83539 in.
	Allowable limit	72.150 mm 2.84055 in.

(A) Top

(B) Middle

(C) Bottom (Skirt)

(a) Right-angled to Piston Pin

(b) Piston Pin Direction

W1051440

### Correcting Cylinder

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

Cylinder I.D. [Oversize]	Factory spec.	72.250 to 72.269 mm 2.84449 to 2.84524 in.
	Allowable limit	72.400 mm 2.85040 in.
Finishing	Horn to 1.2 to 2.0 $\mu\text{m}$ Rmax. $\nabla\nabla\nabla\nabla$ (0.000047 to 0.000079 in. Rmax.)	

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

Oversize	Part Name	Code Number	Marking
0.25 mm 0.0098 in.	Piston	1G962-21900	025
	Piston ring assembly	1G460-21090	025

### NOTE

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

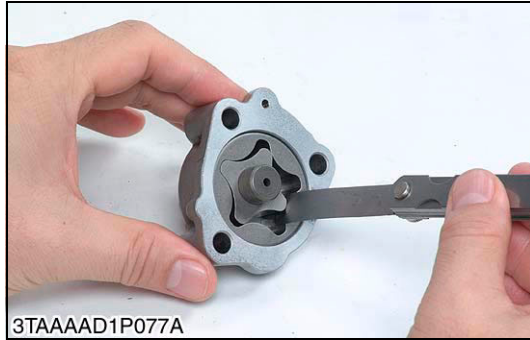
(1) Cylinder I.D.

[Before Correction]

(2) Cylinder I.D. [Oversize]

W1051790

## (6) Oil Pump

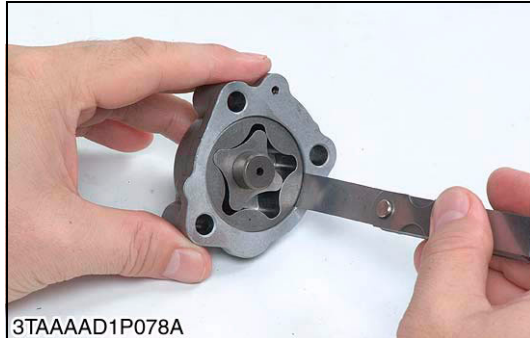


### Rotor Lobe Clearance

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

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

W1052482

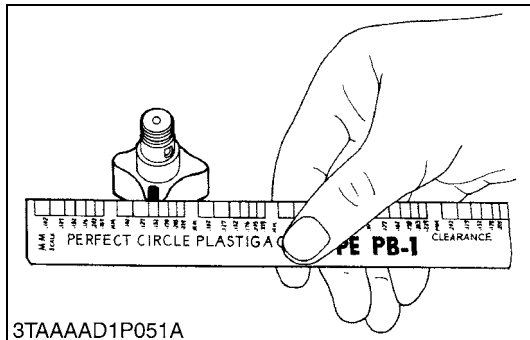


### Clearance between Outer Rotor and Pump Body

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

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

W1052645



### Clearance between Rotor and Cover

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

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

W1052791

# **2 TRANSMISSION**

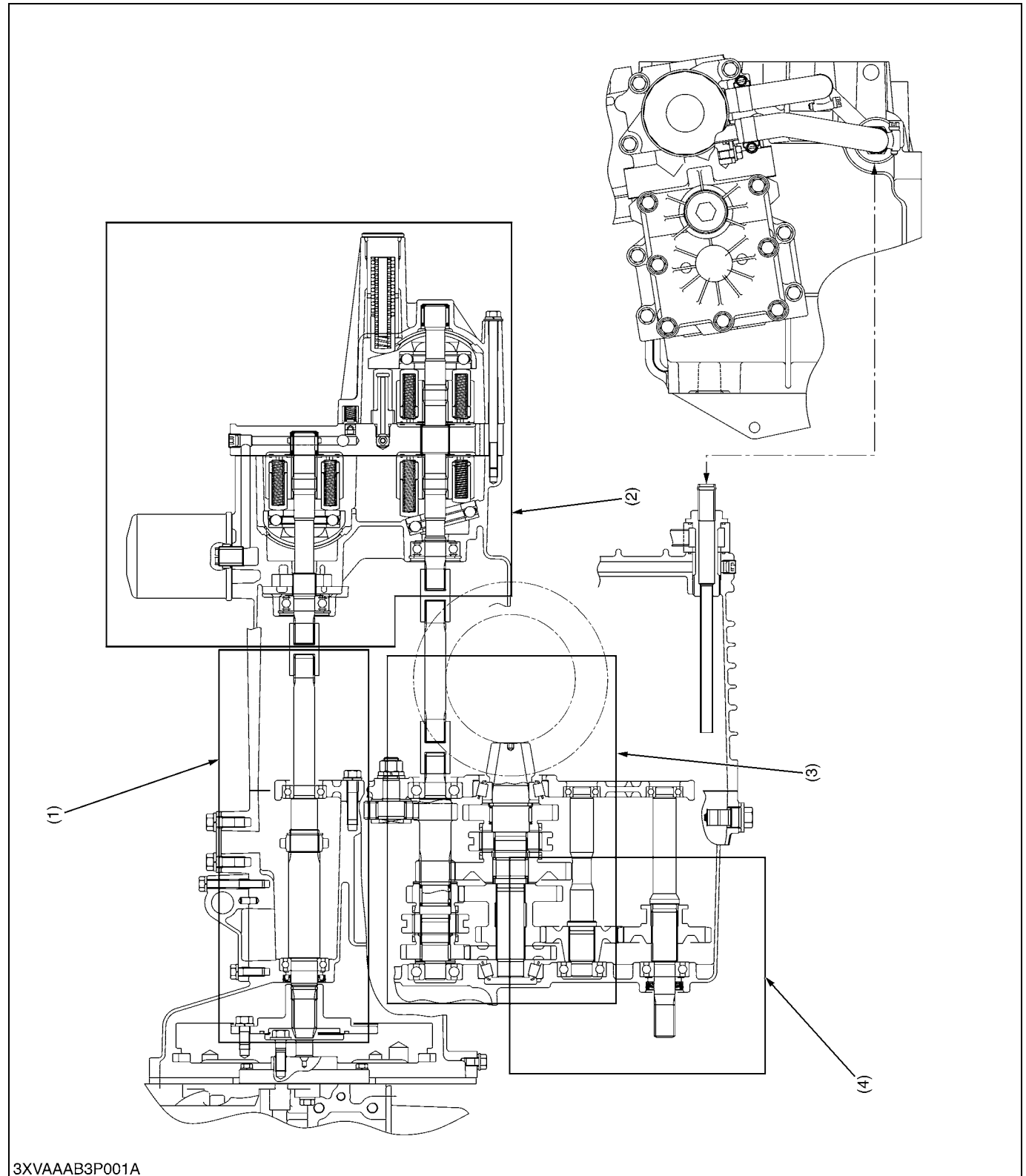


# MECHANISM

## CONTENTS

1. STRUCTURE .....	2-M1
2. POWER TRAIN .....	2-M2
[1] HYDROSTATIC TRANSMISSION (HST) .....	2-M2
(1) Structure .....	2-M2
(2) Oil Flow .....	2-M4
(3) Function of Components .....	2-M5
[2] RANGE GEAR SHIFT SECTION AND FRONT WHEEL DRIVE SECTION .....	2-M20

# 1. STRUCTURE



(1) Input Shaft Section

(2) Hydrostatic Transmission Section

(3) Range Shift Gear Section

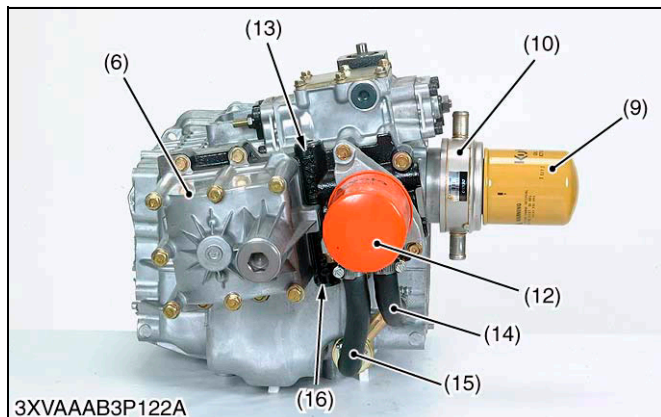
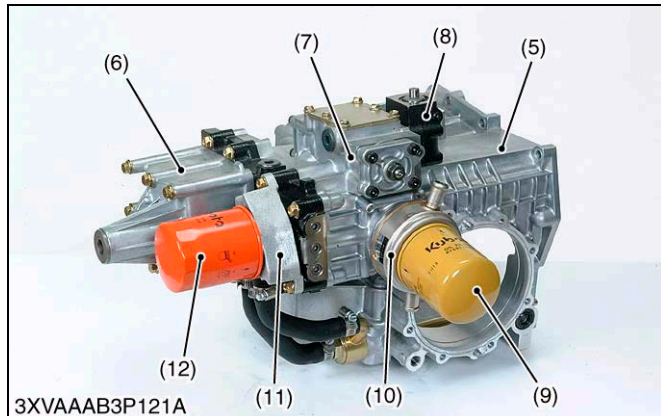
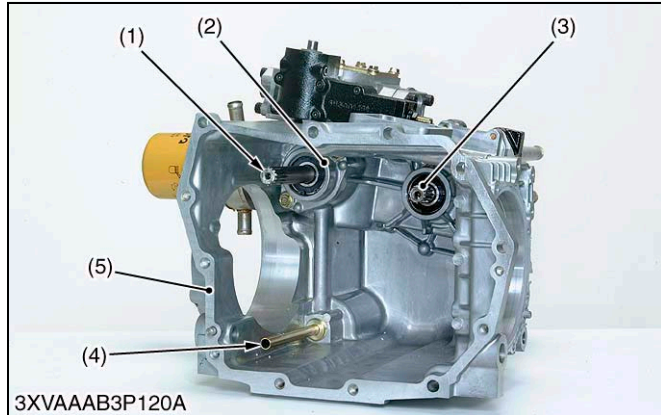
(4) Front Wheel Drive Section

## 2. POWER TRAIN

The transmission of this model consists of a series of gears and shafts as shown in previous page. The traveling system is chiefly composed of hydrostatic transmission section, range gear shift section and front wheel drive section.

### [1] HYDROSTATIC TRANSMISSION (HST)

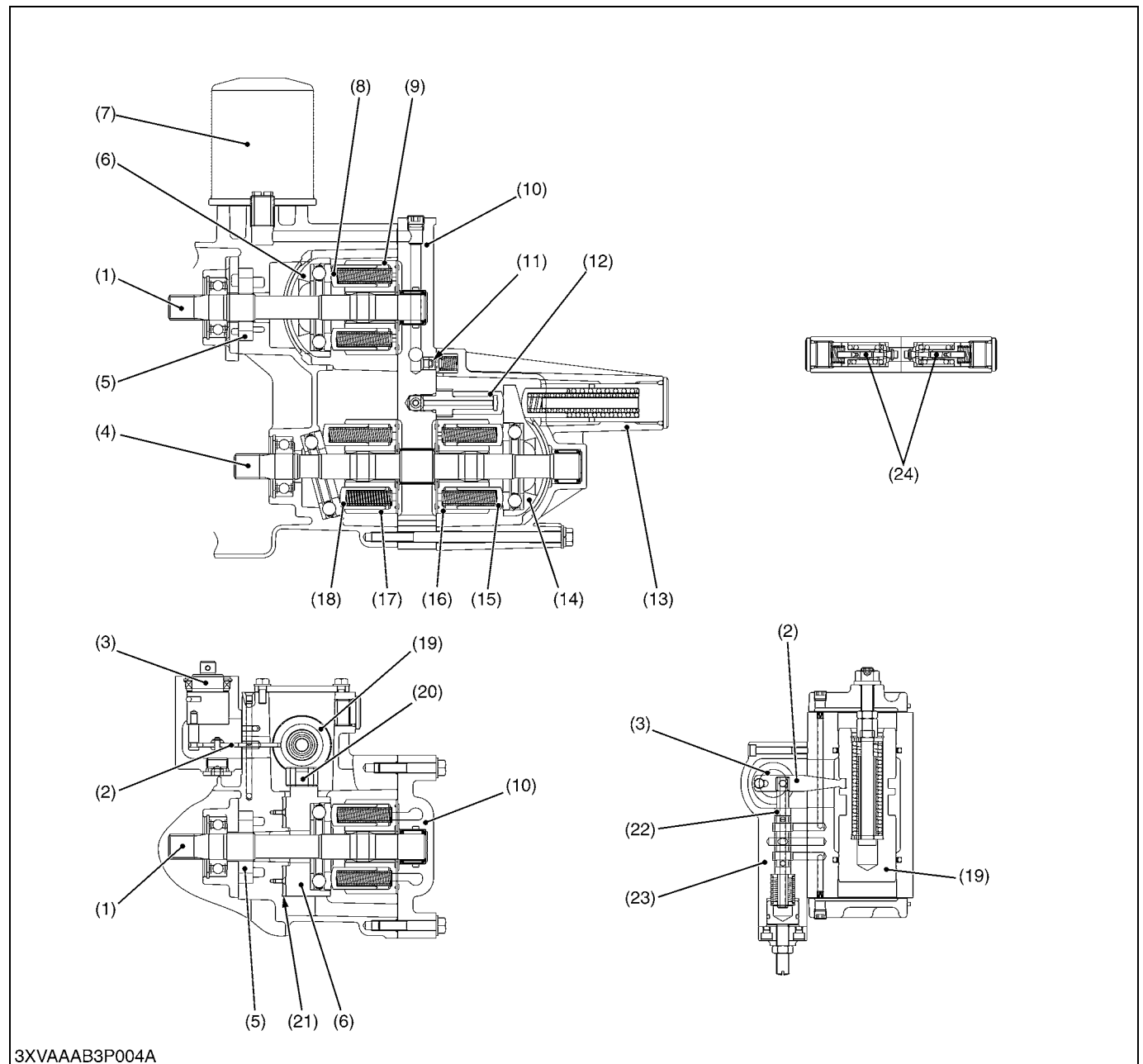
#### (1) Structure



The RTV900 has its HST built into the transmission case and incorporates a hydraulically operated servomechanism. The servomechanism controls the pedal operation hydraulically. As a result a smoother pedal operation can be achieved. The components of the RTV900 HST (transmission case) are variable displacement piston pump, fixed displacement piston motor, variable displacement piston motor, charge pump, servo-regulator and various valves. Refer to the next page for detailed parts in the HST.

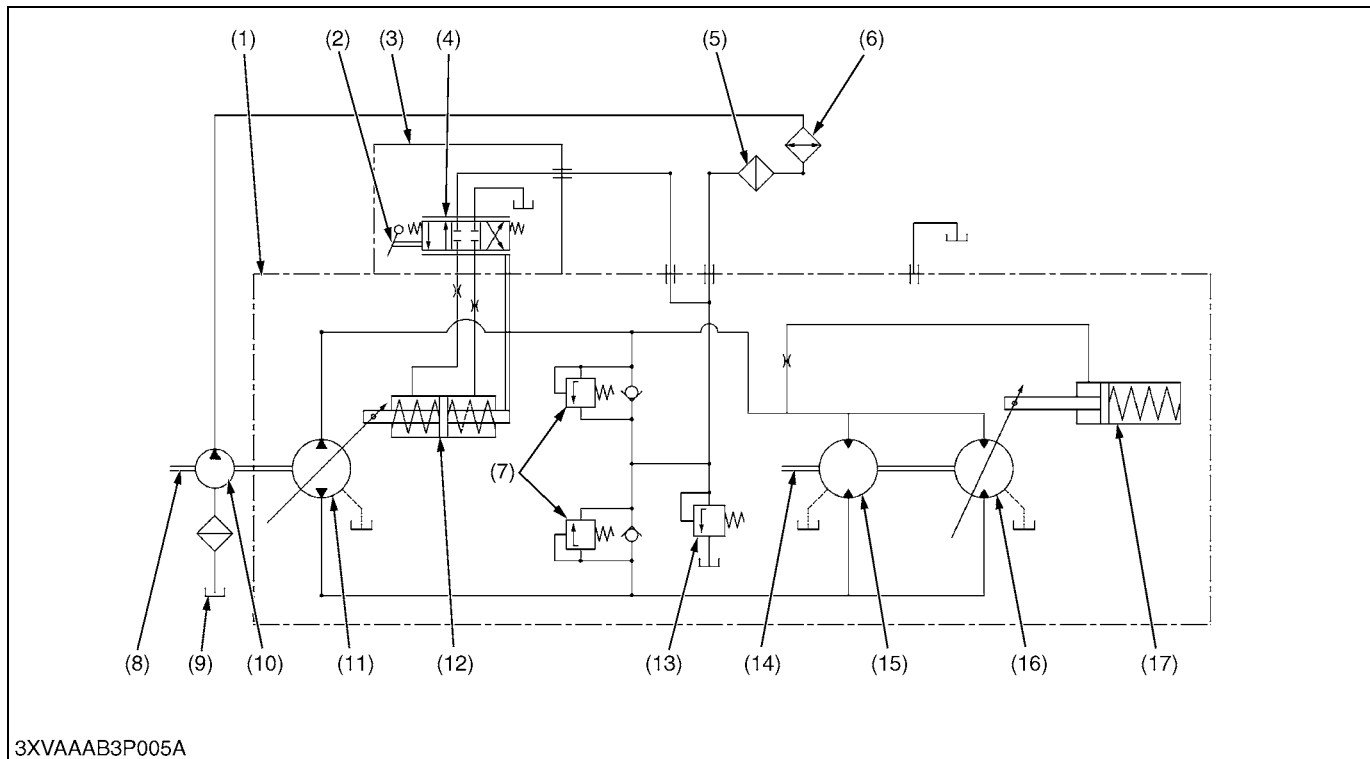
- |                                |                                     |
|--------------------------------|-------------------------------------|
| (1) Input Shaft (Pump Shaft)   | (10) Oil Cooler                     |
| (2) Charge Pump                | (11) Filter Bracket                 |
| (3) Output Shaft (Motor Shaft) | (12) Oil Filter Cartridge (Suction) |
| (4) Suction Pipe               | (Orange Collor)                     |
| (5) HST Housing                | (13) Check and High Pressure        |
| (Transmission Case)            | Relief Valve (Reverse)              |
| (6) Assist Motor Cover         | (14) Suction Hose 2 (Oil Filter to  |
| (7) Servo Piston               | HST Change Pump)                    |
| (8) Servo Regulator            | (15) Suction Hose 1                 |
| (9) Oil Filter Cartridge (HST) | (Transmission Case to Filter)       |
| (Yellow Collor)                | (16) Check and High Pressure        |
|                                | Relief Valve (Forward)              |

W1012858



- |                                |                           |   |   |
|--------------------------------|---------------------------|---|---|
| (1) Input Shaft (Pump Shaft)   | (7) Oil Filter Cartridge  | (14) Variable Swashplate (Assist Motor) | (19) Servo Piston                         |
| (2) Feedback Lever             | (8) Piston                | (15) Piston                             | (20) Guide                                |
| (3) Regulator Shaft            | (9) Cylinder Block (Pump) | (16) Cylinder Block (Assist Motor)      | (21) Cradle Bearing                       |
| (4) Output Shaft (Motor Shaft) | (10) Port Block Cover     | (17) Cylinder Block (Motor)             | (22) Regulator Spool                      |
| (5) Charge Pump                | (11) Charge Relief Valve  | (18) Piston                             | (23) Regulator Valve Assembly             |
| (6) Variable Swashplate (Pump) | (12) Control Piston       |   | (24) Check and High Pressure Relief Valve |
|                                | (13) Assist Motor Cover   |   |   |

## (2) Oil Flow



- |                              |  |                                 |  |
|------------------------------|--|---------------------------------|--|
| (1) HST Assembly             | (6) Oil Cooler                           | (10) Charge Pump                | (15) Cylinder Block (Stationary Motor) |
| (2) Control Lever (Pedal)    | (7) Check and High Pressure Relief Valve | (11) Cylinder Block (HST Pump)  | (16) Cylinder Block (Assist Motor)     |
| (3) Servo Regulator Assembly | (8) Input Shaft (Pump Shaft)             | (12) Servo Piston               | (17) Control Piston                    |
| (4) Regulator Valve          | (9) Strainer                             | (13) Charge Relief Valve        |  |
| (5) Oil Filter Cartridge     |  | (14) Output Shaft (Motor Shaft) |  |

A charge pump (10) is used to feed oil to the hydrostatic transmission (HST). The oil coming from the charge pump (10) flows through the oil cooler (6) and oil filter cartridge (5) into the HST main circuit and regulator valve (4). At this time, the servo regulator valve and HST main circuit (that is closed with the control lever at neutral position) are kept at the charge relief valve's (7) set pressure. Step on the pedal, and the regulator valve (4) switches its oil passage to allow the oil into the service port. Being interlocked with the servo piston (12), the swashplate now tilts to activate the variable pump (11). The pressure of oil then force into the stationary motor (15), which in turn is started to keep the oil circulated between the pump and motor.

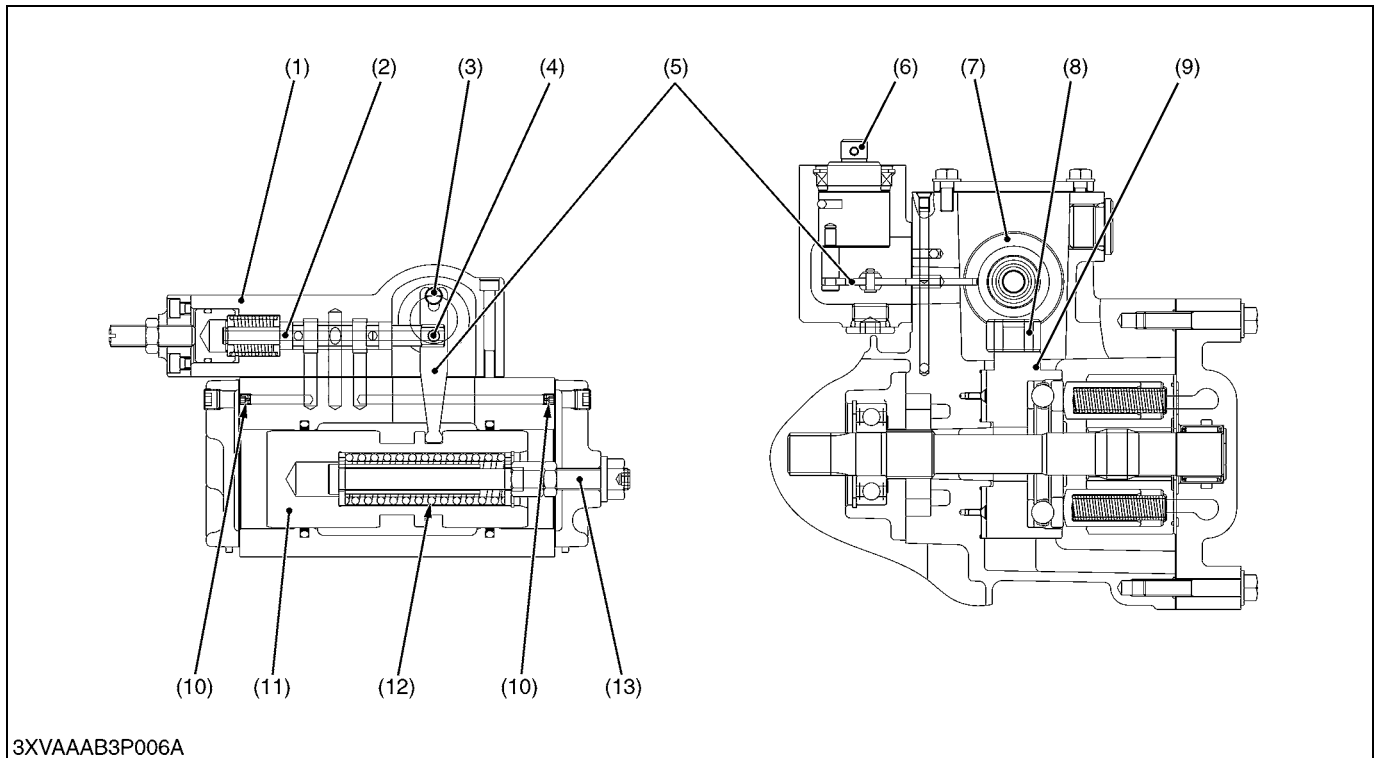
The heavier the load on the output shaft (14), the higher the pressure of the oil coming from the pump (11). Now the assist motor (16) gets activated to increase the output torque. When the load on the output shaft (14) has dropped and the oil pressure of main circuit also dropped, the assist motor (16) is returned to the original position and the stationary motor (15) alone keeps running the output shaft (14). Now a closed circuit is formed by the pump (11) and stationary motor (15).

### (Reference)

- Valve Setting Pressure [Oil temperature : 40 to 60 °C (104 to 140 °F)]  
 Charge Relief Valve : 0.52 to 0.72 MPa (5.3 to 7.3 kgf/cm<sup>2</sup>, 75 to 104 psi)  
 Check and High Pressure Relief Valve : 25.5 to 26.5 MPa (260 to 270 kgf/cm<sup>2</sup>, 3698 to 3840 psi)

### (3) Function of Components

#### (A) Servomechanism



- |   |                              |                                     |                             |
|---|------------------------------|-------------------------------------|-----------------------------|
| (1) Regulator Valve Assembly              | (4) Pin B (Fixed with Spool) | (8) Guide (for Variable Swashplate) | (10) Orifice                |
| (2) Regulator Spool                       | (5) Feedback Lever           | (9) Variable Swashplate (Pump)      | (11) Servo Piston           |
| (3) Pin A<br>(Fixed with Regulator Shaft) | (6) Regulator Shaft          |                                     | (12) Servo Spring           |
|   | (7) Servo Piston             |                                     | (13) Piston Adjusting Screw |

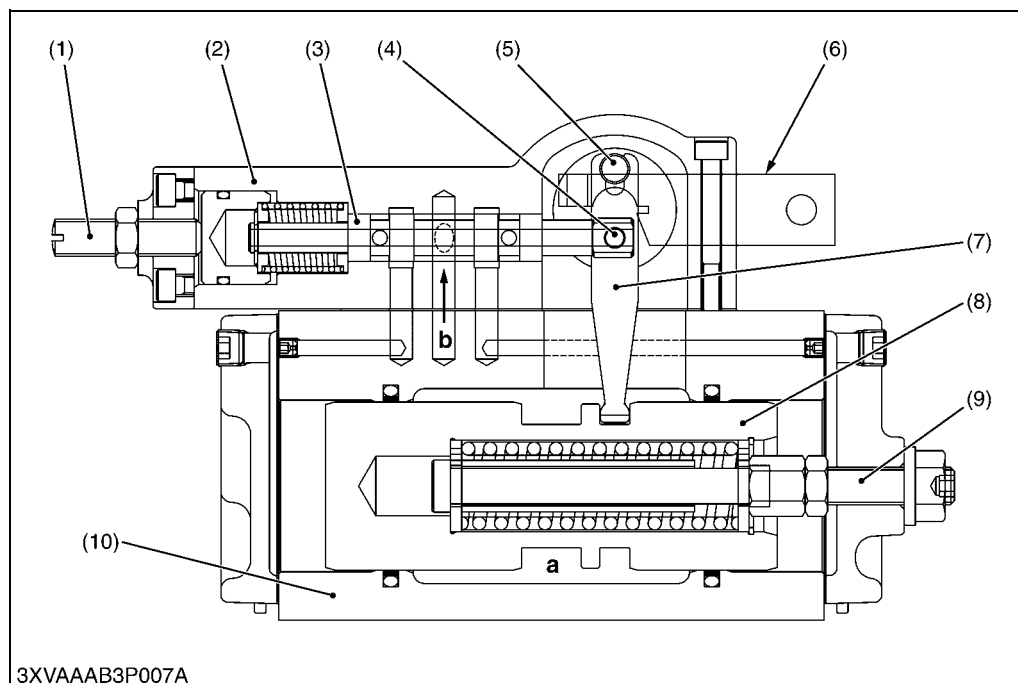
The servomechanism is composed of the following. The regulator (1) is connected to the pedal through cable and linkages, and controls the flow of oil to the servo piston (11) by the pedal operation.

The servo piston moved by hydraulic force, is connected to the pump cylinder variable swashplate (9). Therefore, a tilt angle of swashplate is varied by servo piston movement.

The regulator and the servo piston, it is connected with feedback lever (5), and the movement of the piston is restricted according to the amount of depressing of the pedal.

## (B) Regulator and Servo Piston Operation

### ■ Control Lever at Neutral



- (1) Servo Adjusting Screw
- (2) Regulator Valve Assembly
- (3) Regulator Spool
- (4) Pin B (Fixed with Spool)
- (5) Pin A (Fixed with Regulator Shaft)
- (6) Control Lever
- (7) Feedback Lever
- (8) Servo Piston
- (9) Piston Adjusting Screw
- (10) HST Housing

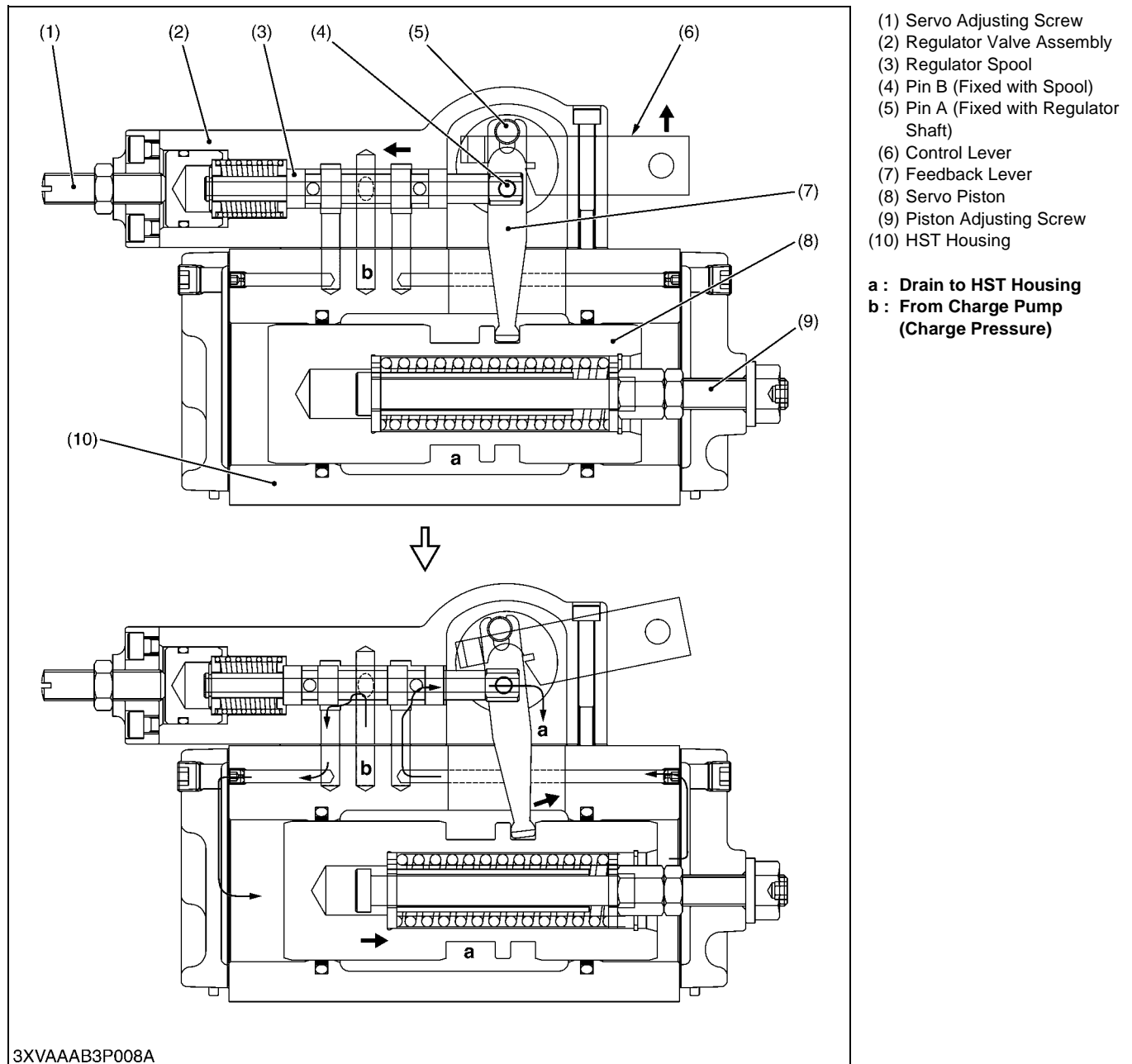
**a : Drain to HST Housing**  
**b : From Charge Pump**  
**(Charge Pressure)**

W1014929

The regulator spool (3) is preset to the neutral position by the servo adjust screw (1). In this state, both ends of the servo piston (8) are open to the drain port.

With the feedback lever (7) in between, the spool senses the servo piston position. When the spool is at the neutral position, the piston adjust screw (9) serves to position the servo piston so that the pump's variable swashplate gets neutral.

### ■ Control Lever Activated (First Step : Moving the Control Lever)

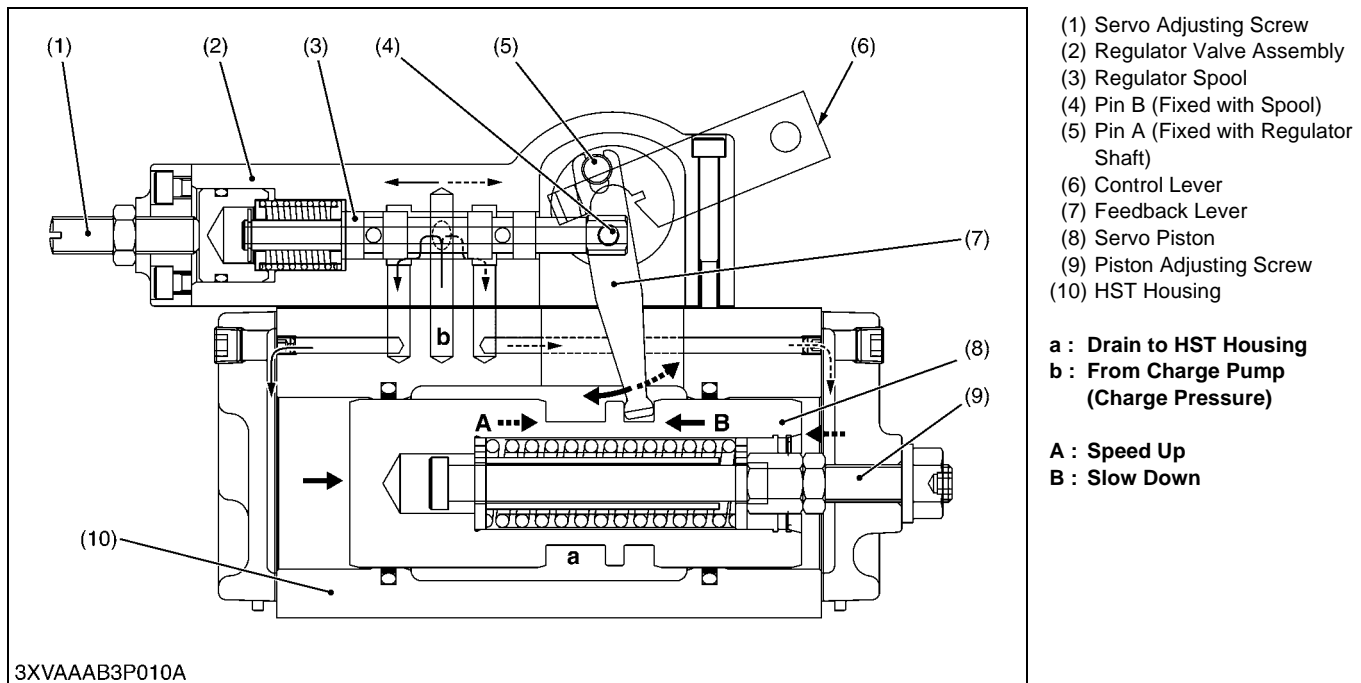


Move the control lever (step on the pedal), and the feedback lever (7) connected with the regulator spool (3) goes against the servo piston (8). Such resistance pulls the regulator spool from the feedback lever. As a result, the hydraulic circuit is formed as shown here.

The servo piston is affected by the charge pressure and starts moving in the direction of arrow.



### ■ Control Lever Activated (with Control Lever at Desired Position)

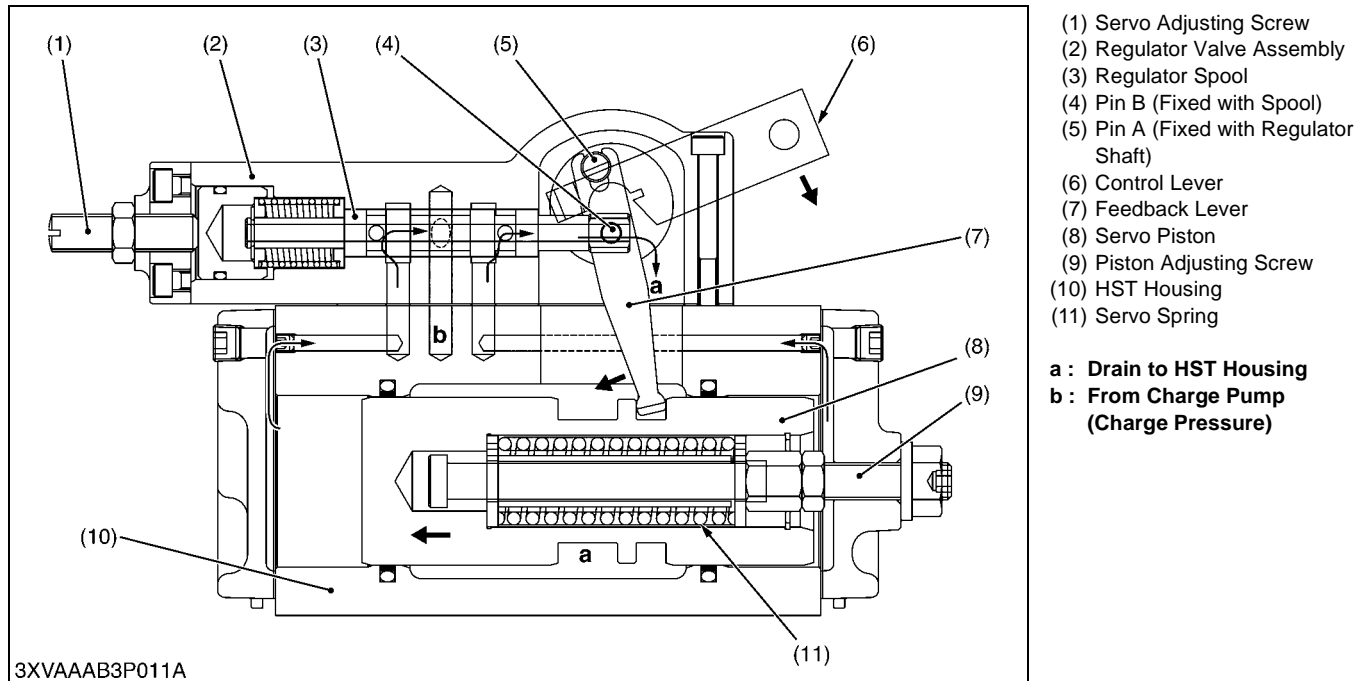


When the control lever has been set to a desired position, the regulator's feedback lever (7) and the servo piston (8) get balanced with each other. Now the regulator spool (3) goes to the neutral position. The pump's variable swashplate interlocked with the servo piston is kept in place to achieve a desired speed.

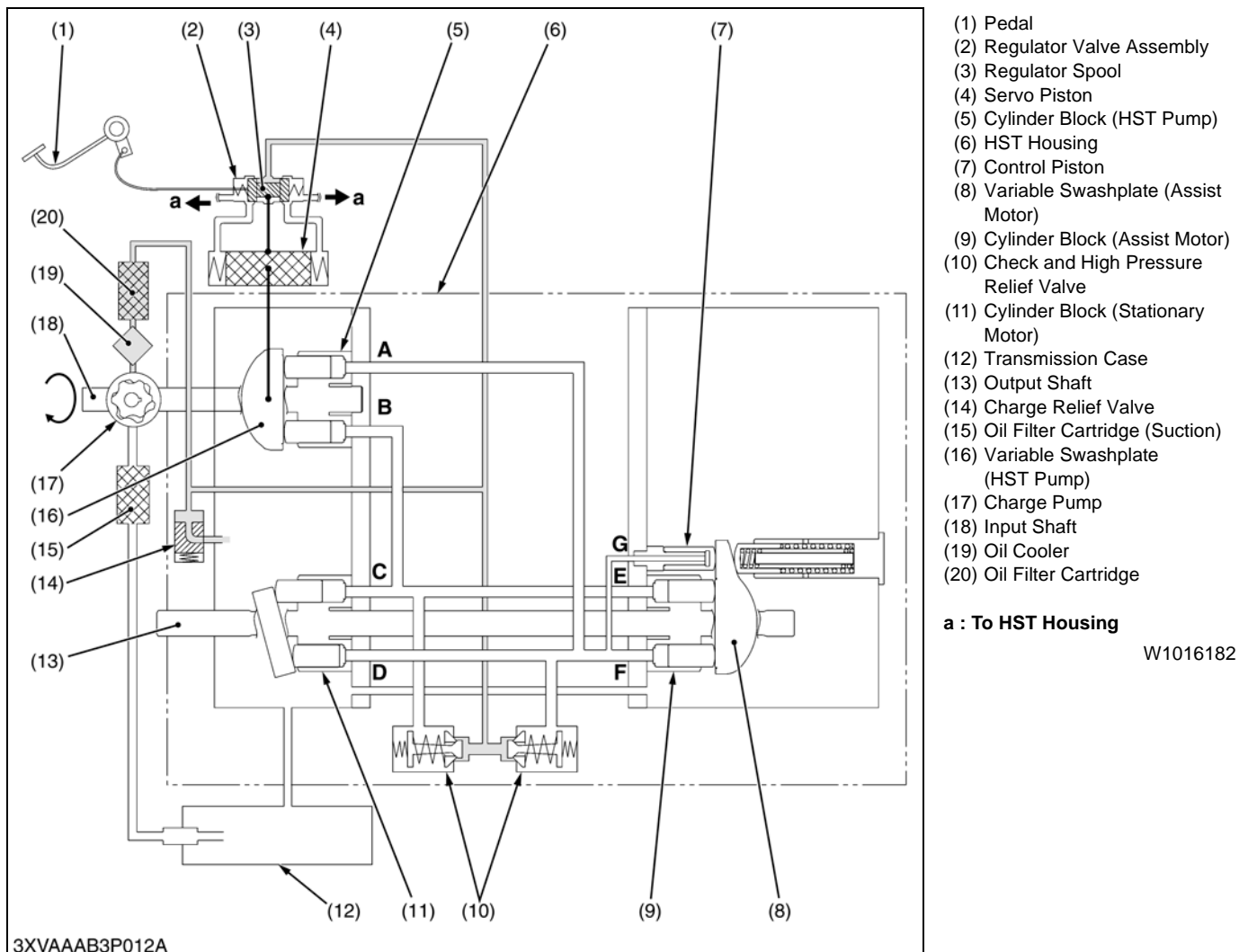
The load on the HST pump is not constant, however. A heavier load returns the servo piston toward the slow-down side. In so doing, the feedback lever works on the spool to switch the hydraulic circuit to the speed-up side. Then the servo piston is brought back (speed-up) until it gets well balanced with the feedback lever.

A smaller load, on the other hand, moves the servo piston toward the speed-up side. The feedback lever now works on the regulator spool to switch the hydraulic circuit to the slow-down side. The servo piston's charge pressure is let out at the slow-down side and introduced at the speed-up side. Then the servo piston is brought back (slow-down) until it gets well balanced with the feedback lever. This cycle of motions is repeated to maintain the desired position.

### ■ Control Lever Deactivated



Release the control lever (release the pedal), and the spool comes back to the neutral position. The oil at both ends of the servo piston (8) flows back to the tank. The oil from the charge pump also flows back to the HST housing. With such circuit formed, the servo spring (11) pushes the servo piston back to the neutral position.

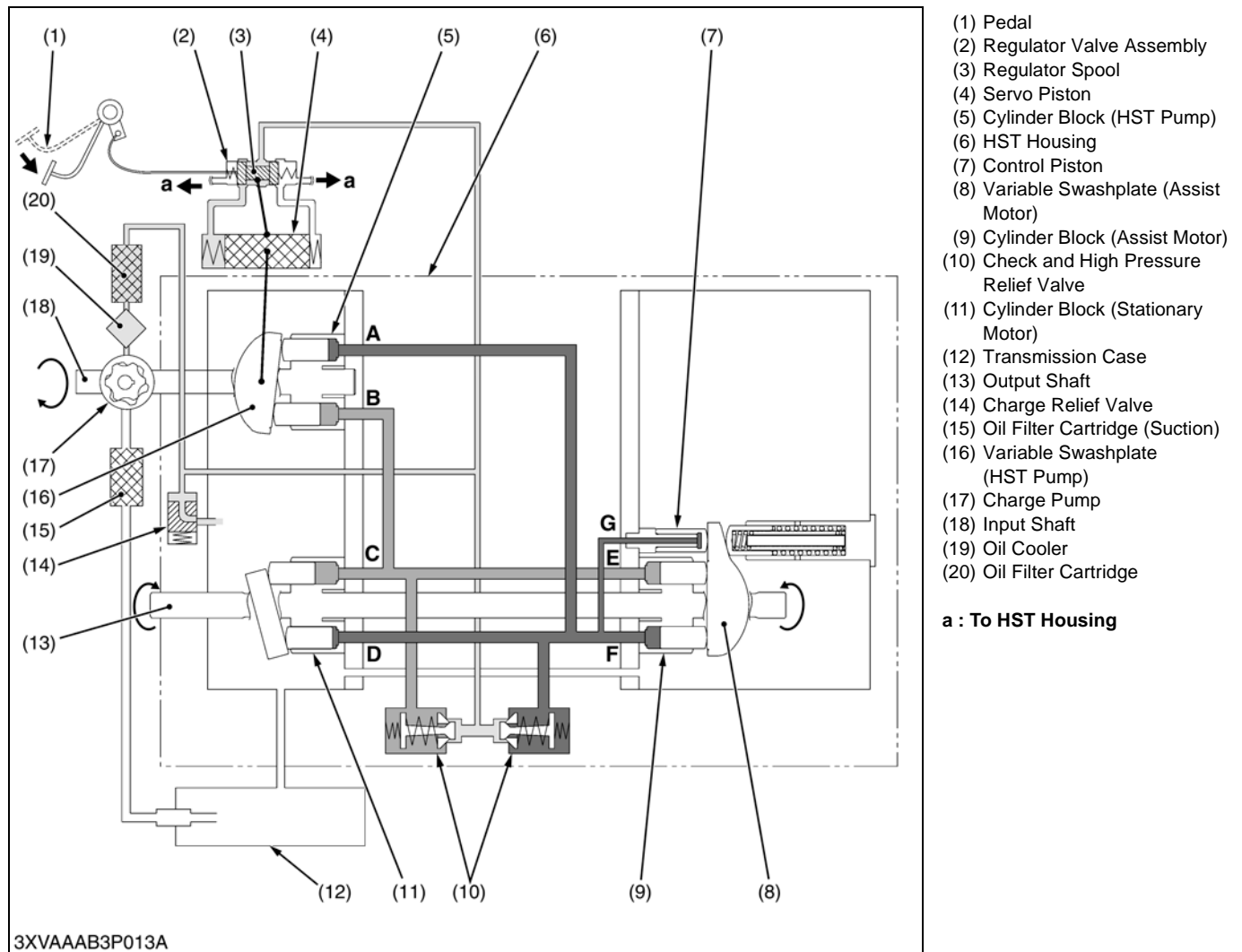
**(C) Motor Mechanism****■ Neutral**

The oil that is sucked by the charge pump (17) from the transmission case (12) flows through the oil cooler (19), oil filter cartridge (20) and charge relief valve (14) into the HST hydraulic circuit and regulator valve. Surplus flow is returned from the charge relief valve to the HST housing and finally into the transmission case.

With the pedal is released (neutral position), the regulator spool (3) is also at the neutral position. The pump's variable swashplate (16) interlocked with the servo piston (4) is not tilted.

In this way, the HST pump keeps running, but the pump piston is not making a reciprocating motion. In other words, no oil is being fed from the HST pump. Until the oil comes back from the HST pump, the cylinder blocks of the stationary motor and assist motor are at a halt, which keeps the output shaft from turning.

### ■ Pedal pressed halfway and under light load



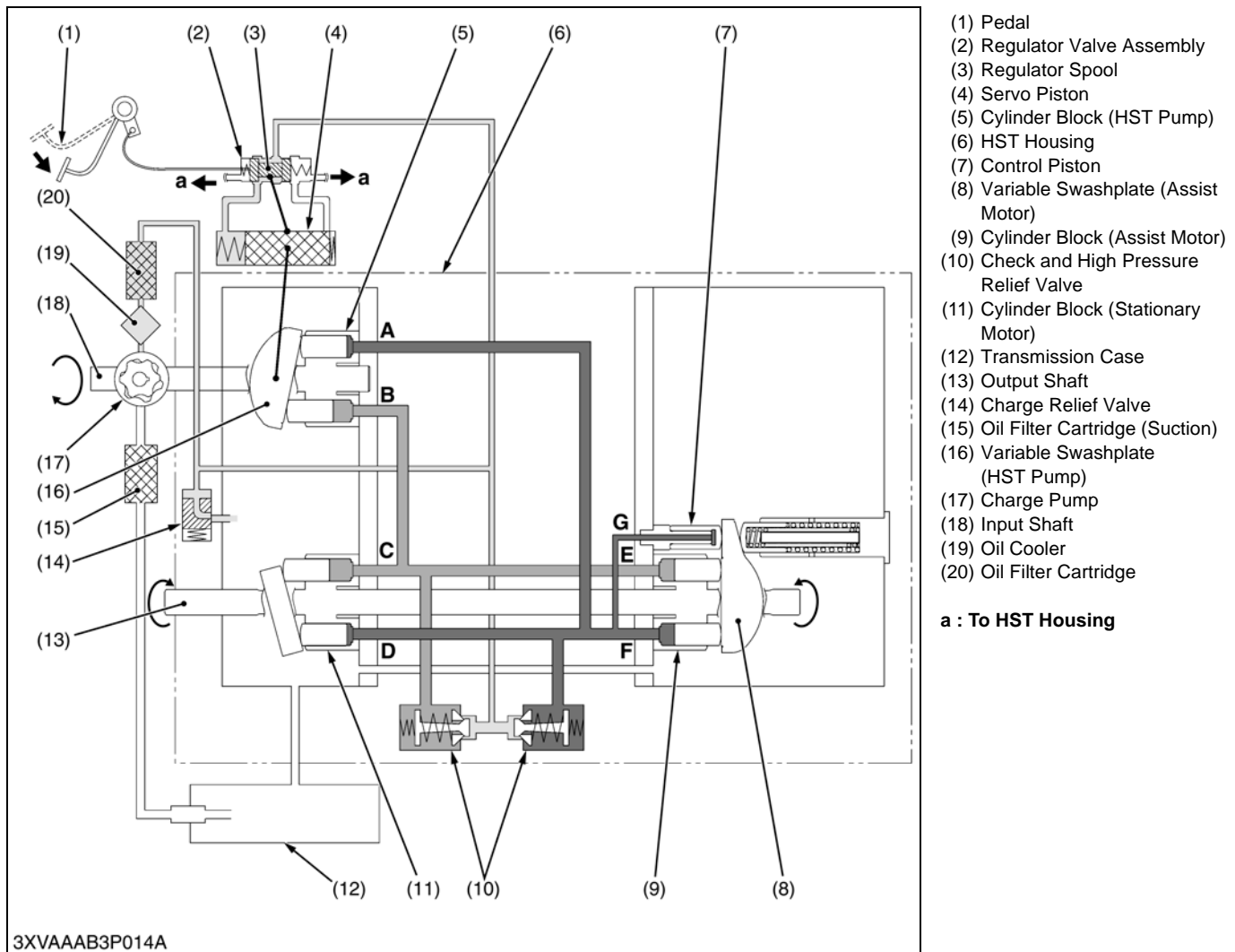
Let's suppose that the pedal is pressed halfway. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate (16) (see the above illustration).

The pump cylinder block (5) is driven by the input shaft (18) to put the oil under high pressure and to feed it out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The motor's piston is actuated by this pressure oil to push down the stationary swashplate. Then together with the motor's cylinder block (11), the output shaft (13) starts turning.

The output shaft rpm is determined by the delivery rate of the HST pump. Therefore, the rpm can be taken out to the variable.

Then the motor's oil drops to a low pressure and returns through the motor port **C** to the pump port **B**.

### ■ Pedal pressed fully and under light load

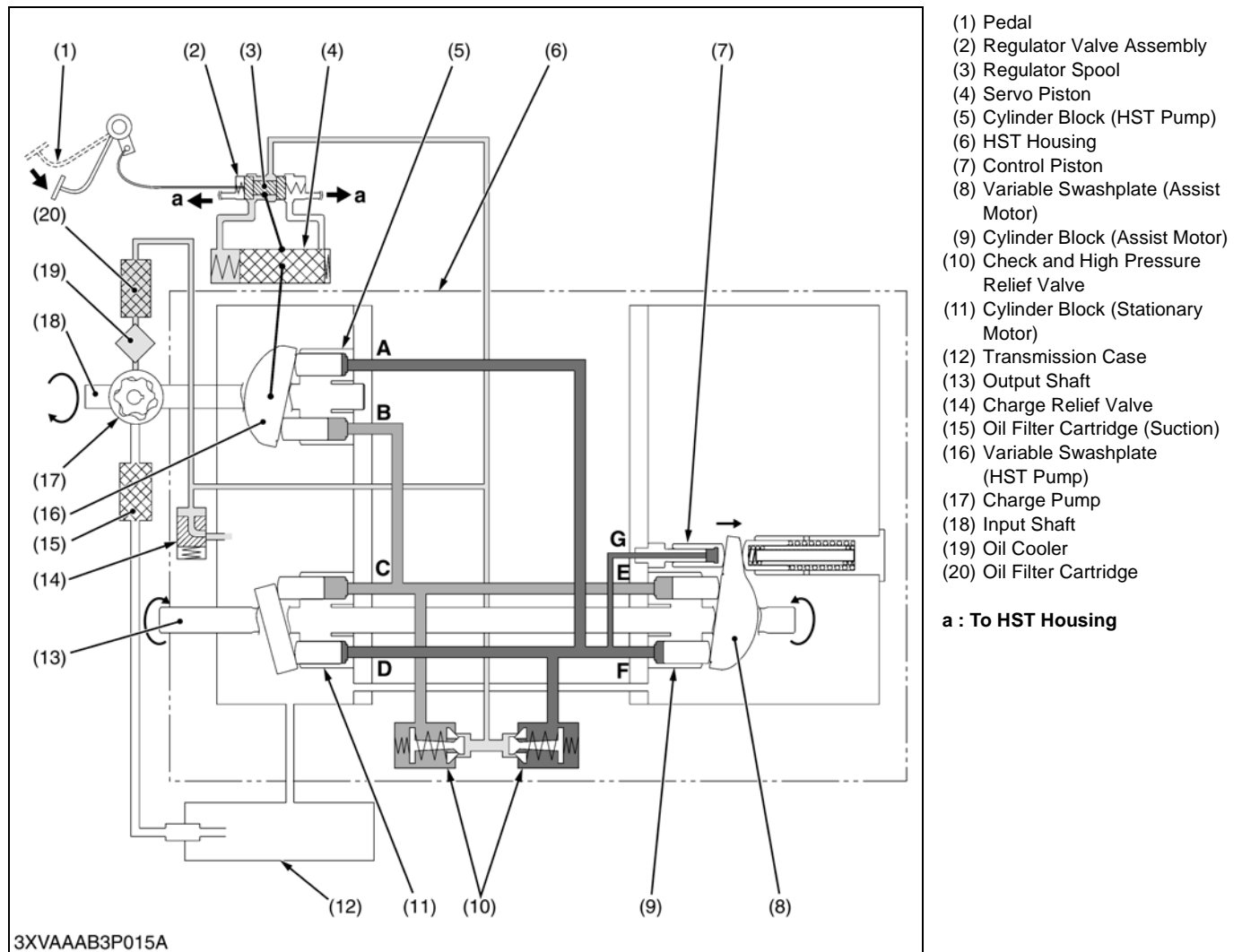


Let's suppose that the pedal is fully pressed. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate to maximum.

The pump cylinder block (5) is driven by the input shaft (18) to put the oil under high pressure and to feed it at the highest rate out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The pressure of the oil from the HST pump is not high enough to get the assist motor started. In this way, the output shaft (13) achieves the maximum rpm with the assist motor off, as shown in the figure above.

Then the motor's oil drops to a low pressure and returns through the motor port **C** to the pump port **A**.

### ■ Pedal pressed fully, under light load and assist motor startup to maximum capacity level

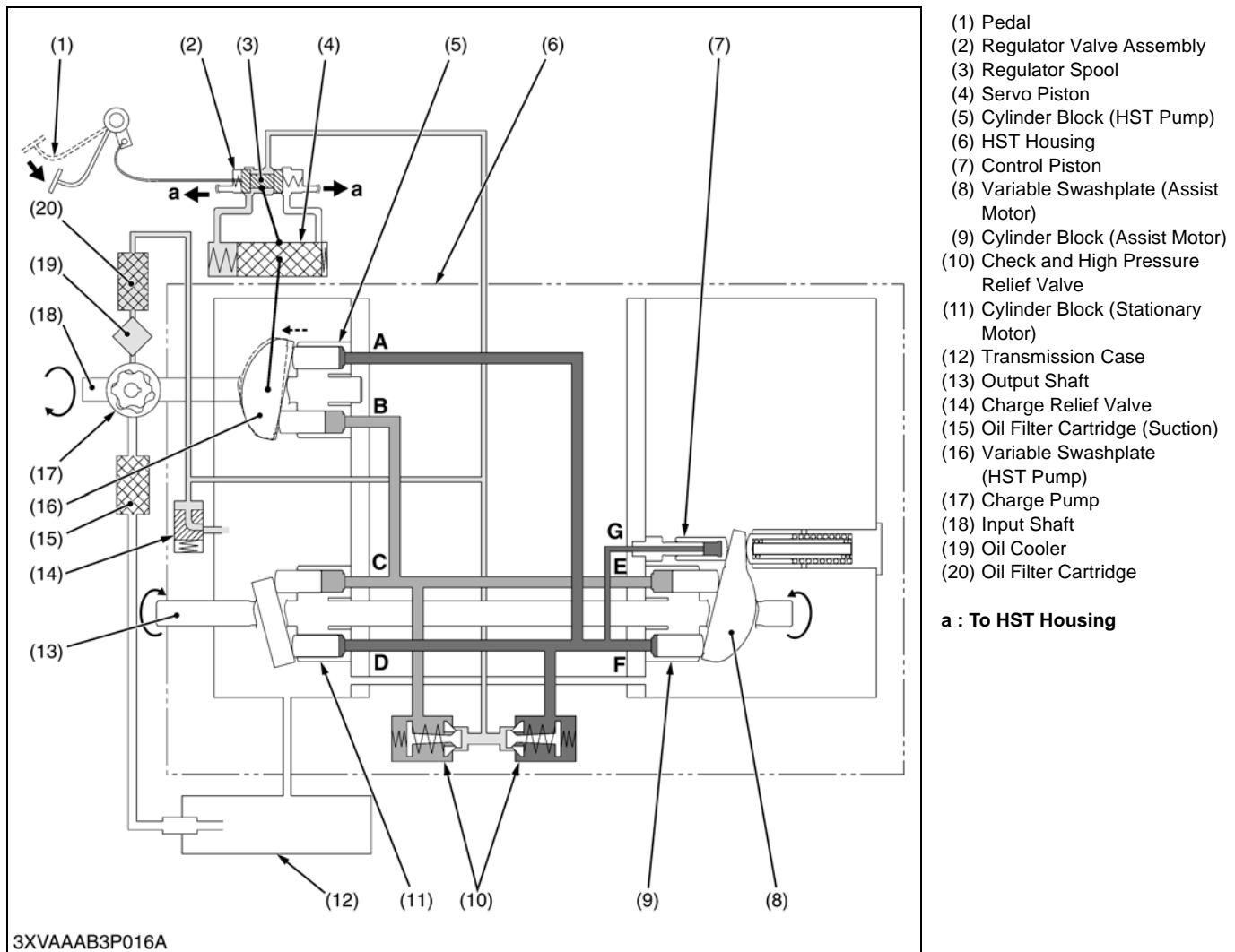


Let's suppose that the pedal is fully pressed. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate to maximum (see the above illustration).

The pump cylinder block (5) is driven by the input shaft (18) to put the oil under high pressure and to feed it at the highest rate out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The pressure of the oil from the HST pump now gets high enough to start tilting the assist motor's variable swashplate (8). The oil is fed to the port **F** (branch flow) and port **G** too. As a result, the output shaft (13) is driven by the stationary motor and assist motor. The output shaft rpm drops in proportion to the tilt of the assist motor's variable swashplate, whereas its torque increases.

Then the stationary motor's oil and the assist motor's one drop to a low pressure and return through their respective ports **C** and **E** to the pump port **B**.

### ■ Pedal pressed fully, under heavy load and input horsepower control

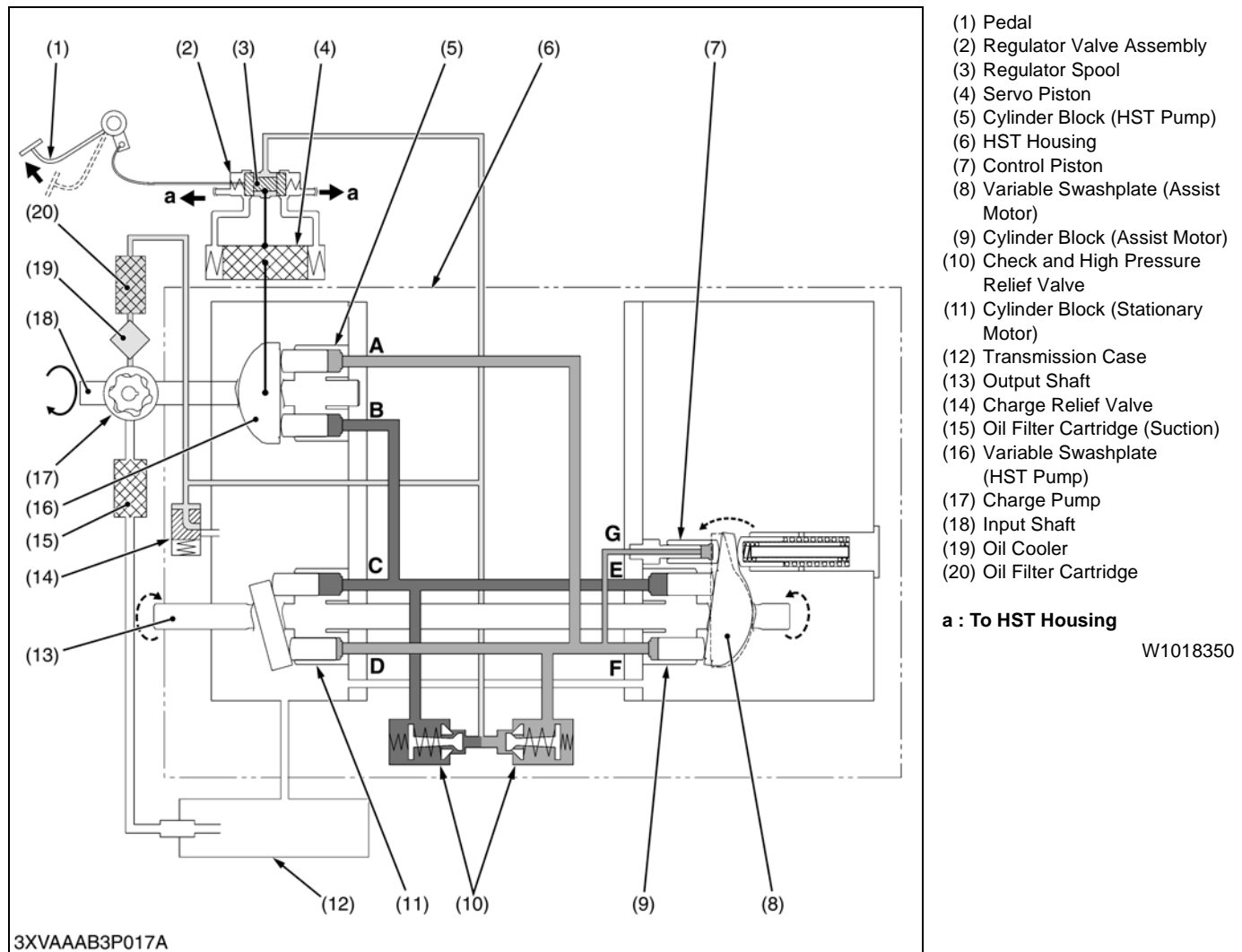


Let's suppose that the pedal is fully pressed. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate to maximum (see the above illustration).

The pump cylinder block (5) is driven by the input shaft (18) to put the oil under high pressure and to feed it at the highest rate out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The oil from the HST pump then reaches the pressure level 17.7 MPa (180 kgf/cm<sup>2</sup>, 2560 psi) to tilt the assist motor's variable swashplate (8) all the way. At this time, the assist motor reaches its maximum capacity.

If the load becomes heavier, the variable swashplate (pump) toward to the neutral position under the reaction force of the HST pump itself. With the variable swashplate tilted back to neutral side, the engine load becomes lighter and the engine rpm higher again. At this time, the pump's delivery rate drops, but the recovered engine rpm enables the delivery oil pressure to go up to the high-pressure relief valve setting. Now the maximum torque is obtained.

## ■ Dynamic Brake



Release the pedal, and the regulator valve forces the servo piston (4) to the neutral position. The pump's variable swashplate (16) also goes back to the neutral position.

Still the machine tends to keep running by inertia force, but no oil is pressure-fed because the pump's variable swashplate is at the neutral position. (There is no oil flow from the HST pump (5).).

The output shaft (13), however, is rotated in the same direction as before releasing the pedal.

Now the stationary motor (11) works like a pump to suck the oil from port **D** and pressure-feed it from port **C**.

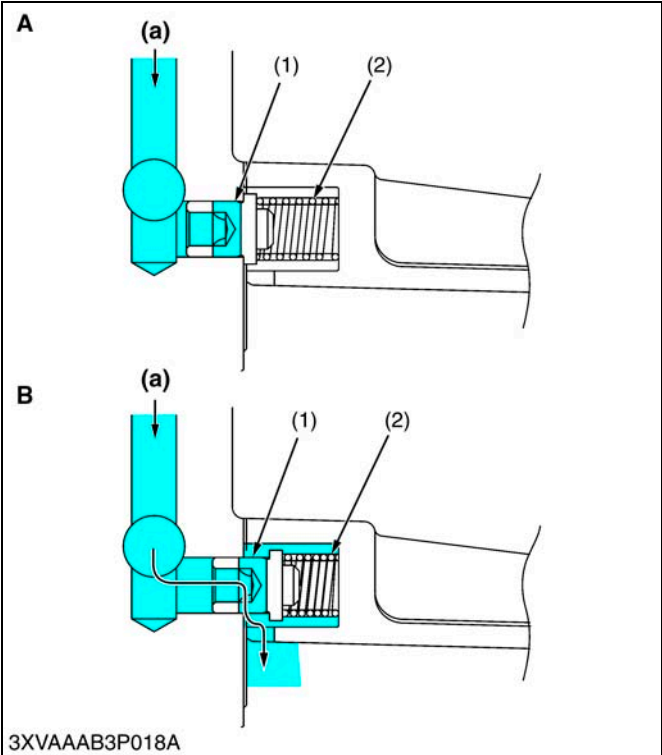
The oil coming from port **C** pushes open the high pressure relief valve and flows through the check valve back to port **D**.

Like this, the dynamic brake force is determined by the force that is exerted to push open the backward travel high-pressure relief valve.

When the dynamic brake is applied, the pressure at port **D** drops below the charge pressure level. And if the oil from port **C** is not enough to make up for the shortage, the charge oil too is supplied together.



(D) Charge Relief Valve



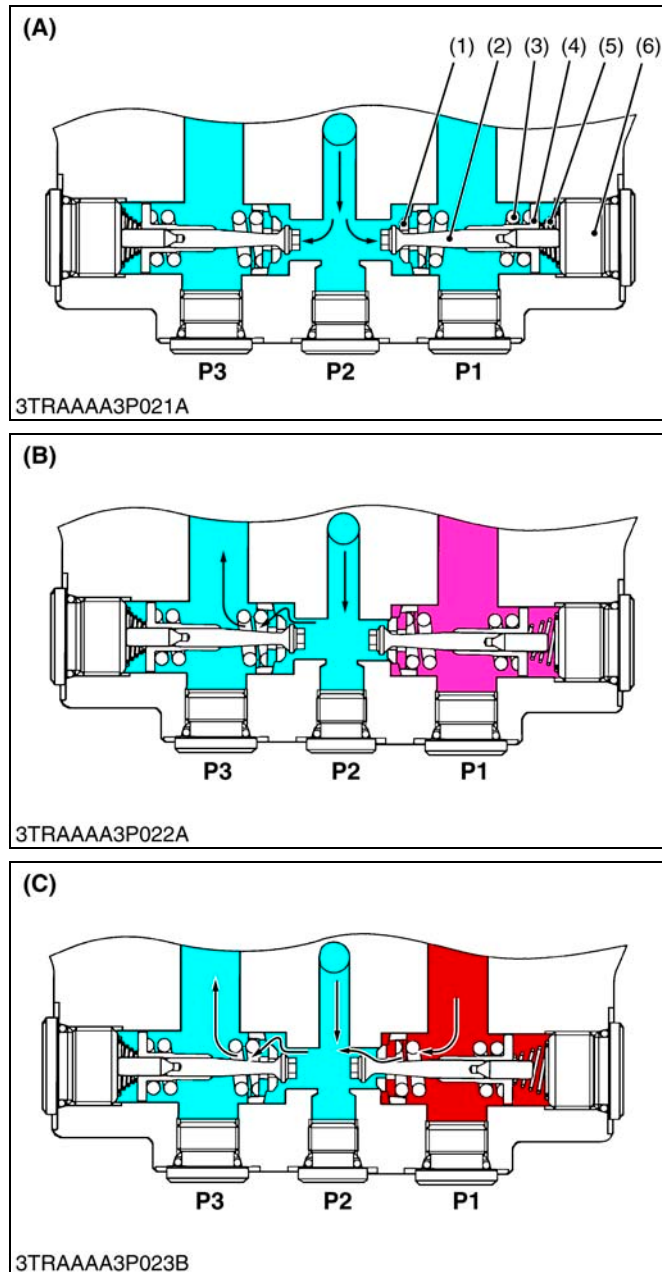
The charge pump feeds oil to the HST main circuit (closed circuit) and the regulator assembly. Oil may leak out of the HST main circuit (in the HST housing) depending on the pressure, oil temperature and other factors. With this in mind, oil must be constantly. Charge relief valve will open when oil pressure exceeds valve operating pressure.

Oil temperature	Valve operating pressure
50 °C (122 °F)	0.52 to 0.72 Mpa 5.3 to 7.3 kgf/cm <sup>2</sup> 75 to 104 psi

- (1) Valve Poppet
- (2) Spring

(a) From Charge Pump  
A : Close  
B : Open

W1018703

**(E) Check and High Pressure Relief Valve**

The cartridge-type check and high-pressure relief valve consists of pressure poppet (2), check valve seat (1), relief valve spring (3), spring guide (4) and check valve spring (5). The spring guide (4) is provided with an anti-rotation, which keeps the threads tight after a pressure has been set.

The valve is used to prevent an overload that would happen at a quick start, sudden stop or even during usual running. This valve doubles as a check valve.

The check and high-pressure relief valves are laid out facing each other as shown in the figure.

When the pressure of both main oil circuit are below the pressure of **P2**, both valves are open and charging oil enters into the main oil circuit through the valves.

At normal operation, the check valve in the high-pressure side is closed and it pushes and opens the another one. An excessive charge flow goes through the charge relief valve into HST housing.

The check and high-pressure relief valve along the high-pressure line serves as a high-pressure relief valve. If the pressure exceeds a high-pressure limit level, the spring (3) force and opens the valve seat that is located between the check valve seat (1) and the pressure poppet (2). Now the flow goes from **P1** to **P2** and **P3**.

If the **P1** pressure drops, the relief valve spring forces the valve seat closed against the pressure. The high-pressure oil at **P1** does not flow to **P2** any longer.

As discussed above, the check and high-pressure relief valve protects engines, pumps, motors, gears and even the machine itself from overload.

Oil temperature	Port	Valve operating pressure
50 °C (122 °C)	<b>P1</b> (Forward)	25.5 to 26.5 MPa 260 to 270 kgf/cm <sup>2</sup> 3698 to 3840 psi
	<b>P2</b> (Charge)	0.52 to 0.72 MPa 5.3 to 7.3 kgf/cm <sup>2</sup> 75 to 104 psi
	<b>P3</b> (Reverse)	25.5 to 26.5 MPa 260 to 270 kgf/cm <sup>2</sup> 3698 to 3840 psi

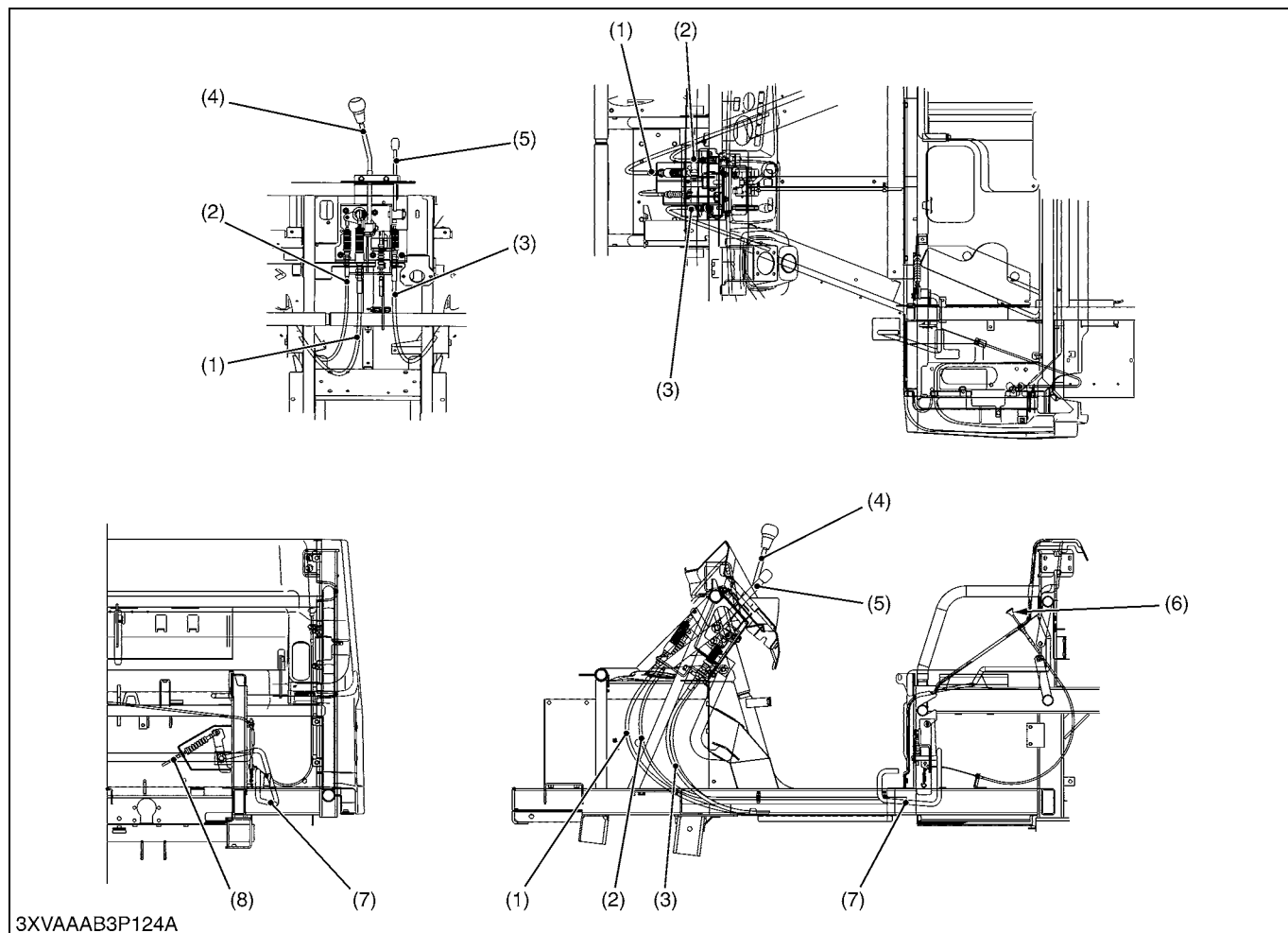
- (1) Check Valve Seat
- (2) Pressure Poppet
- (3) Relief Valve Spring
- (4) Spring Guide
- (5) Check Valve Spring
- (6) Valve Plug

**(A) When both Check Valve Activating**

**(B) When Check Valve Activating**

**(C) When High Pressure Relief Valve Activating**

W1019120

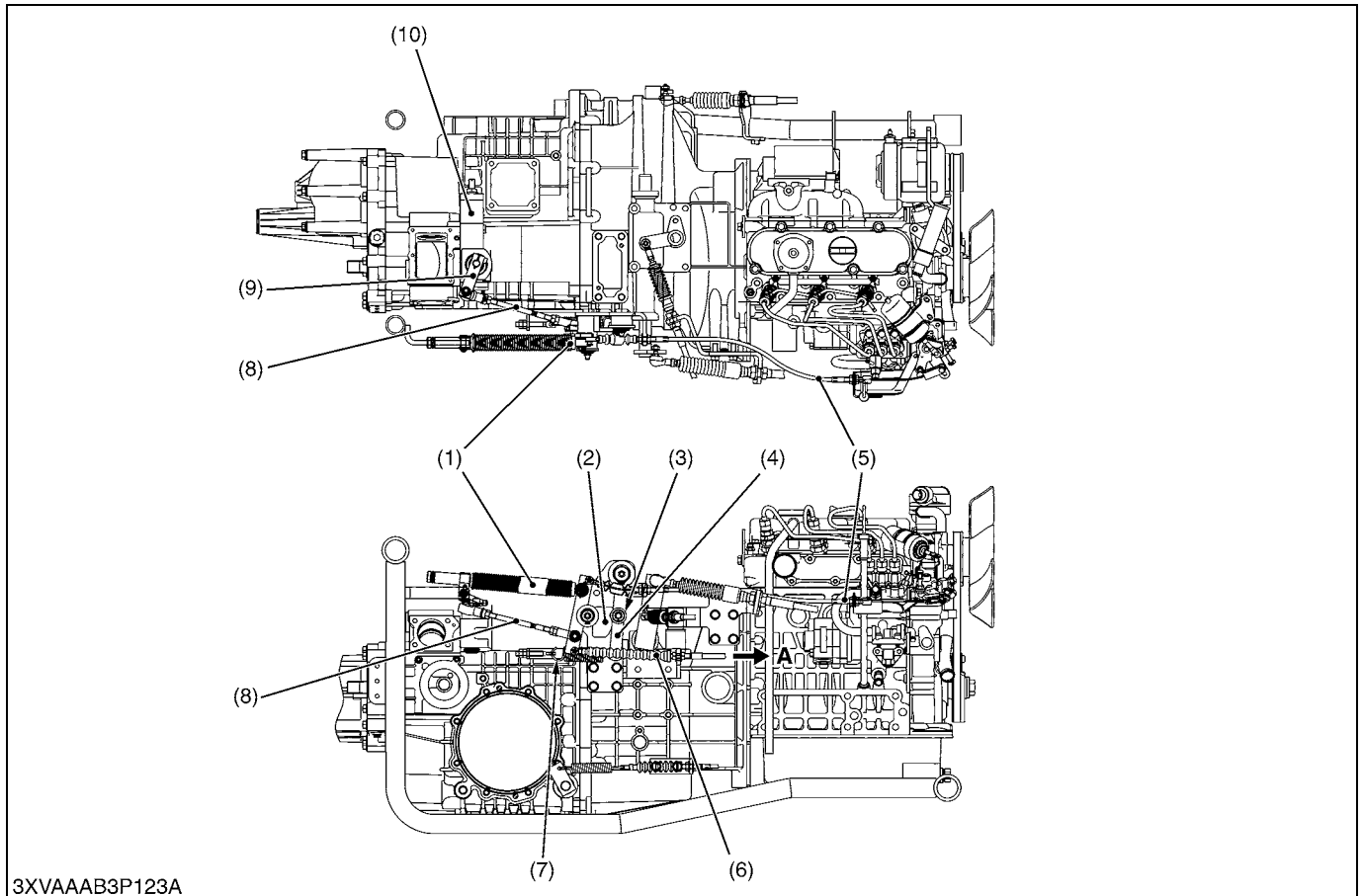
**(F) Cables**

(1) Shift Cable  
(2) Select Cable

(3) 4WD Shift Cable  
(4) Main Shift Lever

(5) 4WD Lever  
(6) Differential Lock Holder

(7) Differential Lock Pedal  
(8) Differential Lock Cable

**(G) Control Linkage**

- |                        |                               |                       |                                   |
|------------------------|-------------------------------|-----------------------|-----------------------------------|
| (1) Damper             | (4) Neutral Holder            | (7) Neutral Spring    | (10) HST Regulator                |
| (2) Neutral Holder Arm | (5) Engine Accelerator Wire   | (8) HST Control Rod   |                                   |
| (3) Ball Bearing       | (6) Speed Control Pedal Cable | (9) HST Control Lever | <b>A : To Speed Control Pedal</b> |

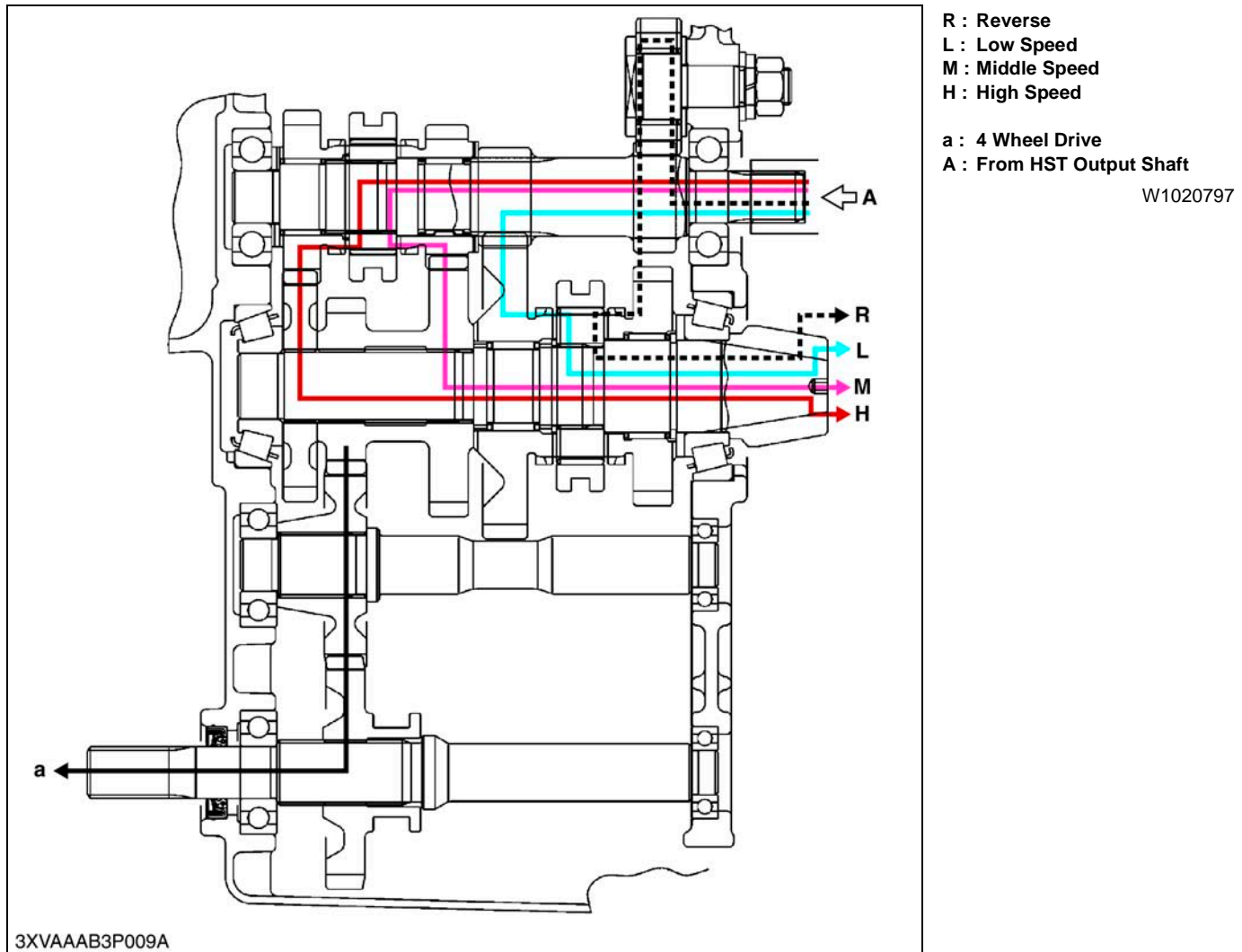
The speed control pedal and neutral holder arm (2) are connected with speed control pedal cable (6). And the HST control lever (9) and neutral holder (2) are linked with HST control rod (8).

The accelerator wire (5) connected with neutral holder arm (2) can be able to be pulled by synchronizing with the speed control pedal cable (A).

As the HST pedal is depressed to forward, the HST control lever (9) is rotated, then the swashplate is tilted by servomechanism and forward travelling speed increases. Then the swashplate is returned to neutral with the neutral holder arm (2), when the pedal is released. The ball bearing (3) on the neutral holder (4) pulled with the neutral spring (7) seats the detent of the neutral holder arm (2) so that the neutral holder arm returns to neutral.

The damper (1) is connected to the speed control pedal through speed control pedal cable and neutral arm (2), restricts the movement of the linkage to prevent abrupt operation.

## [2] RANGE GEAR SHIFT SECTION AND FRONT WHEEL DRIVE SECTION



### ■ Range Gear Shift Section

First, power is transmitted to the HST at the back of the transmission case. The HST power is then taken out to the front and transmitted further to the range shift section.

The speed can be changed in 3 steps forward and in single step backward. The shifting is made through the cable linkage of the shift lever at the operator's seat. The speed change system is of constant mesh type.

### ■ Front Wheel Drive Section

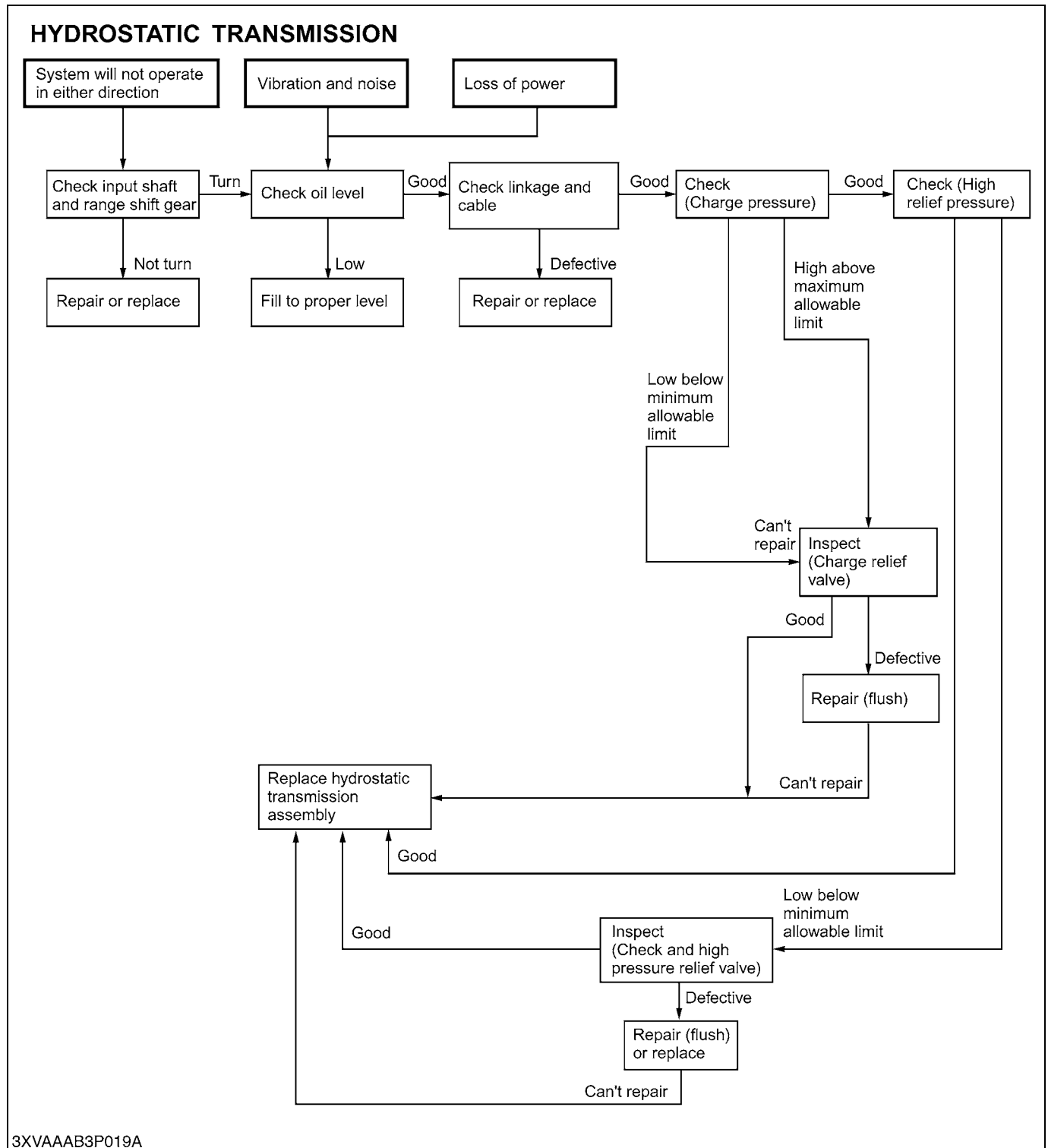
This section is located near the range gear shift section. The front wheel drive select lever at the operator's seat is used to switch between the two wheel and four wheel drive. The front wheel drive select lever and the range gear shift lever are cable connected. Sliding gear system is adopted, in which the shifter gears are directly moved.

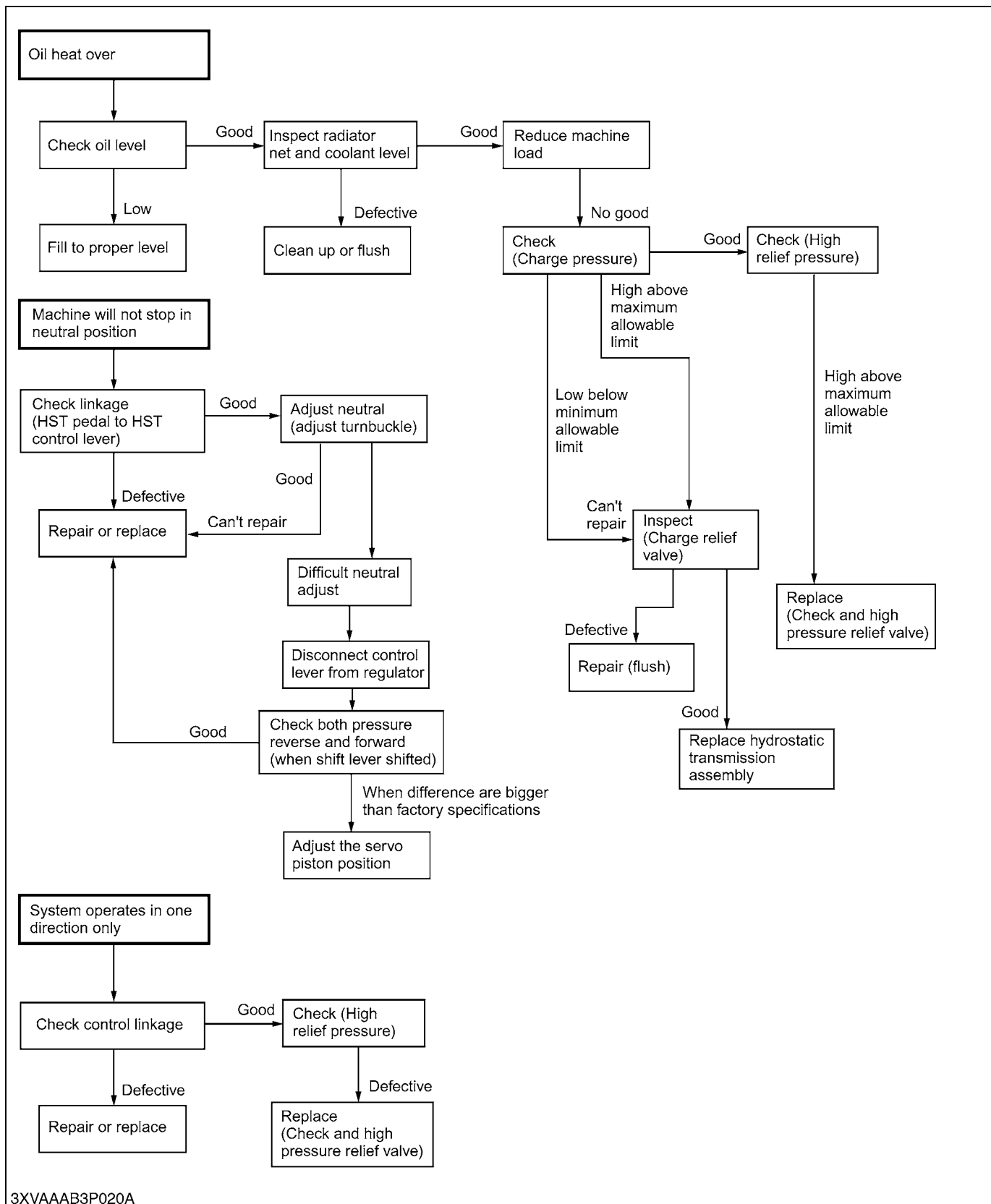
# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	2-S1
2. SERVICING SPECIFICATIONS .....	2-S4
3. TIGHTENING TORQUES .....	2-S5
4. CHECKING .....	2-S6
5. DISASSEMBLING AND ASSEMBLING .....	2-S17
[1] DISASSEMBLING HYDROSTATIC TRANSMISSION.....	2-S17
[2] DISMOUNTING TRANSAXLE .....	2-S21
(1) Front Case .....	2-S28
(2) Transmission Case .....	2-S32
6. SERVICING .....	2-S38

# 1. TROUBLESHOOTING





3XVAAAB3P020A



**TRAVELLING GEAR SHIFT SECTION**

Symptom	Probable Cause	Solution	Reference Page
<b>Noise from Transmission</b>	Transmission oil insufficient	Refill	2-S17
	Gear worn or broken	Replace	2-S29
	Bearings worn	Replace	–
<b>Gear Slip Out of Mesh</b>	Shift fork spring tension insufficient	Replace	2-S29
	Shift fork or shiftier worn	Replace	2-S29
	Shift fork bent	Replace	2-S29

W1012807

**DIFFERENTIAL GEAR SECTION**

Symptom	Probable Cause	Solution	Reference Page
<b>Excessive or Unusual Noise at All Time</b>	Improper backlash between spiral bevel pinion and bevel gear	Adjust	2-S43
	Improper backlash between differential pinion and differential side gear	Adjust	2-S41
	Bearing worn	Replace	–
	Insufficient or improper type of transmission fluid used	Replenish or change	2-S17
<b>Noise while Turning</b>	Differential pinions or differential side gears worn or damaged	Replace	2-S33
	Differential lock binding (does not disengage)	Replace	2-S32
	Bearings worn	Replace	–
<b>Differential Lock Can Not Be Set</b>	Differential lock shift fork damaged	Replace	2-S32
	Differential lock shiftier mounting pin damaged	Replace	2-S32
	Differential lock pin damaged	Replace	2-S33
<b>Differential Lock Pedal Does Not Return</b>	Differential lock pedal return spring weaken or damaged	Replace	–
	Differential lock fork shaft rusted	Repair	2-S32

W1013526

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Charge Relief Valve	Setting Pressure	0.52 to 0.72 MPa 5.3 to 7.3 kgf/cm <sup>2</sup> 75 to 104 psi	—
Check and High Pressure Relief Valve	Setting Pressure	25.5 to 26.5 MPa 260 to 270 kgf/cm <sup>2</sup> 3698 to 3840 psi	—
	—	(Operating Pressure) 22.6 to 26.5 MPa 230 to 270 kgf/cm <sup>2</sup> 3271 to 3840 psi	—
Servo Piston Operation Pressure (When Neutral Adjusted)	Difference Pressure (P1-P2)	+0.05 to +0.20 MPa +0.5 to +2.0 kgf/cm <sup>2</sup> +7.1 to +28.4 psi	—
Rear Wheel (Axle) Rotation at L Speed	At Rated Engine Speed	126 to 141 min <sup>-1</sup> (rpm)	—
Differential Case to Differential Side Gear	Clearance	0.050 to 0.151 mm 0.0020 to 0.0059 in.	0.30 mm 0.0118 in.
	Differential Case (I.D.)	38.000 to 38.062 mm 1.4961 to 1.4985 in.	—
	Differential Side Gear (O.D.)	37.911 to 37.950 mm 1.4926 to 1.4941 in.	—
Differential Pinion Shaft to Differential Pinion	Clearance	0.080 to 0.122 mm 0.0031 to 0.0048 in.	0.30 mm 0.0118 in.
	Differential Pinion (I.D.)	20.060 to 20.081 mm 0.7898 to 0.7906 in.	—
	Differential Pinion Shaft (O.D.)	19.959 to 19.980 mm 0.7858 to 0.7866 in.	—
Differential Pinion to Differential Side Gear	Backlash	0.15 to 0.30 mm 0.0059 to 0.0118 in.	0.40 mm 0.0157 in.
6T Spiral Bevel Pinion Shaft	Turning Torque	0.1 to 0.3 mm 0.0039 to 0.0118 in.	—
Bevel Pinion Shaft to Bevel Gear	Backlash	0.1 to 0.3 mm 0.0039 to 0.0118 in.	—

W1013874

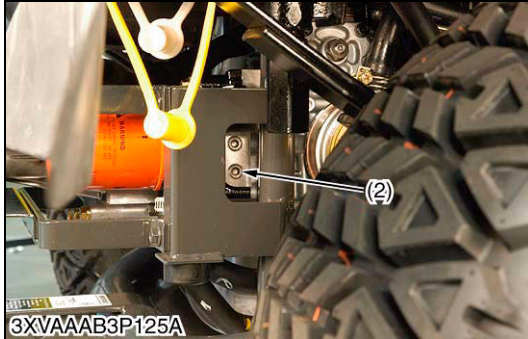
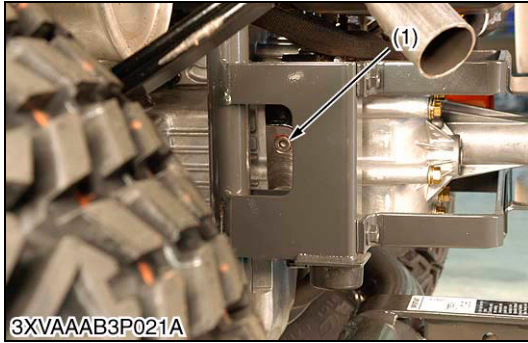
### 3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Pump base mounting screw (if equipped)	48.0 to 56.0	4.9 to 5.7	35.4 to 41.3
Engine mounting screw	18 to 21	1.8 to 2.1	13.3 to 15.5
Leaf spring mounting bolt and nut	48 to 56	4.9 to 5.7	35.4 to 41.3
Rear wheel mounting screw	75 to 90	7.6 to 9.2	55.3 to 66.4
Muffler mounting nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Muffler mounting screws	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Muffler stay mounting bolt	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1
Mission frame mounting bolt and nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.1
Engine set screw	48 to 56	4.9 to 5.7	35.4 to 41.3
Transmission case set screw	39 to 44	4.0 to 4.5	28.8 to 32.5
Front case mounting screw and nut	39 to 44	4.0 to 4.5	28.8 to 32.5
Back idle gear shaft nut	93.2 to 103.0	9.5 to 10.5	68.7 to 75.9
Bearing holder mounting screw	31 to 34	3.2 to 3.5	22.9 to 25.1
Bearing cover mounting screw	18 to 21	1.8 to 2.1	13.3 to 15.5
Differential support cover mounting screw	18 to 21	1.8 to 2.1	13.3 to 15.5
37T spiral bevel gear mounting screw	61 to 71	6.2 to 7.2	45.0 to 52.4
Regulator mounting hexagon socket head screw	5.2 to 6.3	0.53 to 0.64	3.8 to 4.6
Servo piston and cover mounting hexagon socket head screw	17 to 20	1.7 to 2.0	12.5 to 14.8
Piston case mounting screw	70 to 80	7.0 to 8.0	51.6 to 59.0
Motor case mounting screw	18 to 21	1.8 to 2.1	13.3 to 15.5
Port block cover mounting screw	18 to 21	1.8 to 2.1	13.3 to 15.5
Charge pump case mounting screw	17 to 20	1.7 to 2.0	12.5 to 14.8
Hex. socket head plug (P1, P2 and P3)	29 to 44	3.0 to 4.5	21.4 to 32.5
Hex. socket head check and high pressure relief valve plug	59 to 78	6.0 to 8.0	43.5 to 57.5
Drain plug with magnet	58 to 67	5.9 to 6.9	43 to 49

W1012736

## 4. CHECKING



### Checking High Pressure Relief Valve Pressure (Forward Side)

#### ⚠ CAUTION

- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- When checking, park the machine on flat ground, apply the parking brake.
- Work by two people when you measure pressure.
- Note that the allen wrench does not come off firmly because the plug is not loose hard. Otherwise, the plug (2) might be damaged, and the plug not be loosened.

1. Remove the hex. socket head plug from P2 port (2). (P2 is for forward.)

#### ■ NOTE

- The hex. socket plug is securely tightened. Therefore, it is very important to use a proper-sized allen wrench and fit it securely onto the plug. Do not give a shock but put your weight on the plug slowly, paying attention not to damage its hex. socket section. If the allen wrench is fitted on the plug at a slant or an improper-sized allen wrench is used to loose the plug, the hex. socket section will be damaged and you won't be able to loose the plug.
2. Install the HST adaptor and high pressure gauge to P2 port (2).
  3. Check to see that parking brake is applied.
  4. Set the 4WD lever to 2WD position.
  5. Start the engine.
  6. Place the range gear shift lever in H position.
  7. Depress the speed control pedal, and measure the check and high pressure relief valve pressure.
  8. If the measurement is not within the operating pressure, replace the check and high pressure relief valve assembly with new one. (See page 2-S36.).

High pressure relief valve	Operating pressure	22.6 to 26.5 MPa 230 to 270 kgf/cm <sup>2</sup> 3271 to 3840 psi
----------------------------	--------------------	--

#### ■ IMPORTANT

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

#### ■ NOTE

- High pressure gauge is 29.4 MPa (300 kgf/cm<sup>2</sup>, 4267 psi) full scale.

#### (When reassembling)

- Apply liquid lock (Three Bond 1324B or its equivalent) to the hex. socket head plug.

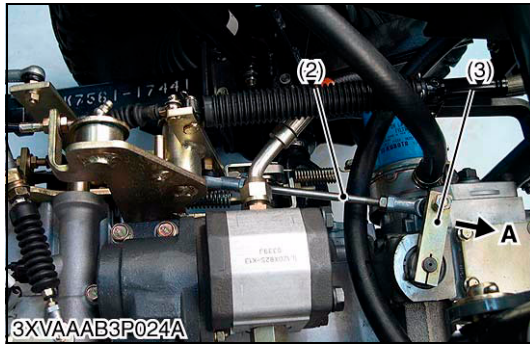
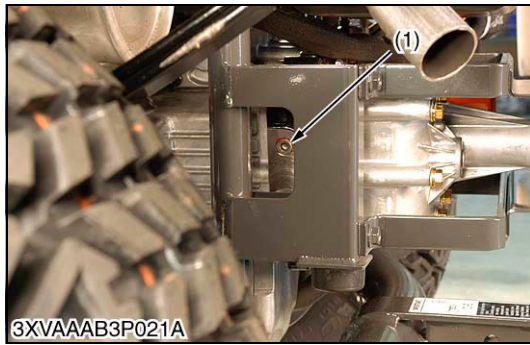
#### Condition

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

(1) P1 Port (for Reverse)

(1) P2 Port (for Forward)

W1018066



### Checking High Pressure Relief Valve Pressure (Reverse Side) (To be continued)

#### **CAUTION**

- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- When checking, park the machine on flat ground, apply the parking brake.
- Work by two people when you measure pressure.
- Note that the allen wrench does not come off firmly because the plug is not loose hard. Otherwise, the plug (1) might be damaged, and the plug not be loosened.

1. Remove the hex. socket head plug from **P1** port (1). (**P1** is for reverse.)

#### **NOTE**

- The hex. socket plug is securely tightened. Therefore, it is very important to use a proper-sized allen wrench and fit it securely onto the plug. Do not give a shock but put your weight on the plug slowly, paying attention not to damage its hex. socket section. If the allen wrench is fitted on the plug at a slant or an improper-sized allen wrench is used to loose the plug, the hex. socket section will be damaged and you won't be able to loose the plug.

2. Install the HST adaptor and high pressure gauge to **P1** port (1).
3. Check to see that parking brake is applied.
4. Raise the cargo bet and set the safety support (if hydraulic cylinder is equipped).
5. Remove the neutral rod (HST control rod) (2) from the HST control lever (3).
6. Set the 4WD lever to 2WD position.
7. Start the engine and depress the speed control pedal when measure pressure.
8. Shift the range gear shift lever in **H** position.
9. Slowly push reverse (**A**) the HST control lever by hand and measure the check and high pressure relief valve pressure.
10. If the measurement is not within the operating pressure, replace the check and high pressure relief valve assembly with new one. (See page 2-S36.)

High pressure relief valve	Operating pressure	22.6 to 26.5 MPa 230 to 270 kgf/cm <sup>2</sup> 3271 to 3840 psi
----------------------------	--------------------	--

#### **IMPORTANT**

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

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

**A** : Reverse

(2) Neutral Rod

(3) HST Control Lever

W1018957

**Checking High Pressure Relief Valve Pressure (Reverse Side)**  
**(Continued)****■ NOTE**

- High pressure gauge is 29.4 MPa (300 kgf/cm<sup>2</sup>, 4267 psi) full scale.

**(When reassembling)**

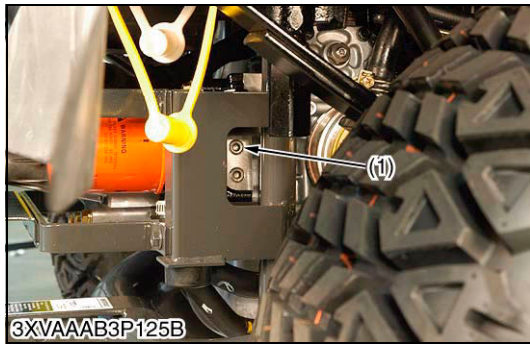
- Apply liquid lock (Three Bond 1324B or its equivalent) to the hex. socket head plug.

**Condition**

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

W1019976





### Checking Charge Relief Pressure

#### ⚠ CAUTION

- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- When checking, park the machine on flat ground, apply the parking brake.
- Work by two people when you measure pressure.
- Note that the allen wrench does not come off firmly because the plug is not loose hard. Otherwise, the plug (1) might be damaged, and the plug not be loosened.

1. Remove the hex. socket head plug from P3 port (1).

#### ■ NOTE

- The hex. socket plug is securely tightened. Therefore, it is very important to use a proper-sized allen wrench and fit it securely onto the plug. Do not give a shock but put your weight on the plug slowly, paying attention not to damage its hex. socket section. If the allen wrench is fitted on the plug at a slant or an improper-sized allen wrench is used to loose the plug, the hex. socket section will be damaged and you won't be able to loose the plug.

2. Install the HST adaptor and high pressure gauge to P3 port (1).
3. Place the range gear shift lever in neutral.
4. Set the 4WD lever to 2WD position.
5. Start the engine.
6. Depress the speed control pedal, and measure the charge pressure.
7. If the measurement is not within the factory specification, check the charge relief valve. (See page 2-S36.)

#### (When reassembling)

- Apply liquid lock (Three Bond 1324B or its equivalent) to the hex. socket head plug.

Charge pressure	Factory spec.	0.52 to 0.72 MPa 5.3 to 7.3 kgf/cm <sup>2</sup> 75 to 104 psi
-----------------	---------------	---

#### ■ NOTE

- Low pressure gauge is 2.9 MPa (30 kgf/cm<sup>2</sup>, 427 psi) full scale.

#### Condition

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

(1) P3 Port (Charge)

W1020209

**Checking Neutral (To be continued)****CAUTION**

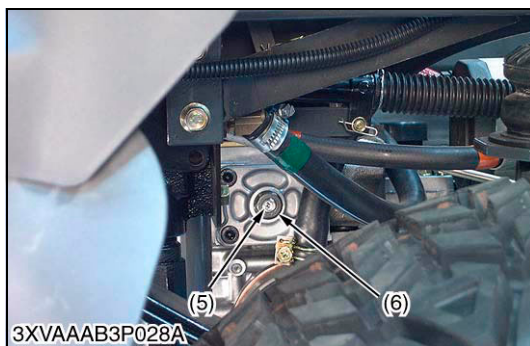
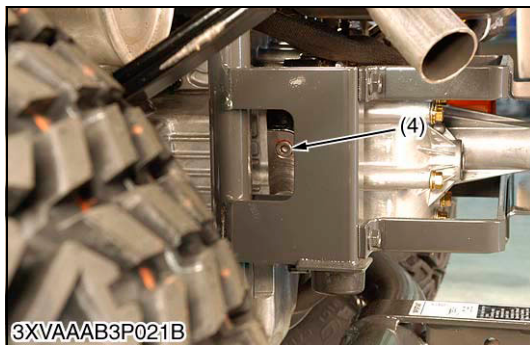
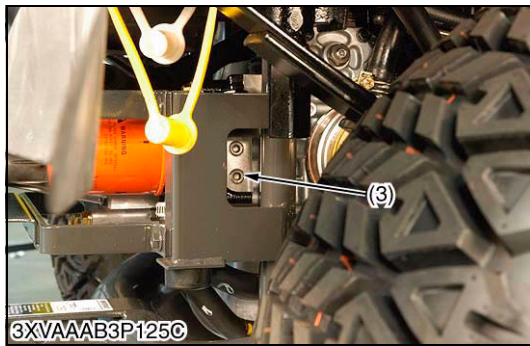
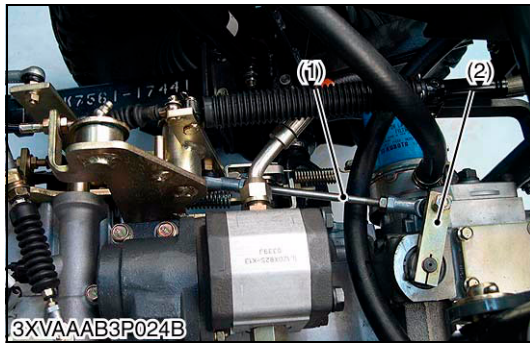
- Park the machine on a hard and level surface.
- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- Lift up and secure with jack stands or blocking the front of machine, do not run the machine while adjusting.
- Work by two people when you checking and adjusting neutral.

**■ NOTE**

- The hex. socket plug is securely tightened. Therefore, it is very important to use a proper-sized allen wrench and fit it securely onto the plug. Do not give a shock but put your weight on the plug slowly, paying attention not to damage its hex. socket section. If the allen wrench is fitted on the plug at a slant or an improper-sized allen wrench is used to loose the plug, the hex. socket section will be damaged and you won't be able to loose the plug.

W1020957





### Checking Neutral (Continued)

#### ■ IMPORTANT

- When the neutral position of the machine is checked, it is advisable to divide the checking procedure as follows :  
First check the HST unit alone, and then connect the HST unit to the link for checking.

- Remove the hex. socket head plug from **P1** port (3) and **P2** port (4).
- Install the HST adaptor and low pressure gauge in **P1** port and **P2** port.
- Remove the HST control rod (1) from the HST control lever (2) to make situation that HST control lever move freely.
- Set the 4WD lever to 2WD position.
- Start the engine and shift the range gear shift lever in **L** position for 5 seconds to make sure that the HST is in neutral position.
- At this time, check both **P1** port (3) and **P2** port (4) pressure if the wheel rotates.
- If the measurement is not within the factory specification, adjust with hex. socket head screw (5).

#### (Adjusting procedure)

- Adjust to loosen the lock nut (6) on a right side of servo piston and for the adjustment hex. socket head screw (5) to make both **P1** port (3) and **P2** port (4) pressure equal while seeing the pressure gauge.
- Retighten the lock nut (6) securely.

#### (Reference)

- The pressure of **P2** port (4) (reverse side) rises when turning the clockwise.
  - The pressure **P1** port (3) (forward side) rises when turning the counterclockwise.
- Reinstall the HST control rod (1) to HST control lever (2) after confirming neutrality in the HST unit.
  - Adjust the rod length and much a neutral position if the wheel rotates after is stalling the HST control rod (1).

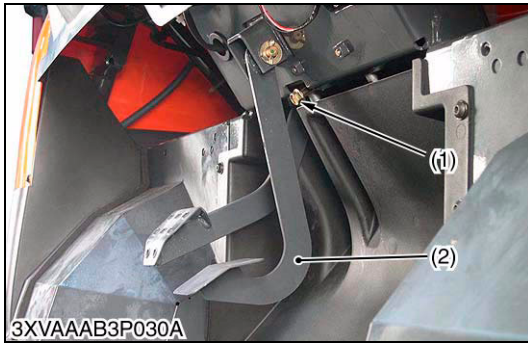
Difference pressure <b>P1 - P2</b>	Factory spec.	+0.5 to +2.0 MPa +0.05 to +0.20 kgf/cm <sup>2</sup> +7.1 to +28.4 psi
---------------------------------------	---------------	---

#### Condition

- Engine speed : Idle (1350 min<sup>-1</sup> (rpm))
- Oil temperature : 45 to 55 °C  
113 to 131 °F

- |                                  |                                  |
|----------------------------------|----------------------------------|
| (1) HST Control Rod              | (4) <b>P2</b> Port (for Reverse) |
| (2) HST Control Lever            | (5) Hex. Socket Head Screw       |
| (3) <b>P1</b> Port (for Forward) | (6) Lock Nut                     |

W1021139



### Checking Travelling Speed

#### ⚠ CAUTION

- Park the machine on a hard and level surface.
- If it is necessary to run engine in an enclosed area, use a gas tight exhaust pipe extension to remove the fumes.
- Always try to work in a well-ventilated area.
- Lift up and secure with jack stands or blocking the front of machine, do not run the machine while adjusting.
- Work by two people when you checking and adjusting travelling speed.

1. Remove the rear wheels.
2. Set the 4WD lever to 2WD position.
3. Start the engine and shift the range shift lever in **L** position and depress the differential lock pedal.
4. Depress the speed control pedal (2) fully, and measure the rotations of rear wheel.
5. If the measurement is not within the factory specification, loosen the lock nut and adjust the length of the speed control pedal stopper bolt (1).

Rear wheel rotation (axle) at L speed	Factory spec.	126 to 141 min <sup>-1</sup> (rpm) at rated engine speed (3200 min <sup>-1</sup> (rpm))
---------------------------------------	---------------	---

#### ■ NOTE

- Confirm the position of the HST control becomes the foremost position when fully depress the speed control pedal, and the HST control rod is not pulled too much.
- And confirm whether to pull the accelerator wire too much at same time.
- Refer to the following paragraph a detailed adjustment of above-mentioned two points.

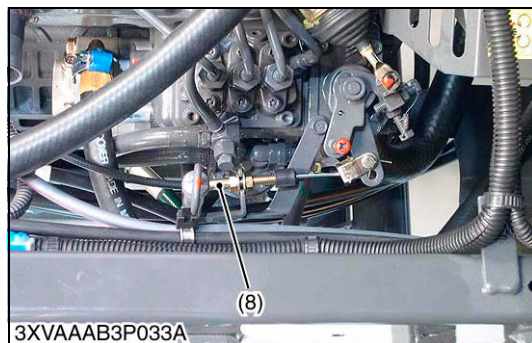
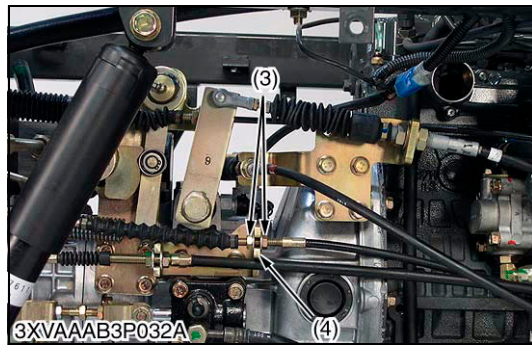
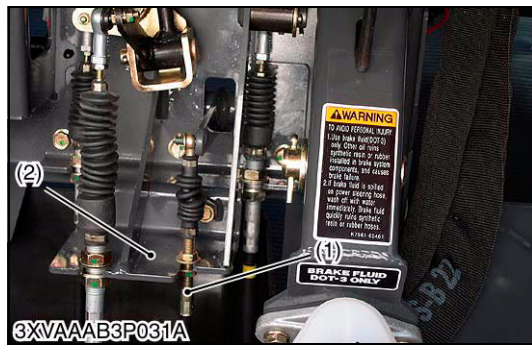
(When reassembling)

Tightening torque	Rear wheel mounting screw	75 to 90 N·m 7.6 to 9.2 kgf·m 55.3 to 66.4 lbf·ft
-------------------	---------------------------	---

(1) Speed Control Pedal Stopper Bolt      (2) Speed Control Pedal

W1022048





### Checking Speed Control Pedal Stroke (Adjustment of the speed control pedal cable)

#### **CAUTION**

- When checking, park the machine on flat ground, apply the parking brake.
- Work by two people when you checking and adjusting speed control pedal stroke.

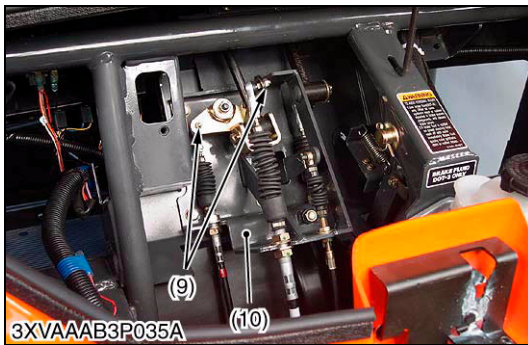
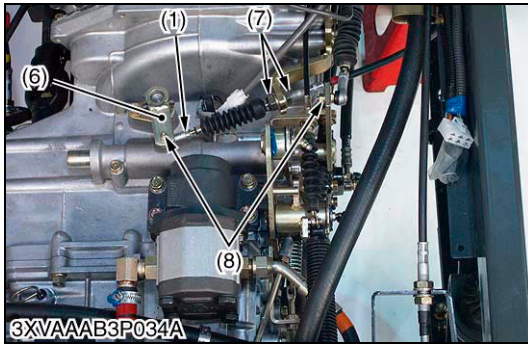
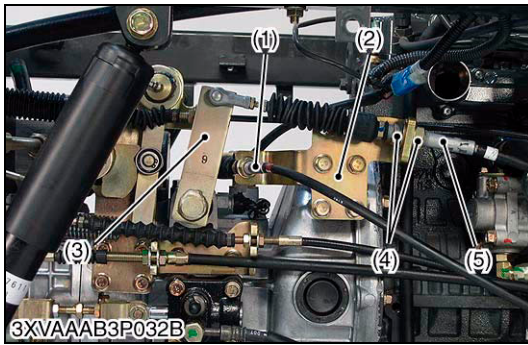
1. Check that the speed control pedal cable (1) is fixed to the lever support (2), with the cable outer section screw being positioned near the center.
2. Loosen the lock nut (3), and remove the cable from the cable stay (4).
3. Manually push the HST control lever (5) forward, and mark (6) the case when the lever is in the foremost position.
4. Put the cable through the cable stay (4) and adjust the length of the cable outer section so that the speed control pedal (7) is positioned in the upper limit (where the pedal comes into contact with the stopper). Then tighten the lock nut (3) firmly.
5. Adjust the height of the speed control pedal stopper bolt so that the control lever (5) is positioned 1 mm (0.04 in.) backward of the marking (6) at the edge of case when the speed control pedal (7) is pressed down to the lowest point.
6. After this, adjust the accelerator wire (8) so that it gives the maximum pull to the engine speed control lever (maximum revolutions) when the speed control pedal (7) is pressed all the way down.

#### **NOTE**

- Adjust the accelerator wire carefully not to pull it excessively. Otherwise the cable damage may result.

- |                               |                         |
|-------------------------------|-------------------------|
| (1) Speed Control Pedal Cable | (5) HST Control Lever   |
| (2) Lever Support             | (6) Mark                |
| (3) Lock Nut                  | (7) Speed Control Pedal |
| (4) Cable Stay                | (8) Accelerator Wire    |

W1022911



### Checking Main Shift Lever Position (Adjusting of the shift cable length and the select cable length)

#### **CAUTION**

- When checking, park the machine on flat ground, apply the parking brake.
  - Work by two people when you checking and adjusting main shift lever position.
1. Loosen the lock nut (4) of the cable outer section at the main shift arm (3) side, and remove the main shift cable (5).
  2. Loosen the lock nut (7) of the cable outer section at the auxiliary shift arm (6) side, and remove the select cable (1).
  3. Check that each cable is fixed to the lever support (10), with the cable outer section screw being positioned near the center. Also check that the lock nut at the cable end and the ball joint are not loose. Check that the ball joint fitting nuts (9) (lever side and link side) are tightened.
  4. Move the main shift arm (3) to right and left to confirm that it is in the neutral position. (Due to a force of the spring in the main shift arm (3), the arm is set to the left side.)
  5. Fix the main shift lever (11) in the neutral position (the midpoint of **H** and **M** in the lever guide).

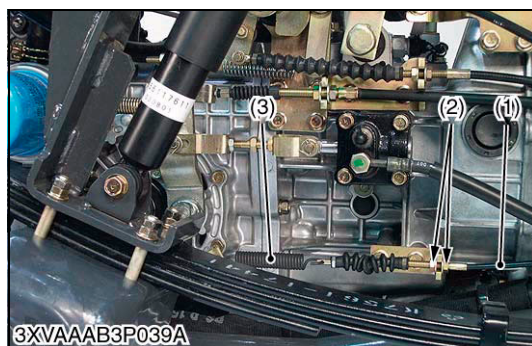
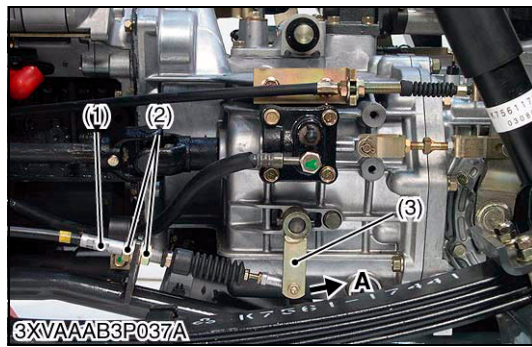
#### **NOTE**

- Check that both cables move smoothly.
6. Keeping this condition, put each cable through the cable stay (2) and adjust the length of the cable outer section while taking care not to move the main shift lever (11) and the auxiliary shift arm (6).  
Tighten the lock nuts (4), (7) firmly.  
Also check that the lock nuts at the cable end and the ball joint are not loose. Check that the ball joint fitting nuts (8) are tightened.

- |                         |                       |
|-------------------------|-----------------------|
| (1) Select Cable        | (7) Lock Nut          |
| (2) Cable Stay          | (8) Fitting Nut       |
| (3) Main Shift Arm      | (9) Fitting Nut       |
| (4) Lock Nut            | (10) Lever Support    |
| (5) Main Shift Cable    | (11) Main Shift Lever |
| (6) Auxiliary Shift Arm |                       |

W1023887





### Checking Four Wheel Drive Lever Position (Adjustment of the 4WD shaft cable length)

#### **CAUTION**

- When checking, park the machine on flat ground, apply the parking brake.
- Work by two people when you checking and adjusting four wheel drive lever position.

1. Loosen the cable lock nut (2) at the sub-frame side, and remove the 4WD shift cable (1).
2. Check that the cable is fixed to the lever support (4), with the cable outer section screw being positioned near the center. Also check that the lock nuts at the cable end and the ball joint are not loose. Check that the ball joint fitting nuts are tightened.
3. Shift the 4WD shift arm (3) to the 2WD position (A).
4. Fix the 4WD lever (5) in the 2WD position.

#### **NOTE**

- Check that the cable moves smoothly.
5. Keeping this condition, put the cable through the cable stay and adjust the length of the cable outer section while taking care not to move the 4WD lever (5). Then tighten the lock nuts (2) firmly. Also check that the lock nuts at the cable end and the ball joint are not loose. Check that the ball joint fitting nuts (lever side and arm side) are tightened.

- (1) 4WD Shift Cable  
(2) Lock Nut  
(3) 4WD Shift Arm

- (4) Lever Support  
(5) 4WD Lever  
**A : 2WD Position**

W1025000

### Checking Differential Lock Cable (Adjustment of the length of the cable for differential lock)

#### **CAUTION**

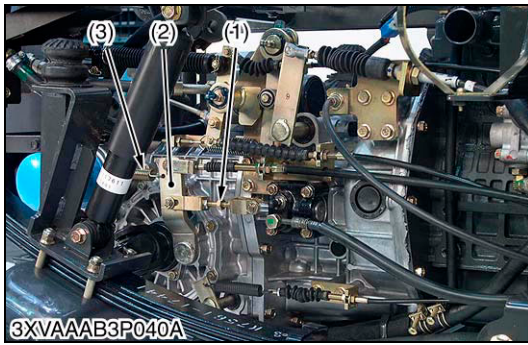
- When checking, park the machine on flat ground, apply the parking brake.

1. Check that the cable is fixed to the main frame, with the cable outer section screw being positioned near the center.
2. Adjust the length of the cable outer section so that the differential lock spring (3) has no play, and tighten the lock nut (2).

- (1) Differential Lock Cable  
(2) Lock Nut

- (3) Differential Lock Spring

W1025903



### Checking Bearing Rod

#### ⚠ CAUTION

- When checking, park the machine on flat ground.
- Work by two people when you measure pressure.

1. Remove the brake return spring (3).
2. Adjust the link length using the turnbuckle (1) so that the brake lever (2) has no play.

#### (Reference)

- Turning torque of the rear axle at this time is 9.8 to 14.7 N·m (1 to 1.5 Kgf·m, 7.2 to 10.8 lbf·ft).

#### ⚠ CAUTION

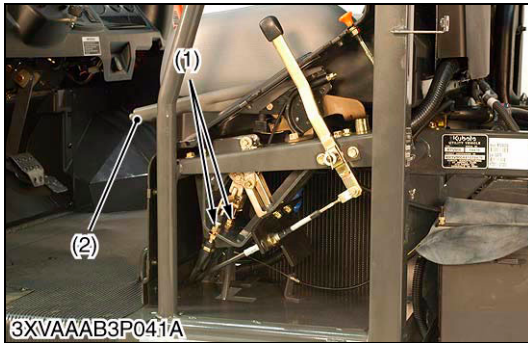
- Over-pulling due to poor turnbuckle adjustment can result in the problem of brake drag (overheating and burning).

(1) Turnbuckle (Brake Rod)

(3) Return Spring

(2) Brake Lever

W1026257



### Checking Parking Brake Lever (Adjustment of the parking brake cable)

#### ⚠ CAUTION

- When checking, park the machine on flat ground.
- Work by two people when you measure pressure.

1. Adjust the length of the parking each brake cable (1) outer section so that the cable does not pull the brake cam lever (3), (4) (not activate the brake) when the parking brake lever (2) is not pulled, and pulls the brake lever (activates the brake) when the parking brake lever is pulled up by one notch.
2. Adjust both right and left brakes so that they are equally conditioned.

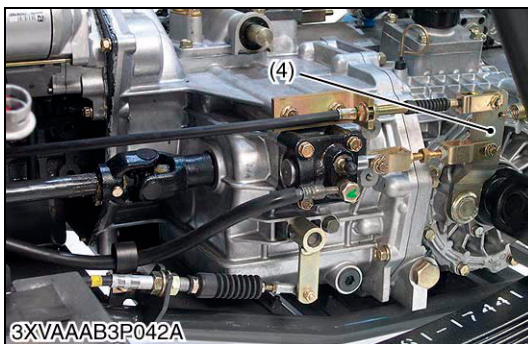
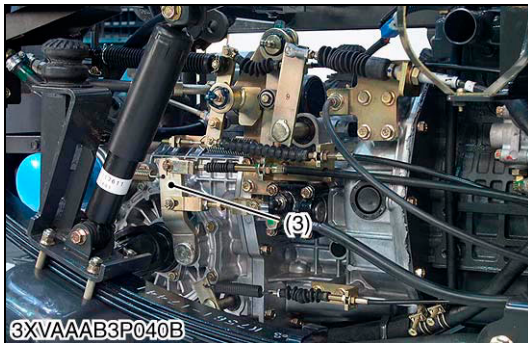
(1) Parking Brake Cable

(3) Brake Cam Lever (RH)

(2) Parking Brake Lever

(4) Brake Cam Lever (LH)

W1026642





## 5. DISASSEMBLING AND ASSEMBLING

### [1] DISASSEMBLING HYDROSTATIC TRANSMISSION



#### Battery



#### CAUTION

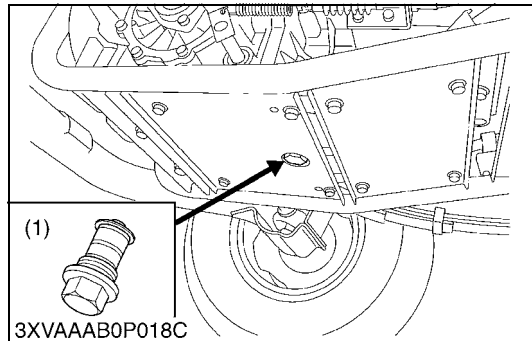
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (1) from the battery.
2. Disconnect the positive cable (2) from the battery.

(1) Negative Cable

(2) Positive Cable

W1027354

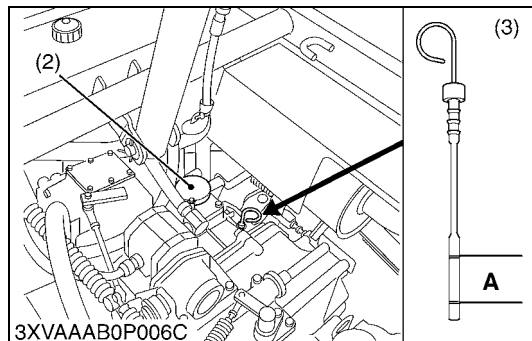


#### Draining the Transmission Fluid

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

#### (When refilling)

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



Transmission fluid capacity		10 L 2.6 U.S.gals 2.2 Imp.gals
Tightening torque	Drain plug with magnet	58 to 67 N·m 5.9 to 6.9 kgf·m 43 to 49 lbf·ft

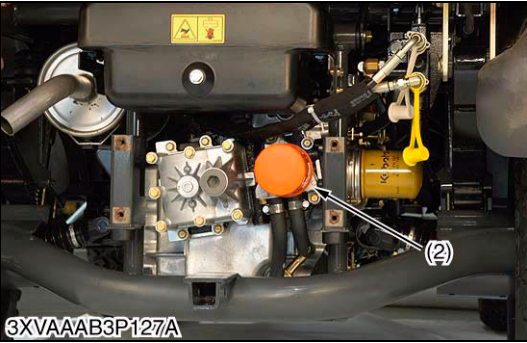
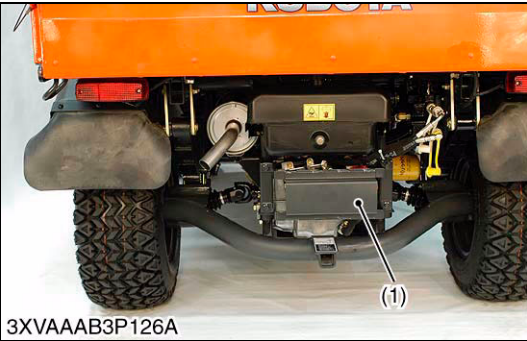
#### ■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.)
- Do not mix different brands of fluid together.

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

A : Oil level is acceptable within this range.

W1027576



**Rear Guard and Oil Filter Bracket**

- 1. Remove the rear guard (1).
- 2. Remove the filter bracket (2) with oil filter cartridge and suction hoses.

**(When reassembling)**

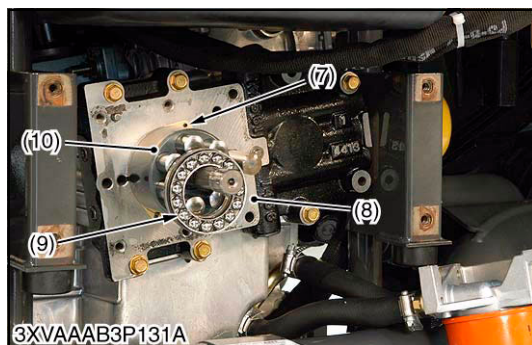
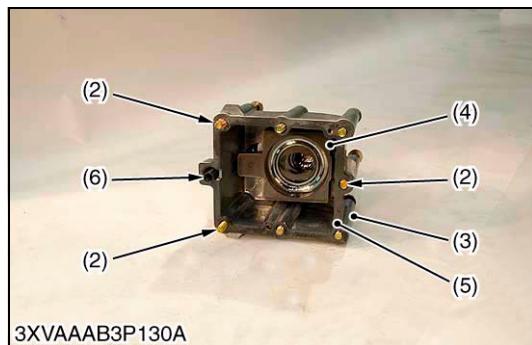
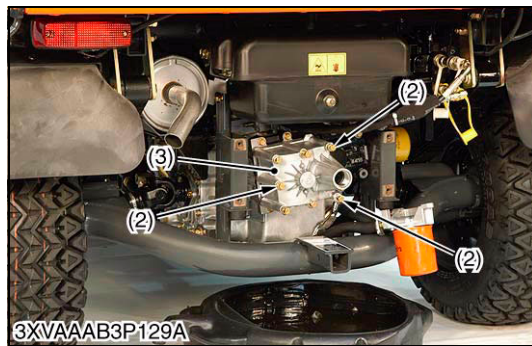
Tightening torque	Oil filter bracket mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
-------------------	-----------------------------------	---

(1) Rear Guard

(2) Oil Filter Bracket

W1028028





### **Piston Case and Motor Case**

1. Place oil pan underneath the motor case (3).
2. Loosen the piston case (1) with return piston, springs and stopper rod.
3. Remove the motor case (3) with variable swashplate (4).
4. Remove the thrust ball bearing (8) and the assist motor cylinder block (10).
5. Remove the valve plate (7).

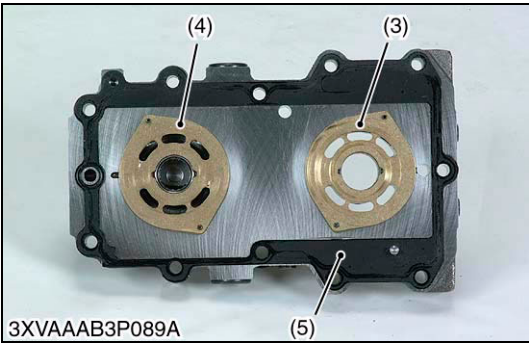
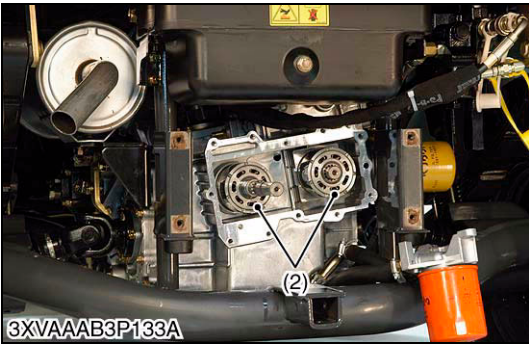
### **(When reassembling)**

- Take care not to damage O-ring on the piston case.
- Replace the motor case gasket (5) with new one.
- Apply a thin coat of oil soluble grease to the surface of valve plate (7) and the variable swashplate (4) and thrust ball bearing (8). This is to hold the parts in place while assembling.
- Be sure to install the motor case (3) and variable swashplate (3) with thrust ball bearing to part block cover (8).
- Be careful not to loose the spring (6) for charge relief valve.
- Thrust ball bearing sequence thin race inside variable swash plate (4), ball bearing (open side down), thick race out side.
- Be careful to note the location of three different length screws (2).
- Wrap the seal tape around the tread of three long screws (4).

Tightening torque	Piston ease	70.0 to 80.0 N·m 7.0 to 8.0 kgf·m 51.6 to 59.6 lbf·ft
	Motor case mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft

- |                         |                             |
|-------------------------|-----------------------------|
| (1) Piston Case         | (6) Spring (Charge Relief)  |
| (2) Long Screw          | (7) Valve Plate             |
| (3) Motor Case          | (8) Port Block Cover        |
| (4) Variable Swashplate | (9) Thrust Ball Bearing     |
| (5) Motor Case Gasket   | (10) Cylinder Block (Motor) |

W1028557



**Port Block Cover**

- 1. Remove the port block cover (1) mounting screw.
- 2. Remove the port block cover (1) carefully and slowly. Leave the cylinder blocks (2).

**(When reassembling)**

- Replace the port block cover gasket (5) with new one.

**■ IMPORTANT**

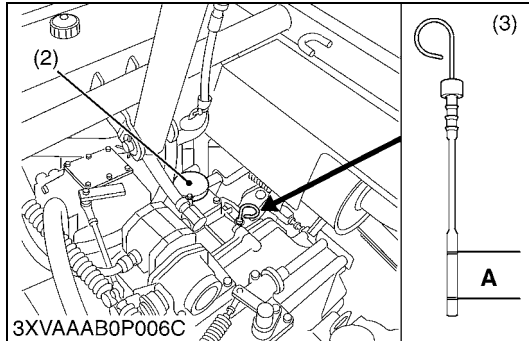
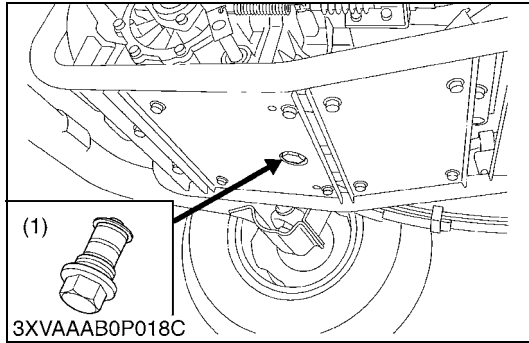
- Valve plate (3), (4) may stick to the port block cover but they are not fixed. Take care not to drop them. And these valve plate are not interchangeable.

Tightening torque	Port block cover mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
-------------------	---------------------------------	---

- (1) Port Block Cover
- (2) Cylinder Block
- (3) Valve Plate (Motor)
- (4) Valve Plate (Pump)
- (5) Gasket

W1029608

## [2] DISMOUNTING TRANSAXLE



### Draining the Transmission Fluid

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

#### (When refilling)

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

Transmission fluid capacity	10 L 2.6 U.S.gals 2.2 Imp.gals
-----------------------------	--------------------------------------

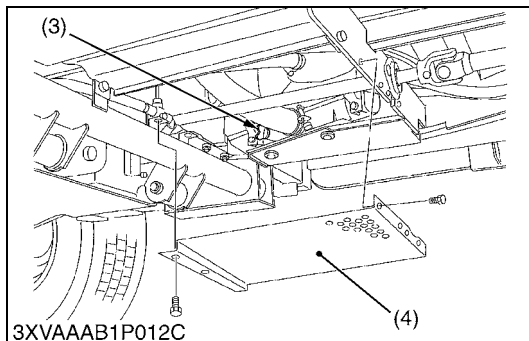
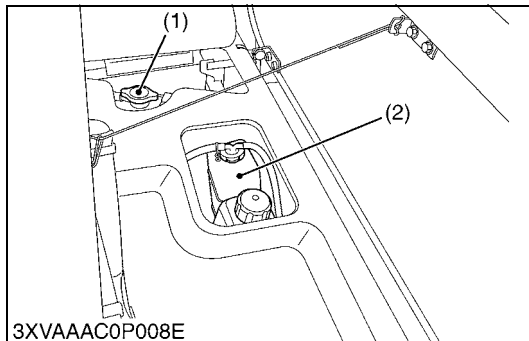
#### ■ IMPORTANT

- Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.).
- Do not mix different brands of fluid together.

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

A : Oil level is acceptable within this range.

W1030200



### Draining Coolant

#### ⚠ CAUTION

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

1. Stop the engine and let cool down.
2. Remove the protective cover (4).
3. Remove the radiator coolant drain plug (3) to drain the coolant.
4. Remove the radiator cap (1) to completely drain the coolant.
5. After all coolant is drained, close the drain plugs.

Coolant capacity	Radiator with recovery tank	4.0 L 4.2 U.S.qts. 3.5 Imp.qts
------------------	-----------------------------	--------------------------------------

- (1) Radiator Cap  
(2) Recovery Tank  
(3) Radiator Coolant Drain Plug  
(4) Protective Cover

W1030780



### Battery

#### ⚠ CAUTION

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

- Disconnect the negative cable (1) from the battery.
- Disconnect the positive cable (2) from the battery.

(1) Negative Cable

(2) Positive Cable

W1031150



### Cargo Bed

- Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop. (If hydraulic cylinder equipped.)
- Remove the cotter pin and clevis pin (2). (If hydraulic cylinder equipped.)
- Disconnect the connector (3) from main harness, then separate the harness for the tail lamps.
- Loosen the lock nut (4) and remove the hinge bolt (5) and nut.

(1) Cargo Bed

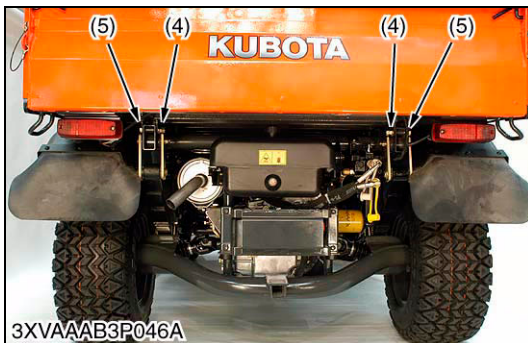
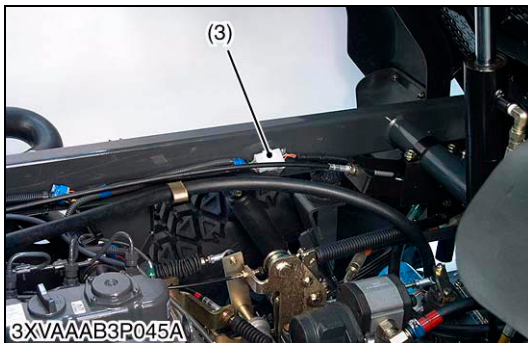
(2) Clevis Pin

(3) Connector

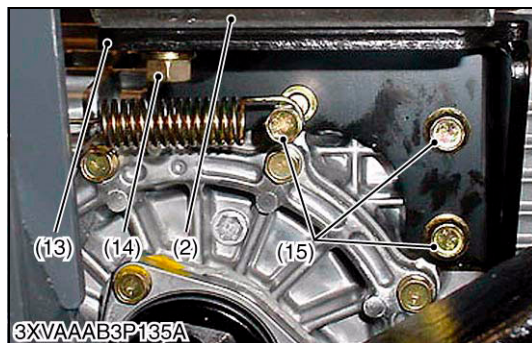
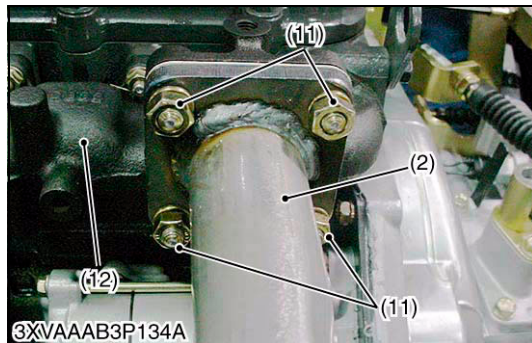
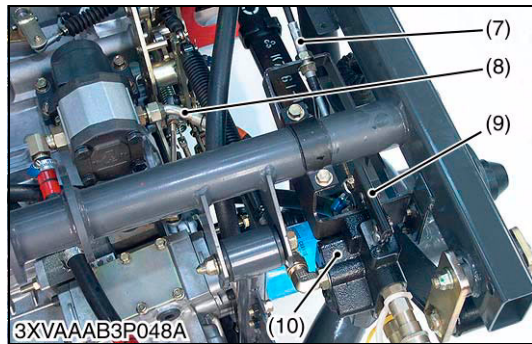
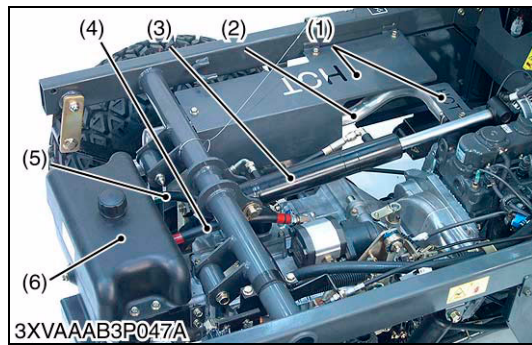
(4) Lock Nut

(5) Hinge Bolt

W1031449







### **Muffler Cover, Muffler, Hydraulic Oil Tank, Hydraulic Cylinder and Hydraulic Control Valve**

1. Remove the muffler cover (1) and muffler (2).
2. Disconnect the quick coupler from hydraulic control valve.
3. Remove the cotter pin and clevis pin, then remove the hydraulic cylinder (3).
4. Disconnect the suction hose (4) and return hose (5), then remove the hydraulic oil tank (6).
5. Disconnect the cable (7) for hydraulic control valve.
6. Disconnect the delivery hose (8) and remove the hydraulic control valve (10).

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

- When connecting the hydraulic control valve (10) cable to hydraulic control valve lever (9), be sure to adjust the length of cable (7).

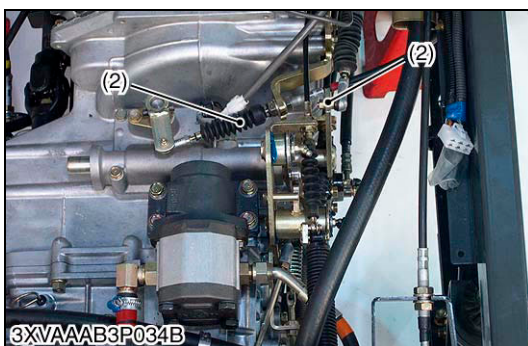
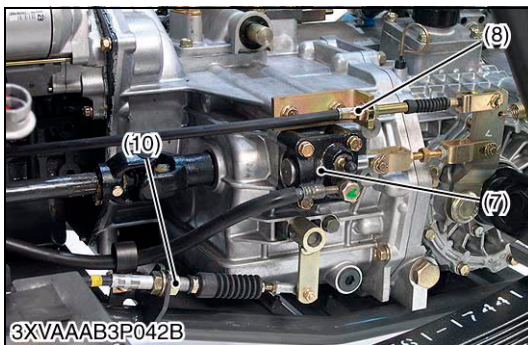
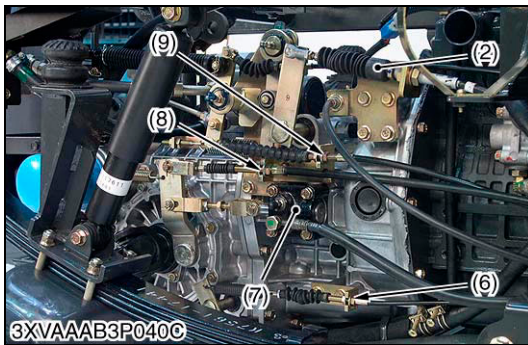
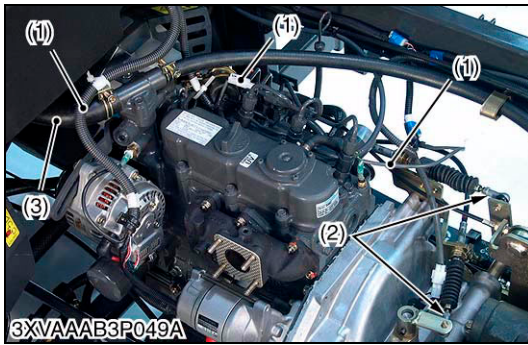
#### **NOTE**

- The muffler shall be assembled in the following order:
1. To secure the muffler (2) to the exhaust manifold, put four spring lock washers on studs and start a nut (11) on each stud. Screw each nut 2 to 3 threads on studs.
  2. To secure muffler (2) to muffler stay (13), start a sems bolt (bolt with plane washer and spring lock washer. Turn sems bolt 2 to 3 threads into underside of muffler stay (13) and the muffler (2).
  3. Tighten nuts (11) that fasten the muffler (2) to the exhaust manifold (12).
  4. Tighten the sems bolt that fasten the underside of the muffler (2) to the muffler stay (13) (On this occasion, check the gap between the underside of the muffler and its stay. When there is a large gap between them, lift the stay and assemble the muffler. And keep them to such a position to fasten the muffler stay.).
  5. Tighten the bolts (15) that fasten muffler stay (13) to transmission.

Tightening torque	Muffler mounting nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Muffler mounting screws bolt	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	Muffler stay mounting bolt	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 lbf·ft

- |                         |                                   |
|-------------------------|-----------------------------------|
| (1) Muffler Cover       | (9) Hydraulic Control Valve Lever |
| (2) Muffler             | (10) Hydraulic Control Valve      |
| (3) Hydraulic Cylinder  | (11) Nut                          |
| (4) Suction Hose        | (12) Exhaust Manifold             |
| (5) Return Hose         | (13) Muffler Stay                 |
| (6) Hydraulic Oil Tank  | (14) Sems Bolt                    |
| (7) Control Valve Cable | (15) Bolt                         |
| (8) Delivery Hose       |                                   |

W1032032



### **Air Cleaner, Wire Harness, Radiator Hose (Upper), Cables and Brake Cylinder**

1. Remove the air cleaner body and intake hose as a unit.
2. Disconnect the wire harness (1) from engine, alternator and stator motor.
3. Remove the ground cable (5) and positive cable (4).
4. Disconnect the parking brake cables (8), four wheel drive cable (10), select cable and shift cable (2).
5. Remove the speed control pedal cable (9).
6. Remove the clevis pin and the brake cylinder (7) with brake rod.
7. Disconnect the differential lock cable (6).
8. Remove the radiator upper hose (3).

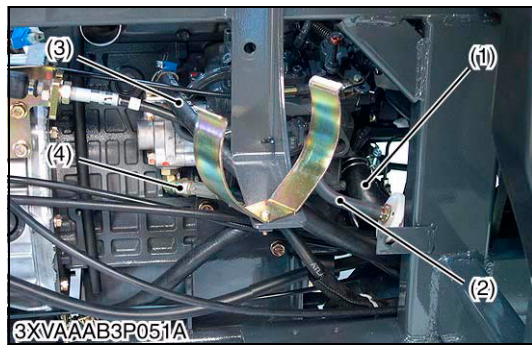
#### **(When reassembling)**

- Adjust the length of the shift cable and select cable. (See page 2-S14.)
- Adjust the length of the speed control pedal cable. (See page 2-S13.)
- Adjust the length of the parking brake cable. (See page 2-S16.)
- Adjust the length of the 4WD shift cable. (See page 2-S15.)

- |                                  |                               |
|----------------------------------|-------------------------------|
| (1) Wire Harness                 | (6) Differential Lock Cable   |
| (2) Shift Cable and Select Cable | (7) Brake Cylinder            |
| (3) Radiator Upper Hose          | (8) Parking Brake Cable       |
| (4) Positive Cable               | (9) Speed Control Pedal Cable |
| (5) Ground Cable                 | (10) 4WD Cable                |

W1033185





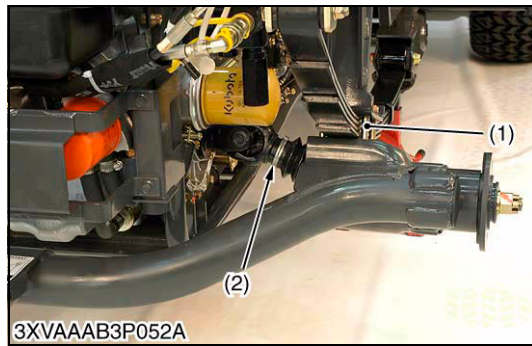
### **Power Steering Hose and Radiator Hose (Lower)**

1. Remove the power steering suction hose (3) and delivery hose (4).
2. Disconnect the fuel hose (2).
3. Disconnect the radiator hose (lower) (1).

(1) Radiator Hose (Lower)  
(2) Fuel Hose

(3) Suction Hose  
(4) Delivery Hose

W1034347



### **Rear Axle Bracket**

1. Remove the boot band (2) on both sides.
2. Place the stand under the both side of frame.
3. Remove the rear wheels.
4. Remove the leaf spring mounting bolt (1) and nut, and remove the rear axle bracket assembly (3) by use the axle support (4).

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

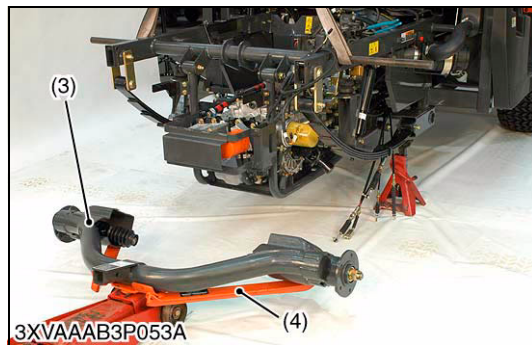
- Align the master spline of propeller shaft and rear axle shaft.
- Replace the boot band with new one.

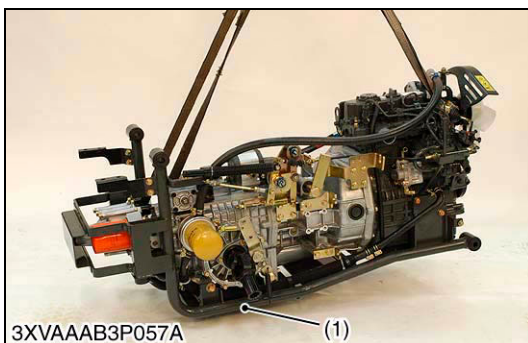
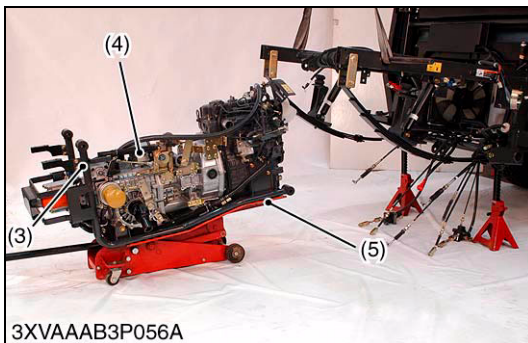
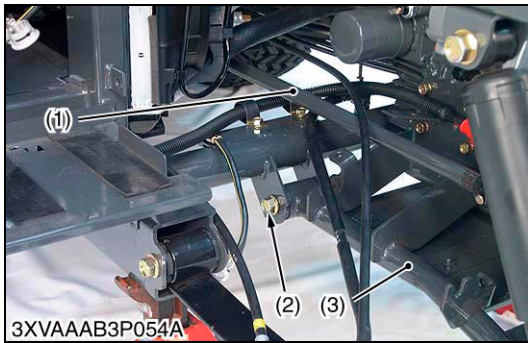
Tightening torque	Leaf spring mounting bolt and nut	48.0 to 56.6 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 lbf·ft
	Rear wheel mounting screw	75.0 to 90.0 N·m 7.6 to 9.2 kgf·m 55.3 to 66.4 lbf·ft

(1) Leaf Spring Mounting Bolt  
(2) Boot Band

(3) Rear Axle Bracket Assembly  
(4) Axle Support

W1034657





### **Dismounting Transmission and Engine One Piece Assembly**

1. Set the power train support (5) and remove the mission frame (3) mounting bolt (2) and nut.
2. Lift up the main frame by hoist.
3. Remove the transmission and engine one piece assembly (4).

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

- The bolt can be put through the rubber bushing more easily if soap water is applied to the bolt. Never hit the bolt.
- Assemble the mission-frame in such a manner as to insert two bolts in the front and then two bolts in the rear, instead of inserting the four bolts at a time.
- When reassembling the transmission and engine one piece assembly (mission frame) into the main frame, do not forget to assemble the 4WD propeller shaft (1) as well.
- Apply grease to splines of 4WD propeller shaft (1).

Tightening torque	Mission frame mounting bolt and nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.1 lbf·ft
-------------------	-------------------------------------	---

- |                                 |  |
|---------------------------------|--|
| (1) 4WD Propeller Shaft         | (4) Transmission and Engine One Piece Assembly |
| (2) Mission Frame Mounting Bolt | (5) Power Train Support                        |
| (3) Mission Frame               |  |

W1035200

### **Mission Frame**

1. Remove the mission frame (1) from engine and transaxle one piece assembly.

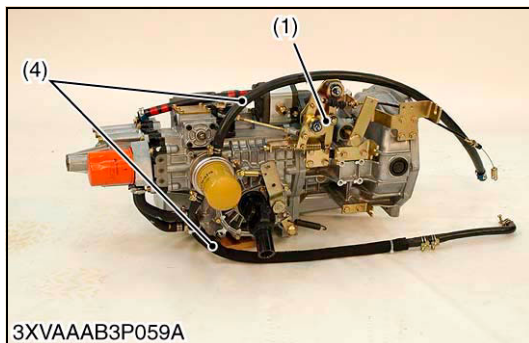
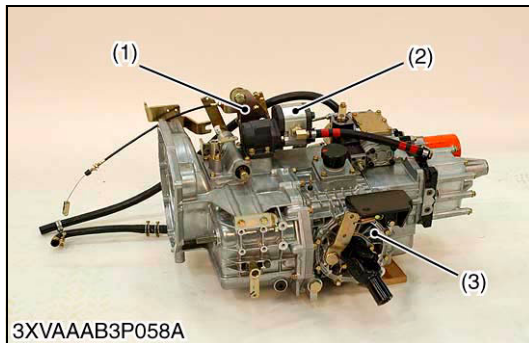
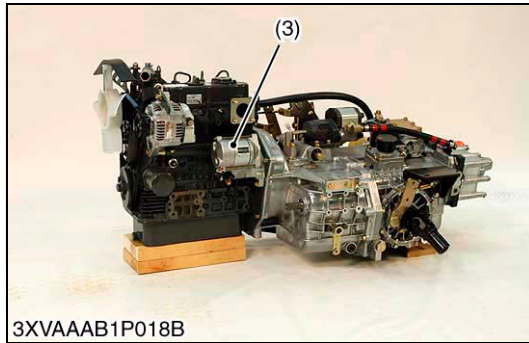
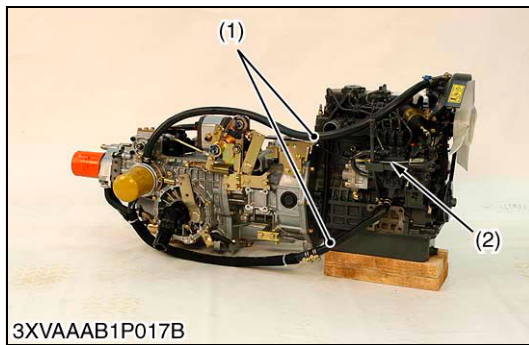
#### **(When reassembling)**

Tightening torque	Engine set screw	48.0 to 56.6 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 lbf·ft
	Transmission case set screw	39.0 to 44.0 N·m 4.0 to 4.5 kgf·m 28.8 to 32.5 lbf·ft

- (1) Mission Frame

W1035944





### **Separate the Transmission and Engine One Piece Assembly**

1. Remove the engine mounting screw and stator motor (2) mounting screws.
2. Disconnect the oil cooler hoses (1).
3. Disconnect the accelerator wire (2).
4. Separate the engine from transmission assembly.

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

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of engine rear-end plate and the transmission case.

Tightening torque	Engine mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
-------------------	-----------------------	---

- (1) Oil Cooler Hose  
(2) Accelerator Wire

(3) Stator Motor

W1036228

### **Remove the Outer Parts**

1. Remove the hydraulic pump with bracket (2) (If equipped).
2. Remove the brake rod and brake return spring (3).
3. Remove the oil cooler hoses (4).
4. Remove the HST linkages (1).

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

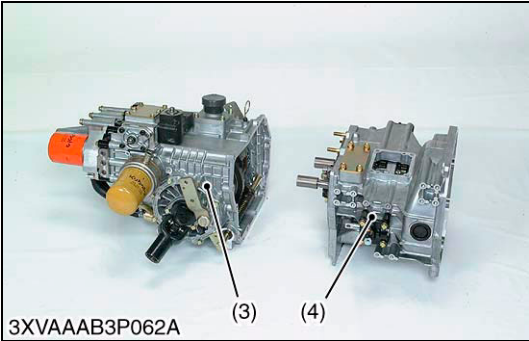
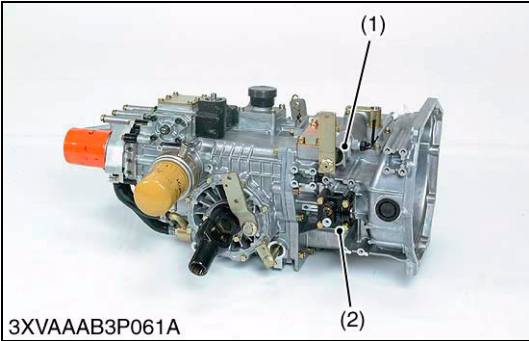
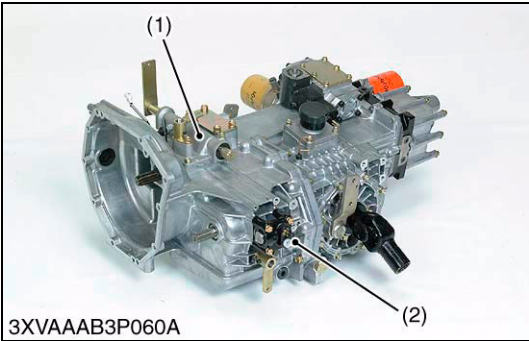
- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of pump base and front case.

Tightening torque	Pump base mounting screw	39.0 to 44.0 N·m 4.0 to 4.5 kgf·m 28.8 to 32.5 lbf·ft
-------------------	--------------------------	---

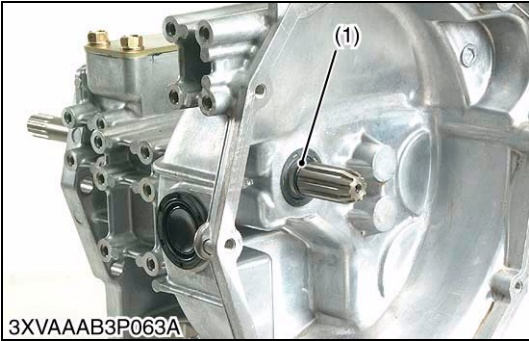
- (1) HST Linkage  
(2) Hydraulic Pump with Bracket

- (3) Brake Return Spring  
(4) Oil Cooler Hose

W1036684



**(1) Front Case**



**Separate the Front Case and Transmission Case**

- 1. Remove the shift cover (1).
- 2. Remove the brake cylinder (2) and separate the front case (4) and transmission case (3).

**(When reassembling)**

- Replace the transmission case gasket with new one.
- Replace the shift cover gasket with new one.

Tightening torque	Front case mounting screw and nut	39.0 to 44.0 N·m 4.0 to 4.5 kgf·m 28.8 to 32.5 lbf·ft
-------------------	-----------------------------------	---

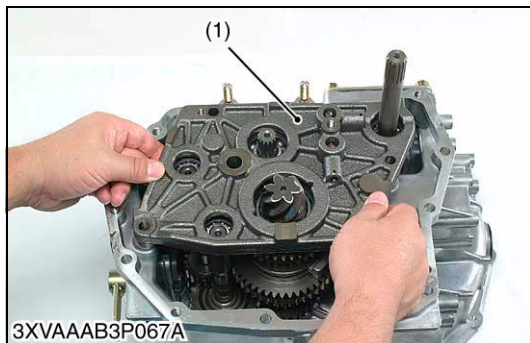
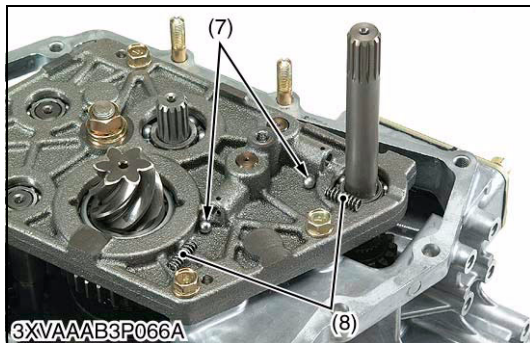
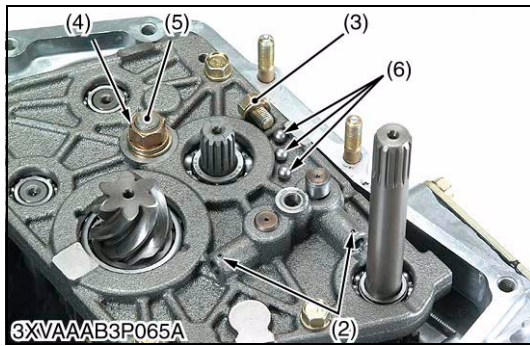
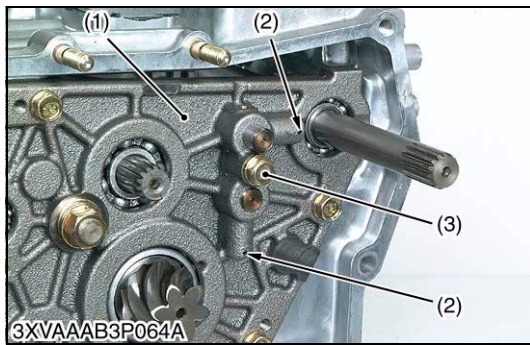
- (1) Shift Cover
- (2) Brake Cylinder
- (3) Transmission Case
- (4) Front Case

W1037115

**Disassembling Front Case Assembly**

- 1. Remove the O-ring (1) from input shaft.
- (1) O-ring

W1037665



### **Detent Ball, Interlocking Ball and Back Idle Gear Shaft**

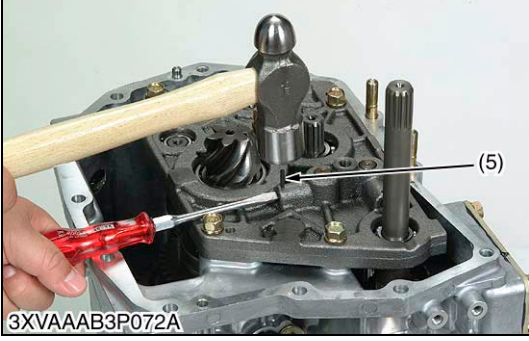
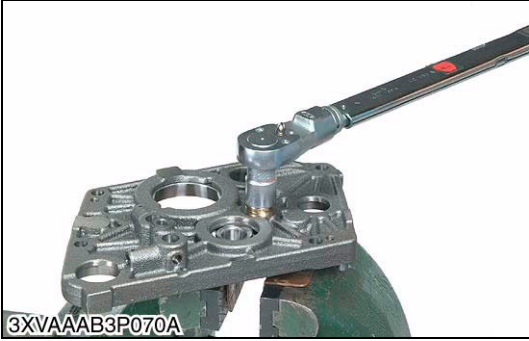
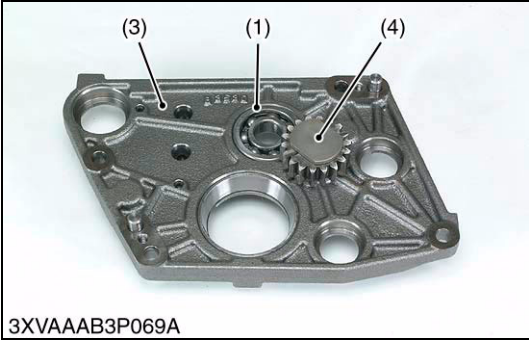
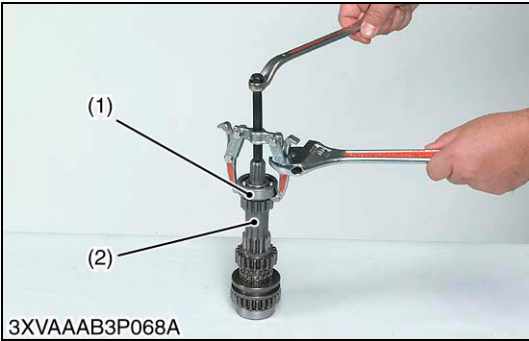
1. Remove the stopper bolt (3) from bearing holder (1).
2. With a magnet, remove the three interlock balls (6).
3. Tap out the roll pins (2) and remove the springs (8) and detent balls (7).
4. Loosen the nut (4) and tap out the back idle shaft (5) to the case side.
5. Remove the bearing holder mounting screws and pull out the bearing holder (1).

- (1) Bearing Holder  
(2) Roll Pin  
(3) Stopper Bolt  
(4) Nut

- (5) Back Idle Shaft  
(6) Interlock Ball  
(7) Detent Ball  
(8) Spring

W1037897





**Detent Ball, Interlocking Ball and Back Idle Gear Shaft (Continued)**

**(When reassembling)**

- Remove the bearing (1) on 12T-14T gear shaft (2).
- Install the bearing to bearing holder (3), first.
- Install the back idle gear and shaft (4), then tighten the nut with specified torque.
- Before assembling the bearing holder, check that the back idle gear, 12T gear shaft and 34T back gear are properly engaged. While ensuring the engagement of the three gears, assemble the bearing holder into the front case by tapping the 12T gear shaft bearing.

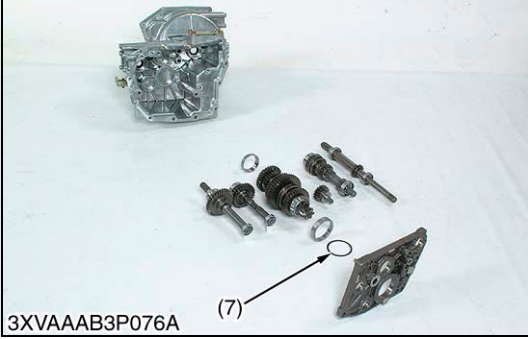
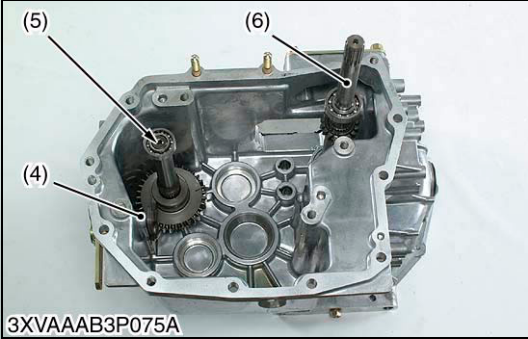
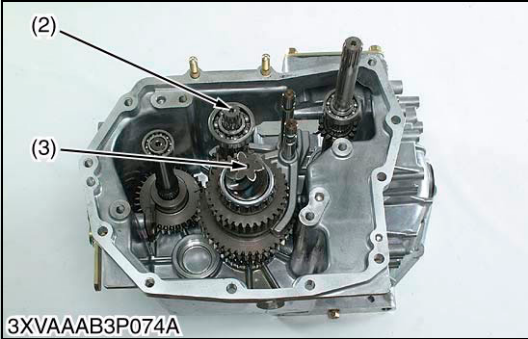
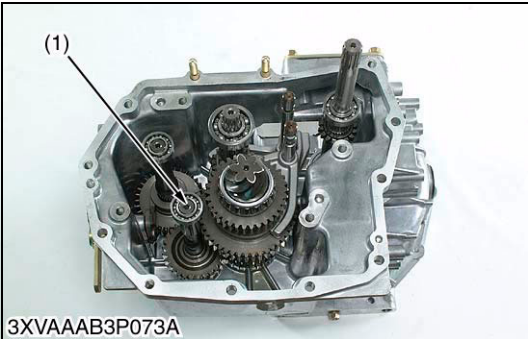
**NOTE**

- After inserting the detent ball, mount the spring. Push the spring inward using a screwdriver or the like, and press in the cotter pin (5). If the spring is not pushed in properly in this step, the cotter pin (5) may bend the spring. Use full care when pressing in the cotter pin (5).

Tightening torque	Back idle gear shaft nut	93.2 to 103.0 N·m 9.5 to 10.5 kgf·m 68.7 to 75.9 lbf·ft
	Bearing holder mounting screw	31.0 to 34.0 N·m 3.2 to 3.5 kgf·m 22.9 to 25.1 lbf·ft

- (1) Bearing
- (2) 12T-14T Gear Shaft
- (3) Bearing Holder
- (4) Idle Gear Shaft
- (5) Cotter Pin

W1038554



**Shaft Assemblies**

- 1. Remove the four wheel drive idle shaft assembly (1).
- 2. Draw out the 6T spiral bevel pinion shaft assembly (3) and 12T-14T gear shaft assembly (2) with shift fork.
- 3. Loosen the lock bolt for four wheel drive shift arm (4).
- 4. Draw out the four wheel drive shaft (5) and input shaft (6).

**(When reassembling)**

- Use same number of shim (7) as before disassembling.

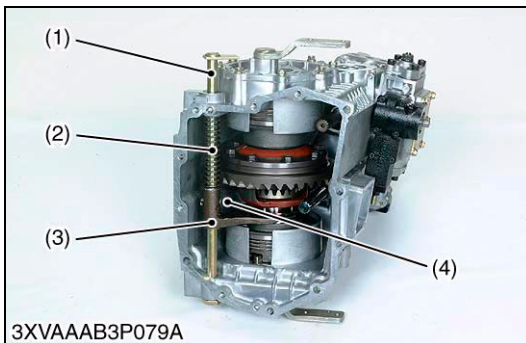
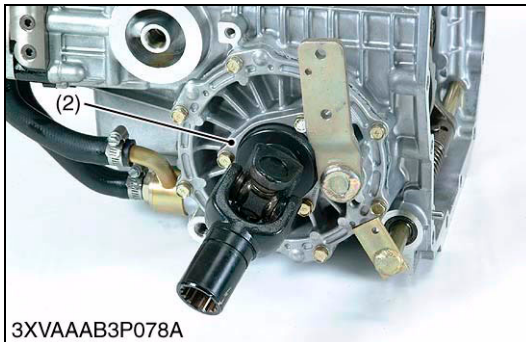
**(Reference)**

Thickness of shim	Factory spec.	0.6 mm 0.24 in.
-------------------	---------------	--------------------

- |   |                              |
|---|------------------------------|
| (1) 4WD Idle Shaft Assembly               | (4) 4WD Shift Arm            |
| (2) 12T-14T Gear Shaft Assembly           | (5) 4WD Shaft (Output Shaft) |
| (3) 6T Spiral Bevel Pinion Shaft Assembly | (6) Input Shaft              |
|   | (7) Shim                     |

W1039086

## (2) Transmission Case



### Propeller Shaft Assembly

1. Remove the bearing cover (2) mounting screw, and remove the propeller shaft assembly (1).

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

Tightening torque	Bearing cover mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
-------------------	------------------------------	---

(1) Propeller Shaft Assembly

(2) Bearing Cover

W1040107

### Differential Support Cover

1. Remove the ring and clevis pin (4) from differential lock fork (3).
2. Remove the differential lock fork (3) and differential lock shaft (1).

#### **■ NOTE**

- **Take care not to fly out the spring (2) when pull out the differential lock shaft.**
3. Remove the differential support cover mounting screws and remove the differential support cover.

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

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the differential support cover and the transmission case.

Tightening torque	Differential support cover mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
-------------------	---	---

(1) Differential Lock Shaft

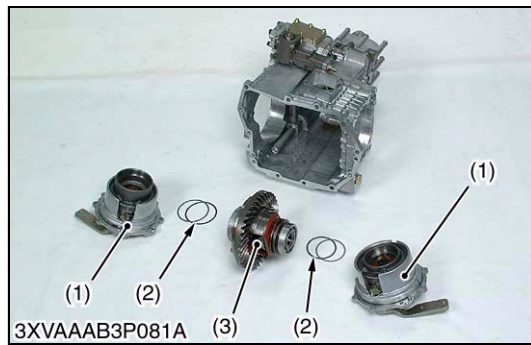
(4) Clevis Pin

(2) Spring

(5) Differential Support Cover

(3) Differential Fork

W1040516



### Differential Gear Assembly

1. Remove the differential support cover (1), noting the number of left shims (2).
2. Take out the differential gear assembly (3), noting the number of right shims.

#### (When reassembling)

- Use same number of shims as before disassembling.

#### (Reference)

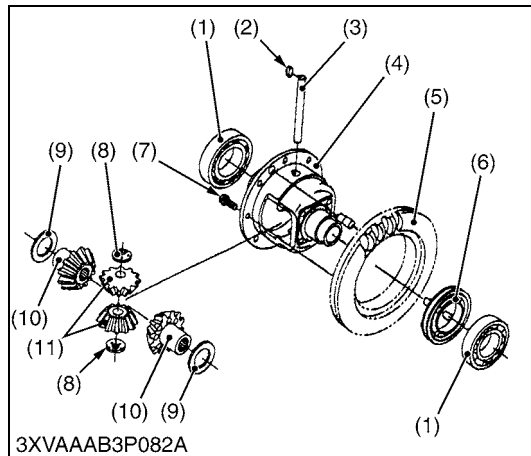
Thickness of shim (LH)	Factory spec.	0.7 to 0.8 mm 0.028 to 0.031 in.
Thickness of shim (RH)	Factory spec.	0.7 to 0.8 mm 0.028 to 0.031 in.

(1) Differential Support Cover

(3) Differential Gear Assembly

(2) Shim

W1040958



### Disassembling Differential Gear Assembly

1. Remove the bearing (1), 37T spiral bevel gear mounting screw (7) and 37T spiral bevel gear (5).
2. Put parting marks on the differential pinions (11) and the differential side gears (10).
3. Tap out the differential pinion shaft (3).
4. Remove the differential pinions (11), differential pinion washers (8), differential side gears (10) and differential side gear washers (9).

#### (When reassembling)

- Install the differential pinion and differential side gear, aligning the parting marks.
- Lock the differential pinion shaft (3) by setting the key (2).

Tightening torque	37T spiral bevel gear mounting screw	61.0 to 71.0 N·m 6.2 to 7.2 kgf·m 45.0 to 52.4 lbf·ft
-------------------	--------------------------------------	---

(1) Bearing

(7) 37T Spiral Bevel Gear Mounting Screw

(2) Key

(8) Differential Pinion Washer

(3) Differential Pinion Shaft

(9) Differential Side Gear Washer

(4) Differential Case

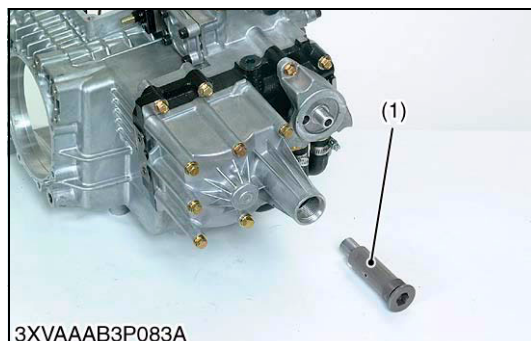
(10) Differential Side Gear

(5) 37T Spiral Bevel Gear

(11) Differential Pinion

(6) Differential Lock Shiftier

W1041389



### Piston Case

1. Loosen the piston case (1) with return piston, springs and stopper rod.

#### (When reassembling)

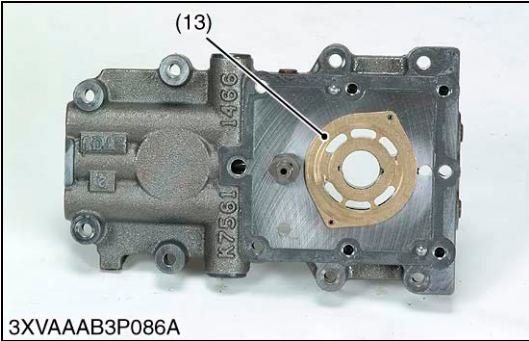
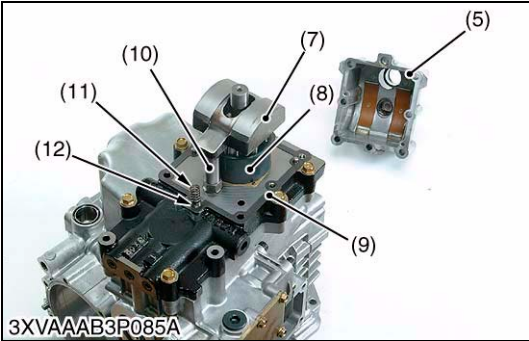
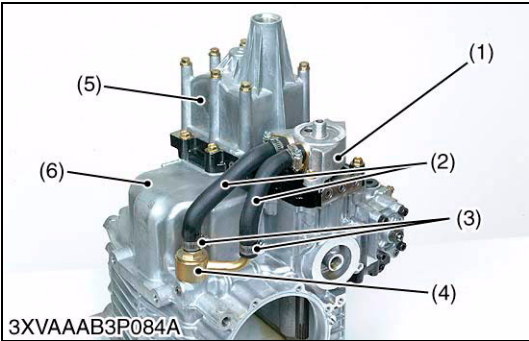
- Take care not to damage O-ring on the piston case.

Tightening torque	Piston case	70.0 to 80.0 N·m 7.0 to 8.0 kgf·m 51.6 to 59.6 lbf·ft
-------------------	-------------	---

(1) Piston Case

W1041858





**Motor Case**

1. Stand up the transmission case (6).
2. Loosen the suction hose clamps (3).
3. Remove the oil filter bracket (1) with suction hose (2).
4. Remove the suction pipe (4).
5. Remove the motor case (5).
6. Remove the variable swashplate (7) and assist motor cylinder block (8), control piston (10) and valve plate (13).
7. Remove the charge relief valve (12) and spring (11).

**(When reassembling)**

- Replace the motor case gasket (9) with new one.
- Be sure to install the motor case to variable swashplate (7).
- Do not forget the charge relief valve and spring.
- Be sure set the valve plate (13) to port block cover.
- Thrust ball bearing sequence thin race inside variable swash plate (7), ball bearing (open side down), thick race outside.

**■ IMPORTANT**

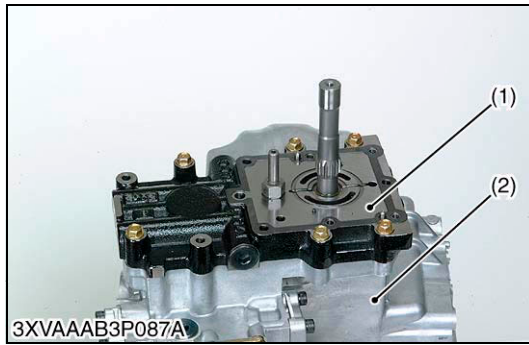
- **Valve plate (13) for assist motor can not be replace with valve plate for motor and valve plate for pump.**

Tightening torque	Motor case mounting screw	18.0 to 21.0 N·m
		1.8 to 2.1 kgf·m
		13.3 to 15.5 lbf·ft

- |                         |                                   |
|-------------------------|-----------------------------------|
| (1) Oil Filter Bracket  | (8) Cylinder Block (Assist Motor) |
| (2) Suction Hose        | (9) Gasket                        |
| (3) Hose Clamp          | (10) Control Piston               |
| (4) Suction Pipe        | (11) Spring                       |
| (5) Motor Case          | (12) Charge Relief Valve          |
| (6) Transmission Case   | (13) Valve Plate (Assist Motor)   |
| (7) Variable Swashplate |                                   |

W1042068





### **Port Block Cover**

1. Remove the port block cover mounting screw.
2. Pull and remove the port block cover (1) from transmission case (2).

### **(When reassembling)**

- Replace the port block cover gasket (5) with new one.

### **■ IMPORTANT**

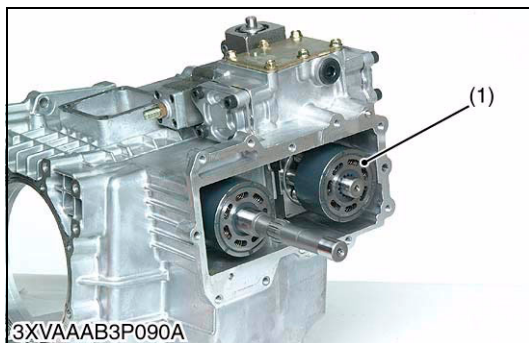
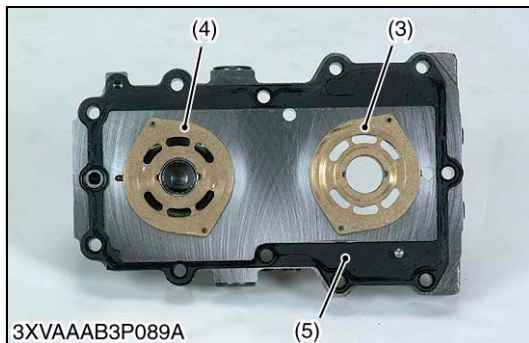
- Valve plate (3), (4) may stick to the port block cover but they are not fixed. Take care not to drop them.  
And these valve plate are not interchangeable.

Tightening torque	Port block cover mounting screw	18.0 to 21.0 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
-------------------	---------------------------------	---

- (1) Port Block Cover  
(2) Transmission Case  
(3) Valve Plate (Motor)

- (4) Valve Plate (Pump)  
(5) Gasket

W1043152

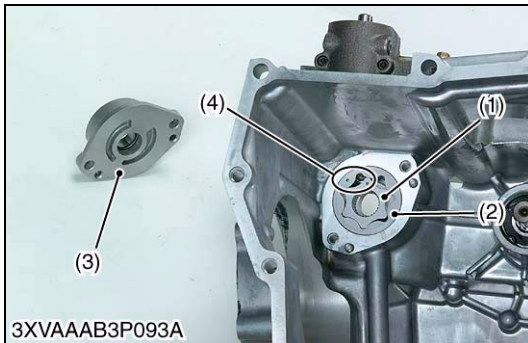
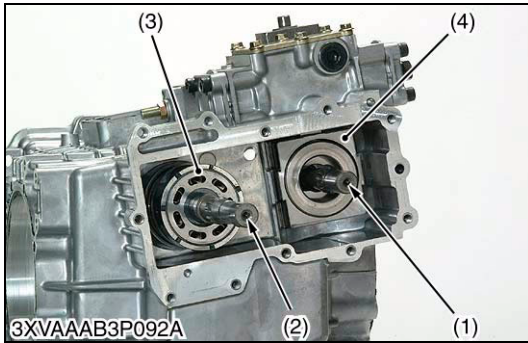
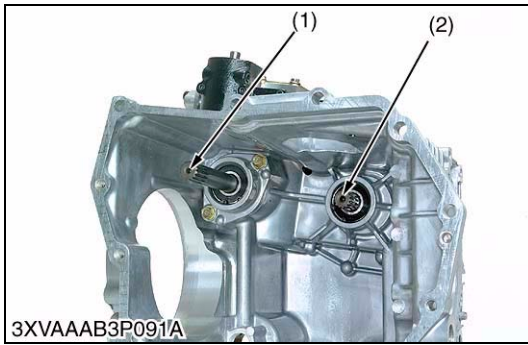


### **Cylinder Block (Pump) Assembly**

1. Remove the pump cylinder block (1) with piston.

- (1) Cylinder Block (Pump)

W1043662



### **Cylinder Block (Motor) Assembly, Motor Shaft Swashplate and Pump Shaft**

1. Tap the motor shaft (2) with a plastic hammer slightly to slide out it with motor cylinder block with piston (3) to the rear side.
2. Tap the pump shaft (1) with a plastic hammer slightly, then slide out to the rear and then remove the swashplate (4) with bearing.

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

- Place the swashplate (4) into the transmission case, align the slot guide of swashplate and groove of servo piston.

- (1) Pump Shaft  
(2) Motor Shaft

- (3) Cylinder Block (Motor)  
(4) Swashplate

W1043852

### **Charge Pump**

1. Remove the charge pump mounting screws, and remove the charge pump cover (3).
2. Remove the rotors (1), (2).

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

#### **■ NOTE**

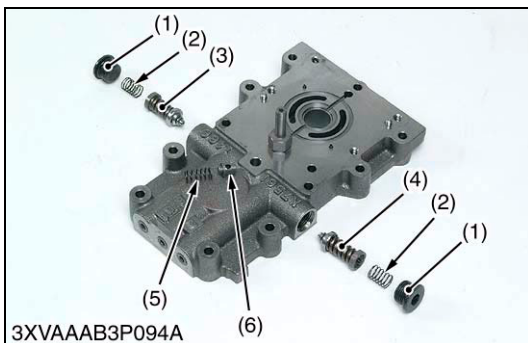
- Align the each alignment mark of rotors.
- Alignment mark should be front side.

Tightening torque	Charge pump case mounting screw	17.0 to 20.0 N·m 1.7 to 2.0 kgf·m 12.5 to 14.8 lbf·ft
-------------------	---------------------------------	---

- (1) Inner Rotor  
(2) Outer Rotor

- (3) Charge Pump Cover  
(4) Alignment Mark

W1044256



### **Charge Relief Valve, Check and High Pressure Relief Valve**

1. Remove the spring (5) and charge relief valve poppet (6).
2. Remove the hex. head socket plug (1) and remove the spring (2), check and high pressure valve assembly (3), (4).

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

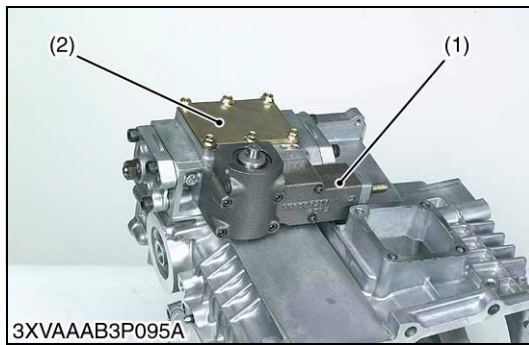
- Take care not to damage the O-ring on the plug.

Tightening torque	Hex. head socket plug	29.0 to 44.0 N·m 3.0 to 4.5 kgf·m 21.4 to 32.4 lbf·ft
-------------------	-----------------------	---

- (1) Hex. Head Socket Plug  
(2) Spring  
(3) Check and High Pressure Valve Assembly (Forward)

- (4) Check and High Pressure Valve Assembly (Reverse)  
(5) Spring  
(6) Charge Relief Valve Poppet

W1044586



### **Servo Regulator Assembly**

1. Remove the servo piston cover (2).
2. Remove the regulator mounting hex. head screw.
3. Remove the servo regulator assembly (1).

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

- Replace the gasket with new ones.
- Install the servo regulator assembly to the housing, align the feedback lever (3) of regulator and groove of servo piston.

#### **NOTE**

- **Do not disassemble the regulator assembly, since it has been factory-adjusted.**

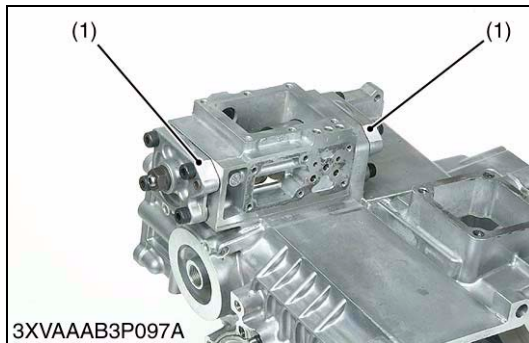
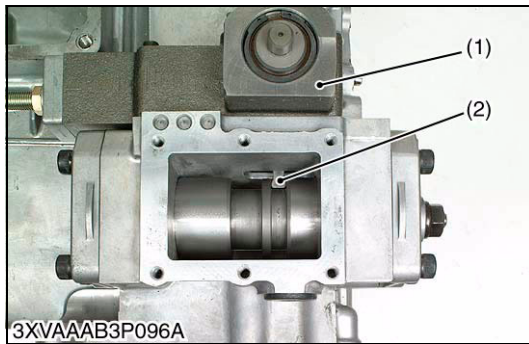
Tightening torque	Regulator mounting hex. head screw	5.2 to 6.3 N·m 0.53 to 0.64 kgf·m 3.8 to 4.6 lbf·ft
-------------------	------------------------------------	---

(1) Servo Regulator Assembly

(3) Feedback Lever

(2) Servo Piston Cover

W1044930



### **Servo Piston Assembly**

1. Remove the servo piston assembly mounting hex. head screw.
2. Pull out the servo piston assembly (2) slightly by the hand.

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

- Replace the gasket with new one.

#### **NOTE**

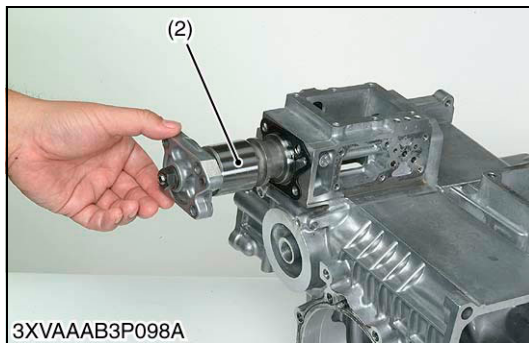
- **Take care not to do damage the surface of servo piston.**
- **Do not disassemble the servo piston assembly, if there is no problem.**

Tightening torque	Servo piston and cover mounting hex. head screw	17.0 to 20.0 N·m 1.7 to 2.0 kgf·m 12.5 to 14.8 lbf·ft
-------------------	---	---

(1) Servo Piston Cover

(2) Servo Piston Assembly

W1045464



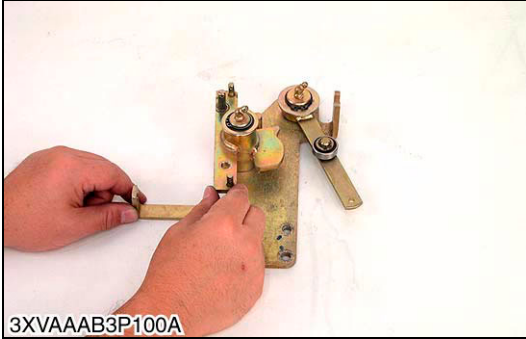
## 6. SERVICING



### Cable

1. Check that the cable move smoothly within the cable outer.
2. If the cable movement is not smooth, if the cable is frayed, or if the cable outer is kinked, replace the cable.

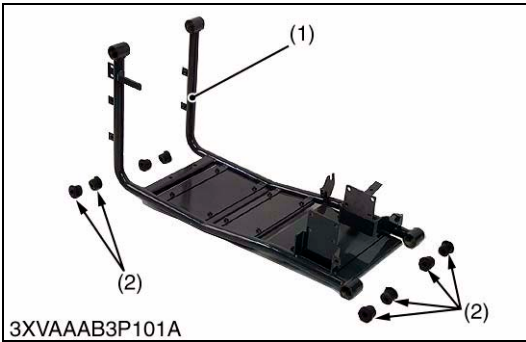
W1045918



### HST Neutral Linkage

1. Check that the linkage move smoothly.
2. If the linkage movement is not smooth, if the inside bearing worned, replace the bearing.

W1046035



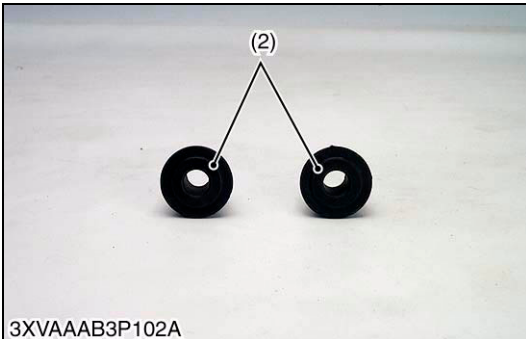
### Mission Frame and Rubber Bush

1. Visually check the mission frame (1) and rubber bushes (2).
2. If the hole is miss hopen, discolored, hardened or been otherwise damaged, replace the rubber bush.

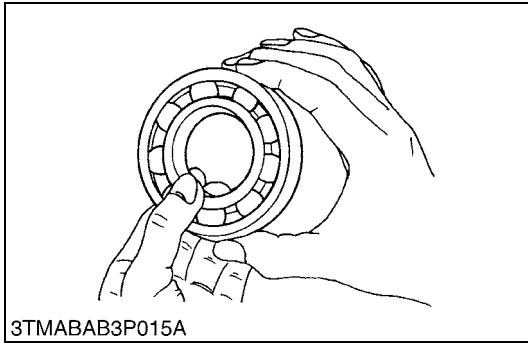
(1) Mission Frame

(2) Rubber Bush

W1046145







### **Checking Bearing**

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

W1046357



### **Checking Gear**

1. Visually check the tooth of gear which comes in contact.
2. If there is any doubt as to the condition of gears, replace it.

W1046499



### **6T Spiral Bevel Pinion Shaft, Gear and Needle Bearing**

1. Remove the 33T gear by using the gear puller.
2. Check the needle bearing for abrasion, color change or other damage.
3. If there is any doubt as to the condition of a needle bearing, replace it.
4. Check both the shaft and the gear surface of the bearing contact point for abrasion, color change or other damage.
5. If there are any doubt as to the condition of shaft and gear.

W1046658





3XVAAAB3P106A

### **Taper Roller Bearing**

1. Check the bearing for abrasion, color change or other damage.
2. If there is any doubt as to the condition of a taper roller bearing, replace it.

W1046874



3XVAAAB3P107A

### **12T-14T Gear Shaft, Gear and Needle Bearing**

1. Remove the bearing.
2. Check the needle bearing for abrasion, color, change or other damage.
3. If there is any doubt as to the condition of a needle bearing, replace it.
4. Check both the shaft and the gear surface of the bearing contact point for abrasion, color change or other damage.
5. If there are any doubt as to the condition of shaft and gear.

W1047021



3XVAAAB3P108A

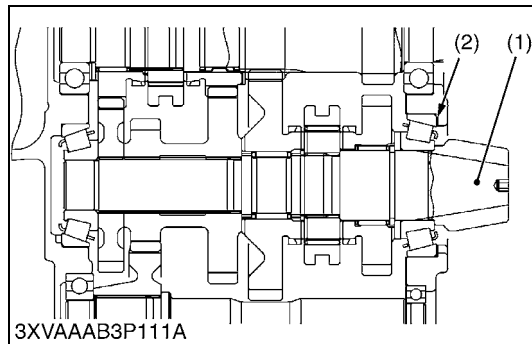
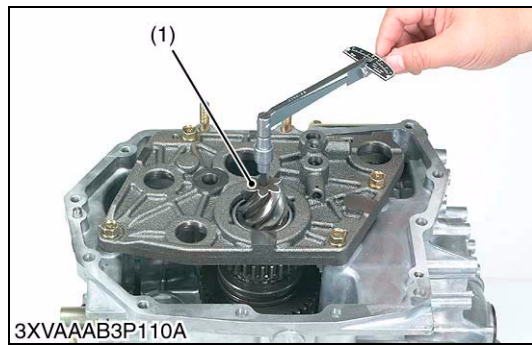
### **Back Idle Gear, Shaft and Needle Bearing**

1. Check the needle bearing for abrasion, color change, or other damage.
2. If there is any doubt as to the condition of a needle bearing, replace it.
3. Check both the shaft and gear bearing surface.

W1047371



3XVAAAB3P109A



### 6T Spiral Bevel Pinion Shaft Turning Torque

#### NOTE

- It is necessary to adjust the pinion gear shaft turning torque, when replacing the 6T spiral bevel pinion shaft, taper roller bearing or other relative parts.

- Assemble the 6T spiral bevel pinion shaft (1) to front case. At this time, install the same shim (2) to bearing holder side.
- Tighten the bearing holder mounting screws to specified torque.
- Check the turning torque by using the allen socket with torque wrench.
- Add or reduce the thickness of shim (2) to make the specified turning torque.

6T spiral bevel pinion shaft turning torque	Factory spec.	0.98 to 1.27 N·m 10.0 to 13.0 kgf/cm <sup>2</sup> 0.72 to 0.94 lbf-ft
---	---------------	---

#### (Reference)

Thickness of shim	Factory spec.	0.6 mm 0.0024 in.
-------------------	---------------	----------------------

- Thickness of shims : 0.1 mm (0.0039 in.), 0.2 mm (0.0079 in.)  
0.3 mm (0.0118 in.), 0.5 mm (0.0197 in.)

(1) 6T Spiral Bevel Pinion Shaft

(2) Shim

W1047523

### Backlash between Differential Pinion and Differential Side Gear

- Secure the differential case with a vise.
- Put the solder (0.5 mm (0.020 in.) thickness) on the position where the tooth of the differential side gear.
- Temporarily install the propeller shaft assembly and rotate the propeller shaft carefully.
- Measure the backlash by thickness of the point where solder is the thinnest.
- If the backlash exceeds the allowable limit, adjust with differential side gear shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.0118 in.
---	---------------	---

#### (Reference)

- Thickness of shims :  
1.5 mm (0.0591 in.), 1.6 mm (0.0630 in.), 1.7 mm (0.0669 in.)

W1048237



3TAAAADKP072A

### **Clearance between Differential Case and Differential Side Gear**

1. Measure the differential side gear boss O.D. with an outside micrometer.
2. Measure the differential case 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 side gear	Factory spec.	0.050 to 0.151 mm 0.0020 to 0.0059 in.
	Allowable limit	0.30 mm 0.0118 in.

Differential case I.D.	Factory spec.	38.000 to 38.062 mm 1.4961 to 1.4985 in.
Differential side gear O.D.	Factory spec.	37.911 to 37.950 mm 1.4926 to 1.4941 in.

W1048599

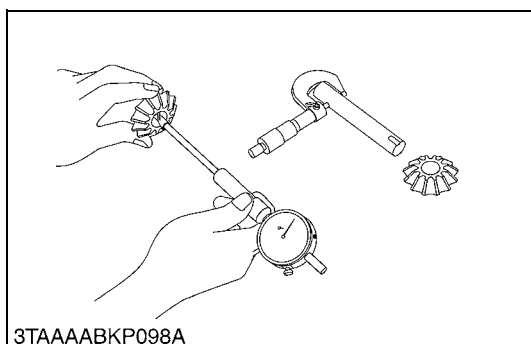
### **Clearance between Differential Pinion Shaft and Differential Pinion**

1. Measure the differential pinion shaft O.D. with an outside micrometer.
2. Measure the differential pinion I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace faulty parts.

Clearance between differential pinion shaft and differential pinion	Factory spec.	0.080 to 0.122 mm 0.0031 to 0.0048 in.
	Allowable limit	0.30 mm 0.0118 in.

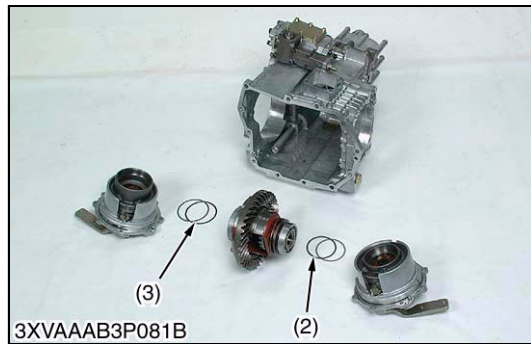
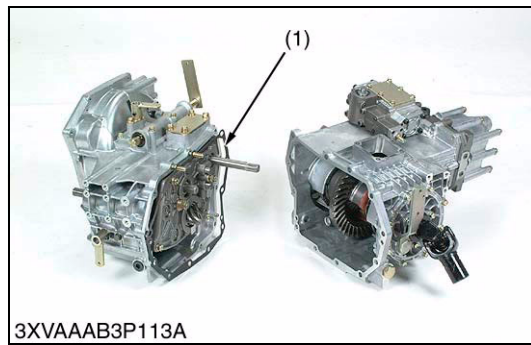
Differential pinion I.D.	Factory spec.	20.060 to 20.081 mm 0.7898 to 0.7906 in.
Differential pinion shaft O.D.	Factory spec.	19.959 to 19.980 mm 0.7858 to 0.7866 in.

W1048850



3TAAAABKP098A





### **Tooth Contact between 6T Spiral Bevel Pinion Shaft and 37T Spiral Bevel Gear**

#### **(When checking)**

- Use the transmission gasket (1) of the same thickness as the origin first.
  - Use same number of shims as before disassembling.
1. Apply red lead (or prussian blue) lightly on the teeth of spiral bevel pinion shaft.
  2. Reassemble the front case and transmission case.  
In this time, set the differential lock shifter to lock position.
  3. Tighten the transmission case mounting screw and nut to specified torque.
  4. Temporarily install the propeller shaft assembly and make the propeller shaft back and forth by 2 to 3 rotations.
  5. Check the tooth contact, if not proper, adjust according to the instructions below.

#### **(Reference)**

Thickness of gasket (1)	Factory spec.	0.5 mm 0.020 in.
Thickness of shim (LH)	Factory spec.	0.7 or 0.8 mm 0.028 or 0.031 in.
Thickness of shim (RH)	Factory spec.	0.7 or 0.8 mm 0.028 or 0.031 in.

- Thickness of gasket  
0.3 mm (0.012 in.), 0.5 mm (0.020 in.), 0.8 mm (0.031 in.)  
1.0 mm (0.039 in.)
- Thickness of shims (2) (LH)  
0.1 mm (0.004 in.), 0.2 mm (0.008 in.), 0.3 mm (0.012 in.)  
0.5 mm (0.020 in.)
- Thickness of shims (3) (RH)  
0.1 mm (0.004 in.), 0.2 mm (0.008 in.), 0.3 mm (0.012 in.)  
0.4 mm (0.016 in.), 0.5 mm (0.020 in.), 0.6 mm (0.024 in.)  
0.7 mm (0.028 in.)

(1) Gasket

W1049115

More than 35 % red lead contact area on the gear tooth surface.  
The center of tooth contact at 1/3 of the entire width from the small end.

#### **(A) Proper Contact**

W1050025

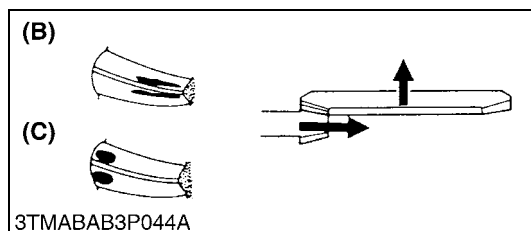
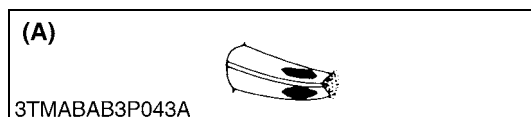
Replace the transmission gasket (1) with thinner one to move the spiral bevel pinion shaft backward.

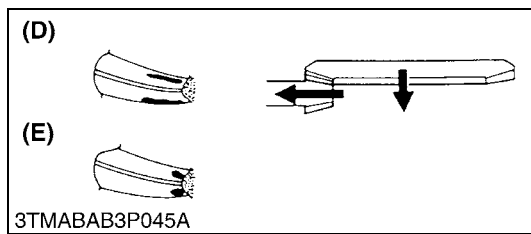
For move the spiral bevel gear rightward, reduce right side shim (2) and add shim (3) of the same thickness as the right side to left side.

#### **(B) Shallow Contact**

#### **(C) Heel Contact**

W1050157





Replace the transmission gasket (1) with a thicker one to move the spiral bevel pinion shaft forward.

For move the spiral bevel gear leftward, reduce left side shim (3) and add shim (2) of the same thickness as the left side to right side.

Repeat above until the proper tooth contact and backlash are achieved.

(D) Deep Contact

(E) Toe Contact

W1050289



### **Backlash between 6T Spiral Bevel Pinion Shaft and 37T Spiral Bevel Gear**

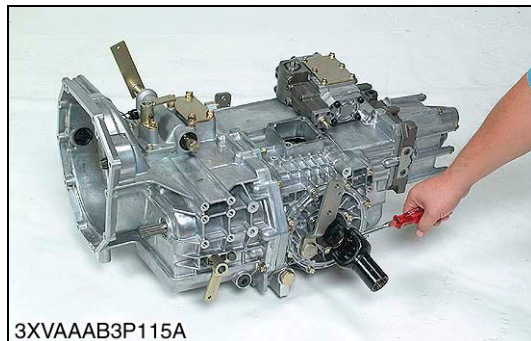
1. Put the solder (0.5 mm (0.020 in.) thickness) (1) on the position where the tooth proper contact of spiral bevel pinon shaft.
2. Reassemble the front case and transmission case. In this time, set the differential lock shiftier to lock position.
3. Temporarily install the propeller shaft assembly and rotate the propeller shaft carefully.
4. Separate the front case and transmission case, again.
5. Measure the backlash by thickness of the point where solder is the thinnest.
6. When the backlash is too large, decrease the number of shims (LH) in the side of the spiral bevel gear, and insert the shim (RH) of the same thickness as the removed ones to the opposite side.
7. When the backlash is too small, do the opposite way to increase backlash.

Adjust the backlash properly by repeating the above procedure.

Backlash between spiral bevel pinion shaft and spiral bevel gear	Factory spec.	0.2 to 0.4 mm 0.0079 to 0.0157 in.
--	---------------	---------------------------------------

(1) Solder

W1050443



### **Piston, Springs and Stopper Rod**

1. Check the springs (3) for breakage and wear.
2. Check the piston (1) for free movement in the piston case (4).
3. Check the stopper rod (2) for vend and wear.

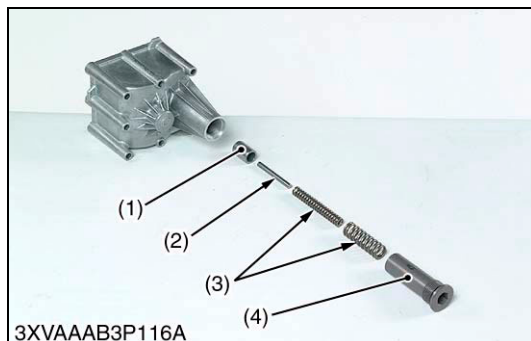
(1) Piston

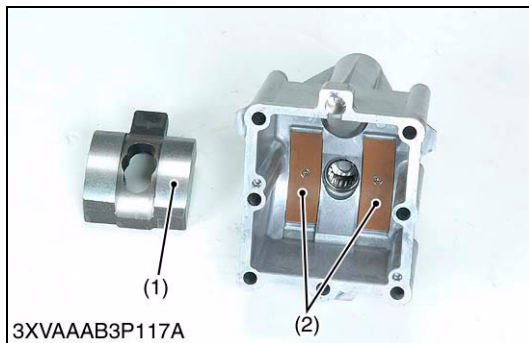
(3) Spring

(2) Stopper Rod

(4) Piston Case

W1050984





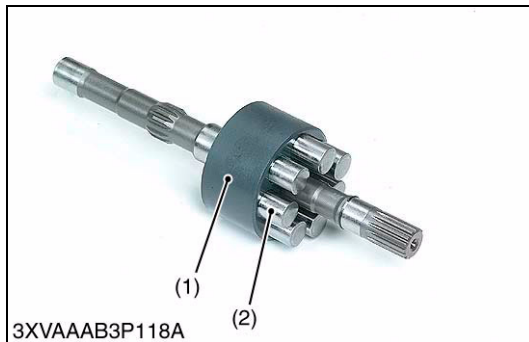
### **Swashplate and Cradle Bearing**

1. Check the surface of swashplate (1) and cradle bearings (2) for scratches and excessive wear.
2. If worn or scored, replace them.

(1) Swashplate

(2) Cradle Bearing

W1051512



### **Cylinder Block Bore and Pistons**

1. Check the pistons (2) for their free movement in the cylinder block (1) bores.
2. If the piston or the cylinder block bore is scored, replace cylinder block assembly.

#### **■ IMPORTANT**

- Do not interchange pistons (2) between pump and motor cylinder block (1).

(1) Cylinder Block

(2) Piston

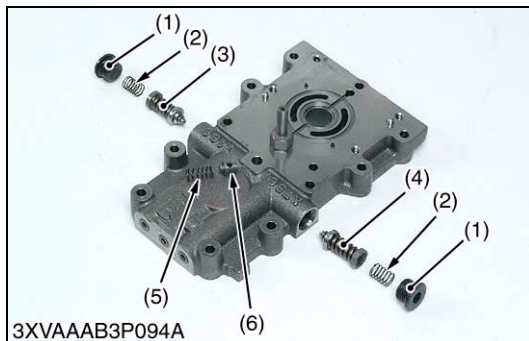
W1051737



### **Pump Shaft, Motor Shaft and Bearings**

1. Check bearings for abrasion, color change, or other damage.
2. If there is any doubt as to the condition of a bearing, replace it.
3. Check the shaft surface for abrasion, color change or other damage.
4. If there is any doubt as to the condition of shaft, replace it.

W1051977



### **Charge Relief Valve, Check and High Charge Pressure Relief Valve**

1. Check the spring (2) and charge relief valve poppet for scratches, breakage and damage.
2. If anything unusual, replace.
3. Check the valve plug (1) and check and high pressure relief valve for scratches and damage.
4. Check the valve seat in the port block cover for damage.
5. Check the spring (2) for breakage and wear.
6. If anything unusual, replace the check and high pressure relief valve assembly (3), (4).

(1) Valve Plug

(2) Spring

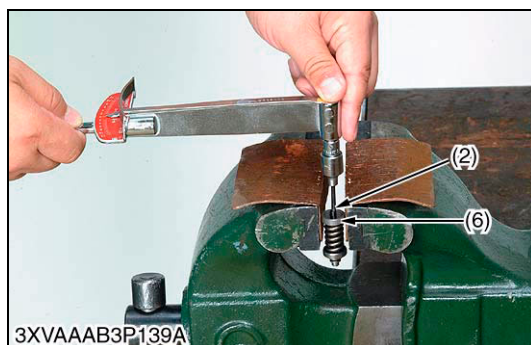
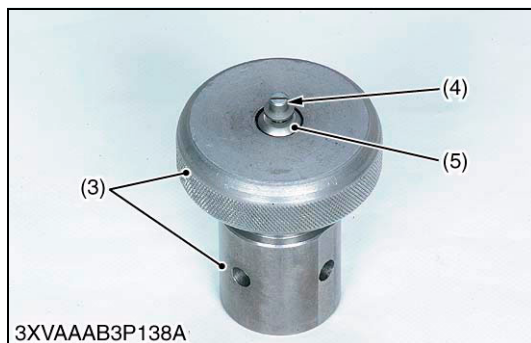
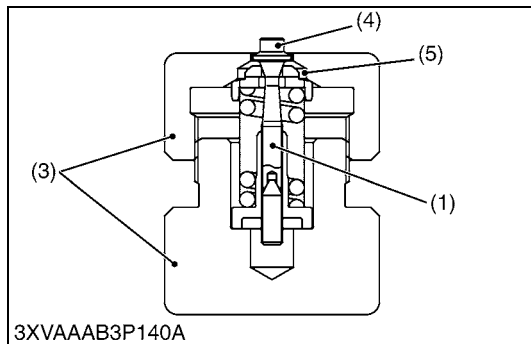
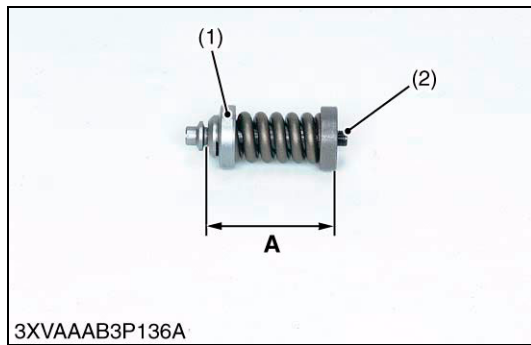
(3) Check and High Pressure Relief Valve Assembly (Forward)

(4) Check and High Pressure Relief Valve Assembly (Reverse)

(5) Spring

(6) Charge Relief Valve Poppet

W1052228



### 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 the exhaust 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 25.5 to 26.5 MPa (260 to 270 kgf/cm<sup>2</sup>, 3698 to 3840 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 22.6 to 26.5 MPa (230 to 270 kgf/cm<sup>2</sup>, 3271 to 3840 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-S7 and 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<sup>2</sup>, 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
-------------------	------------------------	---

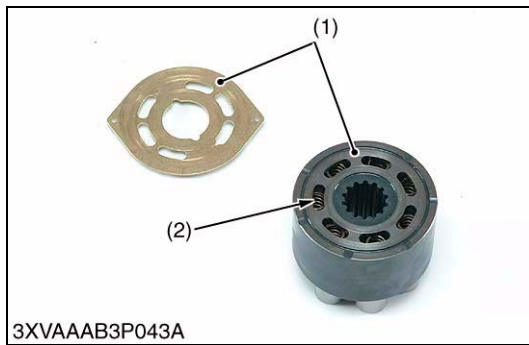
Relief valve readjusting pressure	22.6 to 26.5 N·m 230 to 270 kgf/cm <sup>2</sup> 3271 to 3840 lbf·ft
-----------------------------------	---

Distance <b>A</b>	Reference value	38.60 to 38.70 mm 1.5197 to 1.5236 in.
-------------------	-----------------	---

- |                                  |                |
|----------------------------------|----------------|
| (1) Relief Valve Assembly        | (4) Poppet     |
| (2) Hexagon Socket Head Screw    | (5) Valve Seat |
| (3) Relief Valve Assembling Tool | (6) Setscrew   |

W1052614





### **Cylinder Block Face and Valve Plate**

1. Check the polished face (1) of cylinder block for scoring.
2. If scored, replace cylinder block assembly.
3. Check the spring (2) for breakage.
4. If broken, replace cylinder block assembly.
5. Check the valve plate 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.

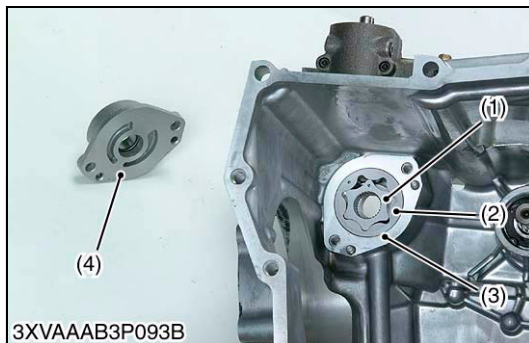
#### **■ NOTE**

- **After checking, coat them with transmission oil.**
- **Valve plates are not interchangeable.**

(1) Polished Face

(2) Spring

W1053757



### **Charge Pump**

1. Check the charge pump housing (transmission case) (3), pump cover (4) and the rotor (1), (2) for scratches and wear.
2. If scratch or worn, replace the charge pump complete assembly.

(1) Inner Rotor  
(2) Outer Rotor

(3) Pump Housing  
(Transmission Case)  
(4) Pump Cover

W1054239

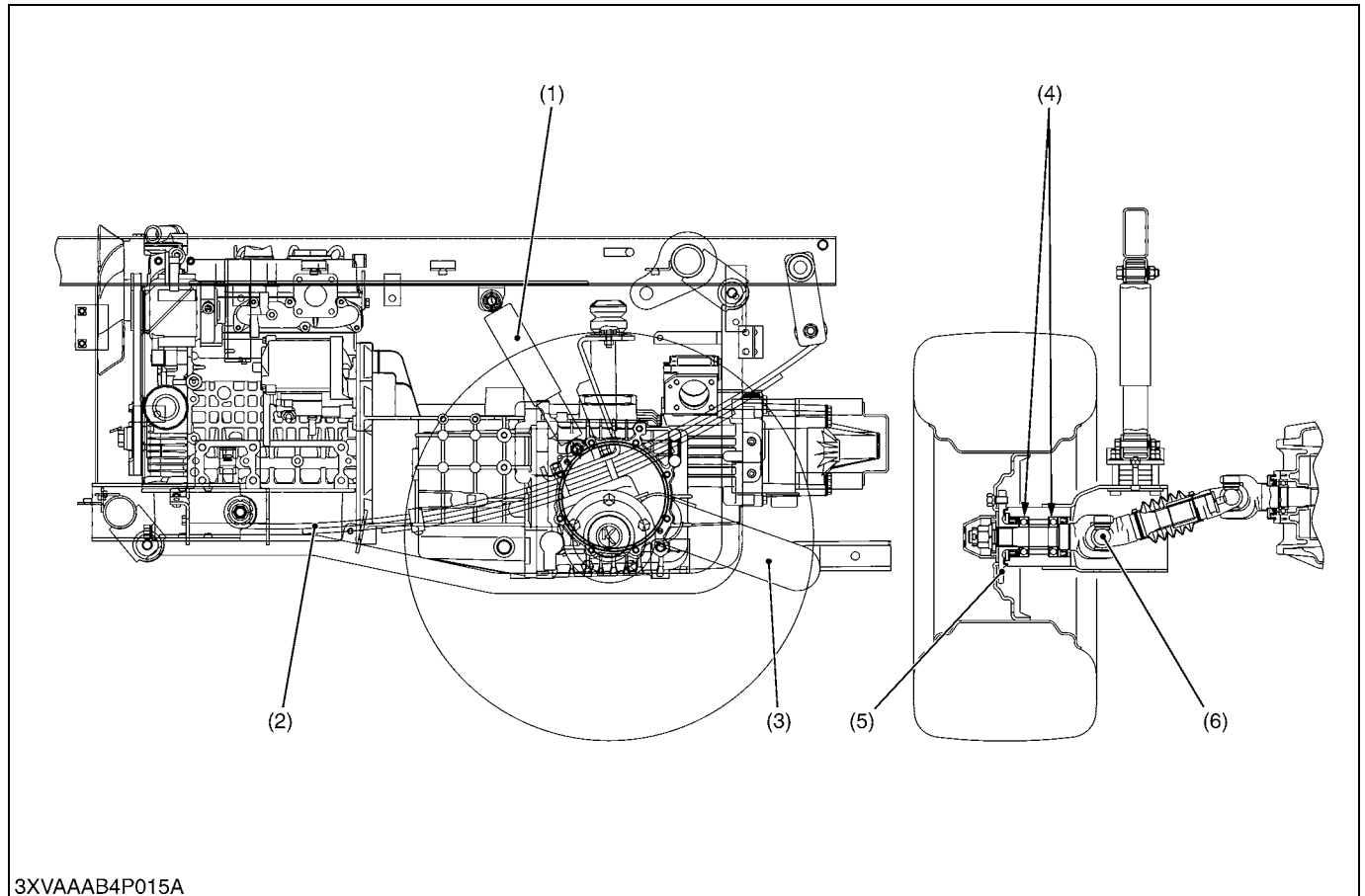
# **3 REAR AXLE**

# MECHANISM

## CONTENTS

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

# 1. STRUCTURE



(1) Shock Absorber  
(2) Leaf Spring

(3) Rear Axle Bracket  
(4) Ball Bearing

(5) Rear Axle

(6) Propeller Shaft

The leaf spring (2) type is adopted for rear suspension.

And the shock absorber (1) is a design to consider riding comfort etc. by using the type which uses the gas together with oil.

After the final reduction, power is transmitted to a rear axle (5) through the propeller shaft (6).



# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	3-S1
2. TIGHTENING TORQUES .....	3-S2
3. CHECKING, DISASSEMBLING AND SERVICING.....	3-S3
[1] DISASSEMBLING AND ASSEMBLING.....	3-S3
[2] SERVICING .....	3-S6

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Noise when Start	Universal joint bearing worn (propeller shaft)	Replace	3-S5
Noise while Forward and Reverse	Universal joint bearing worn (propeller shaft)	Replace	3-S5
Noise	Bearings damaged or broken	Replace	3-S5

W1013526

## 2. TIGHTENING TORQUES

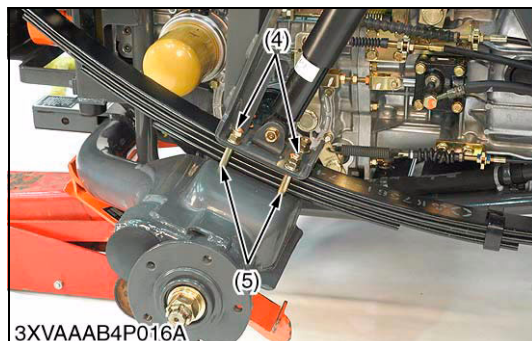
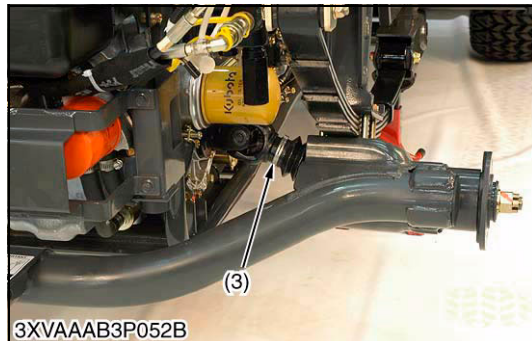
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting screw	75.0 to 90.2	7.6 to 9.2	55.3 to 66.5
Leaf spring mounting bolt and nut	48.0 to 56.0	4.9 to 5.7	35.4 to 41.3
Propeller shaft slotted nut	150	15.3	110.6
Spring reamer bolt and nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.1
Leaf spring reamer bolt and nut	29.4 to 49.0	3.0 to 5.0	21.7 to 36.1
Shock absorber mounting bolt and nut (M10)	48.0 to 56.0	4.9 to 5.7	35.4 to 41.3
Shock absorber mounting bolt and nut (M12)	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5

W1012736

### 3. CHECKING, DISASSEMBLING AND SERVICING

#### [1] DISASSEMBLING AND ASSEMBLING



#### Rear Wheel and Rear Axle Bracket

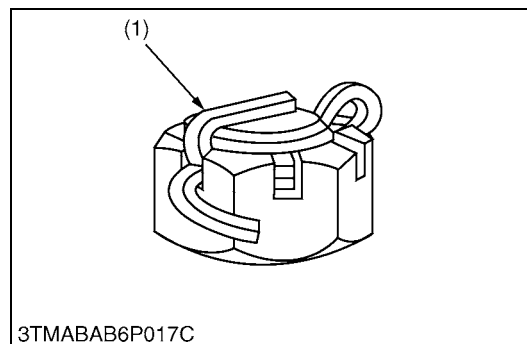
1. Remove the cargo bed.
2. Remove the cotter pin (1) and loosen the propeller shaft slotted nut (2).
3. Remove the boot band (3) on both sides.
4. Remove the rear wheels.
5. Place the stand under the both sides of frame and lift up the frame by hoist.
6. Loosen the lock nut of rear axle bracket mounting nut.
7. Remove the rear leaf spring mounting bolt (5) and nut (4), and then remove the rear leaf axle bracket assembly (6) by use the axle support (7).

#### (When reassembling)

- Align the master spline of propeller shaft and rear axle shaft.
- Replace the boot band with new ones.
- After tightening the propeller shaft slotted nut to specified torques, install a cotter pin as shown in the figure left.

#### NOTE

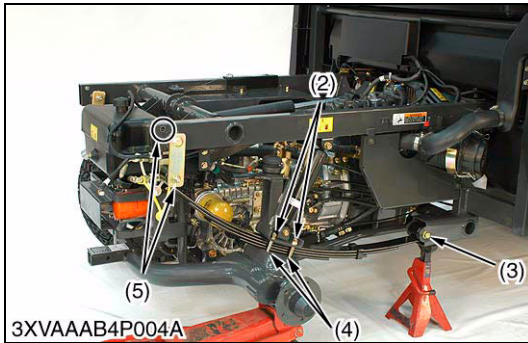
- Tighten the slotted nut to 150 N·m (15.3 Kgf·m, 110.6 lbf·ft). If the slot and pin hole do not meet, tighten the nut until they do meet, and install cotter pin.



Tightening torque	Leaf spring mounting bolt and nut	48.0 to 56.0 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 lbf·ft
	Rear wheel mounting screw	75.0 to 90.2 N·m 7.6 to 9.2 kgf·m 55.3 to 66.5 lbf·ft
	Propeller shaft slotted nut	150 N·m 15.3 kgf·m 110.6 lbf·ft

- |                              |                                |
|------------------------------|--------------------------------|
| (1) Cotter Pin               | (5) Leaf Spring Mounting Nut   |
| (2) Slotted Nut              | (6) Rear Axle Bracket Assembly |
| (3) Boot Band                | (7) Axle Support               |
| (4) Leaf Spring Mounting Nut |                                |

W1012558



### Leaf Spring

1. Place the stand under the frame.
2. Remove the rear wheel (1) and support the rear axle bracket with jack.
3. Loosen the lock nut of rear axle bracket mounting nut.
4. Remove the leaf spring mounting bolt (4) and nut (2).
5. Remove the spring reamer bolt and nut (3).
6. Remove the leaf spring rod and nut (5), and then remove the leaf spring.

#### (When reassembling)

- Tighten the leaf spring rod bolt and nut, spring reamer bolt and nut with specified torque after setting up the wheel and unloading the machine on ground.

Tightening torque	Leaf spring mounting bolt and nut	48.0 to 56.0 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 lbf·ft
	Spring reamer bolt and nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.1 lbf·ft
	Leaf spring rod and nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.1 lbf·ft

- (1) Leaf Spring (4) Leaf Spring Mounting Bolt  
(2) Lock Nut (5) Leaf Spring Rod and Nut  
(3) Spring Reamer Bolt and Nut

W1014288



### Spring Rubber Bush

1. Remove the spring rubber bushes.

#### (When reassembling)

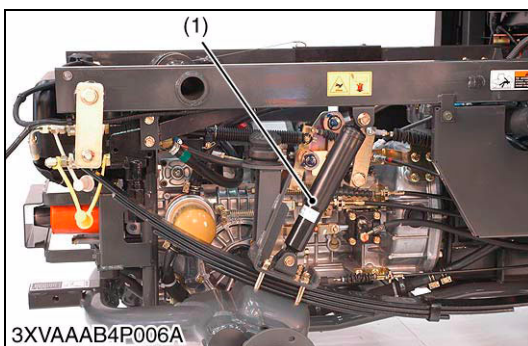
- When installing the bush in the mounts of the leaf spring, lubricate them with a soapy water.



#### CAUTION

- Do not use engine oil or petroleum distillates to lubricate the bushes because they will deteriorate the rubber.

W1014921



### Rear Shock Absorber

1. Remove the shock absorber (1).

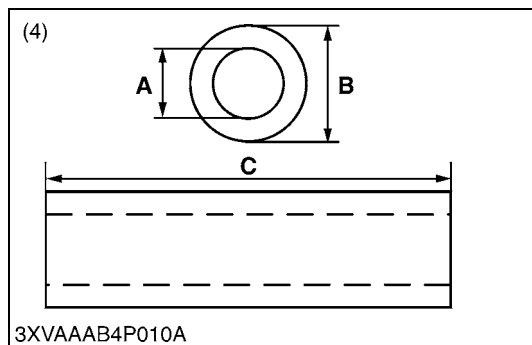
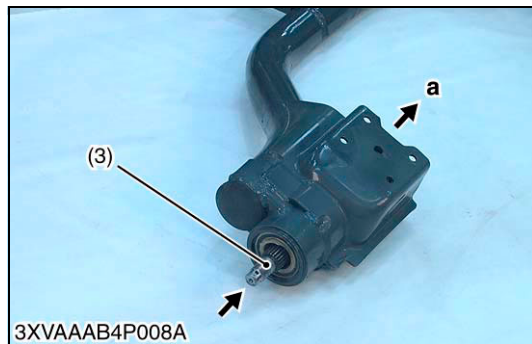
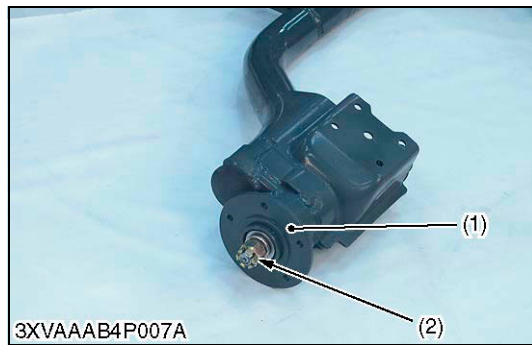
#### (When reassembling)

- Tighten the shock absorber mounting bolt and nut with specified torque after setting up the wheel and unloading the machine on ground.

Tightening torque	Shock absorber mounting bolt and nut (upper)	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft
	Shock absorber mounting bolt and nut (lower)	48.0 to 56.0 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 lbf·ft

- (1) Shock Absorber

W1015108



### Rear Axle and Propeller Shaft

1. Remove the slotted nut (2) and draw out the rear axle (1).
2. Tap the outside of the propeller shaft (3) and remove the propeller shaft to the inside (a).

#### (When reassembling)

- Prepare the pipe (4) of the same diameter as bearing inner, and tap it while keeping the bearing when you tap the propeller shaft.
- Moreover, there is no problem if the bearing is inserted in the position in which a rear axle can be tightened.
- After that, the bearing and the collar can be fixed to a correct position by tightening the propeller shaft slotted nut.
- Apply grease to splines of propeller shaft.

(4) Pipe Dimension	
A	31 mm (1.22 in.)
B	51 mm (2.0 in.)
C	178 mm (7.0 in.)

- (1) Rear Axle  
 (2) Slotted Nut  
 (3) Propeller Shaft  
 (4) Pipe

a : Inside

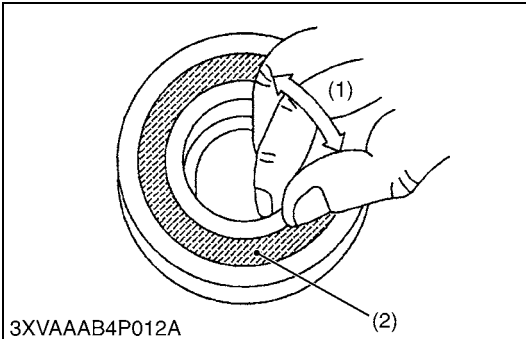
W1013563



## [2] SERVICING



3XVAAAB4P011A



3XVAAAB4P012A



3XVAAAB4P013A



3XVAAAB4P014A

### Checking Oil Seal

1. Visually check the oil seal.
2. If the lips are misshapen, discolored, hardened, or been otherwise damaged, replace it.

W1015374

### Checking Bearing

1. Check the bearing seal for tears or leakage.
2. If the seal is torn or leaking, replace the bearing.
3. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
4. If there is any defect, replace it.

(1) Spin

(2) Bearing Seal

W1015474

### Checking Propeller Shaft and Rear Axle

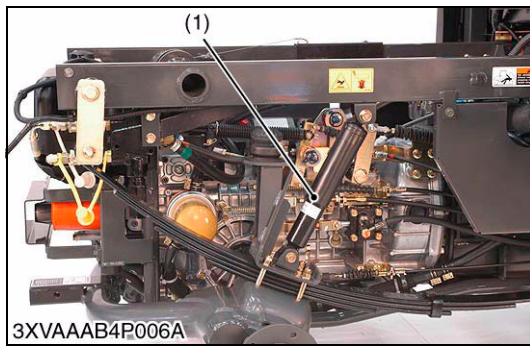
1. Visually check the splines of the propeller shaft and rear axle.
2. If they are twisted, badly worn, or chipped, replace the propeller shaft and / or rear axle with a new one.
3. Check that the universal joint works smoothly without rattling or sticking.
4. If it does not, the bearings of the joint are damaged. Replace the propeller shaft with a new one.

W1015699

### Checking Rubber Bush

1. Visually check the rubber bush.
2. If they are worn, cracked, hardened or been otherwise damaged, replace them with new ones.

W1015858

**Checking Shock Absorber**

1. Visually check the shock absorber (1) for breaks or distortion.
2. If the shock absorber is damaged in any way, replace it.
3. Check for oil leakage at the shock absorber.
4. If oil leakage is noted, replace it.
5. Push, shorten the shock absorber, and check whether to return in former state.
6. Replace the shock absorber for the new one if it does not return to former state.
7. Visually check the rubber bush in the upper and lower mountings of the rear shock absorber.
8. If they are worn, cracked, hardened, or otherwise damaged, replace them with new one.

(1) Shock Absorber

W1015964



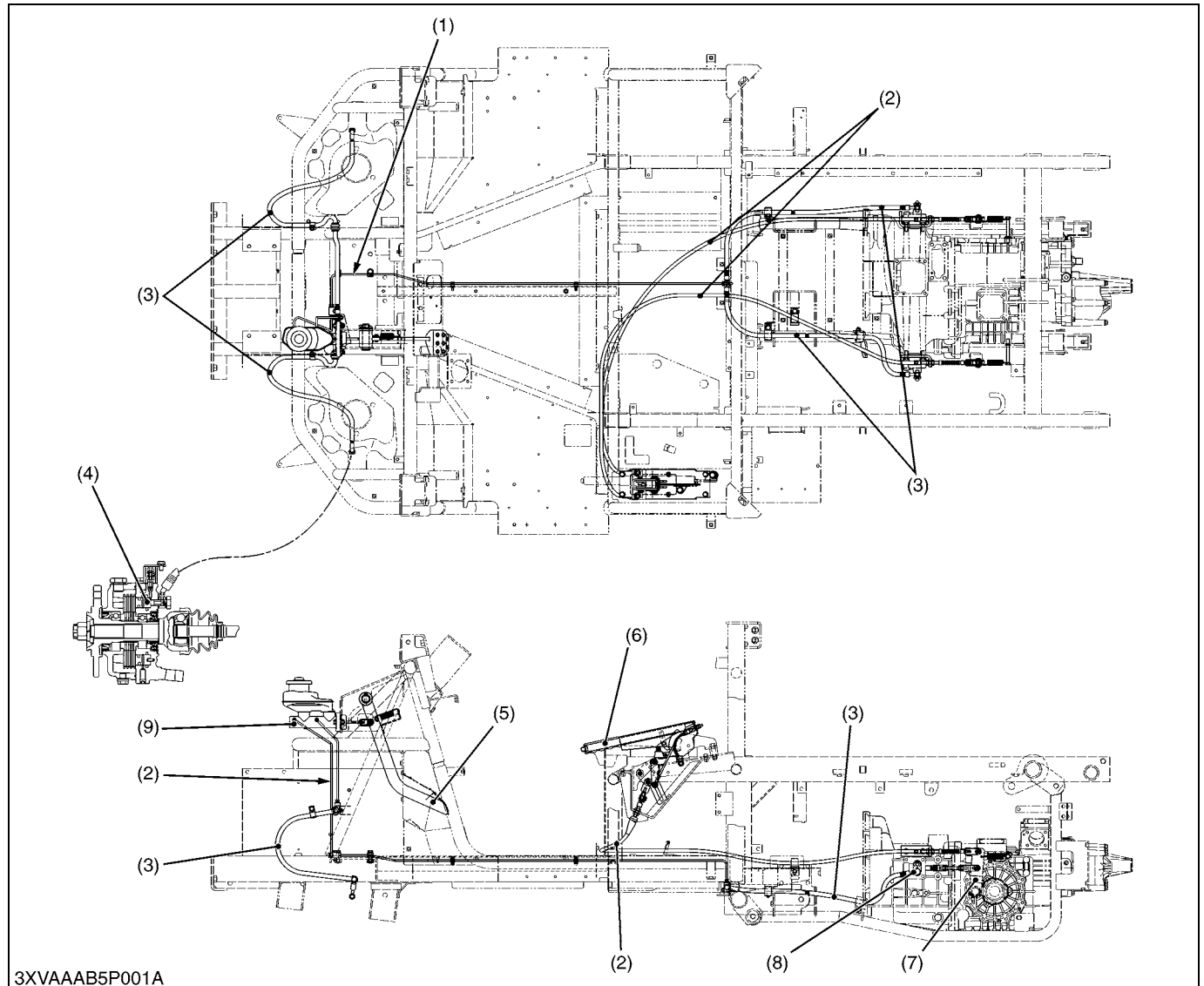
# **4 BRAKES**

# MECHANISM

## CONTENTS

1. GENERAL OUTLINE .....	4-M1
2. KNUCKLE (FRONT BRAKE) .....	4-M2
3. REAR BRAKE .....	4-M3
4. MASTER CYLINDER .....	4-M4
5. BRAKE OIL .....	4-M5
6. PARKING BRAKE .....	4-M6

# 1. GENERAL OUTLINE



- (1) Brake Pipe
- (2) Parking Brake Cable
- (3) Brake Hose

- (4) Brake Piston
- (5) Brake Pedal

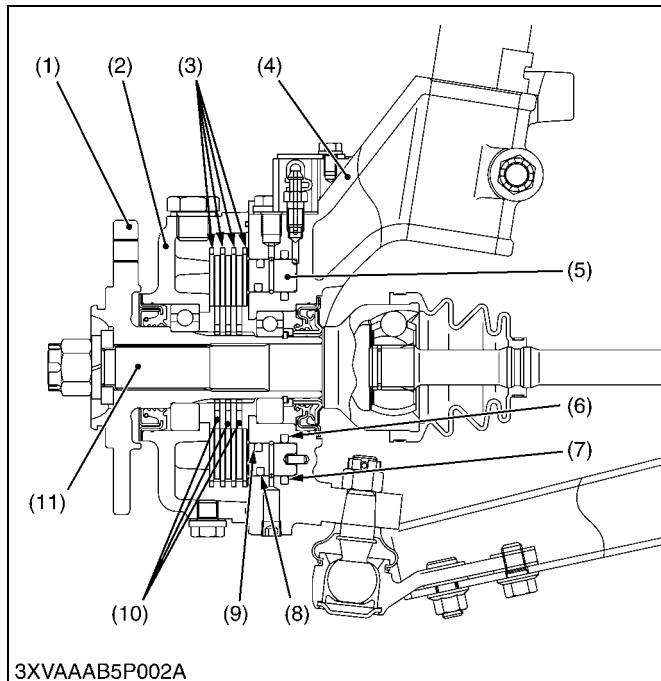
- (6) Parking Brake Lever
- (7) Brake Cam Lever

- (8) Brake Cylinder
- (9) Master Cylinder

Description of the brake system with an illustration with all its component parts in place.

All the four wheels are equipped with an enclosed, wet multi-disc type brake. The system consists of brake pedal (5), master cylinder (9), brake hose (3), brake pipe (1), brake cylinder(8), brake piston (4) and other parts.

## 2. KNUCKLE (FRONT BRAKE)



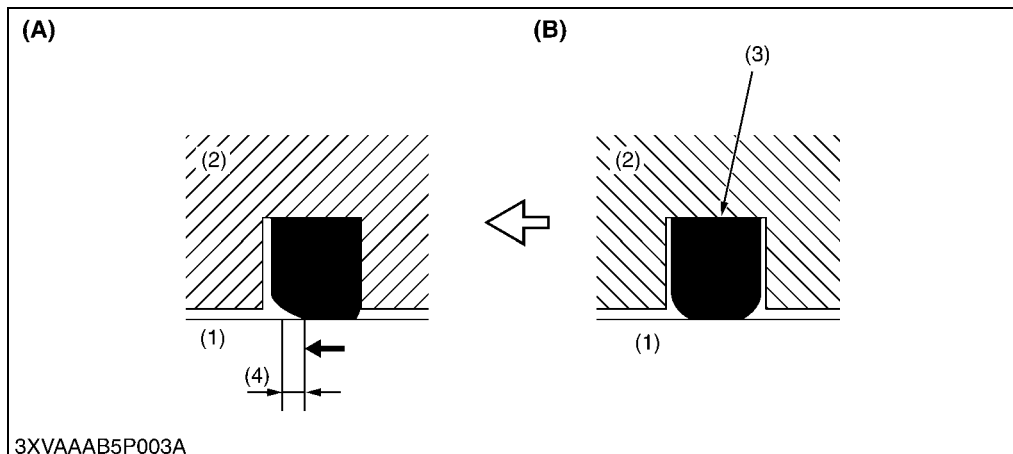
Basically, the brake body is similar to that of the mechanical wet disc brake. It is designed to brake when the brake disc (10) rotating together with the front axle (1) is pressed.

The knuckle (4) of the hydraulic brake serves as a master cylinder.

When brake oil pressure increases, the brake piston (5) is forced out and presses the brake discs against the knuckle cover (2), thereby causing braking. This brake uses three brake discs to obtain big braking force.

- |                   |                                   |
|-------------------|-----------------------------------|
| (1) Front Axle    | (7) Brake Seal 4                  |
| (2) Knuckle Cover | (8) Brake Seal 2                  |
| (3) Plate         | (9) Brake Seal 1                  |
| (4) Knuckle       | (10) Brake Disc                   |
| (5) Brake Piston  | (11) Constant Velocity (CV) Joint |
| (6) Brake Seal 3  |                                   |

W1012853



- |                          |
|--------------------------|
| (1) Knuckle              |
| (2) Brake Piston         |
| (3) Brake Seal           |
| (4) Piston Return Stroke |

**(A) When brake pedal is pressed**

**(B) When brake pedal is released**

W1013209

### ■ Automatic Brake Adjustment.

With a mechanical brake system, when the brake pedal is released, the brake returns to its original position by spring tension and cam mechanism.

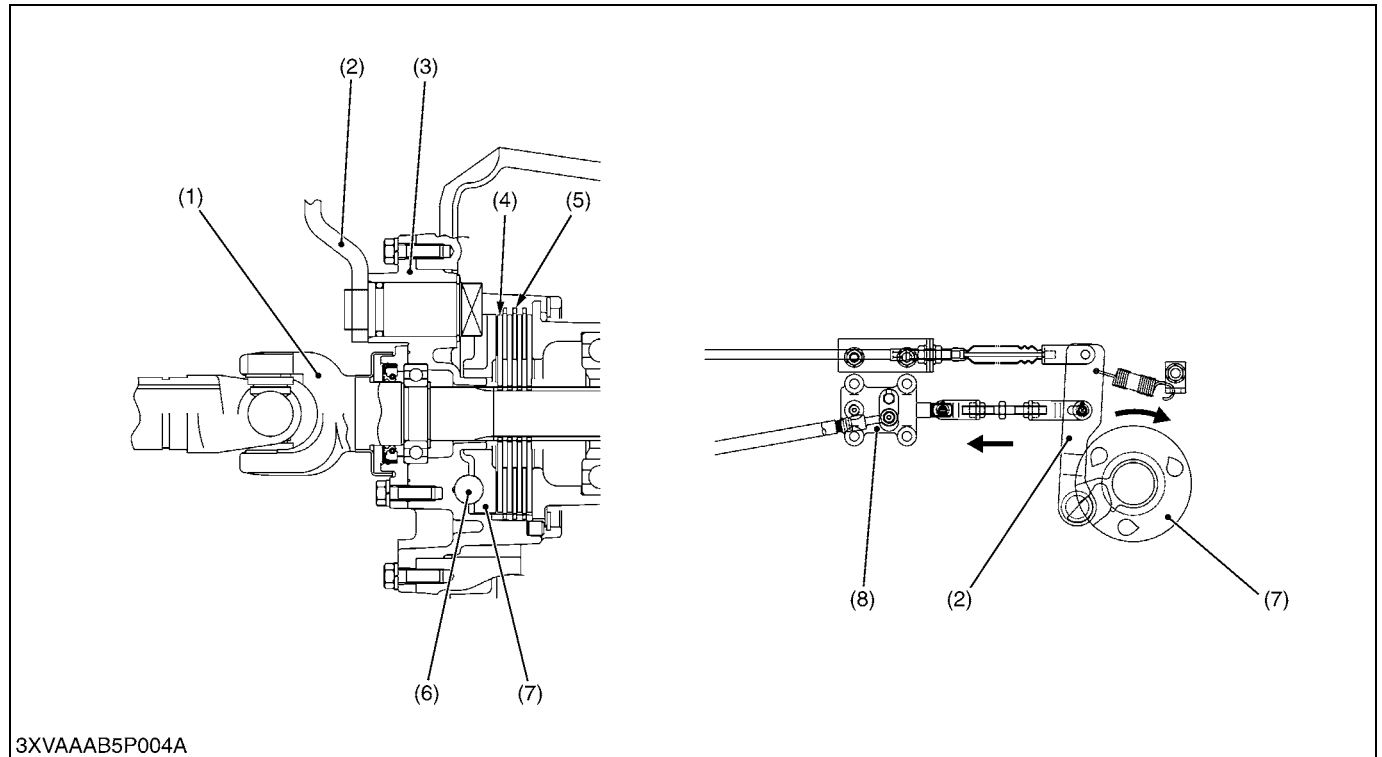
With a hydraulic brake system, the seal (3) serves to return the brake piston (2) to the original position (no braking force).

When the brake pedal is pressed, pressure in the knuckle case rises and the brake piston moves in the direction of arrow and causing the brake discs to press against the knuckle case. At this time, the brake seals are deformed in the knuckle case (1), and are subjected to elastic deformation as shown in the figure above.

When the brake pedal is released, pressure in the knuckle case reduces due to the brake seals reverting back to its original form. Together, a clearance is formed between the brake disc and brake piston to prevent the brake dragging.

Worn brake discs require longer brake piston movement. When the brake piston movement exceeds the elastic limit of brake seal, sliding occurs between the seals and the brake piston. With the brake seals deformed a clearance is automatically kept constant.

### 3. REAR BRAKE



(1) Brake Shaft (Propeller Shaft)

(2) Brake Cam Lever

(3) Differential Support Cover

(4) Friction Plate

(5) Brake Disc

(6) Steel Ball

(7) Cam Plate (Actuator)

(8) Brake Cylinder

The brake body is incorporated in the differential support cover (3) filled with transmission oil and is designed to brake when the brake disc (5) splined with the propeller shaft (1) is pressed against the cam plate (7) by means of the cam mechanism incorporating steel balls (6).

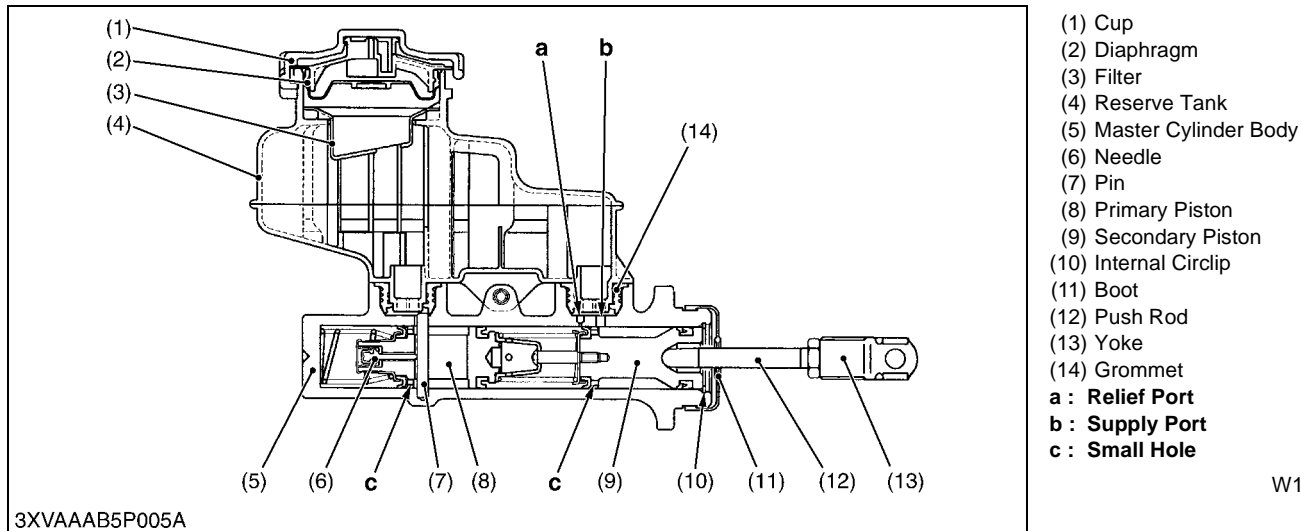
For greater braking force, four brake discs are provided at the right and left sides respectively, and the friction plate (4) fixed to the rear axle case is arranged between the brake discs.

#### ■ During Braking

When brake oil pressure increases, the brake cylinder (8) is shortened, the linkage causes the brake cam lever (2) to turn into the direction of arrow shown in the above figure.

Therefore, the cam plate (7) also moves the direction of arrow. At this time, since the cam plate rides on the steel balls (6) set in the grooves of the differential support cover (3) to press the brake disc (5), the propeller shaft (1) is braked by the frictional force generated by the cam plate and brake disc.

## 4. MASTER CYLINDER



W1013913

The master cylinder is intended to convert the brake pedal operating force to the fluid pressure. It is composed of the reservoir that contains the brake fluid and the cylinder proper that generates the fluid pressure. There are several different fluid pressure generating mechanisms. Kubota has picked up the tandem type cylinder out of them. Even if a pipe has got cracked and the front or rear set of wheels have failed to get braked, this mechanism can apply the brakes on the other set of wheels.

(This is to comply with the rules and regulations stipulating that two lines must be independently controlled.).

Step on the brake pedal, and the push rod (12) drives the piston (9) the primary cup blocks the relief port (a), and the path between the pressure chamber and reservoir is shut off. As the piston moves on, the brake fluid flows through the brake hose or pipe to the front wheel brake piston and the rear wheel brake cylinder, and the fluid pressure is then boosted.

Release the brake pedal, and the piston returns to its initial position under the force of the return spring. But the brake fluid in the front wheel brake piston and the rear wheel brake cylinder is delayed in flowing back, which puts the pressure chamber under negative pressure.

To get rid of the negative pressure, the brake fluid in the reservoir flows through the supply port (b), supply chamber and piston-end small hole (c), along the back of the primary cup, into the pressure chamber.

Now the brake fluid flows back from the front wheel brake piston and the rear wheel brake cylinder.

The brake fluid in the reservoir fluctuates in volume, but there is no pressure fluctuation thanks to the reservoir cap that has a small hole open to the atmosphere.

The tandem type master cylinder works like this. Step on the brake pedal, and the push rod (12) activates the primary piston (8) first (spring force different between front and back; front one weaker), raising its pressure. The primary piston gets balanced in pressure with the secondary one (9) (fluid pressure adjustment). Now the brakes are applied.

The relief port (a) (at the secondary piston side) absorbs temperature dependent volumetric changes in the brake fluid. This helps prevent fluid pressure buildup when unnecessary. If this port is clogged, the braking effect may drag on. (At the primary piston side, the clearance between the needle (6) and piston, as well as the one between the pin (7) and master cylinder body (5), serve as the relief port.)

## 5. BRAKE OIL

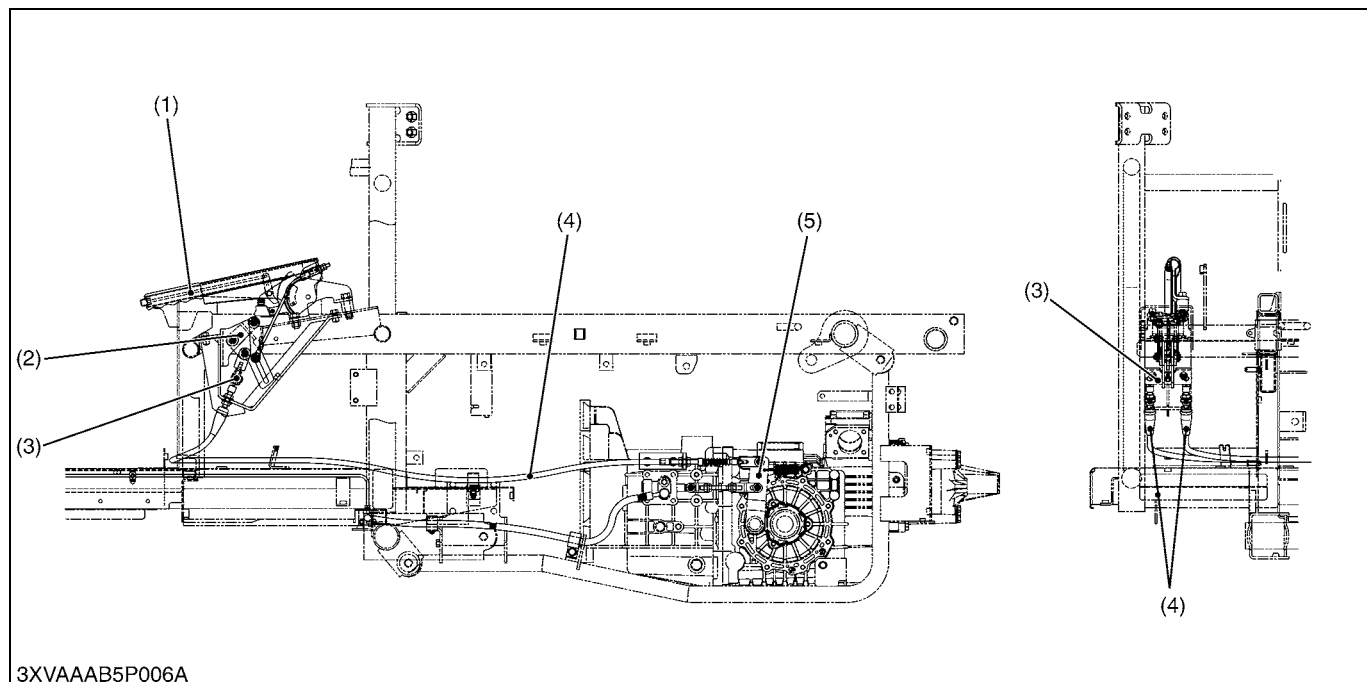
Non-mineral oil is used for the brake oil.

The brake oil for the machine is a brand of vegetable oil, that is basically the same as the DOT3 (FMVSS No. 116 Brake Fluid Standard) used on automobiles and motorcycles.

Keep in mind that the UDT oil used for Kubota tractors so far cannot be applied as the brake oil.

If a coated surface gets stained with the brake oil, the paint becomes degraded. Immediately wipe off the oil just in case. Also immediately wipe the oil off the power steering hose if any.

## 6. PARKING BRAKE



(1) Parking Brake Lever  
(2) Plate

(3) Mechanical Equalizer

(4) Parking Brake Cable

(5) Brake Cam Lever

The parking brake is mechanical type which is connected to the brake cam lever (5) by the parking brake cables (4). This parking brake is a mechanism that same brake discs as travelling brake is operated.

The parking brake consists basically of the following :

Brake cam lever, parking brake lever (1), mechanical equalizer (3) and right and left cables, etc.

Pull the parking brake lever, and the rear wheel brakes are applied and the rear axle comes to a halt. The mechanical equalizer (3) is installed to adjust the right-to-left balance of mechanical force and to achieve an equal force.



# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	4-S1
2. SERVICING SPECIFICATIONS .....	4-S2
3. TIGHTENING TORQUES .....	4-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	4-S4
[1] CHECKING AND ADJUSTING .....	4-S4
[2] DISASSEMBLING AND ASSEMBLING.....	4-S9
[3] SERVICING .....	4-S17

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Poor Braking Force</b>	Brake pedal play excessive	Adjust	4-S4
	Brake disc worn	Replace	4-S12, S16
	Brake fluid insufficient or improper	Replenish or change with specified oil	4-S5
	Brake fluid leakage from brake pipes, bleeder, master cylinder	Repair or replace	4-S14
	Master cylinder malfunctioning	Repair or replace	4-S14
<b>Uneven Braking Force</b>	Brake disc worn	Replace	4-S12, S16
	Brake fluid leakage from brake pipes, bleeder or master cylinder	Repair or replace	4-S14
	Master cylinder malfunctioning	Repair or replace	4-S14
<b>Brake Drags</b>	Brake pedal play too small	Adjust	4-S4
	Master cylinder return spring weaken or broken	Replace	4-S15
	Master cylinder malfunctioning	Repair or replace	4-S14
	Brake seal failure	Replace	4-S13
	Brake lines clogged	Clean	–
	Brake pedal return spring weaken or broken	Replace	–
	Brake fluid improper	Change with specified oil	4-S5
<b>Spongy Brake Pedal</b>	Brake fluid insufficient or improper	Replenish or change with specified oil	4-S5
	Air in brake system	Bleed air	4-S6
<b>Brake Oil Consumed Excessively</b>	Brake seal failure	Replace	4-S13
	Brake fluid leakage in brake lines	Repair or replace	–
<b>Poor Parking Brake Force</b>	Parking brake lever travel excessive	Adjust	4-S7
<b>Parking Brake Drags</b>	Parking brake lever travel too small	Adjust	4-S7

W1054624

## 2. SERVICING SPECIFICATIONS

### TRAVELLING BRAKE

Item		Factory Specification	Allowable Limit
Brake Pedal	Play	7 to 14 mm 0.28 to 0.55 in.	—
	Stroke	Less than 120 mm 4.7 in.	—
Brake Disc	Thickness	3.3 to 3.5 mm 0.130 to 0.138 in.	3.0 mm 0.118 in.
Friction Plate	Thickness	1.92 to 2.08 mm 0.0756 to 0.0819 in.	1.52 mm 0.0598 in.

W1013874

### PARKING BRAKE

Item		Factory Specification	Allowable Limit
Parking Brake Lever	Lever Travel (Number of notches)	1 notch	—

W1012949

### 3. TIGHTENING TORQUES

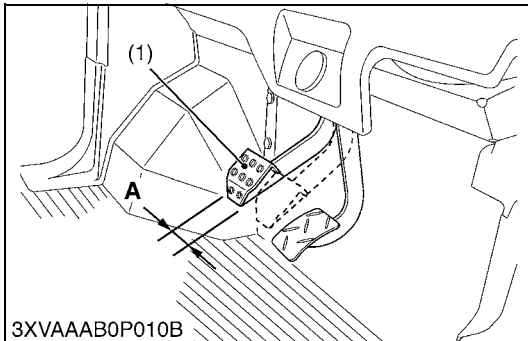
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Front axle slotted nut	150	15.3	110.6
Rear wheel mounting screw	75.0 to 90.2	7.6 to 9.2	55.3 to 66.5
Tie-rod end slotted nut	39.2	4.0	29.0
Ball joint mounting screw and nut	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Knuckle case mounting bolt and slotted nut	39.2	4.0	29.0
Knuckle case cover mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Brake pipe flare nut	15	1.5	10.8

W1012736

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING AND ADJUSTING



#### Brake Pedal Free Play



#### CAUTION

- When checking, park the tractor on flat ground, and stop the engine.

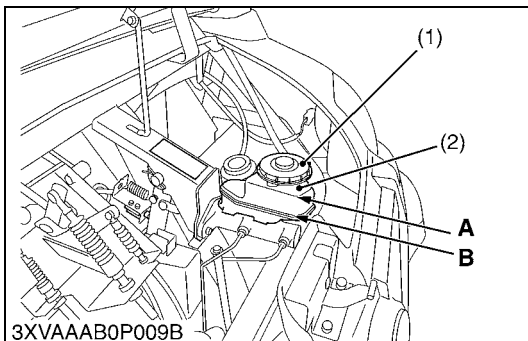
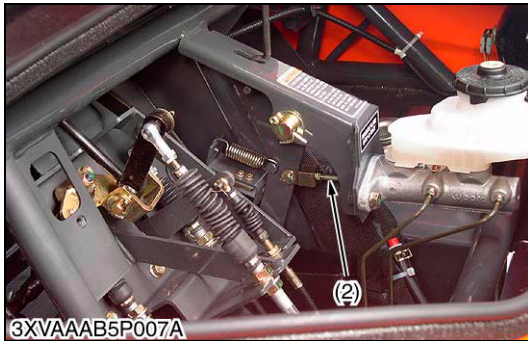
1. Measure the free play by depressing the brake pedal (1).
2. If the measurement is not within the factory specifications, adjust the free play by the push rod (2).
3. After adjustment, tighten the lock nut firmly.

Brake pedal free play	Factory spec.	7 to 14 mm 0.28 to 0.55 in.
-----------------------	---------------	--------------------------------

- (1) Brake Pedal  
(2) Push Rod

A : Free Play

W1013475



#### Brake Fluid

1. Make sure that the brake fluid reservoir is filled with the specified amount of brake fluid.
2. If the brake fluid is insufficient, replenish the specified brake fluid.

#### ■ IMPORTANT

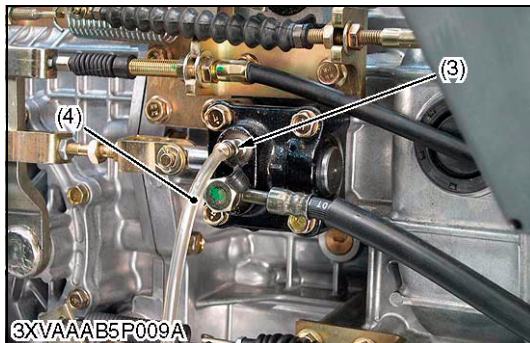
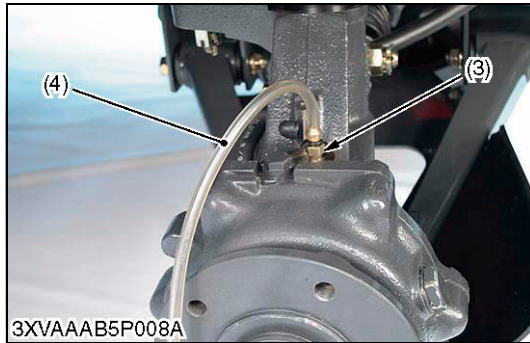
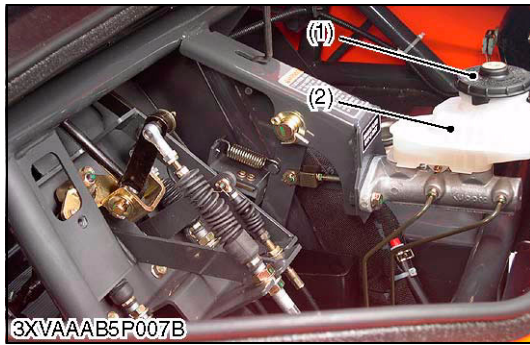
- Never operate the tractor, if the brake fluid is below the "MIN" line.
- Wipe the fluid reservoir cap (1) and its surrounding before removing it.
- When pouring the brake oil, be sure to use the filter and take care not to allow dust or water to enter.

Brake fluid	Tank capacity	0.4 L 0.42 U.S.qts 0.35 Imp.qts
-------------	---------------	---------------------------------------

- (1) Reservoir Cap  
(2) Brake Fluid Reservoir

A : MAX  
B : MIN

W1013731



## Brake Fluid Change

### ⚠ CAUTION

- Use only DOT-3 brake fluid from a sealed container. Conforms to motor vehicle safety standard No. 116. Using other type of oil ruins synthetic resin or rubber installed in brake system components, and may cause brake failure.
- Avoid contamination of the brake fluid. Thoroughly clean area around the filler cap before removing. Do not open the brake fluid reservoir cap unless absolutely necessary.
- Use extreme care when filling the reservoir. If brake fluid is spilled on power steering hoses, wash off with water immediately. Brake fluid quickly ruins synthetic resin or rubber hoses.

### ■ NOTE

- The fluid level must be checked several times during the fluid change and replenished as necessary. If the fluid in the reservoir runs completely out any time during fluid changing, air bleeding must be done since air will have entered the line.
  - Start with the rear either side and finish with the front either side.
1. Jack up the front side of machine and remove the front wheels.
  2. Connect a clear plastic hose (4) to the bleeder (3), running the other end of the hose into a container.
  3. Remove the brake fluid reservoir cap (1).
  4. Fill the reservoir (2) with new brake fluid.
  5. Temporarily install the reservoir cap.
  6. Open the bleeder.
  7. Then, pump brake pedal (5) and hold it.
  8. Close the bleeder and release the brake pedal.
  9. Repeat the previous step for each wheel.
  10. When brake fluid changing is finished, add the fluid to the upper level in the reservoir.
  11. After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.
  12. If necessary, bleed the air from the brake lines.

### ⚠ WARNING

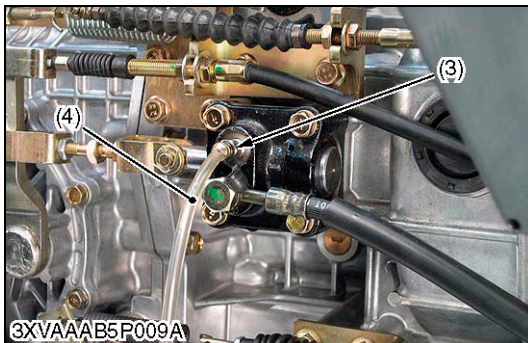
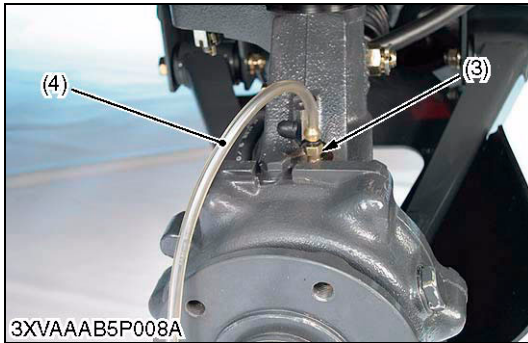
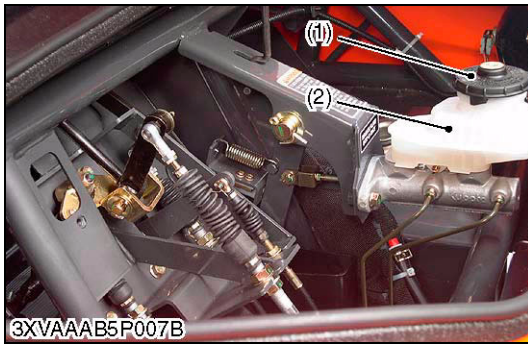
- If the brake pedal has a soft or "spongy feeling" when it is applied, there might be air in the brake line or the brake may be defective. Since it is dangerous to operate the vehicle under such conditions, bleed the air from the brake line immediately.

- (1) Reservoir Cap  
(2) Reservoir  
(3) Bleeder

- (4) Clear Plastic Hose  
(5) Brake Pedal

W1014040





## Brake Line Air Bleeding

### CAUTION

- Use only DOT-3 brake fluid from a sealed container. Conforms to motor vehicle safety standard No. 116. Using other type of oil ruins synthetic resin or rubber installed in brake system components, and may cause brake failure.
- Avoid contamination of the brake fluid. Thoroughly clean area around the filler cap before removing. Do not open the brake fluid reservoir cap unless absolutely necessary.
- Use extreme care when filling the reservoir. If brake fluid is spilled on power steering hoses, wash off with water immediately. Brake fluid quickly ruins synthetic resin or rubber hoses.

### NOTE

- The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.
1. Jack up the front side of machine and remove the front wheels.
  2. Connect a clear plastic hose (4) to the bleeder (3), running the other end of the hose into a container.
  3. Pump the brake pedal (5) until it becomes hard, and apply the brake pedal and hold it.
  4. Quickly open and close the bleeder (3) while holding the brake pedal applied.
  5. Release the brake pedal.
  6. Check the brake fluid level and fill the reservoir (2) with new brake fluid.
  7. Repeat the previous step for each wheel.
  8. Repeat this operation until no more air can be seen coming out into the plastic hose.
  9. When air bleeding is finished, add fluid up to the upper level in the reservoir.
  10. Apply the brake forcefully for a few seconds, and check for fluid leakage around the fittings.

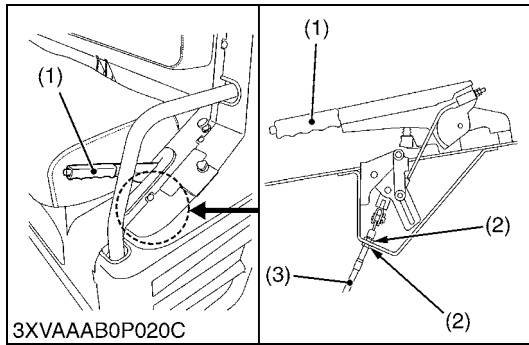
### WARNING

- If the brake pedal has a soft or "spongy feeling" when it is applied, there might be air in the brake line or the brake may be defective. Since it is dangerous to operate the vehicle under such conditions, bleed the air from the brake line immediately.

- (1) Reservoir Cap
- (2) Reservoir
- (3) Bleeder

- (4) Clear Plastic Hose
- (5) Brake Pedal

W1015075



### **Parking Brake Lever Free Play**

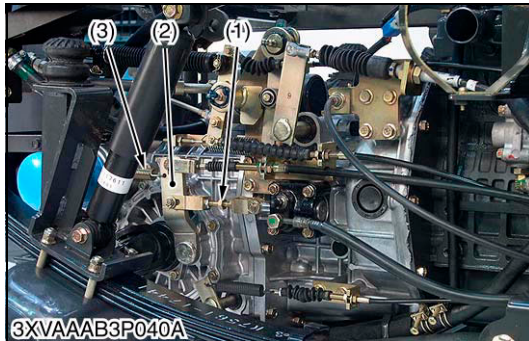
1. Release the parking brake lever (1).
2. If the number of notches is not within the factory specifications, loosen the lock nuts (2) and adjust the length of the parking brake wire (3).
3. After adjustment, tighten the lock nuts firmly.

Parking brake lever free play (number of notches)	Factory spec.	1 notch
---	---------------	---------

(1) Parking Brake Lever  
(2) Lock Nut

(3) Parking Brake Wire

W1016235



### **Checking Brake Rod**



#### **CAUTION**

- When checking, park the machine on flat ground.
- Work by two people when you measure pressure.

1. Remove the brake return spring (3).
2. Adjust the link length using the turnbuckle (1) so that the brake lever (2) has no play.

#### **(Reference)**

- Turning torque of the rear axle at this time is 9.8 to 14.7 N·m (1 to 1.5 Kgf·m, 7.2 to 10.8 lbf·ft).



#### **CAUTION**

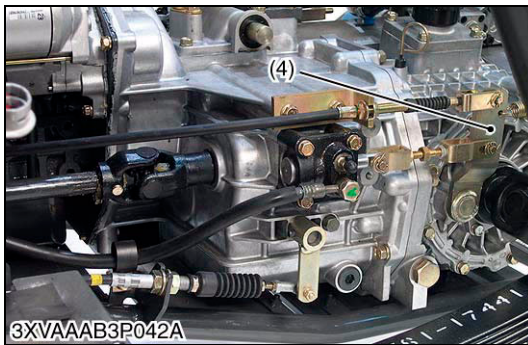
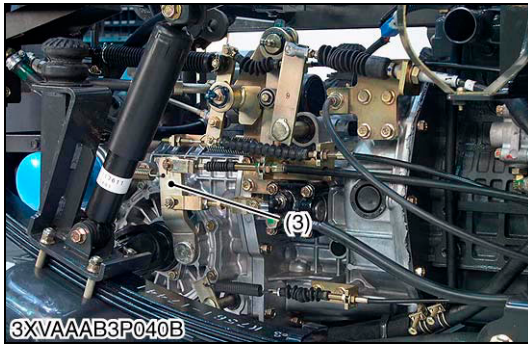
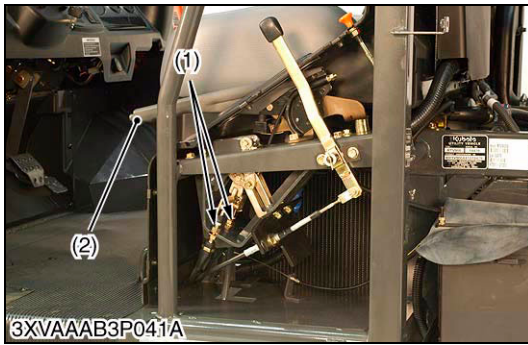
- Over-pulling due to poor turnbuckle adjustment can result in the problem of brake drag (overheating and burning).

(1) Turnbuckle (Brake Rod)  
(2) Brake Lever

(3) Return Spring

W1016641





### **Checking Parking Brake lever** **(Adjustment of the parking brake cable)**

#### **CAUTION**

- **When checking, park the machine on flat ground.**
- **Work by two people when you measure pressure.**

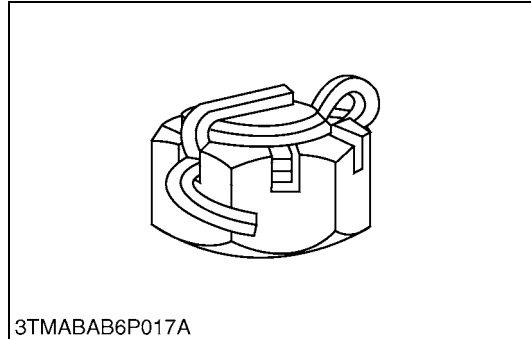
1. Adjust the length of the parking each brake cable (1) outer section so that the cable does not pull the brake cam lever (3), (4) (not activate the brake) when the parking brake lever (2) is not pulled, and pulls the brake lever (activates the brake) when the parking brake lever is pulled up by one notch.
2. Adjust both right and left brakes so that they are equally conditioned.

- (1) Parking Brake Cable  
(2) Parking Brake Lever

- (3) Brake Cam Lever (RH)  
(4) Brake Cam Lever (LH)

W1016973

## [2] DISASSEMBLING AND ASSEMBLING



### Front Wheel and Front Axle Nut

1. Remove the cotter pin and just loosen the slotted nut (1) for drive shaft.
2. Loosen the front wheel mounting screw.

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

- After tightening the this slotted nut to specified torques, install a cotter pin as shown figure left.

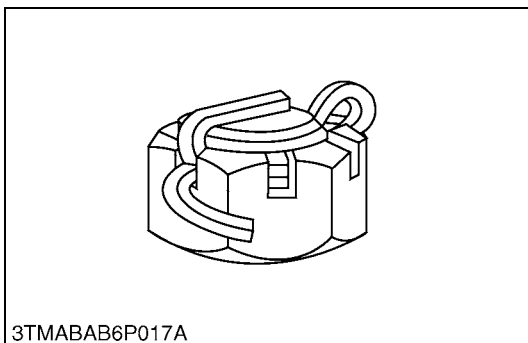
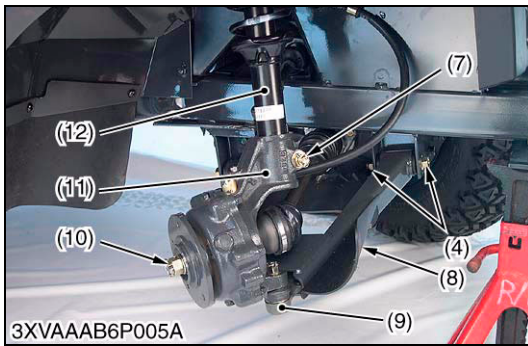
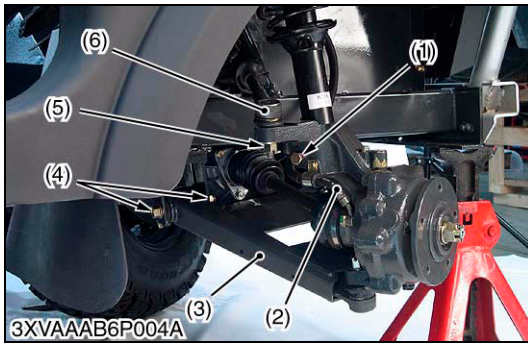
#### ■ NOTE

- **Tighten the slotted nut to 150 N·m (15.3 Kg·m, 110.6 lbf·ft).** If the slot and pin hole do not meet, tighten the nut until they do meet, and install cotter pin.
- **Be sure to split the cotter pin like an anchor.**

Tightening torque	Front axle slotted nut	150 N·m 15.3 kgf·m 110.6 lbf·ft
	Rear wheel mounting screw	75.0 to 90.2 N·m 7.6 to 9.2 kgf·m 55.3 to 66.5 lbf·ft

(1) Slotted Nut

W1017600



### Knuckle Case (To be continued)

#### CAUTION

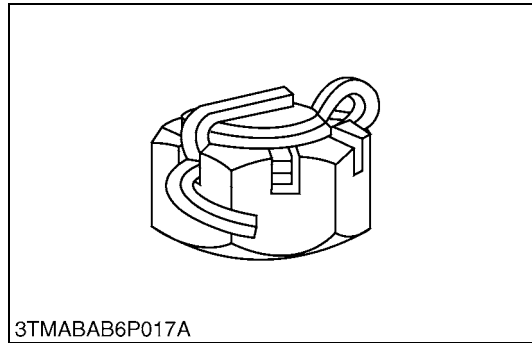
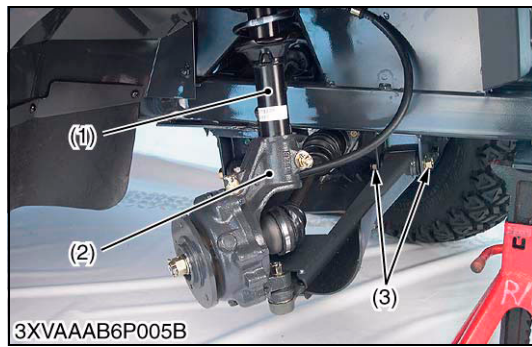
- When the brake hose is removed, the brake fluid comes out. Take care not to stain other hoses or rubber boot with the brake fluid.

Brake fluid stains should be washed and wiped off immediately. Likewise, the brake fluid on the tools should be wiped off immediately.

- Place the stand under the frame front.
- Remove the front wheel.
- Remove the joint guard (8).
- Remove the eye joint bolt for brake hose (2) and drain the brake fluid.
- Remove the cotter pin and remove the slotted nut (5) for tie-rod end (6).
- Loosen the lower arm mounting bolt and nut (4), and then remove the ball joint (9) mounting screw and nut.
- Remove the cotter pin and remove the slotted nut (7) for knuckle case mounting bolt (1).
- Remove the knuckle case mounting bolt (1) and remove the front axle slotted nut (10).
- Remove the knuckle case assembly (14).

- |                                       |                             |
|---------------------------------------|-----------------------------|
| (1) Knuckle Case Mounting Bolt        | (8) Joint Guard             |
| (2) Brake Hose                        | (9) Ball Joint              |
| (3) Lower Arm                         | (10) Front Axle Slotted Nut |
| (4) Lower Arm Mounting Bolt and Nut   | (11) Knuckle Case           |
| (5) Tie-rod End Slotted Nut           | (12) Strut                  |
| (6) Tie-rod End                       | (13) Drive Shaft            |
| (7) Knuckle Case Mounting Slotted Nut | (14) Knuckle Case Assembly  |

W1017974



### **Knuckle Case (Continued)**

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

- When installing the strut to knuckle case, set the wedge to decide the position of strut (1) to the slit of the knuckle case (2).
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the tie-rod end, ball joint and case mounting bolt, tighten the nut clockwise up to next alignment.
- It should be within 30 degree.
- Loosen once and tighten again when the slit goes past the nearest hole.
- After tightening the these slotted nut to specified torques, install a cotter pin as shown figure left.

#### **■ NOTE**

- **Tighten the lower arm mounting bolt and nut (3) with the specified torque after setting up the wheel and unloading the machine on ground.**

Tightening torque	Tie-rod end slotted nut	39.2 N·m 4.0 kgf·m 29.0 lbf·ft
	Ball joint mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	Knuckle case mounting bolt and slotted nut	39.2 N·m 4.0 kgf·m 29.0 lbf·ft

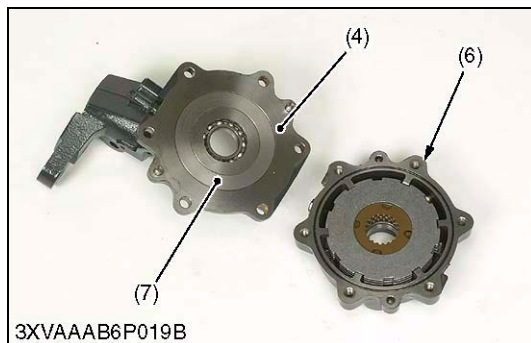
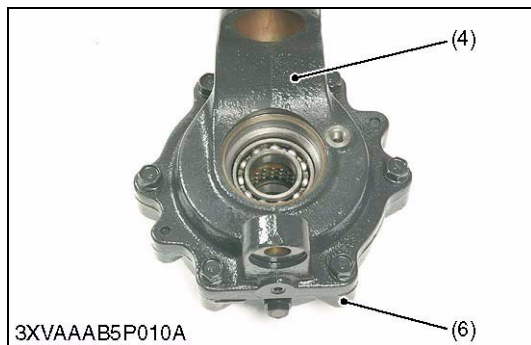
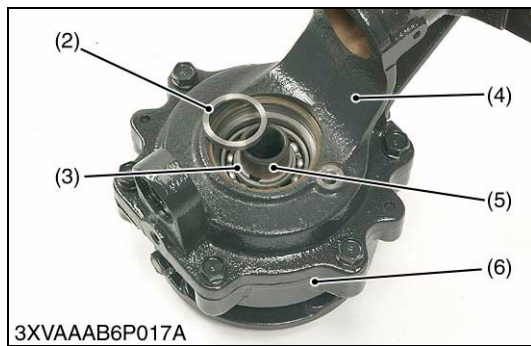
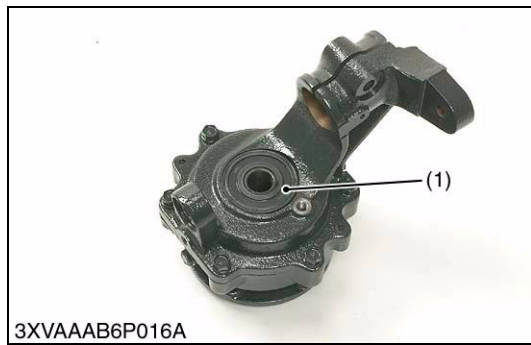
(1) Strut

(2) Knuckle Case

(3) Lower Arm Mounting Bolt and Nut

W1018865





### Brake Piston, Brake Disc and Friction Plate (To be continued)

#### ■ IMPORTANT

- It is recommended to replace the brake seal with a new one every four years.
  - Therefore, do not remove the piston unnecessarily from the knuckle case.
  - If the piston should be removed, replace the seal ring with a new one.
- Remove the oil seal (1).
  - Remove the snap ring collar (2) and remove the external snap ring (3).
  - Tap out the front axle (5) with plastic hammer.
  - Remove the knuckle case (4) mounting screw.
  - Separate the knuckle case and knuckle case cover (6).
  - Remove the brake piston (7) by compressed air.

#### (When reassembling)

- Be sure install the external snap ring.
- Replace the oil seal (1) with new one.
- Take care not to damage the O-ring.
- Replace the brake seal 1 (8), 2 (9), and brake seal 3 (11), 4 (10).
- Insert the bearing and oil seal first to the knuckle case cover (6), and install the knuckle case cover to front axle (5).

#### ⚠ CAUTION

- The brake seal 1 (8), 2 (9) are used for brake fluid only.
- The brake seal 3 (11), 4 (10) are used for transmission fluid only.
- Degrease both the piston (7) and the knuckle case (4) before installing each brake seal.
- Before inserting the piston (7), apply a thin coat of the special grease (KLUBER LUBRICATION : SEALUB-L-101 or equivalent) to the brake seal surface. The special grease is a dual use type that can be applied to the oil seals and the O-rings for both of the brake fluid and the transmission fluid.
- When servicing the brake, pay due attention to any oil adhered to your hands.
- Exert full care when handling the mineral oil (transmission fluid) and the brake fluid.

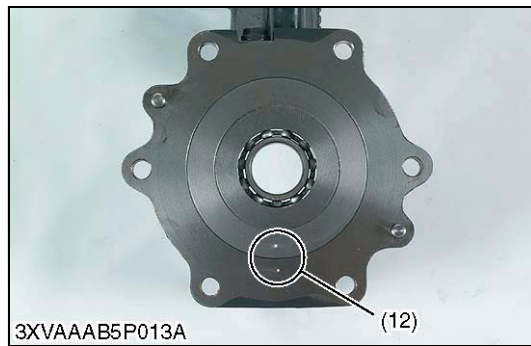
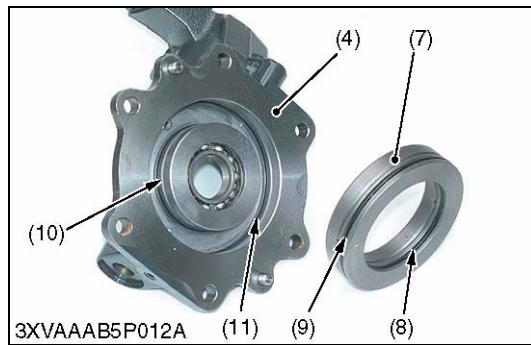
#### ■ NOTE

- Align the each alignment mark (12) of piston and knuckle case.
- Assemble the bearing and oil seal of rear axle into the knuckle case cover side, and then assemble the rear axle.

Tightening torque	Knuckle case cover mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
-------------------	-----------------------------------	---

- |                        |                        |
|------------------------|------------------------|
| (1) Oil Seal           | (5) Front Axle         |
| (2) Snap Ring Roller   | (6) Knuckle Case Cover |
| (3) External Snap Ring | (7) Piston             |
| (4) Knuckle Case       |                        |

W1019414



### **Brake Piston, Brake Disc and Friction Plate (Continued)**

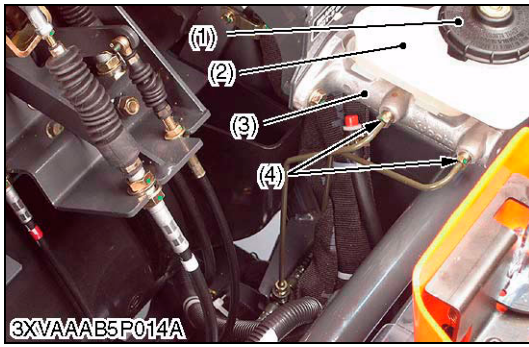
#### **(When reassembling)**

- Refer to front page.

- (4) Knuckle Case
- (7) Piston
- (8) Brake Seal 1
- (9) Brake Seal 2

- (10) Brake Seal 4
- (11) Brake Seal 3
- (12) Alignment Mark

W1020869



### Master Cylinder Assembly



#### CAUTION

- Use only DOT-3 brake fluid from a sealed container. Conforms to motor vehicle safety standard No. 116. Using other type of oil ruins synthetic resin or rubber installed in brake system components, and may cause brake failure.
- Avoid contamination of the brake fluid. Thoroughly clean area around the filler cap before removing. Do not open the brake fluid reservoir cap unless absolutely necessary.
- Use extreme care when filling the reservoir. If brake fluid is spilled on power steering hoses, wash off with water immediately. Brake fluid quickly ruins synthetic resin or rubber hoses.

#### NOTE

- Do not transform, and do not damage the brake pipe.
- Do not reuse the drained brake fluid.
- Do not the brake fluid of the other brand to prevent chemical change from occurring.

1. Remove the brake fluid reservoir cap (1).
2. Suck the brake fluid.
3. Disconnect the brake pipes (4) from master cylinder (3).
4. Remove the master cylinder (3).

#### (When reassembling)

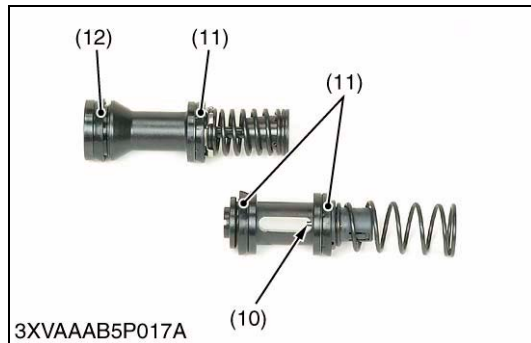
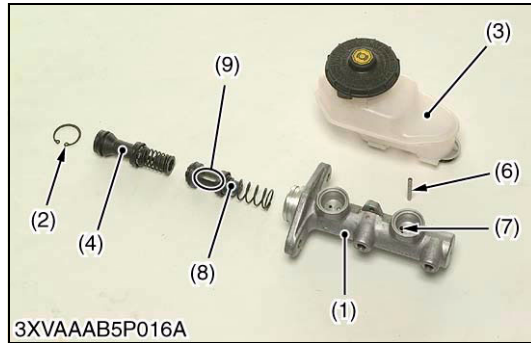
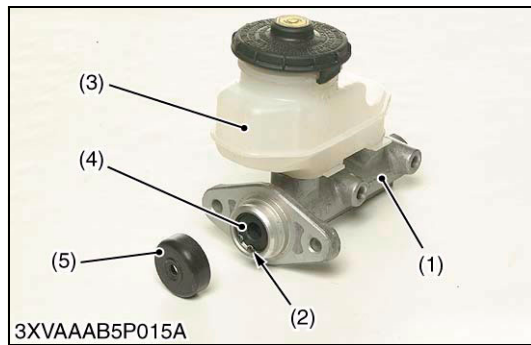
- Air bleed the brake line after master cylinder reassembled. (See page 4-S6.).
- Check and adjust the brake pedal free play. (See page 4-S4.).

Tightening torque	Brake pipe flare nut	15 N·m 1.5 kgf·m 10.8 lbf·ft
-------------------	----------------------	------------------------------------

- (1) Reservoir Cap  
(2) Reservoir

- (3) Master Cylinder  
(4) Brake Pipe

W1021367



### Master Cylinder Inner Parts

1. Remove the reservoir (3) from master cylinder body (1).
2. Pushing in the piston (4), remove the internal snap ring (2).
3. Remove the piston from master cylinder body.
4. Pushing in the secondary piston (8), remove the stop pin (6).
5. Remove the secondary piston from master cylinder body.

### NOTE

- **Keep the disassembled parts in order and prevent them from being contaminated with dust or dirt.**

### (When reassembling)

- Wash the disassembled parts with the brake fluid and clean each port with the compressed air.
- Install the new grommet in the reservoir tank.
- Apply the brake fluid to the piston cup (11) and (12).
- Do not reuse the removed piston (4) and secondary piston (8).
- Before installation, tap the valve stem (10) through the slot (9) of the piston and check that the valve stem moves smoothly.
- Push in the secondary piston, match the slot of the piston with the stop pin (6) installation hole (7) and insert the stop pin (6).
- Apply a thin coat of special grease (COSMO RUBBER GREASE BY COSMO OIL CO.) to surface of piston cup (12) and hole of rod seal (5).

- |                          |                      |
|--------------------------|----------------------|
| (1) Master Cylinder Body | (7) Hole             |
| (2) Internal Snap Ring   | (8) Secondary Piston |
| (3) Reservoir            | (9) Slot             |
| (4) Piston               | (10) Valve Stem      |
| (5) Rod Seal             | (11) Piston Cup      |
| (6) Stop Pin             | (12) Piston Cup      |

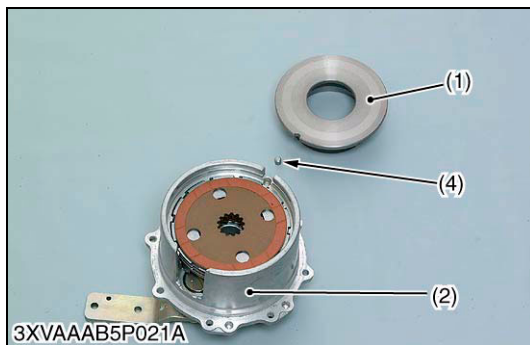
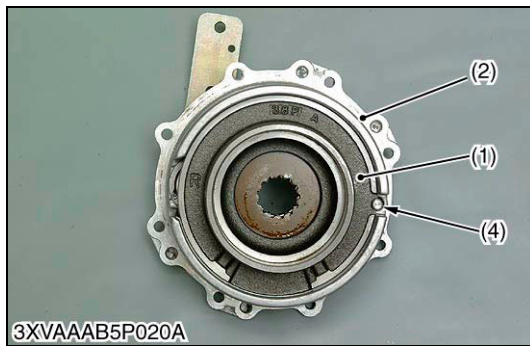
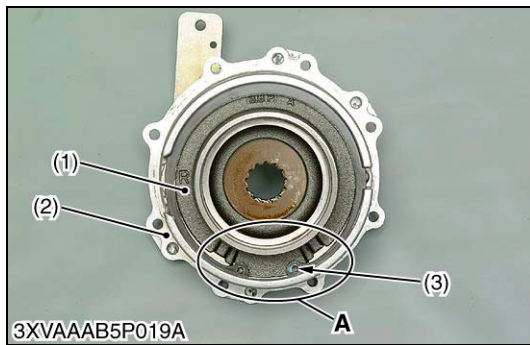
W1021958

### Separating Differential Support Cover

1. Refer to "Transmission Section" (See page 2-S28).

W1022644





### **Bearing Support, Brake Disk and Friction Plate**

1. Remove the internal snap ring (3).
2. Remove the bearing holder (1).
3. Remove the brake disk and friction plate.

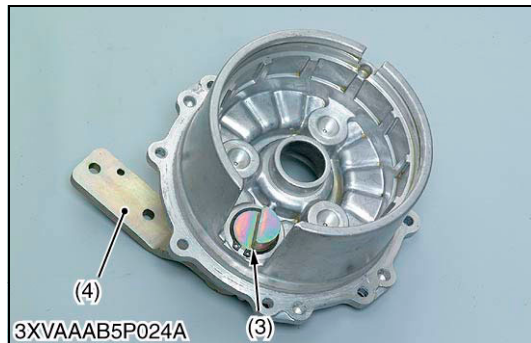
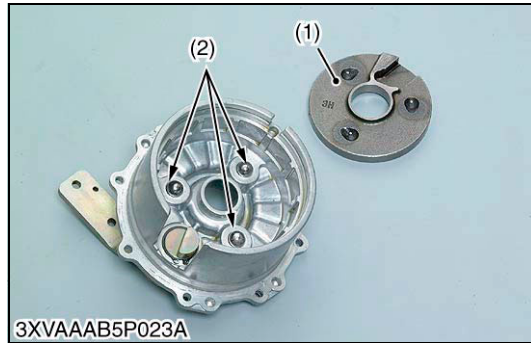
#### **(When reassembling)**

- When installing the internal snap ring to differential support cover (2) as shown in the left photo.
- When installing the bearing holder (1) to differential support cover (2), do not forget to install the straight pin (4).

- (1) Bearing Holder
- (2) Differential Support Cover
- (3) Internal Snap Ring
- (4) Straight Pin

**A : Installation Position**

W1022733



### **Actuator, Ball and Cam Lever**

1. Remove the actuator (1) and balls (2).
2. Remove the external snap ring (3) and remove the cam lever (4).

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

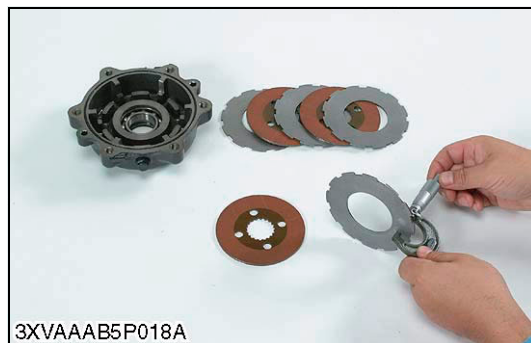
- Take care not to damage the O-ring.

(1) Actuator  
(2) Ball

(3) External Snap Ring  
(4) Cam Lever

W1023281

## **[3] SERVICING**



### **Brake Disc and Friction Plate Wear (Front)**

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 spec.	3.3 to 3.5 mm 0.130 to 0.138 in.
	Allowable limit	3.0 mm 0.118 in.
Friction plate thickness	Factory spec.	1.92 to 2.08 mm 0.0756 to 0.0818 in.
	Allowable limit	1.52 mm 0.0598 in.

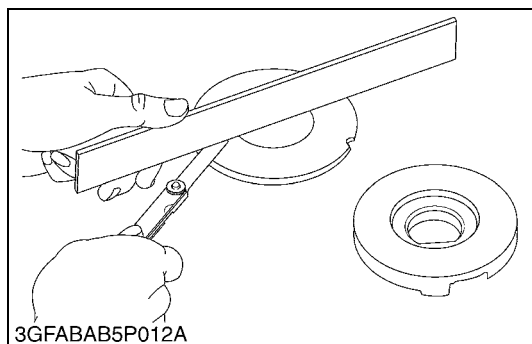
W1023760



### 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.

W1023933

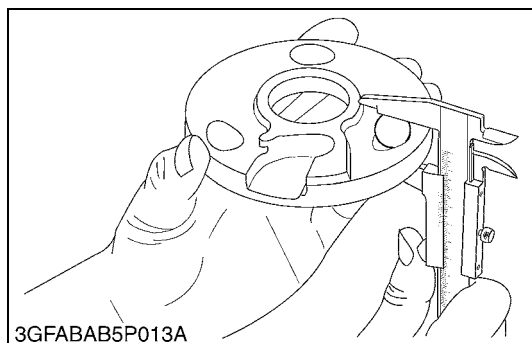


### Flatness of Actuator and Bearing Holder

1. Place a straightedge of 200 mm (7.87 in.) or more in length on the contacting surface of the actuator and the bearing holder.
2. Inspect the friction surface of the actuator and the bearing holder with the straightedge, and determine if a 0.30 mm (0.0118 in.) feeler gauge will fit on the part of wear.
3. If it will fit, resurface.

Flatness of actuator and bearing holder	Allowable limit	0.30 mm 0.0118 in.
---	-----------------	-----------------------

W1024029



### Height of Cam Plate and Ball

1. Measure the height 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 spec.	22.89 to 22.99 mm 0.9012 to 0.9051 in.
	Allowable limit	22.40 mm 0.8819 in.

W1024169



### Brake Disc and Friction Plate Wear (Rear)

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 spec.	3.3 to 3.5 mm 0.130 to 0.138 in.
	Allowable limit	3.0 mm 0.118 in.

Friction plate thickness	Factory spec.	1.92 to 2.08 mm 0.0756 to 0.0818 in.
	Allowable limit	1.52 mm 0.0598 in.

W1024354



### **Brake Cylinder**

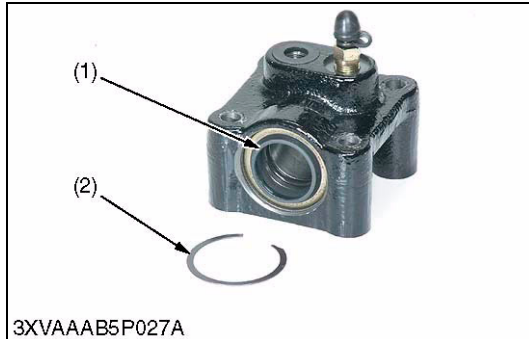
1. Push the brake piston from brake rod connecting side, and pull out the brake piston (1).
2. Check the brake piston and brake cylinder for signs of scoring or other damage.
3. If there is any doubt as to the condition of a piston and cylinder, replace it.

#### **■ NOTE**

- Apply a thin coat of the brake fluid to the piston before inserting it. Never use mineral oil, grease or the like.

(1) Brake Piston

W1024605



### **Dust Seal and O-ring**

1. If oil leaks from dust seal.
2. Remove the internal circlip (2) and remove the dust seal (1) and O-ring and replace the new one.

#### **■ NOTE**

- These O-ring and dust seal are designed specifically for brake fluid application. Use only Kubota genuine parts (for brake fluid use) for replacement. During replacement, take care to avoid adherence of other oil or grease.

(1) Dust Seal

(2) Internal Circlip

W1024810

# **5 FRONT AXLE**

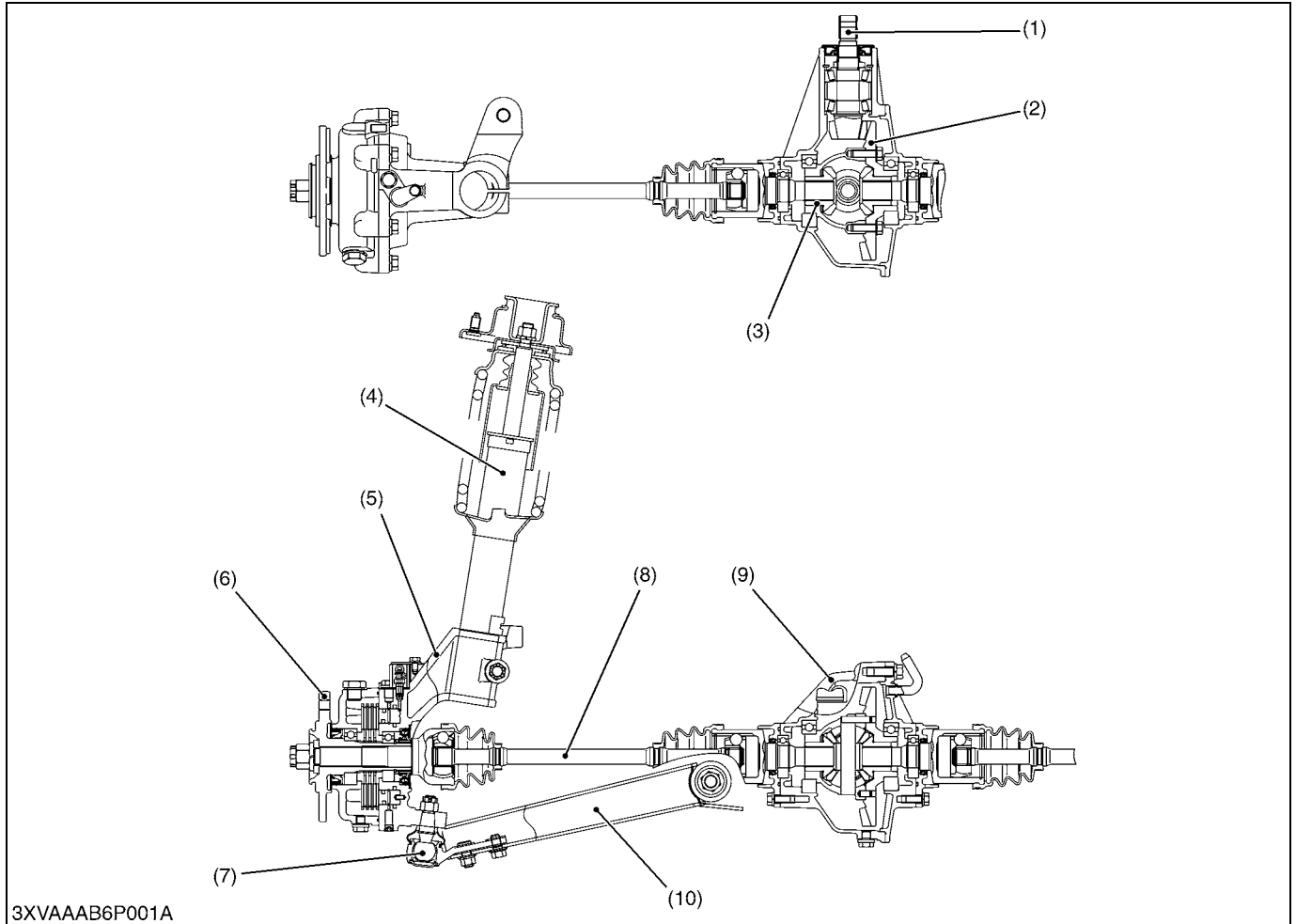
# MECHANISM

## CONTENTS

1. STRUCTURE .....	5-M1
[1] FRONT AXLE.....	5-M1
[2] FRONT SUSPENSION .....	5-M2

# 1. STRUCTURE

## [1] FRONT AXLE



(1) Bevel Gear Shaft (8T)

(2) Bevel Gear (35T)

(3) Side Gear

(4) Strut

(5) Knuckle

(6) Front Axle

(7) Ball Joint

(8) Constant Velocity (CV) Joint

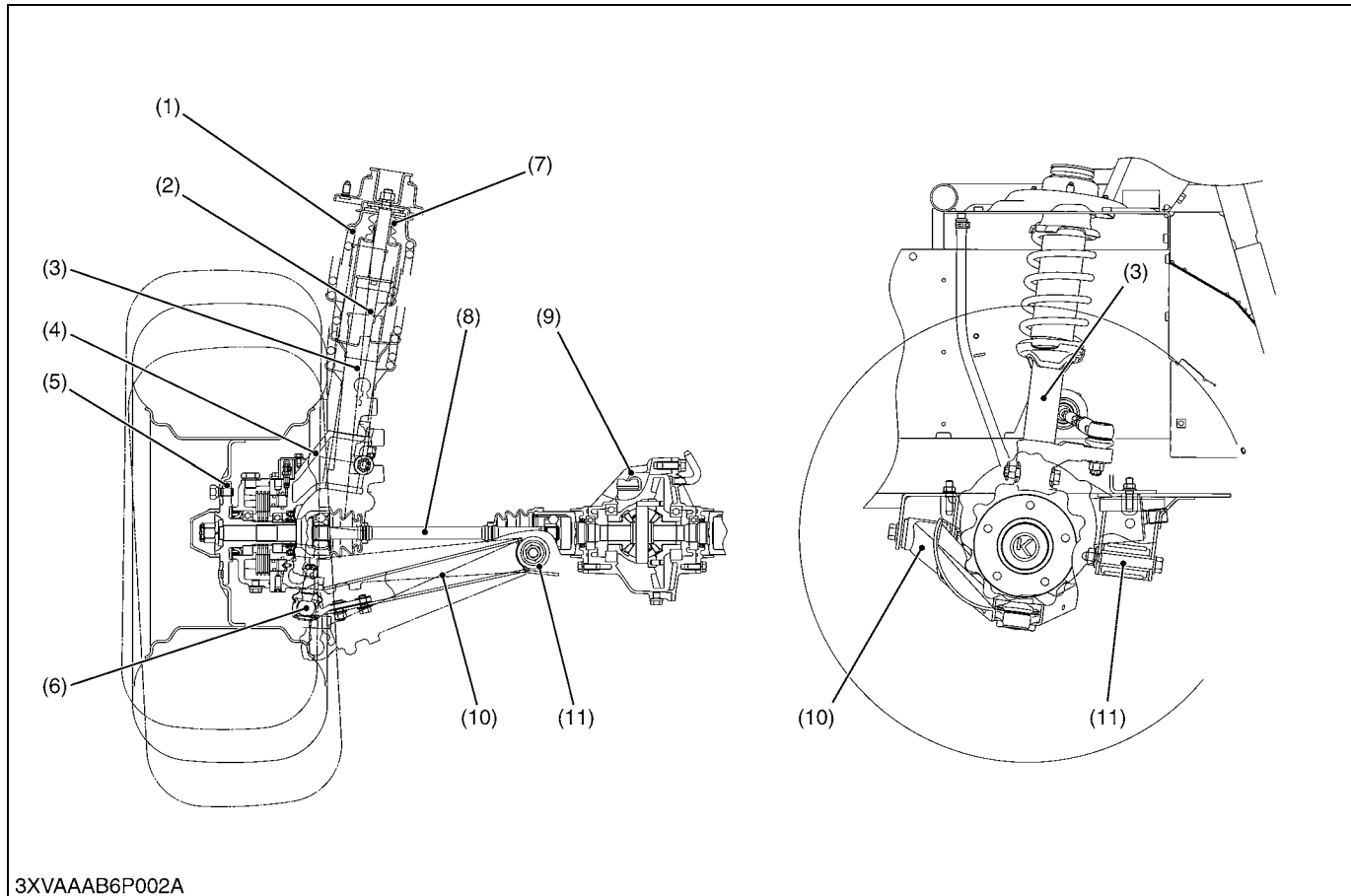
(9) Front Case

(10) Lower Arm

The front axle consists mainly of knuckles (5) (right and left), front case (9) and CV (constant velocity) joint (8). (See the above illustration.)

Power is transmitted from the transmission output shaft through the propeller shaft to the bevel gear shaft (1). The power is further transmitted through the differential bevel gear (2) and differential side gear (3) to the CV joint (8), and finally reaches the front axle (6) in the knuckles. The knuckles and the front case are partitioned from each other. Which means each of the cases must be separately lubricated.

## [2] FRONT SUSPENSION



- |                    |                |                                  |                     |
|--------------------|----------------|----------------------------------|---------------------|
| (1) Spring         | (4) Knuckle    | (7) Bump Stopper                 | (9) Front Case      |
| (2) Shock Absorber | (5) Front Axle | (8) Constant Velocity (CV) Joint | (10) Lower Arm      |
| (3) Strut          | (6) Ball Joint |                                  | (11) Rubber Bushing |

The strut type suspension has the shock absorber (2) as a strut (3) for positioning the front wheels. The top of the strut is fixed to the machine body. Its bottom is rigid-coupled with the knuckle (4). The knuckle case is coupled through the ball joint (6) that is located at the end of the Type lower arm (10). This lower arm, on the other hand, is connected at two points via the rubber bushings (11) with the machine body.

### (Function)

The strut type suspension is a sort of independent suspension. Impacts from the ground are conveyed through the front tires and knuckles (4) and absorbed by the strut (3). The strut not just serves to absorb the shock but withstands the sideways forces. The Type lower arm (10) regulates the to-and-fro as well as sideways movements of the front tires, which maintains a predetermined alignment. This lower arm is constructed with rubber bushings (11) in place, thereby cutting down on vibrations.



# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	5-S1
2. SERVICING SPECIFICATIONS .....	5-S2
3. TIGHTENING TORQUES .....	5-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	5-S4
[1] CHECKING AND ADJUSTING .....	5-S4
[2] PREPARATION .....	5-S4
[3] SERVICING .....	5-S17

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Front Wheels Wander to Right or Left</b>	Tire pressure uneven	Adjust	G-23
	Improper toe-in adjustment (improper alignment)	Adjust	5-S4
	Tie-rod end loose	Tighten	5-S7
	Air sucked in power steering circuit	Bleed	–
<b>Front Wheels Can Not Be Driven</b>	Drive shaft joint broken	Replace	5-S8
	Front wheel drive gears in transmission broken	Replace	2-S29
	Front differential gear broken	Replace	5-S13
<b>Noise</b>	Gear backlash excessive	Adjust or replace	5-S19
	Oil insufficient	Replenish	5-S4
	Bearings damaged or broken	Replace	–
	Gears damaged or broken	Replace	–
	Bevel pinion shaft turning force improper	Adjust	5-S18

W1054624

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	1 to 10 mm 0.04 to 0.39 in.	0.30 mm 0.0118 in.
Differential Case to Differential Side Gear	Clearance	0.25 to 0.066 mm 0.00098 to 0.00260 in.	—
	Differential Case (I.D.)	32.000 to 32.025 mm 1.25984 to 1.260782 in.	—
	Spiral Bevel Gear (I.D.)	32.000 to 32.025 mm 1.25984 to 1.26082 in.	—
	Differential Side Gear (O.D.)	31.959 to 31.975 mm 1.25823 to 1.25886 in.	—
Differential Pinion Shaft to Differential Pinion	Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.30 mm 0.0118 in.
	Differential Pinion Shaft (O.D.)	15.973 to 15.984 mm 0.62986 to 0.62929 in.	—
	Differential Pinion (I.D.)	16.000 to 16.018 mm 0.62992 to 0.63063 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.
Bevel Pinion Shaft	Turning Torque	0.8 to 1.0 N·m 0.08 to 0.10 Kgf·m 0.059 to 0.73 lbf·ft	—
Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.15 to 0.3 mm 0.006 to 0.012 in.	—

W1013874

### 3. TIGHTENING TORQUES

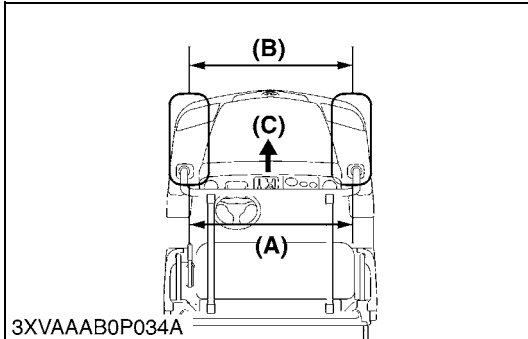
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Front axle slotted nut	150	15.3	110.6
Front wheel mounting screw	75.0 to 90.2	7.6 to 9.2	55.3 to 66.5
Tie-rod end slotted nut	39.2	4.0	29.0
Ball joint mounting and nut	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Knuckle case mounting bolt and slotted nut	39.2	4.0	29.0
Strut mounting nut	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Front case cover mounting screw	17.7 to 20.6	1.8 to 2.1	13.3 to 15.5
Lower arm mounting bolt and nut	102.9 to 117.6	10.5 to 12.0	75.9 to 86.7
Front differential case mounting nut	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5
Knuckle case cover mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Bevel gear UBS screw	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3

W1012736

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING AND ADJUSTING



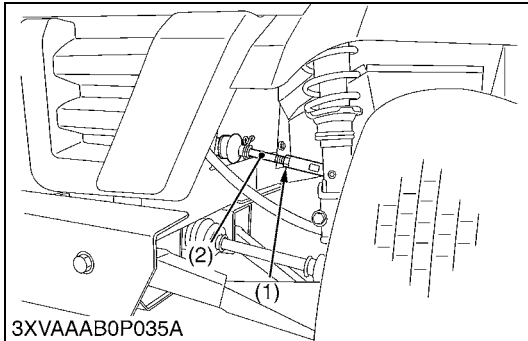
#### Toe-in

1. Park vehicle on a flat place.
2. Turn steering wheel so front wheels are in the straight ahead position.
3. Lock the park brake and stop the engine.
4. Measure distance between tire beads at front of tire, at hub height (A-B).
5. Measure distance between tire beads at rear of tire, at hub height.

Toe-in (A-B)	Factory spec.	0 to 20 mm 0 to 0.79 in.
--------------	---------------	-----------------------------

(A) Wheel to Wheel Distance at Rear (B) Wheel to Wheel Distance at Front  
(C) Front

W1012485



#### Toe-in Adjusting

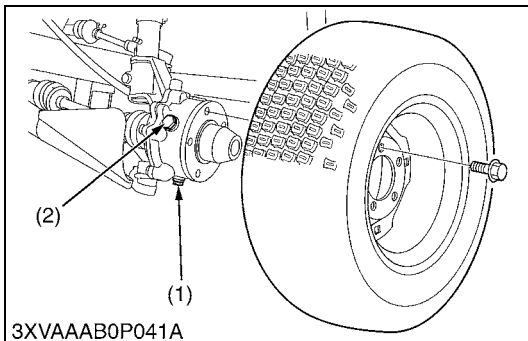
1. Loosen the lock nuts (1).
2. Turn the tie-rod (2) until to be factory specification.
3. Tighten the lock nuts (1).

(1) Lock Nut

(2) Tie-rod

W1013033

### [2] PREPARATION



#### Draining Knuckle Case Oil

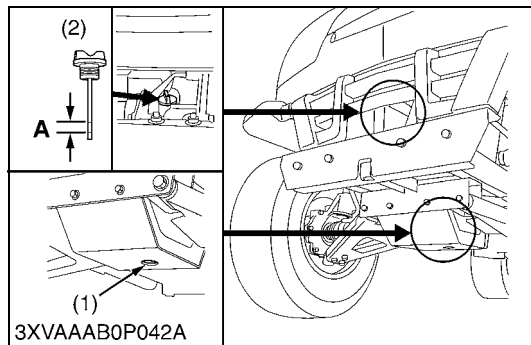
1. Remove the tire.
2. Park the vehicle on a firm, flat and level surface.
3. To drain the used oil, remove the drain the filling plugs at the LH knuckle case and drain the oil completely into the oil pan.
4. After draining, reinstall the drain plug.
5. Use the same procedure to change the RH knuckle case oil.

Knuckle case oil	Reference capacity (one side)	0.15 L 0.16 U.S.qts 0.13 Imp.qts
------------------	----------------------------------	--

(1) Drain Plug

(2) Filling Plug

W1013249



### Changing Front Axle Case Oil

1. Park the vehicle on a firm, flat and level surface.
2. To drain the used oil, remove the drain and filling plugs at the front axle case and drain the oil completely into the oil pan.
3. After draining, reinstall the drain plug.

#### (When reassembling)

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

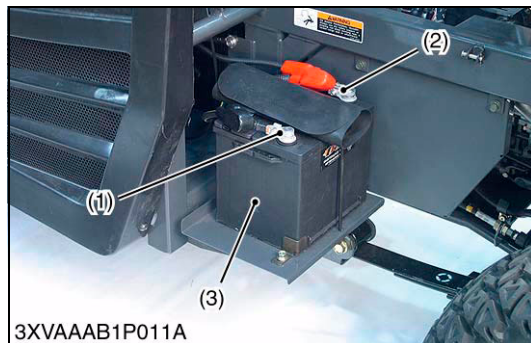
Front axle case oil	Capacity	0.6 L 0.63 U.S.qts 0.52 Imp.qts
---------------------	----------	---------------------------------------

(1) Drain Plug

(2) Filling Plug with Dipstick

A : Oil level is acceptable within this range.

W1013541



### Battery

#### CAUTION

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

1. Disconnect the negative cable (1) from the battery.
2. Disconnect the positive cable (2) from the battery and remove the battery (3).

(1) Negative Cable

(2) Positive Cable

(3) Battery

W1013836



### Front Wheel and Front Axle Nut

1. Remove the cotter pin (2) and just loosen the slotted nut (1) for drive shaft.
2. Loosen the front wheel mounting screw.

#### (When reassembling)

- After tightening the front axle slotted nut to specified torques, install a cotter pin as shown in the figure left.

#### NOTE

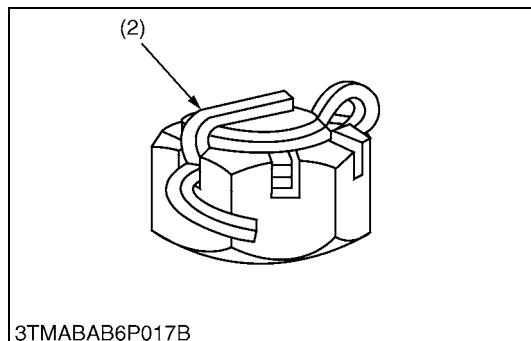
- Tighten the slotted nut to 150 N·m (15.3 Kgf·m, 110.6 lbf·ft). If the slot and pin hole do not meet, tighten the nut until they do meet, and install cotter pin.

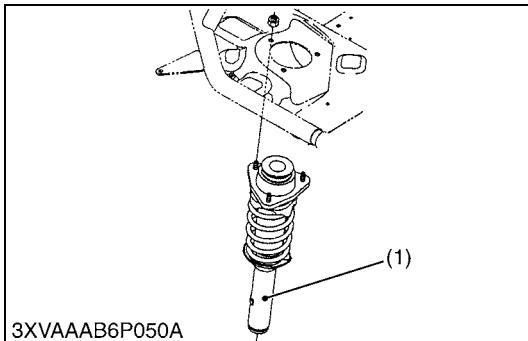
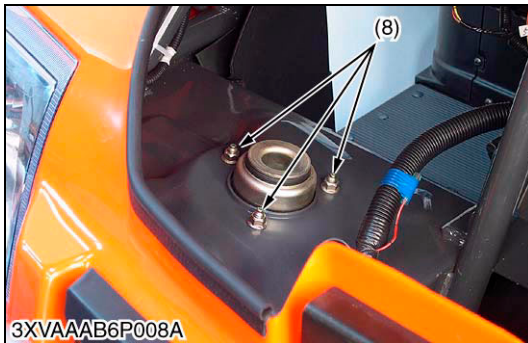
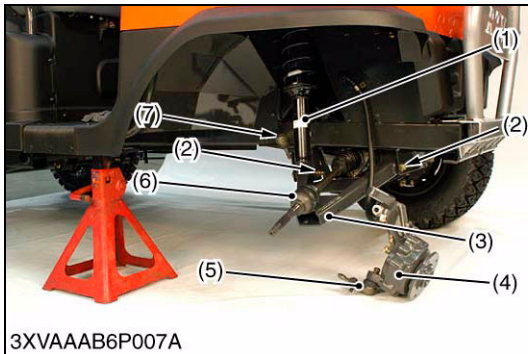
Tightening torque	Front axle slotted nut	150 N·m 15.3 kgf·m 110.6 lbf·ft
	Front wheel mounting screw	75.0 to 90.2 N·m 7.6 to 9.2 kgf·m 55.3 to 66.5 lbf·ft

(1) Slotted Nut

(2) Cotter Pin

W1014067



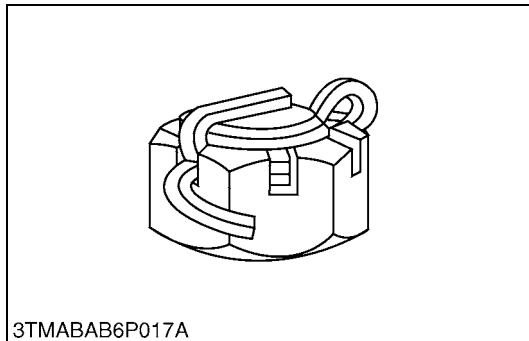
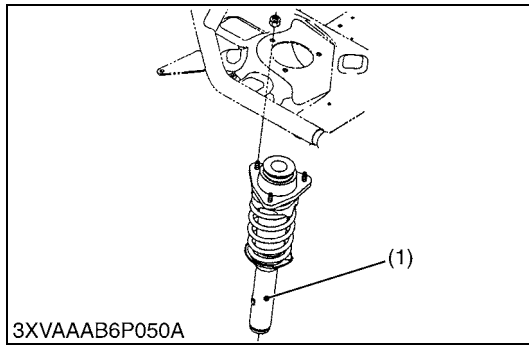


### **Front Suspension (Strut Suspension) (To be continued)**

1. Place the stand under the frame.
2. Remove the front wheel.
3. Remove the joint guard.
4. Loosen the lower arm mounting bolt and nut (2).
5. Remove the cotter pin and remove the tie-rod end (7) slotted nut.
6. Remove the ball joint (5) mounting bolt and nuts.
7. Remove the front axle slotted nut.
8. Remove the cotter pin and remove the knuckle case mounting bolt and nut.
9. Separate the strut (1) and knuckle case assembly (4) from lower arm (3).
10. Remove the strut mounting nut (8) and then remove the strut (1).

- |                                     |                        |
|-------------------------------------|------------------------|
| (1) Strut                           | (5) Ball Joint         |
| (2) Lower Arm Mounting Bolt and Nut | (6) Drive Shaft        |
| (3) Lower Arm                       | (7) Tie-rod End        |
| (4) Knuckle Case Assembly           | (8) Strut Mounting Nut |

W1014479



### Front Suspension (Strut Suspension) (Continued)

#### (When reassembling)

- When installing the strut (1) to knuckle case, set the wedge to decide the position of strut to the slit of the knuckle case.
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the tie-rod end and case mounting bolt, tighten the nut clockwise up to next alignment.
- It should be within 30 degree.
- Loosen once and tighten again when the slit goes past the nearest hole.
- After tightening the these slotted nut to specified torques, install a cotter pin as shown figure left.

#### ■ NOTE

- **Tighten the lower arm mounting bolt and nut (2) with the specified torque after setting up the wheel and unloading the machine on ground.**

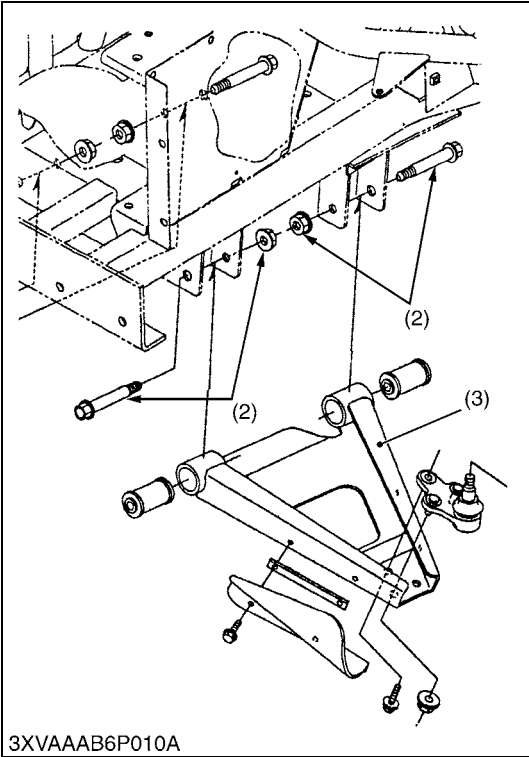
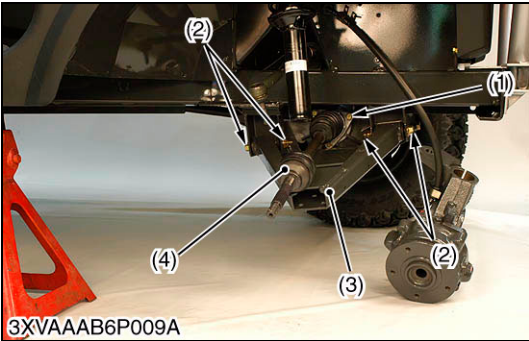
Tightening torque	Tie-rod end slotted nut	39.2 N·m 4.0 kgf·m 29.0 lbf·ft
	Ball joint mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	Knuckle case mounting bolt and slotted nut	39.2 N·m 4.0 kgf·m 29.0 lbf·ft
	Strut mounting nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

(1) Strut

(2) Lower Arm Mounting Bolt and Nut

W1015025





**Drive Shaft and Lower Arm**

- 1. Remove the front case cover mounting screw (1).
- 2. Draw out the drive shaft assembly (4).
- 3. Remove the lower arm mounting bolt and nut (2).
- 4. Remove the lower arm (3).

**(When reassembling)**

- Take care not to damage the O-ring of front case cover.

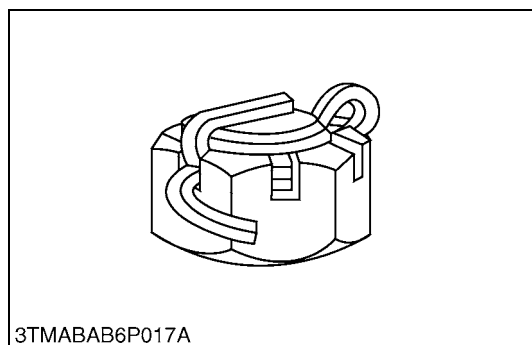
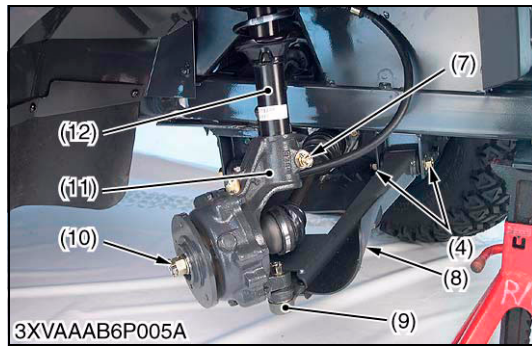
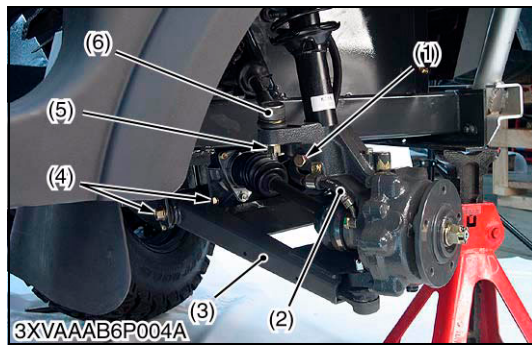
**■ NOTE**

- Tighten the lower arm mounting bolt and nut (2) with the specified torque after setting up the wheel and unloading the machine on ground.

Tightening torque	Front case cover mounting screw	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.3 to 15.5 lbf·ft
	Lower arm mounting bolt and nut	102.9 to 117.6 N·m 10.5 to 12.0 kgf·m 75.9 to 86.7 lbf·ft

- (1) Front Case Cover Mounting Screw    (3) Lower Arm  
(2) Lower Arm Mounting Screw and Nut    (4) Drive Shaft Assembly

W1018017



### Knuckle Case (To be continued)

#### CAUTION

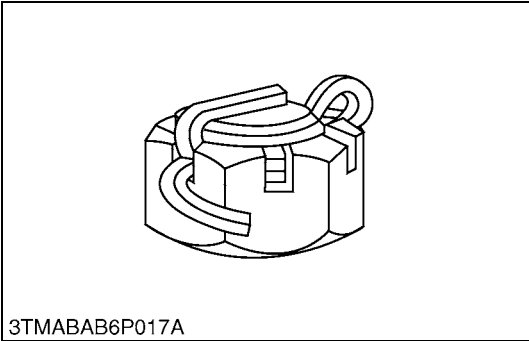
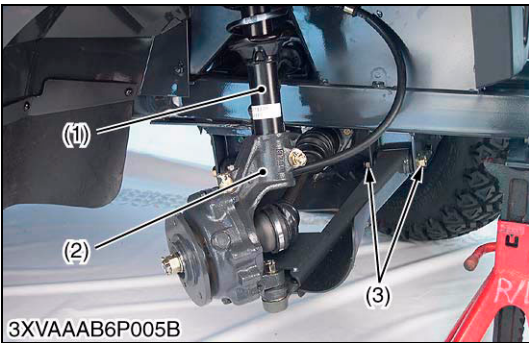
- When the brake hose is removed, the brake fluid comes out. Take care not to stain other hoses or rubber boot with the brake fluid.

Brake fluid stains should be washed and wiped off immediately. Likewise, the brake fluid on the tools should be wiped off immediately.

- Place the stand under the frame front.
- Remove the front wheel.
- Remove the joint guard (8).
- Remove the eye joint bolt for brake hose (2) and drain the brake fluid.
- Remove the cotter pin and remove the slotted nut (5) for tie-rod end (6).
- Loosen the lower arm mounting bolt and nut (4), and then remove the ball joint (9) mounting screw and nut.
- Remove the cotter pin and remove the slotted nut (7) for knuckle case mounting bolt (1).
- Remove the knuckle case mounting bolt (1) and remove the front axle slotted nut (10).
- Remove the knuckle case assembly (14).

- |                                       |                             |
|---------------------------------------|-----------------------------|
| (1) Knuckle Case Mounting Bolt        | (8) Joint Guard             |
| (2) Brake Hose                        | (9) Ball Joint              |
| (3) Lower Arm                         | (10) Front Axle Slotted Nut |
| (4) Lower Arm Mounting Bolt and Nut   | (11) Knuckle Case           |
| (5) Tie-rod End Slotted Nut           | (12) Strut                  |
| (6) Tie-rod End                       | (13) Drive Shaft            |
| (7) Knuckle Case Mounting Slotted Nut | (14) Knuckle Case Assembly  |

W1018554



**Knuckle Case (Continued)**

**(When reassembling)**

- When installing the strut to knuckle case, set the wedge to decide the position of strut (1) to the slit of the knuckle case (2).
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the tie-rod end, ball joint and case mounting bolt, tighten the nut clockwise up to next alignment.
- If should be within 30 degree.
- Loosen once and tighten again when the slit goes past the nearest hole.
- After tightening the these slotted nut to specified torques, install a cotter pin as shown figure left.

**NOTE**

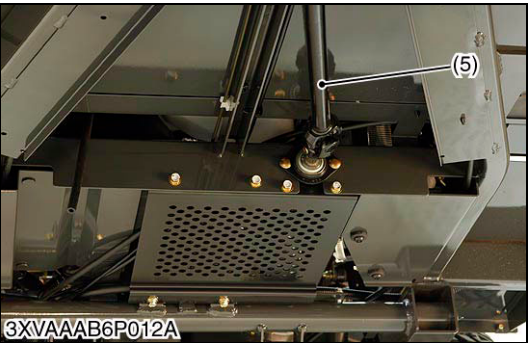
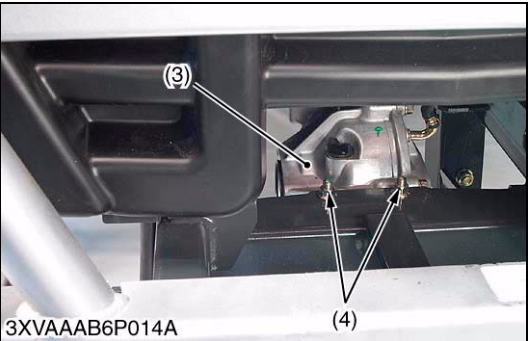
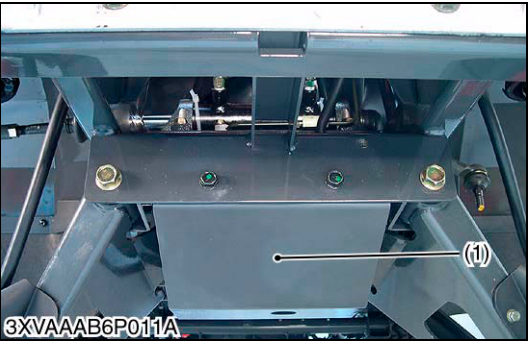
- **Tighten the lower arm mounting bolt and nut (3) with the specified torque after setting up the wheel and unloading the machine on ground**

Tightening torque	Tie-rod end slotted nut	39.2 N·m 4.0 kgf·m 29.0 lbf·ft
	Ball joint mounting screw and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	Knuckle case mounting bolt and slotted nut	39.2 N·m 4.0 kgf·m 29.0 lbf·ft

- (1) Strut  
(2) Knuckle Case

- (3) Lower Arm Mounting Bolt and Nut

W1017617



**Front Differential Case**

1. Remove the front differential protector (1).
2. Remove the front center cover (2).
3. Remove the front differential case mounting nut (4) and separate the front differential case (3) from main frame and propeller shaft 2 (5).

**(When reassembling)**

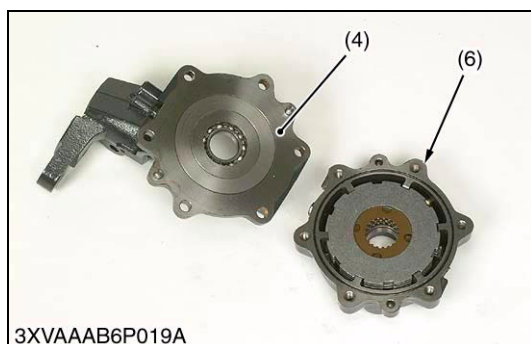
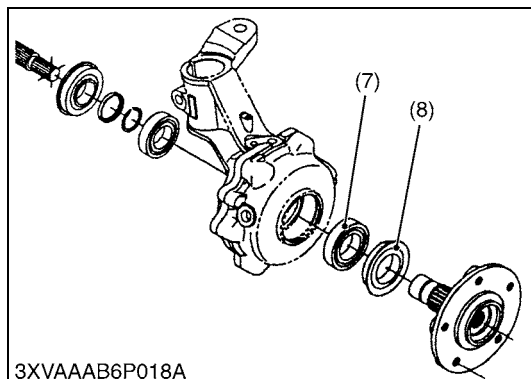
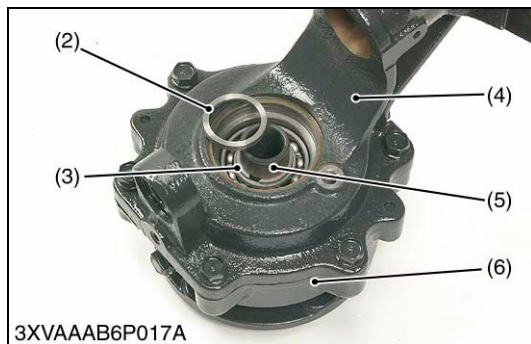
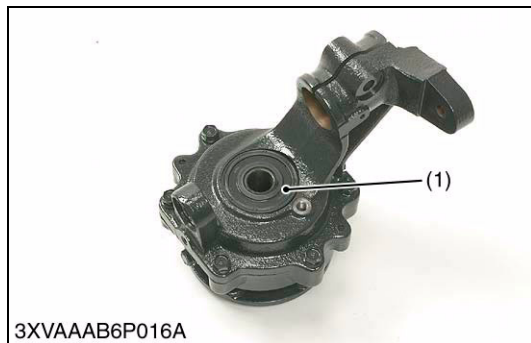
- Apply grease to the splines of propeller shaft 2 (5) and pinion shaft.

Tightening torque	Front differential case mounting nut	39.3 to 40.1 N·m 4.0 to 4.5 kgf·m 29.0 to 32.5 lbf·ft
-------------------	--------------------------------------	---

- |                             |  |
|-----------------------------|--|
| (1) Differential Protector  | (4) Front Differential Case Mounting Nut |
| (2) Front Center Cover      | (5) Propeller Shaft 2                    |
| (3) Front Differential Case |  |

W1019750





### Front Axle

1. Remove the oil seal (1).
2. Remove the snap ring collar (2) and remove the external snap ring (3).
3. Tap out the front axle (5) with plastic hammer.
4. Remove the knuckle case mounting screw.
5. Separate the knuckle case (4) and knuckle case cover (6).

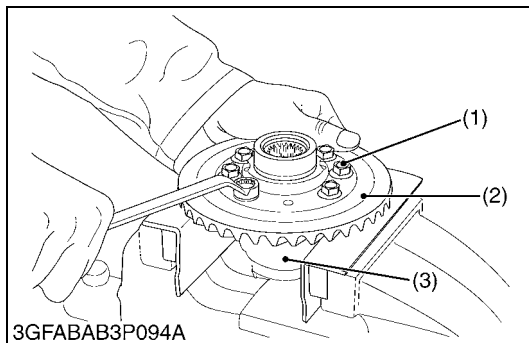
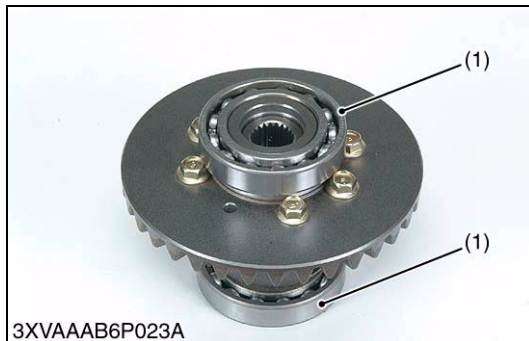
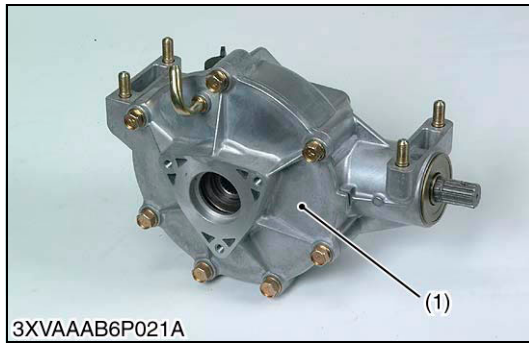
### (When reassembling)

- Be sure insert the external snap ring.
- Replace the oil seal with new one.
- Take care not to damage the O-ring.
- Insert the bearing (7) and oil seal (8) first to the knuckle cover, and then install the knuckle case cover.

Tightening torque	Knuckle case cover mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
-------------------	-----------------------------------	---

- |                        |                        |
|------------------------|------------------------|
| (1) Oil Seal           | (5) Front Axle         |
| (2) Snap Ring Collar   | (6) Knuckle Case Cover |
| (3) External Snap Ring | (7) Bearing            |
| (4) Knuckle Case       | (8) Oil Seal           |

W1020401



### Front Differential Assembly

1. Remove the front differential case cover mounting screws and separate the front differential case cover (1).
2. Remove the differential gear assembly (2).

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the front case cover and front case other eliminate the oil and stuck liquid gasket.
- Use same number of shims as before disassembling.

#### (Reference)

Thickness of shim (RH) (Case side)	Factory spec.	0.5 mm 0.020 in.
Thickness of shim (LH) (Cover side)	Factory spec.	0.9 mm 0.035 in.

(1) Front Differential Case Cover

(3) Front Differential Case

(2) Differential Gear Assembly

W1021469

### Bearings

1. Remove the right and left bearings (1) from the differential case.

(1) Bearing

W1021953

### Bevel Gear

1. Remove the bevel gear UBS screws (1).
2. Remove the 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.

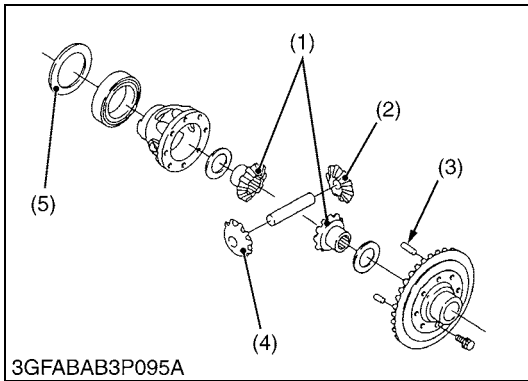
Tightening torque	Bevel gear UBS screw	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
-------------------	----------------------	---

(1) Bevel Gear UBS Screw

(3) Differential Case

(2) Bevel Gear

W1022107

**Differential Side Gear and Differential Pinion**

1. Put parting marks on the differential pinion (2) and the differential side gear (1).
2. Tap out the dowel pin (3).
3. Remove the differential pinion shaft.
4. Remove the differential pinion (4), differential side gear (1) and shim (5).

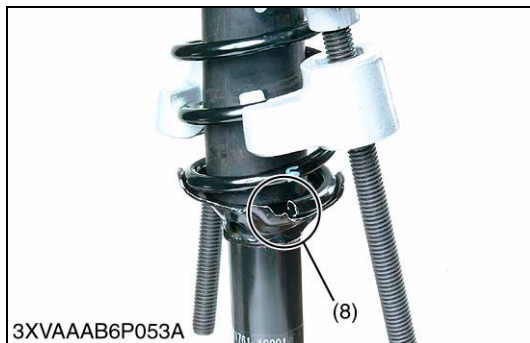
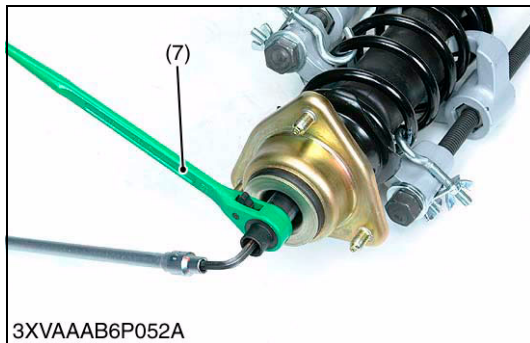
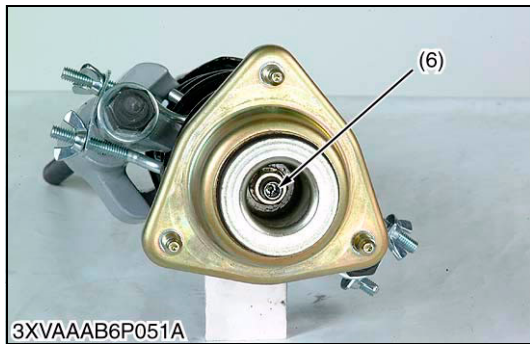
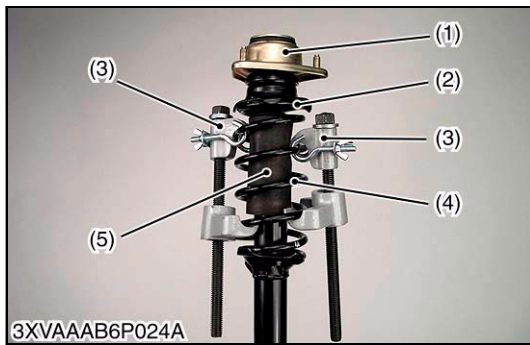
**(When reassembling)**

- Install the differential pinion and differential side gear, aligning the parting marks.

- (1) Differential Side Gear  
(2) Differential Pinion  
(3) Dowel Pin

- (4) Differential Pinion  
(5) Shim

W1022356



### Strut Damper and Spring

1. Cramp the strut in a vise.
2. Shorten spring with a spring compressor (3).
3. Remove the strut mount bracket mounting nut (6).
4. Remove the strut mount bracket (1), spring (4), plates, spacer, spring upper support (2) and stopper (5).

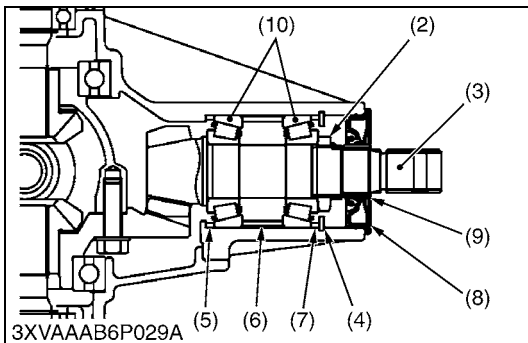
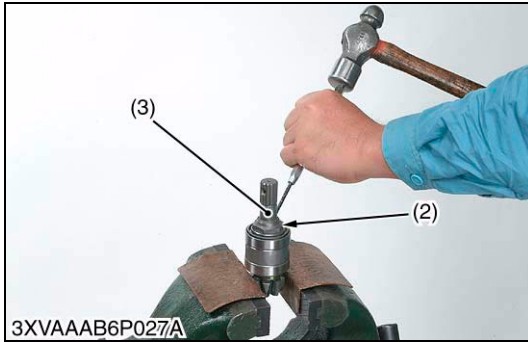
#### (When reassembling)

- Set the spring end to the bulge (8) in the lower spring seat the strut damper.
- Set the spring end to the bulge in the spring upper support (2).

- |                          |  |
|--------------------------|--|
| (1) Strut Mount Bracket  | (6) Nut                                |
| (2) Spring Upper Support | (7) Long Deep Socket Wrench<br>(17 mm) |
| (3) Spring Compressor    | (8) Bulge                              |
| (4) Spring               |  |
| (5) Stopper              |  |

W1022672





### Bevel Pinion Gear Assembly

1. Remove the oil seal (8) and sleeve (9).
2. Remove the internal snap ring (4) and tap out the bevel pinion shaft (3) from front.
3. Cramp the bevel pinion shaft assembly in a vise.
4. Remove the stake of lock nut (2), and then remove the lock nut.

#### (When reassembling)

- Apply gear oil to the taper roller bearings (10) and install them correctly, noting their direction.
- Replace the lock nut (2) and oil seal (8) with new ones.
- After tighten the lock nut (2) to the specified torque, stake it firmly.
- Install the adjusting collars (5), (7) to their original position.
- Use same thickness of collars as before disassembling.

#### (Reference)

##### Combination 1

Thickness of collar (5) (Front)	Factory spec.	4.0 mm 0.17 in.
Thickness of collar (7) (Rear)	Factory spec.	3.6 mm 0.14 in.

##### Combination 2

Thickness of collar (5) (Front)	Factory spec.	4.6 mm 0.18 in.
Thickness of collar (7) (Rear)	Factory spec.	3.4 mm 0.13 in.

(1) Front Differential Case

(2) Staking Lock Nut

(3) Pinion Shaft

(4) Internal Snap Ring

(5) Adjusting Collar

(6) Collar

(7) Adjusting Collar

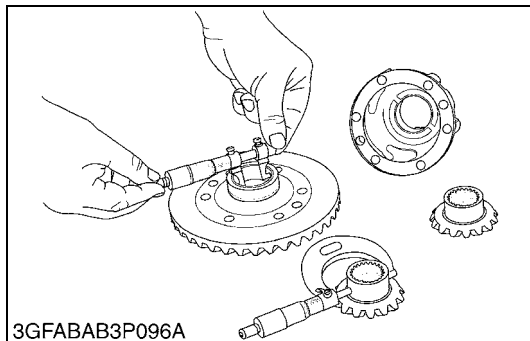
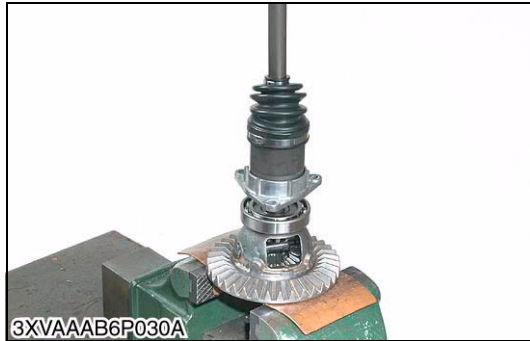
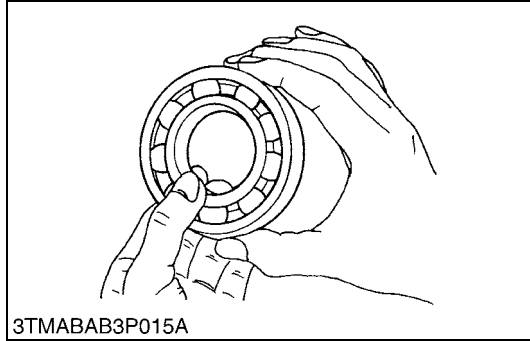
(8) Oil Seal

(9) Sleeve

(10) Taper Roller Bearing

W1023215

### [3] SERVICING



#### **Checking Bearing**

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

W1024422

#### **Backlash between Differential Pinion and Differential Side Gear**

1. Secure the differential case with a vise.
2. Put the solder (0.5 mm (0.020 in.) thickness) on the tooth of the differential pinion.
3. Temporarily install the drive shaft assembly and rotate the drive shaft carefully to measure the backlash.
4. If the measurement exceeds the factory specifications, adjust with the differential side gears shims.

Backlash between differential pinion and differential side gear	Factory spec.	0.1 to 0.3 mm 0.004 to 0.012 in.
---	---------------	-------------------------------------

W1024536

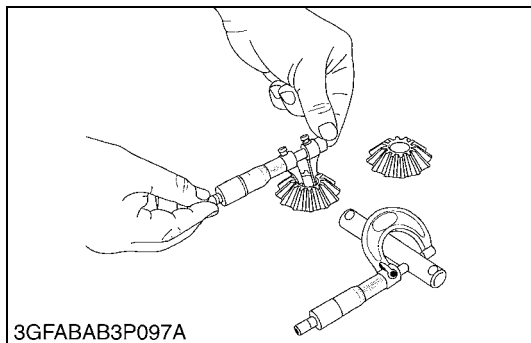
#### **Clearance between Differential Case (Spiral Bevel Gear) and Differential Side Gear**

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 spec.	0.025 to 0.066 mm 0.00098 to 0.00260 in.
	Allowable limit	0.3 mm 0.012 in.

Differential case I.D.	Factory spec.	32.000 to 32.025 mm 1.25984 to 1.26082 in.
Spiral bevel gear I.D.	Factory spec.	32.000 to 32.025 mm 1.25984 to 1.26082 in.
Differential side gear O.D.	Factory spec.	31.959 to 31.975 mm 1.25823 to 1.25886 in.

W1024710



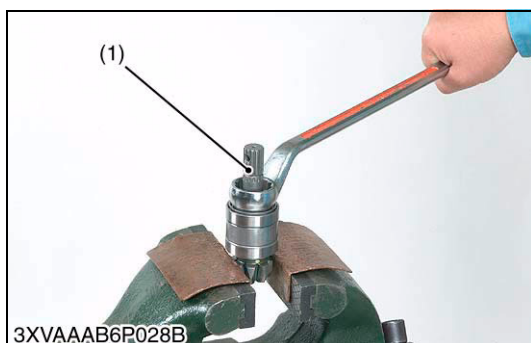
### **Clearance between Differential Pinion Shaft and Differential Pinion**

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 spec.	0.016 to 0.045 mm 0.00063 to 0.00177 in.
	Allowable limit	0.3 mm 0.012 in.

Differential pinion I.D.	Factory spec.	16.000 to 16.018 mm 0.62992 to 0.63063 in.
Differential pinion shaft O.D.	Factory spec.	15.973 to 15.984 mm 0.62886 to 0.62929 in.

W1024957



### **Turning Torque of 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 spec.	0.8 to 1.0 N·m 0.08 to 0.10 Kgf·m 0.59 to 0.73 lbf·ft
----------------	---------------	---

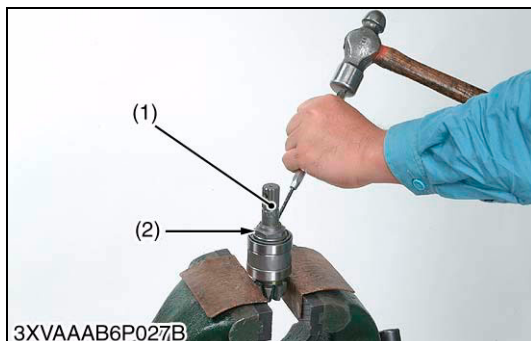
### **NOTE**

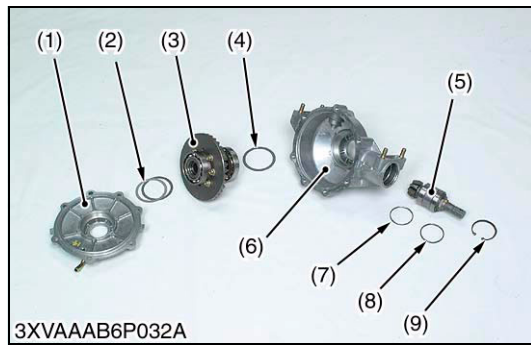
- After turning force adjustment, be sure to stake the lock nut.

(1) Pinion Shaft

(2) Staking Lock Nut

W1025259





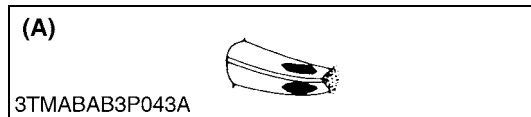
### **Tooth Contact between Bevel Pinion Shaft and Bevel Gear**

#### **(When checking)**

- Use same number of shims as before disassembling.
  - Use same thickness of collar as before disassembling.
1. Apply red lead (or prussian blue) lightly on the teeth of spiral bevel pinion shaft.
  2. Reassemble the front differential case and front differential case cover.
  3. Tighten the front differential case cover mounting screws to specified torque.
  4. Turn the bevel pinion shaft to the clockwise by 5 to 6 rotations and 5 to 6 rotations to the counterclockwise.
  5. Check the tooth contact. If not proper, adjust with shims and collars according to the instructions below.

- |                                      |                                 |
|--------------------------------------|---------------------------------|
| (1) Front Differential Case Cover    | (5) Bevel Pinion Shaft Assembly |
| (2) Adjusting Shim                   | (6) Front Differential Case     |
| (3) Front Differential Gear Assembly | (7) Adjusting Collar            |
| (4) Adjusting Shim                   | (8) Adjusting Collar            |
|                                      | (9) Internal Snap Ring          |

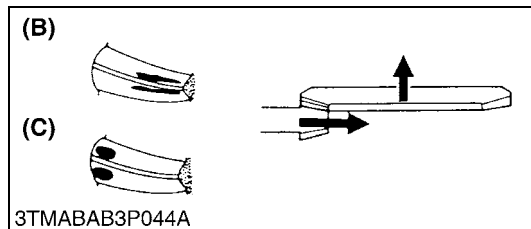
W1025583



More than 35 % red lead contact area on the gear tooth surface.  
The center of tooth contact at 1/3 of the entire width from the small end.

#### **(A) Proper Contact**

W1026092



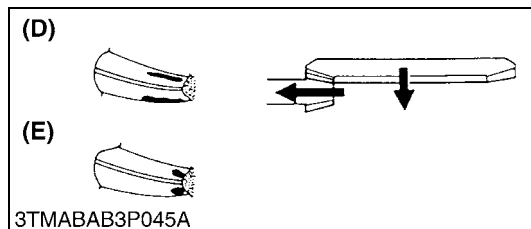
Change the adjusting collar to smaller size, and change the adjusting collar to larger size.

For move the spiral bevel gear rightward, reduce right side shim (2) and add shim (3) of the same thickness as the right side to left side.

#### **(B) Shallow Contact**

#### **(C) Heel Contact**

W1026207



Change the adjusting collar to larger size, and change the adjusting collar to smaller size.

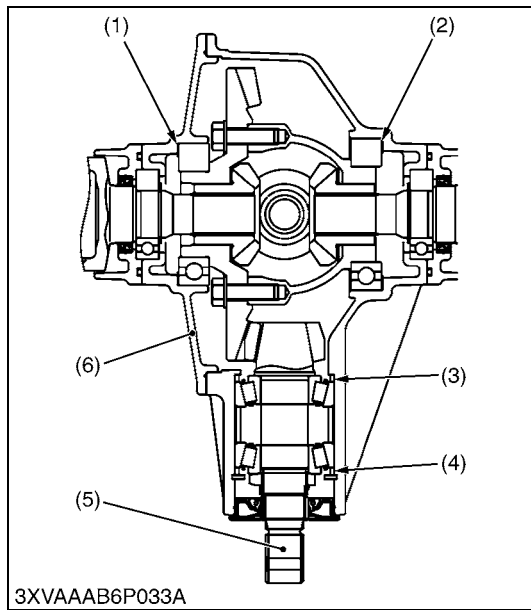
For move the spiral bevel gear leftward, reduce left side shim (3) and add shim (2) of the same thickness as the left side to right side.

Repeat above until the proper tooth contact and backlash are achieved.

#### **(D) Deep Contact**

#### **(E) Toe Contact**

W1026271



### Backlash between Bevel Pinion Shaft and Bevel Gear

1. Put the solder (0.5 mm (0.020 in.) thickness) on the position where the tooth proper contact of bevel pinion shaft.
2. Reassemble the differential assembly and front case cover, and rotate the bevel pinion shaft carefully.
3. Separate the front differential case cover and remove the differential assembly, again.
4. Measure the backlash by thickness of the point where solder is the thinnest.
5. When the backlash is too large, decrease the number of shims (LH) in the side of the bevel gear, and insert the shim (RH) of the same thickness as the removed ones to the opposite side.
6. When the backlash is too small, do the opposite way to increase backlash.

Adjust the backlash properly by repeating the above procedure.

Backlash between bevel pinion shaft and bevel gear	Factory spec.	0.15 to 0.30 mm 0.006 to 0.012 in.
--	---------------	---------------------------------------

### (Reference)

- Thickness of shims (1) (LH) :  
0.2 mm (0.008 in.), 0.3 mm (0.012 in.), 0.5 mm (0.020 in.)
- Thickness of shims (2) (RH) :  
0.1 mm (0.004 in.), 0.2 mm (0.008 in.), 0.3 mm (0.012 in.)  
0.5 mm (0.020 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.)  
3.9 mm (0.154 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.), 4.5 mm (0.177 in.)  
4.6 mm (0.181 in.)

Thickness of shim LH (1) (Cover side)	Factory spec.	0.5 mm 0.020 in.
Thickness of shim RH (2) (Case side)	Factory spec.	0.9 mm 0.035 in.

### Combination 1

Thickness of collar (3) (Front)	Factory spec.	4.4 mm 0.17 in.
Thickness of collar (4) (Rear)	Factory spec.	4.4 mm 0.17 in.

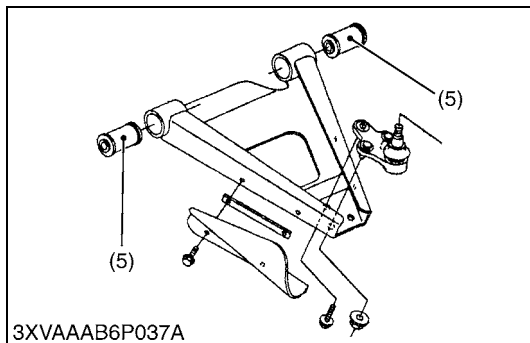
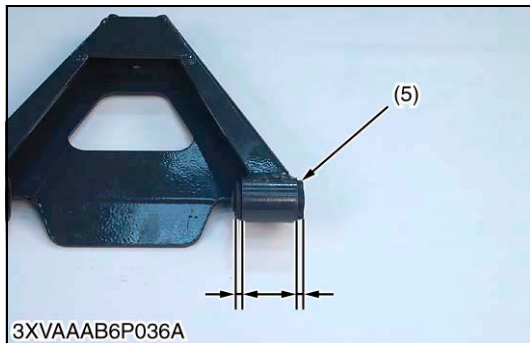
### Combination 2

Thickness of collar (3) (Front)	Factory spec.	4.6 mm 0.18 in.
Thickness of collar (4) (Rear)	Factory spec.	3.4 mm 0.13 in.

- (1) Adjusting Shim  
(2) Adjusting Shim  
(3) Adjusting Collar

- (4) Adjusting Collar  
(5) Bevel Pinion Shaft  
(6) Front Differential Case Cover

W1026468



### **Lower Arm, and Rubber Bush**

1. Replace any bushing that are worn, cracked, hardened, or otherwise damaged.
2. Remove the lower arm rubber bush (5) with press machine and lower arm bush tool 1 (1), 2 (2), 3 (3).
3. Visually inspect the lower arm for breaks or distortion.
4. If the lower arm is damaged in any way, replace it.

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

- Install the lower arm rubber bush with press machine and lower arm bush tool 1 (1), 2 (2), 4 (4).

#### **NOTE**

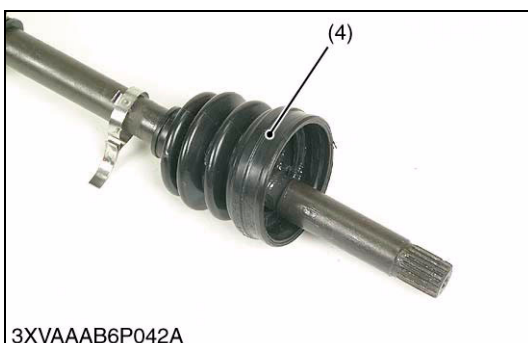
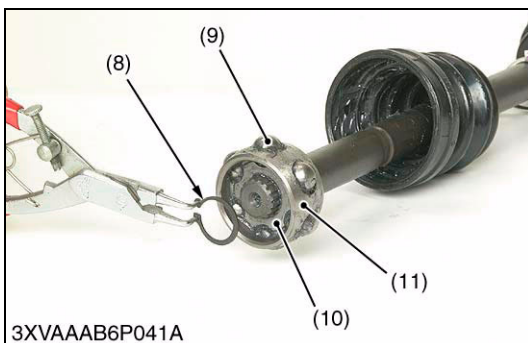
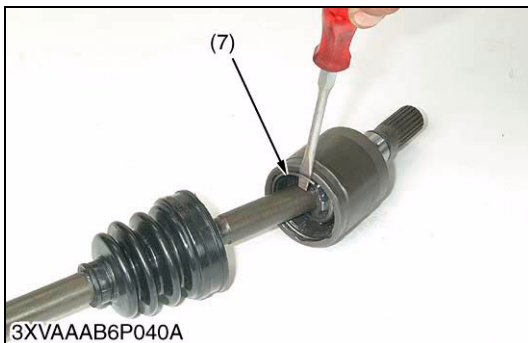
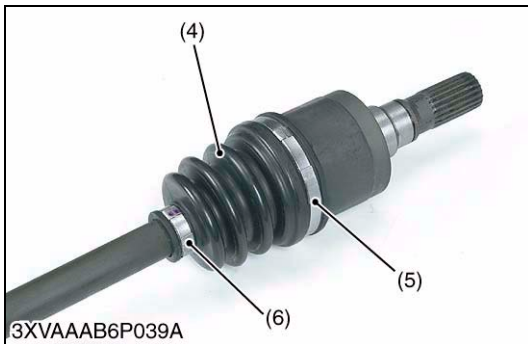
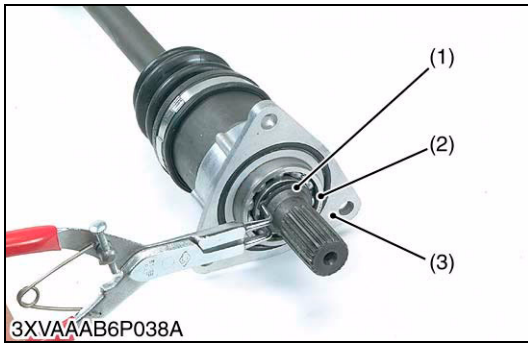
- **Use soapy water when you install the bush. Never use neither oil nor grease, etc..**
- **Bush must install it to go out right and left and evenly (see photo).**

- (1) Lower Bush Tool 1  
(2) Lower Bush Tool 2  
(3) Lower Bush Tool 3

- (4) Lower Bush Tool 4  
(5) Rubber Bush

W1027305



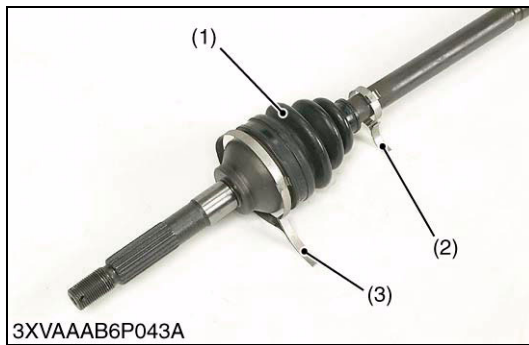


### **Drive Shaft Boot (To be continued)**

1. Remove the external snap ring (1), bearing (2) and bearing holder (3).
2. Unlock the both boot bands (5), (6) and slide the boot DOJ (4).
3. Remove the internal circlip (7) and wipe the old grease.
4. Separate the joint outer and drive shaft assembly.
5. Remove the external snap ring (8) and, then remove the steel ball (9), steel ball retainer (11) and steel ball base (10).
6. Remove the boot DOJ (4) of front case side.

- |                        |                          |
|------------------------|--------------------------|
| (1) External Snap Ring | (7) Internal Circlip     |
| (2) Bearing            | (8) External Snap Ring   |
| (3) Bearing Holder     | (9) Steel Ball           |
| (4) Boot DOJ           | (10) Steel Ball Base     |
| (5) Boot Band          | (11) Steel Ball Retainer |
| (6) Boot Band          |                          |

W1027977

**Drive Shaft Boot (Continued)**

1. Unlock the both boot bands (2), (3) and remove the boot BJ (1) of knuckle case side.
2. Wipe the old grease.

**■ NOTE**

- The knuckle case side (wheel side) joint can not be disassembled.

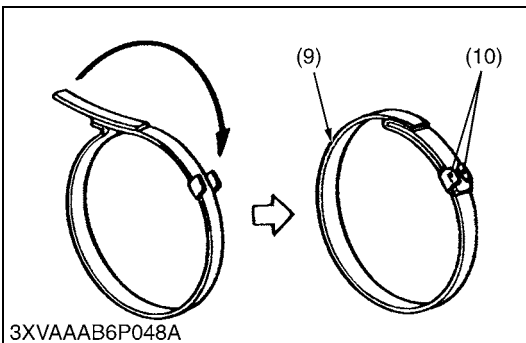
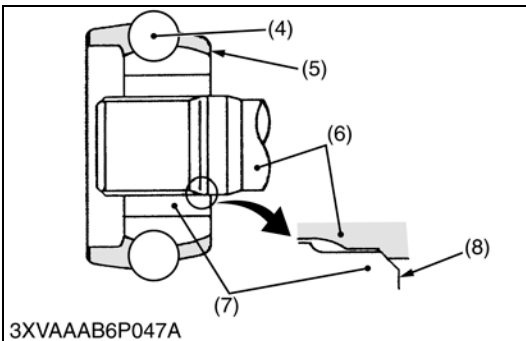
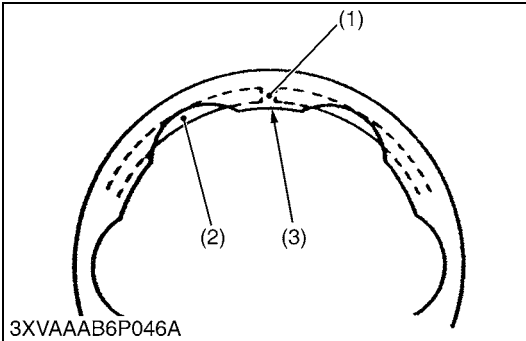
(1) Boot BJ  
(2) Boot Band

(3) Boot Band

W1028776







### **Drive Shaft Boot (Continued)**

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

- Check the each joints, if any joint does not work smoothly without rattling or sticking, the joint bearing is damaged. Replace the drive shaft with new one.
- Visually check the splines on the each shafts, if they are badly worn or chipped, replace the drive shaft with new one.
- Replace the internal circlip, boot and boot band with new ones.
- Be sure to use the special grease is the boot kit.
- When install the internal circlip (2) so that the opening (1) is aligned with one of the projections (3) as shown in the figure left.
- Install the steel ball retainer (5) as shown in the figure left.
- Install the steel ball base (7), face the chamfered side (8) of the steel ball base (7) to the boot as shown in the figure left.
- Clamp the boot bands and bend the tangs (10) securely to hold down the end of the band (9).

- |                         |                     |
|-------------------------|---------------------|
| (1) Opening             | (6) Drive Shaft     |
| (2) Internal Circlip    | (7) Steel Ball Base |
| (3) Projection Part     | (8) Chamfered Side  |
| (4) Steel Ball          | (9) Boot Band       |
| (5) Steel Ball Retainer | (10) Tang           |

W1029130

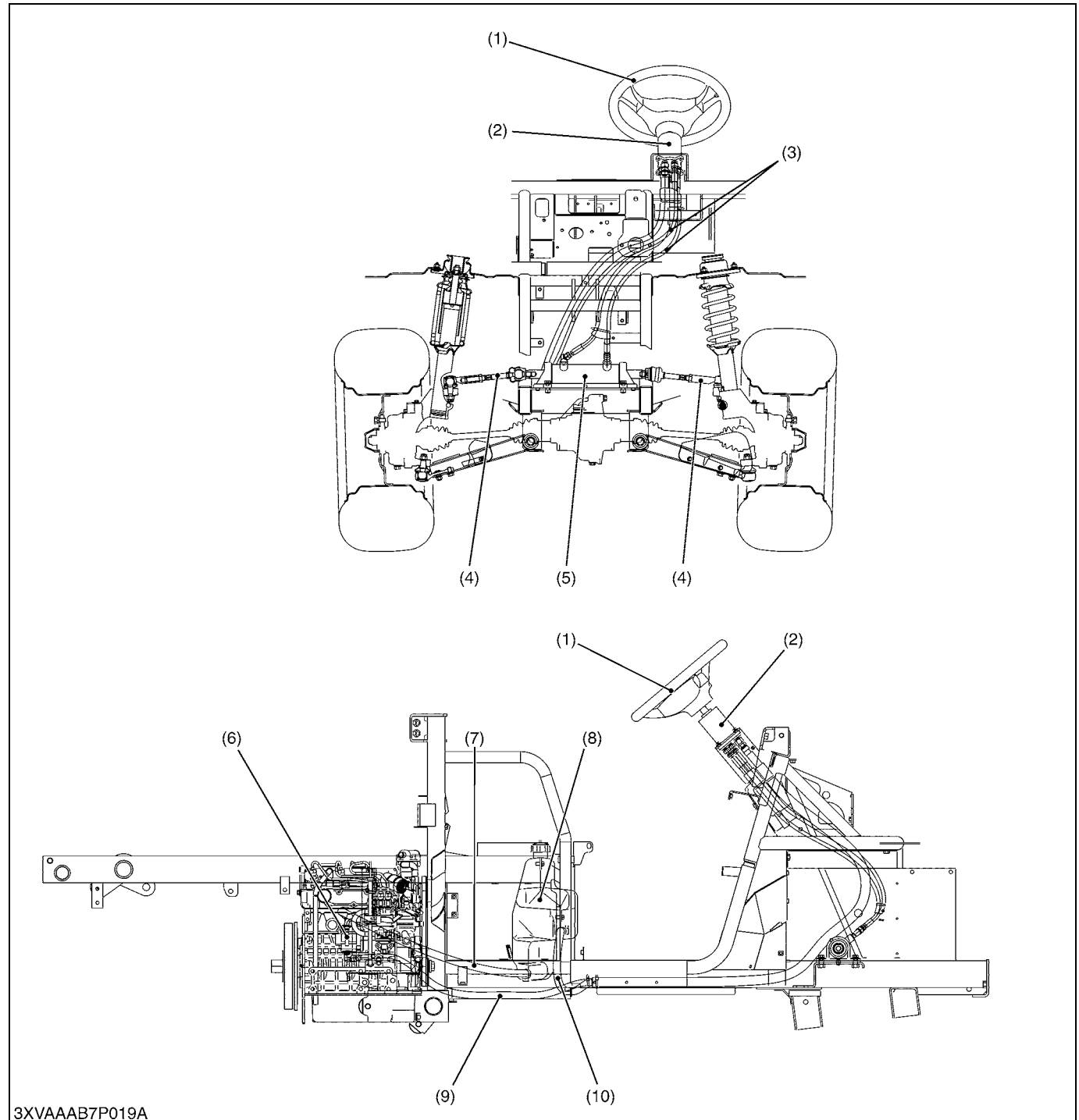
# **6 STEERING**

# MECHANISM

## CONTENTS

1. STRUCTURE .....	6-M1
2. HYDRAULIC CIRCUIT .....	6-M2
3. STEERING CONTROLLER .....	6-M3
4. STEERING CYLINDER.....	6-M5

# 1. STRUCTURE

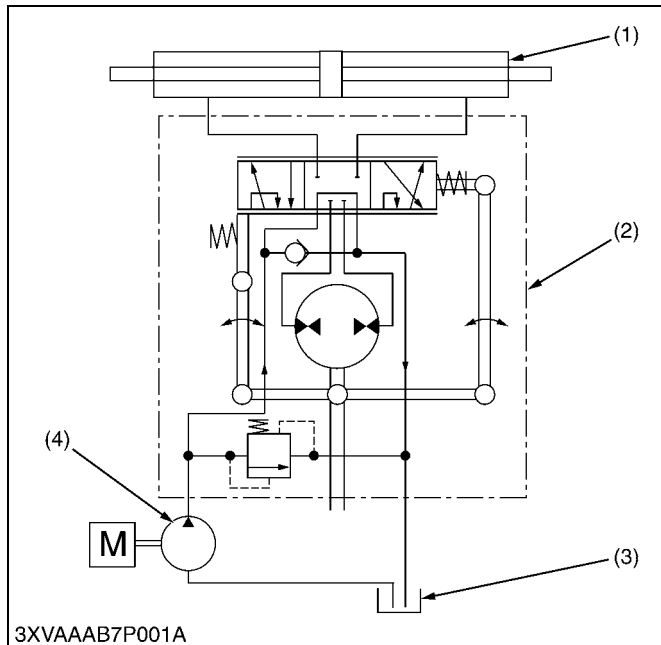


3XVAAAB7P019A

- |                         |                       |                             |                   |
|-------------------------|-----------------------|-----------------------------|-------------------|
| (1) Steering Wheel      | (4) Tie-rod           | (7) Suction Hose            | (9) Delivery Hose |
| (2) Steering Controller | (5) Steering Cylinder | (8) Power Steering Oil Tank | (10) Return Hose  |
| (3) Cylinder Hose       | (6) Hydraulic Pump    |                             |                   |

The full hydrostatic type power steering is used on RTV900. This steering system is composed of steering wheel, steering controller, steering cylinder and other components shown in the figure.

## 2. HYDRAULIC CIRCUIT



This model is provided with a full hydrostatic power steering.

In the full hydrostatic power steering, the steering controller is connected to the steering cylinder (1) with only the hydraulic piping. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc. Therefore, it is simple in construction. This steering system consists of the power steering oil tank (3), hydraulic pump (4), steering controller (2), steering cylinder, etc.

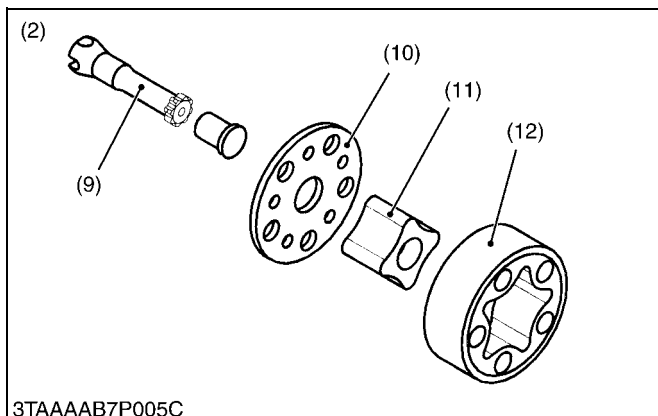
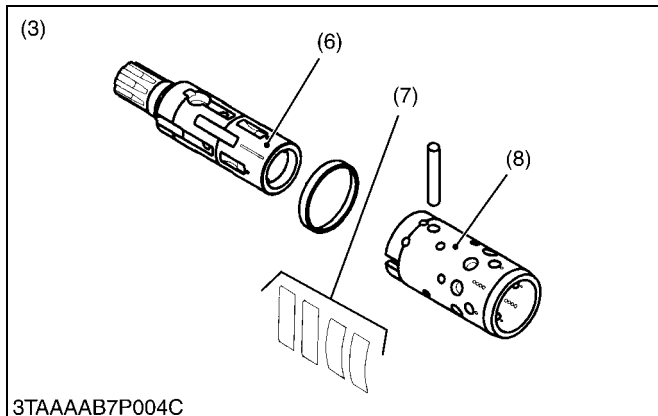
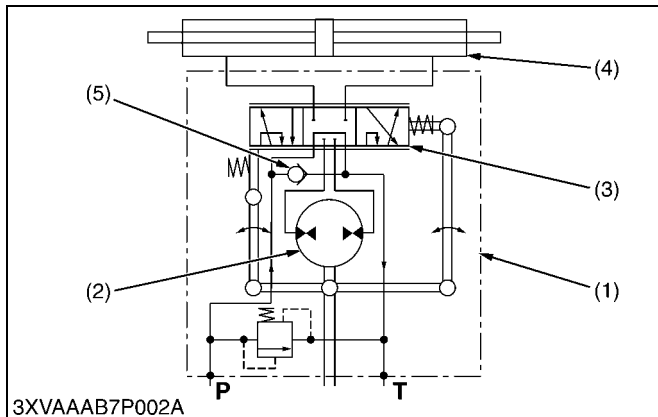
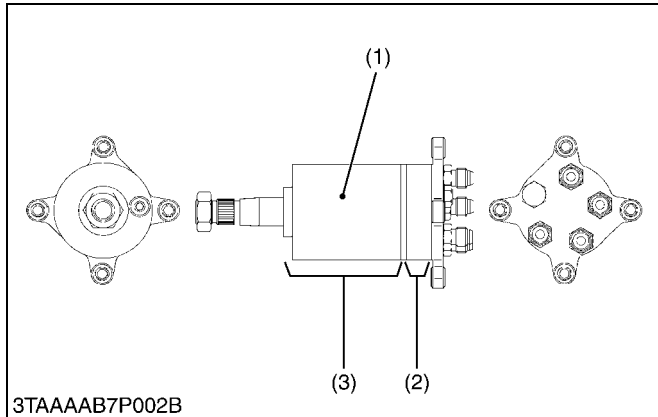
An oil tank dedicated for power steering is located below the operator's seat. The oil in this tank is fed by the engine driven hydraulic pump to the steering controller (3.5 to 8.4 L/min., 0.92 to 2.22 U.S.gals./min.). With the steering wheel at neutral, the oil returns through the controller to the oil tank. Turn the steering wheel, and just a required amount of oil is sent to the steering cylinder. The oil at the side opposite to the cylinder flows back to the tank.

This power steering controller is of non-load reaction type.

- |                         |                    |
|-------------------------|--------------------|
| (1) Steering Cylinder   | (3) Oil Tank       |
| (2) Steering Controller | (4) Hydraulic Pump |

W1012902

### 3. STEERING CONTROLLER



The steering controller consists of a control valve (3) and a metering device (2).

#### ■ Control Valve

The control valve is a rotating spool type.

When the steering wheel is not turned, the position of the spool (6) and sleeve (8) is kept neutral by the centering spring (7). This causes the forming of a "Neutral" oil circuit.

When the steering wheel is turned either clockwise or counterclockwise, the position of the spool and sleeve changes in relation to the centering spring. This allows the forming of a "Right Turning" or "Left Turning" oil circuit. At the same time, the gear pump (Metering device) rotates with the spool and sends the oil to the cylinder corresponding to the rotation of the steering wheel.

#### ■ Metering Device

An oil, sent from the hydraulic pump to the steering cylinder, passes through the metering device (2).

Namely, when the rotor is driven, two chambers suck in oil due to volumetric change in the pup chambers formed between the rotor (11) and the stator (12), while oil is discharged from other two chambers. On the other hand, rotation of the steering wheel is directly transmitted to the rotor through the spool (6), drive shaft (9), etc.

Accordingly, the metering device serves to supply the steering cylinder with oil, amount of which corresponds to the rotation of the steering wheel. The wheels are thus turned by the angle corresponding to the rotation of the steering wheel.

When the engine stops or the hydraulic pump malfunctions, the metering device functions as a manual trochoid pump, which makes manual steering possible.

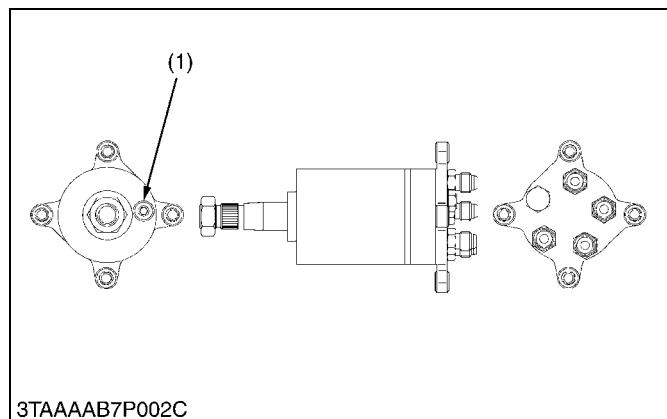
- (1) Steering Controller
- (2) Metering Device
- (3) Control Valve
- (4) Steering Cylinder
- (5) Check Valve
- (6) Spool
- (7) Centering Spring
- (8) Sleeve
- (9) Drive Shaft

- (10) Distributor Plate
- (11) Rotor
- (12) Stator

**P : P Port (From Hydraulic Pump)**

**T : T Port (To Power Steering Oil Tank)**

W1013137



### ■ Relief Valve

The relief valve (1) is located in the steering controller. It controls the maximum pressure of the power steering system.

Its setting pressure is as follows.

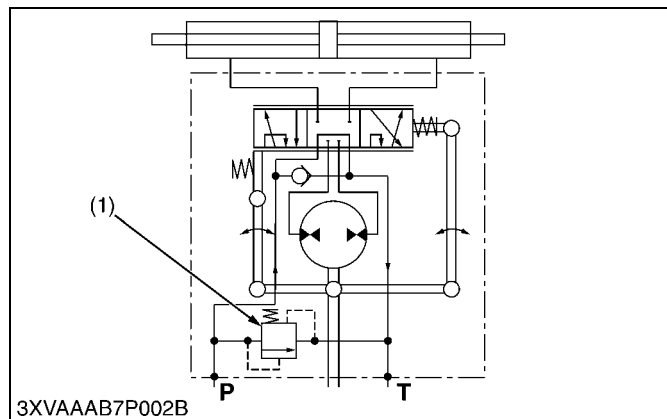
8.33 to 8.83 MPa

85 to 90 kgf/cm<sup>2</sup>.

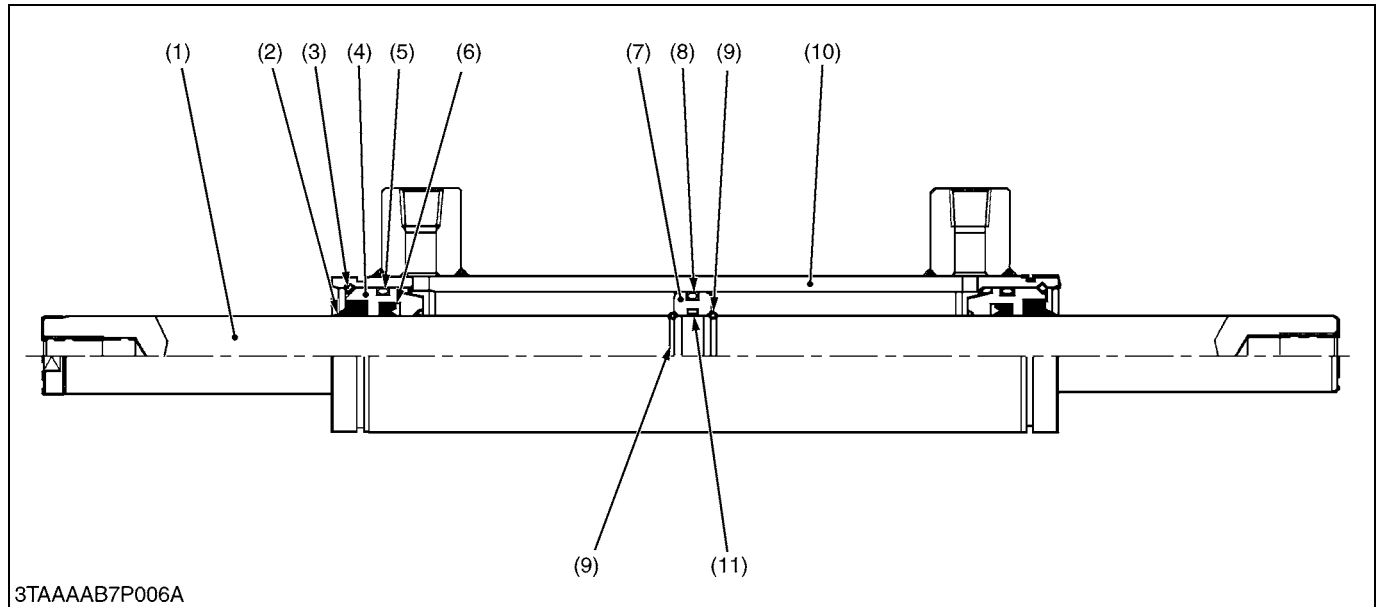
1209 to 1280 psi

(1) Relief Valve

W1013662



## 4. STEERING CYLINDER



- |                        |               |                        |                    |
|------------------------|---------------|------------------------|--------------------|
| (1) Rod                | (4) Guide     | (7) Center Piston      | (10) Cylinder Tube |
| (2) Wiper Ring         | (5) O-ring    | (8) Piston O-ring      | (11) Rod O-ring    |
| (3) Internal Snap Ring | (6) Seal Ring | (9) External Snap Ring |                    |

The steering cylinder is single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods.

The tie-rods connected to both knuckle arm guarantees equal steering movement to both front wheels.

The steering cylinder provide force in both directions. Depending upon direction the steering wheel is turned pressure oil enters at one end of the cylinder to extend, or the other end to retract it, thereby turning front wheel of the tractor.



# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	6-S1
2. SERVICING SPECIFICATIONS .....	6-S2
3. TIGHTENING TORQUES .....	6-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	6-S4
[1] CHECKING .....	6-S4
[2] PREPARATION .....	6-S4
(1) Separating Power Steering Controller .....	6-S4
(2) Separating Power Steering Cylinder .....	6-S6
(3) Separating Hydraulic Pump for Power Steering .....	6-S7
(4) Removing Power Steering Hose .....	6-S8
[3] DISASSEMBLING AND ASSEMBLING.....	6-S11
(1) Power Steering Cylinder .....	6-S11
(2) Hydraulic Pump.....	6-S12

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Cannot Be Steered</b>	Steering controller malfunctioning	Replace	6-S6
	Hose broken	Replace	6-S9
<b>Hard Steering</b>	Power steering oil improper	Change with specified oil	G-41
	Hydraulic pump malfunctioning	Replace	6-S7
	Steering controller malfunctioning	Replace	6-S6
<b>Steering Force Fluctuates</b>	Steering controller malfunctioning	Replace	6-S6
	Air sucked in pump due to lack of oil	Replenish	G-8
	Air sucked in pump from suction circuit	Repair	6-S9
<b>Steering Wheel Turns Spontaneously When Released</b>	Steering controller malfunctioning	Replace	6-S6
<b>Front Wheels Wander to Right and Left</b>	Steering controller malfunctioning	Replace	6-S6
	Air sucked in pump due to lack of oil	Replenish	G-41
	Air sucked in pump from suction circuit	Repair	6-S9
	Insufficient bleeding	Bleed	—
	Cylinder malfunctioning	Repair or replace	6-S11
	Improper toe-in adjustment	Adjust	5-S4
	Tire pressure uneven	Inflate	G-23
<b>Wheels Are Turned to a Direction Opposite to Steering Direction</b>	Cylinder hoses connected in reverse	Repair	6-S9
<b>Steering Wheel Turns Idle in Manual Steering</b>	Insufficient bleeding	Bleed	—
	Air sucked in due to lack of oil	Replenish	G-41
<b>Noise</b>	Air sucked in pump due to lack of oil	Replenish	G-41
	Air sucked in pump from suction circuit	Repair	6-S9
<b>Oil Temperature Increases Rapidly</b>	Steering controller (relief valve) malfunctioning	Replace	6-S6

W1054624

## 2. SERVICING SPECIFICATIONS

### POWER STEERING BODY

Item		Factory Specification	Allowable Limit
Relief Valve	Operating Pressure	8.33 to 8.83 MPa 85 to 90 kgf/cm <sup>2</sup> 1209 to 1280 psi	—

W1013874

### 3. TIGHTENING TORQUES

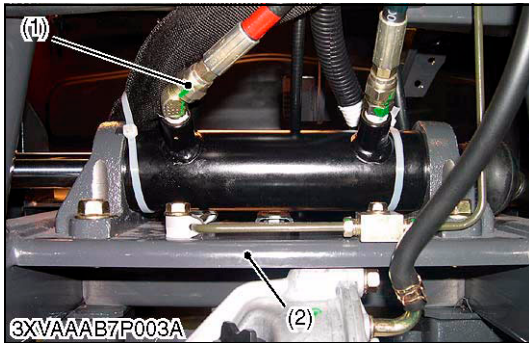
Tightening torques of screws, bolts and nuts on the table below are especially specified.  
(For general use screws, bolts and nuts : See page G-11.)

Item	N·m	kgf·m	lbf·ft
Steering wheel mounting nut	20 to 25	2.0 to 2.6	14.8 to 18.4
Power steering hose mounting nut	28.4 to 30.0	2.9 to 3.1	20.9 to 22.1
Steering cylinder bracket mounting screw	103 to 117	10.5 to 12.0	76.0 to 86.7
Tie-rod end slotted nut	17.7 to 34.3	1.8 to 3.5	13.0 to 25.3
Tie-rod screw	74 to 84	7.5 to 8.6	54.6 to 61.9
ROPS pipe mounting bolt and nut	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
ROPS mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Seat belt mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2

W1012736

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] CHECKING



#### Relief Valve Operating Pressure

##### **CAUTION**

- When checking, park the machine on flat ground, apply the parking brake.
1. Disconnect the power steering hose (1) L (or R) from steering cylinder, and set a pressure gauge.
  2. Start the engine and set at maximum speed.
  3. Fully turn the steering wheel to the left (or right) to check the feeling which the steering wheel lightly locks. Read the relief valve operating pressure when the steering wheel to the above-mentioned lock position.

##### **NOTE**

- After set a pressure gauge, be sure to bleed air.
- Note that the pressure value changes by the pump action of the power steering controller when the steering operation is continued after the steering wheel is lightly locked and accurate relief valve pressure cannot be measured.

##### (Reference)

- Hose and adaptor Tee, swivel (3) (9/16-18).
- Replace the hydraulic pump if pressure does not rise in 7.8 MPa (80 kgf/cm<sup>2</sup>, 1138 psi).

Relief valve operating pressure	Factory spec.	8.33 to 8.83 MPa 85 to 90 kgf/cm <sup>2</sup> 1209 to 1280 psi
---------------------------------	---------------	--

##### Condition

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

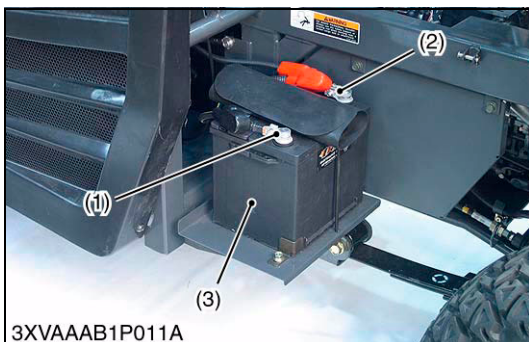
(1) Power Steering Hose  
(2) Power Steering Cylinder

(3) Adaptor Tee, Swivel

W1012400

### [2] PREPARATION

#### (1) Separating Power Steering Controller



#### Battery

##### **CAUTION**

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.
1. Disconnect the negative cable (1) from the battery.
  2. Disconnect the positive cable (2) from the battery and remove the battery (3).

(1) Negative Cable  
(2) Positive Cable

(3) Battery

W1013728



### Bonnet Upper

1. Remove the snap pin and remove the bonnet upper (3).
2. Remove the ROPS pipes (1).
3. Lift ROPS boots and remove the three screws on both sides.
4. Remove the ROPS pipe (front) (2).

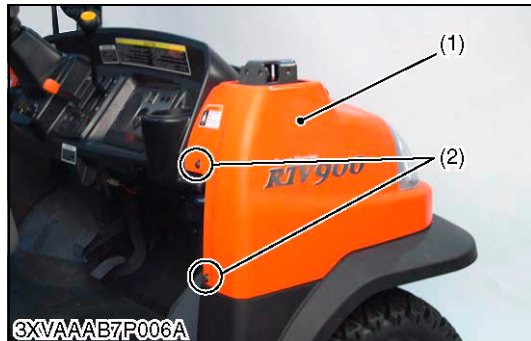
Tightening torque	ROPS pipe mounting bolt and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	ROPS (front) mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) ROPS Pipe

(3) Bonnet Upper

(2) ROPE Pipe, Front

W1013944



### Bonnet Lower

1. Remove the four screw (2).
2. Remove the screw (3) from underneath the bonnet lower.
3. Remove the bonnet lower (1).

(1) Bonnet Lower

(3) Screw (2 pcs)

(2) Screw (4 pcs)

W1014373



### Steering Wheel and Panel

1. Remove the steering wheel cap (7).
2. Remove the steering wheel mounting nut (1) and remove the steering wheel (2).
3. Remove the shift lever grip (3) and four wheel drive lever grip (6).
4. Disconnect the connector for main switch, horn switch and head light switch.
5. Remove the panel mounting screws (5) and the panel support.
6. Disconnect the all connectors from panel and remove the panel (4).

### (When reassembling)

Tightening torque	Steering wheel mounting nut	20 to 25 N·m 2.0 to 2.6 kgf·m 14.8 to 18.4 lbf·ft
-------------------	-----------------------------	---

(1) Steering Wheel Mounting Nut

(5) Screw (2pcs)

(2) Steering Wheel

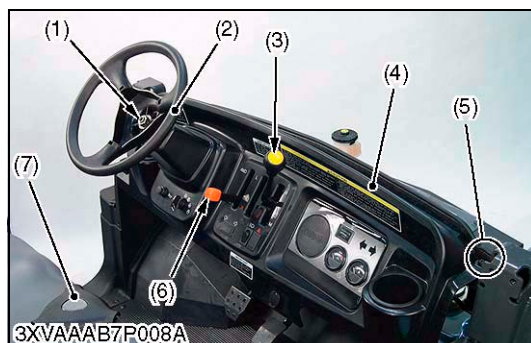
(6) 4WD Lever Grip

(3) Shift Lever Grip

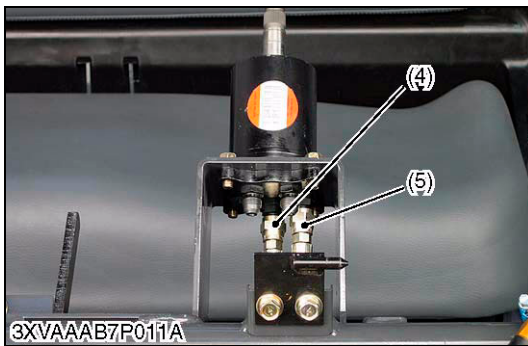
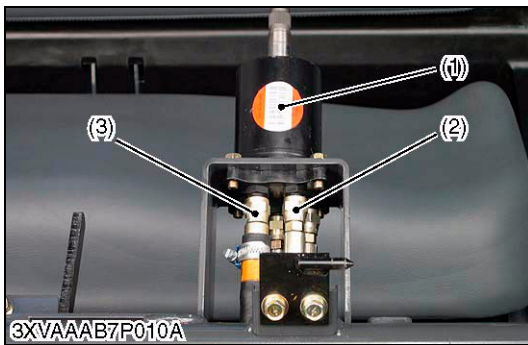
(7) Steering Wheel Cap

(4) Panel

W1014809







### Steering Controller

1. Disconnect the power steering hoses (2), (3), (4), (5).
2. Remove the steering controller mounting screws and remove the steering controller (1).

#### (When reassembling)

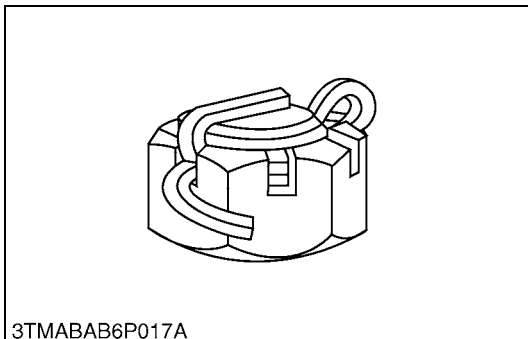
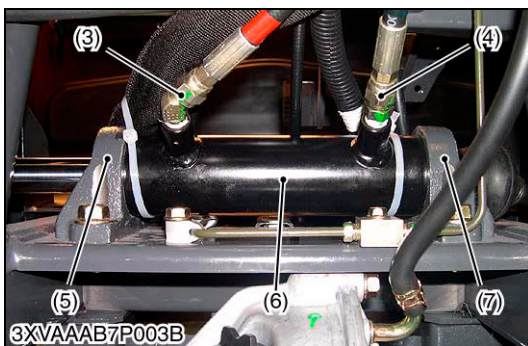
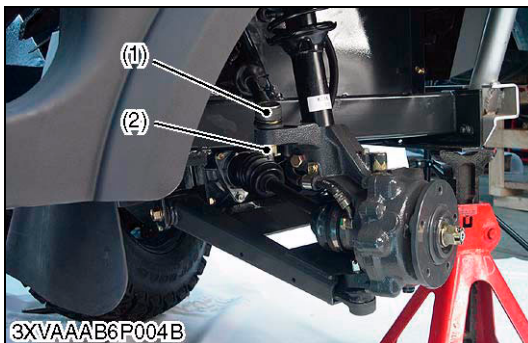
- Be sure to connect the power steering hoses to their original position, and tighten them to the specified torque.

Tightening torque	Power steering hose mounting nut	28.4 to 30.0 N·m 2.9 to 3.1 kgf·m 20.9 to 22.1 lbf·ft
-------------------	----------------------------------	---

- (1) Steering Controller (4) Cylinder Hose RH (L Port)  
 (2) Delivery Hose (Pump Port) (5) Cylinder Hose LH (R Port)  
 (3) Return Hose (Tank Port)

W1015456

## (2) Separating Power Steering Cylinder



### Power Steering Cylinder

1. Place the stand under the frame.
2. Remove the front wheels.
3. Remove the cotter pin and remove the slotted nut (2) for tie-rod end (1).
4. Disconnect the power steering cylinder hoses (3), (4).
5. Cut the cords clamp.
6. Remove the power steering cylinder bracket (5), (7) mounting screws and remove the power steering cylinder (6) with tie-rod.

#### (When reassembling)

- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in tie-rod end, tighten the nut clockwise up to next alignment.
- If should be within 30 degree.
- Loosen once and tighten again when the slit goes past the nearest hole.
- After tightening the these slotted nut to specified torques, install a cotter pin as shown in the figure left.

Tightening torque	Tie-rod slotted nut	17.7 to 34.3 N·m 1.8 to 3.5 kgf·m 13.0 to 25.3 lbf·ft
	Power steering cylinder hose	28.4 to 30.0 N·m 2.9 to 3.1 kgf·m 20.9 to 22.1 lbf·ft
	Bracket mounting screw	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft

- (1) Tie-rod End RH (5) Bracket RH  
 (2) Slotted Nut (6) Power Steering Cylinder  
 (3) Power Steering Hose (RH) (7) Bracket LH  
 (4) Power Steering Hose (LH)

W1015900

### (3) Separating Hydraulic Pump for Power Steering



#### Hydraulic Pump

1. Remove the air cleaner assembly and inlet hose together.
2. Remove the side cover.
3. Disconnect the power steering delivery hose (3) and power steering suction hose (1).
4. Remove the hydraulic pump (2) from engine.

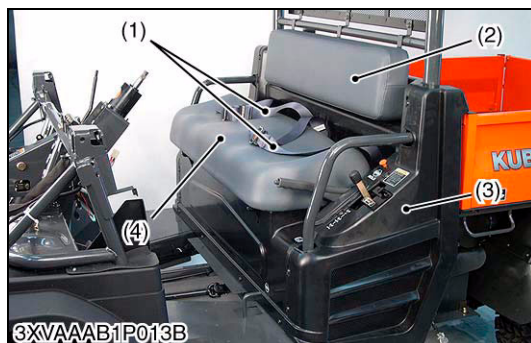
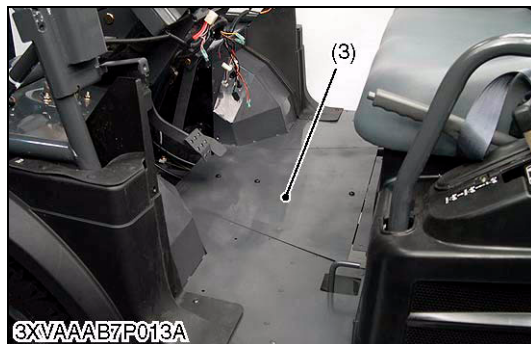
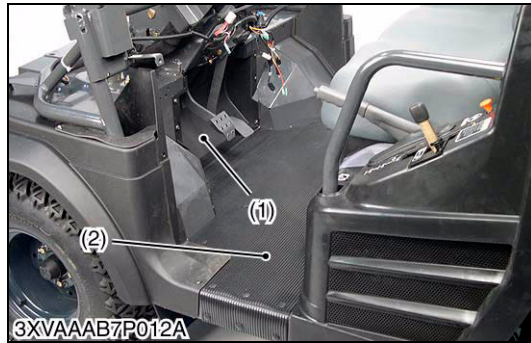
(1) Suction Hose  
(2) Hydraulic Pump

(3) Delivery Hose

W1016932



## (4) Removing Power Steering Hose



### Panel

1. Refer to page 6-S4 to page 6-S6.

W1017194

### Center Cover (Front), Step Mat and Step (Center)

1. Remove the center cover mounting screws and remove the center cover (front) (1).
2. Remove the push rivet and remove the step mat (2).
3. Remove the step (center) mounting screw and remove the step (center) (3).

(1) Center Cover (Front)

(3) Step (Center)

(2) Step Mat

W1017270

### Seat and Center Cover

1. Tilt up the cargo bed.
2. Remove the seat back (2) and seat assembly (4).
3. Remove the center cover LH (3).
4. Remove the fuel tank cap (6) and center cover RH (9).
5. Remove the seat belts (1).
6. Disconnect the differential lock pedal holding wire and remove the center cover (5).
7. Remove the air cleaner assembly (8) and inlet hose together.
8. Remove the side cover (7).

### (When reassembling)

Tightening torque	Seat belt mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
-------------------	--------------------------	---

(1) Seat Belt

(6) Fuel Tank Cap

(2) Seat Back

(7) Side Cover

(3) Center Cover LH

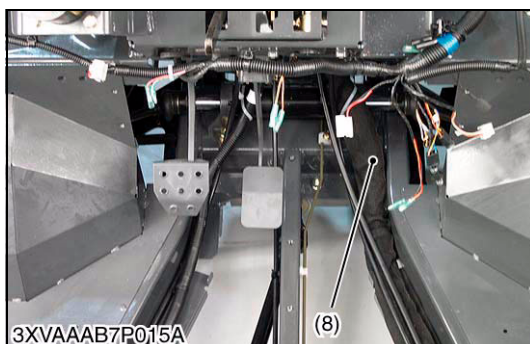
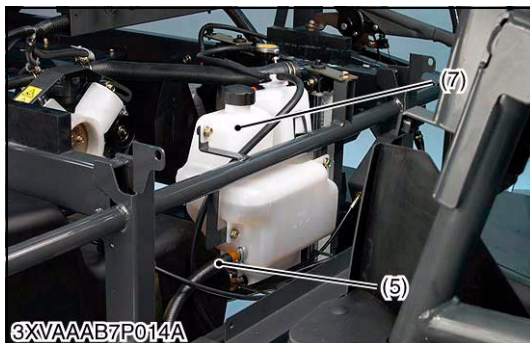
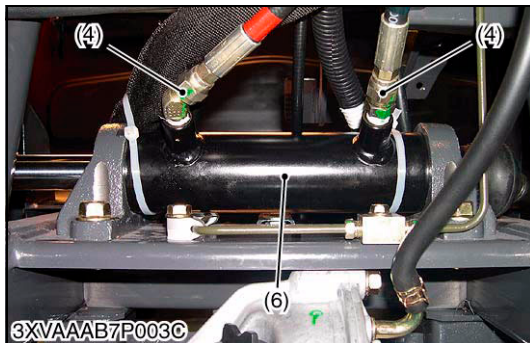
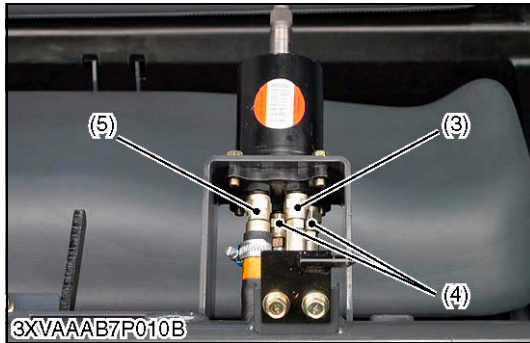
(8) Air Cleaner Assembly

(4) Seat Assembly

(9) Center Cover RH

(5) Center Cover

W1017760



### Power Steering Hose (To be continued)

1. Disconnect the suction hose (1) from hydraulic pump (2) and then drain the power steering oil.
2. Disconnect the delivery hose (3) and return hose (5) from power steering controller.
3. Disconnect the cylinder hoses (4) from power steering controller.
4. Disconnect the cylinder hoses (4) from power steering cylinder (6) and then remove the cylinder hoses.
5. Disconnect the return hose (5) from power steering oil tank (7).
6. Disconnect the delivery hose (3) from hydraulic pump (2), and then remove the two hoses return hose and delivery hose together (8).
7. Disconnect the suction hose from power steering oil tank (7) and remove the suction hose (1).

### (When reassembling)

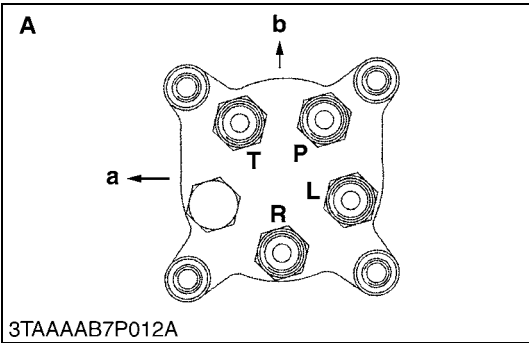
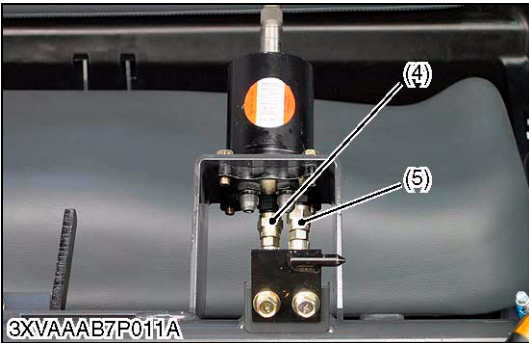
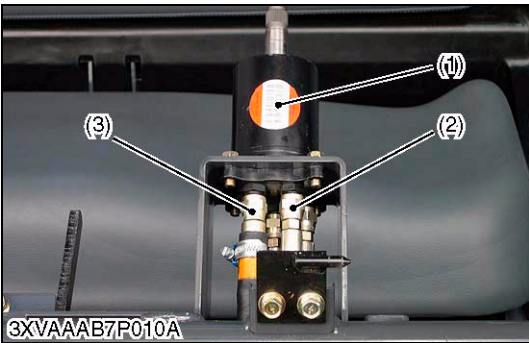
- Fill new oil from filling port after removing the filling plug (2) up to the upper notch on the dipstick (3).
- After running the engine for few minutes, stop it and check the oil level again, if low, add oil to prescribed level.
- Use KUBOTA UDT fluid or SUPER UDT fluid.  
Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.).
- Never work the vehicle immediately after changing the power steering oil. Keeping the engine at medium speed for a few minutes to prevents damage to the hydraulic pump etc..
- Do not mix different brands oil together.

Power steering oil capacity	5.9 L 1.6 U.S.gals 1.3 Imp.gals
-----------------------------	---------------------------------------

- (1) Suction Hose  
(2) Hydraulic Pump  
(3) Delivery Hose  
(4) Cylinder Hose  
(5) Return Hose

- (6) Power Steering Cylinder  
(7) Power Steering Oil Tank  
(8) Two Hoses (Delivery Hose and Return Hose)

W1019208



**Power Steering Hose (Continued)**

**(When reassembling)**

- Be sure to connect the power steering hoses to their original position, and tighten them to the specified torque.

Tightening torque	Power steering hose mounting nut	28.4 to 30.0 N·m 2.9 to 3.1 kgf·m 20.9 to 22.1 lbf·ft
-------------------	----------------------------------	---

- (1) Steering Controller
- (2) Delivery Hose
- (3) Return Hose
- (4) Cylinder Hose RH
- (5) Cylinder Hose LH

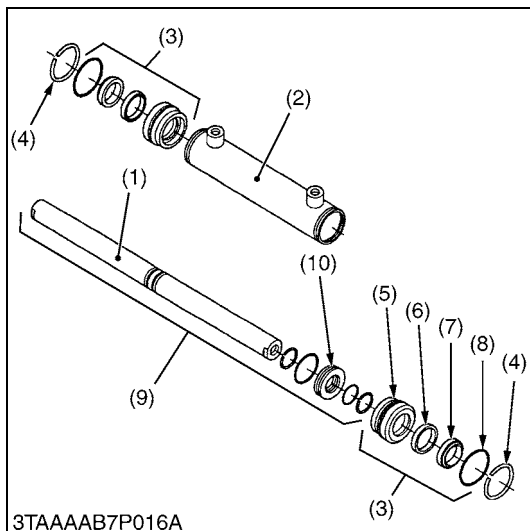
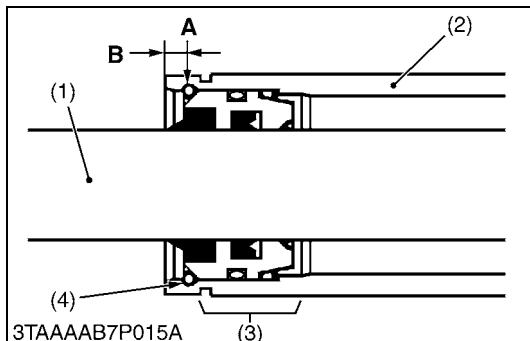
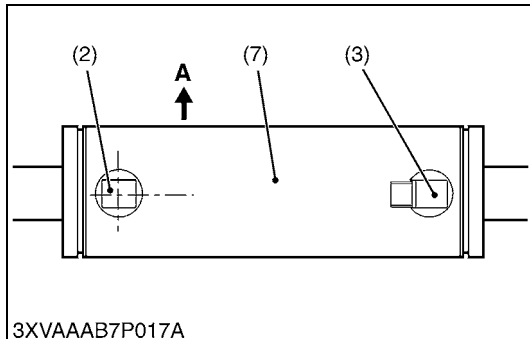
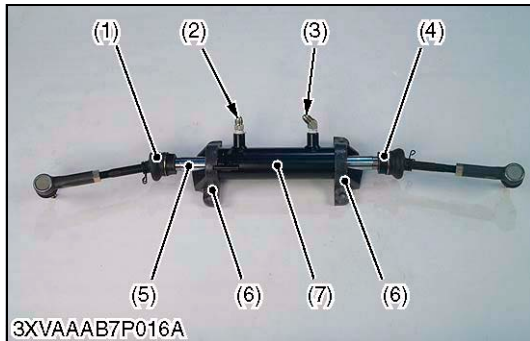
- A : Bottom View
- P : Pump Port  
(Connect to Delivery Hose)
- T : Tank Port  
(Connect to Return Hose)
- L : L Port (Connect to Cylinder LH Hose)
- R : R Port (Connect to Cylinder RH Hose)
- a : Right from Operator
- b : Front

W1020238



### [3] DISASSEMBLING AND ASSEMBLING

#### (1) Power Steering Cylinder



#### Power Steering Cylinder and Tie-rod

1. Remove the cylinder hose adaptors (2), (3).
2. Remove the tie-rods (1), (4) from piston rod (5).
3. Remove the cylinder holders (6).

#### (When reassembling)

- Be sure to install the hose adaptors (2), (3) as shown figure left.
- After reassembling the tie-rod, be sure to adjust the toe-in. (Refer to 5-S4.)
- Apply liquid lock to the thread of piston rod (5).

Tightening torque	Tie-rod screw	74 to 84 N·m 7.5 to 8.6 kgf·m 54.6 to 61.9 lbf·ft
-------------------	---------------	---

- (1) Tie-rod LH  
(2) Hose Adaptor LH  
(3) Hose Adaptor RH  
(4) Tie-rod RH  
(5) Piston Rod

- (6) Cylinder Holder  
(7) Cylinder

A : Front

W1021190

#### Steering Cylinder

1. Carefully clamp the cylinder in a vise.
2. Push one of the guide assembly (3) to inside of cylinder tube (2).
3. Drill a hole (2.5 mm dia., 0.1 in. dia.) on the cylinder tube (2) just over the snap ring (4) as shown figure left.
4. Take a little screwdriver and lift off the snap ring (4) from its groove. Simultaneously support this action by pushing from the outside of the cylinder tube with another little screwdriver or another tool.
5. Push out the piston rod assembly (9) and take off the guide assembly (3).

#### (When reassembling)

#### ■ NOTE

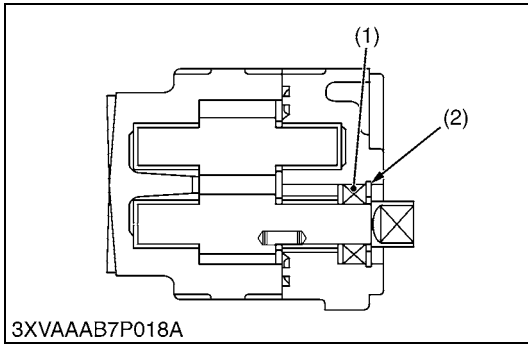
- **Seals must be exchanged after disassembling.**
- **Apply transmission fluid to the exchanged seals.**
- **Enter the piston rod and block the guide assemblies with the snap rings.**

- (1) Piston Rod  
(2) Cylinder Tube  
(3) Guide Assembly  
(4) Snap Ring  
(5) Guide  
(6) Seal Ring  
(7) Wiper Seal  
(8) O-ring  
(9) Piston Rod Assembly  
(10) Center Piston

A : Drill a Hole  
B : 5.25 mm (0.267 in.)

W1021576

## (2) Hydraulic Pump



### Oil Seal

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

### **(When reassembling)**

- If the oil seal is defective, worn or scratched, replace it.

(1) Oil Seal

(2) Internal Snap Ring

W1022067

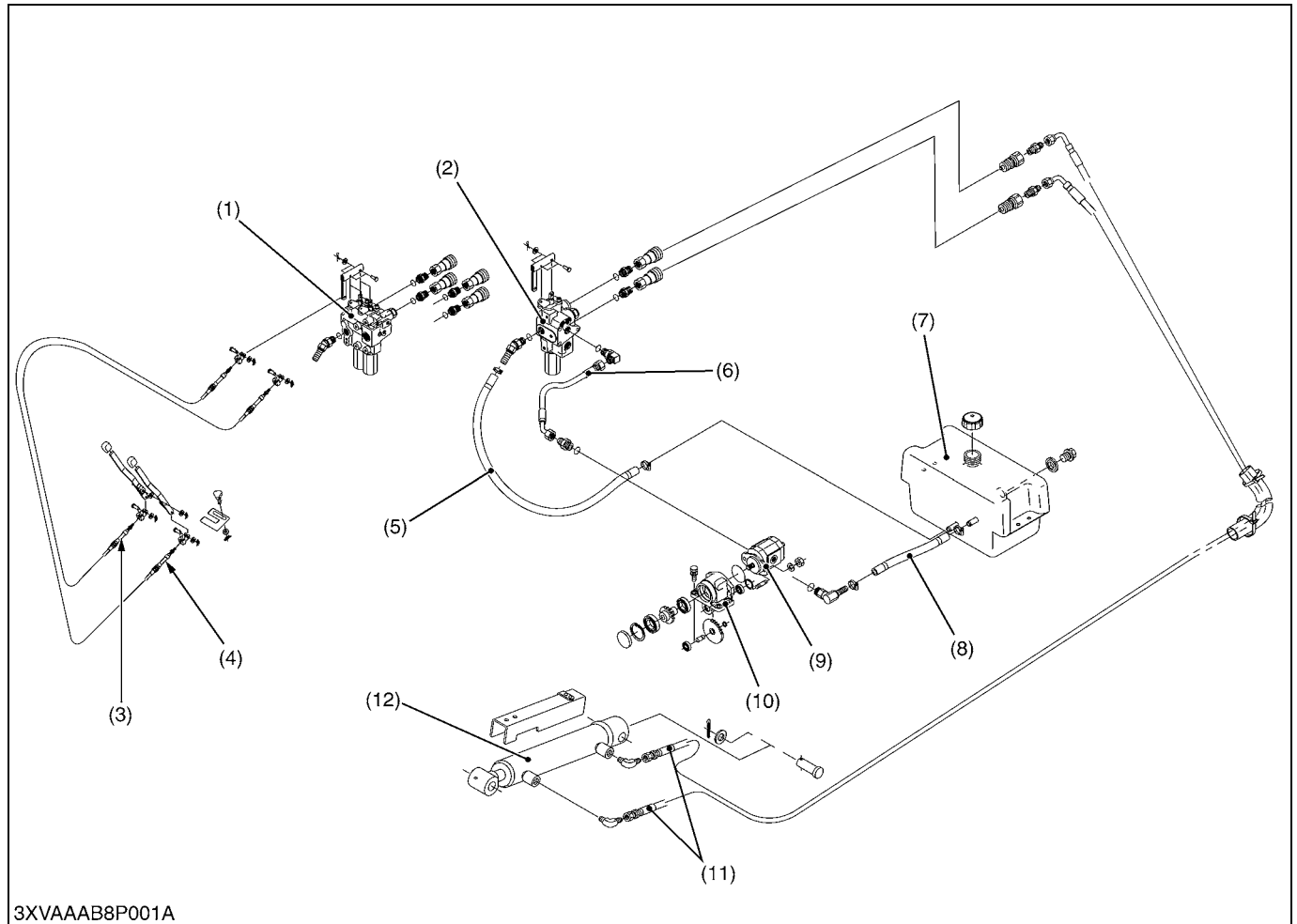
# **7 HYDRAULIC SYSTEM**

# MECHANISM

## CONTENTS

1. STRUCTURE .....	7-M1
2. HYDRAULIC CIRCUIT .....	7-M2
[1] HYDRAULIC CARGO BED LIFT (IF EQUIPPED) .....	7-M2
3. HYDRAULIC PUMP .....	7-M3
4. HYDRAULIC CYLINDER .....	7-M4
5. AUXIALIARY CONTROL VALVE .....	7-M5
[1] DOUBLE ACTING TYPE 1 .....	7-M5
(1) Floating with Detent Valve .....	7-M5
[2] DOUBLE ACTING TYPE 2 (MONO BLOCK).....	7-M9
(1) Floating with Detent Valve .....	7-M9
(2) On-Off Valve .....	7-M13

# 1. STRUCTURE



- |  |                                       |                        |                         |
|--|---------------------------------------|------------------------|-------------------------|
| (1) Monoblock Type Valve (3 Position Control Valve and 4 Position Control) | (2) 4 Position Control Valve          | (5) Return Hose        | (9) Hydraulic Pump      |
| (3) Cable for Hydraulic Outlet   | (3) Cable for Hydraulic Outlet        | (6) Delivery Hose      | (10) Pump Base          |
| (4) Cable for Hydraulic Lift Cylinder                                      | (4) Cable for Hydraulic Lift Cylinder | (7) Hydraulic Oil Tank | (9) Hydraulic Hose      |
|  |                                       | (8) Suction Hose       | (12) Hydraulic Cylinder |

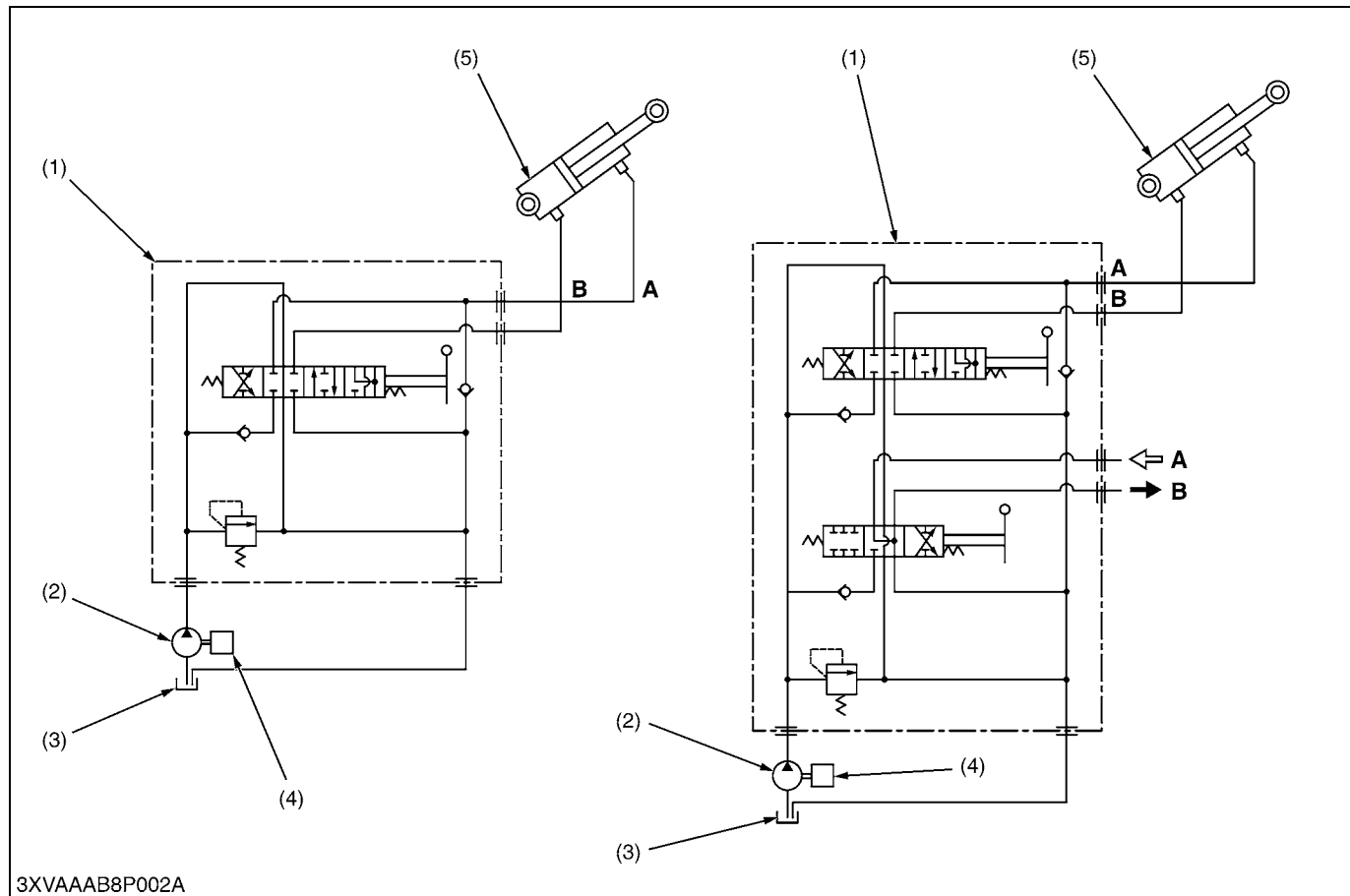
The cargo bed lifting system of RTV900 is composed of the hydraulic pump, control valve, hydraulic cylinder, oil tank and other components as shown in the figure.

This hydraulic system has the hydraulic oil tank besides in the transmission case. Moreover, the control valve is different the adapted type of each model.



## 2. HYDRAULIC CIRCUIT

**[1] HYDRAULIC CARGO BED LIFT (IF EQUIPPED)**



### (1) Hydraulic Control Valve

(2) Hydraulic Pump

(3) Oil Tank

(4) Transmission

(5) Hydraulic Cylinder

**A : ln**

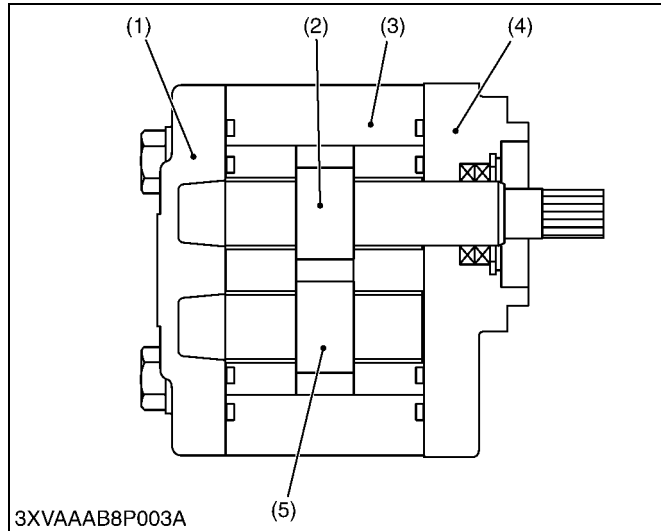
**B : Out**

The cargo bed lifting system of RTV900 is composed of the hydraulic pump, control valve, hydraulic cylinder, oil tank and other components as shown in the figure.

This system has the following functions.

1. Oil is supplied by hydraulic pump which is driven by input shaft in the transmission case. As the input shaft is connected to the idle gear, hydraulic pump starts running when engine is started.
2. The hydraulic pump forces out the oil to hydraulic control valve for cargo bed lift system or hydraulic power take off.

### 3. HYDRAULIC PUMP



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

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

Maximum displacement is as follows.

Displacement	Engine speed	Condition
22.8 L/min. 6.0 U.S.gals./min. 5.0 Imp.gals./min.	At 3200 min <sup>-1</sup> (rpm)	at no load

- (1) Cover
- (2) Drive Gear
- (3) Casing

- (4) Cover
- (5) Driven Gear

W1013296

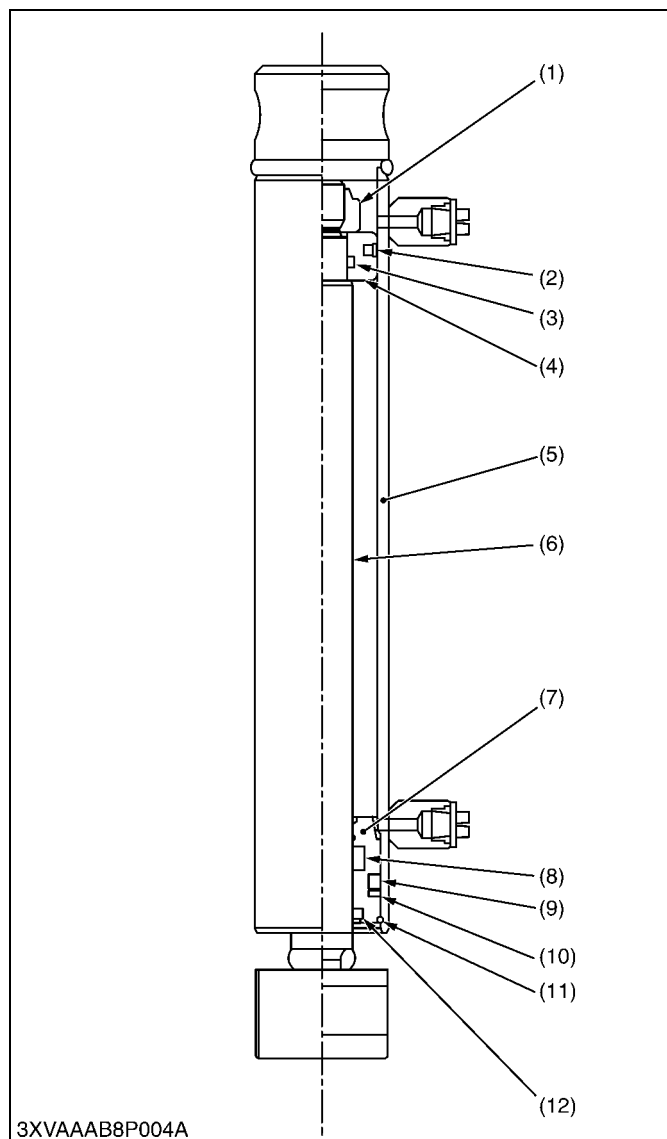
## 4. HYDRAULIC CYLINDER

The external type hydraulic cylinders are used for three point linkage system. This hydraulic cylinder is single double type, and it is installed directly between main frame arm cargo bed.

The main components of the hydraulic cylinder are shown in the figure.

- |                   |                         |
|-------------------|-------------------------|
| (1) Piston Nut    | (7) End Cap             |
| (2) Piston Seal   | (8) End Seal            |
| (3) Piston O-ring | (9) End O-ring          |
| (4) Piston        | (10) Backup Ring        |
| (5) Cylinder Tube | (11) Internal Snap Ring |
| (6) Rod           | (12) Wiper Seal         |

W1013598



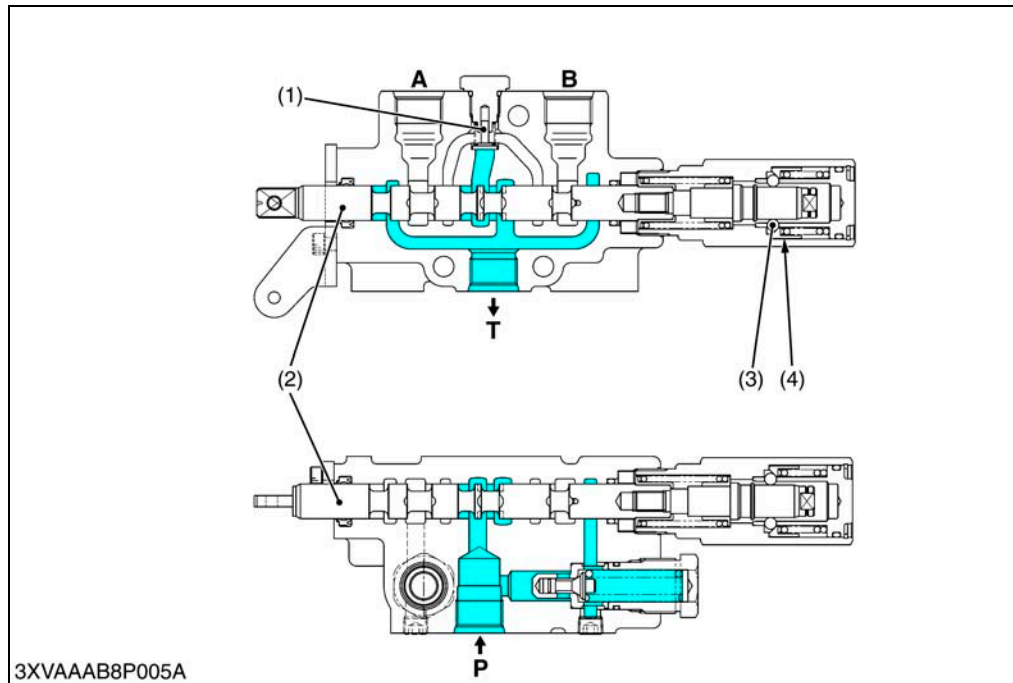
3XVAAAB8P004A

## 5. AUXILIARY CONTROL VALVE

### [1] DOUBLE ACTING TYPE 1

#### (1) Floating with Detent Valve

##### ■ Neutral



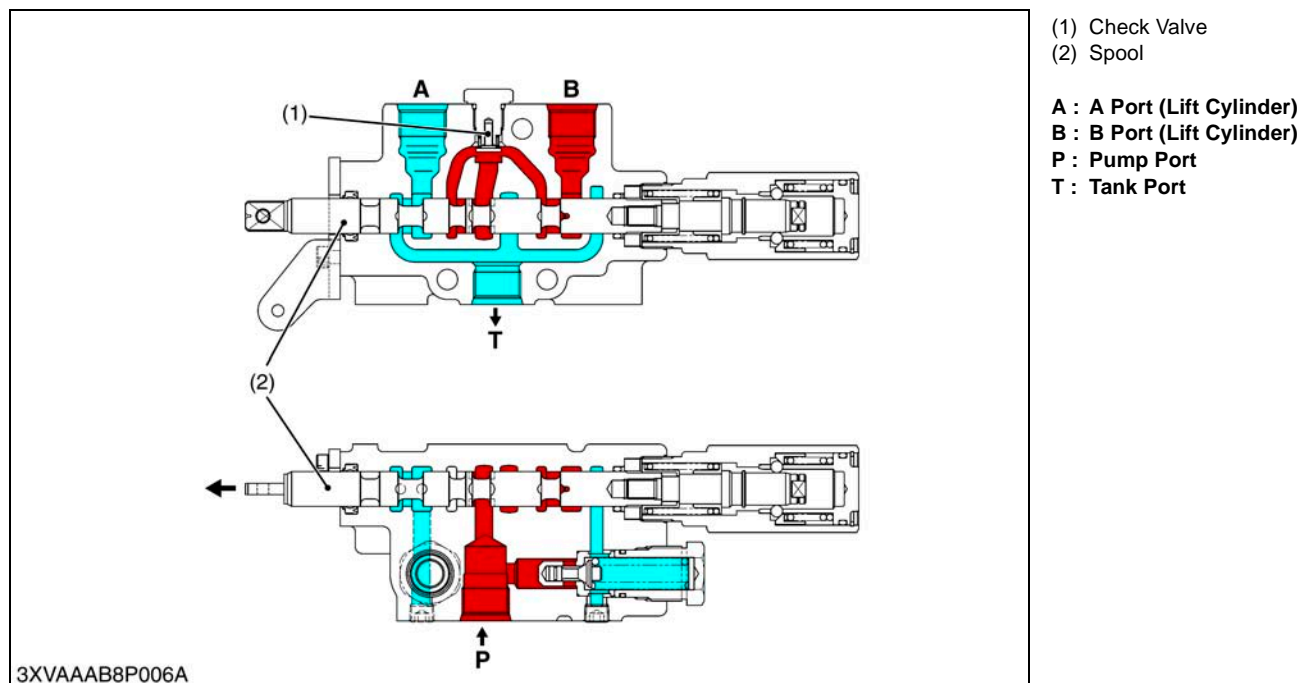
- (1) Spool
- (2) Check Valve
- (3) Detent Ball
- (4) Detent Sleeve

A : A Port (Lift Cylinder)  
 B : B Port (Lift Cylinder)  
 P : From Hydraulic Pump  
 T : To Oil Tank

W1013990

Pressure-fed oil from the hydraulic pump is delivered into the **P** port, and flows to the oil tank through **T** port.

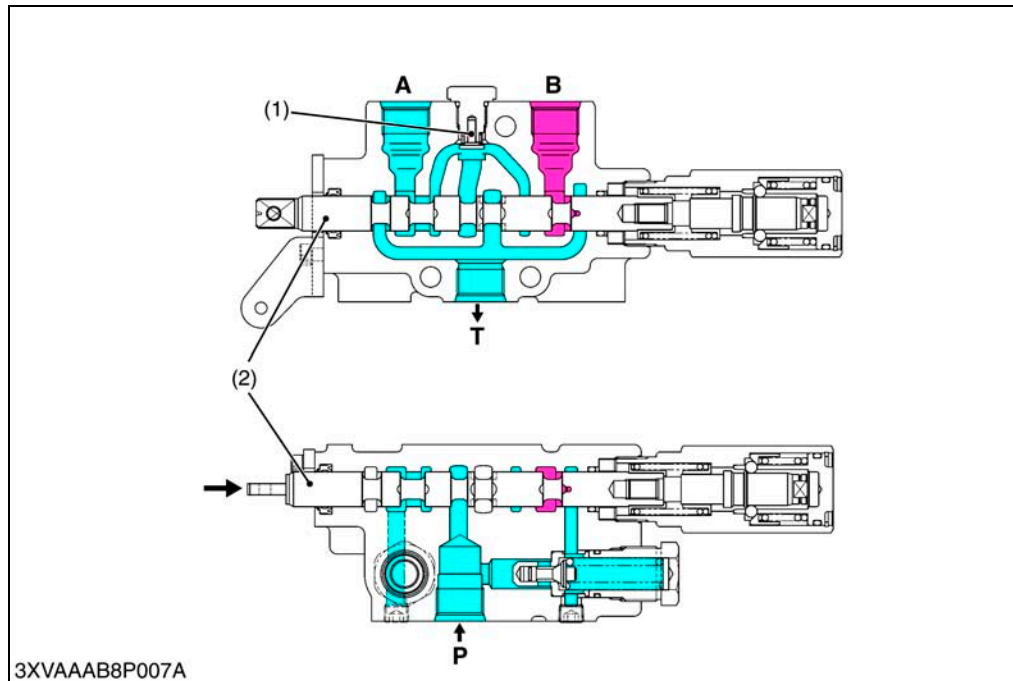
## ■ Lift



When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the implement cylinder via **B** port.

Return oil from the implement cylinder flows from the **A** port to the transmission case through **T** port.

## ■ Down



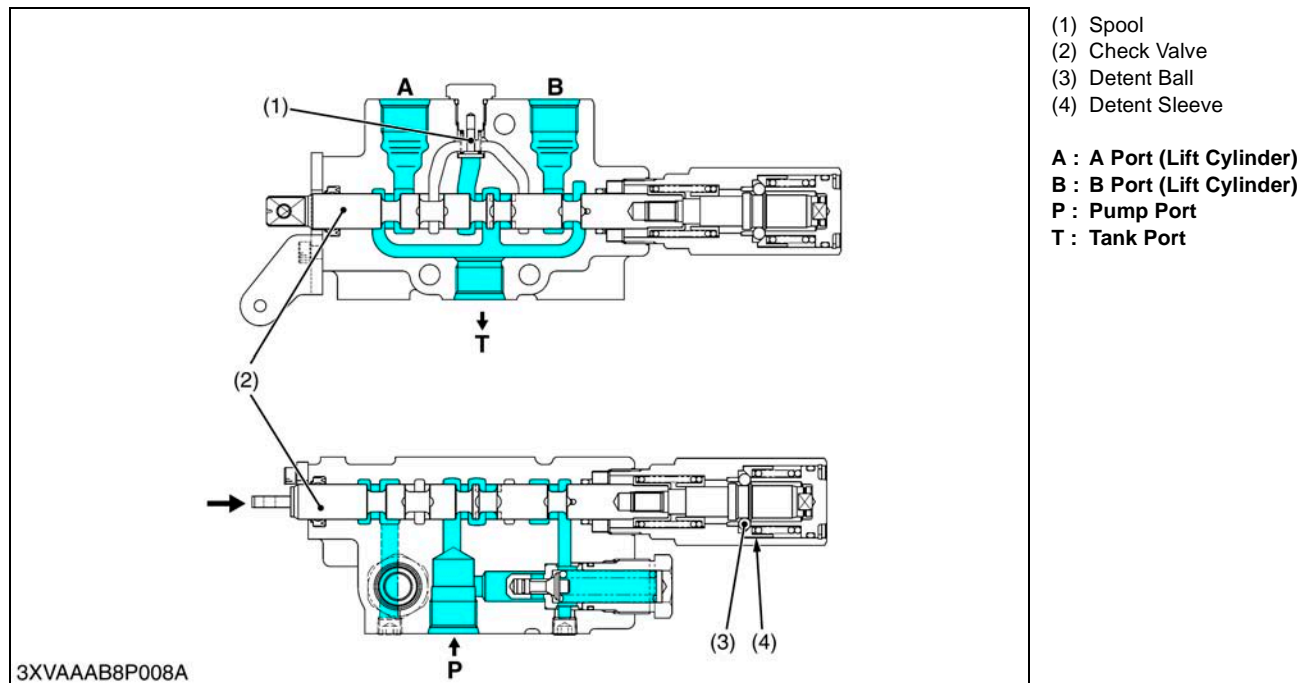
- (1) Check Valve
- (2) Spool

A : A Port (Lift Cylinder)  
B : B Port (Lift Cylinder)  
P : Pump Port  
T : Tank Port

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the implement cylinder via **A** port.

Return oil from the implement cylinder flows from the **B** port to the oil tank through **T** port.

## ■ Floating

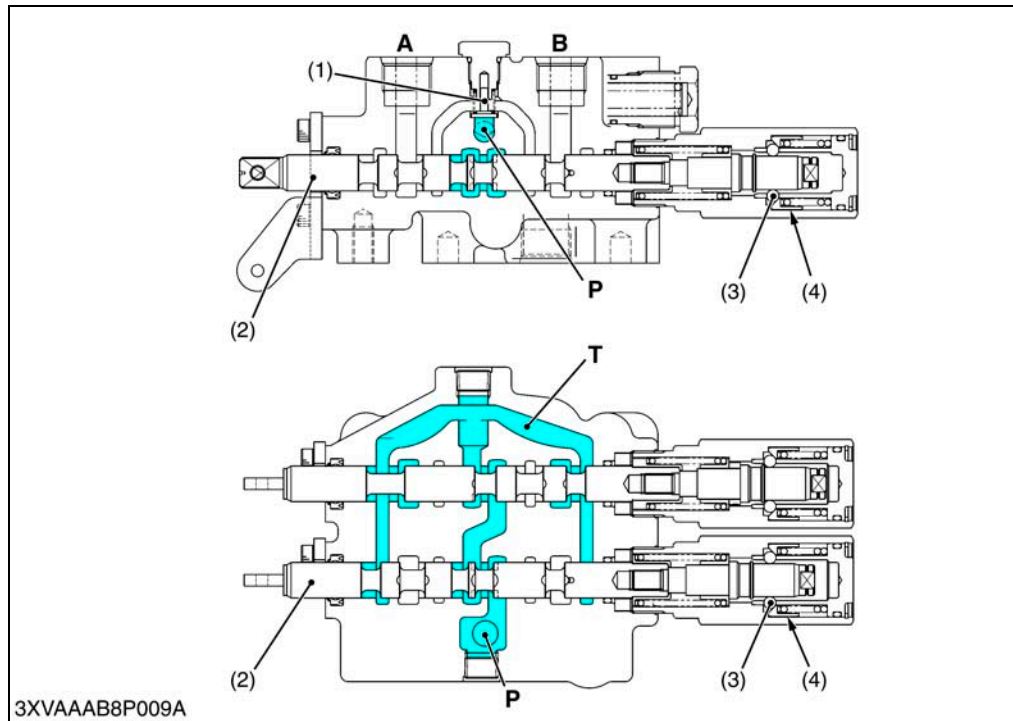


When the spool (2) moves to extreme right, the detent ball (3) and detent sleeve (4) holds the spool (1) at the floating position as shown in the figure. The pressure-fed oil from the hydraulic pump flows to oil tank through **T** port. And, the **A** port and **B** port lead to the **T** port along the notched sections of the spool (2). This result in the attached implement to follow the power from implement.

## [2] DOUBLE ACTING TYPE 2 (MONO BLOCK)

### (1) Floating with Detent Valve

#### ■ Neutral



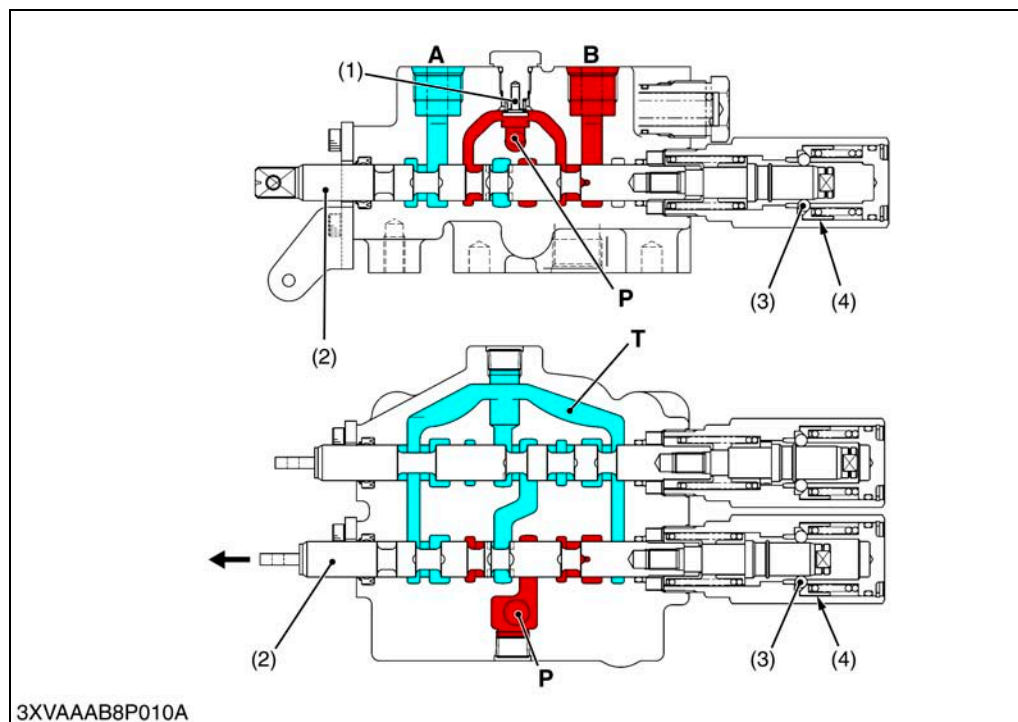
- (1) Spool
- (2) Check Valve
- (3) Detent Ball
- (4) Detent Sleeve

A : A Port (Lift Cylinder)  
 B : B Port (Lift Cylinder)  
 P : Pump Port  
 T : Tank Port

Pressure-fed oil from the hydraulic pump is delivered into the **P** port, and flows to the oil tank through **T** port.



# ■ Lift



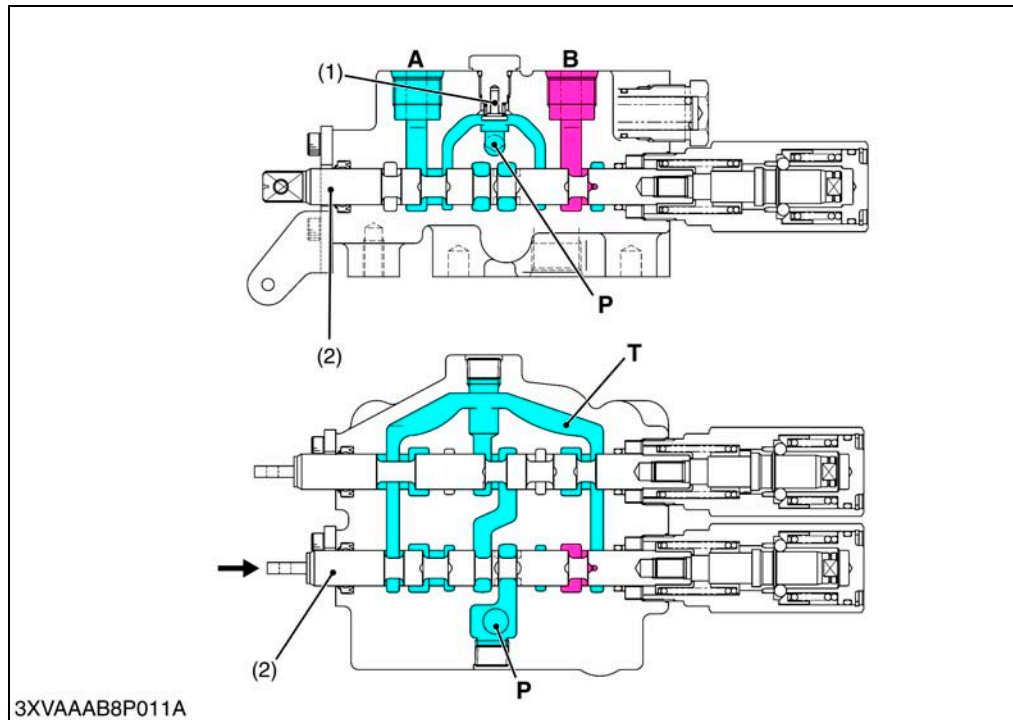
- (1) Check Valve
- (2) Spool

**A** : A Port (Lift Cylinder)  
**B** : B Port (Lift Cylinder)  
**P** : Pump Port  
**T** : Tank Port

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the implement cylinder via **B** port.

Return oil from the implement cylinder flows from the **A** port to the transmission case through **T** port.

# ■ Down



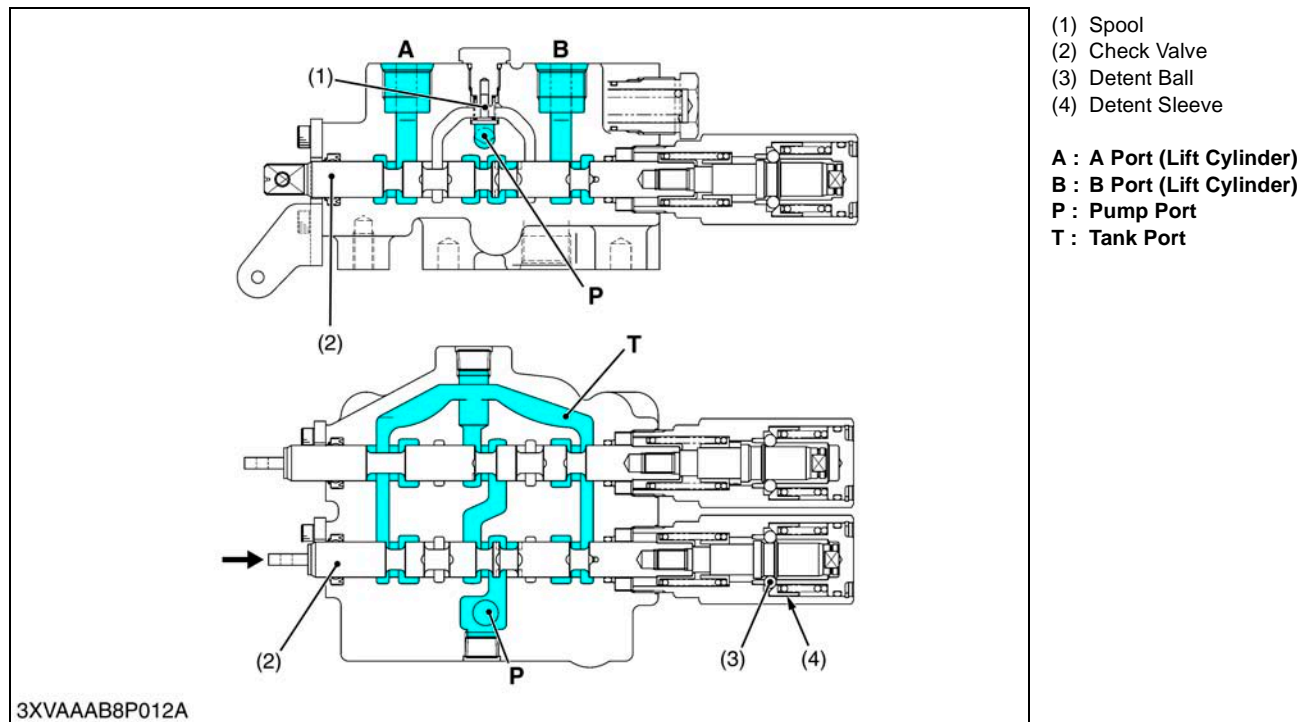
- (1) Check Valve
- (2) Spool

**A** : A Port (Lift Cylinder)  
**B** : B Port (Lift Cylinder)  
**P** : Pump Port  
**T** : Tank Port

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the implement cylinder via **A** port.

Return oil from the implement cylinder flows from the **B** port to the oil tank through **T** port.

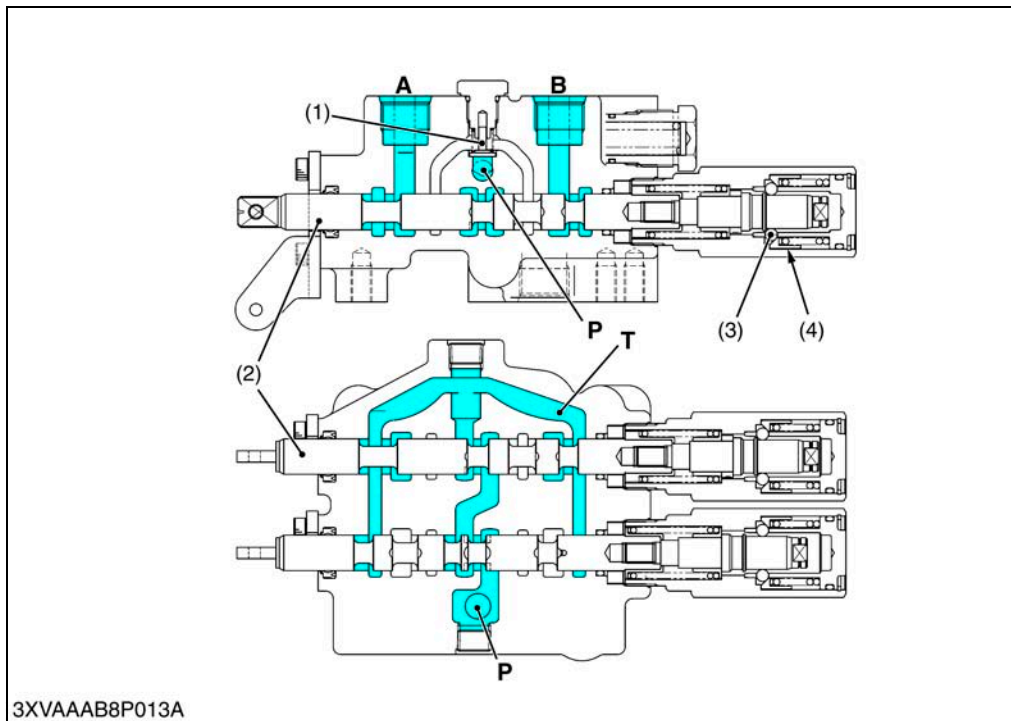
## ■ Floating



When the spool (2) moves to extreme right, the detent ball (3) and detent sleeve (4) holds the spool (1) at the floating position as shown in the figure. The pressure-fed oil from the hydraulic pump flows to oil tank through **T** port. And, the **A** port and **B** port lead to the **T** port along the notched sections of the spool (2). This result in the attached implement to follow the power from implement.

## (2) On-Off Valve

### ■ Neutral (Floating)



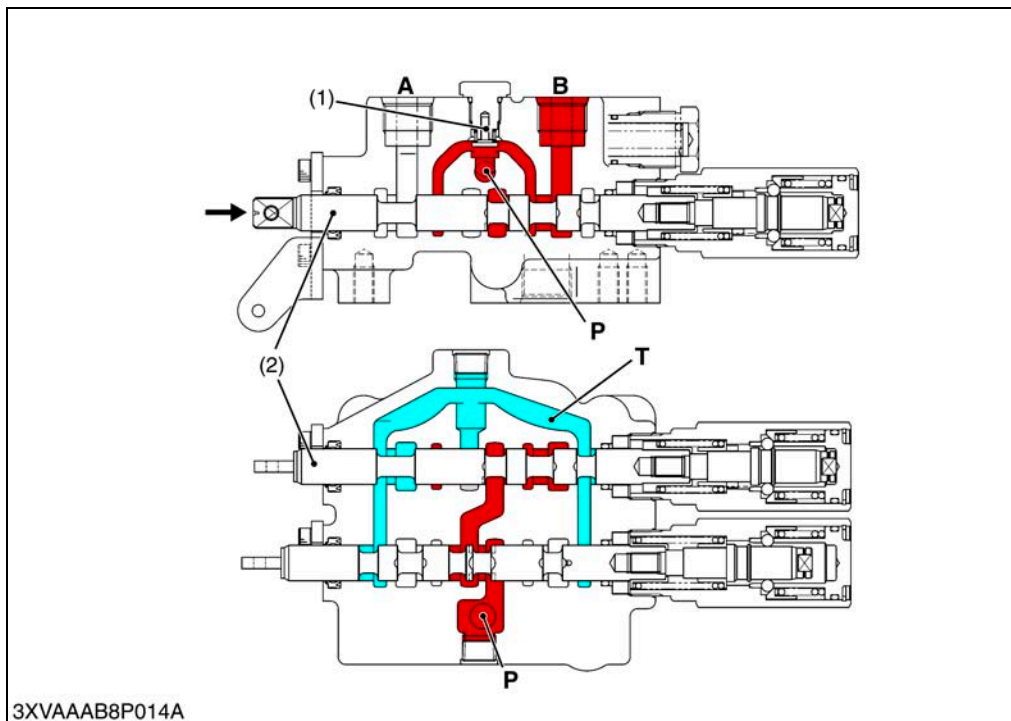
- (1) Spool
- (2) Check Valve
- (3) Detent Ball
- (4) Detent Sleeve

A : A Port (Implement Cylinder)  
 B : B Port (Implement Cylinder)  
 P : Pump Port  
 T : Tank Port

Pressure-fed oil from the hydraulic pump is delivered into the **P** port, and flows to the oil tank through **T** port.

And, the **A** port and **B** port lead to the **T** port along the notched sections of the spool (2). This result in the accached implement to follow the power fro implement.

### ■ Lift



- (1) Check Valve
- (2) Spool

A : A Port (Implement Cylinder)  
 B : B Port (Implement Cylinder)  
 P : Pump Port  
 T : Tank Port

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the implement cylinder via **B** port.

Return oil from the implement cylinder flows from the **A** port to the transmission case through **T** port.

# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	7-S1
2. SERVICING SPECIFICATIONS .....	7-S2
3. TIGHTENING TORQUES .....	7-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	7-S4
[1] CHECKING AND ADJUSTING .....	7-S4
(1) Hydraulic Control Valve, Pump and Cylinder .....	7-S4
[2] DISASSEMBLING AND ASSEMBLING.....	7-S5
(1) Separating Hydraulic Pump .....	7-S5
(2) Separating Hydraulic Cylinder and Control Valve .....	7-S5
(3) Disassembling Control Valve Assembly .....	7-S7
(4) Disassembling Hydraulic Cylinder .....	7-S10

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Implement Does Not Rise (No Noise)</b>	Control valve broken	Replace	7-S6
	Control valve improperly assembled	Repair	7-S7
	Relief valve spring damaged	Replace	7-S6
	Spool sticks	Repair	7-S7
	Piston O-ring or cylinder damaged	Replace	7-S10
<b>(Noise)</b>	Suction hose loosen or broken	Repair or replace	7-S5
	Insufficient hydraulic lift oil	Refill	7-S5
	Relief valve setting pressure too low	Adjust or replace	7-S4
	Hydraulic pump broken	Replace	7-S5
<b>Implement Does Not Lower</b>	Control valve malfunctioning	Repair or replace	7-S6
<b>Implement Drops by Its Weight</b>	Hydraulic lift cylinder worn or damaged	Replace	7-S6
	Piston O-ring worn or damaged	Replace	7-S10
	Control valve malfunctioning	Replace	7-S6

W1054624

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure	14.7 to 15.7 MPa 150 to 160 kgf/cm <sup>2</sup> 2133 to 2276 psi	—

W1013874

### 3. TIGHTENING TORQUES

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

Item	N·m	kgf·m	lbf·ft
Hydraulic pump mounting bolt and nut	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Relief valve plug	29.4 to 43.3	3.0 to 3.5	21.7 to 25.3
Load check valve plug	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Check valve seat	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Check valve plug	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Cargo lift hydraulic cylinder piston mounting nut	120 to 170	12.2 to 17.3	88.5 to 125.4

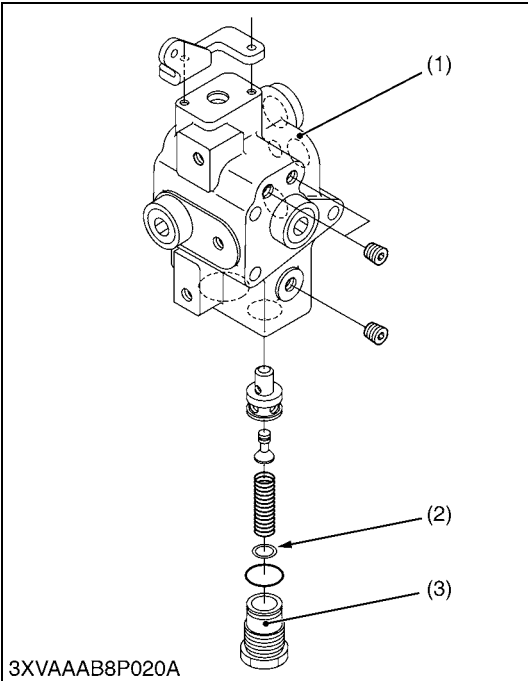
W1012736



# 4. CHECKING, DISASSEMBLING AND SERVICING

## [1] CHECKING AND ADJUSTING

### (1) Hydraulic Control Valve, Pump and Cylinder



#### Relief Valve Setting Pressure

- 1. Set the adaptor, cable and pressure gauge.
- 2. Start the engine and depress the speed control pedal.
- 3. Move the hydraulic lift cylinder lever way up to operate the relief valve and read the gauge.
- 4. If the pressure is not within the factory specifications, adjust with the adjusting shims (3).

Relief valve setting pressure	Factory spec.	14.7 to 15.7 MPa 150 to 160 kgf/cm <sup>2</sup> 2133 to 2276 psi
-------------------------------	---------------	--

#### Condition

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

#### (Reference)

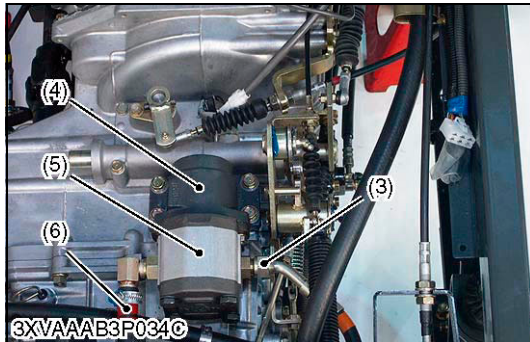
- Replace the hydraulic pump if pressure does not rise in 13.2 MPa (135 kgf/cm<sup>2</sup>, 1920 psi) or more.
- Thickness of shims (2) :  
0.1 mm (0.0039 in.), 0.2 mm (0.0079 in.), 0.4 mm (0.0157 in.)
- 0.27 MPa (2.74 kgf/cm<sup>2</sup>, 39.0 psi) pressure is increased whenever the thickness of adjusting shim is increased by 0.1 mm (0.0039 in.)

- (1) Control Valve Assembly
- (2) Shim
- (3) Plug

W1011746

## [2] DISASSEMBLING AND ASSEMBLING

### (1) Separating Hydraulic Pump



#### Hydraulic Pump

1. Drain the hydraulic lift oil from oil tank.
2. Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop (if hydraulic cylinder equipped).
3. Disconnect the suction hose (6) and delivery hose (3) from hydraulic pump.
4. Remove the pump base (4) and hydraulic pump (5) as a unit.
5. Remove the hydraulic pump mounting bolt and nut, then separate the hydraulic pump.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of pump base and front case.
- Take care not to damage the O-ring on the hydraulic pump.
- Use KUBOTA UDT or KUBOTA SUPER UDT fluid. Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-8.).

Hydraulic lift oil capacity (Hydraulic dumping system model)	8.0 L 2.1 U.S.gal 1.8 Imp.gal
Hydraulic lift oil capacity (Hydraulic PTO model)	7.0 L 1.8 U.S.gal 1.5 Imp.gal

Tightening torque	Pump base mounting screw	39.0 to 44.0 N·m 4.0 to 4.5 kgf·m 28.8 to 32.5 lbf·ft
	Hydraulic pump mounting bolt and nut	48.0 to 56.0 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 lbf·ft

- (1) Cargo Bed  
(2) Safety Support  
(3) Delivery Hose

- (4) Pump Base  
(5) Hydraulic Pump  
(6) Suction Hose

W1012356

### (2) Separating Hydraulic Cylinder and Control Valve



#### Battery

#### ⚠ CAUTION

- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.
1. Disconnect the negative cable (1) from the battery.
  2. Disconnect the positive cable (2) from the battery.

- (1) Negative Cable

- (2) Positive Cable

W1012853

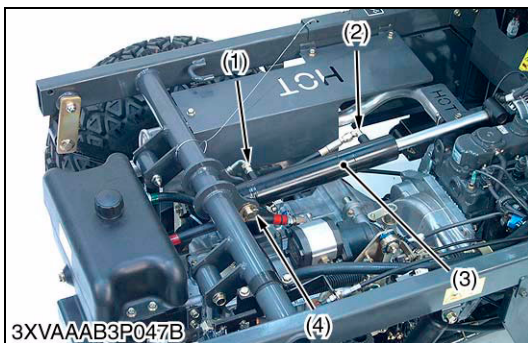
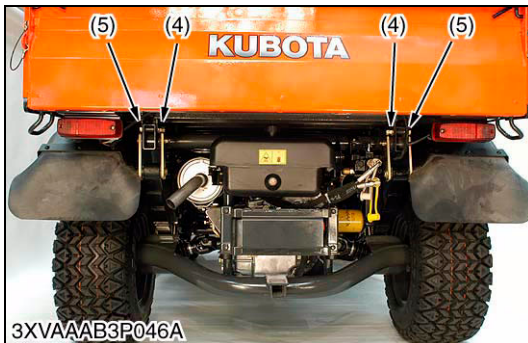
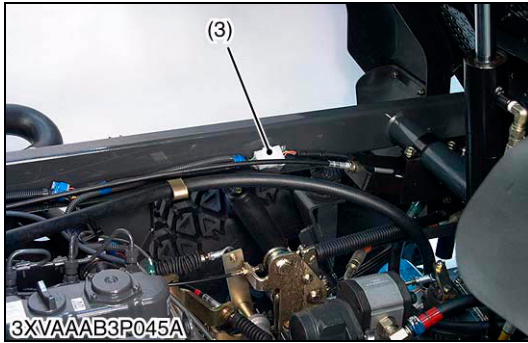


### **Cargo Bed**

1. Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop. (If hydraulic cylinder equipped.)
2. Remove the cotter pin and clevis pin (2). (If hydraulic cylinder equipped.)
3. Disconnect the connector (3) from main harness, then separate the harness for the tail lamps.
4. Loosen the lock nut (4) and remove the hinge bolt (5) and nut.

- |                |                |
|----------------|----------------|
| (1) Cargo Bed  | (4) Lock Nut   |
| (2) Clevis Pin | (5) Hinge Bolt |
| (3) Connector  |                |

W1013071

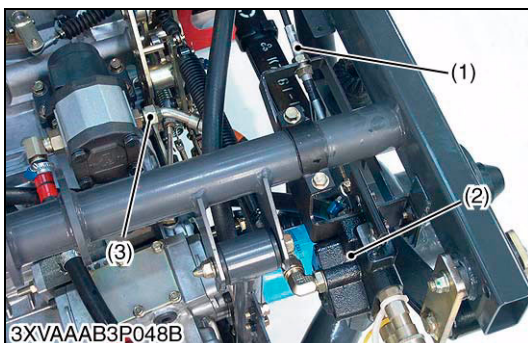


### **Hydraulic Cylinder**

1. Disconnect the hydraulic hoses (1), (2) from hydraulic cylinder (3).
2. Remove the cotter pin and clevis pin (4).

- |                    |                        |
|--------------------|------------------------|
| (1) Hydraulic Hose | (3) Hydraulic Cylinder |
| (2) Hydraulic Hose | (4) Clevis Pin         |

W1013516



### **Control Valve**

1. Remove the quick coupler.
2. Disconnect the cable (1) for hydraulic control valve (2).
3. Disconnect the delivery hose (3) from pump.

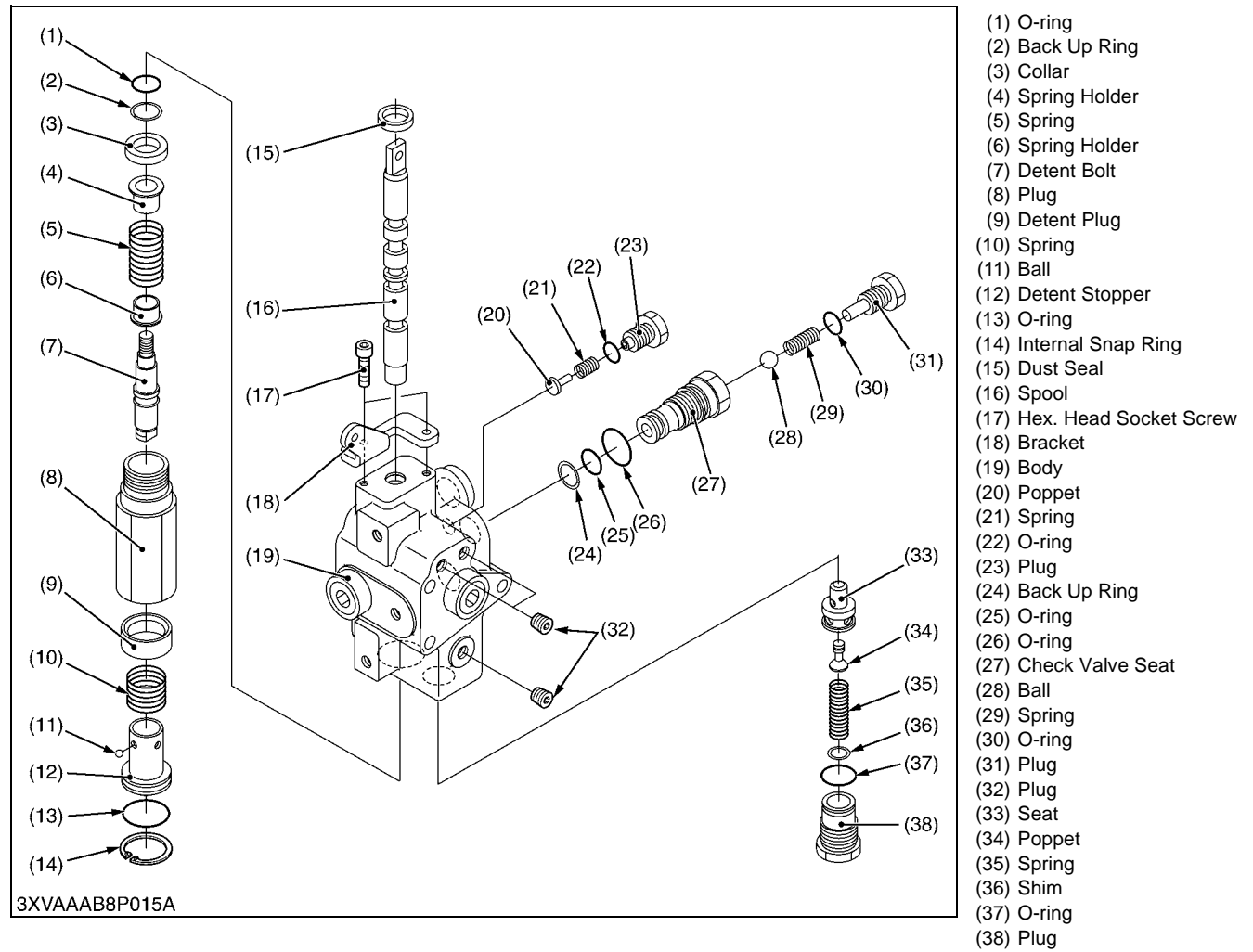
- |                             |                   |
|-----------------------------|-------------------|
| (1) Cable                   | (3) Delivery Hose |
| (2) Hydraulic Control Valve |                   |

W1013731



### (3) Disassembling Control Valve Assembly

#### 3 Position Valve (To be continued)



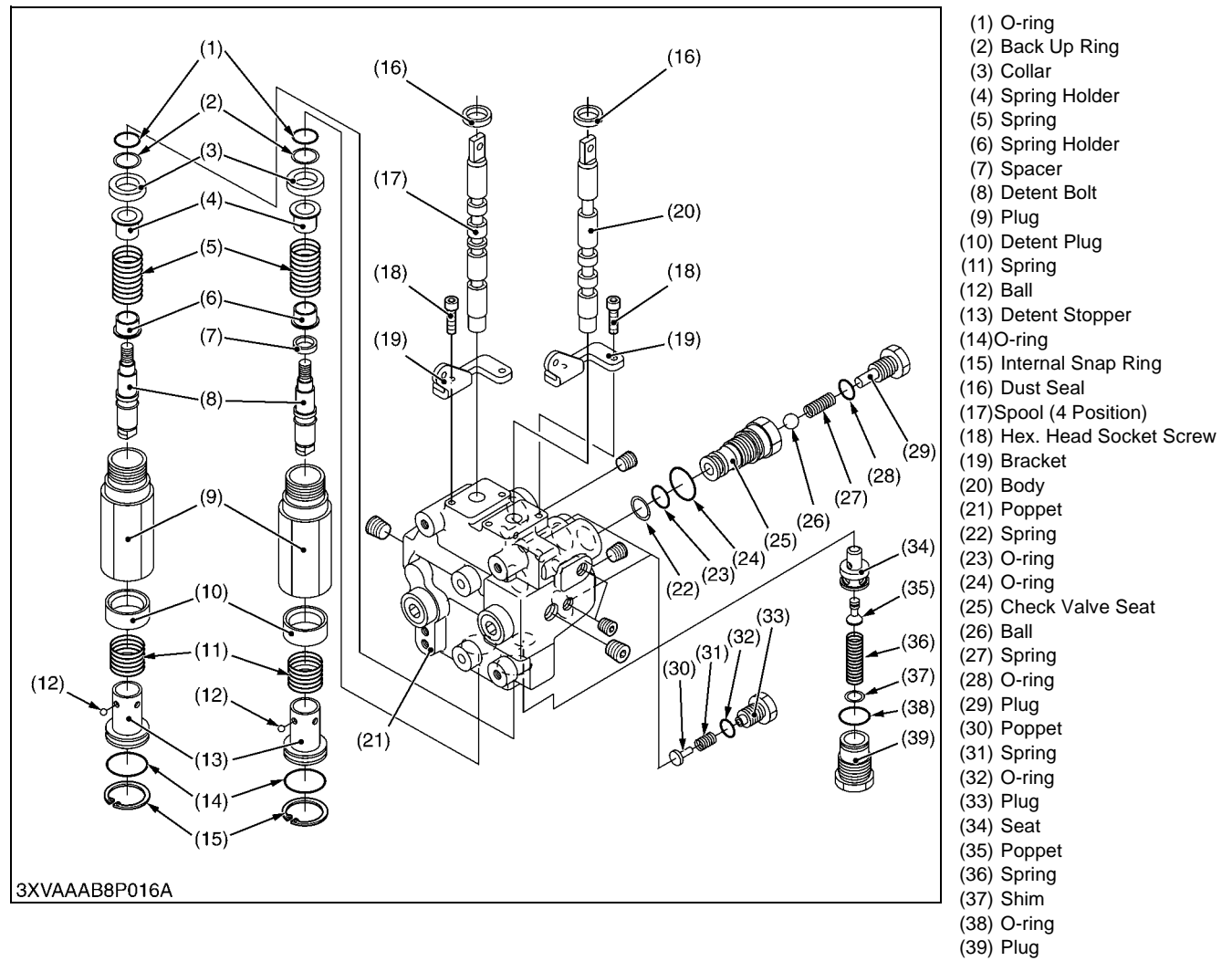
W1014156

**3 Position Valve (Continued)**

1. Loosen the plug (8) and draw out the spool (16) with other component parts from valve body (19).
2. Remove the internal snap ring (14) and detent stopper (12).
3. Loosen the detent bolt (7) from spool (16) and then separate the spool and the detent bolt.
4. Remove the plug (23) and take out the spring (21) and poppet (20).
5. Remove the check valve seat (27) assembly.
6. Remove the plug (38) and take out the shim (36), spring (35) poppet (34) and seat (33).

**(When reassembling)**

- Clean all parts with a suitable solvent, and dry with a lint-free cloth or air.
- Visually inspect all parts for signs of scoring or damage.
- Install the spool and spacer to the valve housing, using care not to damage the O-ring.
- Tightening torque of plug (38) : 29.4 to 43.3 N·m (3.0 to 3.5 Kgf·m, 21.7 to 25.3 lbf·ft)
- Tightening torque of plug (23) : 19.6 to 24.5 N·m (2.0 to 2.5 Kgf·m, 14.5 to 18.1 lbf·ft)
- Tightening torque of check valve seat (27) : 34.3 to 39.2 N·m (3.5 to 4.0 Kgf·m, 25.3 to 28.9 lbf·ft)
- Tightening torque of plug (31) : 24.5 to 29.4 N·m (2.5 to 3.0 Kgf·m, 18.1 to 21.7 lbf·ft)

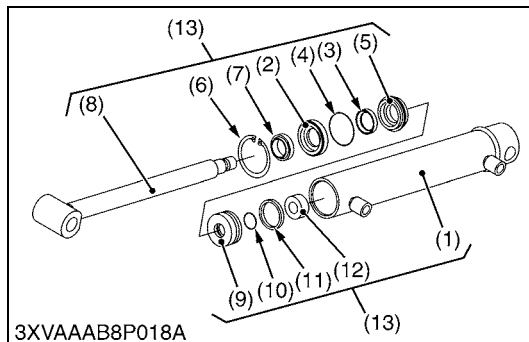
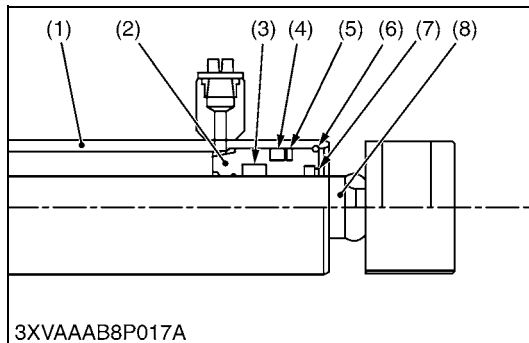
**3 Position Valve and 4 Position Valve (Monoblock Type) (To be continued)**

**3 Position Valve and 4 Position Valve (Monoblock Type) (Continued)**

1. Loosen the plug (9) and draw out the spool (8) with other component parts from valve body (21).
2. Remove the internal snap ring (15) and detent stopper (13).
3. Loosen the detent bolt (8) from spool (17) and then separate the spool and the detent bolt.
4. Remove the plug (9) and draw out the spool (20) with other component parts from valve body (21).
5. Remove the internal snap ring (15) and detent stopper (13).
6. Loosen the detent bolt (8) from spool (20) and then separate the spool the detent bolt.
7. Remove the plug (33) and take out the spring (31) and poppet (30).
8. Remove the check valve seat (25) assembly.
9. Remove the plug (39) and take out the shim (37), spring (36) poppet (35) and seat (34).

**(When reassembling)**

- Clean all parts with a suitable solvent, and dry with a lint-free cloth or air.
- Visually inspect all parts for signs of scoring or damage.
- Install the spool and spacer to the valve housing, using care not to damage the O-ring.

**(4) Disassembling Hydraulic Cylinder****Cargo Lift Hydraulic Cylinder**

1. Drain hydraulic oil from the cylinder, and carefully cramp the tube end of the cylinder in a vise.
2. Push the end cap (2) to inside of cylinder tube (1).
3. Remove the internal snap ring (6).
4. Pull out the rod assembly (13) from the cylinder tube (1).
5. Carefully cramp the rod end in a vise.
6. Unscrew the nut (12), and remove the piston (9) and end cap (2) from the rod (8).

**(When reassembling)**

- Visually inspect the cylinder tube (1) for signs of scoring or damage.
- Visually inspect all parts for signs of scoring or damage.
- Insert the piston rod to the end cap, using care not to damage the wiper seal (7) and end seal (3).
- Insert the rod assembly to the cylinder tube, using care not to damage the piston seal on the piston.
- Install the end cap to the cylinder tube, using care not to damage the O-ring on the cylinder head.

Tightening torque	Cargo lift hydraulic cylinder piston mounting nut	120 to 170 N·m 12.2 to 17.3 kgf·m 88.5 to 125.4 lbf·ft
-------------------	---	--

- |                        |                    |
|------------------------|--------------------|
| (1) Cylinder Tube      | (8) Rod            |
| (2) End Cap            | (9) Piston         |
| (3) End Seal           | (10) Piston O-ring |
| (4) End O-ring         | (11) Piston Seal   |
| (5) Backup Ring        | (12) Piston Nut    |
| (6) Internal Snap Ring | (13) Rod Assembly  |
| (7) Wiper Seal         |                    |

W1015191

# **8 ELECTRICAL SYSTEM**

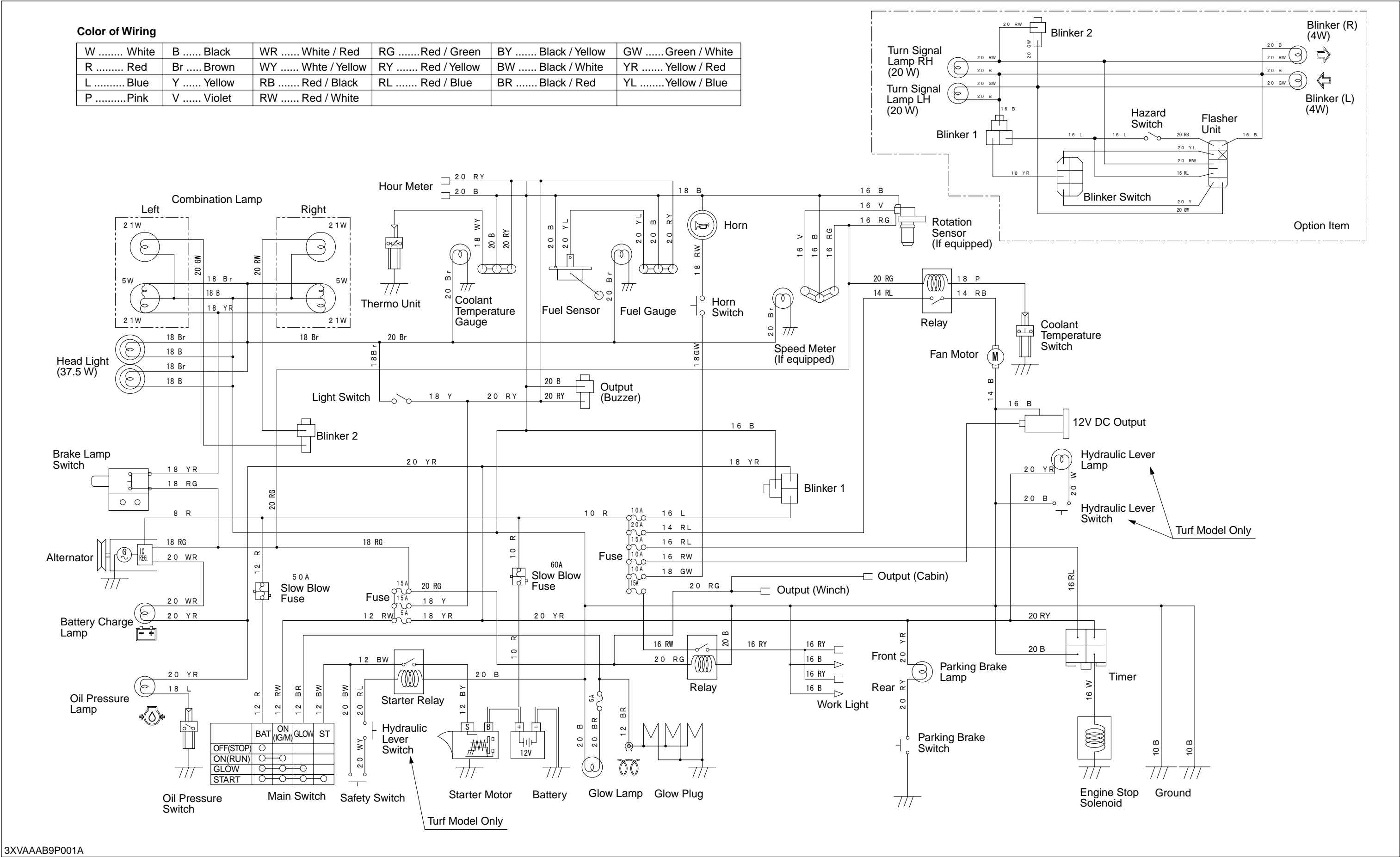


# MECHANISM

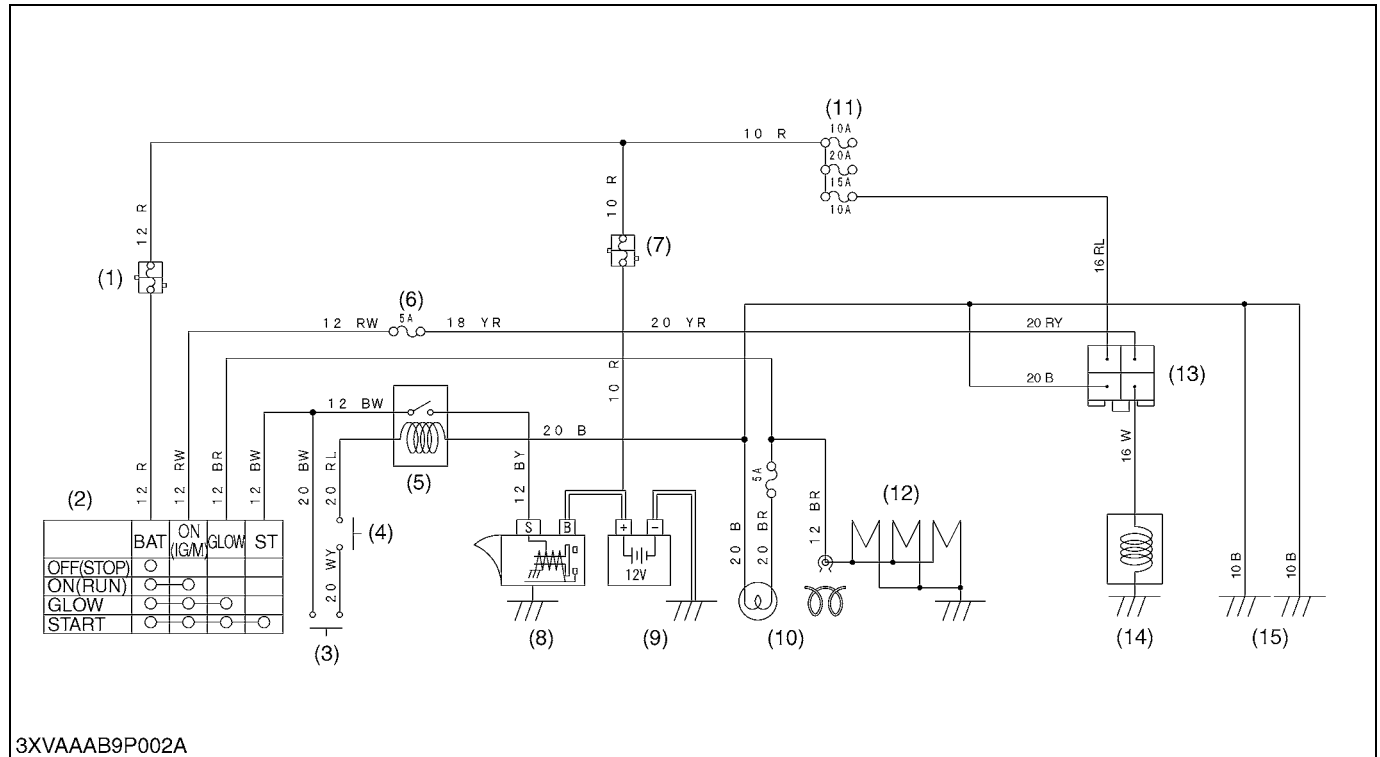
## CONTENTS

1. WIRING DIAGRAM .....	8-M1
2. STARTING SYSTEM .....	8-M2
[1] STARTER .....	8-M3
[2] GLOW PLUG .....	8-M4
[3] SAFETY SWITCH .....	8-M4
(1) Main Shift Arm .....	8-M4
(2) Hydraulic Control Lever (Turf Model Only) .....	8-M1
[4] ENGINE STOP SOLENOID .....	8-M5
3. CHARGING SYSTEM .....	8-M6
[1] ALTERNATOR .....	8-M7
[2] IC REGULATOR .....	8-M8
4. LIGHTING SYSTEM .....	8-M9
5. COOLING SYSTEM .....	8-M10
[1] FAN MOTOR .....	8-M11
[2] COOLANT TEMPERATURE SWITCH .....	8-M11
6. GAUGES .....	8-M12
[1] FUEL QUANTITY .....	8-M12
[2] COOLANT TEMPERATURE .....	8-M13
[3] TRAVELING SPEED SENSOR .....	8-M13
[4] EASY CHECKER .....	8-M14

1. WIRING DIAGRAM



## 2. STARTING SYSTEM



- |   |                           |                |                           |
|---|---------------------------|----------------|---------------------------|
| (1) Slow Blow Fuse (50 A)                       | (5) Starter Relay         | (9) Battery    | (13) Timer                |
| (2) Main Switch                                 | (6) Fuse                  | (10) Glow Lamp | (14) Engine Stop Solenoid |
| (3) Safety Switch                               | (7) Slow Blow Fuse (60 A) | (11) Fuse      | (15) Ground               |
| (4) Hydraulic Lever Switch<br>(Turf Model Only) | (8) Starter Motor         | (12) Glow Plug |                           |

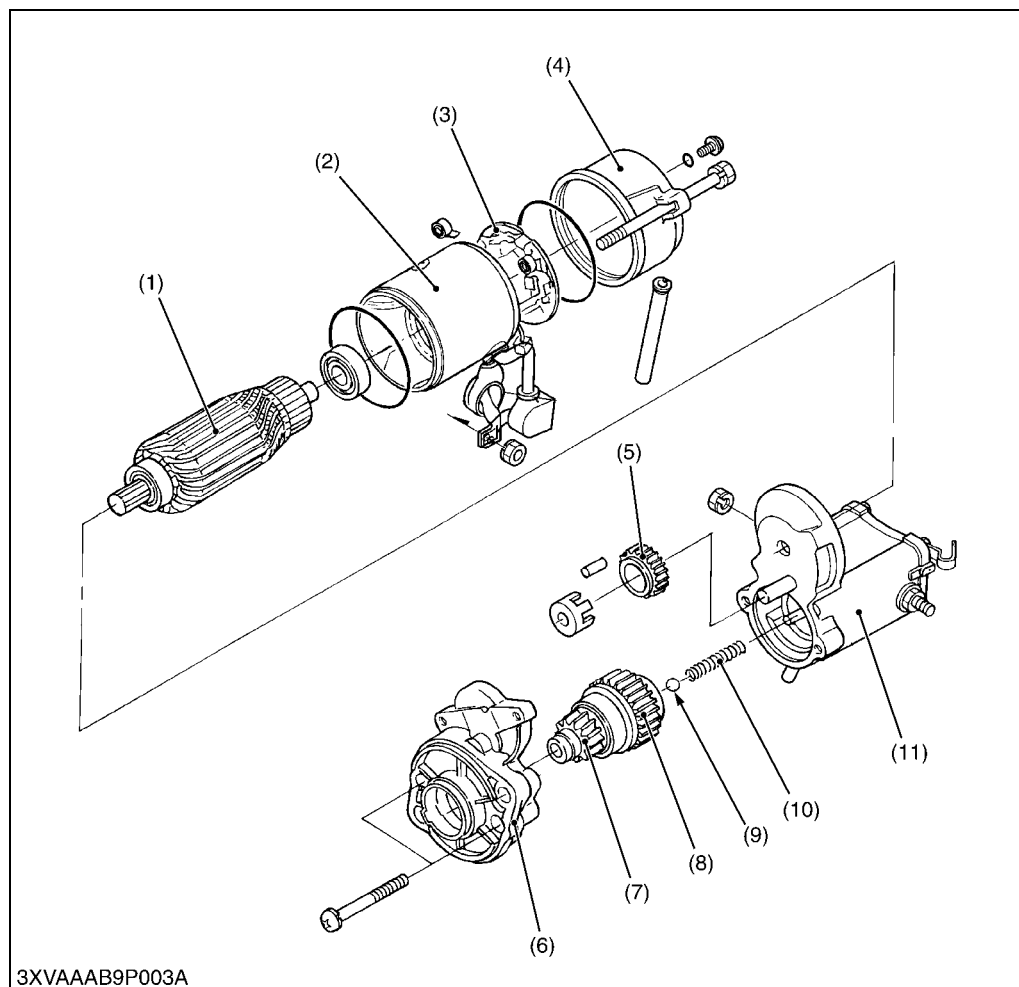
When the main switch is turned to the **PREHEAT** position, the terminal **BAT** is connected to the terminals **GLOW** and **ON**. The glow plugs become red-hot, and the preheat indicator lamp also lights on while preheating.

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

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

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

## [1] STARTER



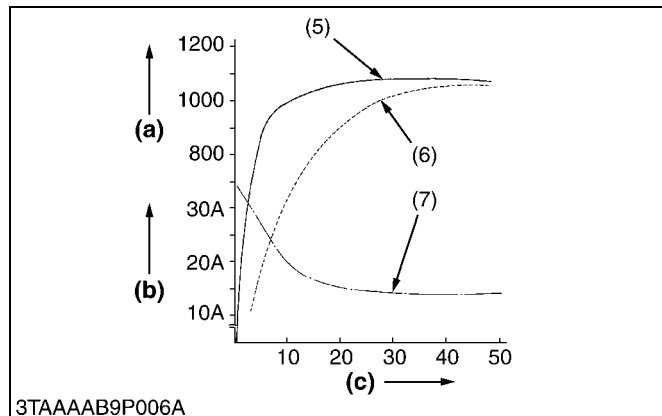
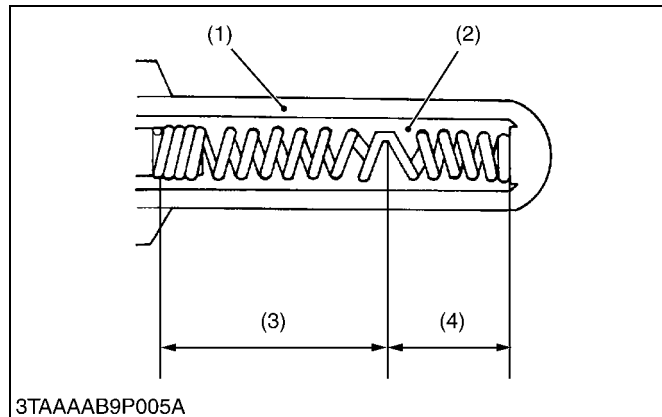
3XVAAAB9P003A

- (1) Armature
- (2) Yoke
- (3) Brush Holder
- (4) End Frame
- (5) Gear
- (6) Drive End Frame
- (7) Pinion
- (8) Roller Clutch
- (9) Ball
- (10) Spring
- (11) Magnet Switch

W1016159

The starter motor is a reduction type. The speed of the pinion gear is reduced to approximately one third of motor one.

## [2] GLOW PLUG



This plug is a two-material type QGS (Quick Glow System) for quick temperature rise, and has self-controlling function as well as excellent durability.

The heater (4) connected in series to the heater (3), which also functions as the resistor, is incorporated in the sheath tube (1) of the super glow plug.

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

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

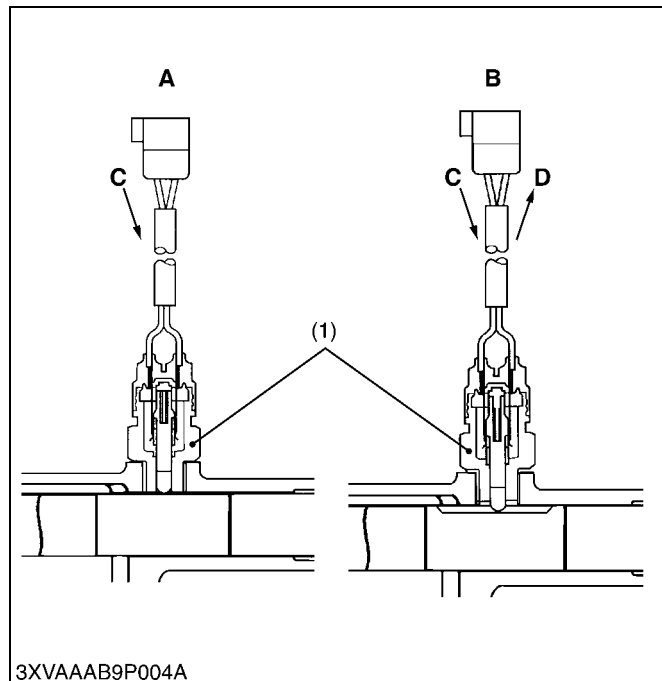
The ignition point is in the area of 2 to 3 mm (0.079 to 0.118 in.) from the tip of the plug in order to reduce its projection into the combustion chamber.

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

W1016465

## [3] SAFETY SWITCH

### (1) Main Shift Arm



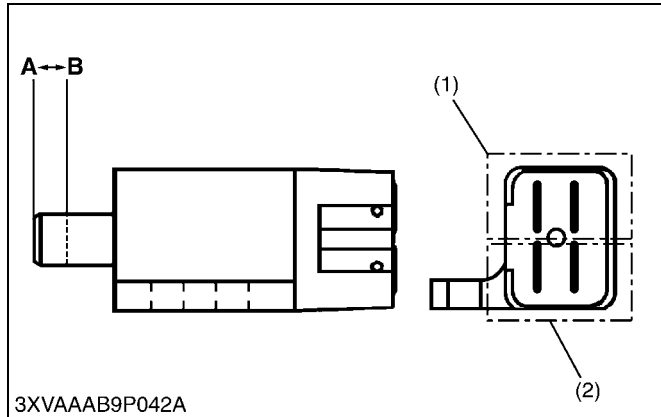
The safety switch prevents current from flowing to the starter when the safety switches are released. This is to ensure safe starting.

The location of the safety switch is in the main shift arm (on the top of transmission case).

- |                   |                      |
|-------------------|----------------------|
| (1) Safety Switch | A : When Shifted     |
|                   | B : When Neutral     |
|                   | C : From Main Switch |
|                   | D : To Starter       |

W1017085

## (2) Hydraulic Control Lever (Turf Model Only)



This switch has two functions. One is a normal open type. Another is a normal close type.

And, a normal open type is used to start the engine safely.

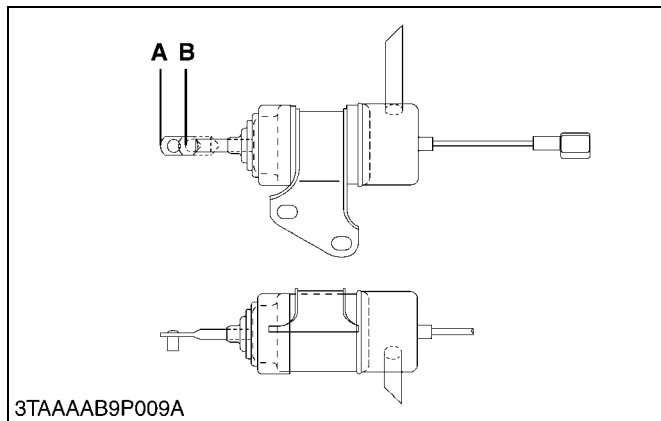
The safety switch prevents current from flowing to the starter when the safety switches are not depressed. This is to ensure safe starting.

The location of the safety switch is in the hydraulic control lever.

- (1) For Engine Start
- (2) For Indicator Lamp  
(Normally Closed Type)

**A : OFF**  
**B : ON**

## [4] ENGINE STOP SOLENOID



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

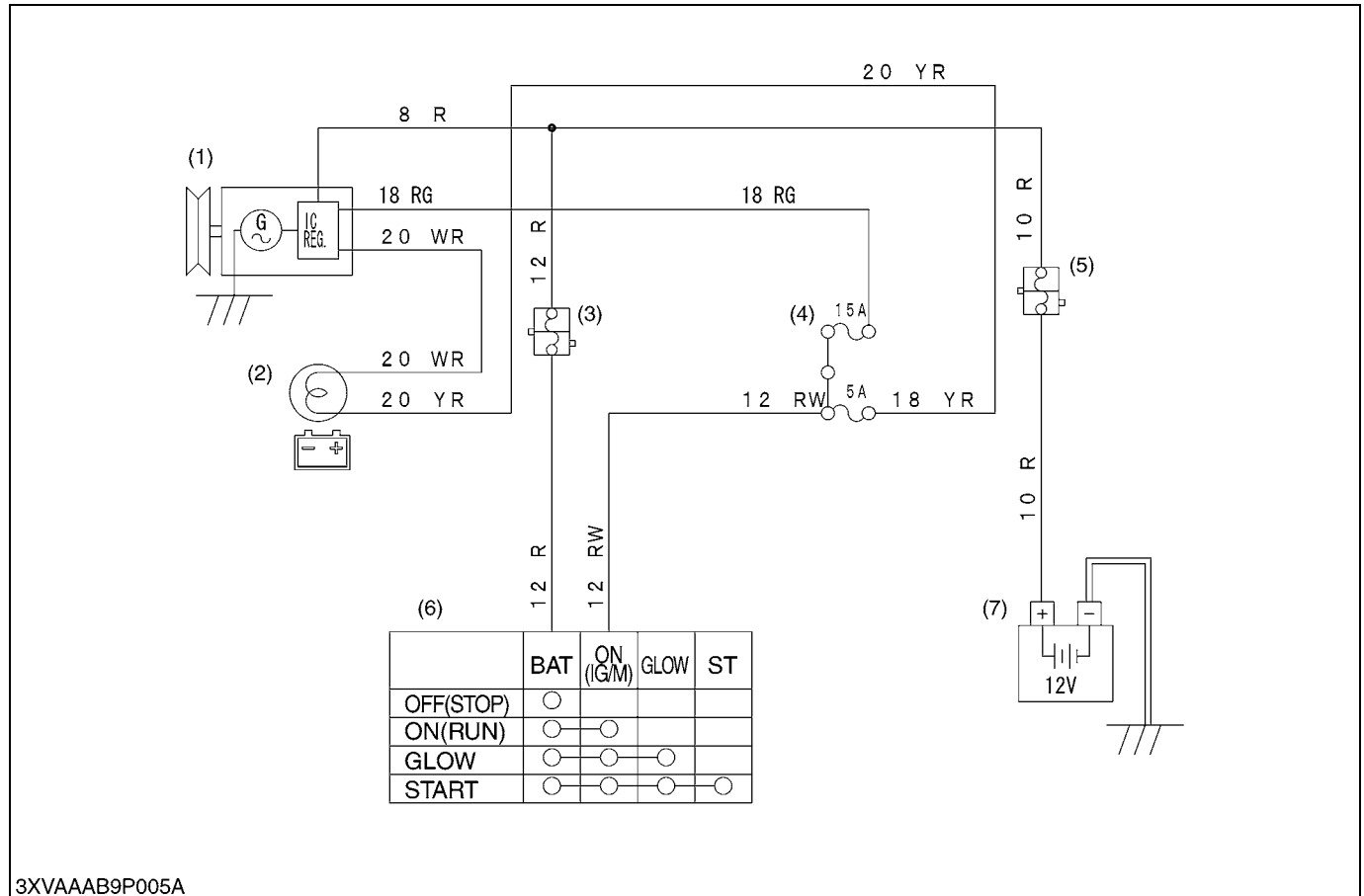
Flowing of the battery current into the coil while the timer relay contact point is closed attracts the plunger to actuate the stop lever of the injection pump. When the battery current stops, the plunger is returned to the original position by the spring.

**A : ON**

**B : OFF**

W1017341

### 3. CHARGING SYSTEM



(1) Alternator  
(2) Battery Charge Lamp

(3) Slow Blow Fuse (50 A)  
(4) Fuse

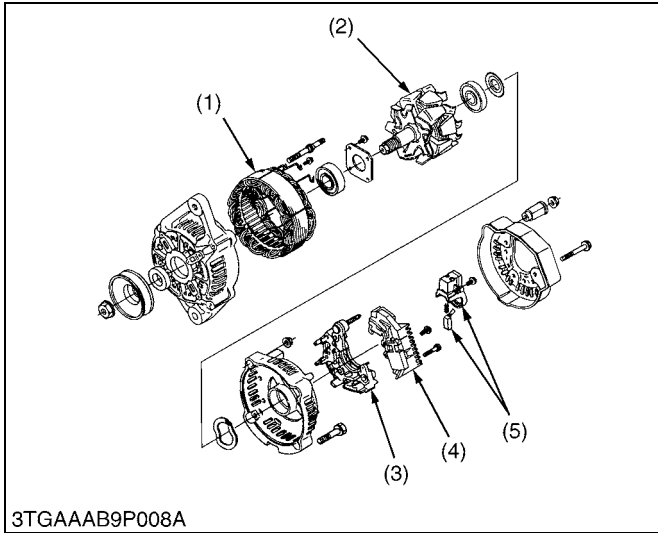
(5) Slow Blow Fuse (60 A)  
(6) Main Switch

(7) Battery

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

This alternator has IC regulator.

## [1] ALTERNATOR



A compact alternator with an IC regulator is used, having the following characteristics :

- Approximately 26 % lighter and 17 % smaller than a standard alternator.
- Cooling performance and safety have been improved by combining the cooling fan with the rotor and incorporating the fan / rotor unit inside the alternator.
- IC regulator is fitted inside the alternator.
- The rectifier, IC regulator and similar components are easy to remove, making it easier to service the alternator.

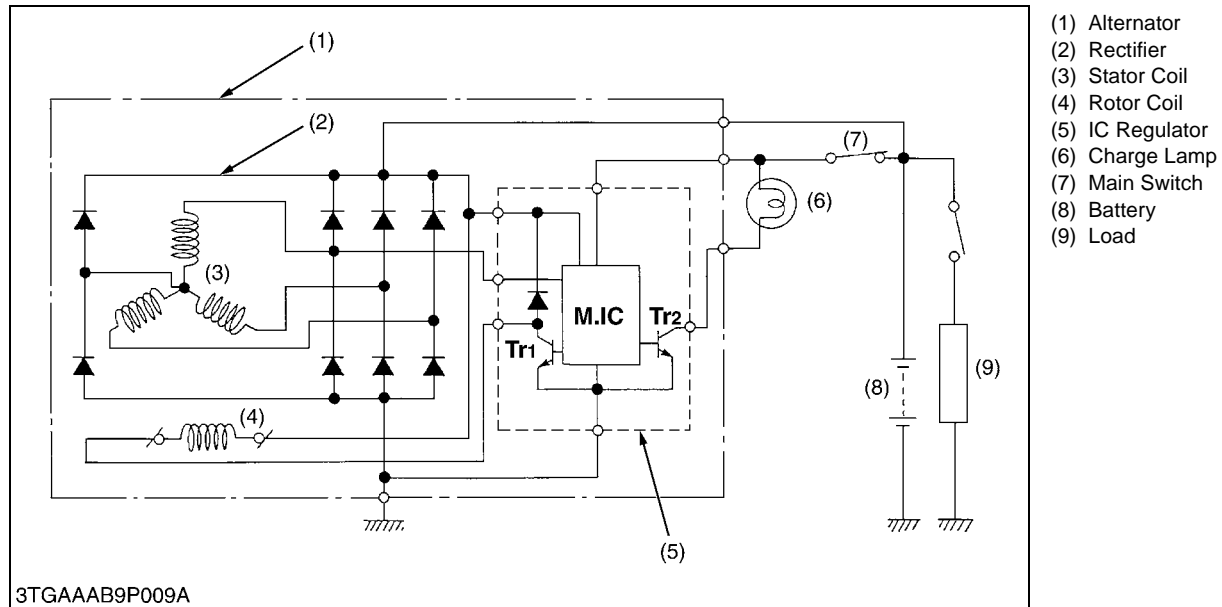
(1) Stator  
(2) Rotor  
(3) Rectifier

(4) IC Regulator  
(5) Brush Holder

W1017761



## [2] IC REGULATOR



W1018047

An IC regulator uses solid state transistors, chips or other semiconductor elements instead of the relays in a conventional regulator. Stable characteristics are achieved by cutting off the field current.

IC regulators have the following characteristics.

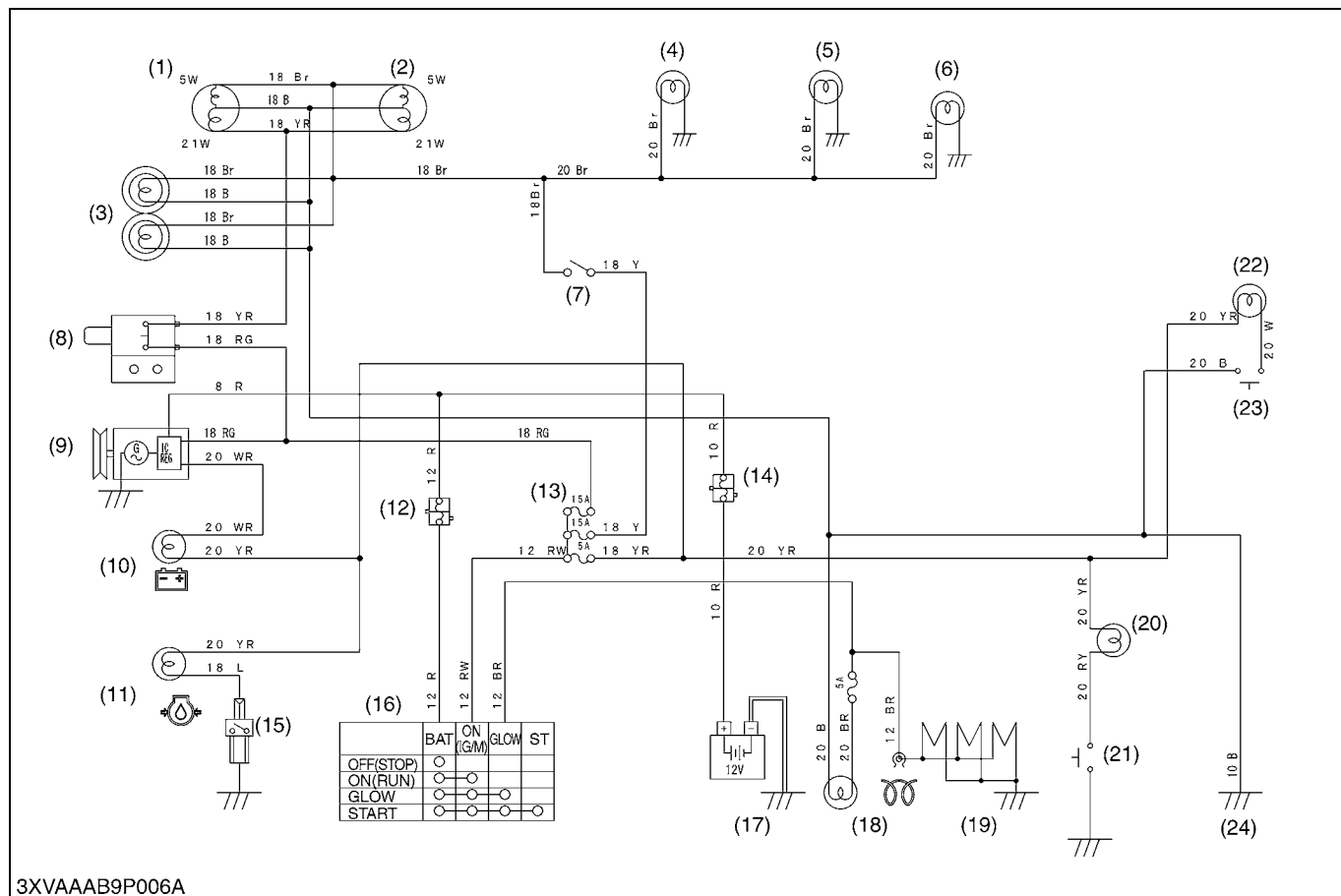
- The control voltage does not change over time, so the need for readjustment is eliminated. Since there are no moving parts, IC regulators are extremely durable and resistant to vibration.
- The overheat compensation characteristics ensure that the control voltage is reduced as the temperature rises, so the battery is charged at just the right level.

The internal circuitry of the IC regulator is shown in the diagram. It consists of a hybrid IC incorporating a monolithic IC. (The internal circuitry of the monolithic IC is extremely complex, so it is shown as simply "**M.IC circuit**".)

**Tr1** acts as the contacts controlling the field current, and **Tr2** acts as the charge lamp relay controlling the flashing of the charge lamp.

The **M.IC** circuit controls **Tr1** and **Tr2**, and monitors the alternator output voltage, and detects any drop in **L** terminal voltage or breaks in the rotor coil.

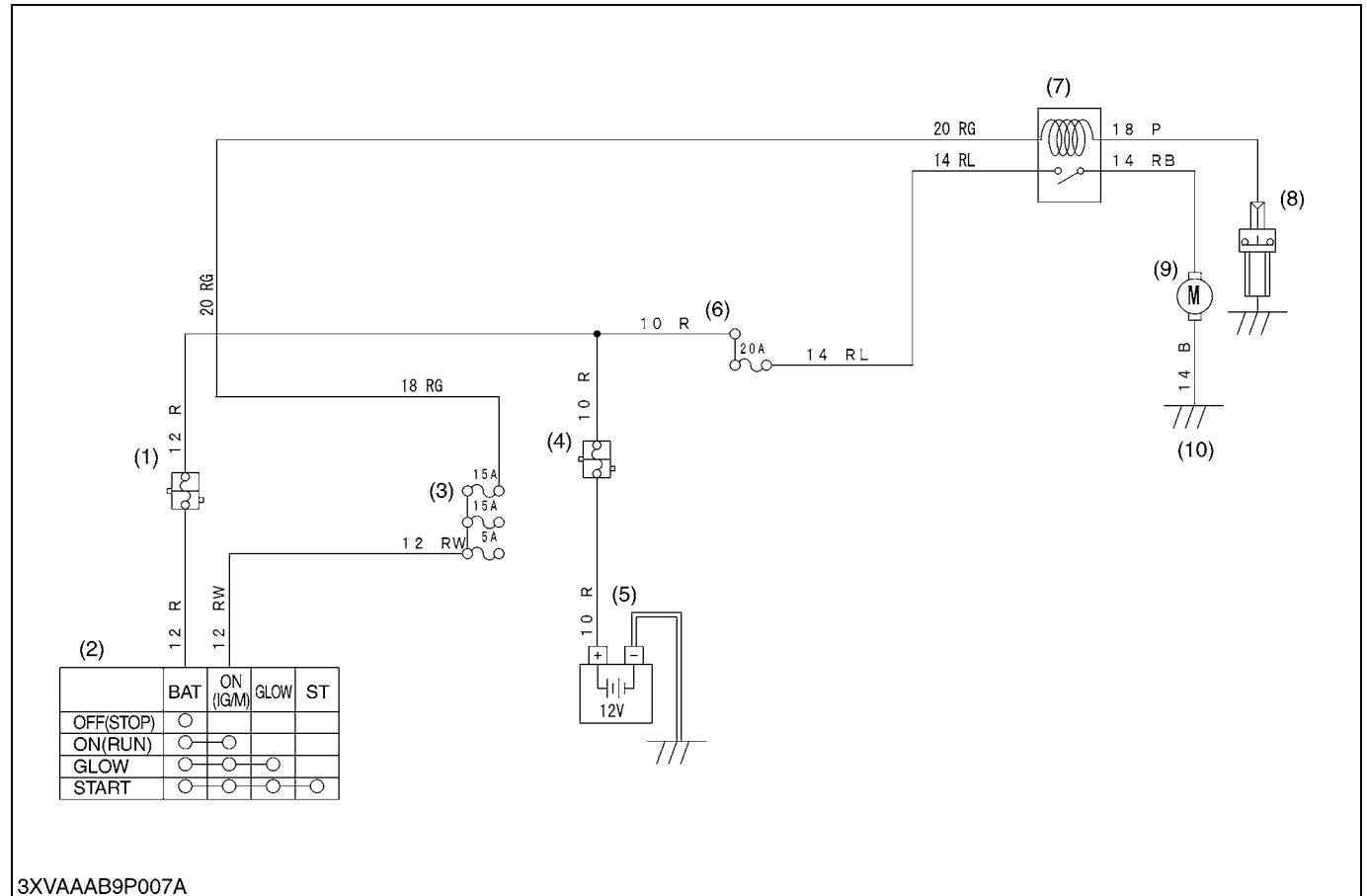
## 4. LIGHTING SYSTEM



- |   |                            |                                 |  |
|---|----------------------------|---------------------------------|--|
| (1) Combination Lamp (LH)                   | (7) Light Switch           | (14) Slow Blow Fuse (60 A)      | (21) Parking Brake Switch                            |
| (2) Combination Lamp (RH)                   | (8) Brake Lamp Switch      | (15) Oil Pressure Switch        | (22) Hydraulic Outlet Warning Lamp (Turf Model Only) |
| (3) Head Light                              | (9) Alternator             | (16) Main Switch                | (23) Hydraulic Lever Switch (Turf Model Only)        |
| (4) Illumination Lamp (Coolant Temperature) | (10) Battery Charge Lamp   | (17) Battery                    | (24) Ground  |
| (5) Illumination Lamp (Speed Meter)         | (11) Oil Pressure Lamp     | (18) Glow Lamp                  |  |
|   | (12) Slow Blow Fuse (50 A) | (19) Glow Plug                  |  |
|   | (13) Fuse                  | (20) Parking Brake Warning Lamp |  |

The lighting system consists of main switch, light switch, head lights, tail lights, etc.

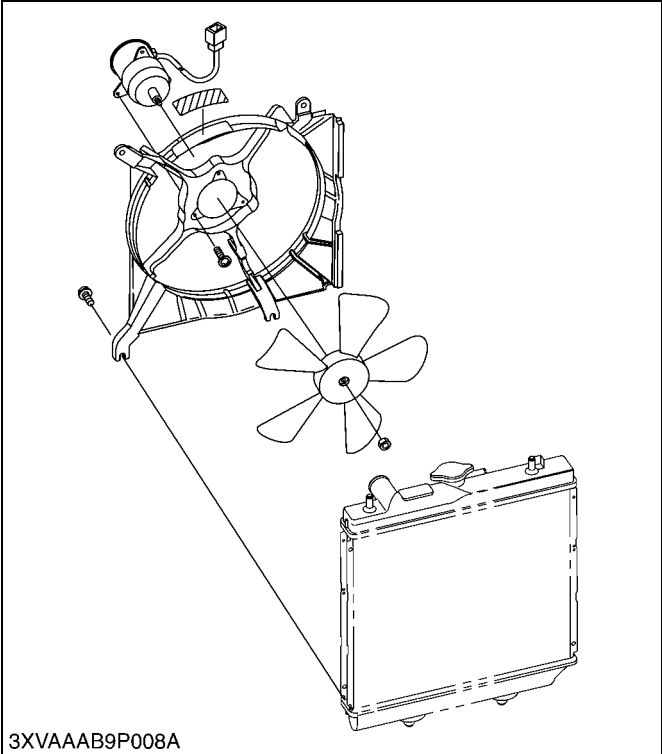
## 5. COOLING SYSTEM



- |                           |                           |                                |               |
|---------------------------|---------------------------|--------------------------------|---------------|
| (1) Slow Blow Fuse (50 A) | (4) Slow Blow Fuse (60 A) | (7) Relay                      | (9) Fan Motor |
| (2) Main Switch           | (5) Battery               | (8) Coolant Temperature Switch | (10) Ground   |
| (3) Fuse                  | (6) Fuse                  |                                |               |

The cooling system consists of coolant temperature switch, relay, fan motor, etc.

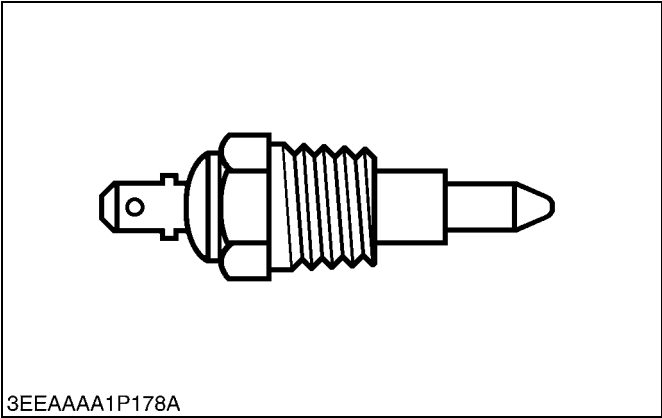
[1] FAN MOTOR



The cooling fan of this vehicle is not driven by the engine drive but an electric motor.  
An electric fan can be installed by separating from the engine.  
And, it can be operated when it is necessary.

W1020119

[2] COOLANT TEMPERATURE SWITCH

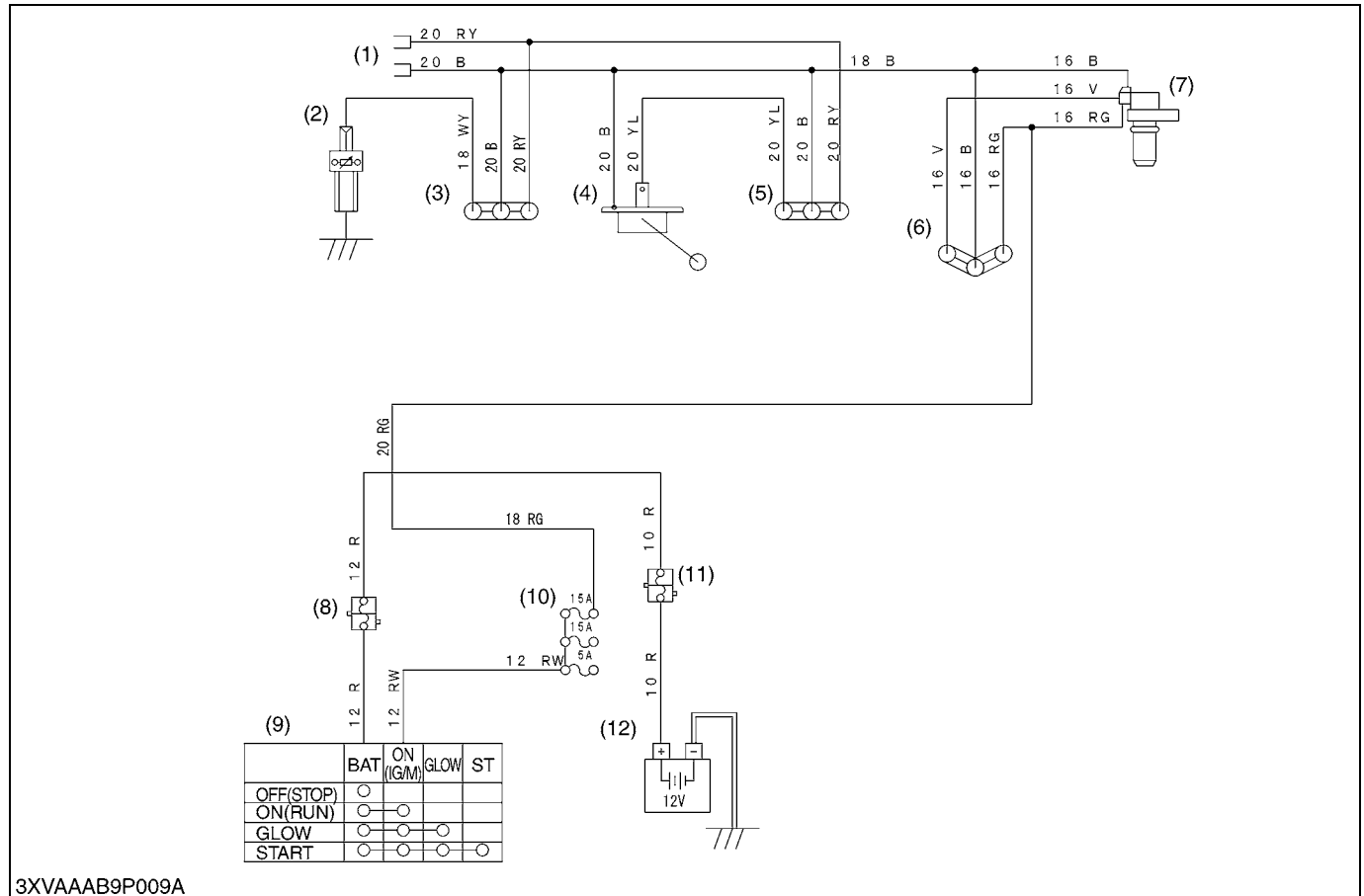


The coolant temperature switch is installed to the water flange of engine, and its tip is in touch with the coolant.  
The fan motor rotates when the coolant temperature goes up more than the specified value.  
When the coolant temperature falls below the specified value, the fan motor stops.

Characteristics of Coolant Temperature Switch		
Type	Operation Temperature	
	Fan motor rotate	Fan motor stop
Normally open	94 to 100 °C (201 to 212 °F)	90 °C (194 °F)

W1020324

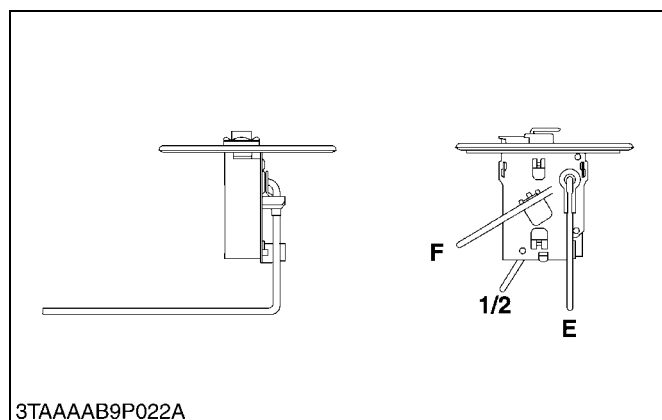
## 6. GAUGES



- (1) Hour Meter (4) Fuel Sensor (7) Rotation Sensor (If equipped) (10) Fuse  
 (2) Thermo Unit (5) Fuel Gauge (8) Slow Blow Fuse (50 A) (11) Slow Blow Fuse (60 A)  
 (3) Coolant Temperature Gauge (6) Speed Meter (If equipped) (9) Main Switch (13) Battery

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

### [1] FUEL QUANTITY



#### ■ Fuel Level Sensor

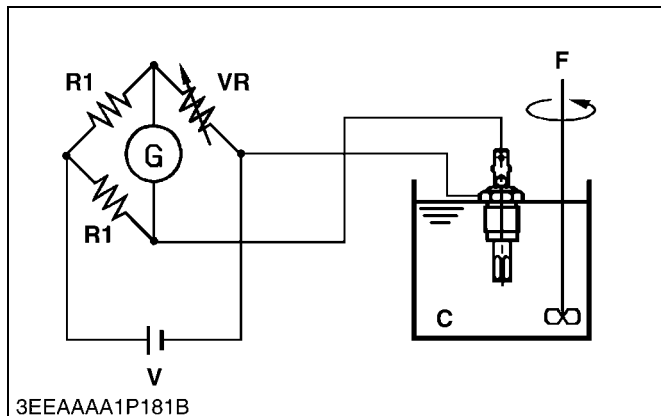
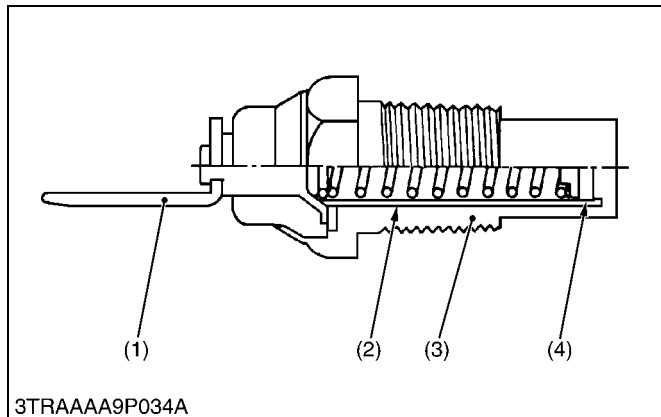
The remaining fuel quantity is detected by the fuel level sensor installed in the fuel tank and indicated on the fuel gauge. For detection, a float and a resistor are used.

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

F	1/2	E (Remaining fuel of approx. 5.0 L, 1.32 U.S.gal., 1.10 Imp.gal.)
1 to 5 Ω	32.5 Ω	103 to 117 Ω

W1021520

## [2] COOLANT TEMPERATURE



### ■ Coolant Temperature Sensor (Thermo Unit)

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

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

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

★ When galvanometer shows 0 (Zero).

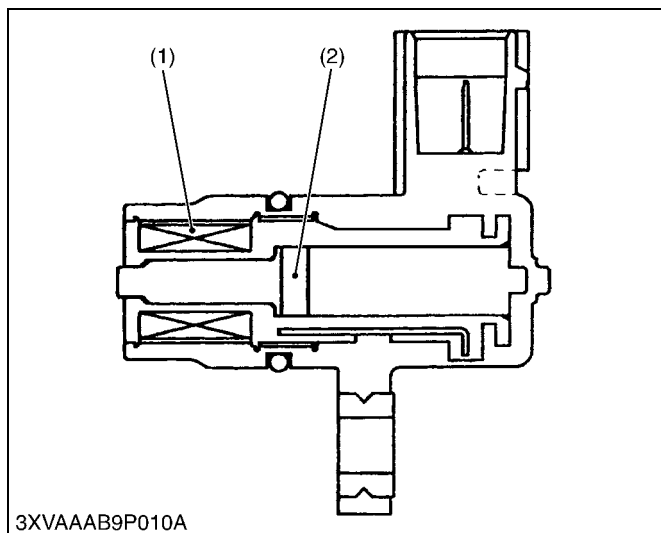
Condition	Setting Value
(A)	R1 : 54.945 to 55.055 Ω V : DC 6.9 to 7.1 V

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

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

W1021761

## [3] TRAVELING SPEED SENSOR



Measure the traveling speed with the rotation sensor at the right side of the front case.

This sensor is the electromagnetic picking up type and is wound with coil (1) around a permanent magnet (2).

When a gear is rotated, a magnetic field is charged and AC voltage is generated in the coil.

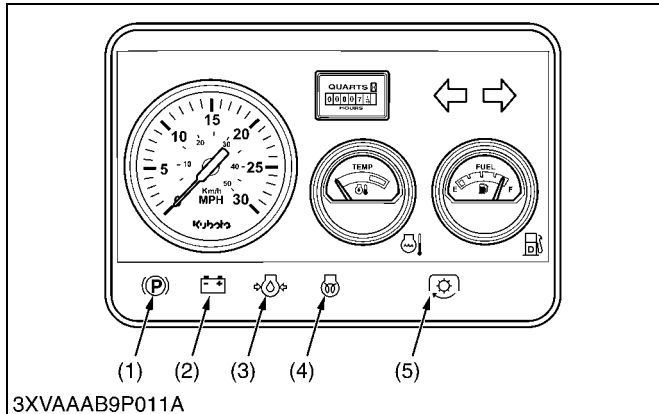
As its frequency is in proportion to the gear revolution, it is input to the speed meter as revolution of the bevel gear shaft.

- (1) Coil
- (2) Permanent Magnet

W1022514

## [4] EASY CHECKER

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



### ■ Indication Items

#### (1) Parking Brake Lamp

When apply parking brake, this lamp illuminates.

#### (2) Charge Lamp

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

#### (3) Oil Pressure Lamp

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

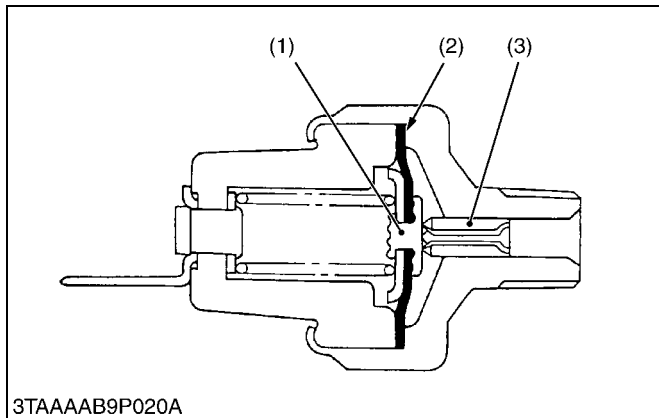
#### (4) Pre-heat Indicator Lamp

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

#### (5) When hydraulic lever is engage, this lamp illuminates (If equipped)

- |                         |                                    |
|-------------------------|------------------------------------|
| (1) Parking Brake       | (4) Glow Plug                      |
| (2) Electrical Charge   | (5) Hydraulic Outlet (If equipped) |
| (3) Engine Oil Pressure |                                    |

W1022713



### ■ Oil Pressure Switch

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

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

W1023000

# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	8-S1
2. SERVICING SPECIFICATIONS .....	8-S6
3. TIGHTENING TORQUES .....	8-S7
4. CHECKING, DISASSEMBLING AND SERVICING.....	8-S8
[1] CHECKING AND ADJUSTING .....	8-S8
(1) Battery.....	8-S8
(2) Main Switch.....	8-S10
(3) Starter .....	8-S12
(4) Glow Plug.....	8-S13
(5) Safety Switch .....	8-S14
(6) Engine Stop Solenoid .....	8-S15
(7) Timer Relay for Stop Solenoid .....	8-S15
(8) Charging System .....	8-S16
(9) Lighting System .....	8-S18
(10)Cooling System.....	8-S21
(11)Gauges .....	8-S23
(12)Others .....	8-S24
[2] DISASSEMBLING AND ASSEMBLING.....	8-S25
(1) Starter .....	8-S25
(2) Alternator .....	8-S26
(3) Panel.....	8-S29
[3] SERVICING .....	8-S30
(1) Starter .....	8-S30
(2) Alternator .....	8-S33



# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>All Electrical Equipments Do Not Operate</b>	Battery discharged or defective	Recharge or replace	G-35
	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	G-48
<b>Fuse Blown Frequently</b>	Short-circuited	Repair or replace	—

W1014322

## BATTERY

Symptom	Probable Cause	Solution	Reference Page
<b>Battery Discharges Too Quickly</b>	Battery defective	Replace	8-S8
	IC Regulator defective	Replace	8-S27
	Wiring harness disconnected or improperly connected (between battery positive terminal and regulator <b>B</b> terminal)	Repair or replace	—
	Cooling fan belt slipping	Adjust tension	G-36

W1012216

**STARTING SYSTEM**

Symptom	Probable Cause	Solution	Reference Page
<b>Starter Motor Does Not Operate</b>	Battery discharged or defective	Recharge or replace	G-35
	Slow blow fuse blown	Replace	G-48
	Safety switch improperly adjusted or defective	Repair or replace	8-S14
	Wiring harness disconnected or improperly connected (between main switch <b>ST</b> terminal and safety switches, between safety switches and starter motor, between battery positive terminal and starter motor)	Repair or replace	—
	Starter motor defective	Repair or replace	8-S25
	Main switch defective	Replace	8-S10
<b>Engine Does Not Stop When Main Switch is Turned OFF</b>	Fuse blown (5 A)	Replace	G-47
	Wiring harness disconnected or improperly connected (between main switch <b>ACC</b> terminal and engine stop solenoid)	Repair or replace	—
	Engine stop solenoid defective	Replace	8-S15
	Timer relay defective	Replace	8-S15
<b>Engine Does Not Start</b>	Engine stop solenoid defective	Replace	8-S15
	Timer relay defective	Replace	8-S15

W1012674

**CHARGING SYSTEM**

Symptom	Probable Cause	Solution	Reference Page
<b>Charging Lamp Does Not Light when Main Switch is Turned ON</b>	Fuse blown (5 A)	Replace	G-47
	Wiring harness disconnected or improperly connected (between main switch <b>ACC</b> terminal and panel board, between panel board and alternator)	Repair or Replace	—
	Alternator defective	Repair or Replace	8-S26
<b>Charging Lamp Does Not Go Off When Engine is Running</b>	Wiring harness disconnected or improperly connected (between main switch <b>B</b> terminal and alternator, between panel board and alternator)	Repair or Replace	—
	Alternator defective	Repair or Replace	8-S26

W1013181

**LIGHTING SYSTEM**

<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>	<b>Reference Page</b>
<b>Head Light Does Not Light</b>	Fuse blown (15 A)	Replace	G-47
	Head light switch defective	Replace	8-S18
	Bulb blown	Replace	G-48
	Wiring harness disconnected or improperly connected (between main switch <b>ACC</b> terminal and head light switch, between head light switch and head light)	Repair or Replace	–
<b>Tail Light Does Not Light</b>	Fuse blown (15 A)	Replace	G-47
	Bulb blown	Replace	G-48
	Wiring harness disconnected or improperly connected (between main switch <b>ACC</b> terminal and head light switch, between head light switch and tail light)	Repair or Replace	–
<b>Hazard Light Does Not Light (If Equipped)</b>	Fuse blown (10 A)	Replace	G-47
	Bulb blown	Replace	G-48
	Wiring harness disconnected or improperly connected	Repair or Replace	–
	Flasher unit defective	Replace	–
	Hazard switch defective	Replace	–
<b>Hazard Indicator Lamp Does Not Light (If Equipped)</b>	Bulb blown	Replace	G-48
	Wiring harness disconnected or improperly connected	Repair or Replace	–
<b>Hazard Light Does Not Flicker (If Equipped)</b>	Flasher unit defective	Replace	–
<b>Turn Signal Light Does Not Light (If Equipped)</b>	Fuse blown (10 A)	Replace	G-47
	Bulb blown	Replace	G-48
	Wiring harness disconnected or improperly connected	Repair or Replace	–
	Flasher unit defective	Replace	–
	Blinker switch defective	Replace	–
<b>Turn Signal Light Indicator Lamp Does Not Light (If Equipped)</b>	Bulb blown	Replace	G-48
	Wiring harness disconnected or improperly connected (blinker switch and indicator lamp)	Repair or Replace	–
<b>Turn Signal Light Does Not Flicker (If Equipped)</b>	Flasher unit defective	Replace	–
	Blinker switch defective	Repair or Replace	–
<b>Pre-heat Indicator Lamp Does Not Light When Main Switch Is in Pre-heat Position</b>	Battery discharged or defective	Recharge or Replace	G-35
	Slow blow fuse blown	Replace	G-48
	Wiring harness disconnected or improperly connected (between main switch <b>G</b> terminal and pre-heat indicator, between pre-heat indicator and glow plugs)	Repair or Replace	–
	Main switch defective	Replace	8-S10
	Pre-heat indicator defective	Replace	8-S30

Symptom	Probable Cause	Solution	Reference Page
<b>Oil Pressure Lamp Lights Up When Engine Is Running</b>	Engine oil pressure too low	Repair engine	–
	Engine oil insufficient	Replenish	G-8
	Oil pressure switch defective	Replace	8-S19
	Short circuit between oil pressure switch lead and chassis	Repair	–
<b>Oil Pressure Lamp Does Not Light When Main Switch Is Turned ON and Engine Is Not Running</b>	Bulb blown	Replace	G-48
	Oil pressure switch defective	Replace	8-S19
	Wiring harness disconnected or improperly connected (between panel board and oil pressure switch)	Repair or Replace	–
<b>Parking (Position) Light Does Not Light</b>	Fuse blown (15 A)	Replace	G-47
	Bulb blown	Replace	8-S30
	Parking light switch defective	Repair or Replace	8-S20
	Wiring harness disconnected (between parking light switch and parking light)	Repair or Replace	–

W1014888

**COOLING SYSTEM**

Symptom	Probable Cause	Solution	Reference Page
<b>Fan Motor Does Not Rotate When Engine Overheats</b>	Coolant temperature gauge defective	Replace	8-S30
	Fuse blown (20 A)	Replace	G-47
	Fan motor relay defective	Replace	8-S22
	Wiring harness disconnected or improperly connected	Repair or Replace	–
	Fan motor defective	Replace	8-S22
	Battery discharged or defective	Recharge or Replace	G-35
<b>Fan Motor Rotates Always (When Main Switch Is ON Position)</b>	Coolant temperature gauge defective	Replace	8-S30
	Fan motor relay defective	Replace	8-S22

W1016752

**GAUGES**

<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>	<b>Reference Page</b>
<b>Fuel Gauge Does Not Function</b>	Fuel gauge defective	Replace	8-S30
	Fuel level sensor defective	Replace	8-S23
	Wiring harness disconnected or improperly connected (between fuel gauge and fuel level sensor)	Replace or Replace	—
<b>Coolant Temperature Gauge Does Not Function</b>	Coolant temperature gauge defective	Replace	8-S30
	Coolant temperature sensor defective	Replace	8-S23
	Wiring harness disconnected or improperly connected (between coolant temperature gauge and coolant temperature sensor)	Repair or Replace	—

W1018080

**HORN**

<b>Symptom</b>	<b>Probable Cause</b>	<b>Solution</b>	<b>Reference Page</b>
<b>Horn Does Not Sound When Horn Button Is Pushed</b>	Fuse blown (10 A)	Replace	G-47
	Horn switch defective	Replace	8-S30
	Horn defective	Replace	—
	Wiring harness disconnected or improperly connected (between combination switch terminal and horn)	Repair or Replace	—

W1018596

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Battery	Voltage	More than 12 V	—
	Potential Difference	Less than 0.1 V	—
Glow Plug	Resistance	Approx. 0.9 $\Omega$	—
Alternator	No-load Voltage	More than 14 V	—
Stator	Resistance	Less than 0.1 $\Omega$	—
Rotor	Resistance	2.9 $\Omega$	—
Slip Ring	O.D.	14.4 mm 0.567 in.	12.8 mm 0.504 in.
Brush	Length	10.5 mm 0.413 in.	8.4 mm 0.331 in.
Head Light Switch	Resistance <b>OFF</b>	Infinity	—
	Resistance <b>ON</b>	0 $\Omega$	—
Starter			
Commutator	O.D.	30.0 mm 1.181 in.	29.0 mm 1.142 in.
Commutator	Difference of O.D.'s	Less than 0.02 mm 0.0008 in.	0.05 mm 0.0020 in.
Mica	Undercut	0.50 to 0.80 mm 0.0197 in.	0.20 mm 0.0079 in.
Brush	Length	14.0 mm 0.551 in.	9.0 mm 0.354 in.
Blinker Switch (If Equipped)	Resistance <b>OFF</b>	Infinity	—
	Resistance <b>R</b>	0 $\Omega$	—
	Resistance <b>L</b>	0 $\Omega$	—
Hazard Light Switch (If Equipped)	Resistance <b>OFF</b>	Infinity	—
	Resistance <b>ON</b>	0 $\Omega$	—

W10138740

### 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
Starter ( <b>B</b> terminal nut)	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7
Alternator (Pulley nut)	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2
ROPS pipe mounting bolt and nut	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
ROPS (front) mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Steering wheel mounting nut	20 to 25	2.0 to 2.6	14.8 to 18.4

W1013236

## 4. CHECKING, DISASSEMBLING AND SERVICING

### [1] 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 splattered with it, wash it away completely with water immediately.
- Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.

#### ■ IMPORTANT

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

#### (1) Battery



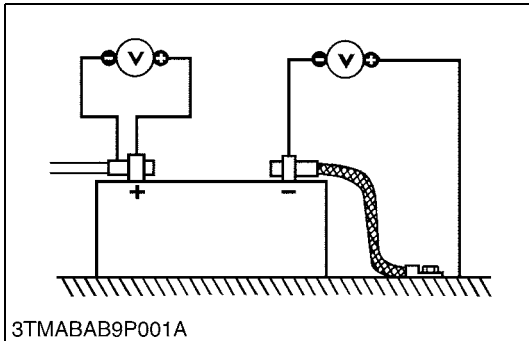
3XVAAAB1P011C

#### Battery Voltage

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

Battery voltage	Factory spec.	More than 12 V
-----------------	---------------	----------------

W1022050



3TMABAB9P001A

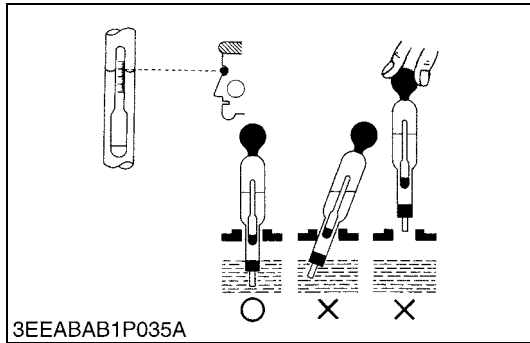
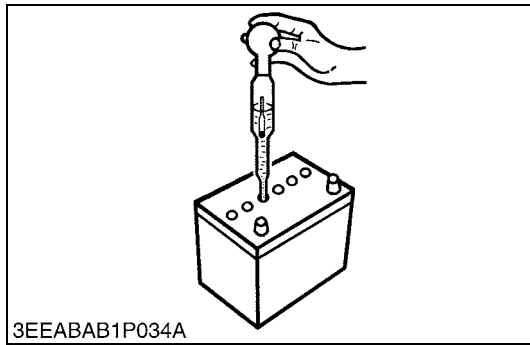
#### Battery Terminal Connection

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

Potential difference	Factory spec.	Less than 0.1 V
----------------------	---------------	-----------------

W1022346





### Battery Specific Gravity

1. Check the specific gravity of the electrolyte in each cell with a hydrometer.
2. When the electrolyte temperature differs from that at which the hydrometer was calibrated, correct the specific gravity reading following the formula mentioned in **(Reference)**.
3. If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.
4. If the specific gravity differs between any two cells by more than 0.05, replace the battery.

#### NOTE

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

#### (Reference)

- Specific gravity slightly varies with temperature. To be exact, the specific gravity decreases by 0.0007 with an increase of 1 °C (0.0004 with an increase of 1 °F) in temperature, and increases by 0.0007 with a decrease of 1 °C (0.0004 with a decrease of 1 °F).

Therefore, using 20 °C (68 °F) as a reference, the specific gravity reading must be corrected by the following formula :

-Specific gravity at 20 °C = Measured value + 0.0007 x (electrolyte temperature - 20 °C)

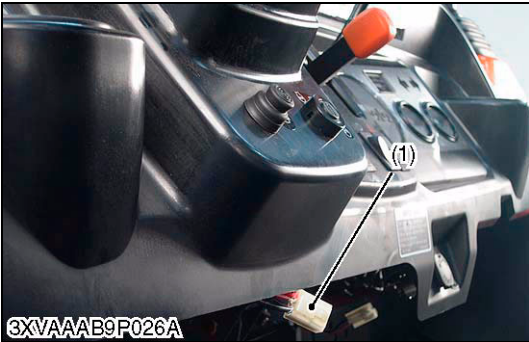
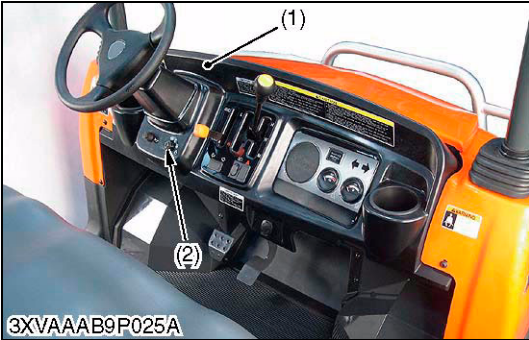
-Specific gravity at 68 °F = Measured value + 0.0004 x (electrolyte temperature - 68 °F).

Specific Gravity	State of Charge
1.260 Sp. Gr.	100 % Charged
1.230 Sp. Gr.	75 % Charged
1.200 Sp. Gr.	50 % Charged
1.170 Sp. Gr.	25 % Charged
1.140 Sp. Gr.	Very Little Useful Capacity
1.110 Sp. Gr.	Discharged

At an electrolyte temperature of 20 °C (68 °F).

W1022490

(2) Main Switch



Main Switch

- 1. Remove the under panel (1).
- 2. Disconnect the **4P** connector and remove the main switch (2).
- 3. Perform the following checks.

- (1) Under Panel
- (2) Main Switch

W1023642

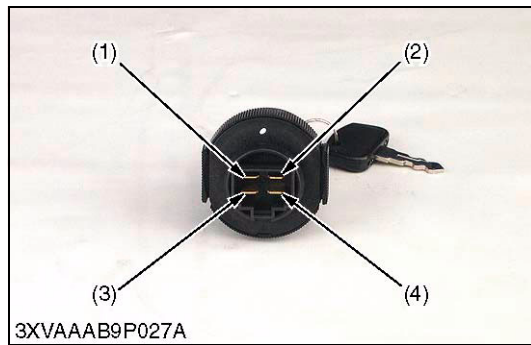
Connector Voltage

- 1. Measure the voltage with a voltmeter across the connector **B** (red) terminal and chassis.
- 2. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector <b>B</b> (Red) terminal - chassis	Approx. battery voltage
---------	---	-------------------------

- (1) Connector

W1024096



### Main Switch Continuity

#### 1) Main Switch Key at OFF Position

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

Resistance	<b>B</b> terminal - <b>ACC</b> terminal	Infinity
	<b>B</b> terminal - <b>ST</b> terminal	
	<b>B</b> terminal - <b>G</b> terminal	

#### 2) Main Switch Key at ON Position

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

Resistance	<b>B</b> terminal - <b>ACC</b> terminal	0 $\Omega$
------------	---	------------

#### 3) Main Switch Key at PREHEAT Position

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

Resistance	<b>B</b> terminal - <b>G</b> terminal	0 $\Omega$
	<b>B</b> terminal - <b>ACC</b> terminal	

#### 4) Main Switch Key at START Position

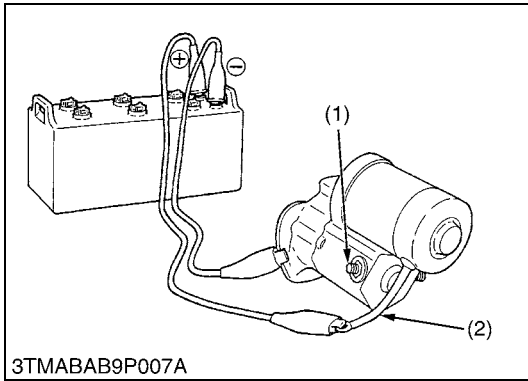
1. Set and hold the main switch key at the **START** position.
2. Measure the resistance with an ohmmeter across the **B** terminal and the **G** terminal, across the **B** terminal and the **ST** terminal, and across the **B** terminal and the **ACC** terminal.
3. If 0 ohm is not indicated, these contacts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

Resistance	<b>B</b> terminal - <b>G</b> terminal	0 $\Omega$
	<b>B</b> terminal - <b>ST</b> terminal	
	<b>B</b> terminal - <b>ACC</b> terminal	

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

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

W1024464

**(3) Starter****Motor Test****CAUTION**

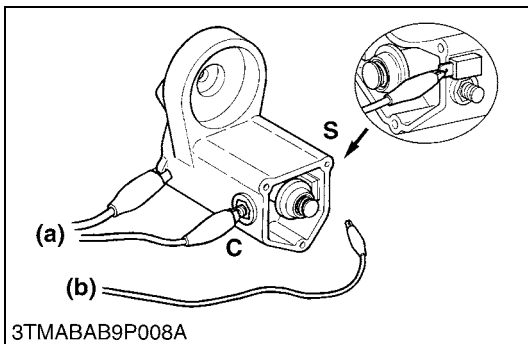
- **Secure the starter to prevent it from jumping up and down while testing the motor.**

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter.
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

W1028696

**Magnet Switch Test (Pull-in, Holding Coils)**

1. Remove the motor from the starter housing.
2. Prepare a 6 V battery for the test.
3. Connect jumper leads from the battery negative terminal to the housing and the starter **C** terminal.
4. The plunger should be attracted and the pinion gear should pop out when a jumper lead is connected from the battery positive terminal to the **S** terminal. It's a correct.
5. Disconnect the jumper lead to the starter **C** terminal. Then the pinion gear should remain popped out. It's a correct.

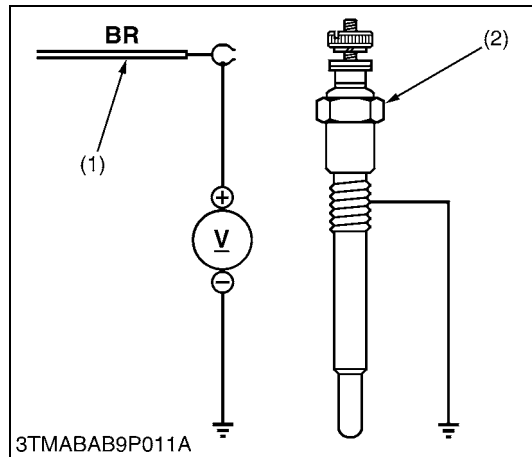
**■ IMPORTANT**

- **Testing time must be 3 to 5 sec..**

**C** : **C** Terminal(a) **To Negative Terminal****S** : **S** Terminal(b) **To Positive Terminal**

W1029265

#### (4) Glow Plug



##### Lead Terminal Voltage

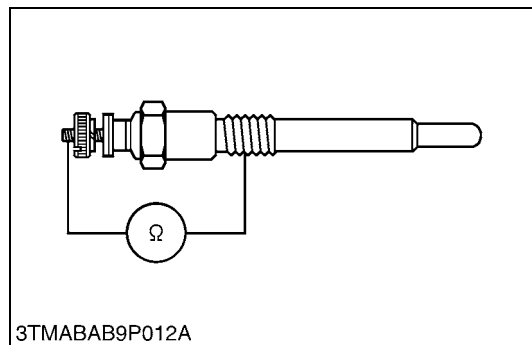
1. Disconnect the wiring lead (1) from the glow plug (2) after turning the main switch off.
2. Turn the main switch key to the **"PREHEAT"** position, and measure the voltage between the lead terminal and the chassis.
3. Turn the main switch key to the **"START"** position, and measure the voltage with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

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

(1) Wiring Lead (Positive)

(2) Glow Plug

W1029642



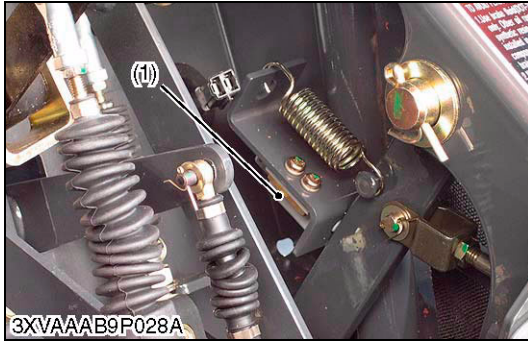
##### Glow Plug Continuity

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

Glow plug resistance	Factory spec.	Approx. 0.9 Ω
----------------------	---------------	---------------

W1030028

## (5) Safety Switch



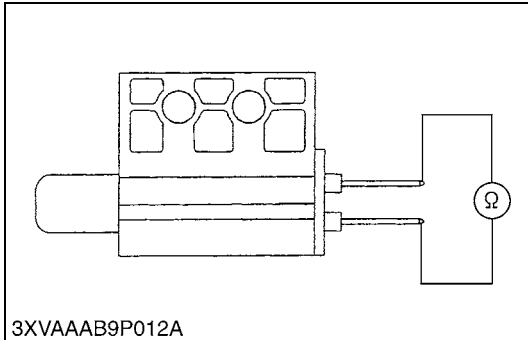
### Brake Switch Continuity

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

Resistance (Across switch terminal)	When switch is pushed	0 $\Omega$
	When switch is released	Infinity

(1) Safety Switch for Brake

W1030336



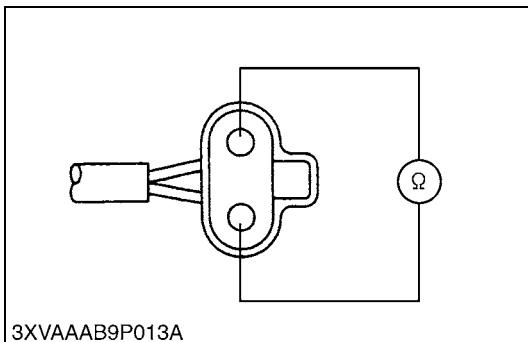
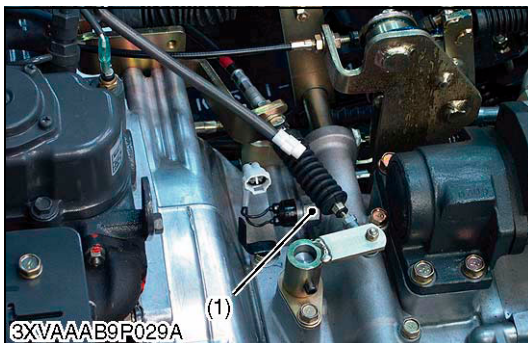
### Safety Switch Continuity

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

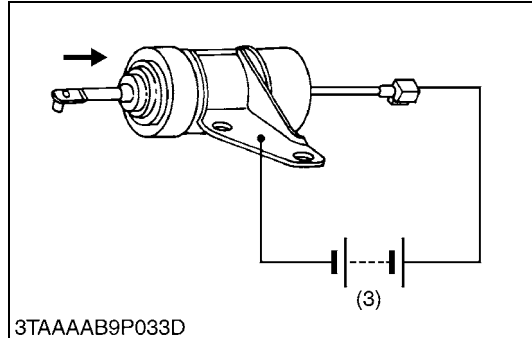
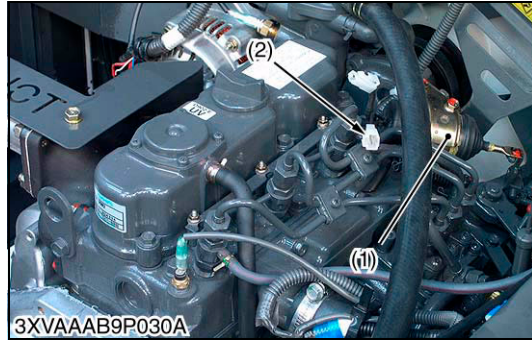
Resistance (Across switch terminal)	When you move the gear shift lever	Infinity
	When you return the gear shift lever	0 $\Omega$

(1) Safety Switch for Main Shift Lever

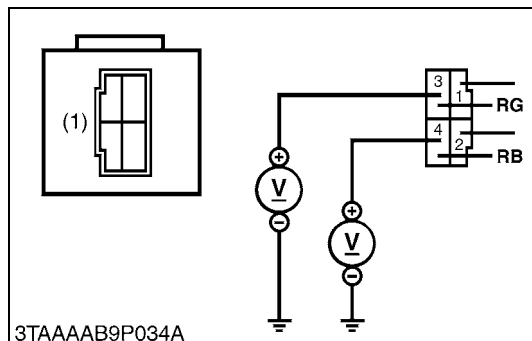
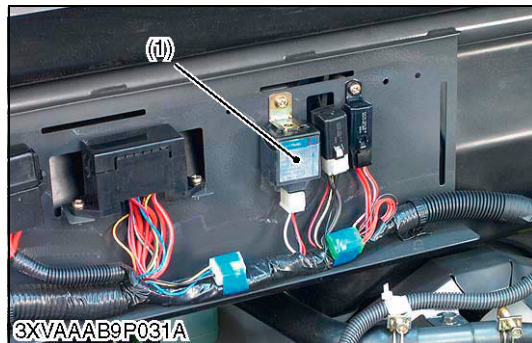
W1030787



## (6) Engine Stop Solenoid



## (7) Timer Relay for Stop Solenoid



### Engine Stop Solenoid Test

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

(1) Stop Solenoid  
(2) **1P** Connector

(3) Battery (12 V)

W1031071

### Timer Relay Connector Voltage

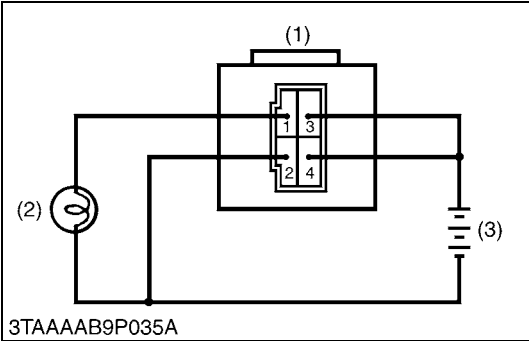
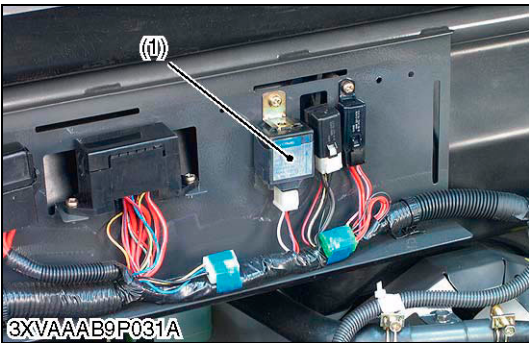
1. Disconnect the connector from the timer relay after turning the main switch off.
2. Measure the voltage with a voltmeter across the connector terminal **4** and chassis.
3. Turn the main switch on, and measure the voltage across the connector terminal **3** and chassis.
4. If these voltages differ from the battery voltage, the wiring harness or main switch is faulty.

Voltage	Connector terminal <b>4</b> - chassis	Approx. battery voltage
	Connector terminal <b>3</b> - chassis	Approx. battery voltage

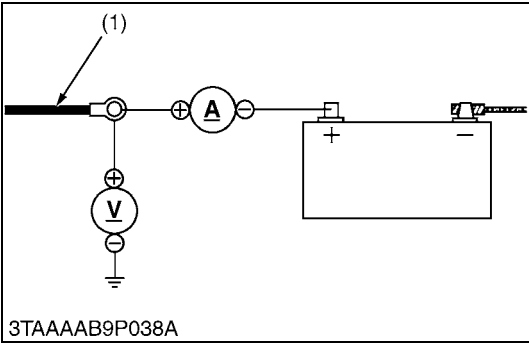
(1) Timer Relay

W1031640





(8) Charging System



Test of Timer Relay

- 1. Remove the timer relay from the tractor.
- 2. Connect jumper leads across the battery positive terminal and the timer relay terminal 3, and across the battery positive terminal and the timer relay terminal 4.
- 3. Connect jumper leads across the battery negative terminal and the timer relay terminal 2, and across the battery negative terminal and the bulb terminal.
- 4. Connect jumper lead across the timer relay terminal 1 and the bulb terminal.
- 5. The bulb lights up when disconnecting a jumper lead from the terminal 3 and goes off 6 to 13 seconds later, the timer relay is proper.

- (1) Timer Relay
- (2) Load (Lamp)
- (3) Battery (12V)

W1031988

Battery Charging Current

- 1. After starting the engine, disconnect the battery positive cord (+), and connect an ammeter and voltmeter. Then switch on all electrical loads (such as head lights) and measure the charging current.

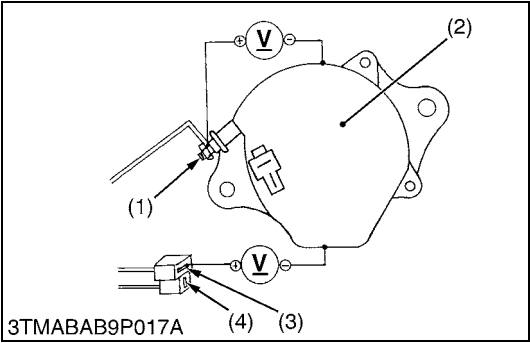
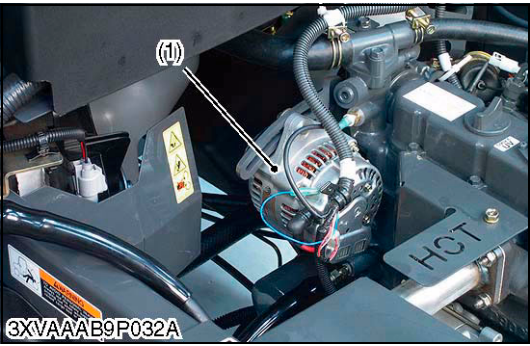
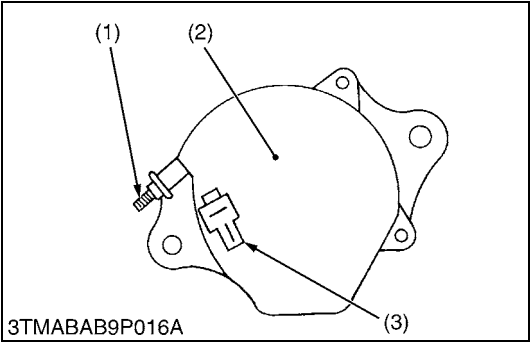
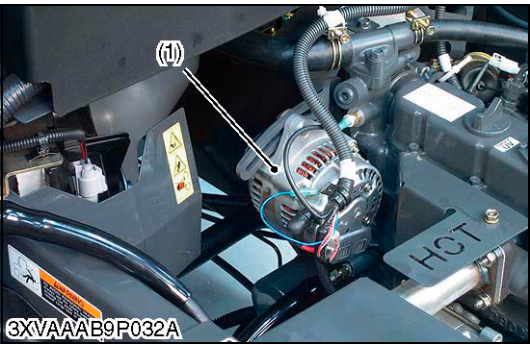
- NOTE
  - Connect an ammeter only after starting the engine.
  - When the electrical loads is considerably low or the battery is fully charged, the specified reading may not be obtained.

Factory spec.	Current	14 to 15 A
	Voltage	14 to 15 A
	Dynamo speed	5200 min <sup>-1</sup> (rpm)

- (1) Battery Positive Cord

W1032497





**Alternator**

1. Disconnect the **2P** connector (3) from alternator after turning the main switch **OFF**.
2. Perform the following checkings.

- (1) B Terminal
- (2) Alternator
- (3) **2P** Connector

W1032752

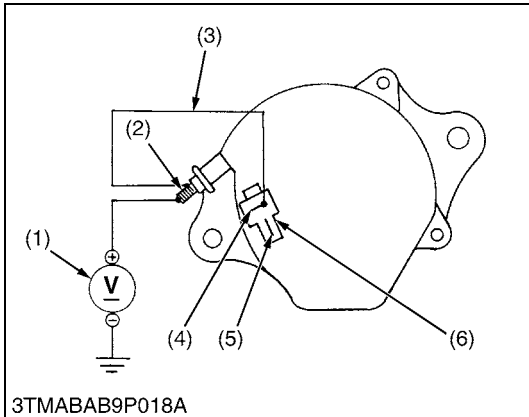
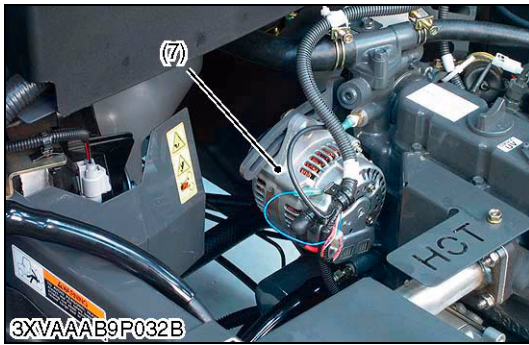
**Connector Voltage**

1. Turn the main switch **OFF**. Measure the voltage between the **B** terminal (1) and the chassis.
2. Turn the main switch **ON**. Measure the voltage between the **IG** terminal (3) and the chassis.

Voltage (Main switch at <b>OFF</b> )	<b>B</b> terminal - Chassis	Approx. battery voltage
Voltage (Main switch at <b>ON</b> )	<b>IG</b> terminal - Chassis	Approx. battery voltage

- (1) **B** Terminal
- (2) Alternator
- (3) **IG** Terminal
- (4) **L** Terminal

W1033083



### No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning the main switch **OFF**.
2. Connect the jumper lead (3) between **IG** terminal (4) and **B** terminal (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the **B** terminal (2) and the chassis.
6. If the measurement is less than the factory specification, disassemble the alternator and check the IC regulator.

Voltage	Factory spec.	More than 14 V
---------	---------------	----------------

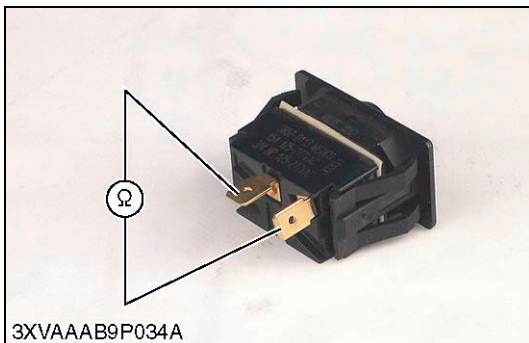
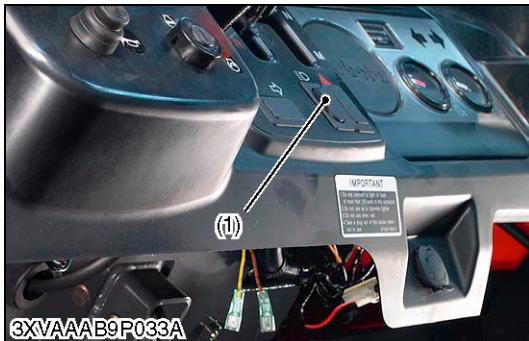
### (Reference)

- Once the engine has started, the alternator temperature rises quickly up to an ambient temperature of 70 to 90 °C (158 to 194 °F). As the temperature goes higher than 50 °C (122 °F), the alternator voltage slowly drops; at higher than 100 °C (212 °F), it drops by about 1 V.

- |                 |                  |
|-----------------|------------------|
| (1) Voltmeter   | (5) L Terminal   |
| (2) B Terminal  | (6) 2P Connector |
| (3) Jumper Lead | (7) Alternator   |
| (4) IG Terminal |                  |

W1033514

## (9) Lighting System



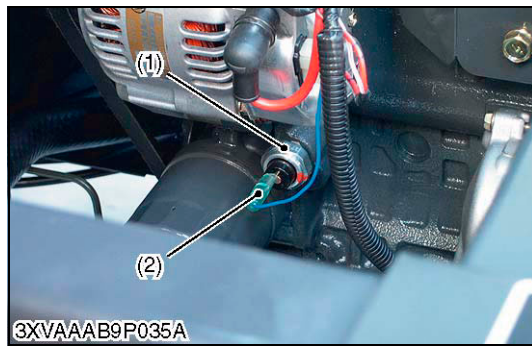
### Head Light Switch Continuity

1. Disconnect the wiring leads from head light switch and remove it.
2. Measure the resistance with an ohmmeter across the head light switch terminals in each position.
3. If the resistance differs from the factory specifications, the head light switch is faulty.

Resistance	Factory spec.	OFF	Infinity
		ON	0 Ω

- (1) Head Light Switch

W1034453



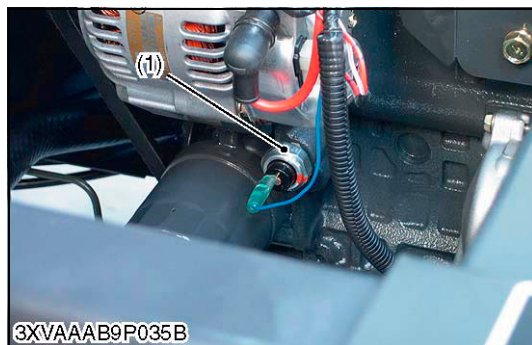
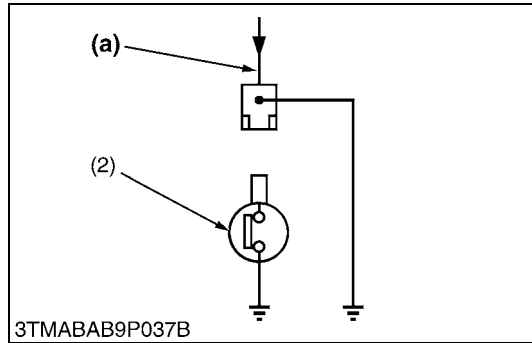
### Engine Oil Pressure Lamp

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

- (1) Engine Oil Pressure Switch  
(2) Wiring Lead

(a) From Oil Pressure Lamp

W1034756



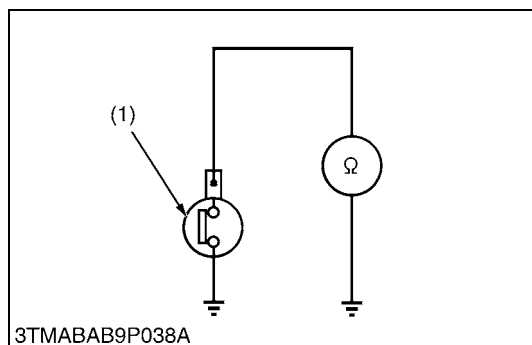
### Engine Oil Pressure Switch Continuity

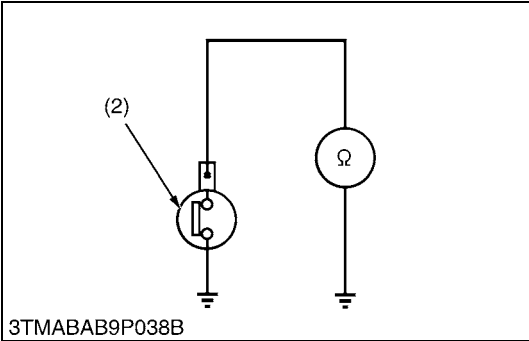
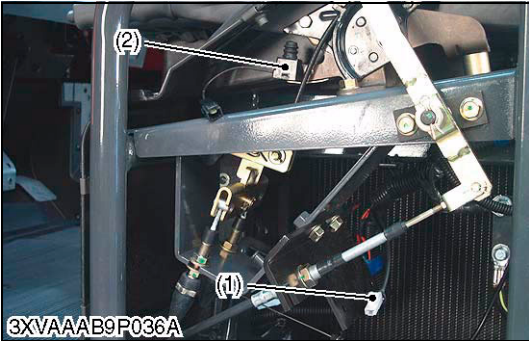
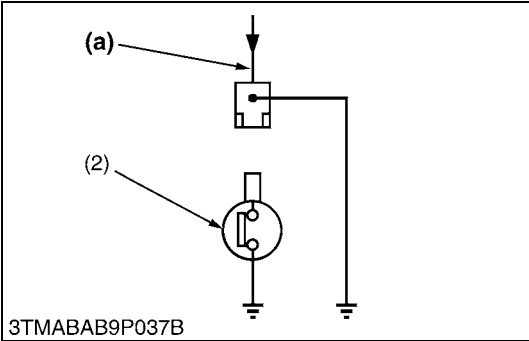
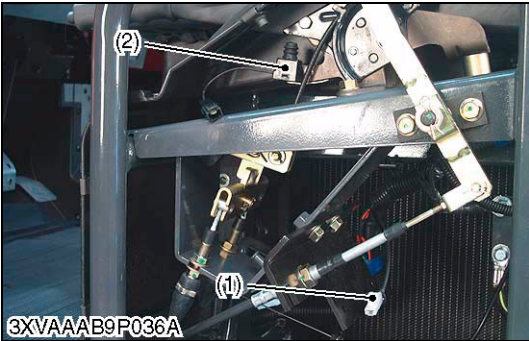
1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 4.9 kPa (0.5 kgf/cm<sup>2</sup>, 7 psi), the switch is faulty.

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

- (1) Engine Oil Pressure Switch

W1035122





**Parking Brake Lamp**

- 1. Disconnect the connecting lead (1) from the parking brake switch after turning the main switch **OFF**.
- 2. Turn the main switch **ON** and connect a jumper lead from the lead to the chassis.
- 3. If the parking brake indicator lamp does not light, the wiring harness is faulty.

- (1) Connecting Lead
- (2) Parking Brake Switch

(a) From Parking Brake Lamp

W1036556

**Parking Brake Switch Continuity**

- 1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
- 2. If 0 ohm is not indicated in the normal state, the switch is faulty.
- 3. If infinity is not indicated at state of parking brake **ON**, the switch is faulty.
- 4. If the safety switch is defective, replace it.

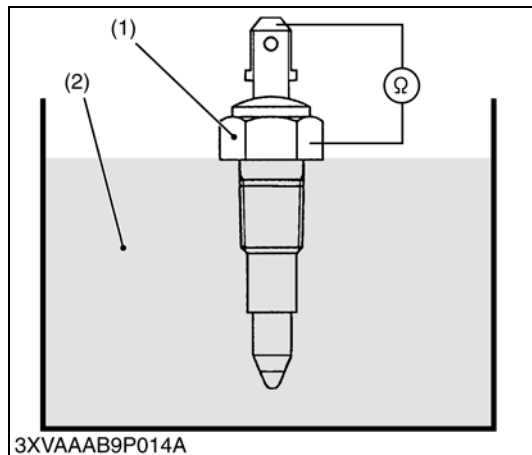
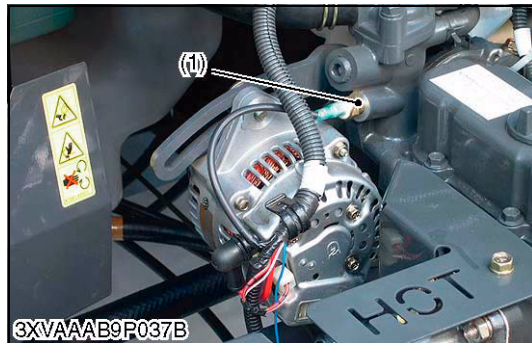
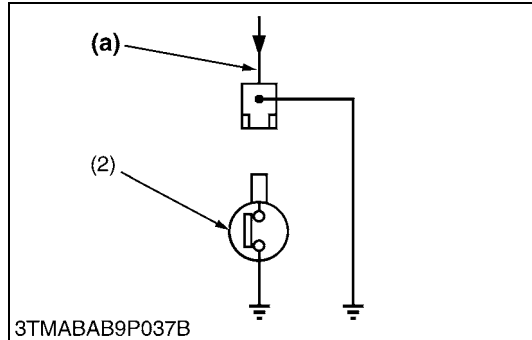
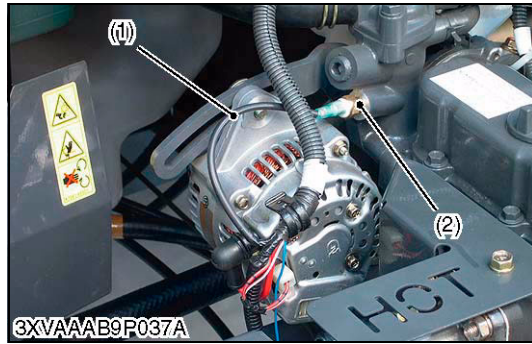
Resistance (Switch terminal - Chassis)	In normal state	0 Ω
	When switch push is released	Infinity

- (1) Connecting Lead
- (2) Parking Brake Switch

W1036844



## (10) Cooling System



### Fan Motor Wiring Harness

1. Disconnect the wiring lead (1) from the engine oil pressure switch after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect a jumper lead from the lead to the chassis.
3. If the fan motor does not rotate wiring harness or relay is faulty.

(1) Wiring Lead

(a) From Fan Motor Relay

(2) Coolant Temperature Sensor

W1037767

### Coolant Temperature Switch

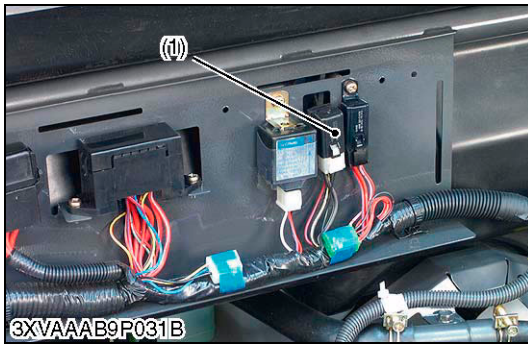
1. Measure the resistance with an ohmmeter across the switch terminal and the switch body.
2. If 0 ohm is not indicated in the coolant temperature at 194 °C (201 °F) or more, the sensor is faulty.
3. If infinity is not indicated in the coolant temperature at lower than 90 °C (194 °F), the sensor is faulty.

Resistance (Switch terminal - Switch body)	At coolant temperature lower than 90 °C (194 °F)	Infinity
	At coolant temperature more than 94 to 100 °C (201 to 212 °F)	0 Ω

(1) Coolant Temperature Sensor

(2) Coolant

W1038343



### Fan Motor Relay

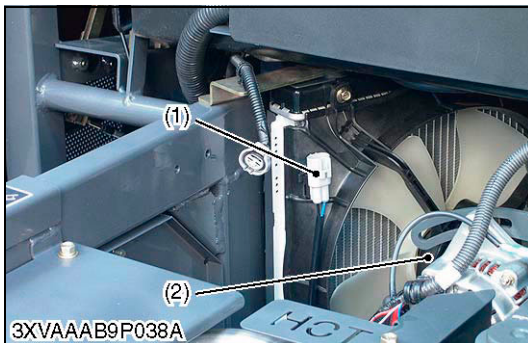
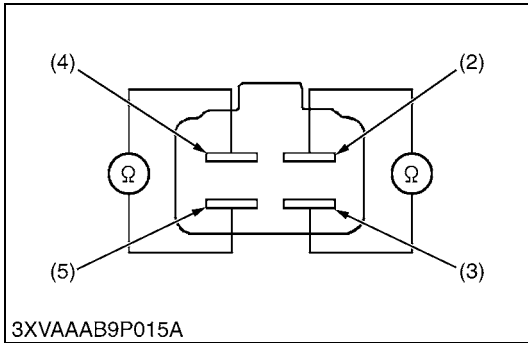
1. Disconnect the connector from fan motor relay (1) after turning the main switch off.
2. Remove the fan motor relay from bracket.
3. Measure the resistance with an ohmmeter across the terminal 1 (2) to terminal 2 (3) and terminal 3 (4) to terminal 4 (5).
4. If resistance differs from the factory specifications,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

Resistance	Terminal 1 (2) - Terminal 2 (3)	Approx. 80 $\Omega$
	Terminal 3 (4) - Terminal 4 (5)	Infinity

- (1) Fan Motor Relay  
(2) Terminal 1  
(3) Terminal 2

- (4) Terminal 3  
(5) Terminal 4

W1038839



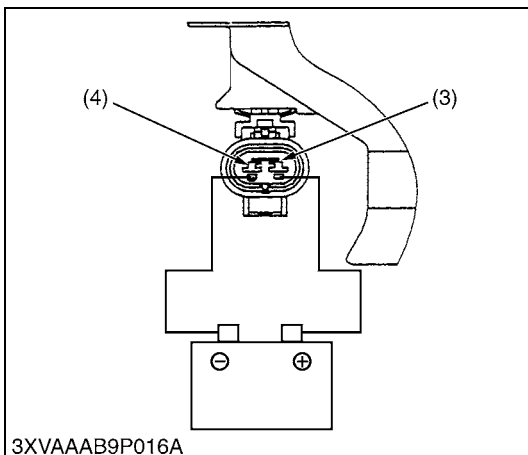
### Fan Motor

1. Disconnect the connector of fan motor (2) after turning the main switch off.
2. Connect a jumper lead from the terminal 2 (3) to the battery positive terminal post.
3. Connect a jumper lead momentarily between the terminal 3 (4) and the battery negative terminal post.
4. If the fan motor does not run, replace the new one.

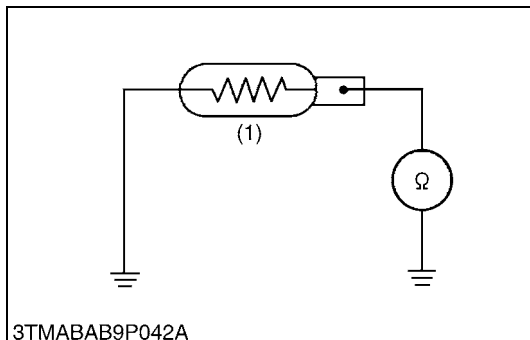
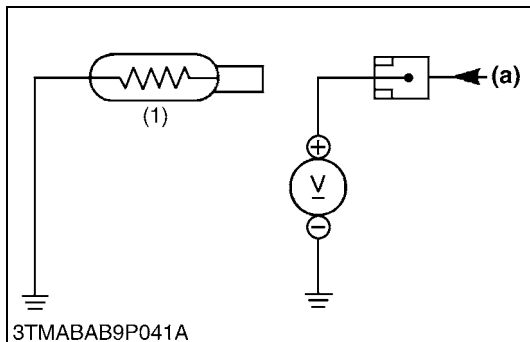
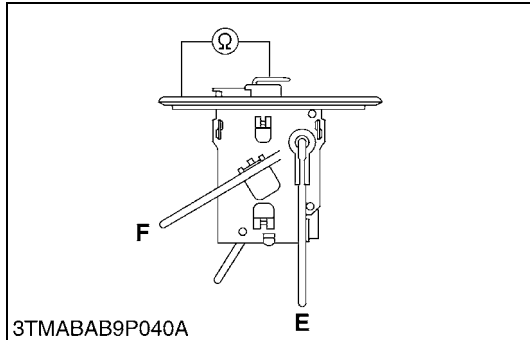
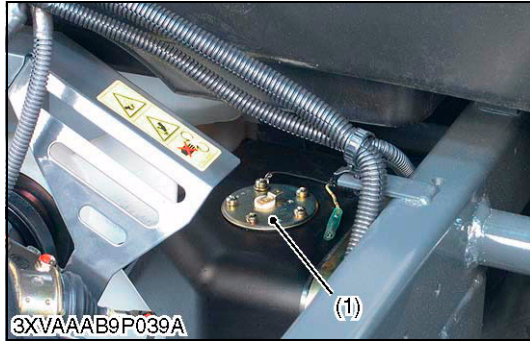
- (1) Fan Motor Connector  
(2) Fan Motor

- (3) Terminal 2 (Positive Side)  
(4) Terminal 3 (Negative Side)

W1039548



## (11) Gauges



### Fuel Level Sensor

#### 1) Sensor Continuity

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

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

(1) Fuel Level Sensor

**E : Empty**

**F : Full**

W1039917

### Coolant Temperature Sensor

#### 1) Lead Terminal Voltage

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

Voltage	Lead terminal - Chassis	Approx. battery voltage
---------	-------------------------	-------------------------

#### 2) Sensor Continuity

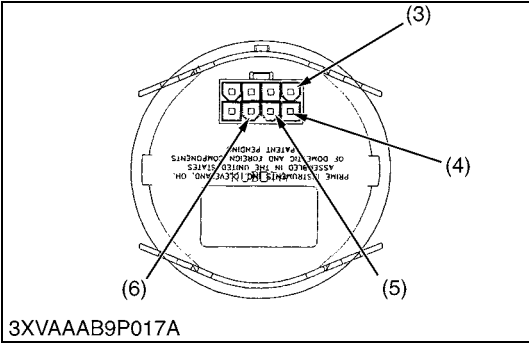
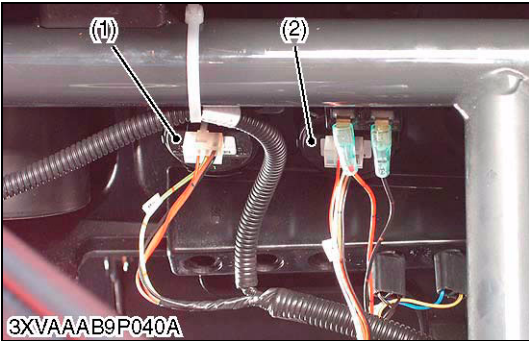
1. Measure the resistances with an ohmmeter across the sensor terminal and the chassis.
2. If the reference value is not indicated, the sensor is faulty.

Resistance (Sensor terminal - Chassis)	Reference value	Approx. 16.1 $\Omega$ at 120 °C (248 °F)
		Approx. 27.4 $\Omega$ at 100 °C (212 °F)
		Approx. 51.9 $\Omega$ at 80 °C (176 °F)
		Approx. 153.9 $\Omega$ at 50 °C (122 °F)

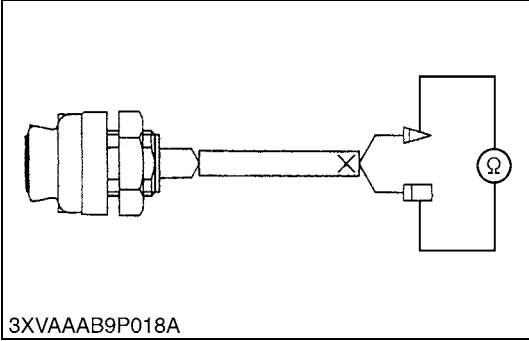
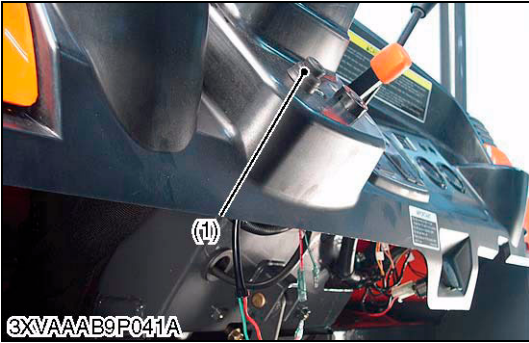
(1) Coolant Temperature Sensor

**(a) From Temperature Gauge**

W1040409



(12) Others



**Fuel Gauge and Coolant Temperature Gauge Operation**

- 1. Remove the under panel.
- 2. Turn the main switch to **ON** position. Measure the voltage with a voltmeter across the **B** terminal (6) and **G** terminal (4) of the gauge.
- 3. If approx. battery voltage is indicated, the ignition and ground lead connections are good.
- 4. Turn the main switch to **OFF** position. Connect a jumper lead between **S** terminal (5) and **G** terminal (4) of the gauge.
- 5. Turn the main switch to **ON** position. If the gauge resisters a full scale reading under those conditions, the gauge is good. If less than full scale reading is indicated, the gauge is defective and should be replaced.

- (1) Fuel Gauge

(2) Temperature Gauge

(3) Illumination Terminal
- (4) **G** (Ground) Terminal

(5) **S** (Signal) Terminal

(6) **B** (Battery) Terminal

W1040960

**Horn Switch Continuity**

- 1. Disconnect the wiring leads from horn switch and remove it.
- 2. Measure the resistance with an ohmmeter across the horn switch terminals in each position.
- 3. If the resistance differs from the factory specifications, the horn switch is faulty.

Resistance	Factory spec.	OFF	Infinity
		ON	0 Ω

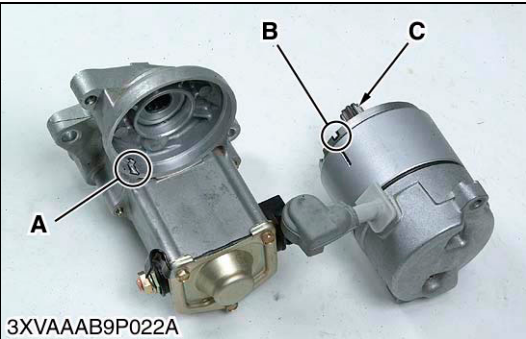
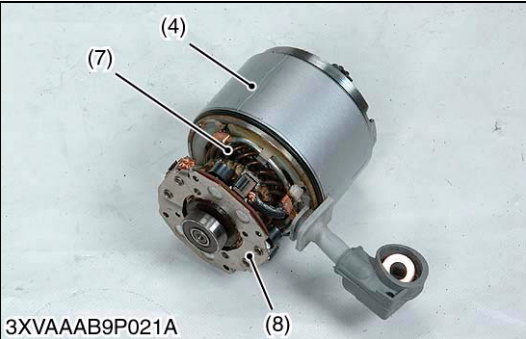
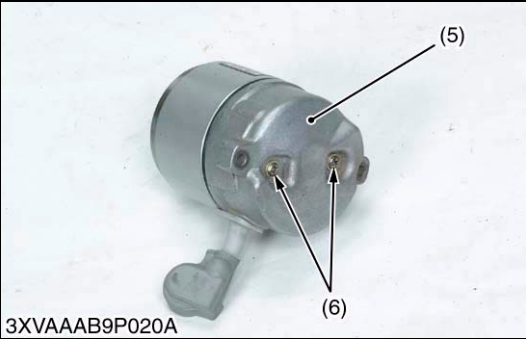
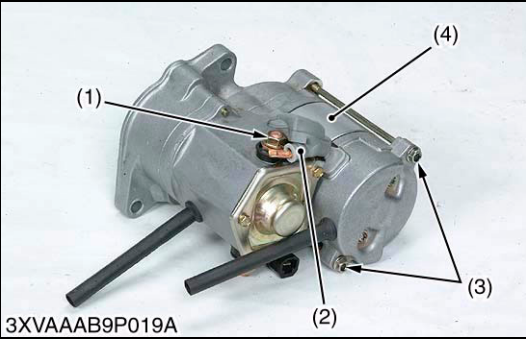
- (1) Horn Switch

W1041934



[2] DISASSEMBLING AND ASSEMBLING

(1) Starter



**Motor**

1. Remove the nut (1), and disconnect the connecting lead (2) from the magnet switch.
2. Remove the motor through screws (3), and then remove the yoke (4).
3. Remove the end frame screws (6) and then remove the end frame (5).
4. Separate the armature (7), the brush holder (8) from the yoke (4).

**(When reassembling)**

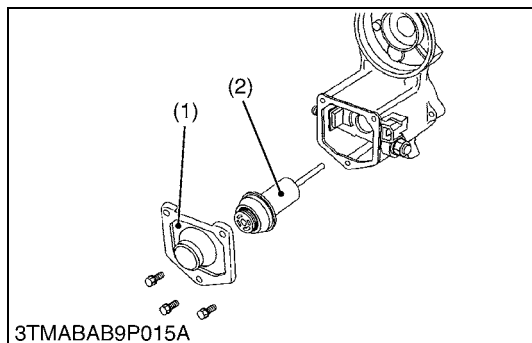
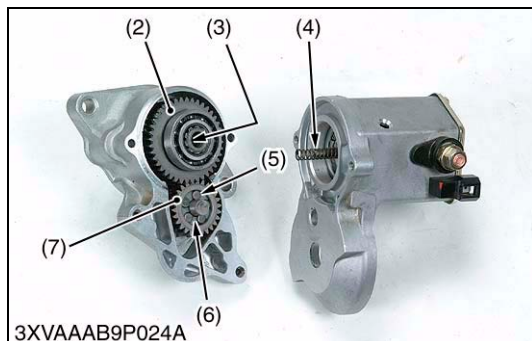
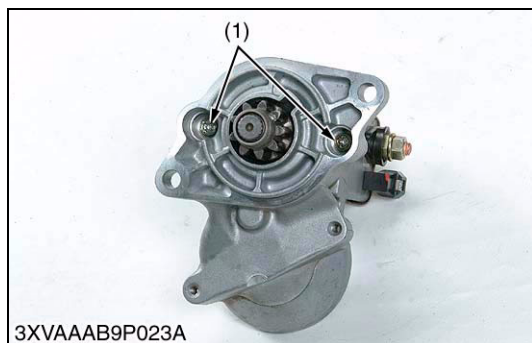
- Apply grease to the spline teeth (C) of the armature (7).
- Fit the projection (B) on the yoke into the notch (A) in the magnet switch.

Tightening torque	Nut (1)	5.9 to 11.8 N·m 0.6 to 1.2 kgf·m 4.3 to 8.7 lbf·ft
-------------------	---------	--

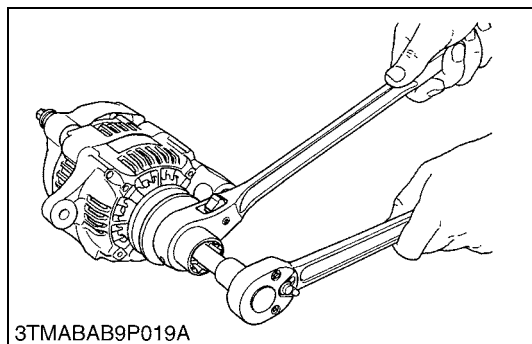
- (1) Nut  
(2) Connecting Lead  
(3) Motor Through Screw  
(4) Yoke  
(5) End Frame  
(6) End Frame Screw  
(7) Armature  
(8) Brush Holder

- A : Notch  
B : Projection  
C : Spline Teeth

W1045559



## (2) Alternator



### Magnet Switch

1. Remove the drive end frame mounting screws (1).
2. Take out the overrunning clutch (2), steel ball (3), spring (4), idle gear (7), rollers (5) and retainer (6).

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

- Apply grease the gear teeth of the idle gear (7) and the overrunning clutch (2), and the steel ball (3).

- |                                    |               |
|------------------------------------|---------------|
| (1) Drive End Frame Mounting Screw | (4) Spring    |
| (2) Overrunning Clutch             | (5) Roller    |
| (3) Steel Ball                     | (6) Retainer  |
|                                    | (7) Idle Gear |

W1046657

### Plunger

1. Remove the end cover (1).
2. Take out the plunger (2).

- |               |             |
|---------------|-------------|
| (1) End Cover | (2) Plunger |
|---------------|-------------|

W1047185

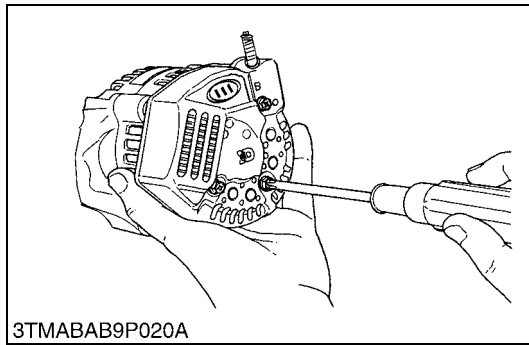
### Pulley

1. Secure the hexagonal end of the pulley shaft with a double-ended ratchet wrench as shown in the figure, loosen the pulley nut with a socket wrench and remove it.

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

Tightening torque	Pulley nut	58.3 to 78.9 N·m 5.95 to 8.05 kgf·m 43.0 to 58.2 lbf·ft
-------------------	------------	---

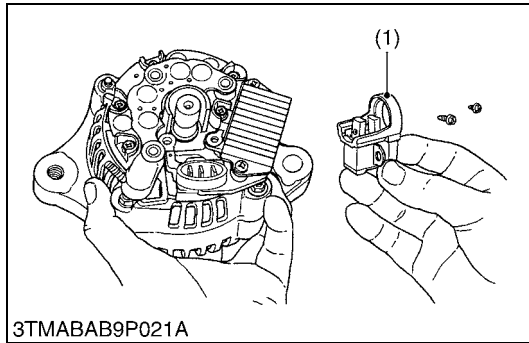
W1047402



### **Rear End Cover**

1. Unscrew the three rear end cover screws and the **B** terminal nut, and remove the rear end cover.

W1047547

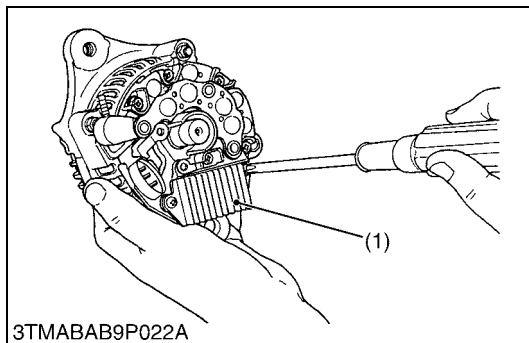


### **Brush Holder**

1. Unscrew the two screws holding the brush holder, and remove the brush holder (1).

(1) Brush Holder

W1047638

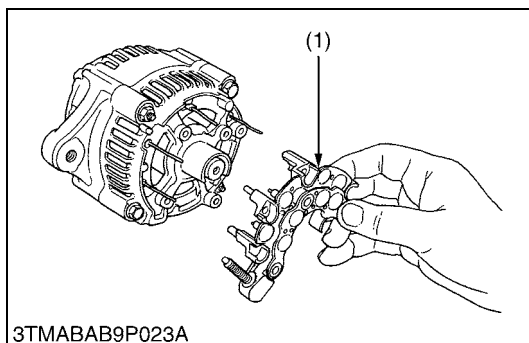


### **IC Regulator**

1. Unscrew the three screws holding the IC regulator, and remove the IC regulator (1).

(1) IC Regulator

W1047889

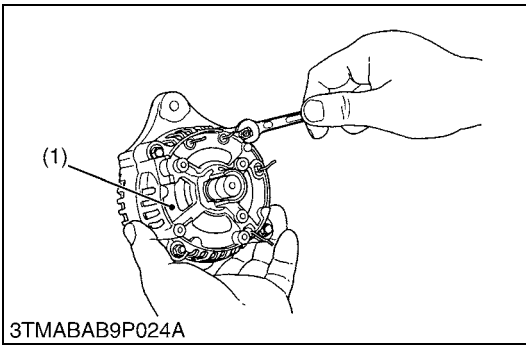


### **Rectifier**

1. Remove the four screws holding the rectifier and the stator lead wires.
2. Remove the rectifier (1).

(1) Rectifier

W1048042

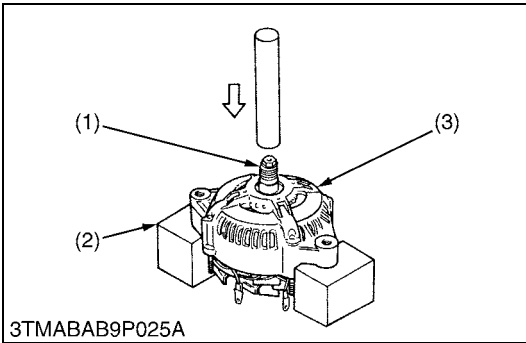


### Rear End Frame

1. Unscrew the two nuts and two screws holding the drive end frame and the rear end frame.
2. Remove the rear end frame (1).

(1) Rear End Frame

W1048215



### Rotor

1. Press out the rotor (1) from drive end frame (3).

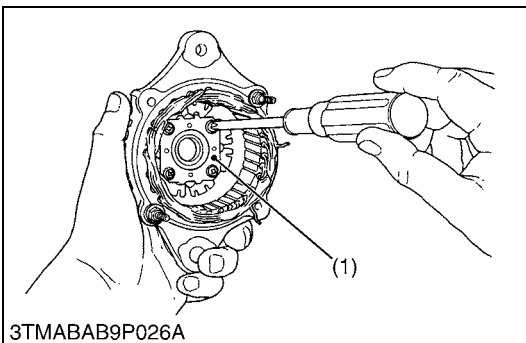
#### ■ IMPORTANT

- Take special care not to drop the rotor and damage the slip ring or fan, etc..

(1) Rotor  
(2) Block

(3) Drive End Frame

W1048368

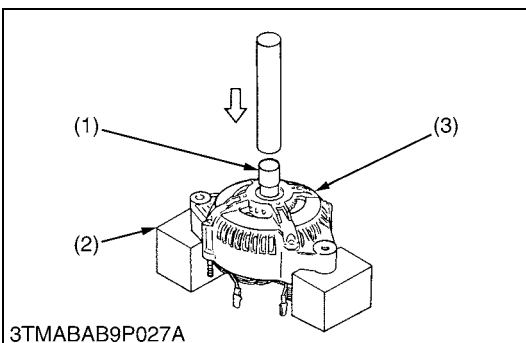


### Retainer Plate

1. Unscrew the four screws holding the retainer plate, and remove the retainer plate (1).

(1) Retainer Plate

W1048574



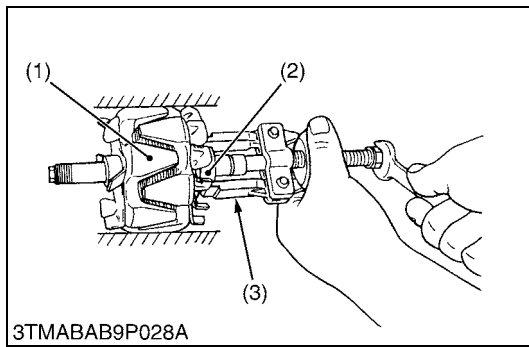
### Bearing on Drive End Side

1. Press out the bearing from drive end frame (3) with a press and jig (1).

(1) Jig  
(2) Block

(3) Drive End Frame

W1048760



### **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

W1048953

### **(3) Panel**



### **Bonnet Upper**

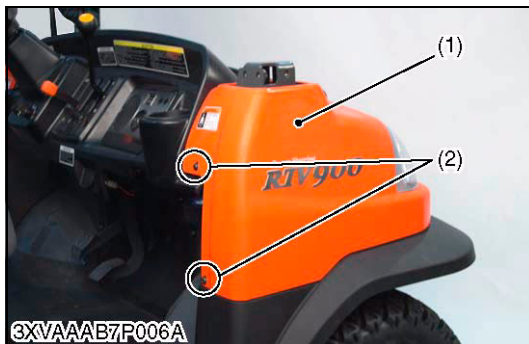
1. Remove the snap pin and remove the bonnet upper (3).
2. Remove the ROPS pipes (1).
3. Lift ROPS boots and remove the three screws on both sides.
4. Remove the ROPS pipe (front) (2).

Tightening torque	ROPS pipe mounting bolt and nut	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	ROPS (front) mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) ROPS Pipe  
(2) ROPE Pipe, Front

(3) Bonnet Upper

W1043911



### **Bonnet Lower**

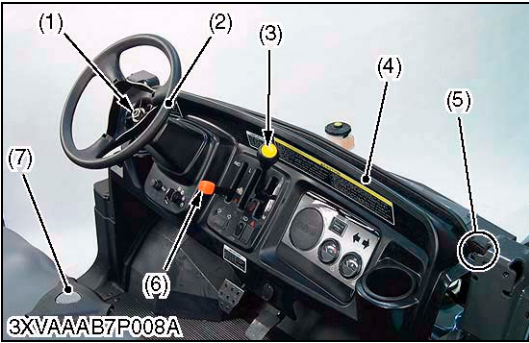
1. Remove the four screw (2).
2. Remove the screw (3) from underneath the bonnet lower.
3. Remove the bonnet lower (1).

(1) Bonnet Lower  
(2) Screw (4 pcs)

(3) Screw (2 pcs)

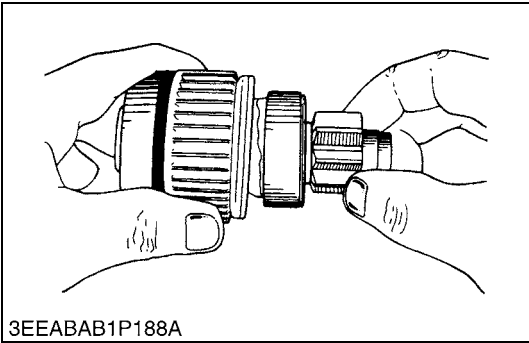
W1044371





[3] SERVICING

(1) Starter



Steering Wheel and Panel

- 1. Remove the steering wheel cap (7).
- 2. Remove the steering wheel mounting nut (1) and remove the steering wheel (2).
- 3. Remove the shift lever grip (3) and four wheel drive lever grip (6).
- 4. Disconnect the connector for main switch, horn switch and head light switch.
- 5. Remove the panel mounting screws (5) and the panel support.
- 6. Disconnect the all connectors from panel and remove the panel (4).

(When reassembling)

Tightening torque	Steering wheel mounting nut	20 to 25 N·m 2.0 to 2.6 kgf·m 14.8 to 18.4 lbf·ft
-------------------	-----------------------------	---

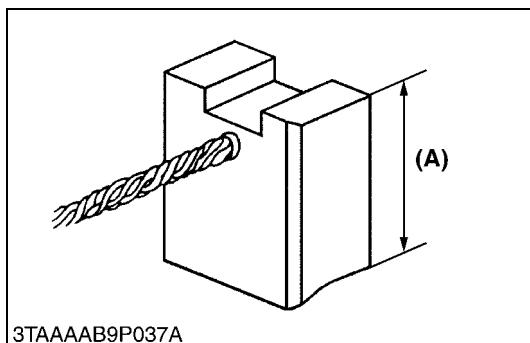
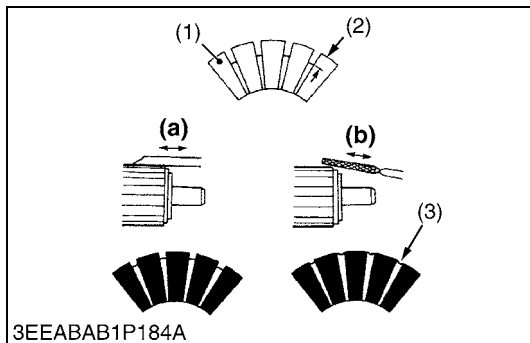
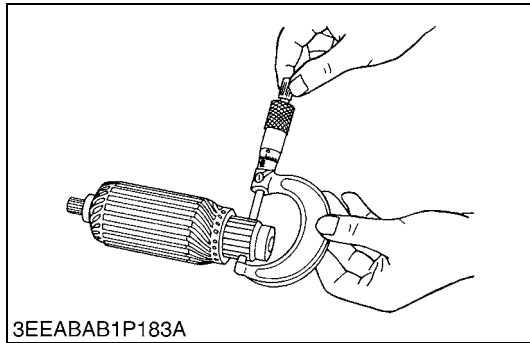
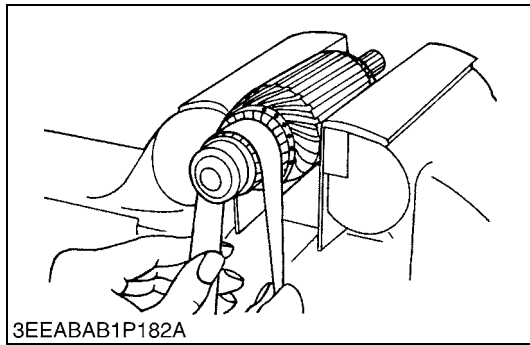
- (1) Steering Wheel Mounting Nut
- (2) Steering Wheel
- (3) Shift Lever Grip
- (4) Panel
- (5) Screw (2pcs)
- (6) 4WD Lever Grip
- (7) Steering Wheel Cap

W1044843

Overrunning Clutch

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

W1049160



### Commutator and Mica

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

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

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

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

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

(a) Correct  
(b) Incorrect

W1049294

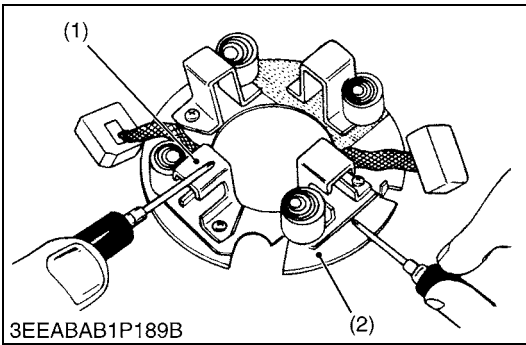
### Brush Wear

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 <b>(A)</b>	Factory spec.	14.0 mm 0.551 in.
	Allowable limit	9.0 mm 0.354 in.

W1049752





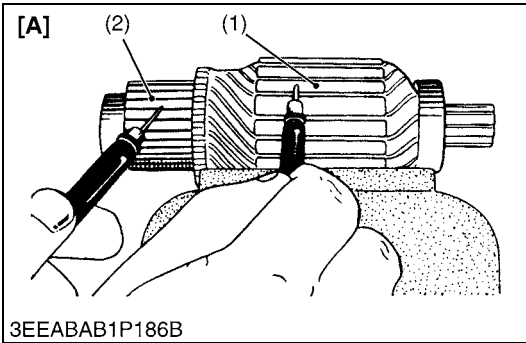
### Brush Holder

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

(1) Brush Holder

(2) Holder Support

W1049931



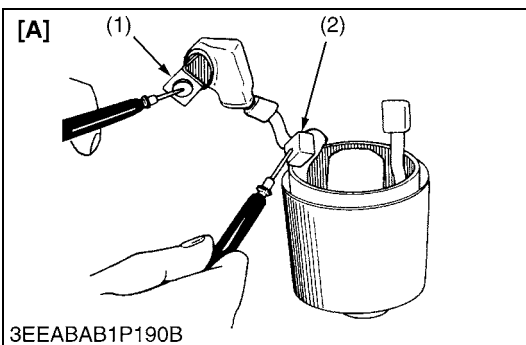
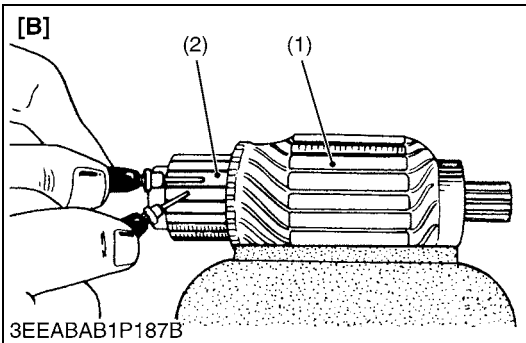
### Armature Coil

1. Check the continuity across the commutator (2) and armature coil core (1) with an ohmmeter. **[A]**
2. If it conducts, replace the armature.
3. Check the continuity across the segments of the commutator (2) with an ohmmeter. **[B]**
4. If it does not conduct, replace the armature.

(1) Armature Coil Core

(2) Commutator

W1050597



### Field Coil

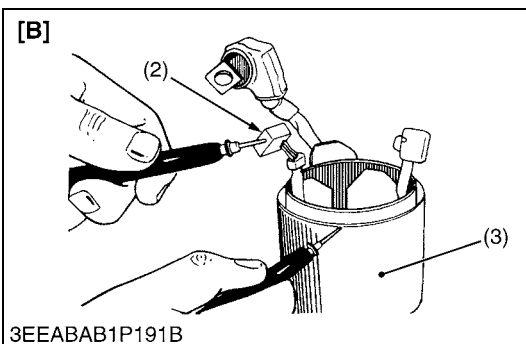
1. Check the continuity across the lead (1) and brush (2) with an ohmmeter. **[A]**
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter. **[B]**
4. If it conducts, replace the yoke assembly.

(1) Lead

(3) Yoke

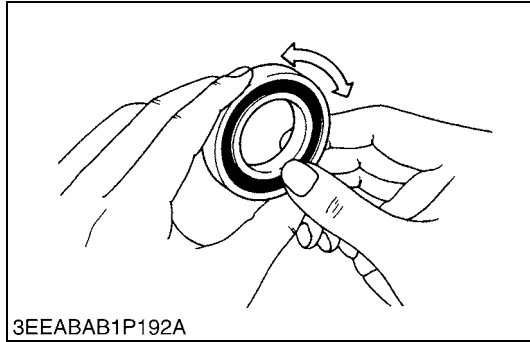
(2) Brush

W1050867





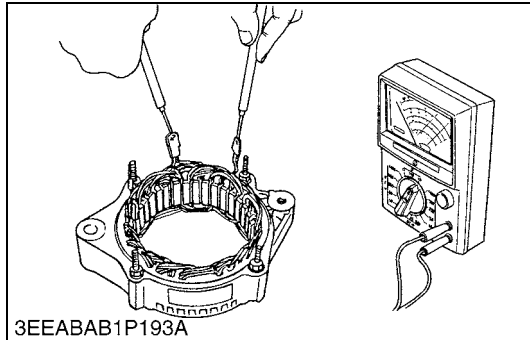
## (2) Alternator



### Bearing

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

W1051152

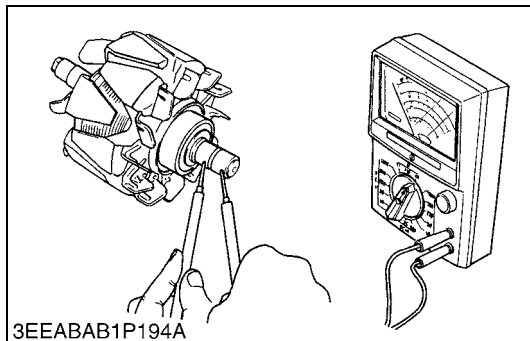


### Stator

1. Measure the resistance across each lead of the stator coil with an ohmmeter.
2. If the measurement is not within factory specification, replace it.
3. Check the continuity across each stator coil lead and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory spec.	Less than 1.0 $\Omega$
------------	---------------	------------------------

W1051376

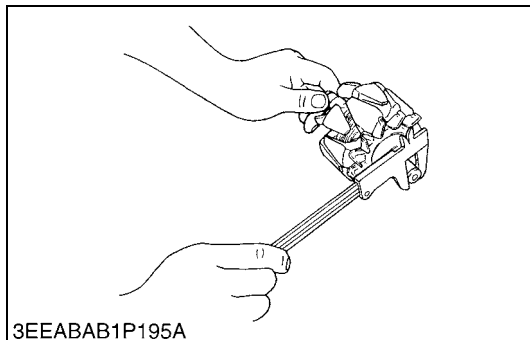


### Rotor

1. Measure the resistance across the slip rings with an ohmmeter.
2. If the resistance is not the factory specification, replace it.
3. Check the continuity across the slip ring and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory spec.	2.9 $\Omega$
------------	---------------	--------------

W1051550

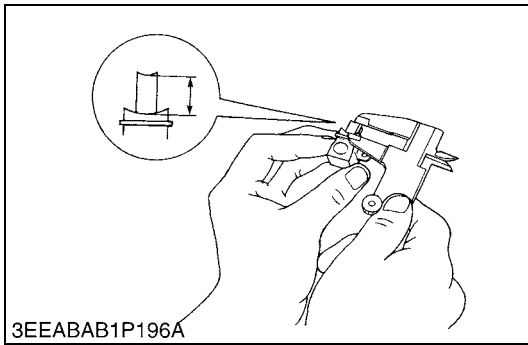


### Slip Ring

1. Check the slip ring for score.
2. If scored, correct with an emery paper or on a lathe.
3. Measure the O.D. of slip ring with vernier calipers.
4. If the measurement is less than the allowable limit, replace it.

Slip ring O.D.	Factory spec.	14.4 mm 0.567 in.
	Allowable limit	14.0 mm 0.551 in.

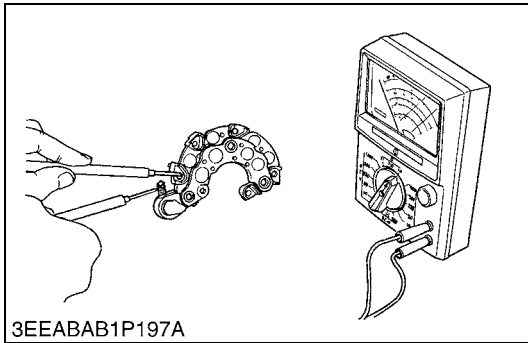
W1051713

**Brush Wear**

1. Measure the brush length with vernier calipers.
2. If the measurement is less than allowable limit, replace it.
3. Make sure that the brush moves smoothly.
4. If the brush is defective, replace it.

Brush length	Factory spec.	10.5 mm 0.413 in.
	Allowable limit	8.4 mm 0.331 in.

W1051936

**Rectifier**

1. Check the continuity across each diode of rectifier with an analog ohmmeter. Conduct the test in the (R x 1) setting.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

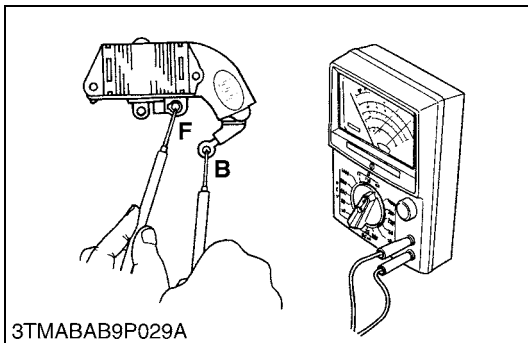
**■ IMPORTANT**

- Do not use a 500 V megger for measuring because it will destroy the rectifier.

**■ NOTE**

- Do not use an auto digital multimeter. Because it's very hard to check the continuity of rectifier by using it.

W1052114

**IC Regulator**

1. Check the continuity across the B terminal and the F terminal of IC regulator with an analog ohmmeter. Conduct the test in the (R x 1) setting.
2. The IC regulator is normal if the IC regulator conducts in one direction and does not conduct in the reverse direction.

**■ IMPORTANT**

- Do not use a 500 V megger for measuring because it will destroy the IC regulator.

**■ NOTE**

- Do not use an auto digital multimeter. Because it's very hard to check the continuity of IC regulator by using it.

W1052329

# **9 HYDRAULIC UTILITY MODEL**



## SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.

It is essential that you read the instructions and safety regulations before you attempt to repair or use this unit.



### DANGER

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



### WARNING

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



### CAUTION

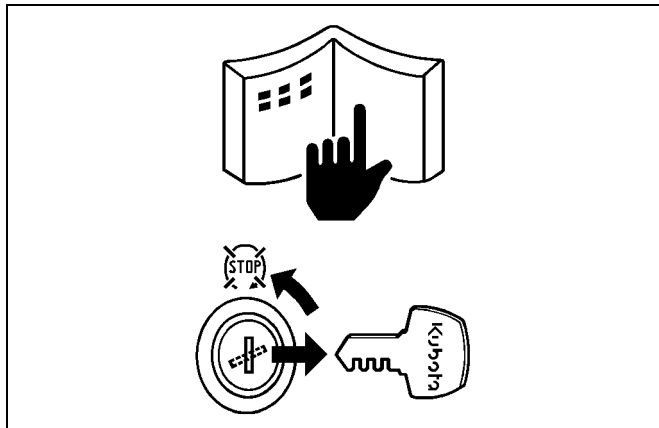
: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

### ■ IMPORTANT

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

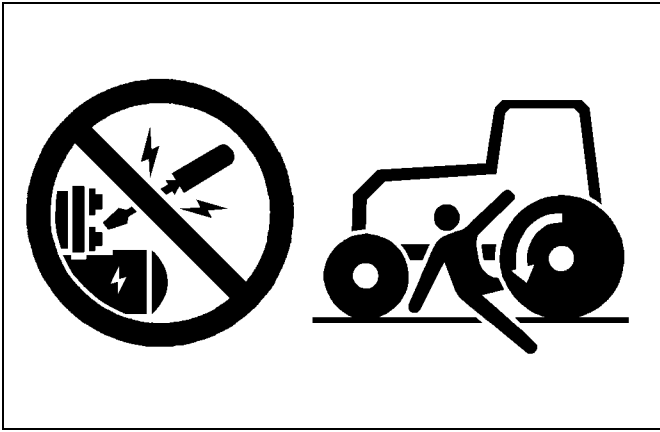
### ■ NOTE

: Gives helpful information.



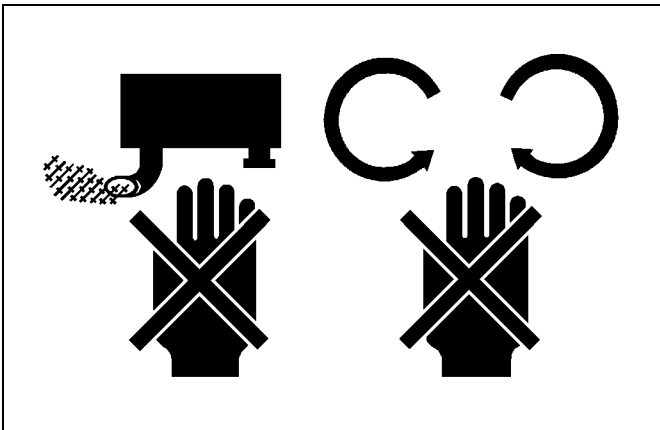
### BEFORE SERVICING AND REPAIRING

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



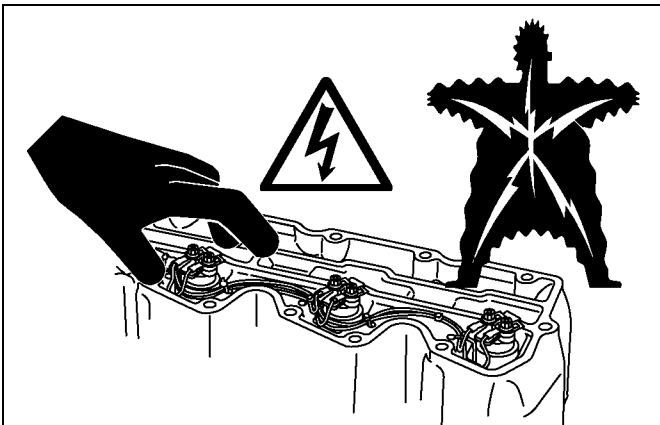
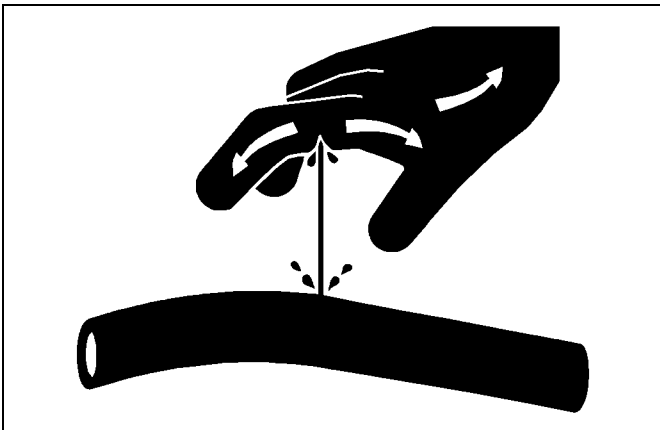
## SAFETY STARTING

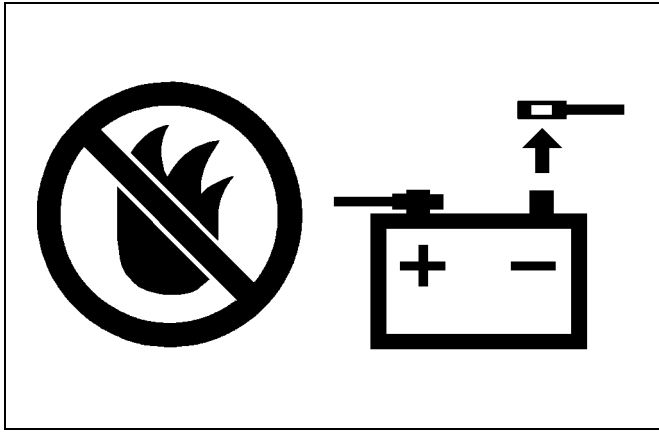
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



## SAFETY WORKING

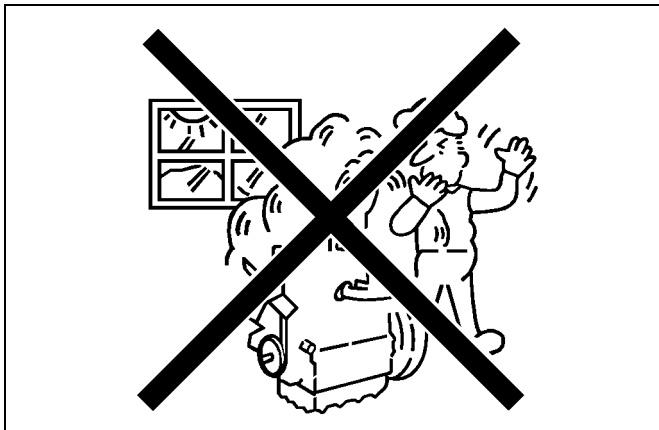
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Do not work under the machine that is supported solely by a jack. Always support the machine by safety stands.
- Do not touch the rotating or hot parts while the engine is running.
- Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
- Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
- Do not open high-pressure fuel system. High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair fuel lines, sensors, or any other components between the high-pressure fuel pump and injectors on engines with high pressure common rail fuel system.
- High voltage exceeding 100 V is generated in the ECU, and is applied to the injector. Pay sufficient caution to electric shock when performing work activities.





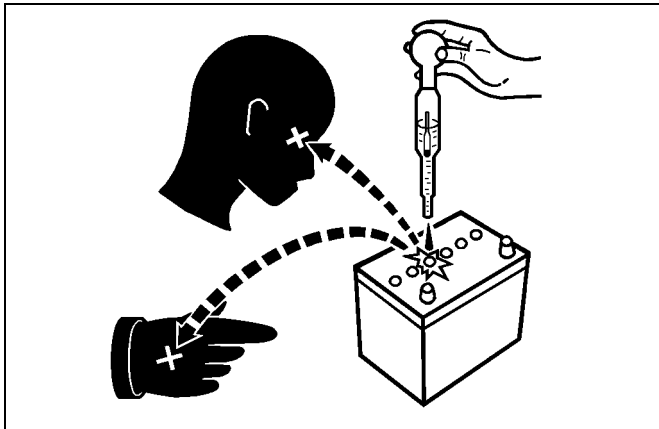
### AVOID FIRES

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



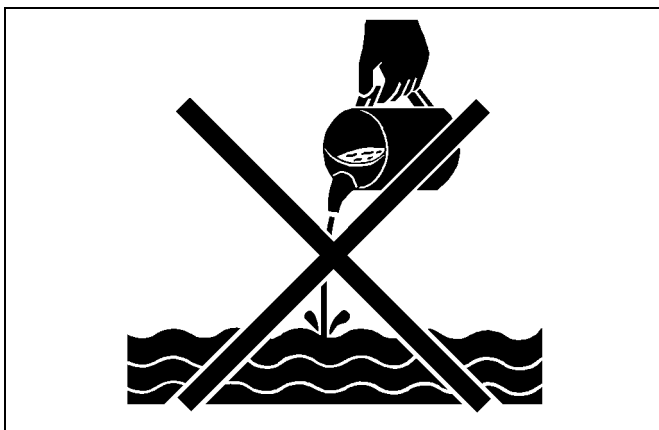
### VENTILATE WORK AREA

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



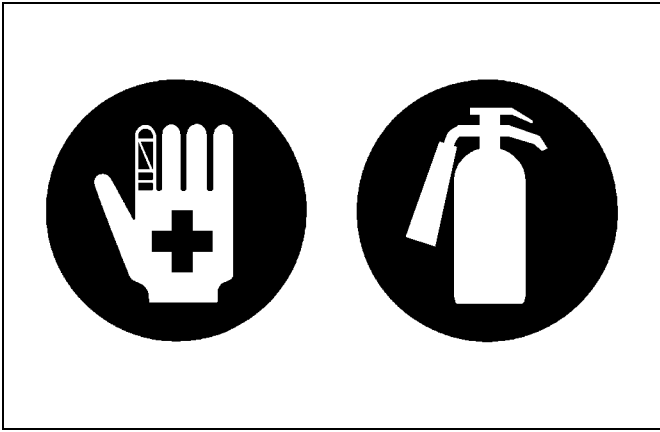
### PREVENT ACID BURNS

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



### DISPOSE OF FLUIDS PROPERLY

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

**PREPARE FOR EMERGENCIES**

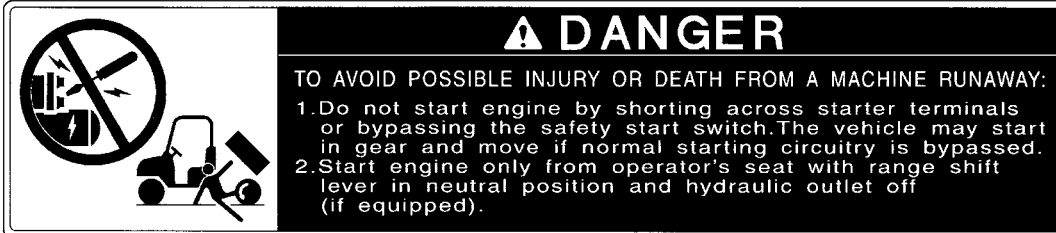
- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

## SAFETY DECALS

The following safety decals are installed on the machine.

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

(1) Part No. K7561-6524-1



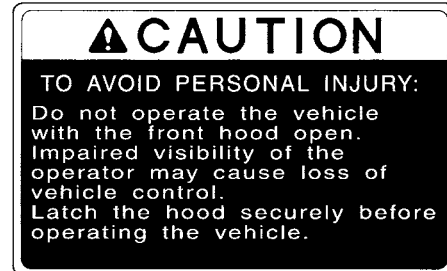
1AYAAAAAP104A

(2) Part No. K7561-6526-1



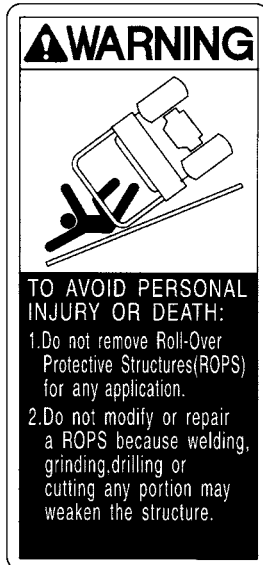
1AYAAAAAP105A

(4) Part No. K7561-6530-2



1AYAAAAAP106A

(3) Part No. K7561-6541-2



1AYAAAAAP109A

(5) Part No. K7561-6565-2

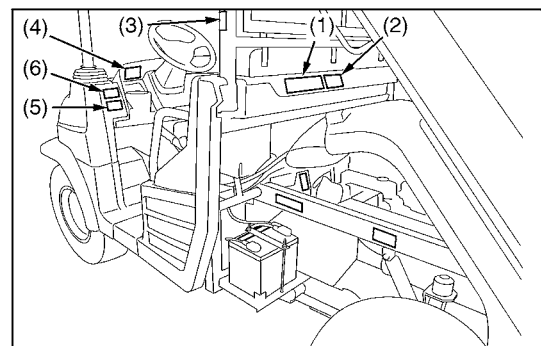


1AYAAAAAP117A

(6) Part No. K7561-6533-1



1AYAAAAAP107A



3XVAAAECP001A

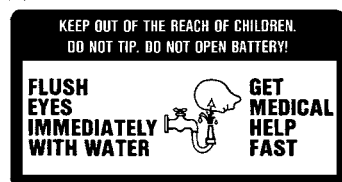


(1) Part No. K1211-6115-1



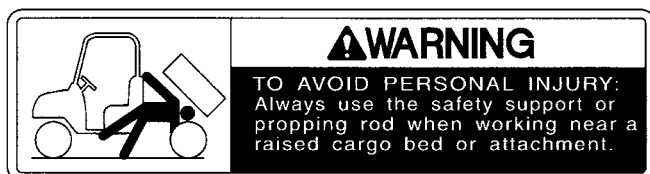
1BDABARAP108A

(2) Part No. K1211-6116-1



1BDABARAP109A

(3) Part No. K7561-6544-1



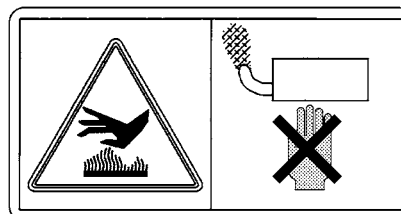
1AYAAAAAP110A

(4) Part No. K7561-6550-1

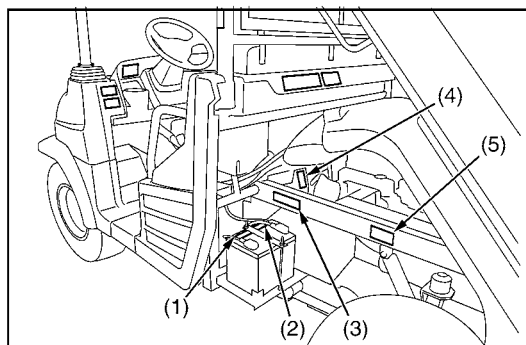


1AYAAAAAP112A

(5) Part No. K7561-6551-1



1AYAAAAAP113A



3XVAAAECP002A

(1) Part No. K7561-6522-2

<b>CAUTION</b>	
<b>TO AVOID PERSONAL INJURY:</b> 1. Read and understand the operator's manual before operation. 2. Never allow anyone without a valid driver's license to operate this vehicle. 3. Before allowing other people to use the vehicle, have them read the operator's manual. 4. This vehicle is for off road use only. Never operate on a public road. 5. Wear safety gear, including helmet and eye protection, as appropriate. 6. Check the tightness of all nuts and bolts regularly.	7. In addition to the driver, only one passenger can be carried. Minimum age for passenger is five years old. 8. Before starting the engine, make sure that everyone is at a safe distance from the vehicle and the hydraulic outlet is off (if equipped). 9. Do not operate the vehicle under the influence of drugs or alcohol. 10. Keep all shields in place and stay away from all moving parts. 11. Slow down for turns, or rough terrain. 12. Before getting off from the vehicle, apply the parking brake, stop the engine and remove the key.

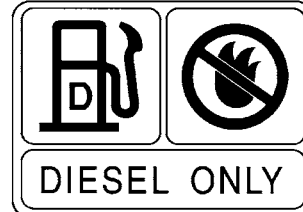
1AYAAAAAP103A

(2) Part No. K7561-6565-2



1AYAAAAAP117A

(3) Part No. K7561-6537-1



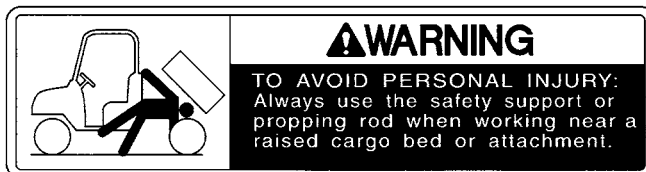
1AYAAAAAP108A

(4) Part No. K7561-6560-1



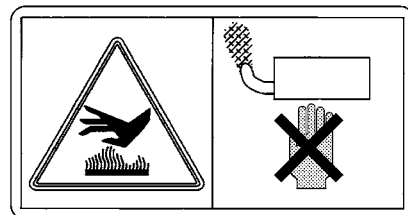
1AYAAAAAP115A

(5) Part No. K7561-6544-1



1AYAAAAAP110A

(6) Part No. K7561-6551-1

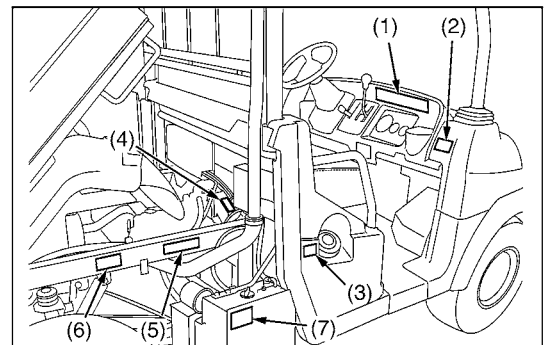


1AYAAAAAP113A

(7) Part No. K7561-6584-1



1AYAAAAP027E



3XVAAAECP003A

(1) Part No. K7561-6542-2

<p><b>⚠ WARNING</b></p> <p><b>TO AVOID PERSONAL INJURY:</b> Attach pulled or towed loads to the drawbar only.</p>	<p>MAX. 8.9 INCH (225 MM)</p>	<p><b>IMPORTANT</b></p> <ol style="list-style-type: none"> <li>1. Carefully read the loading information and trailer hitch sections in the Operator's Manual.</li> <li>2. Towing Capacity           <ul style="list-style-type: none"> <li>• Max. Towing Load : 295kg (650lbs)</li> <li>• Max. Tongue Weight : 50kg (110lbs)</li> </ul> </li> </ol>
---	-----------------------------------	---

1AYAAAAAP135E

(2) Part No. 6C090-4958-2



1AYAAAAAP115A

(3) Part No. K7561-6543-2

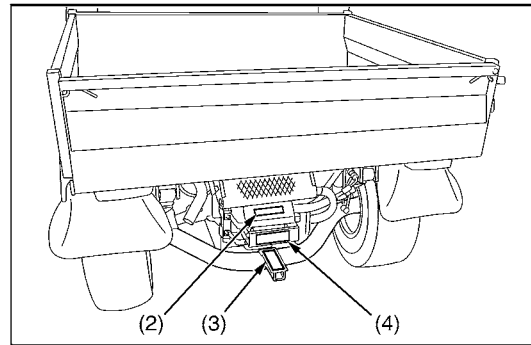
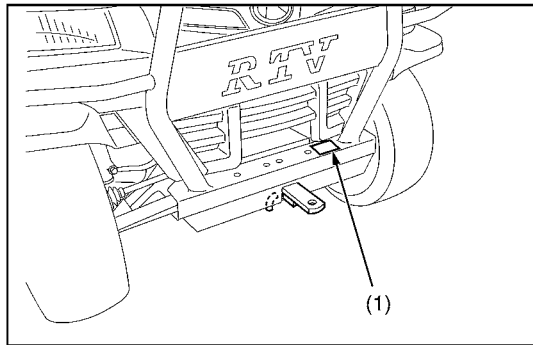
<p><b>⚠ WARNING</b></p> <p><b>TO AVOID PERSONAL INJURY:</b> Attach pulled or towed loads to the drawbar only.</p>	<p>MAX. 7.3 INCH (185 MM)</p> <p><b>IMPORTANT</b></p> <ol style="list-style-type: none"> <li>1. Carefully read the loading information and trailer hitch sections in the Operator's Manual.</li> <li>2. Towing Capacity           <ul style="list-style-type: none"> <li>• Max. Towing Load : 590kg (1300lbs)</li> <li>• Max. Tongue weight : 50kg (110lbs)</li> </ul> </li> </ol>
---	--

1AYAAADAP001E

(4) Part No. K7561-6582-1

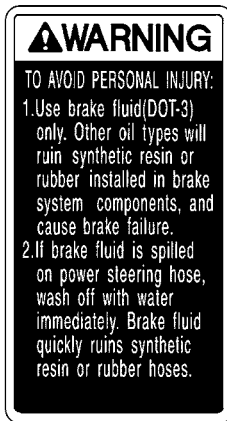
<p><b>⚠ CAUTION</b></p> <p><b>TO AVOID PERSONAL INJURY:</b> Always wear protective gloves when handling hydraulic tools, hoses and couplers.</p>	<p><b>CONTROL VALVE PORTS</b></p>
--	-----------------------------------

1AYAAAJAP025E

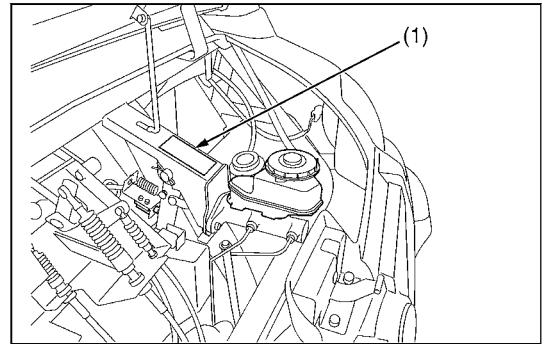


3XVAAAECP004A

(1) Part No. K7561-6546-2



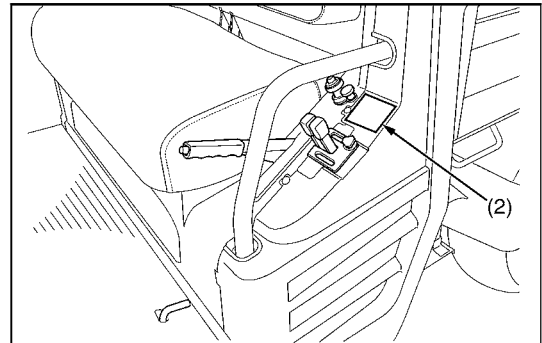
1AYAAAAAP111A



(2) Part No. K7561-6564-1



1AYAAAAAP116A



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 replaced component.
5. Mount new danger, warning and caution labels by applying on a clean dry surface and pressing any bubbles to outside edge.

3XVAAAECP005A

# SPECIFICATIONS

Model			Worksite Utility		Turf Utility	
Engine	Maker		KUBOTA			
	Model		D902-E2-UV			
	Type		Indirect Injection. Vertical, water-cooled, 4-cycle diesel			
	Number of cylinders		3			
	Bore and stroke		72 × 73.6 mm (2.83 × 2.90 in.)			
	Total displacement		898 cm <sup>3</sup> (54.8 cu.in.)			
	Engine gross power (DIN)		16.1 kW (21.6 HP)			
	Rated revolution		53.3 r/s [3200 min <sup>-1</sup> (rpm)]			
	Maximum torque		54.7 N·m (5.6 kgf·m, 40.5 ft-lbs) / 30.0 to 36.7 r/s [1800 to 2200 min <sup>-1</sup> (rpm)]			
	Battery		12 V, CCA : 535 A, RC : 80 min.			
	Starting system		Electric starting with cell starter, 12 V, 1.2 kW			
	Lubrication system		Forced lubrication by trochoidal pump			
	Cooling system		Pressurized radiator, forced circulation with water pump			
	Fuel		Diesel fuel No. 2-D [above −10 °C (14 °F)], Diesel fuel No. 1 [below −10 °C (14 °F)]			
Capacities	Fuel tank		28 L (7.4 U.S.gals, 6.2 Imp.gals)			
	Engine crankcase (with filter)		3.1 L (3.3 U.S.qts, 2.7 Imp.qts)			
	Engine coolant (with recovery tank)		4.0 L (4.2 U.S.qts, 3.5 Imp.qts)			
	Transmission case		10.0 L (2.6 U.S.gals, 2.2 Imp.gals)			
	Front axle case		0.6 L (0.63 U.S.qts, 0.52 Imp.qts)			
	Knuckle case		0.1 L (0.10 U.S.qts, 0.09 Imp.qts)			
	Brake fluid (reservoir and lines)		0.4 L (0.42 U.S.qts, 0.35 Imp.qts)			
	Hydraulic lift oil (Hydraulic dumping system model)		8.0 L (2.1 U.S.gals, 1.8 Imp.gals)			
	Hydraulic auxiliary tank oil (Hydraulic utility model)		17.0 L (18.0 U.S.qts, 15.0 Imp.qts)			
	Power steering oil		5.9 L (1.6 U.S.gals, 1.3 Imp.gals)			
Travelling system	Tires	Front	25 × 10 – 12 HDWS, 6PLY		25 × 12 – 12 Turf, 4PLY	
		Rear	25 × 10 – 12 HDWS, 6PLY		25 × 12 – 12 Turf, 4PLY	
	Steering		Hydrostatic power			
	Transmission		Continuously variable hydro transmission (VHT)			
	Wheels and drive		4 wheels, rear 2WD or 4WD			
	Gear selection		Hi-Med-Lo range, forward, neutral, reverse			
	Differential lock		Standard; foot operated with mechanical holder			
	Brake	Front / Rear	Wet disc type			
		Parking brake	Rear wheel, hand lever			
	Turning diameter		7.8 m (25.6 feet)			
Suspension	Front		Independent, macpherson strut-type			
	Rear		Semi-independent, devion axle with leaf springs and shock absorber			

NOTE: \* Manufacture's estimate

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

W1028103

Model			Worksite	Turf
Dimensions	Overall length		3030 mm (119.3 in.)	
	Overall width		1520 mm (59.8 in.)	
	Overall height		2010 mm (79.1 in.)	2015 mm (79.3 in.)
	Front tread center		1150 mm (45.3 in.)	1180 mm (46.5 in.)
	Rear tread center		1180 mm (46.5 in.)	1210 mm (47.6 in.)
	Wheel base		1965 mm (77.4 in.)	
	Ground clearance	Front axle	205 mm (8.1 in.)	
Rear axle		190 mm (7.5 in.)		
Weight			905 kg (1995 lbs)	910 kg (2006 lbs)
Max. rolling weight (Towing capacity)			590 kg (1300 lbs)	
Payload capacity			710 kg (1565 lbs)	
Cargo bed	Width		1320 mm (52.0 in.)	
	Length		1180 mm (46.7 in.)	
	Depth		290 mm (11.4 in.)	
	Volume		0.455 m <sup>2</sup> (16 cu.ft.)	
	Bed height (unload)		800 mm (31.5 in.)	
	Cargo bed load		500 kg (1102 lbs)	
Sound level (operator ear)			87 db (A)	
Front deluxe guard			Standard	
Body color			Orange	
Bed lift			Standard	
Auxiliary control valve			Standard	
Speedometer			Standard	

NOTE: \* Manufacture's estimate

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

The values in "Ground clearance" and "Weight" are those of the machine equipped with the tires in the table above.

W1030858

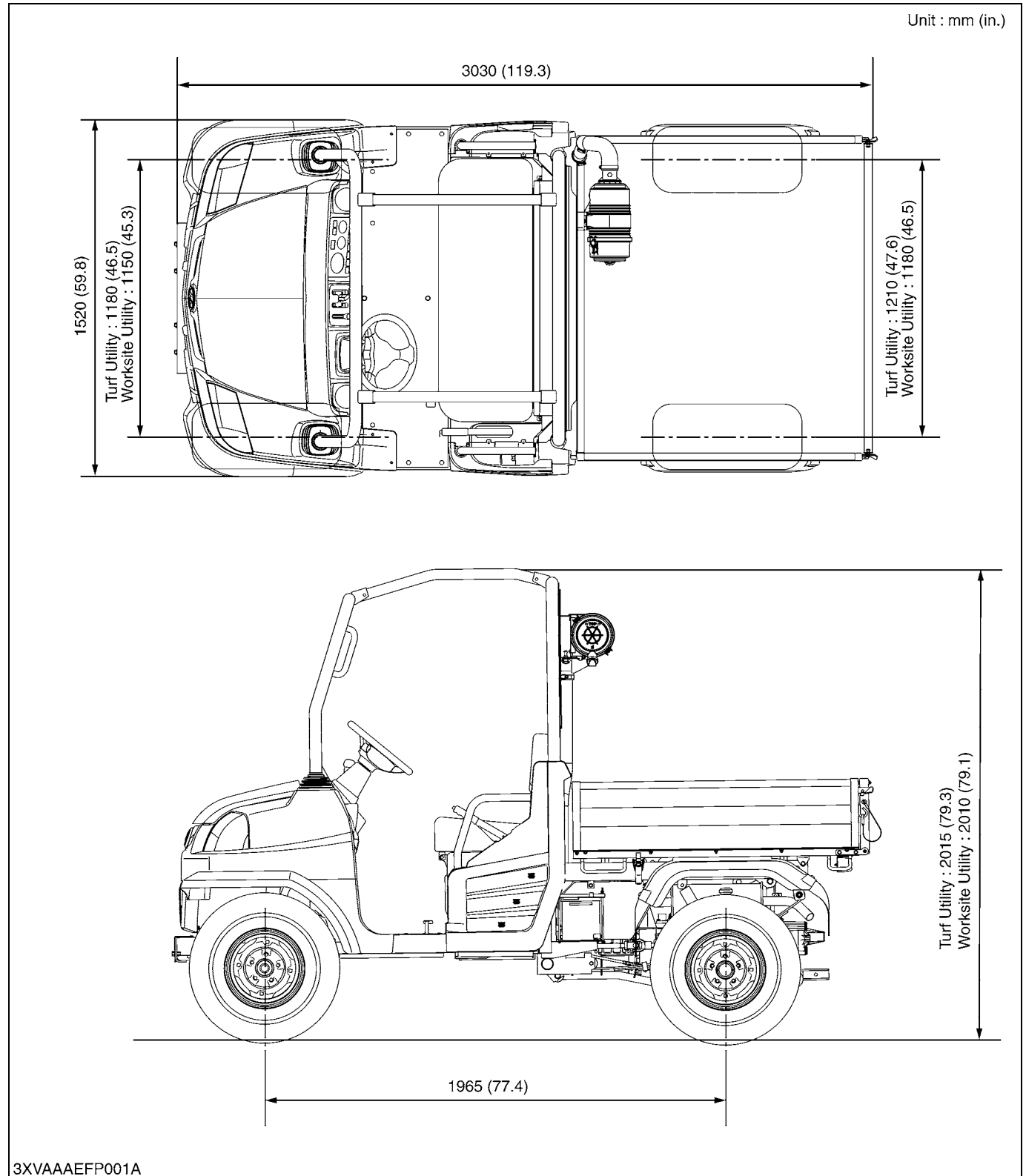
## TRAVELLING SPEEDS

Model	Worksite Utility	Turf Utility
Tire size (Rear)	25 × 10 – 12 HDWS	25 × 12 – 12 Turf
Range gear shift lever	km/h (mph)	km/h (mph)
Low	16 (10)	16 (10)
Medium	29 (18)	29 (18)
High	40 (25)	40 (25)
Reverse	24 (15)	24 (15)

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

W1035065

# DIMENSIONS





# GENERAL

## CONTENTS

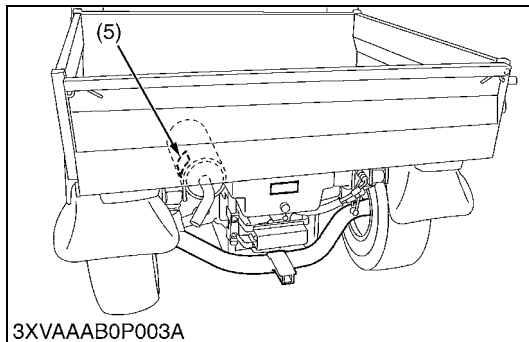
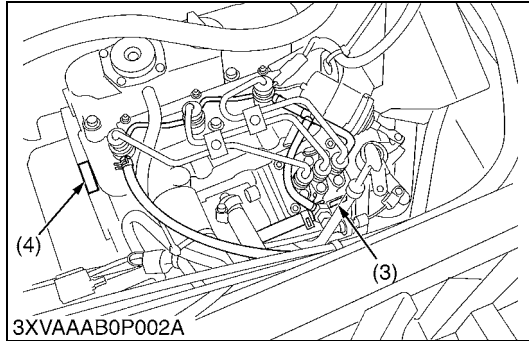
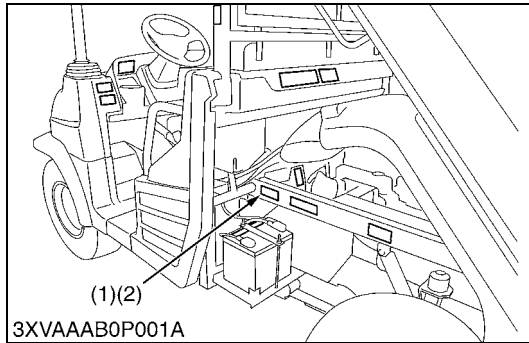
1. TRACTOR IDENTIFICATION .....	HG-1
2. GENERAL PRECAUTIONS .....	HG-2
3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING .....	HG-3
[1] WIRING .....	HG-3
[2] BATTERY .....	HG-5
[3] FUSE .....	HG-5
[4] CONNECTOR .....	HG-5
[5] HANDLING OF CIRCUIT TESTER .....	HG-6
4. LUBRICANTS, FUEL AND COOLANT .....	HG-7
5. TIGHTENING TORQUES .....	HG-9
[1] GENERAL USE SCREWS, BOLTS AND NUTS .....	HG-9
[2] STUD BOLTS .....	HG-9
[3] METRIC SCREWS, BOLTS AND NUTS .....	HG-10
[4] AMERICAN STANDARD SCREWS, BOLTS AND NUTS WITH UNC OR UNF THREADS .....	HG-10
[5] PLUGS .....	HG-10
6. MAINTENANCE CHECK LIST .....	HG-11
[1] FROM FIRST 50 HOURS TO EVERY 550 HOURS .....	HG-11
[2] FROM EVERY 600 HOURS TO EVERY 4 YEARS .....	HG-13
7. CHECK AND MAINTENANCE .....	HG-15
[1] DAILY CHECK .....	HG-15
[2] CHECK POINTS OF EVERY 50 HOURS .....	HG-16
[3] CHECK POINTS OF EVERY 150 HOURS .....	HG-16
[4] CHECK POINTS OF EVERY 200 HOURS .....	HG-17
[5] OTHERS .....	HG-19
8. TIRES .....	HG-20
[1] TYPE OF TIRE .....	HG-20
[2] TIRE PRESSURE .....	HG-20
[3] VEHICLE LIMITATIONS .....	HG-21

# 1. TRACTOR IDENTIFICATION

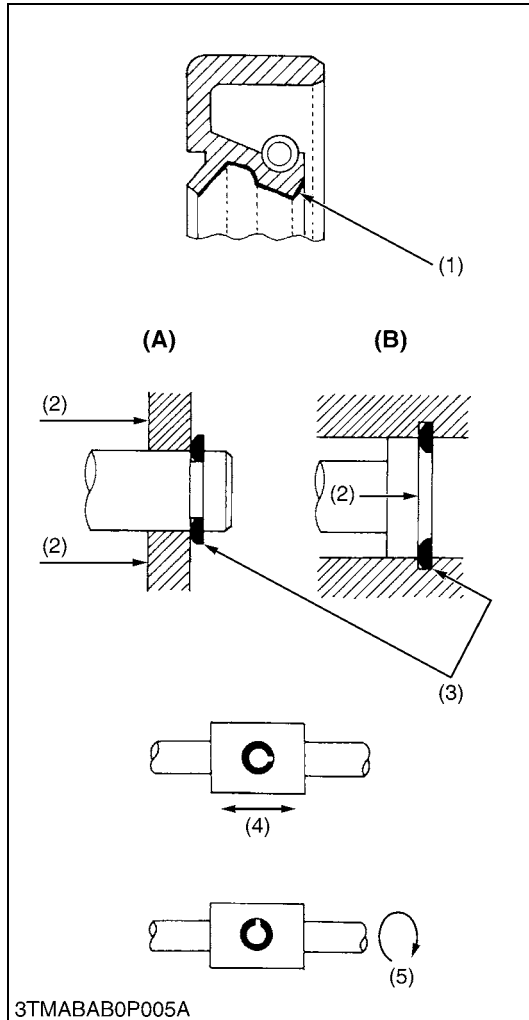
When contacting your local KUBOTA distributor, always specify engine serial number, product serial number and hour meter reading.

- |                                   |   |
|-----------------------------------|---|
| (1) Vehicle Identification Plate  | (4) Transmission Assembly Serial Number           |
| (2) Product Identification Number | (5) Certification Plate of Spark Arrester Muffler |
| (3) Engine Serial Number          |   |

W1010590



## 2. GENERAL PRECAUTIONS



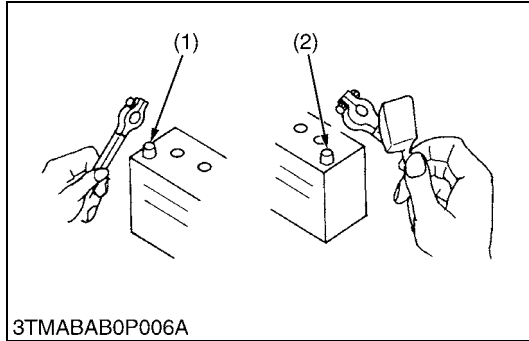
- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Bolts and nuts should be installed in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently used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

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

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

W10109040

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



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

#### ■ IMPORTANT

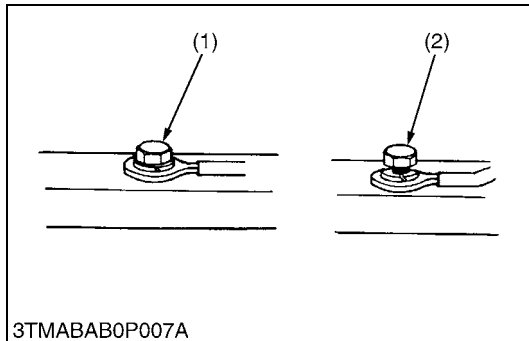
- Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.
- Do not attempt to modify or remodel any electrical parts and wiring.
- When removing the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

(1) Negative Terminal

(2) Positive Terminal

W10111140

#### [1] WIRING

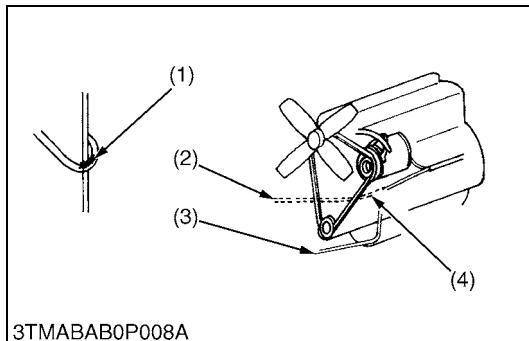


- Securely tighten wiring terminals.

(1) Correct  
(Securely Tighten)

(2) Incorrect  
(Loosening Leads to Faulty Contact)

W10112160

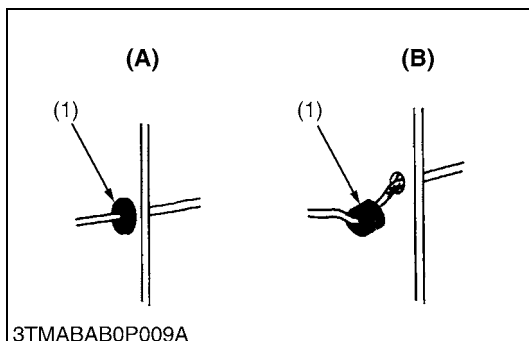


- Do not let wiring contact dangerous part.

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

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

W10113130

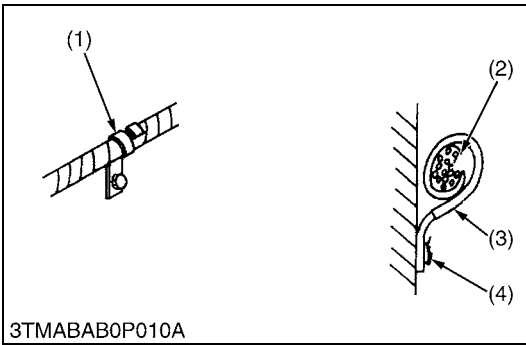


- Securely insert grommet.

(1) Grommet

(A) Correct  
(B) Incorrect

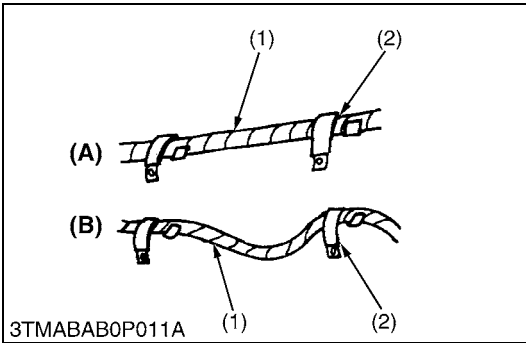
W10113880



- Securely clamp, being careful not to damage wiring.

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

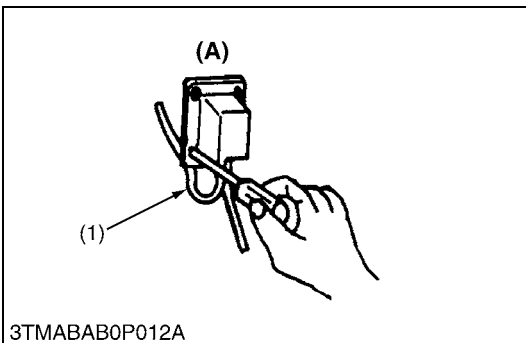
W10114580



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

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

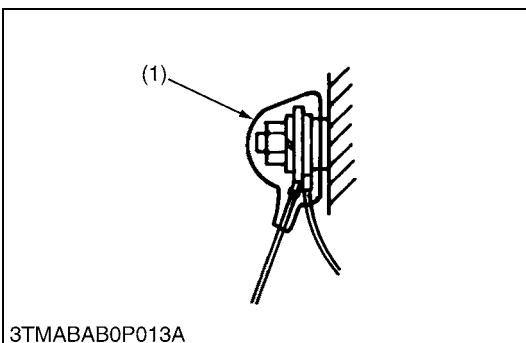
W10115870



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

- (1) Wiring
- (A) Incorrect

W10116700

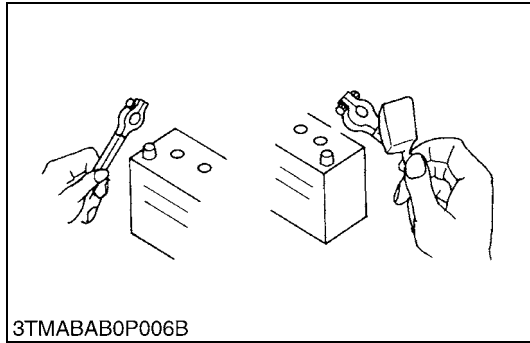


- After installing wiring, check protection of terminals and clamped condition of wiring, only connect battery.

- (1) Cover
  - Securely Install Cover

W10117350

## [2] BATTERY



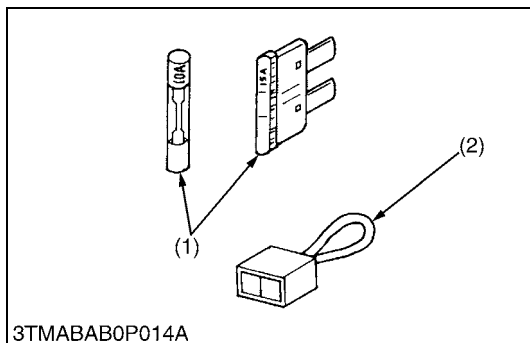
- Take care not to confuse positive and negative terminal posts.
- When removing battery cables, disconnect negative cable first. When installing battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After connecting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

### **CAUTION**

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

W10118160

## [3] FUSE



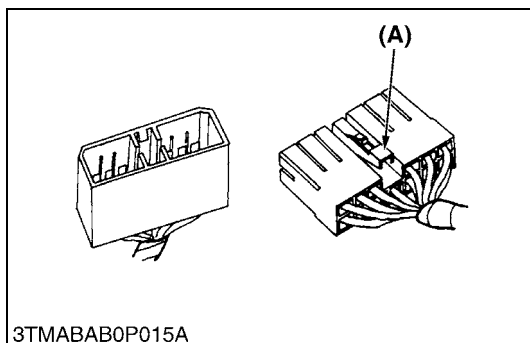
- Use fuses with specified capacity. Neither too large or small capacity fuse is acceptable.
- Never use steel or copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of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

(1) Fuse

(2) Fusible Link

W10120920

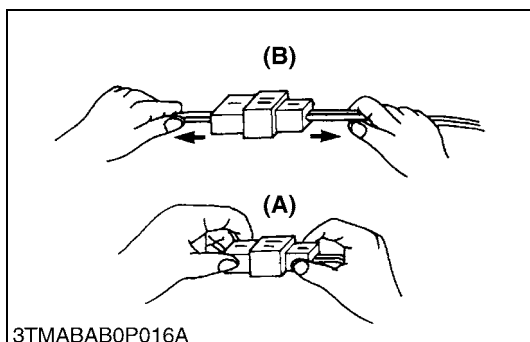
## [4] CONNECTOR



- For connector with lock, push lock to separate.

(A) Push

W10122110

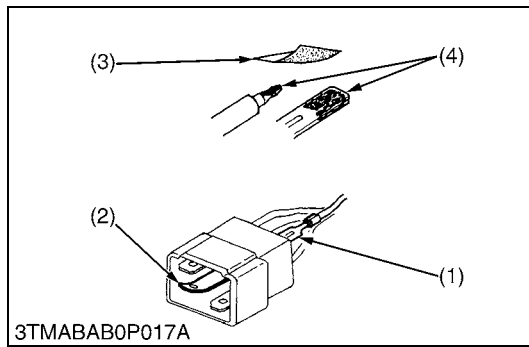


- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct

(B) Incorrect

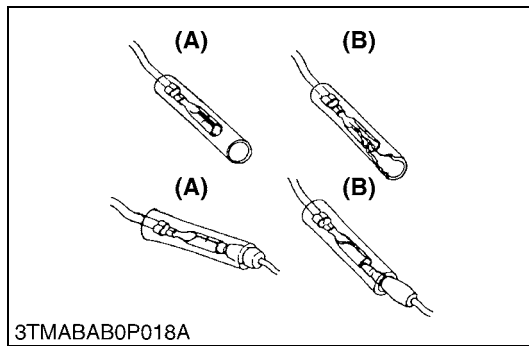
W10122720



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

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

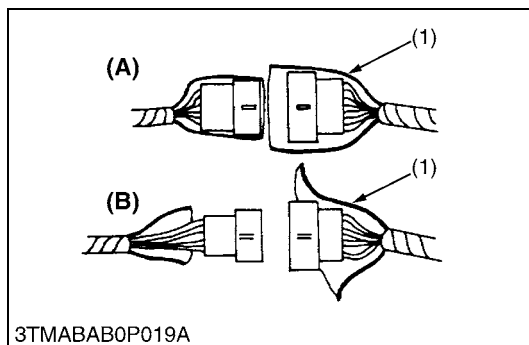
W10123460



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

(A) Correct (B) Incorrect

W10124300

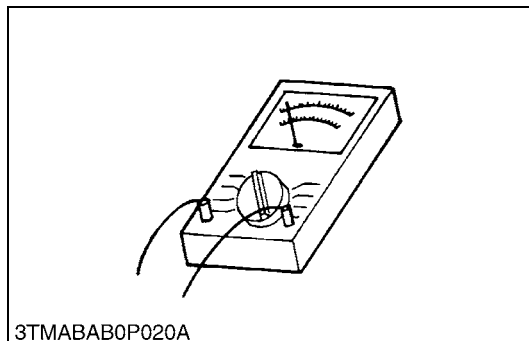


- Make certain plastic cover is large enough to cover whole connector.

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

W10125190

## [5] HANDLING OF CIRCUIT TESTER



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

W10126840

## 4. LUBRICANTS, FUEL AND COOLANT

No.	Place	Capacity	Lubricants, fuel and coolant	
1	Fuel tank	28.0 L 7.4 U.S.gals 6.2 Imp.gals	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below –10 °C (14 °F)	
2	Cooling system with recovery tank	4.0 L 4.2 U.S.qts 3.5 Imp.qts	Fresh clean water with anti-freeze	
3	Engine crankcase with filter	(Oil filter exchanged) 3.1 L 3.3 U.S.qts 2.7 Imp.qts (Oil filter non-exchanged) 2.7 L 2.9 U.S.qts 2.4 Imp.qts	Engine oil : API Service CC,CD or CF Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40 0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 10W-40 Above 25 °C (77 °F): SAE30, 10W-30 or 10W-40	
4	Transmission case	10.0 L 2.6 U.S.gals 2.2 Imp.gals	KUBOTA UDT or SUPER UDT fluid*	
5	Front axle case	0.6 L 0.63 U.S.qts 0.52 Imp.qts	KUBOTA UDT or SUPER UDT fluid*	
6	Knuckle case	Ref. 0.15 L Ref. 0.16 U.S.qts Ref. 0.13 Imp.qts	KUBOTA UDT or SUPER UDT fluid*	
7	Brake fluid (reservoir and lines)	0.4 L 0.42 U.S.qts 0.35 Imp.qts	KUBOTA <b>DOT3</b> GENUINE BRAKE FLUID	
8	Hydraulic auxiliary tank oil	17.0 L 18.0 U.S.qts 15.0 Imp.qts	KUBOTA UDT or SUPER UDT fluid*	
9	Power steering oil	5.9 L 1.6 U.S.gals 1.3 Imp.gals		
Greasing				
No.	Place	No. of greasing point	Capacity	Type of grease
10	VHT link	2	Until grease overflows	Multipurpose type grease
11	Battery terminal	2	Moderate amount	
12	Cargo lift cylinder pivot	2		
13	Cargo bed pivot	2		
14	Parking brake linkage	4		






**■ NOTE**

- **\*KUBOTA UDT or SUPER UDT fluid : KUBOTA original transmission hydraulic fluid**
- **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.
- **Transmission oil :**  
The oil used to lubricate the transmission is also used as hydraulic fluid. To insure proper operation of the hydraulic system and complete lubrication of the transmission, it is important that a multi-grade transmission fluid be used in this system. We recommend the use of KUBOTA SUPER UDT fluid for optimum protection and performance.  
Do not mix different brands or grades.
- **Brake fluid :**  
Always use KUBOTA DOT3 GENUINE BRAKE FLUID from a sealed container. If it is not available, you should use only DOT3 fluid as a temporary replacement from a sealed container.  
However, the use of any non-KUBOTA brake fluid can cause corrosion and decrease the life of the system. Have the brake system flushed and refilled with KUBOTA DOT3 GENUINE BRAKE FLUID as soon as possible.
- **Indicated capacity of water and oil are manufacturer's estimate.**

## 5. TIGHTENING TORQUES

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

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

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

W1034542

### [2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M8 (8 mm, 0.31 in.)	11.8 to 15.6	1.2 to 1.6	8.68 to 11.5	8.82 to 11.8	0.90 to 1.2	6.51 to 8.67
M10 (10 mm, 0.39 in.)	24.6 to 31.3	2.5 to 3.2	18.1 to 23.1	19.7 to 25.4	2.0 to 2.6	14.5 to 18.8
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1

W10481390

### [3] METRIC SCREWS, BOLTS AND NUTS

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



0000001413E

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

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

0000001414E

### [5] PLUGS

Shape	Size	Material of opponent part					
		Ordinariness			Aluminum		
		N-m	kgf-m	ft-lbs	N-m	kgf-m	ft-lbs
<div>Tapered screw</div> 	<b>R1/8</b>	12.7 to 21.6	1.3 to 2.2	9.4 to 15.9	12.7 to 19.6	1.3 to 2.0	9.4 to 15.4
	<b>R1/4</b>	24.5 to 44.1	2.5 to 4.5	18.1 to 32.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.4
	<b>R3/8</b>	49.0 to 88.3	5.0 to 9.0	36.2 to 65.1	49.0 to 58.8	5.0 to 6.0	36.2 to 43.4
	<b>R1/2</b>	58.8 to 107.9	6.0 to 11.0	43.4 to 79.6	58.8 to 78.5	6.0 to 8.0	43.4 to 57.4
<div>Straight screw</div> 	<b>G1/4</b>	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3	—	—	—
	<b>G3/8</b>	61.8 to 82.4	6.3 to 8.4	45.6 to 60.8	—	—	—
	<b>G1/2</b>	49.0 to 88.3	5.0 to 9.0	36.2 to 65.1	—	—	—

0000001666E

## 6. MAINTENANCE CHECK LIST

### [1] FROM FIRST 50 HOURS TO EVERY 550 HOURS

#### ■ IMPORTANT

- The jobs indicated by ★ must be done after the first 50 hours of operation.

(To be continued)

No.	Period Item		Indication on hour meter											Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550			
1	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆			G-30
2	Oiling	Apply	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆			HG-16
3	Engine oil	Change	★	☆		☆		☆		☆		☆				G-23
4	Muffler	Clean	★	☆		☆		☆		☆		☆				G-25
5	Wheel screw torque	Check	★	☆		☆		☆		☆		☆				G-25
6	Spark arrester	Clean		☆		☆		☆		☆		☆				G-33
7	Battery condition	Check		☆		☆		☆		☆		☆				G-35
8	Fan belt	Adjust		☆		☆		☆		☆		☆				G-36
9	VHT neutral spring	Check		☆		☆		☆		☆		☆				G-32
10	Toe-in	Adjust		☆		☆		☆		☆		☆				G-38
11	Air cleaner filter element	Check			☆			☆			☆					HG-16
		Replace										☆				HG-16
12	Air cleaner element	Clean		☆		☆		☆		☆		☆				G-34
		Replace														—
13	Fuel line	Check		☆		☆		☆		☆		☆				G-37
		Replace														—
14	Engine oil filter	Replace	★			☆				☆						G-24
15	Hydraulic auxiliary oil tank oil filter (Yellow color)	Replace	★			☆				☆						HG-17
16	Transmission oil filter (Suction) (Orange color)	Replace	★			☆				☆						G-27
17	Hydraulic auxiliary oil tank oil	Change	★			☆				☆						HG-17
18	Brake pedal	Adjust	★			☆				☆						G-28
19	Parking brake lever	Adjust	★			☆				☆						G-28
20	Brake light switch	Check	★			☆				☆						G-28
21	Front brake case	Check	★			☆				☆						G-29
22	Power steering oil	Change				☆				☆						G-41
23	Hydraulic lift oil	Change				☆				☆						G-40
24	Radiator hose and clamp	Check				☆				☆						G-39
		Replace														—
25	Hydraulic auxiliary oil line	Check				☆				☆						HG-18
		Replace														HG-18
26	Intake air line	Check				☆				☆						HG-18
		Replace														HG-18
27	Brake hose and pipe	Check	★			☆				☆						G-29
		Replace														—

**(Continued)**

No.	Item	Period	Indication on hour meter											Important	Reference page
			50	100	150	200	250	300	350	400	450	500	550		
28	Tire wear	Check	★					☆							G-30
29	Front axle case oil	Change								☆					G-42
30	Knuckle axle case oil	Change								☆					G-42
31	Engine valve clearance	Adjust													—
32	Fuel injection nozzle injection pressure	Check													—
33	Injection pump	Check													—
34	Brake master cylinder inner parts	Replace													—
35	Brake fluid	Change													—
36	Remote hydraulic hose (if equipped)	Replace													—
37	Rear brake cylinder seal	Replace													—
38	Front brake seal	Replace													—
39	Cooling system	Flash													—
40	Coolant	Change													—
41	Fuel system	Bleed													—
42	Fuse	Replace													—
43	Light bulb	Replace													—

W1020106

## [2] FROM EVERY 600 HOURS TO EVERY 4 YEARS

### ■ IMPORTANT

- The jobs indicated by ★ must be done after the first 50 hours of operation.
- \*1 : Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- \*2 : Every year or every 6 times of cleaning.
- \*3 : Replace only if necessary.
- \*4 : When the battery is used for less than 100 hours per year, check the fluid level annually.
- The items listed below (@ 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 following instruction.

(To be continued)

No.	Period Item		Indication on hour meter							After purchase			Important	Reference page
			600	650	700	750	800	1500	3000	1 year	2 years	4 years		
1	Engine start system	Check	☆	☆	☆	☆	☆							G-30
2	Oiling	Apply	☆	☆	☆	☆	☆							HG-16
3	Engine oil	Change	☆		☆		☆							G-23
4	Muffler	Clean	☆		☆		☆							G-25
5	Wheel screw torque	Check	☆		☆		☆							G-25
6	Spark arrester	Clean	☆		☆		☆							G-33
7	Battery condition	Check	☆		☆		☆						*4	G-35
8	Fan belt	Adjust	☆		☆		☆							G-36
9	VHT neutral spring	Check	☆		☆		☆							G-32
10	Toe-in	Adjust	☆		☆		☆							G-38
11	Air cleaner filter element	Check	☆			☆								HG-16
		Replace											@	HG-16
12	Air cleaner element	Clean	☆		☆		☆			☆			*1	G-34
		Replace											*2	—
13	Fuel line	Check	☆		☆		☆							G-37
		Replace									☆		*3	—
14	Engine oil filter	Replace	☆				☆							G-24
15	Hydraulic auxiliary oil tank oil filter (Yellow color)	Replace	☆				☆							HG-17
16	Transmission oil filter (Suction) (Orange color)	Replace	☆				☆							G-27
17	Hydraulic auxiliary oil tank oil	Change	☆				☆							HG-17
18	Brake pedal	Adjust	☆				☆							G-28
19	Parking brake lever	Adjust	☆				☆							G-28
20	Brake light switch	Check	☆				☆							G-28
21	Front brake case	Check	☆				☆							G-29
22	Power steering oil	Change	☆				☆							G-41
23	Hydraulic lift oil	Change	☆				☆							G-40

**(Continued)**

No.	Period  Item		Indication on hour meter							After purchase			Import- tant		Refer- ence page	
			600	650	700	750	800	1500	3000	1 year	2 years	4 years				
24	Radiator hose and clamp	Check	☆				☆								G-39	
		Replace													—	
25	Hydraulic auxiliary oil line	Check	☆				☆								HG-18	
		Replace													HG-18	
26	Intake air line	Check	☆				☆							@	HG-18	
		Replace										*3			HG-18	
27	Brake hose and pipe	Check	☆				☆								G-29	
		Replace										☆			—	
28	Tire wear	Check	☆												G-29	
29	Front axle case oil	Change					☆								G-42	
30	Knuckle axle case oil	Change					☆								G-42	
31	Engine valve clearance	Adjust					☆								1-S12	
32	Fuel injection nozzle injection pressure	Check						☆					@		1-S17	
33	Injection pump	Check							☆				@		—	
34	Brake master cylinder inner parts	Replace									☆				4-S15	
35	Brake fluid	Change									☆				4-S5	
36	Remote hydraulic hose (if equipped)	Replace									☆				7-S6	
37	Rear brake cylinder seal	Replace									☆				4-S19	
38	Front brake seal	Replace									☆				4-S13	
39	Cooling system	Flash									☆				G-44	
40	Coolant	Change									☆				G-44	
41	Fuel system	Bleed								Service as required					G-46	
42	Fuse	Replace														HG-19
43	Light bulb	Replace														G-48

## 7. CHECK AND MAINTENANCE

### [1] DAILY CHECK

To prevent trouble from occurring, it is important to know the condition of the vehicle well. Check it before starting.



#### CAUTION

- Be sure to check and service the vehicle on a level surface with the engine shut off and the parking brake "ON" and implement lowered to the ground if equipped.

#### Walk Around Inspection

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

W1037054

#### Checking Hydraulic Auxiliary Tank Oil Level

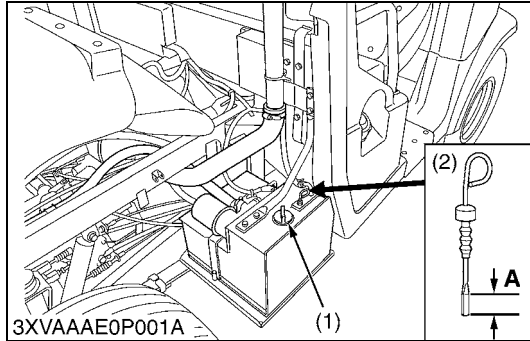
- Park the vehicle on a firm, flat and level surface.
- Raise the cargo bed and mount the safety support.
- To check the oil level, draw out the dipstick, wipe it clean, replace it, and draw out it again. Check to see that the oil level lies between the range.

If the level is too low, add new oil to the prescribed level at the filling plug. Refer to "LUBRICANTS, FUEL AND COOLANT" (See page HG-7).

- Filling Plug
- Dipstick

A : Oil level is acceptable within this range.

W1020188



3XVAAAE0P001A

#### Cleaning Oil Cooler Net



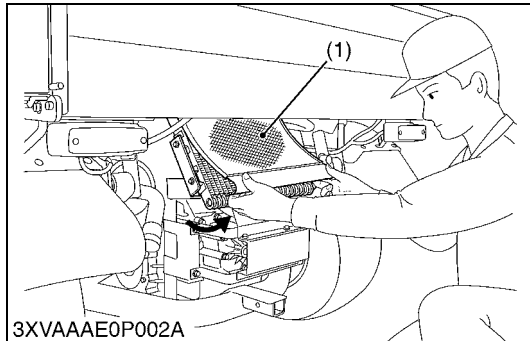
#### CAUTION

- Allow oil cooler or oil line parts to cool down sufficiently, they can be hot and can burn.

- Park the vehicle on a flat surface, lower the cargo bed, shut off engine and turn the key to "OFF" position.  
If the key switch is "ON", the oil cooler fan may start to rotate suddenly.
- Take off the oil cooler net from the lower side and remove all trash.

- Oil Cooler Net

W1020313



3XVAAAE0P002A

#### Checking Tire Inflation Pressure

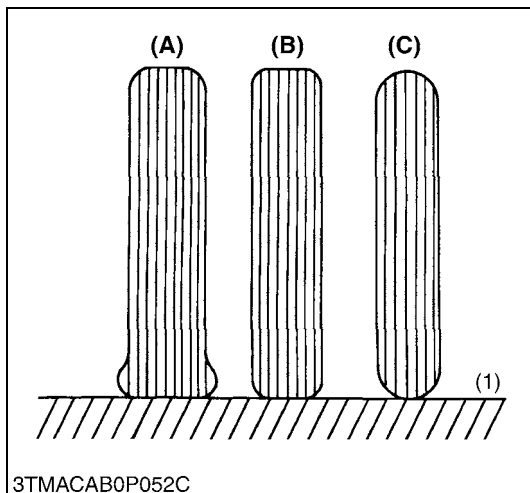
Though the tire pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Thus, check it everyday and inflate as necessary.

Tire sizes	Inflation pressure
25 × 10 – 12 HDWS, Front and Rear	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
25 × 12 – 12 Turf, Front and Rear	

- Ground

A : Insufficient  
B : Normal  
C : Excessive

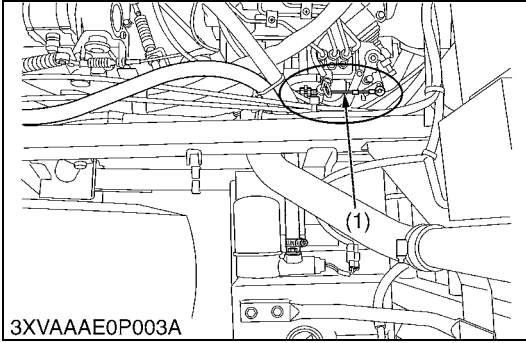
W1039271



3TMACAB0P052C



## [2] CHECK POINTS OF EVERY 50 HOURS



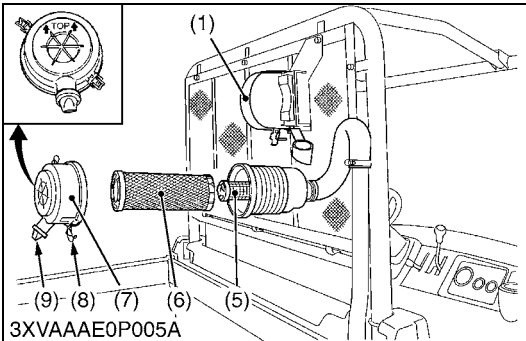
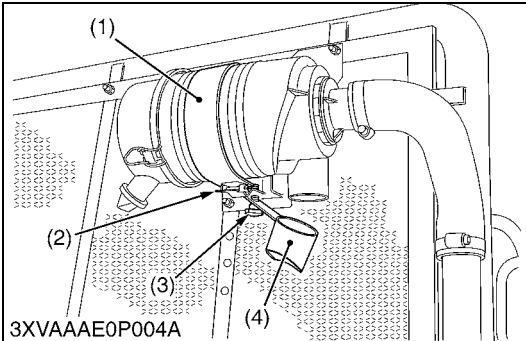
### Oiling

1. Apply a small amount of engine oil to the accelerator wire every 50 hours.

(1) Hand Throttle Wire

W1043356

## [3] CHECK POINTS OF EVERY 150 HOURS



### Cleaning Air Cleaner Primary Element

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

### ■ NOTE

- Check to see if the evacuator valve is blocked with dust.
- Check the rubber seal. Replace if damaged.

### ■ 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 cover with the arrow (on the rear of cover) upright. If the cover is improperly fitted, evacuator valve will not function and dust will adhere to the element.
- Do not touch the secondary element except in cases where replacing is required.

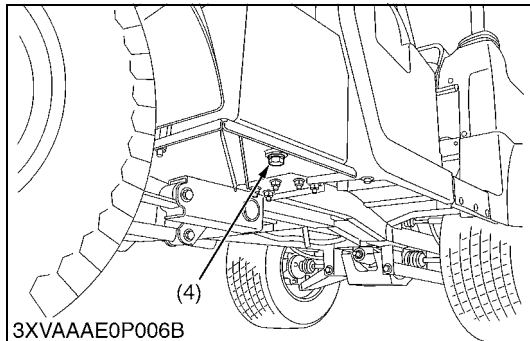
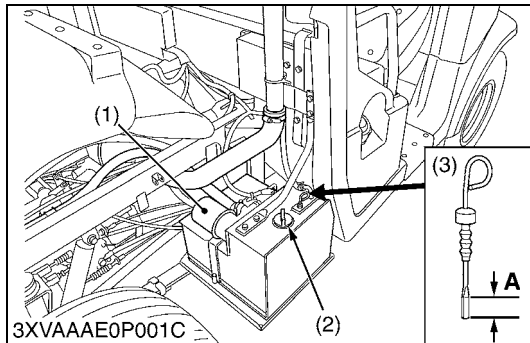
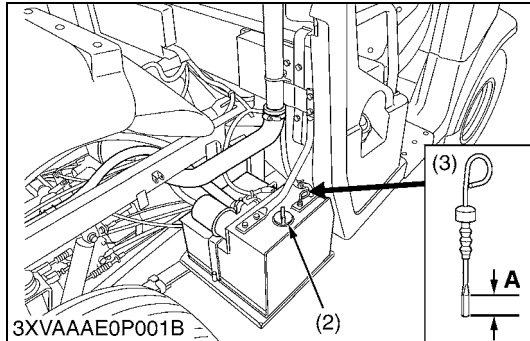
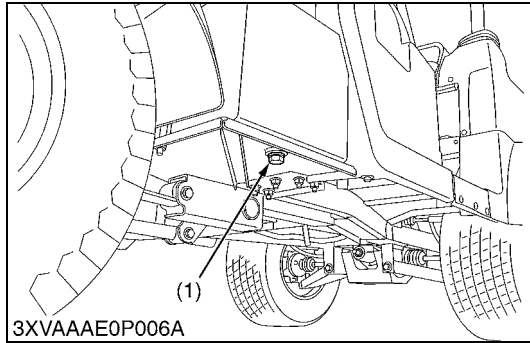
### ■ Evacuator Valve

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

- |                                |                     |
|--------------------------------|---------------------|
| (1) Knob Bolt                  | (6) Primary Element |
| (2) Lock Lever                 | (7) Rubber Seal     |
| (3) Air Cleaner Fixing Band    | (8) Cover           |
| (4) Intake Air Guard           | (9) Evacuator Valve |
| (5) Secondary (Safety) Element |                     |

W1020674

## [4] CHECK POINTS OF EVERY 200 HOURS



### Checking Hydraulic Auxiliary Tank Oil

1. Park the vehicle on a firm, flat and level surface.
2. Raise the cargo bed and mount the safety support.
3. To drain the used oil, remove the drain plug and filling plug and drain the oil completely into the oil pan.
4. After draining reinstall the drain plug.
5. Fill with the new KUBOTA SUPER UDT fluid up to upper notch on the dipstick. Refer to “**LUBRICANTS, FUEL AND COOLANT**” (See page HG-7).
6. After filling reinstall the filling plug.

Hydraulic auxiliary tank oil capacity	17.0 L 18.0 U.S.qts 15.0 Imp.qts
---------------------------------------	--

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

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

W1021251

### Replacing Hydraulic Auxiliary Tank Oil Filter



#### CAUTION

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

1. Park the vehicle on a firm, flat and level surface.
2. Raise the cargo bed and mount the safety support.
3. Remove the drain plug and drain the oil completely into the oil pan.
4. After draining reinstall the drain plug.
5. Remove the oil filter. (Take care of the oil that spills from filter.)
6. Put a film of clean KUBOTA SUPER UDT OIL on the rubber seal of the new filter.
7. Quickly tighten the filter until it contacts the mounting surface, then, with a filter wrench, tighten it an additional 1 turn only.
8. After the new filter has been replaced, fill the auxiliary tank oil up to the upper notch on the dipstick.
9. After running the engine for a few minutes, stop the engine and check the oil level again, add oil to the prescribed level.
10. Make sure that the hydraulic auxiliary tank oil does not leak past the seal on the filter.

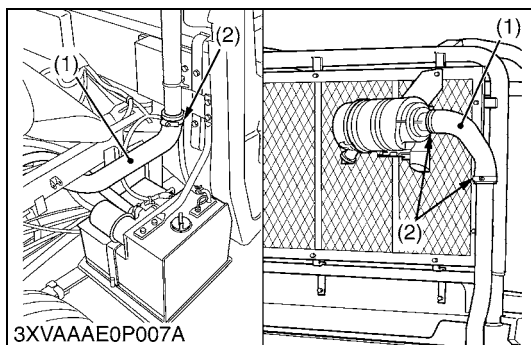
#### ■ IMPORTANT

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

- (1) Hydraulic Auxiliary Tank Oil Filter  
(2) Filling Plug  
(3) Dipstick  
(4) Drain Plug

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

W1021478

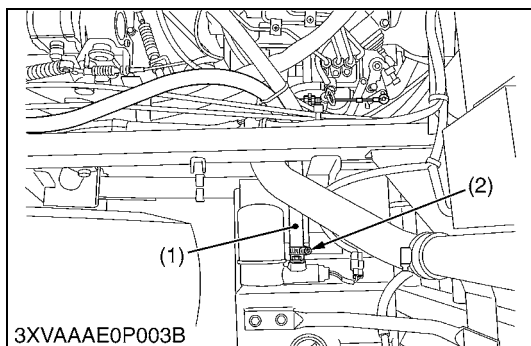
**Checking Intake Air Line**

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

(1) Hose

(2) Hose Clamps

W1021742

**Checking Hydraulic Auxiliary Oil Line**

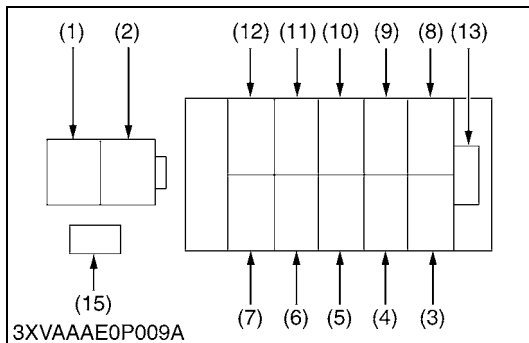
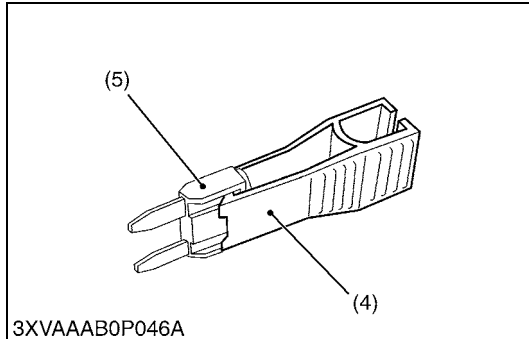
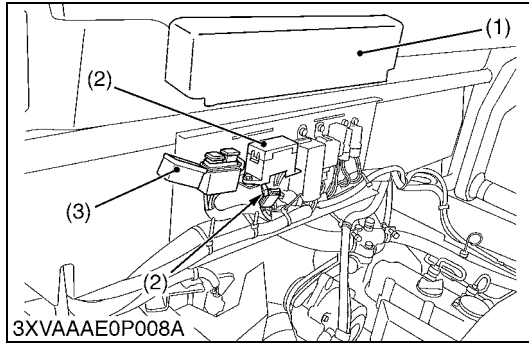
1. Check to see if the hoses and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

(1) Hose

(2) Hose Clamps

W1021913

## [5] OTHERS



### Replacing Fuse

The vehicle 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.

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.

#### ■ Replacement procedure

1. Disconnect the negative cord of the battery.
2. Remove the cover (1) and the fuse box cover (2).
3. Pull out the blown fuse using fuse puller (4) in the fuse box.
4. Insert a new fuse into the fuse box.
5. Install the fuse box cover and the cover.
6. Connect the negative battery cord.

(1) Cover

(2) Fuse Box Cover

(3) Slow Blow Fuse Box Cover

(4) Fuse Puller

(5) Fuse

W1022037

### Protected Circuit

Fuse No.	Capacity (A)	Protected circuit
1	Slow blow fuse (50)	Key switch
2	Slow blow fuse (60)	Alternator
3	15	Head lamp, Tail lamp, Panel
4	5	Glow lamp
5	10	(Hazard)
6	20	Fan motor
7	15	Engine stop
8	15	Alternator, Brake lamp, Fan motor relay
9	5	Panel, Engine stop control
10	10	12 V DC output
11	10	Horn
12	15	(Work light)
13	—	Fuse puller
14	5, 10, 15, 20	Spare
15	20	Oil cooler fan motor

W1052030

### Cleaning Oil Cooler Net

1. Refer to “Cleaning Oil Cooler Net”. (See page HG-15.)

W1022455

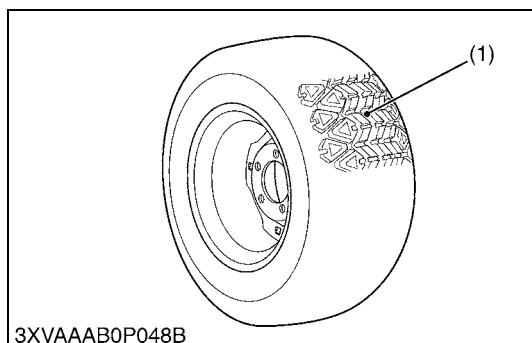
## 8. TIRES

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

**■ IMPORTANT**

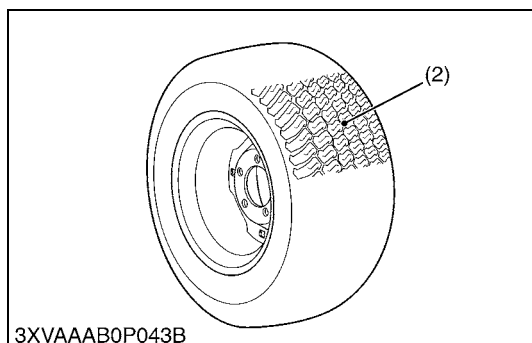
- Do not use tires other than those approved by KUBOTA.

### [1] TYPE OF TIRE

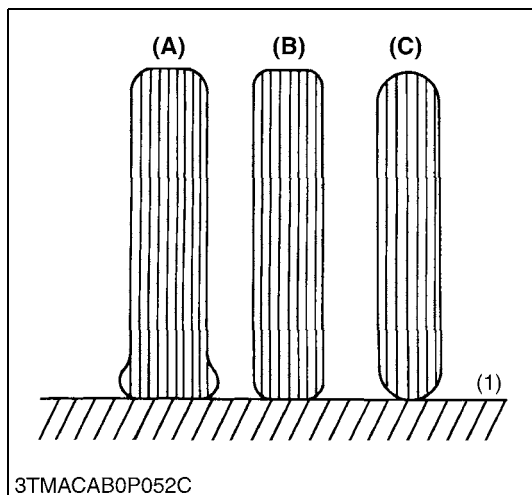


(1) Heavy Duty Work Site Tire (HDWS) (2) Turf Tire

W1055639



### [2] TIRE PRESSURE



#### Checking Tire Inflation Pressure

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

Tire sizes	Inflation pressure
25 × 10 – 12 HDWS, Front and Rear	140 kPa (1.4 kgf/cm <sup>2</sup> , 20 psi)
25 × 12 – 12 Turf, Front and Rear	

(1) Ground

**A : Insufficient**  
**B : Normal**  
**C : Excessive**

W1055728

### [3] VEHICLE LIMITATIONS

The KUBOTA Vehicle 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 Vehicle may result in malfunctions or failures of the vehicle, damage to other property and injury to the operator or others. [Any malfunctions or failures of the vehicle resulting from use with improper implements are not covered by the warranty.]

Max. cargo loading weight (W1)	Rear trailer high	Front trailer hitch
Max. cargo load should not exceed "500 kg (1100 lbs)" or cargo load.	Max. rolling weight (W2) 590 kg (1300 lbs)	Max. towing load (W4) 295 kg (650 lbs)
CL = 710 kg (1565 lbs) - (operator + passenger + option + accessory + cabin weight)	Max. tongue weight (W3) 50 kg (110 lbs)	Max. tongue weight (W5) 50 kg (110 lbs)

3XVAAAB0P023B

rolling weight : Trailer weight + Cargo load

Above mentioned specifications are based on level ground condition.

# SERVICING

## CONTENTS

1. TIGHTENING TORQUES .....	H2-S1
2. DISASSEMBLING AND ASSEMBLING .....	H2-S2
[1] DISMOUNTING TRANSAXLE .....	H2-S2

# 1. 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 HG-9.)

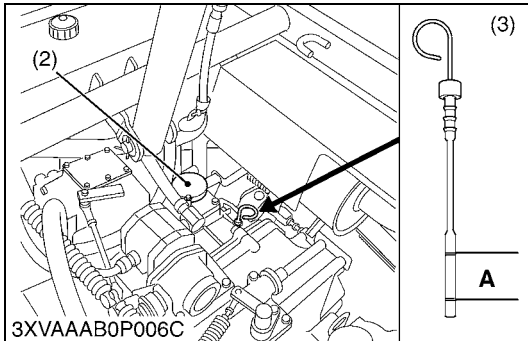
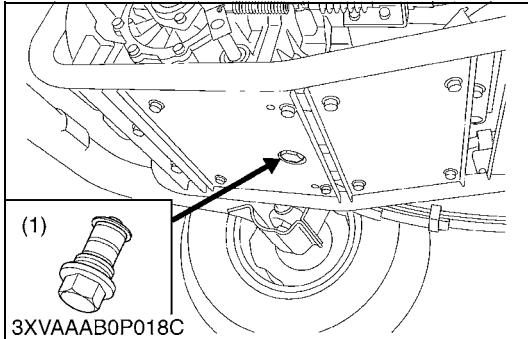
Item	N·m	kgf·m	ft-lbs
Muffler mounting nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Muffler mounting bolt	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Muffler stay mounting bolt	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1

W1012736



## 2. DISASSEMBLING AND ASSEMBLING

### [1] DISMOUNTING TRANSAXLE



#### Draining the Transmission Fluid

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

#### (When refilling)

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

Transmission fluid capacity	10 L 2.6 U.S.gals 2.2 Imp.gals
-----------------------------	--------------------------------------

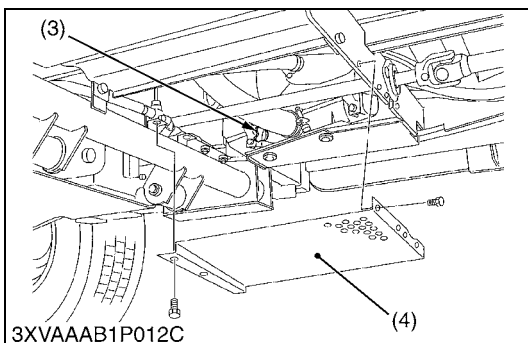
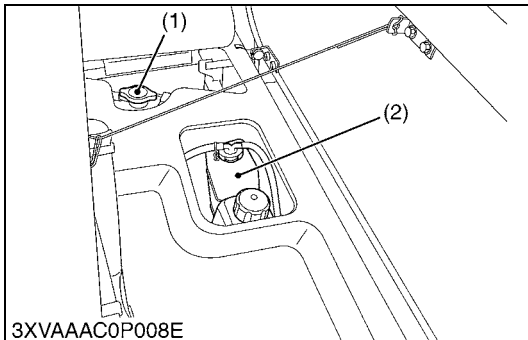
#### ■ IMPORTANT

- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission.**  
Refer to "LUBRICANTS, FUEL AND COOLANT". (See page HG-7.)
- **Do not mix different brands of fluid together.**

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

A : Oil level is acceptable within this range.

W1013492



#### Draining Coolant

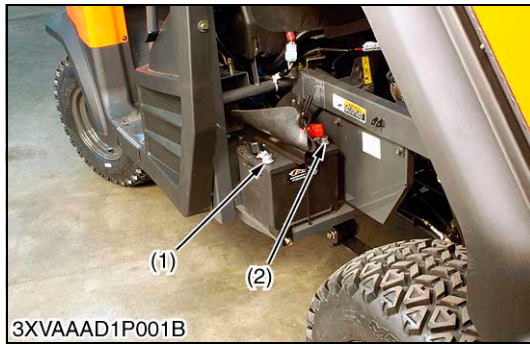
#### ⚠ CAUTION

- **Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**
1. Stop the engine and let cool down.
  2. Remove the protective cover (4).
  3. Remove the radiator coolant drain plug (3) to drain the coolant.
  4. Remove the radiator cap (1) to completely drain the coolant.
  5. After all coolant is drained, close the drain plugs.

Coolant capacity	Radiator with recovery tank	4.0 L 4.2 U.S.qts. 3.5 Imp.qts.
------------------	-----------------------------	---------------------------------------

- (1) Radiator Cap  
(2) Recovery Tank  
(3) Radiator Coolant Drain Plug  
(4) Protective Cover

W1013915



### Battery



#### CAUTION

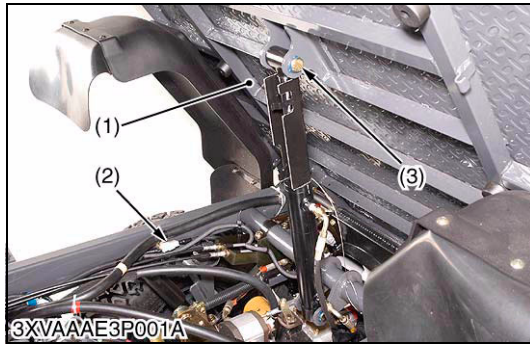
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (1) from the battery.
2. Disconnect the positive cable (2) from the battery.

(1) Negative Cable

(2) Positive Cable

W1017351



### Cargo Bed

1. Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop. (If hydraulic cylinder equipped.)
2. Remove the cotter pin and clevis pin (3). (If hydraulic cylinder equipped.)
3. Disconnect the connector (2) from main harness, then separate the harness for the tail lamps.
4. Loosen the lock nut (4) and remove the hinge bolt (5) and nut.

(1) Cargo Bed

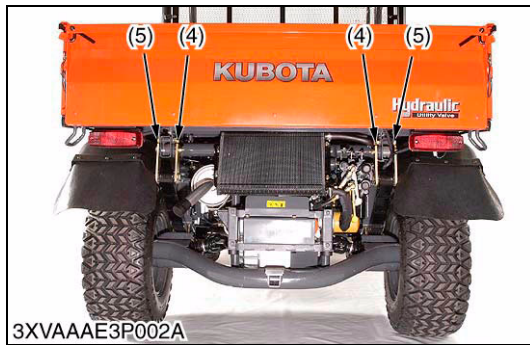
(4) Lock Nut

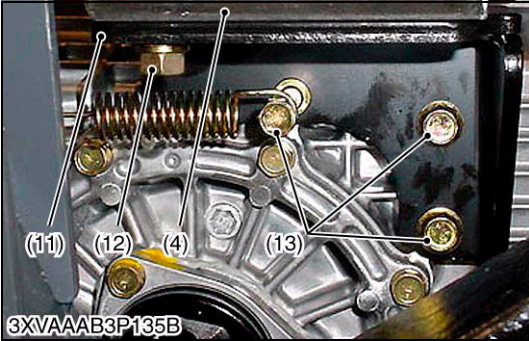
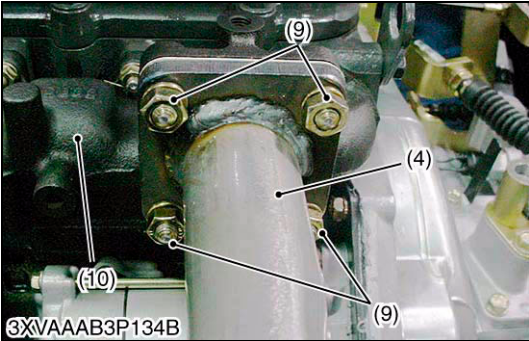
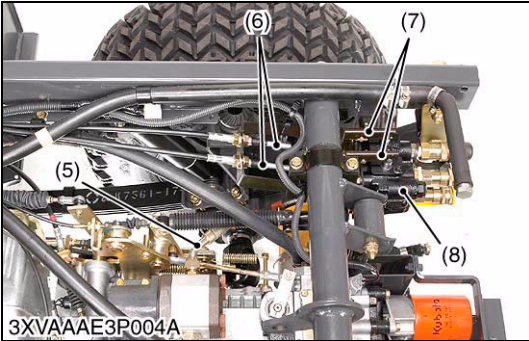
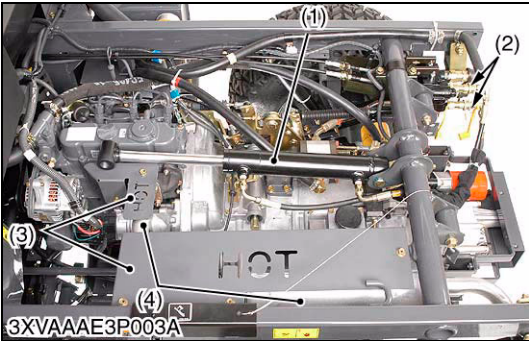
(2) Connector

(5) Hinge Bolt

(3) Clevis Pin

W1017555





**Muffler Cover, Muffler, Hydraulic Cylinder and Hydraulic Control Valve**

1. Remove the muffler cover (3) and muffler (4).
2. Disconnect the quick couplers (2) from hydraulic control valve (8).
3. Remove the cotter pin and clevis pin, then remove the hydraulic cylinder (1).
4. Disconnect the cables (6) for hydraulic control valve.
5. Disconnect the delivery hose (5) and remove the hydraulic control valve (8).

**(When reassembling)**

- When connecting the hydraulic control valve (8) cable to hydraulic control valve lever (7), be sure to adjust the length of cables (6).

**■ NOTE**

- The muffler shall be assembled in the following order:
1. To secure the muffler (4) to the exhaust manifold, put four spring lock washers on studs and start a nut (9) on each stud. Screw each nut 2 to 3 threads on studs.
  2. To secure muffler (4) to muffler stay (11), start a sems bolt (bolt with plane washer and spring lock washer. Turn sems bolt 2 to 3 threads into underside of muffler stay (11) and the muffler (4).
  3. Tighten nuts (9) that fasten the muffler (4) to the exhaust manifold (14).
  4. Tighten the sems bolt that fasten the underside of the muffler (4) to the muffler stay (11) (On this occasion, check the gap between the underside of the muffler and its stay. When there is a large gap between them, lift the stay and assemble the muffler. And keep them to such a position to fasten the muffler stay.).
  5. Tighten the bolts (13) that fasten muffler stay (11) to transmission.

Tightening torque	Muffler mounting nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs
	Muffler mounting bolt (Sems bolt)	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft·lbs
	Muffler stay mounting bolt	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 ft·lbs

- |                                   |                             |
|-----------------------------------|-----------------------------|
| (1) Hydraulic Cylinder            | (8) Hydraulic Control Valve |
| (2) Quick Coupler                 | (9) Nut                     |
| (3) Muffler Cover                 | (10) Exhaust Manifold       |
| (4) Muffler                       | (11) Muffler Stay           |
| (5) Delivery Hose                 | (12) Sems Bolt              |
| (6) Control Valve Cable           | (13) Bolt                   |
| (7) Hydraulic Control Valve Lever |                             |

W1017697





### Oil Cooler with Fan Motor

1. Place oil pan underneath the oil cooler (3).
2. Disconnect the delivery hose (2) from oil cooler (3).
3. Disconnect the return hose (1) from oil cooler (3).
4. Remove the oil cooler with fan motor (3).

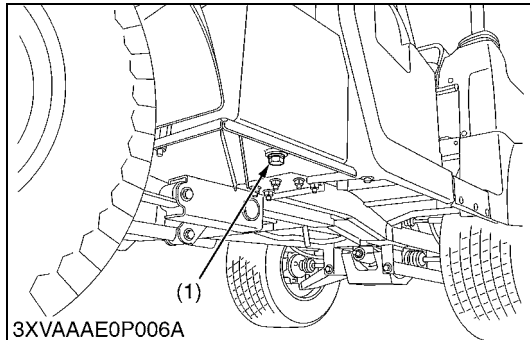
#### (When reassembling)

- When reassembling the oil cooler assembly, pay your attention so that the hydraulic hoses does not contact with the fan cover. Route the hydraulic hoses through the front of the fan cover.

(1) Return Hose  
(2) Delivery Hose

(3) Oil Cooler with Fan Motor

W1011423



### Draining Hydraulic Auxiliary Tank Oil

1. Place oil pans underneath the transmission case.
2. Raise the cargo bed and mount the safety support.
3. Remove the drain plug (1).
4. Drain the hydraulic auxiliary tank oil.
5. Reinstall the drain plug (1).

#### (When refilling)

- Fill up from filling port after removing the filling plug (2) until reaching the upper notch on the dipstick (3).

Hydraulic auxiliary tank oil capacity	17.0 L
	18.0 U.S.qts
	15.0 Imp.qts

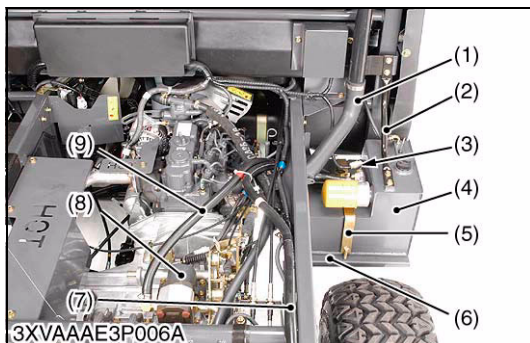
### ■ IMPORTANT

- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission.**  
**Refer to “LUBRICANTS, FUEL AND COOLANT”. (See page HG-7.)**
- **Do not mix different brands of fluid together**

(1) Drain Plug  
(2) Filling Plug  
(3) Dipstick

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

W1011594



### Oil Tank and Intake Air Hose

1. Remove the clamp and the intake air hose (1).
2. Disconnect the suction hose (9) from the hydraulic pump (8).
3. Remove the fuel tank stay (2).
4. Disconnect the wire harness (3) of oil temperature switch.
5. Remove the fuel tank support (5).
6. Remove the fuel tank with return hose (7) and suction hose (9).

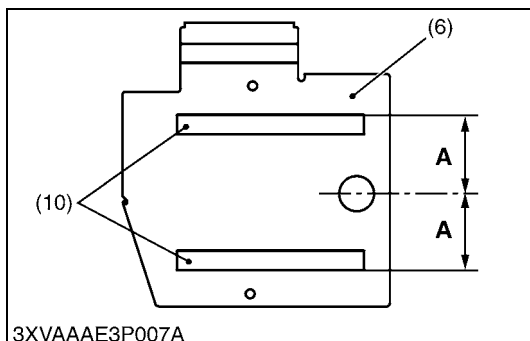
#### (When reassembling)

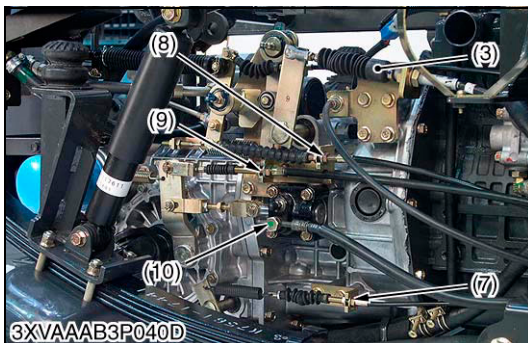
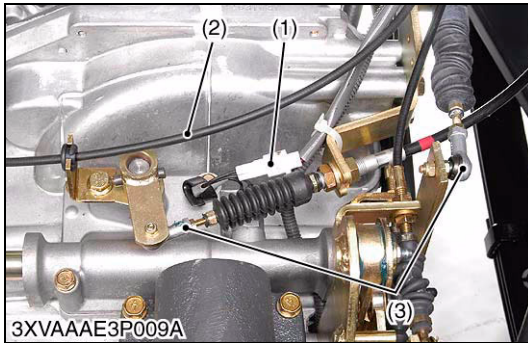
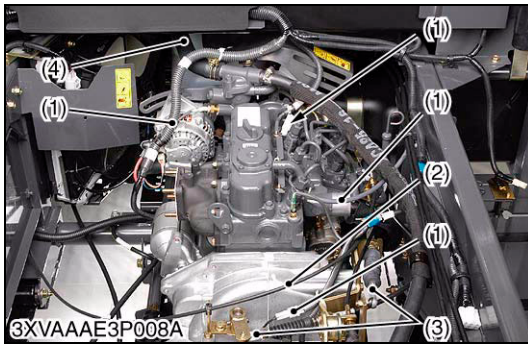
- Make sure that the cushion rubber (10) has not been removed. If you should find that the cushion rubber has been removed and missing, or dislocated, please fix it correctly at the point as shown in the figure.

Length (A)	140 mm 5.5 in.
------------	-------------------

(1) Intake Air Hose  
(2) Fuel Tank Stay  
(3) Wire Harness  
(4) Fuel Tank  
(5) Fuel Tank Support  
(6) Tank Base  
(7) Return Pipe  
(8) Hydraulic Pump  
(9) Suction Hose  
(10) Cushion Rubber

W1011985





### **Wire Harness, Radiator Hose (Upper), Cables and Brake Hoses**

1. Disconnect the wire harness (1) from engine, alternator and stator motor etc..
2. Remove the hand accelerator wire (2).
3. Remove the ground cable (6) and positive cable (5).
4. Disconnect the parking brake cables (9), four wheel drive cable (11), select cable and shift cable (3).
5. Remove the speed control pedal cable (8).
6. Remove the brake hoses (10).
7. Disconnect the differential lock cable (7).
8. Remove the radiator upper hose (4).

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

- Make sure that there is some play on the accelerator wire when the hand throttle has been returned to its lowest position.
- Adjust the length of the shift cable and select cable. (See page 2-S14.)
- Adjust the length of the speed control pedal cable. (See page 2-S13.)
- Adjust the length of the parking brake cable. (See page 2-S16.)
- Adjust the length of the 4WD shift cable. (See page 2-S15.)
- Bleed the brake system. (See page 4-S6.)



#### **CAUTION**

- When the brake hose is removed, the brake fluid comes out. Take care not to stain other hoses or rubber boot with the brake fluid. Brake fluid stains should be washed and wiped off immediately. Likewise, the brake fluid on the tools should be wiped off immediately.

- |                                  |                               |
|----------------------------------|-------------------------------|
| (1) Wire Harness                 | (7) Differential Lock Cable   |
| (2) Hand Accelerator Wire        | (8) Speed Control Pedal Cable |
| (3) Shift Cable and Select Cable | (9) Parking Brake Cable       |
| (4) Radiator Upper Hose          | (10) Brake Hose               |
| (5) Positive Cable               | (11) 4WD Cable                |
| (6) Ground Cable                 |                               |

W1018053

### **Power Steering Hose and Radiator Hose (Lower)**

See page 2-S25.

W1018519

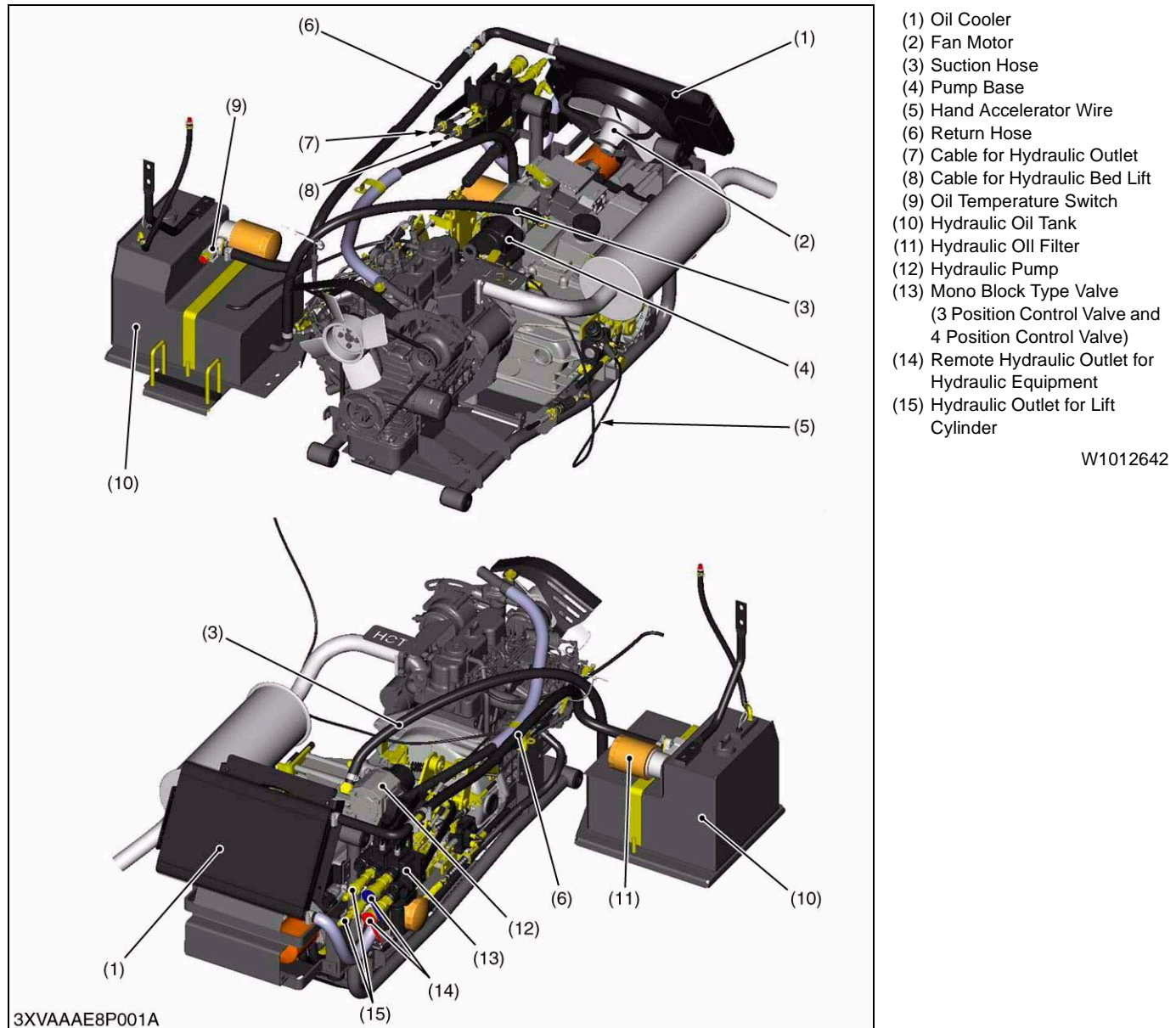
# MECHANISM

## CONTENTS

1. STRUCTURE .....	H7-M1
2. HYDRAULIC CIRCUIT .....	H7-M2
[1] HYDRAULIC CARGO BED LIFT OR HYDRAULIC OUTLET .....	H7-M2
3. HYDRAULIC PUMP .....	H7-M3
4. HYDRAULIC CYLINDER .....	H7-M4
5. HYDRAULIC OUTLET VALVE .....	H7-M5
[1] DOUBLE ACTING TYPE 2 (MONO BLOCK TYPE) .....	H7-M5
(1) Floating with Detent Valve for Hydraulic Lift Cylinder .....	H7-M5
(2) On-Off Valve for Hydraulic Outlet .....	H7-M9



# 1. STRUCTURE

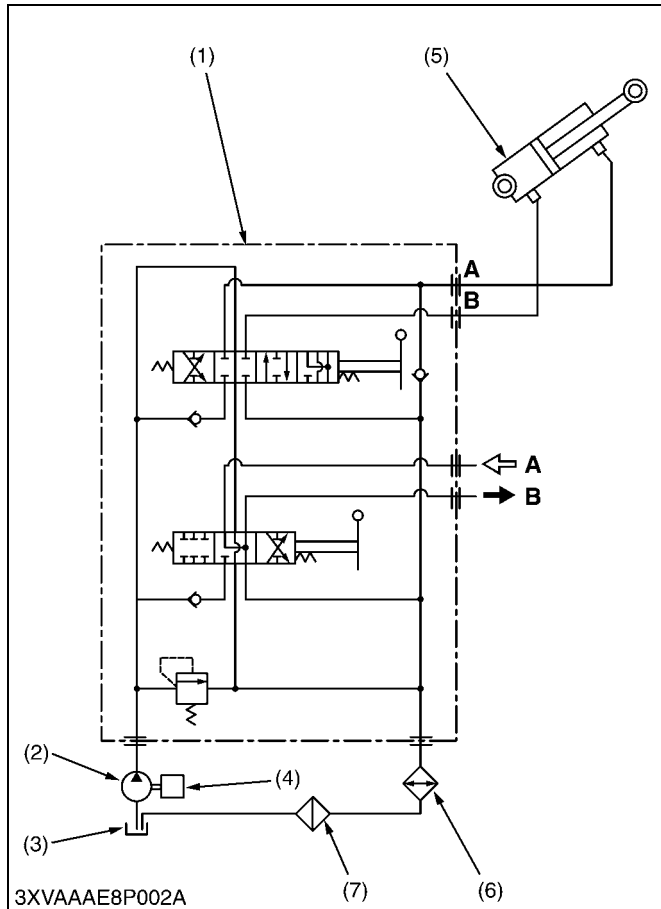


The cargo bed lifting system of RTV900 is composed of the hydraulic pump, control valve, hydraulic cylinder, oil tank and other components as shown in the figure.

This hydraulic system has the hydraulic oil tank besides in the transmission case.

## 2. HYDRAULIC CIRCUIT

### [1] HYDRAULIC CARGO BED LIFT OR HYDRAULIC OUTLET



The cargo bed lifting system of RTV900 is composed of the hydraulic pump, hydraulic outlet valve, hydraulic cylinder, oil tank and other components as shown in the figure.

This system has the following functions.

1. Oil is supplied by hydraulic pump which is driven by input shaft in the transmission case. As the input shaft is connected to the idle gear, hydraulic pump starts running when engine is started.
2. The hydraulic pump forces out the oil to hydraulic outlet valve for cargo bed lift system or hydraulic power take off.
3. An oil cooler has been equipped to the hydraulic utility model in order to make it possible to use the hydraulic unit in a continuous fashion.

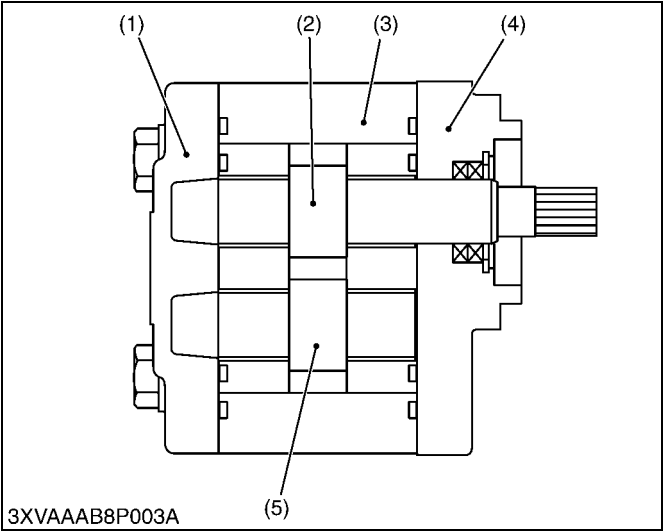
The oil cooler is cooled down by an electric fan. The electric fan has been set to start its operation by a switch when the oil temperature in the oil tank exceeds 60 °C (140 °F).

- |                            |                          |
|----------------------------|--------------------------|
| (1) Hydraulic Outlet Valve | (6) Oil Cooler           |
| (2) Hydraulic Pump         | (7) Oil Filter Cartridge |
| (3) Oil Tank               |                          |
| (4) Transmission           |                          |
| (5) Hydraulic Cylinder     |                          |
|                            | <b>A : In</b>            |
|                            | <b>B : Out</b>           |

W1012930



### 3. HYDRAULIC PUMP



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

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

Maximum displacement is as follows.

Displacement	Engine speed	Condition
18.9 L/min. 5.0 U.S.gals./min. 4.2 Imp.gals./min.	At 3200 min <sup>-1</sup> (rpm)	at no load

- (1) Cover
- (2) Drive Gear
- (3) Casing
- (4) Cover
- (5) Driven Gear

W1013860

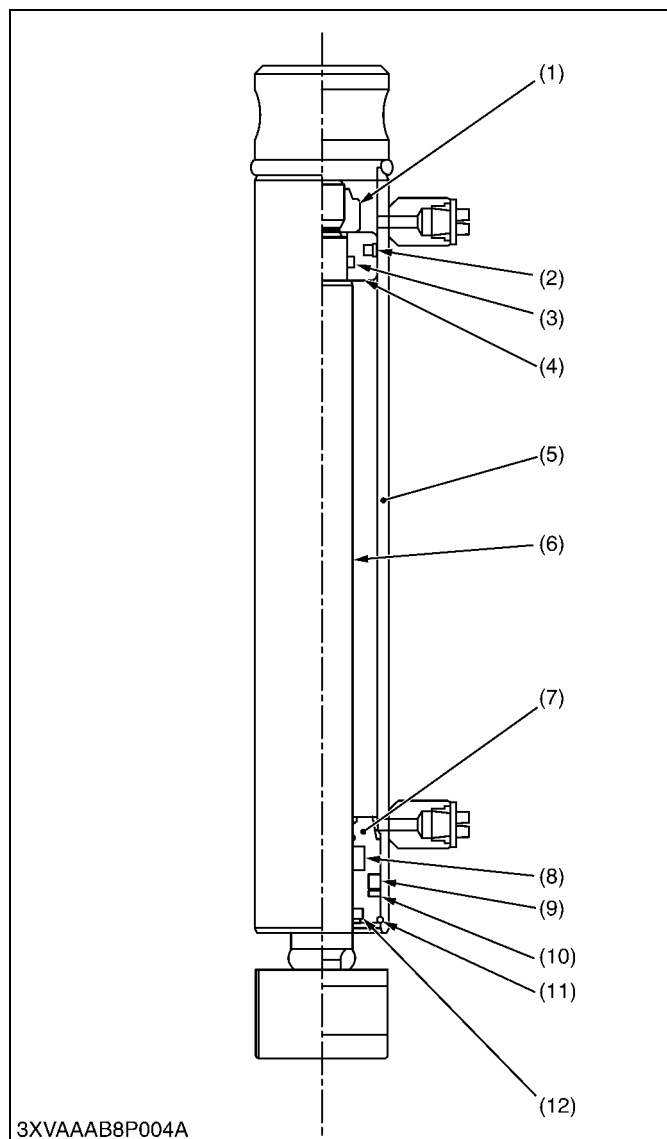
## 4. HYDRAULIC CYLINDER

The external type hydraulic cylinders are used for three point linkage system. This hydraulic cylinder is single double type, and it is installed directly between main frame arm cargo bed.

The main components of the hydraulic cylinder are shown in the figure.

- |                   |                         |
|-------------------|-------------------------|
| (1) Piston Nut    | (7) End Cap             |
| (2) Piston Seal   | (8) End Seal            |
| (3) Piston O-ring | (9) End O-ring          |
| (4) Piston        | (10) Backup Ring        |
| (5) Cylinder Tube | (11) Internal Snap Ring |
| (6) Rod           | (12) Wiper Seal         |

W1013054

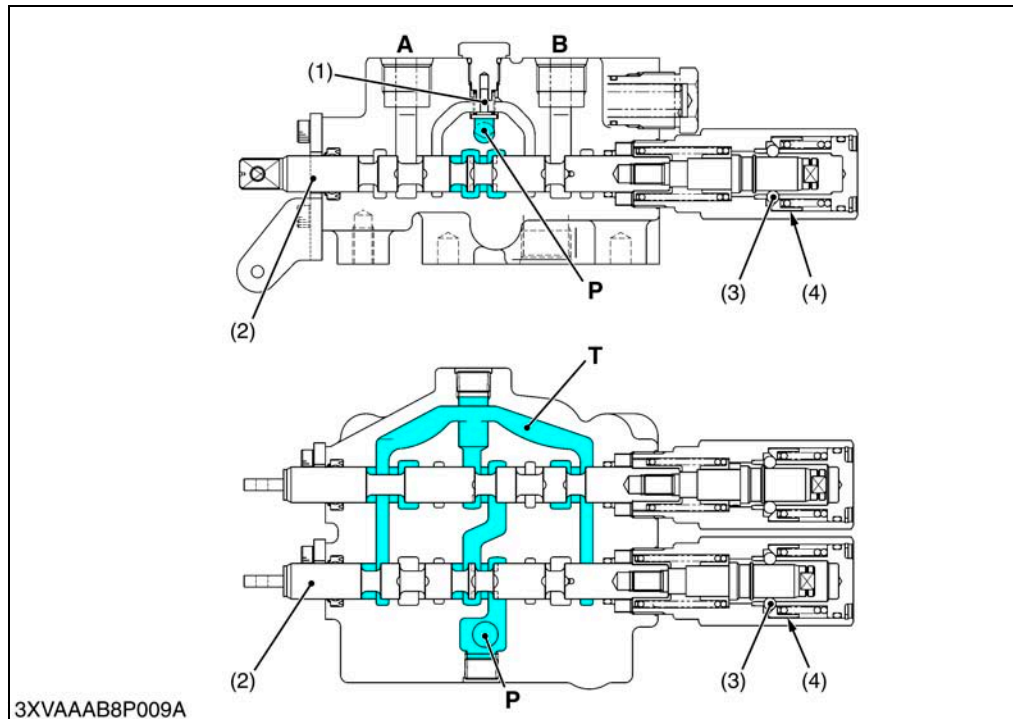


## 5. HYDRAULIC OUTLET VALVE

### [1] DOUBLE ACTING TYPE 2 (MONO BLOCK TYPE)

#### (1) Floating with Detent Valve for Hydraulic Lift Cylinder

##### ■ Neutral

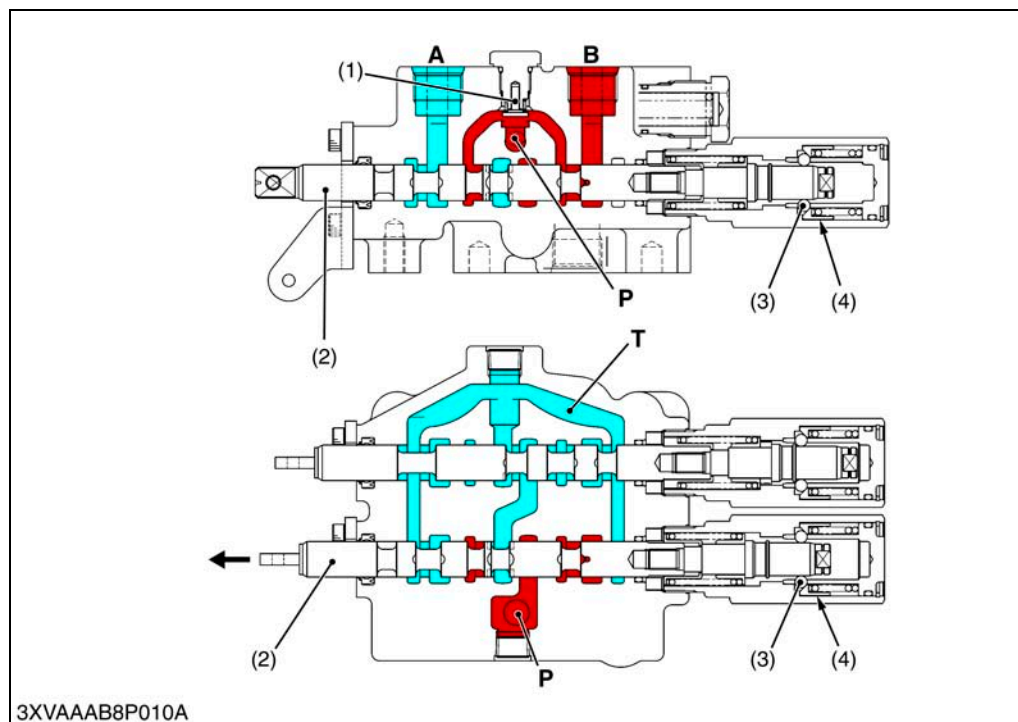


- (1) Spool
- (2) Check Valve
- (3) Detent Ball
- (4) Detent Sleeve

A : A Port (Lift Cylinder)  
 B : B Port (Lift Cylinder)  
 P : Pump Port  
 T : Tank Port

Pressure-fed oil from the hydraulic pump is delivered into the **P** port, and flows to oil tank through **T** port.

## ■ Lift



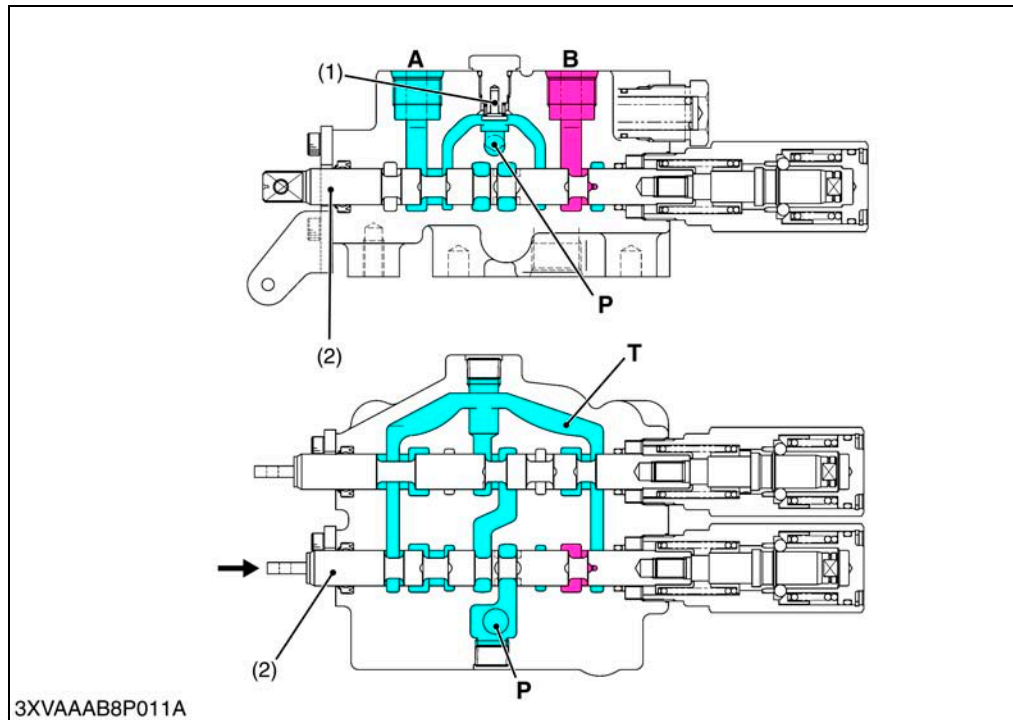
- (1) Check Valve
- (2) Spool

**A : A Port (Lift Cylinder)**  
**B : B Port (Lift Cylinder)**  
**P : Pump Port**  
**T : Tank Port**

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the lift cylinder via **B** port.

Return oil from the lift cylinder flows from the **A** port to the oil tank through **T** port.

■ Down



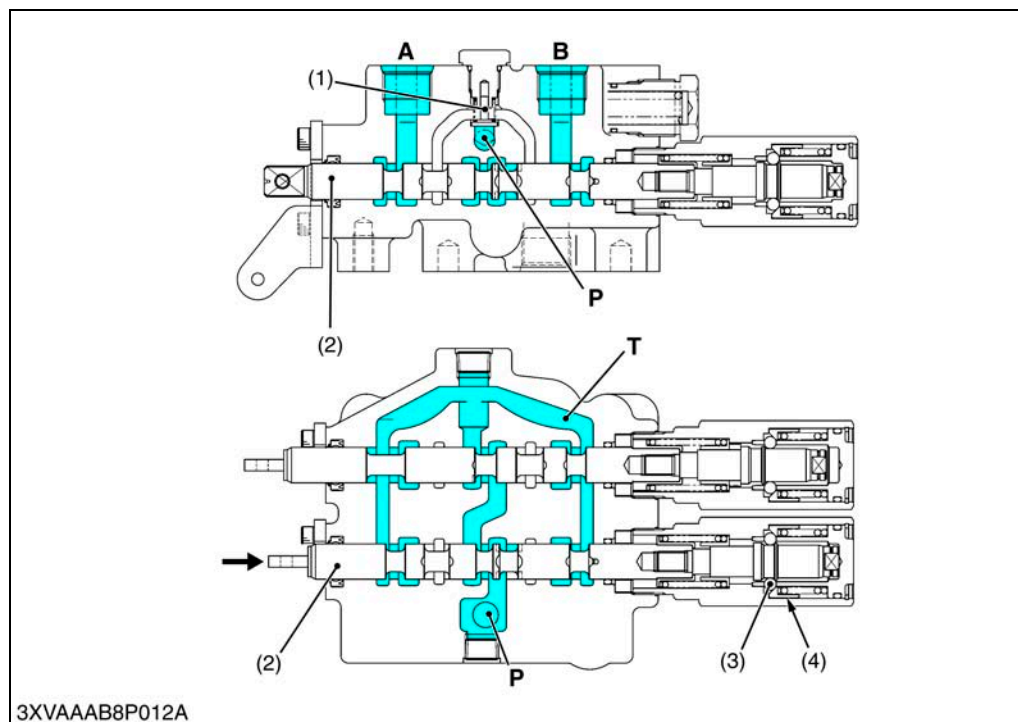
- (1) Check Valve
- (2) Spool

**A : A Port**  
**(Lift Cylinder)**  
**B : B Port**  
**(Lift Cylinder)**  
**P : Pump Port**  
**T : Tank Port**

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the lift cylinder via **A** port.

Return oil from the lift cylinder flows from the **B** port to the oil tank through **T** port.

## ■ Floating



- (1) Check Valve
- (2) Spool
- (3) Detent Ball
- (4) Detent Sleeve

**A : A Port (Lift Cylinder)**

**B : B Port (Lift Cylinder)**

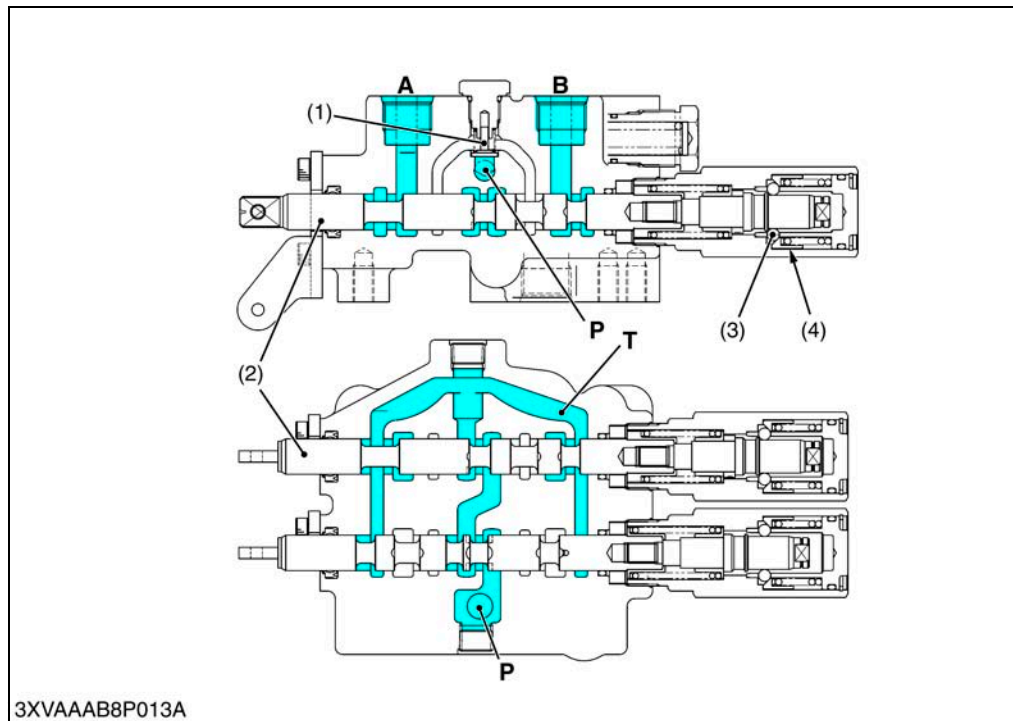
**P : Pump Port**

**T : Tank Port**

When the spool (2) moves to extreme left, the detent ball (3) and detent sleeve (4) hold the spool (2) at the floating position as shown in the figure. The pressure-fed oil from the hydraulic pump flows to oil tank through **T** port. And, the **A** port and **B** port lead to the **T** port along the notched sections of the spool (2). As a result, raising the cargo bed by the hand, and lowering become possible.

## (2) On-Off Valve for Hydraulic Outlet

### ■ Neutral (Floating)



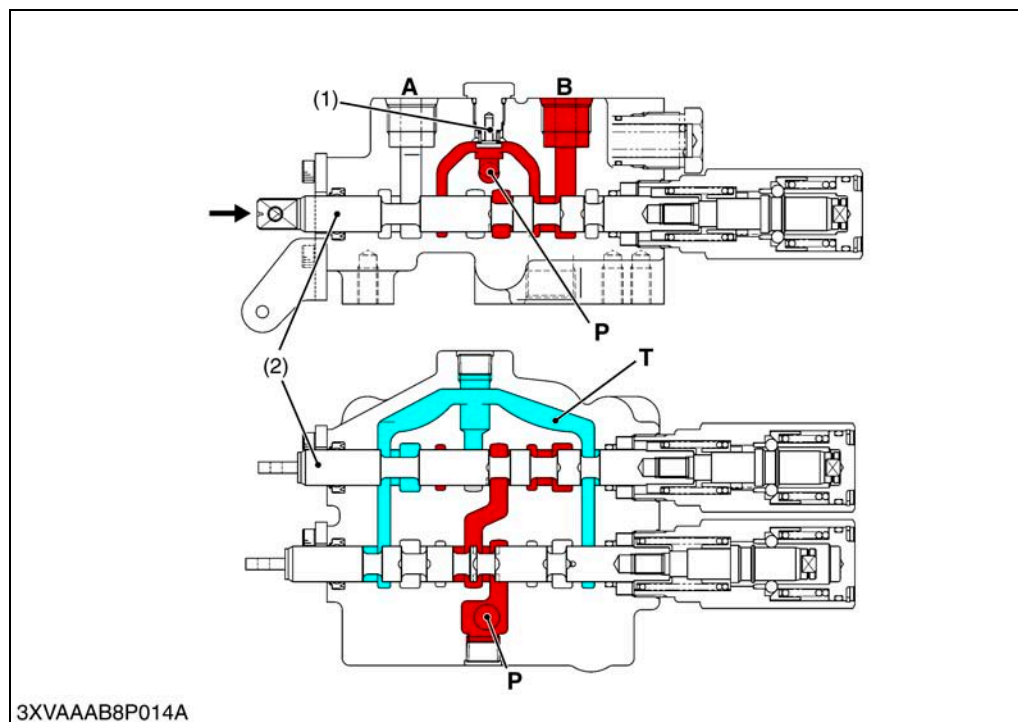
- (1) Check Valve
- (2) Spool
- (3) Detent Ball
- (4) Detent Sleeve

**A : A Port**  
**(Hydraulic Equipment)**  
**B : B Port**  
**(Hydraulic Equipment)**  
**P : Pump Port**  
**T : Tank Port**

Pressure-fed oil from the hydraulic pump is delivered into the **P** port, and flows to oil tank through **T** port.

And, the **A** port and **B** port lead to the **T** port along the notched sections of the spool (2). As a result, the oil pressure which remain in hydraulic equipment can be removed.

# ■ Lift



- (1) Check Valve
- (2) Spool

**A : A Port**  
 (Hydraulic Equipment)  
**B : B Port**  
 (Hydraulic Equipment)  
**P : Pump Port**  
**T : Tank Port**

When the spool (2) is moved in the direction of the arrow, the pressure-fed oil in the **P** port opens the check valve (1) and flows to the hydraulic equipment inlet via **B** port.  
 Return oil from the hydraulic equipment outlet flows from the **A** port to the oil tank through **T** port.



# SERVICING

## CONTENTS

1. TROUBLESHOOTING .....	H7-S1
2. SERVICING SPECIFICATIONS .....	H7-S2
3. TIGHTENING TORQUES .....	H7-S3
4. CHECKING, DISASSEMBLING AND SERVICING.....	H7-S4
[1] CHECKING AND ADJUSTING .....	H7-S4
(1) Hydraulic Control Valve, Pump and Cylinder .....	H7-S4
[2] DISASSEMBLING AND ASSEMBLING.....	H7-S5
(1) Separating Hydraulic Pump .....	H7-S5
(2) Separating Hydraulic Cylinder, Hydraulic Outlet Valve and Oil Cooler .....	H7-S6
(3) Disassembling Hydraulic Outlet Valve Assembly .....	H7-S9
(4) Disassembling Hydraulic Cylinder .....	H7-S10

# 1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
<b>Implement Does Not Rise (No Noise)</b>	Hydraulic outlet valve broken	Replace	H7-S8
	Hydraulic outlet valve improperly assembled	Repair	H7-S9
	Relief valve spring damaged	Replace	H7-S9
	Spool sticks	Repair	H7-S9
	Piston O-ring or cylinder damaged	Replace	H7-S10
<b>Implement Does Not Rise (Noise)</b>	Suction hose loosen or broken	Repair or replace	H7-S5
	Insufficient hydraulic auxiliary oil	Refill	H2-S5
	Relief valve setting pressure too low	Adjust or replace	H7-S4
	Hydraulic pump broken	Replace	H7-S5
<b>Implement Does Not Lower</b>	Hydraulic outlet valve malfunctioning	Repair or replace	H7-S8
<b>Implement Drops by Its Weight</b>	Hydraulic lift cylinder worn or damaged	Replace	H7-S7
	Piston O-ring worn or damaged	Replace	H7-S10
	Hydraulic outlet valve malfunctioning	Replace	H7-S8

W1014322

## 2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure	14.7 to 15.7 MPa 150 to 160 kgf/cm <sup>2</sup> 2133 to 2276 psi	—

W1013874

### 3. TIGHTENING TORQUES

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

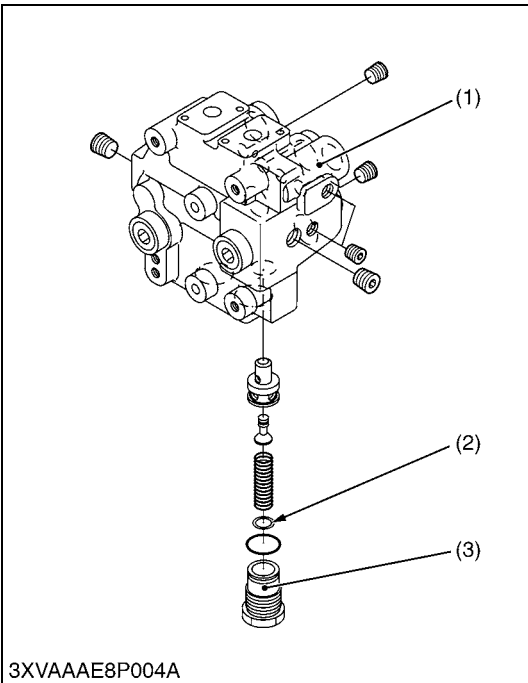
Item	N·m	kgf·m	ft-lbs
Hydraulic pump mounting bolt and nut	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Relief valve plug	29.4 to 43.3	3.0 to 3.5	21.7 to 25.3
Load check valve plug	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Check valve seat	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Check valve plug	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7
Cargo lift hydraulic cylinder piston mounting nut	120 to 170	12.2 to 17.3	88.5 to 125.4

W1012736

# 4. CHECKING, DISASSEMBLING AND SERVICING

## [1] CHECKING AND ADJUSTING

### (1) Hydraulic Control Valve, Pump and Cylinder



#### Relief Valve Setting Pressure

- 1. Set the adaptor, cable and pressure gauge.
- 2. Start the engine and depress the speed control pedal.
- 3. Move the hydraulic lift cylinder lever way up to operate the relief valve and read the gauge.
- 4. If the pressure is not within the factory specifications, adjust with the adjusting shims (3).

Relief valve setting pressure	Factory spec.	14.7 to 15.7 MPa 150 to 160 kgf/cm <sup>2</sup> 2133 to 2276 psi
-------------------------------	---------------	--

#### Condition

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

#### (Reference)

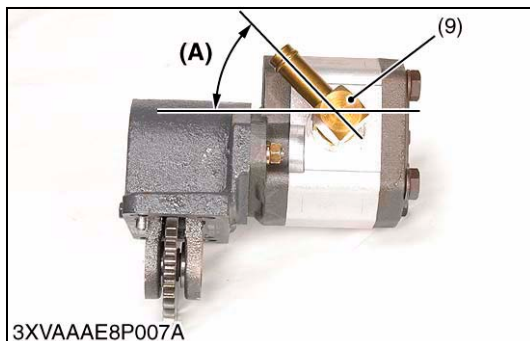
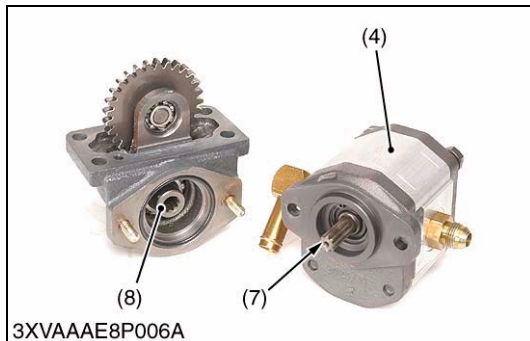
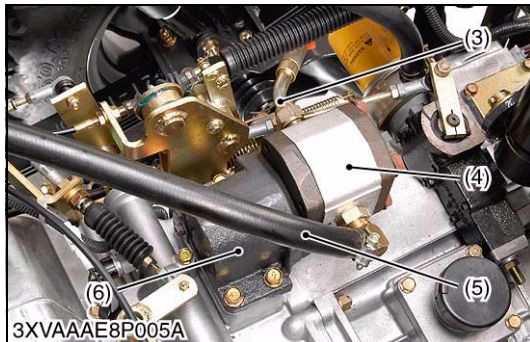
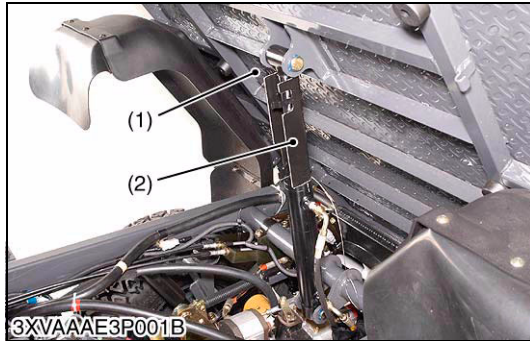
- Replace the hydraulic pump if pressure does not rise in 13.2 MPa (135 kgf/cm<sup>2</sup>, 1920 psi) or more.
- Thickness of shims (3) :  
0.1 mm (0.0039 in.), 0.2 mm (0.0079 in.), 0.4 mm (0.0157 in.)
- 0.27 MPa (2.74 kgf/cm<sup>2</sup>, 39.0 psi) pressure is increased whenever the thickness of adjusting shim is increased by 0.1 mm (0.0039 in.).

- (1) Control Valve Assembly
- (2) Shim
- (3) Plug

W1011231

## [2] DISASSEMBLING AND ASSEMBLING

### (1) Separating Hydraulic Pump



#### Hydraulic Pump

1. Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop (if hydraulic cylinder equipped).
2. Disconnect the suction hose (5) and delivery hose (3) from hydraulic pump.
3. Remove the pump base (6) and hydraulic pump (4) as a unit.
4. Remove the hydraulic pump mounting bolt and nut, then separate the hydraulic pump.

#### (When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of pump base and front case.
- Take care not to damage the O-ring on the hydraulic pump.
- Apply grease to gear shaft inside and hydraulic pump shaft (7).
- The install angle of elbow (9) is as shown in the table below.

Tightening torque	Pump base mounting screw	39.0 to 44.0 N·m 4.0 to 4.5 kgf·m 28.8 to 32.5 ft-lbs
	Hydraulic pump mounting bolt and nut	48.0 to 56.0 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 ft-lbs

Angle of elbow (A)	45 °
--------------------	------

- |                    |                          |
|--------------------|--------------------------|
| (1) Cargo Bed      | (6) Pump Base            |
| (2) Safety Support | (7) Hydraulic Pump Shaft |
| (3) Delivery Hose  | (8) Gear Shaft           |
| (4) Hydraulic Pump | (9) Elbow                |
| (5) Suction Hose   |                          |

W1011584

## (2) Separating Hydraulic Cylinder, Hydraulic Outlet Valve and Oil Cooler



### Battery



#### **CAUTION**

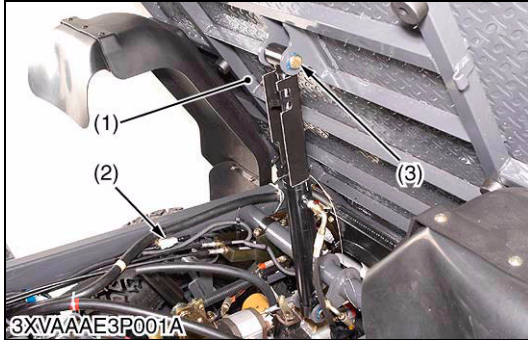
- When disconnecting the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.

1. Disconnect the negative cable (1) from the battery.
2. Disconnect the positive cable (2) from the battery.

(1) Negative Cable

(2) Positive Cable

W1017351



### Cargo Bed

1. Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop. (If hydraulic cylinder equipped.)
2. Remove the cotter pin and clevis pin (3). (If hydraulic cylinder equipped.)
3. Disconnect the connector (2) from main harness, then separate the harness for the tail lamps.
4. Loosen the lock nut (4) and remove the hinge bolt (5) and nut.

(1) Cargo Bed

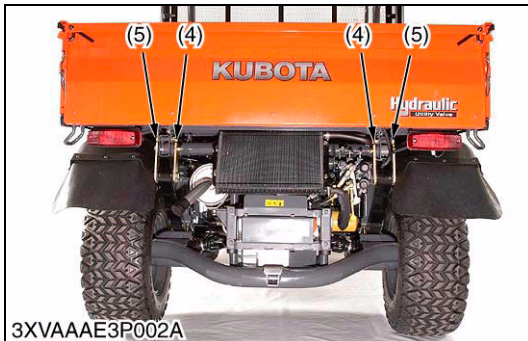
(4) Lock Nut

(2) Connector

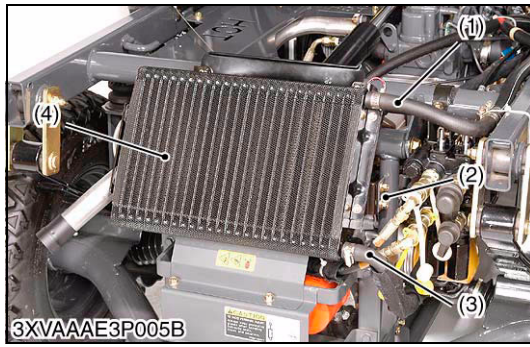
(5) Hinge Bolt

(3) Clevis Pin

W1013914







### **Oil Cooler and Fan Motor Assembly**

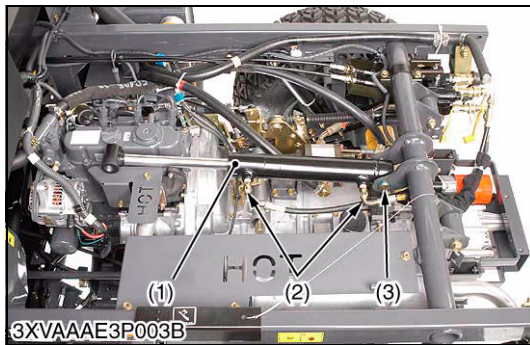
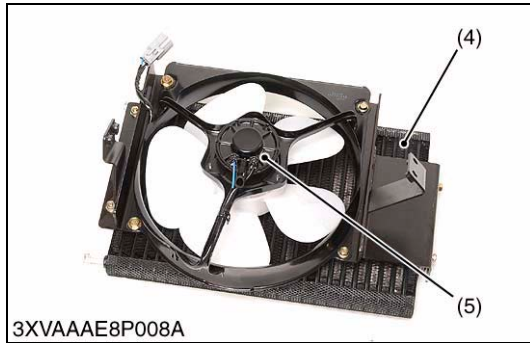
1. Place oil pan underneath the oil cooler (4).
2. Disconnect the delivery hose (3) from oil cooler (4).
3. Disconnect the return hose (1) from oil cooler (4).
4. Remove the oil cooler bracket (2) and remove the oil cooler (4) with fan motor assembly (5).
5. Remove the fan motor assembly (5) from oil cooler (4).

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

- When reassembling the oil cooler assembly, pay your attention so that the hydraulic hose does not contact with the fan cover. Route the hydraulic hose through the front of the fan cover.

- |                        |                        |
|------------------------|------------------------|
| (1) Return Hose        | (4) Oil Cooler         |
| (2) Oil Cooler Bracket | (5) Fan Motor Assembly |
| (3) Delivery Hose      |                        |

W1014094



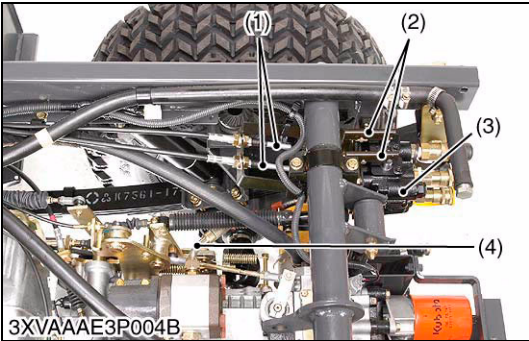
### **Hydraulic Cylinder**

1. Disconnect the hydraulic hoses (2) from hydraulic cylinder (1).
2. Remove the cotter pin and clevis pin (3).

- |                        |                |
|------------------------|----------------|
| (1) Hydraulic Cylinder | (3) Clevis Pin |
| (2) Hydraulic Hose     |                |

W1014286





Hydraulic Outlet Valve Assembly

- 1. Disconnect the cables (1) from hydraulic outlet valve lever (2).
- 2. Disconnect the delivery hose (4) from hydraulic pump.
- 3. Remove the hydraulic outlet valve (3).

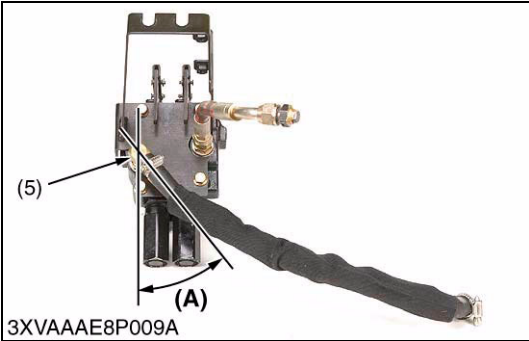
(When reassembling)

- The install angle of elbow (5) is as shown in the table below.

Angle of elbow (A)	0.785 rad (45 °)
--------------------	------------------

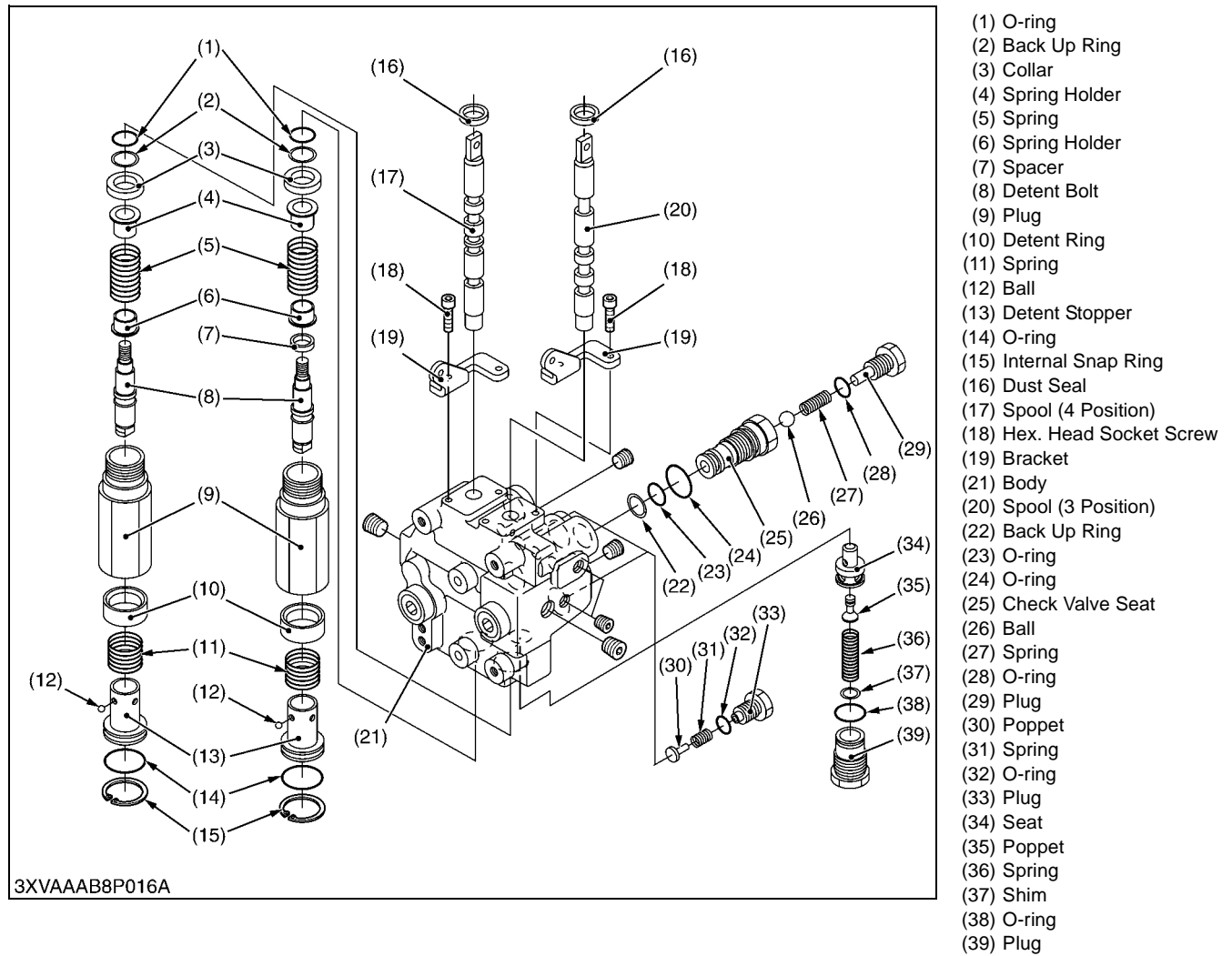
- (1) Cable
- (2) Hydraulic Outlet Valve Lever
- (3) Hydraulic Outlet Valve
- (4) Delivery Hose
- (5) Elbow

W1014380



### (3) Disassembling Hydraulic Outlet Valve Assembly

#### 3 Position Valve and 4 Position Valve (Monoblock Type) (To be continued)



W1013118

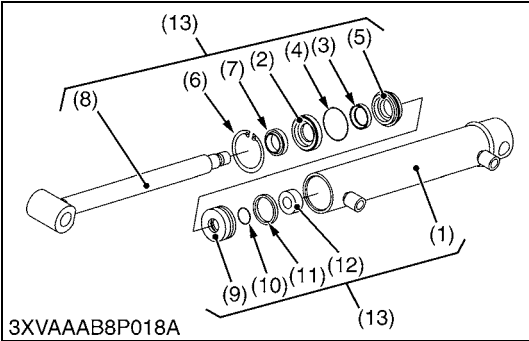
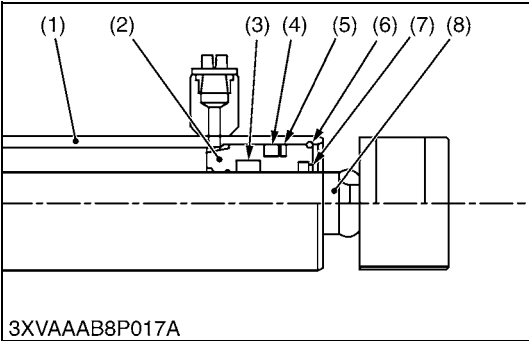
3 Position Valve and 4 Position Valve (Monoblock Type) (Continued)

1. Loosen the plug (9) and draw out the spool (8) with other component parts from valve body (21).
2. Remove the internal snap ring (15) and detent stopper (13).
3. Loosen the detent bolt (8) from spool (17) and then separate the spool and the detent bolt.
4. Loosen the plug (9) and draw out the spool (20) with other component parts from valve body (21).
5. Remove the internal snap ring (15) and detent stopper (13).
6. Loosen the detent bolt (8) from spool (20) and then separate the spool and the detent bolt.
7. Remove the plug (33) and take out the spring (31) and poppet (30).
8. Remove the check valve seat (25) assembly.
9. Remove the plug (39) and take out the shim (37), spring (36), poppet (35) and seat (34).

(When reassembling)

- Clean all parts with a suitable solvent, and dry with a lint-free cloth or air.
- Visually inspect all parts for signs of scoring or damage.
- Install the spool and spacer to the valve housing, using care not to damage the O-ring.

(4) Disassembling Hydraulic Cylinder



Cargo Lift Hydraulic Cylinder

1. Drain hydraulic oil from the cylinder, and carefully cramp the tube end of the cylinder in a vise.
2. Push the end cap (2) to inside of cylinder tube (1).
3. Remove the internal snap ring (6).
4. Pull out the rod assembly (13) from the cylinder tube (1).
5. Carefully cramp the rod end in a vise.
6. Unscrew the nut (12), and remove the piston (9) and end cap (2) from the rod (8).

(When reassembling)

- Visually inspect the cylinder tube (1) for signs of scoring or damage.
- Visually inspect all parts for signs of scoring or damage.
- Insert the piston rod to the end cap, using care not to damage the wiper seal (7) and end seal (3).
- Insert the rod assembly to the cylinder tube, using care not to damage the piston seal on the piston.
- Install the end cap to the cylinder tube, using care not to damage the O-ring on the cylinder head.

Tightening torque	Cargo lift hydraulic cylinder piston mounting nut	120 to 170 N·m
		12.2 to 17.3 kgf·m
		88.5 to 125.4 ft·lbs

- (1) Cylinder Tube

(2) End Cap

(3) End Seal

(4) End O-ring

(5) Backup Ring

(6) Internal Snap Ring

(7) Wiper Seal
- (8) Rod

(9) Piston

(10) Piston O-ring

(11) Piston Seal

(12) Piston Nut

(13) Rod Assembly

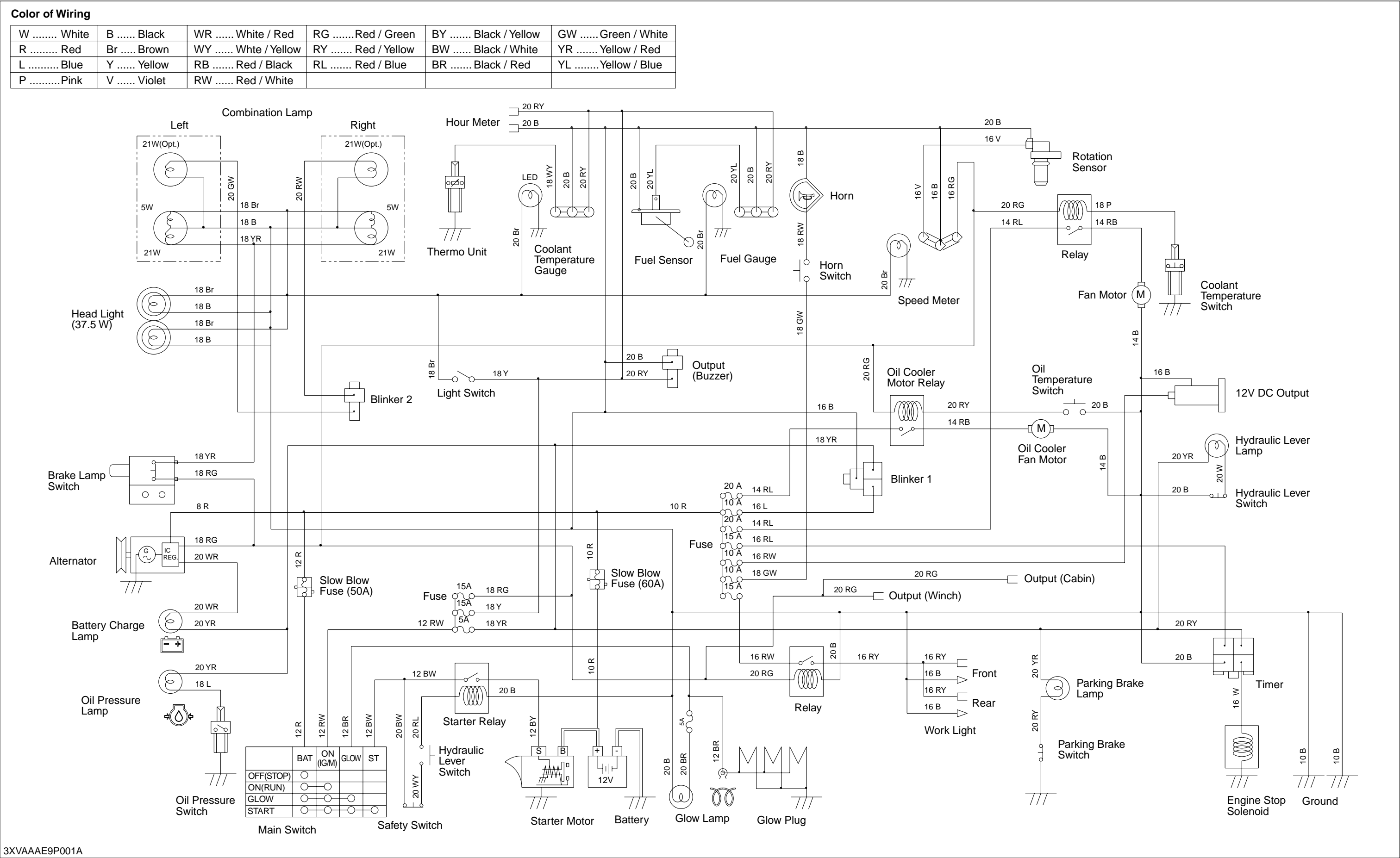
W1014079

# MECHANISM

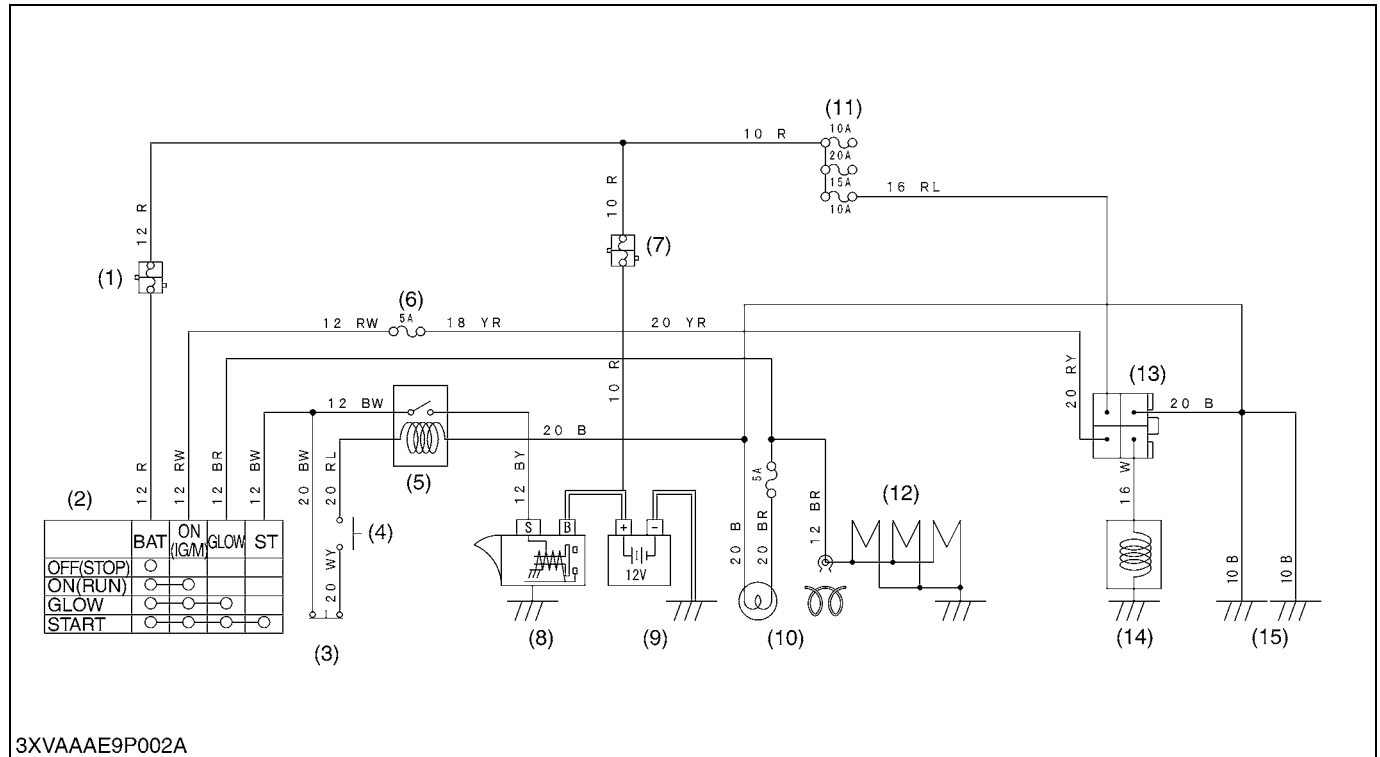
## CONTENTS

1. WIRING DIAGRAM .....	H8-M1
2. STARTING SYSTEM .....	H8-M2
[1] SAFETY SWITCH .....	H8-M3
(1) Hydraulic Outlet Lever .....	H8-M3
3. HYDRAULIC OIL COOLING SYSTEM .....	H8-M4
[1] OIL COOLER FAN MOTOR.....	H8-M5
[2] OIL TEMPERATURE SWITCH.....	H8-M5

1. WIRING DIAGRAM



## 2. STARTING SYSTEM



- |   |                           |                |                           |
|---|---------------------------|----------------|---------------------------|
| (1) Slow Blow Fuse (50 A)                       | (5) Starter Relay         | (9) Battery    | (13) Timer                |
| (2) Main Switch                                 | (6) Fuse                  | (10) Glow Lamp | (14) Engine Stop Solenoid |
| (3) Safety Switch                               | (7) Slow Blow Fuse (60 A) | (11) Fuse      | (15) Ground               |
| (4) Hydraulic Lever Switch<br>(Turf Model Only) | (8) Starter Motor         | (12) Glow Plug |                           |

When the main switch is turned to the **PREHEAT** position, the terminal **BAT** is connected to the terminals **GLOW** and **ON**. The glow plugs become red-hot, and the preheat indicator lamp also lights on while preheating.

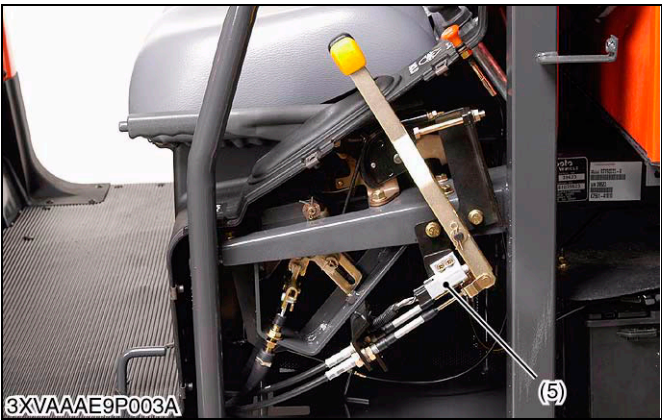
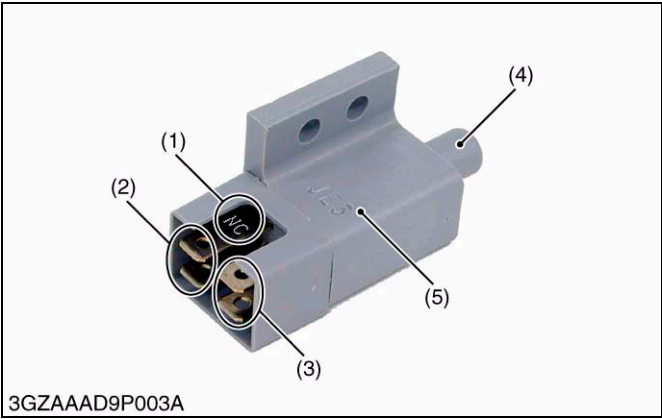
When the main switch is then turned to the **START** position with the safety switches on, the terminal **BAT** is connected to the terminals **ST** and **ON**. Consequently, battery current flows to the starter motor and start the engine.

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

When the main switch turned from the **ON** position to the **OFF** position, the fuel cut-off solenoid moves the fuel injection pump control rack to the “**No Fuel Injection**” position and stop the engine.

[1] SAFETY SWITCH

(1) Hydraulic Outlet Lever



Switches are located at the hydraulic outlet lever.  
Switch is one of the four connectors switch. Four connector are device to two sections.

It means that one switch have independent two switches in the switch.

Hydraulic outlet lever switch has normally open and normally closed connectors.

Function of switch is to control current from main switch to starter and hydraulic outlet warning lamp relay.

Switches are changed to “CLOSE” or “OPEN” electrically by changing the hydraulic outlet lever.

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

Safety switch	Type	
	Connector (RH)	Connector (LH)
Hydraulic outlet lever switch	Normally open	Normally closed

- (1) NC Mark (NC : Normally Closed)

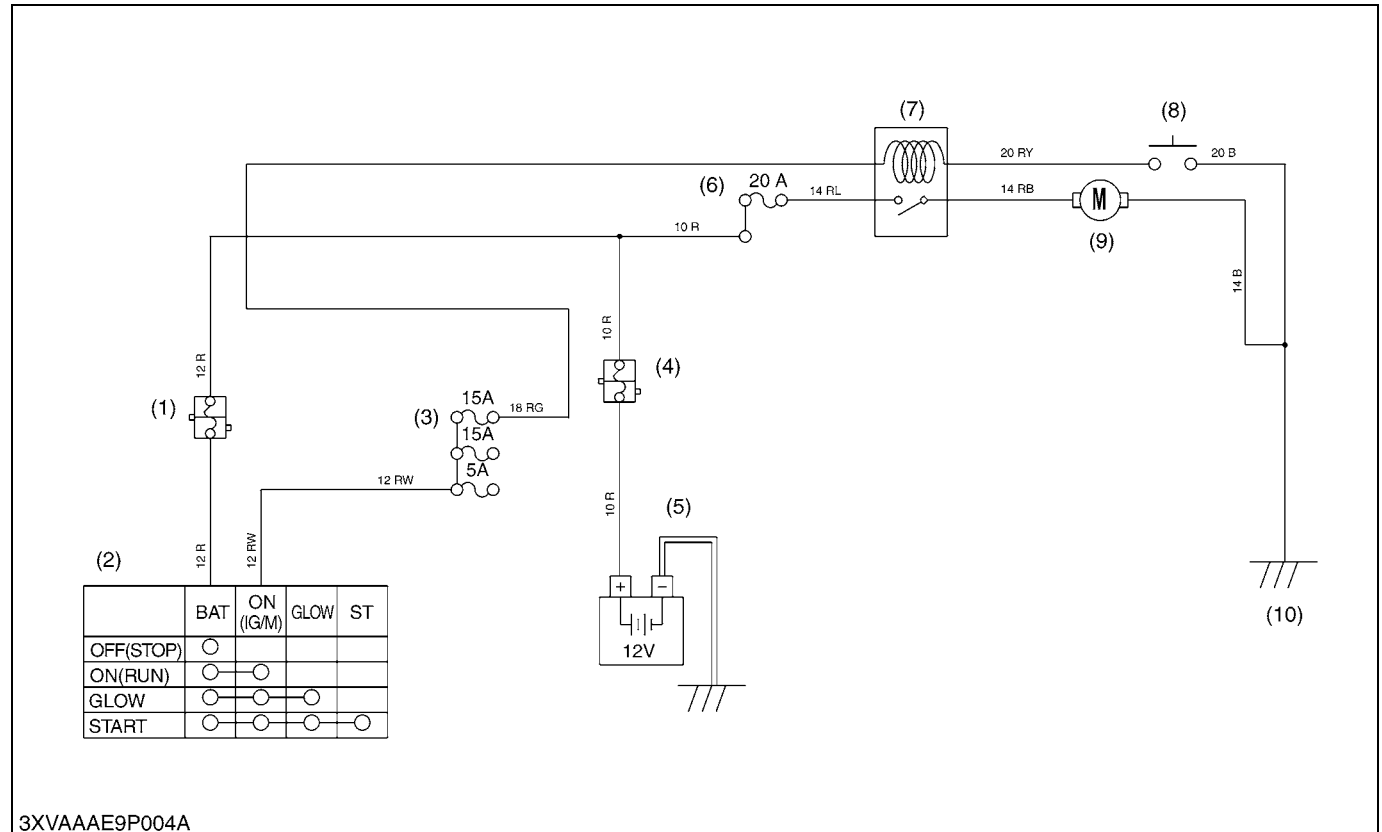
(2) 2P Connector (LH) for Hydraulic Outlet Warning Lamp
- (3) 2P Connector (RH) for Starter Relay

(4) Plunger

(5) Hydraulic Outlet Lever Switch

W1013107

### 3. HYDRAULIC OIL COOLING SYSTEM



(1) Slow Blow Fuse (50 A)

(2) Main Switch

(3) Fuse

(4) Slow Blow Fuse (60 A)

(5) Battery

(6) Fuse

(7) Oil Cooler Motor Relay

(8) Oil Temperature Switch

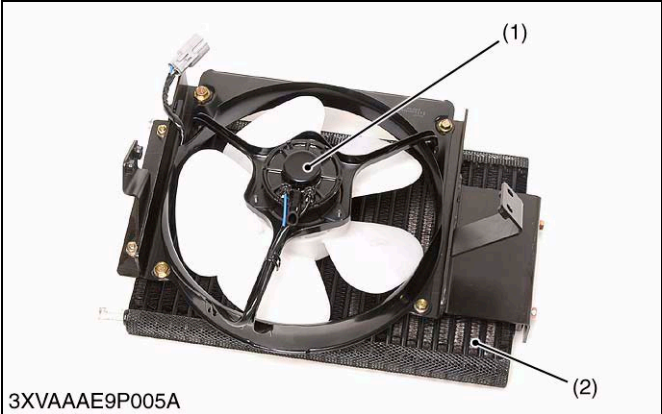
(9) Oil Cooler Fan Motor

(10) Ground

The hydraulic oil cooling system consists of oil temperature switch, oil cooler motor relay, oil cooler fan motor, etc..



[1] OIL COOLER FAN MOTOR

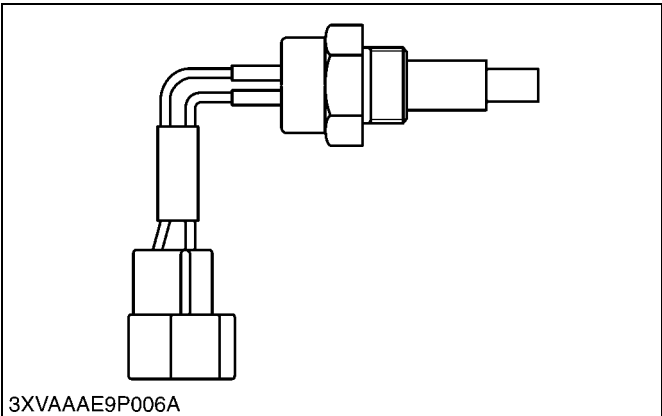


The oil cooler fan motor of this vehicle is not driven by the engine drive but an electric motor.  
An electric fan can be installed by separating from the engine.  
And, it can be operated when it is necessary.

- (1) Oil Cooler Fan Motor
- (2) Oil Cooler

W1015277

[2] OIL TEMPERATURE SWITCH

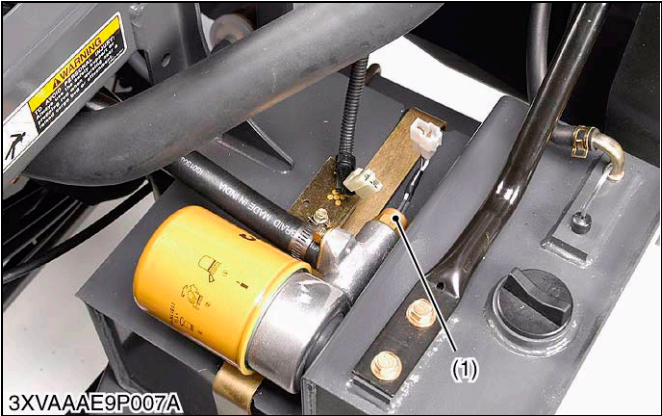


The oil temperature switch is installed to the oil filter cartridge flange of hydraulic oil, and its tip is in touch with the coolant.  
The fan motor rotates when the oil temperature goes up more than the specified value.  
When the oil temperature falls below the specified value, the fan motor stops.

Characteristics of Oil Temperature Switch		
Type	Operation Temperature	
	Fan motor rotate	Fan motor stop
Normally open	55 to 65 °C (131 to 149 °F)	53 °C (127 °F)

- (1) Oil Temperature Switch

W11236190



# SERVICING

## CONTENTS

1. CHECKING, DISASSEMBLING AND SERVICING.....	H8-S1
[1] CHECKING AND ADJUSTING .....	H8-S1
(1) Safety Switch .....	H8-S1
(2) Hydraulic Oil Cooling System .....	H8-S2
(3) Gauges .....	H8-S4

# 1. CHECKING, DISASSEMBLING AND SERVICING

## [1] CHECKING AND ADJUSTING



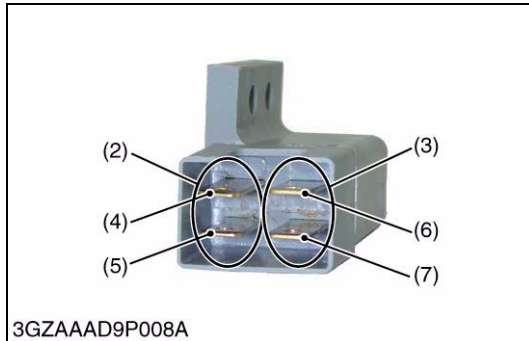
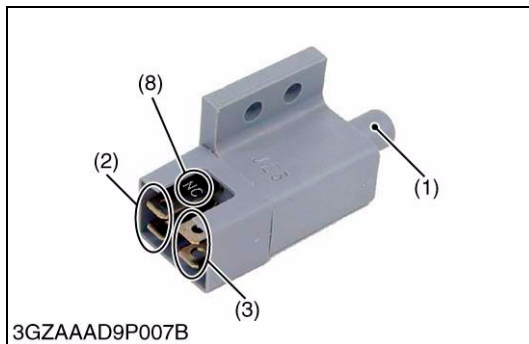
### CAUTION

- 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 splattered with it, wash it away completely with water immediately.
- Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.

### ■ IMPORTANT

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

### (1) Safety Switch



### Hydraulic Outlet Lever Switch

1. Measure the resistance with an ohmmeter between terminals.
2. If the resistance values specified below are not indicated, safety switch faulty.

### ■ Plunger is pushed into the switch body

Resistance 1 terminal (4) – 2 terminal (5)	Factory spec.	Infinity
Resistance 3 terminal (6) – 4 terminal (7)	Factory spec.	Continuity

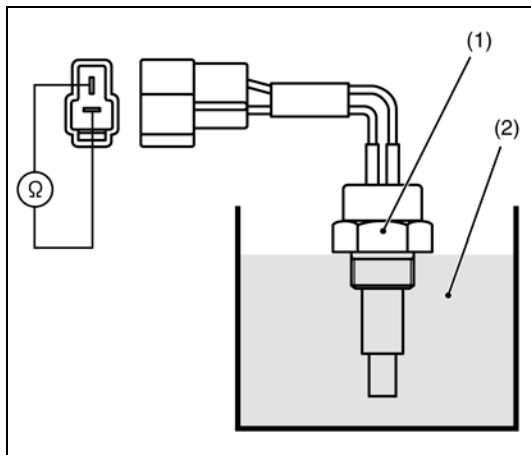
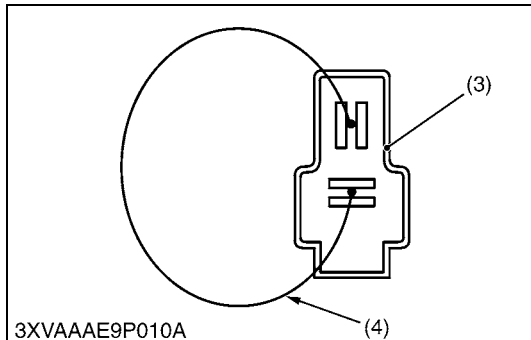
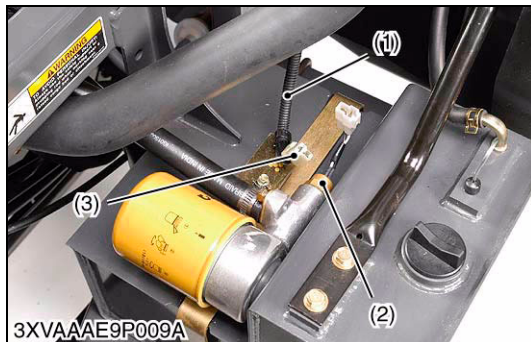
### ■ Plunger is released

Resistance 1 terminal (4) – 2 terminal (5)	Factory spec.	Continuity
Resistance 3 terminal (6) – 4 terminal (7)	Factory spec.	Infinity

- |                       |                                   |
|-----------------------|-----------------------------------|
| (1) Plunger           | (6) 3 Terminal                    |
| (2) 2P Connector (LH) | (7) 4 Terminal                    |
| (3) 2P Connector (RH) | (8) NC Mark                       |
| (4) 1 Terminal        | (9) Hydraulic Outlet Lever Switch |
| (5) 2 Terminal        |                                   |

W1010708

## (2) Hydraulic Oil Cooling System



### Fan Motor Wiring Harness

1. Disconnect the wiring lead (1) from oil temperature switch after turning the main switch **OFF**.
2. Turn the main switch **ON** and connect terminal **A** connect to terminal **B** with a jumper lead (4).
3. If the oil cooler fan motor does not rotate wiring harness or relay is faulty

- (1) Wiring Harness
- (2) Oil Temperature Sensor
- (3) Connector
- (4) Jumper Lead

(a) From Fan Motor Relay

W1018763

### Oil Temperature Switch

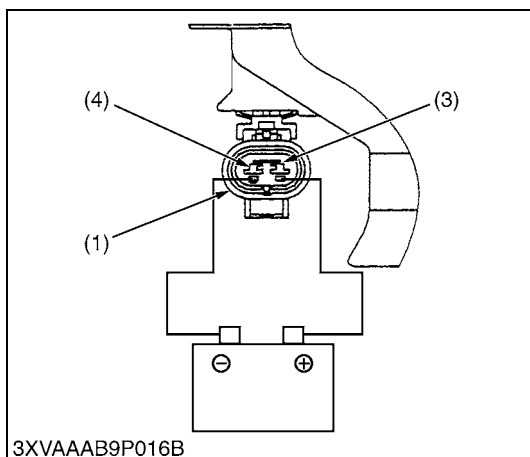
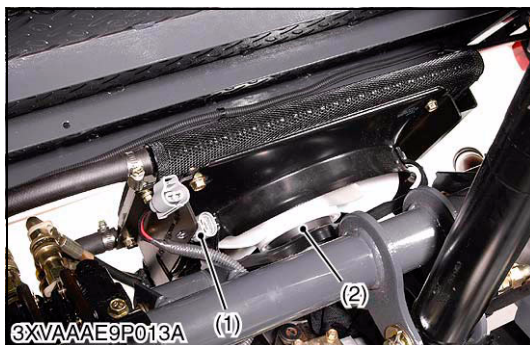
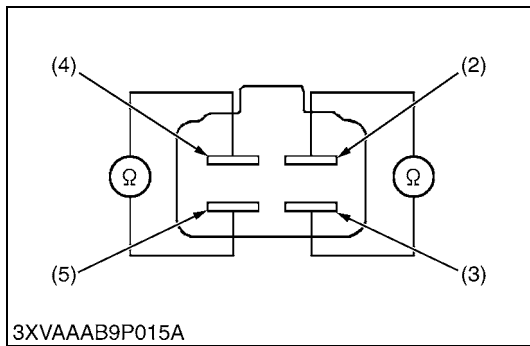
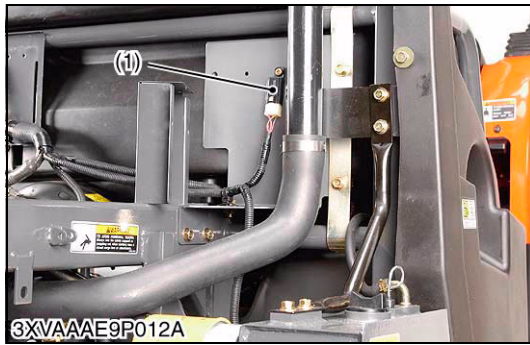
1. Measure the resistance with an ohmmeter across the switch terminal and the switch body.
2. If 0 ohm is not indicated in the oil temperature at 55 °C (131 °F) or more, the sensor is faulty.
3. If infinity is not indicated in the oil temperature at lower than 53 °C (127 °F), the sensor is faulty.

Resistance (Switch terminal – Switch body)	At oil temperature lower than 53 °C (127 °F)	Infinity
	At oil temperature more than 55 to 65 °C (131 to 149 °F)	0 Ω

(1) Oil Temperature Sensor

(2) Oil

W1018994



### **Oil Cooler Fan Motor Relay**

1. Disconnect the connector from oil cooler fan motor relay (1) after turning the main switch off.
2. Remove the fan motor relay from bracket.
3. Measure the resistance with an ohmmeter across the terminal 1 (2) to terminal 2 (3) and terminal 3 (4) to terminal 4 (5).
4. If resistance differs from the factory specifications, the relay is faulty.

Resistance	Terminal 1 (2) – Terminal 2 (3)	Approx. 80 Ω
	Terminal 3 (4) – Terminal 4 (5)	Infinity

- (1) Oil Cooler Fan Motor Relay  
(2) Terminal 1  
(3) Terminal 2

- (4) Terminal 3  
(5) Terminal 4

W1019186

### **Oil Cooler Fan Motor**

1. Disconnect the connector of oil cooler fan motor (2) after turning the main switch off.
2. Connect a jumper lead from the terminal 2 (3) to the battery positive terminal post.
3. Connect a jumper lead momentarily between the terminal 3 (4) and the battery negative terminal post.
4. If the oil cooler fan motor does not run, replace the new one.

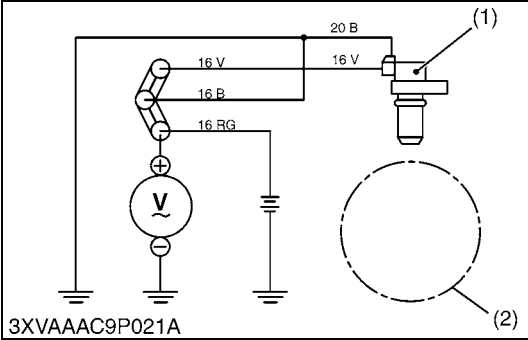
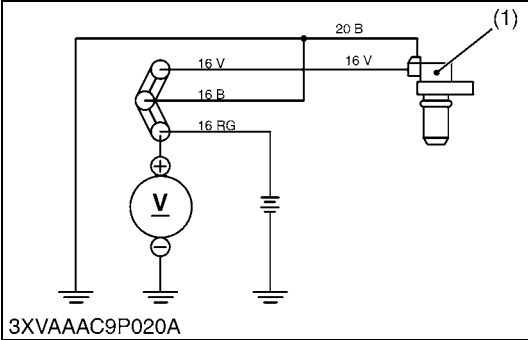
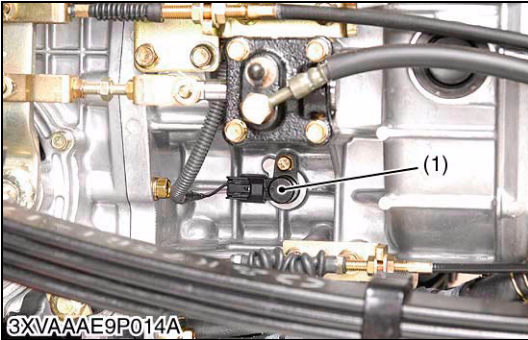
- (1) Fan Motor Connector  
(2) Oil Cooler Fan Motor

- (3) Terminal 2 (Positive Side)  
(4) Terminal 3 (Negative Side)

W1019470



(3) Gauges



Traveling Speed (Rotation) Sensor

**1) Lead Terminal Voltage**

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

Voltage	Lead terminal – Chassis	Approx. battery voltage
---------	-------------------------	-------------------------

**2) Output Voltage**

- 1. Lift up and secure with jack stands and choke the front wheels.
- 2. Remove the rear wheels.
- 3. Set the 4WD lever to **2WD** position.
- 4. Start the engine and shift the range shift lever in **L** position.
- 5. Depress the speed control pedal fully, and measure the output voltage with a voltmeter across the sensor terminal (Violet) and and chassis.
- 6. If the reference value is not indicated, the sensor is faulty.

Voltage of alternating current	Reference value	Approx. 3.6 V
--------------------------------	-----------------	---------------

(1) Rotation Sensor

(2) Gear

W1012120

# **10 NEW TRANSMISSION**

The machine RTV900 serial number of the new transmission for North America was changed into those starting with "50001".

# CONTENTS

TRAVELING SPEEDS.....	10-1
G. GENERAL .....	10-G1
[1] LUBRICANTS, FUEL AND COOLANT.....	10-G1
[2] MAINTENANCE CHECK LIST .....	10-G3
[3] CHECK AND MAINTENANCE .....	10-G3
10. NEW TRANSMISSION .....	10-M1
[1] MECHANISM.....	10-M1
[2] SERVICING .....	10-S1



# TRAVELING SPEEDS

Model	General Purpose			Worksite		Recreational		Worksite Utility	Turf Utility
Tire size (Rear)	25 × 10 – 12 Knobby	25 × 10 – 12 HDWS	25 × 12 – 12 Turf	25 × 10 – 12 HDWS	25 × 10 – 12 ATV	25 × 10 – 12 ATV	25 × 10 – 12 HDWS	25 × 10 – 12 HDWS	25 × 12 – 12 Turf
Range gear shift lever	km/h (mph)								
Low	16 (10)								
Medium	29 (18)								
High	40 (25)								
Reverse	20 (12)								

W1035065

## G. GENERAL

### [1] LUBRICANTS, FUEL AND COOLANT

No.	Place	Capacity	Lubricants, fuel and coolant
1	Fuel tank	28.0 L 7.4 U.S.gals 6.2 Imp.gals	No. 2-D diesel fuel No. 1-D diesel fuel if temperature is below -10 °C (14 °F)
2	Cooling system with recovery tank	4.0 L 4.2 U.S.qts 3.5 Imp.qts	Fresh clean water with anti-freeze
3	Engine crankcase with oil filter	(Oil filter exchanged) 3.1 L 3.3 U.S.qts 2.7 Imp.qts (Oil filter non-exchanged) 2.7 L 2.9 U.S.qts 2.4 Imp.qts	Engine oil : API Service CC, CD or CF Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40 0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 10W-40 Above 25 °C (77 °F): SAE30, 10W-30 or 10W-40
4	Transmission case	10.0 L 2.6 U.S.gals 2.2 Imp.gals	KUBOTA UDT or SUPER UDT fluid*
5	Front axle case	0.6 L 0.63 U.S.qts 0.52 Imp.qts	KUBOTA UDT or SUPER UDT fluid*
6	Knuckle case	Ref. 0.15 L Ref. 0.16 U.S.qts Ref. 0.13 Imp.qts	KUBOTA UDT or SUPER UDT fluid*
7	Brake fluid (reservoir and lines)	0.4 L 0.42 U.S.qts 0.35 Imp.qts	KUBOTA DOT3 GENUINE BRAKE FLUID
8	Hydraulic lift oil (Hydraulic dumping system model)	8.0 L 2.1 U.S.gals 1.8 Imp.gals	KUBOTA UDT or SUPER UDT fluid*
	Hydraulic lift oil (Hydraulic PTO model)	7.0 L 1.8 U.S.gals 1.5 Imp.gals	
9	Power steering oil	5.9 L 1.6 U.S.gals 1.3 Imp.gals	

\*KUBOTA original transmission hydraulic fluid.

Greasing				
No.	Place	No. of greasing point	Capacity	Type of grease
10	VHT link	2	Until grease overflow	Multipurpose type grease NLGI-2 or NLGI-1 (GC-LB)
11	Battery terminal	2	Moderate amount	
12	Cargo lift cylinder pivot	2		
13	Cargo bed pivot	2		
14	Parking brake linkage	4		
15	Range gear shift lever pivot	1		
16	4WD lever pivot	1		
17	VHT pressure release	1		
18	Accelerator wire	—		Engine oil

#### ■ 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.

- **Transmission oil :**

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

Do not mix different brands or grades.

- **Brake fluid :**

Always use KUBOTA DOT3 GENUINE BRAKE FLUID from a sealed container. If it is not available, you should use only DOT3 fluid as a temporary replacement from a sealed container.

However, the use of any non-KUBOTA brake fluid can cause corrosion and decrease the life of the system. Have the brake system flushed and refilled with KUBOTA DOT3 GENUINE BRAKE FLUID as soon as possible.

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

- **Lubricating Oil**

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals.

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

Lubricating oil class \ Fuel	Fuel		Remarks
	Low sulfur (0.5 % $\geq$ )	High sulfur	
CF	○	○	TBN $\geq$ 10
CF-4	○	X	
CG-4	○	X	

○ : Recommendable X : Not recommendable

W1035555

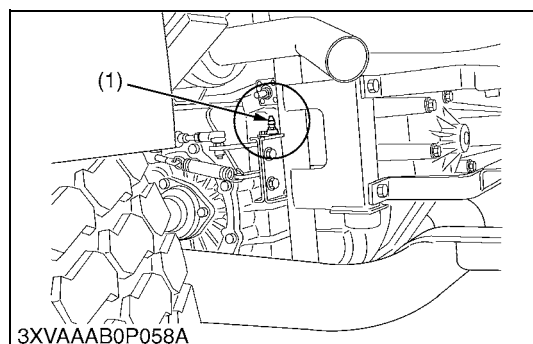
## [2] MAINTENANCE CHECK LIST

No.	Item	Period	Indication on hour meter											Important	Reference page
			50	100	150	200	250	300	350	400	450	500	550		
2	Greasing	Apply	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆		10-G3

No.	Item	Period	Indication on hour meter							After purchase			Important	Reference page
			600	650	700	750	800	1500	3000	1 year	2 years	4 years		
2	Greasing	Apply	☆	☆	☆	☆	☆							10-G3

## [3] CHECK AND MAINTENANCE

### (1) Check Point of Every 50 Hours



#### Greasing

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

- (1) Grease Fitting  
(VHT Pressure Release)

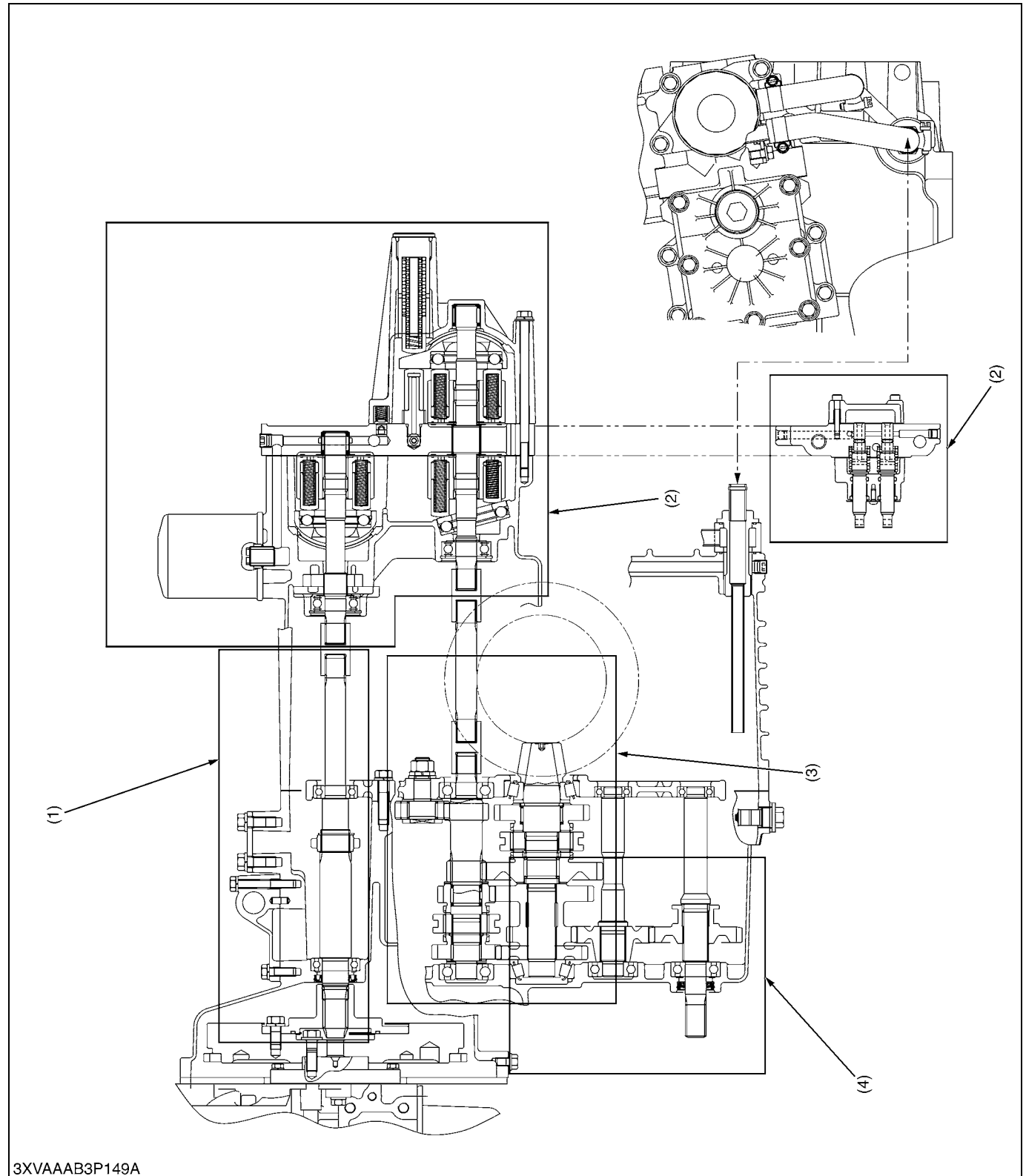
W1043114

# MECHANISM

## CONTENTS

1. STRUCTURE .....	10-M1
2. OIL FLOW .....	10-M3
3. BYPASS VALVE .....	10-M4
4. CONTROL LINKAGE FOR BYPASS VALVE.....	10-M12

# 1. STRUCTURE

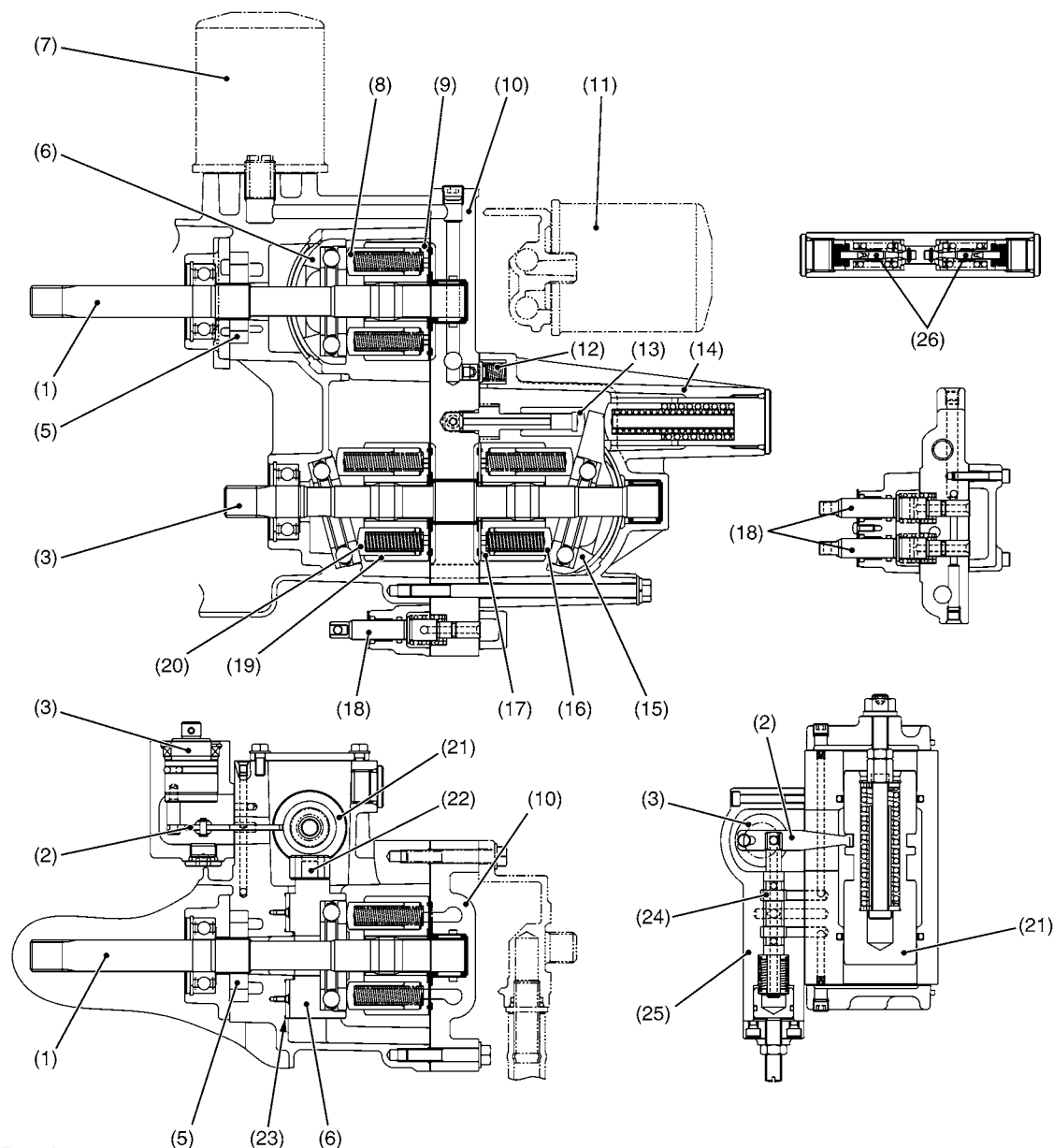


(1) Input Shaft Section

(2) Hydrostatic Transmission  
Section

(3) Range Shift Gear Section

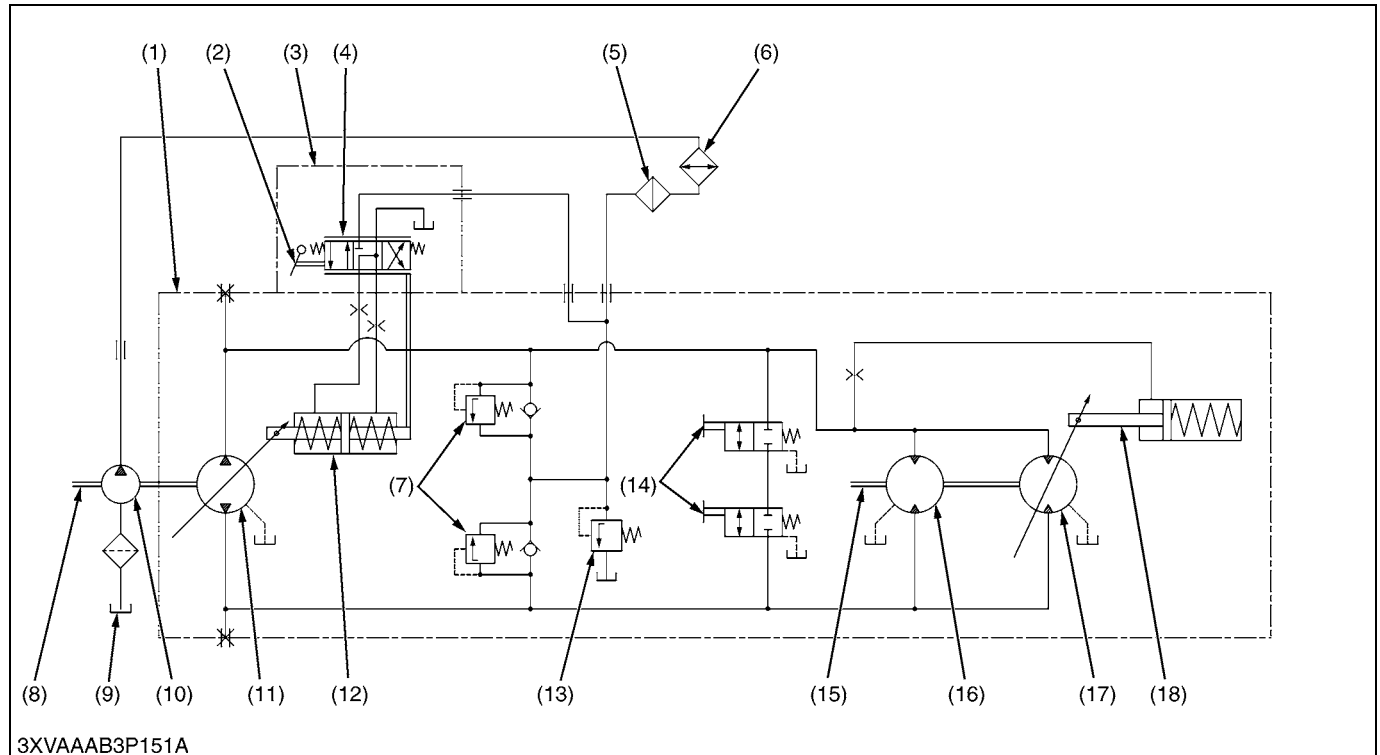
(4) Front Wheel Drive Section



3XVAAAB3P150A

- |                                |                                   |   |   |
|--------------------------------|-----------------------------------|---|---|
| (1) Input Shaft (Pump Shaft)   | (8) Piston                        | (15) Variable Swashplate (Assist Motor) | (21) Servo Piston                         |
| (2) Feedback Lever             | (9) Cylinder Block (Pump)         | (16) Piston                             | (22) Guide                                |
| (3) Regulator Shaft            | (10) Port Block Cover             | (17) Cylinder Block (Assist Motor)      | (23) Cradle Bearing                       |
| (4) Output Shaft (Motor Shaft) | (11) Suction Oil Filter Cartridge | (18) Bypass Spool                       | (24) Regulator Spool                      |
| (5) Charge Pump                | (12) Charge Relief Valve          | (19) Cylinder Block (Motor)             | (25) Regulator Valve Assembly             |
| (6) Variable Swashplate (Pump) | (13) Control Piston               | (20) Piston                             | (26) Check and High Pressure Relief Valve |
| (7) HST Oil Filter Cartridge   | (14) Assist Motor Cover           |   |   |

## 2. OIL FLOW



- |                              |  |                                |  |
|------------------------------|--|--------------------------------|--|
| (1) HST Assembly             | (6) Oil Cooler                           | (10) Charge Pump               | (15) Output Shaft (Motor Shaft)        |
| (2) Control Lever (Pedal)    | (7) Check and High Pressure Relief Valve | (11) Cylinder Block (HST Pump) | (16) Cylinder Block (Stationary Motor) |
| (3) Servo Regulator Assembly | (8) Input Shaft (Pump Shaft)             | (12) Servo Piston              | (17) Cylinder Block (Assist Motor)     |
| (4) Regulator Valve          | (9) Strainer                             | (13) Charge Relief Valve       | (18) Control Piston                    |
| (5) Oil Filter Cartridge     |  | (14) Bypass Valve              |  |

A charge pump (10) is used to feed oil to the hydrostatic transmission (HST). The oil coming from the charge pump (10) flows through the oil cooler (6) and oil filter cartridge (5) into the HST main circuit and regulator valve (4). At this time, the servo regulator valve and HST main circuit (that is closed with the control lever at neutral position) are kept at the charge relief valve's (7) set pressure. Step on the pedal, and the regulator valve (4) switches its oil passage to allow the oil into the service port. Being interlocked with the servo piston (12), the swashplate now tilts to activate the variable pump (11). Pressurized oil is then forced into the stationary motor (16), which then rotates to circulate oil between the pump and motor.

The heavier the load on the output shaft (15), the higher the pressure of the oil coming from the pump (11). Now the assist motor (17) is activated to increase the output torque. When the load on the output shaft (15) decreases, the oil pressure in the main circuit also drops and the assist motor (17) returns to its neutral position and just the stationary motor (16) maintains torque to the output shaft (15). Now a closed circuit is formed by the pump (11) and stationary motor (16).

When the bypass valve is opened, a loop circuit is created between the bypass valve (14) and the motor releasing drive to the output shaft (15).

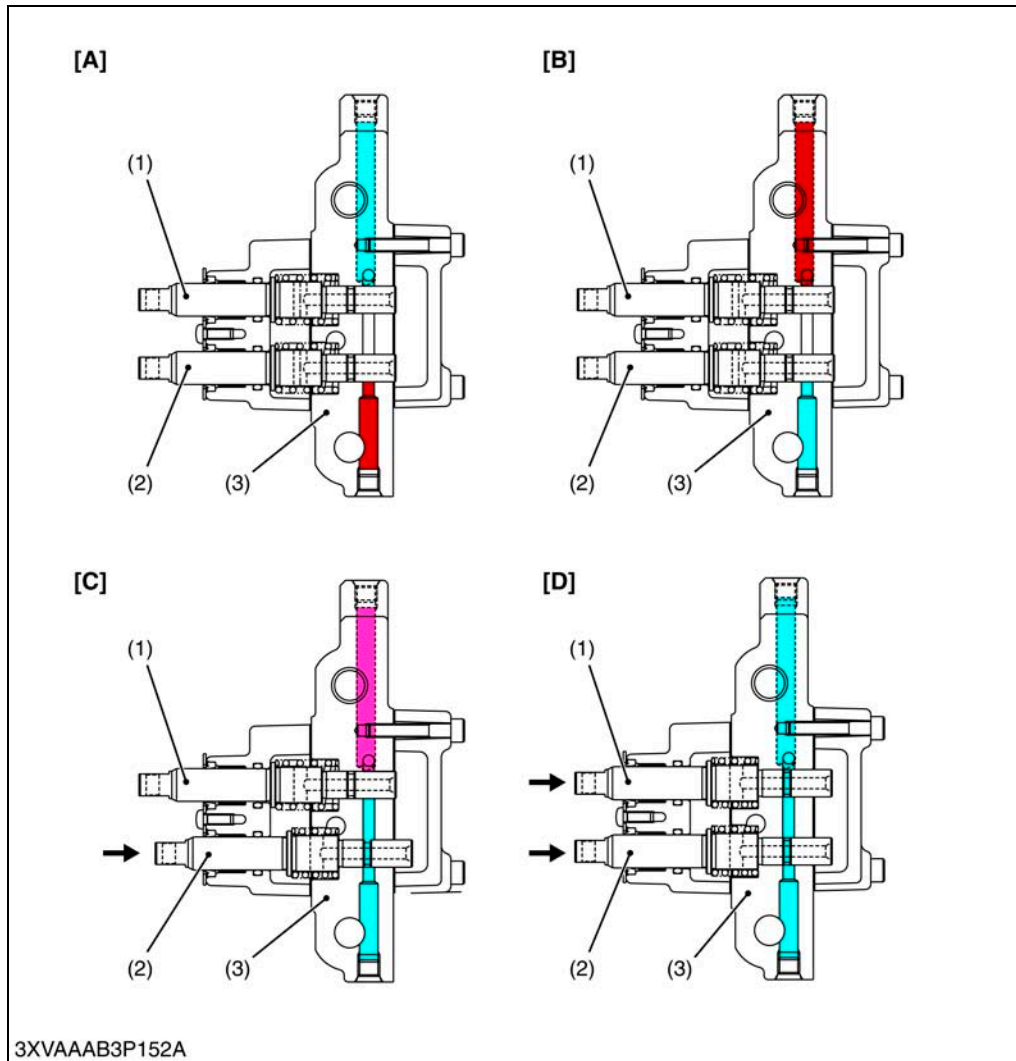
The bypass valve (14) is composed of the manual operation spool and the spool that operates in synchronization with the brake.

### (Reference)

- Valve Setting Pressure [Oil temperature : 40 to 60 °C (104 to 140 °F)]  
 Charge Relief Valve : 0.52 to 0.72 MPa (5.3 to 7.3 kgf/cm<sup>2</sup>, 75 to 104 psi)  
 Check and High Pressure Relief Valve : 25.5 to 26.5 MPa (260 to 270 kgf/cm<sup>2</sup>, 3698 to 3840 psi)



### 3. BYPASS VALVE



- (1) Spool **A** (Connects with VHT Pressure Release Knob)
- (2) Spool **B** (Connects with Brake Cam Lever)
- (3) Port Block Cover

- [A] At Running**
- [B] At Dynamic Braking**
- [C] When Applying the Brake and Stopping**
- [D] When Pull the VHT Pressure Release Knob After It Stops**

W1013315

The purpose of this bypass valve is to release any residual torque within the transmission system by bypass both high pressure and low pressure sides in HST.

Spool **B** (2) is interlocked with a foot brake and is subject to frequent use, which may give impact on the oil seal. Therefore, spool **B** has been installed on the low pressure side.

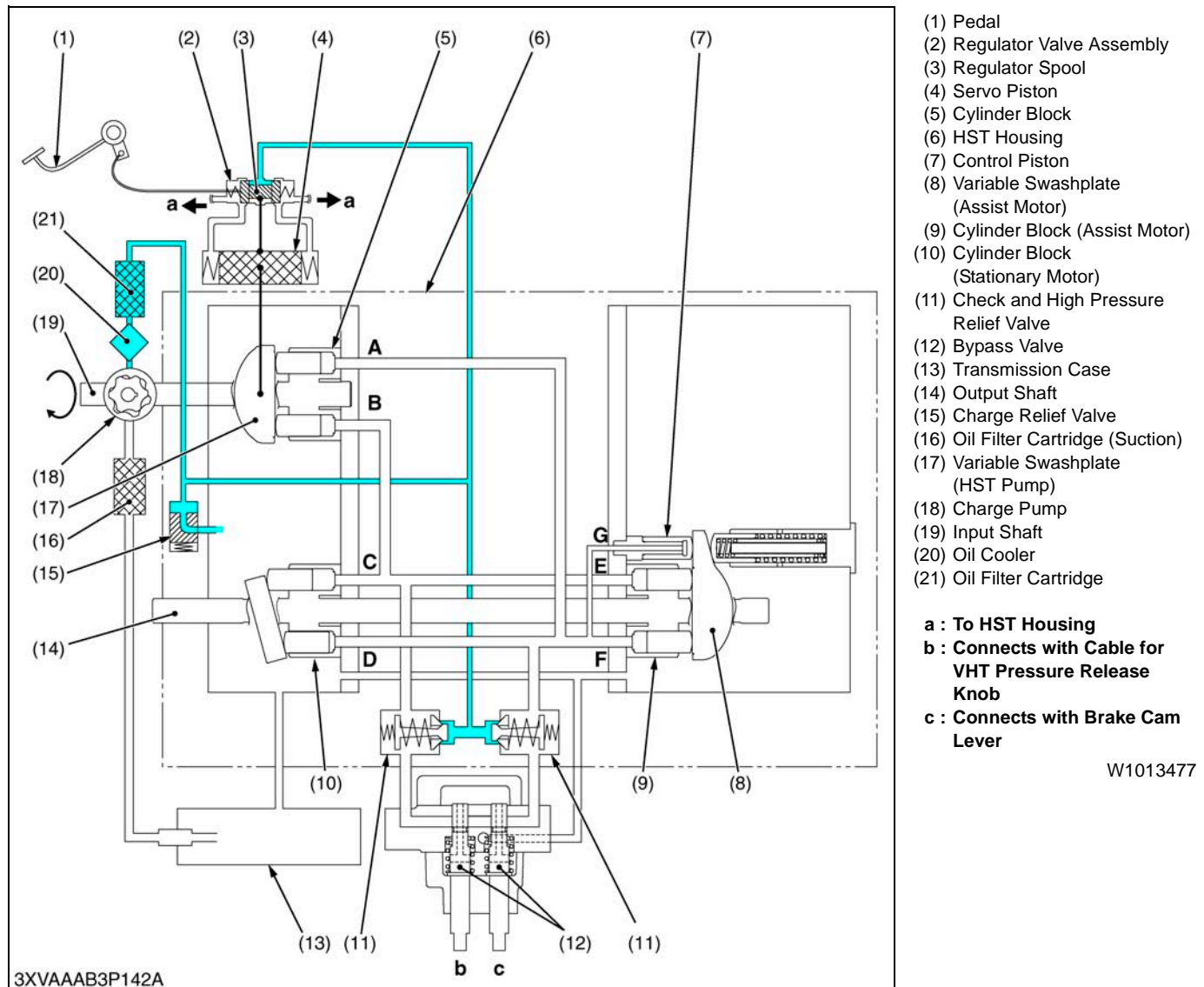
Spool **A** (1) is operated manually (by pulling the VHT pressure release knob).

When the foot brake is applied (or the parking brake activated), the low pressure circuit is directed to the bypass circuit **[C]**.

Pull the VHT pressure release knob for the bypass valve to operate spool **A** (1), the circuit on the high pressure side is also connected to the bypass circuit.

As a result, the pressure on the high pressure side balances that of the low pressure side, this in turn releases any drive from the transmission.

# ■ Neutral



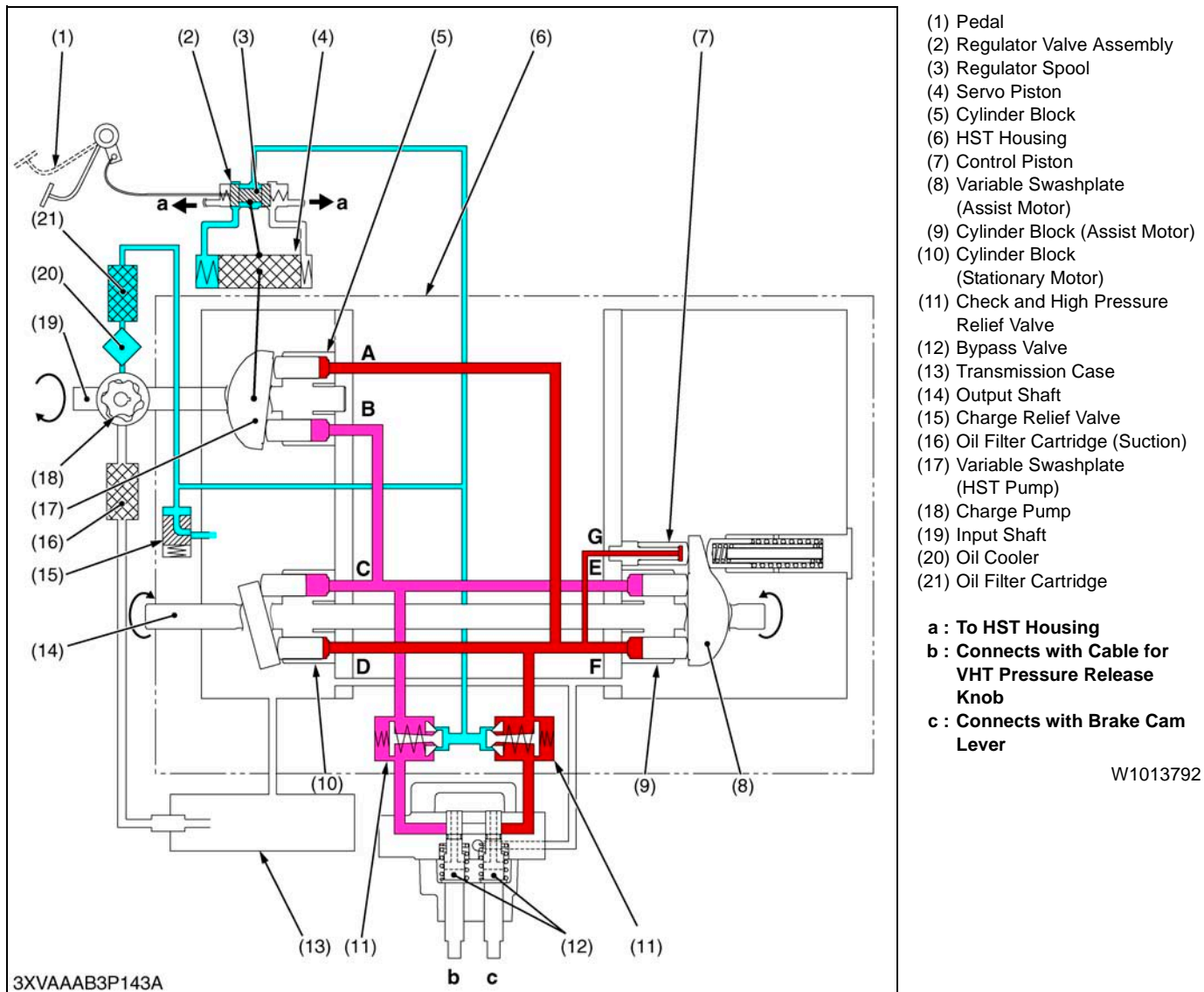
W1013477

The oil that is drawn by the charge pump (18) from the transmission case (13) flows through the oil cooler (20), oil filter cartridge (21) and charge relief valve (15) into the HST hydraulic circuit and regulator valve. Surplus flow is returned from the charge relief valve to the HST housing and finally into the transmission case.

When the pedal is released (neutral position), the regulator spool (3) is also at the neutral position. The pump's variable swash plate (17) is interlocked with the servo piston (4), it will not tilt.

In this way, the HST pump keeps rotating but the pump piston is stationary as no oil is being fed from the HST pump. Until oil is fed back from the HST pump, the cylinder assembly of the stationary motor and assist motor are halted which keeps the output shaft from turning.

## ■ Pedal pressed halfway and under light load



W1013792

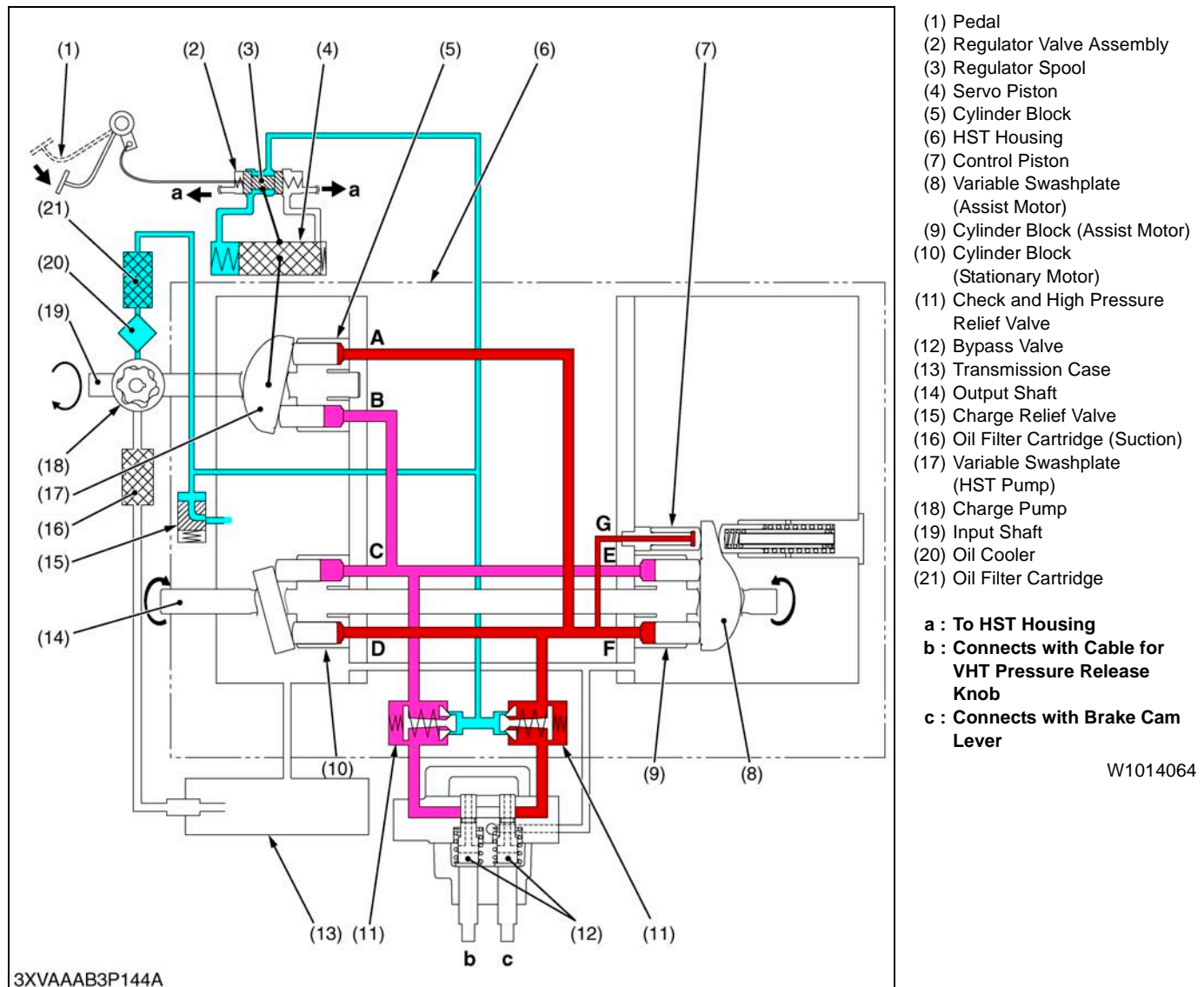
Let's suppose that the pedal is pressed halfway. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate (17) (see the above illustration).

The pump cylinder block (5) is driven by the input shaft (19) to put the oil under high pressure and to feed it out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The motor's piston is actuated by this pressurized oil to push down the stationary swashplate. Then together with the motor's cylinder block (10), the output shaft (14) starts turning.

The output shaft rpm is determined by the delivery rate of the HST pump, varying the rpm.

Then the motor's oil drops to a low pressure and returns through the motor port **C** to the pump port **B**.

### ■ Pedal pressed fully and under light load

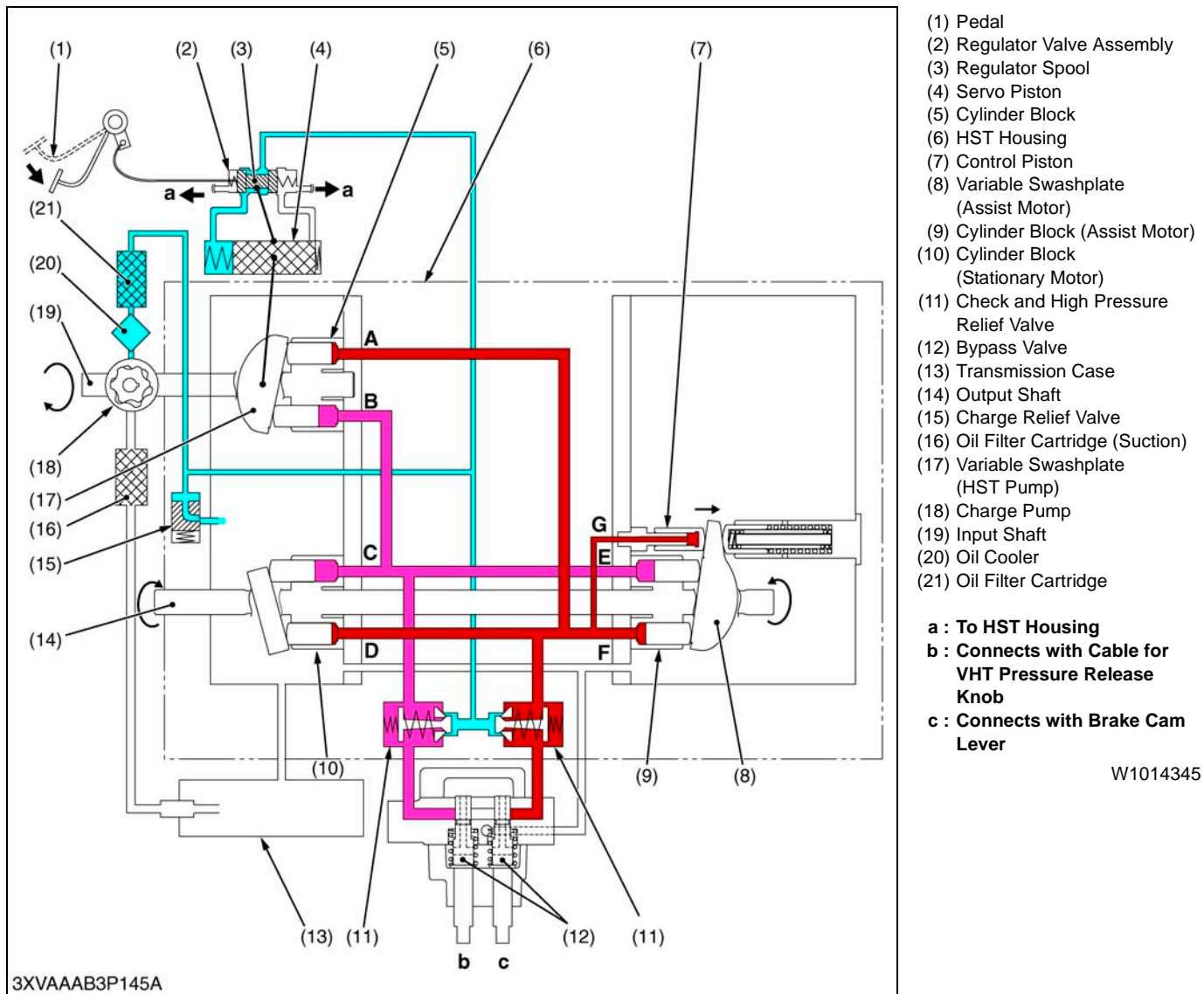


Let's suppose that the pedal is fully pressed. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate to maximum.

The pump cylinder block (5) is driven by the input shaft (19) to put the oil under high pressure and to feed it at the highest rate out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The pressure of the oil from the HST pump is not high enough to get the assist motor started. In this way, the output shaft (14) achieves the maximum rpm with the assist motor off, as shown in the figure above.

Then the motor's oil drops to a low pressure and returns through the motor port **C** to the pump port **A**.

### ■ Pedal pressed fully, under light load and assist motor startup to maximum capacity level



W1014345

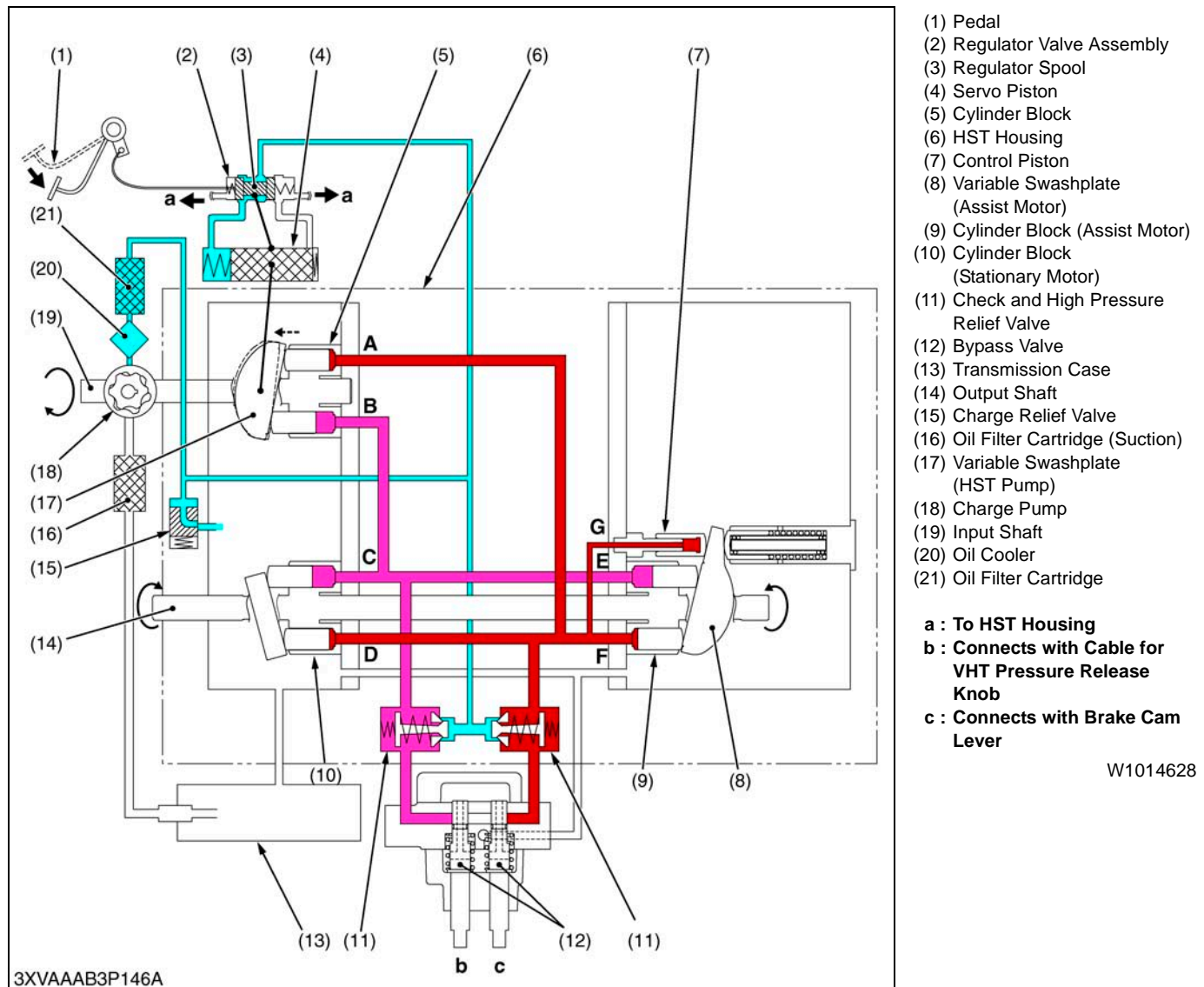
Let's suppose that the pedal is fully pressed. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate to maximum (see the above illustration).

The pump cylinder block (5) is driven by the input shaft (19) to put the oil under high pressure and to feed it at the highest rate out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The pressure of the oil from the HST pump now gets high enough to start tilting the assist motor's variable swashplate (8). The oil is fed to the port **F** (branch flow) and port **G** too. As a result, the output shaft (14) is driven by the stationary motor and assist motor. The output shaft rpm drops in proportion to the tilt of the assist motor's variable swashplate, whereas its torque increases.

Then the stationary motor's oil and the assist motor's oil drops to a low pressure and return through their respective ports **C** and **E** to the pump port **B**.



### ■ Pedal pressed fully, under heavy load and input horsepower control



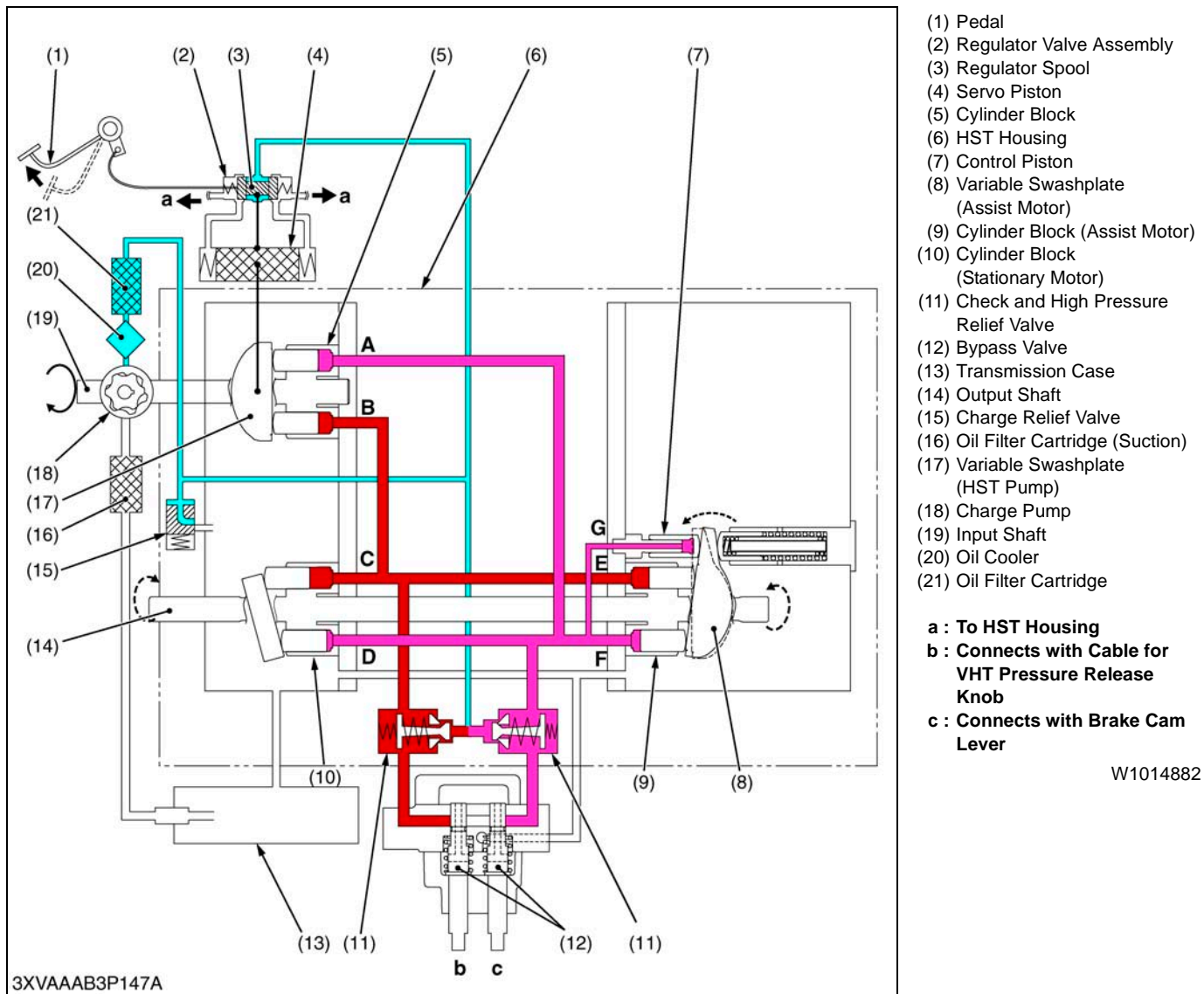
W1014628

Let's suppose that the pedal is fully pressed. The control lever is activated by the pedal to switch the regulator valve's hydraulic circuit. The servo piston (4) is then actuated to tilt the pump's variable swashplate to maximum (see the above illustration).

The pump cylinder block (5) is driven by the input shaft (19) to put the oil under high pressure and to feed it at the highest rate out of the pump port **A**. The pressure-fed oil flows into the motor's port **D** along the circuit. The oil from the HST pump then reaches the pressure level 17.7 MPa (180 kgf/cm<sup>2</sup>, 2560 psi) to tilt the assist motor's variable swashplate (8) all the way. At this time, the assist motor reaches its maximum capacity.

If the load becomes heavier, the variable swashplate (pump) moves toward to the neutral position under the reaction of HST pump itself. With the variable swashplate tilted back to neutral side, the engine load becomes lighter and the engine rpm higher again. At this time, the pump's delivery rate drops, but the recovered engine rpm enables the delivery oil pressure to go up to the high-pressure relief valve setting. Now the maximum torque is obtained.

## ■ Dynamic Brake



W1014882

Release the pedal, and the regulator valve forces the servo piston (4) to the neutral position. The pump's variable swashplate (17) also goes back to the neutral position.

Still the machine tends to keep running by inertia force, but no oil is pressure-fed because the pump's variable swashplate is in the neutral position. (There is no oil flow from the HST pump (5).)

The output shaft (14), however, is rotated in the same direction as before releasing the pedal.

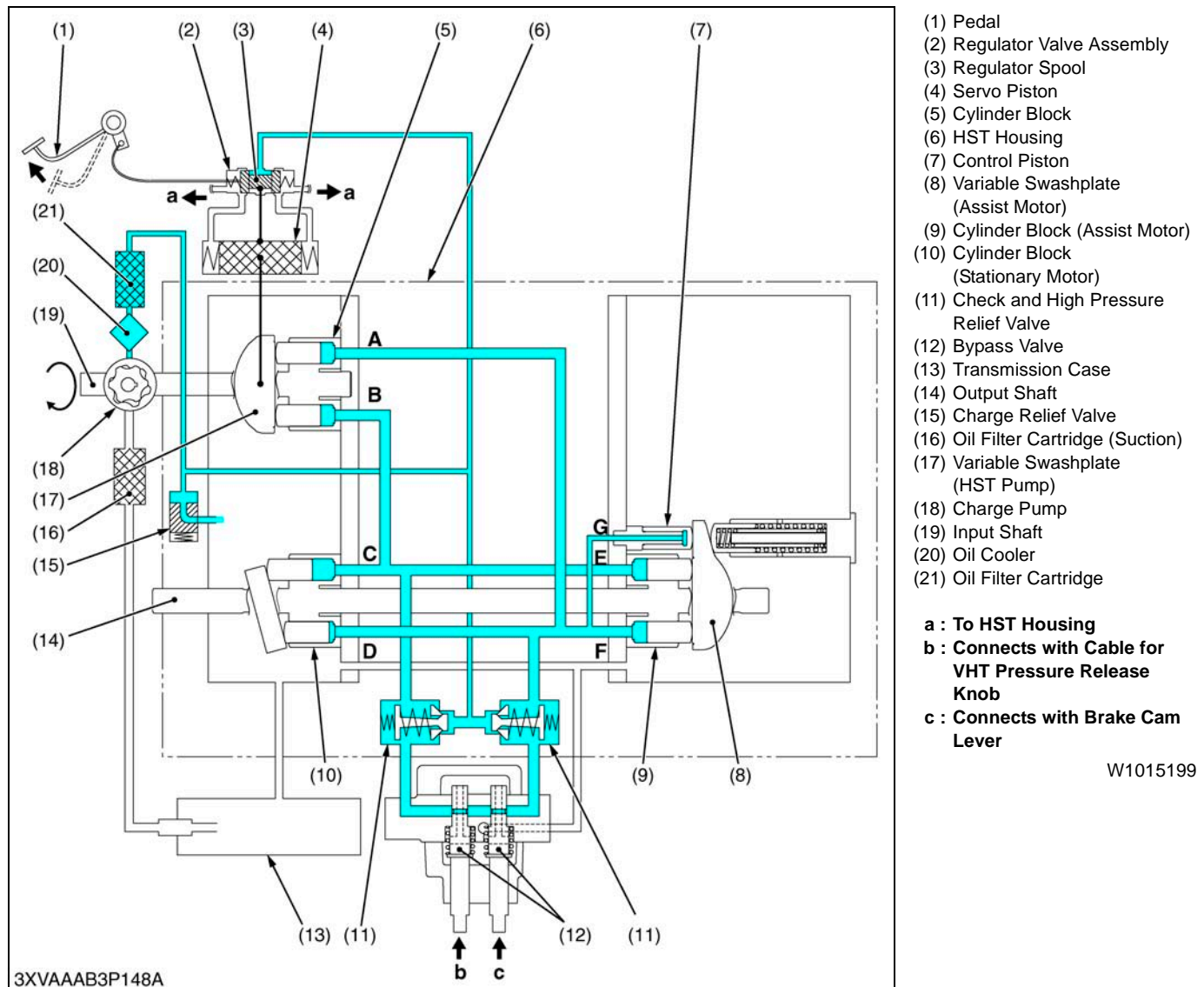
Now the stationary motor (10) works like a pump to suck the oil from port **D** and pressure-feed it from port **C**.

The oil coming from port **C** pushing open the high pressure relief valve and flows through the check valve back to port **D**.

The dynamic brake force is determined by the force that is exerted to push open the backward travel high-pressure relief valve.

When the dynamic brake is applied, the pressure at port **D** drops below the charge pressure level. If the oil from port **C** is not enough to make up for the shortage, the charge oil too is supplied together.

■ After dynamic brake, operating brake and pulling VHT pressure release knob creates a bypass circuit



W1015199

When driving, releasing the pedal to halt the vehicle places the system under the status of dynamic braking, as described in the previous section.

Immediately after halting the vehicle by pressing the brake pedal, or when the deviation from neutral position of variable swashplate (17) is significant, a torque will exist between HST and the transmission.

Under the conditions, shifting the gears is extremely difficult because of friction in the gear box.

Operating the brake and pulling the VHT pressure release knob creates a bypass circuit, which eliminates the difference in pressures between high pressure side and low pressure side.

This operation releases the torque remaining in the transmission.

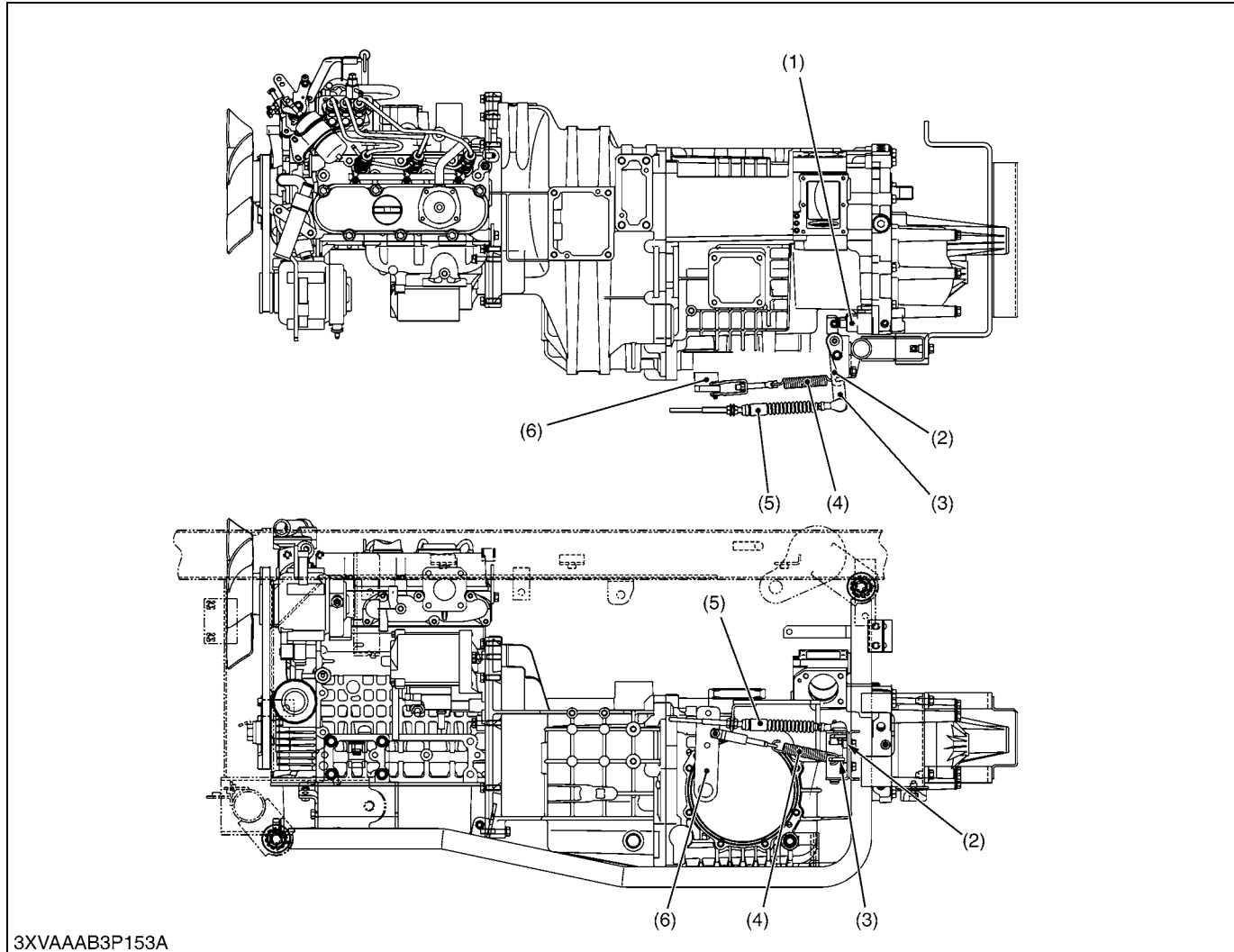
As a result, smooth shifting of gears is made possible.

For oil flow, a loop circuit is made through a bypass valve, between **C** port and **D** port of the fixed motor. This system makes free rotation of the output shaft (14) possible.

The bypass spool **c** must operate in synchronization with braking, and the bypass spool **b** must be controlled manually by the VHT pressure release knob.



## 4. CONTROL LINKAGE FOR BYPASS VALVE



- |                   |                   |                                |                     |
|-------------------|-------------------|--------------------------------|---------------------|
| (1) Bypass Valve  | (3) Bypass Link 1 | (5) VHT Pressure Release Cable | (6) Brake Cam Lever |
| (2) Bypass Link 2 | (4) Spring        |                                |                     |

The upper link that activates the bypass valve is operated manually (by pulling the VHT pressure release knob) and linked by a cable in order to activate the bypass link 2 (2).

In addition, the lower lever has been linked to a brake lever so that it may interlock with the foot brake when this is activated, and the bypass link 1 (3) has been linked by a spring (4).

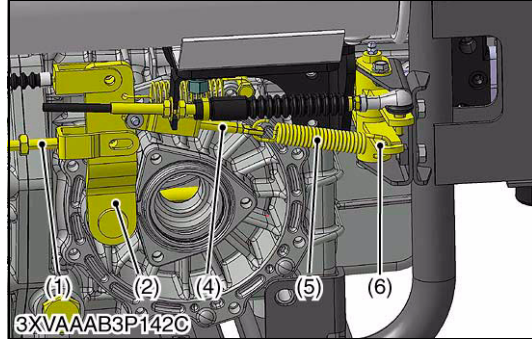
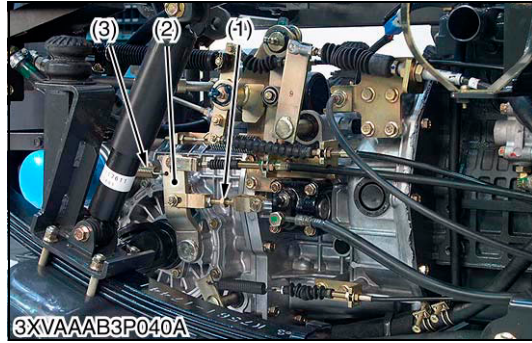
The bypass circuit will not be created even if you activate the VHT pressure release knob unless you apply the brake and stop the unit.

# SERVICING

## CONTENTS

1. CHECKING AND ADJUSTING .....	10-S1
2. DISASSEMBLING AND ASSEMBLING .....	10-S2
[1] DISMOUNTING TRANSAXLE .....	10-S2

# 1. CHECKING AND ADJUSTING



## Checking Brake Rod

### ⚠ CAUTION

- When checking, park the machine on flat ground.
  - Work by two people when you measure pressure.
1. Remove the tension spring (5) from the bypass link 2 (6).
  2. Remove the brake return spring (3).
  3. Adjust the link length using the turnbuckle (1) so that the brake lever (2) has no play.

### ■ IMPORTANT

- After adjusting the brake rod, be sure to adjust the tension spring (5) as well.

### (Adjusting procedure)

1. Adjust the length of tension bolt (4) to remove allowance of the tension spring (5). (To adjust the length, the tension spring (5) must be removed from the bypass link (6) to turn the tension bolt (4).)
2. After removing allowance of the tension spring (5), remove the tension spring (5) once and rotate the tension bolt (4) clockwise by one turn. (A slight tension is given to the tension spring (5).)

### (Reference)

- Turning torque of the rear axle at this time is 9.8 to 14.7 N·m (1 to 1.5 kgf·m, 7.2 to 10.8 ft-lbs).

### ⚠ CAUTION

- Over-pulling due to poor turnbuckle adjustment can result in the problem of brake drag (overheating and burning).

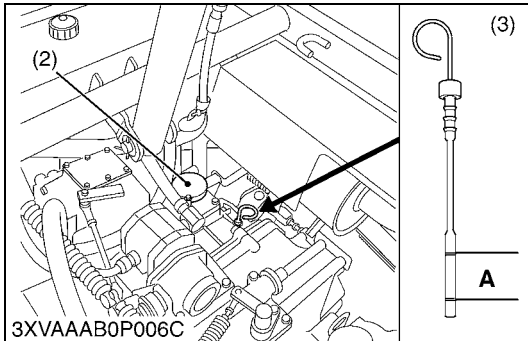
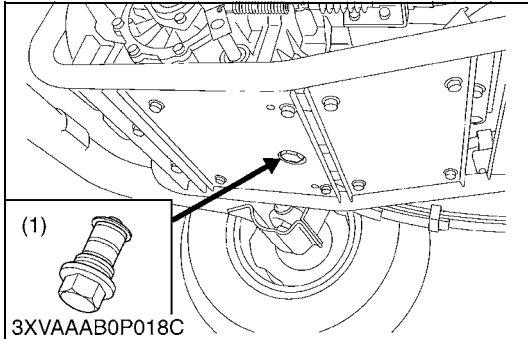
- (1) Turnbuckle (Brake Rod)  
(2) Brake Lever  
(3) Return Spring

- (4) Tension Bolt  
(5) Tension Spring  
(6) Bypass Link 2

W1010622

## 2. DISASSEMBLING AND ASSEMBLING

### [1] DISMOUNTING TRANSAXLE



#### Draining the Transmission Fluid

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

#### (When refilling)

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

Transmission fluid capacity	10 L 2.6 U.S.gals 2.2 Imp.gals
-----------------------------	--------------------------------------

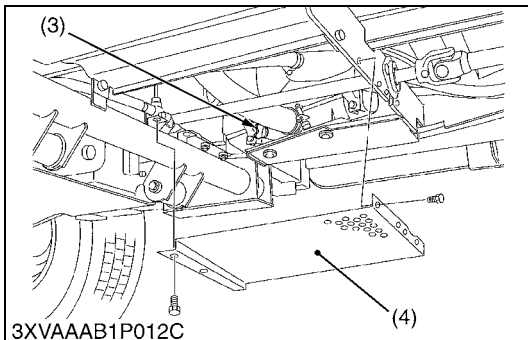
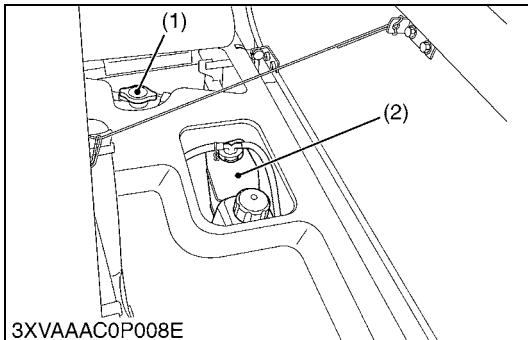
#### ■ IMPORTANT

- **Use only KUBOTA SUPER UDT fluid. Use of other oils may damage the transmission.**  
Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-1.)
- **Do not mix different brands of fluid together.**

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

A : Oil level is acceptable within this range.

W1013492



#### Draining Coolant

#### ⚠ CAUTION

- **Never open the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**
1. Stop the engine and let cool down.
  2. Remove the protective cover (4).
  3. Remove the radiator coolant drain plug (3) to drain the coolant.
  4. Remove the radiator cap (1) to completely drain the coolant.
  5. After all coolant is drained, close the drain plugs.

Coolant capacity	Radiator with recovery tank	4.0 L 4.2 U.S.qts. 3.5 Imp.qts.
------------------	-----------------------------	---------------------------------------

- (1) Radiator Cap  
(2) Recovery Tank  
(3) Radiator Coolant Drain Plug  
(4) Protective Cover

W1013915



### Battery



#### CAUTION

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

1. Disconnect the negative cable (1) from the battery.
2. Disconnect the positive cable (2) from the battery.

(1) Negative Cable

(2) Positive Cable

W1017351



### Cargo Bed

1. Lift up the cargo bed (1) by hand and support it so that the hydraulic cylinder should not drop. (If hydraulic cylinder equipped.)
2. Remove the cotter pin and clevis pin (2). (If hydraulic cylinder equipped.)
3. Disconnect the connector (3) from main harness, then separate the harness for the tail lamps.
4. Loosen the lock nut (4) and remove the hinge bolt (5) and nut.

(1) Cargo Bed

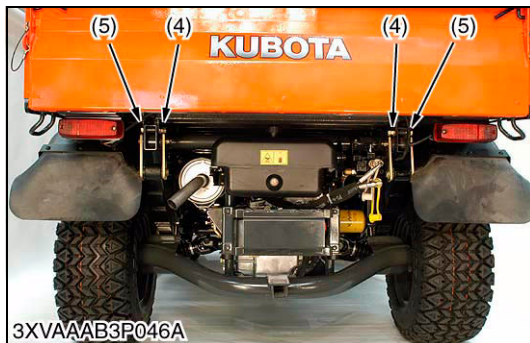
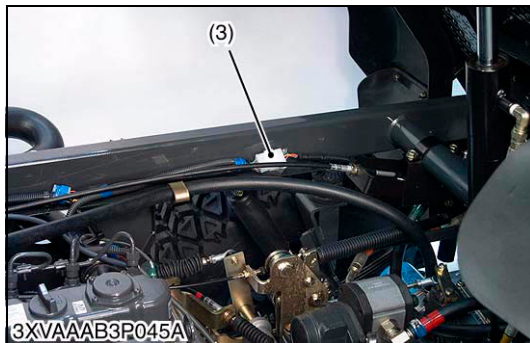
(4) Lock Nut

(2) Clevis Pin

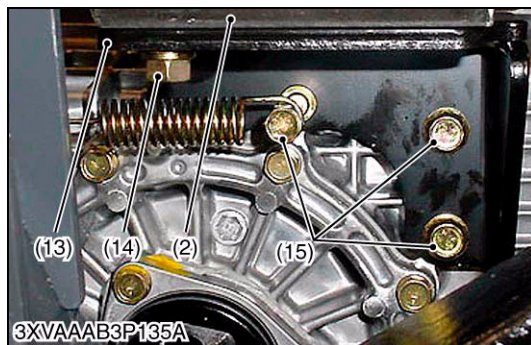
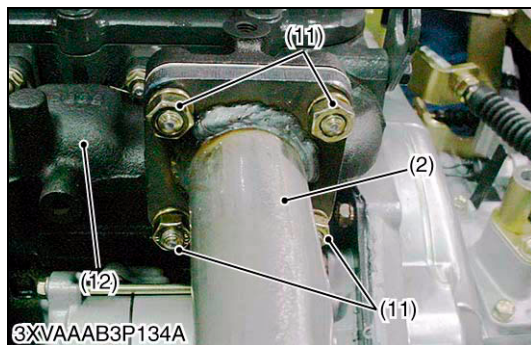
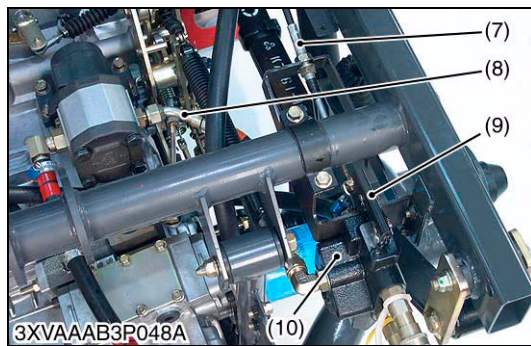
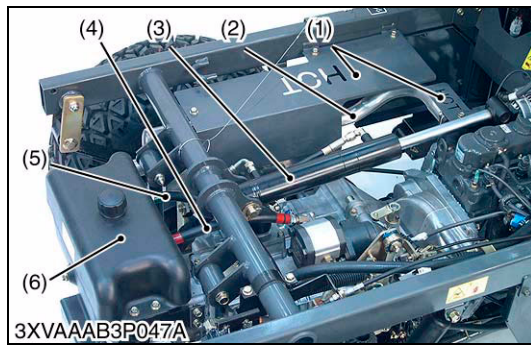
(5) Hinge Bolt

(3) Connector

W1017555







### **Muffler Cover, Muffler, Hydraulic Oil Tank, Hydraulic Cylinder and Hydraulic Control Valve**

1. Remove the muffler cover (1) and muffler (2).
2. Disconnect the quick couplers from hydraulic control valve.
3. Remove the cotter pin and clevis pin, then remove the hydraulic cylinder (3).
4. Disconnect the suction hose (4) and return hose (5), then remove the hydraulic oil tank (6).
5. Disconnect the cables (7) for hydraulic control valve.
6. Disconnect the delivery hose (8) and remove the hydraulic control valve (10).

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

- When connecting the hydraulic control valve (10) cable to hydraulic control valve lever (9), be sure to adjust the length of cables (7).

#### **■ NOTE**

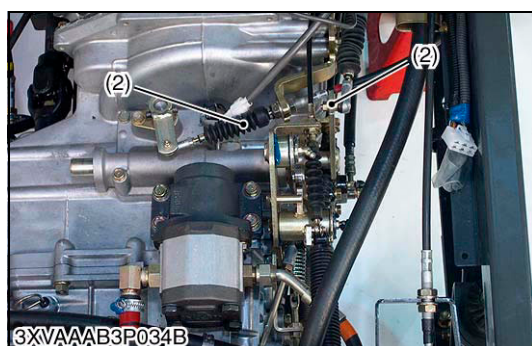
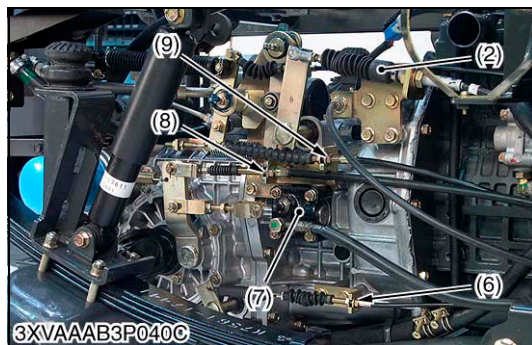
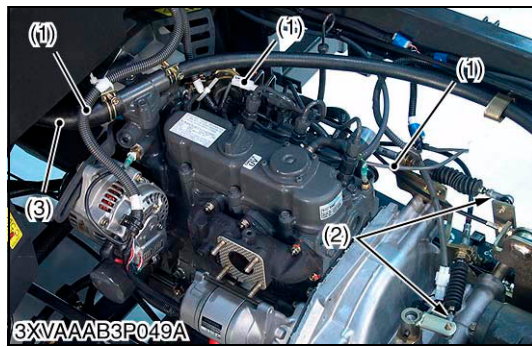
- The muffler shall be assembled in the following order:

1. To secure the muffler (2) to the exhaust manifold, put four spring lock washers on studs and start a nut (11) on each stud. Screw each nut 2 to 3 threads on studs.
2. To secure muffler (2) to muffler stay (13), start a sems bolt (bolt with plane washer and spring lock washer. Turn sems bolt 2 to 3 threads into underside of muffler stay (13) and the muffler (2).
3. Tighten nuts (11) that fasten the muffler (2) to the exhaust manifold (12).
4. Tighten the sems bolt that fasten the underside of the muffler (2) to the muffler stay (13) (On this occasion, check the gap between the underside of the muffler and its stay. When there is a large gap between them, lift the stay and assemble the muffler. And keep them to such a position to fasten the muffler stay.).
5. Tighten the bolts (15) that fasten muffler stay (13) to transmission.

Tightening torque	Muffler mounting nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft-lbs
	Muffler mounting bolt (Sems bolt)	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 ft-lbs
	Muffler stay mounting bolt	17.7 to 20.5 N·m 1.8 to 2.1 kgf·m 13.1 to 15.1 ft-lbs

- |                         |                                   |
|-------------------------|-----------------------------------|
| (1) Muffler Cover       | (9) Hydraulic Control Valve Lever |
| (2) Muffler             | (10) Hydraulic Control Valve      |
| (3) Hydraulic Cylinder  | (11) Nut                          |
| (4) Suction Hose        | (12) Exhaust Manifold             |
| (5) Return Hose         | (13) Muffler Stay                 |
| (6) Hydraulic Oil Tank  | (14) Sems Bolt                    |
| (7) Control Valve Cable | (15) Bolt                         |
| (8) Delivery Hose       |                                   |

W1017697



### **Air Cleaner, Wire Harness, Radiator Hose (Upper), Cables and Brake Cylinder**

1. Remove the air cleaner body and intake hose as a unit.
2. Disconnect the wire harness (1) from engine, alternator and starter motor.
3. Remove the ground cable (5) and positive cable (4).
4. Disconnect the parking brake cables (8), four wheel drive cable (10), select cable and shift cable (2).
5. Remove the speed control pedal cable (9).
6. Remove the clevis pin and the brake cylinder (7) with brake rod.
7. Disconnect the differential lock cable (6).
8. Remove the radiator upper hose (3).

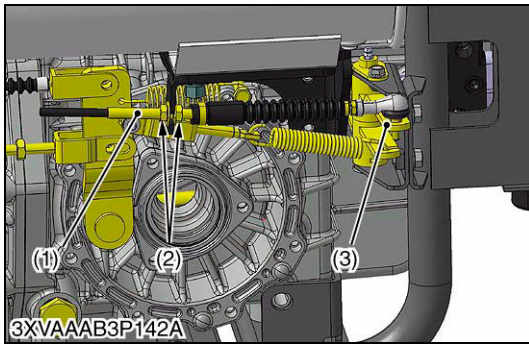
#### **(When reassembling)**

- Adjust the length of the shift cable and select cable. (See page 2-S14.)
- Adjust the length of the speed control pedal cable. (See page 2-S13.)
- Adjust the length of the parking brake cable. (See page 2-S16.)
- Adjust the length of the 4WD shift cable. (See page 2-S15.)

- |                                  |                             |
|----------------------------------|-----------------------------|
| (1) Wire Harness                 | (6) Differential Lock Cable |
| (2) Shift Cable and Select Cable | (7) Brake Cylinder          |
| (3) Radiator Upper Hose          | (8) Parking Brake Cable     |
| (4) Positive Cable               | (9) Speed Control Pedal     |
| (5) Ground Cable                 | (10) 4WD Cable              |

W1013611





### **VHT Pressure Release Cable**

1. Loosen the lock nut (2) and remove the VHT pressure release cable (1) from the bypass link 1 (3).

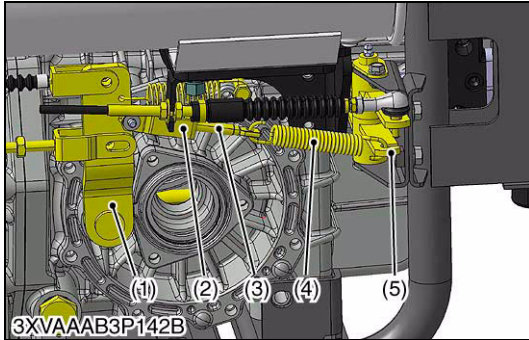
**(When reassembling)**

#### ■ NOTE

- When adjusting the cable tension, take care not to apply excessive tension.
- Adjust the length of the cable outer section so that the cable (1) has no play, and tighten the lock nut.

- |                                |                   |
|--------------------------------|-------------------|
| (1) VHT Pressure Release Cable | (3) Bypass Link 1 |
| (2) Lock Nut                   |                   |

W1014737



### **Tension Spring of VHT Pressure Release Link**

1. Remove the tension spring (4) from the bypass link 2 (5).
2. Remove the clevis (2) from brake cam lever (1).

**(When reassembling)**

#### ■ NOTE

- Before adjusting the tension spring (4), be sure to complete adjustment of the brake rod.
- Adjust the length of tension bolt (3) to remove allowance of the tension spring (4). By adjusting the length of the tension bolt (3), remove allowance of the tension spring (4). (To adjust the length, the tension spring (4) must be removed from the link to turn the tension bolt (3).)
- After removing allowance of the tension spring (4), remove the tension spring (4) once and rotate the bolt clockwise by one turn. (A slight tension is given to the tension spring (4).)

- |                     |                    |
|---------------------|--------------------|
| (1) Brake Cam Lever | (4) Tension Spring |
| (2) Clevis          | (5) Bypass Link 2  |
| (3) Tension Bolt    |                    |

W1014583



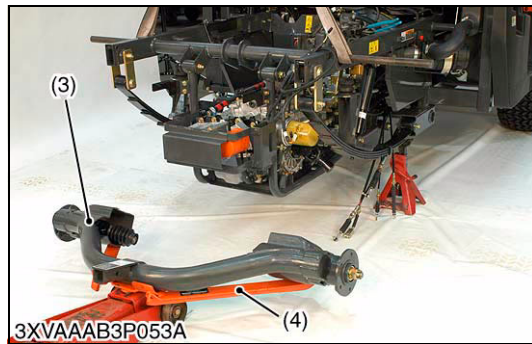
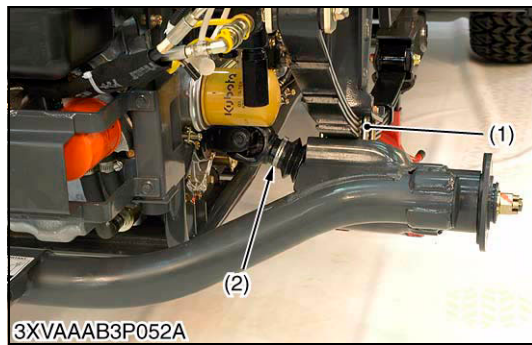
### **Power Steering Hose and Radiator Hose (Lower)**

1. Remove the power steering suction hose (3) and delivery hose (4).
2. Disconnect the fuel hose (2).
3. Disconnect the radiator hose (lower) (1).

- |                           |                   |
|---------------------------|-------------------|
| (1) Radiator Hose (Lower) | (3) Suction Hose  |
| (2) Fuel Hose             | (4) Delivery Hose |

W1015069





### Rear Axle Bracket

1. Remove the boot band (2) on both sides.
2. Place the stand under the both side of frame.
3. Remove the rear wheels.
4. Remove the leaf spring mounting bolt (1) and nut, and remove the rear axle bracket assembly (3) by use the axle support (4).

### (When reassembling)

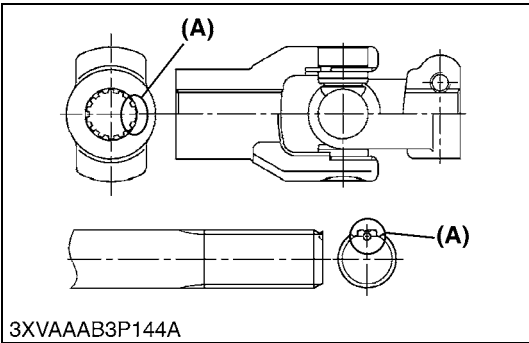
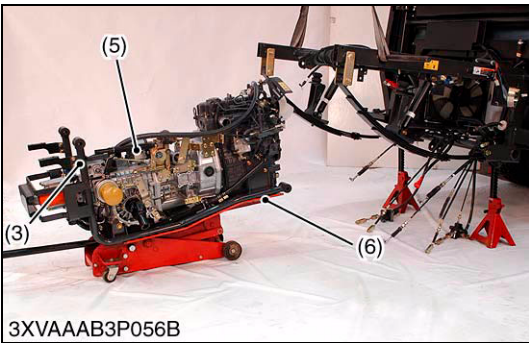
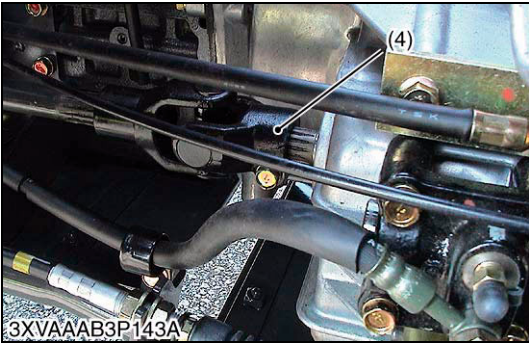
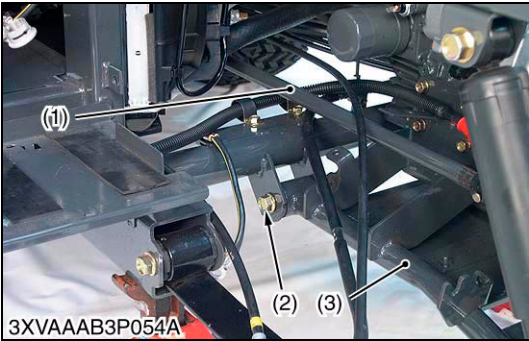
- Align the master spline of propeller shaft and rear axle shaft.
- Replace the boot band with new one.

Tightening torque	Leaf spring mounting bolt and nut	48.0 to 56.6 N·m 4.9 to 5.7 kgf·m 35.4 to 41.3 ft-lbs
	Rear wheel mounting screw	75.0 to 90.0 N·m 7.6 to 9.2 kgf·m 55.3 to 66.4 ft-lbs

(1) Leaf Spring Mounting Bolt  
(2) Boot Band

(3) Rear Axle Bracket Assembly  
(4) Axle Support

W1018767



**Dismounting Transmission and Engine One Piece Assembly**

- 1. Remove the universal joint mounting screw and disconnect the universal joint (4) from transmission.
- 2. Set the power train support (5) and remove the mission frame (3) mounting bolt (2) and nut.
- 3. Lift up the main frame by hoist.
- 4. Remove the transmission and engine one piece assembly (4).

**(When reassembling)**

- Align the master spline **(A)** of 4WD propeller shaft and universal joint.
- The bolt can be put through the rubber bushing more easily if soap water is applied to the bolt. Never hit the bolt.
- Assemble the mission frame in such a manner as to insert two bolts in the front and then two bolts in the rear, instead of inserting the four bolts at a time.
- When reassembling the transmission and engine one piece assembly (mission frame) into the main frame, do not forget to assemble the 4WD propeller shaft (1) with universal joint (4) as well.
- Apply grease to splines of 4WD propeller shaft (1) and splines of universal joint (4).

Tightening torque	Mission frame mounting bolt and nut	29.4 to 49.0 N·m 3.0 to 5.0 kgf·m 21.7 to 36.1 ft·lbs
	Universal joint mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 ft·lbs

- (1) 4WD Propeller Shaft

(2) Mission Frame Mounting Bolt

(3) Mission Frame

(4) Universal Joint
- (5) Transmission and Engine One Piece Assembly

(6) Power Train Support

**(A) Master Spline**

W1015698

**Power Steering Hose and Radiator Hose (Lower)**

Here after, refer to WSM No. 97897-15300 of RTV900, which serves as basis.

W1018519

---

**EDITOR:**

KUBOTA FARM & INDUSTRIAL MACHINERY SERVICE, LTD.

64, ISHIZU-KITAMACHI, SAKAI-KU, SAKAI-CITY, OSAKA, 590-0823, JAPAN

PHONE : (81)72-241-1129

FAX : (81)72-245-2484

E-mail : ksos-pub@kubota.co.jp

---