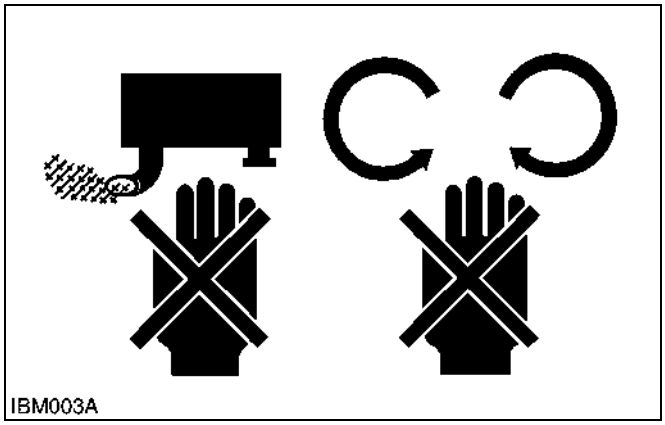
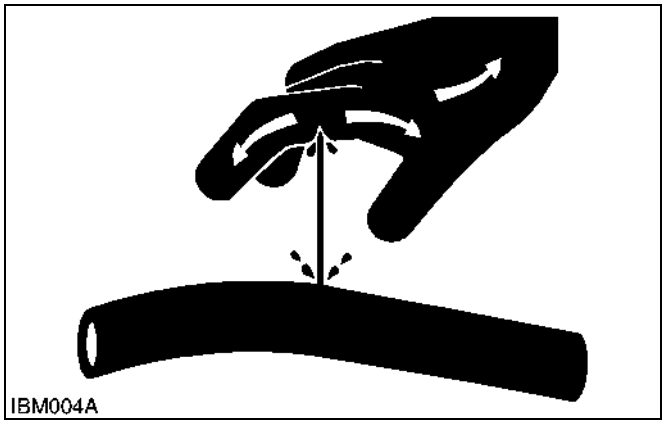
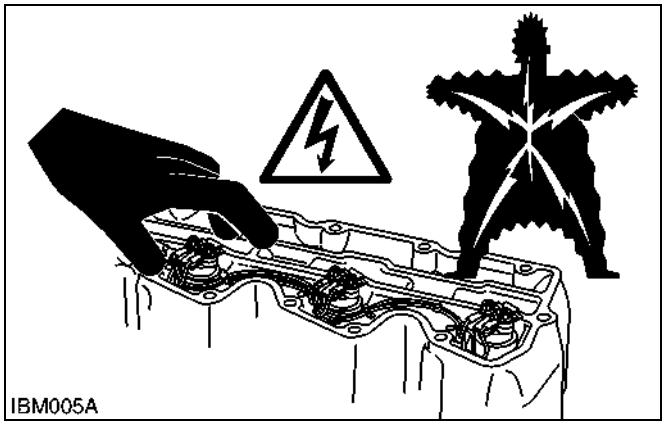

IBM003A


IBM004A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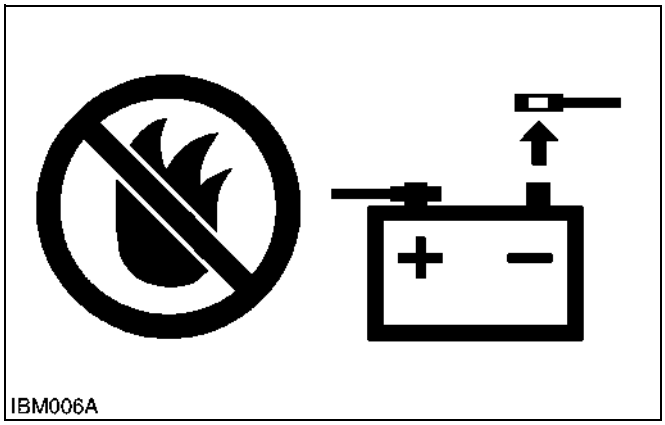
IBM006A

OPERATE SAFELY

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

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PREVENT A FIRE

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

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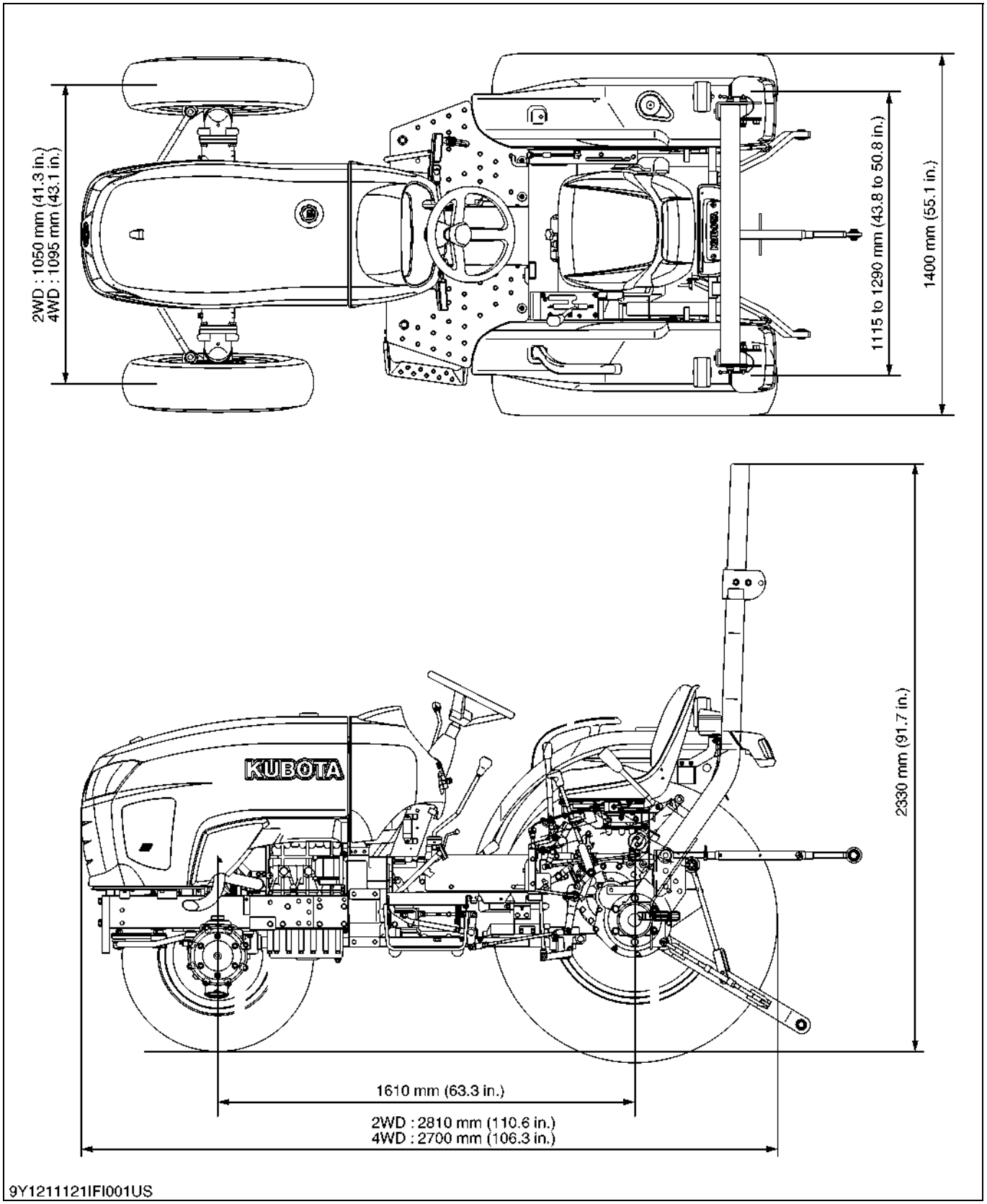
5. DIMENSIONS



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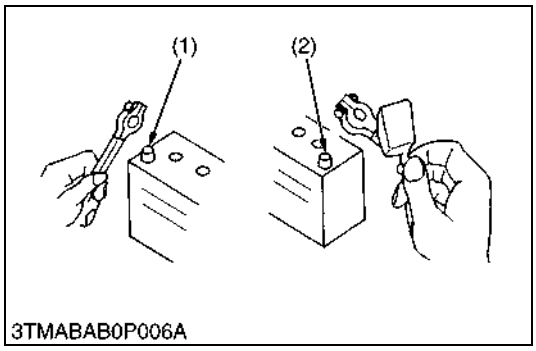
3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



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

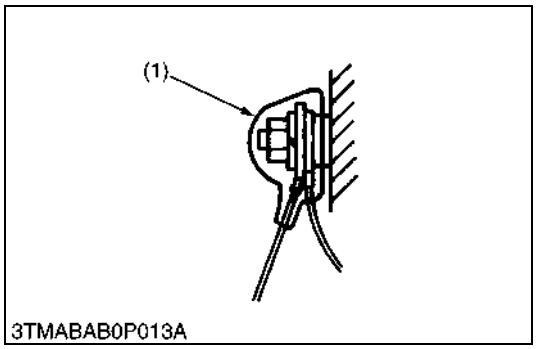
■ **IMPORTANT**

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

(1) Negative Terminal (2) Positive Terminal

WSM000001GEG0062US0

[1] WIRING



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

(1) Cover
(Securely Install Cover)

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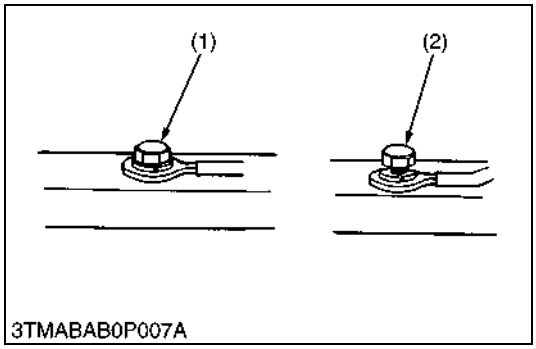

- Securely tighten wiring terminals.

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

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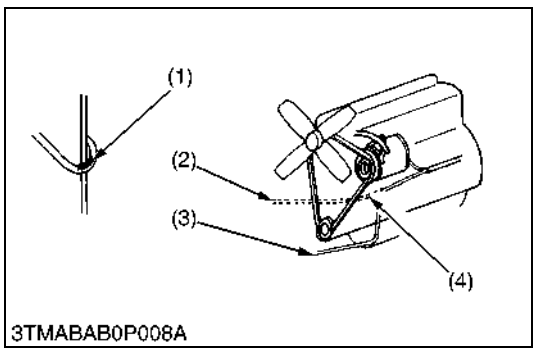

- Do not let wiring contact dangerous part.

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

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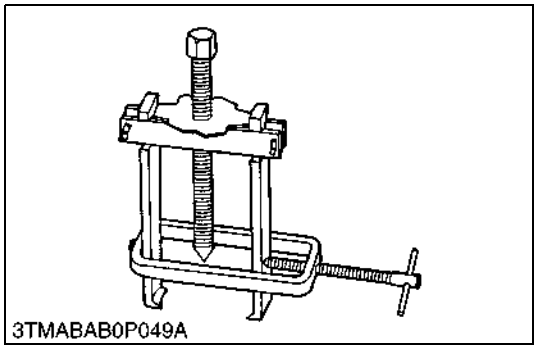
8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE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Special Use Puller Set

Code No.
- 07916-09032

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

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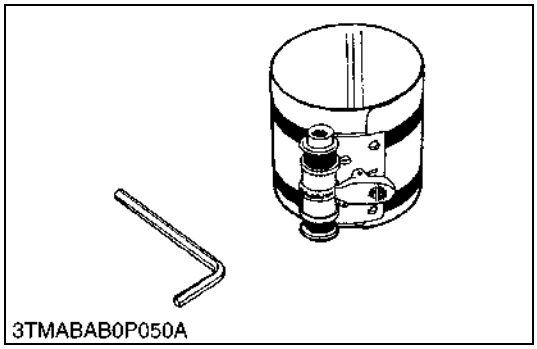
3TMABAB0P050A

Piston Ring Compressor

Code No.
- 07909-32111

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

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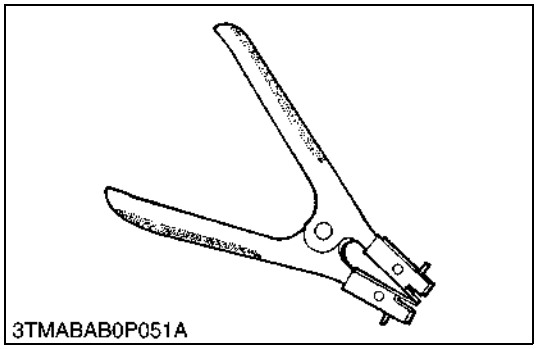
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Piston Ring Tool

Code No.
- 07909-32121

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

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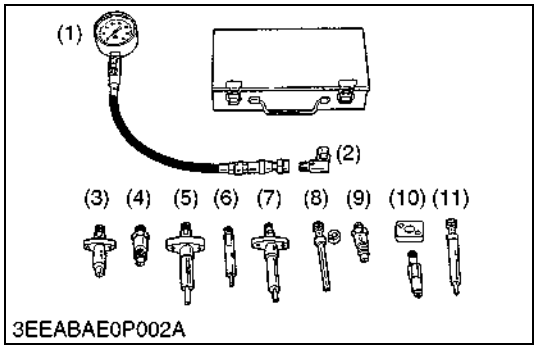

3EEABAE0P002A

Diesel Engine Compression Tester (for Injection Nozzle)

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

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

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

WSM000001GEG0014US0

Symptom	Probable Cause and Checking Procedure	Solution	Reference Page
Low Oil Pressure	1. Engine oil insufficient	Fill	G-9
	2. Different type of oil	Use specified type of oil	G-9
	3. Oil strainer clogged	Clean	1-S48
	4. Relief valve stuck with dirt	Clean	1-S46
	5. Relief valve spring weaken or broken	Replace	1-S46
	6. Oil pump damaged	Replace	1-S48
	7. Excessive oil clearance of crankshaft bearing	Replace	1-S68
	8. Excessive oil clearance of crankpin bearing	Replace	1-S67
	9. Excessive oil clearance of rocker arm	Replace	1-S60
	10. Oil passage clogged	Clean	–
High Oil Pressure	1. Different type of oil	Use specified type of oil	G-9
	2. Relief valve damaged	Replace	1-S46
Engine Overheated	1. Overload running	Reduce the load	–
	2. Engine oil insufficient	Fill	G-9
	3. Coolant insufficient	Fill	G-9
	4. Unsuitable fuel used	Use specified fuel	G-9
	5. Fan belt broken or elongated	Replace or adjust	G-24, 1-S12
	6. Radiator net and radiator fin clogged with dust	Clean	1-S14
	7. Radiator cap damaged	Replace	1-S13
	8. Inside of radiator corroded	Clean or replace	1-S13
	9. Coolant flow route corroded	Clean or replace	1-S13
	10. Head gasket damaged	Replace	1-S42
	11. Incorrect injection timing	Adjust	1-S15

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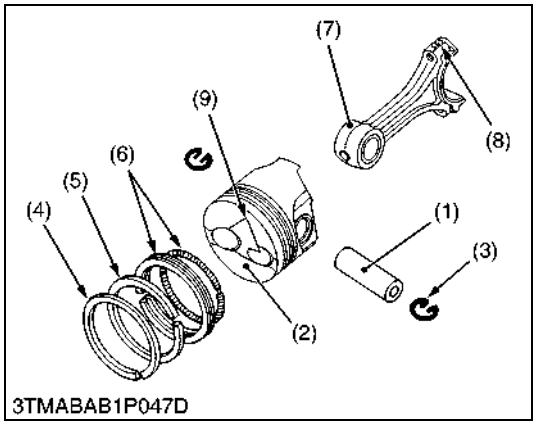

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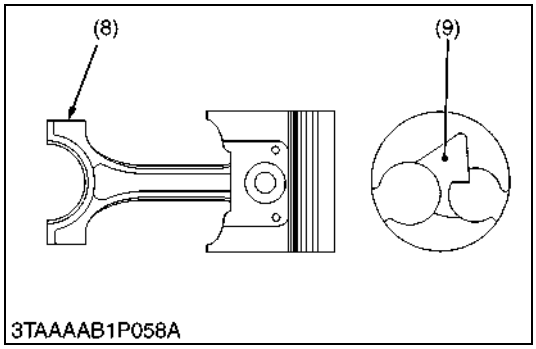

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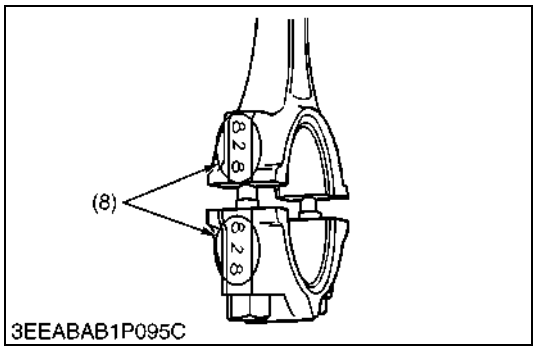

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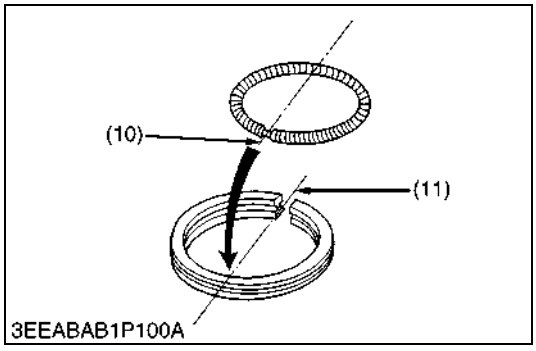

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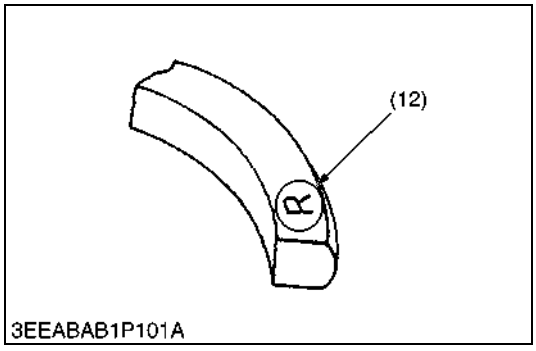

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Piston Ring and Connecting Rod

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

(When reassembling)

- When installing the rings, assemble the rings so that the manufacturer's mark (12) near the gap faces the top of the piston.
- When installing the oil ring onto the piston, place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin.
- When installing the piston pin, 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) Piston Pin
(2) Piston
(3) Piston Pin Snap Ring
(4) Top Ring
(5) Second Ring
(6) Oil Ring
(7) Connecting Rod
(8) Mark
(9) Fan Shaped Concave
(10) Expander Joint
(11) Oil Ring Gap
(12) Manufacturer's Mark

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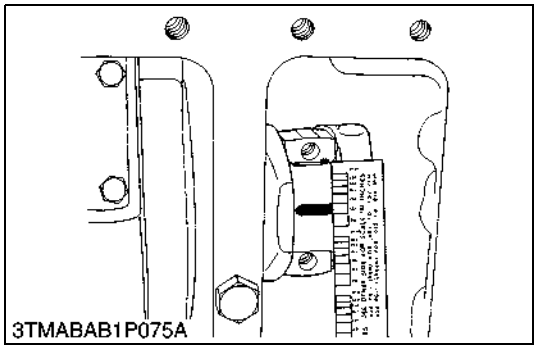

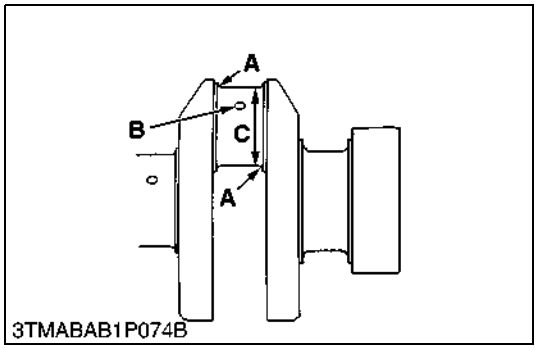

Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage on the center of the crankpin.
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 specification	0.025 to 0.087 mm 0.00099 to 0.0034 in.
	Allowable limit	0.2 mm 0.008 in.

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

(Reference)
- Undersize dimensions of crankpin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **A**	3.3 to 3.7 mm radius 0.13 to 0.14 in. radius	3.3 to 3.7 mm radius 0.123 to 0.14 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	46.759 to 46.775 mm dia. 1.8409 to 1.8415 in. dia.	46.559 to 46.575 mm dia. 1.8331 to 1.8336 in. dia.
The crankshaft journal must be fine-finished to higher than Rmax=0.4S. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

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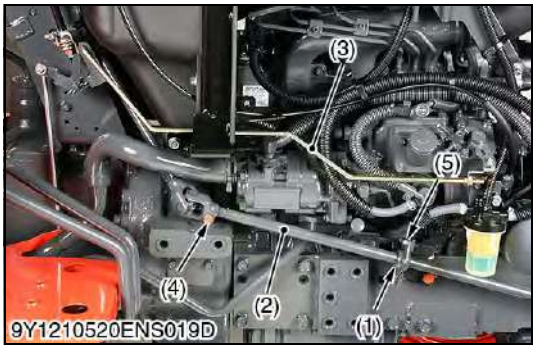


Steering Joint Shaft and Accelerator Rod

1. Remove the screw from support (1) and the steering joint shaft (2).
2. Remove the accelerator rod (3).

(When reassembling)

- Lift the universal joint so that there should be a clearance **(A)** of more than 5 mm (0.2 in.) between the universal joint and flywheel housing.
  Then fit the support (1) in position.
- Be sure to insert the screw (2) into cut-off part of joint shaft (1).
- Apply grease to spline part of joint shaft (1).

Tightening torque	Screw (Joint Shaft)	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Screw (bearing support)	23.5 to 27.4 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

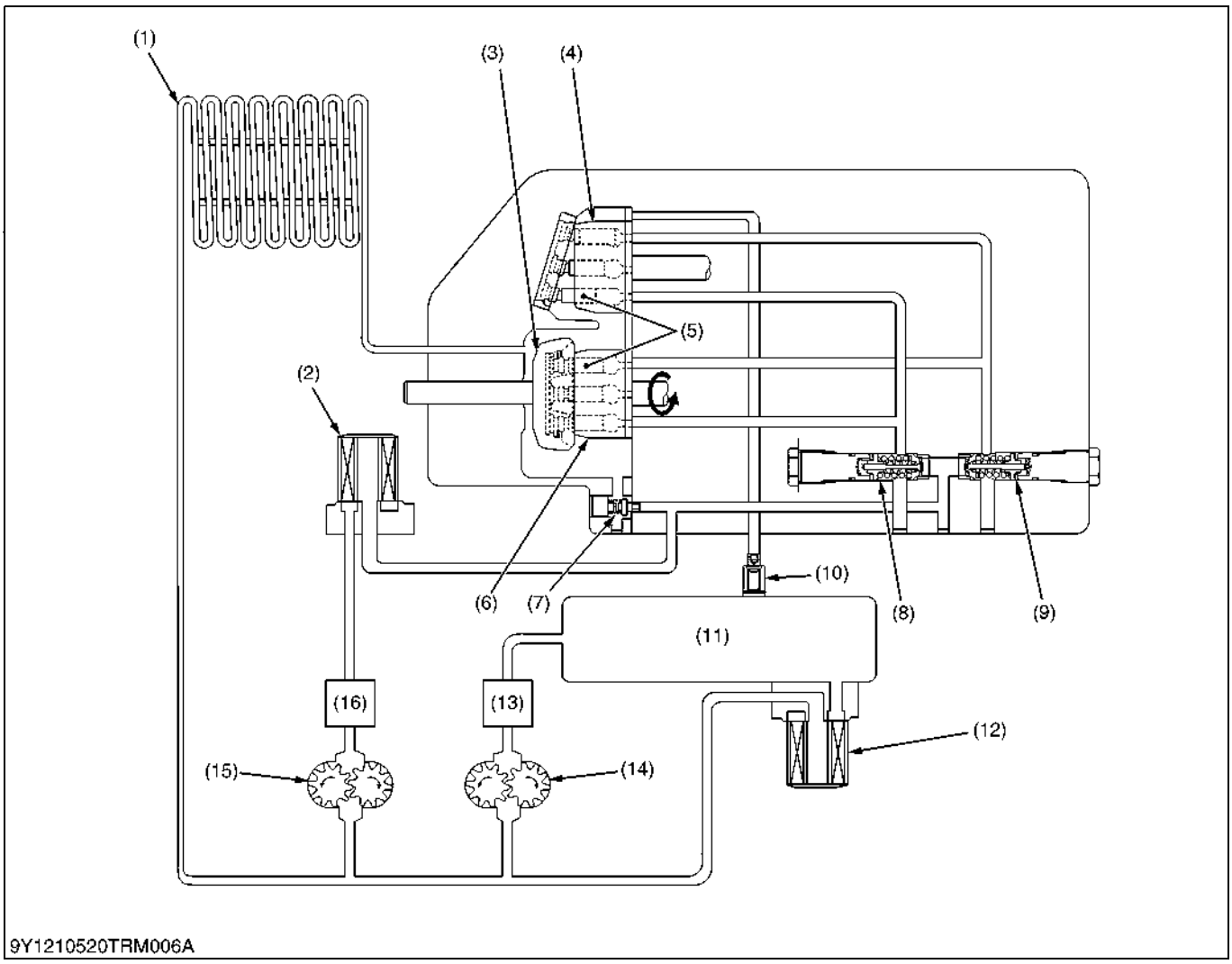
(1) Support (Steering Joint Shaft)
(2) Steering Joint Shaft
(3) Accelerator Rod
(4) Screw (Joint Shaft)
(5) Screw (Bearing Support)

(A) Clearance

9Y1211121CLS0010US0

(3) Operation

When the HST pedal is in the neutral position



(1) Oil Cooler
(2) Oil Filter (HST)
(3) Swash plate
(4) Cylinder Block (Motor)
(5) Piston
(6) Cylinder Block (Pump)
(7) Charge Relief Valve
(8) Check and High Pressure Relief Valve (Forward)
(9) Check and High Pressure Relief Valve (Reverse)
(10) Case Relief Valve
(11) Transmission Case
(12) Oil Filter
(13) Hydraulic Control Valve
(14) Hydraulic Pump (Main Circuit)
(15) Hydraulic Pump (Power Steering)
(16) Power Steering Controller

When the speed control pedal is in neutral, the variable swash-plate is at right angles to the pump piston and they only rotate with cylinder block without reciprocating. Since the oil is not being pumped to the motor, the cylinder block in the motor is stationary and the output shaft does not move.

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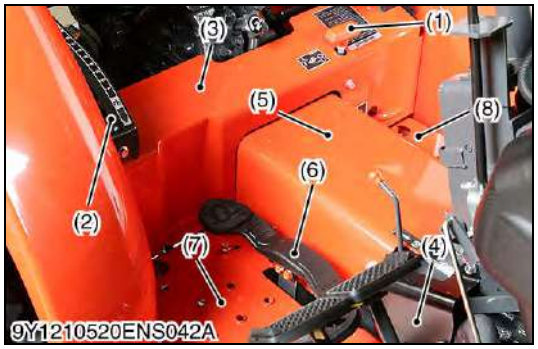
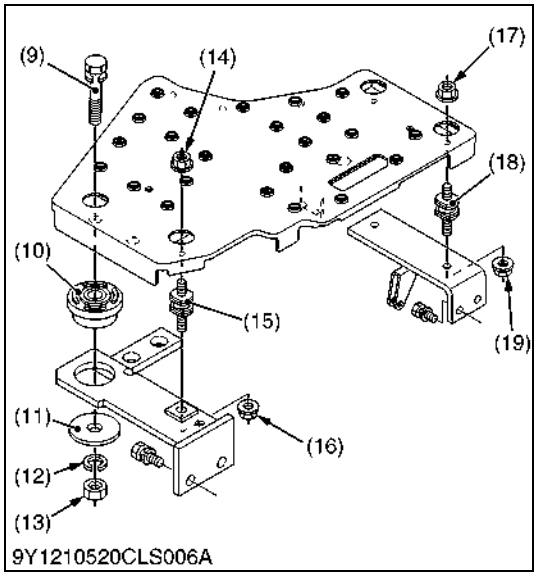


Outer Components

1. Remove the grip (1).
2. Remove the position control lever grip and position control lever guide (2).
3. Remove the floor sheet cover (3).
4. Remove the neutral holder cover (4) and the center cover (5).
5. Disconnect the brake pedal spring.
6. Remove the HST control pedal (6) and step (R.H.) (7).
7. Disconnect the differential lock spring, rod and step (L.H.) (8).

(When reassembling)

- Be sure to set the washers and rubber plates of the steps mounting screw at an original positions as shown in figure.



(1) Grip (Front Drive Lever)
(2) Position Control Lever Guide
(3) Floor Sheet Cover
(4) Neutral Holder Cover
(5) Center Cover
(6) HST Control Pedal
(7) Step (R.H.)
(8) Step (L.H.)
(9) Screw
(10) Rubber Plate
(11) Washer
(12) Spring Washer
(13) Nut
(14) Nut
(15) Cushion
(16) Nut
(17) Nut
(18) Cushion
(19) Nut

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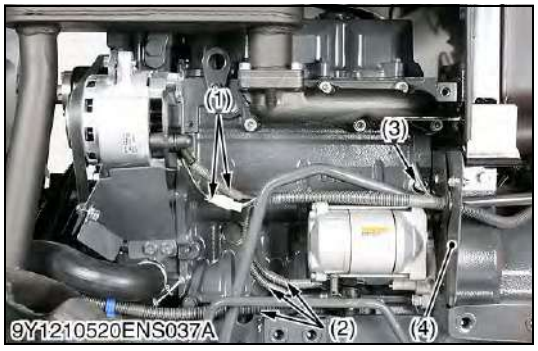


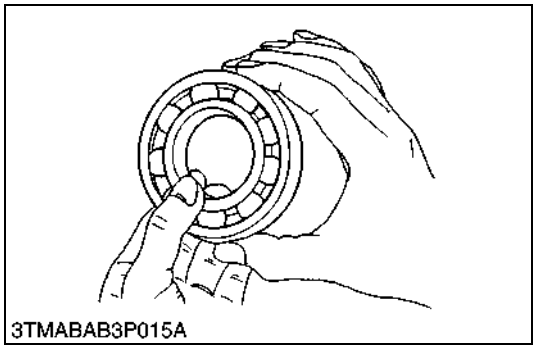
Electrical Wirings 1

1. Disconnect the wiring (1).
2. Disconnect the wirings (2).
3. Disconnect the **1P** connector (3), (7) and the wirings (5), (6).
4. Remove the shutter plate (4) and the wirings from the engine.

(1) Wiring (Alternator)
(2) Wiring (Starter Motor)
(3) **1P** Connector (Engine Oil Switch)
(4) Shutter Plate
(5) Wiring (Engine Stop Solenoid)
(6) Wiring (Glow Plug)
(7) **1P** Connector (Coolant Temperature Sensor)

9Y1211121CLS0018US0

[2] TRANSMISSION CASE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Checking Bearing

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

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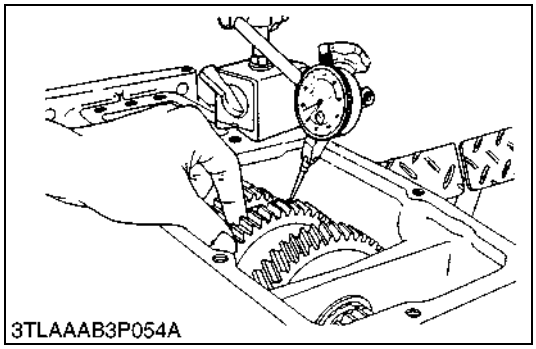
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Gear Backlash

1. Set a dial indicator (lever type) on one of the tooth faces.
2. Clamp the mating gear.
3. Measure backlash by turning the gear to be measured.
4. If the reading exceeds the allowable limit, replace the gear.

Gear backlash	Factory specification	0.1 to 0.3 mm 0.004 to 0.01 in.
	Allowable limit	0.4 mm 0.02 in.

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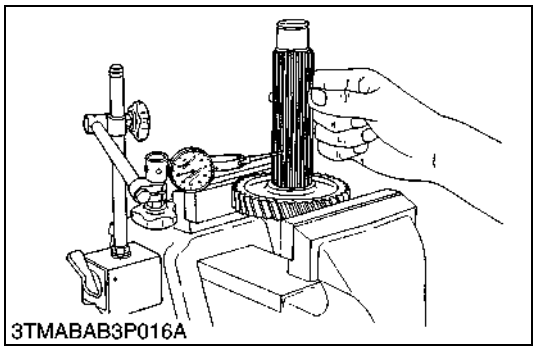
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Clearance between Gear and Spline

1. Secure the gear with a vise.
2. Set a dial indicator (lever type) with its finger on the spline.
3. Move the shaft to measure the clearance.
4. If the clearance exceeds the allowable limit, replace them.

Clearance between gear and spline	Factory specification	0.030 to 0.078 mm 0.0012 to 0.003 in.
	Allowable limit	0.2 mm 0.008 in.

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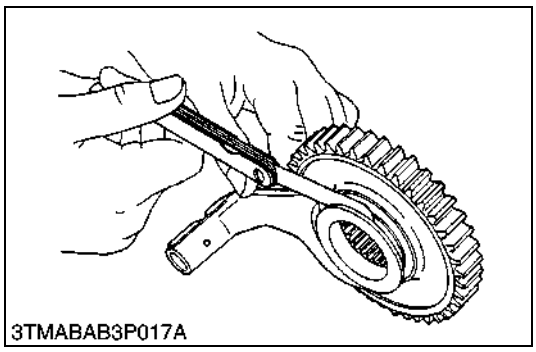
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Clearance between Shift Fork and Shift Gear Groove or Shifter Groove

1. Place for in the groove to check clearance with feeler gauge.
2. If the clearance exceeds allowable limit, replace.

Clearance between shift fork and shift gear groove	Factory specification	0.15 to 0.40 mm 0.0059 to 0.015 in.
	Allowable limit	0.6 mm 0.02 in.

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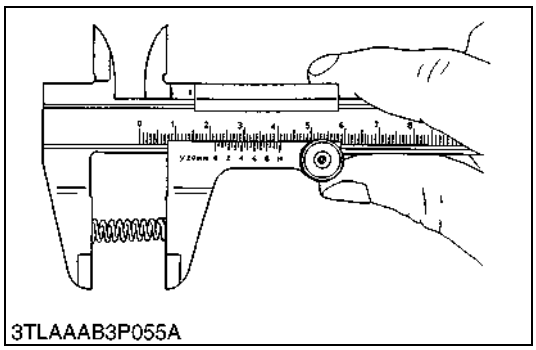
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Free Length of the Shift Fork Spring

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

Free length of the shift fork spring	Factory specification	22 mm 0.87 in.
	Allowable limit	20 mm 0.79 in.

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	15 to 20 mm 0.6 to 0.8 in.	–
Cam Plate	Flatness	–	0.3 mm 0.01 in.
Cam Plate and Ball	Height	20.9 to 21.1 mm 0.823 to 0.830 in.	20.5 mm 0.807 in.
Brake Disc	Thickness	4.60 to 4.80 mm 0.182 to 0.188 in.	4.2 mm 0.17 in.
Plate	Thickness	2.54 to 2.66 mm 0.100 to 0.104 in.	2.1 mm 0.083 in.

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Item		Factory Specification	Allowable Limit
Pinion Shaft to Differential Pinion	Clearance	0.0640 to 0.100 mm 0.00252 to 0.00393 in.	0.25 mm 0.0098 in.
• Pinion Shaft	O.D.	13.950 to 13.968 mm 0.54922 to 0.54992 in.	–
• Differential Pinion	I.D.	14.032 to 14.050 mm 0.55244 to 0.55314 in.	–
Differential Pinion to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.01 in.	–
Spiral Bevel Pinion Shaft to Spiral Bevel Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.01 in.	–
11T Bevel Gear to 16T Bevel Gear	Backlash	0.15 to 0.35 mm 0.0059 to 0.013 in.	–
11T Bevel Gear to 42T Bevel Gear.	Backlash	0.15 to 0.35 mm 0.0059 to 0.013 in.	–
Front Axle Case Boss (Front) to Bracket Bushing	Clearance	0.025 to 0.16 mm 0.00089 to 0.0062 in.	0.35 mm 0.014 in.
• Front Axle Case Boss (Front)	O.D.	49.950 to 49.975 mm 1.9666 to 1.9675 in.	–
• Bushing	I.D.	50.00 to 50.11 mm 1.969 to 1.972 in.	–
Front Axle Case Boss (Rear) to Bracket Bushing	Clearance	0.025 to 0.19 mm 0.00098 to 0.0074 in.	0.35 mm 0.014 in.
• Front Axle Case Boss (Rear)	O.D.	70.000 to 70.035 mm 2.7559 to 2.7572 in.	–
• Bushing	I.D.	70.060 to 70.190 mm 2.7583 to 2.7633 in.	–
Press Fitting Bushing A (Front)	Length	12 mm 0.47 in.	–
Press Fitting Bushing B (Rear)	Length	18 mm 0.71 in.	–

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1. TROUBLESHOOTING

Symptom	Probable Cause and Checking Procedure	Solution	Reference Page
Noise	1. Insufficient oil	Fill	G-9
	2. Air sucked in pump from suction circuit	Bleed	–
Excessive Steering Wheel Play	1. Backlash between sector gear shaft and rack (piston) too large	Adjust	7-S4
	2. Sector gear shaft worn	Replace	7-S11
Front Wheels Vibration	1. Improper toe-in adjustment	Adjust	6-S5
Front Wheels Wander to Right or Left	1. Improper toe-in adjustment	Adjust	6-S5
	2. Tire pressure uneven	Inflate	G-56
	3. Backlash between sector gear shaft and rack (piston) too small	Adjust	7-S4
Steering Wheel Does Not Returnto Neutral Position	1. Valve housing and sleeve jammed	Repair or replace	7-S10
	2. Valve housing oil seal damaged	Replace	7-S10
Hard Steering	1. Oil leak from pipe joint	Solution order 1. Retighten	7-S7, 7-S8
		2. Replace copper washer	8-S9
	2. Insufficient oil	Fill	G-9
	3. Tire pressure uneven	Inflate	G-56
	4. Air sucked in pump from suction circuit	Bleed	–
	5. Improper relief valve adjustment	Adjust	7-S5
	6. Valve housing and sleeve malfunctioning	Replace	7-S10
	7. Seals in steering gear box damaged	Replace	7-S9
Steering Force Fluctuate	1. Insufficient oil	Fill	G-9
	2. Air sucked in pump from suction circuit	Bleed	–
	3. Valve housing and sleeve malfunctioning	Replace	7-S10

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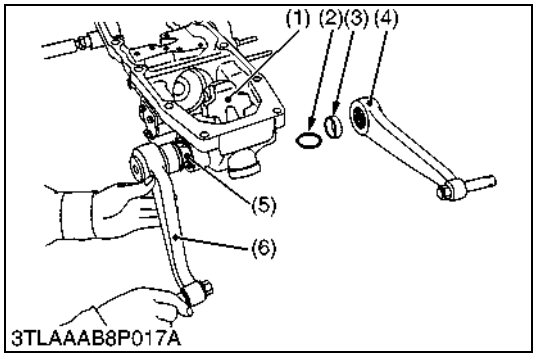

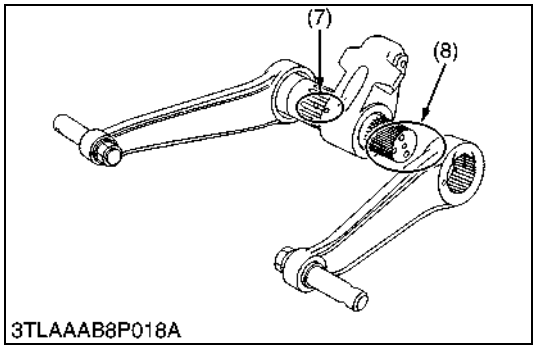

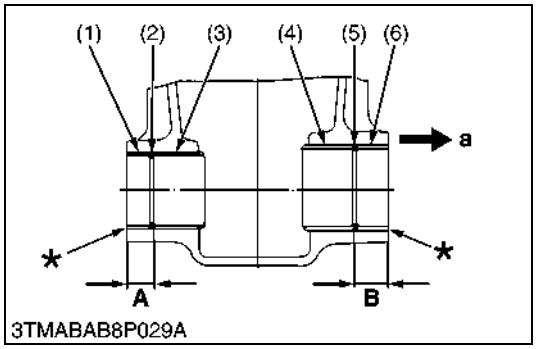

Lift Arm, Hydraulic Arm and Hydraulic Arm Shaft

1. Disconnect the position control rod from feedback lever.
2. Remove the lift arm setting screws.
3. Draw out the hydraulic arm shaft (5) and right lift arm (6) as a unit.
4. Take out the hydraulic arm (1).
5. Remove the collar (3) and O-ring (2).

(When reassembling)

- Align the alignment marks of the hydraulic arm and hydraulic arm shaft (7).
- Align the alignment marks of the lift arm and hydraulic arm shaft (8).
- Apply grease to the right and left bushings of hydraulic cylinder block and O-rings (2).
- Take care not to damage the O-ring (2).

(1) Hydraulic Arm
(2) O-ring
(3) Collar
(4) Lift Arm (Left)
(5) Hydraulic Arm Shaft
(6) Lift Arm (Right)
(7) Alignment Mark (Hydraulic Arm Shaft and Hydraulic Arm)
(8) Alignment Mark (Hydraulic Arm Shaft and Lift Arm)

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Bushings

1. Remove the bushings right (4) and left side (3).

(When reassembling)

- When press-fitting new bushings (3), (4) with a press-fitting tool (see page G-51) observe the dimensions described in the figure.
- Apply transmission fluid to the hydraulic cylinder boss and bushing.
- Press- fit the bushing so that each seam face upward.

Press-fit location of bushings	Factory specification	Dimension **A**	21.75 to 22.75 mm 0.8563 to 0.8956 in.
		Dimension **B**	26.50 to 27.50 mm 1.044 to 1.082 in.

(1) Collar (Left)
(2) O-ring
(3) Bushing (Left)
(4) Bushing (Right)
(5) O-ring
(6) Collar (Right)

a: Right Side
***Flush the end of collar with the end of hydraulic cylinder body.**

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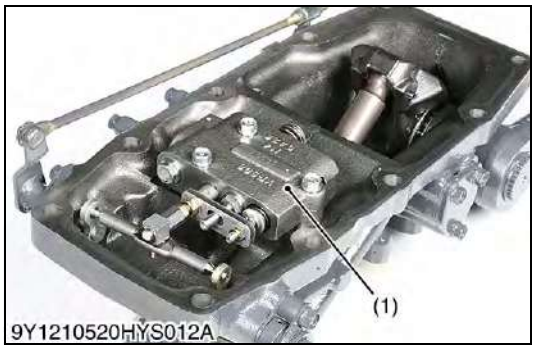
[3] POSITION CONTROL VALVE



Position Control Valve

1. Loosen and remove the position control valve mounting screws.
2. Take out the position control valve (1).

(When reassembling)

- Take care not to damage the O-rings.

Tightening torque	Position control valve mounting screws	20 to 24 N·m 2.0 to 2.5 kgf·m 15 to 18 lbf·ft

■ **IMPORTANT**

- **Measure the distance between the spool edge and spool joint 2 edge before disassembling.**

(1) Position Control Valve

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