# WSM

## WORKSHOP MANUAL
## UTILITY VEHICLE

# RTV1100

Kubota

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KiSC issued 06, 2009 A

# GENERAL

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# SPECIFICATIONS

| Model | | | Worksite | Recreational |
|---|---|---|---|---|
| Engine | Maker | | KUBOTA | |
| | Model | | D1105-E2-UV | |
| | Type | | Indirect Injection. Vertical, water-cooled, 4-cycle diesel | |
| | Number of cylinders | | 3 | |
| | Bore and stroke | | 78 × 78.4 mm (3.1 × 3.09 in.) | |
| | Total displacement | | 1123 $cm^3$ (68.53 cu.in.) | |
| | Engine gross power (DIN) | | 18.5 kW (24.8 HP) | |
| | Rated revolution | | 50.00 r/s [3000 $min^{-1}$ (rpm)] | |
| | Maximum torque | | 69 N·m (7.0 kgf·m, 51 lbf·ft) / 33.34 to 40.00 r/s [2000 to 2400 $min^{-1}$ (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)],<br>Diesel fuel No. 1 [below –10 °C (14 °F)] | |
| Capacities | Fuel tank | | 30 L (7.9 U.S.gals, 6.6 Imp.gals) | |
| | Engine crankcase (with filter) | | 4.0 L (4.3 U.S.qts, 3.6 Imp.qts) | |
| | Engine coolant (with recovery tank) | | 5.2 L (5.5 U.S.qts, 4.6 Imp.qts) | |
| | Transmission case | | 12 L (3.2 U.S.gals, 2.6 Imp.gals) | |
| | Front axle case | | 0.6 L (0.6 U.S.qts, 0.5 Imp.qts) | |
| | Knuckle case | | Ref. 0.15 L (0.16 U.S.qts, 0.13 Imp.qts) | |
| | Brake fluid (reservoir and lines) | | 0.87 L (0.92 U.S.qts, 0.77 Imp.qts) | |
| | Hydraulic oil | | 17.5 L (18.5 U.S.qts, 15.4 Imp.qts) | |
| Travelling system | Tires | Front | 25 × 10-12 HDWS, 6PLY<br>25 × 10-12 ATV, 6PLY<br>25 × 12-12 Turf, 4PLY | 25 × 10-12 HDWS, 6PLY<br>25 × 10-12 ATV, 6PLY |
| | | Rear | 25 × 10-12 HDWS, 6PLY<br>25 × 11-12 ATV, 6PLY<br>25 × 12-12 Turf, 4PLY | 25 × 10-12 HDWS, 6PLY<br>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 | | H-M-L 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 (26 feet) | |
| Suspension | Front | | Independent, MacPherson strut-type | |
| | Rear | | Semi-independent, DeDion axle with leaf springs and shock absorber | |

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

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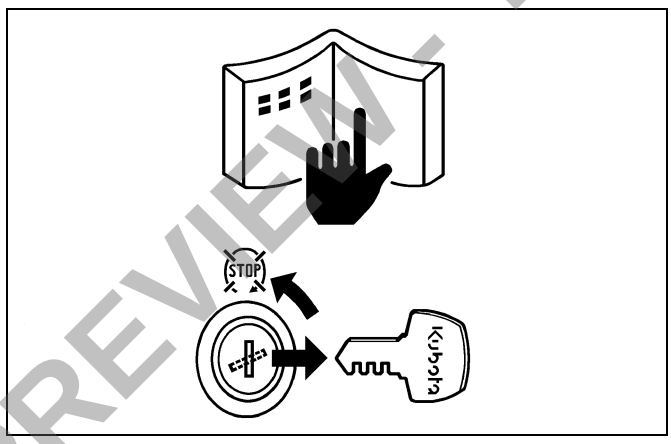
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# ⚠ SAFETY FIRST

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

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

| | |
|---|---|
| ⚠ **DANGER** | **: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.** |
| ⚠ **WARNING** | **: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.** |
| ⚠ **CAUTION** | **: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.** |
| ■ **IMPORTANT** | **: Indicates that equipment or property damage could result if instructions are not followed.** |
| ■ **NOTE** | **: Gives helpful information.** |




## BEFORE SERVICING AND REPAIRING

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

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# 4. LUBRICANTS, FUEL AND COOLANT

| No. | Place | Capacity | Lubricants, fuel and coolant |
|---|---|---|---|
| 1 | Fuel tank | 30 L<br>7.9 U.S.gals<br>6.0 Imp.gals | No. 2-D diesel fuel<br>No. 1-D diesel fuel if temperature is below −10 °C (14 °F) |
| 2 | Cooling system with recovery tank | 5.2 L<br>5.5 U.S.qts<br>4.6 Imp.qts | Fresh clean water with anti-freeze |
| 3 | Engine crankcase with oil filter | (Oil filter exchanged)<br>4.1 L<br>4.3 U.S.qts<br>3.6 Imp.qts<br>(Oil filter non-exchanged)<br>3.8 L<br>4.0 U.S.qts<br>3.3 Imp.qts | Engine oil : API Service Classification CF or better<br>Below 0 °C (32 °F) : SAE10W, 10W-30 or 10W-40<br>0 to 25 °C (32 to 77 °F): SAE20, 10W-30 or 10W-40<br>Above 25 °C (77 °F): SAE30, 10W-30 or 10W-40 |
| 4 | Transmission case | 12 L<br>3.2 U.S.gals<br>2.6 Imp.gals | KUBOTA UDT or SUPER UDT fluid* |
| 5 | Front axle case | 0.6 L<br>0.6 U.S.qts<br>0.5 Imp.qts | KUBOTA UDT or SUPER UDT fluid* |
| 6 | Knuckle case | Ref. 0.15 L<br>Ref. 0.16 U.S.qts<br>Ref. 0.13 Imp.qts | KUBOTA UDT or SUPER UDT fluid* |
| 7 | Brake fluid (reservoir and lines) | 0.87 L<br>0.92 U.S.qts<br>0.77 Imp.qts | KUBOTA DOT3 GENUINE BRAKE FLUID |
| 8 | Hydraulic oil | 17.5 L<br>18.5 U.S.qts<br>15.4 Imp.qts | KUBOTA UDT or SUPER UDT fluid* |

* KUBOTA original transmission hydraulic fluid.

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# 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-27 |
| 2 | Greasing | Apply | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | | | G-28 |
| 3 | Engine oil | Change | ★ | | | ☆ | | | | ☆ | | | | | | G-22 |
| 4 | Muffler (Spark arrester) | Clean | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-31 |
| 5 | Wheel screw torque | Check | ★ | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-23 |
| 6 | Battery condition | Check | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-33 |
| 7 | Fan belt tension | Adjust | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-34 |
| 8 | VHT neutral spring | Check | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-30 |
| 9 | Toe-in | Adjust | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-35 |
| 10 | Fuel filter element | Check | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-35 |
| | | Replace | | | | | | | | | | | | | | – |
| 11 | Air cleaner element | Clean | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-32 |
| | | Replace | | | | | | | | | | | | | | – |
| 12 | Fuel line | Check | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | | | G-35 |
| | | Replace | | | | | | | | | | | | | | – |
| 13 | Engine oil filter | Replace | ★ | | | ☆ | | | | ☆ | | | | | | G-23 |
| 14 | Transmission oil filter (HST) (Yellow color) | Replace | ★ | | | ☆ | | | | ☆ | | | | | | G-25 |
| 15 | Transmission oil filter (Suction) (Orange color) | Replace | ★ | | | ☆ | | | | ☆ | | | | | | G-25 |
| 16 | Transmission oil | Change | ★ | | | | | | | ☆ | | | | | | G-24 |
| 17 | Parking brake lever | Adjust | ★ | | | ☆ | | | | ☆ | | | | | | G-25 |
| 18 | Brake light switch | Check | ★ | | | ☆ | | | | ☆ | | | | | | G-25 |
| 19 | Front brake case | Check | ★ | | | ☆ | | | | ☆ | | | | | | G-26 |
| 20 | Hydraulic oil | Change | | | | ☆ | | | | ☆ | | | | | | G-37 |
| 21 | Hydraulic oil line | Check | | | | ☆ | | | | ☆ | | | | | | G-39 |
| 22 | Hydraulic tank oil filter (Yellow color) | Replace | | | | ☆ | | | | ☆ | | | | | | G-38 |
| 23 | Radiator hose and clamp | Check | | | | ☆ | | | | ☆ | | | | | | G-36 |
| | | Replace | | | | | | | | | | | | | | G-43 |
| 24 | Power steering oil line | Check | | | | ☆ | | | | ☆ | | | | | | G-38 |
| | | Replace | | | | | | | | | | | | | | G-43 |
| 25 | Intake air line | Check | | | | ☆ | | | | ☆ | | | | | | G-39 |
| | | Replace | | | | | | | | | | | | | | G-43 |
| 26 | Brake hose and pipe | Check | ★ | | | ☆ | | | | ☆ | | | | | | G-26 |
| | | Replace | | | | | | | | | | | | | | G-46 |
| 27 | Inner air filter | Clean | | | | ☆ | | | | ☆ | | | | | | G-39 |
| 28 | Fresh air filter | Clean | | | | ☆ | | | | ☆ | | | | | | G-40 |
| 29 | Air conditioner condenser | Check | | | | ☆ | | | | ☆ | | | | | | G-40 |
| 30 | Air conditioner drive belt | Adjust | | | | ☆ | | | | ☆ | | | | | | G-41 |

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# 3. TIGHTENING TORQUES

Tightening torques of screws bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts : Refer to "**5. TIGHTENING TORQUES**" in "**G. GENERAL**" section.)

| Item | N·m | kgf·m | lbf·ft |
|---|---|---|---|
| Cylinder head cover cap nut | 7 to 8 | 0.7 to 0.9 | 5 to 6 |
| Injection pipe retaining nut | 25 to 34 | 2.5 to 3.5 | 18 to 25 |
| Nozzle holder assembly | 49 to 68 | 5.0 to 7.0 | 37 to 50 |
| Nozzle holder | 35 to 39 | 3.5 to 4.0 | 26 to 28 |
| Overflow pipe assembly retaining nut | 20 to 24 | 2.0 to 2.5 | 15 to 18 |
| Glow plug | 7.9 to 14 | 0.8 to 1.5 | 5.8 to 10 |
| * Rocker arm bracket nut | 22 to 26 | 2.2 to 2.7 | 16 to 19 |
| * Cylinder head screw | 64 to 68 | 6.5 to 7.0 | 47 to 50 |
| * Fan drive pulley screw | 236 to 245 | 24.0 to 25.0 | 174 to 180 |
| * Connecting rod screw | 42 to 46 | 4.2 to 4.7 | 31 to 33 |
| * Flywheel screw | 54 to 60 | 5.5 to 6.0 | 40 to 43 |
| Bearing case cover screw | 9.81 to 11.3 | 1.00 to 1.15 | 7.24 to 8.31 |
| * Main bearing case screw 1 | 30 to 34 | 3.0 to 3.5 | 22 to 25 |
| * Main bearing case screw 2 | 49 to 53 | 5.0 to 5.5 | 37 to 39 |
| * Idle gear shaft 1 mounting screw | 9.80 to 11.3 | 1.00 to 1.15 | 7.23 to 8.33 |
| Oil pressure switch | 15 to 19 | 1.5 to 2.0 | 11 to 14 |

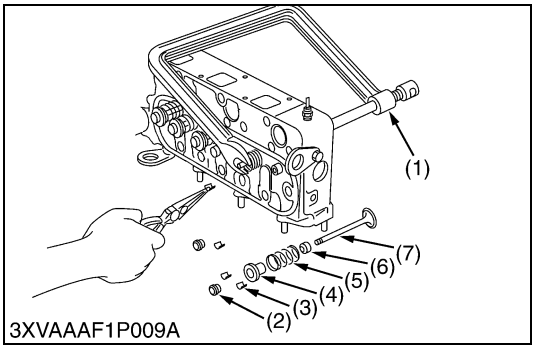
■ **NOTE**

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

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**Valves**

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

**(When reassembling)**

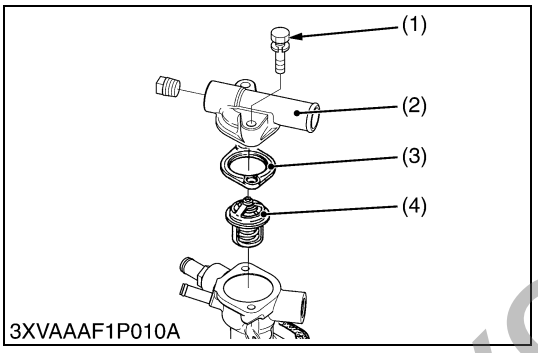
- Wash the valve stem and valve guide hole, and apply engine oil sufficiently.
- After installing the valve spring collets, lightly tap the stem to assure proper fit with a plastic hammer.

■ **IMPORTANT**

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

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

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**Thermostat Assembly**

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

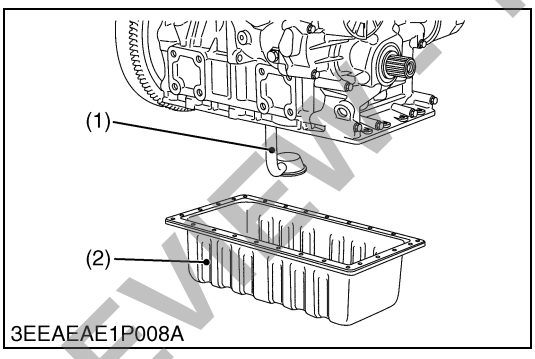
**(When reassembling)**

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

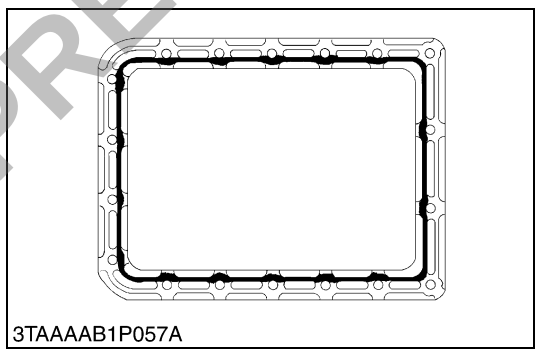
(1) Thermostat Cover Mounting Screw
(2) Thermostat Cover
(3) Thermostat Cover Gasket
(4) Thermostat Assembly

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## (3) Gear Case and Timing Gears



3EEAEAE1P008A


3TAAAAB1P057A

**Oil Pan and Oil Strainer**

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

**(When reassembling)**

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

■ **IMPORTANT**

- **Scrape off the old adhesive completely. Wipe the sealing surface clean using waste cloth soaked with gasoline. Now apply new adhesive 3.0 to 5.0 mm (0.12 to 0.19 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" container at its second notch. Apply "liquid gasket" about 5.0 mm (0.19 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.**

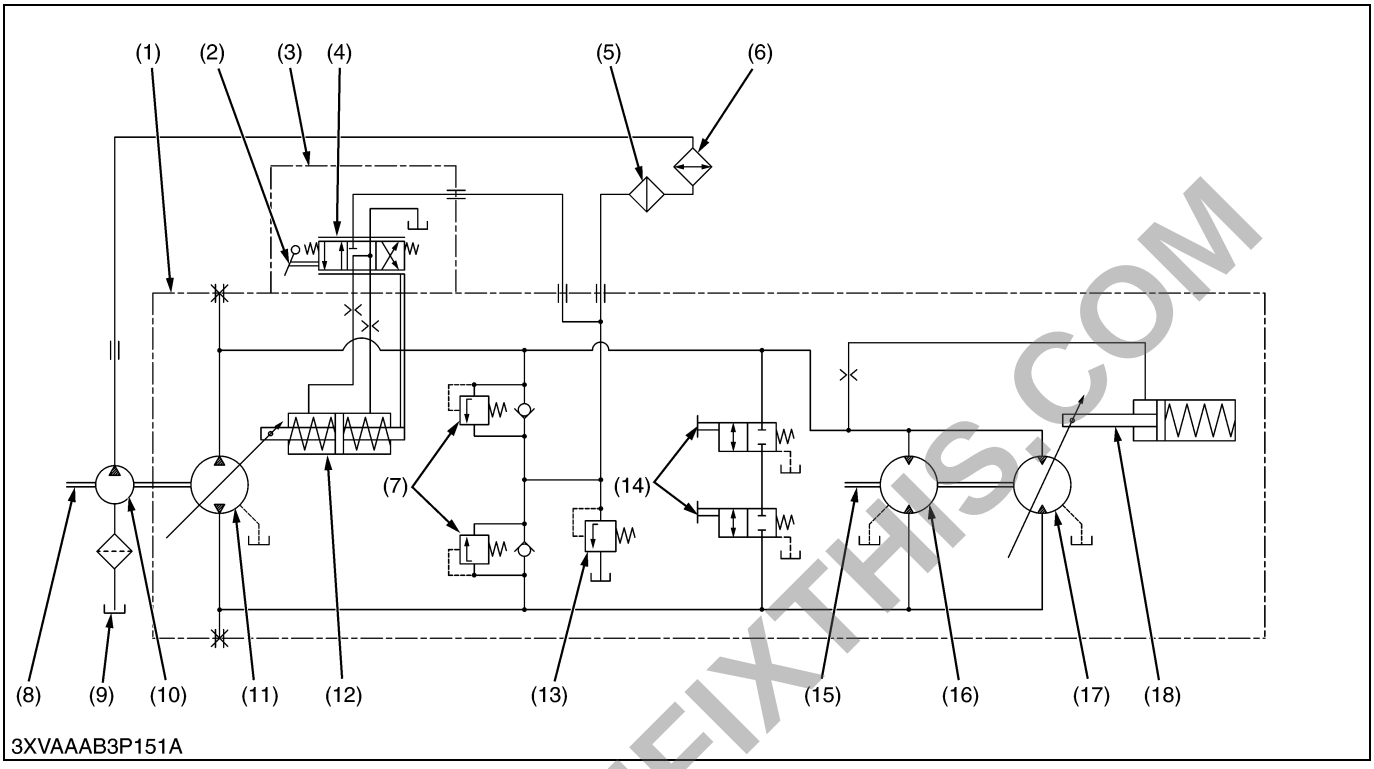
(1) Oil Strainer
(2) Oil Pan

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## (2) Oil Flow




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

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 0.71 MPa (5.3 to 7.3 kgf/cm$^2$, 75 to 100 psi)
  Check and High Pressure Relief Valve : 25.5 to 26.4 MPa (260 to 270 kgf/cm$^2$, 3700 to 3840 psi)

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# 1. TROUBLESHOOTING

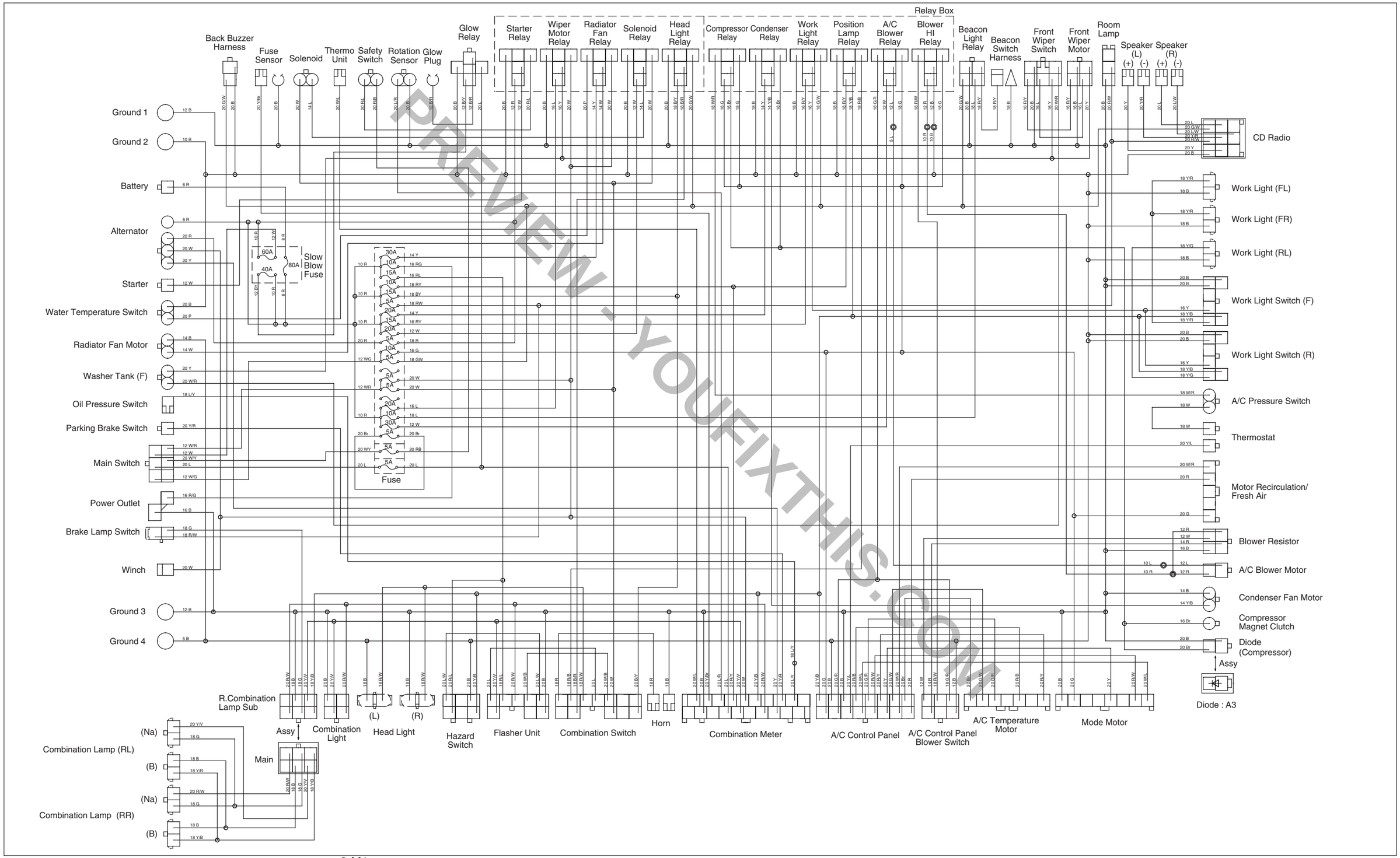
| Symptom | Probable | Solution | Reference page |
|---|---|---|---|
| **Engine Does Not Start** | No fuel | Replenish fuel | G-8 |
| | Air in the fuel system | Bleed | G-46 |
| | Water in the fuel system | Change fuel and repair or replace fuel system | – |
| | Fuel pipe clogged | Clean | G-35 |
| | Fuel filter clogged | Change | G-35 |
| | 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-S23 |
| | Incorrect injection timing | Adjust | 1-S16 |
| | Fuel camshaft worn | Replace | – |
| | Injection nozzle clogged | Repair or replace | 1-S19 |
| | Injection pump malfunctioning | Replace | 1-S29 |
| | Seizure of crankshaft, camshaft, piston, cylinder or bearing | Repair or replace | – |
| | Compression leak from cylinder | Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder | 1-S24, S26 |
| | Improper valve timing | Correct or replace timing gear | 1-S30 |
| | Piston ring and cylinder worn | Repair or replace | 1-S32 |
| | Excessive valve clearance | Adjust | 1-S12 |
| **(Starter Does Not Run)** | Battery discharged | Charge | G-33 |
| | Starter malfunctioning | Repair or replace | 8-S28 to S29 |
| | Main switch malfunctioning | Replace | 8-S8 to S9 |
| | Brake switch defective | Replace | 8-S12 |
| | Main shift lever switch defective | Replace | 8-S12 |
| | Wiring disconnected | Connect | – |
| **Engine Revolution Is Not Smooth** | Fuel filter clogged or dirty | Change | G-35 |
| | Air cleaner clogged | Clean or replace | G-32 |
| | Fuel leak due to loose injection pipe retaining nut | Tighten retaining nut | 1-S23 |
| | Injection pump malfunctioning | Replace | 1-S29 |
| | Incorrect nozzle injection pressure | Adjust | 1-S18 |
| | Injection nozzle stuck or clogged | Repair or replace | 1-S19 |
| | Governor malfunctioning | Repair | – |

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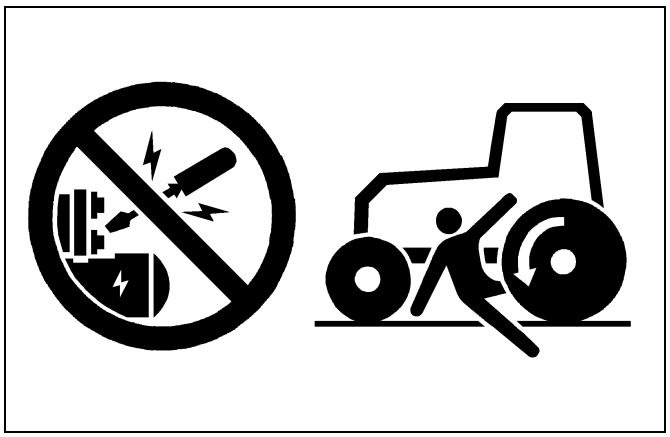
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# 1. WIRING DIAGRAM



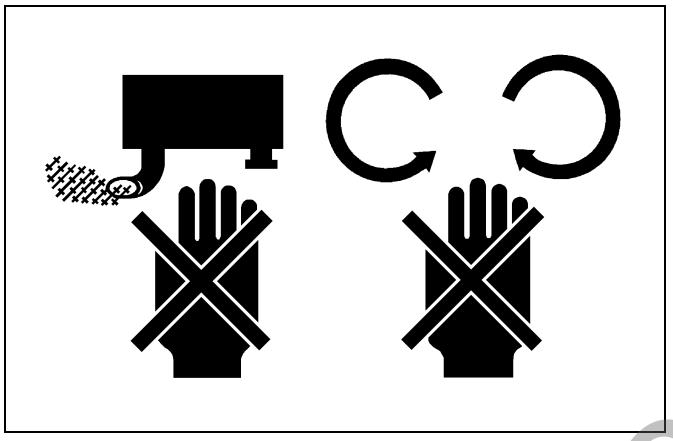

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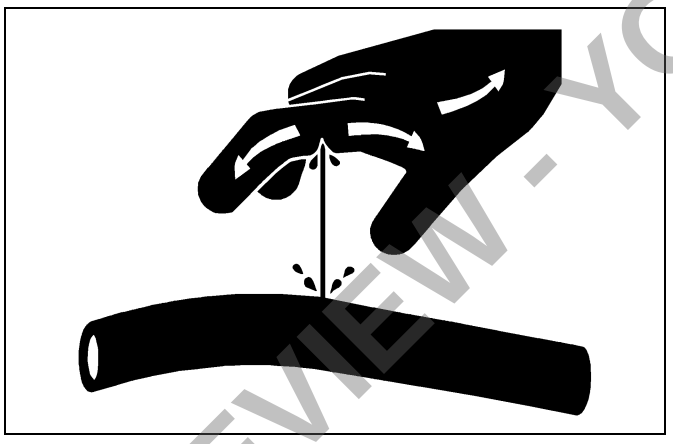
## SAFETY STARTING

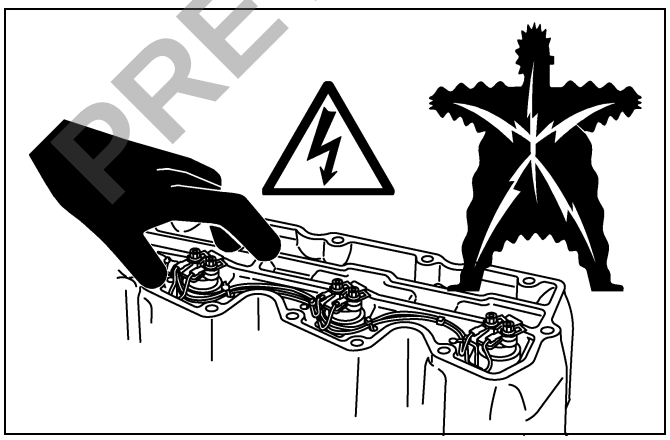
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



## SAFETY WORKING

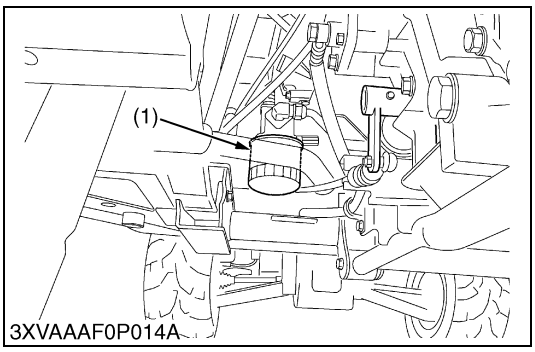
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing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





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## 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.**

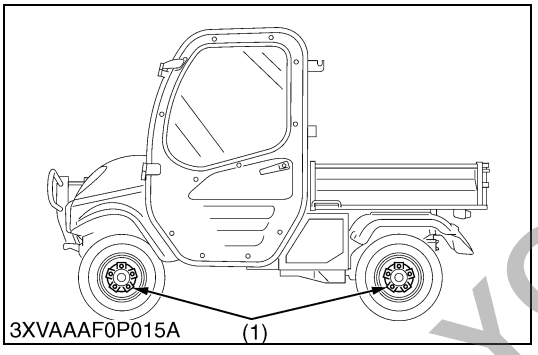
1. Remove the oil filter (1).
2. Put a film of clean engine oil on the rubber seal of the new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. After the new filter has been replaced, the engine oil normally decreases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




## 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<br>7.6 to 9.2 kgf·m<br>55 to 66 lbf·ft |

(1) Wheel Mounting Screw

W1059106

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# 9. TIRES

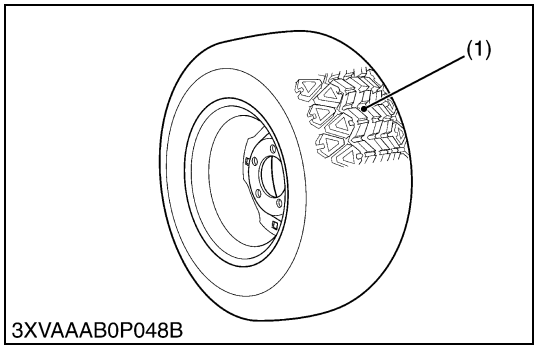
**CAUTION**

- **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.**

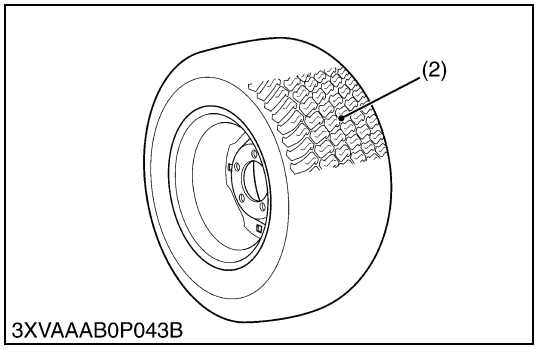
■ **IMPORTANT**

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

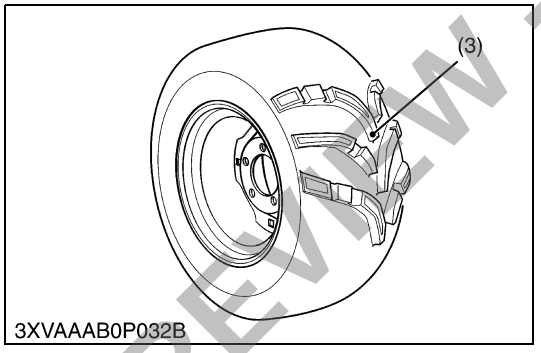
## [1] TYPE OF TIRE



3XVAAAB0P048B



3XVAAAB0P043B



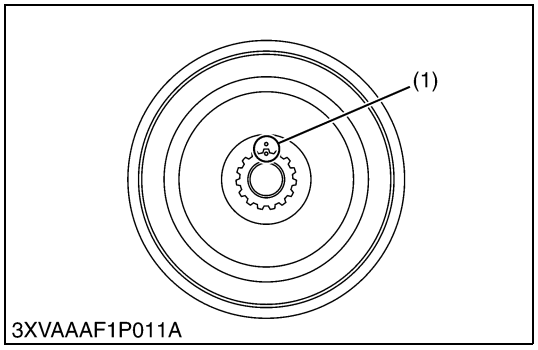
3XVAAAB0P032B

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

W1092542

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3XVAAAF1P011A

## Fan Drive Pulley

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

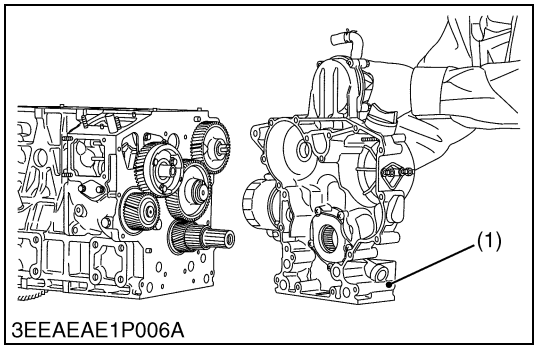
**(When reassembling)**

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

| | | |
|---|---|---|
| Tightening torque | Fan drive pulley screw | 236 to 245 N·m<br>24.0 to 25.0 kgf·m<br>174 to 180 lbf·ft |

(1) Aligning Mark

W10495610



3EEAEAE1P006A

## Gear Case

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

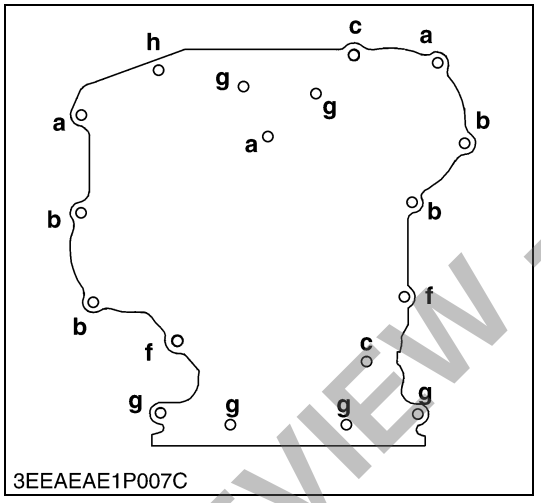
**(When reassembling)**

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

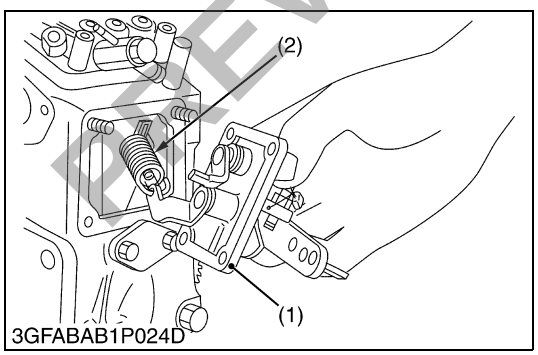
(1) Gear Case

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

W1048812



3EEAEAE1P007C



3GFABAB1P024D

## Speed Control Plate

1. Remove the engine stop solenoid.
2. Remove the speed control plate (1).
3. Remove the governor spring (2). Be careful not to drop spring into crankcase.

**(When reassembling)**

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

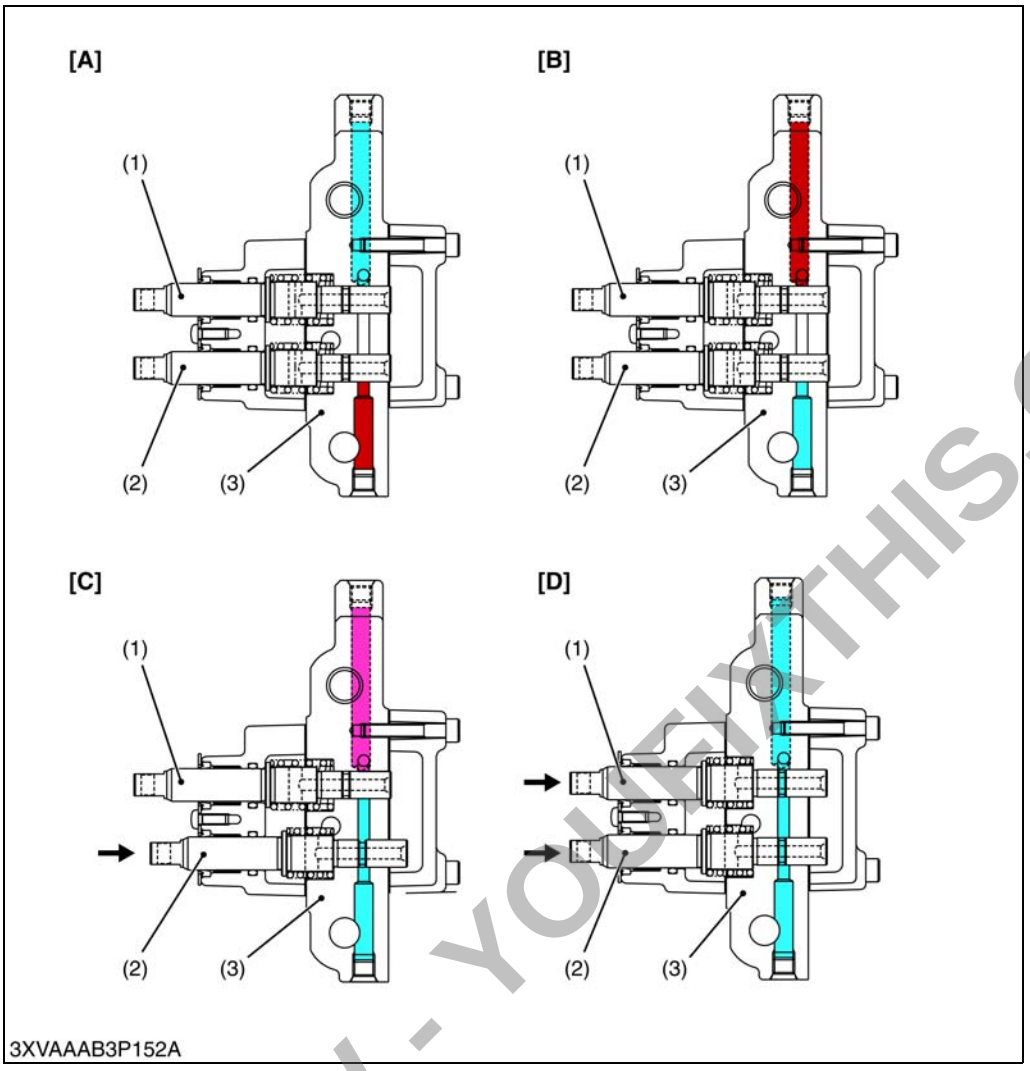
(1) Speed Control Plate (2) Governor Spring

W1031942

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## (C) 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**

W1028643

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).

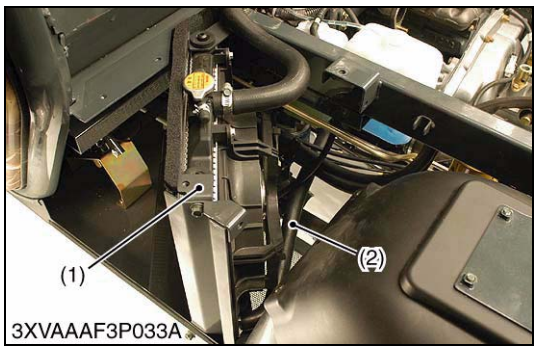
When the foot brake is applied (or the parking brake activated), the low pressure circuit is directed to the bypass circuit **[C]**.

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.

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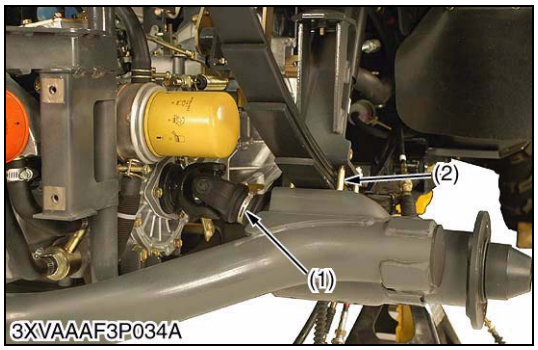



## Radiator Lower Hose

1. Remove the radiator cover 1.
2. Disconnect the radiator lower hose (2) from the radiator (1).

(1) Radiator (2) Radiator Lower Hose

W1035830



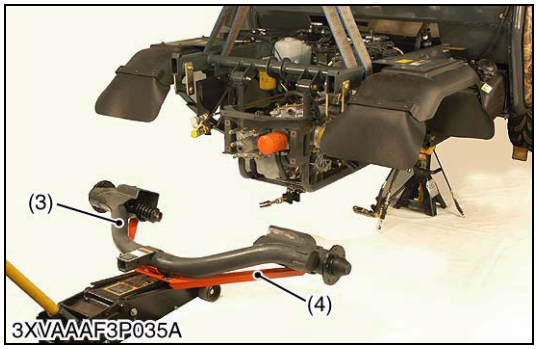

## Rear Axle Bracket

1. Remove the boot band (1) 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 (2) 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 to 55 N·m<br>4.9 to 5.7 kgf·m<br>36 to 41 lbf·ft |
| | Rear wheel mounting screw | 75 to 90 N·m<br>7.6 to 9.2 kgf·m<br>55 to 66 lbf·ft |



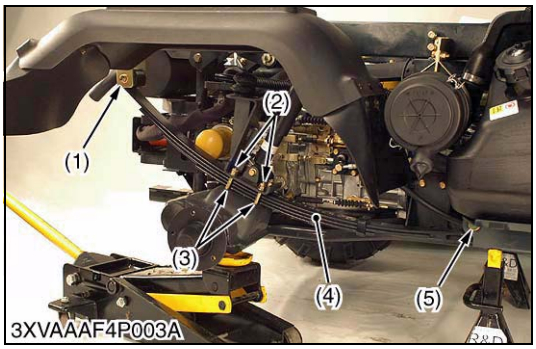

(1) Boot Band (3) Rear Axle Bracket Assembly
(2) Leaf Spring Mounting Bolt (4) Axle Support

W1036300

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## (2) Leaf Spring




**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 (2).
4. Remove the leaf spring mounting bolt (3) and nut (2).
5. Remove the spring reamer bolt and nut (5).
6. Remove the leaf spring rod and nut (1), and then remove the leaf spring (4).

**(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 | Rear axle bracket mounting bolt and nut | 48 to 55 N·m<br>4.9 to 5.7 kgf·m<br>36 to 41 lbf·ft |
| | Spring reamer bolt and nut | 30 to 49 N·m<br>3.0 to 5.0 kgf·m<br>22 to 36 lbf·ft |
| | Leaf spring rod and nut | 30 to 49 N·m<br>3.0 to 5.0 kgf·m<br>22 to 36 lbf·ft |

(1) Leaf Spring Rod and Nut
(2) Rear Axle Bracket Nut
(3) Rear Axle Bracket Bolt
(4) Leaf Spring
(5) Spring Reamer Bolt and Nut

W1014288




**Spring Rubber Bush**

1. Remove the spring rubber bushes (1).

**(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.**

(1) Spring Rubber Bush

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) | 79 to 90 N·m<br>7.9 to 9.2 kgf·m<br>58 to 66 lbf·ft |
| | Shock absorber mounting bolt and nut (lower) | 48 to 55 N·m<br>4.9 to 5.7 kgf·m<br>36 to 41 lbf·ft |

(1) Shock Absorber

W1015108

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# 2. SERVICING SPECIFICATIONS

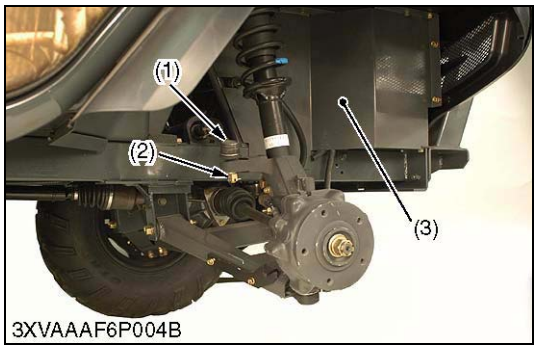
| Item | | Factory Specification | Allowable Limit |
|---|---|---|---|
| Front Wheel Alignment | Toe-in | 0 to 20 mm<br>0 to 0.78 in. | – |
| Differential Pinion to Differential Side Gear | Backlash | 0.10 to 0.30 mm<br>0.0040 to 0.011 in. | – |
| Differential Case to Differential Side Gear | Clearance | 0.25 to 0.066 mm<br>0.00099 to 0.0025 in. | 0.30 mm<br>0.012 in. |
| | Differential Case (I.D.) | 32.000 to 32.025 mm<br>1.2599 to 1.2608 in. | – |
| | Spiral Bevel Gear (I.D.) | 32.000 to 32.025 mm<br>1.2599 to 1.2608 in. | – |
| | Differential Side Gear (O.D.) | 31.959 to 31.975 mm<br>1.2583 to 1.2589 in. | – |
| Differential Pinion Shaft to Differential Pinion | Clearance | 0.016 to 0.045 mm<br>0.00063 to 0.0017 in. | 0.30 mm<br>0.012 in. |
| | Differential Pinion (I.D.) | 16.000 to 16.018 mm<br>0.62993 to 0.63062 in. | – |
| | Differential Pinion Shaft (O.D.) | 15.973 to 15.984 mm<br>0.62986 to 0.62929 in. | – |
| Bevel Pinion Shaft | Turning Torque | 0.79 to 0.98 N·m<br>0.080 to 0.10 kgf·m<br>0.058 to 0.72 lbf·ft | – |
| Bevel Pinion Shaft to Spiral Bevel Gear | Backlash | 0.15 to 0.30 mm<br>0.0059 to 0.011 in. | – |

W1013874

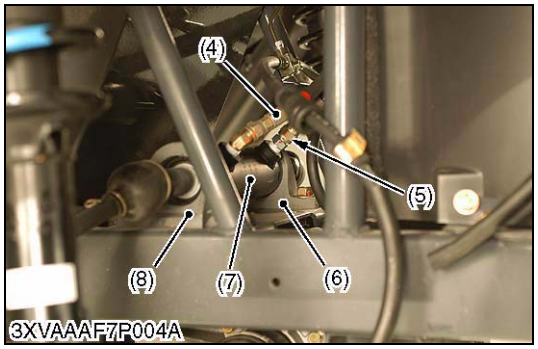
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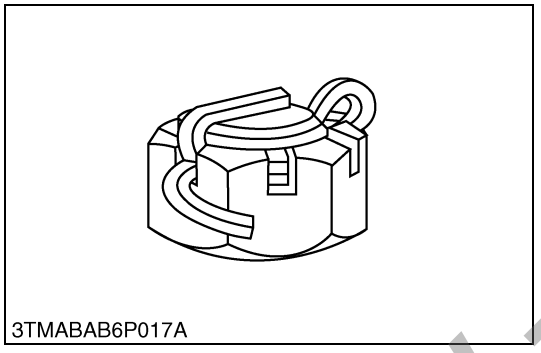
## (2) Separating Power Steering Cylinder



3XVAAAF6P004B



3XVAAAF7P004A


3TMABAB6P017A

**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. Remove the differential side cover RH (3).
5. Disconnect the power steering cylinder hoses (4), (5).
6. Remove the power steering cylinder bracket (6), (8) mounting screws and remove the power steering cylinder (7) 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. 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 in the figure left.

| | | |
|---|---|---|
| Tightening torque | Tie-rod end slotted nut | 39 N·m<br>4.0 kgf·m<br>29 lbf·ft |
| | Power steering cylinder hose retaining nut | 21.6 to 27.5 N·m<br>2.21 to 2.62 kgf·m<br>16.0 to 18.9 lbf·ft |
| | Power steering cylinder bracket mounting screw | 103 to 117 N·m<br>10.5 to 12.0 kgf·m<br>76.0 to 86.7 lbf·ft |

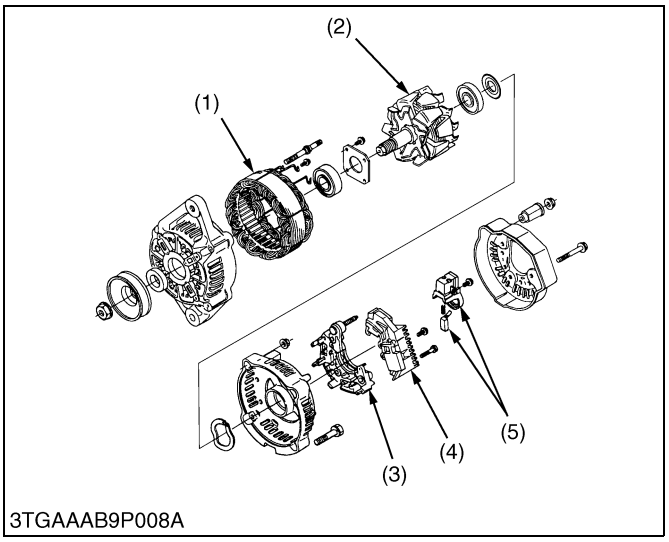
(1) Tie-rod End RH
(2) Slotted Nut (for Tie-rod End)
(3) Differential Side Cover RH
(4) Power Steering Cylinder Hose (RH)
(5) Power Steering Cylinder Hose (LH)
(6) Power Steering Cylinder Bracket (LH)
(7) Power Steering Cylinder
(8) Power Steering Cylinder Bracket (RH)

W1015900

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# [1] ALTERNATOR



3TGAAAB9P008A

A compact alternator with an IC regulator is used, having the following characteristics :

- 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.

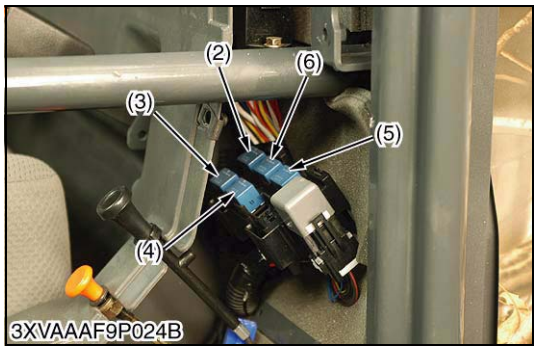
(1) Stator
(2) Rotor
(3) Rectifier
(4) IC Regulator
(5) Brush Holder

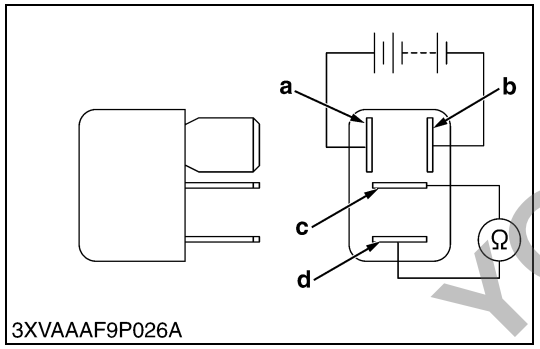
W1017761

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**Relay (for Except Glow Plug)**

1. Turn the main switch **OFF**.
2. Remove the side cover (1).
3. Remove the relay which should be checked.
4. Connect the jumper load across the battery positive terminal to relay terminal **1** (**a**), and the battery negative terminal to relay terminal **2** (**b**).
5. Check the continuity with an ohmmeter between the relay terminal **5** (**c**) and terminal **3** (**d**).
6. If the continuity is 0 ohms, the relay is proper.

(1) Side Cover
(2) Relay for Starter Motor
(3) Relay for Engine Stop Solenoid
(4) Relay for Head Light
(5) Relay for Radiator Fan Motor
(6) Relay for Wiper Motor

**a : Relay Terminal 1**
**b : Relay Terminal 2**
**c : Relay Terminal 5**
**d : Relay Terminal 3**

W1059707

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# 4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE

When checking or repairing the air conditioning system, the following precautions and rules must be observed. And it is of first importance that no other personnel than a well-trained serviceman should be allow to handle the refrigerant.

**⚠ CAUTION**

- **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
- **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never heat the refrigerant container above 40 °C (104 °F) or drop it from a high height.**
- **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**
- **If you improperly connect the hose between the service valve of compressor and gauge manifold, or incorrectly handle the valves, the refrigerant service container or charging hose will explode. When connecting the hose or handling the valve, be sure to check the high pressure side or low pressure side.**
- **In case the refrigerant is charged while the compressor is operated, do not open the high pressure valve of the gauge manifold.**
- **Beware of the toxicity of the gas. The gas is harmless and nontoxic in its original state, however it produces a toxic substance when it comes in contact with high temperature parts and decomposes.**
- **Do not heat the service can unless necessary. When it has to be heated, use warm water of 40 °C (104 °F) or lower. Do not heat using boiling water.**

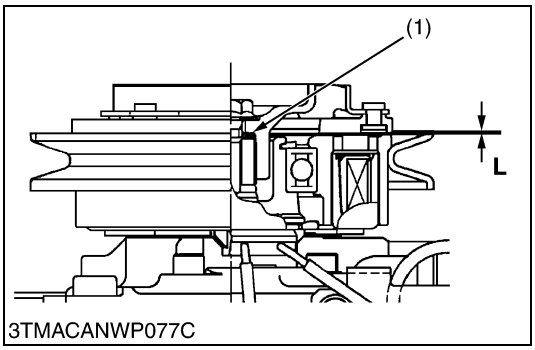
**■ IMPORTANT**

- **If the refrigerant, O-rings, etc. for R12 are used in the R134a air conditioner system, problems such as refrigerant leakage or cloudiness in the sight glass may occur. Therefore, in order to prevent charging of refrigerant or erroneous connections, the shapes of the piping joint as well as the shapes of the service valve and the service tools have been changed.**
- **Always keep the working place clean and dry and free from dirt and dust. Wipe off water from the line fittings with a clean cloth before disconnecting.**
- **Use only for R134a refrigerant service tool.**
- **Use for R134a refrigerant recovery and recycling machine when discharging the refrigerant.**
- **Before attaching the charging hose to the can tap valve of the refrigerant container, check each packing for clogging.**
- **When disconnecting the charging hose from the charging valve of compressor and receiver, remove it as quick as possible so that gas leakage can be minimized.**
- **Be sure to charge the specified amount of refrigerant, but not excessively. Over-charging of the refrigerant in particular may cause insufficient cooling, etc..**
- **Since the charging hose can be connected to can tap valve by hand, do not use a pliers for tightening it.**
- **Keep refrigerant containers in a cool and dark place avoiding such place which are subject to strong sunlight or high temperature.**
- **R134a compressor oil absorbs moisture easily, so that be sure to seal after disconnecting the each parts.**
- **Do not use old-type refrigerant R12a or compressor oil for old-type refrigerant.**
- **When replacing the condenser, evaporator and receiver, etc., replenish the compressor oil to compressor according to the table below.**

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# [3] SERVICING



3TMACANWP077C

**Adjustment of Air Gap**

1. Measure the air gap with a feeler gauge.
2. When the measurement value comes off from factory specification, adjustment shim (3) is added or deleted.

| | | |
|---|---|---|
| Air gap (**L**) | Factory spec. | 0.20 to 0.45 mm<br>0.0079 to 0.017 in. |

**(Reference)**

| Adjusting Shim Size | Code No. |
|---|---|
| 0.10 mm (0.0039 in.) | T1065-87340 |
| 0.15 mm (0.0059 in.) | T1065-87350 |
| 0.40 mm (0.016 in.) | T1065-87360 |
| 0.60 mm (0.024 in.) | T1065-87370 |
| 1.00 mm (0.0394 in.) | T1065-87380 |

(1) Shim **L : Air Gap**

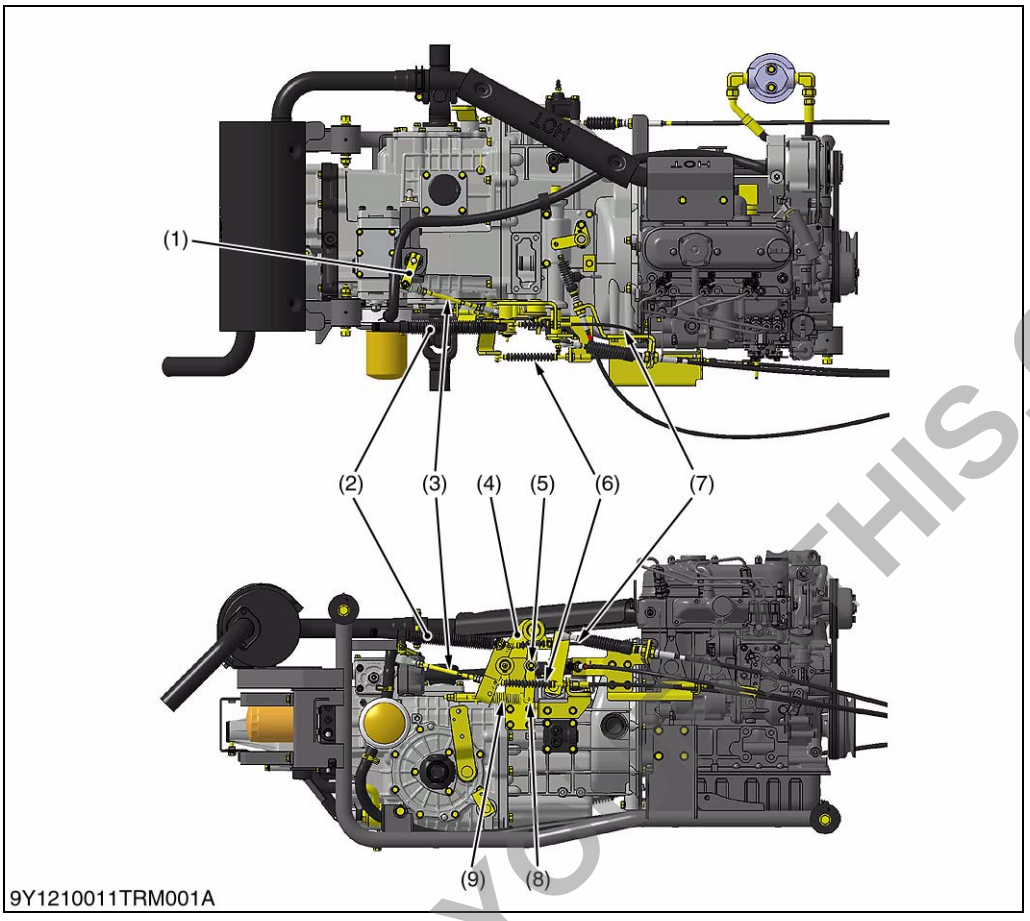
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## (H) Control Linkage

### ■ For HST




(1) HST Control Lever
(2) Damper
(3) HST Control Rod
(4) Neutral Holder Arm
(5) Ball Bearing
(6) Speed Control Pedal Cable
(7) Engine Accelerator Wire
(8) Neutral Holder
(9) Neutral Spring

W1018249

The speed control pedal and neutral holder arm (4) are connected with speed control pedal cable (6). And the HST control lever (1) and neutral holder arm (4) are linked with HST control rod (3).

The accelerator wire (7) connected with neutral holder arm (4) is able to be pulled by synchronizing with the speed control pedal cable.

As the HST pedal is depressed to forward, the HST control lever (1) 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 (4), when the pedal is released. The ball bearing (5) on the neutral holder (8) pulled with the neutral spring (9) seats the detent of the neutral holder arm (4) so that the neutral holder arm returns to neutral.

The damper (2) is connected to the speed control pedal through speed control pedal cable and neutral holder arm (4), restricts the movement of the linkage to prevent abrupt operation.

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