# WSM

## WORKSHOP MANUAL
## TRACTOR

# MX4700,MX5100

Kubota

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KiSC issued 05, 2009 A

# GENERAL

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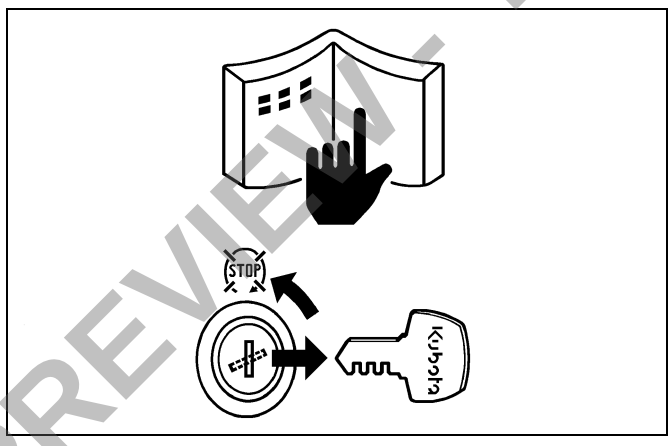
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# ⚠ SAFETY FIRST

**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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# SPECIFICATIONS

| Model | | | MX4700 | | MX5100 | |
|---|---|---|---|---|---|---|
| | | | 2WD | 4WD | 2WD | 4WD |
| Engine | Model | | V2403-M-E3 | | V2403-M-TE3 | |
| | Type | | E-TVCS Indirect injection, water-cooled diesel | | | |
| | No. of cylinders / Aspiration | | Natural | | 4 / Turbocharged | |
| | Total displacement | | 2.434 L (148.6 cu.in.) | | | |
| | Bore and stroke | | 87 × 102.4 mm (3.4 × 4.0 in.) | | | |
| | Net power | | 34.3 kW (46.0 HP)* | | 37.3 kW (50 HP)* | |
| | PTO power (factory observed) | | 29.5 kW (39.5 HP)* / 2700 $min^{-1}$ (rpm) | | 32.8 kW (44 HP)* / 2700 $min^{-1}$ (rpm) | |
| | Maximum torque | | 166.3 N·m (122.7 lbf·ft) | | | |
| | Battery capacity | | 12 V, RC : 133 min, OCA : 582 A | | | |
| | Fuel | | Diesel fuel No. 1 [below −10 °C (14 °F)] Diesel fuel No. 2 [above −10 °C (14 °F)] | | | |
| Capacities | Fuel tank | | 48 L (12.7 U.S.gals, 10.6 Imp.gals) | | | |
| | Engine crankcase (with filter) | | 8.0 L (8.5 U.S.qts, 7.0 Imp.qts) | | | |
| | Engine coolant | | 7.0 L (7.4 U.S.qts, 5.8 Imp.qts) | | | |
| | Transmission case | | 44.0 L (11.6 U.S.gals, 9.7 Imp.gals) | | | |
| Dimensions | Overall length (without 3P) | | 3245 mm (127.8 in.) | 3120 mm (122.8 in.) | 3245 mm (127.8 in.) | 3120 mm (122.8 in.) |
| | Overall width (min. tread) | | 1770 mm (69.7 in.) | | | |
| | Overall height (with ROPS) | | 2430 mm (95.7 in.) | | | |
| | Wheel base | | 1895 mm (74.6 in.) | | | |
| | Min. ground clearance | | 405 mm (15.9 in.) | 385 mm (15.2 in.) | 405 mm (15.9 in.) | 385 mm (15.2 in.) |
| | Tread | Front | 1280 mm (50.4 in.), 1380 mm (54.3 in.) 1480 mm (58.3 in.), 1580 mm (62.2 in.) | 1325 mm (52.2 in.) | 1280 mm (50.4 in.), 1380 mm (54.3 in.) 1480 mm (58.3 in.), 1580 mm (62.2 in.) | 1325 mm (52.2 in.) |
| | | Rear | 1375 mm (54.1 in.), 1490 mm (58.7 in.) | | | |
| Weight (with ROPS) | | | 1525 kg (3362 lbs) | 1640 kg (3616 lbs) | 1528 kg (3369 lbs) | 1642 kg (3620 lbs) |
| Travelling system | Standard tire size | Front | 7.5L-15 | 9.5-16 | 7.5L-15 | 9.5-16 |
| | | Rear | 14.9-26 | | | |
| | Clutch | | Dry type single stage | | | |
| | Steering | | Hydrostatic power steering | | | |
| | Transmission | | Gear shift, 8 forward and 8 reverse | | | |
| | Braking system | | Wet disk type | | | |
| | Min. turning radius (with brake) | | 2.6 m (8.5 feet) | 2.7 m (8.9 feet) | 2.6 m (8.5 feet) | 2.7 m (8.9 feet) |
| Hydraulic unit | Hydraulic control system | | Position control (standard), Draft (Option) | | | |
| | Pump capacity | | 35.8 L (9.5 U.S.gals) | | | |
| | Three point hitch | | SAE Category I & II | | | |
| | Max. lift force | At lift points | 1300 kg (2870 lbs) | | | |
| | | 24 in. behind lift points | 1050 kg (2310 lbs) | | | |
| | System pressure | | 17.7 MPa (180 $kgf/cm^2$) | | | |
| PTO | Rear PTO | | SAE 1-3/8, 6 splines | | | |
| | PTO / Engine speed | | 540 / 2700 $min^{-1}$ (rpm) | | | |

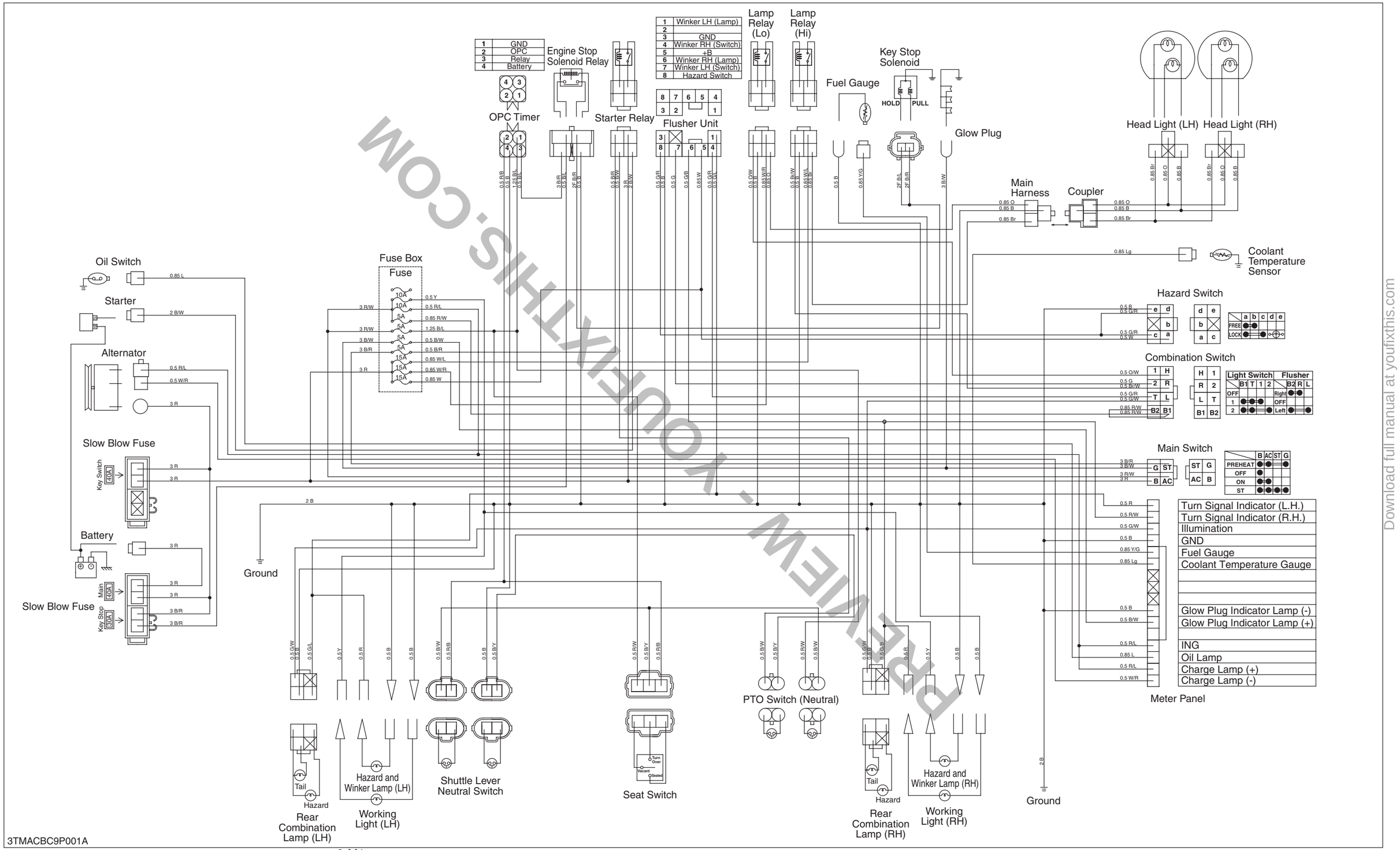
NOTE: *Manufacture's estimate
The company reserves the right to change the specifications without notice.

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# 1. WIRING DIAGRAM

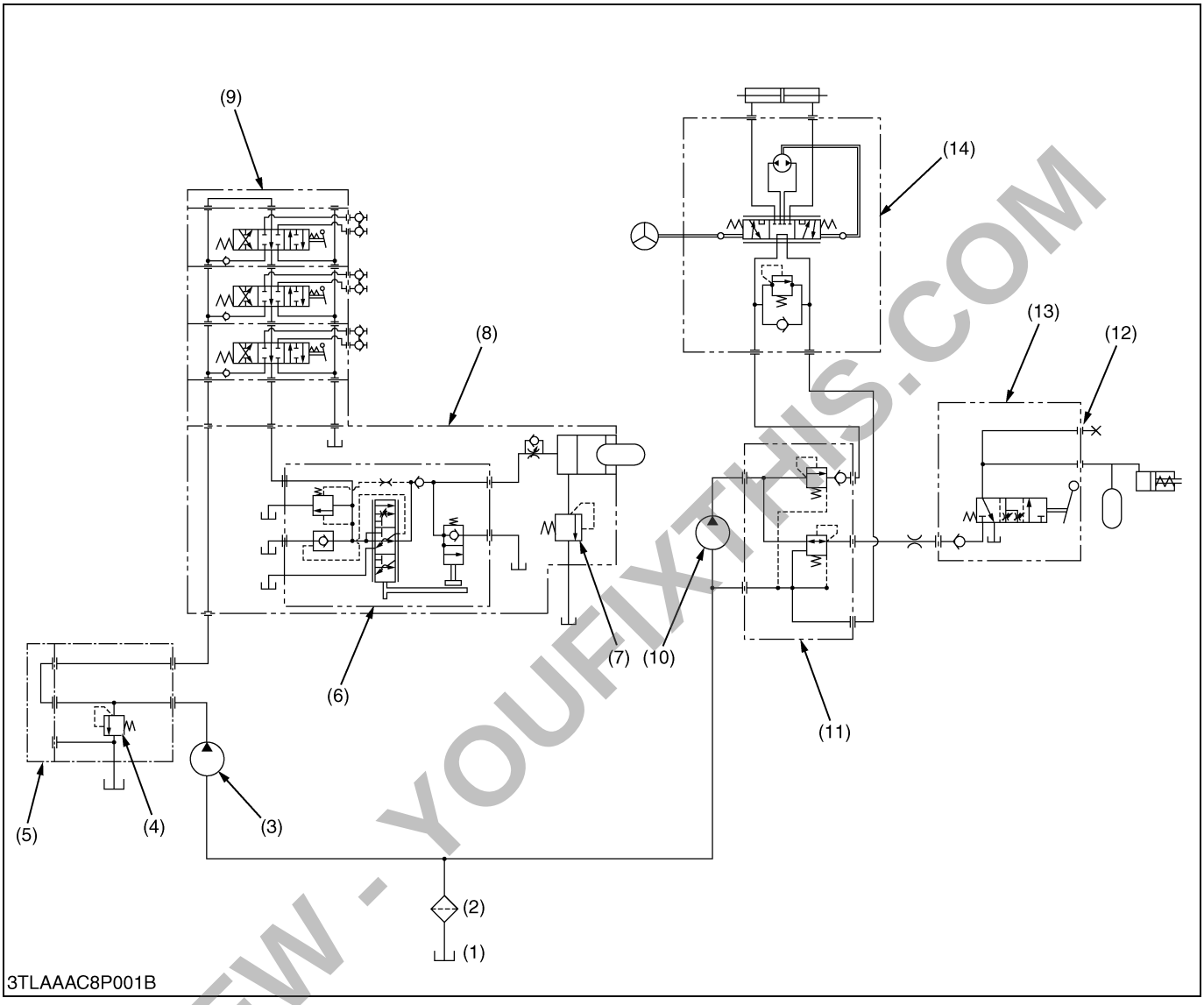



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# 1. HYDRAULIC CIRCUIT

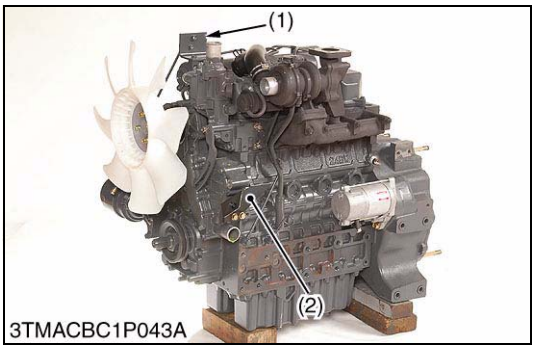


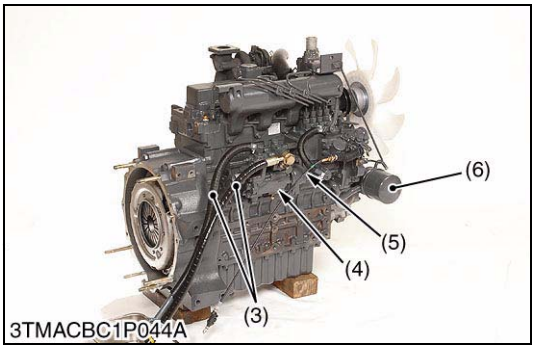

(1) Transmission Case
(2) Oil Filter
(3) Hydraulic Pump (for 3-points Hitch)
(4) Relief Valve
(5) Front Hydraulic Block
(6) Position Control Valve
(7) Cylinder Safety Valve
(8) Hydraulic Cylinder Block
(9) Auxiliary Control Valve (Option)
(10) Hydraulic Pump (for Power Steering and PTO Clutch)
(11) Regulator Valve
(12) Check Port (for PTO Clutch Operating Pressure)
(13) PTO Clutch Valve (Refer to CLUTCH Section)
(14) Power Steering Controller (Refer to STEERING Section)

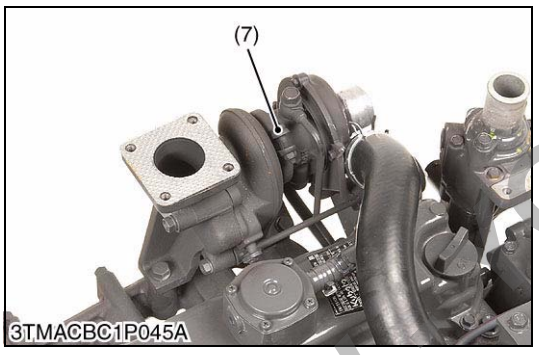
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## (2) Engine External Components




**Removing Engine Outer Parts**

1. Remove the tank stay (1).
2. Remove the fan belt protection cover (2).
3. Remove the accelerating wire (5) and the oil filter (6).
4. Check oil leakage from the turbocharger (7). (MX5100)

**(When reassembling)**

- If the oil leakage from the turbocharger is found, replace the turbocharger as an assembly. Refer to page 1-S37.

(1) Tank Stay
(2) Fan Belt Protection Cover
(3) Hydraulic Hose
(4) Hydraulic Pump
(5) Accelerating Wire
(6) Oil Filter
(7) Turbocharger (MX5100)

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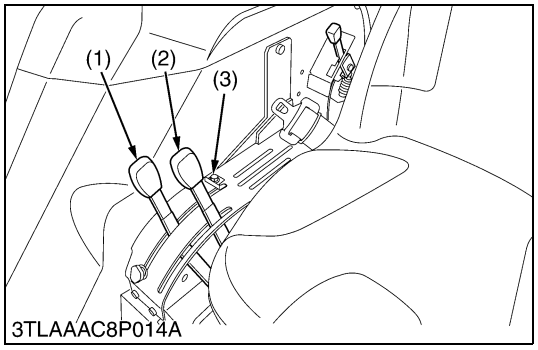
# 1. TROUBLESHOOTING

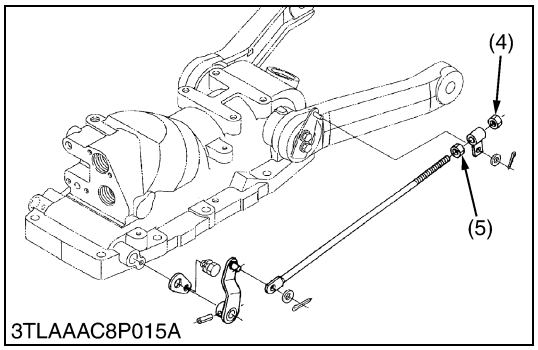
| Symptom | Probable Cause | Solution | Reference Page |
|---|---|---|---|
| **Engine Does Not Start** | No fuel | Replenish fuel | G-14 |
| | Air in the fuel system | Vent air | G-41 |
| | Water in the fuel system | Change fuel and repair or replace fuel system | – |
| | Fuel hose clogged | Clean or replace | G-27 |
| | Fuel filter clogged | Replace | G-26 |
| | 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-S38 |
| | Incorrect injection timing | Adjust | 1-S19 |
| | Fuel camshaft worn | Replace | 1-S46, S47 |
| | Injection nozzle clogged | Clean or replace | 1-S39 |
| | Injection pump malfunctioning | Replace | 1-S43 |
| | Seizure of crankshaft, camshaft, piston, cylinder or bearing | Repair or replace | 1-S46, S47, S49, S50 |
| | Compression leak from cylinder | Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder | 1-S41 |
| | Improper valve timing | Correct or replace timing gear | 1-S47 |
| | Piston ring and cylinder worn | Replace | 1-S51 |
| | Excessive valve clearance | Adjust | 1-S16 |
| | Stop solenoid malfunctioning | Replace | 1-S28 |
| **Starter Does Not Run** | Battery discharged | Charge | G-23 |
| | Starter malfunctioning | Repair or replace | 1-S33 |
| | Key switch malfunctioning | Replace | 9-S9 |
| | Wiring disconnected | Connect | – |
| | Shuttle lever neutral switch malfunctioning | Replace | 9-S11 |
| | PTO switch malfunctioning | Replace | 9-S11 |

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## Position Control Feedback Rod Adjustment

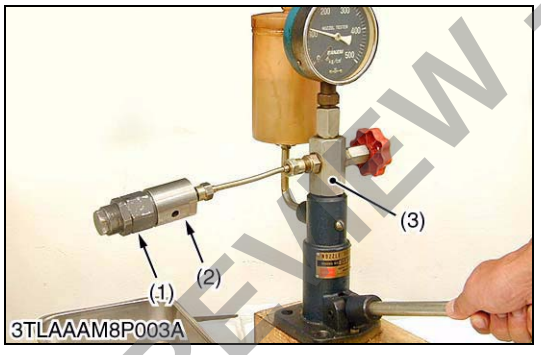
1. Set the position control lever (1) (the draft control lever (2), if equipped) to the lowest position.
2. Start the engine and set the engine at idling speed (allow the engine to warm up for approx. 5 minutes).
3. Move the position control lever (1) to the uppermost position. [Contact to the position control lever stopper (3).]
4. Turn the adjusting nut (4) and lock nut (5) together clockwise until the relief valve begins to be operated.
5. Turn the adjusting nut (4) and lock nut (5) together counter clockwise 2 turns.
6. Tighten the lock nut (5).
7. Set the engine speed at the maximum.
8. Move the position control lever (1) to the lowest position and uppermost position (3 to 5 times) to check the relief valve does not operate.
9. Set the position control lever (1) to the uppermost position, then move the lift arm to the upper end by hand and measure the free play.
10. Stop the engine.
11. If the measurement is not within the factory specifications, adjusting position control feedback rod again.

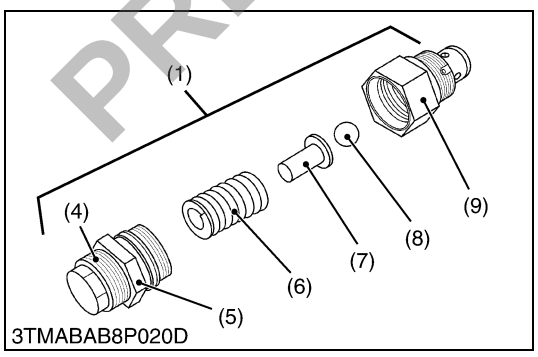
| | | |
|---|---|---|
| Lift arm free play at maximum raising position | Factory spec. | 10 to 15 mm<br>0.39 to 0.58 in. |

(1) Position Control Lever
(2) Draft Control Lever (If Equipped)
(3) Position Control Feedback Rod
(4) Adjusting Nut
(5) Lock Nut

**A : Lift Arm Free Play**

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## Cylinder Safety Valve Operating Pressure

1. Install the cylinder safety valve to the cylinder safety valve setting pressure adaptor.
2. Set the cylinder safety valve setting pressure adaptor to the nozzle tester.
3. Measure the cylinder safety valve operating pressure.
4. If the operating pressure is not within the factory specifications, adjust the operating pressure by turning the adjusting screw (4).
5. After adjustment, tighten the lock nut (5) firmly.

■ **NOTE**

- **Use specified transmission fluid to measure the cylinder safety valve operating pressure.**

| | | |
|---|---|---|
| Hydraulic c4ylinder safety valve operating pressure | Factory spec. | 19.6 to 22.6 MPa<br>200 to 230 kgf/cm$^2$<br>2845 to 3277 psi |

| | | |
|---|---|---|
| Tightening torque | Cylinder safety valve lock nut | 58.8 to 78.5 N·m<br>6.0 to 8.0 kgf·m<br>43.4 to 57.9 lbf·ft |

(1) Cylinder Safety Valve
(2) Cylinder Safety Valve Setting Pressure Adaptor
(3) Nozzle Tester
(4) Adjusting Screw
(5) Lock Nut
(6) Spring
(7) Seat
(8) Ball
(9) Housing

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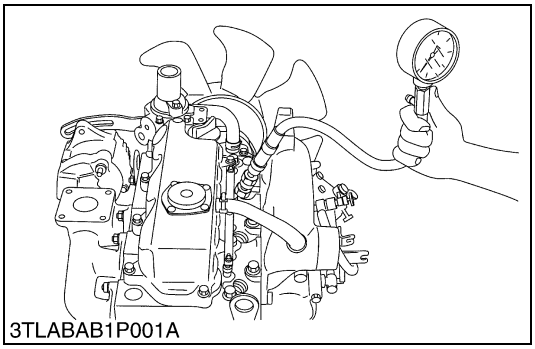
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# 4. CHECKING, DISASSEMBLING AND SERVICING

## [1] CHECKING AND ADJUSTING

### (1) Engine Body


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**Compression Pressure**

1. Run the engine until it is warmed up.
2. Stop the engine and disconnect the **2P** connector from the stop solenoid in order not to inject fuel.
3. Remove the air cleaner, the muffler and all injection nozzles.
4. Set a compression tester with the adaptor to the nozzle hole.
5. After making sure that the stop lever is set at the stop position (non-injection).
6. While cranking the engine with the starter, measure the compression pressure.
7. Repeat steps 4 through 6 for each cylinder.
8. If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.
9. If the compression pressure is still less than the allowable limit, check the top clearance, valve and cylinder head.
10. If the compression pressure increases after applying oil, check the cylinder wall and piston rings.

■ **NOTE**

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

| | | |
|---|---|---|
| Compression pressure | Factory spec. | 3.24 to 3.72 MPa<br>33.0 to 38.0 kgf/cm$^2$<br>470 to 540 psi |
| | Allowable limit | 2.55 MPa<br>26.0 kgf/cm$^2$<br>370 psi |

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# 2. SERVICING SPECIFICATIONS

**ENGINE BODY**

| Item | | Factory Specification | Allowable Limit |
|---|---|---|---|
| Valve Clearance (When Cold) | | 0.18 to 0.22 mm<br>0.0071 to 0.0086 in. | – |
| Compression Pressure<br>(When Cranking with Starting Motor) | | 3.24 to 3.72 MPa /<br>290 $min^{-1}$ (rpm)<br>33.0 to 38.0 $kgf/cm^2$ /<br>290 $min^{-1}$ (rpm)<br>470 to 540 psi /<br>290 $min^{-1}$ (rpm) | 2.55 MPa /<br>290 $min^{-1}$ (rpm)<br>26.0 $kgf/cm^2$ /<br>290 $min^{-1}$ (rpm)<br>370 psi /<br>290 $min^{-1}$ (rpm) |
| Top Clearance | | 0.575 to 0.675 mm<br>0.0227 to 0.0265 in. | – |
| Cylinder Head Surface | Flatness | – | 0.05 mm / 500 mm<br>0.002 in. /<br>19.7 in. |
| Valve Recessing<br>(Protrusion to Recessing) | Protrusion | 0.05 mm<br>0.002 in. | – |
| | Recessing | 0.15 mm<br>0.0059 in. | 0.40 mm<br>0.016 in. |
| Valve Stem to Valve Guide | Clearance | 0.040 to 0.070 mm<br>0.0016 to 0.0027 in. | 0.10 mm<br>0.0039 in. |
| Valve Stem | O.D. | 7.960 to 7.975 mm<br>0.3134 to 0.3139 in. | – |
| Valve Guide | I.D. | 8.015 to 8.030 mm<br>0.3156 to 0.3161 in. | – |
| Valve Face | Angle (Intake) | 1.0 rad<br>60 ° | – |
| | Angle (Exhaust) | 0.79 rad<br>45 ° | – |
| Valve Seat | Width (Intake) | 2.12 mm<br>0.0835 in. | – |
| | Width (Exhaust) | 2.12 mm<br>0.0835 in. | – |
| Valve Seat | Angle (Intake) | 1.0 rad<br>60 ° | – |
| | Angle (Exhaust) | 0.79 rad<br>45 ° | – |
| Valve Timing (Intake Valve) | Open | 0.35 rad (20 °)<br>before T.D.C. | – |
| | Close | 0.79 rad (45 °)<br>after B.D.C. | – |

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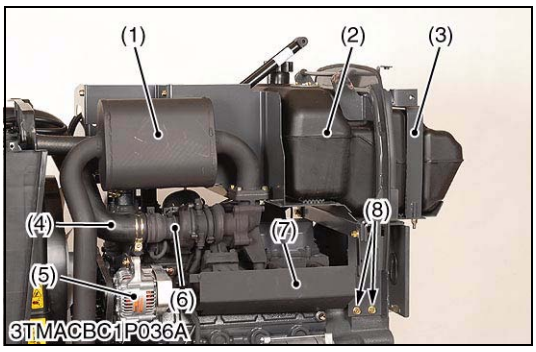
# 6. MAINTENANCE

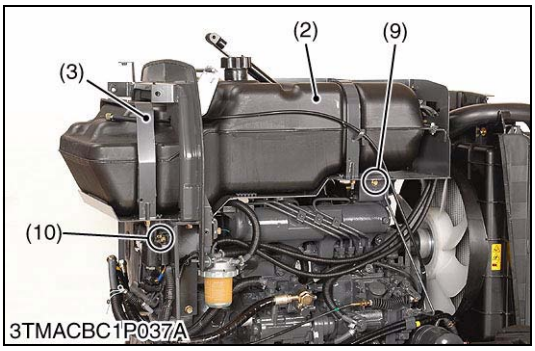
| No. | Item | | | Indication on hour meter | | | | | | | | | | | | | | Inter-val | Refer-ence page | Impor-tant | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | | | | |
| 1 | Greasing | | – | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | every 50 Hr | G-21 | | |
| 2 | Engine start system | | Check | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | every 50 Hr | G-22 | | |
| 3 | Wheel bolt torque | | Check | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | every 50 Hr | G-22 | | |
| 4 | Battery condition | | Check | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-23 | *4 | |
| 5 | Fan belt | | Adjust | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-25 | | |
| 6 | Clutch pedal free travel | | Adjust | ★ | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-25 | | |
| 7 | Brake pedal free travel | | Adjust | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-25 | | |
| 8 | Fuel filter element | | Clean | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-26 | | @ |
| | | | Replace | | | | | | | | ☆ | | | | | | | every 400 Hr | G-32 | | |
| 9 | Air cleaner element [Double type] | Primary element | Clean | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-26 | *1 | @ |
| | | | Replace | | | | | | | | | | | | | | | every 1 year | G-38 | *2 | |
| | | Secondary element | Replace | | | | | | | | | | | | | | | every 1 year | G-38 | | |
| 10 | Fuel line | | Check | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | | ☆ | every 100 Hr | G-27 | | @ |
| | | | Replace | | | | | | | | | | | | | | | every 2 years | G-40 | | |
| 11 | Engine oil | | Change | ★ | | | ☆ | | | | ☆ | | | | ☆ | | | every 200 Hr | G-19 | | |
| 12 | Engine oil filter | | Replace | ★ | | | ☆ | | | | ☆ | | | | ☆ | | | every 200 Hr | G-20 | | |
| 13 | Toe-in | | Adjust | | | | ☆ | | | | ☆ | | | | ☆ | | | every 200 Hr | G-29 | | |
| 14 | Radiator hose and clamp | | Check | | | | ☆ | | | | ☆ | | | | ☆ | | | every 200 Hr | G-30 | | |
| | | | Replace | | | | | | | | | | | | | | | every 2 years | G-40 | | |
| 15 | Power steering oil line | | Check | | | | ☆ | | | | ☆ | | | | ☆ | | | every 200 Hr | G-30 | | |
| | | | Replace | | | | | | | | | | | | | | | every 2 years | G-40 | | |
| 16 | Intake air line | | Check | | | | ☆ | | | | ☆ | | | | ☆ | | | every 200 Hr | G-30 | | @ |
| | | | Replace | | | | | | | | | | | | | | | every 2 years | G-40 | | |
| 17 | Hydraulic oil filter | | Replace | | | | | | | | ☆ | | | | | | | every 400 Hr | G-31 | | |
| 18 | Transmission fluid | | Change | | | | | | | | ☆ | | | | | | | every 400 Hr | G-31 | | |

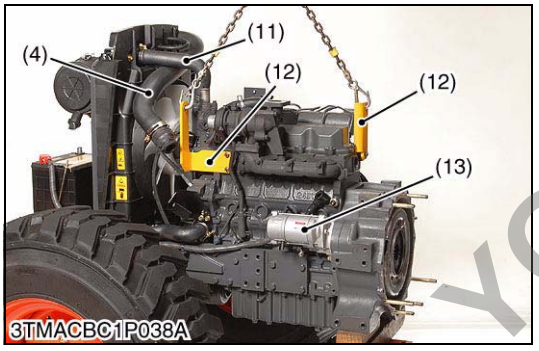
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**Removing Muffler, Fuel Tank, Fuel Tank Stay and Wiring Harness**

1. Remove the muffler (1).
2. Remove the exhaust manifold cover (7).
3. Remove the fuel tank stay mounting bolts (8) (9) (10).
4. Disconnect the radiator hose (11) from the engine. Disconnect the inlet hose (4) from the inlet manifold (MX4700) or turbocharger (MX5100).
5. Remove the alternator (5) from the engine.
6. Disconnect the fuel hose from the fuel feed pump.
7. Hook the fuel tank stay using a nylon sling.
8. Disconnect the water temperature sensor lead from the cylinder head.
9. Disconnect the fuel overflow hose from the fuel injection nozzle.
10. Remove the fuel tank (2) with the fuel tank stay (3).
11. Set the engine hooks to the engine.

(1) Muffler
(2) Fuel Tank
(3) Fuel Tank Stay
(4) Inlet Hose
(5) Alternator
(6) Turbocharger (MX5100)
(7) Exhaust Manifold Cover
(8) Bolt
(9) Bolt
(10) Bolt
(11) Radiator Hose
(12) Engine Hook
(13) Starter Motor

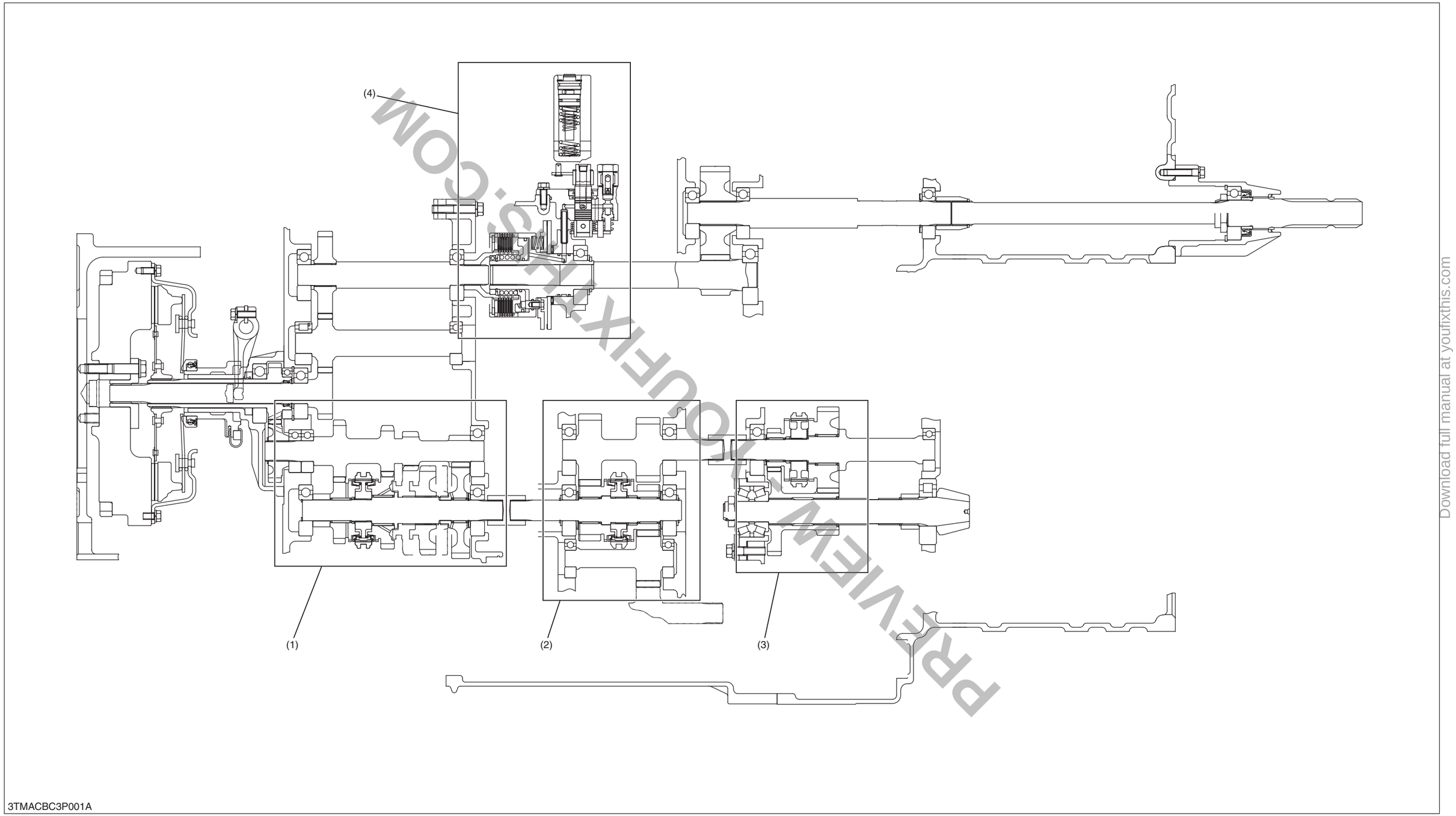
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# 1. STRUCTURE

## [1] 2WD MODEL




3TMACBC3P001A

(1) Main Gear Shift Section
(2) Shuttle Shift Section
(3) Range Gear Section
(4) PTO Clutch Pack and Valve Section





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# 5. TIGHTENING TORQUES

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

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

| Indication on top of bolt | ⬡ 4 No-grade or 4T | | | | | | ⑦ 8.8 7T or Property class 8.8 | | | | | | ⑨ 10.9 9T or Property class 10.9 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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.) | 7.9 to 9.3 | 0.80 to 0.95 | 5.8 to 6.8 | 7.9 to 8.8 | 0.80 to 0.90 | 5.8 to 6.5 | 9.81 to 11.2 | 1.00 to 1.15 | 7.24 to 8.31 | 7.9 to 8.8 | 0.80 to 0.90 | 5.8 to 6.5 | 12.3 to 14.2 | 1.25 to 1.45 | 9.05 to 10.4 |
| **M8** (8 mm, 0.31 in.) | 18 to 20 | 1.8 to 2.1 | 13 to 15 | 17 to 19 | 1.7 to 2.0 | 13 to 14 | 24 to 27 | 2.4 to 2.8 | 18 to 20 | 18 to 20 | 1.8 to 2.1 | 13 to 15 | 30 to 34 | 3.0 to 3.5 | 22 to 25 |
| **M10** (10 mm, 0.39 in.) | 40 to 45 | 4.0 to 4.6 | 29 to 33 | 32 to 34 | 3.2 to 3.5 | 24 to 25 | 48 to 55 | 4.9 to 5.7 | 36 to 41 | 40 to 44 | 4.0 to 4.5 | 29 to 32 | 61 to 70 | 6.2 to 7.2 | 45 to 52 |
| **M12** (12 mm, 0.47 in.) | 63 to 72 | 6.4 to 7.4 | 47 to 53 | – | – | – | 78 to 90 | 7.9 to 9.2 | 58 to 66 | 63 to 72 | 6.4 to 7.4 | 47 to 53 | 103 to 117 | 10.5 to 12.0 | 76.0 to 86.7 |
| **M14** (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 |

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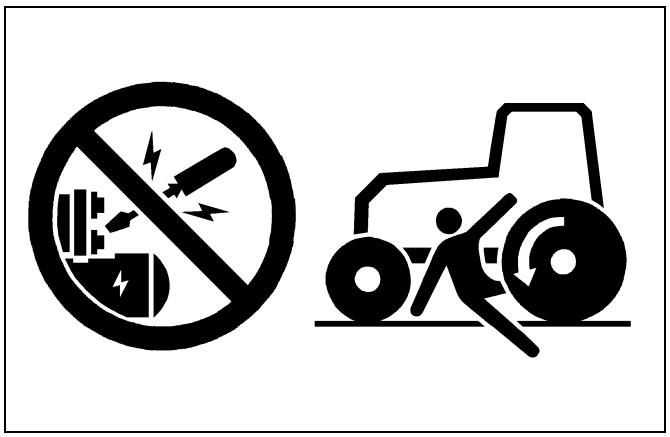
## [2] STUD BOLTS

| 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.) | 12 to 15 | 1.2 to 1.6 | 8.7 to 11 | 8.9 to 11 | 0.9 to 1.2 | 6.5 to 8.6 |
| **M10** (10 mm, 0.39 in.) | 25 to 31 | 2.5 to 3.2 | 18 to 23 | 20 to 25 | 2.0 to 2.6 | 15 to 18 |
| **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 |
| **M14** (14 mm, 0.55 in.) | 62 to 73 | 6.3 to 7.5 | 46 to 54 | – | – | – |
| **M16** (16 mm, 0.63 in.) | 98.1 to 112 | 10.0 to 11.5 | 72.4 to 83.1 | – | – | – |
| **M18** (18 mm, 0.71 in.) | 172 to 201 | 17.5 to 20.5 | 127 to 148 | – | – | – |

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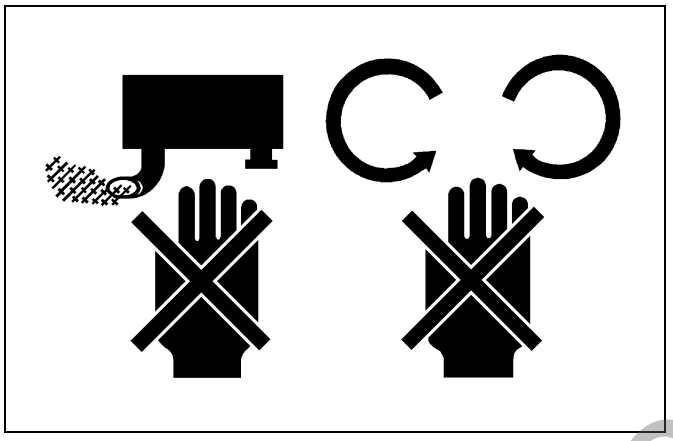
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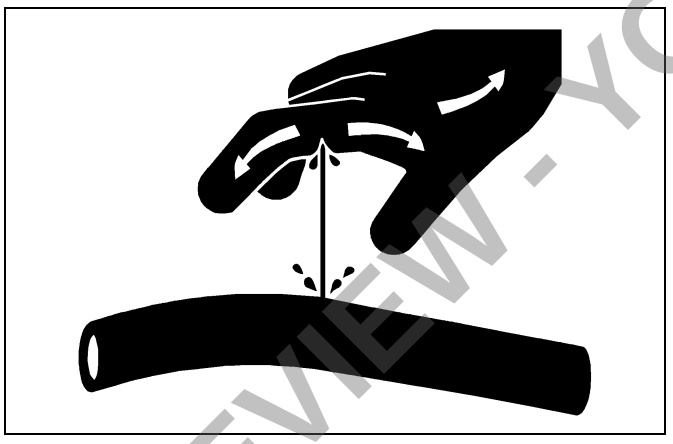
## SAFETY STARTING

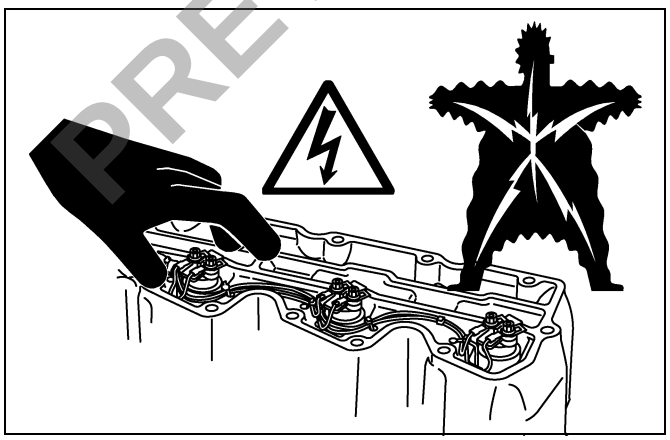
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Do not alter or remove any part of machine safety system.
- Before starting the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Never start the engine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



## SAFETY WORKING

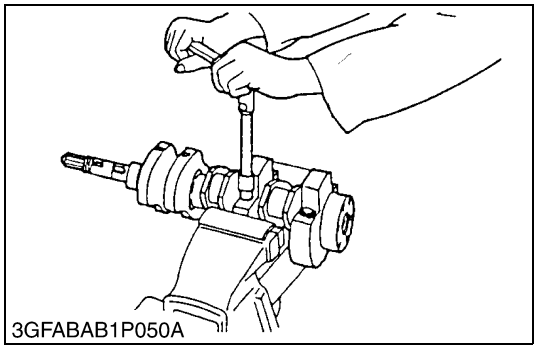
- Do not work on the machine while under the influence of alcohol, medication, or other substances or while fatigued.
- Wear close fitting clothing and safety equipment appropriate to the job.
- Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
- When servicing 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 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.

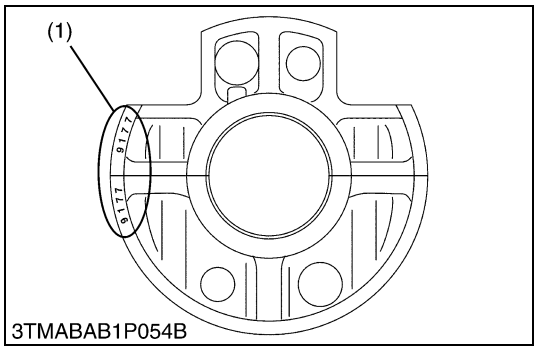




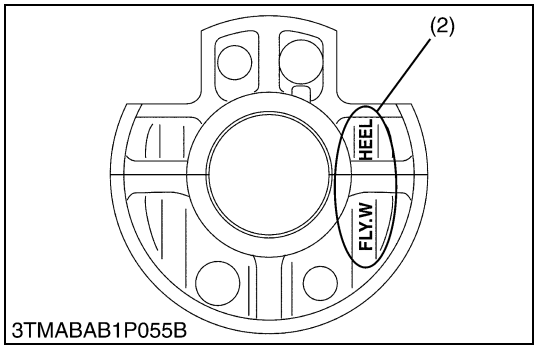
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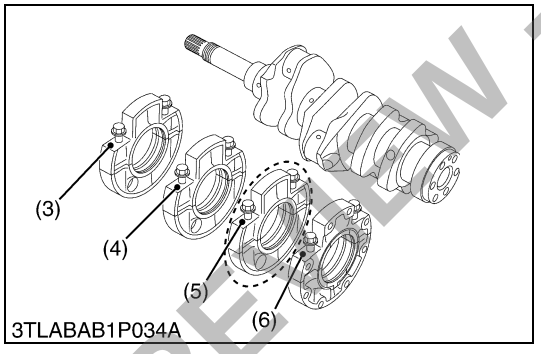

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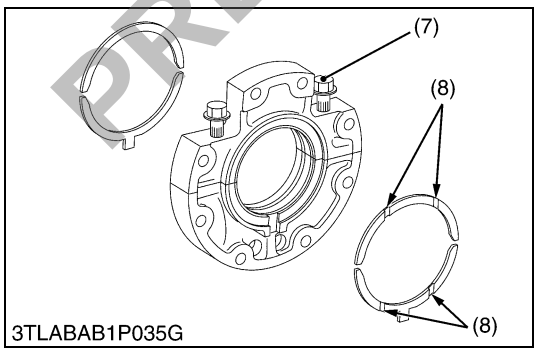
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3TLABAB1P035G

**Main Bearing Case Assembly**

1. Remove the two main bearing case screws 1 (7), and remove the main bearing case assembly being careful with thrust bearing and crankshaft bearing.
2. Remove the main bearing case 1, 2 as above.

**(When reassembling)**

- Clean the oil passage in the main bearing case.
- Apply clean engine oil on the bearings.
- Install the main bearing case assemblies in the original positions. Since diameters of main bearing cases vary, install them in order of makings (A, B for 3 cylinders and A, B, C for 4 cylinders) from the gear case side.
- Match the alignment numbers (1) and mark (2) on the main bearing case.
- When installing the main bearing case 1 and 2, face the mark **"FLYWHEEL"** to the flywheel.
- Install the thrust bearing with its oil groove (8) facing outward.
- Confirm that the main bearing case moves smoothly after tightening the main bearing case screw 1 (7) to the specified torque.

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

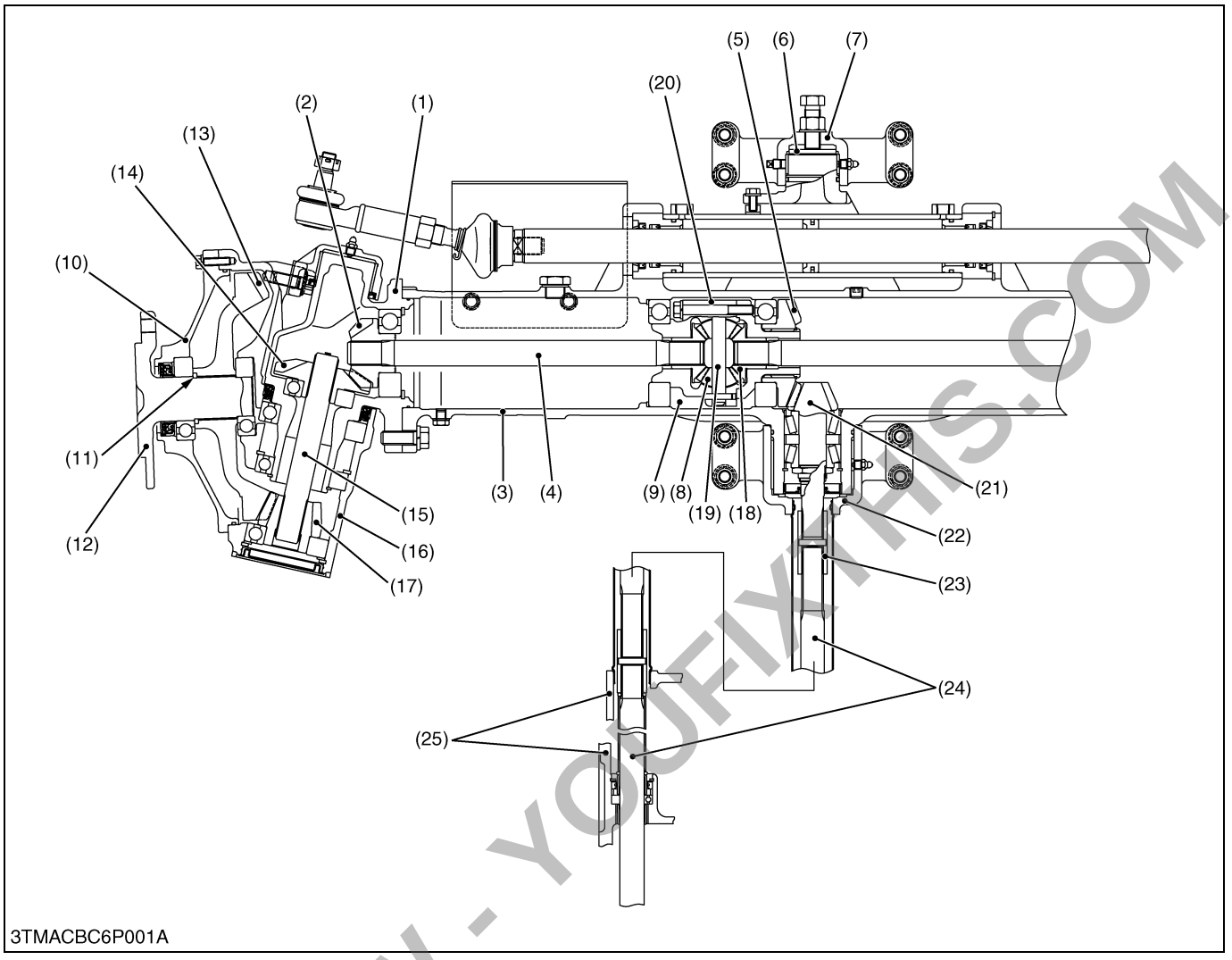
(1) Alignment Number
(2) Alignment Mark
(3) A
(4) B
(5) C
(6) No Mark
(7) Main Bearing Case Screw 1
(8) Oil Groove

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## [2] 4WD TYPE




(1) Bevel Gear Case
(2) Bevel Gear (10T)
(3) Front Axle Case
(4) Differential Yoke Shaft
(5) Spiral Bevel Gear (21T)
(6) Collar
(7) Front Axle Bracket, Front
(8) Differential Pinion
(9) Differential Case
(10) Axle Flange
(11) Collar
(12) Axle
(13) Bevel Gear (43T)
(14) Bevel Gear (14T)
(15) Bevel Gear Shaft
(16) Front Gear Case
(17) Bevel Gear (9T)
(18) Differential Side Gear
(19) Pinion Shaft
(20) Differential Assembly
(21) Spiral Bevel Pinion Shaft (8T)
(22) Front Bracket, Rear
(23) Coupling
(24) Propeller Shaft
(25) Clutch Housing

The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission through the propeller shaft (24) and to the bevel pinion shaft (21), then to the spiral bevel gear (5) after that to the differential gear.

The power through the differential is transmitted to the differential yoke shaft (4), and to the bevel gear shaft (15) in the bevel gear case (1).

The revolution is greatly reduced by the bevel gears (17), (13), then the power is transmitted to the axle (12).

The differential system allows each wheel to rotate at a different speed to make turning easier.

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