WSM

WORKSHOP MANUAL
DIESEL ENGINE

V3300DI-B,V3300DI-TB

Kubota

KiSC issued 09, 2005 A

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MECHANISM

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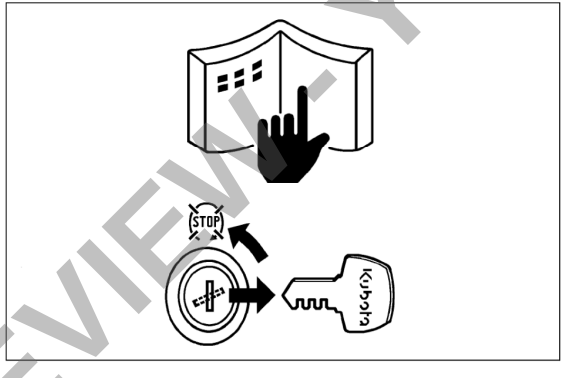
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SAFETY FIRST

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 engine safety decals.
- Clean the work area and engine.
- Park the machine on a firm and level ground.
- Allow the engine to cool before proceeding.
- Stop the engine, and remove the key.
- Disconnect the battery negative cable.

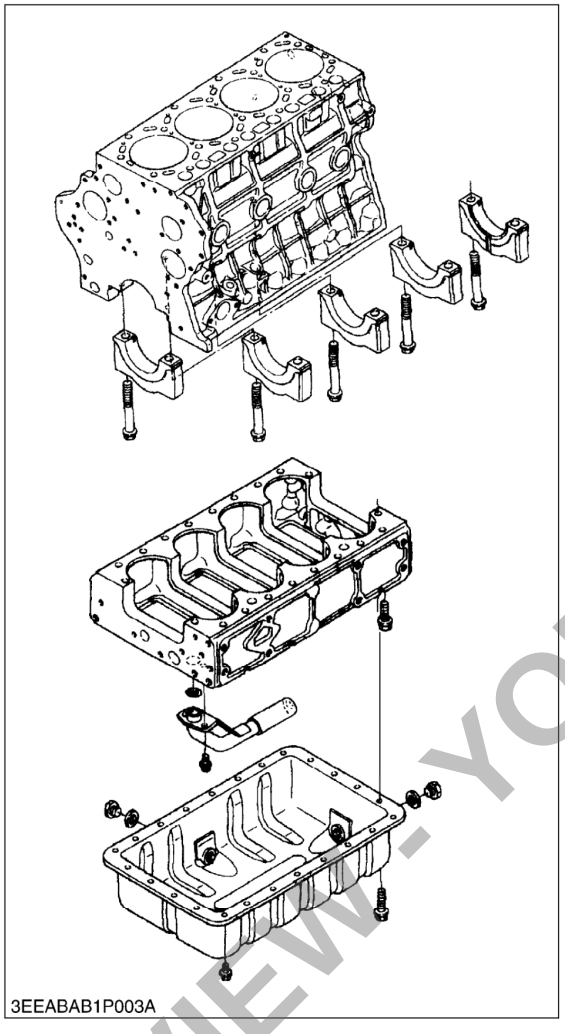
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2. ENGINE BODY

[1] CYLINDER BLOCK



This engine employs separate type crankcases - the crankcase 1 with combustion part and the crankcase 2 which supports the crankcase 1 and reduces noise.

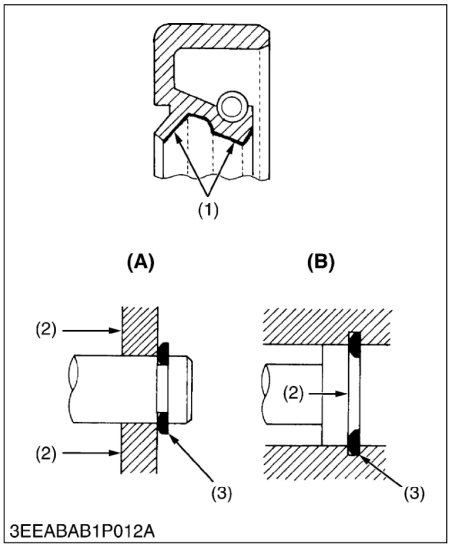
Since it is a hanger type, you can easily assemble / disassemble it. The cylinder is a linerless type which enables good cooling operation, less strain and good abrasion resistance.

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[2] GENERAL PRECAUTION



- During disassembly, carefully arrange removed parts in a clean area to prevent confusion later. Screws, bolts and nuts should be replaced in their original position to prevent reassembly errors.
- When special tools are required, use KUBOTA genuine special tools. Special tools which are not frequently used should be made according to the drawings provided.
- Before disassembling or servicing live wires, make sure to always disconnect the grounding cable from the battery first.
- Remove oil and dirt from parts before measuring.
- Use only KUBOTA genuine parts for parts replacement to maintain engine performance and to ensure safety.
- Gaskets and O-rings must be replaced during reassembly. Apply grease to new O-rings or oil seals before assembling.
- When reassembling external or internal snap rings, position them so that the sharp edge faces against the direction from which force is applied.
- Be sure to perform run-on the serviced or reassembled engine. Do not attempt to give heavy load at once, or serious damage may result to the engine.

(1) Grease
(2) Force
(3) Place the Sharp Edge against the Direction of Force

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

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[3] TIGHTENING TORQUES

Screws, bolts and nuts must be tightened to the specified torque using a torque wrench, several screws, bolts and nuts such as those used on the cylinder head must be tightened in proper sequence and the proper torque.

(1) Tightening Torques for General Use Screws, Bolts and Nuts

Grade / Nominal Diameter / Unit	Standard Screw and Bolt ④			Special Screw and Bolt ⑦		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

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Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

Punched number	Screw and bolt material grade
None or 4	Standard screw and bolt SS400, S20C
7	Special screw and bolt S43C, S48C (Refined)

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[4] TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	• No fuel	Replenish fuel	S-19
	• Air in the fuel system	Vent air	S-19
	• Water in the fuel system	Change fuel and repair or replace fuel system	S-19, 20, 22
	• Fuel pipe clogged	Clean	S-19
	• Fuel filter clogged	Clean or change	S-20, 22
	• Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	4, S-21
	• Fuel with low cetane number	Use specified fuel	4
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	S-4
	• Incorrect injection timing	Adjust	S-88
	• Injection nozzle clogged	Repair or replace	S-28
	• Injection pump malfunctioning	Repair or replace	S-58, 59, 60
	• Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	• Compression leak from cylinder	Replace head gasket, tighten cylinder head screw and nozzle holder	S-44, 47 to 50
	• Improper valve timing	Correct or replace timing gear	S-62
	• Piston ring and cylinder worn	Replace	S-78, 83
	• Excessive valve clearance	Adjust	S-23
(Starter Does Not Run)	• Stop solenoid malfunctioning	Replace	–
	• Battery discharged	Charge	S-26, 27
	• Starter malfunctioning	Repair or replace	S-89
	• Key switch malfunctioning	Repair or replace	–
	• Wiring disconnected	Connect	–
Engine Revolution Is Not Smooth	• Fuel filter clogged or dirty	Clean or change	S-20, 22
	• Air cleaner clogged	Clean or change	S-20
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	S-4
	• Injection pump malfunctioning	Repair or replace	S-58, 59, 60
	• Incorrect nozzle opening pressure	Repair or replace	S-28
	• Injection nozzle stuck or clogged	Repair or replace	S-28
	• Governor malfunctioning	Replace	S-53, 54
	• Turbocharger bearing worn out	Replace the turbocharger assembly	S-97, 98, 99
	• Turbocharger shaft bent		S-97, 98, 99
	• Turbocharger fin or other part damaged due to foreign matters		S-97, 98, 99
Either White or Blue Exhaust Gas Is Observed	• Excessive engine oil	Reduce to specified level	S-18
	• Piston ring and liner worn or stuck	Repair or replace	S-78, 83
	• Incorrect injection timing	Adjust	S-88

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SPECIFICATIONS

Model		V3300DI-B	V3300DI-TB
Number of Cylinder		4	
Type		Vertical, water-cooled, 4-cycle diesel engine	
Bore × Stroke		98 × 110 mm (3.86 × 4.33 in.)	
Total Displacement		3318 cm^3 (202.48 cu.in.)	
Engine	SAE Net Cont.	46.0 kW / 2600 min^{-1} (rpm) (61.7 HP / 2600 min^{-1} (rpm))	56.2 kW / 2600 min^{-1} (rpm) (75.3 HP / 2600 min^{-1} (rpm))
	SAE Net Intermittent	53.0 kW / 2600 min^{-1} (rpm) (71.0 HP / 2600 min^{-1} (rpm))	64.7 kW / 2600 min^{-1} (rpm) (86.7 HP / 2600 min^{-1} (rpm))
	SAE Gross Intermittent	55.4 kW / 2600 min^{-1} (rpm) (74.2 HP / 2600 min^{-1} (rpm))	67.1 kW / 2600 min^{-1} (rpm) (89.9 HP / 2600 min^{-1} (rpm))
	ISO 3046 Cont.	46.0 kW / 2600 min^{-1} (rpm) (61.7 ps / 2600 min^{-1} (rpm))	56.2 kW / 2600 min^{-1} (rpm) (75.3 ps / 2600 min^{-1} (rpm))
	ISO 3046 Overload	53.0 kW / 2600 min^{-1} (rpm) (71.0 ps / 2600 min^{-1} (rpm))	64.7 kW / 2600 min^{-1} (rpm) (86.7 ps / 2600 min^{-1} (rpm))
	ISO 3046 Gross	55.4 kW / 2600 min^{-1} (rpm) (74.2 ps / 2600 min^{-1} (rpm))	67.1 kW / 2600 min^{-1} (rpm) (89.9 ps / 2600 min^{-1} (rpm))
Maximum Bare Speed		2800 min^{-1} (rpm)	
Minimum Idling Speed		775 to 825 min^{-1} (rpm)	
Combustion System		Center Direct Injection System (E-CDIS)	
Fuel Injection Pump		Bosch Type Mini Pump	
Direction of Rotation		Counter-clockwise (Viewed from flywheel side)	
Injection Nozzle		BOSCH P Type	
Injection Timing		0.245 rad. (14 °) before T.D.C.	0.23 rad. (13 °) before T.D.C.
Firing Order		1-3-4-2	
Injection Pressure		1st stage 15.69 MPa (160 kgf/cm^2, 2276 psi), 2nd stage 21.57 MPa (220 kgf/cm^2, 3129 psi)	
Compression Ratio		19.5	18.8
Lubricating System		Forced Lubrication by Pump	
Oil Pressure Indicating		Electrical Type Switch	
Lubricating Filter		Full Flow Paper Filter (Cartridge Type)	
Cooling System		Pressurized radiation, forced Circulation with Water Pump	
Starting System		Electric Starting with Starter	
		12 V, 2.5 kW	
Starting Support Device		Intake Air Heater in Intake Manifold	
Battery		12 V, 112 AH	
Dynamo for Charging		12 V, 540 W	
Fuel		Diesel Fuel No. 2-D (ASTM D975)	
Lubricating Oil		Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page S-17, 18, 21.	
Lubricating Oil Capacity		13.2 L (3.49 U.S.gal, 2.90 Imp.gal.)	
Weight (Dry)		246 kgf (542.4 lbs)	255 kgf (562.2 lbs)

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[5] SERVICING SPECIFICATIONS

(1) Engine Body

Cylinder Head

Item		Factory Specification	Allowable Limit
Cylinder Head Surface Flatness		–	0.05 mm 0.0019 in.
Top Clearance		0.72 to 0.90 mm 0.0283 to 0.0354 in.	–
Compression Pressure	V3300DI-B	3.82 MPa / 250 min^{-1} (rpm) 39 kgf/cm^2 / 250 min^{-1} (rpm) 554 psi / 250 min^{-1} (rpm)	2.83 MPa / 250 min^{-1} (rpm) 28.9 kgf/cm^2 / 250 min^{-1} (rpm) 411 psi / 250 min^{-1} (rpm)
	V3300DI-TB	3.43 MPa / 250 min^{-1} (rpm) 35 kgf/cm^2 / 250 min^{-1} (rpm) 498 psi / 250 min^{-1} (rpm)	2.53 MPa / 250 min^{-1} (rpm) 25.8 kgf/cm^2 / 250 min^{-1} (rpm) 367 psi / 250 min^{-1} (rpm)
Variance Among Cylinders		–	10 % or less

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Valves

Valve Clearance (Cold)		0.23 to 0.27 mm 0.0091 to 0.0106 in.	–
Valve Seat Width	IN.	1.6 to 2.0 mm 0.0630 to 0.0790 in.	–
	EX.	2.3 to 2.6 mm 0.0906 to 0.1024 in.	
Valve Seat Angle	IN.	1.047 rad 60 °	–
	EX.	0.785 rad 45 °	
Valve Face Angle	IN.	1.047 rad 60 °	–
	EX.	0.785 rad 45 °	
Valve Recessing	IN.	0.6 to 0.8 mm 0.0236 to 0.0315 in.	1.2 mm 0.0472 in.
	EX.	0.85 to 1.05 mm 0.0335 to 0.0413 in.	1.2 mm 0.0472 in.

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[6] MAINTENANCE CHECK LIST

To maintain long-lasting and safe engine performance, make it a rule to carry out regular inspections by following the table below.

The lubricating oil change intervals listed in the table below are for Classes CF, CE and CD lubricating oils of API classification with a high-sulfur fuel in use. If the CF-4 or CG-4 lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals than recommended in the table below depending on the operating condition.

Item	Service Interval								
	Initial 50 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1 or 2 months	Every 1500 hrs	Every 3000 hrs	Every 1 year	Every 2 year
*Changing engine oil									
Changing oil filter cartridge									
*Checking fuel pipes and clamps									
*Cleaning air filter element									
*Cleaning fuel filter									
Checking battery electrolyte level									
Checking radiator hoses and clamps									
*Checking intake air line									
Checking fan belt tension and damage									
Checking electrical lines and damage									
*Changing fuel filter cartridge									
Changing fan belt									
Cleaning radiator interior									
Checking valve clearance									
Recharging battery									
*Checking nozzle injection pressure									
*Checking turbocharger									
Checking fuel injection pump									
*Checking injection timing (spill timing)									
*Changing air filter element									
Changing radiator coolant (L.L.C.)									
Changing radiator hoses and clamps									
*Changing fuel hoses and clamps									
*Changing intake air line									
Changing battery									

* The items listed above (* marked) are registered as emission related critical parts by KUBOTA in the U.S.EPA nonroad emission regulation.
As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.

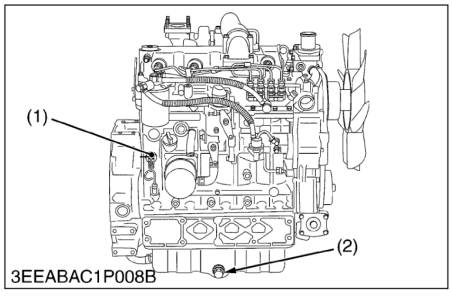
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[2] DISASSEMBLING AND ASSEMBLING

(1) Draining Water and Oil



Draining Coolant and Engine Oil

CAUTION

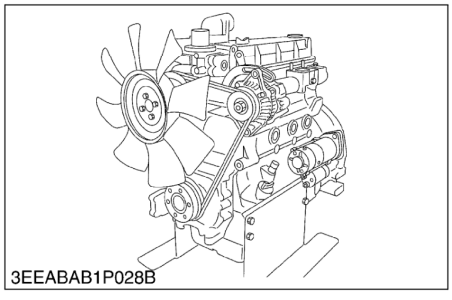
- **Never remove radiator cap until coolant temperature is below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Prepare a bucket. Open the drain cock to drain coolant.
2. Prepare an oil pan. Remove the drain plug to drain engine oil in the pan.

(1) Drain Cock (2) Drain Plug

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(2) External Components



Air Cleaner, Muffler and Others

1. Remove the air cleaner and muffler.
2. Remove the fan, fan belt, alternator and starter.

(When reassembling)

- Check to see that there are no crack on the belt surface.

IMPORTANT

- **After reassembling the fan belt, be sure to adjust the fan belt tension.**
- **Do not confuse the direction of the fan. Attach the fan with its "1C010" marking facing frontward (toward the radiator).**

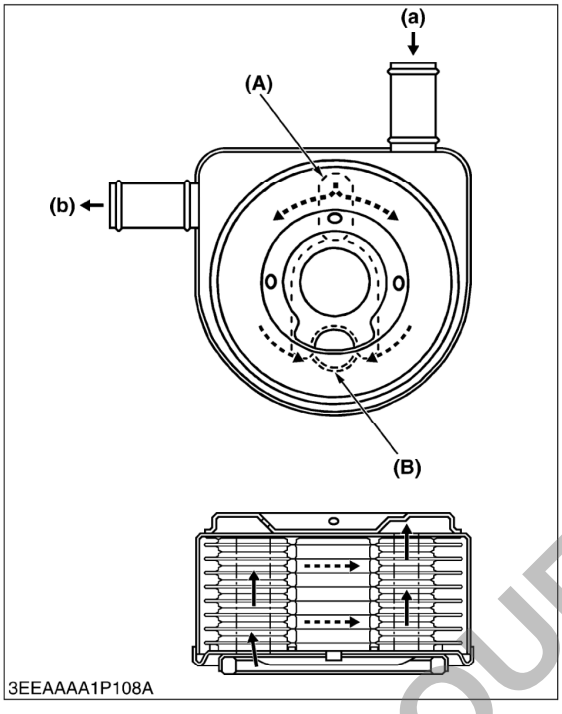
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3. LUBRICATING SYSTEM

[1] OIL COOLER



V3300DI-B and V3300DI-TB have a water-cooled oil cooler that keeps the oil against overheat and also warms it up just after the engine gets started.

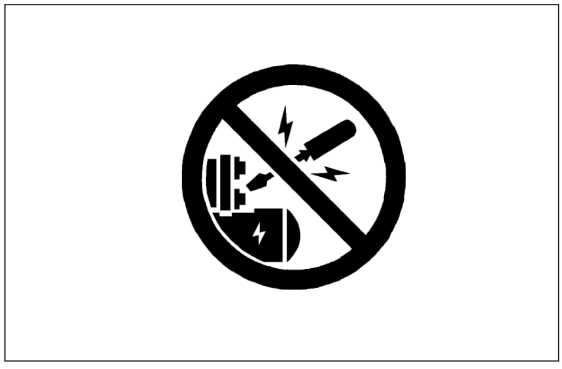
As shown in the figure, the oil flows inside the connected cooler plate, whereas coolant is kept circulating outside the cooler plate, thereby cooling down the oil.

(A) Oil Inlet Port
(B) Oil Outlet Port
(a) Coolant Inlet Port
(b) Coolant Outlet Port

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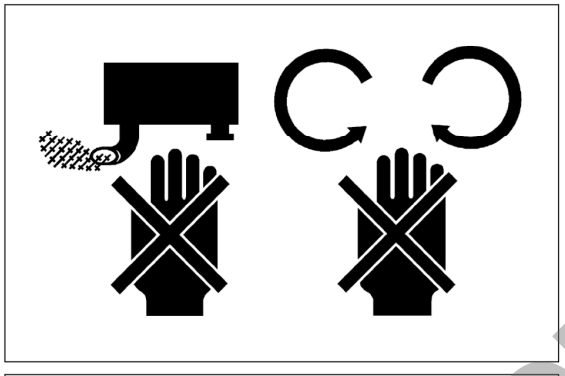
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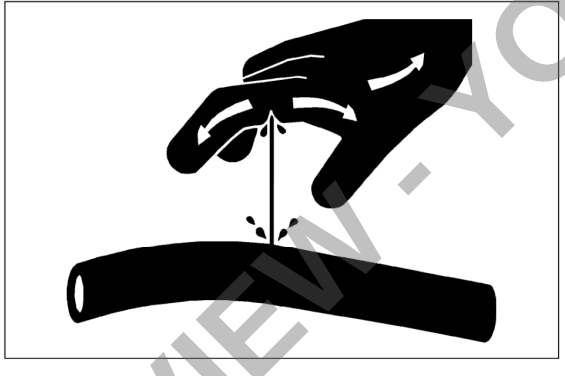
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SAFETY STARTING

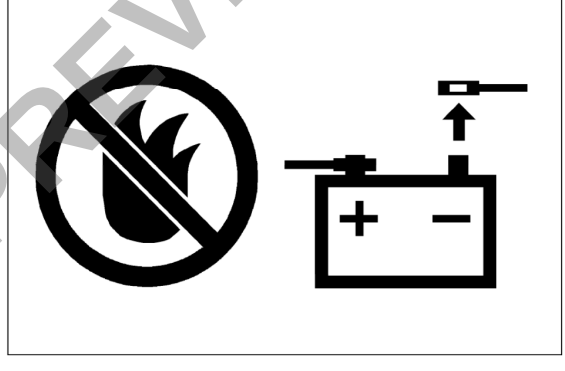
- Do not start the engine by shorting across starter terminals or bypassing the safety start switch.
- Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.





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 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.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



AVOID FIRES

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

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