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WORKSHOP MANUAL
DIESEL ENGINE

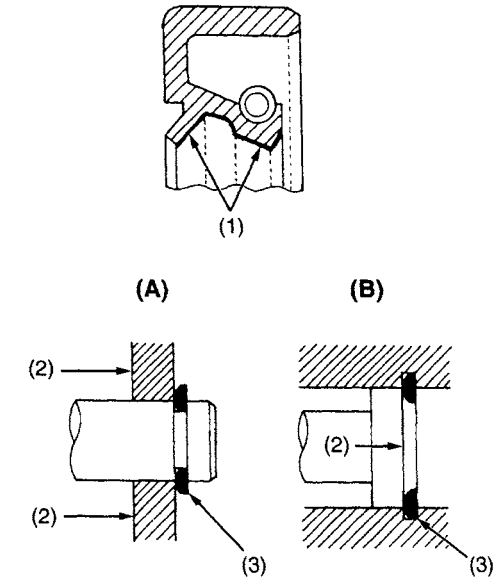
EA300-E2-NB1,
EA300-E2-NB1-APU,
EL300-E2-AR,
EL300-E2-AR-KCL

Kubota

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2. GENERAL PRECAUTIONS



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- 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-in 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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⚠ 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.**

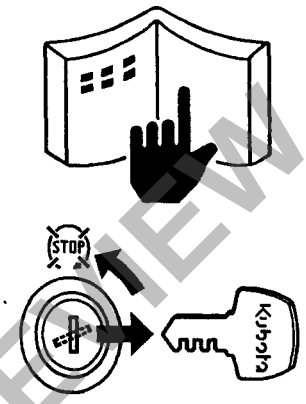
⚠ WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ 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.**

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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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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.

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SPECIFICATIONS

Model		EA300-E2-NB1	EA300-E2-NB1-APU
Type		Horizontal, water-cooled, 4-cycle diesel engine	
Number of Cylinder		1	
Bore x Stroke		75 mm x 70 mm	
		2.95 in x 2.76 in	
Displacement		309 cc	
		18.86 cu.in.	
Brake Horsepower	SAE Intermittent kW (PS) / rpm	5.1 (7) / 3000	
	SAE Cont. kW (PS) / rpm	4.4 (6) / 3000	
Cooling System		Radiator	
Combustion System		Spherical type (TVCS)	
Injection Timing		0.45 rad (25.5 °)	
		Before T.D.C.	
Fuel		SAE No. 2-D Light Diesel Oil	
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 G-5)	
Lubricating System		Forced Lubrication with Trochoid Pump	
Starting System		Electric Start	
Direction of Revolution		Counterclockwise Facing Flywheel	
Cooling Water Capacity		1.2 L (1.3 U.S.qts, 1.06 Imp.qts)	
Fuel Tank Capacity		4.8 L (1.27 U.S.qts, 1.06 Imp.qts)	
Engine Oil Capacity		1.3 L (1.4 U.S.qts, 1.14 Imp.qts)	
Dry Weight		54.0 kg (119.1 lbs)	46.0 kg (101.2 lbs)

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[2] TIGHTNING TORQUES FOR GENERAL USE SCREWS, BOLTS AND NUT

When the tightening torques are not specified in each section, tighten the screws, bolts and nuts according to the table below.

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	7.85 to 9.32	0.80 to 0.95	5.79 to 6.87	9.81 to 11.2	1.00 to 1.15	7.24 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.6 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	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2

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	Standard screw and bolt SS41, S20C
7	Special screw and bolt SS43, S48C (Refined)
9	Special screw and bolt SCr435, SCM435 (Refined)

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Symptom	Probable Cause	Solution	Reference Page
Engine Revolution is Not Smoothly	● Fuel filter clogged or dirt	Clean or replace	G-8
	● Air cleaner clogged	Clean or replace	G-7
	● Fuel leak due to loose injection pipe retaining nut	Tighten nut	M-18
	● Injection pump malfunctioning	Replace	M-16
	● Incorrect nozzle opening pressure	Adjust	S-21
	● Injection nozzle stuck or clogged	Repair or replace	S-21
	● Fuel over flow pipe clogged	Clean	—
	● Governor malfunctioning	Repair	M-21
Either White or Blue Exhaust Gas is Observed	● Excessive engine oil	Reduce to the specified level	G-6
	● Piston ring and liner worn or stuck	Repair or replace	S-53, 60
	● Incorrect injection timing	Adjust	S-19
	● Deficient compression	Check top clearance and correct valve recessing	S-12, 14, 15
Either Black or Dark Gray Exhaust Gas is Observed	● Overload	Lessen the load	—
	● Low grade fuel used	Use specified fuel	—
	● Fuel filter clogged	Replace	G-8
	● Air cleaner clogged	Clean or replace	G-7
Deficient Output	● Incorrect injection timing	Adjust	S-19
	● Engine's moving parts seem to be seizing	Repair or replace	—
	● Uneven fuel injection	Repair or replace the injection pump	S-21
	● Deficient nozzle injection	Repair or replace the nozzle	S-21
	● Compression leak	Replace head gasket, tighten cylinder head screw, glow plug, nozzle holder and correct valve seat	S-12, 14, 15
Excessive Lubricant Oil Consumption	● Piston ring's gap facing the same direction	Shift ring gap direction	S-31
	● Oil ring worn or stuck	Replace	S-53
	● Piston ring groove worn	Replace the piston	S-53
	● Valve stem and guide worn	Replace	S-48
	● Crank pin bearing worn	Replace	S-54, 55
	● Oil leak	Repair	—
Fuel Mixed into Lubricant Oil	● Injection pump's plunger worn	Replace injection pump	S-19, 20
	● Injection pump broken	Replace	S-19, 20

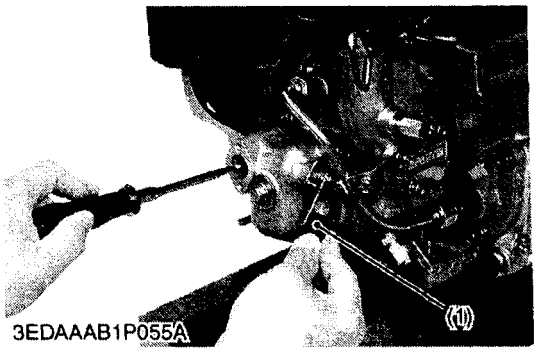
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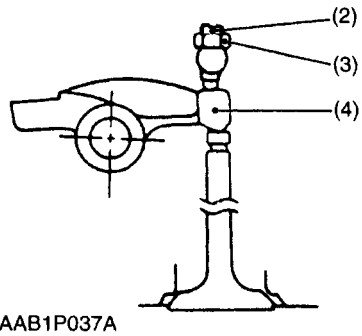
Item		Factory Specification	Allowable Limit
Setting Load / Setting Length		58.8 N / 31 mm 6.0 kgf / 31 mm 13.2 lbs / 1.22 in.	49.0 N / 31 mm 5.0 kgf / 31 mm 11.0 lbs / 1.22 in.
Tilt		—	1.2 mm 0.047 in.
Rocker Arm shaft and Rocker Arm I.D.	Oil Clearance	0.016 to 0.045 mm 0.0006 to 0.0018 in.	—
	Rocker Arm Shaft (O.D.)	10.973 to 10.984 mm 0.4320 to 0.4324 in.	—
	Rocker Arm (I.D.)	11.000 to 11.018 mm 0.4331 to 0.4338 in.	—
Tappet and Guide	Oil Clearance	0.020 to 0.062 mm 0.00079 to 0.00244 in.	0.15 mm 0.0059 in.
	Tappet (O.D)	19.959 to 19.980 mm 0.78579 to 0.78661 in.	—
	Tappet Guide Bore (I.D.)	20.000 to 20.021 mm 0.78740 to 0.78823 in.	—
Push Rod Alignment		—	0.125 mm 0.00492 in.
Piston Skirt O.D.		74.925 to 74.945 mm 2.94980 to 2.95059 in.	Liner I.D. - 0.25 mm 0.0098 in.
Piston Pin Bore I.D.		20.000 to 20.013 mm 0.78740 to 0.78791 in.	20.04 mm 0.7890 in.
Fitting between Piston Pin Bore and PIn		-0.010 to + 0.011 mm -0.00039 to + 0.00043 in.	—
Clearance between Ring Groove and Ring	Top Ring	—	—
	Second Ring	0.085 to 0.112 mm 0.00335 ti 0.00441 in.	0.2 mm 0.008 in.
	Oil Ring	0.020 to 0.055 mm 0.00079 to 0.00217 in.	0.15 mm 0.0059 in.
Piston Ring Width	Top Ring	—	—
	Second Ring	1.458 to 1.470 mm 0.05740 to 0.05787 in.	—
	Oil Ring	3.975 to 3.990 mm 0.15650 to 0.15709 in.	—
Piston Ring Groove Width	Top Ring	—	—
	Second Ring	1.555 to 1.570 mm 0.06122 to 0.06181 in.	—
	Oil Ring	4.01 to 4.03 mm 0.1579 to 0.1587 in.	—

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Decompression Device

1. Align the **T** mark on the flywheel to the mark on the fan cover at the top dead center in the compression stroke.
2. Remove the decompression cover from the cylinder head cover.
3. Pull the decompression lever (1) to the operating position.
4. Loosen the lock nut (3) and screw (2) until it contacts the rocker arm (4).
5. From the position where the adjusting screw contacts the rocker arm, further screw in the adjusting screw by one and a half turns (9.42 ± 1.57 rad., 540 ± 90°).
6. Tighten the lock nut.
7. After adjustment, make sure that the piston does not push up the valve when slightly turning the flywheel with the decompression lever.

Decompression device	Factory spec.	0.94 to 1.31 mm 0.0370 to 0.0516 in.

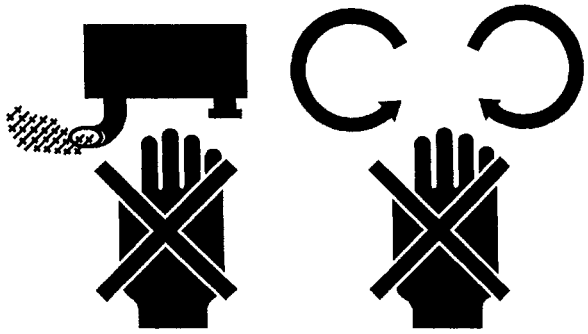
(Adjusting screw pitch: 0.75 mm (0.0295 in.))

(1) Decompression Lever
(2) Decompression Adjusting Screw
(3) Lock Nut
(4) Rocker Arm

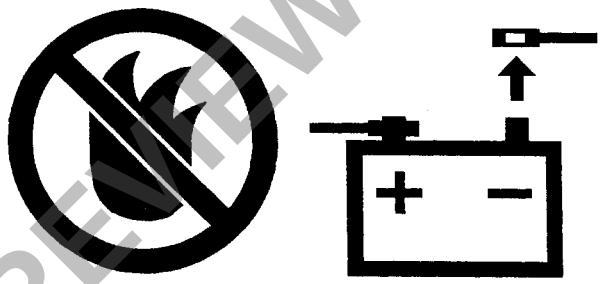
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SAFETY WORKING

- 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.

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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.

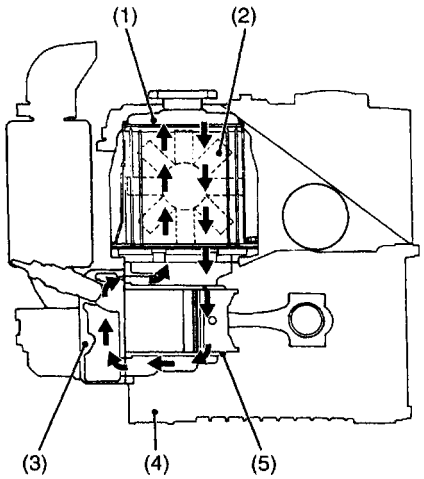
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4. COOLING SYSTEM

[1] GENERAL



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This engine employ a pressurized radiator natural convection cooling system.

Cooling by the radiator (1) and radiator fan (2) increases in specific gravity. And it absorbs combustion heat of the cylinder liner (5) and cylinder head (3) and friction heat generated from moving parts to cool them.

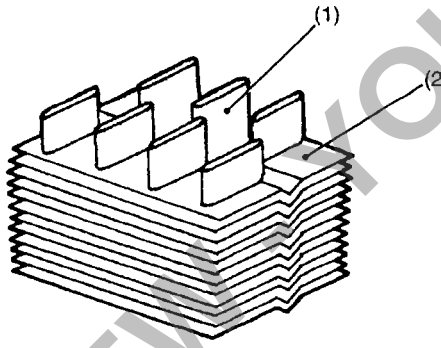
Then, cooling water moves upward, as the water absorbs heat and decreases in specific gravity.

The heated water is cooled again by the radiator. Thus, the cooling water circulates naturally to cool the engine.

(1) Radiator
(2) Radiator Fan
(3) Cylinder Head
(4) Cylinder Block
(5) Cylinder Liner

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[2] RADIATOR



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The radiator adopted is of a plate fin type which is durable and resistant to pressure, and has good heat transfer proper ties. As it passes through the radiator core, cooling water is cooled by air from outside, and is again circulated to the engine body.

The radiator core is composed of a tube (1), through which water flow, and cooling fins (2). Both of the components are formed of thin copper plate, etc. which gives good heat transfer. Cooling air passing between the fins helps cooling water in the tube to give off heat.

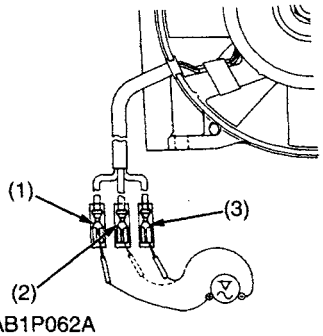
(1) Tube
(2) Cooling Fin (Waved Plate Fin)

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(5) Electrical System



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Fan Dynamo

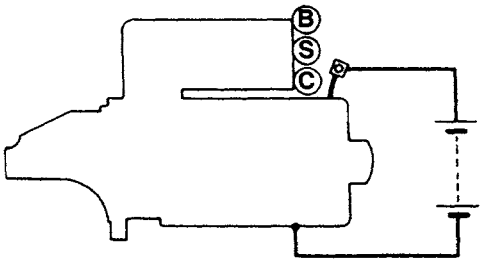
Power Generation Performance

1. Disconnect the lead from the dynamo.
2. Run the engine at the rated speed, and measure AC voltage between the two leads (yellow) (2), (3) and lead (red) (1) from the dynamo.
3. If the voltage is less than the factory specification, replace the cooling fan assembly.

Power generation performance	Factory spec.	Fan speed	6950 min^{-1} (r.p.m)	Approx. 13 V

(1) Lead (Red) (3) Lead (Yellow)
(2) Lead (Yellow)

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Starter

Motor Test

1. Disconnect the ground cable clamp from the battery negative terminal post.
2. Disconnect the battery positive cable and leads from the starter.
3. Remove the starter from the engine.
4. Disconnect the connecting lead from the starter **C** terminal.

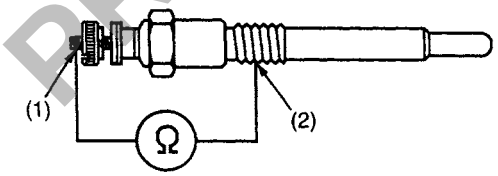
CAUTION

- **Secure the starter in a vise to prevent it from jumping up and down while testing the motor.**

5. Connect a jumper lead from the connecting lead to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter housing and battery negative terminal post.
7. If the motor does not run, check the motor.

(1) Body Earth (2) Connecting Lead

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Glow Plug (EA300-NB1)

Glow Plug Disconnection / Short-circuit Test

1. Remove the glow plug cord.
2. Measure the resistance between the thread (1) at the glow plug end and engine body or the resistance between the thread and housing (2) with an ohmmeter.
3. If the resistance is 0 ohm or infinity, replace the glow plug.

Glow plug resistance	Factory spec.	0.9 Ω (Normal temperature)

(1) Thread (2) Housing

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