WSM

WORKSHOP MANUAL
DIESEL GENERATOR

SQ 50 HERTZ SERIES

Kubota

KiSC issued 05, 2006 A

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MECHANISM

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⚠ SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and decals on the generators 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.**

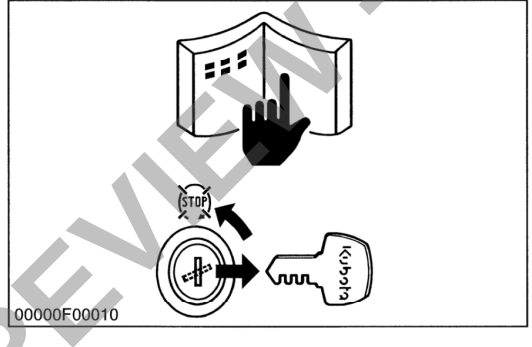
⚠ **WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ **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

(1) Read all instructions and safety instructions in this manual and on your generator safety decals.
(2) Clean the work area and generator.
(3) Place the generator on a firm and level ground.
(4) allow the engine to cool before proceeding.
(5) Stop the engine, and remove the key.
(6) Disconnect the battery negative cable.

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SPECIFICATIONS

	Model	SQ-1120-STD	SQ-1150-STD	SQ-3140-STD
Generator	Type	Revolving-field types self-exciting AC brushless generator		
	Insulation class	H		
	Frequency	50 Hz		
	Output	11.2 kVA (11.2 kW)	15 kVA (15 kW)	14 kVA (11.2 kW)
	Voltage	110 / 220 V		220 / 380 V
	Current	50.9 + 50.9 / 50.9 A	68.2 + 68.2 / 68.2 A	21.3 A
	Number of phases	Single		Three
	Number of poles	4		
	Power factor	100 %		80 %
Engine	Model	D1703-EBG	V2203-EBG	D1703-EBG
	Type	Vertical, liquid cooled, 4-cycle, diesel engine		
	Number of cylinders	3	4	3
	Bore × Stroke	87 × 92.4 mm (3.43 × 3.64 in.)		
	Total displacement	1647 cm^3 (100.51 cu.in.)	2197 cm^3 (134.07 cu.in.)	1647 cm^3 (100.51 cu.in.)
	Output Rated	13.6 kW (18.5 PS)	18.4 kW (25 PS)	13.6 kW (18.5 PS)
	Speed	1500 rpm		
	Combustion system	Spherical combustion chamber		
	Compression ratio	23 : 1		
	Cooling system	Pressurized radiator, forced circulation with water pump		
	Lubricating system	Forced lubrication by trochoid pump		
	Lubricating oil	Better than CD class (API)		
	Starting system	Electric type		
	Battery	80D26R (55 Ah)		
	Fuel tank capacity	62 L (16.4 U.S.gals, 13.6 Imp.gals.)		
	Cooling system capacity	5.5 L (5.8 U.S.qts., 4.8 Imp.qts.)	6.3 L (6.7 U.S.qts., 5.5 Imp.qts.)	5.5 L (5.8 U.S.qts., 4.8 Imp.qts.)
	Crankcase oil capacity	5.6 L (5.9 U.S.qts., 4.9 Imp.qts.)	7.6 L (8.0 U.S.qts., 6.7 Imp.qts.)	5.6 L (5.9 U.S.qts., 4.9 Imp.qts.)
Continuous operating hours (at 3/4 load)		20.7 hrs	15.1 hrs	21.4 hrs
Net weight		640 kg (1411 lbs)	730 kg (1609 lbs)	640 kg (1411 lbs)
Emergency stop mechanism		When the oil pressure or the water temperature is abnormal, the fan belt is broken, and the side door or safety cover is opened while the engine is running.		

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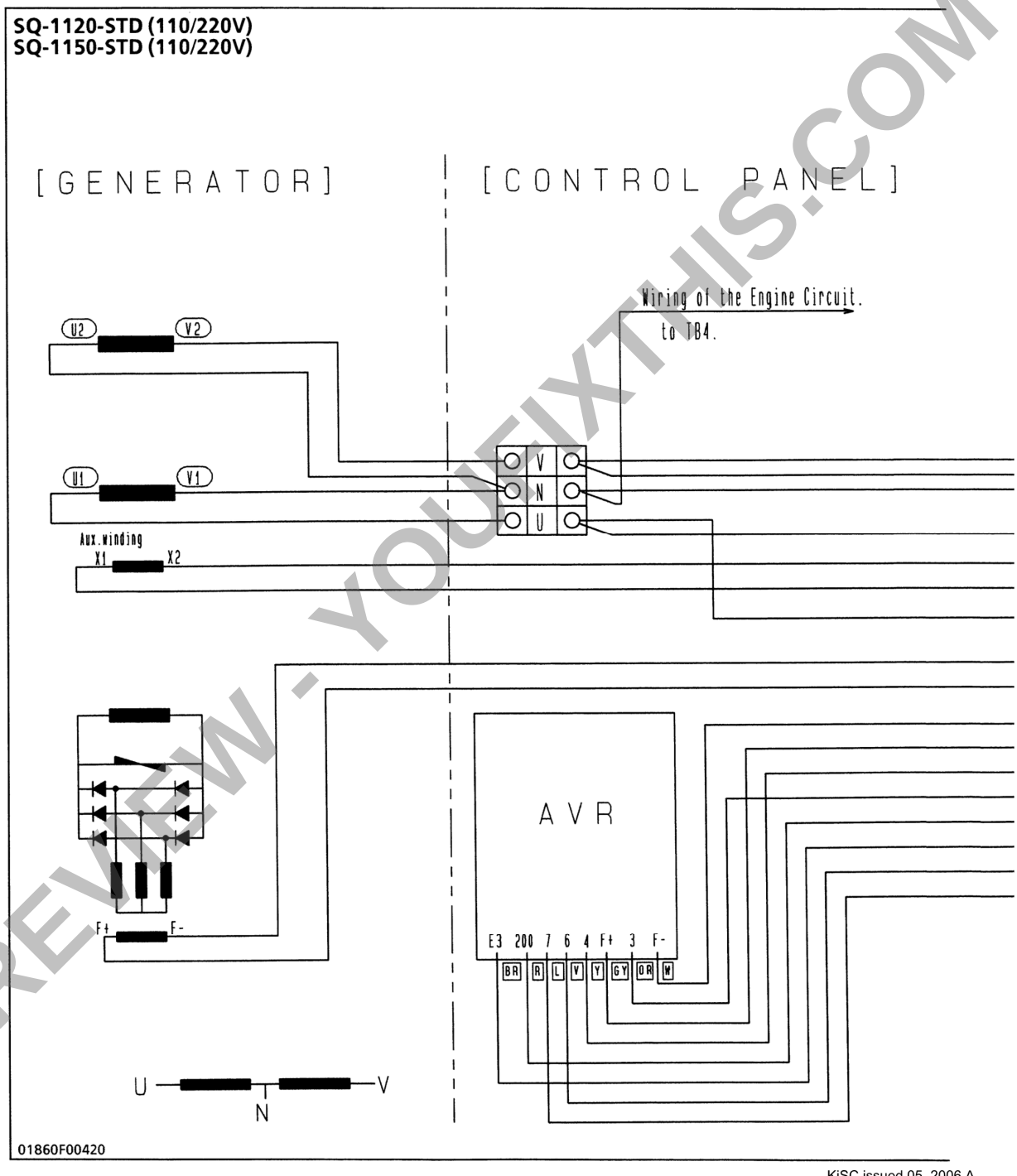
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[8] WIRING DIAGRAM

(1) Generator Diagram

SQ-1120-STD (110/220V)
SQ-1150-STD (110/220V)

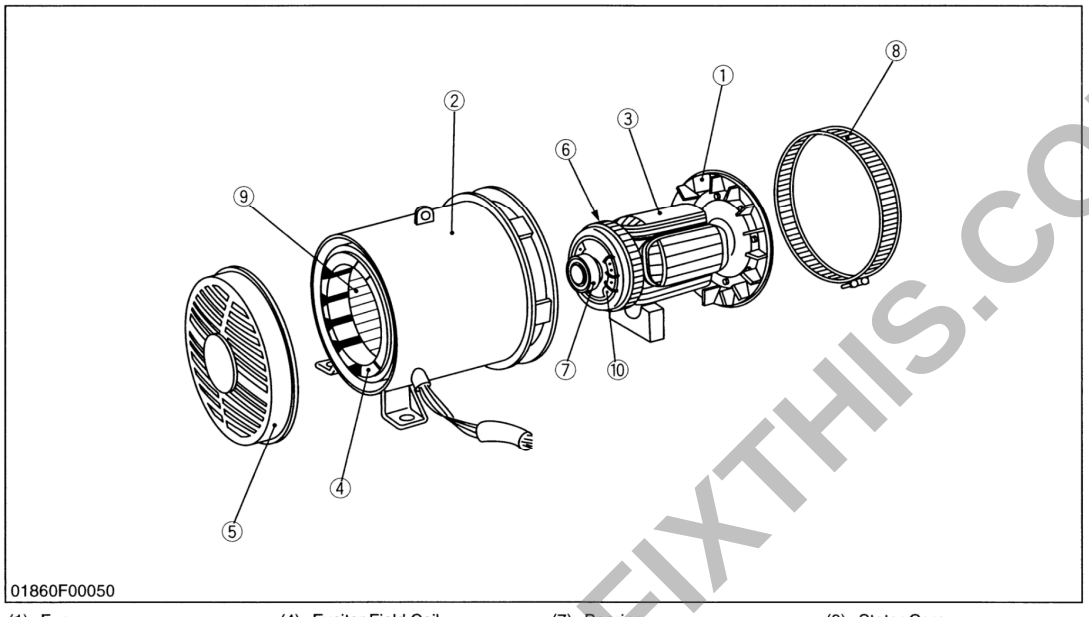


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[2] STRUCTURE

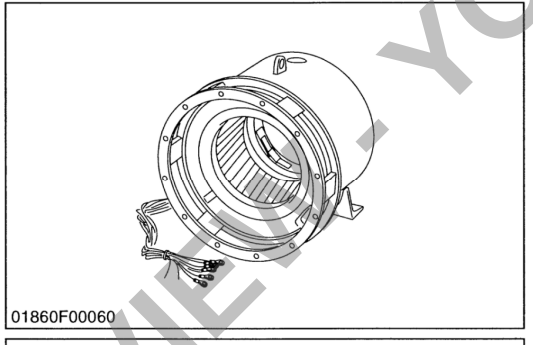


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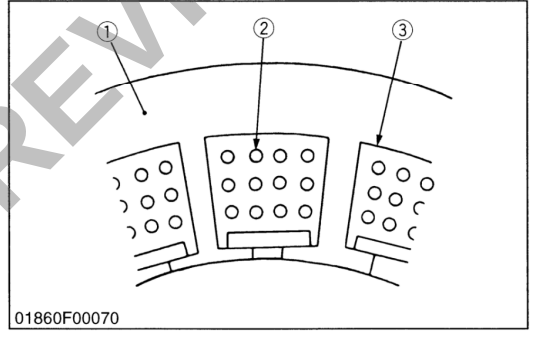
(1) Fan
(2) Frame
(3) Core Rotor
(4) Exciter Field Coil
(5) End Cover
(6) Exciter Armature Coil
(7) Bearing
(8) Cover
(9) Stator Core
(10) Diode Stack

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(1) Stator



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The armature winding (2) is wound around the core slot (3) where generating AC voltage.

Beside the armature windings, the stator is wrapped with auxiliary winding which function as the AVR power source.

(1) Core
(2) Armature Coil
(3) Slot

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[4] TROUBLESHOOTING

[GENERATOR]

■ **NOTE**

- **In order to replace the parts in safety, remove negative terminal of battery so as to prevent the battery and the parts from short-circuiting.**
- **To avoid errors on delivery of spare parts, all information marked on nameplates should be supplied on parts orders, in particular model and serial number of the alternator. Also give the parts numbers from the parts list.**

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(1) Evident Physical Defects (Overheating, Noise, Vibrations ...)

	Fault	Action	Origin of fault
A	Excessive overheating of bearing (temp. of bearing over 80 ˚C) (With or without abnormal bearing noise)	Replace bearing	• If the bearing has turned blue or if the grease has turned black, change the bearing. • Bearing race badly locked (moving in its housing). • Bracket misalignment.
B	Excessive overheating of alternator frame (temperature 30 ˚C (86 ˚F) above ambient)	Check • Air inlets and outlets of alternator • Measuring equipment (voltmeter-Ammeter) • Ambient temperature	• Air flow (inlet-outlet) partially clogged or hot air is being recycled either from alternator or prime mover. • Alternator overloaded. • Fan belt slips.
C	Excessive vibration and humming noise coming from the alternator	Stop the gen-set and check the installation and others.	• Three phase alternator is single phase loaded in excess of acceptable level.
		Start up with no-load: if humming persists...	• Short-circuit in the alternator stator.
D	Alternator damaged by a significant impact which is followed by humming and vibration	Stop the gen-set immediately	• Short-circuit in external circuit. • Break or deterioration in the coupling. • Break or twist in shaft extension. • shifting or short-circuit of the main field winding. • Bursting or unlocking of the fan. • Diode burnt, regulator, rectifier bridge damaged.
E	Smoke, sparks, of flames issuing from the alternator	Stop the gen-set immediately	• Short-circuit in external circuit (including wiring between alternator and control board). • Object fallen into the machine. • Short-circuit or flash in stator winding.

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[5] SERVICING SPECIFICATIONS
[GENERATOR]
(1) For General

Item \ Model			SQ-1120-STD	SQ-1150-STD	SQ-3140-STD	SQ-3200-STD	SQ-3300-STD
Frequency		(Hz)	50				
Voltage		(V)	110 / 220	110 / 220	380	380	380
Current	1 ∅	(A)	50.9 × 2	68.2 × 2	12.5 × 3	19.6 × 3	29.5 × 3
	1 ∅	(A)	50.9	68.2	–	–	–
	3 ∅	(A)	–	–	21.3	30.4	45.6
Armature connection			Series		Star with neutral		
Exciter field		(Ω)	31.2	34.7	41.1	45.8	45.8
Exciter armature		(Ω)	0.553	0.605	0.553	0.605	0.605
Stator coil (U-V)		(Ω)	0.242	0.14	0.789	0.415	0.31
Auxiliary winding		(Ω)	1.51	1.25	1.36	1.08	0.97
Rotor field coil		(Ω)	2.54	3.51	2.54	3.51	3.9
Air gap mm (in.)	Main stator		1.4				
	Exciter side		0.8				
Bearing			6308ZZ				
Regulated voltage value		(%)	1.5				
Circuit breaker capacity		(A)	50	75	30	30	50

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[3] LUBRICANTS, FUEL AND COOLANT

Item	Model	Capacity	Grade
Engine oil	SQ-1120-STD SQ-1120-AUS	5.6 L 5.92 U.S.qts. 4.93 Imp.qts.	Higher than CD claas (API) Above 25 ˚C (77 ˚F) ..... SAE10W-30 SAE10W-40 SAE30 0 to 25 ˚C (32 to 77 ˚F) ... SAE10W-30 SAE10W-40 SAE20 Below 0 ˚C (32 ˚F) SAE10W-30 SAE10W-40 SAE10
	SQ-1150-STD SQ-1150-AUS	7.6 L 8.03 U.S.qts. 6.69 Imp.qts.	
	SQ-3140-STD SQ-3140-AUS	5.69 L 5.92 U.S.qts. 4.93 Imp.qts.	
	SQ-3200-STD SQ-3200-AUS	7.6 L 8.03 U.S.qts. 6.69 Imp.qts.	
	SQ-3300-STD SQ-3300-AUS	13.20 L 13.95 U.S.qts. 11.61 Imp.qts	
Fuel	SQ-1120-STD SQ-1120-AUS	62 L 16.38 U.S.gals. 13.64 Imp.gals.	Diesel fuel No.2-D
	SQ-1150-STD SQ-1150-AUS		
	SQ-3140-STD SQ-3140-AUS		
	SQ-3200-STD SQ-3200-AUS		
	SQ-3300-STD SQ-3300-AUS	68 L 17.97 U.S.gals. 14.96 Imp.gals.	
Coolant	SQ-1120-STD SQ-1120-AUS	5.5 L 5.81 U.S.qts. 4.84 Imp.qts.	Clean water (Soft water) Use antifreeze 50/50
	SQ-1150-STD SQ-1150-AUS	6.3 L 6.66 U.S.qts. 5.54 Imp.qts.	
	SQ-3140-STD SQ-3140-AUS	5.5 L 5.81 U.S.qts. 4.84 Imp.qts.	
	SQ-3200-STD SQ-3200-AUS	6.3 L 6.66 U.S.qts. 5.54 Imp.qts.	
	SQ-3300-STD SQ-3300-AUS	8.2 L 8.67 U.S.qts. 7.22 Imp.qts	

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

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.

Grade / Nominal Diameter / Unit	Standard Screw and Bolt ⬡ or 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	48.1 to 55.9	4.9 to 5.7	35.4 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
M14	107.9 to 125.5	11.0 to 12.8	79.6 to 92.6	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5

* The figures on thew table above are indicated the top of screw or bolt.

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[7] MAINTENANCE CHECK LIST

Observe the following for service and maintenance.

The lubricating oil change intervals listed in the table below are for classes CG, CE and CD lubricating oil of API classification with a low-sulfur fuel in use. If the CF-4 of 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.

CAUTION

- **When checking and servicing the generator, be sure to level and stop the engine.**

No.	Item / Service interval		Daily	Initial 50 hours	Every 100 hours	Every 200 hours	Every 400 hours	Every 500 hours	Every 800 hours	Every 1500 hours	Every 1 year	Every 2 years	Reference page
1	Engine oil	Checking	☆										S-26
		Changing		☆		☆							S-26
2	Radiator coolant (L.L.C)	Checking	☆										S-26
		Changing										☆	–
3	Water separator (Sedimentor)	Clearing			☆								S-27
4	Air cleaner element	Clearing			☆								S-27
		Changing						☆			☆		–
5	Fan belt	Checking					☆						S-106
		Changing							☆				–
6	Fuel line (Fuel line and clamps)	Checking			☆								S-27
		Changing										☆	S-28
7	Battery	Checking			☆								S-27
		Changing										☆	
8	Water pipes and clamps	Checking				☆							S-28
		Changing										☆	S-29
9	Oil filter cartridge	Changing		☆			☆						S-26
10	Fuel filter cartridge	Changing					☆						S-28
11	Fuel tank	Clearing						☆					–
12	Valve clearance	Checking							☆				S-51
13	Injection nozzle	Checking								☆			S-111
14	Generator side bearing	Checking										☆	S-44

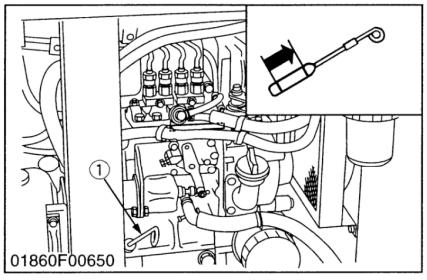
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[8] CHECK AND MAINTENANCE

(1) Check Points of Daily



Checking Engine Oil Level

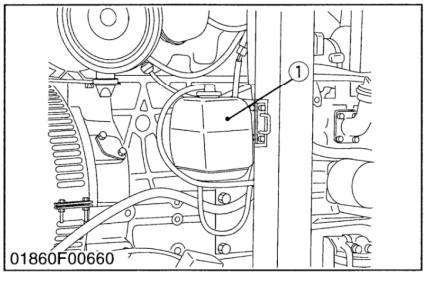
1. Level the engine and check the oil level on the gauge (1).
2. If the level below the lower mark, add new oil to the upper mark.
3. When using an oil of different maker or viscosity from the previous one, drain all old oil. Never mix two different types of oil.

■ **IMPORTANT**

- **Use the specified engine oil.**
  Refer to "LUBRICANTS, FUEL AND COOLANT". (See page S-2)

(1) Gauge

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Checking Coolant Level

CAUTION

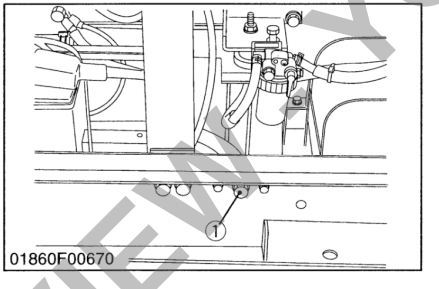
- **Do not remove the radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**

1. Remove the radiator cap and check to see that the coolant level is just below the port.
2. If low, add clean water to the radiator.
3. Check the reserve tank (1) and keep the coolant level between the "**FULL**" and "**LOW**" marks.

(1) Reserve Tank

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(2) Check Points of Initial 50 Hours



Changing Engine Oil

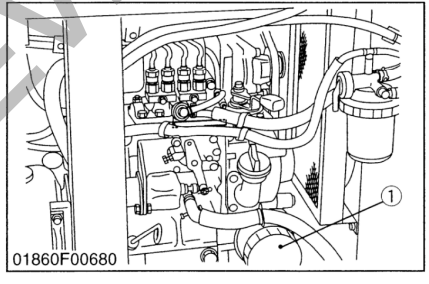
1. After warming up, stop the engine.
2. Remove the drain plug (1) to drain the dirty engine oil completely.
3. Reinstall the drain plug.
4. Fill the new engine oil up to the upper notch on the gauge.

■ **IMPORTANT**

- **Use the specified engine oil.**
  Refer to "LUBRICANTS, FUEL AND COOLANT". (See page S-2)

(1) Drain Plug

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Changing Engine Oil Filter Cartridge

1. Remove the engine oil filter cartridge (1).
2. Apply engine oil slightly to the rubber gasket of new cartridge.
3. Install the new cartridge, screwing it in by hand.
   Over-tightening may cause deformation of the rubber gasket.
4. After the cartridge has been changed, the engine oil level normally lowers a little. Add engine oil to proper level.

■ **IMPORTANT**

- **To prevent serious damage to the engine, replacement oil filter cartridge must be highly efficient. Use only a genuine KUBOTA filter cartridge or its equivalent.**

(1) Engine Oil Filter Cartridge

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[6] 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 at the proper torque.

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

■ **NOTE**

- **In removing and applying the screws, bolts and nuts marked with "*", a pneumatic wrench or similar pneumatic tool, if employed, must be used with enough care not to get them seized.**
- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**
- **After well cleaning its thread and bearing surface, fit a new head bolt (rust-preventive oil applied) without applying engine oil to it.**

Section	Item	N·m	kgf·m	ft-lbs
Generator	Rotor mounting screw	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
	Stator mounting screw	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
	End bracket mounting screw	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Engine	Head cover cap nut			
	D1703-EBG, V2203-EBG	6.9 to 8.8	0.7 to 0.9	5.1 to 6.5
	V3300-EBG	1.6 to 2.3	0.16 to 0.23	1.15 to 1.66
	Nozzle holder	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
	* Rocker arm bracket nut			
	D1703-EBG, V2203-EBG	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
	Rocker arm bracket screw			
	V3300-EBG	49.0 to 61.8	5.0 to 5.7	36.2 to 41.2
	* Cylinder head screw			
	D1703-EBG, V2203-EBG	93.2 to 98.0	9.5 to 10.0	68.7 to 72.3
	V3300-EBG	98.1 to 107.8	10.0 to 11.0	72.3 to 79.5
	Fan drive pulley mounting nut			
	D1703-EBG, V2203-EBG	137.3 to 156.9	14.0 to 16.0	101.3 to 115.7
	* Fan drive pulley mounting screw			
	V3300-EBG (~YN0476)	343.4 to 372.8	35.0 to 38.0	253.1 to 274.7
	(YN0477~)	255.1 to 274.7	26.0 to 28.0	188.1 to 202.5
	* Connecting rod screw			
	D1703-EBG, V2203-EBG	44.1 to 49.0	4.5 to 5.0	32.6 to 36.2
	V3300-EBG	78.5 to 83.4	8.0 to 8.5	57.8 to 61.5
	* Flywheel screw	98.1 to 107.8	10.0 to 11.0	72.3 to 79.5
	* Bearing case screw 1			
	D1703-EBG, V2203-EBG	46.1 to 50.9	4.7 to 5.2	34.0 to 37.6
	* Bearing case screw 2			
	D1703-EBG, V2203-EBG	68.6 to 73.5	7.0 to 7.5	50.6 to 54.2
	* Main bearing case screw			
	V3300-EBG	137.7 to 147.2	14.0 to 15.0	101.2 to 108.5
	Injection pipe retaining nut			
	D1703-EBG, V2203-EBG	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
	V3300-EBG	22.6 to 36.3	2.3 to 3.7	16.6 to 26.8
	Overflow pipe retaining nut			
	V3300-EBG	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
	Injection pump drive shaft nut			
	V3300-EBG	73.5 to 83.4	7.5 to 8.5	54.2 to 61.5
	Oil switch	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
	Glow plug	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
	Starter's B terminal nut	5.9 to 9.8	0.6 to 1.0	4.3 to 7.2
	Alternator pulley nut	58.35 to 78.9	5.95 to 8.05	43.03 to 58.22

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