GENERAL

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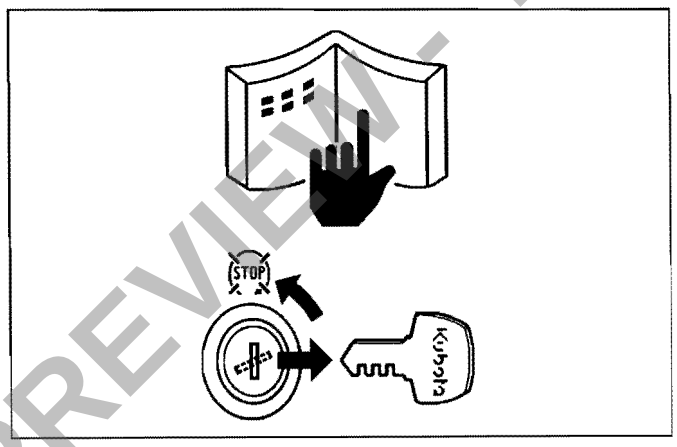
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⚠ SAFETY FIRST

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.**



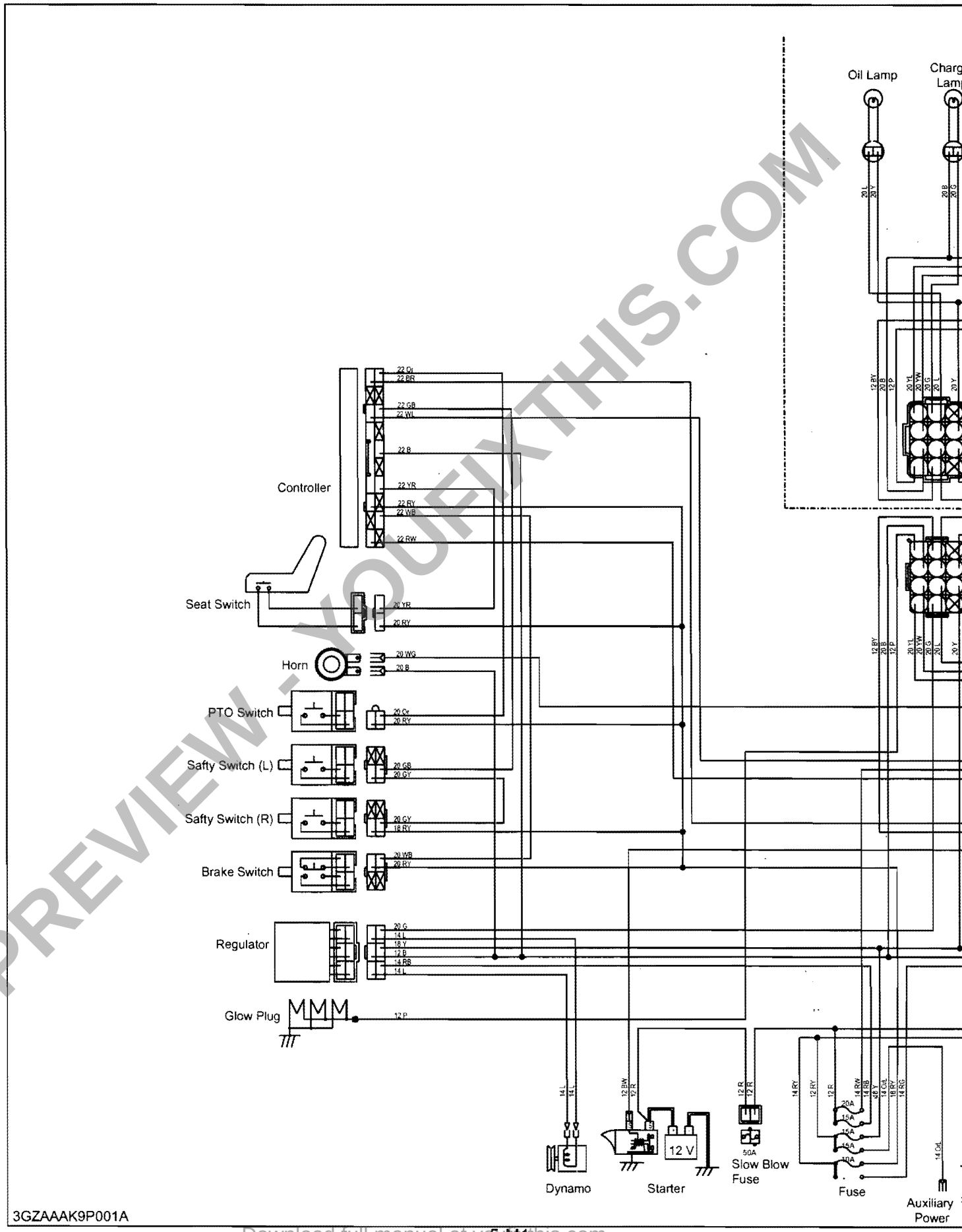
BEFORE SERVICING AND REPAIRING

- 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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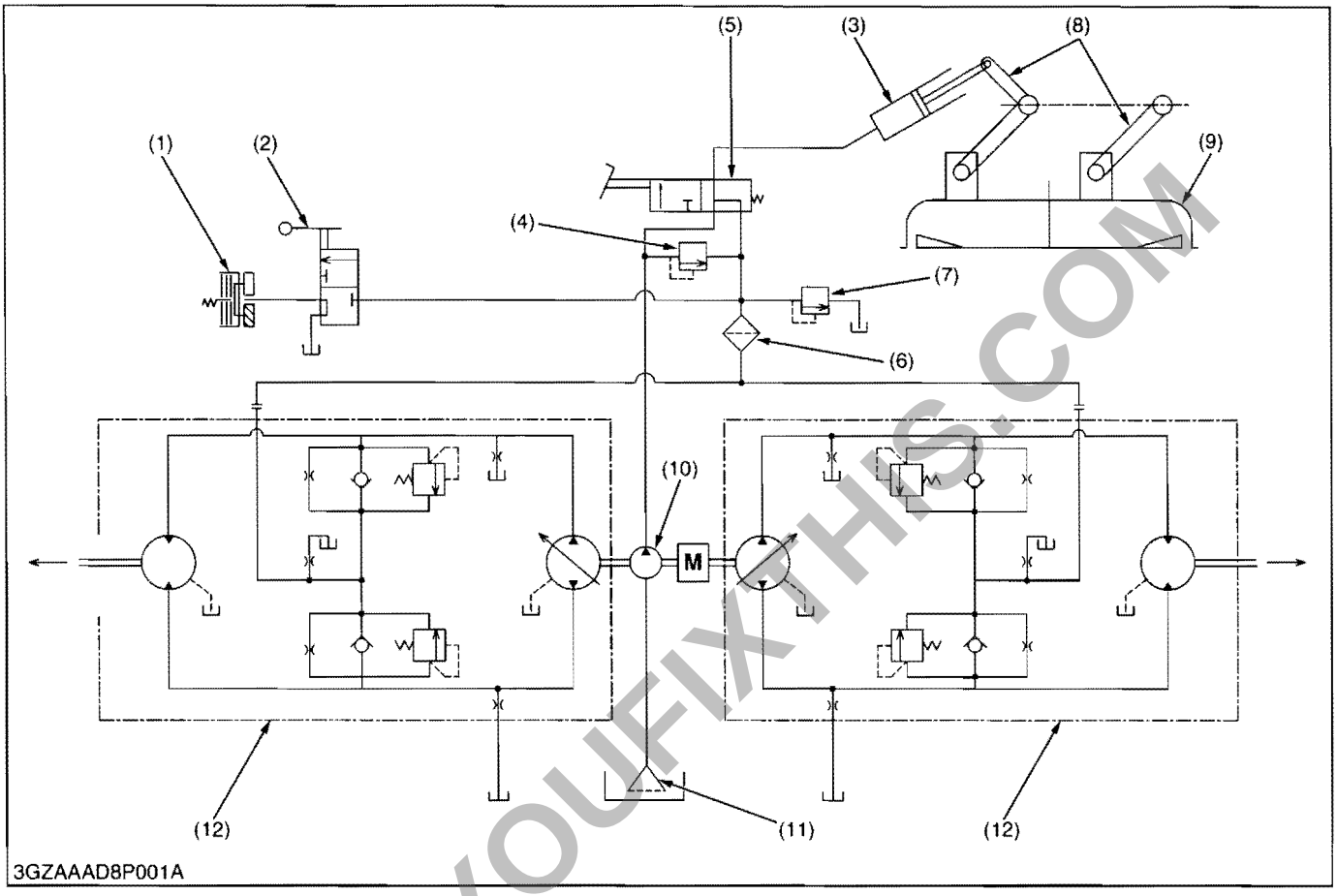
1. WIRING DIAGRAM



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1. HYDRAULIC CIRCUIT



(1) PTO Clutch
(2) PTO Clutch Valve
(3) Mower Lift Cylinder
(4) Relief Valve
(5) Control Valve
(6) Oil Filter
(7) Regulator Valve
(8) Mower Link
(9) Mower Deck
(10) Hydraulic Pump
(11) Oil Strainer
(12) Hydrostatic Transmission

The hydraulic system of this machine is composed of a hydraulic pump (10), control valve assembly (5), mower lift cylinder (3) and other components.

This system has the following functions.

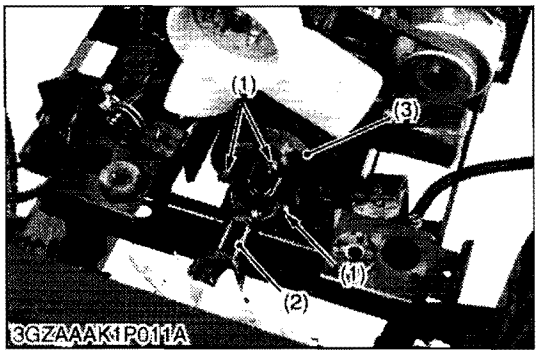
Oil is supplied by hydraulic pump (10) which is driven by engine.

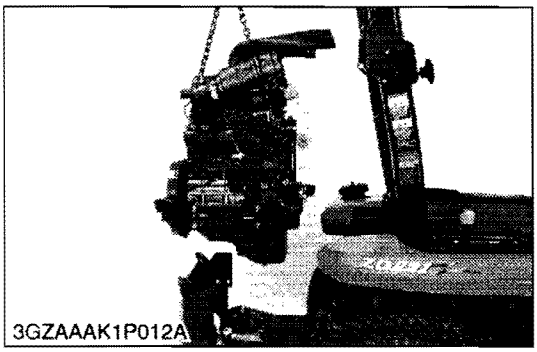
Power from the input shaft (pump shaft) is distributed right and left with the bevel gears and drives each hydrostatic transmission (12).

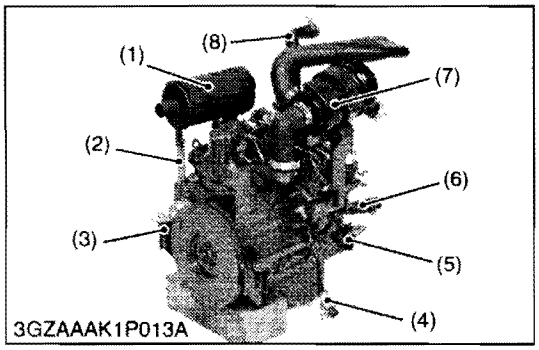
Moreover, oil from the hydraulic pump (10) is sent to the transmission centre case through the control valve. On the other hand, oil is regulated with the regulator valve (7) to constant pressure and sent to the hydrostatic transmission (12) and PTO clutch (1).

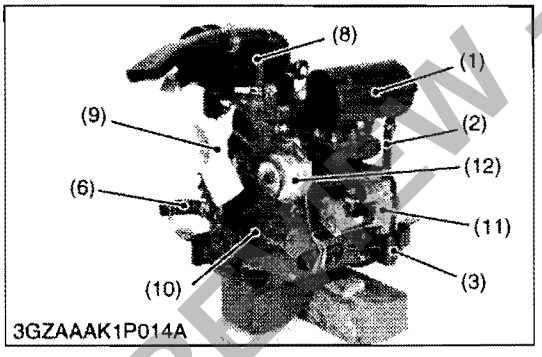
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Separating Engine

1. Remove the engine mounting nuts.
2. Remove the universal joint mounting bolts (1).
3. Disconnect the universal joint (2) from the fun drive pulley (3).
4. Separate the engine from the machine body.

(When reassembling)

- Apply grease to the grease nipples on the universal joint.

Tightening torque	Universal joint mounting bolt	26.0 to 28.0 N·m 2.7 to 2.9 kgf·m 19.2 to 20.7 lbf·ft
	Engine mounting nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

(1) Universal Joint Mounting Bolt
(2) Universal Joint
(3) Fan Drive Pulley

Air Cleaner, Muffler, Fan and Engine Outer Parts

1. Remove the muffler (5) and the muffler stay (2).
2. Remove the fan belt (10), the dynamo (12) and the cooling fan (9).
3. Remove the starter motor (11).
4. Remove the lower hose (6) and the upper hose (8).
5. Remove the air cleaner assembly (7).
6. Remove the battery cable (4).
7. After hooking the engine support mounting bolts. Remove the engine supports (3) (5).
   Set the engine stands to the engine.

(When reassembling)

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

■ **IMPORTANT**

- **After reassembling the fan belt, be sure to adjust the fan belt tension.**

Tightening torque	Engine support mounting bolt	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Muffler
(2) Muffler Stay
(3) Engine Support (LH)
(4) Battery Cable
(5) Engine Support (RH)
(6) Lower Hose
(7) Air Cleaner Assembly
(8) Upper Hose
(9) Cooling Fan
(10) Fan Belt
(11) Starter Motor
(12) Dynamo

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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 : See page G-10.)

Item	Size x Pitch	N·m	kgf·m	lbf·ft
*Cylinder head cover screw	M6 x 1	6.86 to 11.3	0.7 to 1.15	5.1 to 8.3
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe retaining nut	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Glow plug	M8 x 1	7.8 to 14.7	0.8 to 1.5	5.8 to 10.8
*Rocker arm bracket nut	M6 x 1	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
*Cylinder head screw	M8 x 1.25	37.3 to 42.2	3.8 to 4.3	27.5 to 31.1
*Fan drive pulley screw	M12 x 1.5	117.7 to 127.5	12.0 to 13.0	86.8 to 94.0
*Idle gear shaft mounting screw	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
Oil pump mounting screw	M8 x 1.25	17.7 to 21.6	1.80 to 2.20	13.0 to 15.9
*Connecting rod screw	M7 x 0.75	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Flywheel screw	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
Bearing case cover mounting screw	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Main bearing case screw 2	M7 x 1	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Main bearing case screw 1	M6 x 1	12.7 to 15.7	1.3 to 1.6	9.4 to 11.6
Oil pressure switch	PT 1/8	15 to 19	1.5 to 2.0	11 to 14
Nozzle holder	–	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Drain plug with copper gasket	M12 x 1.25	32.4 to 37.3	3.3 to 3.8	23.9 to 27.5
Drain plug with copper gasket	M22 x 1.5	63.7 to 73.5	6.5 to 7.5	47.0 to 54.2
Drain plug with rubber coated gasket	M22 x 1.5	44.1 to 53.9	4.5 to 5.5	32.5 to 39.8

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■ **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 x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.**

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	G-7
	Air in the fuel system	Vent air	G-48
	Water in the fuel system	Change fuel and repair or replace fuel system	–
	Fuel pipe clogged	Clean or replace	G-44
	Fuel filter clogged	Replace	G-38
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-7
	Fuel with low cetane number	Use specified fuel	–
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	–
	Incorrect injection timing	Adjust	1-S17
	Fuel camshaft worn	Replace	1-S32
	Injection nozzle clogged	Clean or replace	1-S25
	Injection pump malfunctioning	Replace	1-S29
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	1-S31 to 39 1-S46 to 56
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S27
	Improper valve timing	Correct or replace timing gear	1-S31
	Piston ring and cylinder worn	Replace	1-S34, S35
	Excessive valve clearance	Adjust	1-S13
	Stop solenoid malfunctioning	Replace	–
Starter Does Not Run	Battery discharged	Charge	G-32
	Starter malfunctioning	Repair or replace	1-S24
	Key switch malfunctioning	Replace	5-S8
	Wiring disconnected	Connect	–

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7. MAINTENANCE CHECK LIST

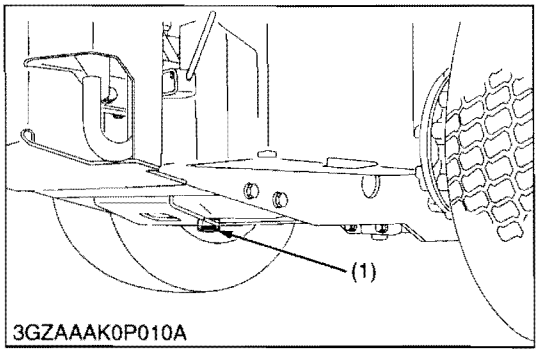
No.	Items \ Period		Service interval												After since	Reference page		
			50	100	150	200	250	300	350	400	450	500	550	600				
1	Engine oil	Change	★			☆				☆				☆	every 200 Hr	G-18		
2	Engine oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-18		
3	Transmission fluid and rear axle gear case (RH and LH) fluid	Change								★					every 400 Hr	G-21		
4	Transmission oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-19		
5	Transmission strainer	Clean								★					every 400 Hr	G-22		
6	Motion control lever pivot	Adjust				☆				☆				☆	every 200 Hr	G-36		
7	Safety device	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-23		
8	Mower gear box oil	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-28		
		Change			☆			☆			☆			☆	every 150 Hr	G-34		
9	Greasing (without mower)	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-25		
10	Oiling	Oil	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-27		
11	Air cleaner primary element	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	G-29	*1	@
		Replace													every 1 year	G-41		
	Secondary element	Replace													every 1 year	G-41		
12	Fuel filter element	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-29		@
		Replace								☆					every 400 Hr	G-38	*2	
13	Fuel line	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-29		@
		Replace													every 2 years	G-44	*2	
14	Fan belt	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-30		
15	Parking brake	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-31	*2	
16	Battery condition	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-32		
17	Radiator hose and clamp	Check				☆				☆				☆	every 200 Hr	G-36		
		Replace													every 2 years	G-44	*2	
18	Hydraulic hose	Check				☆				☆				☆	every 200 Hr	G-37		
		Replace													every 2 years	G-44	*2	

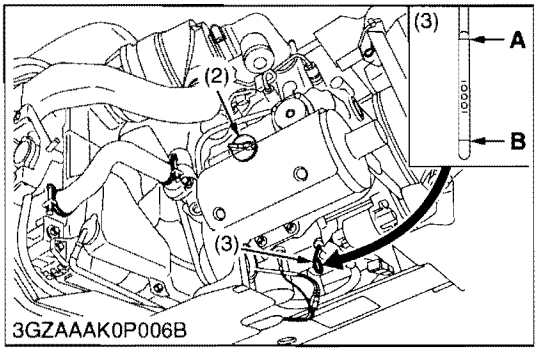
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[2] CHECK POINTS OF INITIAL 50 HOURS





Changing Engine Oil

CAUTION

- **Be sure to stop the engine before changing oil.**

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. To change the used oil, remove the drain plug (1) at the bottom of the engine and drain the oil completely.
4. Screw in the drain plug (1).
5. Fill with the new oil up to upper line on the dipstick (3).

IMPORTANT

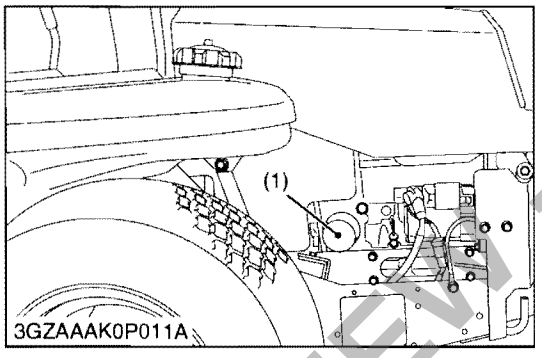
- **When using oil of different manufacture or viscosity from the previous one, remove all of the old oil.**
- **Never mix two different type of oil.**
- **Use the proper SAE engine oil according to ambient temperatures.**
  Refer to "LUBRICANTS, FUEL AND COOLANT".
  (See page G-7.)

Engine oil capacity	3.5 L 3.70 U.S.qts 3.08 Imp.qts

(1) Drain Plug
(2) Oil Inlet Plug
(3) Dipstick

A : Upper Level
B : Lower Level

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Replacing Engine Oil Filter Cartridge

CAUTION

- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and may cause burns.**

1. Remove the engine oil filter cartridge (1) with the filter wrench.
2. Apply a slight coat of oil onto the rubber gasket of new cartridge.
3. To install the new cartridge, screw it in by hand. Over tightening may cause deformation of rubber gasket.
4. After the cartridge has been replaced, the engine oil level normally lowers a little. Add engine oil to proper level. Check for oil leaks around filter gasket.

IMPORTANT

- **To prevent serious damage to the engine, element of recommended type must be used. Use only a genuine KUBOTA filter or its equivalent.**

(1) Engine Oil Filter Cartridge

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2. SERVICING SPECIFICATIONS

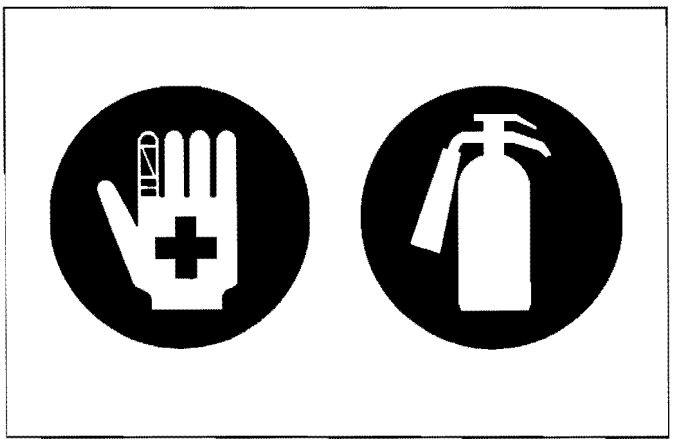
ENGINE BODY

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	–
Compression Pressure		2.84 to 3.24 MPa 29.0 to 33.0 kgf/cm^2 413 to 469 psi	2.26 MPa 23.0 kgf/cm^2 327 psi
Difference among Cylinders		–	10 % or less
Top Clearance		0.50 to 0.70 mm 0.0197 to 0.0276 in.	–
Cylinder Head Surface	Flatness	–	0.05 mm 0.0020 in.
Valve Recessing	Intake and Exhaust	–0.10 to 0.10 mm –0.0039 to 0.0039 in.	0.30 mm 0.0118 in.
Valve Stem to Valve Guide	Clearance	0.030 to 0.057 mm 0.00118 to 0.00224 in.	0.10 mm 0.0039 in.
Valve Stem	O.D.	5.968 to 5.980 mm 0.23496 to 0.23543 in.	–
Valve Guide	I.D.	6.010 to 6.025 mm 0.23661 to 0.23720 in.	–
Valve Face	Angle	0.785 rad 45 °	–
Valve Seat	Angle	0.785 rad 45 °	–
	Width	2.12 mm 0.0835 in.	–
Valve Spring	Free Length	31.3 to 31.8 mm 1.232 to 1.252 in.	28.4 mm 1.118 in.
	Tilt	–	1.2 mm 0.047 in.
	Setting Load / Setting Length	64.7 N / 27.0 mm 6.6 kgf / 27.0 mm 14.6 lbf / 1.063 in.	54.9 N / 27.0 mm 5.6 kgf / 27.0 mm 12.3 lbf / 1.063 in.

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PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher handy at all times.
- Keep emergency numbers for doctors, ambulance service, hospital and fire department near your telephone.

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MECHANISM

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      (1) Structure 2-M2
      (2) Pump and Motor 2-M3
      (3) Check Valve and High Pressure Relief Valve 2-M4
      (4) Oil Flow 2-M5
      (5) Power Trains Operation 2-M6
      (6) Control Linkage 2-M7
      (7) Final Reduction Gear Section 2-M8
      (8) PTO System 2-M9

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