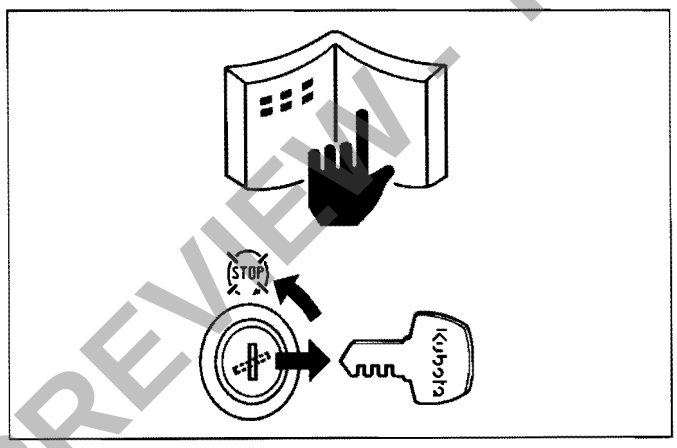
⚠ SAFETY FIRST

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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GENERAL

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SPECIFICATIONS

Model			ZG222S	ZG222	ZG227
Engine	Model		KGZ770-E2-M3		KGZ770-E2-M2
	Maximum engine power (Gross)		16.4 kW (22 HP)*1		20.1 kW (27 HP)*1
	Type		Air-cooled gasoline engine		
	Number of cylinders		2 (V-Twin)		
	Bore and stroke		84.2 x 69 mm (3.31 x 2.72 in.)		
	Total displacement		768 cm^3 (46.9 cu.in.)		
	Rated revolution		3200 min^{-1} (rpm)		
	Fuel		Automobile unleaded or regular gasoline		
	Starter		Electric starter with battery		
	Lubrication		Full pressure lubrication		
	Cooling		Forced air cooled		
	Battery		U1-9 (12 V, RC : 30 min, CCA : 285, CA : 340)		
Capacities	Fuel tank		28 L (7.4 U.S.gals, 6.2 Imp.gals)		
	Engine crankcase (with filter)		1.8 L (1.9 U.S.qts, 1.6 Imp.qts)		2.0 L (2.1 U.S.qts, 1.8 Imp.qts)
	Transmission including rear axle gear case		7.5 L (7.9 U.S.qts, 6.6 Imp.qts)*3		
Dimensions	Overall length		2060 mm (81.1 in.)		
	Overall width Without mower deck		1210 mm (47.7 in.)		
	Overall height	With ROPS upright	1775 mm (69.9 in.)		
		With ROPS folded	1320 mm (51.9 in.)		
	Wheel base		1295 mm (51.0 in.)		
	Minimum ground clearance		130 mm (5.12 in.) with 48S, 48P		130 mm (5.12 in.) with 54P
	Tread	Front	860 mm (33.9 in.)		
		Rear	930 mm (36.3 in.)		
Weight (with Mower Deck)			519 kg (1145 lbs) with 48S	527 kg (1162 lbs) with 48P	537 kg (1184 lbs) with 54P
Travelling system	Tires	Front	13 x 5.0-6 (4PR) Rib		
		Rear	23 x 10.5-10 (4PR) Turf		
	Travelling speeds	Forward	0 to 14.5 km/h (0 to 9.0 mph)*2		
		Reverse	0 to 8.0 km/h (0 to 5.0 mph)*2		
	Steering		2-Hand levers		
	Transmission		2-Hydrostatic transmission with gear		
	Parking brake		Wet multi disc / foot applied, released		
	Min. turning radius		0 mm (0 in.)		
PTO	Revolution		1 speed (2530 rpm at 3200 engine rpm)		
	Drive system		Shaft drive, KUBOTA 10 tooth in involute spline		
	Clutch type		Wet multi discs		
	PTO brake		Wet single disc		

NOTE: Specifications and design subject to change without notice.
*1 : Manufacturer's estimate
*2 : At 3200 min^{-1} (rpm)
*3 : Oil amount when the oil level is at the upper level.

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7. MAINTENANCE CHECK LIST

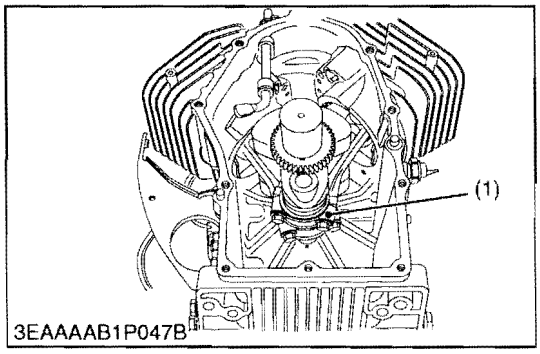
No.	Items \ Period		Indication hour meter (Hr) 50	100	150	200	250	300	350	400	450	500	550	600	After since	Reference page		
1	Engine oil	Change	★		☆		☆		☆		☆		☆		every 100 Hr	G-19		
2	Engine oil filter	Replace	★				☆				☆				every 200 Hr	G-19		
3	Transmission oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-20		
4	Transmission strainer	Clean				★				☆				☆	every 400 Hr	G-20		
5	Transmission fluid and rear axle gear case (RH and LH) fluid	Change								★					every 400 Hr	G-21		
6	Mower gear box oil	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-23		
		Change			☆			☆			☆			☆	every 150 Hr	G-34		
7	Safety device	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-22		
8	Greasing (without mower)	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-24		
9	Oiling	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-25		
10	Air cleaner primary element	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	G-26	*1	@
		Replace													every 1 year	G-37		
	Secondary element	Replace													every 1 year	G-37		
11	Fuel filter element	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-29		@
		Replace								☆					every 400 Hr	G-36	*2	
12	Fuel line	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-29		@
		Replace													every 2 years	G-38	*2	
13	Parking brake	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-30		
14	Battery condition	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-31		
15	Engine shroud panel	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	G-27	*2	
16	Engine oil cooler fins	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	G-28	*1 *2	
17	Fuel filter bowl	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	G-33		
18	Throttle cable	Oil		☆		☆		☆		☆		☆		☆	every 100 Hr	G-34		

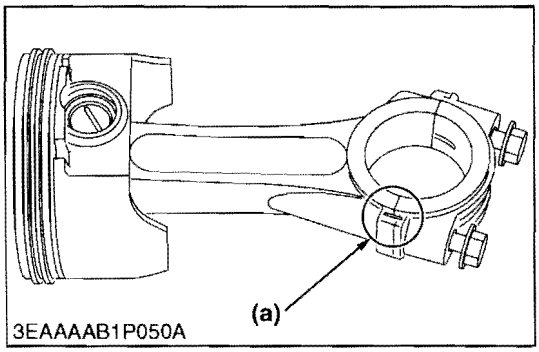
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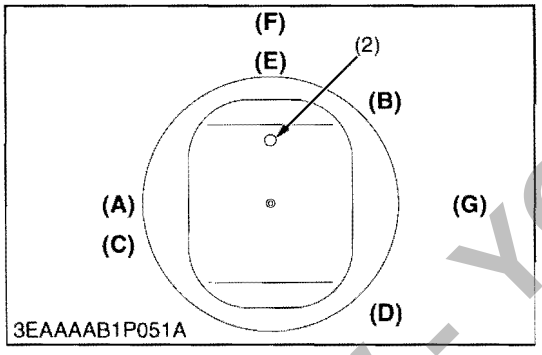
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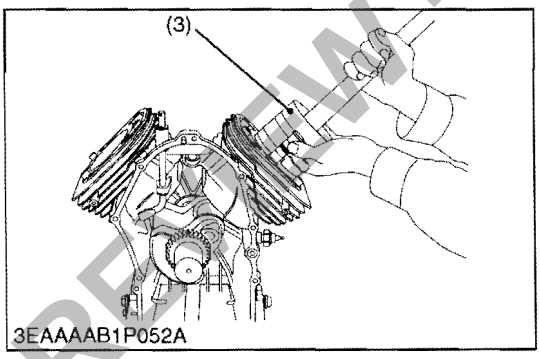
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(7) Piston and Connecting Rod









Connecting Rod and Piston

1. Remove the connecting rod cap (1).
2. Turn the flywheel and bring the piston to top dead center.
3. Draw out the piston upward by lightly tapping it from the inside of the crankcase with the grip of a hammer.
4. Draw out the other piston in the same method as above.

(When reassembling)

- Align the marks **(a)** with each other.
- Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque. If the connecting rod screw won't be screwed in smoothly, clean the threads. If the connecting rod screw is still hard to screw in, replace it.
- Before inserting the piston into the cylinder, apply enough engine oil to the piston.
- When inserting the piston into the cylinder, face the mark (2) on the upper of the piston to the flywheel.

■ **IMPORTANT**

- **Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No.1 piston.**
- **When installing the piston into the cylinder, place the gaps of all the piston rings as shown in the figure.**
- **Carefully insert the pistons using a piston ring compressor (3). Otherwise, their chrome-plated section may be scratched, causing trouble inside the cylinder.**

Tightening torque	Connecting rod screw	21.6 to 27.4 N·m 2.21 to 2.79 kgf·m 16.0 to 20.2 lbf·ft

(1) Connecting Rod Cap
(2) Mark
(3) Piston Ring Compressor

(A) Top Ring Gap
(B) Second Ring Gap
(C) Side Rail Gap
(D) Spacer Rail Gap
(E) Side Rail Gap
(F) Flywheel Side
(G) Push Rod Side
(a) Mark

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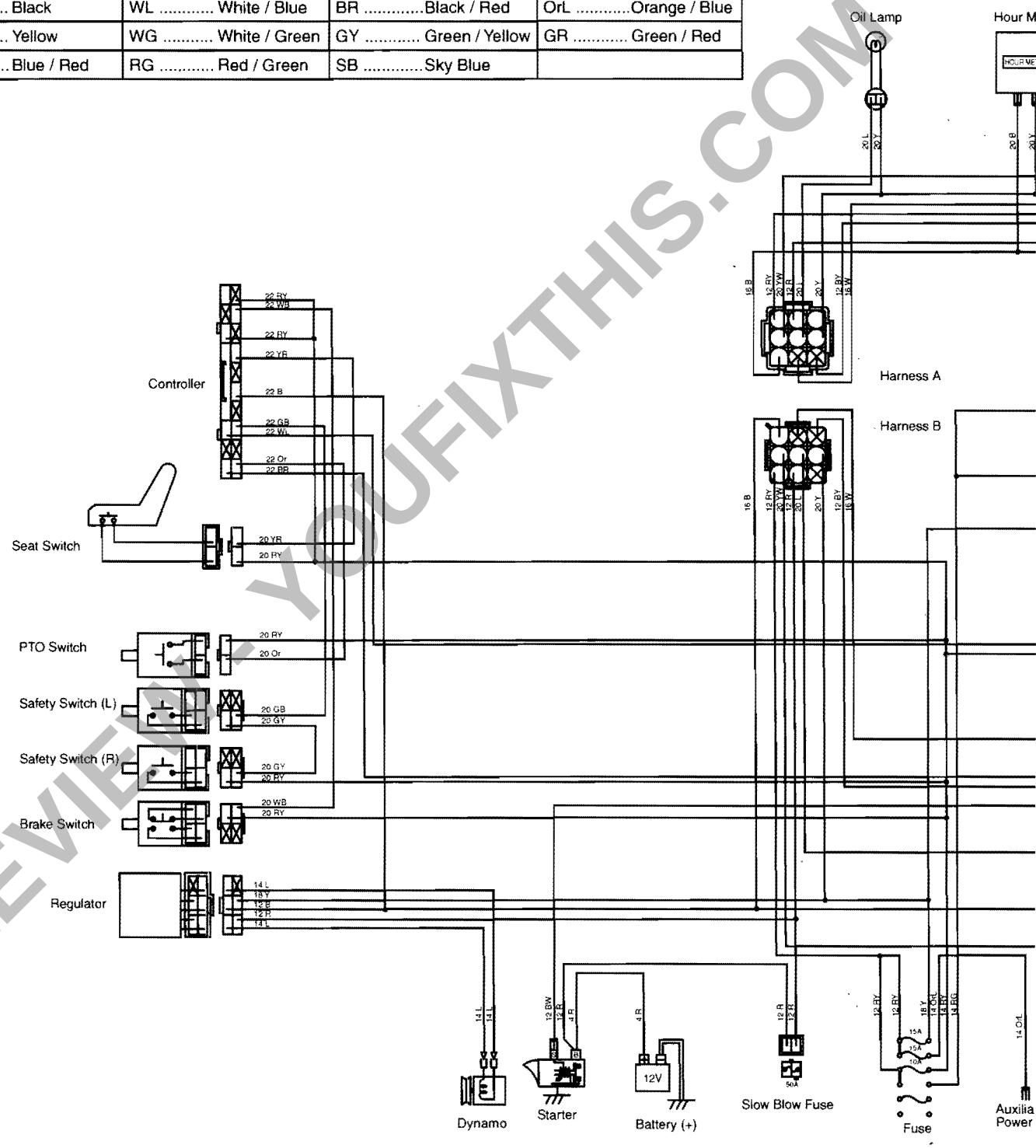
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1. WIRING DIAGRAM

Color of Wiring

W ..... White	V ..... Violet	RY ..... Red / Yellow	YR ..... Yellow / Red
R ..... Red	Or ..... Orange	BY ..... Black / Yellow	YW ..... Yellow / White
L ..... Blue	WB ..... White / Black	BW ..... Black / White	GB ..... Green / Black
B ..... Black	WL ..... White / Blue	BR ..... Black / Red	OrL ..... Orange / Blue
Y ..... Yellow	WG ..... White / Green	GY ..... Green / Yellow	GR ..... Green / Red
LR ..... Blue / Red	RG ..... Red / Green	SB ..... Sky Blue	

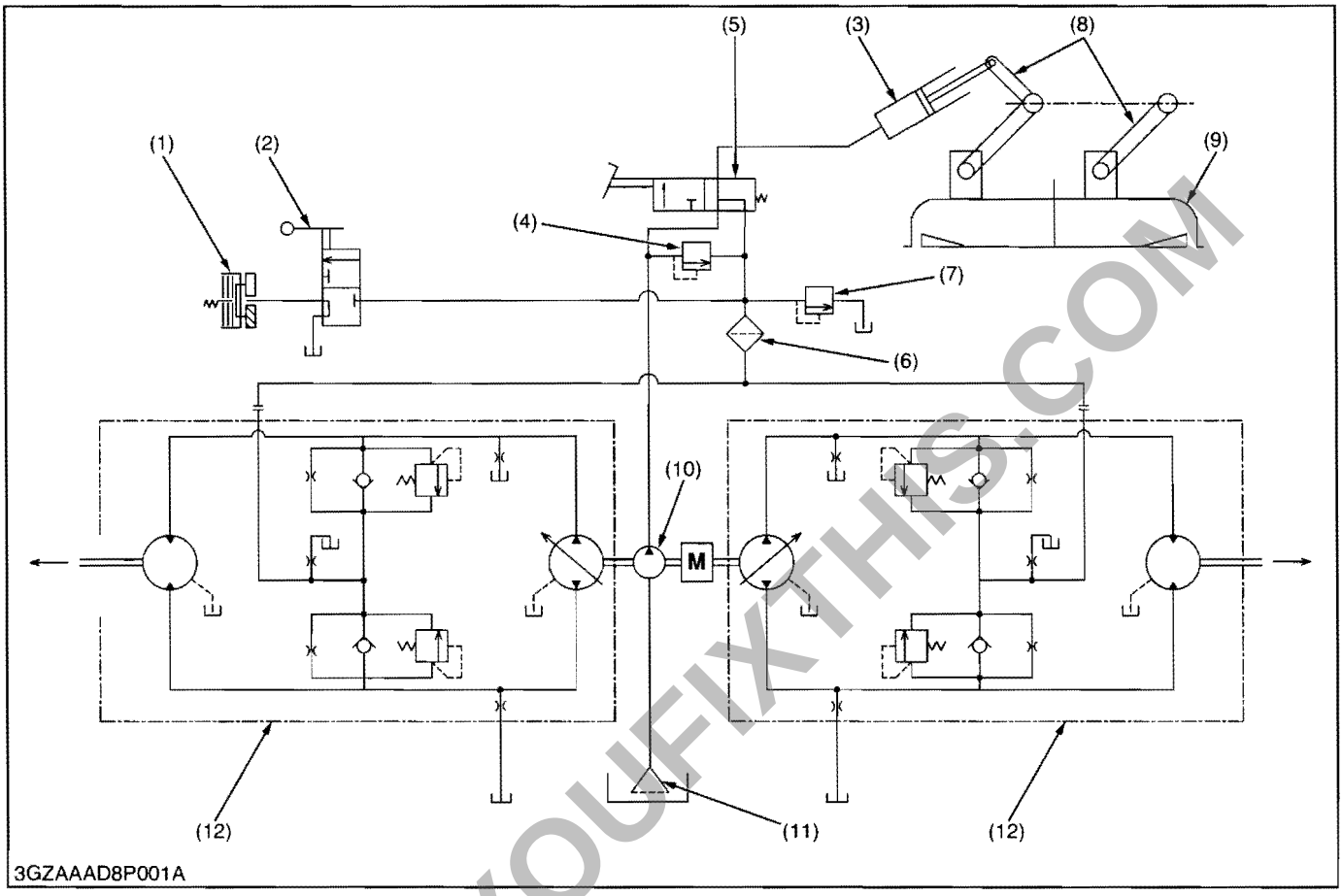


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1. HYDRAULIC CIRCUIT



(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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1. TROUBLESHOOTING

The engine malfunctions can result from a large number of cause. The following describes symptoms that are encountered relatively more often than others, their major causes and remedies.

Symptom	Probable Cause	Solution	Reference Page
Starter Does Not Run	Battery discharged	Charge	G-32
	Improper or imperfect wiring	Check the wiring	–
	Main switch malfunctioning	Replace	–
	Starter malfunctioning	Repair or replace	1-S15, 5-S14
	Safety switch malfunctioning	Replace	5-S8
Engine Does Not Start	No fuel	Replenish fuel	–
	Air Cleaner clogged	Clean or replace	G-28
	Fuel pipe clogged	Clean or replace	G-29
	Fuel filter clogged	Replace	G-33
	Spark plug electrodes are wet with gasoline	Dry electrode and restart, being careful not to close choke excessively. Check to see if there is no overflow from carburetor, if affirmative, disassembled and clean carburetor.	–
	No spark forms in spark plug	Disconnected cord and wrong wiring	1-S11
	Only weak spark forms	Defective ignition coil Defective ignition control unit	1-S11
	Insufficient compression	Check the valve clearance Check degree of contact of intake and exhaust valves with their seat Check the tightening torque on cylinder head screws Check the wear of piston ring, piston and cylinder	1-S9 1-S26 1-S19 1-S31, S32, S34
Improper Low-Speed Running and Idling	Improper spark plug	Repair or replace	1-S19
	Defective Igniter	Replace	1-S25
	Defective carburetor	Clean or replace	1-S17
	Defective governor	Adjust	1-S10
Engine Speed Does Not Increase	Defective carburetor	Repair or replace	1-S17
	Defective governor	Adjust	1-S10

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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.
(For general use screws, bolts and nuts : See page G-10.)

[1] TIGHTENING TORQUES FOR GENERAL USE SCREWS, BOLTS AND NUTS

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

Nominal Diameter	N·m	kgf·m	lbf·ft
M6 (Standard Screw and Bolt)	6.86 to 14.7	0.700 to 1.49	5.06 to 10.8
M6 (Self tap type)	9.81 to 14.7	1.00 to 1.49	7.24 to 10.8
M8 (Standard Screw and Bolt)	13.7 to 29.4	1.40 to 2.99	10.1 to 21.6

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[2] TIGHTENING TORQUES FOR SPECIAL USE SCREWS, BOLTS AND NUTS

■ **NOTE**

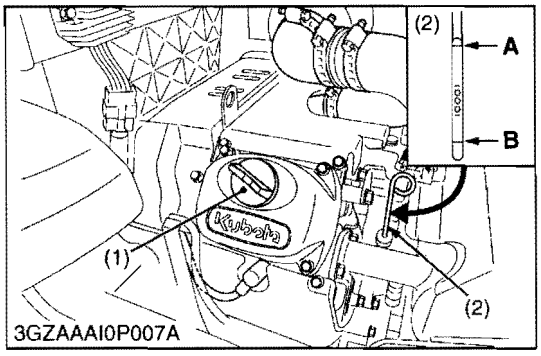
- **For "*" marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**
- **The letter "M" in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.**

Item	Size x Pitch	N·m	kgf·m	lbf·ft
Engine mounting bolt and nut	–	24 to 28	2.4 to 2.8	18 to 20
Cylinder head cover screw	M6 x 1.0	9.80 to 13.8	1.00 to 1.40	7.23 to 10.1
*Cylinder head screw	M10 x 1.5	41.2 to 50.0	4.21 to 5.09	30.4 to 36.8
Crankcase cover screw	M8 x 1.25	21.6 to 29.4	2.21 to 2.99	16.0 to 21.6
*Flywheel screw	M12	100 to 120	10.2 to 12.2	73.8 to 88.5
*Connecting rod screw	M8 x 1.25	21.6 to 27.4	2.21 to 2.79	16.0 to 20.2
Spark plug	M14 x 1.25	9.81 to 19.6	1.00 to 1.99	7.24 to 14.4
Oil pressure switch	PT 1/8	14.7 to 19.6	1.50 to 1.99	10.9 to 14.4
Starter's **B** terminal nut	M8	7.85 to 9.81	0.801 to 1.00	5.79 to 7.23
Drain plug with copper gasket	–	34.3 to 44.1	3.50 to 4.49	25.3 to 32.5
Dust cover screw	M6	9.81 to 14.7	1.00 to 1.49	7.24 to 10.8
Governor lever screw	M8	10.8 to 24.5	1.11 to 2.49	7.97 to 18.0

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Checking Engine Oil Level

CAUTION

To avoid personal injury:

- **Always stop the engine and remove the key before checking oil.**

1. Check engine oil before starting and 5 minutes or more after the engine has stopped.
2. Wipe dipstick area clean.
3. To check the oil level, remove the dipstick, wipe it clean, replace it, and draw it out again. Check to see that the oil level is between the two lines.
4. Add new oil to the prescribed level at the oil port if necessary.
5. When using a different brand or viscosity oil from the previous one, remove all of the old oil and oil filter. Never mix two different types of oil.
6. Use the proper Engine Oil SAE according to the ambient temperatures. (See page G-9.)

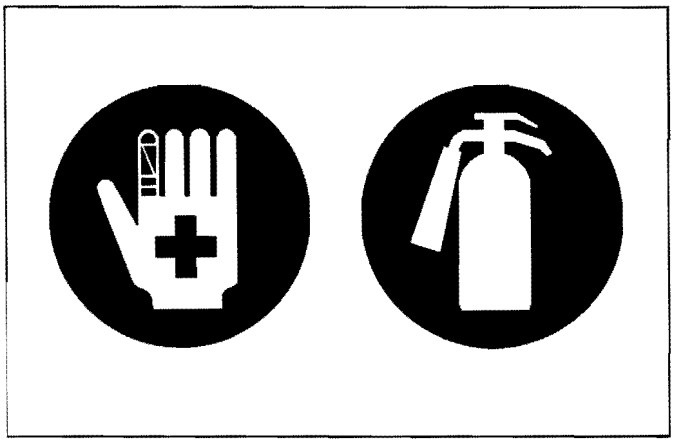
(1) Engine Oil Port
(2) Oil Level Dipstick

A : Upper Level
B : Lower Level

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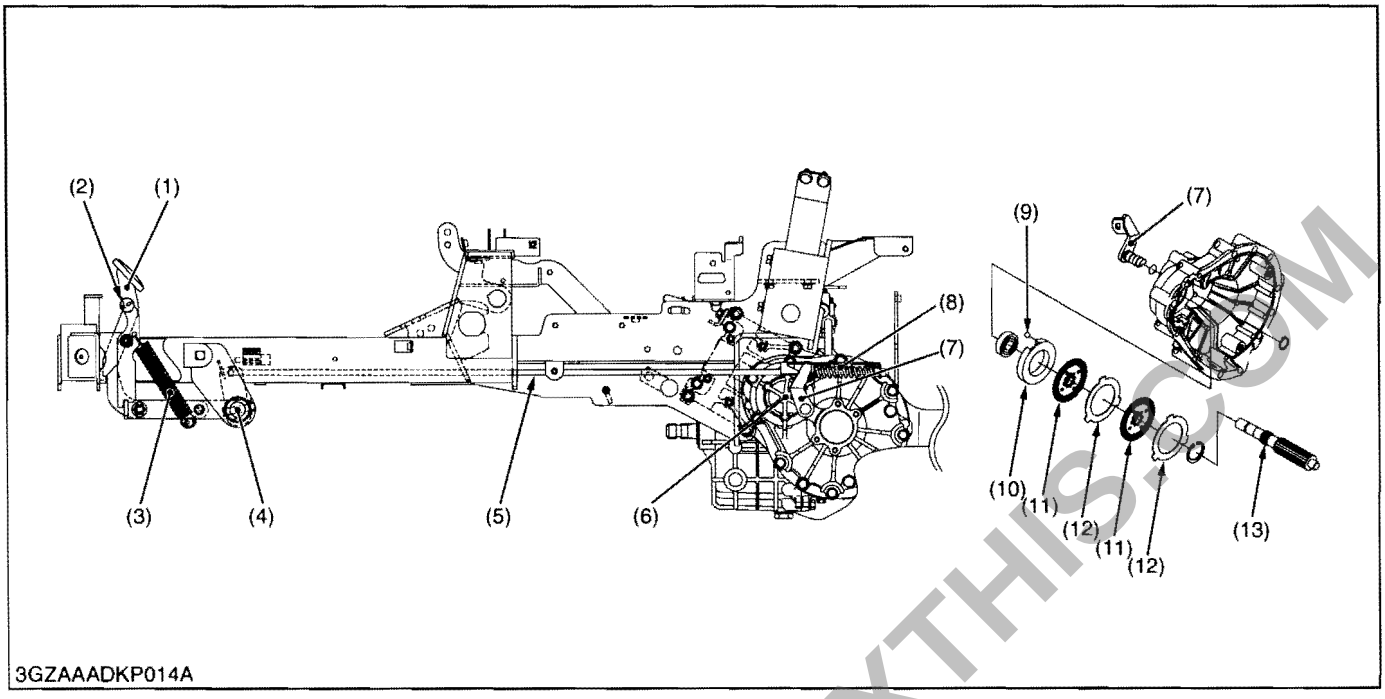
PREPARE FOR EMERGENCIES

- 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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■ Parking Brake



(1) Brake Pedal
(2) Parking Lock Pedal
(3) Brake Pedal Return Spring
(4) Brake Shaft
(5) Brake Rod
(6) Brake Assembly
(7) Brake Arm
(8) Brake Spring
(9) Ball
(10) Actuator
(11) Brake Disk
(12) Brake Plate
(13) HST Motor Shaft (Brake)

The parking brake is composed of brake pedal (1), parking lock pedal (2), brake pedal return spring (3), brake shaft (4), brake rods (5), brake arms (7) and brake assemblies (6).

The brake is mechanical wet disks type.

When the brake pedal (1) is pressed, the brake shaft (4) is rotated forward and the brake rods (5) is pulled forward. And the brake arms (7) are rotated forward.

The brake arms (7) is connected mechanically to the grooves of the actuators (10).

The brake arms (7) rotates the actuators (10) and the actuators (10) mounting on three balls pushes the brake disks (11) and brake plates (12) to stop the brake shafts rotation.

As both the brake pedal (1) and parking lock pedal (2) are pressed, the parking brake will be applied and locked.

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