GENERAL

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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.

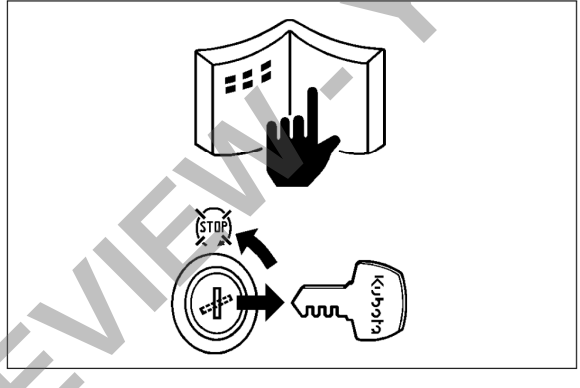
DANGER : **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

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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SPECIFICATIONS

Model		GZD21-HD
Maximum gross power		15.6 kW (21 HP) *1
Engine	Model	D782-GZD21
	Type	Indirect injection, Vertical, water-cooled, 4-cycle diesel engine
	Number of cylinder	3
	Bore and stroke	67.0 x 73.6 mm (2.64 x 2.90 in.)
	Total displacement	778 cm^3 (47.5 cu.in.)
	Rated revolution	3000 rpm
	Combustion chamber	Spherical type (E-TVCS)
	Fuel injection pump	Bosh MD type mini pump
	Governor	Centrifugal ball mechanical governor
	Injection nozzle	Bosh throttle type
	Injection timing	0.28 to 0.32 rad (16 ° to 18 °) before T.D.C.
	Injection order	1-2-3
	Injection pressure	13.73 MPa (140 kgf/cm^2, 1990 psi)
	Lubricating system	Forced lubrication by gear pump
	Cooling system	Pressurized radiator, forced circulation with water pump
	Lubricating oil	API Service classification CD, CE or CF, below 0 °C (32 °F) : SAE 10W, 10W-30 or 10W-40, 0 to 25 °C (32 to 77 °F) : SAE 20, 10W-30 or 10W-40, above 25 °C (77 °F) : SAE 30, 10W-30 or 10W-40
	Starting system	Electrical starter (12 V, 1.1 kW)
	Battery	65D23L (12V, 52A.H. at 5H.R.)
	Fuel	No.2-D Diesel fuel (ASTM D975) [No. 1-D diesel fuel, if temperature is below -10 °C (14 °F)]
Capacities	Fuel tank	20 L (5.3 U.S.gals, 4.4 Imp.gals)
	Engine crankcase	2.8 L (3.0 U.S.qts, 2.5 Imp.qts)
	Engine coolant	1.9 L (2.0 U.S.qts, 1.7 Imp.qts)
	Recovery tank	0.25 L (0.26 U.S.qts., 0.22 Imp.qts)
	Transmission case & rear axle gear case (RH & LH)	10.0 L (10.6 U.S.qts., 8.8 Imp.qts)
	Front PTO case	0.13 L (0.14 U.S.gals, 0.11 Imp.gals)
	Mower gear case oil	0.15 L (0.16 U.S.qts, 0.13 Imp.qts)
Tyres	Front	15 x 6.0 - 6 (4 PR) Rib
	Rear	23 x 10.5 - 12 (4 PR) Turf
Traveling speeds	Forward	0 to 15.5 km/h (0 to 9.6 mph)
	Reverse	0 to 11.5 km/h (0 to 7.1 mph)

NOTE: *1 Manufacture's estimate

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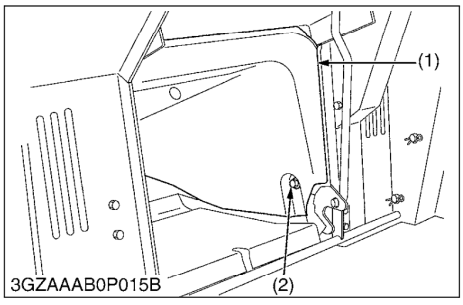
6. MAINTENANCE

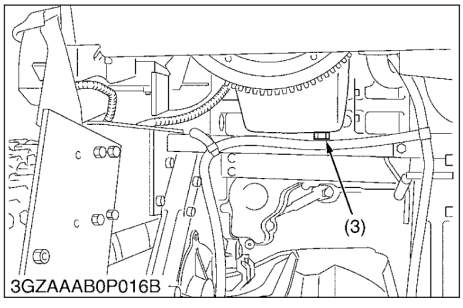
No.	Item \ Period		Indication on hour meter												After since	Reference page	
			50	100	150	200	250	300	350	400	450	500	550	600			
1	Engine oil	Change	★	☆		☆		☆		☆		☆		☆	every 100 Hr	G-19	
2	Engine oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-20	
3	Transmission and Rear axle gear case (RH and LH) fluid	Change	★			☆				☆				☆	every 200 Hr	G-21	
4	Transmission oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-20	
5	Transmission strainer	Clean	★			☆				☆				☆	every 200 Hr	G-23	
6	Front PTO case fluid	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-29	
		Change			☆			☆			☆			☆	every 150 Hr	G-29	
7	Front axle pivot	Adjust		★		☆				☆				☆	every 200 Hr	G-24	*2
8	Safety device	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-25	
9	Oiling	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-28	
10	Greasing (without mower)	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-27	
11	Mower gear box oil	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-26	
		Change			☆			☆			☆			☆	every 150 Hr	G-34	
12	Air cleaner element	Clean	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-26	*1
		Replace													every 1 year	G-36	
13	Battery condition	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-32	
14	Fan belt	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-31	
15	Parking brake	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-31	*2
16	Fuel filter element	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-30	
		Replace								☆					every 400 Hr	G-36	*2
17	Fuel line	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-30	
		Replace													every 2 years	G-39	*2

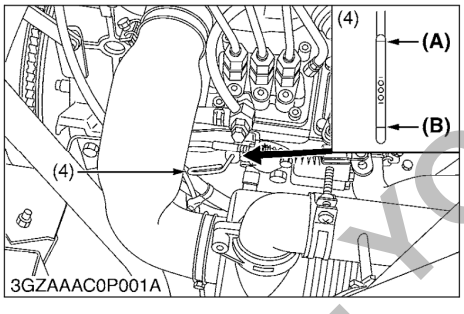
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[2] CHECK POINTS OF INITIAL 50 HOURS







Changing Engine Oil

CAUTION

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

1. Raise the grass collector from the machine.
2. Remove the bolts (2) and duct (1).
3. To change the used oil, remove the drain plug at the bottom of the engine and drain the oil completely. The used oil can be drained out more easily if the engine is warm.
4. Fill with the new oil up to the upper notch on the dipstick (4).
5. To check the oil level, remove the dipstick (4), wipe it clean, insert it and draw it out again. Check to see that the oil level is between two marks.

■ IMPORTANT

- **When using an 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	2.8 L 3.0 U.S.qts 2.5 Imp.qts

(1) Duct
(2) Bolt
(3) Drain Plug
(4) Oil Level Dipstick

(A) Upper Level
(B) Lower Level

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3. TIGHTENING TORQUES

Tightening torques of screws and nuts on the table below are especially specified.
(For general use screws and nuts : See page G-9.)

Item	Size x Pitch	N·m	kgf·m	lbf·ft
Under cover mounting screw and nut	M6 x 1	7.8 to 8.8	0.80 to 0.89	5.8 to 6.4
Front coupling mounting screw	M8 x 1.25	23.5 to 27.4	2.4 to 2.8	17.3 to 20.2
Engine mounting nut	M8 x 1.25	23.5	2.4	17.3
Cushion mounting nut	M8 x 1.25	23.5	2.4	17.3
Air cleaner stay screw	M8 x 1.25	23.5 to 27.4	2.4 to 2.8	17.4 to 20.3
Engine support screw	M10 x 1.25	48.0 to 55.9	4.9 to 5.7	35.4 to 41.2
* Cylinder head cover cap nut	M6 x 1	3.9 to 5.9	0.4 to 0.6	2.9 to 4.3
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	7.85 to 14.7	0.8 to 1.5	5.8 to 10.8
* Rocker arm bracket screw	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
* 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	117.6 to 127.4	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
* 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 22.5
* Main bearing case screw 1	M6 x 1	12.7 to 15.7	1.3 to 1.6	9.37 to 11.6
Nozzle holder	–	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Oil pressure switch	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5

■ **NOTE**

- **In removing and applying the screws 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 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 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

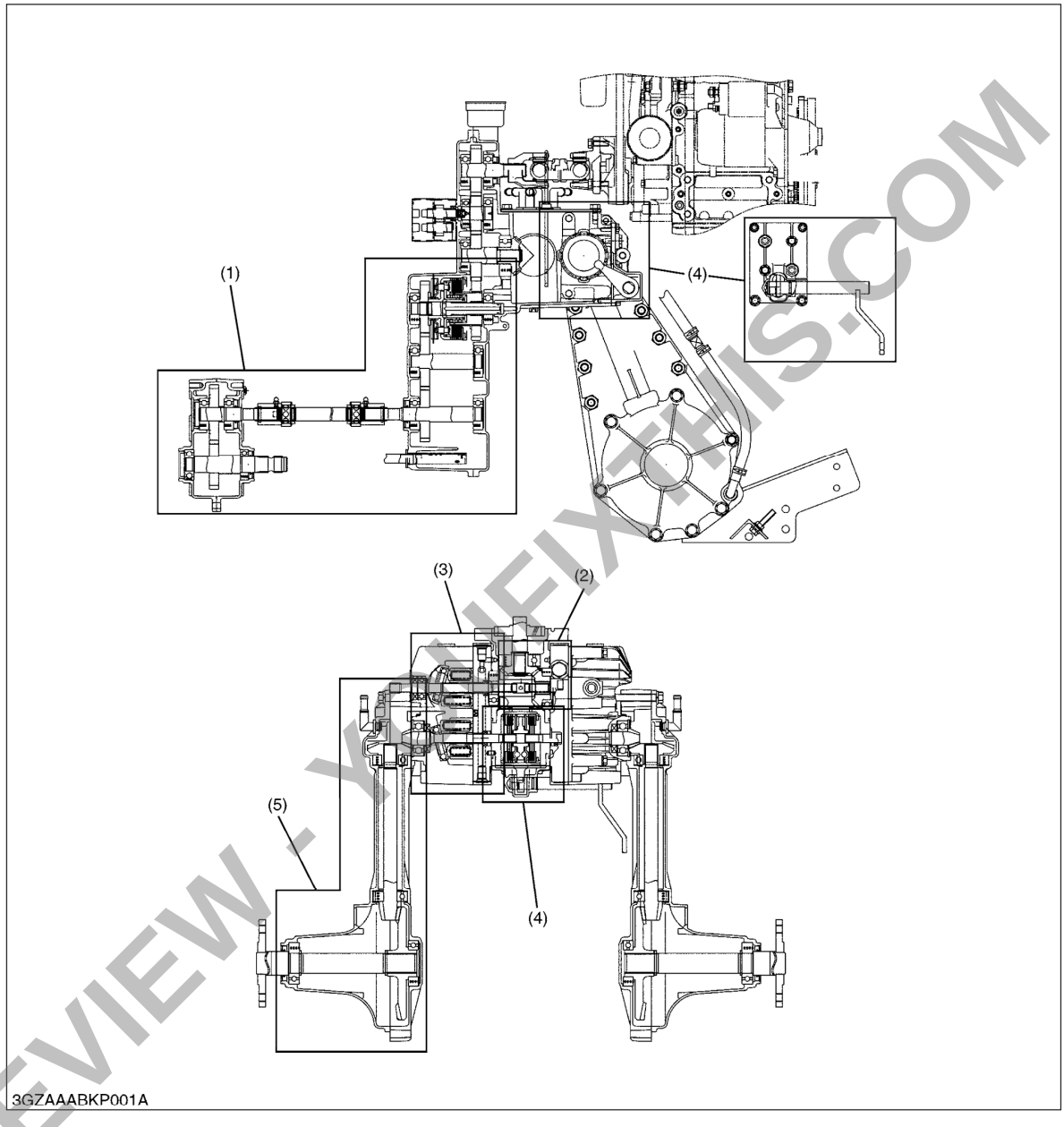
Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Replenish fuel	G-15
	Air in the fuel system	Bleed	G-42
	Water in the fuel system	Change fuel and repair or replace fuel system	G-30, 42
	Fuel pipe clogged	Clean	G-30
	Fuel filter clogged	Change	G-36
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-7
	Fuel with low cetane number	Use specified fuel	G-7
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S24
	Incorrect injection timing	Adjust	1-S56
	Fuel camshaft worn	Replace	–
	Injection nozzle clogged	Repair or replace	1-S59
	Injection pump malfunctioning	Replace	–
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	–
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S16
	Improper valve timing	Correct or replace timing gear	1-S25
	Piston ring and cylinder worn	Replace	1-S42, S49
	Excessive valve clearance	Adjust	1-S18
(Starter Does Not Run)	Battery discharged	Charge	G-32, 33
	Starter malfunctioning	Repair or replace	5-S13 to S15
	Main switch malfunctioning	Repair or replace	–
	Safety switches malfunctioning	Adjust or replace	5-S10 to S11
	Wiring disconnected	Connect	–

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1. STRUCTURE

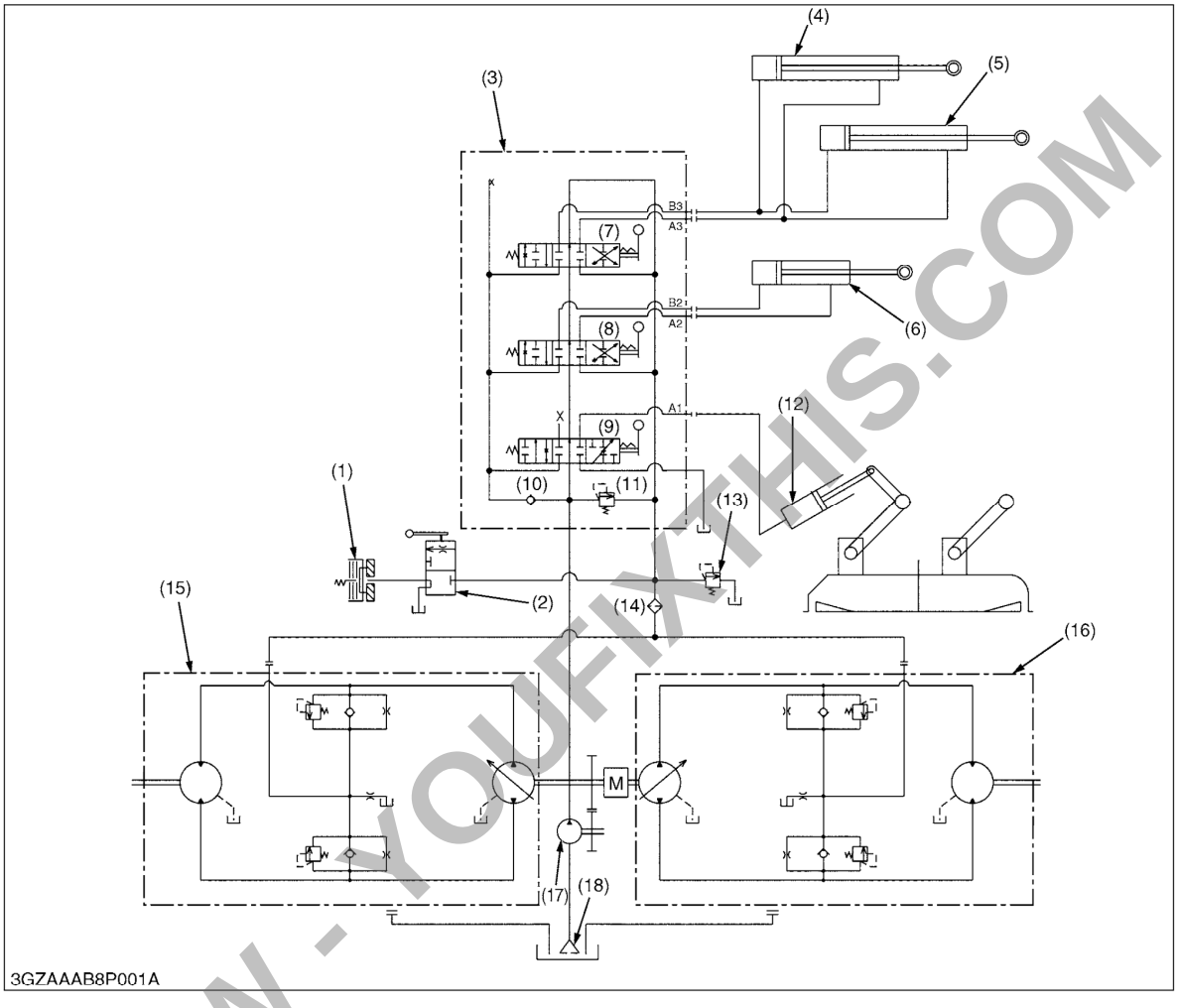


(1) PTO Section
(2) Bevel Gear Section
(3) Hydrostatic Transmission
(4) Brake Section
(5) Final Reduction Gear Section

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1. HYDRAULIC CIRCUIT



(1) PTO Clutch
(2) PTO Clutch Valve
(3) Hydraulic Control Valve Assembly
(4) Grass Collector Lift Cylinder (RH)
(5) Grass Collector Lift Cylinder (LH)
(6) Grass Collector Dump Cylinder
(7) Grass Collector Lifting Control Valve
(8) Grass Collector Dumping Control Valve
(9) Mower Lifting Control Valve
(10) Check Valve
(11) Relief Valve
(12) Mower Lift Cylinder
(13) Regulator Valve
(14) Oil Filter
(15) HST (LH)
(16) HST (RH)
(17) Hydraulic Pump
(18) Oil Strainer

The hydraulic system of this machine is composed of a hydraulic pump (17), control valve assembly (3), grass collector lift cylinder (4), (5) and other components.

This system has the following functions.

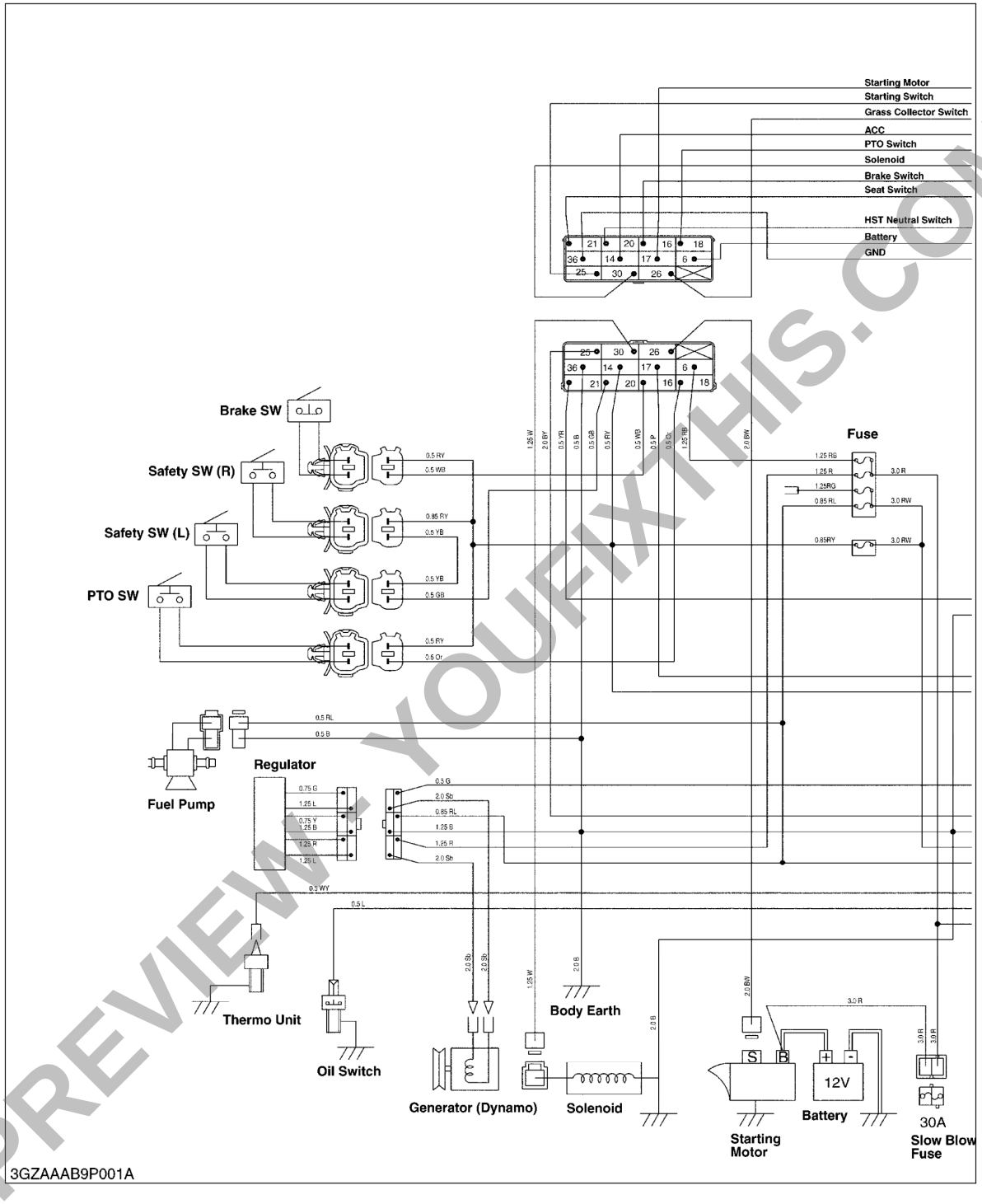
Oil is supplied by hydraulic pump (17) which is driven by engine.

Power from the input shaft (pump shaft) is distributed right and left with the bevel gears and drives each hydrostatic transmission (15), (16).

Moreover, oil from the hydraulic pump (17) is sent to the transmission centre case through the control valve. On the other hand, oil is regulated with the regulator valve (13) to constant pressure and sent to the hydrostatic transmission (15), (16) and PTO clutch (1).

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2 TRANSAXLE

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