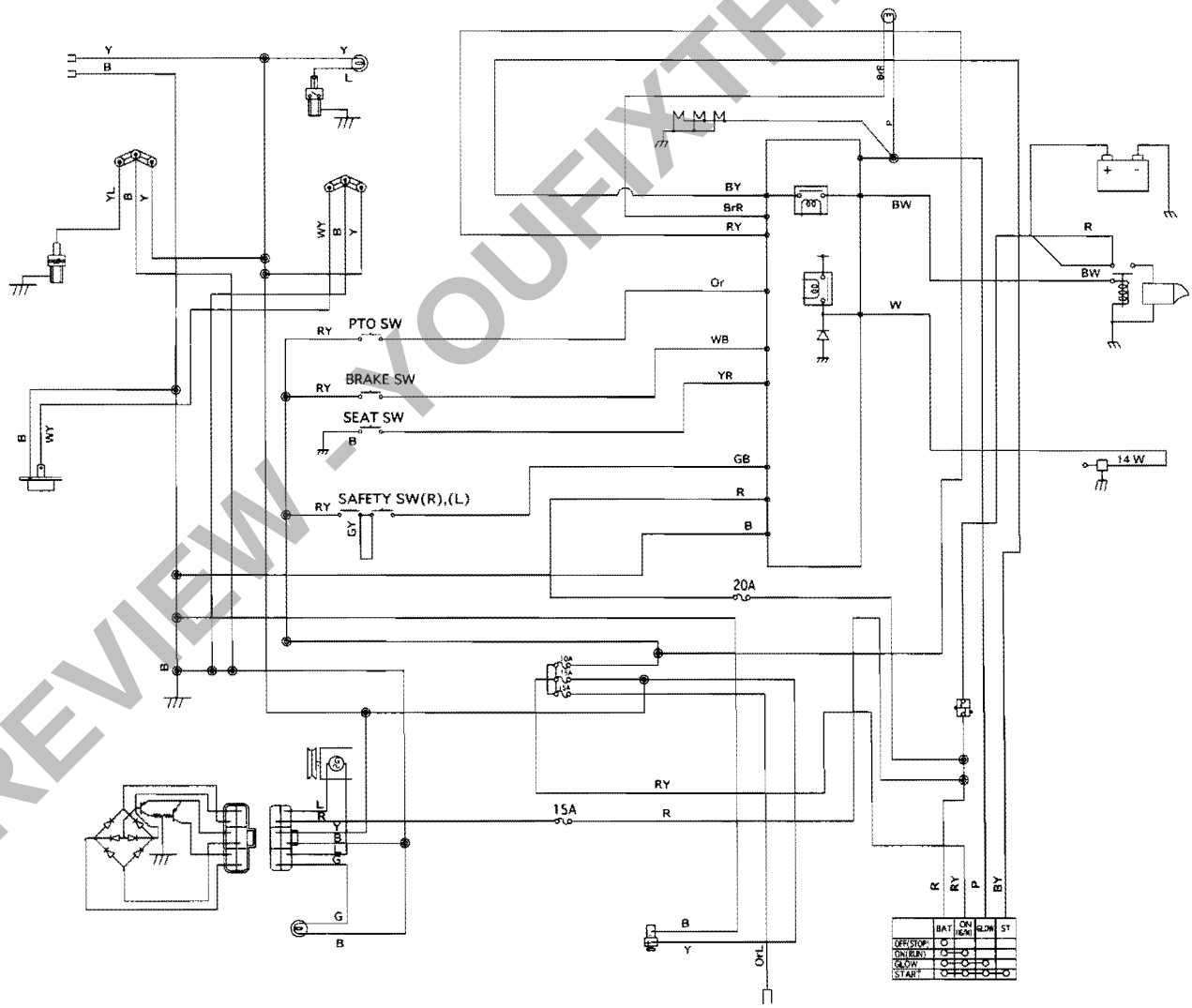
1. WIRING DIAGRAM

• **Color or Wiring**

W ····· White	Or ····· Orange	BrR ····· Brown / Red	BW ····· Black / White
R ····· Red	BY ····· Black / Yellow	WR ····· White / Red	BR ····· Black / Red
L ····· Blue	WB ····· White / Black	WY ····· White / Yellow	GW ····· Green / White
P ····· Pink	GB ····· Green / Black	RW ····· Red / White	YR ····· Yellow / Red
B ····· Black	OrL ····· Orange / Blue	RY ····· Red / Yellow	YL ····· Yellow / Blue
G ····· Green	YB ····· Yellow / Black	YW ····· Yellow / White	

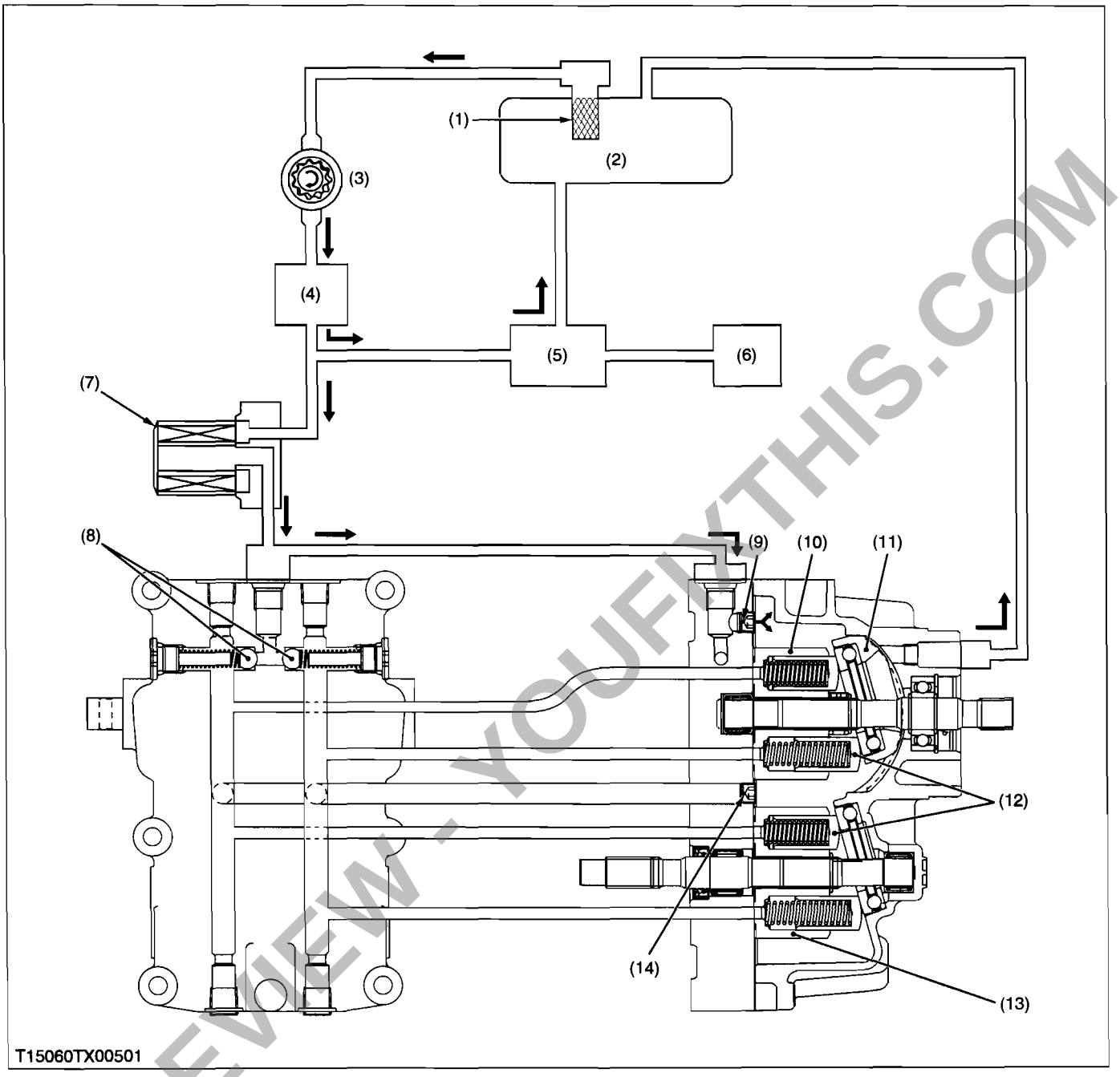


T15060EL00301

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(4) Oil Flow



(1) Oil Strainer
(2) Transmission Case
(3) Hydraulic Pump
(4) Control Valve
(5) Regulator Valve
(6) PTO Clutch
(7) Oil Filter Cartridge
(8) Check Valve
(9) Lubricating Orifice
(10) Cylinder Block (Pump)
(11) Swashplate
(12) Piston
(13) Cylinder Block (Motor)
(14) Neutral Orifice

The pump and motor are joined in a closed hydraulic loop and most of oil circulates within the main oil circuit. A little oil lubricates and oozes out from the clearance between the moving parts of the case. Then oil in the main oil circuit of the HST needs to be supplied a want.

The oil from the power steering circuit flows into the HST for charging.

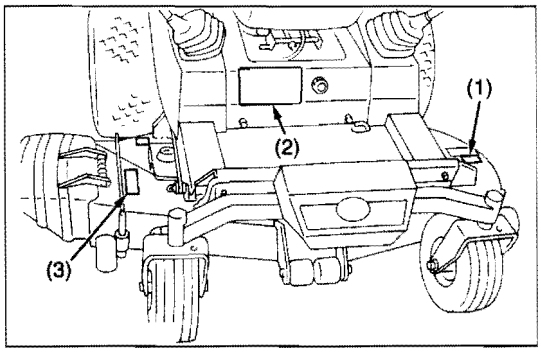
The charge oil aids smooth operation of pistons for pump and motor. The charge oil passes through the oil filter cartridge to charge relief valve port. The rest of oil passes through the charge relief valve into the HST housing. And overflow oil from HST housing return to the transmission case.

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SAFETY DECALS

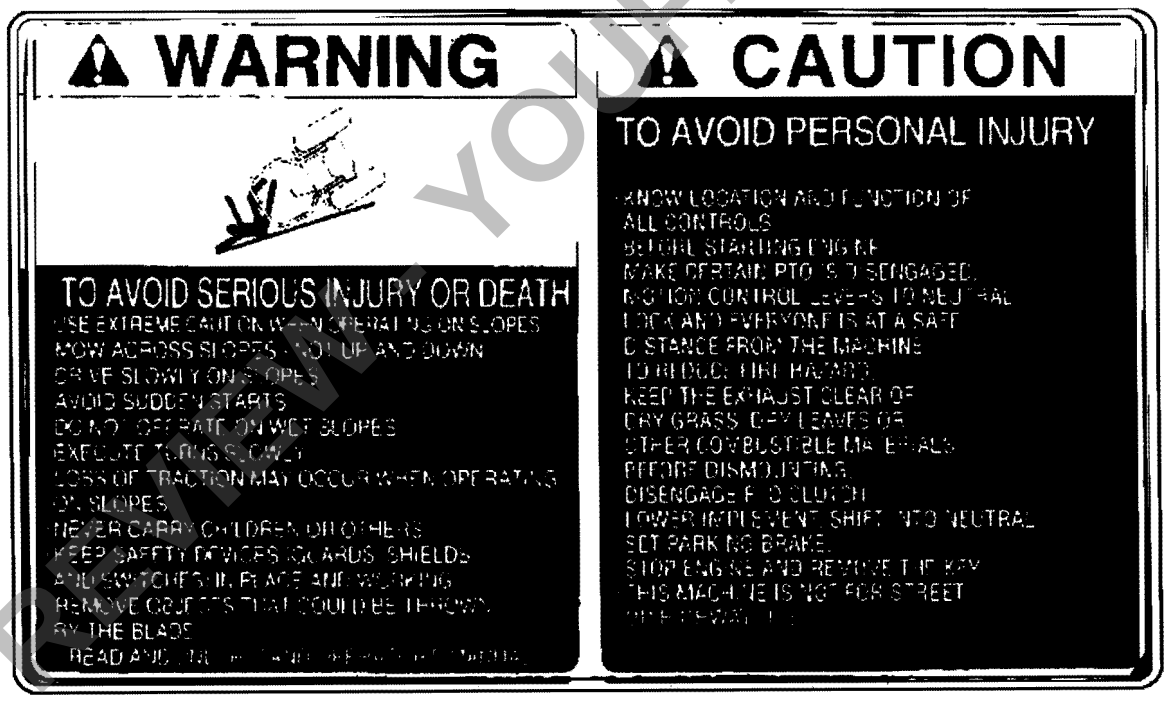
· **The following safety decals are installed on the machine.**
If a decal becomes damaged, illegible or is not on the machine, replace it. The decal part number is listed in the parts list.



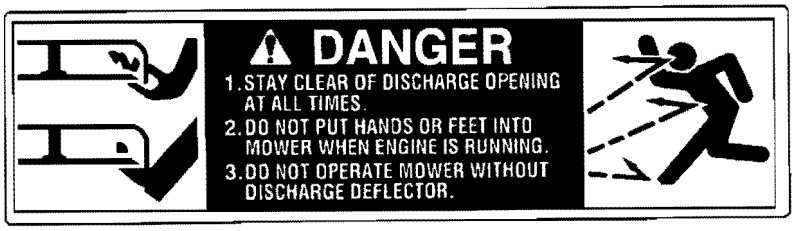
(1) Part No. K5112-7312-2



(2) Part No. K3111-6581-1



(3) Part No. K5112-7311-2



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5. TIGHTENING TORQUES

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Screws, bolts, and nuts whose tightening torques are not specified in this Workshop Manual should be tightened according to the table below.

Indication on top of bolt	⟨4⟩ No-grade or 4T						⟨7⟩ 7T						⟨9⟩ 9T		
Material of bolt	SS400, S20C						S43C, S48C						SCr435, SCM435		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit / Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6 (6 mm, 0.24 in.)	7.85 to 9.31	0.80 to 0.95	5.79 to 6.87	7.85 to 8.82	0.80 to 0.90	5.79 to 6.50	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31	7.85 to 8.82	0.80 to 0.90	5.79 to 6.50	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8 (8 mm, 0.31 in.)	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1	16.7 to 19.6	1.7 to 2.0	12.3 to 14.4	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	17.7 to 20.5	1.8 to 2.1	13.1 to 15.1	29.5 to 34.3	3.0 to 3.5	21.7 to 25.3
M10 (10 mm, 0.39 in.)	39.3 to 45.1	4.0 to 4.6	29.0 to 33.2	31.4 to 34.3	3.2 to 3.5	23.2 to 25.3	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	39.3 to 44.1	4.0 to 4.5	29.0 to 32.5	60.9 to 70.6	6.2 to 7.2	44.9 to 52.0
M12 (12 mm, 0.47 in.)	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	–	–	–	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5	62.8 to 72.5	6.4 to 7.4	46.3 to 53.5	103 to 117	10.5 to 12.0	76.0 to 86.7
M14 (14 mm, 0.55 in.)	108 to 125	11.0 to 12.8	79.6 to 92.5	–	–	–	124 to 147	12.6 to 15.0	91.2 to 108	–	–	–	167 to 196	17.0 to 20.0	123 to 144
M16 (16 mm, 0.63 in.)	167 to 191	17.0 to 19.5	123 to 141	–	–	–	197 to 225	20.0 to 23.0	145 to 166	–	–	–	260 to 304	26.5 to 31.0	192 to 224
M18 (18 mm, 0.71 in.)	246 to 284	25.0 to 29.0	181 to 209	–	–	–	275 to 318	28.0 to 32.5	203 to 235	–	–	–	344 to 402	35.0 to 41.0	254 to 296
M20 (20 mm, 0.79 in.)	334 to 392	34.0 to 40.0	246 to 289	–	–	–	368 to 431	37.5 to 44.0	272 to 318	–	–	–	491 to 568	50.0 to 58.0	362 to 419

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[2] METRIC SCREWS, BOLTS AND NUTS

Grade / Unit / Nominal Diameter	Property class 8.8 ⟨8.8⟩			Property class 10.9 ⟨10.9⟩		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M8	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
M10	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2	60.8 to 70.5	6.2 to 7.2	44.9 to 52.1
M12	77.5 to 90.1	7.9 to 9.2	57.2 to 66.5	103.0 to 117.0	10.5 to 12.0	76.0 to 86.8
M14	124.0 to 147.0	12.6 to 15.0	91.2 to 108.0	167.0 to 196.0	17.0 to 20.0	123.0 to 144.0
M16	196.0 to 225.0	20.0 to 23.0	145.0 to 166.0	260.0 to 303.0	26.5 to 31.0	192.0 to 224.0

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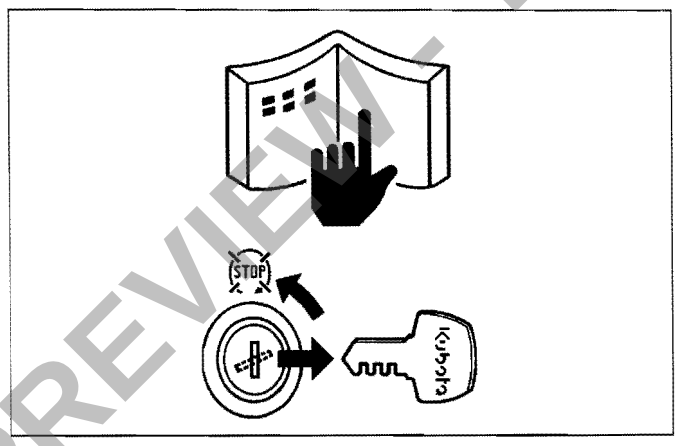
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⚠ SAFETY FIRST

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. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	• No fuel	Replenish fuel	–
	• Air in the fuel system	Bleed fuel system	–
	• Water in the fuel system	Change fuel and replace fuel system	–
	• Fuel pipe clogged	Clean fuel pipe	–
	• Fuel filter clogged	Replace fuel filter	G-29
	• 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-S18
	• Incorrect injection timing	Adjust injection timing	1-S49
	• Fuel camshaft worn	Replace fuel camshaft	1-S23
	• Injection nozzle clogged	Clean injection nozzle	1-S52
	• Injection pump malfunctioning	Repair or replace injection pump	1-S49
	• Seizure of crankshaft, camshaft, piston, cylinder or bearing	Replace crankshaft, camshaft, piston, cylinder or bearing	1-S25, S28
	• Compression leak from cylinder	Replace head gasket, tighten cylinder head screw, glow plug and nozzle holder	1-S20
	• Improper valve timing	Correct valve timing	1-S22
	• Piston ring and cylinder worn	Replace piston ring and bore oversize cylinder	1-S26, S43
	• Excessive valve clearance	Adjust valve clearance	1-S17
(Starter Does Not Run)	• Battery discharged	Charge battery	G-24
	• Starter malfunctioning	Repair or replace starter	5-S12
	• Slow blow fuse blown	Replace slow blow fuse	G-33
	• Main switch malfunctioning	Repair or replace main switch	5-S8
	• PTO switch defective	Replace PTO switch	5-S10
	• Parking brake switch defective	Replace brake switch	5-S10
	• Speed control lever switch defective	Replace reverse switch or adjust reverse switch gap	5-S10
	• Seat switch defective	Replace seat switch	5-S10
	• Wiring harness disconnected	Connect wiring harness	–

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SPECIFICATIONS

Model			ZD18	ZD21
Maximum gloss power			13.4 kW (18 HP)*1	15.7 kW (21 HP)*1
Engine	Model		D722-E-XFM5	D782-E-XFM5
	Type		Indirect injection, vertical, water cooled, 4-cycle diesel engine	
	Number of cylinders		3	
	Bore and stroke		67.0 × 68.0 mm (2.64 × 2.68 in.)	67.0 × 73.6 mm (2.64 × 2.90 in.)
	Total displacement		719 cm^3 (43.9 cu.in.)	778 cm^3 (47.5 cu.in.)
	Rated revolution		3200 rpm	
	Combustion chamber		Spherical type (E-TVCS)	
	Fuel injection pump		Bosch MD type mini pump	
	Governor		Centrifugal ball mechanical governor	
	Injection nozzle		Bosch throttle type	
	Injection timing		0.33 to 0.37 rad. (19° to 21°) before T.D.C.	
	Injection order		1-2-3	
	Injection pressure		13.73 MPa (140 kgf/cm^2, 1990 psi)	
	Compression ratio		24 : 1	
	Lubricating system		Forced lubrication by gear pump	
	Cooling system		Pressurized radiator, forced circulation with water pump	
	Lubricating oil		API Service classification CC or CD, Below 0 °C (32 °F) : SAE 10W or 10W-30, 0 to 25 °C (32 °F to 77 ° F) : SAE 20 or 10W-30, Above 25 °C (77 °F) : SAE 30 or 10W-30	
	Starting system		Electric starter (12 V, 1.1 kW)	
	Battery		51 R (12 V, 450 CCA)	
	Fuel		No. 2-D Diesel fuel (ASTM D975) [No. 1-D diesel fuel, if temperature is below – 10 °C (14 °F)]	
Capacities	Fuel tank		30 L (5.8 U.S.gals., 4.8 Imp.gals.)	
	Engine crankcase		3.2 L (3.4 U.S.qts., 2.8 Imp.qts.)	3.5 L (3.7 U.S.qts., 3.1 Imp.qts.)
	Engine coolant		2.6 L (2.7 U.S.qts., 2.3 Imp.qts.)	
	Recovery tank		0.25 L (0.26 U.S.qts., 0.22 Imp.qts.)	
	Transmission (Including HST and cylinder)		4.0 L (4.2 U.S.qts., 3.5 Imp.qts.)*2	
	Rear axle gear case		1.8 L (1.9 U.S.qts., 1.6 Imp.qts.)*2 each	
	Mower gear case oil		0.40 L (0.42 U.S.qts., 0.35 Imp.qts.)	
Tires	Front		15 × 6.0-6 (4PR) Rib	
	Rear		23 × 10.5-12 (4PR) Turf	24 × 12.0-12 (4PR) Turf
Travelling speeds	Forward		0 to 14.5 km/h (0 to 9.0 mph)*3	0 to 15.0 km/h (0 to 9.3 mph)*3
	Reverse		0 to 8.0 km/h (0 to 5.0 mph)*3	0 to 8.3 km/h (0 to 5.2 mph)*3
Dimensions	Overall length		2040 mm (80.3 in.)	
	Overall width (Without mower)		1328 mm (52.3 in.)	1451 mm (57.1 in.)
	Overall height (Without ROPS)		1140 mm (44.9 in.)	1150 mm (45.3 in.)
	Wheel base		1250 mm (49.2 in.)	
	Treads	Front	975 mm (38.4 in.)	
		Rear	1080 mm (42.5 in.)	1150 mm (45.3 in.)
Weight (With mower deck)			530 kg (1168.7 lbs) / With 54" mower deck	550 kg (1212.8 lbs) / With 60" mower deck
PTO			Shaft drive KUBOTA 10 tooth in spline (2530 rpm)	
PTO clutch			Wet multi discs	
Revolution (PTO speed)			1 speed (2530 rpm at 3200 engine rpm)	
PTO brake			Wet single disc	

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SERVICE INTERVALS

The following servicing tasks should be carried out on the machine at the stated running-time intervals.

No.	Items	Period	Indication hour meter (Hr)												Reference Page	
			50	100	150	200	250	300	350	400	450	500	550	600	After since	
1	Engine oil	Change	●	○		○		○		○		○		○	every 100Hr	G-16	
2	Engine oil filter	Replace	●			○				○				○	every 200Hr	G-17	
3	Transmission fluid	Change				●				○				○	every 200Hr	G-19	
4	Transmission oil filter	Replace	●			○				○				○	every 200Hr	G-17	
5	Transmission strainer	Clean				●				○				○	every 200Hr	G-19	
6	Rear axle gear case (RH & LH) fluid	Change				●				○				○	every 200Hr	G-20	
7	Front axle pivot	Adjust		●		○				○				○	every 200Hr	G-18	
8	Safety device	Check	○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	G-21	
9	Greasing (without mower)	——	○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	G-23	
10	Mower gear box oil	Check	○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	G-25	
		Change			○			○			○			○	every 150Hr	G-30	
11	Air cleaner element	Clean	○	○	○	○	○	○	○	○	○	○	○	○	every 50Hr	G-25	*1
		Replace													every 1 year	G-32	
12	Battery condition	Check		○		○		○		○		○		○	every 100Hr	G-25	
13	Fan belt	Adjust		○		○		○		○		○		○	every 100Hr	G-27	
14	Parking brake	Adjust		○		○		○		○		○		○	every 100Hr	G-28	*2
15	Fuel filter element	Check		○		○		○		○		○		○	every 100Hr	G-27	
		Replace								○					every 400Hr	G-32	*2
16	Fuel line	Check		○		○		○		○		○		○	every 100Hr	G-27	
		Replace													every 2 years	G-35	*2
17	Radiator hose and clamp	Check				○				○				○	every 200Hr	G-30	
		Replace													every 2 years	G-35	*2
18	Hydraulic hose	Check				○				○				○	every 200Hr	G-30	
		Replace													every 2 years	G-35	*2
19	Intake air line	Check				○				○				○	every 200Hr	G-31	
		Replace													every 2 years	G-35	*2
20	Motion control lever pivot	Adjust				○				○				○	every 200Hr	G-31	
21	Radiator	Clean													every 1 year	G-33	
22	Coolant	Change													every 1 year	G-33	
23	Mower gear box oil seal	Replace													every 2 years	G-35	*2
24	Fuel system	Bleed	Service as required													G-37	
25	Fuse	Replace														G-36	
26	Blade	Replace														G-37	
27	Mower belt	Replace														G-37	

IMPORTANT:

The jobs indicated by ● must be done initially

*1 This maintenance should be done more often in dusty conditions. Suggested cleaning interval is every 100 hours in normal conditions.

*2 These items dhould be serviced by an authorized KUBOTA dealer, unless the owner has the proper tools and is mechanically proficient

6. Correction to Work Shop Manual Section "Engine", page 1-S65

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GENERAL

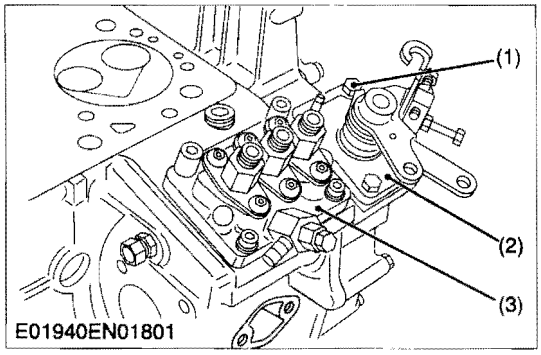
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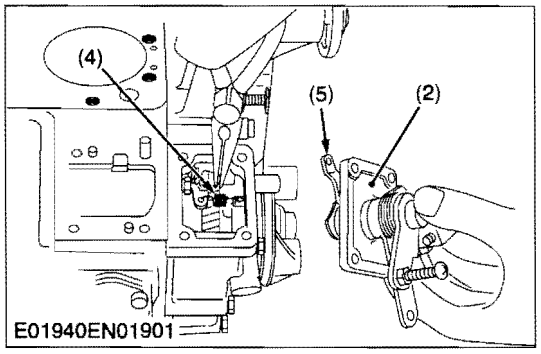
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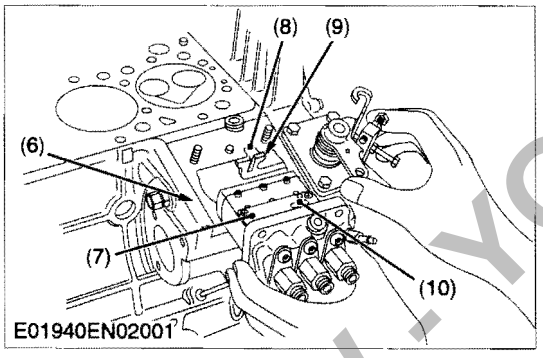
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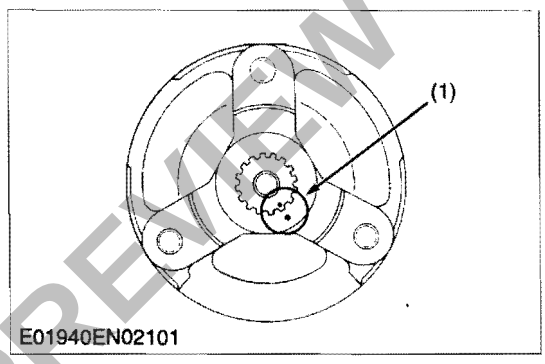
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(B) Timing Gears and Camshaft









Injection Pump and Speed Control Plate

1. Remove the socket head screws and nuts, and remove the injection pump (3).
2. Remove the screws and separate the speed control plate (2), taking care not to damage the spring (4).
3. Disconnect the spring (4) and remove the speed control plate (2).

(When reassembling)

- Hook the spring (4) to the lever (5) first and install the speed control plate (2).
- Be sure to place the copper washers underneath two screws (1) (as shown in the figure).
- Position the slot (9) on the fork lever just under the slot (8) on the crankcase.
- Insert the injection pump (3) so that the control rod (7) should be pushed by the spring (6) at its end and the pin (10) on the rod engages with the slot (9) on the fork lever (as shown in the figure).

■ **NOTE**

- **The sealant is applied to both sides of the soft metal gasket shim. The liquid gasket is not required for assembling.**
- **Addition or reduction of shim (0.05 mm, 0.0020 in.) delays or advances the injection timing by approx. 0.0087 rad. (0.5°).**
- **In disassembling and replacing, be sure to use the same number of new gasket shims with the same thickness.**

(1) Screws and Copper Washers
(2) Speed Control Plate
(3) Injection Pump
(4) Spring
(5) Lever
(6) Spring
(7) Control Rod
(8) Slot (Crankcase Side)
(9) Slot (Fork Lever Side)
(10) Pin

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Fan Drive Pulley

1. Set the stopper to the flywheel.
2. Remove the fan drive pulley retaining screw.
3. Draw out the fan drive pulley with a puller.

(When reassembling)

- Install the pulley to the crankshaft, aligning the mark (1) on them.
- Apply engine oil to the fan drive pulley retaining screws. And tighten them.

Tightening torque	Fan drive pulley retaining screw	117.6 to 127.4 N·m 12.0 to 13.0 kgf·m 86.8 to 94.0 ft-lbs

(1) Aligning Mark

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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-8.)

Item	N·m	kgf·m	ft-lbs
Wheel bolt and lock nut	1.0 to 1.5	0.1 to 0.15	0.74 to 1.11
Wheel bracket lock nut	45 to 55	4.59 to 5.61	33.19 to 40.57

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