WSM

WORKSHOP MANUAL

F2690E,F2690,F3990,RCK60P-F39, RCK60R-F36,RCK72P-F39, RCK72R-F36

Kubota

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KiSC issued 09, 2013 A

INFORMATION

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1. MACHINE

[1] SAFETY FIRST

⚠ 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 try to repair or use this unit.**

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

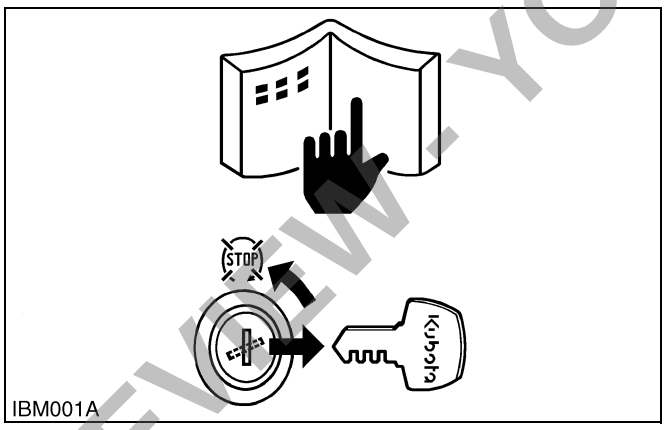
⚠ WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ CAUTION
- **Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**

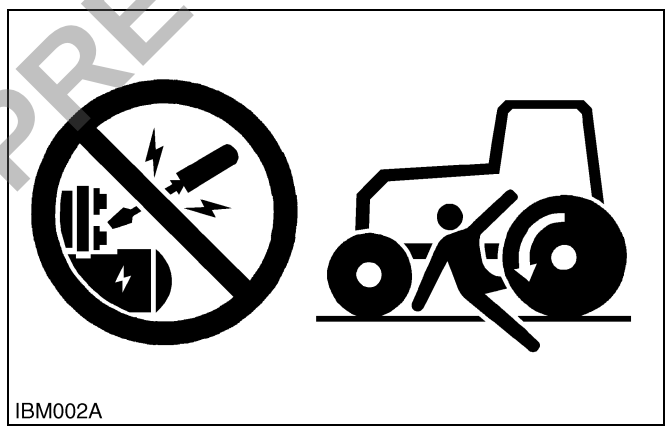
■ IMPORTANT
- **Indicates that equipment or property damage could result if instructions are not followed.**

■ NOTE
- **Gives helpful information.**

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IBM001A


IBM002A

BEFORE YOU START SERVICE

- 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 stable and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, then remove the key.
- Disconnect the battery negative cable.
- Hang a **"DO NOT OPERATE"** tag in the operator station.

WSM000001INI0010US0

START SAFELY

- Do not do the procedures below when you start the engine.
  - short across starter terminals
  - bypass the safety start switch
- Do not alter or remove any part of machine safety system.
- Before you start the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Do not start the engine when you stay on the ground. Start the engine only from operator's seat.

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[3] SPECIFICATIONS

Model			F2690E	F2690	F3990
Engine	Model		D1105-E4-FM-2		V1505-T-E4-FM
	Engine gross power (SAE) *1		19.0 kW (25.5 HP)		28.9 kW (39 HP)
	Type		Indirect Injection, vertical, water-cooled, 4-cycle diesel		
	Number of cylinders		3		4
	Bore and stroke		78.0 × 78.4 mm (3.07 × 3.09 in.)		
	Total displacement		1123 cm^3 (68.58 cu.in.)		1498 cm^3 (91.42 cu.in.)
	Rated revolution		3000 min^{-1} (rpm)		[PTO ON] 2500 min^{-1} (rpm) [PTO OFF] 2700 min^{-1} (rpm)
	Low idling revolution		1300 to 1400 min^{-1} (rpm)		
	Starting system		Electric starter with battery, glow plug, 12 V, 1.4 kW		
	Lubricating system		Forced lubrication by gear pump		
	Cooling system		Pressurized radiator, forced circulation with water pump		
	Battery		12 V, RC: 133 min, CCA: 582 A		
	Fuel		Diesel fuel No. 1-D S15 [below −10 °C (14 °F)] Diesel fuel No. 2-D S15 [above −10 °C (14 °F)]		
Capacities	Fuel tank		61.0 L (16.1 U.S.gals, 13.4 Imp.gals)		
	Engine crankcase (with filter) *2		3.5 L (3.7 U.S.qts, 3.1 Imp.qts)		4.7 L (5.0 U.S.qts, 4.1 Imp.qts)
	Engine coolant		4.6 L (4.9 U.S.qts, 4.0 Imp.qts)		3.7 L (3.9 U.S.qts, 3.3 Imp.qts)
	Recovery tank		0.6 L (0.6 U.S.qts, 0.5 Imp.qts)		1.1 L (1.2 U.S.qts, 1.0 Imp.qts)
	Transmission case		14.0 L (14.8 U.S.qts, 12.3 Imp.qts)		
	Rear axle differential case		1.5 L (1.6 U.S.qts, 1.3 Imp.qts)		
	Rear axle gear case		0.5 L (0.5 U.S.qts, 0.4 Imp.qts)		
Tire	Front		23 × 10.5-12 (4PR) Turf	24 × 12-12 (4PR) Turf	
	Rear		16 × 6.5-8 (4PR) Turf	18 × 9.5-8 (4PR) Turf	
Travelling speeds *3	Forward	Low	0 to 5.6 mph (0 to 9.0 km/h)		
		High	0 to 12.5 mph (0 to 20.1 km/h)		
	Reverse	Low	0 to 3.0 mph (0 to 4.8 km/h)		
		High	0 to 6.9 mph (0 to 11.0 km/h)		
Dimensions	Overall length		2450 mm (96.5 in.)		2510 mm (98.9 in.)
	Overall width		1240 mm (48.8 in.)	1370 mm (53.9 in.)	
	Overall height	without ROPS	1350 mm (53.1 in.)		
		with ROPS	1985 mm (78.2 in.)		
	Wheel base		1300 mm (51.2 in.)		
	Min. ground clearance		185 mm (7.3 in.)		
	Tread	Front	975 mm (38.4 in.)	1063 mm (41.9 in.)	
		Rear	875 mm (34.4 in.)	1020 mm (40.2 in.)	
Weight (without mower deck)			756 kg (1667 lbs)	770 kg (1698 lbs)	855 kg (1885 lbs)
PTO	Revolution		1 speed (2545 rpm at 3000 engine rpm)		1 speed (2583 rpm at 2500 engine rpm)
	Drive system		Shaft drive. KUBOTA 10-tooth involute spline (2545 rpm)		Shaft drive. KUBOTA 10-tooth involute spline (2583 rpm)
	Clutch type		Wet multi plates		
	PTO brake		Wet single plate		
Traveling system	Steering		Hydrostatic power steering		
	Transmission		Main-hydrostatic transmission, High-Low gear shift (2 forward, 2 reverse)		
	Brake		Wet disk type		
	Minimum turning radius		Less than 750 mm (29.5 in.) (inside of front tire)		
	Differential	Front	Bevel gear		
		Rear	–	Bevel gear	
	4WD system		–	Dual-acting overrunning 4WD	

■ **NOTE**

- **Specifications and design subject to change without notice**
  ***1: Manufacture's estimate.**
  ***2: At the center of the oil level gauge.**
  ***3: F2690E, F2690 : At 3000 engine min^{-1} (rpm) / F3990 : At 2700 engine min^{-1} (rpm) [PTO OFF]**

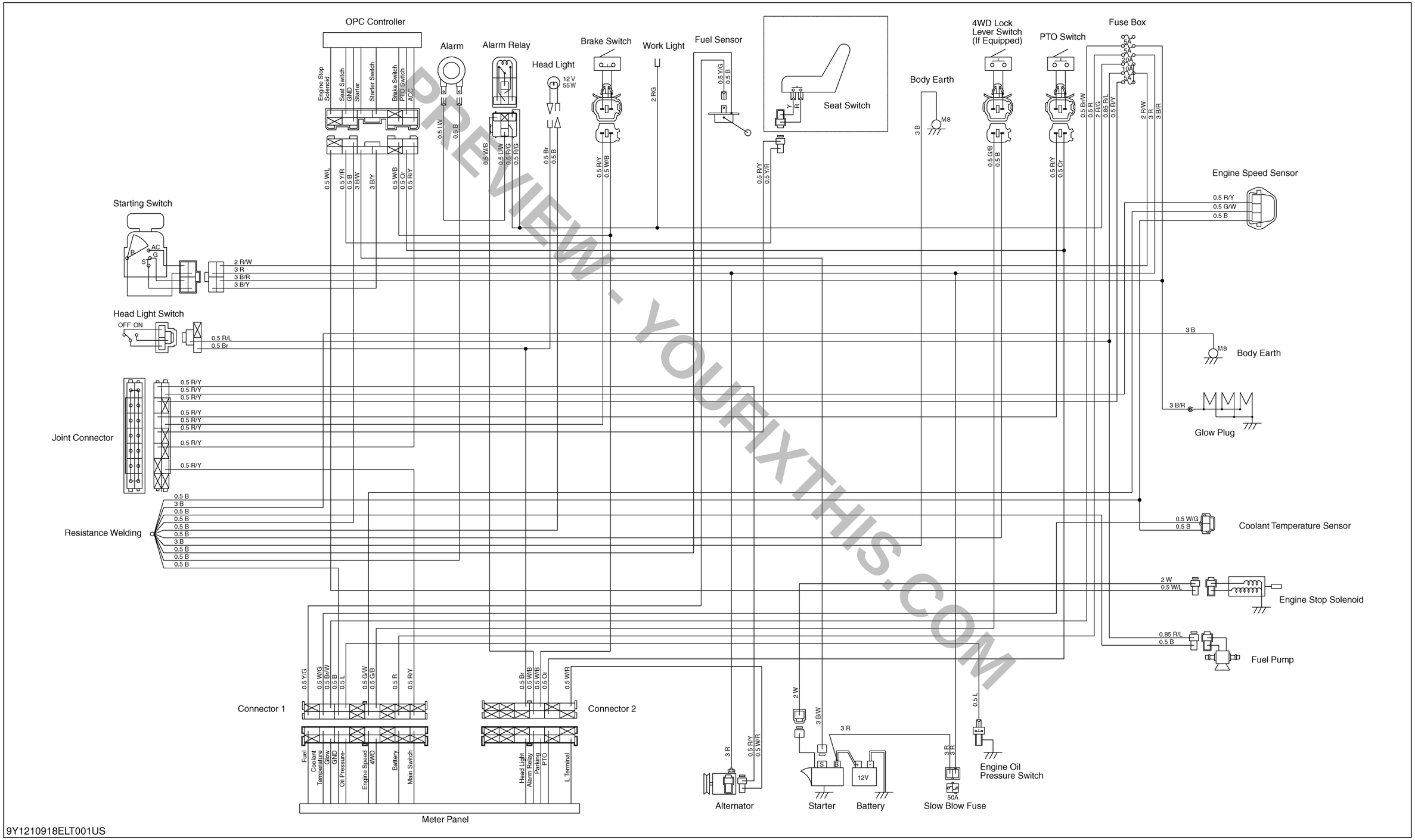
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1. WIRING DIAGRAM

[1] F2690E, F2690



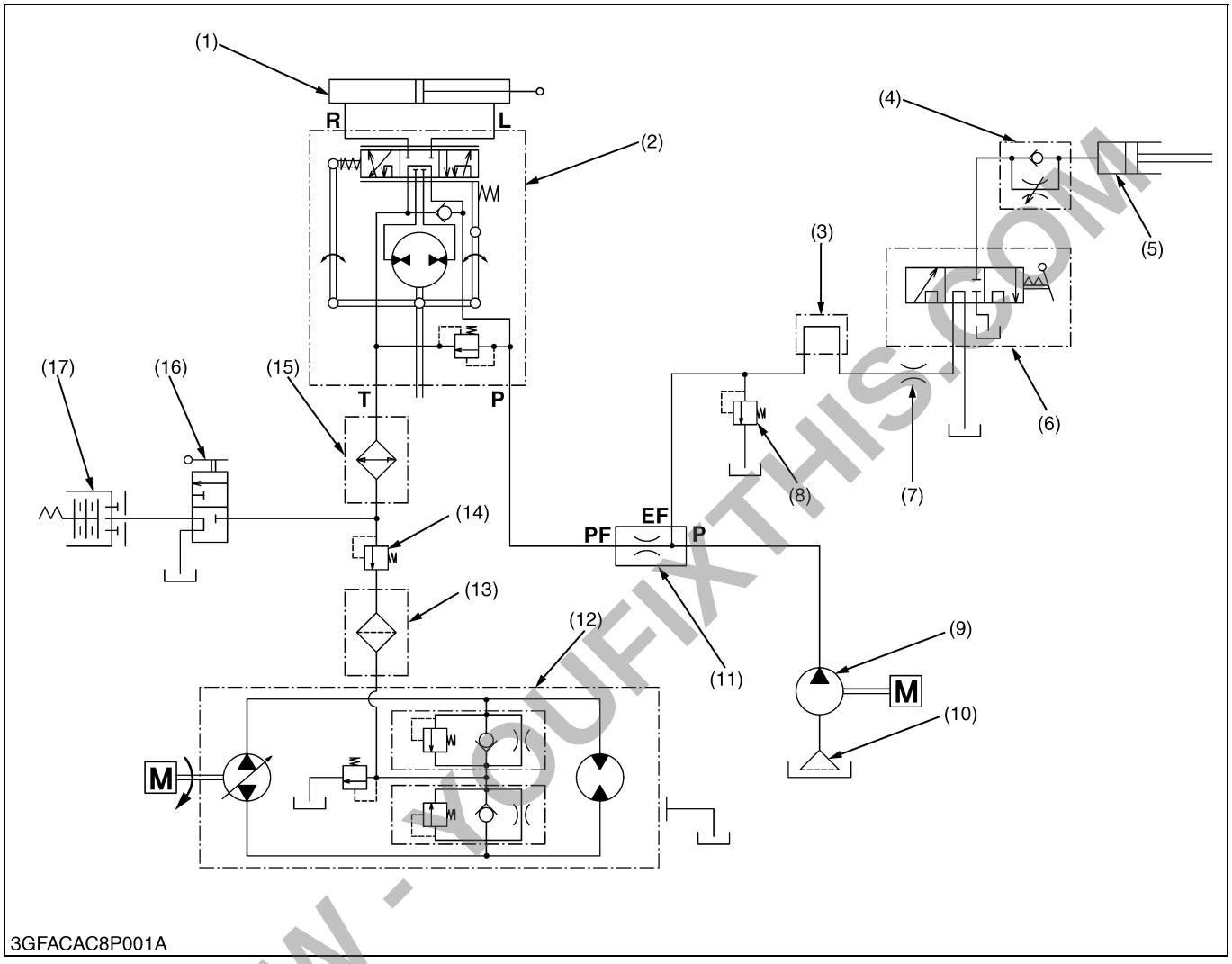
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1. HYDRAULIC CIRCUIT

[1] F2690E, F2690



(1) Steering Cylinder
(2) Steering Controller
(3) Hydraulic Block Type Outlet
(4) Lowering Speed Adjusting Valve
(5) Hydraulic Cylinder
(6) Implement Control Valve
(7) Orifice
(8) Relief Valve
(9) Hydraulic Pump
(10) Oil Strainer
(11) Flow Priority Valve
(12) Hydraulic Transmission
(13) Filter Cartridge
(14) PTO Charge Relief Valve
(15) Oil Cooler
(16) PTO Control Valve
(17) Hydraulic PTO Clutch

EF: EF Port (to Hydraulic Cylinder)
PF: PF Port (to Power Steering)
P: P Port
T: T Port
L: L Port
R: R Port

The hydraulic system of these machines consists of a hydraulic pump (9), hydraulic block type outlet (3), implement control valve (6), hydraulic cylinder (5) and other components.

This system has the following functions.

Position control of the front implement connected to the lift arm.

Hydraulic power take off from the hydraulic block type outlet (3) to operate the implements such as a grass collector and, etc..

Oil is supplied by a hydraulic pump (9) connected to the engine. When an engine is started, hydraulic pump (9) starts running, sucks oil from a transmission case. The hydraulic pump (9) forces out the oil to the hydraulic block type outlet (3), implement control valve (6), hydraulic cylinder (5), steering controller (2), PTO control valve (16), hydraulic PTO clutch (17) and hydrostatic transmission (12).

9Y1210918HYM0001US0

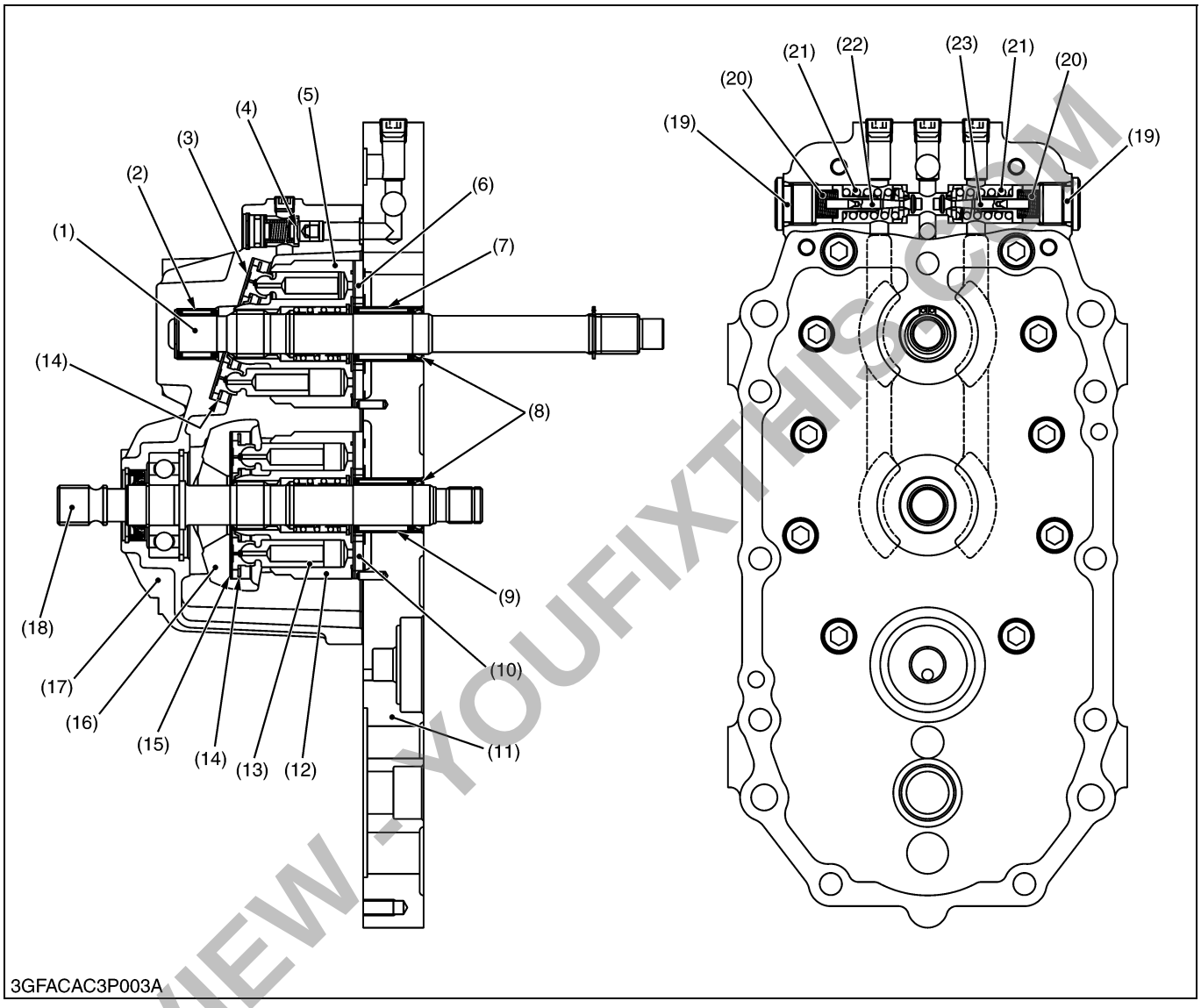
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2. POWER TRAIN

[1] HYDROSTATIC TRANSMISSION (HST)

(1) Structure



(1) Motor Shaft
(2) Needle Bearing
(3) Thrust Plate
(4) Charge Relief Valve
(5) Cylinder Block (Motor)
(6) Valve Plate
(7) Needle Bearing
(8) Oil Seal
(9) Needle Bearing
(10) Valve Plate
(11) Center Section
(12) Cylinder Block (Pump)
(13) Piston
(14) Retainer Plate
(15) Thrust Plate
(16) Variable Swashplate
(17) HST Housing
(18) Pump Shaft
(19) Valve Plug
(20) Check Valve Spring
(21) Relief Valve Spring
(22) Check and High Pressure Relief Valve (Forward)
(23) Check and High Pressure Relief Valve (Reverse)

The hydrostatic transmission (HST) consists of a variable displacement piston pump, a fixed displacement piston motor, two check and high pressure relief valves and a charge relief valve.

The pump and motor have nine pistons in their cylinder blocks.

The discharge rate of the HST is 18.9 cm^3/rev. (1.15 cu.in./rev.).

The speed control pedal permits simple operation of the machine, starting, stopping, increasing or decreasing speed.

9Y1210918TRM0003US0

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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-12.)

Item	N·m	kgf·m	lbf·ft
Oil pressure switch	15 to 19	1.5 to 2.0	11 to 14
Nozzle holder	34 to 39	3.5 to 4.0	25 to 29
Overflow pipe assembly retaining nut	20 to 25	2.0 to 2.5	15 to 18
Nozzle holder assembly	49 to 68	5.0 to 7.0	36 to 51
DPF muffler flange mounting screw	23.5 to 27.5	2.40 to 2.80	17.4 to 20.2
Temperature sensor	25 to 35	2.6 to 3.5	19 to 25
Drive shaft mounting screw	20 to 29	2.0 to 3.0	15 to 21
Double flare pipe 1 retaining nut (doser flange side)	16.0 to 22.1	1.64 to 2.25	11.8 to 16.3
Double flare pipe retaining nut (air valve side)	8.0 to 11	0.82 to 1.12	5.9 to 8.1
Double flare pipe 2 retaining nut (both side)	16.0 to 22.1	1.64 to 2.25	11.8 to 16.3
Turbocharger lubrication oil delivery pipe retaining nut (both side)	15.7 to 19.6	1.60 to 2.00	11.6 to 14.4
Differential pressure sensor pipe retaining nut (doser flange side)	16.0 to 22.1	1.64 to 2.25	11.8 to 16.3
Cylinder head cover screw [D1105]	7 to 8	0.7 to 0.8	5 to 6
Cylinder head cover screw [V1505]	9.8 to 11	1.0 to 1.1	7.2 to 8.3
Injection pipe retaining nut	25 to 34	2.5 to 3.5	18 to 25
Exhaust manifold mounting nut	15.7 to 18.6	1.60 to 1.90	11.6 to 13.7
Glow plug	7.8 to 15	0.8 to 1.5	5.8 to 10
* Rocker arm bracket nut	21.6 to 26.5	2.2 to 2.7	15.9 to 19.5
* Cylinder head screw	64 to 68	6.5 to 7.0	47 to 50
* Fan drive pulley screw	236 to 245	24.0 to 25.0	174 to 180
Rack position sensor mounting screw	6.0 to 8.0	0.62 to 0.81	4.5 to 5.9
* Connecting rod screw	42 to 46	4.2 to 4.7	31 to 33
* Flywheel screw	54 to 58	5.5 to 6.0	40 to 43
Bearing case cover screw	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
* Main bearing case screw 2	49 to 53	5.0 to 5.5	37 to 39
* Main bearing case screw 1	30 to 34	3.0 to 3.5	22 to 25

■ **NOTE**

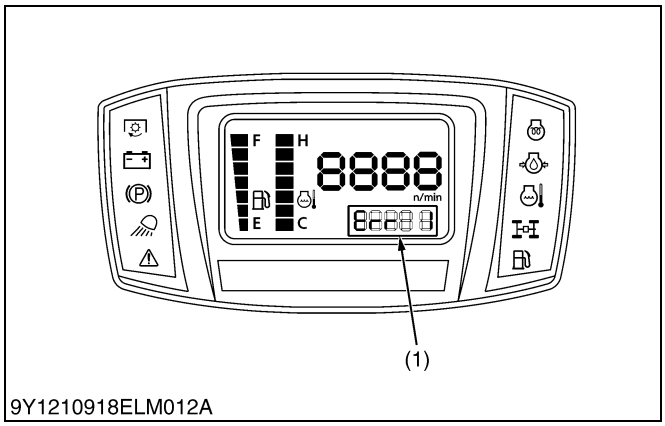
- **For * marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.**
- **The letter "M" in Size × Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm or the threads. The pitch is the nominal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

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[3] ERROR CODE DISPLAY



9Y1210918ELM012A

If trouble should occur at the meter panel or CAN communication between engine ECU and meter panel, the indicator flashes and error code appears as a warning.

If the trouble is not corrected by restarting the machine, solve the problem according to the following table.

(1) Error Code

[F2690E, F2690]

Error code	Trouble	Check point or solution
Err 1	Water temperature sensor power circuit trouble	Checking battery voltage or replacing meter panel
Err 2	Fuel sensor power circuit trouble	Checking battery voltage or replacing meter panel
Err 3	Meter panel memory reading trouble	Replacing meter panel

[F3990]

Error code	Trouble	Check point or solution
Err 2	Fuel sensor power circuit trouble	Checking battery voltage or replace meter panel
Err 3	Meter panel memory reading trouble	Replacing meter panel
Err 21	CAN communication trouble	Checking CAN communication wire,replacing engine ECU or replacing meter panel

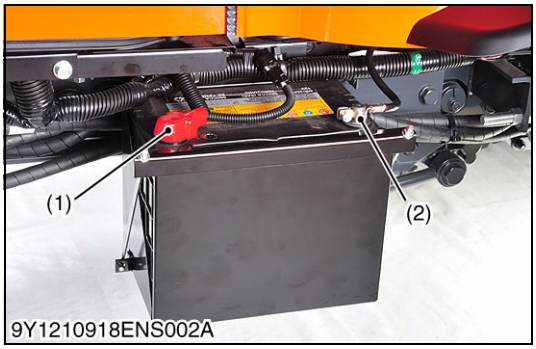
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[2] DISASSEMBLING AND ASSEMBLING

(1) DPF Muffler (Only F3990)



Battery

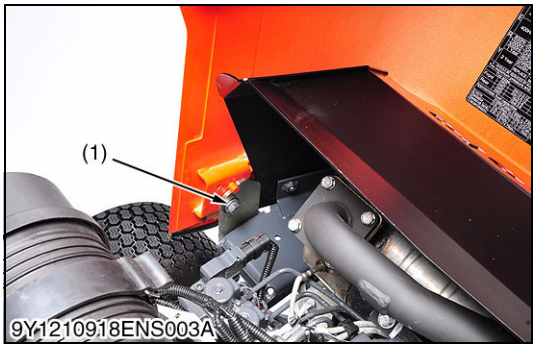
CAUTION

- **When disassembling the battery cables, disconnect the negative cable from the battery first. When connecting, connect the positive cable to the battery first.**

1. Disconnect the negative cable (2) from the battery.
2. Disconnect the positive cable (1) from the battery.

(1) Positive Cable (2) Negative Cable

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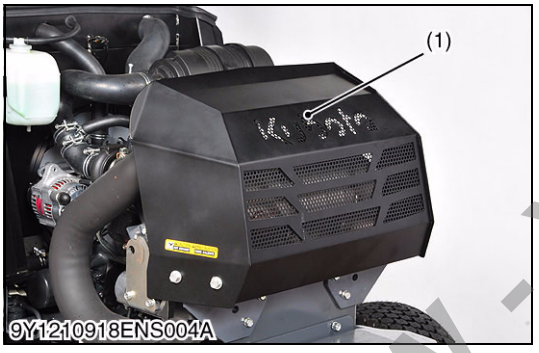


Bonnet

1. Remove the bonnet mounting bolts (1), then remove the bonnet.

(1) Bolt

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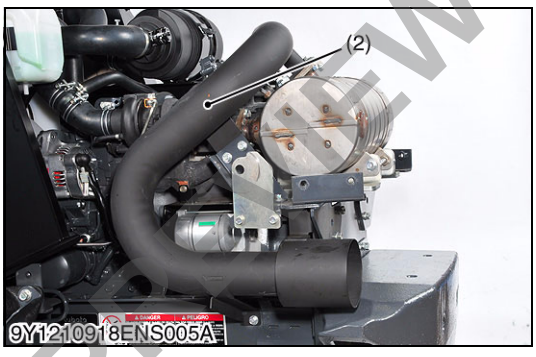


DPF Cover and Muffler Pipe

1. Remove the DPF cover (1).
2. Remove the muffler pipe (2).

(1) DPF Cover (2) Muffler Pipe

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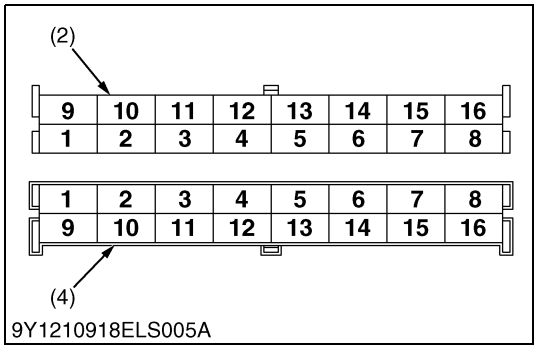
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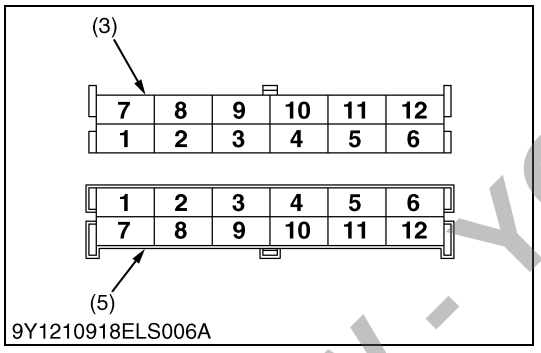
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[5] METER PANEL, OPC CONTROLLER AND ENGINE ECU

(1) Meter Panel







Arrangement of Digital Display Connector Pin [F2690E, F2690]

[Connector 1]

Terminal No.	Item	Color of wiring
1	Fuel Sensor	Y/G
2	Coolant Temperature Sensor	W/G
3	GND	B
4	Blank	–
5	Engine Speed Sensor	G/W
6	Blank	–
7	Battery	R
8	ACC	R/Y
9	Blank	–
10	Glow Indicator	Br/W
11	Engine Oil Pressure Switch	L
12	Blank	–
13	4WD Lock Lever Switch	G/B
14	Blank	–
15	Blank	–
16	Blank	–

[Connector 2]

Terminal No.	Item	Color of wiring
1	Blank	–
2	Blank	–
3	Blank	–
4	Alarm Relay	W/B
5	PTO Switch	Or
6	Blank	–
7	Blank	–
8	Blank	–
9	Head Light Indicator	Br
10	Parking Brake Indicator	W/B
11	Blank	–
12	**L** Terminal	W/R

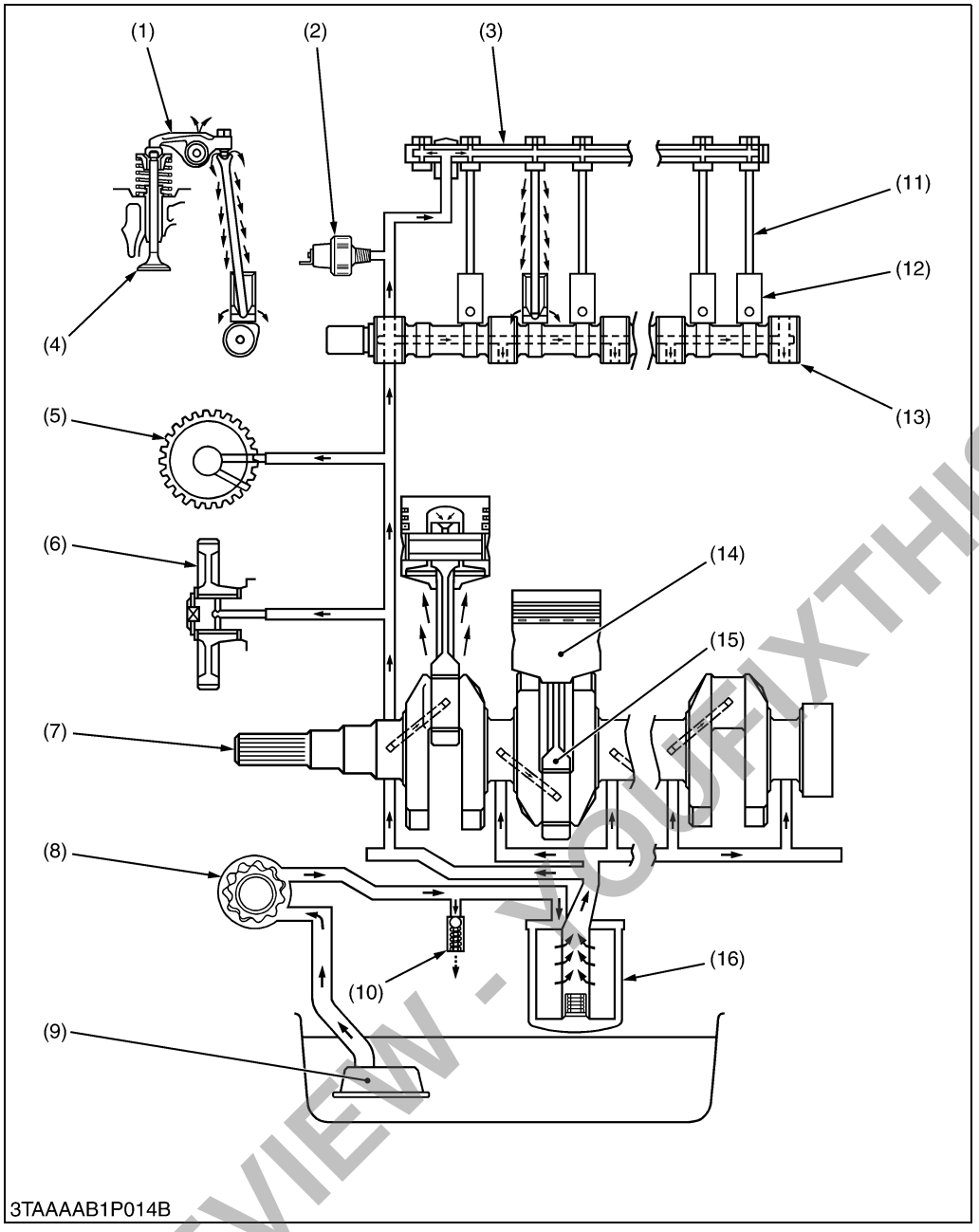
(1) Meter Panel
(2) Connector 1 (Harness Side)
(3) Connector 2 (Harness Side)
(4) Connector 1 (Panel Side)
(5) Connector 2 (Panel Side)

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2. LUBRICATING SYSTEM



(1) Rocker Arm
(2) Oil Pressure Switch
(3) Rocker Arm Shaft
(4) Valve
(5) Governor Shaft
(6) Idle Gear
(7) Crankshaft
(8) Oil Pump
(9) Oil Strainer
(10) Relief Valve
(11) Push Rod
(12) Tappet
(13) Camshaft
(14) Piston
(15) Connecting Rod
(16) Oil Filter Cartridge

This engine's lubricating system consists of oil strainer (9), oil pump (8), relief valve (10), oil filter cartridge (16) and oil pressure switch (2).

The oil pump sucks lubricating oil from the oil pan through the oil strainer and the oil flows down to the filter cartridge, where it is further filtered. Then the oil is forced to crankshaft (7), connecting rods (15), idle gear (6), governor shaft (5), camshaft (13) and rocker arm shaft (3) to lubricate each part.

Some part of oil, splashed by the crankshaft or leaking and dropping from gaps of each part, lubricates these parts : pistons (14), cylinders, small ends of connecting rods, tappets (12), push rods (11), inlet and exhaust valves (4) and timing gears.

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Fill fuel	G-10
	Air in the fuel system	Bleed	G-40
	Water in the fuel system	Change fuel and repair or replace fuel system	G-10, 1-S15
	Fuel pipe clogged	Clean	G-31
	Fuel filter clogged	Change	G-31
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-10
	Fuel with low cetane number	Use specified fuel	G-10
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S37
	Incorrect injection timing	Adjust	1-S15
	Fuel camshaft worn	Replace	1-S46
	Injection nozzle clogged	Repair or replace	1-S19
	Injection pump malfunctioning	Repair or replace	1-S44
	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-S40
	Improper valve timing	Correct or replace timing gear	1-S46
	Piston ring and cylinder worn	Repair or replace	1-S47
	Excessive valve clearance	Adjust	1-S11
(Starter Does Not Run)	Battery discharged	Charge	G-28
	Starter malfunctioning	Repair or replace	8-S48
	Main switch malfunctioning	Replace	8-S18
	Brake switch damaged	Replace	8-S19
	PTO switch damaged	Replace	8-S19
	Seat switch damaged	Replace	8-S19
	Wiring disconnected	Connect	–
Engine Revolution Is Not Smooth	Fuel filter clogged or dirty	Change	G-36
	Air cleaner clogged	Clean or replace	G-30
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S37
	Injection pump malfunctioning	Replace	1-S44
	Incorrect nozzle injection pressure	Adjust	1-S18
	Injection nozzle stuck or clogged	Repair or replace	1-S19
	Governor malfunctioning	Repair	–

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2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Compression Pressure (D1105)		3.73 to 4.11 MPa 38.0 to 42.0 kgf/cm^2 541 to 597 psi	2.26 MPa 23.0 kgf/cm^2 327 psi
• Difference among Cylinders		–	10 % or less
Compression Pressure (V1505)		3.14 to 3.53 MPa 32.0 to 36.0 kgf/cm^2 456 to 512 psi	2.26 MPa 23.0 kgf/cm^2 327 psi
• Difference among Cylinders		–	10 % or less
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	–
Top Clearance		0.55 to 0.75 mm 0.022 to 0.029 in.	–
Cylinder Head Surface	Flatness	–	0.05 mm 0.0020 in.
Valve Recessing	Intake and Exhaust	−0.05 to 0.25 mm −0.0020 to 0.0098 in.	0.40 mm 0.0157 in.
Valve Stem to Valve Guide	Clearance	0.035 to 0.065 mm 0.0014 to 0.0025 in.	0.10 mm 0.0039 in.
• Valve Stem	O.D.	6.960 to 6.975 mm 0.2741 to 0.2746 in.	–
• Valve Guide	I.D.	7.010 to 7.025 mm 0.2760 to 0.2765 in.	–
Valve Face	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
Valve Seat	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
	Width	2.12 mm 0.0835 in.	–
Valve Spring	Tilt	–	1.0 mm 0.039 in.
	Free Length	37.0 to 37.5 mm 1.457 to 1.476 in.	36.5 mm 1.437 in.
	Setting Load	117.4 N / 31.0 mm 11.97 kgf / 31.0 mm 26.4 lbf / 1.22 in.	100.0 N / 31.0 mm 10.2 kgf / 31.0 mm 22.5 lbf / 1.22 in.

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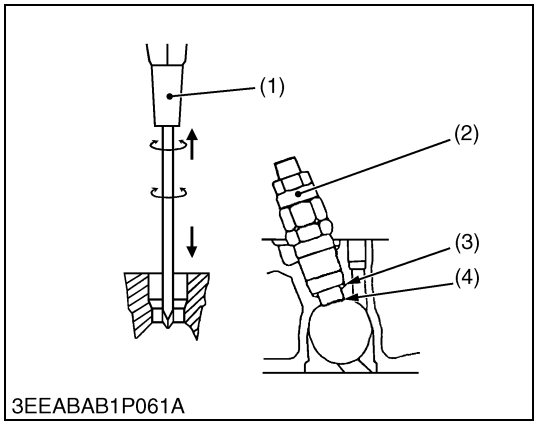
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6. MAINTENANCE CHECK LIST

No.	Item		Indication on hour meter (Hr)												Interval	Reference page		
			50	100	150	200	250	300	350	400	450	500	550	600				
1	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-24		
2	OPC system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-25		
3	Greasing	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-26		
4	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-27		
5	Oiling	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr	G-27		
6	Battery condition	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-28		
7	Air cleaner element	Clean		☆		☆		☆		☆		☆		☆	every 100 Hr	G-30	*1	@
		Replace													every 1 year	G-30		
8	Engine oil	Change	★			☆				☆				☆	every 200 Hr	G-22		
9	Fan belt	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-32	*2	
10	Brake pedal	Adjust		☆		☆		☆		☆		☆		☆	every 100 Hr	G-32		
11	Fuel filter element	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-31		@
		Replace								☆					every 400 Hr	G-36	*2	
12	Engine oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-23		
13	Transmission fluid	Change								☆					every 400 Hr	G-35		
14	Transmission oil filter	Replace	★			☆				☆				☆	every 200 Hr	G-23		
15	Transmission strainer	Clean								☆					every 400 Hr	G-35		
16	Rear axle differential case fluid	Change								☆					every 400 Hr	G-36		
17	Rear axle gear case (RH and LH) fluid	Change								☆					every 400 Hr	G-36		
18	Radiator hose and clamp	Check				☆				☆				☆	every 200 Hr	G-33		
		Replace													every 2 years	G-33	*2	
19	Hydraulic hose	Check				☆				☆				☆	every 200 Hr	G-34		@
		Replace													every 2 years	G-34	*2	
20	Fuel line	Check		☆		☆		☆		☆		☆		☆	every 100 Hr	G-31		@
		Replace													every 2 years	G-31	*2	
21	Intake air line	Check				☆				☆				☆	every 200 Hr	G-34		@
		Replace													every 2 years	G-34	*3	
22	Engine breather hose	Replace													every 2 years	1-S37		
23	Rear axle pivot	Adjust								☆					every 400 Hr	G-36		
24	Engine valve clearance	Adjust													every 800 Hr	1-S11		

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Nozzle Heat Seal Service Removal Procedure

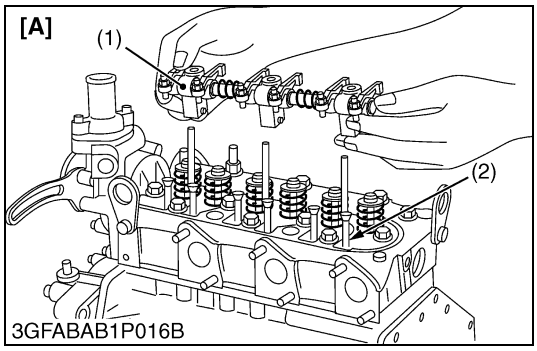
■ **IMPORTANT**
- **Use a plus (phillips head) screw driver (1) whose diameter is bigger than the heat seal hole (Approx. 6 mm (1/4 in.)).**

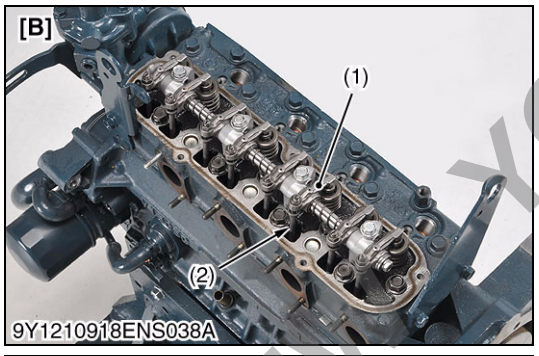
1. Drive screw driver (1) lightly into the heat seal hole.
2. Turn screw driver 3 or 4 times each way.
3. While turning the screw driver, slowly pull the heat seal (4) out together with the injection nozzle gasket (3).
4. If the heat seal drops, repeat the above procedure.

(When reassembling)
- Heat seal and injection nozzle gasket must be changed when the injection nozzle is removed for cleaning or for service.

(1) Plus Screw Driver
(2) Nozzle Holder
(3) Injection Nozzle Gasket
(4) Heat Seal

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Rocker Arm and Push Rod

1. Remove the rocker arm bracket screws/nuts.
2. Remove the rocker arm assembly (1).
3. Remove the push rods (2).

(When reassembling)
- When refitting the push rods (2) into the tappets (3), make sure the push rod locates correctly into the tappet seat.

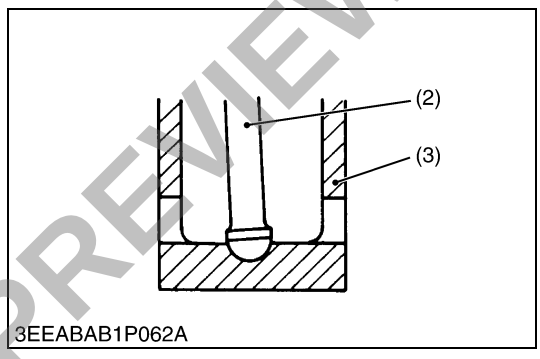
■ **IMPORTANT**
- **After installing the rocker arm, be sure to adjust the valve clearance.**

Tightening torque	Rocker arm bracket nut	21.6 to 26.5 N·m 2.2 to 2.7 kgf·m 15.9 to 19.5 lbf·ft

(1) Rocker Arm Assembly
(2) Push Rod
(3) Tappet

[A] D1105
[B] V1505

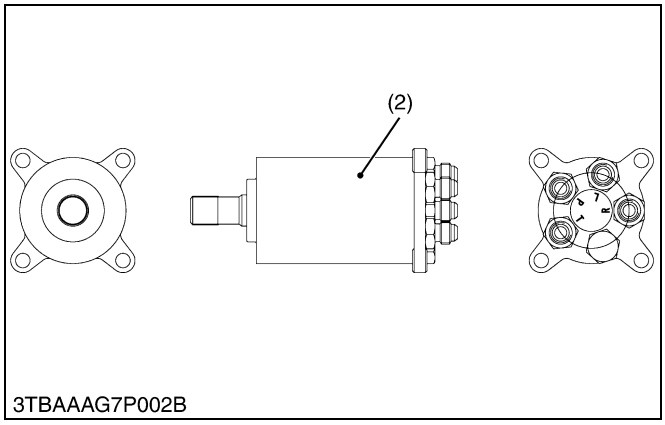
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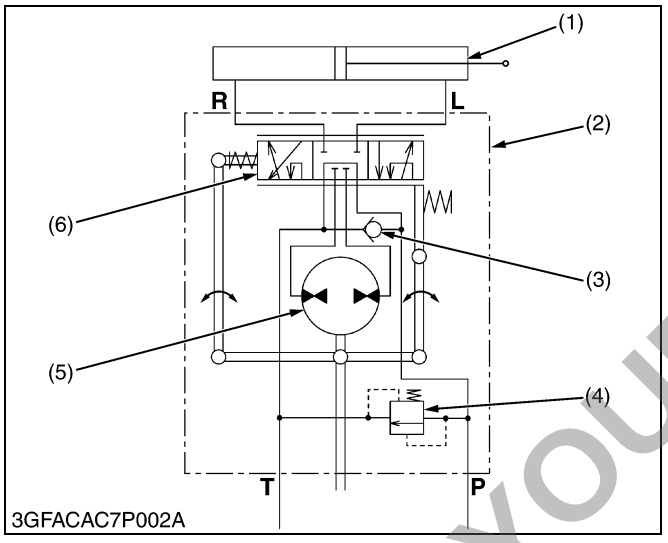
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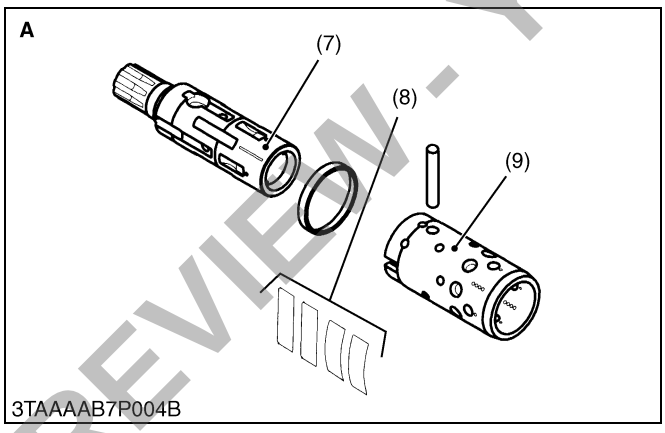
2. STEERING CONTROLLER



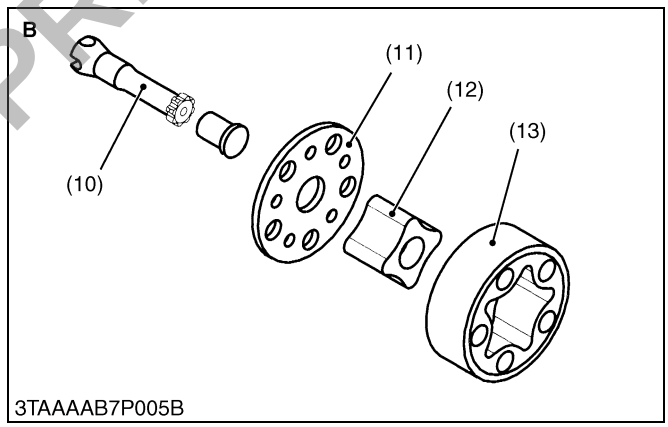
3TBAAAG7P002B



3GFACAC7P002A



3TAAAAB7P004B



3TAAAAB7P005B

The steering controller (2) consists of a control valve (6) and a metering device (5).

■ **Control Valve**

The control valve is a rotating spool type. When the steering wheel is not turned, the position of the spool (7) and sleeve (9) is kept neutral by the centering spring (8). This causes the forming of a "Neutral" oil circuit. When the steering wheel is turned either clockwise or counterclockwise, the position of the spool and sleeve changes in relation to the centering spring. This allows the forming of a "Right Turning" or "Left Turning" oil circuit. At the same time, the metering device rotates with the spool and sends the oil to the cylinder corresponding to the rotation of the steering wheel.

■ **Metering Device**

The oil, sent from the hydraulic pump to the steering cylinder, passes through the metering device (5). Namely, when the rotor is driven, two chambers suck in oil due to volumetric change in the pump chambers formed between the rotor (12) and the stator (13), while oil is discharged from other two chambers. On the other hand, rotation of the steering wheel is directly transmitted to the rotor through the spool (7), drive shaft (10), etc. Accordingly, the metering device serves to supply the steering cylinder with oil, amount of which corresponds to the rotation of the steering wheel. The wheels are thus turned by the angle corresponding to the rotation of the steering wheel. When the engine stops or the hydraulic pump malfunctions, the metering device functions as a manual trochoid pump, which makes manual steering possible.

■ **Relief Valve**

The relief valve (1) is located in the steering controller. It controls the maximum pressure of the power steering system.

Its setting pressure is as follows.

10.8 to 11.3 MPa

110.2 to 115.2 kgf/cm^2

1567 to 1638 psi

(1) Steering Cylinder
(2) Steering Controller
(3) Check Valve
(4) Relief Valve
(5) Metering Device
(6) Control Valve
(7) Spool
(8) Centering Spring
(9) Sleeve
(10) Drive Shaft
(11) Distributor Plate
(12) Rotor
(13) Stator

A: Control Valve
B: Metering Device
P: P Port (From Hydraulic Pump)
T: T Port (To Independent PTO Clutch Valve and HST Circuit)
L: L Port
R: R Port

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