⚠ SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and decals 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.**

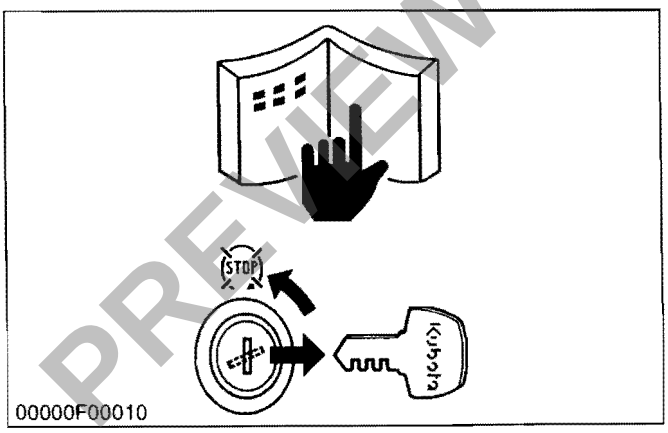
⚠ **WARNING**: **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ **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.**

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BEFORE SERVICING AND REPAIRING

(1) Read all instructions and safety instructions in this manual and on your machine safety decals.
(2) Clean the work area and machine.
(3) Park the machine on a firm and level ground, and set the parking brake.
(4) Lower the implement to the ground.
(5) Stop the engine, and remove the key.
(6) Disconnect the battery negative cable.
(7) Hang a **"DO NOT OPERATE"** tag in operator station.

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GENERAL

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[6] MAINTENANCE CHECK LIST

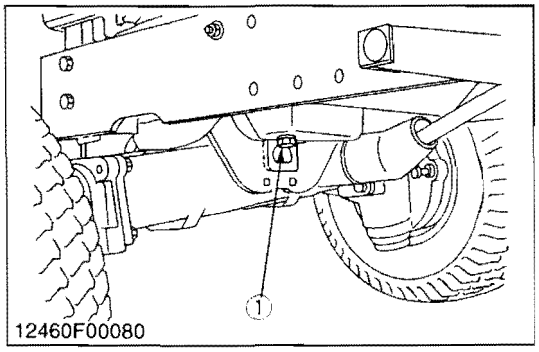
No.	Item	Period	Indication on hour meter																	After purchase		Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	1500	3000	1 year	2 years		
1	Engine oil	Change	★	☆		☆		☆		☆		☆		☆		☆		☆							G-12
2	Engine oil filter	Replace	★			☆				☆				☆				☆							G-12
3	Transmission oil filter	Replace	★					☆						☆											G-13
4	Transmission fluid	Change	★					☆						☆											G-13
5	Transmission strainer	Clean						☆						☆											G-22
6	Front axle case oil	Change						☆						☆											G-22
7	Front axle pivot	Adjust								☆								☆							G-22
8	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆							G-14
9	Greasing	–	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆							G-14
10	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆							G-15
11	Battery condition	Check		☆		☆		☆		☆		☆		☆		☆		☆					*4		G-15
12	Air cleaner element	Clean		☆		☆		☆		☆		☆		☆		☆		☆					*1	@	G-17
		Replace																			☆		*2		G-17
13	Fuel filter element	Check		☆		☆		☆		☆		☆		☆		☆		☆						@	G-18
		Replace										☆													G-23
14	Fan belt	Adjust		☆		☆		☆		☆		☆		☆		☆		☆							G-18
15	HST neutral spring	Adjust		☆		☆		☆		☆		☆		☆		☆		☆							G-19
16	Brake	Adjust		☆		☆		☆		☆		☆		☆		☆		☆							G-19
17	Radiator hose and clamp	Check				☆				☆				☆				☆							G-20
		Replace																				☆			G-20
18	Power steering oil line	Check				☆				☆				☆				☆							G-20
		Replace																				☆			G-20
19	Fuel line	Check		☆		☆		☆		☆		☆		☆		☆		☆						@	G-18
		Replace																				☆			G-18
20	Intake air line	Check				☆				☆				☆				☆							G-21
		Replace																				☆	*3		G-21
21	Toe-in	Adjust				☆				☆				☆				☆							G-21
22	Engine valve clearance	Adjust																☆							1-S22
23	Fuel injection nozzle injection pressure	Check																	☆	☆				@	1-S68
24	Injection pump	Check																		☆				@	1-S67
25	Cooling system	Flush																				☆			G-25
26	Coolant	Change																				☆			G-25

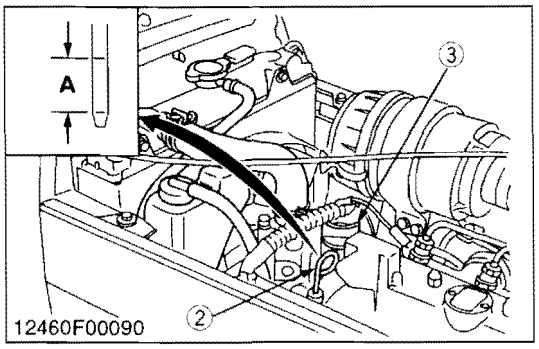
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(2) Check Points of Initial 50 Hours





Changing Engine Oil

CAUTION

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

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. To drain 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 new oil up to upper line on the dipstick (2).

IMPORTANT

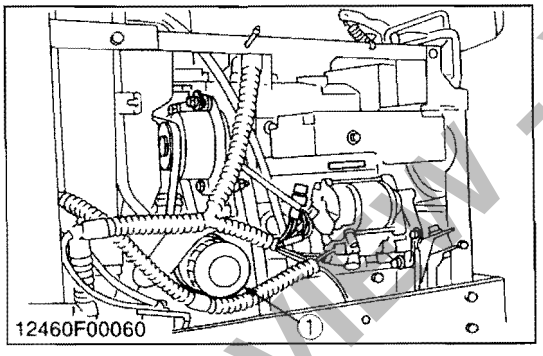
- **When using an oil of different manufacture or viscosity from the previous one, remove all of the old oil.**
- **Never mix two different types of oil.**
- **Use the proper SAE Engine Oil according to ambient temperatures.**
- **Refer to "LUBRICANTS, FUEL AND COOLANT". (See page G-7.)**

Engine oil capacity	BX1800	1.9 L 2.01 U.S.qts 1.67 Imp.qts
	BX2200	2.5 L 2.64 U.S.qts 2.20 Imp.qts

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

(A) Oil level is acceptable within this range.

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Replacing Engine Oil Filter Cartridge

CAUTION

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

1. Remove the oil filter cartridge with the filter wrench.
2. Apply a slight coat of oil onto the cartridge gasket.
3. To install the new cartridge, screw it in by hand. Over tightening may cause deformation of rubber gasket.
4. After the new cartridge has been replaced, the engine oil normally decrease a little. Thus see that the engine oil does not leak through the seal and be sure to read the oil level on the dipstick. Then, replenish the engine oil up to the specified level.

IMPORTANT

- **To prevent serious damage to the engine, replacement element must be highly efficient. Use only a KUBOTA genuine filter or its equivalent.**

(1) Engine Oil Filter Cartridge

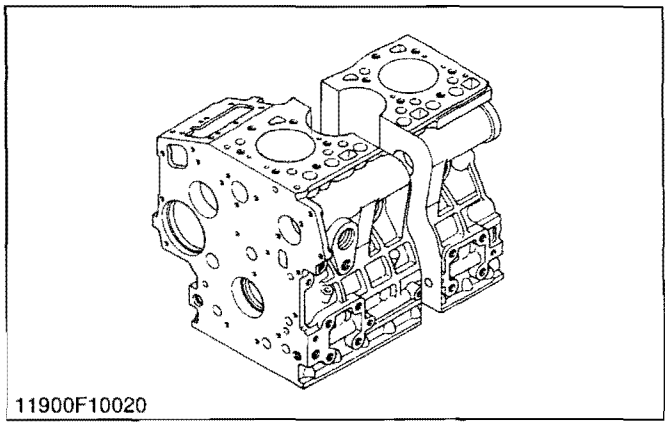
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[1] ENGINE BODY

(1) Cylinder Block


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The engine has a high durability tunnel-type cylinder block in which the crank bearing component is a constructed body.

Furthermore, liner less type, allow effective cooling, less distortion, and greater wear-resistance.

The noise level is reduced to a minimum because each cylinder has its own chamber.

11900M10020

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TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	• No fuel	Replenish fuel	G-7
	• Air in the fuel system	Bleed	G-27
	• Water in the fuel system	Change fuel and repair or replace fuel system	G-18
	• Fuel pipe clogged	Clean	G-18
	• Fuel filter clogged	Change	G-23
	• 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-S66
	• Fuel camshaft worn	Replace	–
	• Injection nozzle clogged	Clean	1-S68
	• Injection pump malfunctioning	Repair or 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-S20
	• Improper valve timing	Correct or replace timing gear	1-S27, S32
	• Piston ring and cylinder worn	Replace	1-S51 1-S61
	• Excessive valve clearance	Adjust	1-S22
(Starter Does Not Run)	• Battery discharged	Charge	G-16
	• Starter malfunctioning	Repair or replace	G-14, 6-S12
	• Main switch malfunctioning	Repair or replace	–
	• Safety switches malfunctioning	Adjust or replace	6-S9
	• Wiring disconnected	Connect	–
Engine Revolution Is Not Smooth	• Fuel filter clogged or dirty	Change	G-23
	• Air cleaner clogged	Clean or replace	G-17
	• Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S24
	• Injection pump malfunctioning	Repair or replace	–
	• Incorrect nozzle injection pressure	Adjust	1-S68
	• Injection nozzle stuck or clogged	Repair or replace	1-S68
	• Governor malfunctioning	Repair	–
Either White or Blue Exhaust Gas Is Observed	• Excessive engine oil	Reduce to specified level	G-7, 12
	• Piston ring and cylinder worn or stuck	Repair or replace	1-S51 1-S61
	• Incorrect injection timing	Adjust	1-S66
	• Deficient compression	Adjust top clearance	1-S20

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SPECIFICATIONS

Model			BX1800	BX2200
PTO power			10.2 KW (13.7 HP)	12.4 kW (16.7 HP)
Engine	Maker		KUBOTA	
	Model		D722-E-BX	D905-E-BX
	Type		Indirect Injection. Vertical, water-cooled, 4-cycle diesel	
	Number of cylinders		3	
	Bore and stroke		67 × 68 mm (2.64 × 2.68 in.)	72 × 73.6 mm (2.83 × 2.90 in.)
	Total displacement		719 cm^3 (43.9 cu.in.)	898 cm^3 (54.8 cu.in.)
	Engine gross power (DIN)		13.4 kW (18.0 HP)	16.4 kW (22.0 HP)
	Rated revolution		53.3 r/s (3200 rpm)	
	Maximum torque		41.5 N·m (4.23 kgf·m, 30.6 ft-lbs)/ 36.7 to 43.3 r/s (2200 to 2600 rpm)	54.9 N·m (5.6 kgf·m, 40.5 ft-lbs)/ 36.7 to 43.3 r/s (2200 to 2600 rpm)
	Battery		12 V, CCA : 435 A, RC : 62 min.	12 V, CCA : 535 A, RC : 80 min.
	Starting system		Electric starting with cell starter 12 V, 1.4 kW	
	Lubricating system		Forced lubrication by trochoidal pump	
	Cooling system		Pressurized radiator, forced circulation with water pump	
	Fuel		Diesel fuel No. 2-D [above –10 °C (14 °F)], Diesel fuel No. 1 [below –10 °C (14 °F)]	
Capacities	Fuel tank		21 L (5.5 U.S.gals., 4.6 Imp.gals.)	
	Engine crankcase (with filter)		1.9 L (2.01 U.S.qts., 1.67 Imp.qts.)	2.5 L (2.64 U.S.qts., 2.20 Imp.qts.)
	Engine coolant (with recovery tank)		2.9 L (3.06 U.S.qts., 2.55 Imp.qts.)	3.5 L (3.70 U.S.qts., 3.08 Imp.qts.)
	Transmission case		10.1 L (2.7 U.S.gals., 2.2 Imp.gals.)	
	Front axle case		4.7 L (4.97 U.S.qts., 4.14 Imp.qts.)	
Dimensions	Overall length (without 3P)		2025 mm (79.7 in.)	
	Overall width		1145 mm (45.1 in.)	
	Overall height (with ROPS)		1800 mm (70.9 in.)	
	Overall height (top of steering wheel)		1200 mm (47.2 in.)	
	Wheel base		1400 mm (55.1 in.)	
	Minimum ground clearance (bottom of hitch bracket)		170 mm (6.7 in.)	
	Tread	Front	910 mm (35.8 in.)	
		Rear	820 mm (32.3 in.)	
Weight			570 kg (1257 lbs)	590 kg (1301 lbs)
Travelling system	Tires	Front	18 × 8.50 – 8 (Turf)	
		Rear	26 × 12.00 – 12 (Turf)	
	Steering		Hydrostatic power steering	
	Transmission		Main-hydrostatic transmission, Range gear shift (2 forward and 2 reverse)	
	Brake		Wet disc type	
	Min. turning radius (without brake)		2.3 m (7.5 feet)	
	Differential		Bevel gear	
Hydraulic system	Hydraulic control system		Directional control, auto-return lever system	
	Pump capacity		21.0 L/min. (5.5 U.S.GPM, 4.6 Imp.GPM)	
	Three point hitch		SAE Category I	
	Max. lift force (24 in. behind lift points)		3040 N (310 kg, 684 lbs)	
PTO system	Clutch		Wet type, multiple discs	
	Mid	PTO shaft	USA No. 5 (KUBOTA 10-tooth) involute spline	
		Revolution	41.7 r/s (2500 rpm) / engine 52.1 r/s (3125 rpm)	
	Rear	PTO shaft	SAE 1-3/8, 6 splines	
		Revolution	9.0 r/s (540 rpm) / engine 51.1 r/s (3068 rpm)	

Note : * Manufacture's estimate the company reserves the right to change the specifications without notice.

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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) Stud Bolts

Material of opponent part	Ordinariness			Aluminum		
Unit / Diameter	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M8 (8 mm, 0.31 in.)	11.8 to 15.6	1.2 to 1.6	8.68 to 11.5	8.82 to 11.8	0.90 to 1.2	6.51 to 8.67
M10 (10 mm, 0.39 in.)	24.6 to 31.3	2.5 to 3.2	18.1 to 23.1	19.7 to 25.4	2.0 to 2.6	14.5 to 18.8
M12 (12 mm, 0.47 in.)	29.5 to 49.0	3.0 to 5.0	21.7 to 36.1	31.4	3.2	23.1

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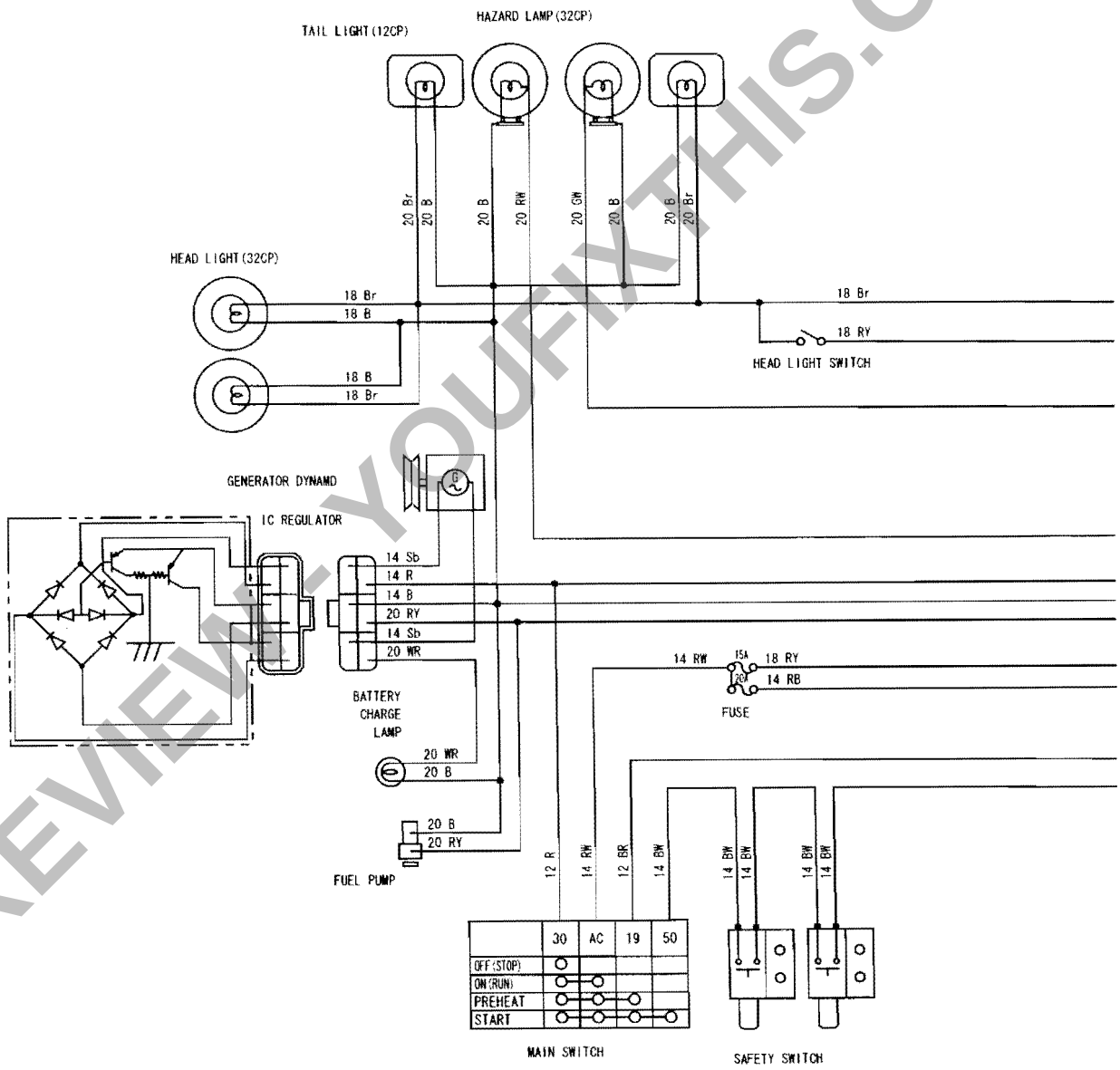
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[1] WIRING DIAGRAM

- **Color of Wiring**

W ---------- White	WR ---------- White / Red	BW ---------- Black / White
R ---------- Red	WY ---------- White / Yellow	BR ---------- Black / Red
L ---------- Blue	RB ---------- Red / Black	GW ---------- Green / White
P ---------- Pink	RW ---------- Red / White	YR ---------- Yellow / Red
B ---------- Black	RG ---------- Red / Green	YL ---------- Yellow / Blue
Br ---------- Brown	RY ---------- Red / Yellow	LW ---------- Blue / White
Sb ---------- Sky Blue		

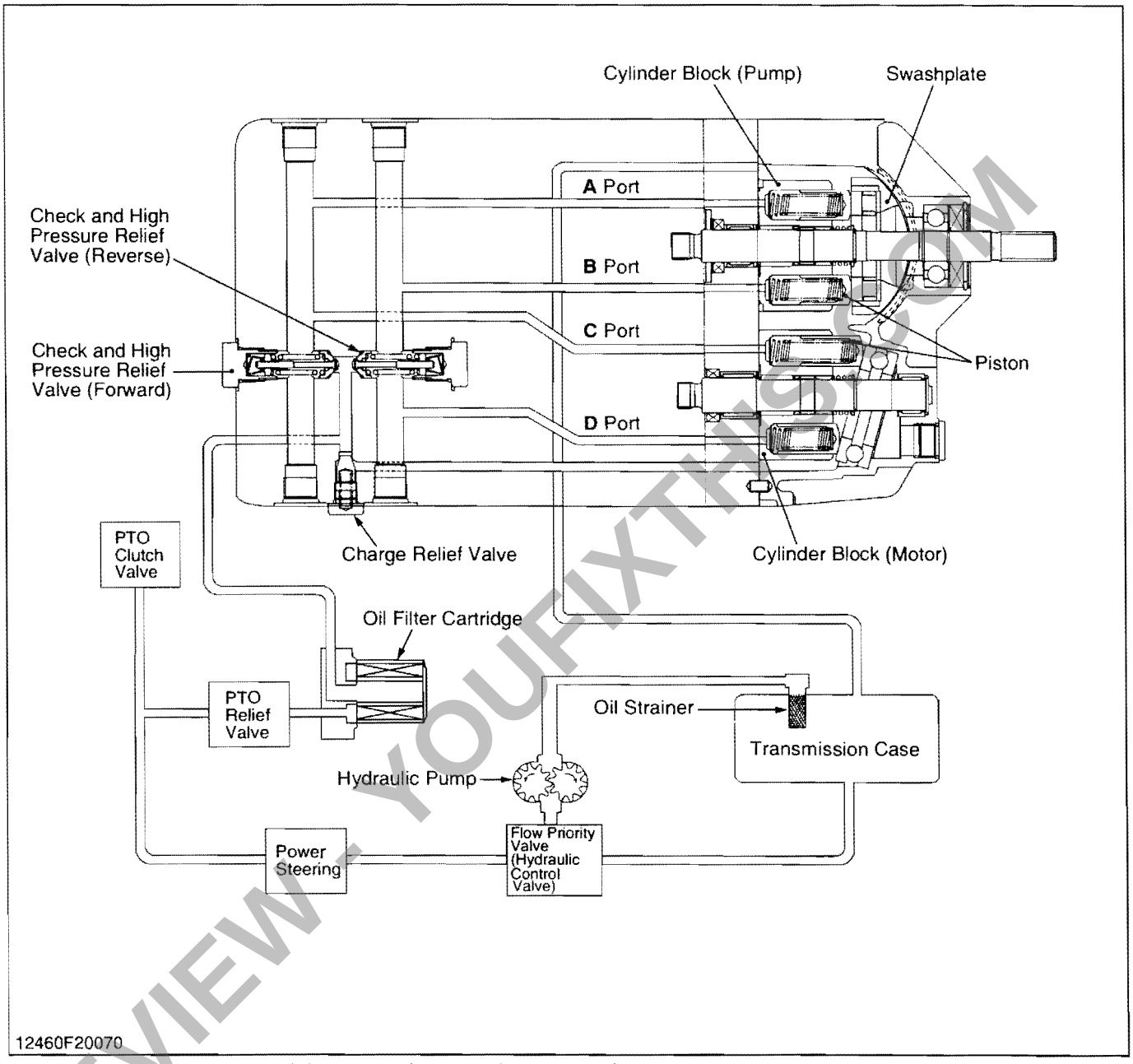


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(5) Oil Flow



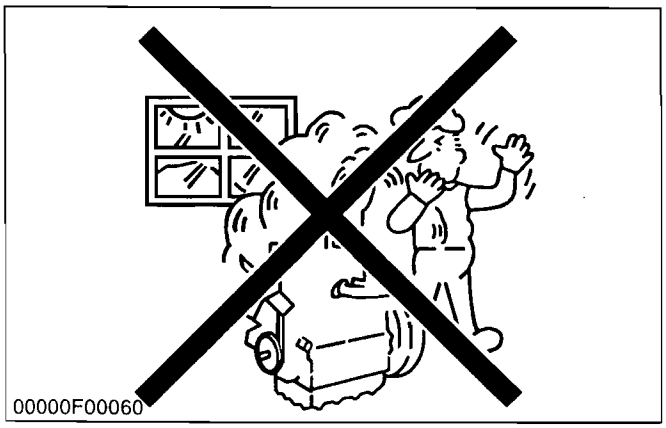
The pump and motor are joined in a closed hydraulic loop and most of oil circulates within the main oil circuit. A little oil lubricates and oozes out from the clearance between the moving parts of the case. Then oil in the main oil circuit of the HST needs to be supplied a want.

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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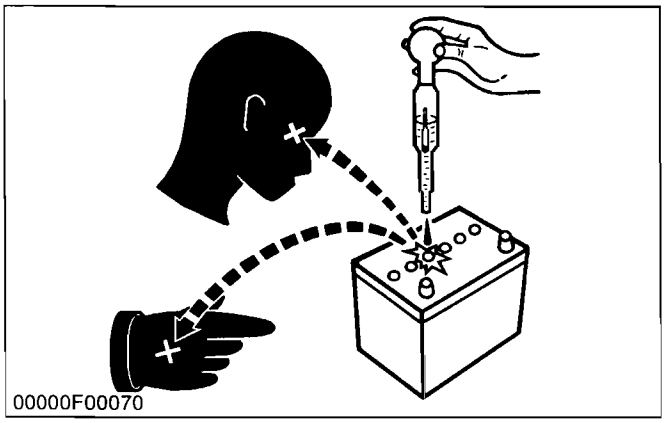
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VENTILATE WORK AREA

(1) If the engine must be running to do some work, make sure the area is well ventilated. Never run the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

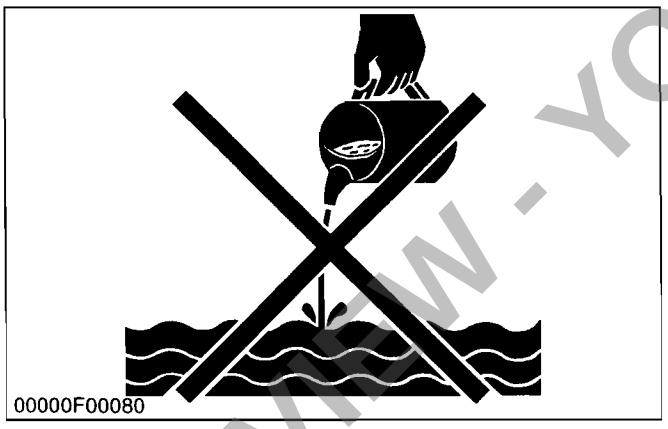
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PREVENT ACID BURNS

(1) Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, clothing and cause blindness if splashed into eyes. Keep electrolyte away from eyes, hands and clothing. If you spill electrolyte on yourself, flush with water, and get medical attention immediately.

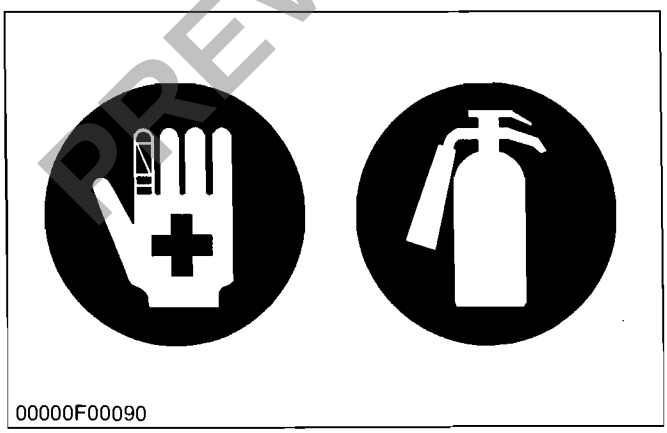
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DISPOSE OF FLUIDS PROPERLY

(1) Do not pour fluids into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, electrolyte and other harmful waste.

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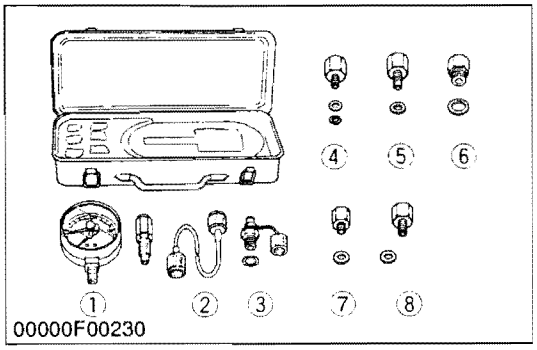
PREPARE FOR EMERGENCIES

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

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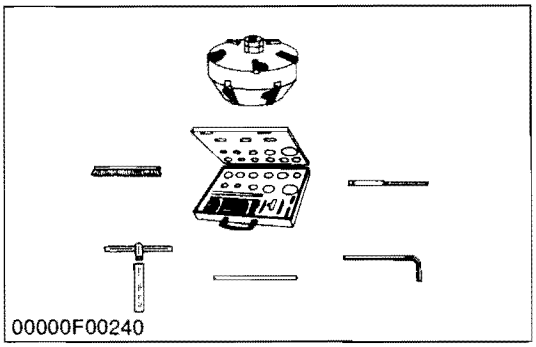
Oil Pressure Tester

Code No : 07916-32032

Application : Use to measure lubricating oil pressure.

(1) Gauge
(2) Cable
(3) Threaded Joint
(4) Adaptor 1
(5) Adaptor **2**
(6) Adaptor **3**
(7) Adaptor 4
(8) Adaptor **5**

00000G00080



Valve Seat Cutter

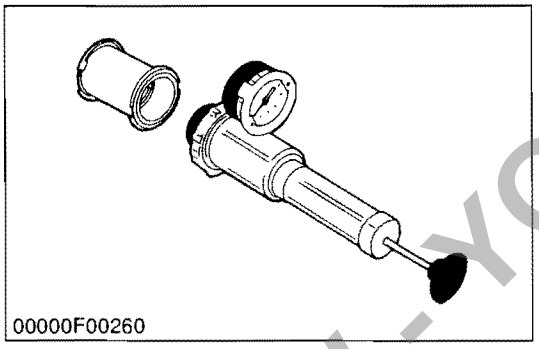
Code No : 07909-33102

Application : Use to reseat valves.

Angle : 0.785 rad. (45°)
0.262 rad. (15°)

Diameter : 28.6 mm (1.126 in.)
31.6 mm (1.244 in.)
35.0 mm (1.378 in.)
38.0 mm (1.496 in.)
41.3 mm (1.626 in.)
50.8 mm (2.000 in.)

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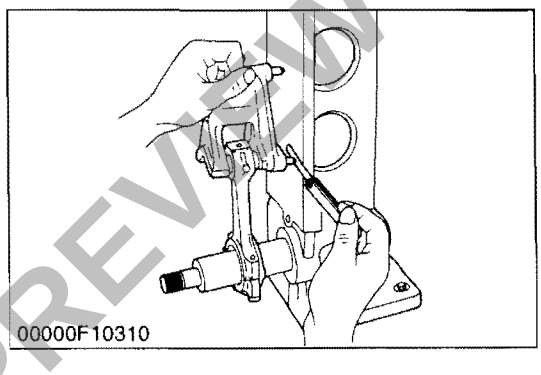


Radiator Tester

Code No : 07909-31551

Application : Use to check of radiator cap pressure, and leaks from cooling system.

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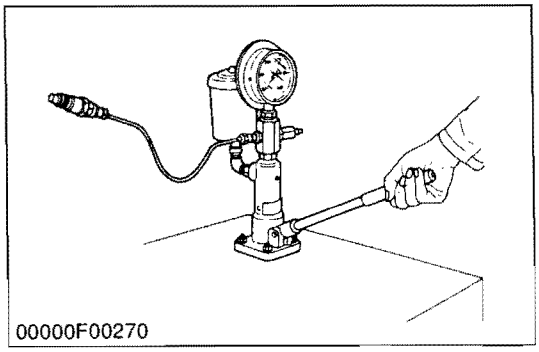
Connecting Rod Alignment Tool

Code No : 07909-31661

Application : Use to check the connecting rod alignment.

Applicable range : Connecting rod big end I.D.
30 to 75 mm (1.18 to 2.95 in.) dia.
Connecting rod length
65 to 300 mm (2.56 to 11.81 in.)

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Nozzle Tester

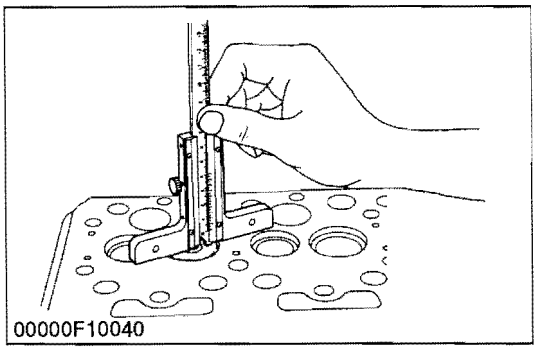
Code No : 07909-31361

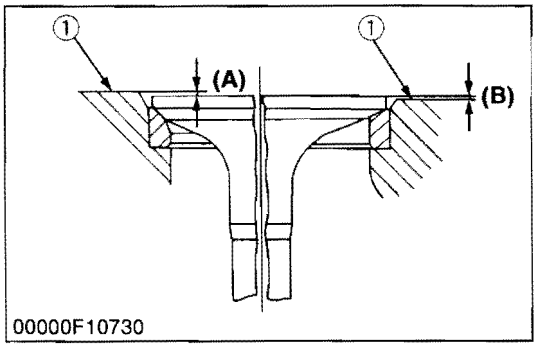
Application : Use to check the fuel injection pressure and spray pattern of nozzle.

Measuring range : 0 to 50 MPa
(0 to 500 kgf/cm^2, 0 to 7000 psi)

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Valve Recessing

1. Clean the cylinder head surface, valve face and valve seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
5. If it still exceeds the allowable limit after replacing the valve, correct the valve seat face of the cylinder head with a valve seat cutter (Code No. 07909-33102) or valve seat grinder.
6. Then, correct the cylinder head surface with a surface grinder, or replace the cylinder head.

[D722]

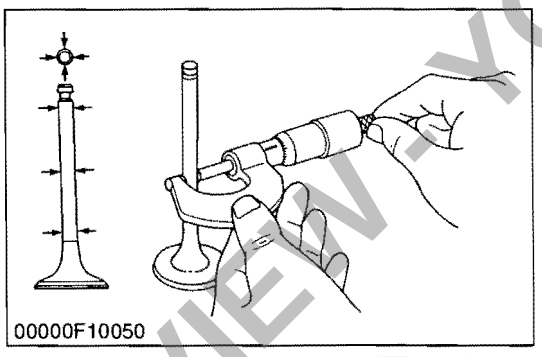
Valve recessing	Factory spec.	0.10 (protrusion) to 0.10 (recessing) mm 0.0039 (protrusion) to 0.0039 (recessing) in.
	Allowable limit	0.30 (recessing) mm 0.0118 (recessing) in.

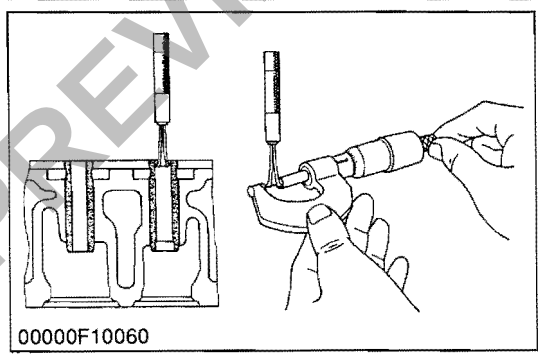
[D905]

Valve recessing	Factory spec.	0.05 (protrusion) to 0.15 (recessing) mm 0.0020 (protrusion) to 0.0059 (recessing) in.
	Allowable limit	0.40 (recessing) mm 0.0157 (recessing) in.

(1) Cylinder Head Surface
(A) Recessing
(B) Protrusion

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00000F10050


00000F10060

Clearance between Valve Stem and Valve Guide

1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. with a small hole gauge, and calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

[D722]

Clearance between valve stem and valve guide	Factory spec.	0.030 to 0.057 mm 0.00118 to 0.00224 in.
	Allowable limit	0.10 mm 0.0039 in.
Valve stem O.D.	Factory spec.	5.968 to 5.980 mm 0.23496 to 0.23543 in.
Valve guide I.D.	Factory spec.	6.010 to 6.025 mm 0.23661 to 0.23720 in.

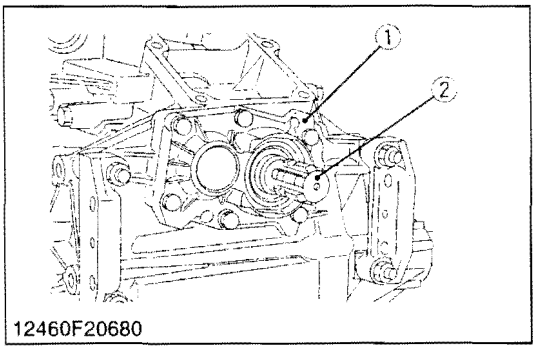
[D905]

Clearance between valve stem and valve guide	Factory spec.	0.035 to 0.065 mm 0.00138 to 0.00256 in.
	Allowable limit	0.10 mm 0.0039 in.
Valve stem O.D.	Factory spec.	6.960 to 6.975 mm 0.27402 to 0.27461 in.
Valve guide I.D.	Factory spec.	7.010 to 7.025 mm 0.27599 to 0.27657 in.

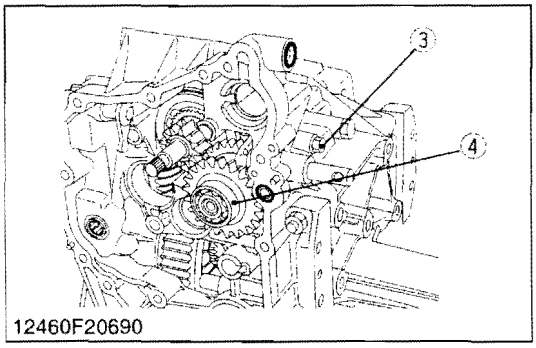
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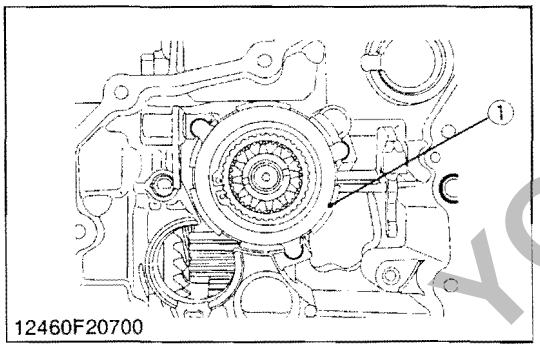
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12460F20680



12460F20690



12460F20700

Rear Cover, Rear PTO Shaft and Rear PTO Drive Shaft

1. Remove the rear cover (1) and rear PTO shaft assembly (2).
2. Remove the PTO select bolt (3) and draw out the spring and steel ball.
3. Remove the rear PTO drive shaft assembly (4).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D or equivalent) to joint face of the transmission case to rear cover.
- Apply grease to the lip of oil seal.

Tightening torque	Rear cover mounting screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 ft-lbs
	PTO select bolt	21.6 to 25.5 N·m 2.2 to 2.6 kgf·m 15.9 to 18.8 ft-lbs

(1) Rear Cover
(2) Rear PTO Shaft Assembly
(3) PTO Select Bolt
(4) Rear PTO Drive Shaft Assembly

12460S20480

PTO Clutch Assembly

1. Remove PTO clutch assembly (1) from transmission case.

(When reassembling)

- Apply transmission oil to the seal ring on the clutch shaft.

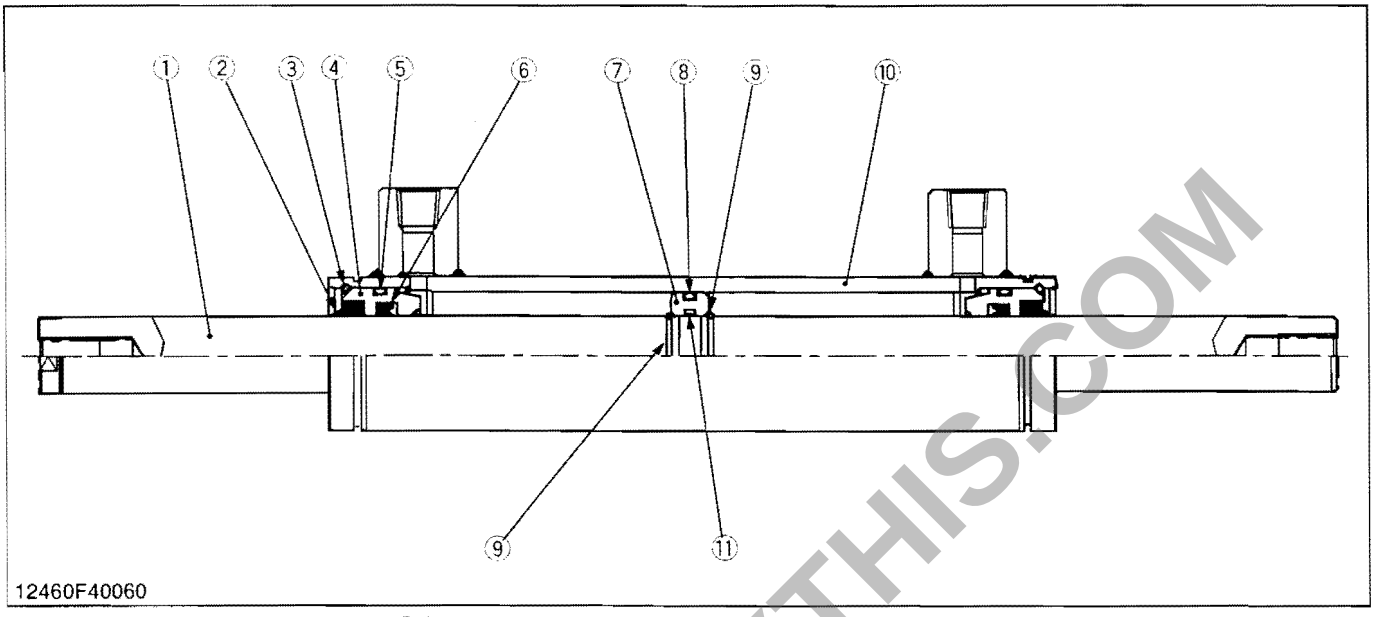
(1) PTO Clutch Assembly

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[3] STEERING CYLINDER



12460F40060

(1) Rod
(2) Wiper Ring
(3) Internal Snap Ring
(4) Guide
(5) O-ring
(6) Seal Ring
(7) Center Piston
(8) Piston O-ring
(9) External Snap Ring
(10) Cylinder Tube
(11) Rod O-ring

The steering cylinder is single piston both rod double-acting type. This steering cylinder is installed parallel to the front axle and connected to tie-rods.

The tie-rods connected to both knuckle arm guarantees equal steering movement to both front wheels.

The steering cylinder provide force in both directions. Depending upon direction the steering wheel is turned pressure oil enters at one end of the cylinder to extend, or the other end to retract it, thereby turning front wheel of the tractor.

12460M40030

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