WSM

WORKSHOP MANUAL
DIESEL ENGINE

V3300-E2B,V3300-T-E2B

Kubota

KiSC issued 06, 2006 A

TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the mechanism, service and maintenance of V3300-E2B, V3300-T-E2B. It is divided into three parts, “General”, “Mechanism” and “Servicing”.

■ **General**

Information on the engine identification, the general precautions, maintenance check list, check and maintenance and special tools are described.

■ **Mechanism**

Information on the construction and function are included. This part should be understood before proceeding with troubleshooting, disassembling and servicing.

Refer to Diesel Engine Mechanism Workshop Manual (Code No. 9Y021-01870) for the one which has not been described to this workshop manual.

■ **Servicing**

Information on the troubleshooting, servicing specification lists, tightening torque, checking and adjusting, disassembling and assembling, and servicing which cover procedures, precautions, factory specifications and allowable limits.

All information illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

The right is reserved to make changes in all information at any time without notice.

Due to covering many models of this manual, information or picture being used have not been specified as one model.

March 2004

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SPECIFICATIONS

Model	V3300-E2B	V3300-T-E2B
Number of Cylinder	4	
Type	Vertical, water-cooled, 4-cycle diesel engine	
Bore × Stroke	98 × 110 mm (3.86 × 4.33 in.)	
Total Displacement	3318 cm^3 (202.48 cu.in.)	
ISO Net Continuous	44.1 kW / 2600 min^{-1} (rpm) (59.1 HP / 2600 min^{-1} (rpm))	53.8 kW / 2600 min^{-1} (rpm) (72.1 HP / 2600 min^{-1} (rpm))
ISO / SAE Net Intermittent	50.7 kW / 2600 min^{-1} (rpm) (68.0 HP / 2600 min^{-1} (rpm))	61.9 kW / 2600 min^{-1} (rpm) (83.0 HP / 2600 min^{-1} (rpm))
SAE Gross Intermittent	54.5 kW / 2600 min^{-1} (rpm) (73.0 HP / 2600 min^{-1} (rpm))	65.2 kW / 2600 min^{-1} (rpm) (87.4 HP / 2600 min^{-1} (rpm))
DIN6271-NA	44.6 kW / 2600 min^{-1} (rpm) (59.8 ps / 2600 min^{-1} (rpm))	53.8 kW / 2600 min^{-1} (rpm) (73.1 ps / 2600 min^{-1} (rpm))
DIN6271-NB	48.9 kW / 2600 min^{-1} (rpm) (66.5 ps / 2600 min^{-1} (rpm))	59.7 kW / 2600 min^{-1} (rpm) (81.2 ps / 2600 min^{-1} (rpm))
DIN70020	52.7 kW / 2600 min^{-1} (rpm) (71.7 ps / 2600 min^{-1} (rpm))	64.4 kW / 2600 min^{-1} (rpm) (87.6 ps / 2600 min^{-1} (rpm))
Maximum Bare Speed	2800 min^{-1} (rpm)	
Minimum Bare Idling Speed	700 to 750 min^{-1} (rpm)	
Combustion Chamber	Spherical Type (E-TVCS)	
Fuel Injection Pump	Bosch Type Mini Pump	
Governor	All speed mechanical governor	
Direction of Rotation	Counter-clockwise (Viewed from flywheel side)	
Injection Nozzle	BOSCH Throttle-Type	
Injection Timing	0.21 rad. (12 °) before T.D.C.	0.12 rad. (7 °) before T.D.C.
Firing Order	1-3-4-2	
Injection Pressure	13.73 MPa (140 kgf/cm^2, 1991 psi)	
Compression Ratio	22.6	21.8
Lubricating System	Forced lubrication by trochoid pump	
Oil Pressure Indicating	Electrical Type Switch	
Lubricating Filter	Full Flow Paper Filter (Cartridge Type)	
Cooling System	Pressurized radiator, forced circulation with water pump	
Starting System	Electric Starting with Starter	
Starting Motor	12 V, 2.5 kW	
Starting Support Device	By Glow Plug in Combustion Chamber	
Battery	12 V, 112 AH equivalent	
Charging Alternator	12 V, 540 W	
Fuel	Diesel Fuel No. 2-D (ASTM D975)	
Lubricating Oil	Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page G-5, 11.	
Lubricating Oil Capacity	13.2 L (3.49 U.S.gals)	
Weight (Dry)	241 kg (531 lbs)	250 kg (551 lbs)

* The specification described above is of the standard engine of each model.
* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

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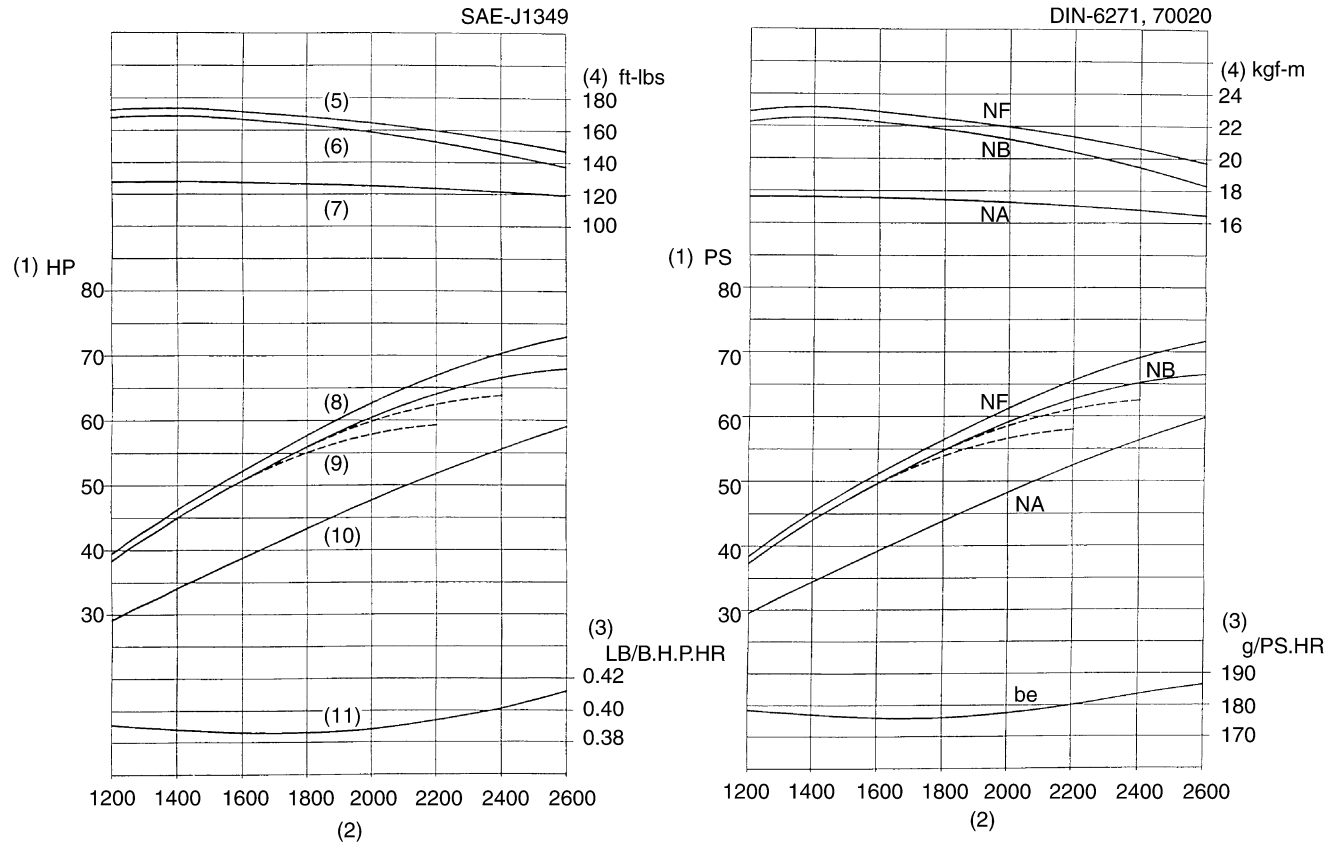
PERFORMANCE CURVES

V3300-E2B



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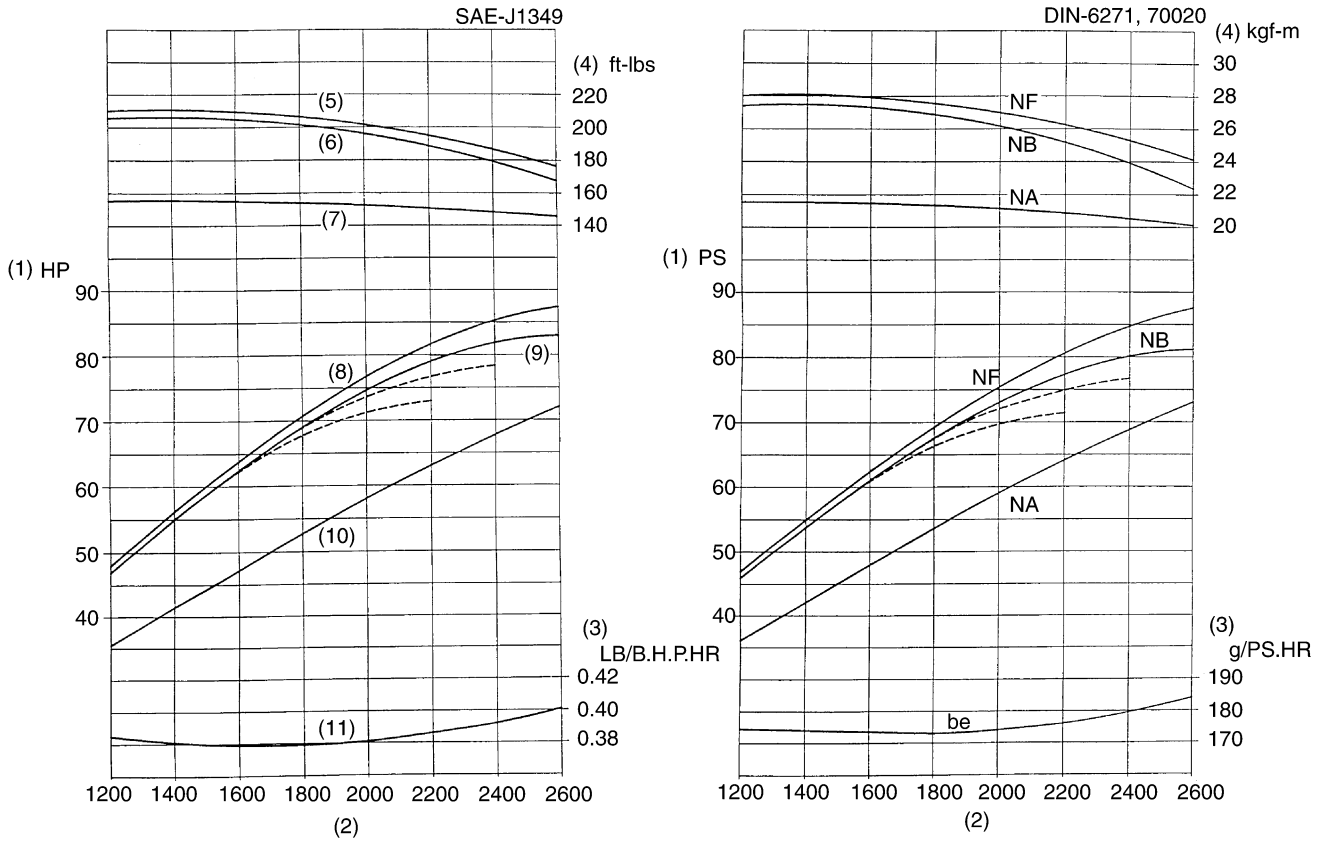
(1) Brake Horsepower
(2) Engine Speed
(3) B.S.F.C.
(4) Torque
(5) Gross Intermittent Torque
(6) Net Intermittent Torque
(7) Net Continuous Torque
(8) Gross Intermittent B.H.P.
(9) Net Intermittent B.H.P.
(10) Net Continuous B.H.P.
(11) B.S.F.C. (Net Intermittent)

V3300-T-E2B



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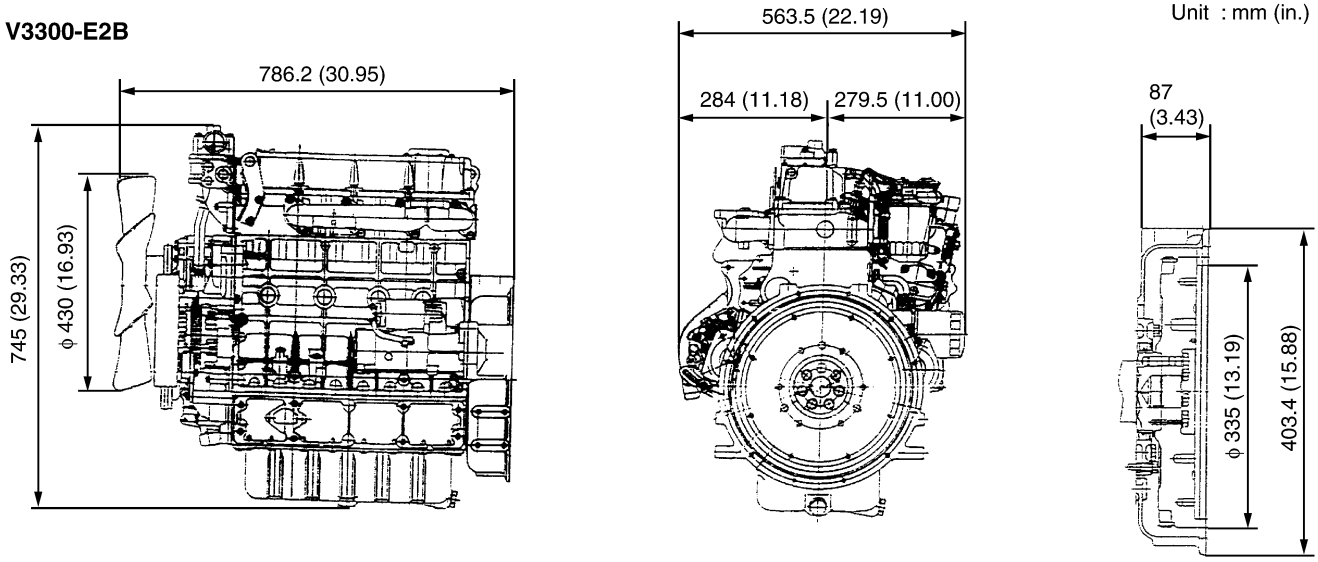
(10) Net Continuous B.H.P.
(11) B.S.F.C. (Net Intermittent)

DIMENSIONS

Unit : mm (in.)

V3300-E2B



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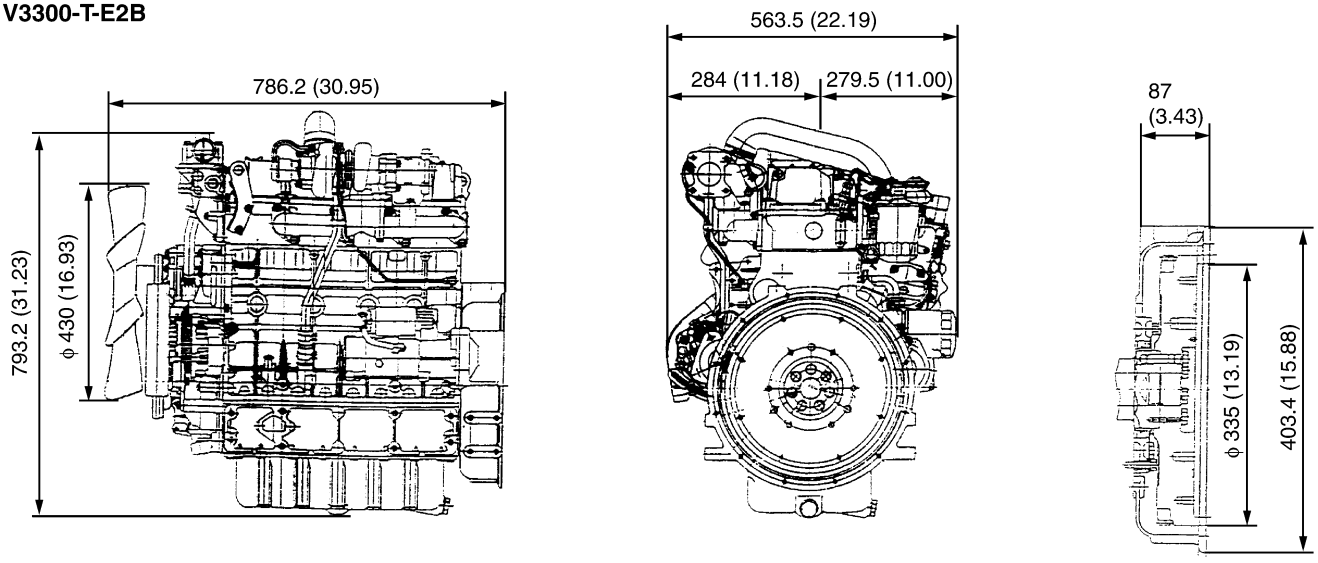

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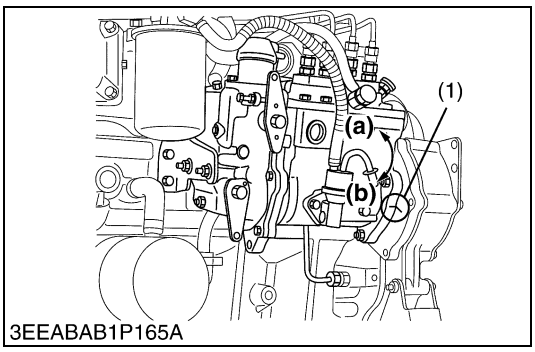
GENERAL

CONTENTS



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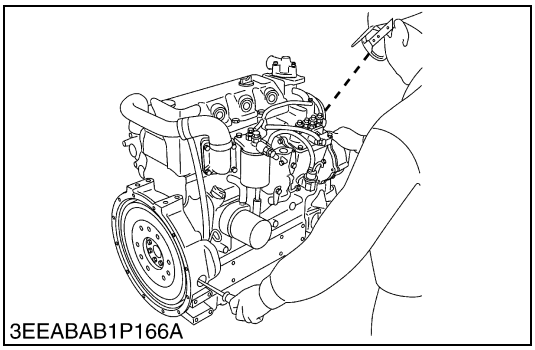
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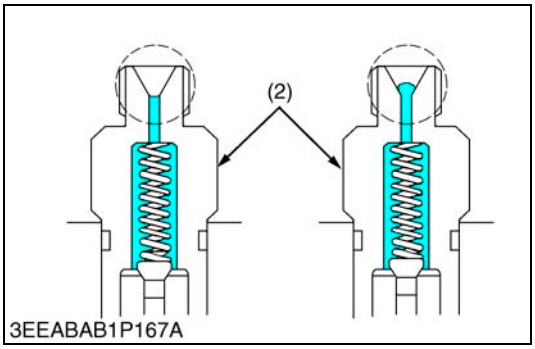

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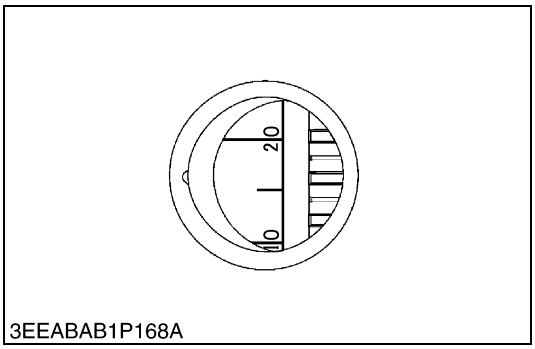

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Injection Timing

1. Make sure of matching the injection timing align mark (1) of the injection pump unit and the plate (gearcase), as shown in the illustration.
2. Remove the injection pipes.
3. Remove the stop solenoid.
4. Turn the flywheel counterclockwise (viewed from flywheel side) until the fuel fills up to the hole of the delivery valve holder (2) for No.1 cylinder.
5. After the fuel fills up to the hole of the delivery valve holder for No.1 cylinder, turn back (clockwise) the flywheel around 1.57 rad (90 °).
6. Turn the flywheel counterclockwise to set at around 0.35 rad (20 °) before T.D.C..
7. Slowly turn the flywheel counterclockwise and stop turning when the fuel begins to come up, to get the present injection timing.
8. Check to see the degree on flywheel.
   The flywheel has mark “1TC”, “10” and “20” for the crank angle before the top dead center of No.1 piston.
9. If the injection timing is not within the specification, rotate the injection pump unit to adjust the injection timing.

■ **IMPORTANT**

- **When installing the injection pump unit to the engine body, follow the correct procedure.**
  See the “Injection Pump Unit”.

Injection timing	Factory spec.	V3300-E2B	0.19 to 0.23 rad (11 ° to 13 °) before T.D.C.
		V3300-T-E2B	0.11 to 0.14 rad (6 ° to 8 °) before T.D.C.

Tightening torque	Injection pipe retaining nut	22.6 to 36.3 N·m 2.3 to 3.7 kgf·m 16.6 to 26.8 ft-lbs
	Injection pump unit mounting nut	17.7 to 20.6 N·m 1.8 to 2.1 kgf·m 13.0 to 15.2 ft-lbs

(1) Injection Timing Align Mark
(2) Delivery Valve Holder
(a) Injection Timing Advanced
(b) Injection Timing Retarded

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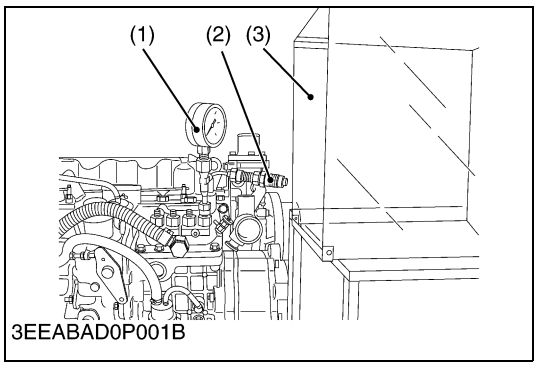

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Checking Injection Pump

(Fuel Tightness of Pump Element)

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Install the injection pump pressure tester to the injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1). (Refer to the figure.)
5. Set the speed control lever to the maximum speed position.
6. Run the starter to increase the pressure.
7. If the pressure can not reach the allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

(Fuel Tightness of Delivery Valve)

1. Remove the engine stop solenoid.
2. Remove the injection pipes and glow plugs.
3. Set a pressure tester to the fuel injection pump.
4. Install the injection nozzle (2) jetted with the proper injection pressure to the injection pump pressure tester (1).
5. Run the starter to increase the pressure.
6. Stop the starter when the fuel jets from the injection nozzle. After that, turn the flywheel by the hand and raise the pressure to approx. 13.73 MPa (140 kgf/cm^2, 1991 psi).
7. Now turn the flywheel back about half a turn (to keep the plunger free). Maintain the flywheel at this position and clock the time taken for the pressure to drop from 13.73 to 12.75 MPa (from 140 to 130 kgf/cm^2, from 1991 to 1849 psi).
8. Measure the time needed to decrease the pressure from 13.73 to 12.75 MPa (140 to 130 kgf/cm^2, 1991 to 1849 psi).
9. If the measurement is less than allowable limit, replace the pump with new one or repair with a Kubota-authorized pump service shop.

Fuel tightness of pump element	Allowable limit	13.73 MPa 140 kgf/cm^2 1991 psi
Fuel tightness of delivery valve	Factory spec.	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi
	Allowable limit	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm^2 1991 → 1849 psi

■ **NOTE**

- **Never try to disassemble the injection pump assembly. For repairs, you are strongly requested to contact a Kubota-authorized pump service shop.**

(1) Injection Pump Pressure Tester
(2) Injection Nozzle
(3) Protection Cover for Jetted Fuel

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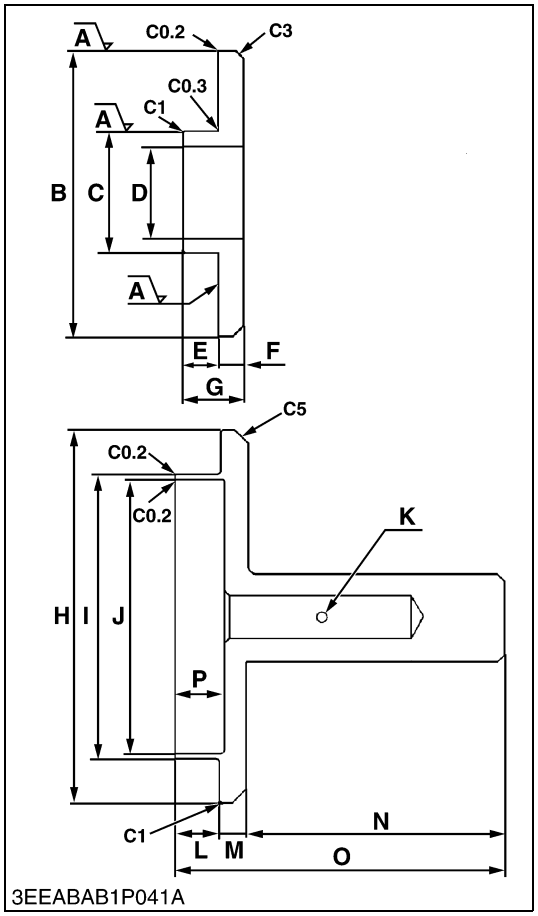

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Auxiliary Socket for Fixing Crankshaft Sleeve

Application: Use to fix the crankshaft sleeve of the diesel engine.

A	Rmax = 12.5 S
B	94.5 to 95.0 mm dia. (3.7205 to 3.7402 in. dia.)
C	40 mm dia. (1.5748 in. dia.)
D	30 mm dia. (1.1811 in. dia.)
E	12 mm (0.4724 in.)
F	7.9 to 8.1 mm (0.3110 to 0.3189 in.)
G	20 mm (0.7874 in.)
H	130 mm dia. (5.1181 in. dia.)
I	99.4 to 99.6 mm dia. (3.9134 to 3.9213 in. dia.)
J	95.05 to 95.20 mm dia. (3.7421 to 3.7480 in. dia.)
K	3 mm dia. (0.1181 in.dia.)
L	15 mm (0.5905 in.)
M	10 mm (0.3937 in.)
N	90 mm (3.5433 in.)
O	115 mm (4.5275 in.)
P	16.9 to 17.1 mm (0.6654 to 0.6732 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C3	Chamfer 3.0 mm (0.1181 in.)
C5	Chamfer 5.0 mm (0.1969 in.)
C0.2	Chamfer 0.2 mm (0.0079 in.)
C0.3	Chamfer 0.3 mm (0.0118 in.)

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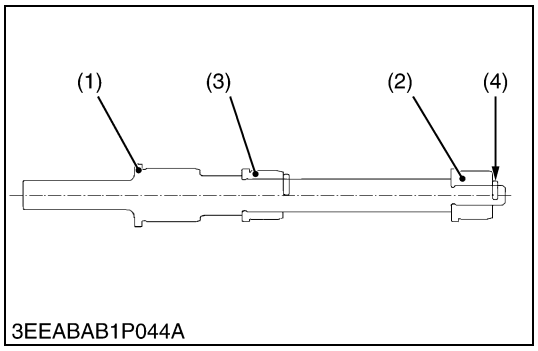

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Balancer Bushing Replacing Tool 1 Assembly

Application: Use to press fit the bushing.

No.	Name of Part	Q'ty.	Remarks
(1)	Shaft	1	
(2)	Piece 1	1	
(3)	Piece 2	1	
(4)	Bolt	2	M6 × P1.0

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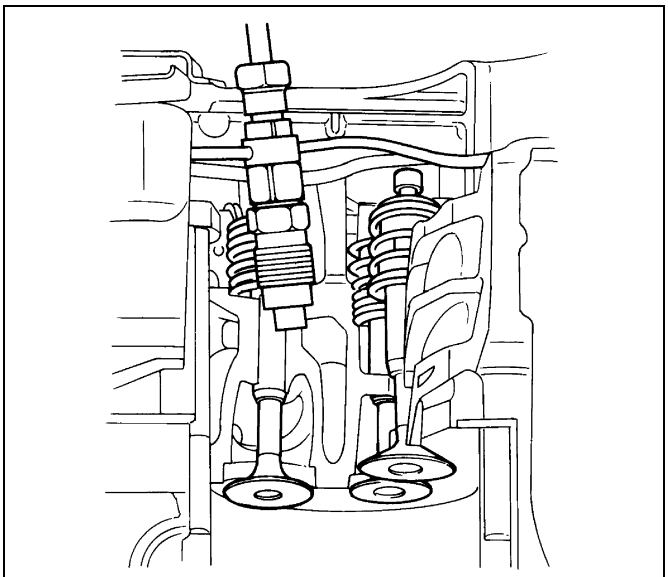
[3] CYLINDER HEAD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This engine employs three valve system - two inlet valves and double ports, and one exhaust valve which produce good inlet inertia to improve combustion efficiency and volumetric efficiency. It also employs Kubota's unique combustion chamber with multiple injection grooves.

Besides the conventional cross port system, it employs the forced cooling method between valves to eliminate heat distortion, thus enabling durable and reliable configuration.

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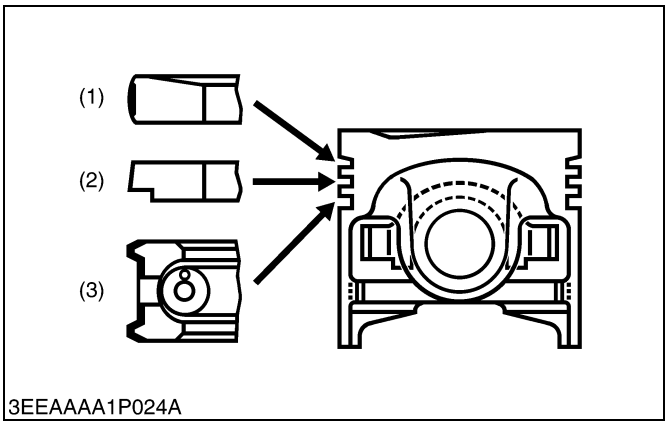
[4] PISTON AND PISTON RINGS



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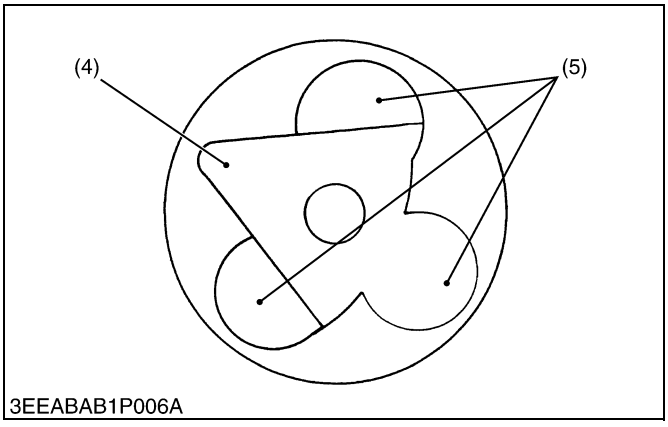

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This engine employs the E-TVCS VERSION-II so that the improved combustion surface at the top of piston enables more complete combustion efficiency than the conventional models.

The profile and the offset of piston are optimized to reduce slapping noises. The oil jet at the small end of the connecting rod reduces heat load of the piston.

Three rings are installed in grooves in the piston. The top ring (1) is made of nitrizing steel to get more reliability than the chrome plated ring. It is a keystone type ring to get durability against heavy load. At the sliding part, a special piston ring which is conformable to the cylinder wall is employed. The second ring is chromeplated on the peripheral surface and it is an undercut ring to prevent shortage of oil.

The oil ring (3) has chamfered contact faces and an expander ring, which increase the pressure of the oil ring against the cylinder wall.

Several grooves are cut on the topland to help heat dissipate and to prevent scuffing.

(1) Top Ring
(2) Second Ring
(3) Oil Ring
(4) Depression
(5) Valve Recess

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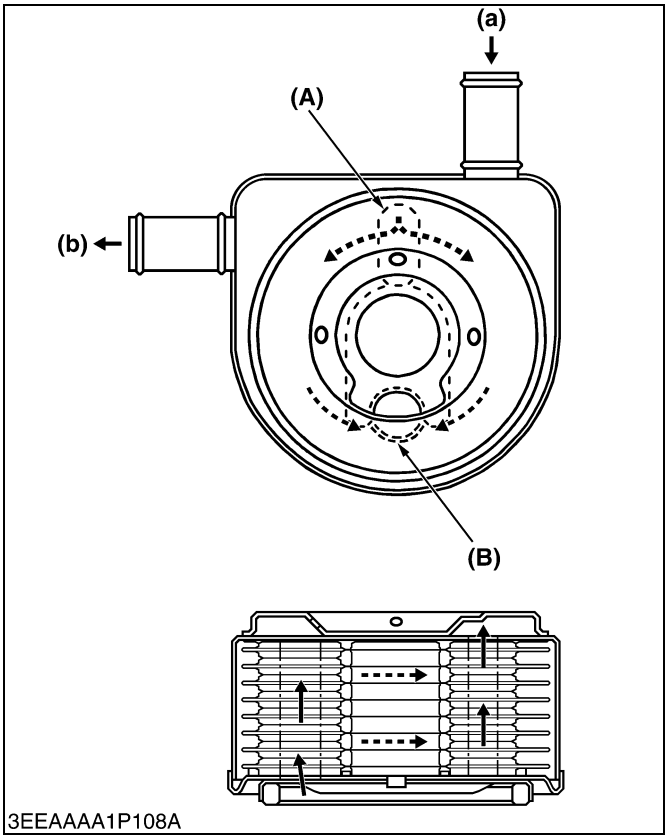
3. LUBRICATING SYSTEM

[1] OIL COOLER



V3 series engine has a water-cooled oil cooler that not only cools hot oil, but also warms the cool engine oil shoftly after start up.

As shown in the figure, the oil flows inside the connected cooler plate, whereas coolant is kept circulating outside the cooler plate, thereby cooling down or warming the oil.

(A) Oil Inlet Port
(B) Oil Outlet Port
(a) Coolant Inlet Port
(b) Coolant Outlet Port

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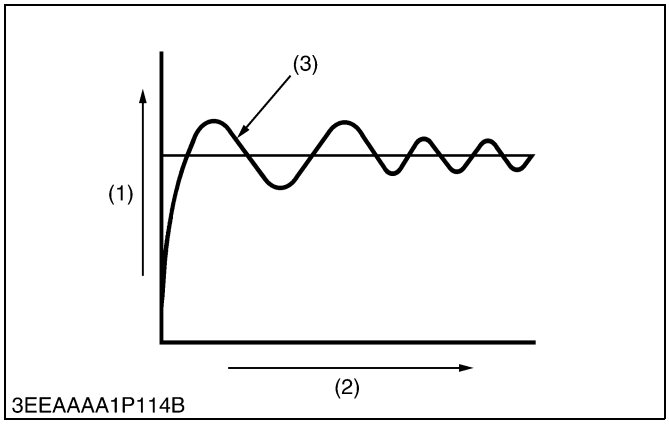
4. COOLING SYSTEM

[1] THERMOSTAT



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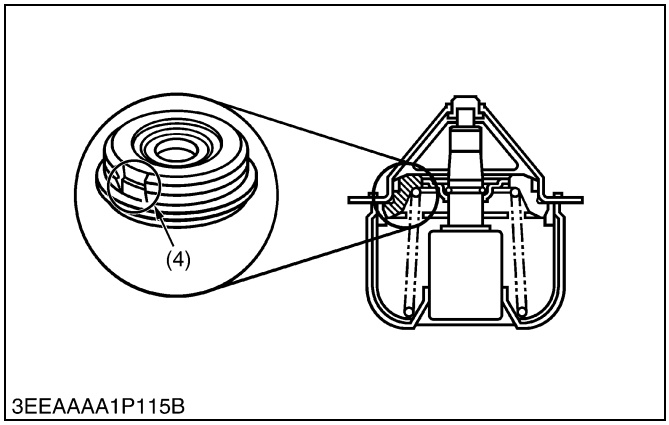

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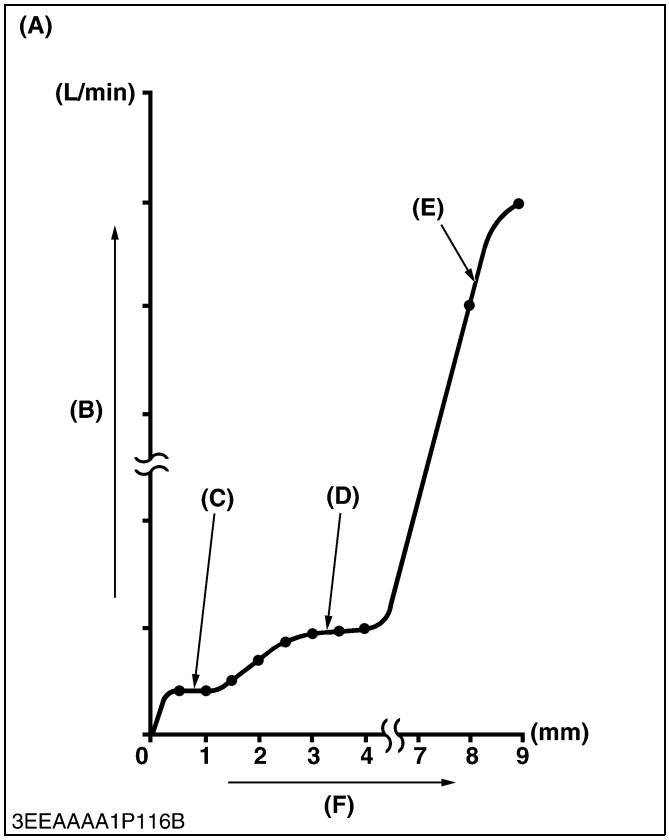

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Conventional thermostatically-controlled valves (outlet water temperature control type) open against the flow of coolant. In this design, the pressure (steam pressure + water pump's discharge pressure) affects the open/close performance of such valve. In other words, the valve may be delayed in opening at a preset opening temperature opening suddenly, above the preset temperature. This is called the overshoot phenomenon.

The overshoot problem invites the undershoot phenomenon too. Too much water cooled by the radiator flows through the water passage, which suddenly closes the valve below the thermostat's preset valve closing temperature.

A repeated cycle of such overshoot and undershoot phenomena is called the water temperature hunting. This hunting problem may adversely affects the cooling system parts, and also the engine and its related components.

To cope with this trouble, the V3 series engine is equipped with the flow control thermostat. The valve has a notch to control the coolant flowrate smoothly in small steps.

(1) Coolant Temperature
(2) Time
(3) Overshoot
(4) Notch

(A) Valve Lift Versus Flowrate
(B) Flowrate
(C) At Short Valve Lift
(D) At Medium Valve Lift
(E) At High Valve Lift
(F) Valve Lift

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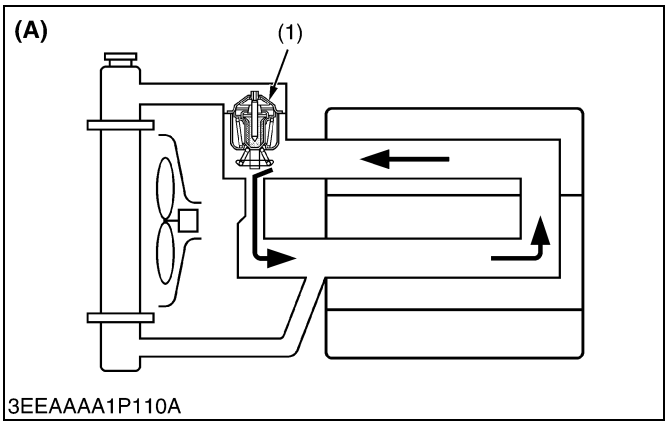
[2] BOTTOM BYPASS SYSTEM



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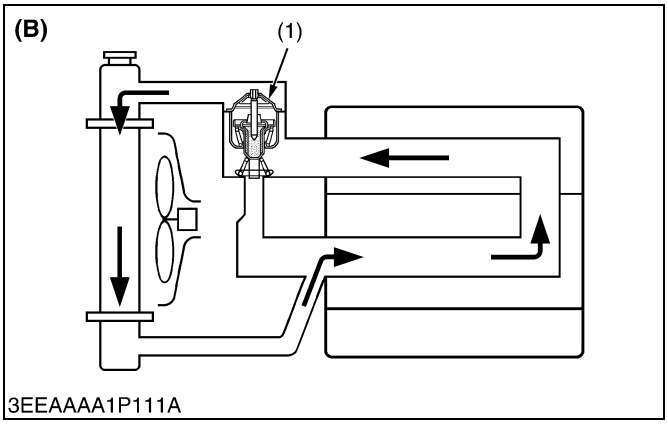

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Bottom bypass system is introduced in V3 series for improving the cooling performance of the radiator.

While the temperature of coolant in the engine is low, the thermostat is held closed and the coolant is allowed to flow through the bypass pipe and to circulate in the engine.

When the temperature exceeds the thermostat valve opening level, the thermostat fully opens itself to prevent the hot coolant from flowing through the bypass into the engine.

In this way, the radiator can increase its cooling performance.

(1) Thermostat

(A) Bypass Opened
(B) Bypass Closed

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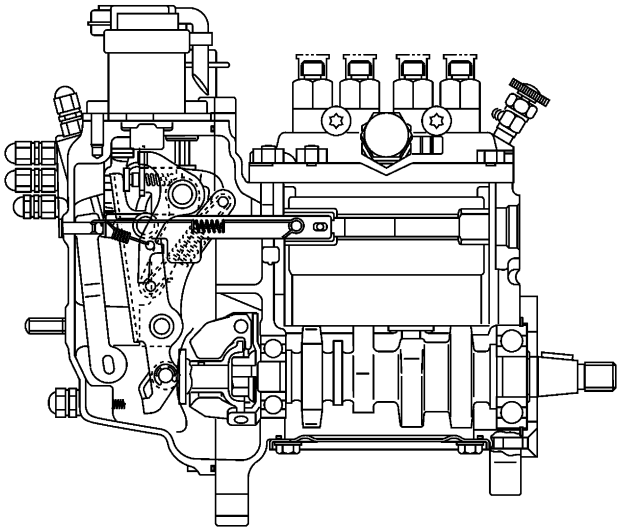
5. FUEL SYSTEM

[1] GOVERNOR



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The engine employs the separated fuel injection pump in combination with Kubota's own small multi-function mechanical governor, which enable more dependability.

It also employs the torque limiting mechanism to control the maximum peak torque so that it complies with the regulations of exhaust gas.

This mechanism maintains engine speed at a constant level even under fluctuating loads, provides stable idling and regulates maximum engine speed by controlling the fuel injection rate.

This engine uses a mechanical governor that controls the fuel injection rate at all speed ranges (from idling to maximum speed) by utilizing the balance between the flyweight's centrifugal force and spring tension.

A governor shaft for monitoring engine speed is independent of the injection pump shaft and rotates at twice the speed of conventional types, providing better response to load fluctuation and delivering greater engine output.

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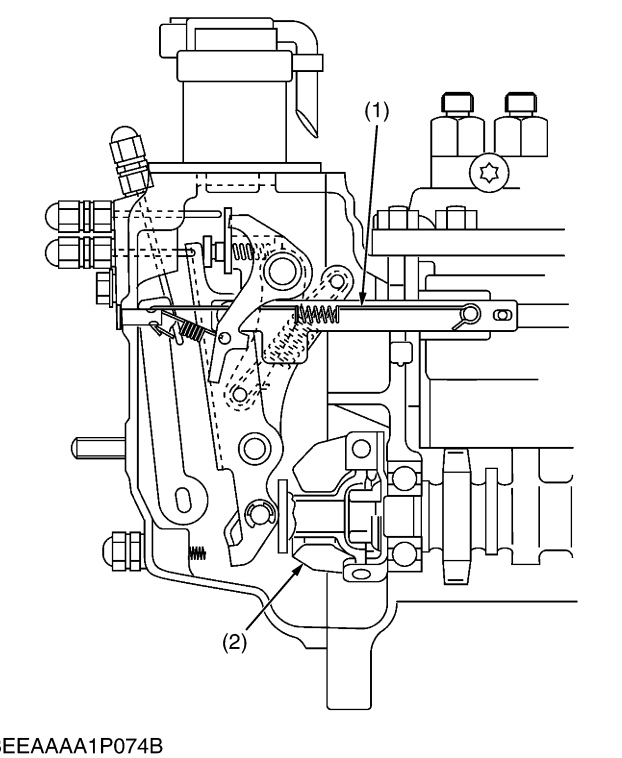

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■ **At Start**

The stop solenoid (energized-to-run type) is powered to release the stop lever.

As no centrifugal force is applied to flyweight (2), low tension of start spring (1) permits control rack to move the starting position, supplying the amount of fuel required to start the engine.

(1) Start Spring (2) Flyweight

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