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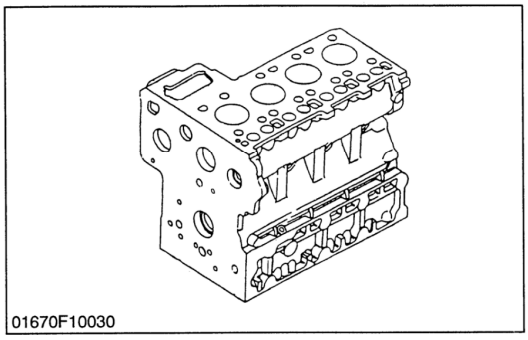
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1 ENGINE BODY

[1] CYLINDER BLOCK


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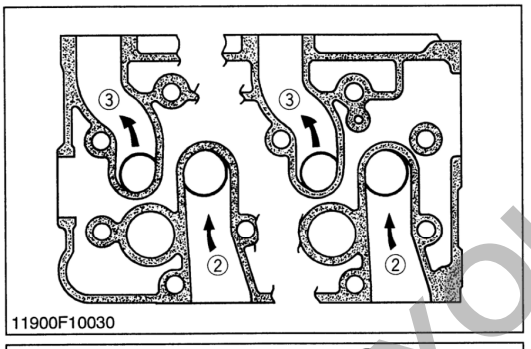
The engine has a high durability tunnel-type cylinder block in which the crank bearing component is a constructed body.

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

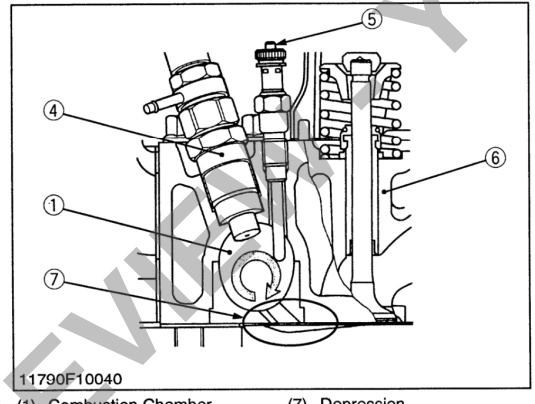
The noise level is reduced to a minimum because each cylinder has its own chamber.

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[2] CYLINDER HEAD



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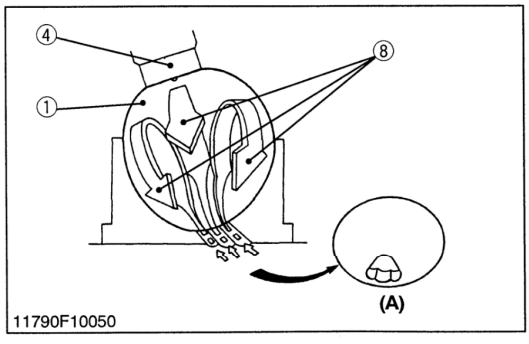
(1) Combustion Chamber
(2) Intake Port
(3) Exhaust Port
(4) Nozzle Assembly
(5) Glow Plug
(6) Cylinder Head
(7) Depression
(8) Compressed Air

(A) Connect to Combustion Chamber

The cross-flow type intake / exhaust ports in this engine have their openings at both sides of the cylinder head. Because overlaps of intake / exhaust ports are smaller than in ports of other types which have openings on one side, the suction air can be protected from being heated and expanded by heated exhaust air. The cool, high density suction air has high volume efficiency and raises the power of the engine. Furthermore, distortion of the cylinder head by heated exhaust gas is reduced because intake ports are arranged alternately.

The combustion chamber is of KUBOTA's exclusive E-TVCS combustion chamber type. Suction air is whirled to be mixed effectively with fuel, prompting combustion and reducing fuel consumption.

In the combustion chamber are installed throttle type injection nozzle and rapid heating sheathed type glow plug. This glow plug assures easier than ever engine starts even at –15 °C (5 °F).



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⚠ SAFETY FIRST

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

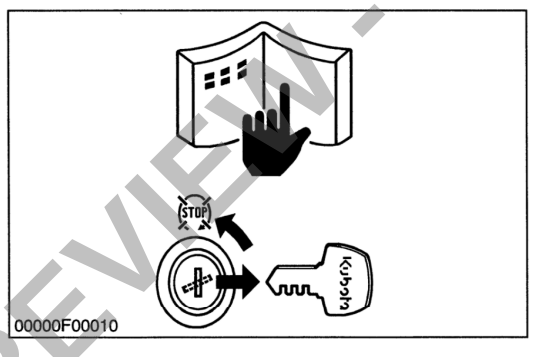
⚠ **WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ **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 engine safety decals.
(2) Clean the work area and engine.
(3) Place the engine on a firm and level ground.
(4) allow the engine to cool before proceeding.
(5) Stop the engine, and remove the key.
(6) Disconnect the battery negative cable.

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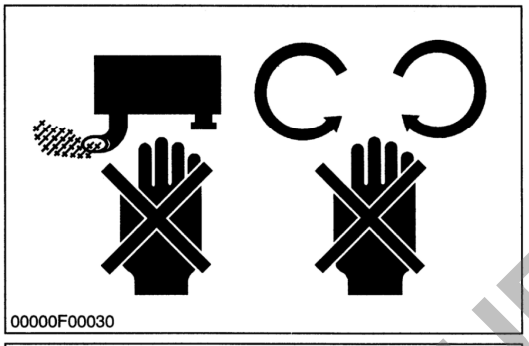
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SAFETY STARTING

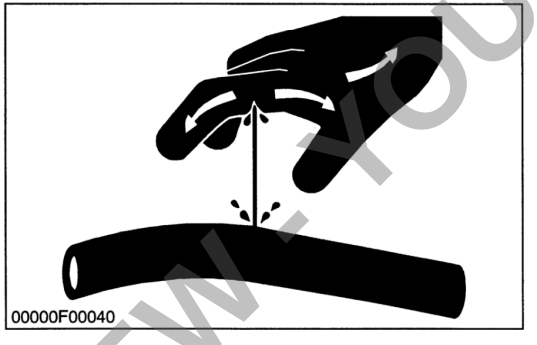
(1) Do not start the engine by shorting across starter terminals.
(2) Unauthorized modifications to the engine may impair the function and / or safety and affect engine life.

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SAFETY WORKING

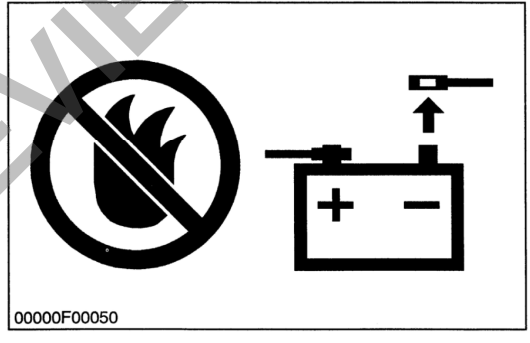
(1) Do not work on the engine while under the influence of alcohol, medication, or other substances or while fatigued.
(2) Wear close fitting clothing and safety equipment appropriate to the job.
(3) Use tools appropriate to the work. Makeshift tools, parts, and procedures are not recommended.
(4) When servicing is performed together by two or more persons, take care to perform all work safely.
(5) Do not touch the rotating or hot parts while the engine is running.
(6) Never remove the radiator cap while the engine is running, or immediately after stopping. Otherwise, hot water will spout out from radiator. Only remove radiator cap when cool enough to touch with bare hands. Slowly loosen the cap to first stop to relieve pressure before removing completely.
(7) Escaping fluid (fuel or hydraulic oil) under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or fuel lines. Tighten all connections before applying pressure.
(8) Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.


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AVOID FIRES

(1) Fuel is extremely flammable and explosive under certain conditions. Do not smoke or allow flames or sparks in your working area.
(2) To avoid sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
(3) Battery gas can explode. Keep sparks and open flame away from the top of battery, especially when charging the battery.
(4) Make sure that no fuel has been spilled on the engine.


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[1] SPECIFICATIONS

Model		V2203-DI-B
Type		Vertical, water-cooled, 4 cycle diesel engine
Number of cylinders		4
Bore x stroke		87 x 92.4 mm (3.43 x 3.64 in.)
Total displacement		2197 cc (134.1 cu.in.)
Brake Horsepower	DIN 6270-NB	44.5 PS/2800 rpm
	SAE intermittent H.P.	46.0 HP/2800 rpm
Maximum speed		Below 3050 rpm
Idling speed		850 to 950 rpm
Combustion chamber		Direct injection
Injection pump		Bosch "K" type mini pump
Governor		Centrifugal ball mechanical governor
Injection nozzle		Pencil type
Injection timing		B T D C 17.0° to B T D C 19.0°
Firing order		1-3-4-2
Injection pressure		22.4 to 23.4 MPa (228.5 to 239.0 kgf/cm² 3249.9 to 3399.2 psi)
Compression ratio		19 : 1
Lubricating system		Forced lubrication by pump
Oil pressure indication		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 motor
		12 V/2.0 kW
Alternator for charging		12 V, 420 W
Starting support device		By glow plug in combustion chamber
Fuel		Diesel fuel No.2-D (ASTM D975)
Lubricating oil		Military specification MIL-L-2104C or API service CC class, above 25°C (77°F) SAE 30, 0°C to 25°C (32°F to 77°F) SAE20, below 0°C (32°F) SAE 10W-30
Lubricating oil capacity		7.6 ℓ·8.03 U.S. qts·6.69 Imp. qts (Oil pan depth is 90 mm·3.54 in)
		9.8 ℓ·10.34 U.S. qts·8.62 Imp. qts (Oil pan depth is 124 mm·4.88 in)
Weight (Dry)		179.6 kg (396.0 lbs)

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VALVES

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)	IN. EX.	0.18 to 0.22 mm (0.0071 to 0.0087 in.)	–
Valve Seat Angle	IN. EX.	44°55′ to 45°05′ (0.7840 to 0.7868 rad.)	–
Valve Face Angle	IN. EX.	45°23′ to 45°37′ (0.7920 to 0.7960 rad.)	–
Valve Head Thickness	IN.	2.65 to 3.05 mm (0.1043 to 0.1201 in.)	–
	EX.	2.80 to 3.20 mm (0.1102 to 0.1260 in.)	–
Valve Recessing	IN. EX.	0.65 to 0.85 mm (0.0256 to 0.0335 in.)	1.15 mm (0.0453 in.)
Clearance between Valve Stem and Valve Guide		0.040 to 0.070 mm (0.00157 to 0.00276 in.)	0.10 mm (0.004 in.)
Valve Stem O.D.		7.960 to 7.975 mm (0.31339 to 0.31398 in.)	–
Valve Guide I.D.		8.015 to 8.030 mm (0.31555 to 0.31614 in.)	–

VALVE TIMING

Inlet Valve	Open (I.O.)	Before T.D.C. 12° (0.21 rad)	–
	Close (I.C.)	After B.D.C. 36° (0.63 rad.)	–
Exhaust Valve	Open (E.O.)	Before B.D.C.60° (1.05 rad.)	–
	Close (E.C.)	After T.D.C.12° (0.21 rad.)	–

VALVE SPRING

Free Length	41.7 to 42.2 mm (1.642 to 1.661 in.)	41.2 mm (1.622 in.)
Setting Load/Setting Length	12.0 kgf/35.15 mm (117 N/35.15 mm 26.5 lbs/1.3839 in.)	10.2 kgf/35.15 mm (100 N/35.15 mm 22.5 lbs/1.3839 in.)
Tilt	–	1.0 mm/42 mm (0.039 in./1.654 in.)

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[6] MAINTENANCE CHECK LIST

To maintain long-lasting and safe engine performance, make it a rule to carry out regular inspections by following the table below.

Item		Service Interval								
		Every 50 hrs	Every 100 hrs	Every 150 hrs	Every 200 hrs	Every 400 hrs	Every 500 hrs	Every 800 hrs	Every one year	Every two years
Checking fuel pipes and clamps		☆								
* Changing engine oil	Oil pan depth 90 mm (3.54 in.)			☆						
	Oil pan depth 124 mm (4.88 in.)				☆					
Cleaning air filter element			☆							
Cleaning fuel filter element			☆							
Checking fan belt tension and damage			☆							
Checking water pipes and clamps					☆					
* Changing oil filter cartridge	Oil pan depth 90 mm (3.54 in.)			☆						
	Oil pan depth 124 mm (4.88 in.)				☆					
Changing fuel filter cartridge						☆				
Cleaning radiator interior							☆			
Changing radiator coolant (L.L.C)										☆
** Changing air filter element									☆	
Cheking valve clearance								☆		
Changing water pipes and clamps										☆
Checking inlet pipe					☆					
Chenging inlet pipe and clamps										☆
Changing fuel pipes and clamps										☆

* Change engine oil and oil filter cartridge after the first 50 hours of operation.
** Every year or every six cleanings of air cleaner elements.

CAUTION

- **When changing or inspecting, be sure to level and stop the engine.**

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TO THE READER

This Workshop Manual has been prepared to provide servicing personnel with information on the service and maintenance of KUBOTA Diesel Engine V2203DI-B.

■ **Disassembling and Servicing**

The heading "General" includes general precautions, check and maintenance and special tools. For each engines section, there are troubleshooting, servicing specification lists, 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 production information available at the time of publication.

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

July '89

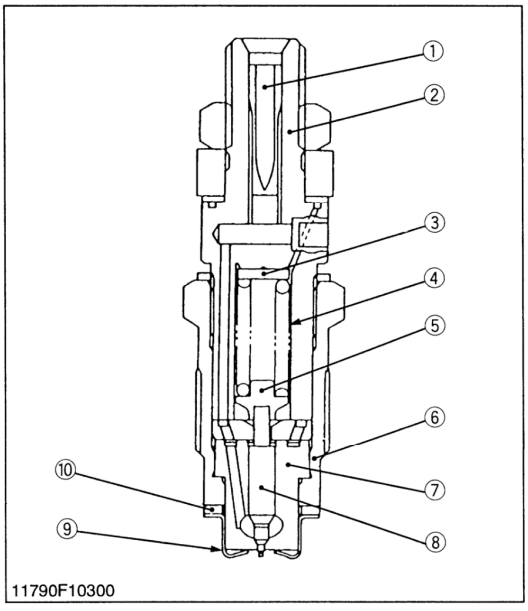
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[3] INJECTION NOZZLE



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This nozzle is throttle-type. The needle valve (8) is pushed against the nozzle body (7) by the nozzle spring via the push rod (5). Fuel pressurized by the injection pump pushes the needle valve up and then is injected into the sub-combustion chamber.

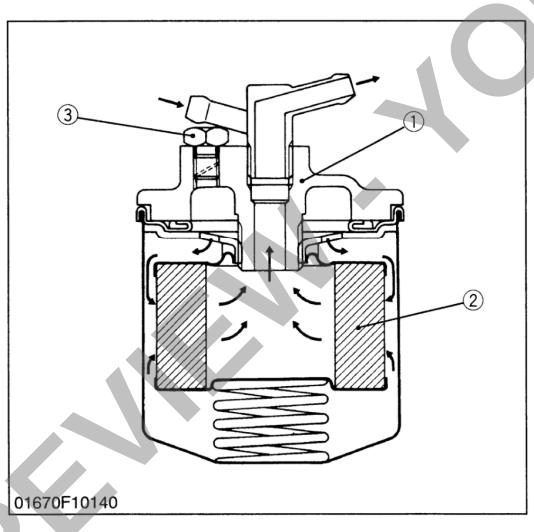
Excessive flow passes from nozzle holder center through the eye joint and the fuel overflow pipe to the fuel tank.

The injection pressure is 13.73 to 14.71 MPa (140 to 150 kgf/cm^2, 1991 to 2133 psi), and is adjusted with adjusting washers (3).

(1) Bar Filter
(2) Nozzle Holder Body
(3) Adjusting Washer
(4) Nozzle Spring
(5) Push Rod
(6) Retaining Nut
(7) Nozzle Body
(8) Needle Valve
(9) Heat Seal
(10) Gasket

11790M10272

[4] FUEL FILTER (not included in the basic model)



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A fuel filter is used to prevent dirty fuel from reaching the injection pump and injection nozzles.

The filter cartridge will require occasional replacement to maintain an adequate flow of fuel to the injection pump. The frequency of this service will vary according to the cleanliness of available fuel and the care used in storage.

The fuel filter eliminates the foreign matter which is fed from the fuel tank and protects injection pump and injection nozzles. When fuel enters the filter, it passes from the filter element's circumference forward the center for filtering.

(1) Cover
(2) Fuel Filter Element
(3) Air Vent Plug

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Crankshaft

Item		Factory Specification	Allowable Limit
Crankshaft Alignment		–	0.02 mm 0.0008 in.
Oil Clearance between Crankshaft and Crankshaft Bearing 1		0.04 to 0.118 mm 0.0016 to 0.0046 in.	0.20 mm 0.0079 in.
Crankshaft O.D.	(Serial No.:below 3R9999)	51.921 to 51.940 mm 2.0441 to 2.0449 in.	–
	(Serial No.:above 3S0001)	59.921 to 59.940 mm 2.3591 to 2.3598 in.	–
Crankshaft Bearing 1 I.D.	(Serial No.:below 3R9999)	51.980 to 52.039 mm 2.0465 to 2.0488 in.	–
	(Serial No.:above 3S0001)	59.980 to 60.039 mm 2.3614 to 2.3637 in.	–
Oil Clearance between Crankshaft and Crankshaft Bearing 2		0.04 to 0.104 mm 0.0016 to 0.0041 in.	0.20 mm 0.0079 in.
Crankshaft O.D.	(Serial No.:below 3R9999)	51.921 to 51.940 mm 2.0441 to 2.0449 in.	–
	(Serial No.:above 3S0001)	59.921 to 59.940 mm 2.3591 to 2.3598 in.	–
Crankshaft Bearing 2 I.D.	(Serial No.:below 3R9999)	51.980 to 52.025 mm 2.0465 to 2.0482 in.	–
	(Serial No.:above 3S0001)	59.980 to 60.025 mm 2.3614 to 2.3632 in.	–
Oil Clearance between Crank Pin and Crank Pin Bearing		0.025 to 0.087 mm 0.0009 to 0.0034 in.	0.20 mm 0.0079 in.
Crank Pin O.D.		46.959 to 46.975 mm 1.8488 to 1.8494 in.	–
Crank Pin Bearing I.D.		47.000 to 47.046 mm 1.8504 to 1.8522 in.	–
Crankshaft Side Clearance		0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.

Cylinder Liner

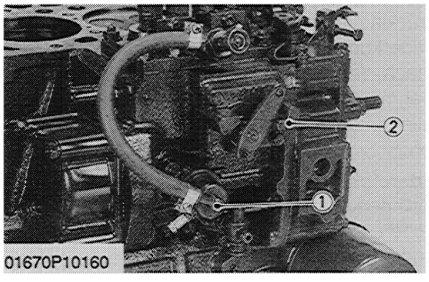
Cylinder Liner I.D.	83.000 to 83.022 mm 3.2677 to 3.2686 in.	+ 0.15 mm 0.0059 in.
Oversized Cylinder Liner I.D.	83.500 to 83.522 mm 3.2874 to 3.2883 in.	+ 0.15 mm 0.0059 in.

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[4] GEAR CASE



Fuel Feed Pump and Pump Cover

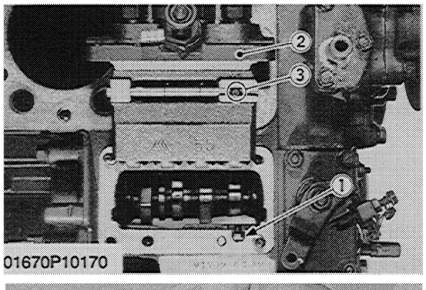
1. Loosen the pipe clamp and remove the fuel pipe from the injection pump side.
2. Remove the fuel feed pump mounting nuts.
3. Remove the fuel feed pump (1).
4. Remove the injection pump cover (2).

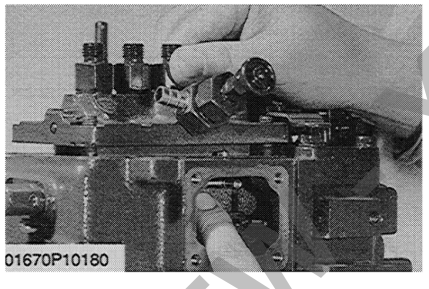
(When reassembling)

- Apply a liquid gasket (Three Bond 1215 or equivalent) to the both sides of fuel feed pump gasket and hour meter gear case.

(1) Fuel Feed Pump (2) Injection Pump Cover

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Injection Pump

1. Align the control rack pin (3) with the notch (1) on the crankcase, and remove the injection pump (2).
2. Remove the injection pump shims.
3. In principle, the injection pump should not be disassembled.

(When reassembling)

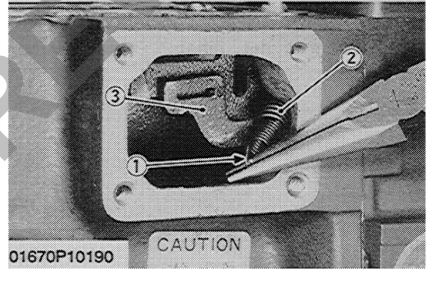
- When installing the injection pump, insert the control rack pin (3) firmly into the groove of the fork lever and thrust lever.

■ 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) Notch (3) Control Rack Pin
(2) Injection Pump

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Governor Spring

1. Remove the governor springs 1 (2) and 2 (1) from the fork lever 2 (3).

(When reassembling)

- Fix the governor springs 1 and 2 to the governor lever, and pull the springs through the window of the injection pump, and springs will be able to be hooked on to the governor fork lever 2 with ease.

(1) Governor Spring 2 (3) Fork Lever 2
(2) Governor Spring 1

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