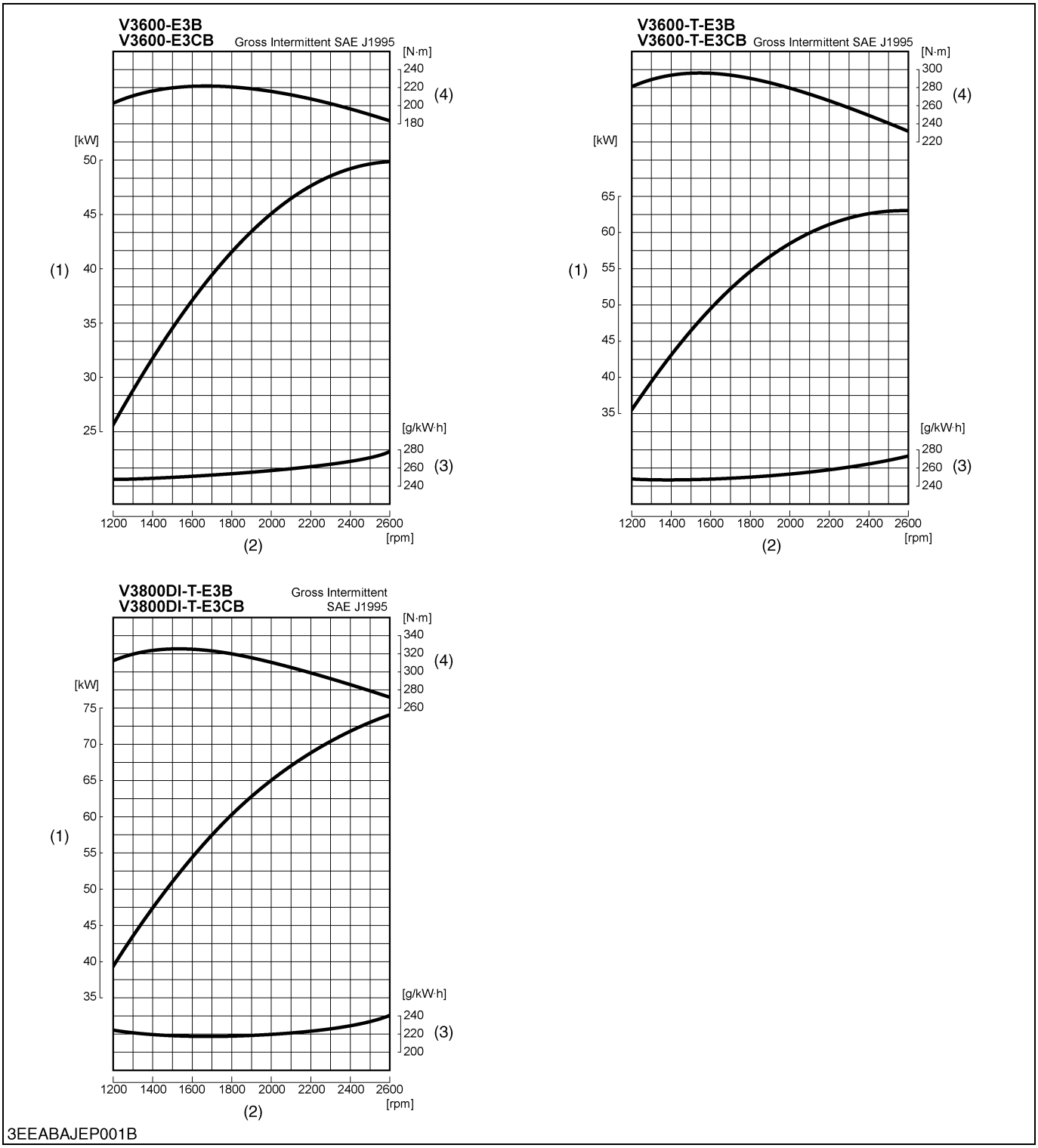
PERFORMANCE CURVES



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(1) Brake Horse Power (2) Engine Speed (3) B.S.F.C. (4) Torque

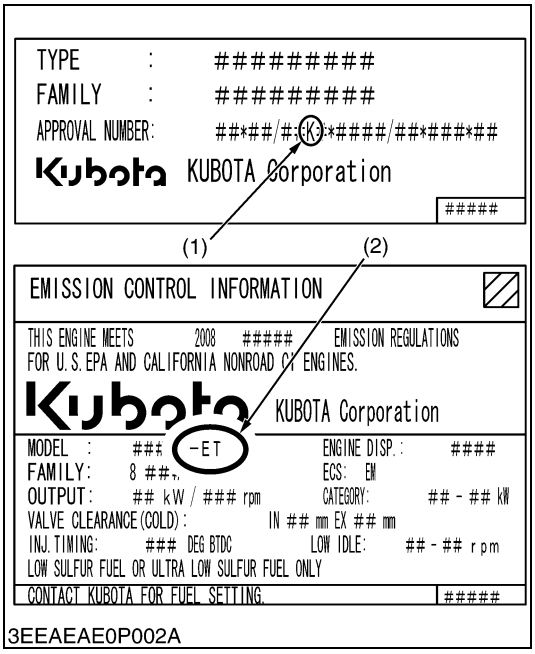
[2] E3B ENGINE

[Example : Engine Model Name V3600-**E3B**-XXXX]

The emission controls previously implemented in various countries to prevent air pollution will be stepped up as Non-Road Emission Standards continue to change. The timing or applicable date of the specific Non-Road Emission regulations depends on the engine output classification.

Over the past several years, Kubota has been supplying diesel engines that comply with regulations in the respective countries affected by Non-Road Emission regulations. For Kubota Engines, E3B will be the designation that identifies engine models affected by the next emission phase (See the table below).

When servicing or repairing ###-E3B series engines, use only replacement parts for that specific E3B engine, designated by the appropriate E3B Kubota Parts List and perform all maintenance services listed in the appropriate Kubota Operator's Manual or in the appropriate E3B Kubota Workshop Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E2B engines), may result in emission levels out of compliance with the original E3B design and EPA or other applicable regulations.Please refer to the emission label located on the engine head cover to identify Output classification and Emission Control Information. E3B engines are identified with "ET" at the end of the Model designation, on the US EPA label. Please note : E3B is not marked on the engine.



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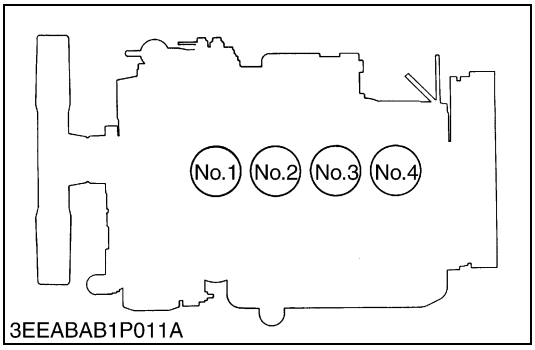
Category (1)	Engine output classification	EU regulation
K	From 19 to less than 37 kW	STAGE IIIA
J	From 37 to less than 75 kW	STAGE IIIA
I	From 75 to less than 130 kW	STAGE IIIA

Category (2)	Engine output classification	EPA regulation
ET	Less than 19kW	Tier 4
	From 19 to less than 56 kW	Interim Tier 4
	From 56 to less than 75 kW	Tier 3
	From 75 to less than 130 kW	Tier 3

(1) EU regulation engine output classification category
(2) "E3B" engines are identified with "ET" at the end of the Model designation, on the US EPA label.
"E3B" designates Tier 3 and some Interim Tier 4 / Tier 4 models, depending on engine output classification.

W1031971

[3] CYLINDER NUMBER



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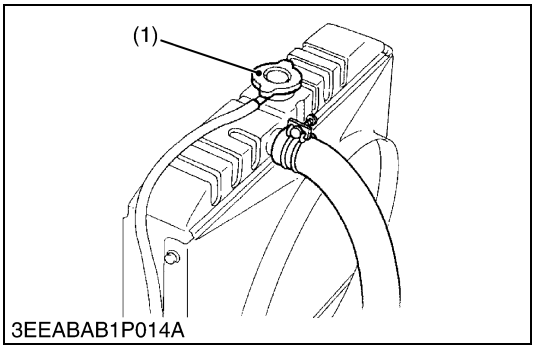
The cylinder numbers of kubota diesel engine are designated as shown in the figure.

The sequence of cylinder numbers is given as No.1, No.2, No.3 and No.4 starting from the gear case side.

W1011077



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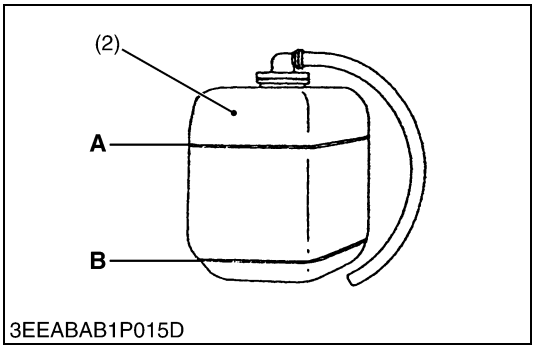

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Checking and Replenish Coolant

1. Without recovery tank :
   Remove the radiator cap (1) and check to see that the coolant level is just below the port.
   With recovery tank (2) :
   Check to see that the coolant level lies between **FULL** (**A**) and **LOW** (**B**).
2. If coolant level is too low, check the reason for decreasing coolant.
   (Case 1)
   If coolant is decreasing by evaporation, replenish only fresh, soft water.
   (Case 2)
   If coolant is decreasing by leak, replenish coolant of the same manufacture and type in the specified mixture ratio (fresh, soft water and L.L.C.). If the coolant brand cannot be identified, drain out all of the remaining coolant and refill with a totally new brand of coolant mix.

CAUTION

- **Do not remove the radiator cap until coolant temperature is below its boiling point. Then loosen the cap slightly to relieve any excess pressure before removing the cap completely.**

■ **IMPORTANT**

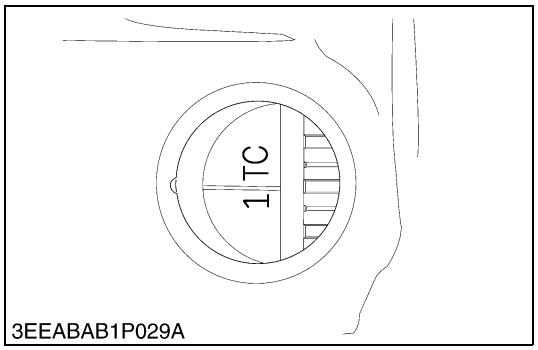
- **During filling the coolant, air must be vented from the engine coolant passages. The air vents by jiggling the radiator upper and lower hoses.**
- **Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and the engine could overheat.**
- **Do not use an antifreeze and scale inhibitor at the same time.**
- **Never mix the different type or brand of L.L.C..**

(1) Radiator Cap
(2) Recovery Tank

A: FULL
B: LOW

W1035779

[6] CHECK POINT OF EVERY 1000 HOURS



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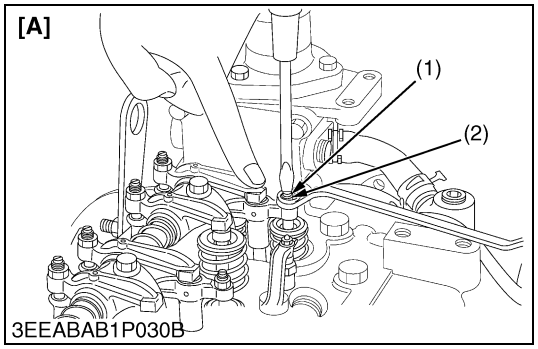

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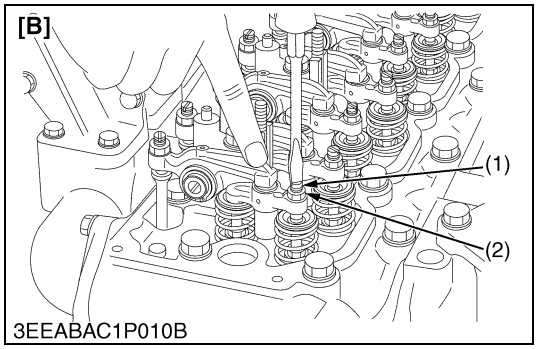

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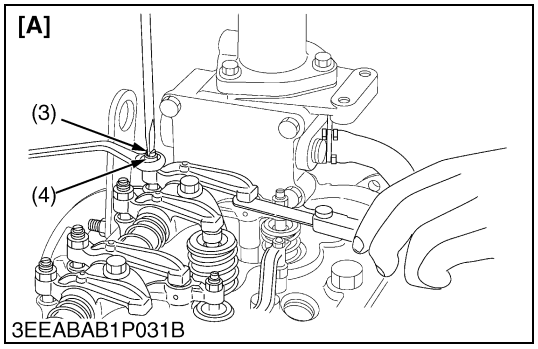

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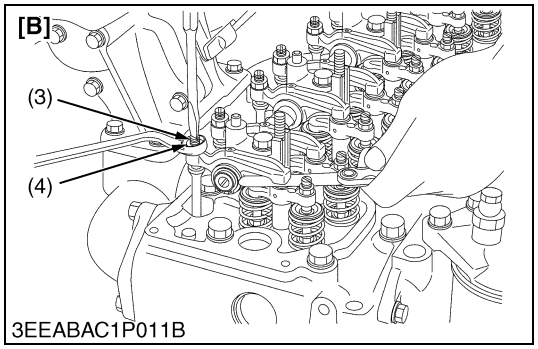

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Checking Valve Clearance

■ **IMPORTANT**

- **Valve clearance must be checked and adjusted when engine is cold.**

1. Remove the injection pipes. (V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG only)
2. Remove the head cover.
3. Set the No.1 piston at the compression top dead center.
4. Slightly push the rocker arm by your finger. (Valve bridge height adjustable type only)
5. Tighten the valve bridge height adjusting screw (1) slowly until you feel the screw touch the top of valve stem. (Valve bridge height adjustable type only)
6. Tighten the lock nut (2). (Valve bridge height adjustable type only)
7. Adjust the valve clearance with feeler gauge.
8. Tighten the lock nut (4).

Valve clearance	Factory spec.	0.23 to 0.27 mm 0.0091 to 0.010 in.

■ **NOTE**

- **After adjusting, tighten the lock nut (4) securely.**

Valve arrangement / Adjustment cylinder / Location of piston		IN.	EX
When No.1 piston is at compression top dead center	1st	☆	☆
	2nd	☆	
	3rd		☆
	4th		
When No.1 piston is at overlap position	1st		
	2nd		☆
	3rd	☆	
	4th	☆	☆

Tightening torque	Cylinder head cover screw	6.9 to 11.2 N·m 0.70 to 1.15 kgf·m 5.1 to 8.31 lbf·ft

Tightening torque	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

(1) Valve Bridge Height Adjusting Screw
(2) Lock Nut
(3) Adjusting Screw
(4) Lock Nut

[A] V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG
[B] V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG

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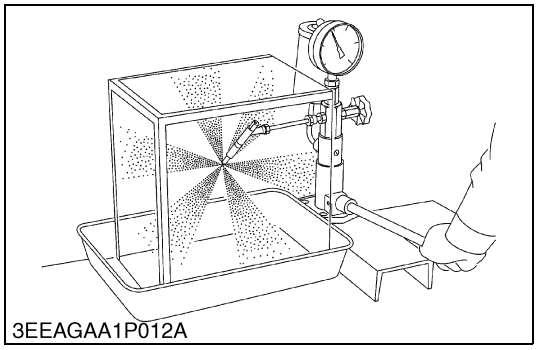
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[V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG]
1. Set the injection nozzle to the nozzle tester.
2. Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.
3. If the measurement is not within the factory specifications, replace the injection nozzle assembly or repair at Denso service shop.

■ **NOTE**
- **Injection nozzle gasket must be replaced when the injection nozzle is removed for checking.**

Injection pressure	Factory spec.	1st stage	18.64 to 19.61 MPa 190.0 to 200.0 kgf/cm^2 2703 to 2844 psi

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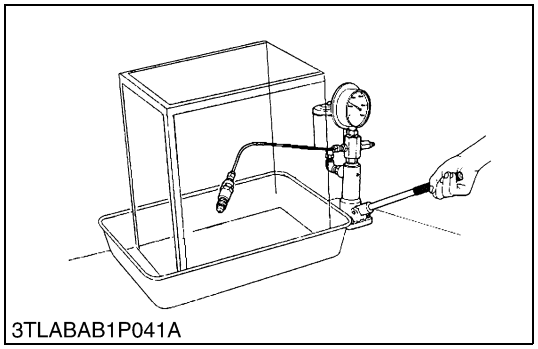
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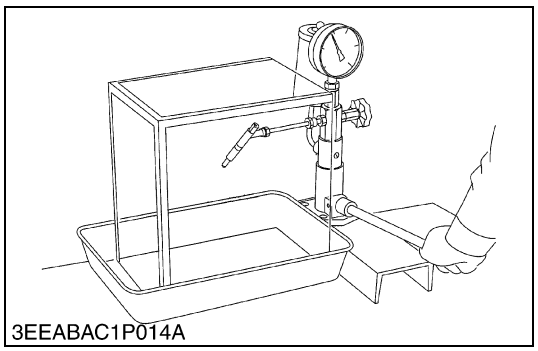
Valve Seat Tightness

[V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG]
1. Set the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 12.75 MPa (130.0 kgf/cm^2, 1849 psi) for 10 seconds.
3. If any fuel leak is found, replace the nozzle piece.

Valve seat tightness	Factory spec.	No fuel leak at 12.75 MPa 130.0 kgf/cm^2 1849 psi

W10287890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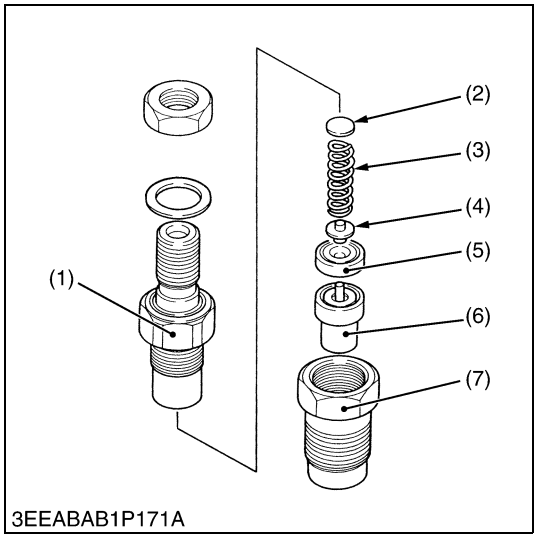
[V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG]
1. Set the injection nozzle to a nozzle tester.
2. Raise the fuel pressure, and keep at 16.67 MPa (170.0 kgf/cm^2, 2418 psi) for 10 seconds.
3. If any fuel leak is found, replace the injection nozzle assembly or repair at Denso service shop.

Valve seat tightness	Factory spec.	No fuel leak at 16.67 MPa 170.0 kgf/cm^2 2418 psi

W10291060



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Nozzle Holder

[V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG]
1. Secure the nozzle retaining nut (7) with a vise.
2. Remove the nozzle holder (1), and take out parts inside.

(When reassembling)
- Assemble the nozzle in clean fuel oil.
- Install the push rod (4), noting its direction.
- After assembling the nozzle, be sure to adjust the fuel injection pressure.

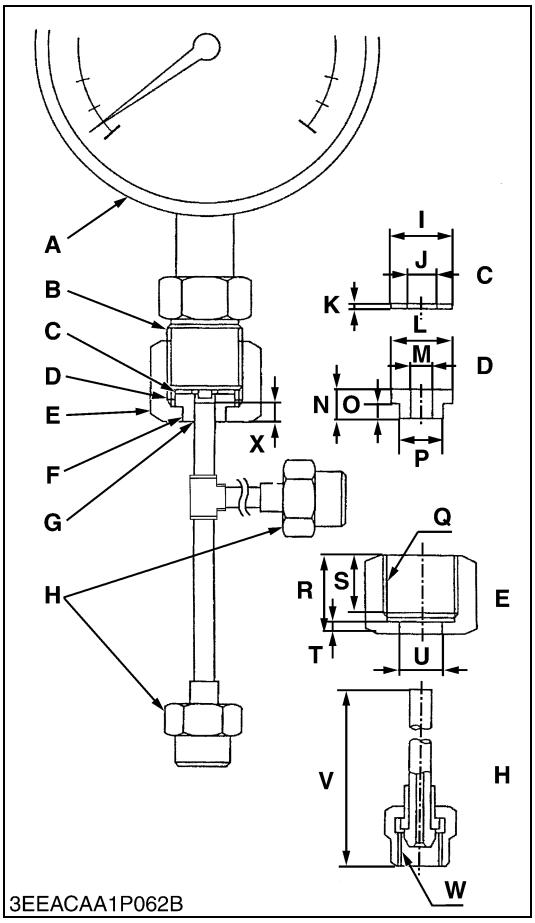
Tightening torque	Nozzle holder	35 to 39 N·m 3.5 to 4.0 kgf·m 26 to 28 lbf·ft
	Overflow pipe retaining nut	20 to 24 N·m 2.0 to 2.5 kgf·m 15 to 18 lbf·ft
	Nozzle holder assembly	49 to 68 N·m 5.0 to 7.0 kgf·m 37 to 50 lbf·ft

(1) Nozzle Holder
(2) Adjusting Washer
(3) Nozzle Spring
(4) Push Rod
(5) Distance Piece
(6) Nozzle Piece
(7) Nozzle Retaining Nut

W1018491

■ **NOTE**

- **The following special tools are not provided, so make them referring to the figure.**



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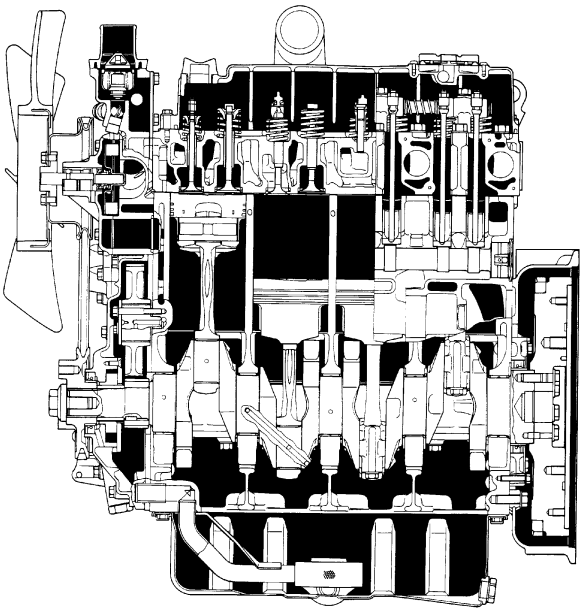
Injection Pump Pressure Tester

Application: Use to check fuel tightness of injection pumps.

A	Pressure gauge full scale : More than 29.4 MPa (300 kgf/cm^2, 4270 psi)
B	PF 1/2
C	Copper gasket
D	Flange (Material : Steel)
E	Hex. nut 27 mm (1.1 in.) across the plat
F	Adhesive application
G	Fillet welding on the enter circumference
H	Retaining nut
I	17 mm dia. (0.67 in. dia.)
J	8 mm dia. (0.3 in. dia.)
K	1.0 mm (0.039 in.)
L	17 mm dia. (0.67 in. dia.)
M	6.10 to 6.20 mm dia. (0.241 to 0.244 in. dia.)
N	8 mm (0.3 in.)
O	4 mm (0.2 in.)
P	11.97 to 11.99 mm dia. (0.4713 to 0.4720 in. dia.)
Q	PF 1/2
R	23 mm (0.91 in.)
S	17 mm (0.67 in.)
T	4 mm (0.2 in.)
U	12.00 to 12.02 mm dia. (0.4725 to 0.4732 in. dia.)
V	100 mm (3.94 in.)
W	M12 × P1.5
X	5 mm (0.2 in.)

W10252400

1. FEATURE



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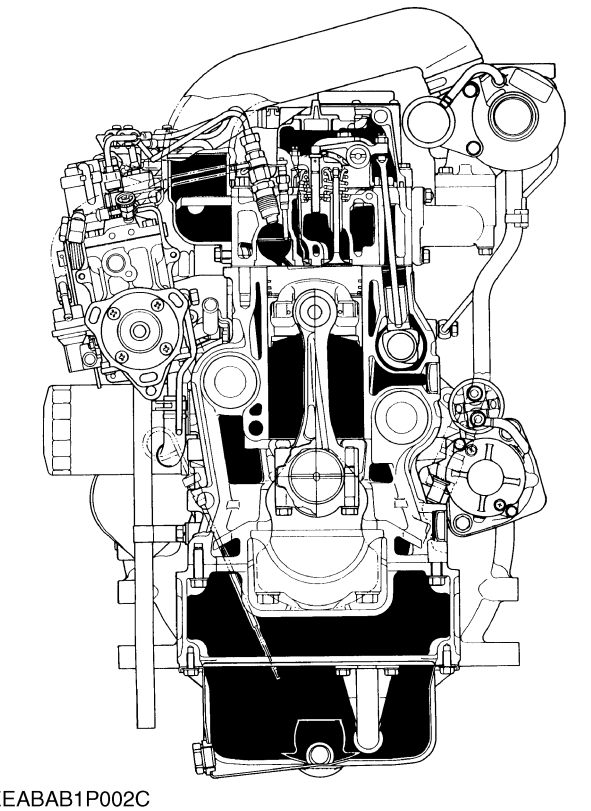

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[V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG]

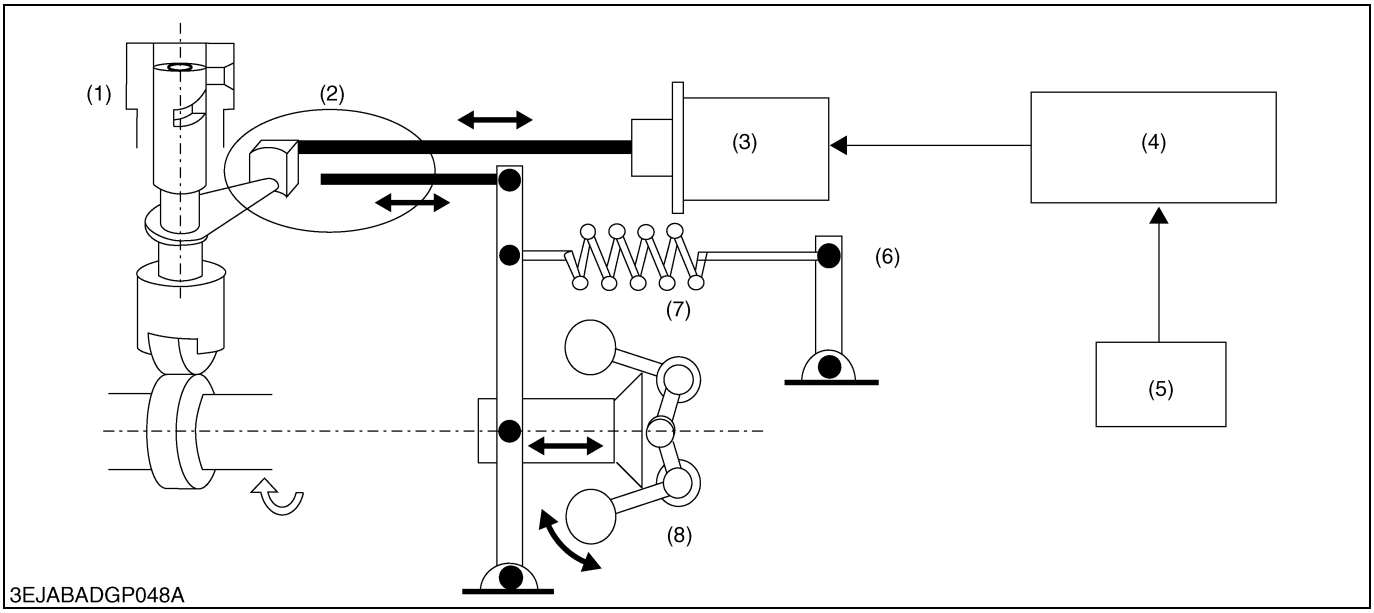
V3 series IDI engine is the vertical type 4-cycle diesel engine featuring the advanced performances shown below.

This is a small sized, high power and environment conscious engine, which employs the three valve system, two inlet valves with double ports, and one exhaust valve with the new E-TVCS VERSION-II. Thus, this engine achieves high combustion efficiency and complies with various regulations of exhaust gas.

Based upon the conventional model, Kubota developed a unique governor system and various new mechanisms which reduces exhaust emission, noise and vibration and realize durability and high torque.

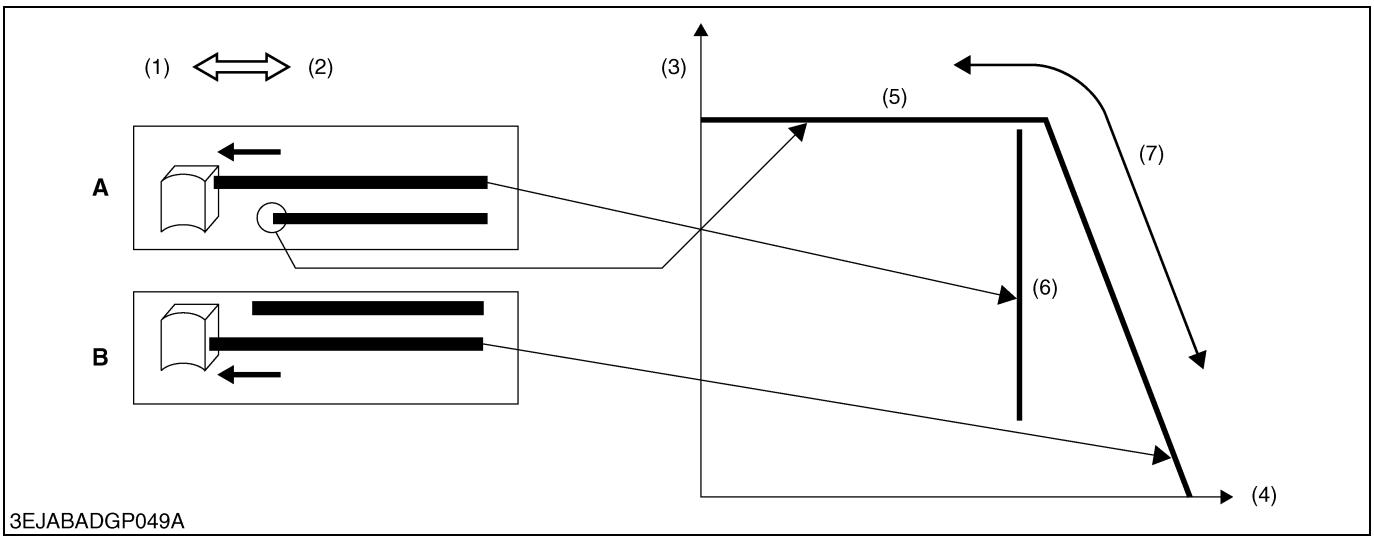
W1013043

(2) Construction



(1) Injection Pump
(2) Control Rack
(3) Proportional Solenoid
(4) ECU
(5) Engine Speed
(6) Accelerate Lever (fixed at maximum speed)
(7) Governor Spring
(8) Governor Weight

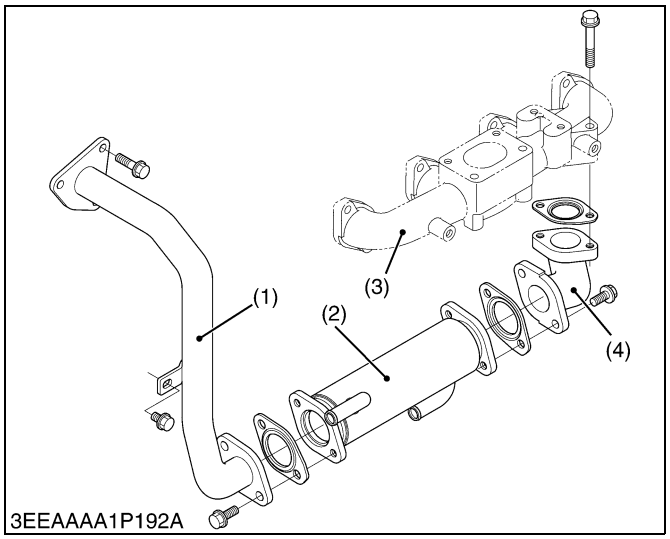
(3) Controlling mechanism



(1) Quantity Reduction
(2) Quantity Increase
(3) Fuel Quantity
(4) Engine Speed
(5) Mechanical Governor Fuel Control
(6) Isochronous Control
(7) Mechanical Governor Operating Curve

A : Within the range of the mechanical governor, free speed control occurs.
B : If the engine rotational speed increases, priority is given to the mechanical governor control function.

(A) EGR Cooler



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The EGR (Exhaust Gas Recirculation) cooler is used to lower combustion temperature and efficiently cool EGR gas, with the aim of reducing the NOx that is in the exhaust gas of diesel engine.

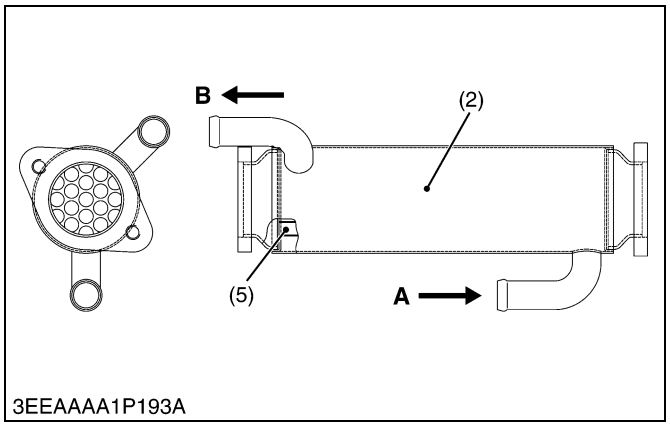
The EGR cooler is placed between the exhaust manifold and the intake manifold of the engine and returns the cooled exhaust gases to the engine suction side.

The EGR cooler has resistant to clogging up, compact and efficient tubes internally.

(1) Pipe
(2) EGR Cooler
(3) Exhaust Manifold
(4) Flange
(5) Tube

A Coolant Inlet Port
B Coolant Outlet Port

W1175338



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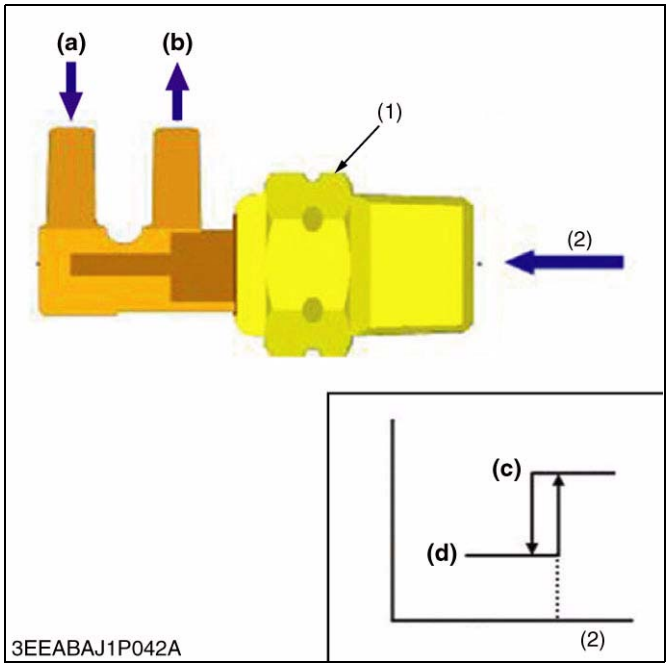
(B) Thermo Valve



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Thermo valve controls boost pressure “ON / OFF” for the EGR valve.

If the coolant temperature is low, thermo valve is closed, so that boost pressure does not reach to the EGR valve.

If the coolant temperature is high, thermo valve is open, so that boost pressure reaches to the EGR valve.

(1) Thermo Valve
(2) Coolant Temperature

(a) Boost Pressure From Intake Manifold
(b) Boost Pressure To EGR Valve
(c) Open
(d) Close

W1175753

ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Valve Seat **[V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG]**	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
	Width	2.12 mm 0.0835 in.	–
[V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG]	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
	Width (Intake)	1.6 to 2.0 mm 0.063 to 0.078 in.	–
	Width (Exhaust)	2.3 to 2.6 mm 0.091 to 0.10 in.	–
Valve Face	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
Valve Recessing **[V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG]**	Intake	−0.2 to 0 mm −0.007 to 0 in.	0.4 mm 0.02 in.
	Exhaust	−0.050 to 0.15 mm −0.0019 to 0.0059 in.	0.4 mm 0.02 in.
[V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG]	Intake	0.60 to 0.80 mm 0.024 to 0.031 in.	1.2 mm 0.047 in.
	Exhaust	0.850 to 1.05 mm 0.0335 to 0.0413 in.	1.2 mm 0.047 in.

Item	Size x Pitch	N·m	kgf·m	lbf·ft
Injection pump gear mounting nut (V3600-T-E3B, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG)	M14 x 1.5	74 to 83	7.5 to 8.5	55 to 61
Timer gear mounting nut (V3600-E3B, V3800DI-T-E3B, V3600-E3CB, V3800DI-T-E3CB, V3800DI-T-E3BG)	–	74 to 83	7.5 to 8.5	55 to 61
Injection pump unit mounting nut	M8 x 1.25	18 to 20	1.8 to 2.1	13 to 15
Gear case cover	M8 x 1.25 (7T)	24 to 27	2.4 to 2.8	18 to 20
	M8 x 1.25 (10T)	33 to 36	3.3 to 3.7	24 to 26
Relief valve retaining screw	–	69 to 78	7.0 to 8.0	51 to 57
Idle gear mounting screw	M8 x 1.25	24 to 27	2.4 to 2.8	18 to 20
Plate mounting screw (standard gear train type only)	M8 x 1.25	24 to 27	2.4 to 2.8	18 to 20
Camshaft set screw	M8 x 1.25	24 to 27	2.4 to 2.8	18 to 20
Flywheel housing mounting screw	M12 x 1.25	78 to 90	7.9 to 9.2	58 to 66
Crankcase 2 mounting screw	M10 x 1.25	49 to 55	5.0 to 5.7	37 to 41
Injection pump mounting screw	M8 x 1.25	24 to 27	2.4 to 2.8	18 to 20
Injection pump mounting nut	M8 x 1.25	18 to 20	1.8 to 2.1	13 to 15
Boost actuator (Boost compensator model only)	–	40 to 45	4.0 to 4.6	29 to 33
Governor weight mounting nut	M12 x 1.25	63 to 72	6.4 to 7.4	47 to 53
Fuel camshaft stopper mounting screw	–	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8
Governor housing mounting screw	M6 x 1.0	9.8 to 11.2	1.00 to 1.15	7.24 to 8.31
Anti-rotation nut	M5 x 0.8	2.8 to 4.0	0.29 to 0.41	2.1 to 2.9
Balancer shaft set screw (Balancer model only)	M8 x 1.25	24 to 27	2.4 to 2.8	18 to 20
Bearing case cover mounting screw	M8 x 1.25	24 to 27	2.4 to 2.8	18 to 20
Alternator pulley nut	–	58.4 to 78.9	5.95 to 8.05	43.1 to 58.2
Thermo valve (V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG)	R 3/8	30 to 39	3.0 to 4.0	22 to 28

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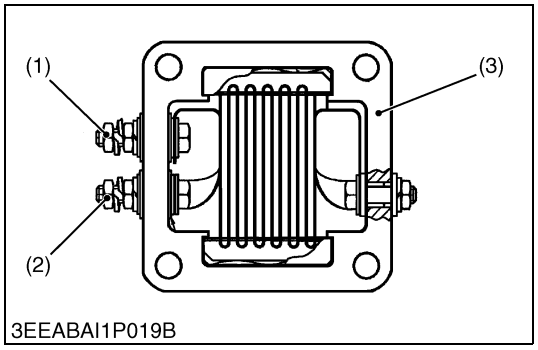

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Intake Air Heater

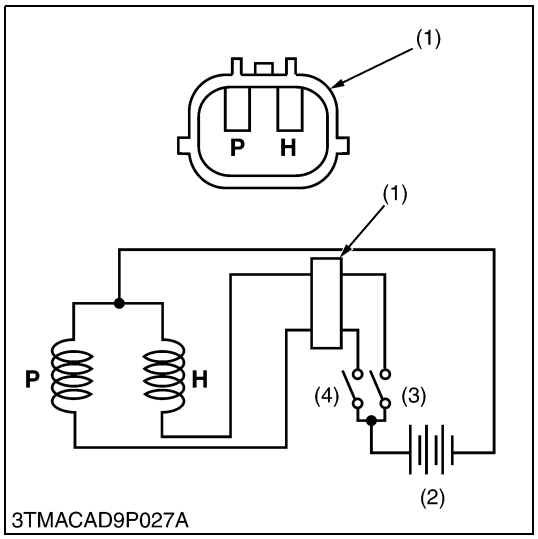
[V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG]

1. Disconnect the lead.
2. Measure the resistance between each + terminal (1) / (2) and intake air heater body (3).
3. If the resistance is infinity, the intake air heater is faulty.

Intake air heater resistance	Factory spec.	Approx. 0.3 Ω (At cold occasion)

(1) + Terminal
(2) + Terminal
(3) Intake Air Heater Body

W1073774



3TMACAD9P027A

Engine Stop Solenoid

1. Remove the engine stop solenoid from the engine.
2. Connect the jumper leads from the pulling coil **P** terminal to the switch (3), and from switch (3) to the battery positive terminal.
3. Connect the jumper leads from the holding coil **H** terminal to the switch (4), and from switch (4) to the battery positive terminal.
4. Connect the jumper leads from the engine stop solenoid body to the battery negative terminal.
5. When switch (4) is turn on, the plunger pull into the solenoid body and then turn off the switch (4), the plunger comes out.
6. Turn on the switch (3) then turn on the switch (4), the plunger pull into the solenoid body and it keep in holding position after turn off the switch (4).
7. If the plunger is not attracted, the engine stop solenoid is faulty.

■ **IMPORTANT**

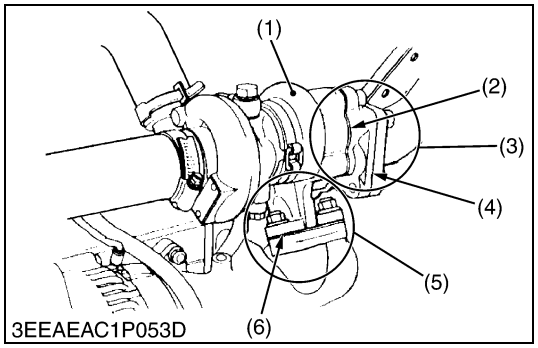
- **Never apply the current for pulling coil more than two seconds when inspecting.**

(1) Connector
(2) Battery
(3) Switch for Holding Coil
(4) Switch for Pulling Coil

P : Terminal for Pulling Coil
H : Terminal for Holding Coil

W1478825

(6) Turbocharger



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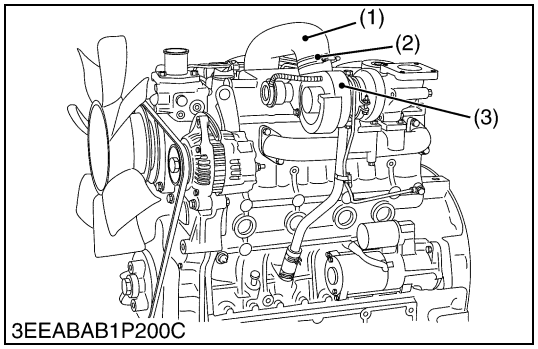
Turbine Side

1. Check the exhaust port (3) and inlet port (5) side of turbine housing (1) to see if there is no exhaust gas leak.
2. If any gas leak is found, retighten the bolts and nuts or replace the gasket (2) / (4) / (6) with new one.

(1) Turbine Housing
(2) Gasket
(3) Exhaust Port
(4) Gasket
(5) Inlet Port
(6) Gasket

W1076917



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Compressor Side

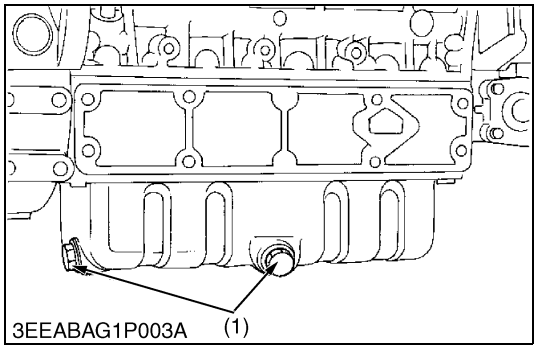
1. Check the inlet hose (1) of the compressor cover (3) to see if there is no air leak.
2. Check for loose connections or cracks in the suction side of the intake hose.
3. If any air leak is found, change the clamp (2) and or inlet hoses.

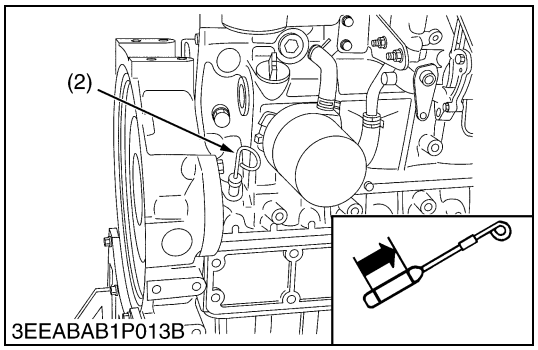
(1) Inlet Hose
(2) Clamp
(3) Compressor Cover

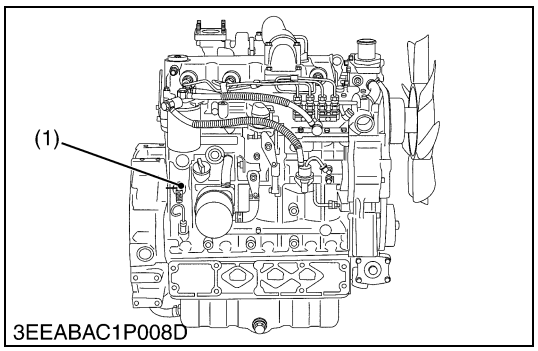
W1077032

[3] DISASSEMBLING AND ASSEMBLING

(1) Draining Oil and Coolant







Draining Engine Oil

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. Remove the drain plug (1) to drain oil.
4. After draining, screw in the drain plug.

(When refilling)

- Fill the engine oil up to the upper line on the dipstick (2).

■ **IMPORTANT**

- **Never mix two different types of oil.**
- **Use the proper SAE Engine Oil according to ambient temperature.**

(1) Drain Plug (2) Dipstick

W1023464

Draining Coolant

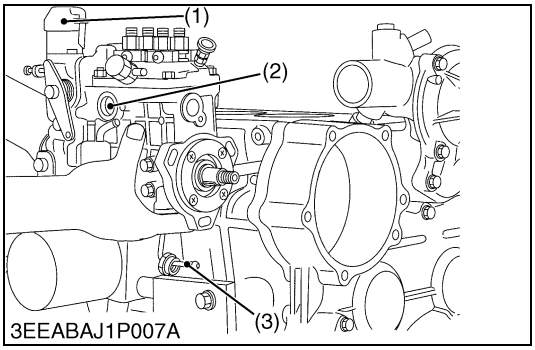
CAUTION

- **Never remove radiator cap while operating or immediately after stopping. Otherwise, hot water will spout out from the radiator. Wait for more than ten minutes to cool the radiator, before opening the cap.**

1. Prepare a bucket. Open the coolant drain cock.

(1) Coolant Drain Cock

W1023496



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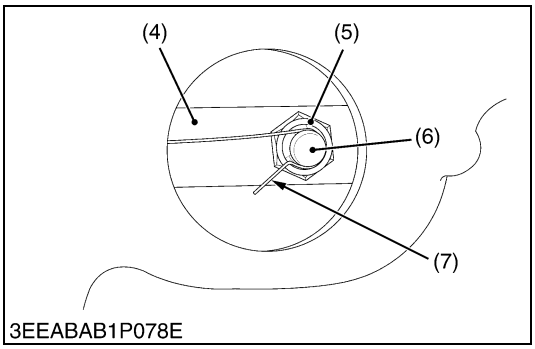

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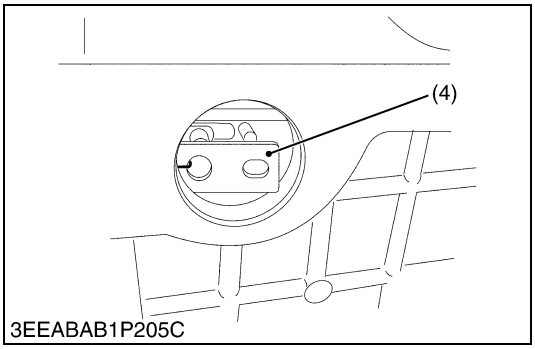

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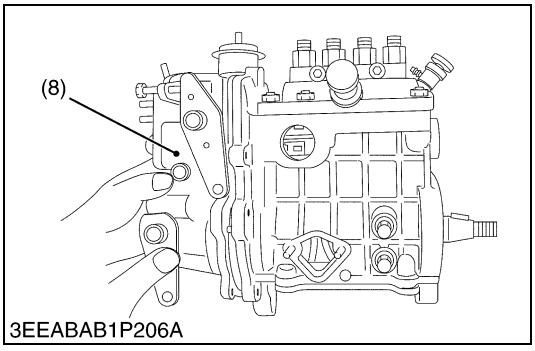

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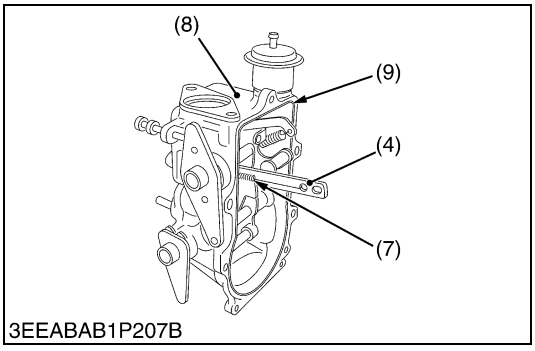

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Governor Housing Assembly

1. Remove the injection pump unit from the engine. (See the "Injection Pump Unit".)
2. Remove the governor lubricating pipe (3).
3. Remove the solenoid (1).
4. Detach the sight cover (2) from the injection pump unit.
5. Unhook the start spring (7) from the rack pin (6) of injection pump assembly.
6. Remove the anti-rotation nut (5).

■ **NOTE**

- **Be careful not to drop the nut inside.**

7. Slide off the governor connecting rod (4) completely from the rack pin of injection pump assembly.
8. Remove the governor housing mounting screws.
9. Remove the governor housing assembly (8) from the injection pump unit.

(When reassembling)

- When reassembling the inside parts, put the oil on each inside part slightly.
- After sliding on the governor connecting rod to the rack pin, tighten the anti-rotation nut with the specified torque with using the jig for keeping the governor connecting rod horizontal. (See the Replacing Injection Pump Assembly.)
- After tightening the anti-rotation nut, hook the start spring on the rack pin.
- Check the movement of control rack of injection pump assembly by the stop lever.

■ **NOTE**

- **When installing the governor housing assembly to the injection pump unit, be careful not to damage O-ring (9).**
- **When linking the governor connecting rod to the rack pin of injection pump, use the jig for keeping the governor connecting rod horizontal. Otherwise the control rack may be stuck, and causes to be difficult to start the engine or hunting of governor. (See the Replacing Injection Pump Assembly.)**

Tightening torque	Governor housing mounting screw	9.8 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Anti-rotation nut	2.8 to 4.0 N·m 0.29 to 0.41 kgf·m 2.1 to 2.9 lbf·ft

(1) Solenoid
(2) Sight Cover
(3) Governor Lubricating Pipe
(4) Governor Connecting Rod
(5) Anti-Rotation Nut
(6) Rack Pin
(7) Start Spring
(8) Governor Housing Assembly
(9) O-ring

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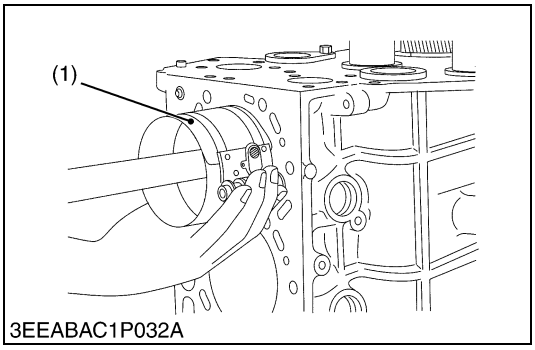

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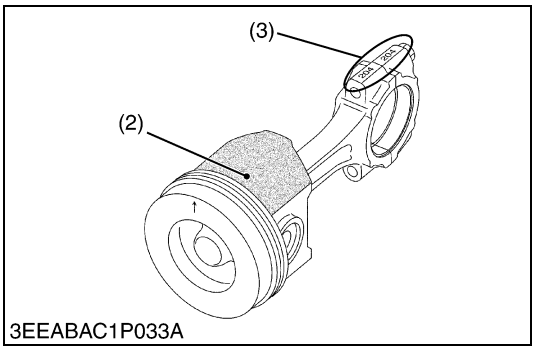

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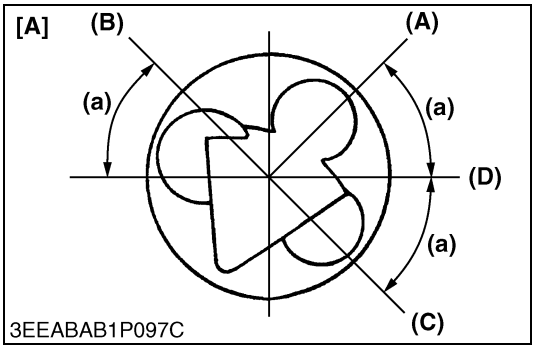

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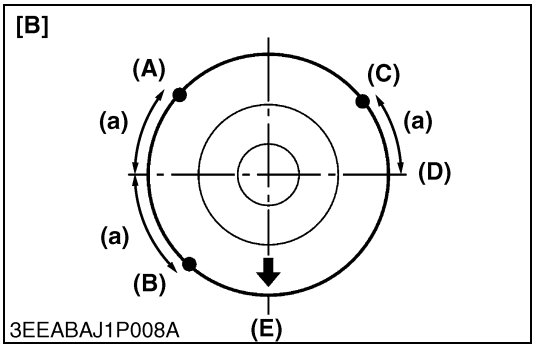

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Piston

1. Clean carbon in each cylinder completely.
2. Remove a connecting rod cap.
3. Turn the flywheel to set a piston at the top dead center.
4. Push a connecting rod from the bottom side of crankcase with grip of a hammer to remove a piston.
5. Do the same procedure (2. to 4.) for each piston.

(When reassembling)

- Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.
- When inserting the piston into the cylinder, face the mark (3) on the connecting rod to the injection pump.

■ **IMPORTANT**

- **Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 position.**
- **When inserting the piston into the cylinder, place the gap of each piston ring like the figure.**
- **Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.**
- **When inserting the piston, be careful not to damage the molybdenum disulfide coating.**

Tightening torque	Connecting rod screw	79 to 83 N·m 8.0 to 8.5 kgf·m 58 to 61 lbf·ft

(1) Piston Ring Compressor
(2) Molybdenum Disulfide Coating in piston skirt
(3) Mark
(a) 0.79 rad (45 °)

(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole
(E) Injection Pump Side

[A] V3600-E3B, V3600-T-E3B, V3600-E3CB, V3600-T-E3CB, V3300-E3BG, V3600-T-E3BG
[B] V3800DI-T-E3B, V3800DI-T-E3CB, V3800DI-T-E3BG

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