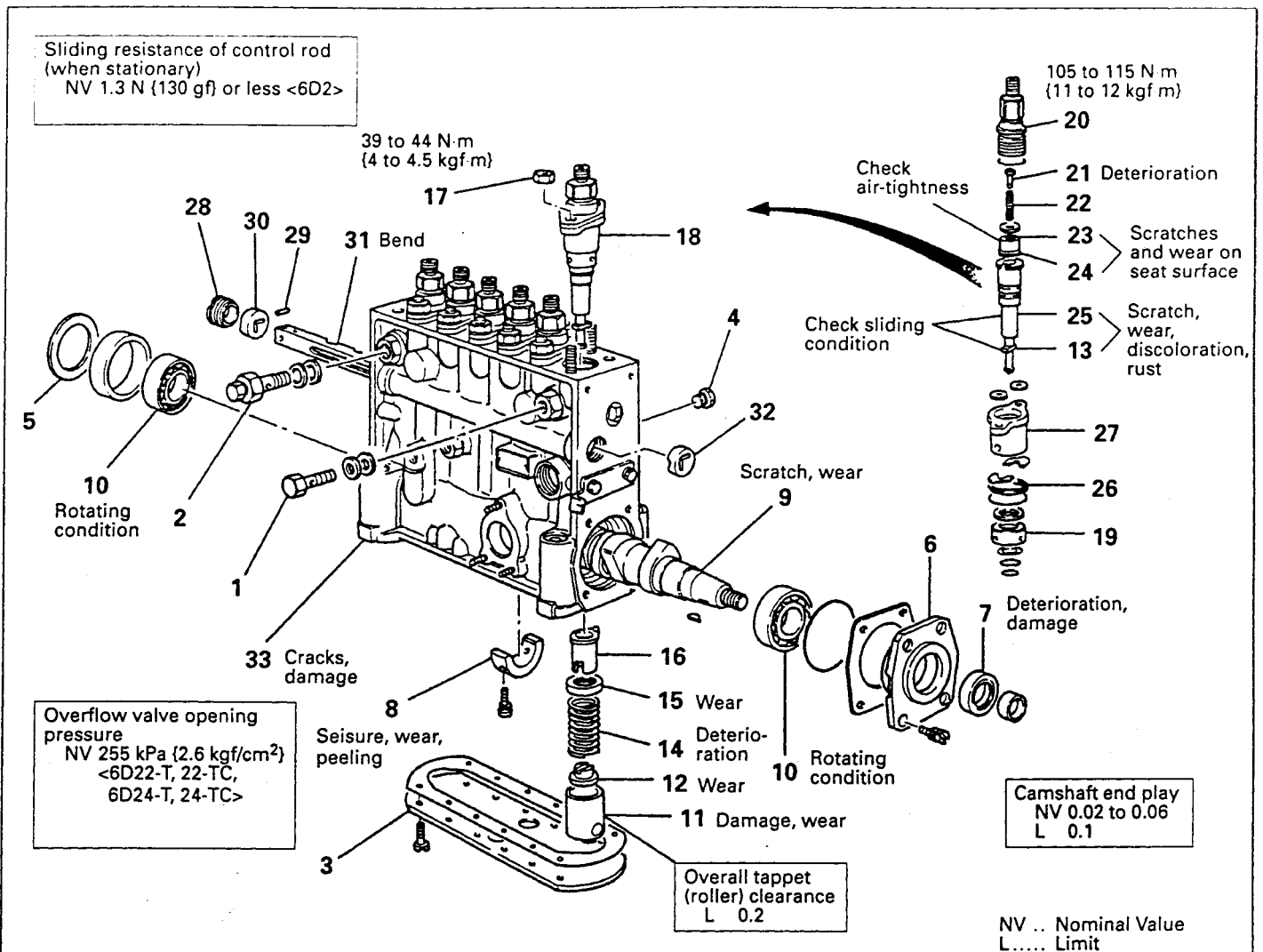


5.3.1 Disassembly, inspection and reassembly



Disassembly sequence

- | | | |
|--|---------------------------|------------------------|
| 1 Pipe joint bolt (or Overflow valve) | 11 Tappet assembly | 23 Delivery valve |
| 2 Overflow valve (or Pipe joint bolt) | 12 Lower spring seat | 24 Delivery valve seat |
| 3 Bottom cover | 13 Plunger | 25 Plunger barrel |
| 4 Screw plug | 14 Plunger spring | 26 Distance ring |
| 5 Shim | 15 Upper spring seat | 27 Flange sleeve |
| 6 Bearing cover | 16 Control sleeve | 28 Screw bushing |
| 7 Oil seal | 17 Nut | 29 Pin |
| 8 Center bearing | 18 Plunger block assembly | 30 Bushing |
| 9 Camshaft | 19 Deflector | 31 Control rod |
| 10 Roller bearing | 20 Delivery valve holder | 32 Bushing |
| | 21 Stopper | 33 Pump housing |
| | 22 Delivery valve spring | |

D1568B

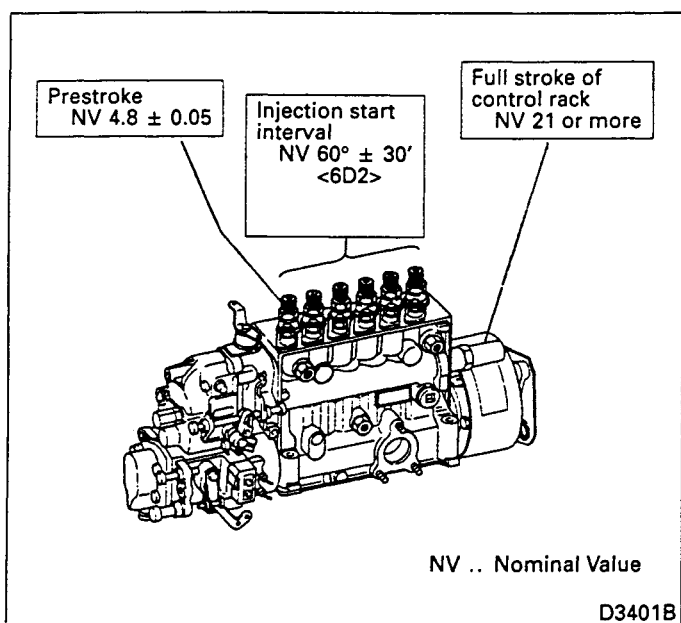
Precautions when removing and fitting delivery valve holder

Before removing or fitting only a delivery valve holder, first confirm that the two nuts that hold the flange sleeve down are completely tight.

If a delivery valve holder is removed or fitted with the nuts loose, the flange sleeve can move and thus alter the fuel injection volume.

5.3.2 Testing and adjustment

Since injection volume adjustment values and measurement conditions vary according to configuration, please refer to a Zexel service station.

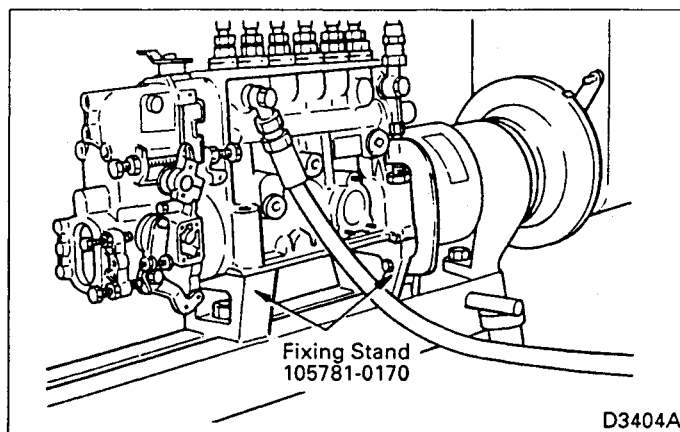


Injection sequence

1 – 5 – 3 – 6 – 2 – 4 <6D2>

NOTE:

1. Fill the injection pump cam chamber with oil.
2. Adjust the injection rate after adjusting the governor.

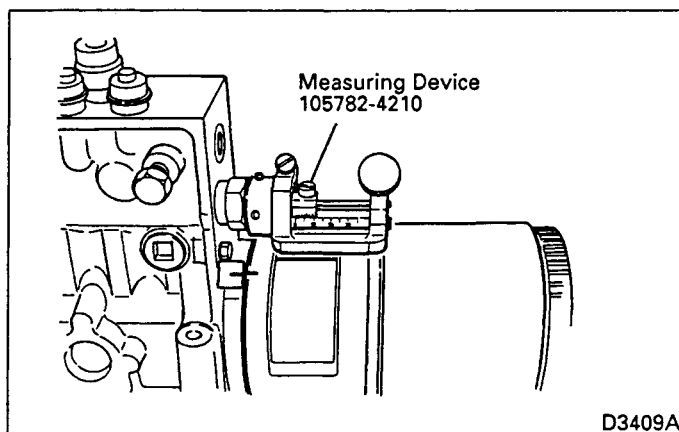


- (1) Install and secure two injection pump tester Fixing Stands (special tool) to the injection pump.

NOTE:

Make sure that the center of coupling is aligned with that of injection pump so that the coupling and injection pump turn smoothly.

- (2) Control rod "0" position setting



<With RSV governor>

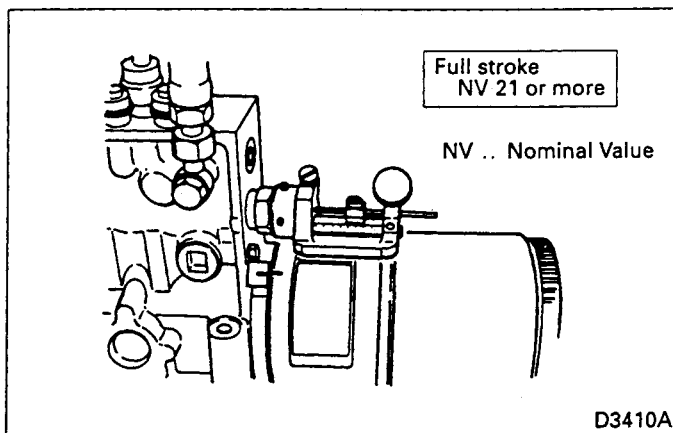
- (a) Maintain a pump speed of 750 rpm.
- (b) Loosen the stopper bolt and pull the adjusting lever in the "injection stop" direction.
- (c) Push the end of the measuring device fully against the side of the governor and zero the Measuring Device's scale.

- (c) Push the end of the Measuring Device fully against the side of the governor and zero the Measuring Device's scale.

NOTE:

1. Unless the injection pump is run at the speed given above, the scale cannot be zeroed regardless of how hard the control rod is pushed. Also, the governor's link mechanism may be damaged.
2. The damper springs must be removed.
3. If a boost compensator is fitted, it must be removed before the measuring device is fitted.

(3) Control rod stroke check



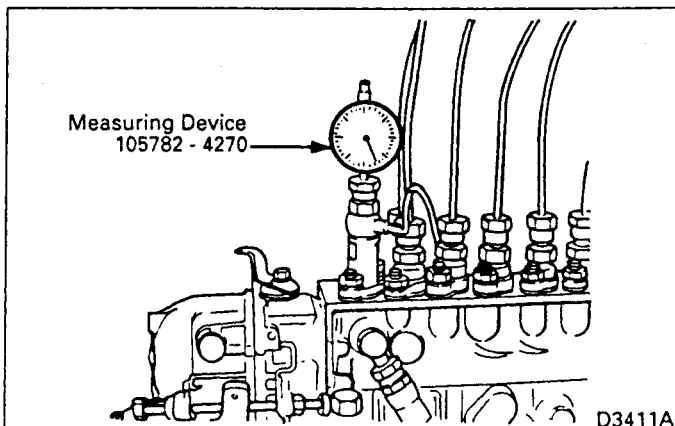
Move the control rod to ensure that its entire stroke is more than as specified.

Also confirm that the start spring and idling spring move the control rod smoothly in the maximum injection volume direction.

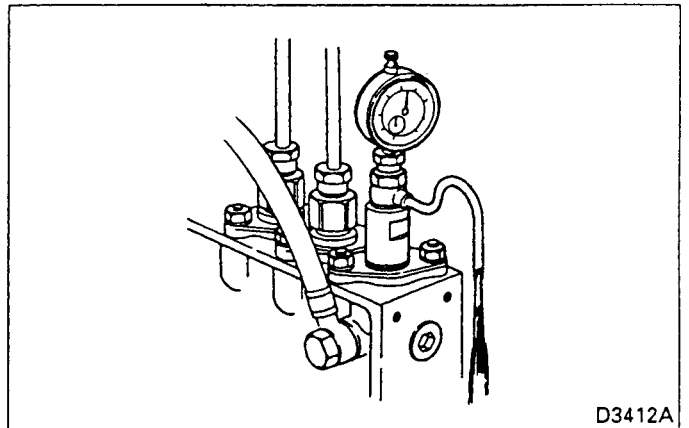
(4) Adjustment of prestroke

Remove the overflow valve and install the blind plug.

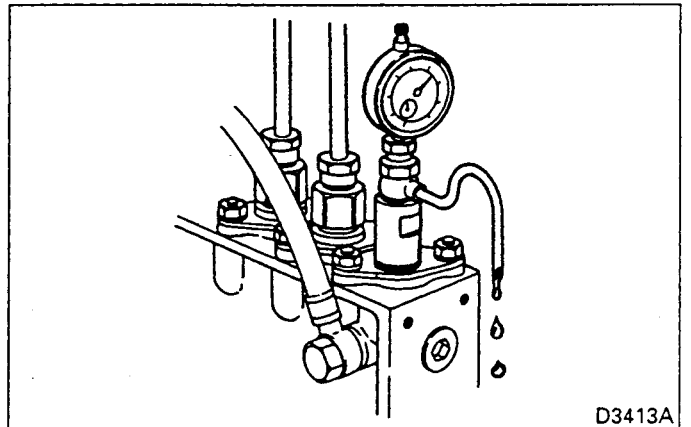
- (a) Remove the delivery valve holder, spring, delivery valve, and gasket from the No. 1 cylinder on the governor end.



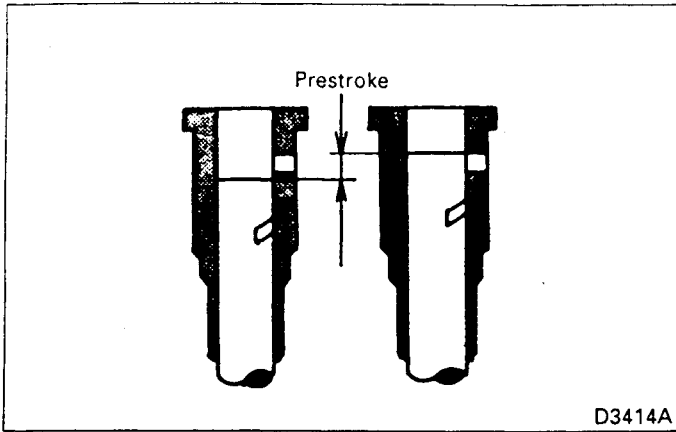
- (b) Install Measuring Device (special tool) to the flange sleeve.
- (c) Turn the pump tester flywheel to determine the bottom dead center of the plunger with the dial indicator.



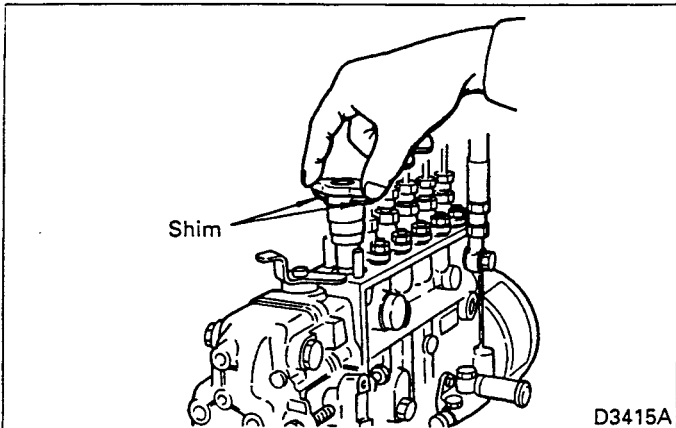
- (d) With the control rod set in the full position, send fuel under high pressure to the injection pump and let it flow out from the overflow pipe.



- (e) Slowly turn the pump tester flywheel clockwise until no more fuel flows out from the overflow pipe (static injection start).



- (f) Measure the plunger prestroke from BDC to the point where fuel stops flowing (static injection start).



- (g) If the prestroke is out of specification, adjust by varying shims between flange sleeve and pump housing.

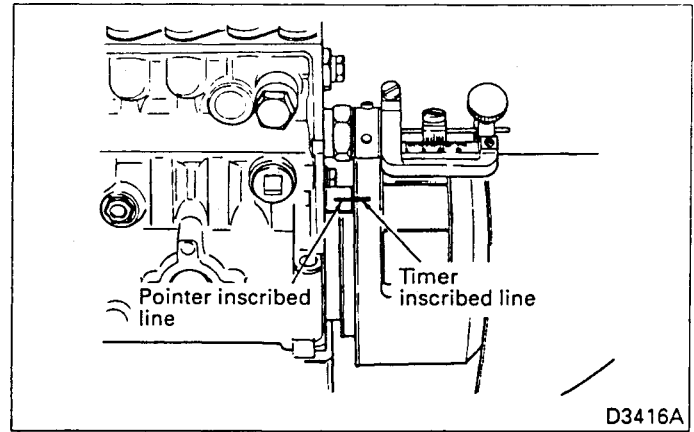
Shim thickness:

0.5 to 1.975, 59 types in 0.025 steps

Use thicker shim to increase the stroke; thinner one to decrease the stroke.

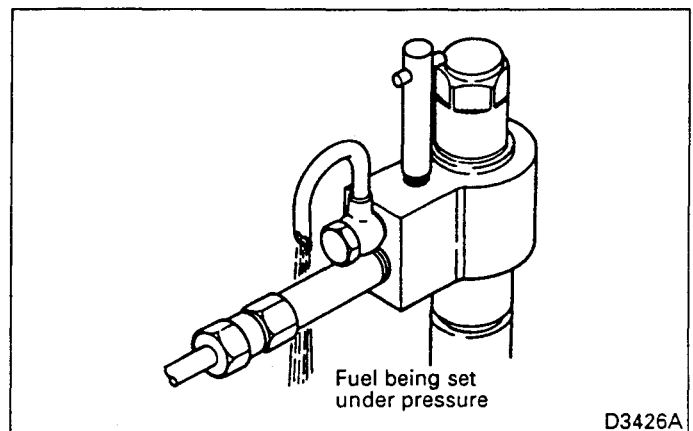
NOTE:

When installing the plunger block, apply grease to each O-ring. First, install the O-ring under the plunger barrel into the pump housing; then, apply grease to plunger barrel skirt.



- (h) After making prestroke adjustments, confirm that the inscribed lines on the timer and pointer are aligned with each other. If they are not aligned, inscribe a new line on the timer. The same instructions apply if the automatic timer is replaced with a new one.

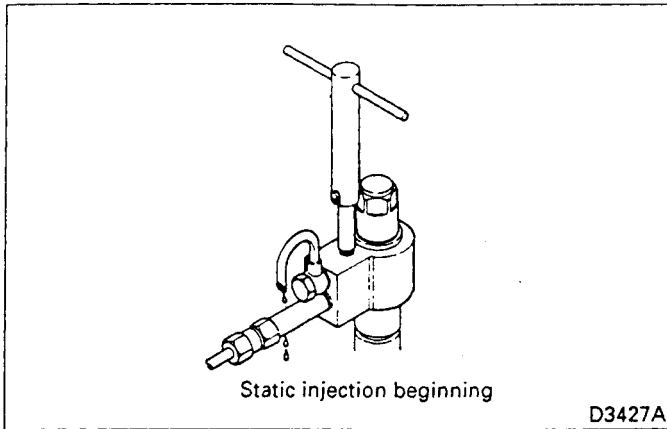
(5) Adjustment of injection start interval



- (a) Set the static injection start position of No. 1 cylinder with the pump tester dial.
 (b) Feed high-pressure fuel into the injection pump to let the fuel flow out from the overflow pipe of the tester nozzle.

NOTE:

The fuel pressure must be higher than the delivery valve opening pressure.



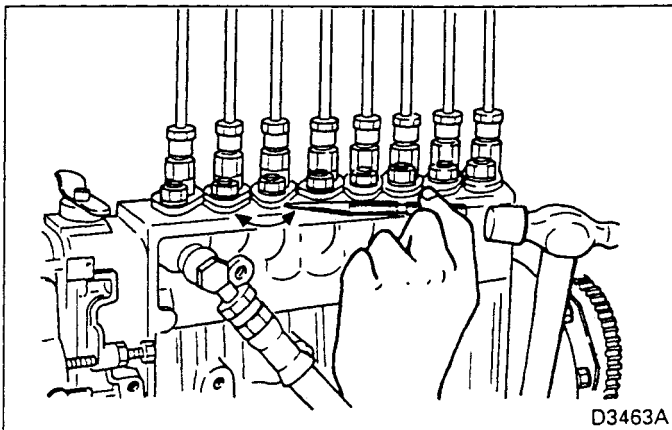
(c) Slowly turn the pump tester flywheel clockwise until the fuel stops flowing out from the tester nozzle.

Read the interval between static injection starts according to the injection sequence.

(d) If the injection start intervals are not up to specification, adjust by using the same procedure as the prestroke adjustment.

(6) Adjustment of fuel injection rate

Install the overflow valve and hose to the pump. Use a measuring cylinder to measure the fuel injection rate and uneven ratio to see if they are up to specification with the specified rack position and speed. Adjust as follows if the measured values are out of specification.



- (a) Loosen two nuts that secure the flange sleeve.
 - (b) Tap the flange sleeve to give it a turn.
 - (c) Tighten nuts to specification to secure the flange sleeve (39 to 44 N·m {4 to 4.5 kgf·m}).
- Repeat these steps.

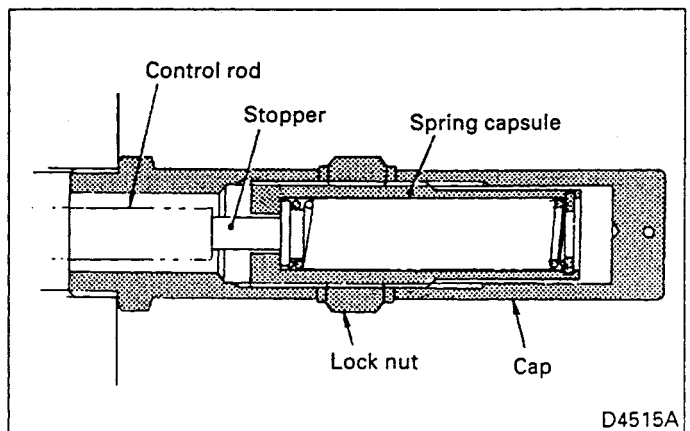
NOTE:

- 1. Use special care to make the adjustment. Improper or failure of adjustment greatly influences engine performance.
- 2. The fuel injection rate varies with nozzle and pipe used. Strictly observe the measuring requirements.
- 3. Injection rate uneven ratio

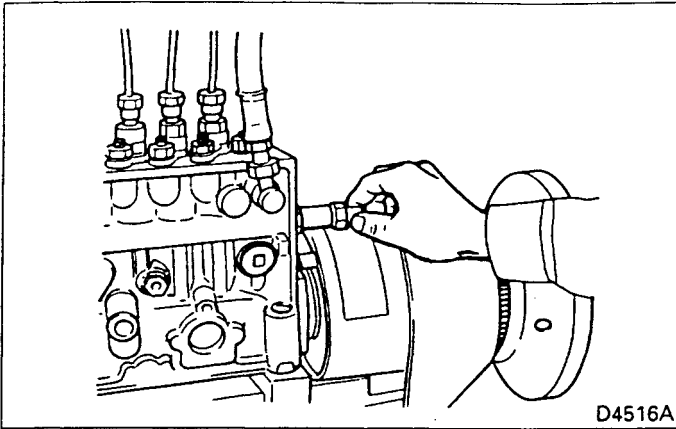
$$\text{Uneven ratio (+)} = \frac{\text{Maximum injection amount in each cylinder} - \text{Average injection amount of each cylinder}}{\text{Average injection amount of each cylinder}} \times 100 (\%)$$

$$\text{Uneven ratio (-)} = \frac{\text{Maximum injection amount in each cylinder} - \text{Average injection amount of each cylinder}}{\text{Average injection amount of each cylinder}} \times 100 (\%)$$

(7) Adjustment of smoke limiter



Place the load control lever in the full-load position. Run the pump at the specified speed to place the control rod in the specified position. Remove Measuring Device (special tool) and install the smoke set assembly (without cap). Tighten the spring capsule until the stopper comes in contact with the control rod.



With the pump run at 100 rpm, measure the fuel injection rate. If the rate is out of specification, retighten or back off the spring capsule.

Run the pump at 700 rpm and ensure that the fuel injection rate is up to specification. Secure the spring capsule with lock nut, then mount the cap.

(8) Adaptation to engine

After the governor has been adjusted, measure the fuel injection rate adaptable to the engine.

(9) Diesel fuel and oil leak check

- Diesel fuel leak from delivery valve mounting area and other parts.
- Oil leak from oil seals and other parts.

(10) Miscellaneous check

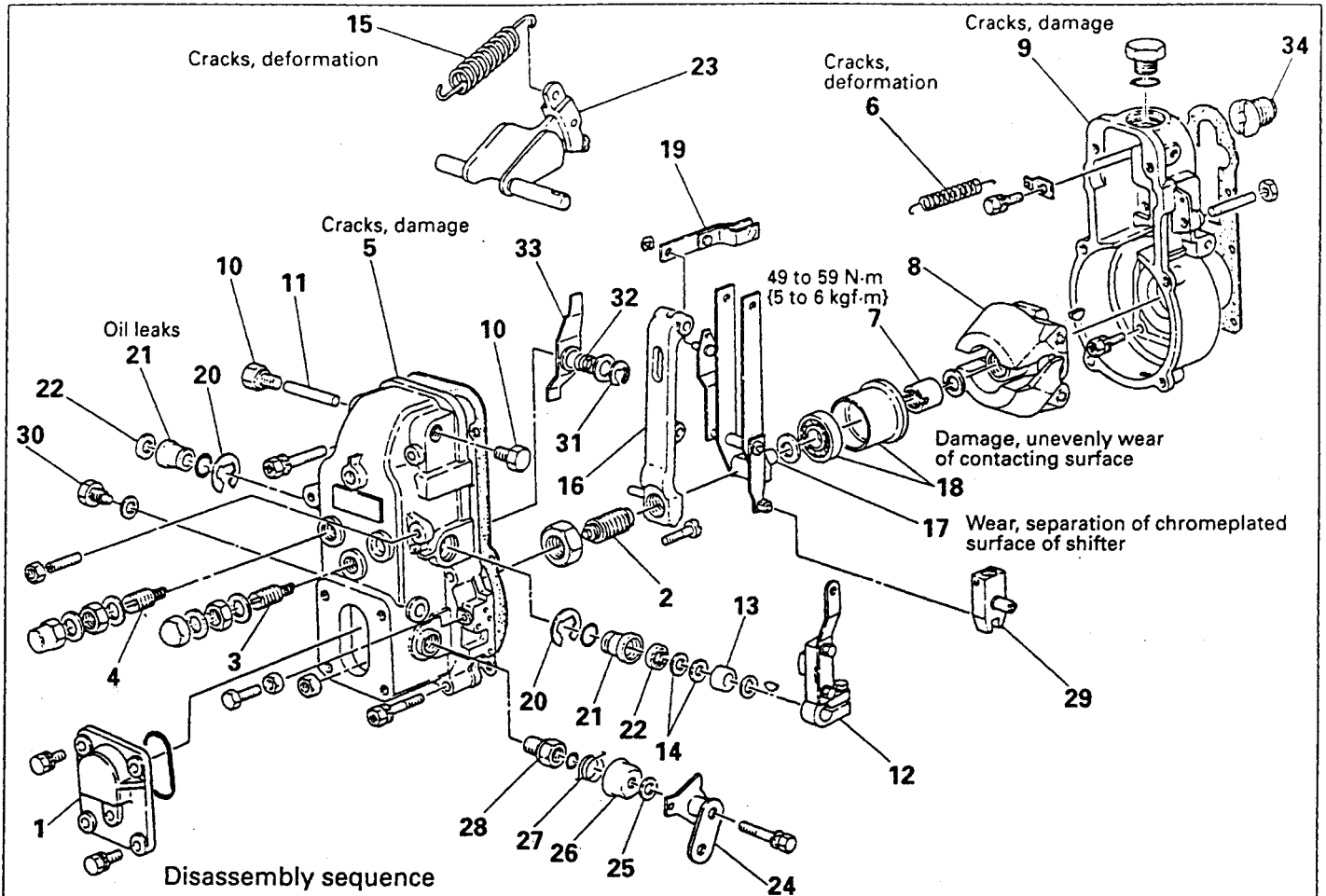
Check for unusual noise and overheated bearings.

5.4 RSV Type Governor

The following Zexel special tools should be used for governor maintenance:

| Special tool name | Part No. (Zexel product No.) | Application |
|-------------------|---------------------------------|---------------------------------------|
| Handle | 157910-1120 | Removal and installation of lock nut |
| Socket wrench | 157914-0500 | |
| Special wrench | 157915-0100 | Removal and installation of round nut |
| Wrench | 157916-2620 | Adjustment of Ungleich |
| Extractor | | Removal and installation of flyweight |
| | P type injection pump | |

5.4.1 Disassembly, inspection and reassembly



Disassembly sequence

- | | | |
|------------------------------------|------------------------|-------------------------|
| 1 Cover | 12 Adjusting lever | 24 Stop lever |
| 2 Ungleich spring or idling spring | 13 Collar | 25 Shim |
| 3 Idling sub spring | 14 Shim | 26 Spring cap |
| 4 Torque spring | 15 Governor spring | 27 Return spring |
| 5 Governor cover | 16 Tension lever | 28 Bushing |
| 6 Start spring | ⑰ Guide lever assembly | 29 Sliding lever |
| 7 Round nut | ⑱ Sleeve | 30 Bolt |
| 8 Flyweight | 19 Shackle | 31 Snap ring |
| 9 Governor housing | 20 Snap ring | 32 Spring |
| 10 Plug | 21 Bushing | 33 Torque control lever |
| 11 Tension lever shaft | 22 Oil seal | 34 Adaptor |
| | 23 Swivel lever | |

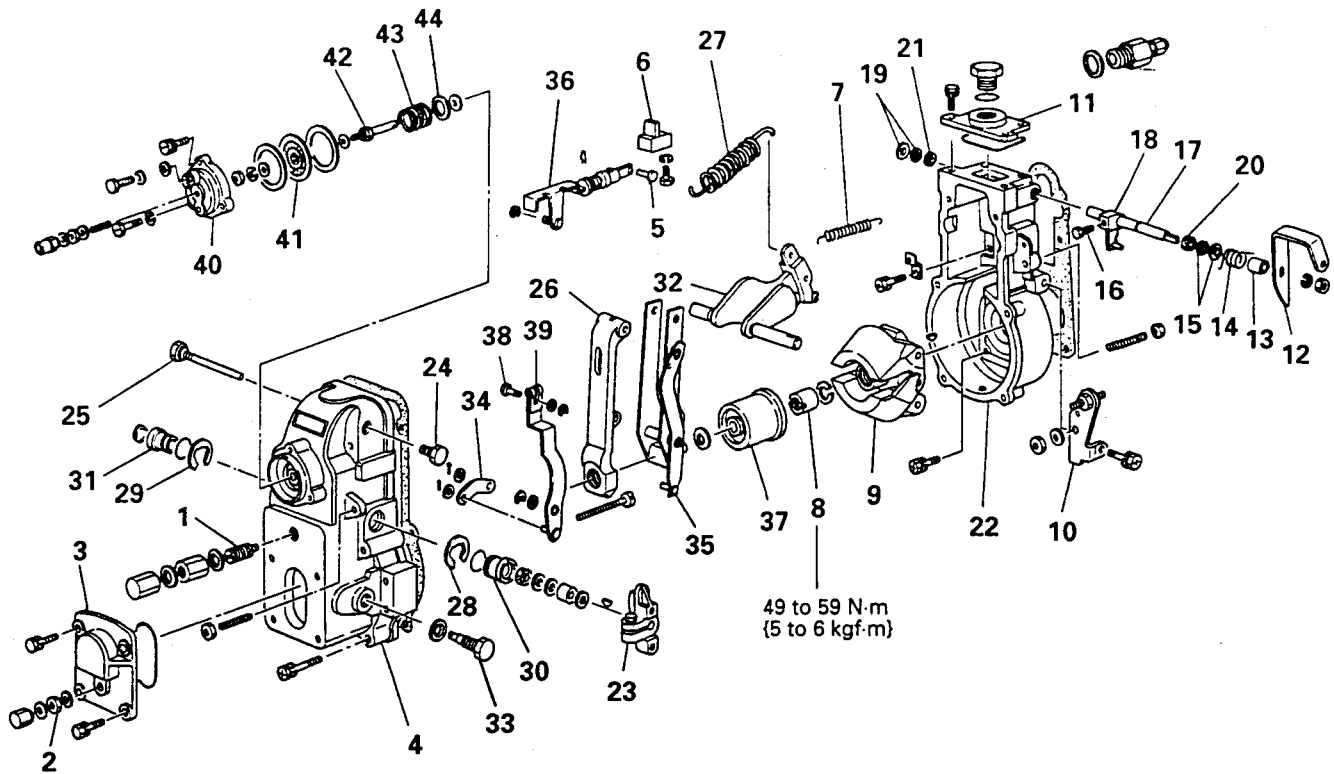
For parts with an encircled number, refer to Disassembly Procedure that follows.
For reassembly, reverse the order of disassembly.

NOTE:

1. Do not remove the shackle and sleeve from the guide lever unless replacement is necessary.
2. Do not remove the swivel lever from the governor cover unless parts replacement is necessary or when its motion is not smooth.
3. Do not remove the governor housing unless oil leak is evident or parts replacement is necessary. If it needs to be removed, use Tappet Insert (special tool) to make sure that the camshaft will not contact with the tappet.

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<With Boost compensator>



Disassembly sequence

- | | | |
|---------------------|------------------------|--------------------------------|
| 1 Idling sub spring | 16 Bolt | 31 Bushing |
| 2 Lock nut | 17 Shaft | 32 Swivel lever |
| 3 Cover | 18 Lever | 33 Bolt |
| 4 Governor cover | 19 Washer | 34 Link |
| 5 Pin | 20 Oil seal | ③⑤ Guide lever assembly |
| 6 Connector | 21 Oil seal | 36 Link |
| 7 Start spring | 22 Governor housing | ③⑦ Sleeve |
| 8 Round nut | 23 Adjusting lever | 38 Pin |
| 9 Flyweight | 24 Plug | 39 Lever |
| 10 Bracket | 25 Tension lever shaft | 40 Cover |
| 11 Cover | 26 Tension lever | 41 Diaphragm |
| 12 Stop lever | 27 Governor spring | 42 Push rod |
| 13 Collar | 28 Snap ring | 43 Boost compensator spring |
| 14 Return spring | 29 Snap ring | 44 Adjusting shim |
| 15 Washer | 30 Bushing | |

For parts with an encircled number, refer to Disassembly Procedure that follows.

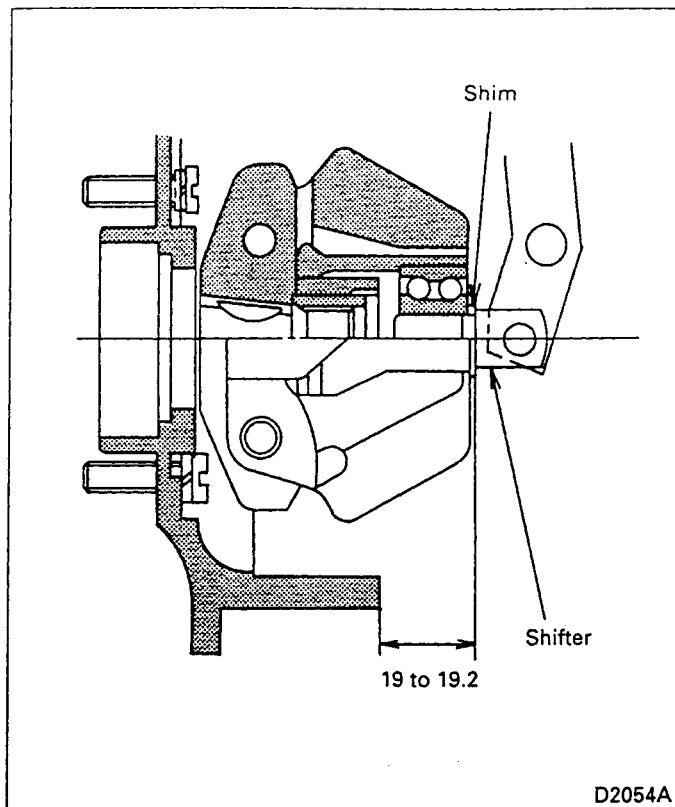
For reassembly, reverse the order of disassembly.

NOTE:

- Do not remove the shackle and sleeve from the guide lever unless replacement is necessary.
- Do not remove the swivel lever from the governor cover unless parts replacement is necessary or when its motion is not smooth.
- Do not remove the governor housing unless oil leak is evident or parts replacement is necessary. If it needs to be removed, use Tappet Insert (special tool) to make sure that the camshaft will not contact with the tappet.

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Shifter assembly dimensions



When the shifter and sleeve are assembled, the shifter's assembly dimensions are adjusted using the shims. Therefore, do not rearrange the shims. If the shim needs to be replaced, install the associated parts into position. Select the shim of a correct thickness to obtain the specified dimension between the housing end face and shifter.

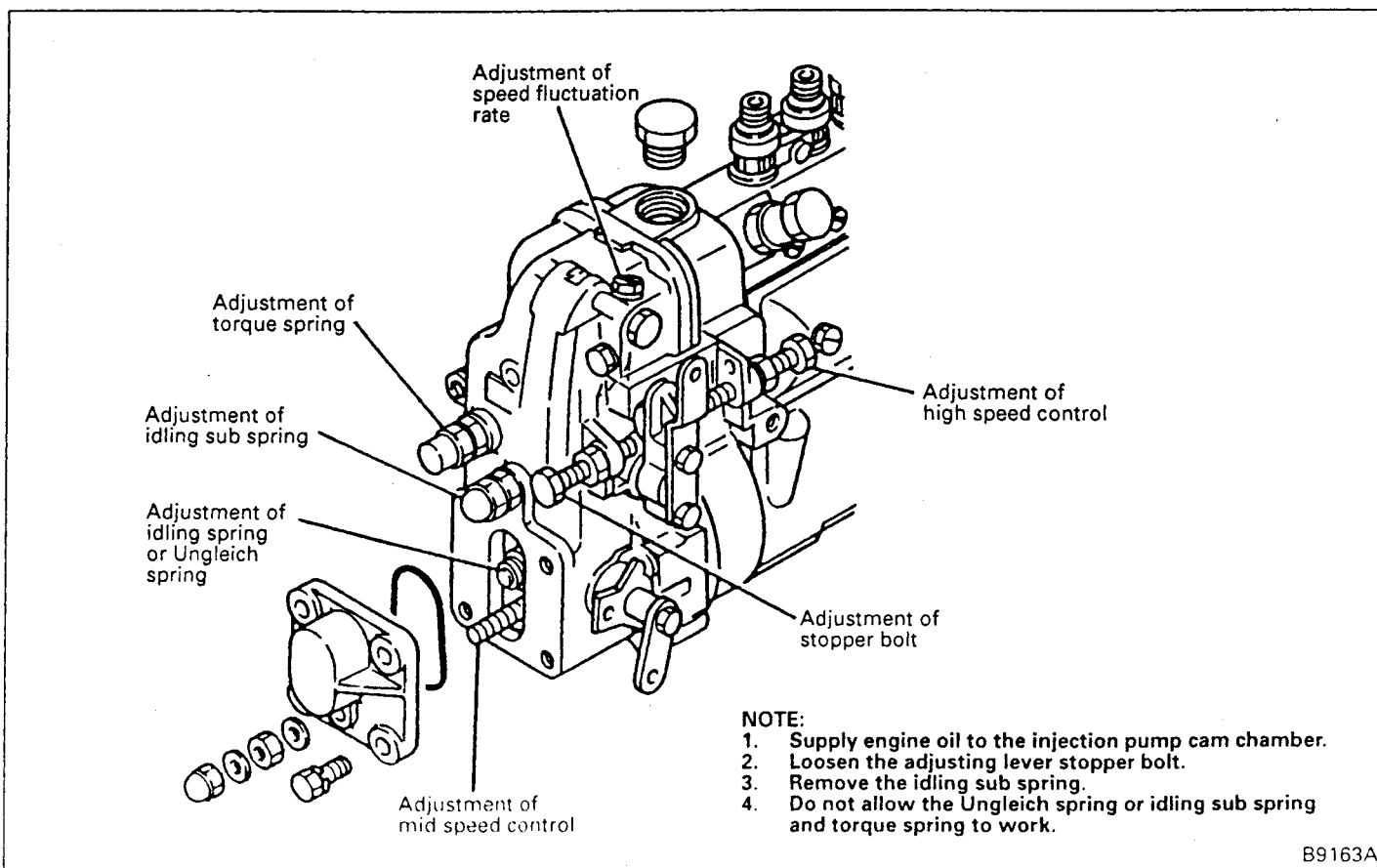
Shim thickness (6 types): 0.2, 0.3, 0.4, 0.5, 1.0, 1.5

NOTE:

Measure the dimension as assembled without lifting the flyweights.

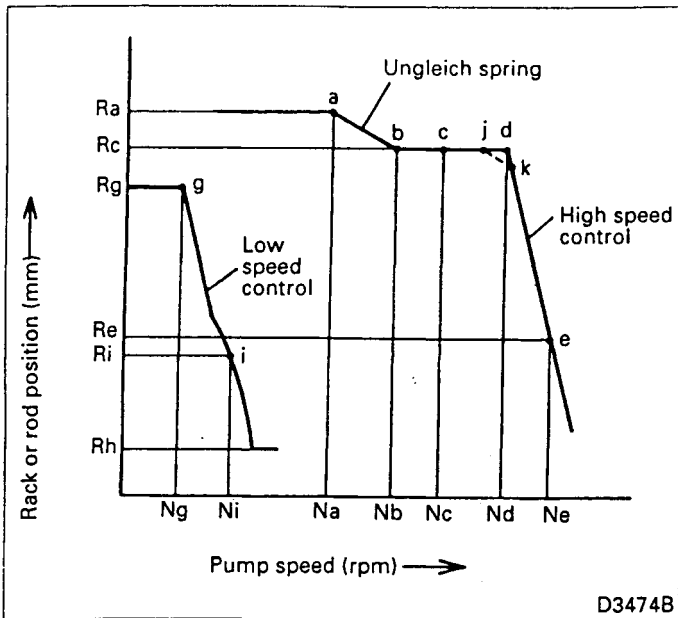
5.4.2 Testing and adjustment

The performance curves used when making governor adjustments vary according to the governor configuration. Please refer to a Zexel service station for details.



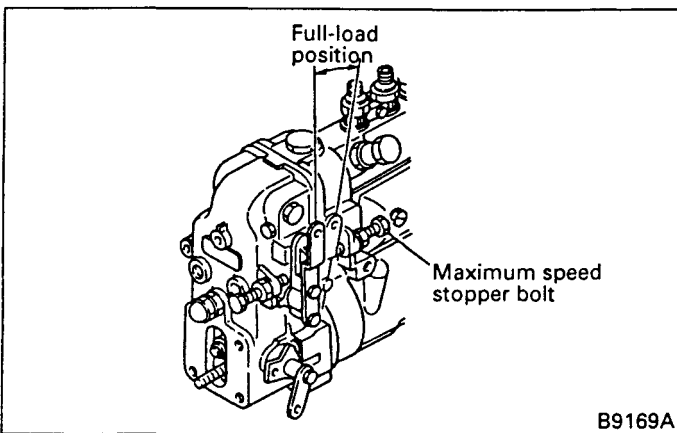
- NOTE:**
1. Supply engine oil to the injection pump cam chamber.
 2. Loosen the adjusting lever stopper bolt.
 3. Remove the idling sub spring.
 4. Do not allow the Ungleich spring or idling sub spring and torque spring to work.

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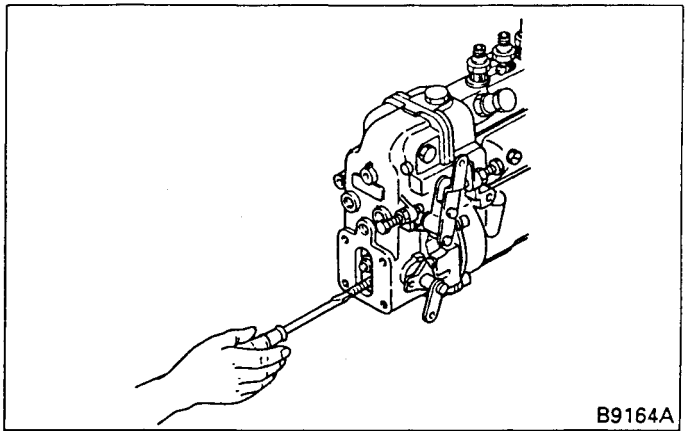
Adjust the relationship between pump speed and the rack or rod position to specified governor performance curve by the following procedure.

- (1) "0" position setting of control rod <P type pump> [Refer to Section 5.3.2 (2).]
- (2) Install the angle scale plate for fixing the adjusting lever.
- (3) Temporary adjustment of high speed control



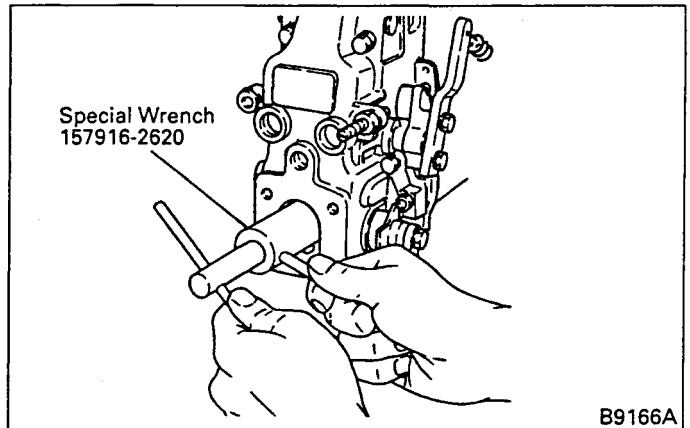
With the adjusting lever in full position, adjust the maximum speed stopper bolt so that high speed control starts to work when the pump speed is "Nd".

(4) Adjustment of intermediate speed control



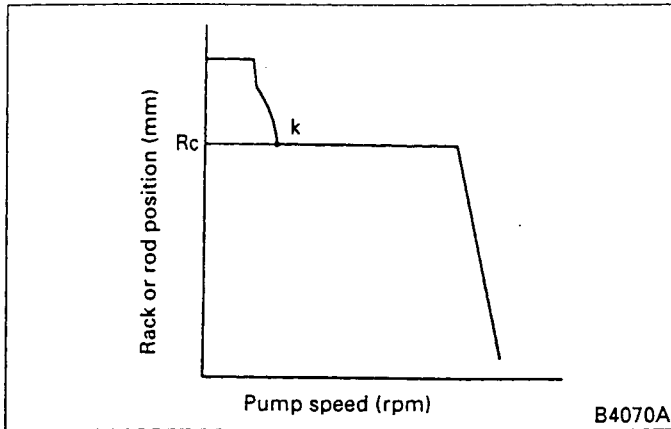
Adjust the full-load stopper bolt so that the pump speed becomes "Nc" which is slightly lower than "Nd".

(5) Adjustment of Ungleich spring (governor with Ungleich spring only)



- (a) Keep the pump running at a speed which is slightly lower than "Na" (speed at which Ungleich spring starts to work).
- (b) Fix the adjusting lever at the full position.
- (c) Using Wrench (special tool), tighten the Ungleich spring so that the rack will move from "Rc" to "Ra". Fix the spring with lock nut.
- (d) Check that the pump speed is "Na" and "Nb" when the rack position is "Ra" and "Rc", respectively.

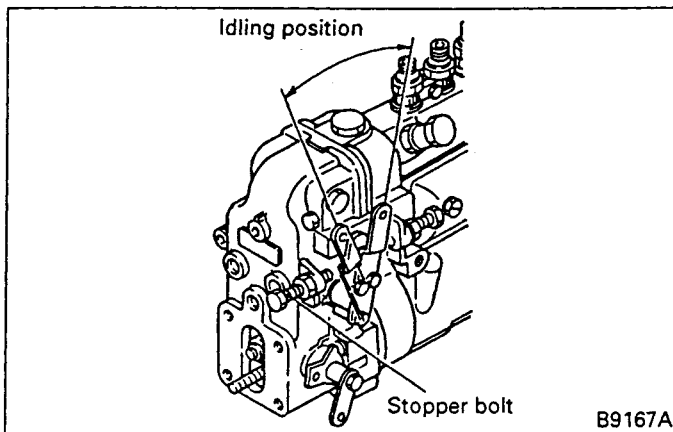
(6) Adjustment of idling spring
(governor with idling spring only)



Adjust the idling spring so that the rack or rod starts to move from "Rc" to direction to increase fuel rate at point k.

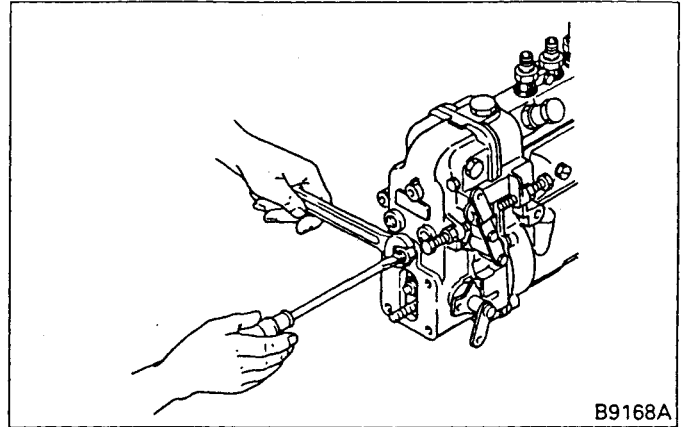
(7) Adjustment of low speed control

(a) Adjustment of stopper bolt



Adjust the stopper bolt so that the rack or rod is positioned at "Rg" when the adjusting lever is set at idling position with the pump stationary.

(b) Adjustment of idling sub spring

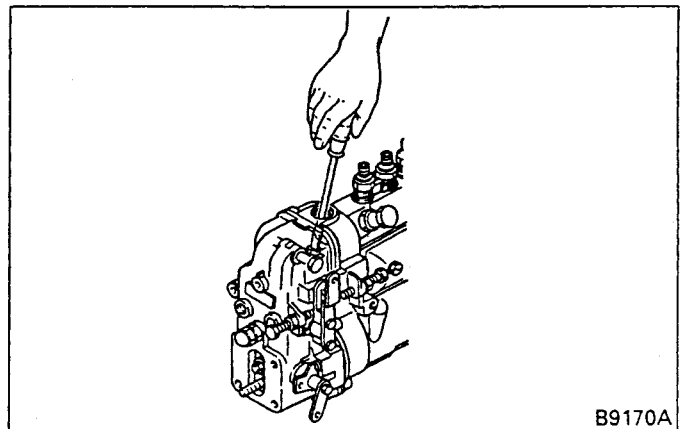


Adjust the idling sub spring so that the rack or rod is positioned at "Ri" when the pump speed is "Ni". Check that the rack is positioned at "Rh" when the pump speed is further increased.

(8) Adjustment of high speed control

Adjust as in Item (3) and fix the maximum speed stopper bolt in position.

(9) Adjustment of speed regulation



Check that the rack or rod is pulled back to position "Re" when the pump speed is increased from "Nd" to "Ne".