

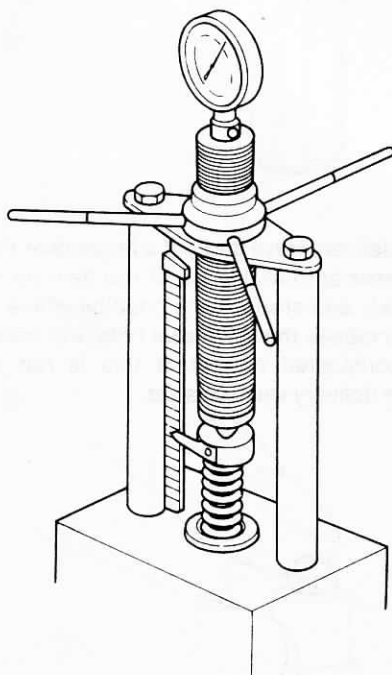
- (3) Place your finger over the hole in the bottom of the valve seat and insert the valve into the valve body. If the valve returns to its original position when you remove your finger, the valve is okay. If some defect is found, replace with a new valve.
- (4) If the valve closes completely by its own weight when you remove your finger from the hole on the bottom of the valve seat, the valve is okay. If it doesn't close perfectly replace with a new valve.



NOTE: When using a brand-new set, wash off the rustproof oil with clean oil or gasoline. Then, wash once more with clean oil, and follow the steps outlined above.

2-5.6 Plunger spring and delivery valve spring

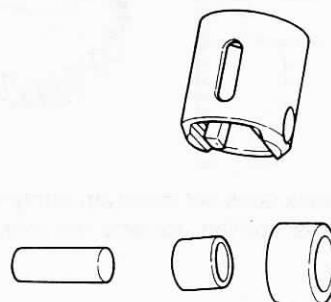
Inspect the plunger spring and delivery valve spring for fractured coils, rust, inclination and permanent strain. Replace the spring when faulty.



	Free length	Set length	Set load
Plunger spring	35.5mm (1.3976in.)	29.5mm (1.1614in.)	11.59 ±1.1 kg (23.13 ~ 27.98 lb)
Delivery valve spring	21mm (0.8268in.)	17.25mm (0.6791in.)	2.4 ±0.24 kg (4.76 ~ 5.82 lb)

2-5.7 Plunger guide

Check the tappet roller (Inside and outside) and roller pin for damage and uneven wear, and replace if required. Measure the clearance between the plunger and plunger guide. If the clearance exceeds the limit, replace.



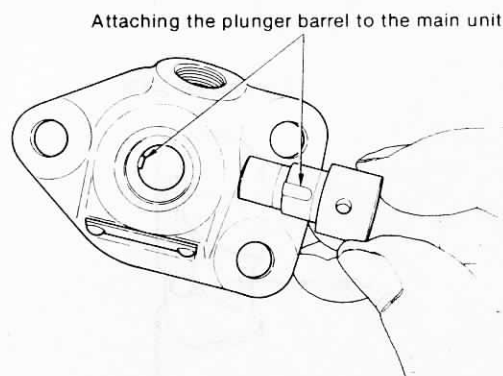
	mm (in.)
Clearance limit	0.3 (0.0118)

2-6 Assembling the fuel injection pump

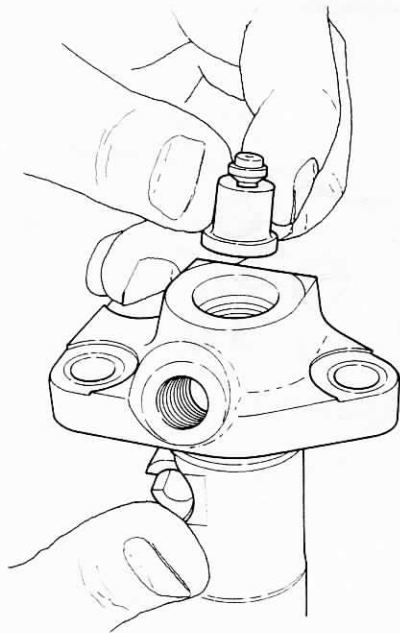
- NOTES:** 1) After inspection, divide the components into two groups, i.e. the components to be replaced, and those that are reusable. Rinse the components and store the two groups separately.
- 2) Replace the packing with a new one.

1GM

- (1) While lining up the plunger barrel positioning groove with the dowel of the main unit, attach the plunger barrel to the main unit.



- (2) Attach the delivery valve seat and the delivery valve to the main unit.



Attaching the delivery valve to the main unit

NOTE: If the delivery valve tip projects noticeably above the top of the main unit of the pump, the plunger barrel has been installed incorrectly, and must be re-attached.

- (3) Attach the delivery valve packing and the delivery valve spring to the main unit and carefully tighten the delivery valve holder.

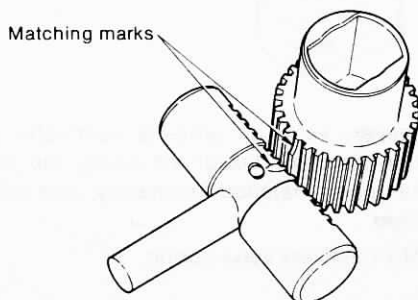
NOTE: Tighten the delivery valve holder with a torque wrench after attaching the plunger and while checking the fuel control rack for sliding motion.

1GM	kg·m (ft·lb)
Tightening torque	4.0 ~ 4.5 (28.92 ~ 32.54)

- (4) With the matching mark of the fuel control rack directed towards the lower part of the main unit of the pump, attach the fuel control rack to the main unit.

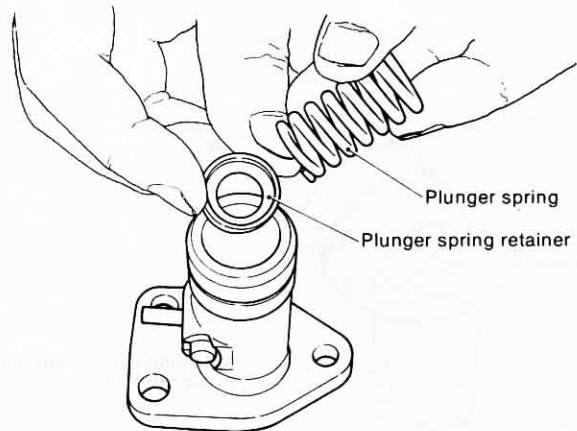
NOTE: Make sure the fuel control rack moves smoothly along its entire stroke.

- (5) By aligning the matching mark on the fuel control pinion with that on the fuel control rack, attach the fuel control pinion to the main unit.



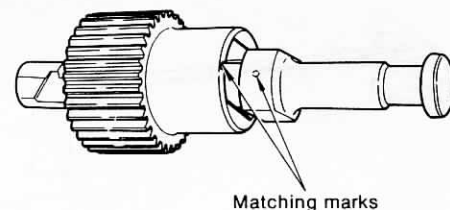
NOTE: After attaching the fuel control pinion to the main unit, check its meshing by moving the fuel control rack.

- (6) Insert the plunger spring retainer and attach the plunger spring to the main unit.



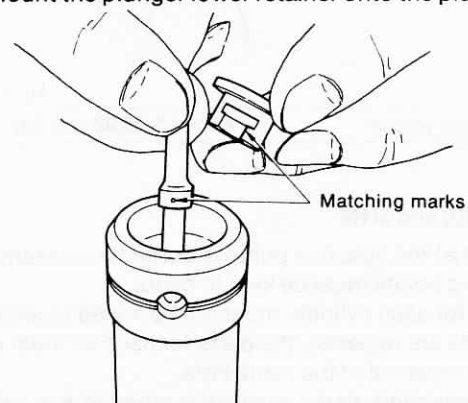
NOTE: The plunger spring retainer should face the underside of the pump.

- (7) After aligning the matching mark on the plunger flange with that on the fuel control pinion, attach the plunger to the main unit.



NOTE: By inverting and standing the main unit of the pump upright attach the plunger to it carefully.

- (8) Mount the plunger lower retainer onto the plunger.

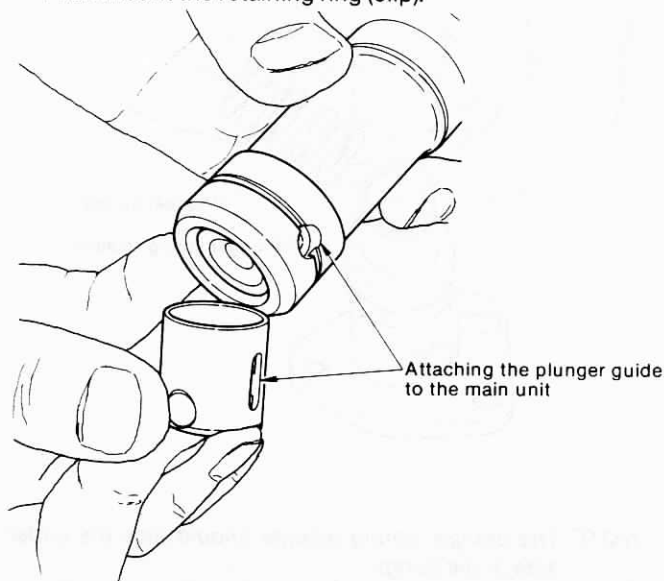


- (9) Insert the plunger adjusting shims.

NOTE: Insert the same number of shims with the same thickness as those inserted before disassembling the pump. After re-assembling the pump, measure and adjust the top clearance of the plunger.

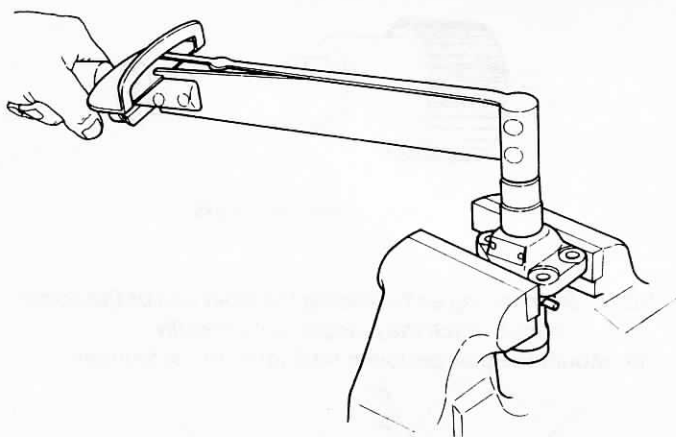
- (10) While adjusting the direction of the plunger guide stopper hole for the plunger guide, insert the plunger guide carefully.

When the plunger guide stopper hole is lined up with the plunger guide, insert the plunger guide stopper. Then mount the retaining ring (clip).



Attaching the plunger guide to the main unit

- (11) After attaching tighten the delivery valve holder with a torque wrench.



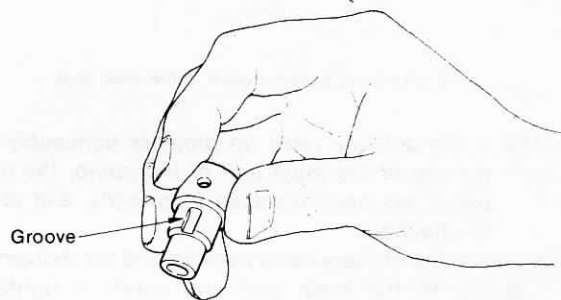
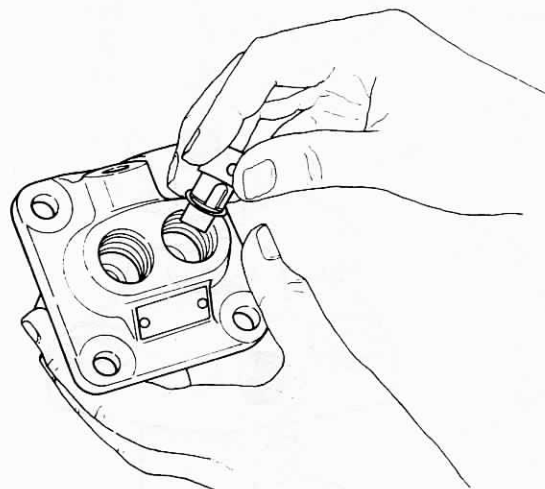
1GM		kg-m (ft-lb)
Tightening torque		4.0 ~ 4.5 (28.92 ~ 32.54)

2GM, 3GM(D) and 3HM

To ensure that the injection pump is correctly reassembled, the following points must be kept in mind:

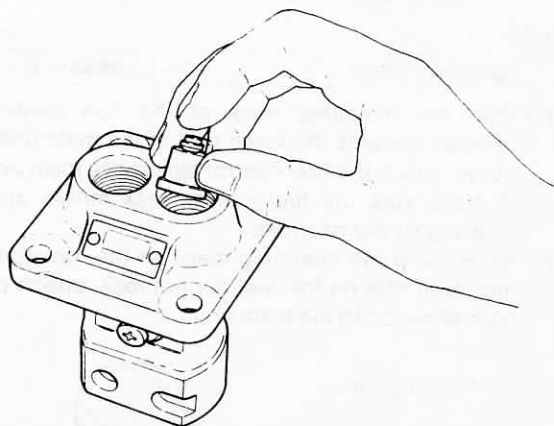
- The parts for each cylinder must not be mixed together.
- When parts are replaced, the parts for each cylinder must always be replaced at the same time.
- When assembling, parts must be washed in fuel oil and matching marks and scribe lines must be lined up.

- (1) Install the No.1 plunger barrel packing.
(2) Insert the No.1 plunger barrel by aligning the groove of the barrel lock pin.



Groove

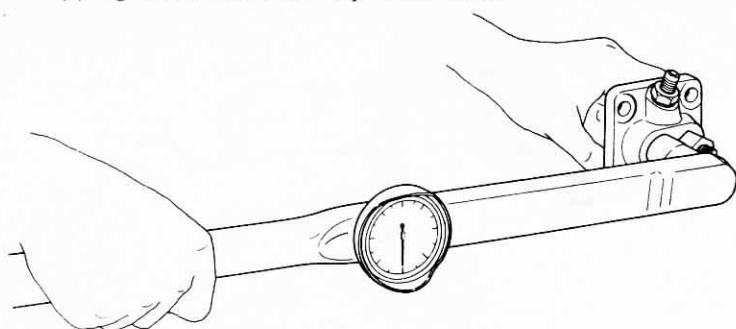
- (3) Install the No.1 delivery valve, delivery valve seat and packing.



NOTE: If the delivery valve tip projects noticeably above the top of the main unit of the pump, the plunger barrel has been installed incorrectly, and must be re-attached.

- (4) Insert the No.1 delivery valve spring.

- (5) Tighten the No.1 delivery valve holder.



2GM, 3GM(D), 3HM

kg-m (ft-lb)

Tightening torque	4.0 ~ 4.5 (28.92 ~ 32.54)
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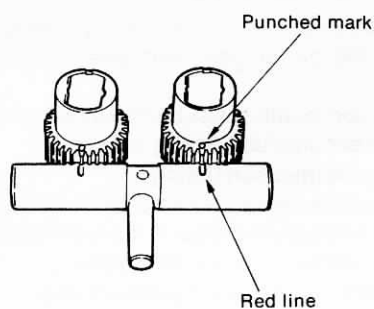
NOTE: Tighten the delivery valve holder with a torque wrench after attaching the plunger and while checking the fuel control rack for sliding motion.

- (6) With the matching mark of the fuel control rack directed towards the lower part of the main unit of the pump, attach the fuel control rack to the main unit.

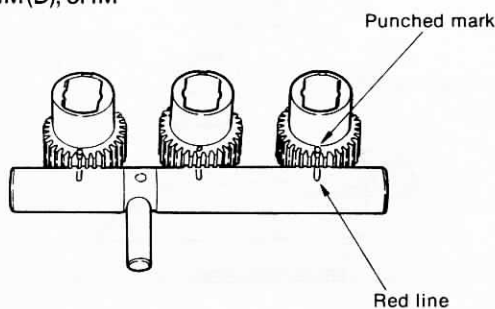
NOTE: Make sure the fuel control rack moves smoothly along its entire stroke.

- (7) By aligning the matching mark on the fuel control pinion with that on the fuel control rack, attach the fuel control pinion to the main unit.

2GM

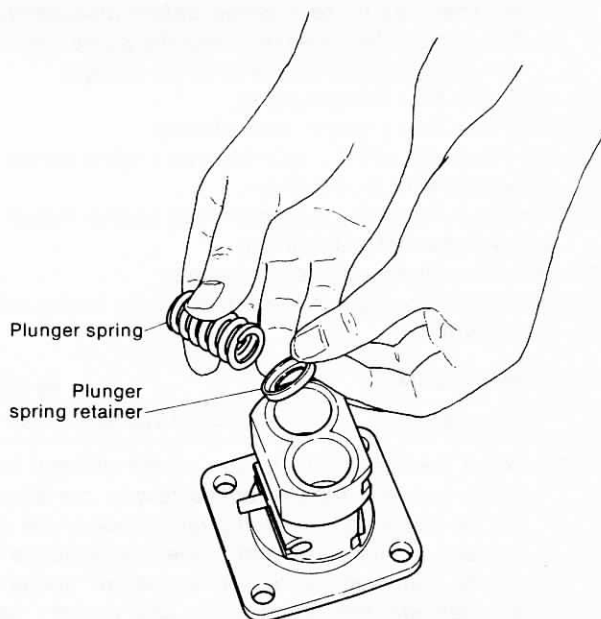


3GM(D), 3HM



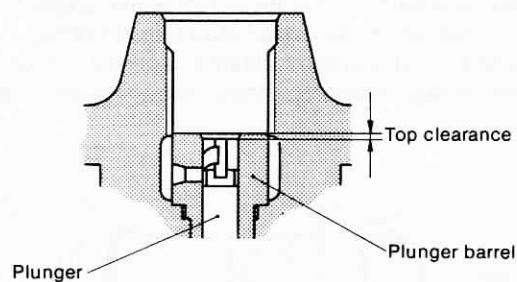
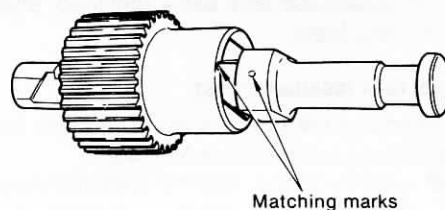
NOTE: After attaching the fuel control pinion to the main unit, check its meshing by moving the fuel control rack.

- (8) Insert the No.1 plunger spring retainer and attach the plunger spring to the main unit.



NOTE: The plunger spring retainer should face the underside the pump.

- (9) After aligning the matching mark on the plunger flange with that on the fuel control pinion, attach the plunger to the main unit.



NOTE: By inverting and standing the main unit of the pump upright attach the plunger to it carefully.

- (10) Install the No.1 plunger spring lower retainer. Make sure that it is not installed backwards.

(11) Insert the plunger shim.

NOTE: Insert the same number of shims with the same thickness as those inserted before disassembling the pump. After re-assembling the pump, measure and adjust the top clearance of the plunger.

(12) Insert the No.1 plunger guide.

(13) Insert the No.1 plunger guide stopper.

(14) For the pump of the 2 cylinder type engine, repeat the above steps for No.2 cylinder.

(15) For the pump of the 3 cylinder type engine, repeat the above steps for No.3 cylinder.

(16) Install the plunger guide stopper pin.

(17) After attaching tighten the delivery valve holder with a torque wrench.

2GM, 3GM(D), 3HM		kg-m (ft-lb)
Tightening torque		4.0 ~ 4.5 (28.92 ~ 32.54)

NOTE: When the tightening torque of the delivery valve holder exceeds the prescribed torque, the plunger will be distorted, the sliding resistance of the control rack will increase, and proper performance will not be obtained. Moreover, excessive tightening will damage the pump body and delivery valve gasket, and cause a variety of other problems.

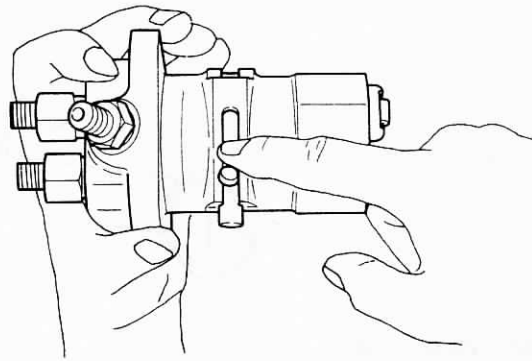
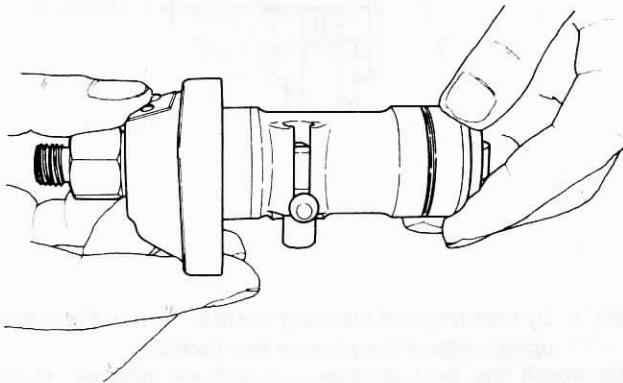
2-7 Inspection after reassembly

When the engine doesn't run smoothly and the injection pump is suspected as being the cause, or when the pump has been disassembled and parts replaced, always conduct the following tests.

2-7.1 Control rack resistance test

After reassembling the pump, wash it in clean fuel, move the rack and check resistance as follows:

- (1) This test is performed to determine the resistance of the control rack. When the resistance is large, the engine will run irregularly or race suddenly.
- (2) Place the pump on its side, hold the control rack up and allow it to slide down by its own weight. The rack should slide smoothly over its entire stroke. Place the pump on end and perform the above test again; check for any abnormalities. [Resistance below 60g (0.132 lb)]
- (3) Since a high sliding resistance is probably a result of the following, disassemble the pump and wash or repair it.



- (a) Resistance of the rotating and sliding parts of the plunger assembly is too high.
- (b) Delivery valve holder is too tight (plunger barrel distorted).
- (c) Control rack or control pinion teeth and control rack outside circumference are dirty or damaged.
- (d) Injection pump body control rack hole is damaged.
- (e) Plunger barrel packing is not installed correctly and the barrel is distorted. (Since in this case fuel will leak into the crankcase and dilute the lubricating oil, special care must be taken).

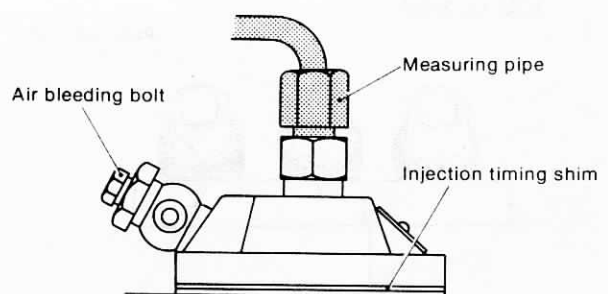
2-7.2 Fuel injection timing

Fuel injection timing is adjusted by timing shims inserted between the pump body and gear case pump mounting seat.

The injection pump must be mounted on the engine, and each cylinder injection timing adjusted.

Adjusting the injection timing

- (1) Remove the high pressure pipe from the pump.
- (2) Install a measuring pipe if the injection pump does not have a nipple on the delivery side.
- (3) Bleed the air from the injection pump.



- (4) Set the control rack to the middle fuel injection position (Pull the lever when setting the accelerator lever.)
- (5) Turn the crankshaft slowly by hand, and read the timing mark (TD) on the flywheel the instant fuel appears at the measuring pipe or pipe joint nipple. (FID+ Fuel injection from delivery valve.)