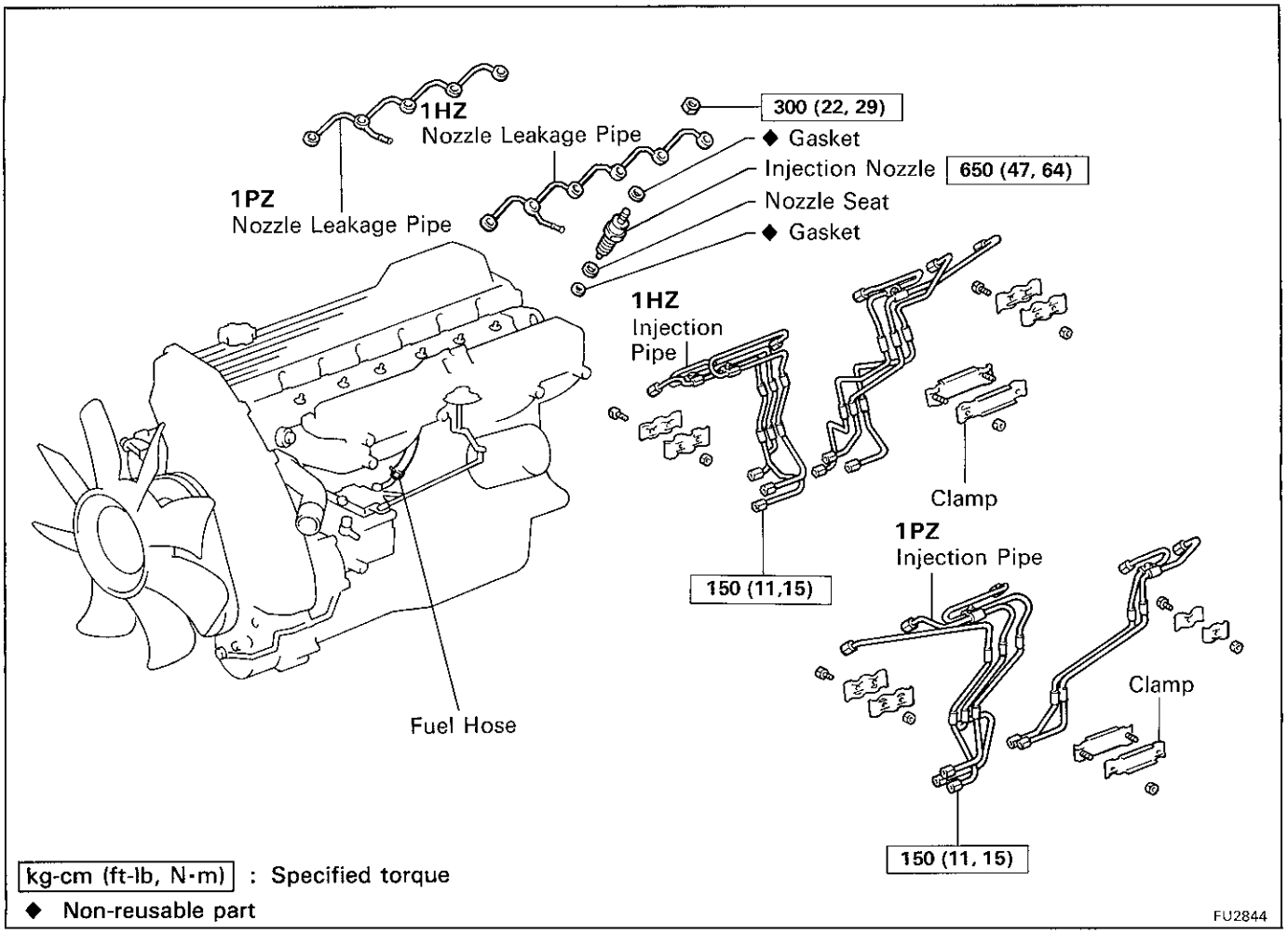
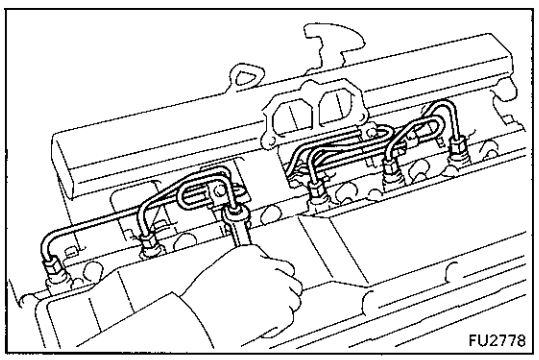
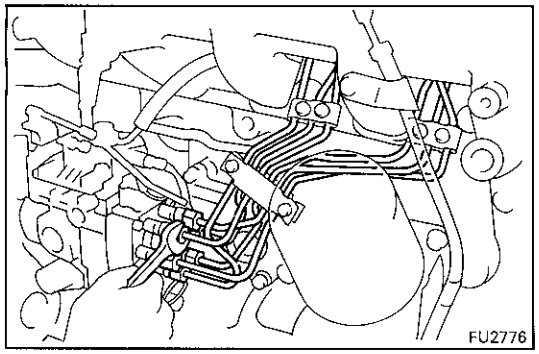
INJECTION NOZZLES (1PZ and 1HZ)

REMOVAL OF INJECTION NOZZLES

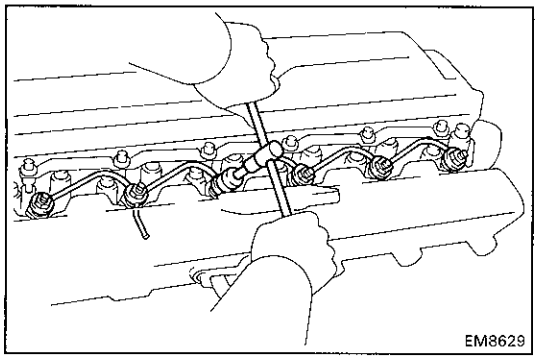






1. **REMOVE INTAKE PIPE**
   (See step 6 on page EM-34)

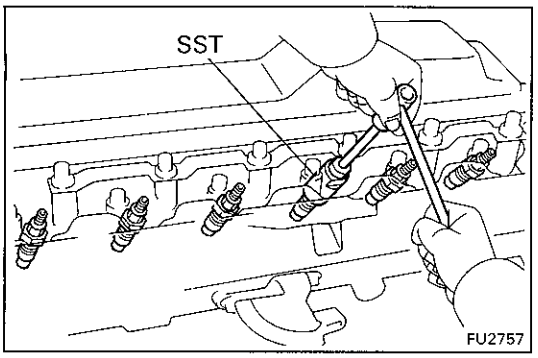
2. **REMOVE INJECTION PIPES**
   (a) Loosen the union nuts of the injection pipes from the injection nozzles.
   (b) Loosen the union nuts of the injection pipes from the injection pump.
   (c) Remove the three clamps and injection pipes.



3. REMOVE NOZZLE LEAKAGE PIPE

(a) Disconnect the fuel hose from the nozzle leakage pipe.

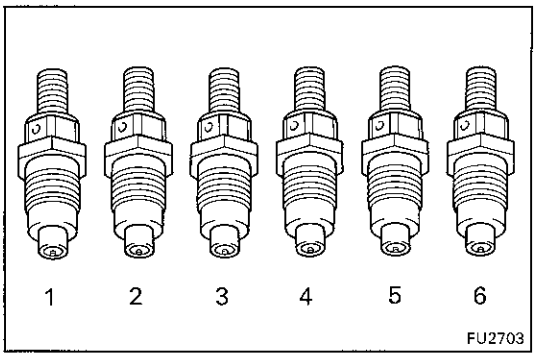
(b) Remove the nuts, leakage pipe and gaskets.



4. REMOVE INJECTION NOZZLES

Using SST, remove the injection nozzles, seats and gaskets.

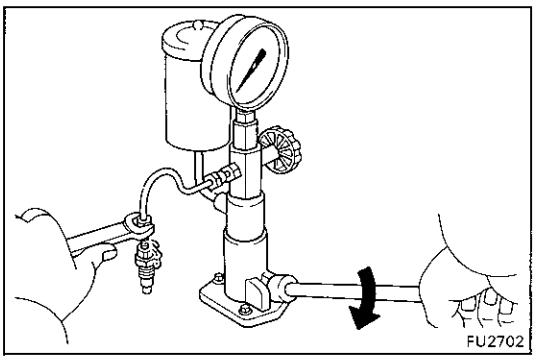
SST 09268-64010



HINT: Arrange the injection nozzles in correct order.

TEST OF INJECTION NOZZLES

1. INJECTION PRESSURE TEST



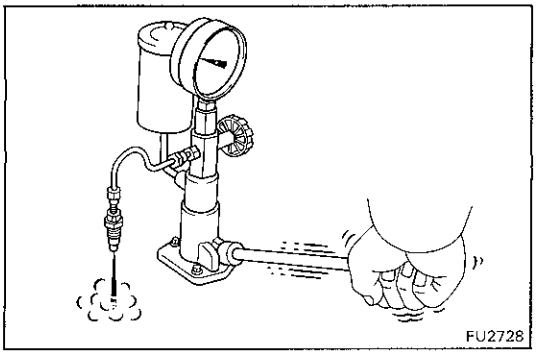
(a) Install the injection nozzle to the injection nozzle hand tester and bleed air from the union nut.

CAUTION: Do not place your finger over the nozzle injection hole.

(b) Pump the tester handle a few times as fast as possible to discharge the carbon from the injection hole.

(c) Pump the tester handle slowly and observe the pressure gauge.

(d) Read the pressure gauge just as the injection pressure begins to drop.



Opening pressure:

New nozzle	**145 – 155 kg/cm^2 (2,062 – 2,205 psi) (14,220 – 15,200 kPa)**
Reused nozzle	**135 – 155 kg/cm^2 (1,920 – 2,205 psi) (13,239 – 15,200 kPa)**

HINT: Proper nozzle operation can be determined by a swishing sound.

If the opening pressure is not as specified, disassemble he nozzle holder and change the adjusting shim on the top of the pressure spring. (See page FU-13).

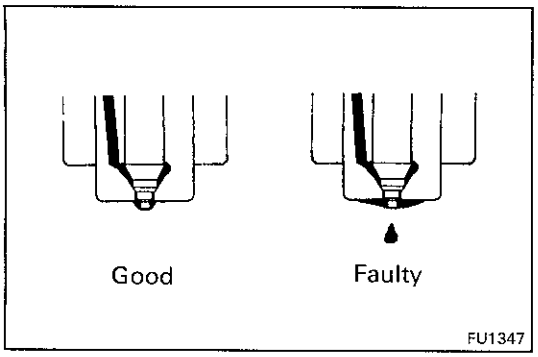
Adjusted opening pressure: 135 – 155 kg/cm² (1,920 – 2.205 psi) (13,239 – 15,200 kPa)

Adjusting shim thickness mm (in.)		
0.900 (0.0354)	1.275 (0.0502)	1.650 (0.0650)
0.925 (0.0364)	1.300 (0.0512)	1.675 (0.0659)
0.950 (0.0374)	1.325 (0.0522)	1.700 (0.0669)
0.975 (0.0384)	1.350 (0.0531)	1.725 (0.0679)
1.000 (0.0394)	1.375 (0.0541)	1.750 (0.0689)
1.025 (0.0404)	1.400 (0.0551)	1.775 (0.0699)
1.050 (0.0413)	1.425 (0.0561)	1.800 (0.0709)
1.075 (0.0423)	1.450 (0.0571)	1.825 (0.0719)
1.100 (0.0433)	1.475 (0.0581)	1.850 (0.0728)
1.125 (0.0443)	1.500 (0.0591)	1.875 (0.0738)
1.150 (0.0453)	1.525 (0.0600)	1.900 (0.0748)
1.175 (0.0463)	1.550 (0.0610)	1.925 (0.0758)
1.200 (0.0472)	1.575 (0.0620)	1.950 (0.0768)
1.225 (0.0482)	1.600 (0.0630)	
1.250 (0.0492)	1.625 (0.0640)	

HINT:

- Varying the adjusting shim thickness by 0.025 mm (0.0010 in.) changes the injection pressure by about 4.5 kg/cm² (64 psi, 441 kPa) (1PZ).
- Varying the adjusting shim thickness by 0.025 mm (0.0010 in.) changes the injection pressure by about 3.5 kg/cm² (50 psi, 343 kPa) (1HZ).
- Only one adjusting shim should be used.

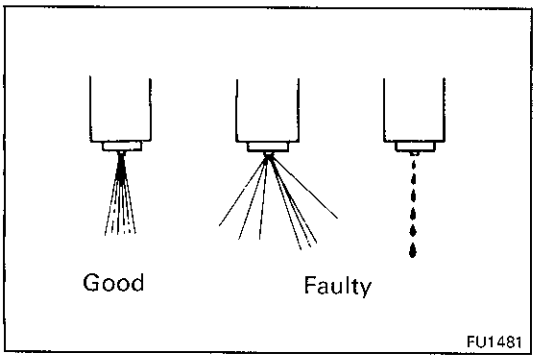
(f) There should be no dripping after injection.



2. LEAKAGE TEST

While maintaining pressure at about 10 – 20 kg/cm² (142 – 284 psi, 981 – 1,961 kPa) below opening pressure (adjust by tester handle), check that there is no dripping for 10 seconds from the injection hole or around the retaining nut.

If the nozzle drips within 10 seconds, replace or clean and overhaul the nozzle assembly.



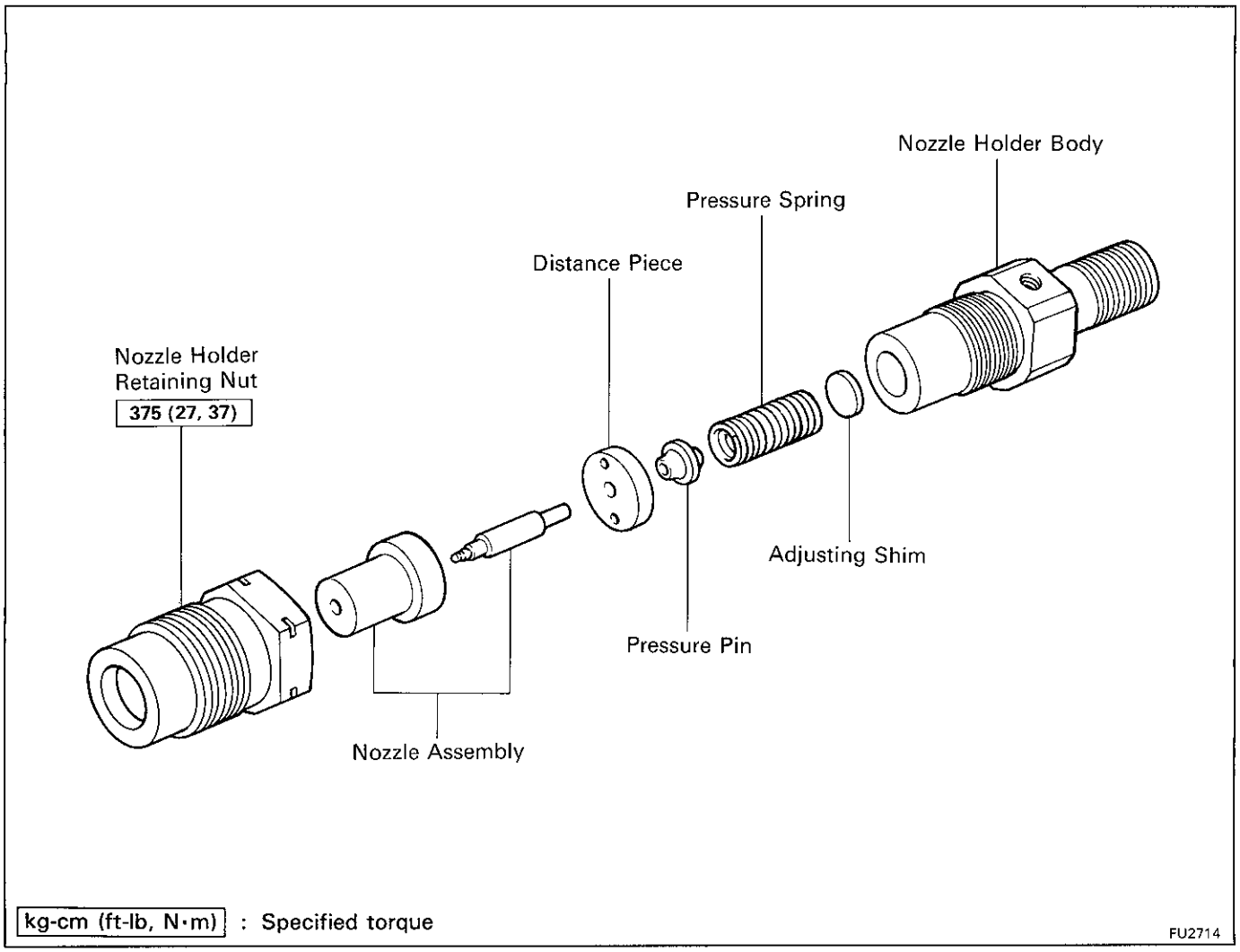
3. SPRAY PATTERN TEST

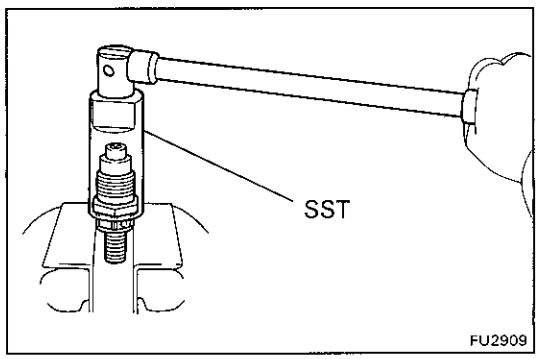
(a) The injection nozzle should shudder at a certain pumping speed between 15 – 60 times (old nozzle) or 30 – 60 times (new nozzle) per minute.

(b) Check the spray pattern during shuddering.

If the spray pattern is not correct during shuddering, the nozzle must be replaced or cleaned.

COMPONENTS





DISASSEMBLY OF INJECTION NOZZLES

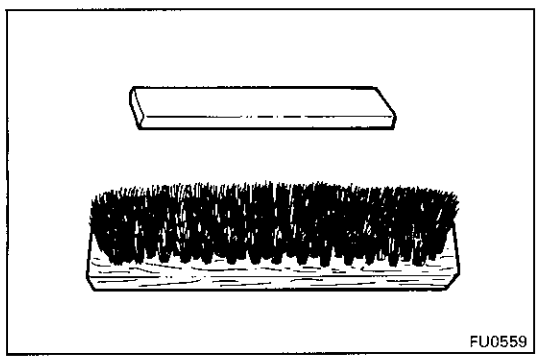
DISASSEMBLE INJECTION NOZZLES

(a) Using SST, remove the nozzle holder retaining nut.

SST 09268-64010

NOTICE: When disassembling the nozzle, be careful not to drop the inner parts.

(b) Remove the pressure spring, shim, pressure pin, distance piece and the nozzle assembly.

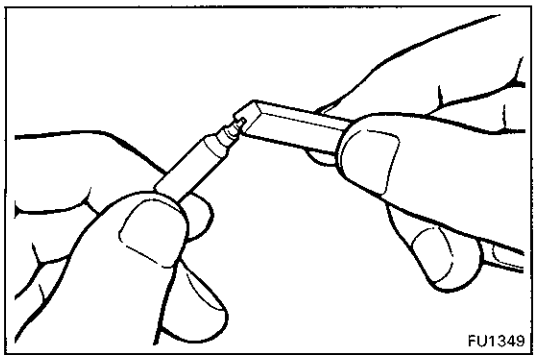


CLEANING AND INSPECTION OF INJECTION NOZZLES

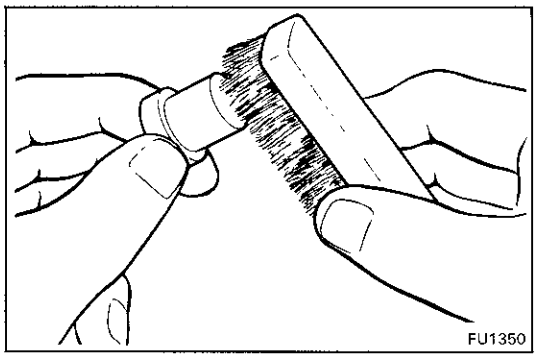
1. NOZZLE CLEANING

(a) To wash the nozzles. Use a wooden stick and brass brush. Wash them in clean diesel fuel.

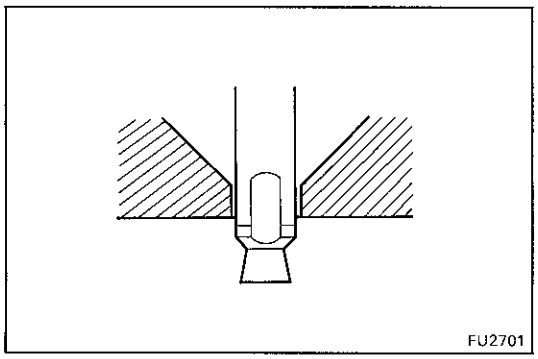
HINT: Do not touch the nozzle mating surfaces with your fingers.



(b) Using a wooden stick, remove the carbon adhering to the nozzle needle tip.



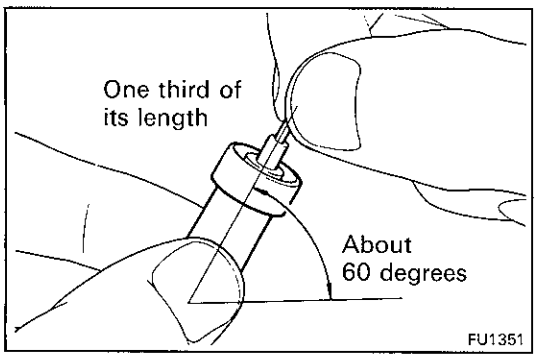
(c) Using a brass brush, remove the carbon from the exterior of the nozzle body (except lapped surface).



(d) Check the seat of the nozzle body for burns or corrosion.

(e) Check the nozzle needle tip for damage or corrosion.

If any of these conditions are present, replace the nozzle assembly.

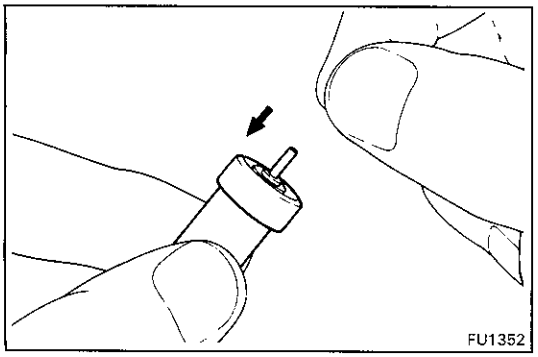


2. INSPECT NOZZLE ASSEMBLY

(a) Wash the nozzle in clean diesel fuel.

HINT: Do not touch the nozzle mating surfaces with your fingers.

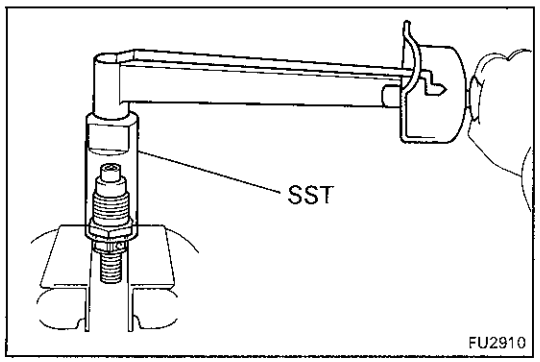
(b) Tilt the nozzle body about 60 degrees and pull the needle out about one third of its length.



(c) When released, the needle should sink down into the body vent smoothly by its own weight.

(d) Repeat this test, rotating the needle slightly each time.

If the needle does not sink freely, replace the nozzle assembly.



ASSEMBLY OF INJECTION NOZZLES

(See page FU-12)

1. **ASSEMBLE INJECTION NOZZLE HOLDERS**

   (a) Assemble the nozzle holder retaining nut, the nozzle assembly, distance piece, pressure pin, pressure spring, adjusting shim and nozzle holder body, and finger tighten the retaining nut.

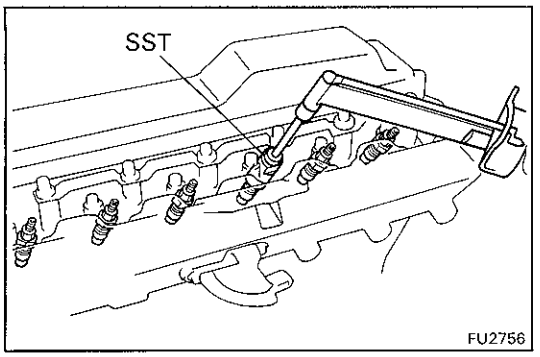
   (b) Using SST, tighten the retaining nut.

   SST 09268-64010

   Torque: 375 kg-cm (27 ft-lb, 37 N·m)

   NOTICE: Over torquing could cause nozzle deformation and needle adhesion or other defects.

2. **PERFORM PRESSURE AND SPRAY PATTERN TEST (See pages FU-10, 11)**



INSTALLATION OF INJECTION NOZZLES

(See page FU-9)

1. **INSTALL INJECTION NOZZLES**

   (a) Place new gaskets and the nozzle seats into the injection nozzle holes of the cylinder head.

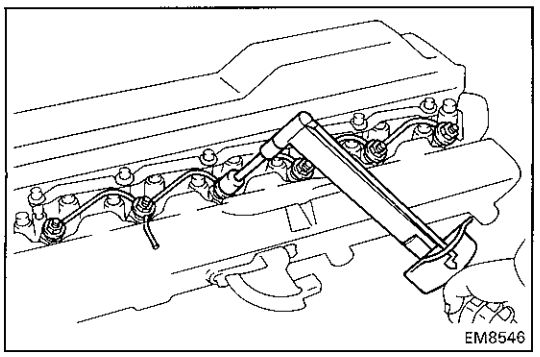
   (b) Using SST, install the injection nozzles.

   SST 09268-64010

   Torque: 650 kg-cm (47 ft-lb, 64 N·m)

   NOTICE:

   - **Over torquing could cause nozzle deformation and needle adhesion or other defects.**
   - **When installing the injection nozzle, never torque the nozzle holder body. Torque the retaining nut section.**

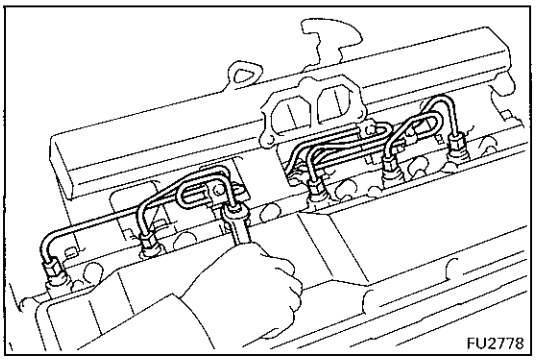


2. **INSTALL NOZZLE LEAKAGE PIPE**

   (a) Install new gaskets and the leakage pipe with the nuts.

   Torque: 300 kg-cm (22 ft-lb, 29 N·m)

   (b) Connect the fuel hose to the return pipe.

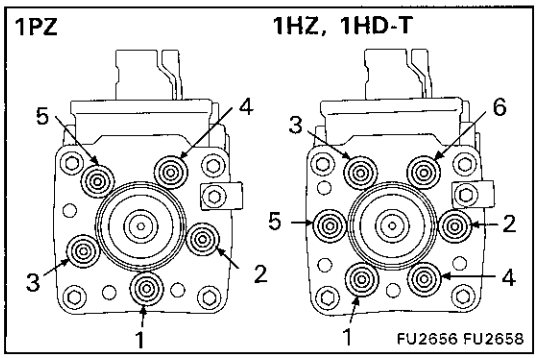


3. INSTALL INJECTION PIPES

(a) Place the two clamps on the intake manifold.

(b) Connect the injection pipes to injection nozzle.

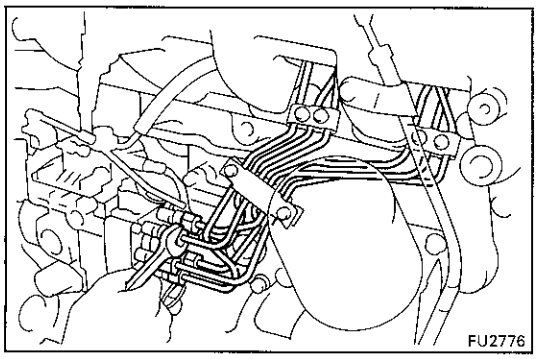
Torque: 150 kg-cm (11 ft-lb, 15 N·m)



(c) Connect the injection pipes to injection pump.

Torque: 150 kg-cm (11 ft-lb, 15 N·m)

(d) Secure the injection pipes with clamps and bolts.



4. INSTALL INTAKE PIPE
(See step 3 on page EM-38)

5. START ENGINE AND CHECK FOR FUEL LEAKS