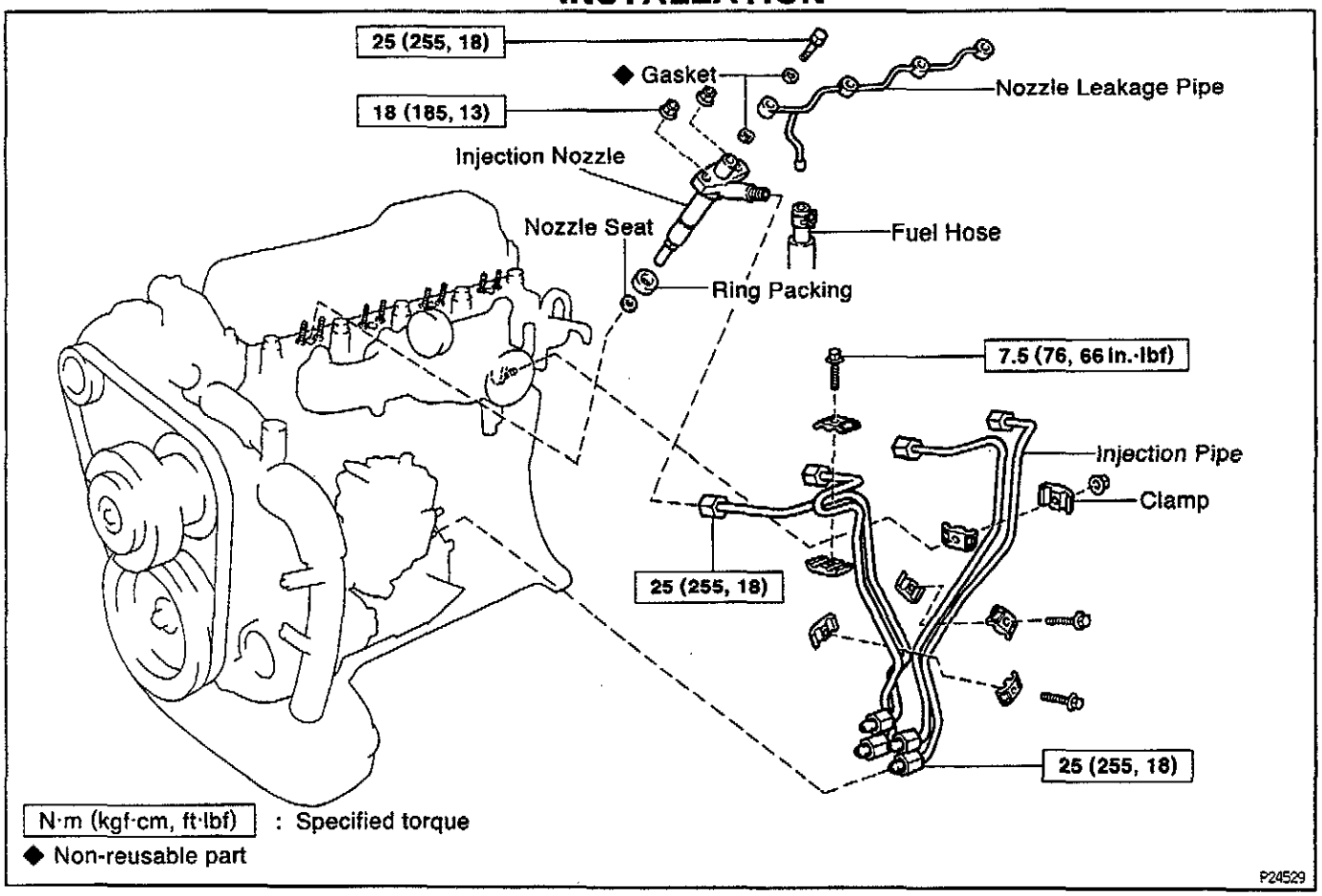
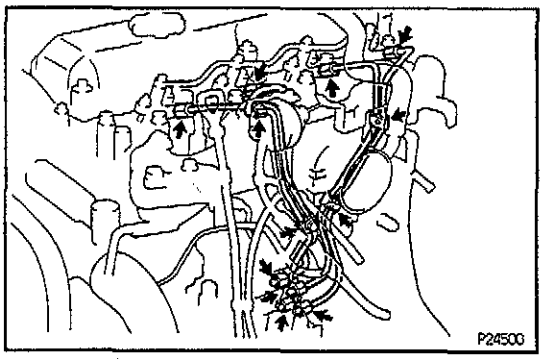
# INJECTION NOZZLE (14B)

## COMPONENTS FOR REMOVAL AND INSTALLATION



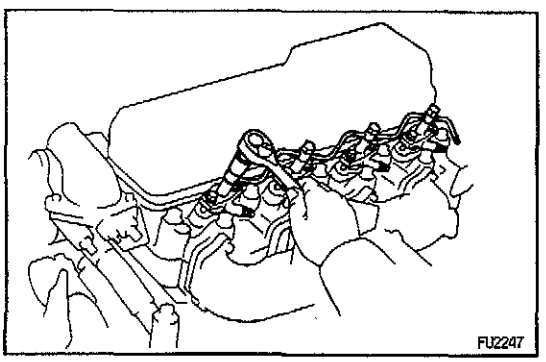




## INJECTION NOZZLES REMOVAL

**1. REMOVE INJECTION PIPES**

(a) Loosen the union nuts of the 4 injection pipes.
**Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)**

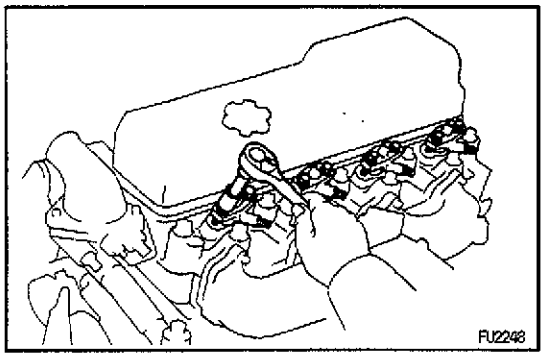
(b) Remove the 3 bolts, nut, 4 injection pipes and clamps.
**Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)**




**2. REMOVE NOZZLE LEAKAGE PIPE**

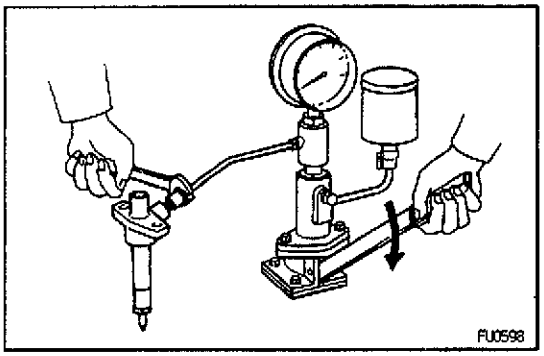
(a) Disconnect the fuel hose from the leakage pipe.

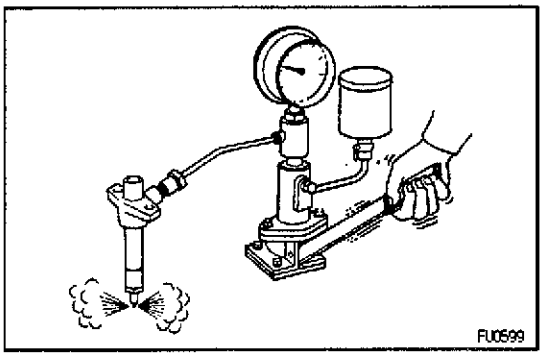
(b) Remove the 4 hollow bolts, leakage pipe and 8 gaskets.
**Torque: 25 N·m (255 kgf·cm, 18 ft·lbf)**
INSTALLATION HINT: Install the leakage pipe with new gaskets.




### 3. REMOVE INJECTION NOZZLES

Remove the 2 nuts, nozzle, ring packing and seat.
Remove the 4 nozzles.
**Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)**
HINT: Arrange the nozzles in correct order.




## INJECTION NOZZLES TEST

### 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**
**19,610 – 20,590 kPa**
**(200 – 210 kgf/cm², 2,840 – 2,990 psi)**
**Reused nozzle**
**17,650 – 20,590 kPa**
**(180 – 210 kgf/cm², 2,560 – 2,990 psi)**
HINT: Proper nozzle operation can be determined by a swishing sound.
If the opening pressure is not as specified, disassemble the nozzle holder and change the adjusting shim on the top of the pressure spring.
**Adjusted opening pressure:**
**17,650 – 20,590 kPa**
**(180 – 210 kgf/cm², 2,560 – 2,990 psi)**

**Adjusting shim thickness:** mm (in.)

| | | |
|---|---|---|
| 0.700 (0.0276) | 1.125 (0.0443) | 1.425 (0.0561) |
| 0.750 (0.0295) | 1.150 (0.0453) | 1.450 (0.0571) |
| 0.800 (0.0315) | 1.175 (0.0463) | 1.475 (0.0581) |
| 0.850 (0.0335) | 1.200 (0.0472) | 1.500 (0.0591) |
| 0.900 (0.0354) | 1.225 (0.0482) | 1.550 (0.0610) |
| 0.950 (0.0374) | 1.250 (0.0492) | 1.600 (0.0630) |
| 0.975 (0.0384) | 1.275 (0.0502) | 1.650 (0.0650) |
| 1.000 (0.0394) | 1.300 (0.0512) | 1.700 (0.0669) |
| 1.025 (0.0404) | 1.325 (0.0522) | 1.750 (0.0689) |
| 1.050 (0.0413) | 1.350 (0.0531) | 1.800 (0.0709) |
| 1.075 (0.0423) | 1.375 (0.0541) | – |
| 1.100 (0.0433) | 1.400 (0.0551) | – |

HINT:

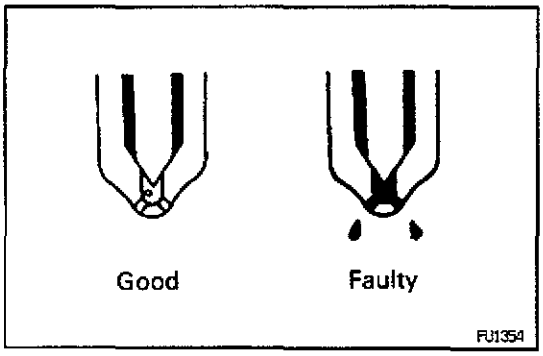
- Varying the adjusting shim thickness by 0.025 mm (0.0010 in.) changes the injection pressure by about 373 kPa (3.8 kgf/cm², 54 psi) .
- Only one adjusting shim should be used.

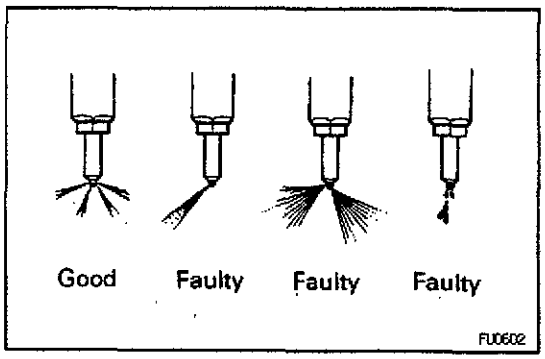
(e) There should be no dripping after injection.

**2. LEAKAGE TEST**

While maintaining pressure at about 981 – 1,961 kPa (10 – 20 kgf/cm², 142 – 284 psi) 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**

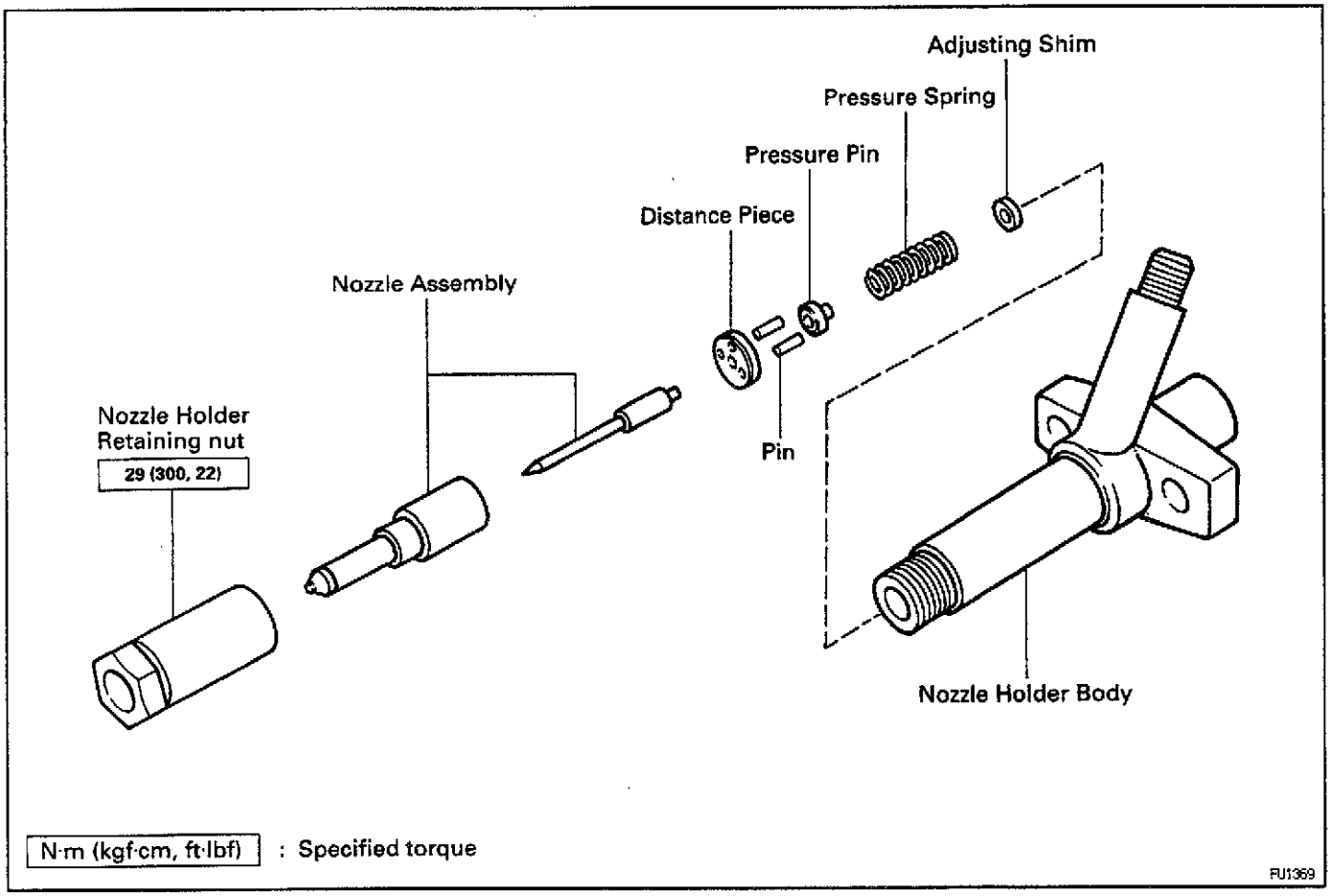
(a) The injection nozzle should shudder at a certain pumping speed between 15 – 60 times (old nozzle) or 30 – 60 times (new nozzle) per minute.

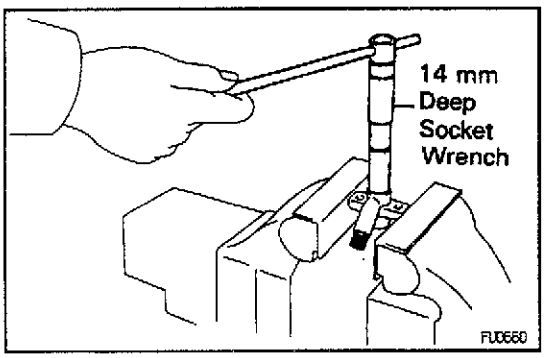
(b) Check the spray pattern during shuddering.

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

## COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EG




## INJECTION NOZZLE DISASSEMBLY

### DISASSEMBLE INJECTION NOZZLES

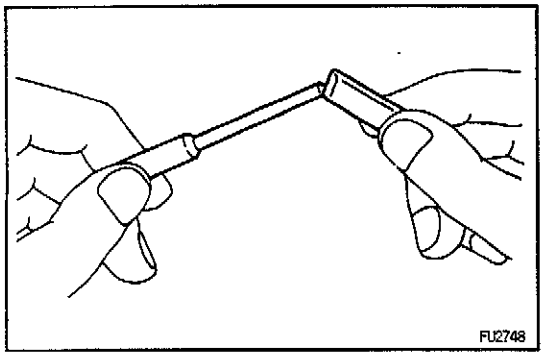
(a) Using a 14 mm deep socket wrench, unscrew the nozzle holder retaining nut.
**NOTICE: When disassembling the nozzle, be careful not to drop the inner parts.**

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

## INJECTION NOZZLES CLEANING AND INSPECTION

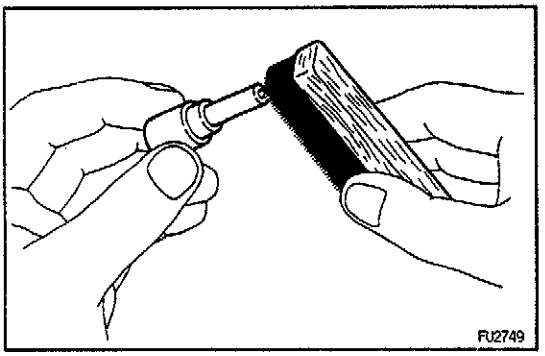
### 1. NOZZLE CLEANING

(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.

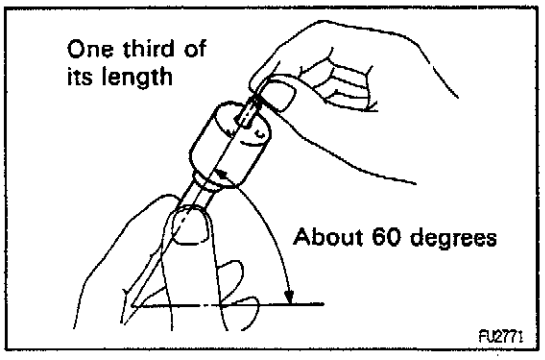



(b) Using a wooden stick, remove the carbon adhering to the nozzle needle tip.



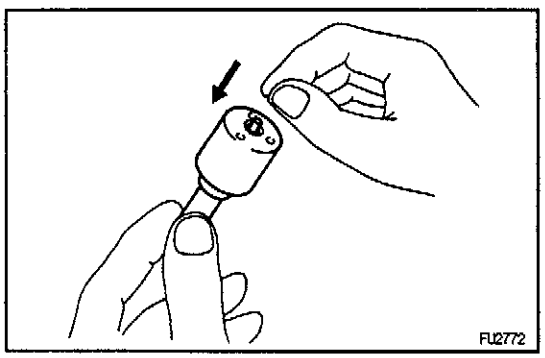



(c) Using a brass brush, remove the carbon from the exterior of the nozzle body (except lapped surface).
(d) Check the nozzle body for burns or corrosion.
(e) Check the nozzle needle tip for damage or corrosion.
If any of these conditions are present, replace the nozzle assembly.

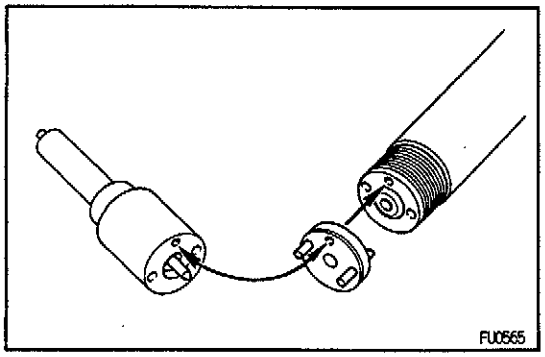



**2. INSPECT NOZZLE ASSEMBLY**

(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.



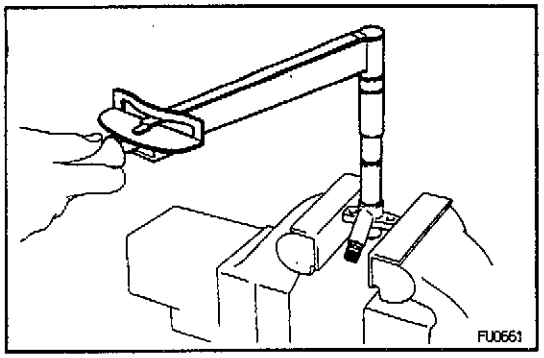

(c) When released, the needle should stick down into the body vent smoothly by its own weight.
(d) Repeat this test, rotating the needle slightly each time.
If the needle does not sink freely, replace the nozzle assembly.




## INJECTION NOZZLES ASSEMBLY

**1. ASSEMBLE INJECTION NOZZLES**

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




(b) Using a 14 mm deep socket wrench, torque the retaining nut.
**Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)**

2. **PERFORM PRESSURE AND SPRAY PATTERN TEST (See injection nozzles test)**

## INJECTION NOZZLES INSTALLATION

**Installation is in the reverse order of removal.**