

FU-1

FUEL SYSTEM

NOTE: For troubleshooting procedures, refer to DIESEL ENGINE DIAGNOSIS (EM Section).

	Page
REPLACEMENT OF FUEL FILTER	FU-2
INJECTION NOZZLES [B and 3B]	FU-4
INJECTION NOZZLES [11B, 13B and 13B-T]	FU-10
FUEL FEED PUMP	FU-16
AUTOMATIC TIMER	FU-21
INJECTION PUMP	FU-27

FU

FU-2 **FUEL SYSTEM — Replacement of Fuel Filter**

REPLACEMENT OF FUEL FILTER

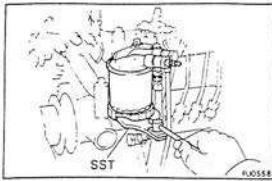
1. REPLACE FUEL FILTER

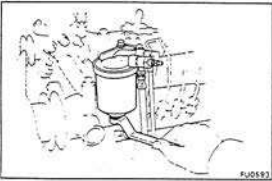
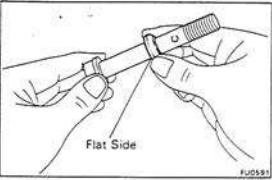
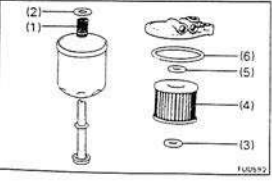
[Cartridge Type]

- Using SST, remove the fuel filter and O-ring.
SST 09228-34010
- Install a new fuel filter with a new O-ring.
 - Put a light coat of fuel on the O-ring.
 - Hand tighten only. DO NOT use SST to tighten the filter.

[Paper Element Type]

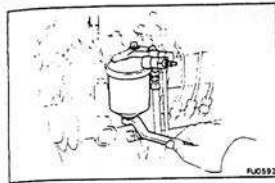
- Loosen the center bolt and remove the bolt with the fuel filter lower body assembly.
- Remove the upper body gasket from the fuel filter upper body.
- Remove the rubber gaskets, element, spring plate and spring from the lower body.
- Remove the O-ring from the center bolt.
- Install a new O-ring facing its flat side toward the center bolt head.
 - Put a light coat of fuel on the O-ring.
- Install the spring (1), spring plate (2), a new rubber gasket (3), a new element (4) and a new rubber gasket (5) to the lower body.
- Install a new upper body gasket (6) to the upper body.
 - Put a light coat of fuel on the body gasket.



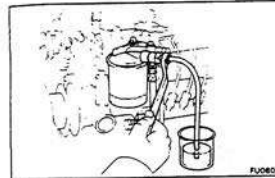




FUEL SYSTEM — Replacement of Fuel Filter

FU-3

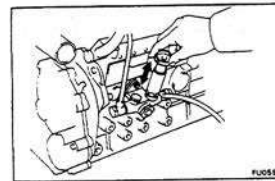


- (h) Install the fuel filter lower body assembly with the center bolt.



2. BLEED FUEL FILTER

- (a) Connect a vinyl tube to the fuel filter bleeder plug.
 (b) Insert other end of the tube in a container of fuel.
 (c) Loosen the fuel filter bleeder plug.



- (d) Turn the priming pump handle counterclockwise to free it.
 (e) Operate the priming pump handle until there are no air bubbles emitted from the fuel filter bleeder plug.
 (f) Turn the priming pump handle clockwise and tighten it.
 (g) Tighten the fuel filter bleeder plug.

3. START ENGINE AND CHECK FOR FUEL LEAKS

FU-4

FUEL SYSTEM — Injection Nozzles [B and 3B]

INJECTION NOZZLES [B and 3B]

REMOVAL AND TEST OF INJECTION NOZZLES

Nozzle Leakage Pipe

Injection Nozzle

◆ Gasket

◆ Gasket

Nozzle Seat

Fuel Hose

Clamp

Injection Pipe

480 (32, 44)

700 (51, 69)

280 (18, 26)

kg-cm (ft-lb, N-m) : Specified torque

◆ Non-reusable part

FU1565

FU1567

1. REMOVE INJECTION PIPES

(a) Loosen the union nuts of the four injection pipes.

(b) Remove the two bolts, four injection pipes and clamps.

2. REMOVE NOZZLE LEAKAGE PIPE

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

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

FUEL SYSTEM — Injection Nozzles [B and 3B]

FU-5

SST

FU1568

1 2 3 4

FU0299

FU0142

FU0143

3. REMOVE INJECTION NOZZLES

Using SST, remove the four nozzles, seats and gaskets.
SST 09260-46012 (09268-46012, 09268-46021)

NOTE: Arrange the nozzles in correct order.

4. INJECTION PRESSURE TEST

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

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

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

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

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

Opening pressure:

New nozzle	115 – 125 kg/cm ² (1,636 – 1,778 psi) (11,278 – 12,258 kPa)
Reused nozzle	105 – 125 kg/cm ² (1,493 – 1,778 psi) (10,296 – 12,258 kPa)

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

<https://cardiagn.com/fuel-system-b-engine/>

5/101

FU-6

FUEL SYSTEM — Injection Nozzles [B and 3B]

If the opening pressure is not within specification, disassemble the nozzle and change the adjusting shim on the top of the pressure spring.

Adjusted opening pressure: 105 – 125 kg/cm²
(1,493 – 1,778 psi)
(10,296 – 12,258 kPa)

Adjusting shim thickness	mm (in.)
1.00 (0.0394)	1.50 (0.0591)
1.05 (0.0413)	1.55 (0.0610)
1.10 (0.0433)	1.60 (0.0630)
1.15 (0.0453)	1.65 (0.0650)
1.20 (0.0472)	1.70 (0.0669)
1.25 (0.0492)	1.75 (0.0689)
1.30 (0.0512)	1.80 (0.0709)
1.35 (0.0531)	1.85 (0.0728)
1.40 (0.0551)	1.90 (0.0748)
1.45 (0.0571)	1.95 (0.0768)

NOTE:

- Varying the adjusting shim thickness by 0.05 mm (0.0020 in.) changes the injection pressure by about 6.4 kg/cm² (91 psi, 628 kPa).
- Only one adjusting shim should be used.

(e) There should be no dripping after injection.

FU0144

FU0145

FU0146

5. LEAKAGE TEST

While maintaining pressure at about 10.0 – 20.0 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 it or clean and overhaul the nozzle assembly.

6. SPRAY PATTERN TEST

(a) The injection nozzle should shudder at a 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.

FUEL SYSTEM — Injection Nozzles (B and 3B)

FU-7

COMPONENTS

Nozzle Holder Retaining Nut
700 (51, 69)

Adjusting Shim

Pressure Spring

Pressure Pin

Distance Piece

Nozzle Assembly

Nozzle Holder Body

kg-cm (ft-lb, N.m) : Specified torque

FU1245

FU0559

DISASSEMBLY, CLEANING AND TEST OF INJECTION NOZZLE

1. DISASSEMBLE INJECTION NOZZLE

(a) Using SST, unscrew the nozzle holder retaining nut.
SST 09260-46012 (09268-46012, 09268-46021)

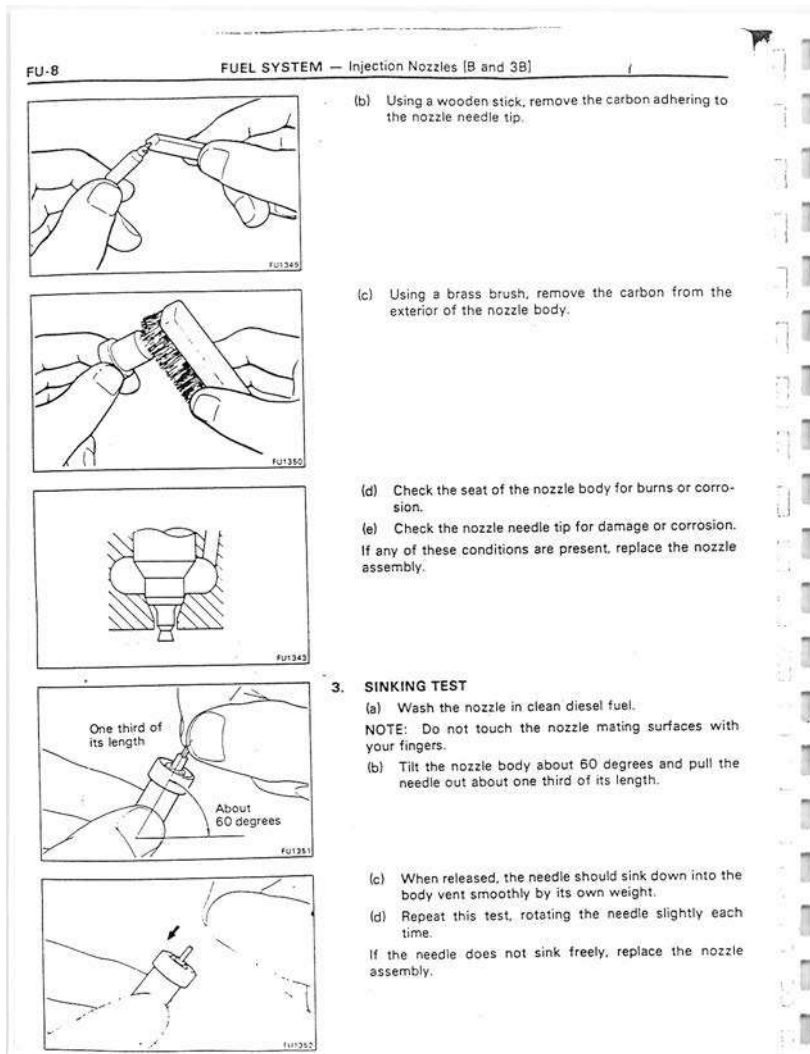
CAUTION: When disassembling the nozzle, be careful not to drop the inner parts.

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

2. NOZZLE CLEANING

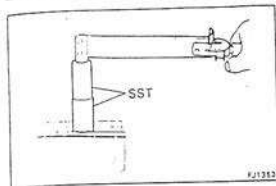
(a) To wash the nozzles, use a wooden stick and brass brush. Wash in clean diesel fuel.

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



FUEL SYSTEM — Injection Nozzles [8 and 38]

FU-9



ASSEMBLY OF INJECTION NOZZLES

(See page FU-7)

1. ASSEMBLE INJECTION NOZZLES

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

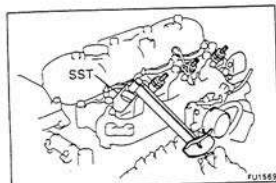
- Using SST, torque the retaining nut.

SST 09260-46012 (09268-46012, 09268-46021)

Torque: 700 kg-cm (51 ft-lb, 69 N-m)

2. PERFORM PRESSURE AND SPRAY PATTERN TEST

(See steps 4 to 6 on pages FU-4 and 5)



INSTALLATION OF INJECTION NOZZLES

(See page FU-4)

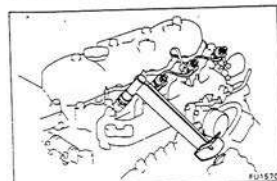
1. INSTALL INJECTION NOZZLES

- Place new four gaskets and the four nozzle seats in the cylinder head.

- Using SST, install and torque the four nozzles.

SST 09260-46012 (09268-46012, 09268-46021)

Torque: 700 kg-cm (51 ft-lb, 69 N-m)

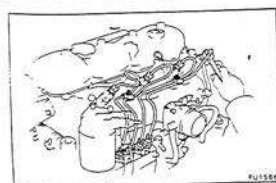


2. INSTALL NOZZLE LEAKAGE PIPE

- Install new four gaskets and the leakage pipe with the four nuts. Torque the nuts.

Torque: 450 kg-cm (33 ft-lb, 44 N-m)

- Connect the fuel hose to the leakage pipe.



3. INSTALL INJECTION PIPES

- Place the two lower clamps in position on the intake manifold.

- Install the four injection pipes. Torque the union nuts.

Torque: 250 kg-cm (18 ft-lb, 25 N-m)

- Secure the injection pipes with the two upper clamps and nuts.

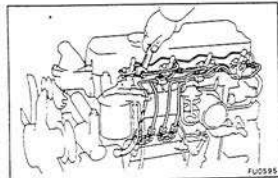
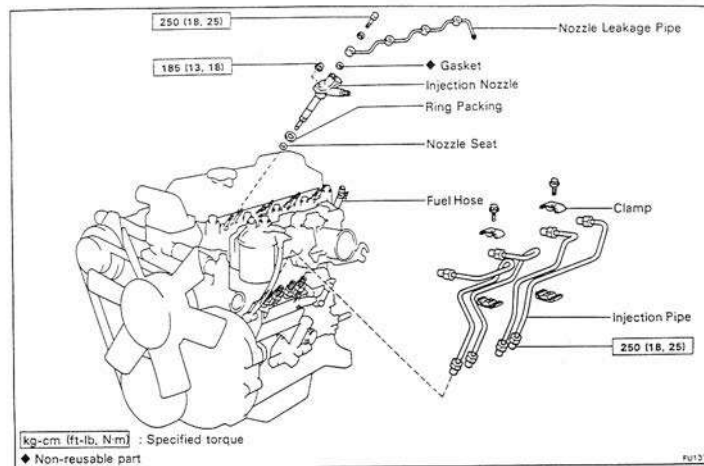
4. START ENGINE AND CHECK FOR LEAKS

FU-10

FUEL SYSTEM — Injection Nozzles [11B, 13B and 13B-T]

INJECTION NOZZLES [11B, 13B and 13B-T]

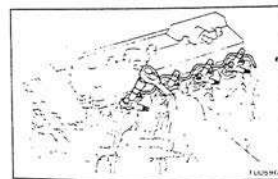
REMOVAL AND TEST OF INJECTION NOZZLES



1. [13B-T] REMOVE INTAKE AIR CONNECTOR PIPE

2. REMOVE INJECTION PIPES

- Loosen the union nuts of the four injection pipes.
- Remove the two bolts, four injection pipes and clamps.

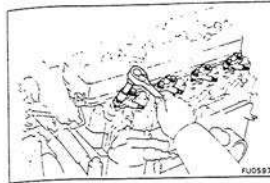


3. REMOVE NOZZLE LEAKAGE PIPE

- Disconnect the fuel hose from the leakage pipe.
- Remove the four hollow bolts, leakage pipe and eight gaskets.

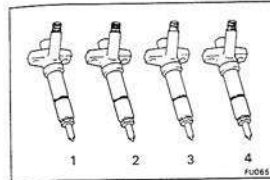
FUEL SYSTEM — Injection Nozzles [11B, 13B and 13B-T]

FU-11

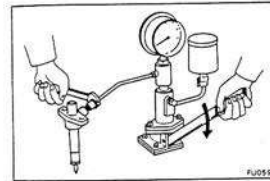


4. REMOVE INJECTION NOZZLES

Remove the two bolts, nozzle, ring packing and seat.
Remove the four nozzles.



NOTE: Arrange the nozzles in correct order.



5. INJECTION PRESSURE TEST

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

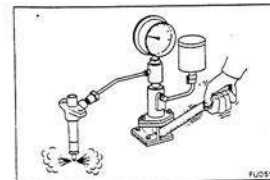
WARNING: Do not place your finger over the nozzle injection hole.

- (b) Pump the tester handle a few times as fast as possible by hand discharge the carbon from the injection hole.
- (c) Pump the tester handle slowly and observe the pressure gauge.
- (d) Read the pressure gauge when the injection pressure just begins to drop.

Opening pressure:

New nozzle	200 – 210 kg/cm ² (2,845 – 2,987 psi) (19,613 – 20,594 kPa)
Reused nozzle	180 – 210 kg/cm ² (2,560 – 2,987 psi) (17,652 – 20,594 kPa)

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



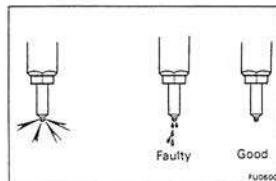
FU-12

FUEL SYSTEM — Injection Nozzles [11B, 13B and 13B-T]

If the opening pressure is not within specification, disassemble the nozzle and change the adjusting shim on the top of the pressure spring.

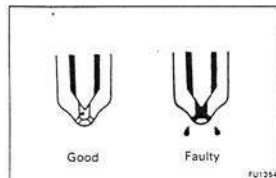
Adjusting opening pressure: **180 – 210 kg/cm²**
(2,560 – 2,987 psi)
(17,652 – 20,594 kPa)

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



NOTE:

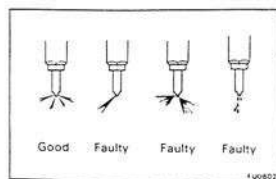
- Varying the adjusting shim thickness by 0.025 mm (0.0010 in.) changes the injection pressure by about 3.8 kg/cm² (54 psi, 373 kPa).
- Only one adjusting shim should be used.
- (e) There should be no dripping after injection.



6. LEAKAGE TEST

While maintaining pressure at about 10.0 – 20.0 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 it or clean and overhaul the nozzle assembly.



7. SPRAY PATTERN TEST

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

- (b) Check the spray pattern during shuddering.

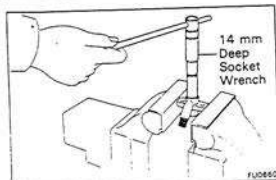
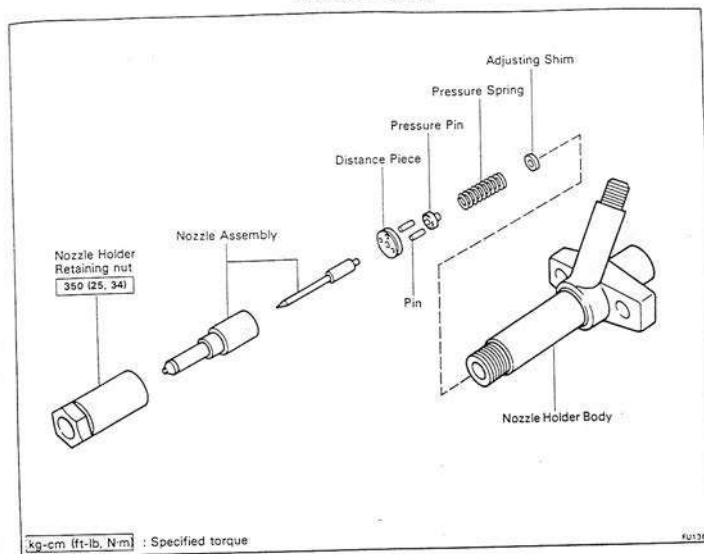
If the spray pattern is not correct, the nozzle must be cleaned or replaced.

NOTE: The 11B engine has 5 spray orifices and the 13B and 13B-T engines have 4 spray orifices.

FUEL SYSTEM — Injection Nozzles [11B, 13B and 13B-T]

FU-13

COMPONENTS



DISASSEMBLY, CLEANING AND TEST OF INJECTION NOZZLE

1. DISASSEMBLE INJECTION NOZZLE

- (a) Using a 14 mm deep socket wrench, unscrew the nozzle holder retaining nut.

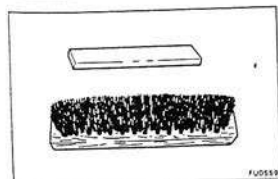
CAUTION: When disassembling the nozzle holder, be careful not to drop the inner parts.

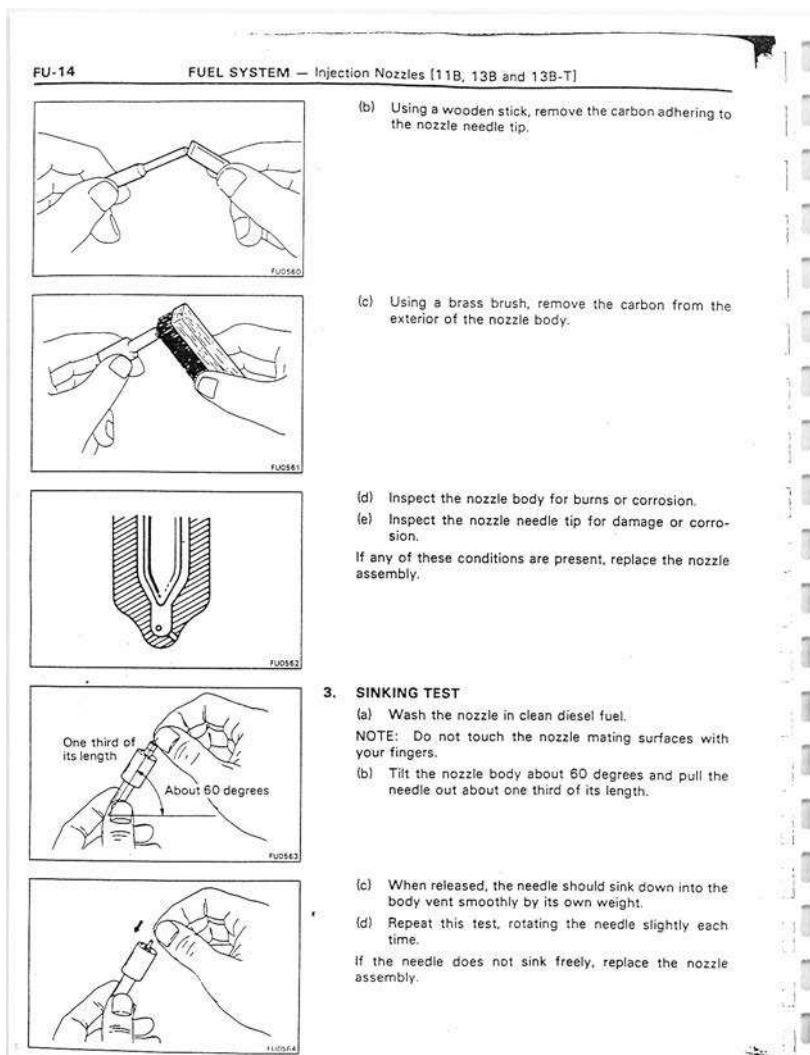
- (b) Remove the pressure spring, adjusting shim, pressure pin, pin, distance piece and the nozzle assembly.

2. NOZZLE CLEANING

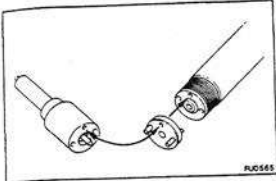
- (a) To wash the nozzles, use a wooden stick and brass brush. Wash in clean diesel fuel.

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

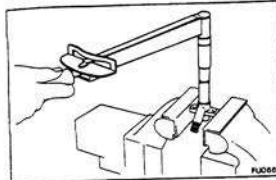




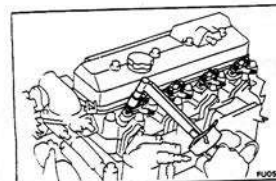
FUEL SYSTEM — Injection Nozzles [11B, 13B and 13B-T] **FU-15**



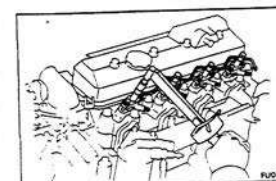
FUG565



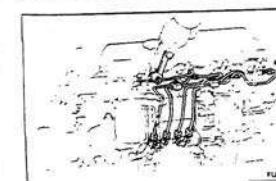
FUG561



FUG566



FUG567



FUG595

ASSEMBLY OF INJECTION NOZZLES
(See page FU-13)

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.

NOTE: 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: 350 kg-cm (25 ft-lb, 34 N-m)
2. **PERFORM PRESSURE AND SPRAY PATTERN TEST**
(See steps 6 to 8 on pages FU-10 and 11)

INSTALLATION OF INJECTION NOZZLES
(See page FU-10)

1. **INSTALL INJECTION NOZZLES**
Install the nozzle seat, ring packing and injection nozzle with the two nuts. Install the four injection nozzles. Torque the nuts.
Torque: 185 kg-cm (13 ft-lb, 18 N-m)
2. **INSTALL NOZZLE LEAKAGE PIPE**
 - (a) Install new eight gaskets, and the leakage pipe with the four hollow bolts. Torque the hollow bolts.

Torque: 250 kg-cm (18 ft-lb, 25 N-m)

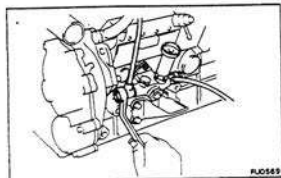
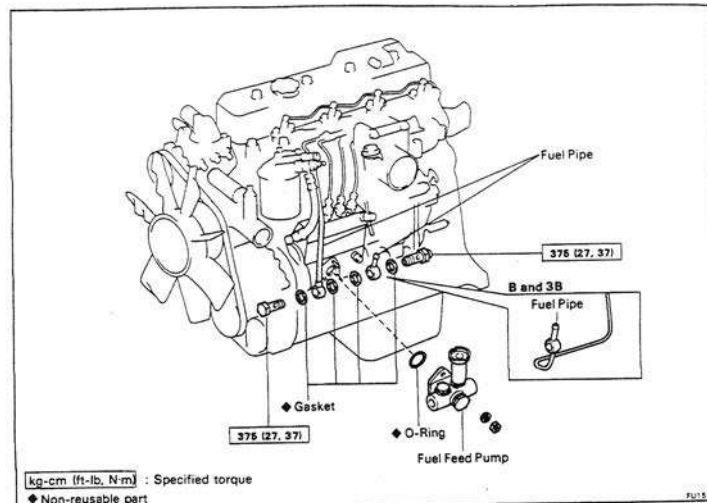
 - (b) Connect the fuel hose to the leakage pipe.
3. **INSTALL INJECTION PIPES**
 - (a) Place the two lower clamps in position of the intake manifold.
 - (b) Install the four injection pipes. Torque the union nuts.

Torque: 250 kg-cm (18 ft-lb, 25 N-m)

 - (c) Secure the injection pipes with the two upper clamps and bolts.
4. **START ENGINE AND CHECK FOR FUEL LEAKS**
5. **[13B-T]**
INSTALL INTAKE AIR CONNECTOR PIPE

FU-16

FUEL SYSTEM — Fuel Feed Pump

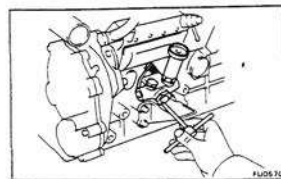
FUEL FEED PUMP**REMOVAL AND TEST OF FUEL FEED PUMP**

1. DISCONNECT INLET AND OUTLET PIPES FROM FEED PUMP
[13B-T]

Remove the two union bolt and four gasket, and disconnect the fuel pipes.

[11B, 13B and 13B-T]

- (a) Remove the union bolt, two gaskets and inlet fuel pipe.
- (b) Remove the union bolt and two gasket, and disconnect the outlet fuel pipe.

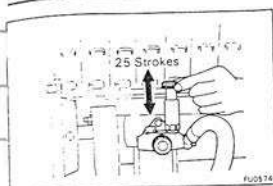


2. REMOVE FEED PUMP FROM INJECTION PUMP

Remove the three nuts, spring washers and feed pump.

FUEL SYSTEM — Fuel Feed Pump

FU-17



3. SUCTION TEST

- (a) Mount the feed pump on the pump tester.
- (b) Connect a suction pipe with the following specifications:

Pipe inner diameter: 8 mm (0.31 in.)

Pipe length: 2 m (78.7 in.)

Suction height: 1 m (39.4 in.)

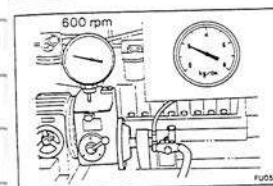
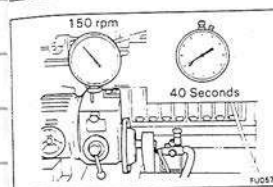
- (c) Operate the priming pump 60 strokes per minute and count the number of strokes before fuel is discharged.

Fuel must discharge within 25 strokes

- (d) Drain any fuel from the feed pump.

- (e) Operate the feed pump at 150 rpm and check the amount of time until fuel is discharged.

Fuel must discharge within 40 seconds



4. DISCHARGE TEST

- (a) Install the pressure gauge to the feed pump discharge side.
- (b) Operate the feed pump at 600 rpm and check the discharge pressure.

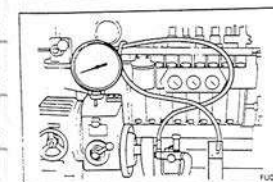
Discharge pressure:

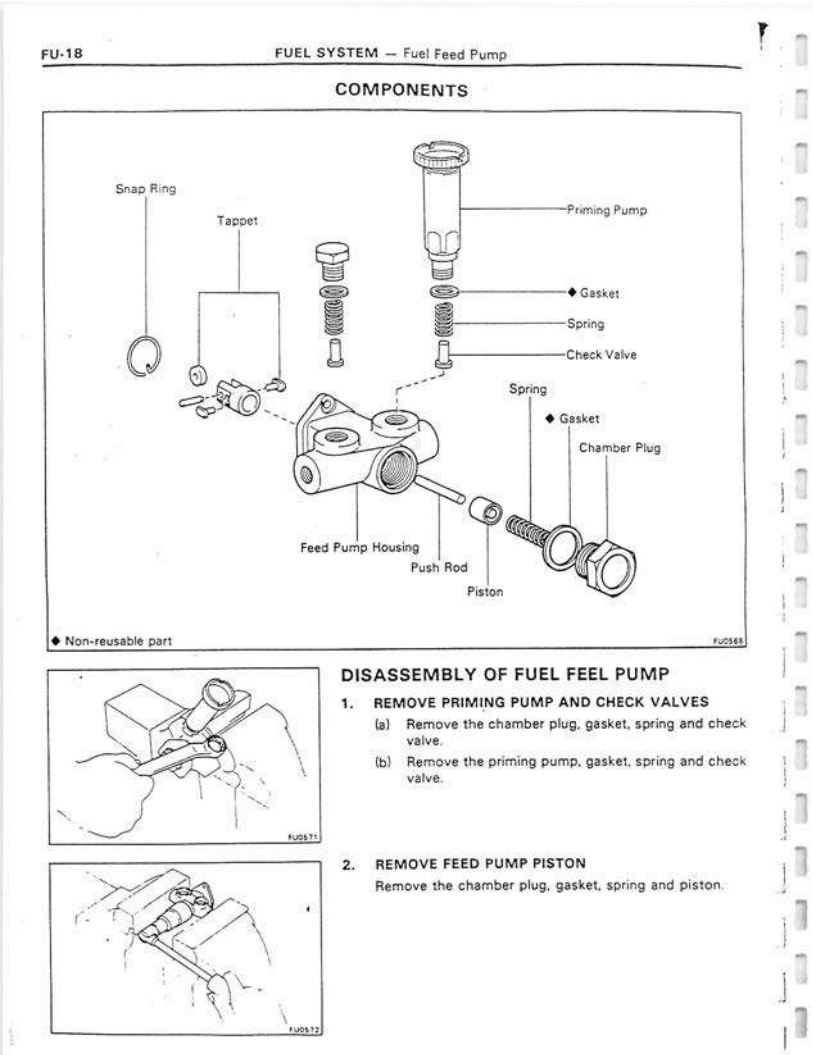
1.8 – 2.2 kg/cm² (26 – 31 psi, 177 – 216 kPa)

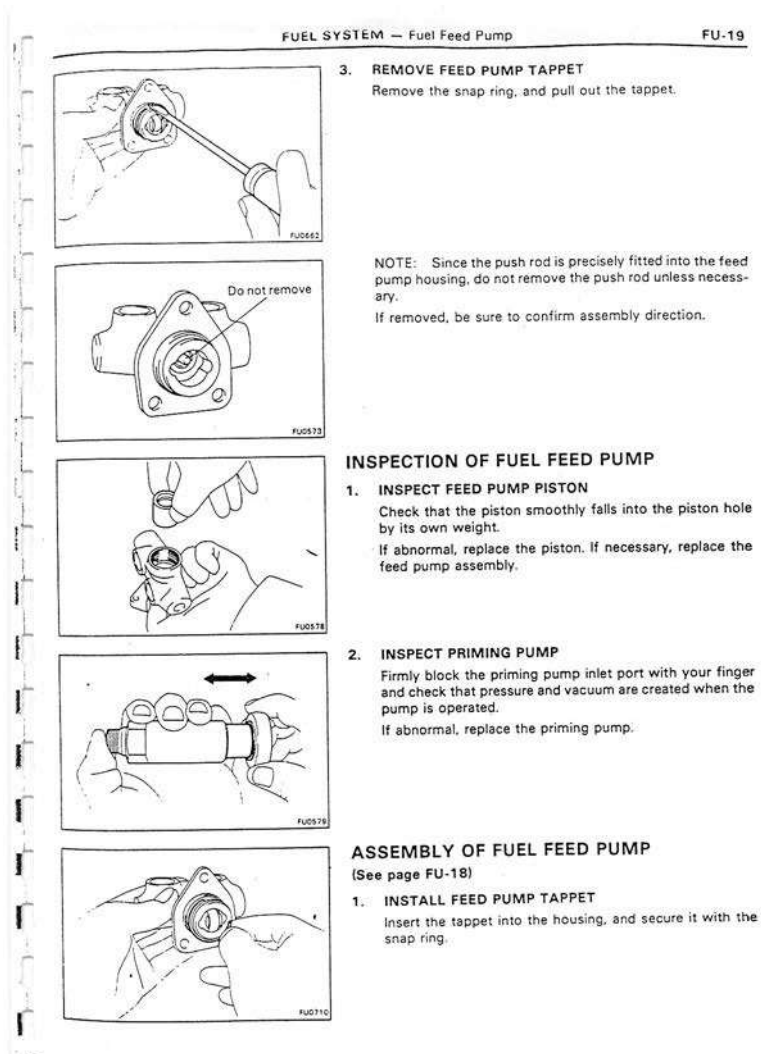
- (c) Install a 1.54 mm (0.0606 in.) nozzle to the feed pump discharge side.
- (d) Operate the feed pump at 1,000 rpm, and measure discharge volume.

Discharge volume:

900 cc/min (54.9 cu in./min.) or more

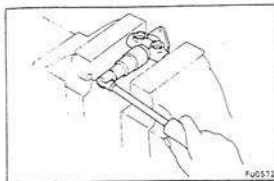






FU-20

FUEL SYSTEM — Fuel Feed Pump

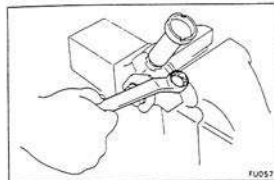


Fu0572

2. INSTALL FEED PUMP PISTON

Install the piston, spring, a new gasket and the chamber plug.

Torque: 1,500 kg-cm (109 ft-lb, 147 N-m)



Fu0573

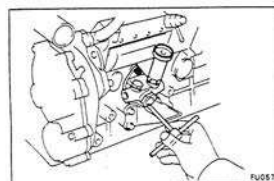
3. INSTALL PRIMING PUMP AND CHECK VALVES

(a) Install the check valve, spring, a new gasket and the priming pump.

Torque: 500 kg-cm (36 ft-lb, 49 N-m)

(b) Install the check valve, spring, a new gasket and the plug.

Torque: 500 kg-cm (36 ft-lb, 49 N-m)



Fu0570

INSTALLATION OF FUEL FEED PUMP

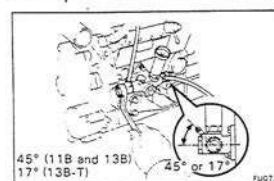
(See page FU-16)

1. INSTALL FEED PUMP

(a) Place a new O-ring in position on the injection pump housing.

(b) Install the feed pump with the three spring washers and nuts.

Torque: 95 kg-cm (82 in.-lb, 9.3 N-m)



Fu0729

45° (11B and 13B)
17° (13B-T)

2. INSTALL INLET AND OUTLET FUEL PIPES [B and 3B]

Connect the fuel pipe with new two gaskets and the union bolt. Connect the two fuel pipes. torque the union bolts.

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

[11B, 13B and 13B-T]

Install the inlet fuel pipe with new two gaskets and the union bolt. Connect the outlet fuel pipe with new two gaskets and the union bolt. Torque the union bolts.

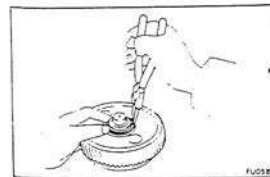
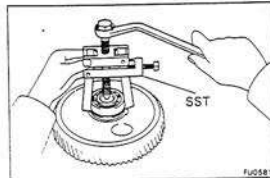
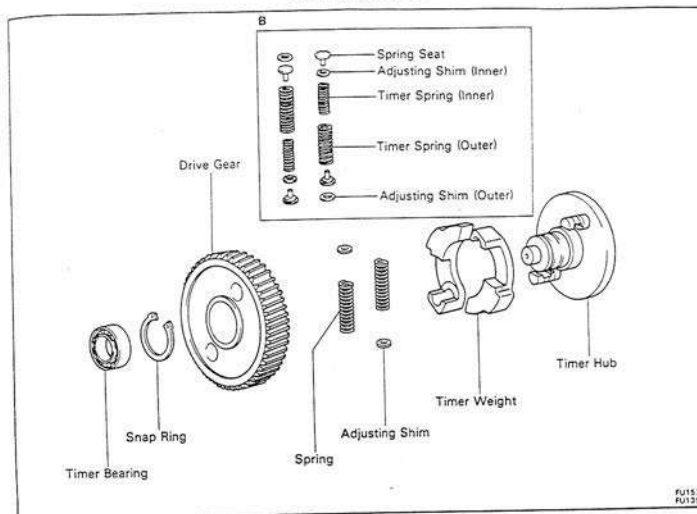
Torque: 375 kg-cm (27 ft-lb, 37 N-m)

3. BLEED FUEL FEED PUMP (See step 2 on page FU-3)**4. START ENGINE AND CHECK FOR FUEL LEAKS**

FUEL SYSTEM — Automatic Timer

FU-21

AUTOMATIC TIMER COMPONENTS



REMOVAL OF AUTOMATIC TIMER

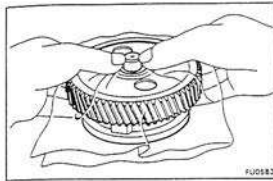
(See steps 1, 3 and 11 to 13 on pages EM-64 to 66)

DISASSEMBLY OF AUTOMATIC TIMER

- 1. REMOVE TIMER BEARING**
Using SST, remove the timer bearing.
SST 09286-46011
- 2. DISASSEMBLY AUTOMATIC TIMER**
 - (a) Using snap ring pliers, remove the snap ring.

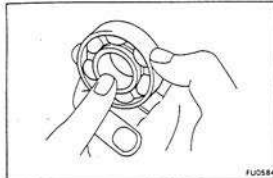
FU-22

FUEL SYSTEM — Automatic Timer



FU0583

- (b) Cover the timer with a shop towel to prevent the spring seats (B), springs and adjusting shims from flying out.
- (c) Pull up the drive gear, and remove the spring seats (B), springs and adjusting shims.
- (d) Remove the timer weights from the timer hub.



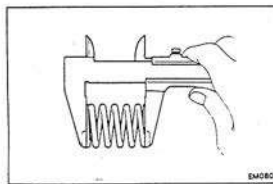
FU0584

INSPECTION OF AUTOMATIC TIMER

1. INSPECT TIMER BEARING

Check that the timer bearing operation is not rough or noisy.

If necessary, replace the timer bearing.



EM0801

2. INSPECT TIMER SPRINGS

Using calipers, measure the free length of the spring.

Free length:

B	Inner	43.7 mm (1.720 in.)
	Outer	54.2 mm (2.134 in.)
3B		50.7 mm (1.996 in.)
11B (w/o HAC) and 13B (w/o HAC)		50.3 mm (1.980 in.)
11B (w/ HAC) and 13B (w/ HAC)		44.4 mm (1.748 in.)
13B-T		48.5 mm (1.909 in.)

If the free length is not as specified, replace the spring.

FUEL SYSTEM — Automatic Timer

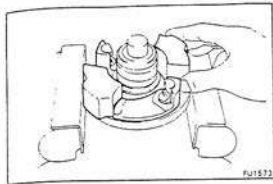
FU-23

ASSEMBLY OF AUTOMATIC TIMER

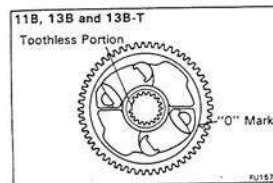
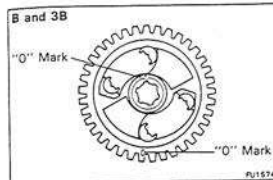
(See page FU-21)

1. ASSEMBLE AUTOMATIC TIMER

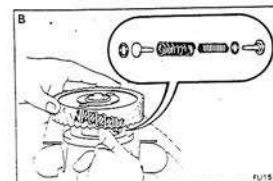
- (a) Mount the timer hub in a soft jaw vise.
- (b) Install the timer weights to the timer hub.



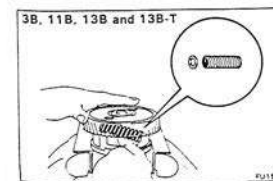
- (c) Assemble the timer hub and drive gear as shown.



- (d) [B] Install the spring seats, timer springs and adjusting shims (inner and outer).

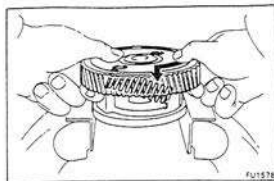


- (e) [3B, 11B, 13B and 13B-T] Install the timer springs and adjusting shims.

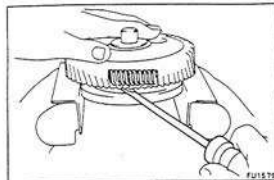


FU-24

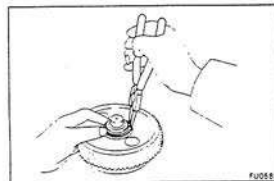
FUEL SYSTEM — Automatic Timer



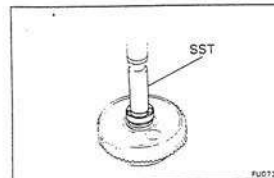
(f) Turn and push and drive gear onto the timer hub.



(g) Using a screwdriver, snugly seat the spring seats (B), springs and adjusting shims.



(h) Using snap ring pliers, install the snap ring.

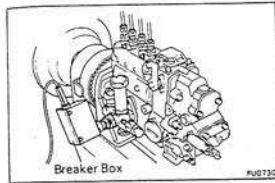
**2. INSTALL TIMER BEARING**

Using SST and a press, press in the bearing.
SST B and 3B 09620-30010 (09623-30010)
11B, 13B and 13B-T
09260-58010 (09285-76020)

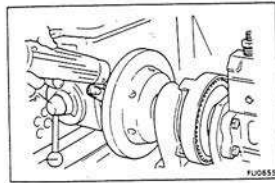
ADJUSTMENT OF AUTOMATIC TIMER

1. PREPARATION

- Remove the injection pump without disconnecting the feed pump. (See page FU-27)
- Install the automatic timer to the injection pump.



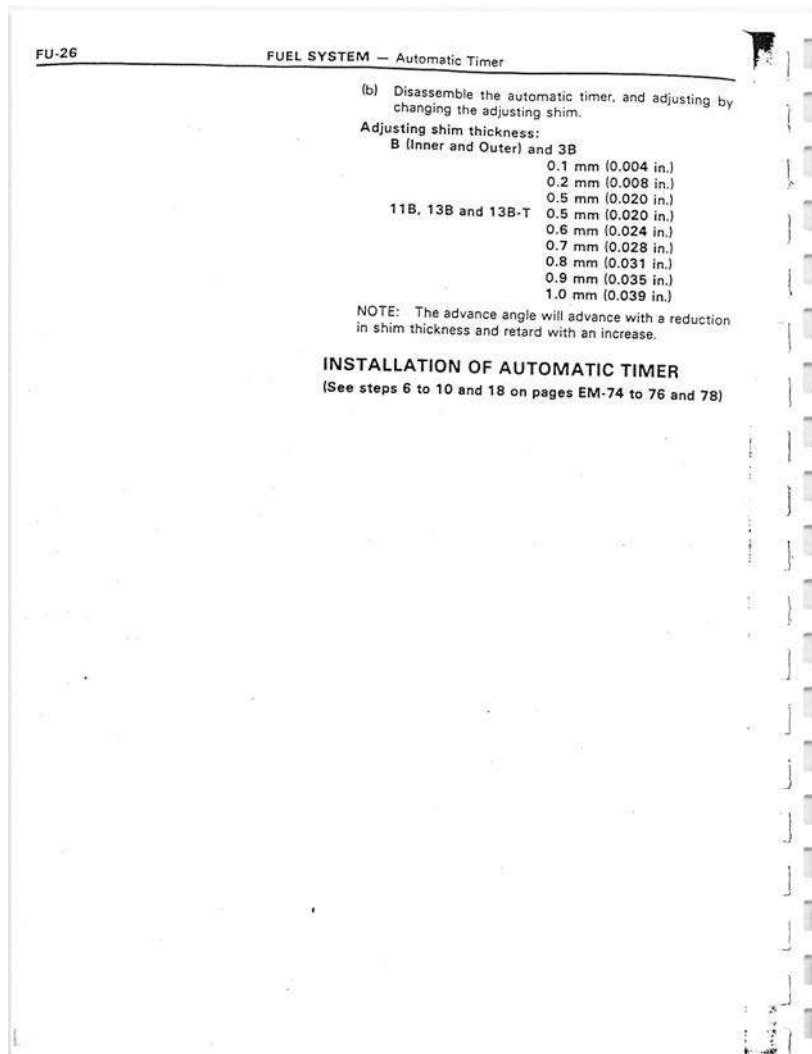
- (c) Mount the injection pump on the pump tester.
- (d) Fill the camshaft chamber of the injection pump with engine oil.
- (e) Install the timer breaker box to the piston bore of the feed pump.

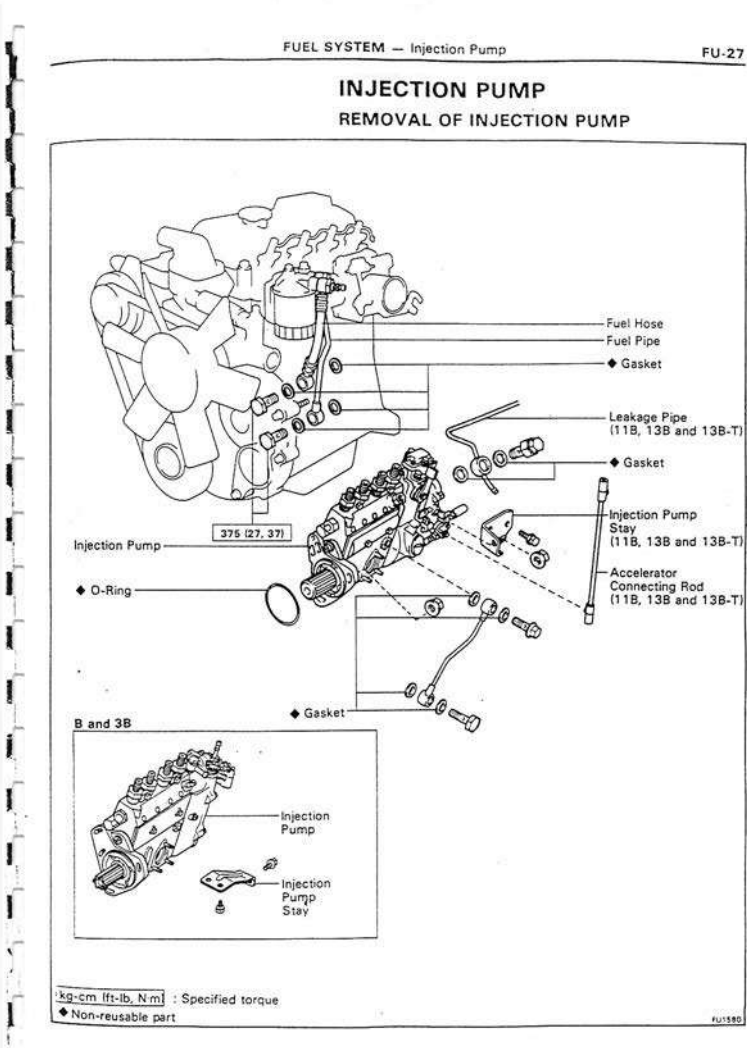


2. ADJUST ADVANCE ANGLE

- (a) Using a timing light, measure the advance angle.

Item	Pump rpm	Advance angle
B	700	0.5° or less
	750	0.3 – 1.3°
	900	2.7 – 3.7°
	1,100	3.5 – 4.5°
	1,400	4.8 – 5.8°
	1,750	6.0 – 7.0°
	1,850	6.0 – 7.0°
3B	700	0.5° or less
	800	0.2 – 1.1°
	1,000	1.3 – 2.3°
	1,400	3.8 – 4.8°
	1,750	6.0 – 7.0°
	1,900	6.0 – 7.0°
11B (w/o HAC)	1,450	0.5° or less
	1,750	4.5 – 5.5°
13B (w/o HAC)	1,400	0.5° or less
	1,700	4.5 – 5.5°
11B (w/ HAC)	1,000	0.5° or less
13B (w/ HAC)	1,700	3.0 – 4.0°
13B-T	1,400	0.5° or less
	1,700	3.5 – 4.5°

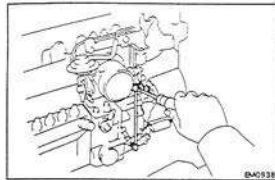




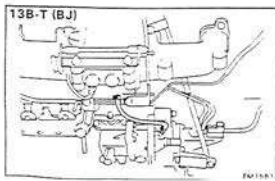
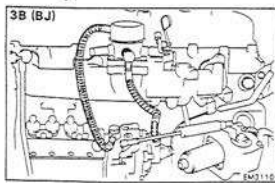
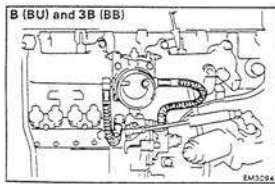
FU-28

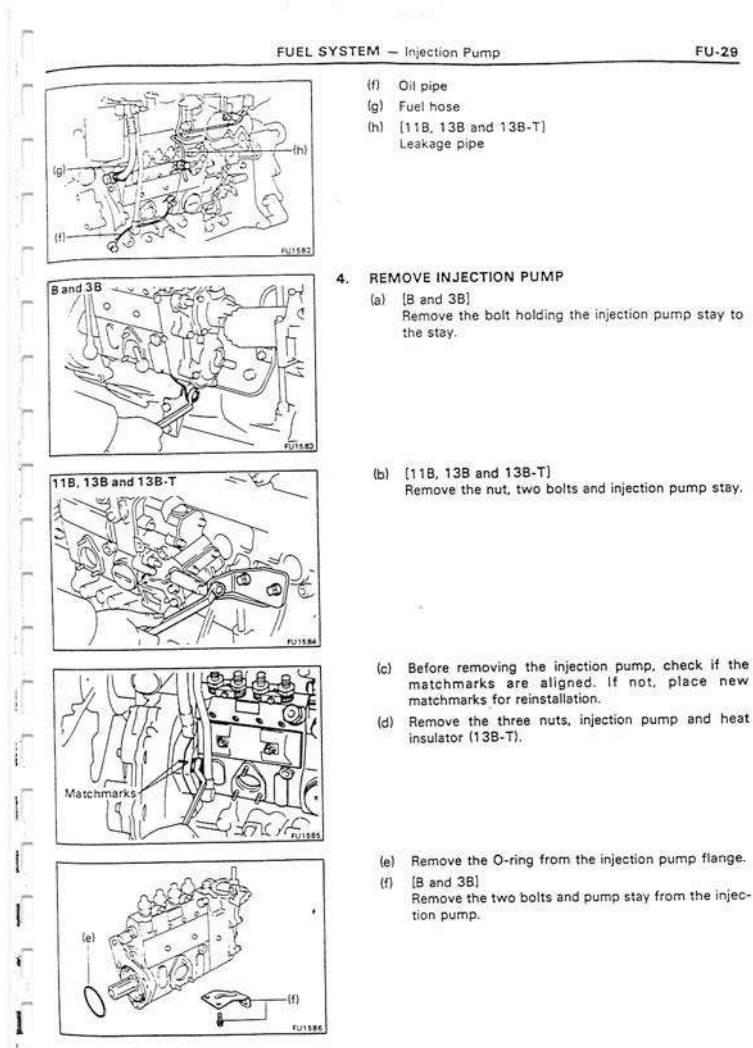
FUEL SYSTEM — Injection Pump

1. REMOVE INJECTION PIPES
(See step 1 on page FU-4) B and 3B
(See steps 1 and 2 on page FU-10)
11B, 13B and 13B-T
2. REMOVE FUEL FEED PUMP
(See steps 1 and 2 on page FU-16)



3. REMOVE PARTS
 - (a) [B and 3B (w/ EDIC System)]
Connecting rod of EDIC motor
 - (b) [B (w/o EDIC system)]
Connecting rod of fuel cut diaphragm
 - (c) [3B (w/o EDIC System)]
Connecting wire of overinjection magnet
 - (d) [11B, 13B and 13B-T]
Accelerator connecting rod
 - (e) [B, 3B and 13B-T]
Vacuum hose(s)



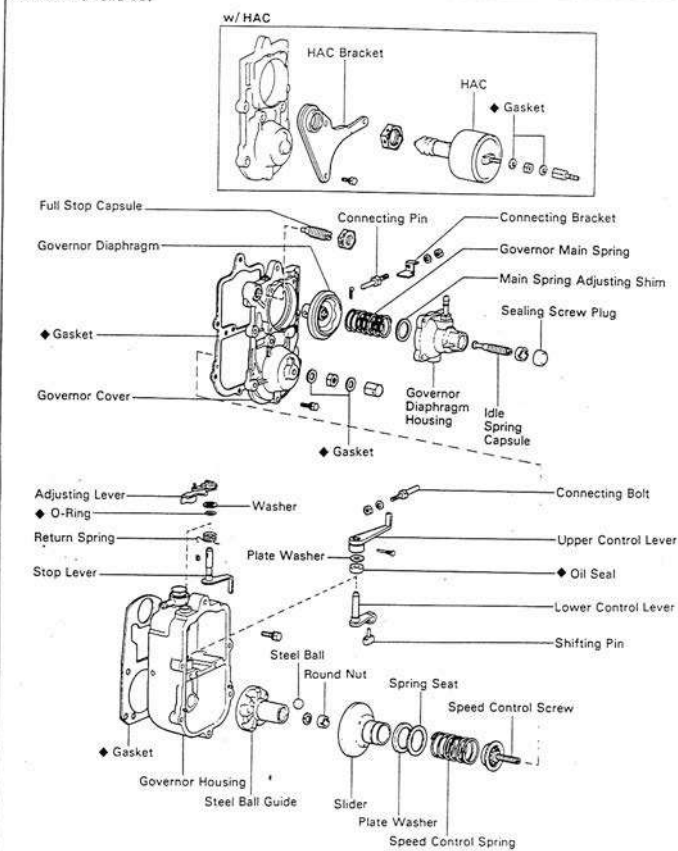


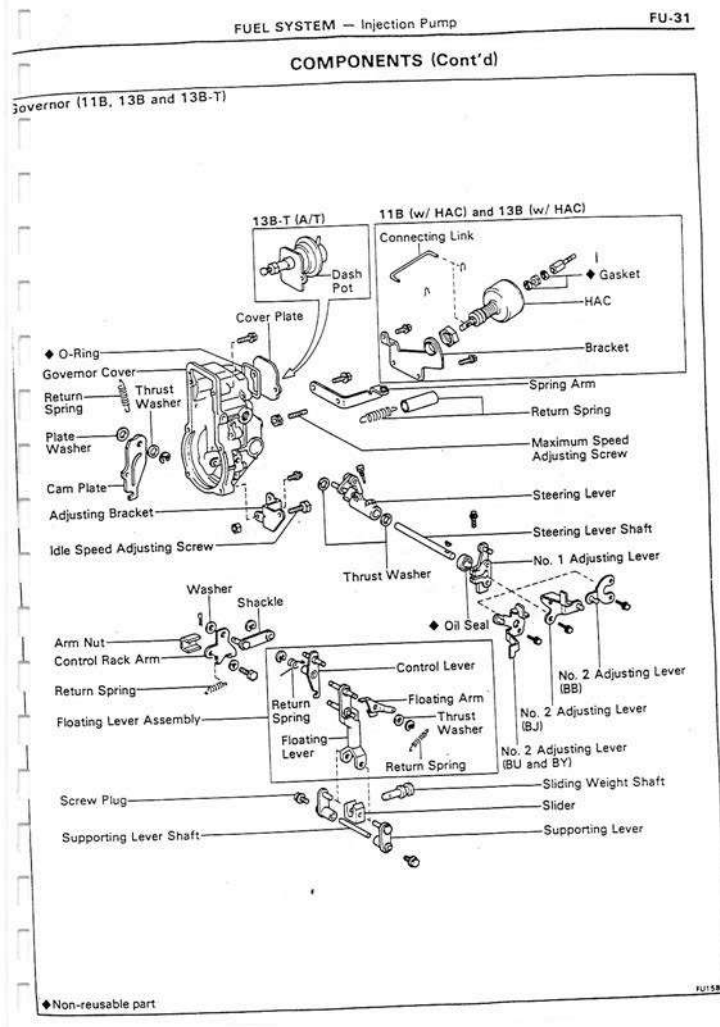
FU-30

FUEL SYSTEM — Injection Pump

COMPONENTS

Governor (B and 3B)



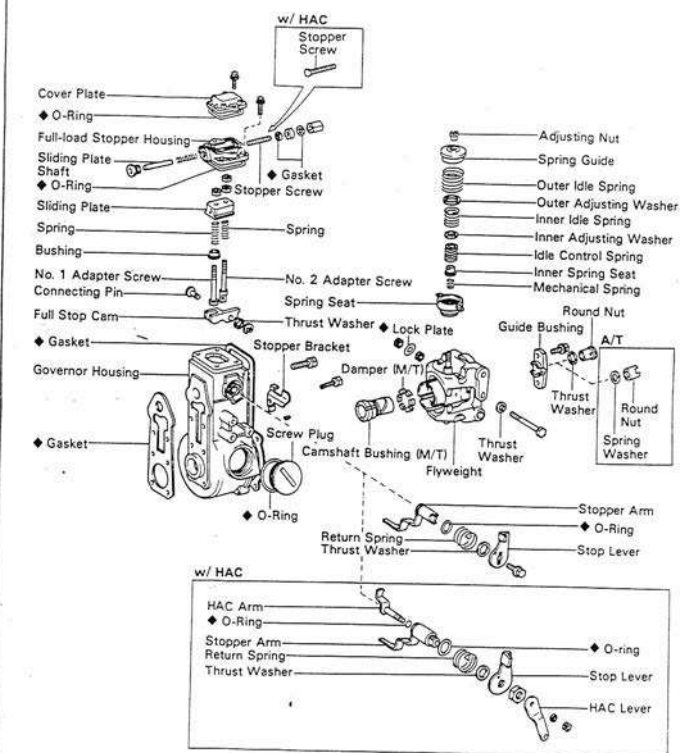


FU-32

FUEL SYSTEM — Injection Pump

COMPONENTS (Cont'd)

Governor (11B and 13B)

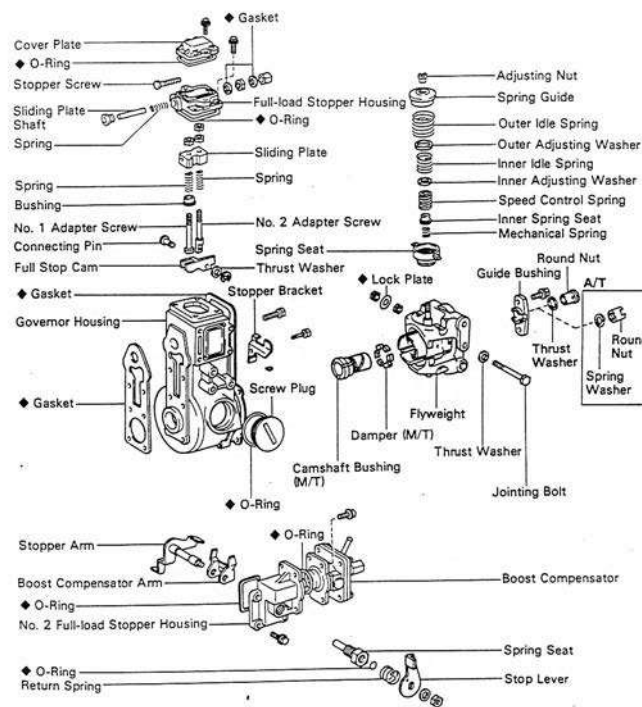


FUEL SYSTEM — Injection Pump

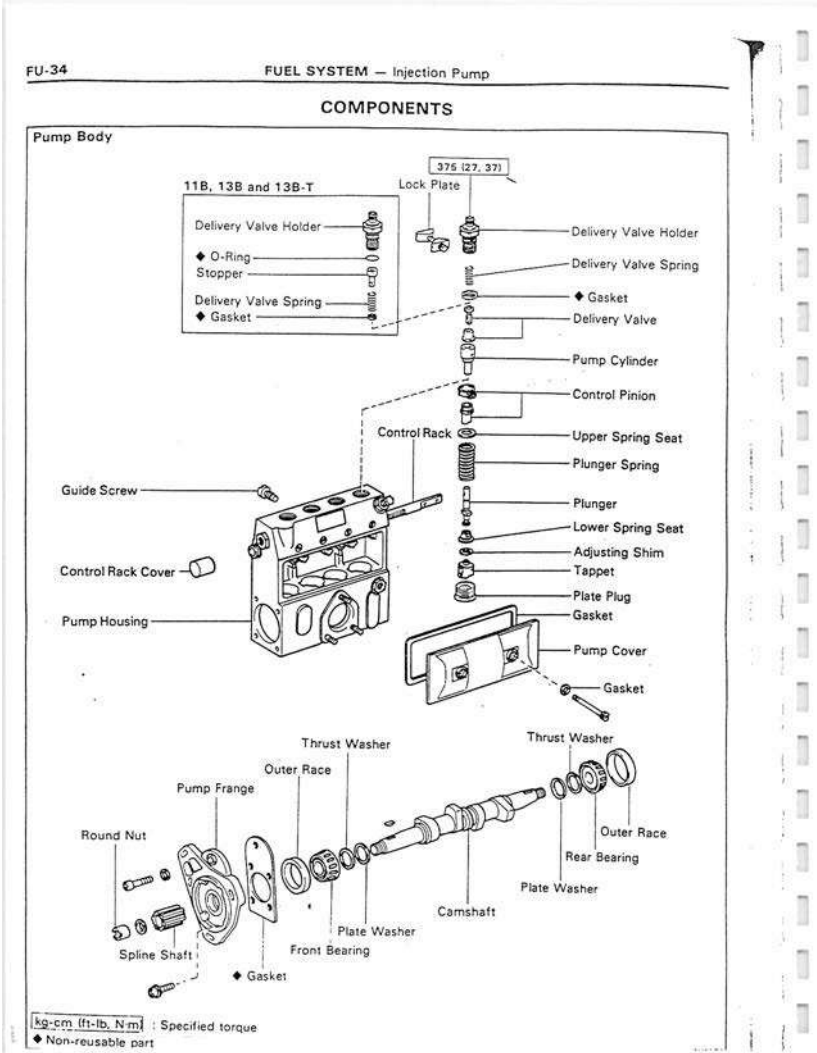
FU-33

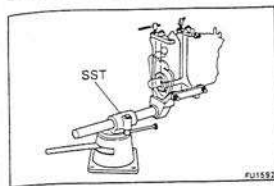
COMPONENTS (Cont'd)

Governor (13B-T)



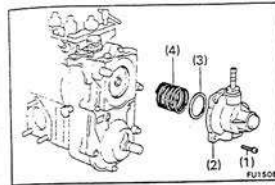
FU1590



**DISASSEMBLY OF INJECTION PUMP****Disassembly of Governor [B and 3B]**

(See page FU-30)

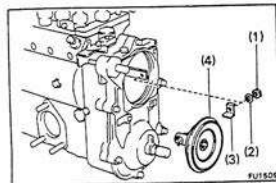
1. MOUNT PUMP ASSEMBLY TO SST (STAND)
SST 09241-76022



2. REMOVE GOVERNOR DIAPHRAGM HOUSING AND MAIN SPRING

Remove the following parts:

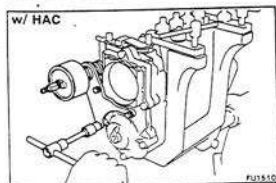
- (1) Four screws
- (2) Governor diaphragm housing
- (3) Adjusting shim(s)
- (4) Governor main spring



3. REMOVE GOVERNOR DIAPHRAGM

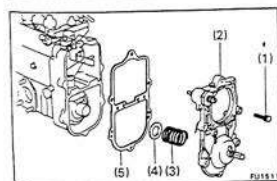
Remove the following parts:

- (1) Nut
- (2) Spring washer
- (3) Connecting bracket
- (4) Governor diaphragm



4. [w/ HAC]
REMOVE HIGH ALTITUDE COMPENSATOR (HAC)

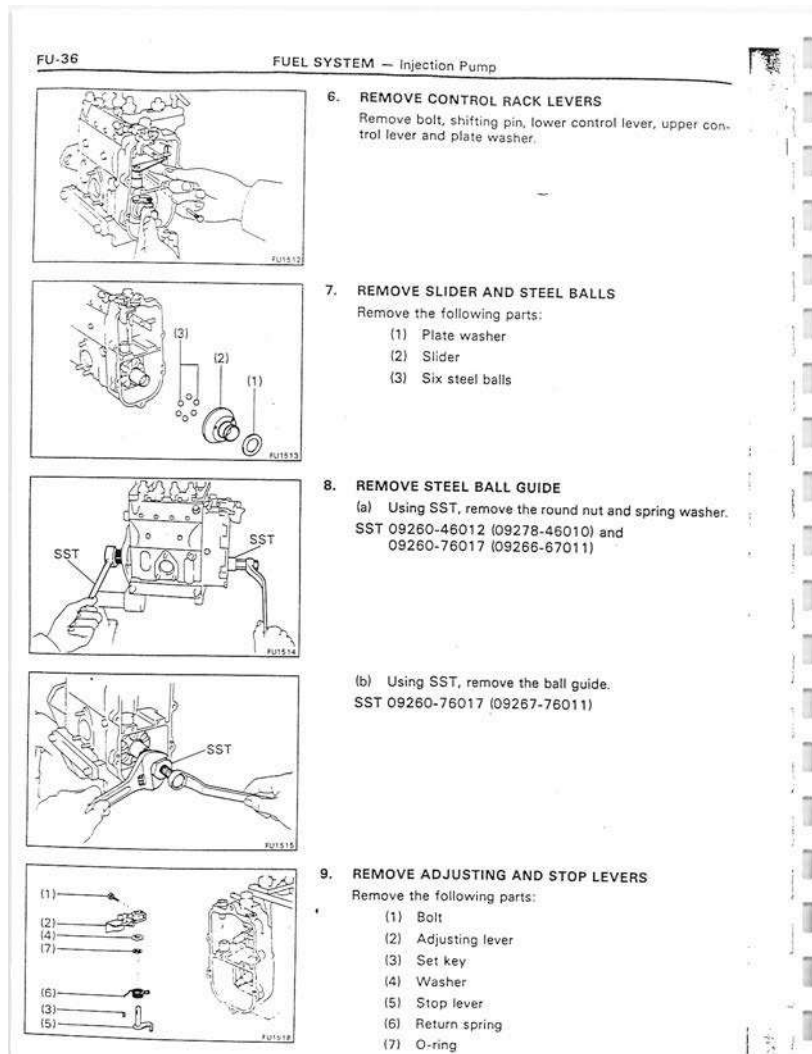
Remove the three bolts and HAC.



5. REMOVE GOVERNOR COVER AND SPEED CONTROL SPRING

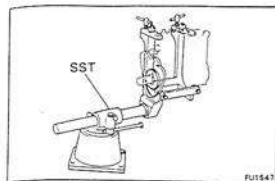
Remove the following parts:

- (1) Six bolts
- (2) Governor cover
- (3) Speed control spring
- (4) Spring seat
- (5) Gasket

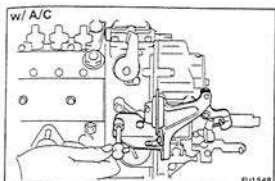


FUEL SYSTEM -- Injection Pump

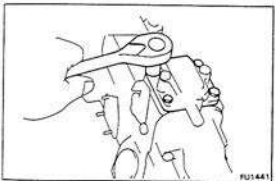
FU-37

**Disassembly of Governor**
[11B, 13B and 13B-T](See page FU-31 and 32) 11B and 13B
(See page FU-31 and 33) 13B-T

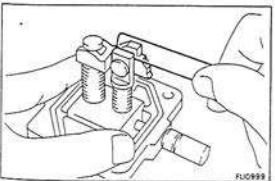
1. MOUNT PUMP ASSEMBLY TO SST (STAND)
SST 09241-76022



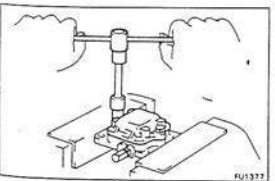
2. [w/ A/C]
REMOVE IDLE-UP ACTUATOR



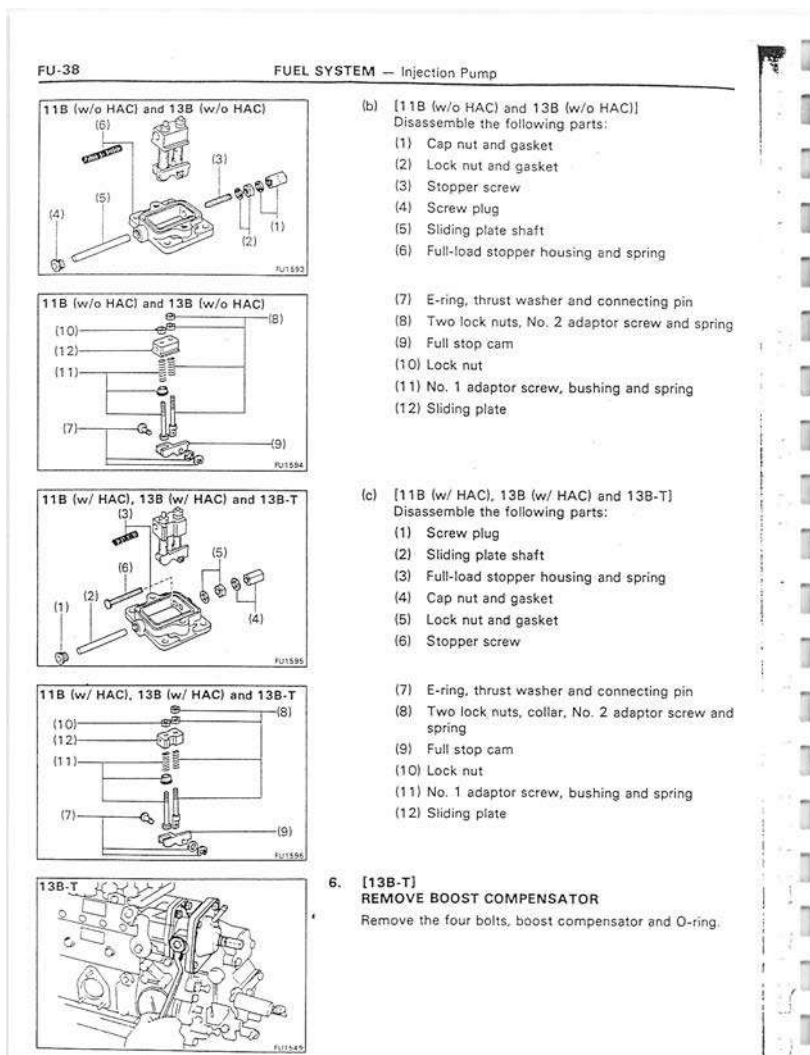
3. REMOVE FULL-LOAD STOPPER HOUSING ASSEMBLY
Remove the four bolts, the stopper housing assembly and O-ring.

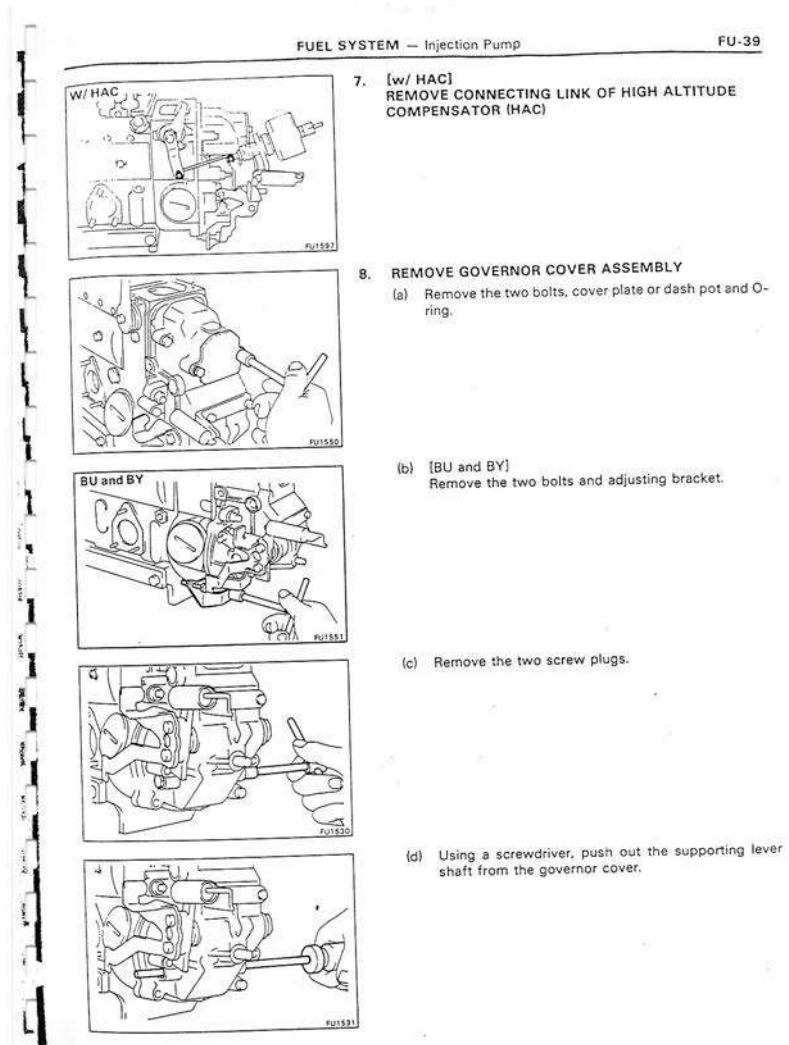


4. CHECK THRUST CLEARANCE OF FULL STOP CAM
Using a feeler gauge, measure the thrust clearance between the full stop cam and No. 2 adapter screw.
Thrust clearance: 0.03 - 0.08 mm
(0.0012 - 0.0032 in.)
If the clearance is not within specification, replace the thrust washer.
Thrust washer thickness: 0.05 mm (0.0020 in.)
0.10 mm (0.0039 in.)
0.20 mm (0.0079 in.)

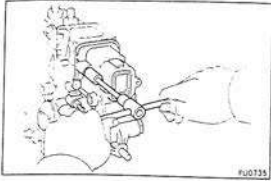


5. DISASSEMBLE FULL-LOAD STOPPER HOUSING ASSEMBLY
(a) Remove the two bolts, cover plate and O-ring.

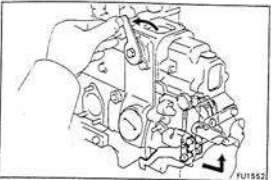




FU-40 **FUEL SYSTEM — Injection Pump**

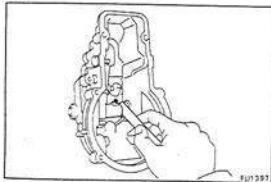


(e) Remove the six bolts.

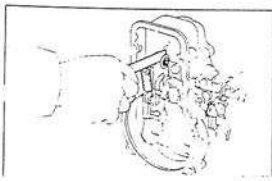


(f) Turn the stop lever, and disconnect the sliding block of the steering lever from the floating lever hole. Remove the governor cover assembly and gasket.

CAUTION: Be careful not drop the supporting levers and slider.



9. CHECK THRUST CLEARANCE OF STEERING LEVER
Using a feeler gauge, measure the thrust clearance between the steering lever and governor cover.
Thrust clearance: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)
If the clearance is not within specification, replace the thrust washer.
Thrust washer thickness: 0.50 mm (0.0197 in.)
0.55 mm (0.0217 in.)
0.60 mm (0.0236 in.)
0.65 mm (0.0256 in.)
0.70 mm (0.0276 in.)
0.75 mm (0.0295 in.)
0.80 mm (0.0315 in.)



10. CHECK THRUST CLEARANCE OF CAM PLATE
Using a feeler gauge, measure the thrust clearance between the cam plate and governor cover.
Thrust clearance: 0.08 – 0.12 mm
(0.0031 – 0.0047 in.)
If the clearance is not within specification, replace the thrust washer.
Thrust washer thickness: 0.2 mm (0.008 in.)
0.3 mm (0.012 in.)

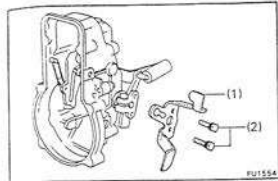
FUEL SYSTEM -- Injection Pump

FU-41

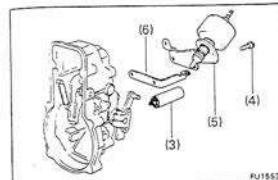
11. DISASSEMBLE GOVERNOR COVER ASSEMBLY

Remove the following parts:

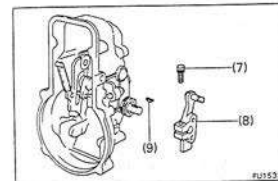
- (1) Two bolts
- (2) No. 2 adjusting lever



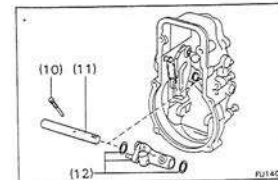
- (3) Return spring
- (4) Two bolts
- (5) [w/ HAC]
HAC with bracket
- (6) Spring arm



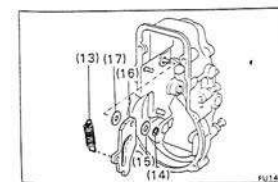
- (7) Bolt
- (8) No. 1 adjusting lever
- (9) Set key



- (10) Bolt
- (11) Steering lever shaft
- (12) Steering lever and thrust washers

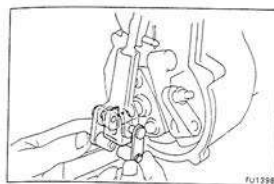
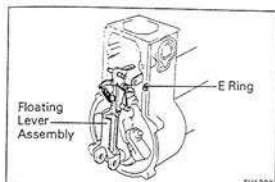


- (13) Return spring
- (14) E-ring
- (15) Thrust washer
- (16) Cam plate
- (17) Plate washer

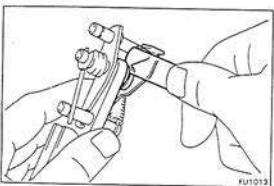


FU-42

FUEL SYSTEM — Injection Pump

**12. REMOVE SUPPORTING LEVERS AND SLIDER****13. REMOVE FLOATING LEVER ASSEMBLY**

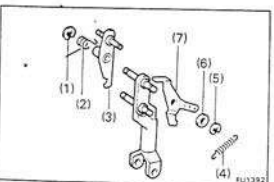
Remove the E-ring and the floating lever assembly.

**14. CHECK THRUST CLEARANCE OF FLOATING ARM**

Using a feeler gauge, measure the thrust clearance between the floating arm and floating lever.

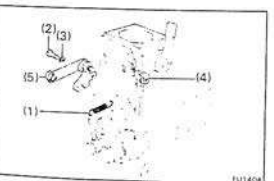
Thrust clearance: 0.05 – 0.12 mm
(0.0020 – 0.0047 in.)

If the clearance is not within specification, replace the thrust washer.

Thrust washer thickness: 0.05 mm (0.0020 in.)
0.10 mm (0.0039 in.)
0.20 mm (0.0079 in.)
0.40 mm (0.0157 in.)**15. DISASSEMBLE FLOATING LEVER ASSEMBLY**

Remove the following parts:

- (1) E-ring
- (2) Return spring
- (3) Control lever
- (4) Return spring
- (5) E-ring
- (6) Thrust washer
- (7) Floating arm

**16. REMOVE SHACKLE AND CONTROL RACK ARM ASSEMBLY**

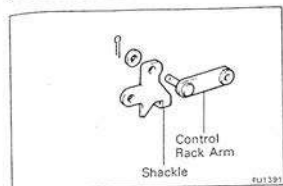
Remove the following parts:

- (1) Return spring
- (2) Bolt
- (3) Spring washer
- (4) Arm nut

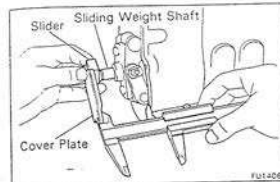
(5) Shackle and control rack arm

FUEL SYSTEM — injection pump

FU-43

**17. SEPARATE SHACKLE AND CONTROL RACK ARM**

Remove the cotter pin and washer, and separate the shackle and arm.

**18. CHECK FITTING DIMENSIONS OF SLIDING WEIGHT SHAFT**

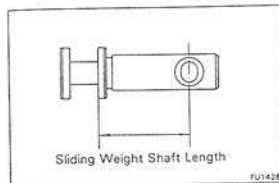
While pulling on the sliding weight shaft, measure the fitting dimensions with calipers as shown.

Fitting dimensions: 49.7 – 50.1 mm
(1.957 – 1.972 in.)

If the dimensions are not within specification, replace the sliding weight shaft.

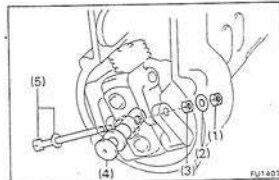
Sliding weight shaft length:

30.7 mm (1.209 in.)
30.9 mm (1.217 in.)
31.1 mm (1.224 in.)
31.3 mm (1.232 in.)
31.5 mm (1.240 in.)
31.7 mm (1.248 in.)
31.9 mm (1.256 in.)

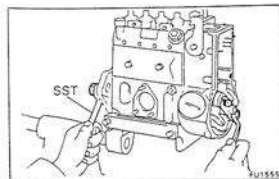
**19. CHECK THRUST CLEARANCE OF JOINTING BOLT**

(See pge FU-80)

Thrust clearance: 1.5 – 2.0 mm
(0.059 – 0.079 in.)

**20. REMOVE SLIDING WEIGHT SHAFT**

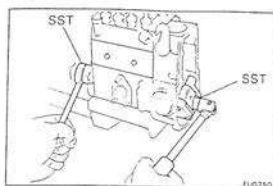
- (a) Unstake the lock washer.
- (b) Remove the following parts:
 - (1) Lock nut
 - (2) Lock washer
 - (3) Lock nut
 - (4) Jointing bolt with thrust washer
 - (5) Sliding weight shaft

**21. REMOVE GUIDE BUSHING**

Using SST, remove the two bolts and guide bushing.
SST 09260-58010 (09278-46020)

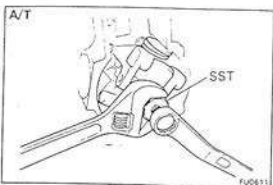
FU-44

FUEL SYSTEM -- Injection Pump

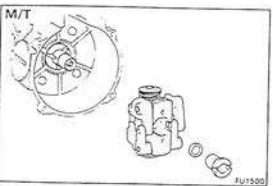


22. REMOVE FLYWEIGHT ASSEMBLY

- Using SST, remove the round nut, SST 09260-58010 (09260-78010, 09278-46020)
- [A/T] Remove the spring washer.
- [M/T] Remove the thrust washer and the flyweight assembly.



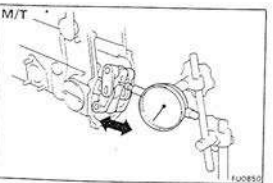
- [A/T] Using SST, remove the flyweight assembly, SST 09260-58010 (09267-76011)



23. [M/T] CHECK THRUST CLEARANCE OF FLYWEIGHT

- Install the flyweight without the dampers.
- Install the thrust washer and round nut.

Torque: 525 kg-cm (38 ft-lb, 51 N-m)



- Using a dial indicator, measure the thrust clearance between the flyweight and camshaft bushing.

Thrust clearance: 0.02 - 0.10 mm
(0.0008 - 0.0039 in.)

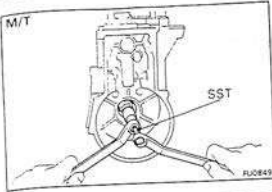
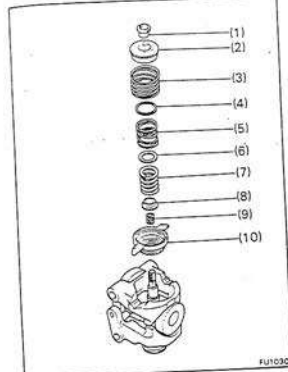
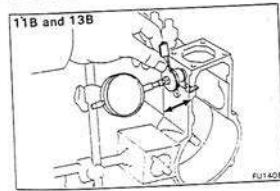
If the clearance is not with specification, replace the thrust washer.

Thrust washer thickness:

- | |
|----------------------|
| 1.60 mm (0.0630 in.) |
| 1.65 mm (0.0650 in.) |
| 1.70 mm (0.0670 in.) |
| 1.75 mm (0.0689 in.) |
| 1.80 mm (0.0709 in.) |
| 1.85 mm (0.0728 in.) |
| 1.90 mm (0.0748 in.) |
| 1.95 mm (0.0768 in.) |
| 2.00 mm (0.0787 in.) |
| 2.10 mm (0.0827 in.) |
| 2.20 mm (0.0866 in.) |
| 2.30 mm (0.0906 in.) |

- Remove the flyweight assembly.

FUEL SYSTEM — Injection Pump FU-45

24. [M/T]
REMOVE CAMSHAFT BUSHING
 Using SST, remove the camshaft bushing.
 SST 09260-58010 (09267-76030)

25. DISASSEMBLE FLYWEIGHT ASSEMBLY
 Remove the following parts:

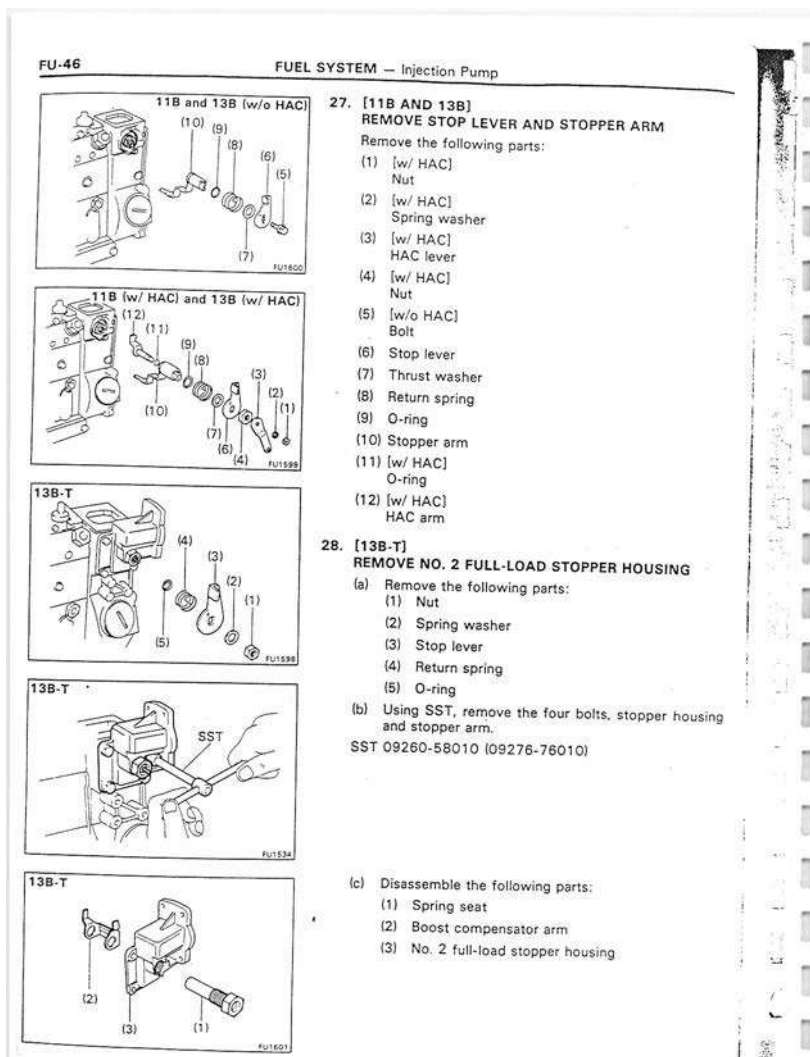
- (1) Adjusting nut
- (2) Spring guide
- (3) Outer idle spring
- (4) Outer adjusting washer
- (5) Inner idle spring
- (6) Inner adjusting washer
- (7) Speed control spring
- (8) Inner spring seat
- (9) Mechanical spring
- (10) Spring seat

CAUTION: Be careful not to get these parts mixed up.

26. [11B AND 13B]
CHECK THRUST CLEARANCE OF STOPPER ARM
 Using a dial indicator, measure the thrust clearance between the stopper arm and governor housing.
 Thrust clearance: 0.05 — 0.20 mm
 (0.0020 — 0.0079 in.)

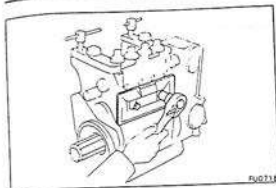
If the clearance is not within specification, replace the thrust washer.

Thrust washer thickness: 0.1 mm (0.004 in.)
 0.2 mm (0.008 in.)
 0.5 mm (0.020 in.)



FUEL SYSTEM — Injection Pump

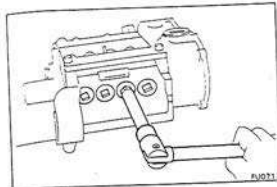
FU-47

**Disassembly of Pump Body**

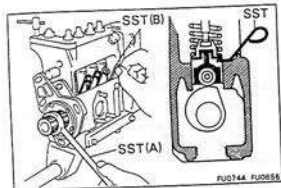
(See page FU-30 and 34) B and 3B
 (See page FU-31, 32 and 34) 11B and 13B
 (See page FU-31, 33 and 34) 13B-T

1. REMOVE PUMP COVER

Remove the two bolts, pump cover and gaskets.

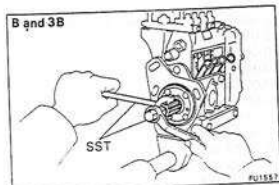
**2. REMOVE PLATE PLUGS**

Remove the four plate plugs.

**3. INSTALL SST TO TAPPET SERVICE HOLES**

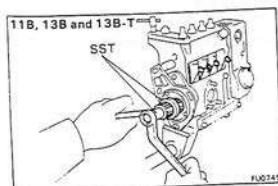
Using SST(A), turn the camshaft and insert SST(B) into each tappet service hole when the tappets are at their highest positions.

SST B and 3B 09260-46012
 (09274-46011, 09278-46010)
 11B, 13B and 13B-T
 09260-58010
 (09274-46011, 09278-46020)

**4. REMOVE SPLINE SHAFT**

(a) Using SST, remove the round nut and spring washer.

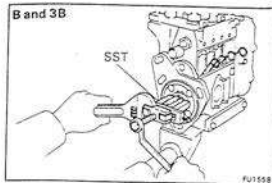
SST B and 3B 09260-46012
 (09266-46011, 09278-46010)
 11B, 13B and 13B-T
 09260-58010
 (09266-76011, 09278-46020)



FU-48

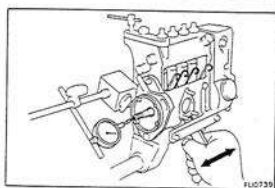
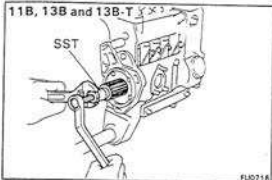
FUEL SYSTEM — Injection Pump

B and 3B



- (b) Using SST, remove the spline shaft.
 SST B and 3B 09286-46011
 11B, 13B and 13B-T
 09260-58010 (09267-76011)

11B, 13B and 13B-T



5. CHECK CAMSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth with a wooden stick.

Standard clearance: 0.03 – 0.05 mm
 (0.0012 – 0.0020 in.)
 Maximum clearance: 0.1 mm (0.004 in.)

If the clearance is greater than maximum, replace the thrust washer.

Thrust washer thickness:

B, 3B (Front and rear), 11B, 13B and 13B-T (Front)

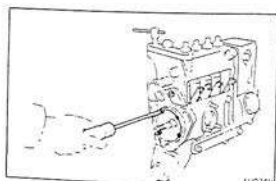
0.10 mm (0.0039 in.)
 0.12 mm (0.0047 in.)
 0.14 mm (0.0055 in.)
 0.16 mm (0.0063 in.)
 0.18 mm (0.0071 in.)
 0.50 mm (0.0197 in.)

11B, 13B and 13B-T (Rear)

0.10 mm (0.0039 in.)
 0.15 mm (0.0059 in.)
 0.30 mm (0.0118 in.)
 0.50 mm (0.0197 in.)

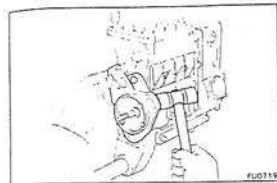
6. REMOVE PUMP FLANGE AND CAMSHAFT

- (a) Remove the five screws.

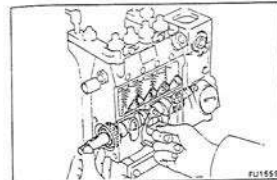


FUEL SYSTEM — Injection Pump

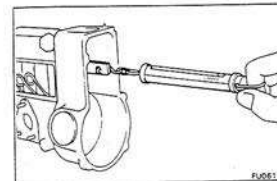
FU-49



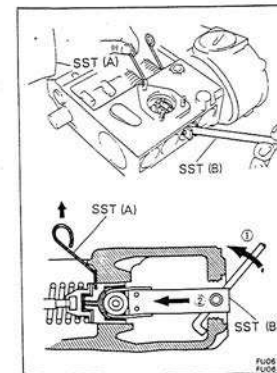
- (b) Using a plastic-faced hammer, lightly tap out the pump flange.



- (c) Remove the camshaft.



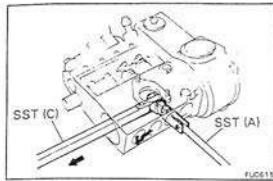
7. CHECK SLIDING RESISTANCE OF CONTROL RACK
Using a spring tension gauge, measure the sliding resistance. The rack should move smoothly.
Sliding resistance: 120 g (4.2 oz) or less



8. REMOVE TAPPETS, PLUNGERS AND PINIONS
(a) Using SST (B), push the tappet to remove SST (A).
SST B and 3B 09260-46012 (09274-46011) and
09260-76017 (09272-76011)
11B, 13B and 13B-T
09260-58010
(09272-76011, 09274-46011)

FU-50

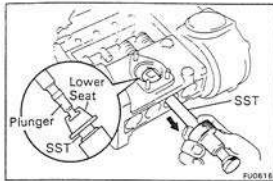
FUEL SYSTEM — Injection Pump



- (b) Using SST (B), hold the tappet in the camshaft chamber and take out the tappet through the camshaft bearing hole with SST (C).

SST B and 3B 09260-76017
(09272-76011, 09273-76011)
11B, 13B and 13B-T
09260-58010
(09272-76011, 09273-76011)

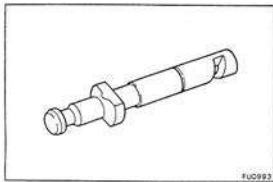
- (c) Remove the adjusting shim(s).



- (d) Using SST, hold the lower spring seat and take it out together with the plunger.

SST B and 3B 09260-46012 (09275-46010)
11B, 13B and 13B-T
09260-58010 (09275-46010)

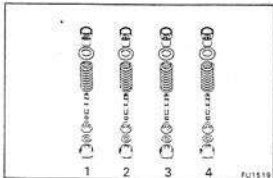
- (e) Remove the spring, upper spring seat and pinion.



NOTE:

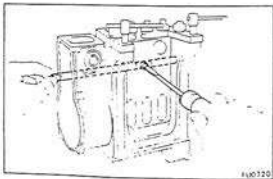
- Do not touch the sliding surfaces of the plunger with your hand.

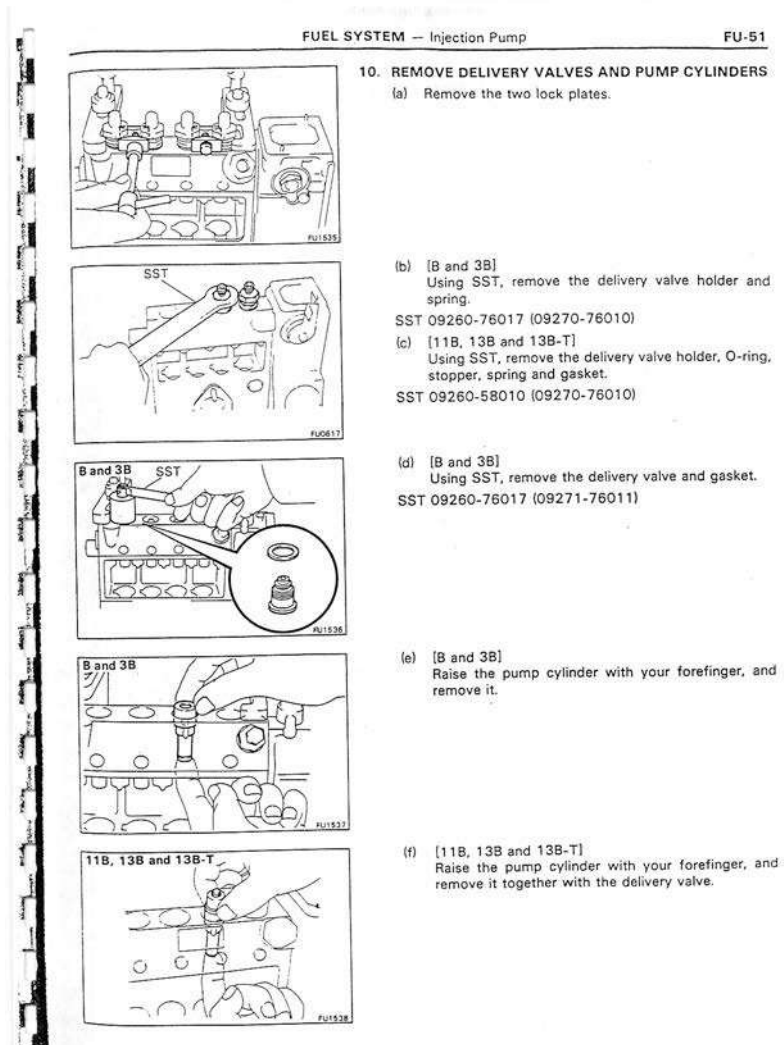
- Arrange all parts in correct order.

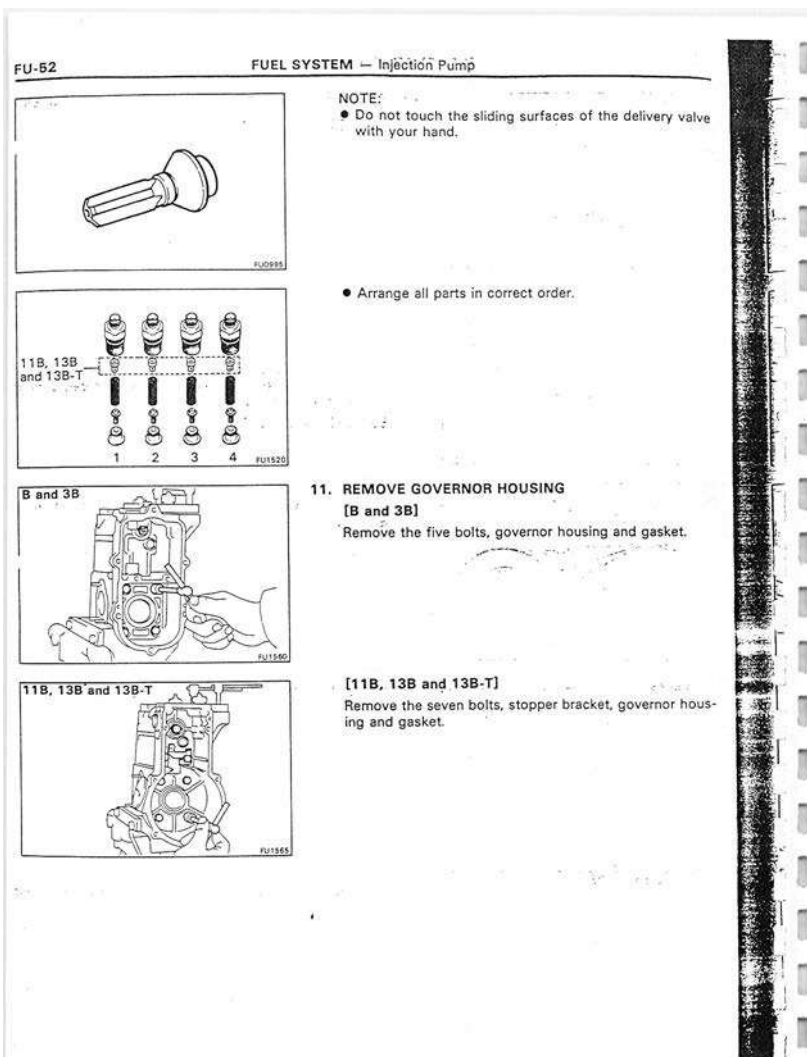


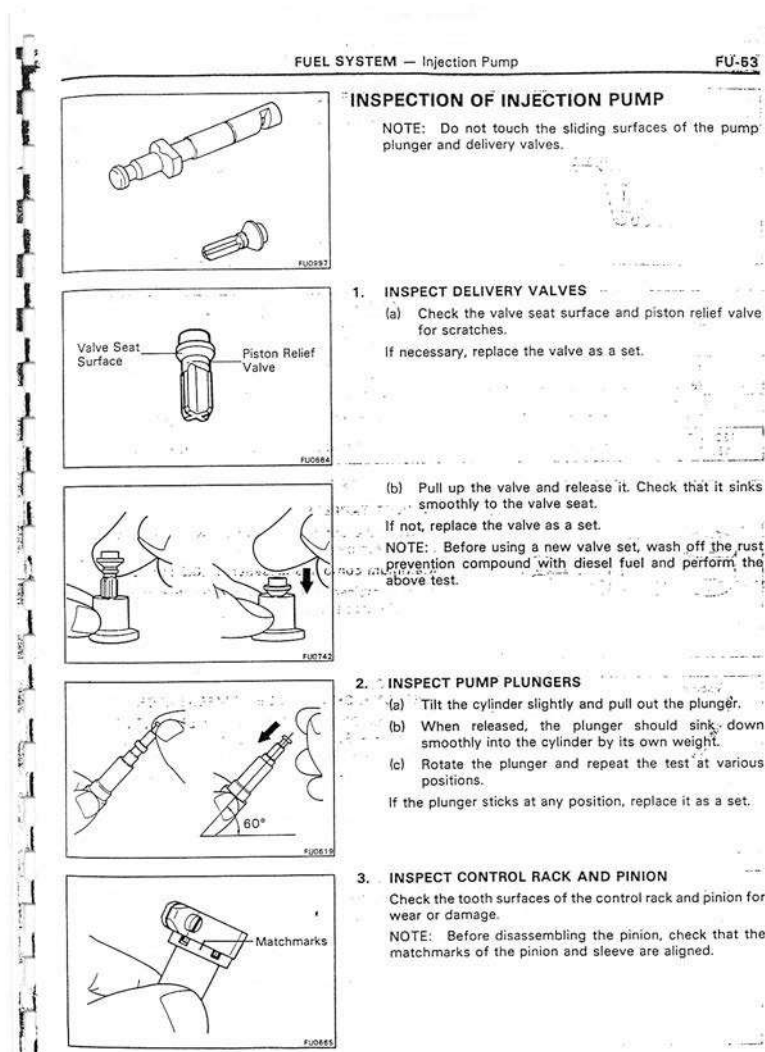
9. REMOVE CONTROL RACK

- Remove the guide screw and pull out the control rack.



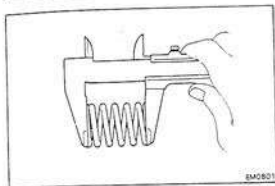






FU-54

FUEL SYSTEM — Injection Pump

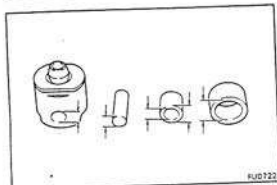


4. INSPECT SPRINGS

Using calipers, measure the free length of the spring.

Item	Free length (Approx.)						
	Delivery valve spring	Plunger spring	Governor main spring	Mechanical governor spring	Speed control spring	Inner idling spring	Outer idling spring
B	37.0 (1.457)	49.4 (1.945)	45.6 (1.795)		38.0 (1.496)		
3B	37.0 (1.457)	49.4 (1.945)	51.6 (2.031)		38.0 (1.496)		
11B, 13B (M/T) and 13B-T (M/T)	19.8 (0.780)	49.4 (1.945)		10.2 (0.402)	24.0 (0.945)	26.0 (1.024)	23.8 (0.937)
13B (A/T) and 13B-T (A/T)	19.8 (0.780)	49.4 (1.945)		10.2 (0.402)	24.0 (0.945)	24.4 (0.961)	23.8 (0.937)

If the free length is not as specified, replace the spring.

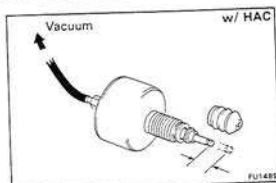


5. INSPECT TAPPETS

Measure the combined looseness with the tappet roller when assembled.

Maximum combined looseness: 0.3 mm (0.012 in.)

If the combined looseness is greater than maximum, replace the tappet assembly.



6. [w/ HAC]

INSPECT HIGH ALTITUDE COMPENSATOR (HAC)

(a) Apply 370 – 700 mmHg (14.57 – 27.56 in. Hg, 49.3 – 93.3 kPa) of vacuum to the HAC, and check that push rod moves.

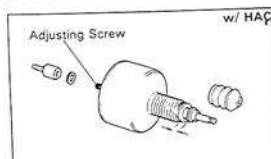
Stroke: 3.1 – 3.6 mm (0.122 – 0.142 in.)

If abnormal, replace the HAC.

(b) Measure the clearance between the push rod flange and HAC body.

Clearance (at sea level):
B and 3B 0.1 – 0.3 mm (0.004 – 0.012 in.)
11B and 13B 0.2 – 0.5 mm (0.008 – 0.020 in.)

If the clearance is not within specification, adjust with the adjusting screw.



FUEL SYSTEM — Injection Pump

FU-55

Altitude (m)

Atmospheric Pressure (mm Hg)

560

2,000

660

1,000

760

0

0

0.5

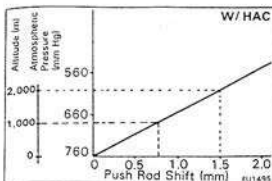
1.0

1.5

2.0

Push Rod Shift (mm) in (1/32)

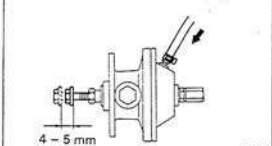
W/HAC



NOTE: Since the position of the push rod depends on altitude, the clearance mentioned above must be 0.1 – 0.3 mm (0.004 – 0.012 in.) or 0.2 – 0.5 mm (0.008 – 0.020 in.) plus the amount of push rod shift as shown in the figure.

13B-T

Pressure 1.36 kg/cm²

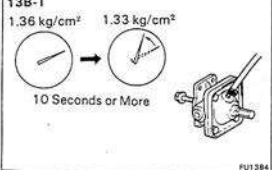


4 – 5 mm

FU1283

13B-T

1.36 kg/cm² → 1.33 kg/cm²



10 Seconds or More

FU1284

7. [13B-T]

INSPECT BOOST COMPENSATOR

(a) Apply 1.36 kg/cm² (19.3 psi, 133 kPa) of pressure to the boost compensator.

(b) Measure the push rod stroke.

Push rod stroke: 4.0 – 5.0 mm (0.157 – 0.197 in.)

If the stroke is not within specification, replace the boost compensator.

(c) Apply 1.36 kg/cm² (19.3 psi, 133 kPa) of pressure to the boost compensator.

(d) Measure the time it takes for the pressure to drop to 1.33 kg/cm² (18.9 psi, 130 kPa).

Pressure drop: 10 seconds or more

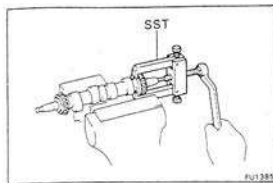
If the pressure drops in less time than specified, replace the boost compensator.

<https://cardiagn.com/fuel-system-b-engine/>

55/101

FU-56

FUEL SYSTEM — Injection Pump



REPLACEMENT OF BEARINGS AND OIL SEALS

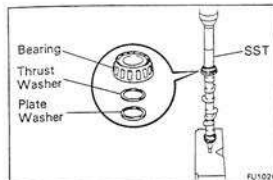
1. REPLACE CAMSHAFT BEARINGS

[Front and Rear Bearings]

(a) Using SST, remove the bearings.

SST B and 3B 09950-20017

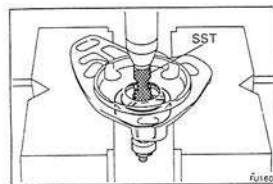
11B, 13B and 13B-T
09950-58010 (09287-58010)



(b) Using SST and a press, press in a new bearing together with the plate washer and thrust washer(s).

SST B and 3B 09285-76010

11B, 13B and 13B-T
09260-58010 (09285-76020)

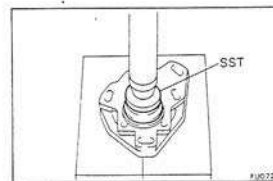


[Outer Race of Front Bearing]

(a) Using SST and a press, press out the outer race.

SST B and 3B 09286-76011

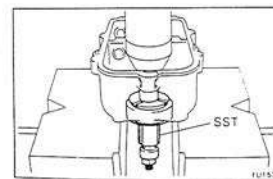
11B, 13B and 13B-T
09260-58010 (09286-78010)



(b) Using SST and a press, press in a new outer race.

SST B and 3B 09608-12010 (09608-00040)

11B, 13B and 13B-T
09260-58010 (09289-00010)

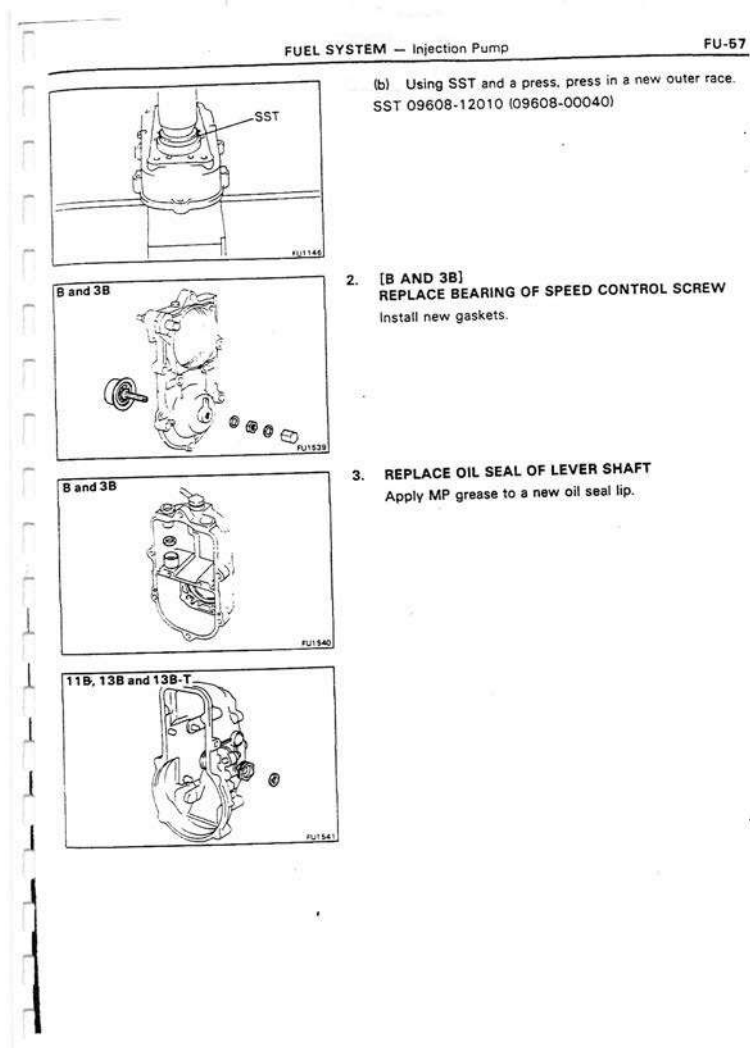


[Outer Race of Rear Bearing]

(a) Using SST and a press, press out the outer race.

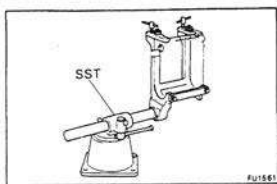
SST B and 3B 09286-76011

11B, 13B and 13B-T
09260-58010 (09286-76011)



FU-58

FUEL SYSTEM — Injection Pump

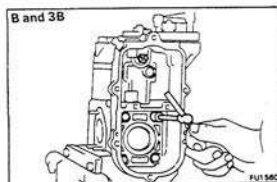
**ASSEMBLY OF INJECTION PUMP****Assembly of Pump Body**

(See pages FU-30 and 34) B and 3B

(See pages FU-31, 32 and 34) 11B and 13B

(See pages FU-31, 33 and 34) 13B-T

1. MOUNT PUMP HOUSING TO SST (STAND)
SST 09241-76022

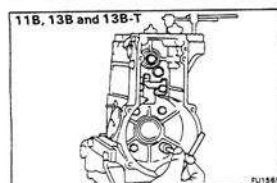


2. INSTALL GOVERNOR HOUSING
[B and 3B]

Install a new gasket and the governor housing with five bolts.

Torque:

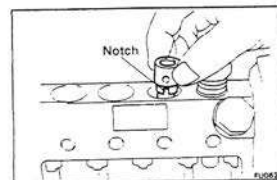
10 mm bolt head	85 kg-cm (74 in.-lb 8.3 N·m)
12 mm bolt head	190 kg-cm (14 ft.-lb, 19 N·m)

**[11B, 13B and 13B-T]**

Install a new gasket, the governor housing and stop bracket with the seven screws.

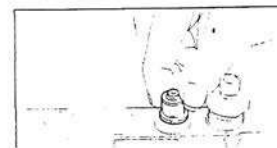
Torque:

10 mm bolt head	85 kg-cm (74 in.-lb 8.3 N·m)
12 mm bolt head	190 kg-cm (14 ft.-lb, 19 N·m)



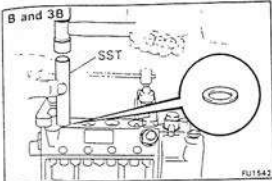
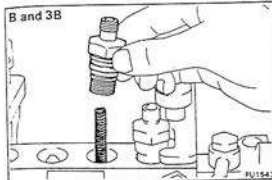
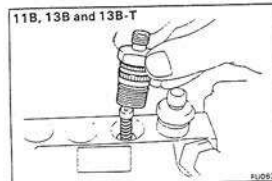
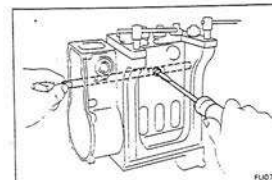
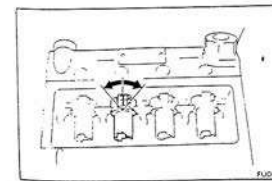
3. INSTALL PUMP CYLINDERS AND DELIVERY VALV

- (a) Align the notch of the pump cylinder with the knuckle pin of the pump housing.
- (b) Install the pump cylinder.



- (c) Install the delivery valve.

FUEL SYSTEM — Injection Pump
FU-59

(d) [B and 3B]
Using SST and a plastic-faced hammer, lightly tap in a new gasket.
SST 09260-76017 (09262-76010)

(e) [11B, 13B and 13B-T]
Install a new gasket.

(f) [B and 3B]
Install the delivery valve spring and holder. Do not torque the delivery valve holder yet.

(g) [11B, 13B and 13B-T]
Install a new O-ring to the delivery valve holder. Install the delivery valve spring, stopper and holder. Do not torque the delivery valve holder yet.

4. INSTALL CONTROL RACK AND PINIONS

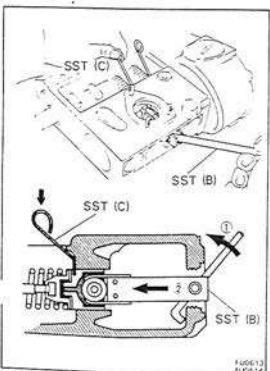
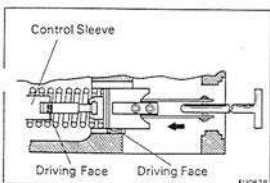
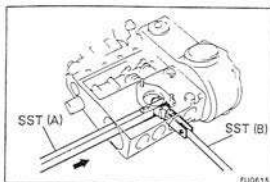
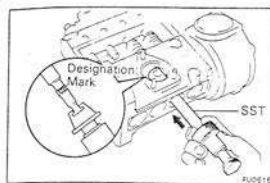
(a) Install the control rack with the guide screw.

(b) Assemble so that the pinion with the sleeve swings evenly left and right when the rack is moved to the right and left.

(c) When installing the pinion to each pump cylinder, check the control rack for smooth and effortless movement.

FU-60

FUEL SYSTEM — Injection Pump



5. INSTALL PLUNGERS AND TAPPETS

- Install the upper spring seat and plunger spring.
- Assemble the plunger and lower spring seat.
- Using SST, insert the plunger and lower seat assembly with the designation mark of the plunger driving face facing pump cover side.

SST B and 3B 09260-46012 (09275-46010)
11B, 13B and 13B-T
09260-58010 (09275-46010)

Designation mark (Example): 5,799

NOTE: After inserting the plunger, turn the lower spring seat a half turn to position the notch facing downward so the plunger will not slip out.

- Using SST (A), insert the tappet together with the adjusting shim through the camshaft bearing hole and hold the tappet to SST (B).

SST B and 3B 09260-76017
(09272-76011, 09273-76011)
11B, 13B and 13B-T
09260-58010
(09272-76011, 09273-76011)

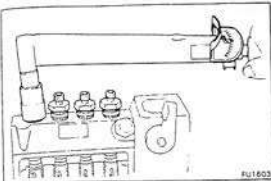
- Align the driving face of the tappet with the groove of the pump housing.
- Align the driving face of the plunger with the groove of the control sleeve.

- Using SST (B), press in the tappet and insert SST (C) into the tappet service hole.

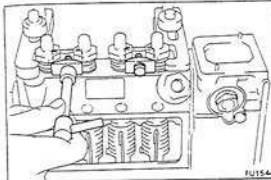
SST B and 3B 09260-46012 (09274-46011) and
09260-76017 (09272-76011)
11B, 13B and 13B-T
09260-58010
(09272-76011, 09274-46011)

- When installing each plunger and tappet, check the control rack for smooth and effortless movement.

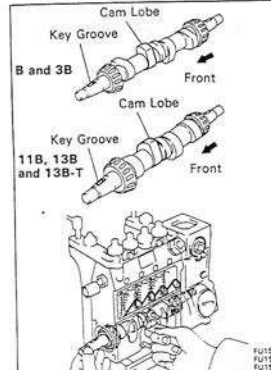
FUEL SYSTEM — Injection Pump **FU-61**



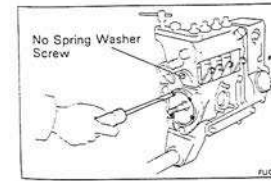
FU1503



FU1544



FU1545
FU1546
FU1559



FU5749

6. TORQUE DELIVERY VALVE HOLDERS

(a) Torque the four delivery valve holders.

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

NOTE: When one delivery valve holder is tightened, move the control rack to the right and left and check the tightness of the rack.

(b) Install the two lock plates.

7. CHECK SLIDING RESISTANCE OF CONTROL RACK
(See page FU-49)

Sliding resistance: 120 g (4.2 oz) or less

8. INSTALL CAMSHAFT

(a) Insert the camshaft into the pump housing.

CAUTION: Be careful of the installation direction.

(b) Apply liquid sealer to the screw without the spring washer.

(c) Install a new gasket and the pump flange with the five screws.

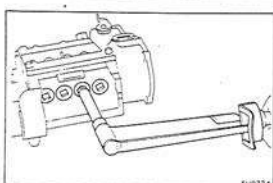
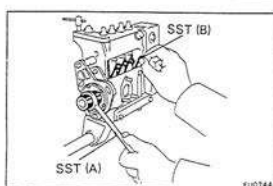
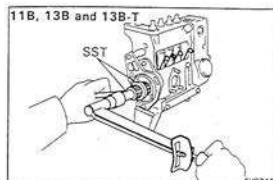
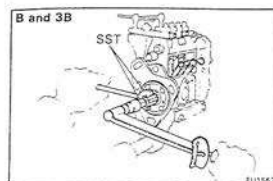
9. CHECK CAMSHAFT THRUST CLEARANCE
(See page FU-48)

Standard clearance: 0.03 – 0.05 mm
(0.0012 – 0.0020 in.)

Maximum clearance: 0.1 mm (0.004 in.)

FU-62

FUEL SYSTEM — Injection Pump



10. INSTALL SPLINE SHAFT

- Install the set key on the camshaft.
- Align the set key groove of the spline shaft with the set key.
- Using SST, install the spline shaft with the spring washer and round nut.

SST B and 3B 09260-46012
(09266-46011, 09278-46010)
11B, 13B and 13B-T
09260-58010
(09266-76011, 09278-46020)

Torque:

B and 3B 650 kg-cm
(47 ft-lb, 64 N-m)
11B, 13B and 13B-T 925 kg-cm
(69 ft-lb, 91 N-m)

11. REMOVE SST FROM TAPPET SERVICE HOLES

Using SST (A), turn the camshaft and remove the SST (B).

SST B and 3B 09260-46012
(09274-46011, 09278-46010)
11B, 13B and 13B-T
09260-58010
(09274-46011, 09278-46020)

12. INSTALL PLATE PLUGS

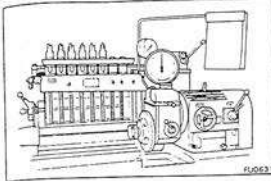
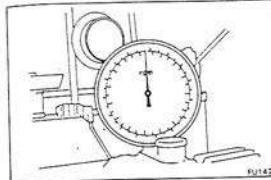
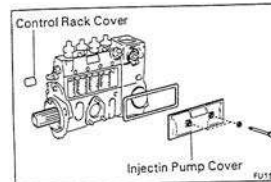
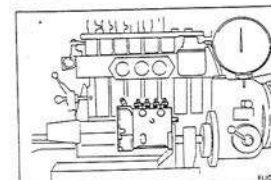
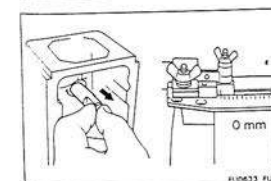
- Apply liquid sealer on the threads and under the plate plug heads.
- Install the four plate plugs.

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

13. INSTALL PUMP COVER

Install the gasket and pump cover with the two gaskets and bolts.

FUEL SYSTEM — Injection Pump
FU-63

Adjustment of Pump Body

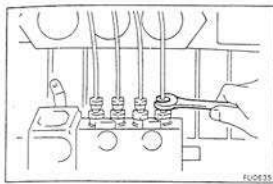
1. PRE-TEST CHECK AND PREPARATION
 - (a) The specifications for test nozzles and nozzle holders are as follows:

Test nozzle:	DN 4 SD 24 ND 80
B	DN4 SDND 135
3B	DN 12 SD 12A
11B, 13B and 13B-T	
 - Test nozzle holder valve opening pressure;

B and 3B	115 – 125 kg/cm ² (1,636 – 1,778 psi) (11,278 – 12,258 kPa)
11B, 13B and 13B-T	170 – 180 kg/cm ² (2,418 – 2,560 psi) (16,671 – 17,651 kPa)
 - (b) Check the accuracy of the tachometer.
Allowable error: ± 40 rpm at 2,000 rpm
 - (c) Remove the injection pump and control rack covers.
 - (d) Mount the injection pump body on the pump tester.
 - (e) Rotate the pump by hand and check that it turns smoothly.
 - (f) Install the rack scale so that its zero point is at the position where the control rack is pulled fully toward the governor side, and set it to allow easy reading of the scale graduations.

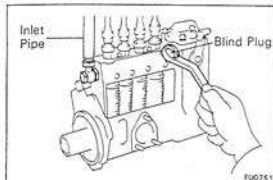
FU-64

FUEL SYSTEM — Injection Pump

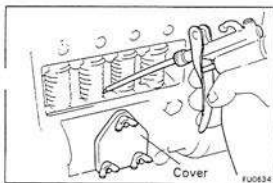


(g) Install the injection pipe with the following specifications:

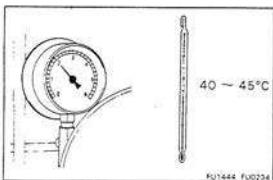
Outer diameter: 6.0 mm (0.236 in.)
 Inner diameter: 2.0 mm (0.079 in.)
 Length: 600 mm (23.62 in.)
 Minimum bending radius: 25 mm (0.98 in.) or more



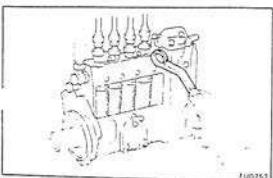
(h) Connect the fuel inlet pipe.
 (i) Install the blind plug to the bleeder hole.



(j) Install the cover to the feed pump installation surface, and fill the pump camshaft chamber with engine oil.



(k) [B and 3B]
 Fuel feeding pressure to injection pump should be 0.5 kg/cm² (7.1 psi, 49 kPa).
 (l) [11B, 13B and 13B-T]
 Fuel feeding pressure to injection pump should be 2.0 kg/cm² (28 psi, 196 kPa).
 (m) Fuel temperature for pump testing should be 40 - 45°C (104 - 113°F).



(n) Bleed the air from the pump housing.
 NOTE: Be careful that fuel does not enter the pump housing during bleeding.

(o) Race the injection pump to 1,000 rpm for 5 minutes.
 CAUTION: Check that there is no fuel leakage or abnormal noise.

FUEL SYSTEM — Injection Pump

FU-65

30 Seconds

FU0638 FU0639

FU07442

11.0 mm

FU0637

High Pressure

Kg/cm²

FU0638 FU0639

NOTE:

- Measure the volume of each injection cylinder with a measuring cylinder.
- Tilt the measuring cylinder for 30 seconds and pour out the fuel. Then, raise the cylinder upright and measure the next one.
- To obtain an accurate reading, wait until the bubbles in the graduated cylinder disappear before measuring.

2. CHECK SLIDING RESISTANCE OF CONTROL RACK

Using a spring tension gauge, measure the sliding resistance.

Pump rpm	Sliding resistance g (oz)
0	120 (4.2) or less
1,000	50 (1.8) or less

3. ADJUST INJECTION TIMING

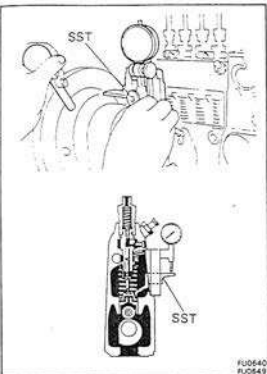
A. Adjust pre-stroke for No. 1 Plunger

(a) Set the control rack position at 11.0 mm (0.433 in.).

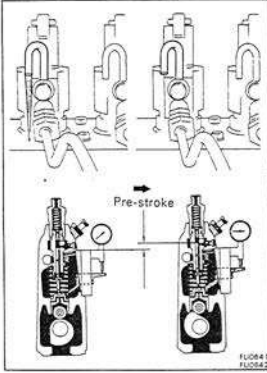
(b) Loosen the overflow cock of the pump tester bench nozzle holder.

(c) Fuel feeding pressure to the injection pump should be on the high side.

FU-66 **FUEL SYSTEM — Injection Pump**



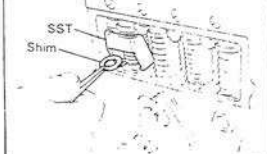
(d) Using SST, set the No. 1 tappet to BDC position, and then set the dial gauge on the No. 1 tappet.
 SST B and 3B 09260-46012 (09283-46010)
 11B, 13B and 13B-T
 09260-58010 (09283-46010)



(e) Rotate the camshaft clockwise, and measure the lift of the No. 1 plunger when it moves from BDC to the injection starting position (the point where fuel flowing from the overflow pipe stops).

Pre-stroke:

B and 3B	1.90 – 2.00 mm (0.0748 – 0.0787 in.)
11B, 13B and 13B-T	3.05 – 3.15 mm (0.1201 – 0.1240 in.)



(f) Using SST, adjust by changing the adjusting shim.
 SST B and 3B 09260-46012 (09280-46010)
 11B, 13B and 13B-T
 09260-58010 (09280-46010)

Adjusting shim thickness:

0.10 mm (0.0039 in.)
0.15 mm (0.0059 in.)
0.20 mm (0.0079 in.)
0.30 mm (0.0118 in.)
0.40 mm (0.0158 in.)

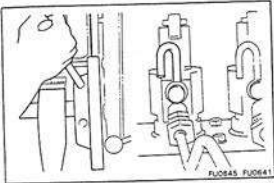
FUEL SYSTEM — Injection PumpFU-67

Adjusting shim thickness (cont'd):

- 0.60 mm (0.0236 in.)
- 0.70 mm (0.0276 in.)
- 0.80 mm (0.0315 in.)
- 0.90 mm (0.0354 in.)
- 1.00 mm (0.0394 in.)
- 1.10 mm (0.0433 in.)
- 1.20 mm (0.0472 in.)
- 1.30 mm (0.0519 in.)
- 1.40 mm (0.0551 in.)

NOTE:

- The pre-stroke will increase with a decrease in shim thickness and decrease with an increase.
- When adjusting the pre-stroke, the matchmarks placed on the pump and pump retainer during disassembly may not align. Therefore, make a note of the pre-stroke value for installation of the pump retainer.



FU0645, FU0641

B. Adjust Injection Interval

(a) Using the No. 1 cylinder injection starting time position as a base, measure the injection starting angles in the order of injection.

Cylinder No.	Injection starting angle
1	0°
3	89°30' – 90°30'
4	179°30' – 180°30'
2	269°30' – 270°30'

(b) Adjust by using the same procedure as pre-stroke adjustment.

NOTE: The injection starting angle will change about 30' with 0.1 mm (0.004 in.) change in shim thickness.

C. Adjust Tappet Clearance

(a) Using SST (A), insert the 0.2 mm (0.008 in.) gauge of SST (B) between the spring lower seat and adjusting shim, and rotate the camshaft slowly.

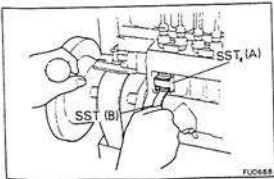
SST B and 3B 09260-46012 (09280-46010) and 09288-46011

11B, 13B and 13B-T

09260-58010 (09280-46010) and 09288-46011

Tappet clearance: 0.2 mm (0.008 in.) or more

CAUTION: If there is interference between the plunger driving face and lower portion of the cylinder, or if resistance is felt while rotating the camshaft, it indicates that there is less than 0.2 mm (0.008 in.) clearance so do not rotate it any further.



FU0658

<https://cardiagn.com/fuel-system-b-engine/>

67/101

FU-68

FUEL SYSTEM — Injection Pump

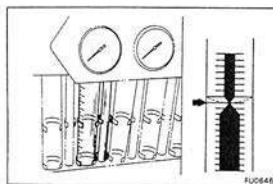
- (b) If the tappet clearance is less than specification, recheck the pre-stroke.

Pre-stroke:

B and 3B	1.90 – 2.00 mm (0.0748 – 0.0787 in.)
11B, 13B and 13B-T	3.05 – 3.15 mm (0.1201 – 0.1240 in.)

- (c) Recheck the injection interval.

Cylinder No.	Injection starting angle
1	0°
3	89°30' – 90°30'
4	179°30' – 180°30'
2	269°30' – 270°30'



4. ADJUST INJECTION VOLUME

- (a) Remove the blind plug from the bleeder hole and install an overflow valve.
(b) Measure each injection volume.

Item	Control rack position mm (in.)	Pump rpm	Measuring stroke	Injection volume of each cylinder cc (cu in.)	Variation limit cc (cu in.)
B	16.0 (0.630)	100	200	14.0 – 16.0 (0.85 – 0.98)	1.2 (0.07)
	8.6 (0.339)	1,000	200	4.6 – 5.6 (0.28 – 0.34)	0.4 (0.02)
	11.7 (0.460)	1,100	200	10.0 – 10.8 (0.61 – 0.65)	0.4 (0.02)
	11.7 (0.460)	1,700	200	10.4 – 11.4 (0.63 – 0.70)	0.6 (0.04)
	6.5 (0.256)	325	500	2.5 – 4.5 (0.15 – 0.34)	1.0 (0.06)
3B (Cold weather spec.) Part No. 22100-58022	17.5 (0.689)	100	200	13.5 – 16.5 (0.82 – 1.01)	1.8 (0.11)
	8.0 (0.315)	1,000	200	4.3 – 5.1 (0.26 – 0.31)	0.6 (0.04)
	12.9 (0.508)	1,100	200	11.1 – 11.7 (0.68 – 0.71)	0.6 (0.04)
	12.9 (0.508)	* 1,700	200	11.3 – 12.3 (0.69 – 0.75)	0.9 (0.05)
	6.5 (0.256)	325	500	2.0 – 5.0 (0.12 – 0.31)	1.5 (0.09)
3B (Others)	17.5 (0.689)	100	200	14.0 – 16.0 (0.85 – 0.98)	1.2 (0.07)
	8.0 (0.315)	1,000	200	4.3 – 5.1 (0.26 – 0.31)	0.4 (0.02)
	12.9 (0.508)	1,100	200	11.1 – 11.7 (0.68 – 0.71)	0.4 (0.02)
	12.9 (0.508)	1,700	200	11.3 – 12.3 (0.69 – 0.75)	0.6 (0.04)
	6.5 (0.256)	325	500	2.5 – 4.5 (0.15 – 0.34)	1.0 (0.06)

FUEL SYSTEM — Injection Pump

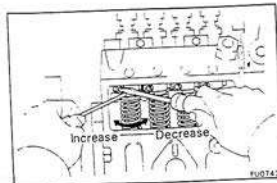
FU-69

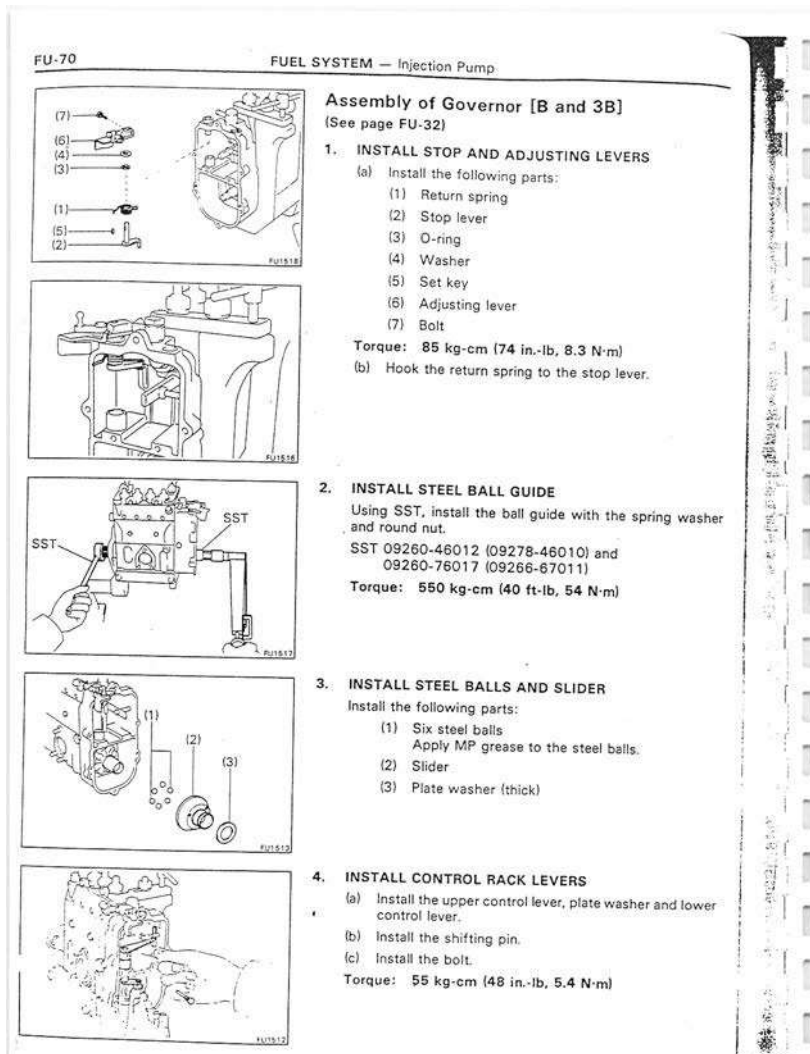
Cont'd

Item	Control rack position mm (in.)	Pump rpm	Measuring stroke	Injection volume of each cylinder cc (cu in.)	Variation limit cc (cu in.)
11B (w/o HAC)	16.0 (0.630)	100	200	10.0 - 14.0 (0.61 - 0.85)	1.6 (0.10)
	10.4 (0.409)	1,100	200	10.1 - 11.5 (0.62 - 0.70)	0.9 (0.05)
	10.2 (0.402)	1,800	200	8.9 - 10.1 (0.54 - 0.62)	1.2 (0.07)
	Approx. 9.1 (0.358)	325	500	3.5 - 6.5 (0.21 - 0.40)	1.5 (0.09)
11B (w/ HAC)	16.0 (0.630)	100	200	10.0 - 14.0 (0.61 - 0.85)	1.6 (0.10)
	10.4 (0.409)	1,100	200	9.5 - 10.1 (0.58 - 0.62)	0.9 (0.05)
	10.3 (0.406)	1,800	200	9.3 - 10.5 (0.57 - 0.64)	1.2 (0.07)
	Approx. 9.1 (0.358)	325	500	3.5 - 6.5 (0.21 - 0.40)	1.5 (0.09)
13B M/T (w/o HAC)	16.0 (0.630)	100	200	12.4 - 16.4 (0.76 - 1.00)	1.6 (0.10)
	10.5 (0.413)	1,100	200	11.2 - 11.8 (0.68 - 0.72)	0.9 (0.05)
	10.3 (0.406)	1,700	200	10.8 - 12.0 (0.66 - 0.73)	1.2 (0.07)
	Approx. 9.1 (0.358)	325	500	3.5 - 6.5 (0.21 - 0.40)	1.5 (0.09)
13B M/T (w/ HAC)	16.0 (0.630)	100	200	12.4 - 16.4 (0.76 - 1.00)	1.6 (0.10)
	10.5 (0.413)	1,100	200	11.2 - 11.8 (0.68 - 0.72)	0.9 (0.05)
	10.4 (0.409)	1,700	200	11.3 - 12.3 (0.69 - 0.75)	1.2 (0.07)
	Approx. 9.1 (0.358)	325	500	3.5 - 6.5 (0.21 - 0.40)	1.5 (0.09)
13B A/T	16.0 (0.630)	100	200	18.8 - 22.8 (1.15 - 1.39)	1.6 (0.10)
	10.2 (0.402)	1,100	200	11.2 - 11.8 (0.68 - 0.72)	0.9 (0.05)
	10.0 (0.393)	1,700	200	10.6 - 11.8 (0.65 - 0.72)	1.2 (0.07)
	8.4 (0.331)	400	500	4.25 - 7.25 (0.26 - 0.44)	1.5 (0.09)
13B-T M/T	16.0 (0.630)	100	200	12.4 - 16.4 (0.76 - 1.00)	1.6 (0.10)
	11.1 (0.437)	1,100	200	13.5 - 14.3 (0.82 - 0.87)	0.9 (0.05)
	10.9 (0.429)	1,700	200	12.9 - 13.9 (0.79 - 0.85)	1.2 (0.07)
	Approx. 9.1 (0.358)	325	500	3.5 - 6.5 (0.21 - 0.40)	1.5 (0.09)
13B-T A/T	16.0 (0.630)	100	200	17.6 - 22.8 (1.07 - 1.39)	1.6 (0.10)
	10.8 (0.425)	1,100	200	12.8 - 13.6 (0.78 - 0.83)	0.9 (0.05)
	10.9 (0.429)	1,700	200	13.6 - 14.6 (0.83 - 0.89)	1.2 (0.07)
	8.4 (0.331)	400	500	4.25 - 7.25 (0.26 - 0.44)	1.5 (0.09)

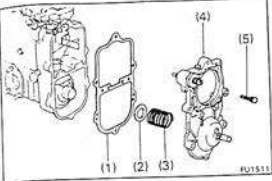
*BB

- (c) Loosen the clamp screw of the control pinion, and adjust by rotating the control sleeve.





FUEL SYSTEM — Injection Pump **FU-71**



(1) (2) (3) (4) (5)

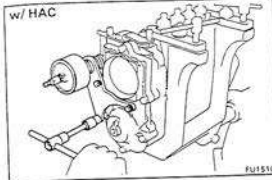
FU1511

5. INSTALL SPEED CONTROL SPRING AND GOVERNOR COVER

Install the following parts:

- (1) New gasket
- (2) Spring seat (thin)
- (3) Speed control spring
- (4) Governor cover
- (5) Six bolts

Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



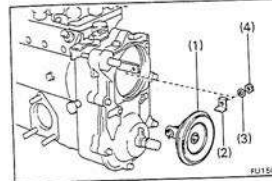
w/ HAC

FU1510

6. [w/ HAC] INSTALL HIGH ALTITUDE COMPENSATOR (HAC)

Install the HAC with the three bolts.

Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



(1) (2) (3) (4)

FU1509

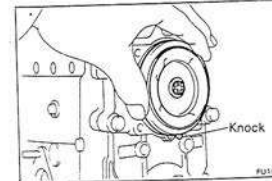
7. INSTALL GOVERNOR DIAPHRAGM

(a) Install the following parts:

- (1) Governor diaphragm
- (2) Connecting bracket
- (3) Spring washer
- (4) Nut

(b) Align the knock of the governor diaphragm with the knock groove of the governor cover.

(c) Insert the governor diaphragm into the governor cover.



(1) (2) (3) (4)

FU1508

8. INSTALL GOVERNOR MAIN SPRING AND GOVERNOR DIAPHRAGM HOUSING

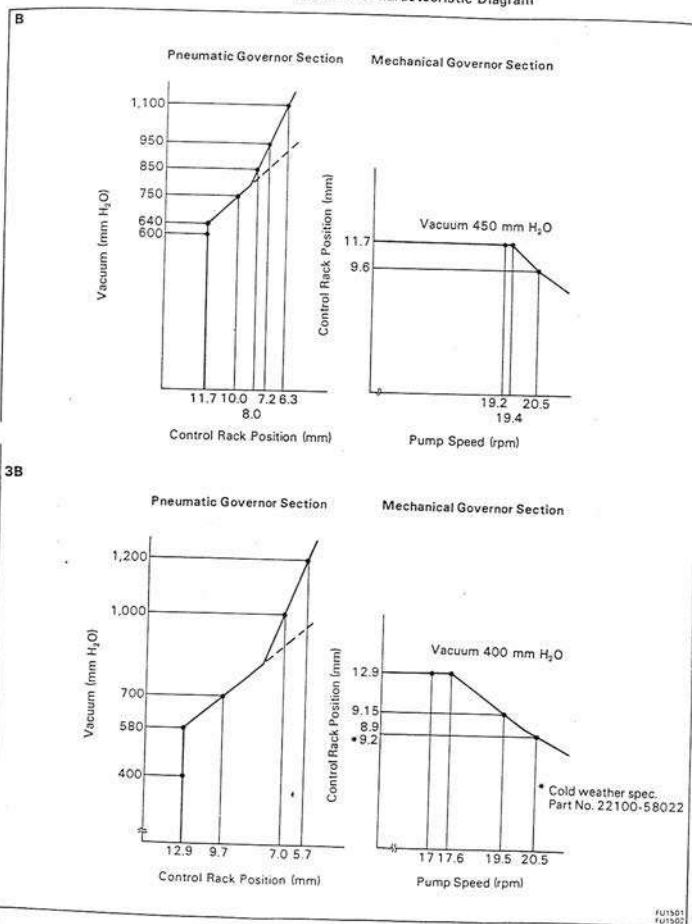
Install the following parts:

- (1) Governor main spring
- (2) Adjusting shim(s)
- (3) Governor diaphragm housing
- (4) Four screws

FU-72

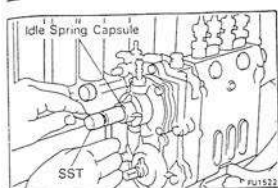
FUEL SYSTEM — Injection Pump

Adjustment of Governor [B and 3B] Governor Characteristic Diagram



FUEL SYSTEM — Injection Pump

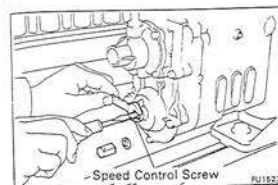
FU-73

1. PRE-TEST CHECK AND PREPARATION
(See page FU-63)

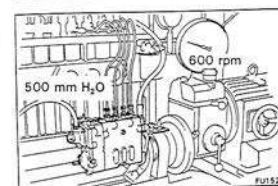
2. PREPATION

- Remove the sealing screw plug.
- Using SST, loosen the idle spring capsule to keep it inoperative.

SST 09260-76017 (09282-76010)

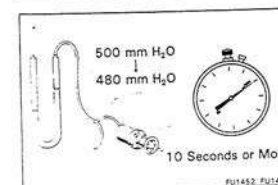


- Remove the cap nut and gasket.
- Fully tighten the speed control screw.



3. CHECK AIR-TIGHT OF VACUUM CHAMBER

- Set the pump speed at 600 rpm.
- Apply 500 mm H₂O (19.69 in. H₂O, 4.90 kPa) of vacuum to vacuum chamber.



- Measure the time it takes for the vacuum to drop to 480 mm H₂O (18.9 in. H₂O, 6.28 kPa).

Pressure drop: 10 seconds or more

If the pressure is less than specification, retighten the screws of the governor diaphragm housing. If necessary, replace the governor diaphragm.

4. ADJUST PNEUMATIC GOVERNOR SECTION

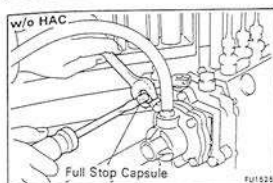
A. Adjust initial position of control rack

- Measure the control rack position.

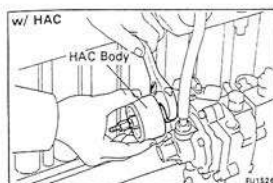
Item	Pump rpm	Vacuum mm H ₂ O (in. H ₂ O, kPa)	Control rack position mm (in.)
B	600	600 (23.62, 5.88)	11.7 (0.461)
3B	600	400 (15.75, 3.92)	12.9 (0.508)

FU-74

FUEL SYSTEM — Injection Pump



- (b) [w/o HAC]
Adjust by turning the full stop capsule.

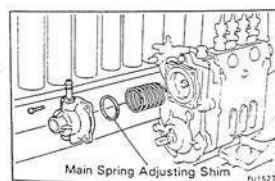


- (c) [w/ HAC]
Adjust by turning the HAC body.

B. Adjust governor main spring

- (a) Measure the control rack position.

Item	Pump rpm	Vacuum mm H ₂ O (in. H ₂ O, kPa)	Control rack position mm (in.)
B	600	600 (23.62, 5.88)	11.7 (0.461)
		640 (25.20, 6.28)	11.4 – 11.7 (0.449 – 0.461)
		750 (29.53, 7.35)	9.3 – 10.7 (0.366 – 0.421)
3B (Cold weather spec. Part No. 22100-58022)	600	400 (15.75, 3.92)	12.7 – 13.1 (0.500 – 0.516)
		580 (22.83, 5.69)	12.3 – 13.2 (0.484 – 0.520)
		700 (27.56, 6.86)	8.7 – 10.7 (0.343 – 0.421)
3B (Others)	600	400 (15.75, 3.92)	12.9 (0.508)
		580 (22.83, 5.69)	12.5 – 12.9 (0.492 – 0.508)
		700 (27.56, 6.86)	8.9 – 10.5 (0.350 – 0.413)



- (b) Remove the governor diaphragm housing, and adjust by changing the main spring adjusting shim.

Adjusting shim thickness: 0.5 mm (0.020 in.)
1.0 mm (0.039 in.)
2.0 mm (0.079 in.)
3.0 mm (0.118 in.)

NOTE: The control rack position will increase with a decrease in shim thickness and decrease with an increase.

- (c) Recheck the initial position of the control rack.

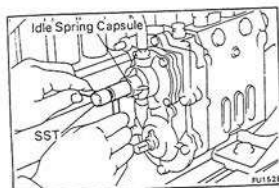
FUEL SYSTEM — Injection Pump

FU-75

C. Adjust idling spring

(a) Measure the control rack position.

Item	Pump rpm	Vacuum mm H ₂ O (in. H ₂ O, kPa)	Control rack position mm (in.)
B	600	850 (33.46, 8.34)	7.5 – 8.5 (0.295 – 0.335)
		950 (37.40, 9.32)	7.1 – 7.3 (0.280 – 0.287)
		1,100 (43.31, 10.79)	5.3 – 7.3 (0.209 – 0.287)
3B (Cold weather spec. Part No. 22100-58022)	600	1,000 (39.37, 9.81)	6.7 – 7.3 (0.264 – 0.287)
		1,200 (47.24, 11.77)	5.0 – 6.4 (0.197 – 0.252)
		1,000 (39.37, 9.81)	6.9 – 7.1 (0.272 – 0.280)
3B (Others)	600	1,000 (39.37, 9.81)	6.9 – 7.1 (0.272 – 0.280)
		1,200 (47.24, 11.77)	5.2 – 6.2 (0.205 – 0.244)



(b) Using SST, adjust by turning the idling spring capsule.

SST 09260-76017 (09282-76010)

5. ADJUST MECHANICAL GOVERNOR SECTION

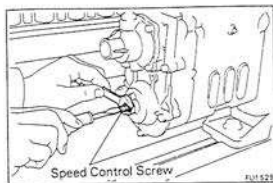
Adjust speed control spring

(a) Measure the control rack position.

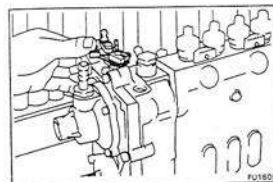
Item	Pump rpm	Vacuum mm H ₂ O (in. H ₂ O, kPa)	Control rack position mm (in.)
B	1,920	450 (17.72, 4.41)	11.7 (0.461)
	1,940	450 (17.72, 4.41)	11.5 – 11.7 (0.453 – 0.461)
	2,050	450 (17.72, 4.41)	8.8 – 10.4 (0.346 – 0.409)
3B (Cold weather spec. Part No. 22100-58022)	1,700	400 (15.75, 3.92)	12.5 – 13.3 (0.492 – 0.524)
	1,760	400 (15.75, 3.92)	12.3 – 13.3 (0.484 – 0.524)
	1,950	400 (15.75, 3.92)	7.7 – 10.6 (0.303 – 0.417)
3B (Others)	2,050	400 (15.75, 3.92)	9.2 (0.362) or less
	1,700	400 (15.75, 3.92)	12.7 – 13.1 (0.500 – 0.516)
	1,760	400 (15.75, 3.92)	12.5 – 12.9 (0.492 – 0.508)
	1,950	400 (15.75, 3.92)	7.9 – 10.4 (0.311 – 0.409)
	2,050	400 (15.75, 3.92)	8.9 (0.350) or less

FU-76

FUEL SYSTEM — Injection Pump



- (b) Adjust by turning the speed control screw.



6. ADJUST TOTAL INJECTION VOLUME

- (a) Operate the adjusting lever in several times in order to stabilize the injection pump.
(b) Measure the total injection volume.

Item	Pump rpm	Vacuum mm H ₂ O (in. H ₂ O, kPa)	Measuring stroke	Total injection volume of each cylinder cc (cu in.)
B w/o HAC	700	120 (4.72, 1.77)	1,000	182.0 – 198.0 (11.1 – 12.1)
	1,100	120 (4.72, 1.77)	1,000	202.0 – 210.0 (12.3 – 12.8)
	1,700	120 (4.72, 1.77)	1,000	210.0 – 226.0 (12.8 – 13.8)
B w/ HAC (w/o Tachometer)	700	120 (4.72, 1.77)	1,000	190.0 – 206.0 (11.6 – 12.6)
	1,100	120 (4.72, 1.77)	1,000	202.0 – 210.0 (12.3 – 12.8)
	1,700	120 (4.72, 1.77)	1,000	212.0 – 228.0 (12.9 – 13.9)
B w/ HAC (w/ Tachometer)	700	150 (5.91, 1.47)	1,000	190.0 – 206.0 (11.6 – 12.6)
	1,100	300 (11.81, 2.94)	1,000	202.0 – 210.0 (12.3 – 12.8)
	1,700	450 (17.72, 4.41)	1,000	212.0 – 228.0 (12.9 – 13.9)
3B w/o HAC (Cold weather spec. Part No. 22100-58022)	700	150 (5.91, 1.47)	1,000	198.0 – 222.0 (12.1 – 13.5)
	1,100	260 (10.24, 2.55)	1,000	222.0 – 234.0 (13.5 – 14.3)
	1,700	400 (15.75, 3.92)	1,000	226.0 – 250.0 (13.8 – 15.3)
3B w/o HAC (Others)	700	150 (5.91, 1.47)	1,000	202.0 – 218.0 (12.3 – 13.3)
	1,100	260 (10.24, 2.55)	1,000	224.0 – 232.0 (13.7 – 14.2)
	1,700	400 (15.75, 3.92)	1,000	230.0 – 246.0 (14.0 – 15.0)
3B w/ HAC	700	150 (5.91, 1.47)	1,000	206.0 – 222.0 (12.6 – 13.5)
	1,100	260 (10.24, 2.55)	1,000	224.0 – 232.0 (13.7 – 14.2)
	1,700	400 (15.75, 3.92)	1,000	226.0 – 242.0 (13.8 – 14.8)

FUEL SYSTEM — Injection Pump

FU-77

w/o HAC

Full Stop Capsule

FU1525

w/ HAC

HAC Body

FU1526

w/o HAC

FU1608

w/ HAC (Type A)

FU1607

w/ HAC (Type B)

FU1606

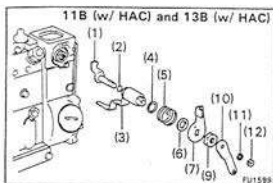
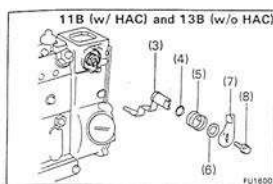
(c) [w/o HAC]
Adjust by turning the full stop capsule.

(d) [w/ HAC]
Adjust by turning the HAC body.

7. SEAL PARTS
Seal with new seal wire, lead seal and sealing screw plug as shown.

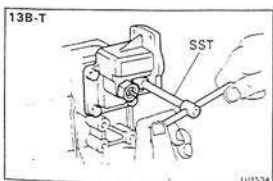
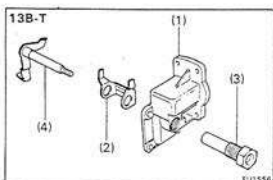
FU-78

FUEL SYSTEM — Injection Pump

**Assembly of Governor [11B, 13B and 13B-T]**(See pages FU-31 and 32) 11B and 13B
(See pages FU-31 and 33) 13B-T**1. [11B AND 13B]
INSTALL STOPPER ARM AND STOP LEVER**

Install the following parts:

- (1) [w/ HAC]
HAC arm
- (2) [w/ HAC]
New O-ring
- (3) Stopper arm
- (4) New O-ring
- (5) Return spring
- (6) Thrust washer
- (7) Stop lever
- (8) [w/o HAC]
Bolt
- (9) [w/ HAC]
Nut
- (10) [w/ HAC]
HAC lever
- (11) [w/ HAC]
Spring washer
- (12) [w/ HAC]
Nut

**2. [11B AND 13B]
CHECK THRUST CLEARANCE OF STOPPER ARM**
(See page FU-45)Thrust clearance: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)**3. [13B-T]
INSTALL NO.2 FULL-LOAD STOPPER HOUSING**

(a) Assemble following parts:

- (1) No. 2 Full-load stopper housing
- (2) Boost compensator arm
- (3) Spring seat
- (4) Stopper arm

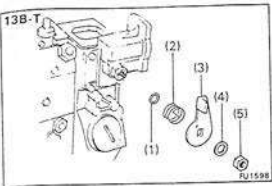
Torque: 190 kg-cm (14 ft-lb, 19 N·m)

(b) Using SST, install a new O-ring and the No. 2 stopper housing with the four bolts.

SST 09260-58010 (09276-76010)

Torque: 85 kg-cm (74 in.-lb, 8.3 N·m)

FUEL SYSTEM — Injection Pump **FU-79**

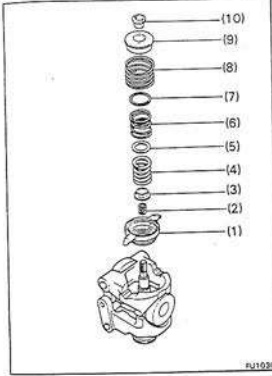


13B-T

FU1598

(c) Install the following parts:

- (1) New O-ring
- (2) Return spring
- (3) Stop lever
- (4) Spring washer
- (5) Nut



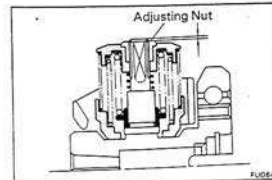
FU1620

4. ASSEMBLY FLYWEIGHT

(a) Install the following parts:

- (1) Spring seat
- (2) Mechanical spring
- (3) Inner spring seat
- (4) Speed control spring
- (5) Inner adjusting washer
- (6) Inner idle spring
- (7) Outer adjusting washer
- (8) Outer idle spring
- (9) Spring guide
- (10) Adjusting nut

CAUTION: Install the adjusting washers on the guide sleeve side.



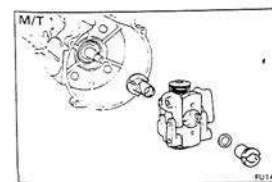
Adjusting Nut

FU0648

(b) Preset the protrusion of the adjusting nut.

Protrusion: Minus 0.4 — Plus 0.2 mm
(Minus 0.016 — Plus 0.008 in.)

CAUTION: If the protrusion is too large, the adjusting nut will contact the governor housing.



FU1499

5. [M/T] CHECK THRUST CLEARANCE OF DAMPER

(a) Install the camshaft bushing and flyweight without the dampers.

(b) Install the thrust washer and round nut.

Torque: 525 kg-cm (38 ft-lb, 51 N·m)

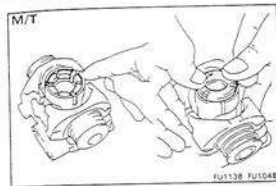
(c) Measure the thrust clearance. (See page FU-47)

Thrust clearance: 0.02 — 0.10 mm
(0.0008 — 0.0039 in.)

(d) Remove the flyweight assembly and camshaft bushing. (See page FU-44)

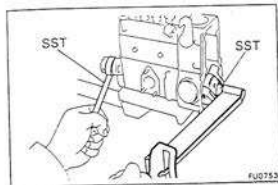
FU-80

FUEL SYSTEM — Injection Pump



6. [M/T] INSTALL DAMPERS AND CAMSHAFT BUSHING

- (a) Place the six dampers in position into the flyweight holder.
- (b) Push in the camshaft bushing.

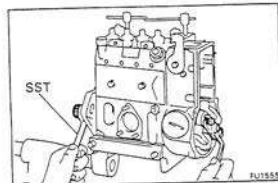


7. INSTALL FLYWEIGHT ASSEMBLY

- (a) [A/T] Install the set key to the camshaft.
- (b) [A/T] Align the set key with the flyweight key groove.
- (c) Slide the flyweight assembly onto the camshaft.
- (d) [A/T] Install the spring washer.
- (e) [M/T] Install the thrust washer.
- (f) Using SST, install the round nut.

SST 09260-58010 (09260-78010, 09278-46020)

Torque: M/T 525 kg-cm (38 ft-lb, 51 N-m)
A/T 550 kg-cm (40 ft-lb, 54 N-m)

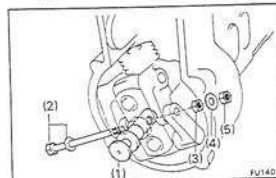


8. INSTALL GUIDE BUSHING

Using SST, install the guide bushing with the two bolts.

Torque: 80 kg-cm (69 in.-lb, 7.8 N-m)

SST 09260-58010 (09278-46020)



9. INSTALL SLIDING WEIGHT SHAFT

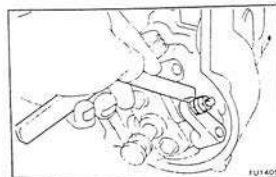
- (a) Install the following parts:
 - (1) Sliding weight shaft
Check that the sliding weight shaft slides lightly.
 - (2) Jointing bolt with thrust washer
 - (3) Lock nut
 - (4) Lock washer
 - (5) Lock nut
- (b) Adjust the thrust clearance of the jointing bolt.
Using a feeler gauge, measure the thrust clearance between the jointing bolt and flyweight.

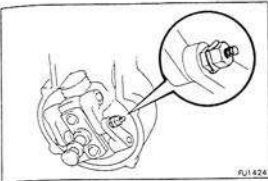
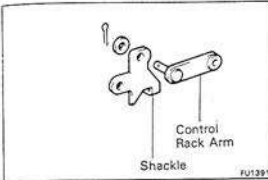
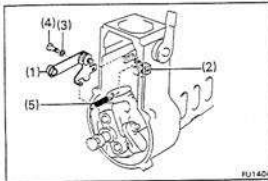
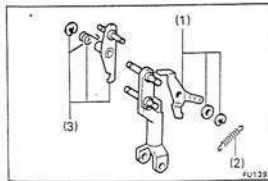
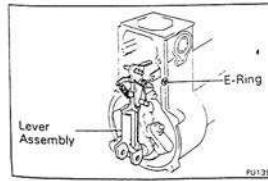
Thrust clearance: 1.5 – 2.0 mm
(0.059 – 0.079 in.)

If the thrust clearance is not within specification, adjust with the two lock nuts. If necessary, adjust by increasing the thrust washer.

- (c) Check the fitting dimensions of the sliding weight shaft. (See page FU-43)

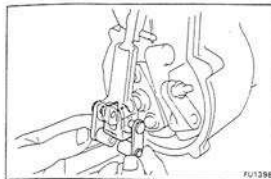
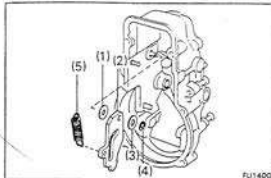
Fitting dimensions: 49.7 – 50.1 mm
(1.957 – 1.972 in.)



FUEL SYSTEM — Injection Pump		FU-81
 FU1424	(d) Stake the lock washer.	
 Control Rack Arm Shackle FU1391	10. ASSEMBLE SHACKLE AND CONTROL RACK ARM Assemble the shackle and arm with the E-ring.	
 (4) (3) (1) (2) (5) FU1404	11. INSTALL SHACKLE AND CONTROL RACK ARM ASSEMBLY Install the following parts: (1) Shackle and arm assembly (2) Arm nut (3) Spring washer (4) Bolt (5) Return Spring	
 (1) (3) (2) FU1392	12. ASSEMBLE FLOATING LEVER (a) Install the following parts: (1) Floating arm, thrust washer and E-ring Check the thrust clearance of the floating lever arm. (See page FU-42) Thrust clearance: 0.05 – 0.20 mm (0.0020 – 0.0079 in.) (2) Return spring (3) Control lever, return spring and E-ring	
 E-Ring Lever Assembly FU1395	13. INSTALL FLOATING LEVER ASSEMBLY Install the floating lever assembly with the E-ring.	

FU-82

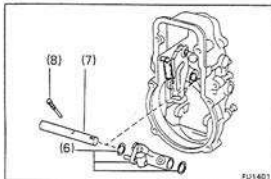
FUEL SYSTEM — Injection Pump

**14. INSTALL SLIDER AND SUPPORTING LEVERS****15. ASSEMBLE GOVERNOR COVER**

Install the following parts:

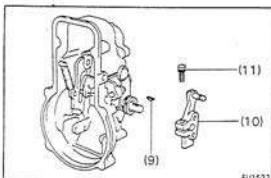
- (1) Plate washer
 - (2) Cam plate
 - (3) Thrust washer
 - (4) E-ring
- Check the thrust clearance of the cam plate.
(See page FU-40)

Thrust clearance: 0.08 — 0.12 mm
(0.0031 — 0.0047 in.)



- (5) Return spring
 - (6) Steering lever and thrust washers
 - (7) Steering lever shaft
- Check the thrust clearance of the steering lever.
(See page FU-40)

Thrust clearance: 0.05 — 0.20 mm
(0.0020 — 0.0079 in.)

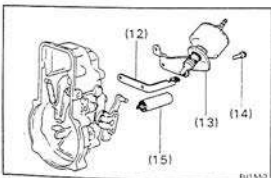


- (8) Tapered bolt
- Position the key groove of the steering lever upward, and install the tapered bolt.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

- (9) Set key
- (10) No. 1 adjusting lever
- (11) Bolt

Torque: 85 kg-cm (74 in.-lb, 8.3 N·m)



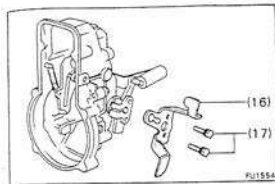
- (12) Spring arm
- (13) [W/ HAC]
HAC with bracket
- (14) Two bolts

Torque: 85 kg-cm (74 in.-lb, 8.3 N·m)

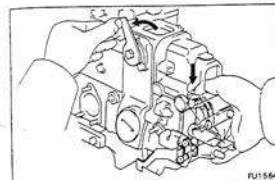
- (15) Return spring

FUEL SYSTEM — Injection Pump

FU-83



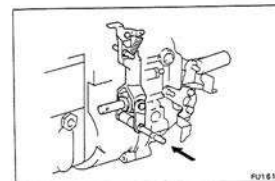
- (16) No. 2 adjusting lever
 Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)
 (17) Two bolts



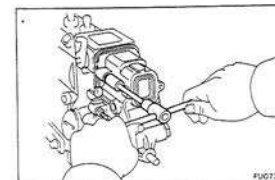
16 INSTALL GOVERNOR COVER ASSEMBLY

- (a) Place a new gasket in position on the governor housing.
 (b) Turn the stop lever clockwise.
 (c) Support the sliding block with your finger, and insert it into the floating lever hole.

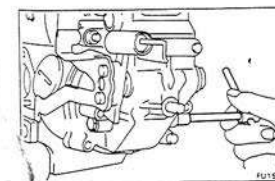
CAUTION: Position the long end of the sliding block upward.



- (d) Using a small screwdriver, align the shaft holes of the supporting levers and governor cover.
 (e) Push in the supporting lever shaft.



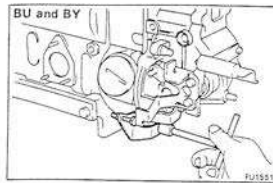
- (f) Install the governor cover with the six bolts.
 Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



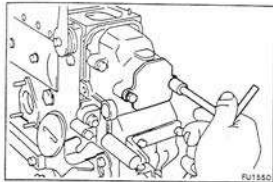
- (g) Apply liquid sealer on the threads and under the screw plug heads.
 (h) Install the two screw plugs.
 Torque: 120 kg-cm (9 ft.-lb, 12 N-m)

FU-84

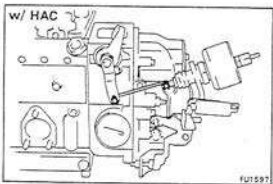
FUEL SYSTEM — Injection Pump



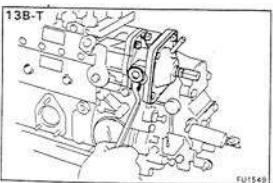
- (i) [BU and BY]
Adjusting bracket with the two bolts.
Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



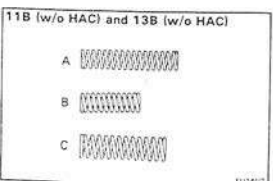
- (j) Install a new O-ring and the cover plate or dash pot with the two bolts.
Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



17. [w/ HAC]
INSTALL CONNECTING LINK OF HIGH ALTITUDE COMPENSATOR (HAC)



18. [13B-T]
INSTALL BOOST COMPENSATOR
Install a new O-ring and the boost compensator with the four bolts.
Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



19. ASSEMBLE FULL-LOAD STOPPER HOUSING
(a) [11B (w/o HAC) and 13B (w/o HAC)]
Assemble the following parts:
NOTE: Use the springs indicated "A," "B" and "C."

FUEL SYSTEM — Injection Pump **FU-85**

11B (w/o HAC) and 13B (w/o HAC) (FU1554)

11B (w/o HAC) and 13B (w/o HAC) (FU1555)

11B (w/ HAC), 13B (w/ HAC) and 13B-T (FU1403)

11B (w/ HAC), 13B (w/ HAC) and 13B-T (FU1556)

11B (w/ HAC), 13B (w/ HAC) and 13B-T (FU1555)

- (1) Sliding plate
- (2) No.1 adapter screw, bushing and "B" spring
- (3) Lock nut
- (4) Full stop cam
- (5) No. 2 adaptor screw, "C" spring and two lock nuts
- (6) Connecting pin, thrust washer and E-ring
Check the thrust clearance of the full stop cam.
(See page FU-37)

**Thrust clearance: 0.03 – 0.08 mm
(0.0012 – 0.0032 in.)**

- (7) "A" spring and full-load stopper housing
- (8) Sliding plate shaft
- (9) Screw plug
Apply liquid sealer on the threads and under the screw plug head.
- (10) Stopper screw
- (11) New gasket and nut
- (12) New gasket and cap nut

(b) [11B (w/ HAC), 13B (w/ HAC) and 13B-T]
Assemble the following parts:
NOTE: Use the spring indicated "A," "B" and "C."

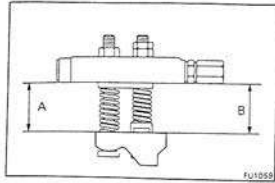
- (1) Sliding plate
- (2) No. 1 adaptor screw, bushing and "B" spring
- (3) Lock nut
- (4) Full stop cam
- (5) No. 2 adaptor screw, "C" spring and two lock nuts
- (6) Connecting pin, thrust washer and E-ring
Check the thrust clearance of the full stop cam.
(See page FU-37)

**Thrust clearance: 0.03 – 0.08 mm
(0.0012 – 0.0032 in.)**

- (7) Stopper screw
- (8) "A" spring and full-load stopper housing
- (9) Sliding plate shaft
- (10) Screw plug
Apply liquid sealer on the threads and under the screw plug head.
- (11) New gasket and nut
- (12) New gasket and cap nut

FU-86

FUEL SYSTEM — Injection Pump

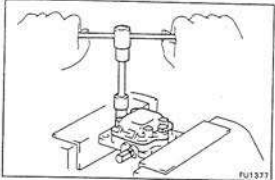


(c) Preset the full stop cam position with the No. 1 and No. 2 adaptor screws.

Distance (A and B):

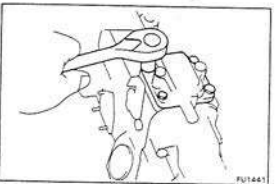
11B (w/o HAC) and 13B (w/o HAC)
Approx. 27.0 mm (1.063 in.)

11B (w/ HAC), 13B (w/ HAC) and 13B-T
Approx. 22.5 mm (0.886 in.)



(d) Install a new O-ring and the cover plate with the two bolts.

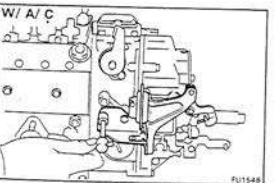
Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



20. INSTALL FULL-LOAD STOPPER HOUSING ASSEMBLY

Install a new O-ring and the stopper housing assembly with the four bolts.

Torque: 85 kg-cm (74 in.-lb, 8.3 N-m)



21. [w/ A/C]

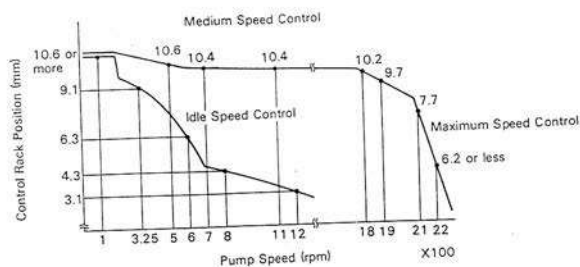
INSTALL IDLE-UP ACTUATOR

FUEL SYSTEM — Injection Pump

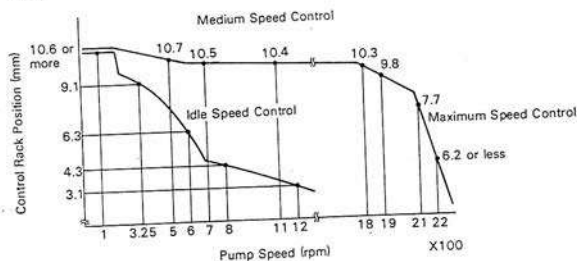
FU-87

Adjustment of Governor [11B, 13B and 13B-T]
Governor Characteristic Diagram

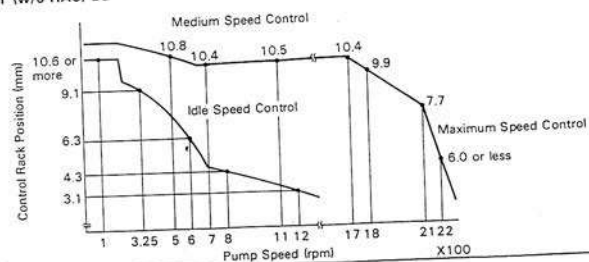
11B (w/o HAC)



11B (w/ HAC)



13B M/T (w/o HAC) BB

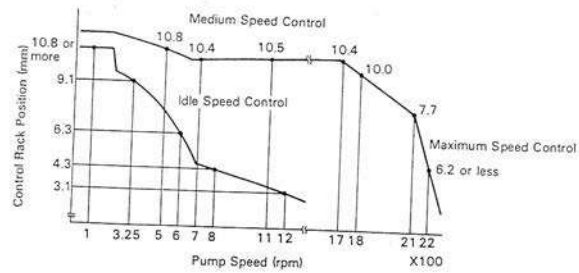
FU1503
FU1503
FU1504

FU-88

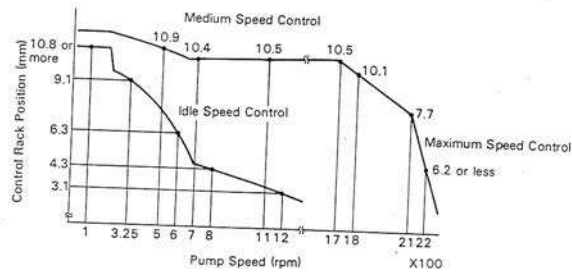
FUEL SYSTEM — Injection Pump

Governor Characteristic Diagram (Cont'd)

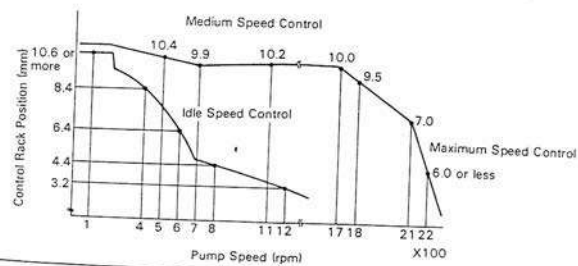
13B M/T (w/o HAC) BU and BY

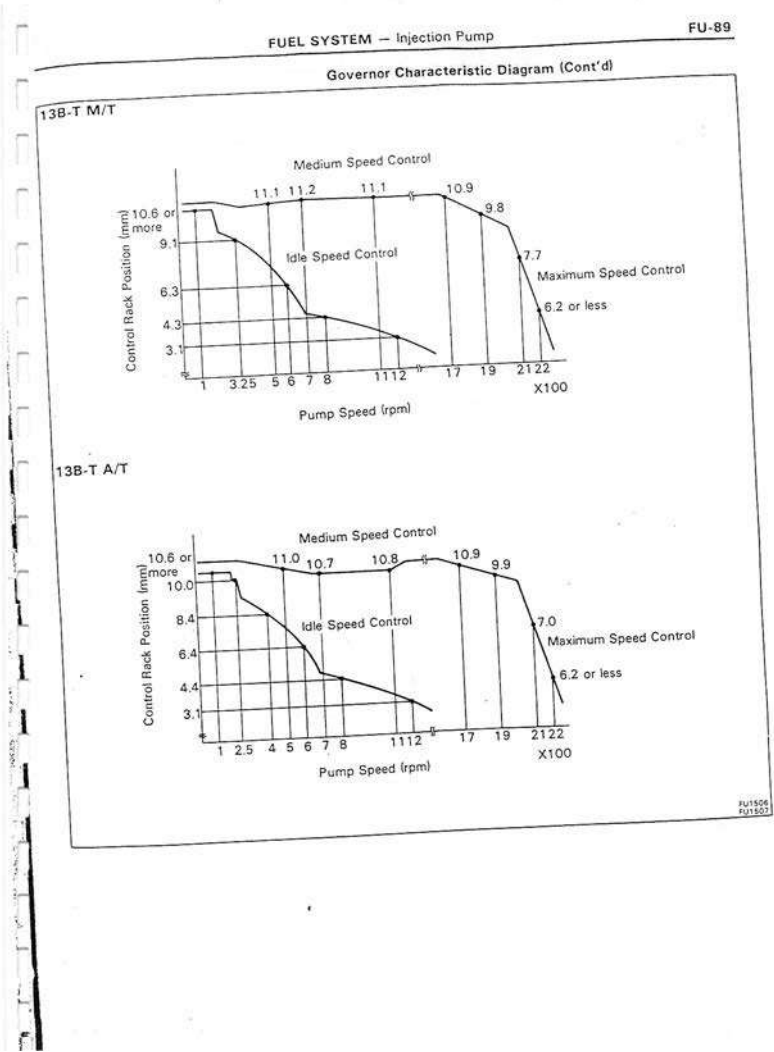


13B M/T (w/ HAC)



13B A/T

FUEL 88
FUEL 88
FUEL 88



FU-90

FUEL SYSTEM — Injection Pump

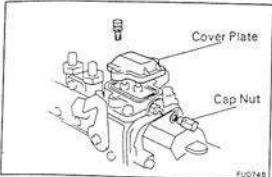


Diagram showing the injection pump assembly with labels for the Cover Plate and Cap Nut.

11B and 13B

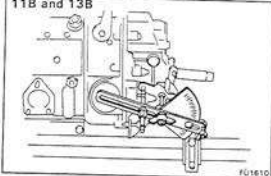


Diagram showing the injection pump assembly for models 11B and 13B, with an angle gauge installed on the adjusting lever.

13B-T

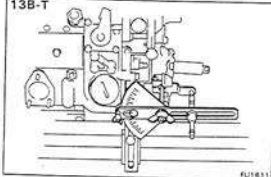


Diagram showing the injection pump assembly for model 13B-T, with an angle gauge installed on the adjusting lever.

1. PRE-TEST CHECK AND PREPARATION
(See page FU-63)

2. REMOVE CAP NUT AND COVER PLATE

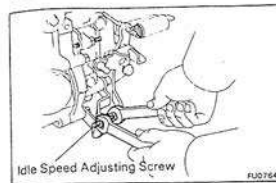
3. INSTALL ANGLE GAUGE TO ADJUSTING LEVER

4. PRESET IDLE SPEED CONTROL
(a) Measure the control rack position.

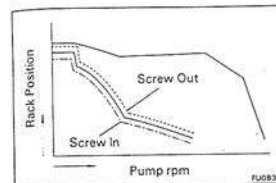
Item	Adjusting lever position	Adjusting lever angle	Pump rpm	Control rack position mm (in.)
11B M/T and 13B M/T	Idle	Approx. 23.5°	325	8.8 – 9.4 (0.346 – 0.370)
13B A/T	Idle	Approx. 23.5°	400	8.1 – 8.7 (0.319 – 0.343)
13B-T M/T	Idle	Approx. 0°	325	8.8 – 9.4 (0.346 – 0.370)
13B-T A/T	Idle	Approx. 0°	400	8.1 – 8.7 (0.319 – 0.343)

FUEL SYSTEM — Injection Pump

FU-91



(b) Adjust by turning the idle speed adjusting screw.



NOTE: The idle adjusting screw will change the governor characteristic as shown in the illustration.

5. ADJUST IDLE SPEED CONTROL

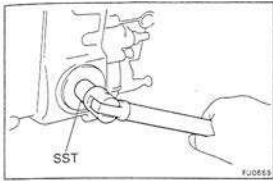
- (a) Measure the control rack position.

Item	Adjusting lever position	Pump rpm	Control rack position mm (in.)	Adjusting point
11B M/T 13B M/T 13B-T M/T	Idle	100	10.6 (0.417) or more	—
		325	8.8 — 9.4 (0.346 — 0.370)	Idle speed adjusting screw
		600	5.6 — 7.0 (0.220 — 0.276)	Adjusting nut or washer (A)
		800	3.9 — 4.7 (0.154 — 0.185)	Adjusting nut or washer (B)
		1,200	2.4 — 3.8 (0.094 — 0.150)	—
13B A/T	Idle	100	10.6 (0.417) or more	—
		400	8.1 — 8.7 (0.319 — 0.343)	Idle speed adjusting screw
		600	5.7 — 7.1 (0.224 — 0.280)	Adjusting nut or washer (A)
		800	4.0 — 4.8 (0.157 — 0.189)	Adjusting nut or washer (B)
		1,200	2.5 — 3.9 (0.098 — 0.154)	—
13B-T A/T	Idle	100	10.6 (0.417) or more	—
		250	9.1 — 11.1 (0.390 — 0.437)	—
		400	8.1 — 8.7 (0.319 — 0.343)	Idle speed adjusting screw
		600	5.7 — 7.1 (0.224 — 0.280)	Adjusting nut or washer (A)
		800	4.0 — 4.8 (0.157 — 0.189)	Adjusting nut or washer (B)
		1,200	2.4 — 3.8 (0.094 — 0.150)	—

(b) Adjust by turning the idle speed adjusting screw.

FU-92

FUEL SYSTEM — Injection Pump



(c) Using SST, remove the screw plug and adjust by turning the adjusting nut or changing the adjusting washers.

SST 09260-58010 (09260-78020)

Adjusting washer thickness:

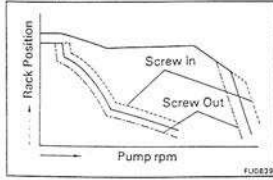
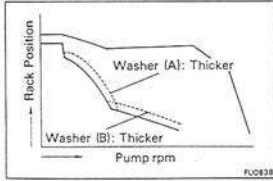
0.2 mm (0.008 in.)	Outer
0.4 mm (0.016 in.)	Inner and outer
0.5 mm (0.20 in.)	Outer
0.55 mm (0.022 in.)	Inner
0.6 mm (0.024 in.)	Inner and outer

CAUTION:

- To insure that there is no interference between the adjusting nut and housing, set the amount of protrusion within minus 0.4 mm (0.016 in.) to plus 0.2 mm (0.08 in.).
- Be sure to assemble the adjusting washers on the guide sleeve side.

NOTE:

- By adding a thicker adjusting washer, the governor characteristic will change as shown in the illustration.



6. PRESET MAXIMUM SPEED CONTROL

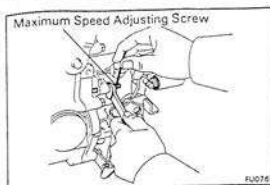
(a) [13B-T]
Apply 0.27 kg/cm² (3.9 psi, 26 kPa) of pressure to the boost compensator.

(b) Measure the control rack position.

Item	Adjusting lever position	Adjusting lever angle	Pump rpm	Control rack position mm (in.)
11B M/T and 13B M/T	Maximum	Approx. 23.5°	2,100	7.0 – 8.4 (0.276 – 0.331)
13B A/T	Maximum	Approx. 23.5°	2,100	6.3 – 7.7 (0.248 – 0.303)
13B-T M/T	Maximum	Approx. 0°	2,100	7.0 – 8.4 (0.276 – 0.331)
13B-T A/T	Maximum	Approx. 0°	2,100	6.3 – 7.7 (0.248 – 0.303)

FUEL SYSTEM — Injection Pump

FU-93



- (c) Adjust by turning the maximum speed adjusting screw.

7. ADJUST MEDIUM SPEED CONTROL

- (a) [13B-T]
Apply 0.27 kg/cm² (3.9 psi, 26 kPa) of pressure to the boost compensator.
- (b) Raise the pump speed above 600 rpm.
- (c) Move the adjusting lever to idle speed side, and then set it to maximum speed side.
- (d) Measure the control rack position.

Item	Adjusting lever position	Pump rpm	Control rack position mm (in.)	Adjusting point
11B (w/o HAC)	Maximum	500	10.0 – 11.0 (0.394 – 0.435)	No. 1 adapter screw
		700	10.0 – 10.8 (0.394 – 0.425)	—
		1,100	10.1 – 10.7 (0.398 – 0.421)	Full-load stopper screw
		1,800	9.6 – 10.6 (0.378 – 0.417)	No. 1 and No. 2 adapter screws
		1,900	9.3 – 10.1 (0.366 – 0.398)	—
11B (w/ HAC)	Maximum	500	10.1 – 11.1 (0.398 – 0.437)	No. 1 adapter screw
		700	10.1 – 10.9 (0.398 – 0.429)	—
		1,100	10.1 – 10.7 (0.398 – 0.421)	Full-load stopper screw
		1,800	9.7 – 10.7 (0.382 – 0.421)	No. 1 and No. 2 adapter screws
		1,900	9.4 – 10.2 (0.370 – 0.402)	—
13B M/T (w/o HAC)	Maximum	500	10.2 – 11.2 (0.402 – 0.441)	No. 1 adapter screw
		700	10.0 – 10.8 (0.394 – 0.425)	—
		1,100	10.2 – 10.8 (0.402 – 0.425)	Full-load stopper screw
		1,700	10.0 – 10.7 (0.394 – 0.421)	No. 1 and No. 2 adapter screws
		1,800	9.4 – 10.4 (0.370 – 0.409) * 9.3 – 10.3 (0.366 – 0.406)	—
13B M/T (w/ HAC)	Maximum	500	10.3 – 11.3 (0.406 – 0.445)	No. 1 Adapter screw
		700	10.0 – 10.8 (0.394 – 0.425)	—
		1,100	10.2 – 10.8 (0.402 – 0.425)	Full-load stopper screw
		1,700	9.9 – 10.9 (0.390 – 0.429)	No. 1 and No. 2 adapter screws
		1,800	9.7 – 10.5 (0.382 – 0.413)	—
13B A/T	Maximum	500	Approx. 10.4 (0.409)	No. 1 adapter screw
		700	9.5 – 10.3 (0.374 – 0.406)	—
		1,100	9.9 – 10.5 (0.390 – 0.413)	Full-load stopper screw
		1,700	9.6 – 10.3 (0.378 – 0.405)	No. 1 and No. 2 adapter screws
		1,800	8.9 – 9.9 (0.350 – 0.390)	—

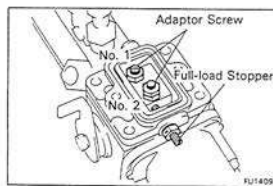
* 88

FU-94

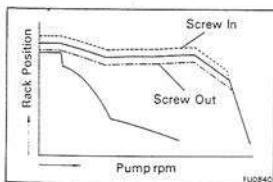
FUEL SYSTEM — Injection Pump

Cont'd

Item	Adjusting lever position	Pump rpm	Control rack position mm (in.)	Adjusting point
13B-T M/T	Maximum	500	10.7 – 11.5 (0.421 – 0.453)	No. 1 adaptor screw
		700	10.8 – 11.6 (0.425 – 0.457)	—
		1,100	10.8 – 11.4 (0.425 – 0.449)	Full-load stopper screw
		1,700	10.5 – 11.3 (0.413 – 0.445)	No. 1 and No. 2 adaptor screws
		1,900	9.4 – 10.2 (0.370 – 0.402)	—
13B-T A/T	Maximum	500	10.6 – 11.4 (0.417 – 0.449)	No. 1 adaptor screw
		700	10.3 – 11.1 (0.406 – 0.437)	—
		1,100	10.5 – 11.1 (0.413 – 0.437)	Full-load stopper screw
		1,700	10.5 – 11.3 (0.413 – 0.445)	No. 1 and No. 2 adaptor screws
		1,900	9.5 – 10.3 (0.374 – 0.406)	—

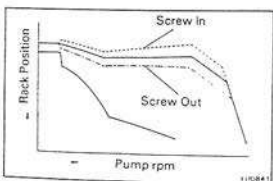


- (e) Adjust by turning the full-load stopper and adaptor screws.



NOTE:

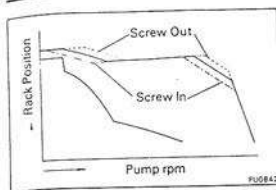
- The full-load stopper will change the governor characteristic as shown in the illustration.



- The No. 1 adaptor screw will change the governor characteristic as shown in the illustration.

FUEL SYSTEM — Injection Pump

FU-95



- By turning adaptor screws No. 1 and No. 2 together, the governor characteristic will change as shown in the illustration.

8. ADJUST MAXIMUM SPEED CONTROL

(a) [13B-T]

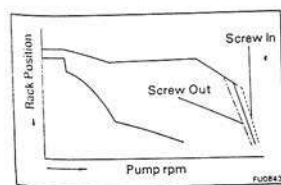
Apply 0.27 kg/cm² (3.9 psi, 26 kPa) of pressure to the boost compensator.

(b) Measure the control rack position.

Item	Adjusting lever position	Pump rpm	Control rack position mm (in.)	Adjusting point
11B 13B M/T (w/ HAC)	Maximum	2,100	7.0 – 8.4 (0.276 – 0.331)	Maximum adjusting screw
		2,200	6.2 (0.244) or less	—
	Idle → Maximum	0	Approx. 16.0 (0.630)	*
13B-T M/T	Maximum	2,100	7.0 – 8.4 (0.276 – 0.331)	Maximum adjusting screw
		2,200	6.0 (0.236) or less	—
	Idle → Maximum	0	Approx. 16.0 (0.630)	*
13B M/T (w/o HAC)	Maximum	2,100	6.3 – 7.7 (0.248 – 0.303)	Maximum adjusting screw
		2,200	6.0 (0.236) or less	—
	Idle → Maximum	0	Approx. 16.0 (0.630)	*
13B A/T	Maximum	2,100	6.3 – 7.7 (0.248 – 0.303)	Maximum adjusting screw
		2,200	6.0 (0.236) or less	—
	Idle → Maximum	0	Approx. 16.0 (0.630)	*
13B-T A/T	Maximum	2,100	6.3 – 7.7 (0.248 – 0.303)	Maximum adjusting screw
		2,200	6.2 (0.244) or less	—
	Idle → Maximum	0	Approx. 16.0 (0.630)	*

- * With the pump not moving (0 rpm), move the stop lever and return it, change the adjusting lever position from idle to maximum position.

(c) Adjust by turning the maximum speed adjusting screw. (See page FU-93)



NOTE: The maximum speed adjusting screw will change the governor characteristic as shown in the illustration.

FU-96

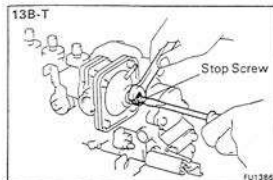
FUEL SYSTEM -- Injection Pump

9. [13B-T]

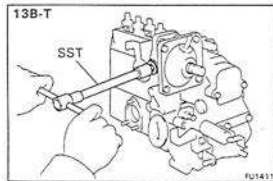
ADJUST BOOST COMPENSATOR

(a) Measure the control rack position.

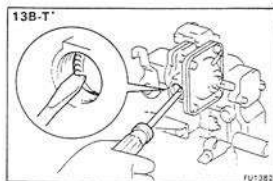
Item	Adjusting lever position	Pump rpm	Boost compensator pressure kg/cm ² (psi, kPa)	Control rack position mm (in.)	Adjusting point
13B-T M/T	Maximum	500	0	10.3 - 10.9 (0.406 - 0.429)	Stop screw
			0.12 (1.7, 12)	10.7 - 11.5 (0.421 - 0.453)	Guide bushing
13B-T A/T	Maximum	500	0	10.45 - 11.05 (0.411 - 0.435)	Stop screw
			0.12 (1.7, 12)	10.6 - 11.4 (0.417 - 0.449)	Guide bushing



(b) Adjust the stop screw.
Remove the cap nut, adjust by turning the stop screw.



(c) Adjust the guide bushing.
(1) Using SST, remove the screw plug.
SST 09043-38100



(2) Adjust by turning the guide bushing.

10. ADJUST TOTAL INJECTION VOLUME

(a) Measure the total injection volume.

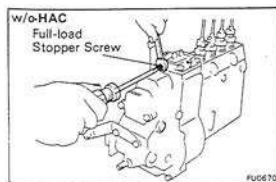
Item	Adjusting lever position	Boost compensator pressure kg/cm ² (psi, kPa)	Pump rpm	Measuring stroke	Total injection volume of each cylinder cc (cu in.)
11B (w/o HAC)	Maximum	-	500	1,000	124.0 - 160.0 (7.57 - 9.76)
			1,100	1,000	190.0 - 202.0 (11.59 - 12.33)
			1,800	1,000	178.0 - 202.0 (10.86 - 12.33)

FUEL SYSTEM — Injection Pump

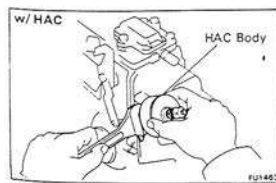
FU-97

Cont'd

Item	Adjusting lever position	Boost compensator pressure kg/cm ² (psi, kPa)	Pump rpm	Measuring stroke	Total injection volume of each cylinder cc (cu in.)
11B (w/ HAC)	Maximum	—	500	1,000	132.0 – 168.0 (8.06 – 10.25)
			1,100	1,000	190.0 – 202.0 (11.59 – 12.33)
			1,800	1,000	186.0 – 210.0 (11.35 – 12.82)
13B M/T (w/o HAC)	Maximum	—	500	1,000	154.0 – 190.0 (9.40 – 11.59)
			1,100	1,000	224.0 – 236.0 (13.67 – 14.40)
			1,700	1,000	216.0 – 240.0 (13.18 – 14.65)
13B M/T (w/ HAC)	Maximum	—	500	1,000	162.0 – 198.0 (9.89 – 12.08)
			1,100	1,000	224.0 – 236.0 (13.67 – 14.40)
			1,700	1,000	224.0 – 248.0 (13.67 – 15.13)
13B A/T	Maximum	—	700	1,000	156.0 – 180.0 (9.52 – 10.98)
			1,100	1,000	224.0 – 236.0 (13.67 – 14.40)
			1,700	1,000	212.0 – 236.0 (12.94 – 14.40)
13B-T M/T	Maximum	0.27 (3.9, 26)	500	1,000	182.0 – 218.0 (11.11 – 13.30)
		0.27 (3.9, 26)	1,100	1,000	272.0 – 284.0 (16.60 – 17.33)
		0.27 (3.9, 26)	1,700	1,000	256.0 – 280.0 (15.62 – 17.09)
		0	500	1,000	158.0 – 170.0 (9.64 – 10.37)
13B-T A/T	Maximum	0.27 (3.9, 26)	500	1,000	190.0 – 226.0 (11.59 – 13.79)
		0.27 (3.9, 26)	1,100	1,000	258.0 – 270.0 (15.74 – 16.48)
		0.27 (3.9, 26)	1,700	1,000	270.0 – 294.0 (16.48 – 17.94)
		0	500	1,000	188.0 – 200.0 (11.47 – 12.20)



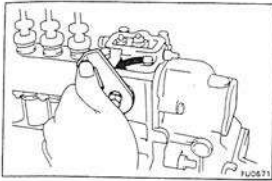
(b) [w/o HAC]
Adjust by turning the full-load stopper screw.



(c) [w/ HAC]
Adjust by turning the HAC body.

FU-98

FUEL SYSTEM — Injection Pump



FU0673

11. CHECK STOP LEVER OPERATION

Measure the control rack position when the stop lever operates.

Adjusting lever position	Pump rpm	Control rack position mm (in.)
Idle	0	5.5 (0.217) or less

12. INSTALL CAP NUTS AND COVER PLATE

13. SEAL PARTS

Seal with new wire and lead seal as shown.

11B (w/o HAC) and 13B (w/o HAC)



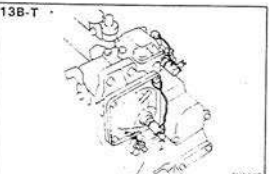
FU0748

11B (w/ HAC) and 13B (w/ HAC)



FU1454

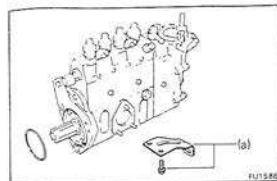
13B-T



FU1440

FUEL SYSTEM — Injection Pump

FU-99

**INSTALLATION OF INJECTION PUMP**

(See page FU-27)

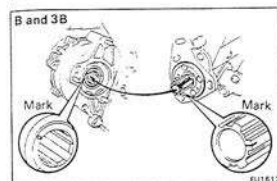
1. INSTALL INJECTION PUMP

(a) [B and 3B]

Install the injection pump stay with the two bolts.

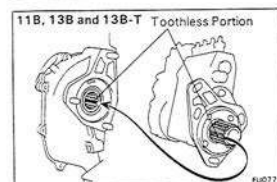
Torque: 185 kg-cm (13 ft-lb, 18 N-m)

(b) Install a new O-ring to the injection pump flange.



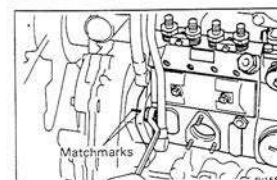
(c) [B and 3B]

Align the marks of the injection pump spline and automatic timer hub, and install the injection pump.



(d) [11B, 13B and 13B-T]

Align the spline toothless portions of the injection pump and automatic timer hub, and install the injection pump.



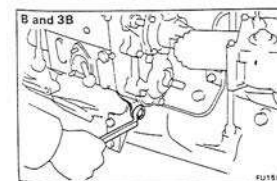
(e) [13B-T]

Place the heat insulator in position between the injection pump and cylinder block.

(f) Align the matchmark of the injection pump flange and timing gear case.

(g) Install the injection pump with the three nuts.

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



(h) [B and 3B]

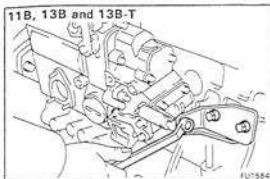
Install the bolt holding the injection pump stay to the stay.

Torque: 185 kg-cm (13 ft-lb, 18 N-m)

FU-100

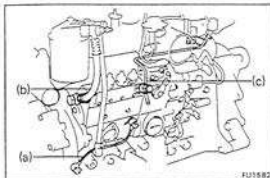
FUEL SYSTEM — Injection Pump

11B, 13B and 13B-T



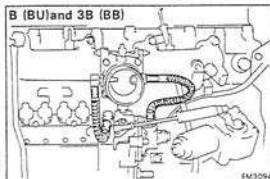
- (i) [11B, 13B and 13B-T]
Install the injection pump stay with the two bolts and nut.

Torque: Bolt 185 kg-cm (13 ft-lb, 18 N·m)
Nut 375 kg-cm (27 ft-lb, 37 N·m)



2. INSTALL PARTS

- (a) Oil pipe
(b) Fuel hose
(c) [11B, 13B and 13B-T]
Leakage pipe



- (d) [B, 3B and 13B-T]
Vacuum hose(s)

