

FU-1

FUEL SYSTEM

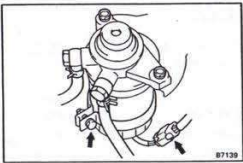
NOTE: For troubleshooting procedures, refer to DIESEL ENGINE DIAGNOSIS (EM Section).

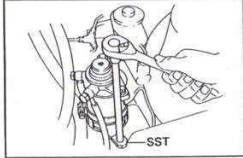
	Page
REPLACEMENT OF FUEL FILTER	FU-2
FUEL FILTER WARNING SWITCH	FU-3
INJECTION NOZZLE	FU-4
INJECTION PUMP	FU-12

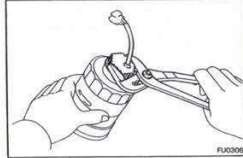
FU

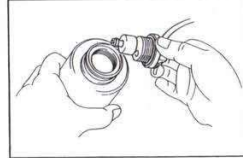
FU-2

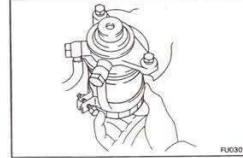
FUEL SYSTEM — Replacement of Fuel Filter


87139


SST


FU0305


FU0307


FU0307

REPLACEMENT OF FUEL FILTER

1. DISCONNECT FUEL FILTER WARNING SWITCH CONNECTOR

2. LOOSEN FUEL FILTER CLAMP BOLT

3. DRAIN FUEL FROM FUEL FILTER

NOTE: Put a suitable container or shop towel under the fuel filter.

4. REMOVE FUEL FILTER

(a) Using SST, remove the fuel filter with the gasket.

SST 09228-64010

(b) Using pliers, remove the fuel filter warning switch with the O-ring.

CAUTION: Be careful not to damage the warning switch.

5. INSTALL NEW FUEL FILTER

(a) Install a new O-ring to the fuel filter warning switch.

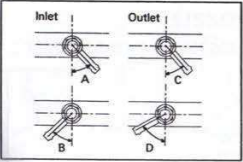
(b) Apply fuel to the O-ring of the fuel filter warning switch.

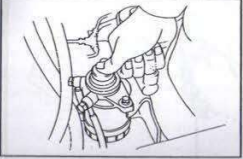
(c) Install the fuel filter warning switch to the fuel filter by hand.

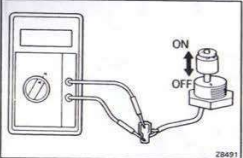
(d) Apply fuel to the gasket of the new fuel filter.

(e) Install the fuel filter to the fuel filter bracket by hand.

FUEL SYSTEM — Replacement of F


Inlet Outlet
A B C D




28491

NO
85 s

CE
CE
CE
CA
CM

6. TIG

7. COI
COI

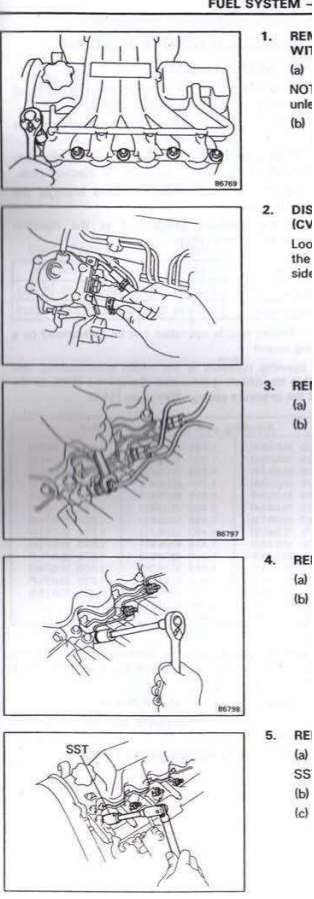
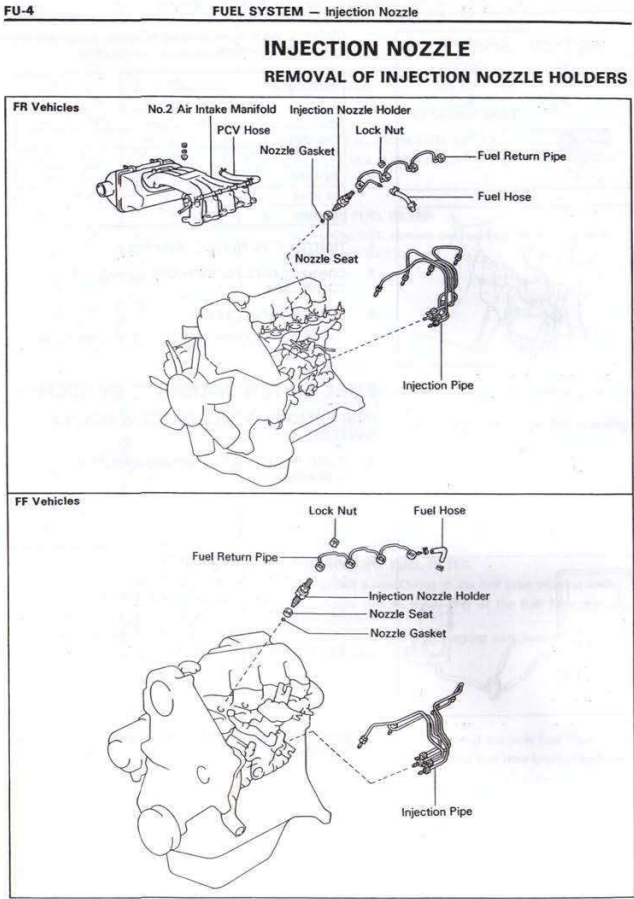
8. CHI
Usir

**FUEL
INSPE
SWITC**

1. REI
(Se

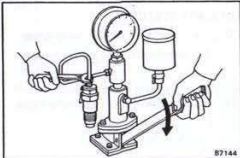
2. INS
(a)
(b)
If or

3. INS
(Se

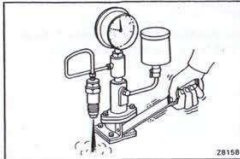


FU-6

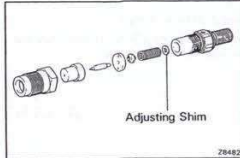
FUEL SYSTEM — Injection Nozzle



87144

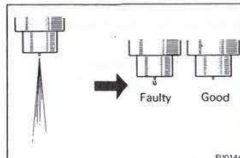


28158



Adjusting Shim

28482



Faulty Good

FU0144

TEST OF INJECTION NOZZLE HOLDERS

1. INJECTION PRESSURE TEST

(a) Install the nozzle holder to the injection nozzle hand tester and bleed 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 to discharge the carbon from the injection hole.

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

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

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

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

If the opening pressure is not within specification, disassemble the nozzle holder and change the shim on the top of the pressure spring. (See page FU-8)

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

NOTE:

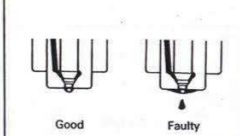
● Varying the adjusting shim thickness by 0.025 mm (0.0010 in.) changes the injection pressure by about 3.5 kg/cm² (50 psi, 343 kPa).

● Only one adjusting shim should be used.

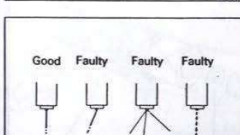
● If adjusting the opening pressure, use the specification for a new nozzle.

(e) There should be no dripping after injection.

FUEL SYSTEM —



Good



Faulty

2. LEA

Whi

- 2

(adj

for

reta

If th

ove

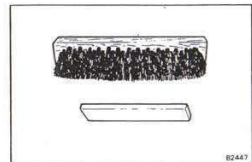
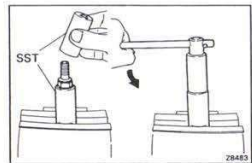
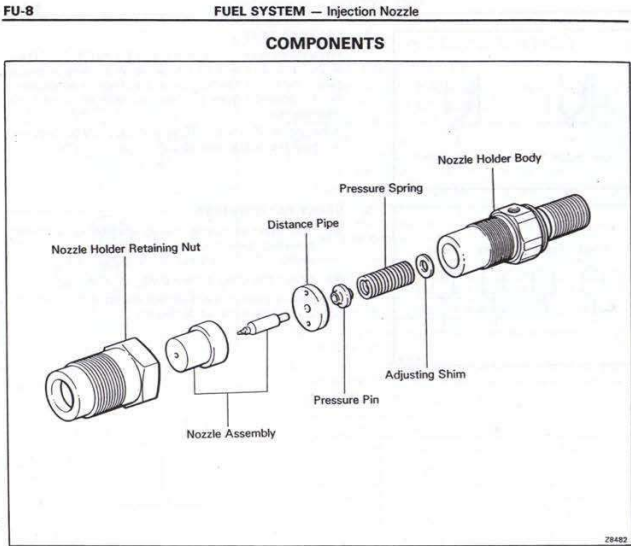
3. SPF

(a)

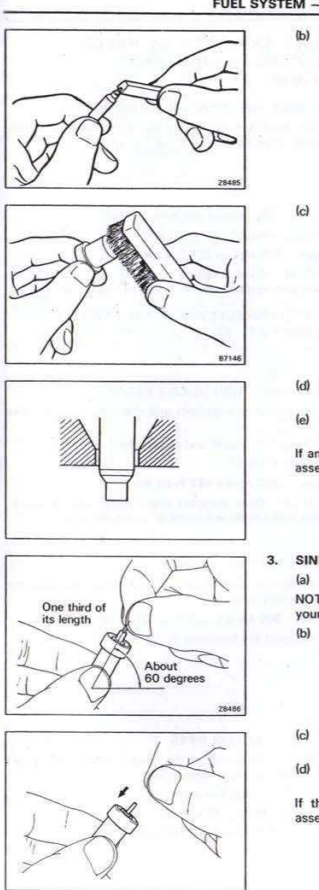
(b)

If th

noz

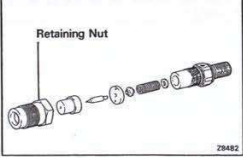


- DISASSEMBLY, CLEANING AND TEST OF INJECTION NOZZLE HOLDER**
- 1. DISASSEMBLE INJECTION NOZZLE HOLDER**
- (a) Using SST, unscrew the nozzle holder retaining nut. SST 09268-64010
- CAUTION:** When disassembling the nozzle holder, be careful not to drop the inner parts.
- (b) Remove the pressure spring, shim, pressure pin, distance piece and nozzle assembly.
- 2. NOZZLE CLEANING**
- (a) Use a wooden stick and brass brush to wash the nozzles. Wash in clean diesel fuel.
- NOTE:** Do not touch the nozzle mating surfaces with your fingers.



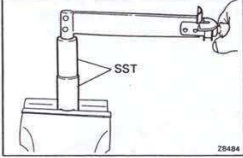
FU-10

FUEL SYSTEM — Injection Nozzle



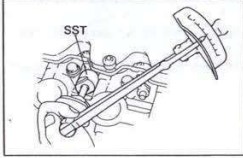
Retaining Nut

28482



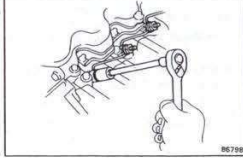
SST

28484

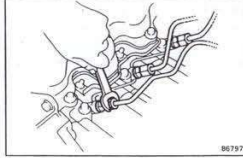


SST

86798



86798



86797

ASSEMBLY AND INSTALLATION OF INJECTION NOZZLE HOLDERS
(See page FU-8)

1. ASSEMBLY INJECTION NOZZLE HOLDERS

(a) As shown in the figure, assemble the injection nozzle and finger tighten the retaining nut.

(b) Using SST, torque the retaining nut.
SST 09268-64010
Torque: 375 kg-cm (27 ft-lb, 37 N-m)
CAUTION: Over torquing could cause nozzle deformation and needle adhesion or other defects.

2. PERFORM PRESSURE AND SPRAY PATTERN TEST

(See page FU-6)

3. INSTALL INJECTION NOZZLE HOLDERS

(a) Place four new gaskets and the nozzle seats in the cylinder head.

(b) Using SST, install and torque the four nozzles.
SST 09268-64010
Torque: 650 kg-cm (47 ft-lb, 64 N-m)
CAUTION: Over torquing could cause nozzle deformation and needle adhesion or other defects.

4. INSTALL FUEL RETURN PIPE

(a) Install four new gaskets and the return pipe with the four lock nuts.

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

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

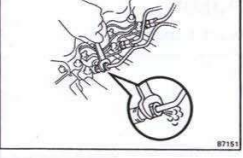
5. INSTALL INJECTION PIPES

(a) Connect both ends of the injection pipes to the injection pump and nozzle holder.

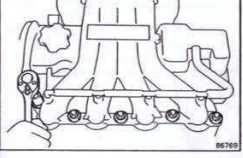
(b) Install the injection pipe clamps.

(c) Torque the injection pipe union nuts.
Torque: 300 kg-cm (22 ft-lb, 29 N-m)

FUEL SYSTEM —



86798



86797

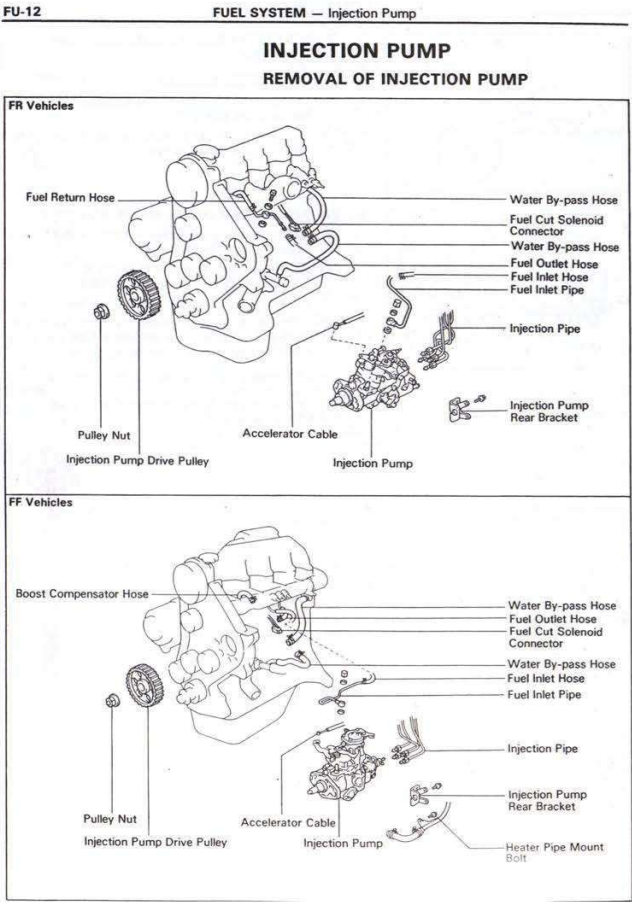
6. COI
(CV

7. BLE
(a)
(b)

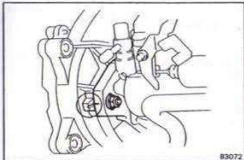
8. INS
(a)
Ton
(b)
NO
nec
and

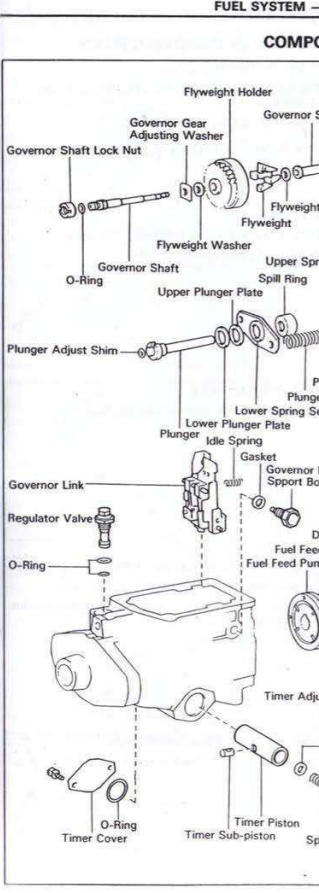
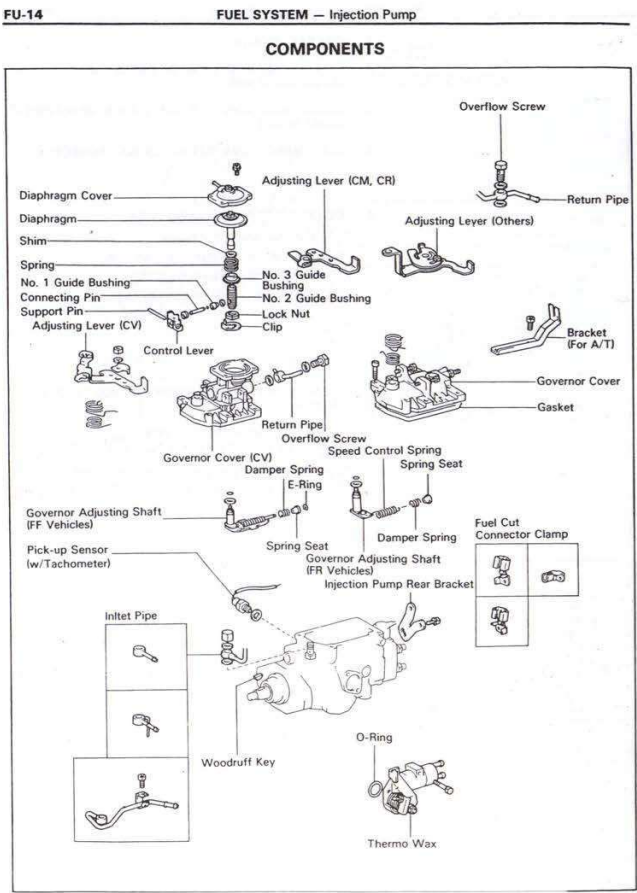
9. ST/

10. CHI
SPE



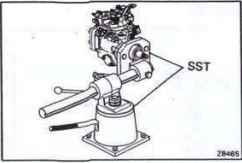
- FUEL SYSTEM —**
1. DRA
 2. DISI
INJI
 3. DISI
PUN
 4. DISI
 5. DISI
(a)
(b)
(c)
(d)
 6. REN
(FF
 7. REN
(Sei
 8. REN
(Sei
 9. REN
(a)
If n
(b)
CAI
adj
10. REI
11. REI



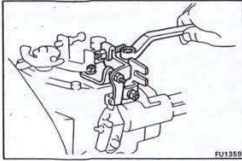


FU-16

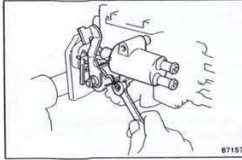
FUEL SYSTEM — Injection Pump



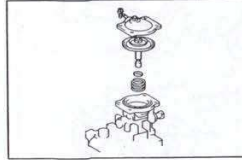
28485



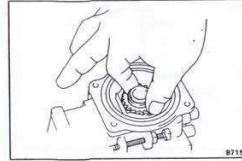
FU1353



87187



87187



87159

DISASSEMBLY OF INJECTION PUMP
(See pages FU-14 and 15)

1. MOUNT INJECTION PUMP TO STAND (SST) FOR DISASSEMBLY
SST 09241-76022 and 09245-54010

2. REMOVE WOODRUFF KEY FROM DRIVE SHAFT

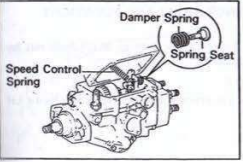
3. REMOVE IDLE-UP
(a) Loosen the collar lock bolt and pull out the collar.
(b) Remove the three bolts and idle-up.

4. REMOVE THERMO WAX
Remove the two bolts, thermo wax and O-ring.

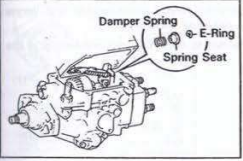
5. REMOVE BOOST COMPENSATOR DIAPHRAGM (CV)
(a) Remove the four bolts and diaphragm cover.
(b) Remove the diaphragm, boost compensator shim and spring.

6. REMOVE NO. 3 GUIDE BUSHING (CV)
Turn the guide bushing counterclockwise to remove it.

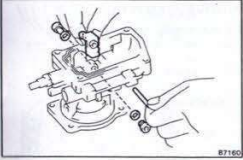
FUEL SYSTEM —



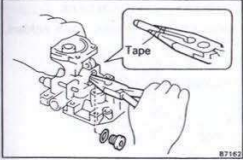
87185



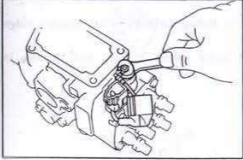
87185



87185



87185



87185

7. REM (FR (a) (b) (c)

(FF (a) (b) (c)

8. REN (CV (a) (b)

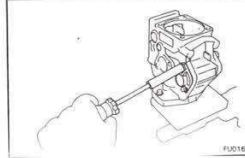
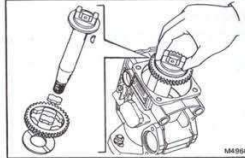
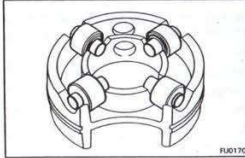
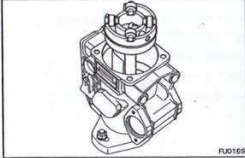
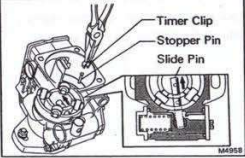
9. REN CO (a) (b) CAI not

10. REN (a) (b)

11. REN

FU-20

FUEL SYSTEM — Injection Pump



20. REMOVE ROLLER RING AND DRIVE SHAFT

(a) Remove the timer clip and stopper pin.

(b) Push on the slide pin as shown.

(c) Push the drive shaft and remove the roller ring.

NOTE:

- Be careful not to drop the rollers.
- Do not alter the position or assembly of the rollers.

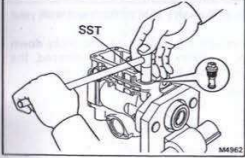
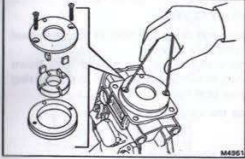
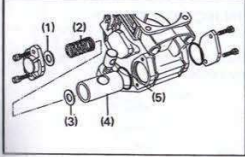
(d) Remove the drive shaft with the governor drive gear.

(e) Remove the drive shaft washer.

21. REMOVE TIMER

(a) Remove the two timer covers and O-rings.

FUEL SYSTEM —



(b)

22. REM

(a)

(b)

(c)

CAU

posit

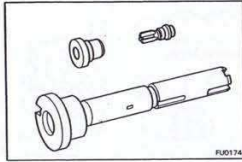
23. REM

Using

SST

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

11/27



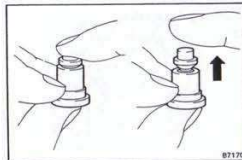
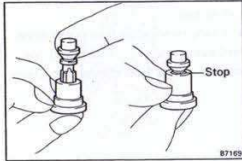
INSPECTION OF INJECTION PUMP COMPONENTS

NOTE: Do not touch the sliding surfaces of the pump plunger and delivery valves.

1. INSPECT DELIVERY VALVES

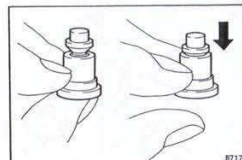
- (a) Pull up the valve and close the hole at the valve seat bottom end with your thumb. When the valve is released, it should sink down quickly and stop at the position where the relief ring closes the valve seat hole.

If defective, replace the valve as a set.



- (b) Close the hole at the valve seat bottom end with your thumb.
Insert the valve into the valve seat and press down with your finger. When your finger is released, the valve should rise back to its original position.

Replace if defective.



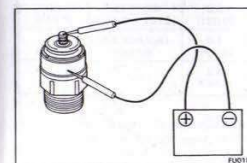
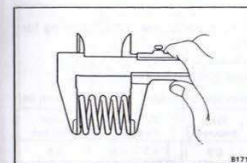
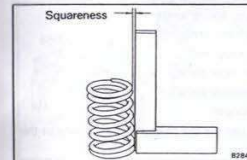
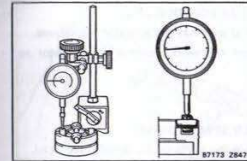
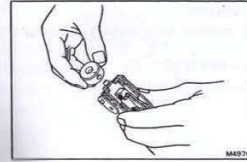
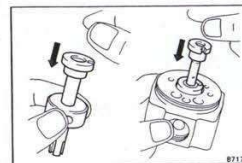
- (c) Remove your thumb from the valve seat hole.
The valve should close completely by its own weight.
Replace if defective.

NOTE: Before using a new valve set, wash off the rust prevention compound with light oil or gasoline. Then re-wash with diesel fuel and perform the above tests.

2. INSPECT PUMP PLUNGER, SPILL RING AND DISTRIBUTIVE HEAD

- Tilt the spill ring (distributive head) slightly and pull out the plunger.
- When released, the plunger should sink down smoothly into the spill ring (distributive head) by its own weight.
- Rotate the plunger and repeat the test at various positions.

If the plunger sticks at any position, replace the parts as a set.



(d) 1

3. INSP
Using
Rolle
If not
as a

4. **INSP**
Using
spring
Maxi
If on
repla

5. **INSP**
Using

S
M

If the

6. INSP

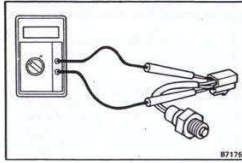
(a)

(b)

If the

FU-24

FUEL SYSTEM — Injection Pump

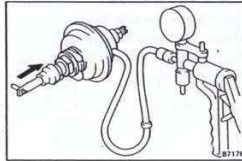


7. INSPECT PICKUP SENSOR

Using an ohmmeter, measure the resistance between terminals.

Resistance: 600 – 800 Ω

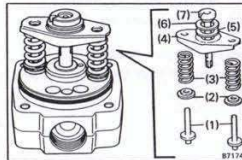
If not within specification, replace the sensor.



8. INSPECT ACTUATOR FOR IDLE-UP

Apply vacuum and check that the actuator rod moves.

If the actuator does not work, replace the actuator as necessary.



9. ADJUST PLUNGER SPRING SHIM

- (a) Install the following parts to the distributive head.
 - (1) Two plunger spring guides
 - (2) Two upper spring seats
 - (3) Two plunger springs
 - (4) Lower spring seat
 - (5) Upper plunger plate
 - (6) Lower plunger plate
 - (7) Pump plunger

NOTE: Do not assemble the plunger spring shims at this time.

- (b) Using calipers, measure clearance A indicated in the figure.

(c) Determine the shim size by using the following formula and chart.

New shim thickness = $5.8 - A$

A Plunger position measured

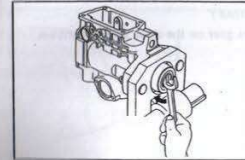
Shim selection chart mm (in.)

Measured clearance	Shim thickness	Measured clearance	Shim thickness
More than 5.3 (0.209)	0.5 (0.020)	4.3 – 4.5 (0.169 – 0.177)	1.5 (0.059)
5.0 – 5.2 (0.196 – 0.205)	0.8 (0.031)	4.0 – 4.2 (0.157 – 0.165)	1.8 (0.071)
4.8 – 4.9 (0.189 – 0.193)	1.0 (0.039)	Less than 3.9 (0.154)	2.0 (0.079)
4.6 – 4.7 (0.181 – 0.185)	1.2 (0.047)	—	—

NOTE:

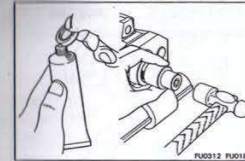
- For a measurement between listed sizes, use the next larger size. Ex. If thickness is 1.1 mm (0.043 in.) by calculation, use a 1.2 mm (0.047 in.) shim.
- Select two shims which have the same thickness.

FUEL SYSTEM —



10. IF NE

- (a)

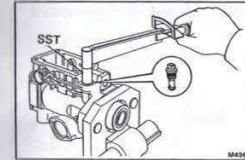


- (b)
(c)

CAU'

seal.

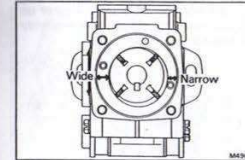
(d)



ASSEM

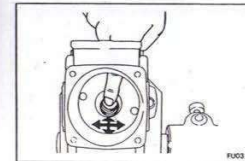
(See page

1. INST
Using
SST
Torq



2. INST

- (a)
- (b)



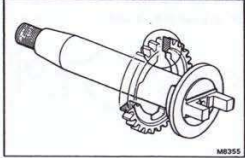
- (d)

NOTI

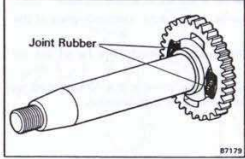
align

FU-26

FUEL SYSTEM — Injection Pump

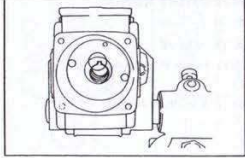


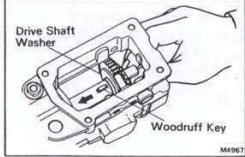
ME295



Joint Rubber

B7173

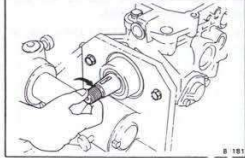




Drive Shaft Washer

Woodruff Key

ME967



B 181

3. INSTALL DRIVE SHAFT

(a) Install the drive gear on the drive shaft as shown.

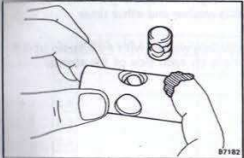
(b) Install new two joint rubbers into the drive gear.
NOTE: Replace the joint rubber when overhauling.

(c) Position the notch of the feed pump rotor upward.

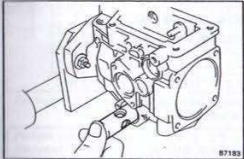
(d) Install the woodruff key and drive shaft washer on the drive shaft and insert the drive shaft assembly into the pump housing.

(e) Check that the drive shaft turns without catching.

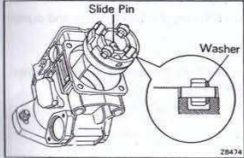
FUEL SYSTEM —



B7182



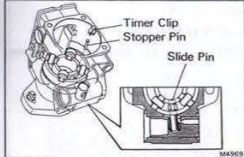
B7182



Slide Pin

Washer

28474

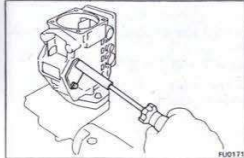


Timer Clip

Stopper Pin

Slide Pin

ME968



FD3121

4. INST/

(a) /

(b) li

(c) I

5. INST.

(a) I

(b) I

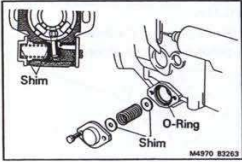
(c) I

(d) I

(e) I

FU-28

FUEL SYSTEM — Injection Pump



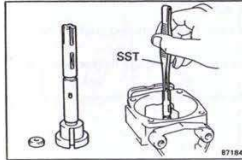
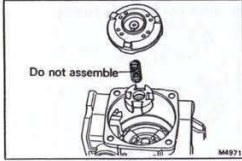
(f) Install a new O-ring, the adjusting washer, spring, another adjusting washer and other timer cover with the two bolts.

NOTE: Insert an adjusting washer with a thickness of 0.5 mm (0.020 in.) or more on each side of the spring.

6. ADJUST PLUNGER ADJUSTING SHIM

(a) Install the coupling and camplate.

NOTE: Do not assemble the coupling spring.

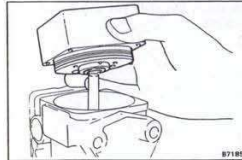


(b) Clean the adjusting shim and contacting surface area.

(c) Using SST, install the used adjusting shim and pump plunger.

SST 09260-54012

(d) Check that the notch on the pump plunger is aligned with the camplate pin.

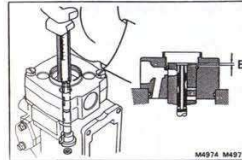


(e) Install the distributive head with the four bolts.

Torque the bolts.

Torque: 120 kg-cm (9 ft-lb, 12 N-m)

CAUTION: Be careful not to damage the pump plunger.



(f) Using calipers, measure clearance B indicated in the figure.

(g) Determine the shim size by using the following formula and chart.

New shim thickness = T + (B - 3.3)

T . . . Thickness of shim used

B . . . Plunger position measured

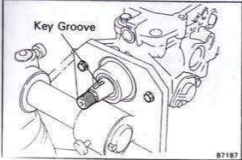
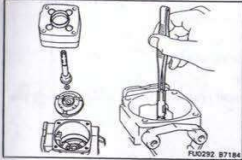
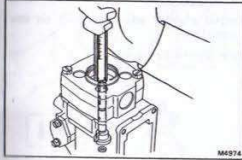
FUEL SYSTEM —

		Shim select									
		Measured clearance									
Installed shim (mm)		2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2
	1.9										
	2.0									1.9	
	2.1								1.9	1.9	
	2.2							1.9	1.9	2.0	
	2.3						1.9	1.9	2.0	2.1	
	2.4				1.9	1.9	2.0	2.1	2.2		
	2.5			1.9	1.9	2.0	2.1	2.2	2.3		
	2.6		1.9	1.9	2.0	2.1	2.2	2.3	2.4		
	2.7	1.9	1.9	2.0	2.1	2.2	2.3	2.4	2.5		
	2.8	1.9	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	
	2.9	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	

Example: 2.5 mm (0.098 in.) shim installed. Measured clearance is 2.8 mm (0.110 in.).

Replace with 2.2 mm (0.087 in.) shim.

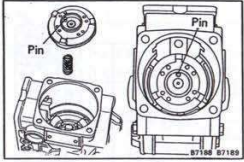
Plunger adjusting shim thickness	1.9	2.0	2.1	2.2
mm (in.)	(0.075)	(0.079)	(0.083)	(0.087)



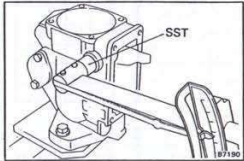
7. INST

FU-30

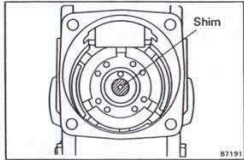
FUEL SYSTEM — Injection Pump



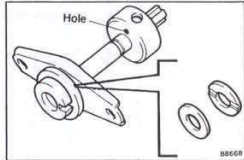
(b) Install the coupling spring and camplate with the camplate pin facing toward the governor cover side.



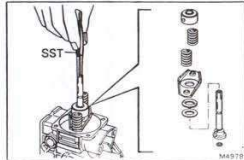
8. INSTALL GOVERNOR LINK
(a) Using SST, install the governor link with the two support bolts and gaskets. Torque the bolts.
Torque: 115 kg-cm (8 ft-lb, 11 N-m)
SST 09260-54012
(b) Check that the governor link moves smoothly after assembly.



9. INSTALL PUMP PLUNGER
(a) Place the selected plunger adjusting shim on the center of the camplate.
NOTE: Do not apply grease to the shim.

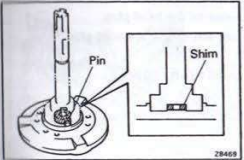


(b) Install the following parts to the pump plunger:
(1) Lower plunger plate
(2) Upper plunger plate
(3) Lower spring seat
(4) Spill ring
NOTE: Face the spill ring with the hole side toward the lower seat.

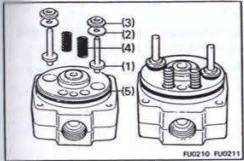


(c) Using SST, install the pump plunger and plunger springs.
SST 09260-54012

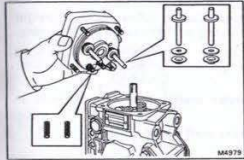
FUEL SYSTEM —



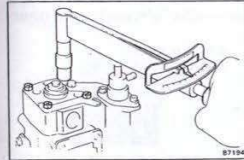
(d)
(e)



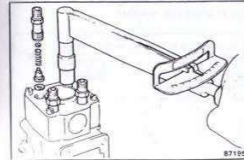
10. INST



(b) CAU
plun



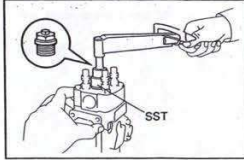
(c)
(d) Tort



11. INS
(a)
(b)
(c)
SST
Tori

FU-32

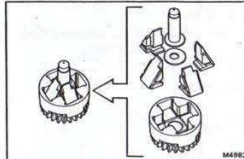
FUEL SYSTEM — Injection Pump



12. INSTALL DISTRIBUTIVE HEAD PLUG

- (a) Install a new O-ring on the head plug.
 - (b) Using SST, install and torque the head plug.
- SST 09260-54012

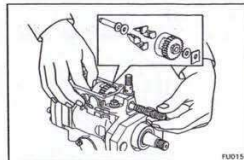
Torque: 700 kg-cm (51 ft-lb, 69 N·m)



13. INSTALL GOVERNOR SHAFT AND FLYWEIGHT HOLDER ASSEMBLY

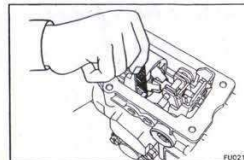
- (a) Install the four flyweights, flyweight washer and governor sleeve on the flyweight holder.

NOTE: Replace the four flyweights as a set.



- (b) Install a new O-ring to the governor shaft.
- (c) Put the flyweight holder subassembly, flyweight washer and adjusting washer into the pump housing.
- (d) Install the governor shaft through the adjusting washer, flyweight washer and flyweight holder subassembly.
- (e) Turn the governor shaft counterclockwise with an allen wrench.

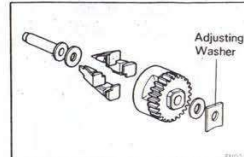
NOTE: The governor shaft has LH threads.



14. CHECK FLYWEIGHT HOLDER THRUST CLEARANCE

Using a feeler gauge, measure the flyweight holder thrust clearance.

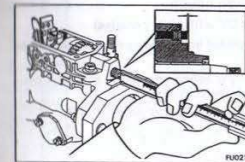
Thrust clearance: 0.15 – 0.35 mm
(0.0059 – 0.0138 in.)



If the thrust clearance is not within specification, adjust with an governor gear adjusting washer.

Governor gear adjusting washer thickness mm (in.)	
1.05 (0.0413)	1.65 (0.0650)
1.25 (0.0492)	1.85 (0.0728)
1.45 (0.0571)	

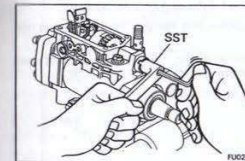
FUEL SYSTEM –



15. ADJ

- (a)

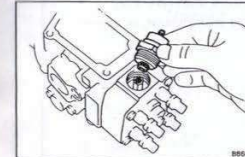
Prot
If the
ing t
NOT



- (b)

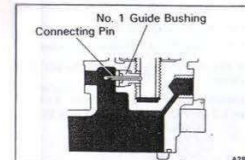
SST
NOT

16. INST



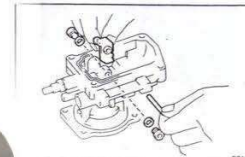
17. INST

- (a)
(b)
(c)
(d)



18. INS'

(CV)
Insert



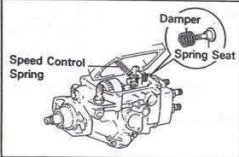
19. INS'

(a)

(b)

FU-34

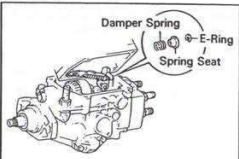
FUEL SYSTEM — Injection Pump



Speed Control Spring

Damper Spring

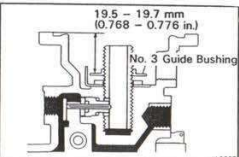
Spring Seat



Damper Spring

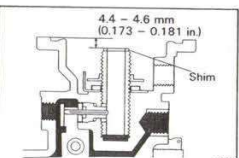
E-Ring

Spring Seat



19.5 - 19.7 mm
(0.768 - 0.776 in.)

No. 3 Guide Bushing



4.4 - 4.6 mm
(0.173 - 0.181 in.)

Shim

20. INSTALL GOVERNOR COVER
(FR with M/T and CV with M/T Vehicles)

(a) Install a new gasket into the groove of the governor cover.

(b) Install the damper spring and spring seat, and connect them with the control spring.

(c) Using an allen wrench, install the four bolts.

(FF with M/T except CV and A/T Vehicles)

(a) Install a new gasket into the groove of the governor cover.

(b) Install the damper spring and governor spring seat and connect them with the E-ring.

(c) Using an allen wrench, install the four bolts.

21. INSTALL NO. 3 GUIDE BUSHING (CV)

Install and adjust the guide bushing as shown.

22. SELECT BOOST COMPENSATOR SHIMS (CV)

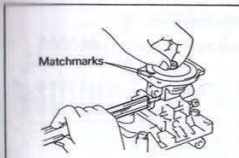
(a) Put the shims on the No. 2 guide bushing.

(b) Using calipers, measure the dimension as shown.

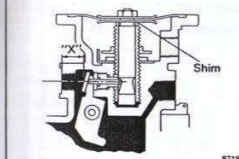
If the dimension is not within specification, select and install the correct shims.

NOTE: Shim are available in 11 sizes, in increment of 0.2 mm (0.008 in.), from 1.3 mm (0.051 in.) to 3.3 mm (0.130 in.).

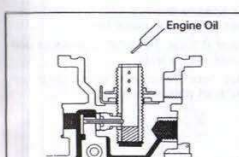
FUEL SYSTEM —



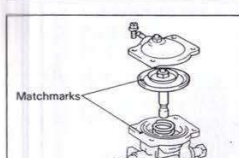
Matchmarks



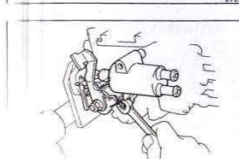
Shim



Engine Oil



Matchmarks



23. ADJ

(a)

NOTE

(b)

Dime

NOTE

If dir

diaph

(c)

(d)

(e)

24. INST

(a)

(b)

(c)

(d)

25. INST

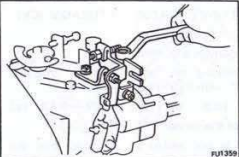
Insta

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

18/27

FU-36

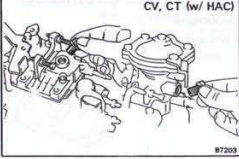
FUEL SYSTEM — Injection Pump



FU3359

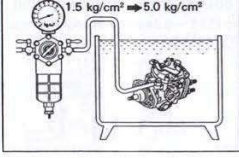
26. INSTALL IDLE-UP
Install the idle-up with three bolts.

27. REMOVE INJECTION PUMP FROM STAND



CV, CT (w/ HAC)

87203



1.5 kg/cm² ⇒ 5.0 kg/cm²

28. PERFORM AIR TIGHT TEST

(a) Replace the overflow screw with a bolt.

(b) Connect an air hose to the fuel inlet hole and submerge the injection pump in diesel fuel.

(c) Apply 1.5 kg/cm² (21 psi, 147 kPa) of pressure and confirm that there are no leaks.

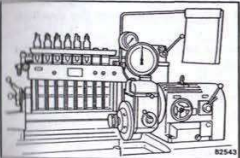
(d) Next check that there are no leaks with 5.0 kg/cm² (71 psi, 490 kPa) of pressure applied.

29. INSTALL WOODRUFF KEY ON DRIVE SHAFT

FUEL SYSTEM —

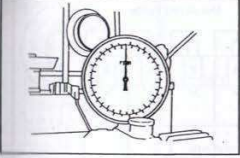
ADJUST

1. PRE-
(a) Test
Test



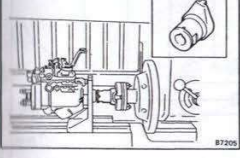
82543

(b) Allow



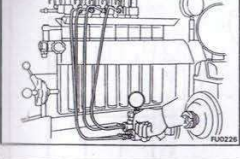
87203

(c) NOTE
(d) coupl



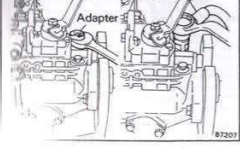
87203

(e) Outer
Inner
Length
Mini

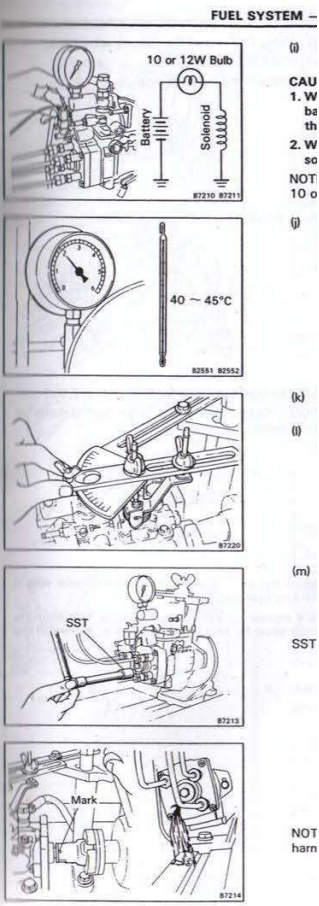
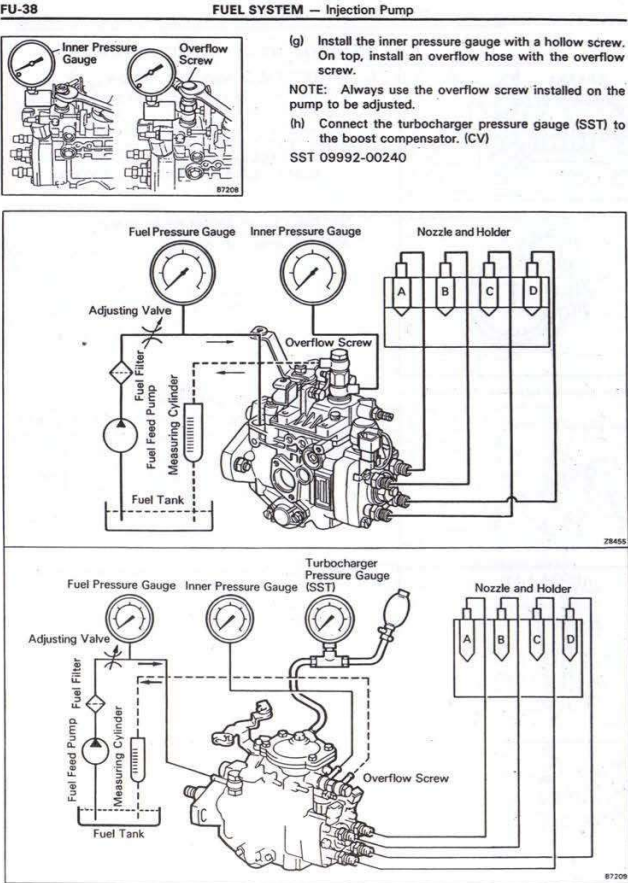


FU0228

(f)

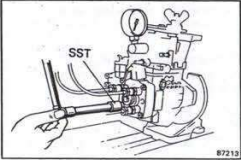


87203



FU-40

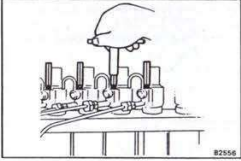
FUEL SYSTEM — Injection Pump



87213

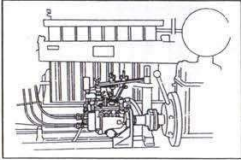
(5) Using SST, install the delivery valve holder.
SST 09260-54012

(6) Connect the injection pipe.



82556

(n) Bleed the air from the injection pipes.

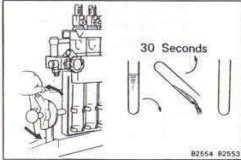


82554

(o) Race the injection pump for 5 minutes at 2,000 rpm.
CAUTION: Check that there is no fuel leakage or abnormal noise.

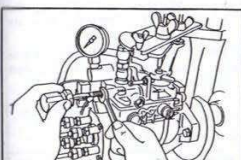
NOTE:

- Measure the volume of each injection cylinder with a measuring cylinder.
- Before measuring the injection volume, first hold the cylinder tilted for at least 30 seconds to discard all the fuel.



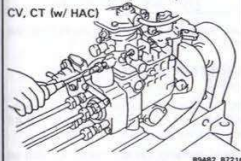
82554 82553

FUEL SYSTEM —

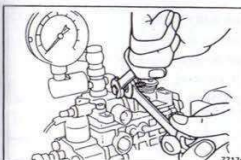


80482 87213

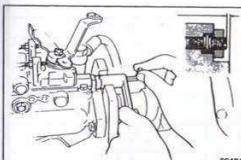
CV, CT (w/ HAC)



27174



27174



82554 82553

2. PRE-
(a) S
(b) J
s

CE70
CE80
CV +
CT (w
CT (w
CM II

-1: A
-2: A
-3: H
NOTE
(0.18

3. PRE-
(a) S
(b) J
i

CE, I
CM, I
CV

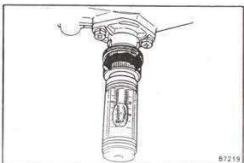
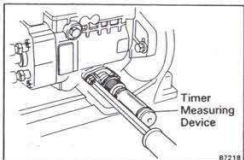
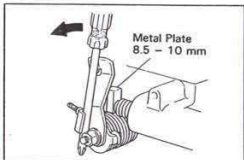
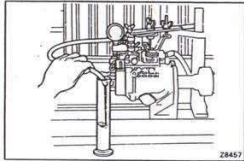
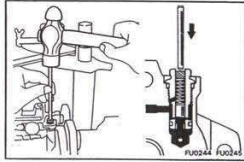
4. PRE-
Using
the g
SST
Protr

5. MEA
Meas
Other

CV

FU-42

FUEL SYSTEM — Injection Pump



- If the pressure is low, adjust by lightly tapping the regulator valve piston while watching the pressure gauge.
- If the pressure is too high or if the regulator valve was tapped in too far, the regulator valve must be replaced.

6. MEASURE OVERFLOW VOLUME

Measure the overflow volume at the below listed rpm.

Pump rpm	Overflow volume	cc/min. (cu in./min.)
2,200	370 - 800	(22.6 - 48.8)

NOTE: Always use the overflow screw installed on the pump to be adjusted.

7. RELEASE COLD STARTING SYSTEM FOR NEXT INSPECTIONS (CM)

Using a screwdriver, turn the cold start lever counterclockwise and put a metal plate of 8.5 – 10 mm (0.33 – 0.39 in.) in thickness between the lever and thermo wax.

NOTE: Keep the cold starting system released until all measurements and adjustments are finished.

8. MEASURE AND ADJUST TIMER

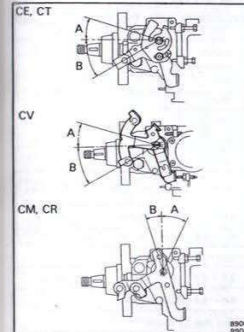
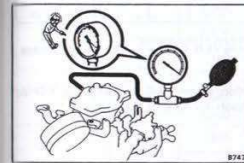
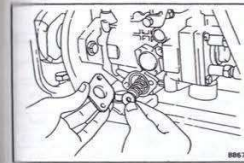
- Remove the timer cover.
- Install the timer measuring device.
- Set the timer measuring device at zero.
- Measure the piston stroke at the below listed rpms.

Item	Pump rpm	Piston strokes mm (in.)
CE70, 80 CM (STD) CT CR	800	0.20 ~ 1.20 (0.0079 ~ 0.0472)
	1,800	3.87 ~ 4.67 (0.1445 ~ 0.1839)
	2,350	5.58 ~ 6.69 (0.2197 ~ 0.2591)
CM (OPT*)	800	0.61 ~ 1.61 (0.0240 ~ 0.0634)
	1,800	4.08 ~ 5.08 (0.1606 ~ 0.2000)
	2,350	5.99 ~ 6.99 (0.2358 ~ 0.2752)
CV	700	0.24 ~ 1.24 (0.0094 ~ 0.0488)
	1,800	4.32 ~ 5.32 (0.1701 ~ 0.2094)
	2,250	5.99 ~ 6.99 (0.2358 ~ 0.2752)

NOTE: Confirm that the hysteresis is within 0.3 mm (0.012 in.).

- 1: High altitude

FUEL SYSTEM



- If a
adju

NO
and
CA
side

9. INS
(a)

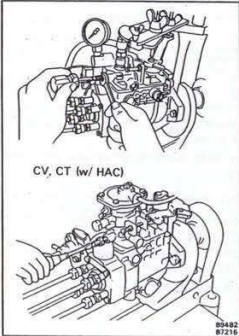
Pre

10. ME VO (a)

CE
CE
CM
CV

FU-44

FUEL SYSTEM — Injection Pump

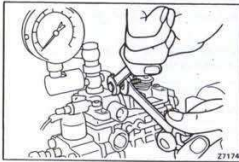


(b) Adjust the injection volume with the full load set screw.

Item	Adjusting lever angle	Pump rpm	Injection volume cc (cu in.)
CE70	Plus 9 – 19°	1,500	7.9 – 8.3 (0.48 – 0.51)
CE80	Plus 13 – 23°		7.7 – 8.1 (0.47 – 0.49)
CM (STD)	Plus 3 – 10°		
CV	Plus 14 – 22°		10.1 – 10.5 (0.62 – 0.64)
CT (w/o HAC)	Plus 13 – 23°		8.1 – 8.5 (0.49 – 0.52)
CT (w/ HAC)	Plus 13 – 23°		7.9 – 8.4 (0.48 – 0.51)
CR	Plus 3 – 10°	1,500	8.1 – 8.5 (0.49 – 0.52)
CM (OPT)	Plus 3 – 10°		7.1 – 7.5 (0.43 – 0.46)

- *1: Apply 0.48 kg/cm² (6.8 psi, 47 kPa) pressure
*2: Apply 730 ± 1.5 mm Hg (28.74 ± 0.06 in. Hg, 97.3 ± 0.2 kPa) absolute pressure
*3: High altitude

NOTE: The injection volume will increase about 3 cc (0.18 cu in.) with each 1/2 turn of the screw.



11. ADJUST MAXIMUM SPEED
Adjust the injection volume with the maximum speed adjusting screw.

Item	Adjusting lever angle	Pump rpm	No. of measuring strokes	Injection volume cc (cu in.)	Remarks
CE70 CE80	Plus 9 – 19° (Others) Plus 13 – 23° (CE80)	2,700	200	2.0 – 3.2 (0.12 – 0.20)	Adjust
		2,600		4.1 – 5.8 (0.25 – 0.35)	—
		2,850		Less than 1.5 (0.09)	
CV	Plus 14 – 22°	2,600	200	2.6 – 3.8 (0.16 – 0.23)	Adjust
		2,500		5.9 – 8.3 (0.36 – 0.51)	—
		2,800		Less than 1.5 (0.09)	
CT	Plus 13 – 23°	2,700	200	2.0 – 3.2 (0.12 – 0.20)	Adjust
		2,600		4.3 – 6.1 (0.26 – 0.37)	—
		2,850		Less than 1.5 (0.09)	
CM, CR	Plus 3 – 10°	2,700	200	2.2 – 3.0 (0.13 – 0.18)	Adjust
		2,600		4.3 – 6.1 (0.26 – 0.37)	—
		2,850		Less than 1.5 (0.09)	

- *1: Apply 0.48 kg/cm² (6.8 psi, 47 kPa) pressure
*2: w/ HAC Apply 730 ± 1.5 mm Hg (28.74 ± 0.06 in. Hg, 97.3 ± 0.2 kPa) absolute pressure
*3: For CM (OPT): High altitude

FUEL SYSTEM —

12. INSP

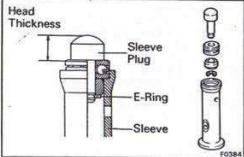
Meas

Item	Adjusting lever angle	Pump rpm	No. of measuring strokes	
CE70	Plus 9 – 19°	1,500	200	7
		100		8
		500		6
		2,350		6
CE80 CM (STD)	Plus 13 – 23° (CE80) 3 – 13° (CM)	1,500	200	7
		100		8
		500		6
		2,350		6
CV	Plus 14 – 22°	1,500	200	10
		100		1
		2,250		1
		2,350		1
CT (w/o HAC)	Plus 13 – 23°	1,500	200	6
		100		8
		500		4
		2,350		6
CT (w/HAC) Apply 730 ± 1.5 mm Hg (28.74 ± 0.06 in. Hg, 97.3 ± 0.2 kPa) absolute pressure	Plus 13 – 23°	1,500	200	1
		100		1
		500		1
		2,350		1
CR	Plus 3 – 13°	1,500	200	1
		100		1
		500		1
		2,350		1
CM (OPT): High altitude	Plus 3 – 13°	1,500	200	1
		100		1
		500		1
		2,350		1

- * Apply 530 ± 1.5 mm Hg (20.87 ± 0.06 in. Hg, 70.6 ± 0.2 kPa) absolute pressure

FU-46

FUEL SYSTEM — Injection Pump



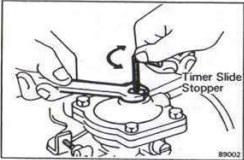
Head Thickness
Sleeve Plug
E-Ring
Sleeve

F0384

If the injection volume at 100 rpm is not within specification, replace the governor sleeve plug.

Governor sleeve plug head thickness mm (in.)	
3.3 (0.130)	3.7 (0.146)
3.4 (0.134)	3.8 (0.150)
3.5 (0.138)	3.9 (0.154)
3.6 (0.142)	4.0 (0.157)

NOTE: Lengthening the plug 0.1 mm (0.004 in.) will increase injection volume by 0.6 cc (0.04 cu in.).
If the variation limit exceeds specification, replace the delivery valve.

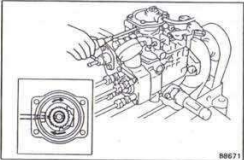


13. MEASURE AND ADJUST FULL LOAD MINIMUM INJECTION VOLUME (CV)

(a) Measure the injection volume.

Pump rpm	No. of measuring strokes	Injection volume cc (cu in.)
500	200	6.9 – 7.6 (0.42 – 0.46)

(b) Using an allen wrench, adjust the timer slide stopper.



14. MEASURE AND ADJUST BOOST COMPENSATOR CHARACTERISTIC (CV)

(a) Apply 0.14 kg/cm² (2.0 psi, 14 kPa) of pressure to the boost compensator.

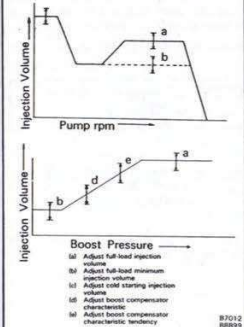
(b) Measure the injection volume.

Pump rpm	No. of measuring strokes	Injection volume cc (cu in.)
1,500	200	8.4 – 9.2 (0.51 – 0.56)

(c) Using a screwdriver, adjust the No. 3 guide bushing.

NOTE: When the guide bushing is turned clockwise, as seen from above, the injection volume will increase.

FUEL SYSTEM —



Injection Volume
Pump rpm

Injection Volume
Boost Pressure

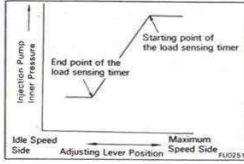
a
b

a
b
c
d
e

87012
88893

15. INSP
TENT
(a)
(b)
Pum
1.

16. CHEI
Comj
tor p
kg/cr
NOTI
lever
lower
Pum
rpm
1,50
If not
boos
oil.



Injection Pump Output Pressure
Adjusting Lever Position

Starting point of the load sensing timer
End point of the load sensing timer

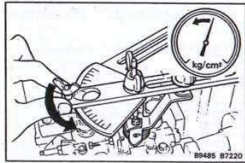
Idle Speed Side
Maximum Speed Side

F00281

17. ADJ
(a)
(b)
lev
f
s

FU-48

FUEL SYSTEM — Injection Pump



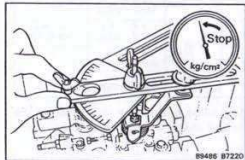
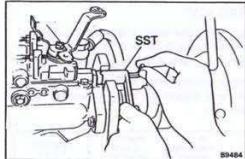
- (c) Slowly move the adjusting lever from the maximum speed side to the idle speed side, and secure it at the point where the pump inner pressure begins to drop.
(d) Measure the injection volume at the drop point (starting point).

Pump revolution (rpm)	Measuring strokes	Injection volume cc (cu in.)
1,800	200	Measured value at Step (b) minus 1.0 (0.06) ± 0.3 (0.02)

If the injection volume is not within standard, adjust by turning the governor shaft with SST, and perform the measurement again until it is within standard.

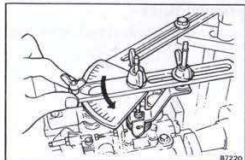
SST 09260-54012

NOTE: One-half turn of the governor shaft will alter the injection volume by 3 cc (0.2 cu in.).



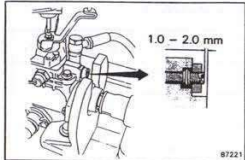
- (e) Check the end point injection volume by slowly moving the adjusting lever from the maximum speed side to the idle speed side, and secure it at the point where the pump inner pressure stops dropping.

Pump revolution (rpm)	Measuring strokes	Injection volume cc (cu in.)
1,800	200	1.7 – 2.3 (0.10 – 0.14)



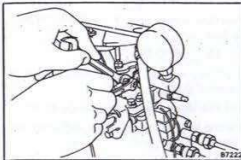
- (f) Check the timer piston fluctuation when the adjusting lever is moved from the full side to the idle side.

Pump rpm	Timer piston fluctuation mm (in.)
1,100	0.93 – 1.53 (0.057 – 0.093)



- (g) Check the protrusion of the governor shaft.
Protrusion: 1.0 – 2.0 mm (0.039 – 0.079 in.)

FUEL SYSTEM —



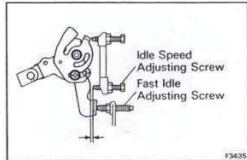
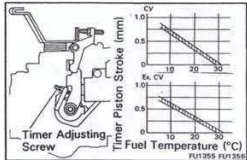
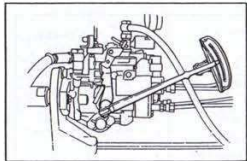
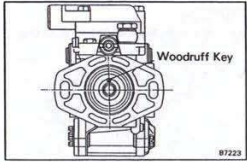
18. ADJUSTING
Adjusting screw

Item	Adjusting lever angle	Pump rpm	No. of measuring strokes	
CE70, 80 CV CT	Minus 24 – 34°	400	200	q=1.65
		375		More than
		475		q Minus
CM CR	Minus 30 – 40°	400	200	q=1.65
		375		More than
		475		q Minus

*1: w/HAC Apply 730 ± 1.5 mm Hg (28.74 ± 0.06 in. Hg, 97.3

FU-50

FUEL SYSTEM — Injection Pump



19. ADJUST COLD STARTING SYSTEM

- (a) Remove the overflow screw and check the fuel temperature in the fuel pump.
- Fuel temperature: 15 – 35°C (59 – 95°F)
- (b) Set the woodruff key on the pump drive shaft in a vertical or horizontal position.
- (c) Set the scale of the timer measuring device to zero.
- (d) Check the adjusting lever opening angle and consider this angle as zero.
- (e) Remove the metal plate put between the cold starting lever and thermo wax.
- (f) Torque the cold starting lever clockwise to approx. 50 kg-cm (43 in.-lb, 4.9 N-m) and keep the lever tightened for about 10 seconds. Then release the torque.

- (g) Measure the timer piston stroke.
- If not within specification, adjust with the timer adjusting screw.
- NOTE: Screw in for stroke decrease.

20. ADJUST FAST IDLE

- (a) Measure the clearance between the adjusting lever and idle speed adjusting screw.

Fuel temperature	Clearance
15°C (59°F)	1.5 mm (0.059 in.)
40°C (104°F)	0 mm (0 in.)

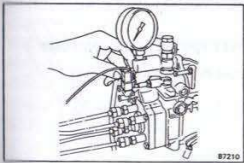
- (b) Adjust the fast idle adjusting screw.

FUEL SYSTEM —

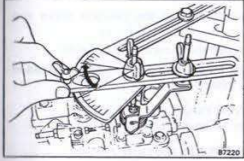
21. POS

(a)

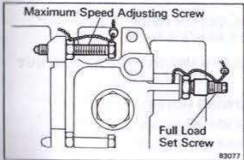
Pur



(b)



(c)



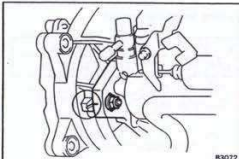
FU-52

FUEL SYSTEM — Injection Pump

INSTALLATION OF INJECTION PUMP
(See page FU-12)

1. INSTALL FUEL INLET PIPE TO INJECTION PUMP

2. INSTALL INJECTION PUMP REAR BRACKET



3. INSTALL INJECTION PUMP

(a) Align the matchmarks on the injection pump and water pump.

(b) Temporarily install the mount bolt and nuts.

NOTE: Torque the mount bolt and nut to specification after adjusting the injection timing.

4. INSTALL INJECTION PUMP DRIVE PULLEY
(See steps 4, 7 to 19 on pages EM-32 to 37)

5. INSPECT AND ADJUST INJECTION TIMING
(See page EM-20)

6. INSTALL FOUR INJECTION PIPES
(See steps 5 and 8 on pages FU-10 and 11)

7. INSTALL HEATER PIPE MOUNTING BOLT AND NUT
(FF Vehicles)

8. CONNECT FOLLOWING HOSES:

(a) A/C or heater idle-up vacuum hose

(b) Boost compensator hose (CV)

(c) No. 1 and No. 2 water by-pass hoses

(d) Fuel inlet and outlet hoses

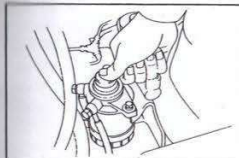
9. CONNECT FUEL CUT SOLENOID CONNECTOR

10. CONNECT THROTTLE CABLE TO INJECTION PUMP (w/ AT)

11. CONNECT ACCELERATOR CABLE TO INJECTION PUMP

12. FILL WITH COOLANT (See step 3 on page CO-3)

FUEL SYSTEM —



13. FILL
Oper

14. BLEE
(a)
(b)

15. STAI

16. CHEI
(See

17. RECI

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

27/27