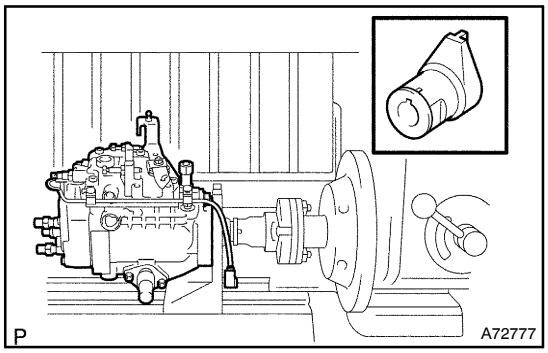
110PW–01

ADJUSTMENT

1. INSTALL INJECTION PUMP ASSY

(a) The specifications for test nozzle and nozzle holders are as follows.
Test nozzle: DN12SD12 (DENSO)
Test nozzle opening pressure:
14,220 – 15,200 kPa
(145 – 155 kgf/cm^2, 2,062 – 2,205 psi)

(b) Check the accuracy of the tachometer.
Allowable error: ± 40 rpm

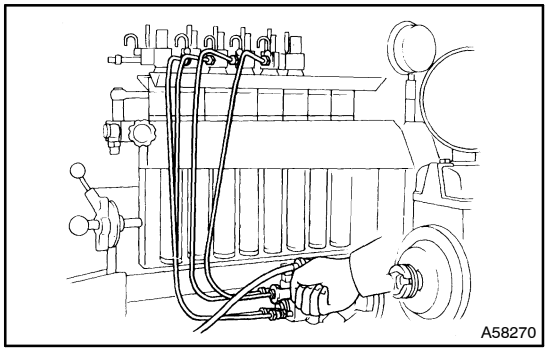


(c) Install the angle gauge stand.

(d) Mount the injection pump body on the pump tester.

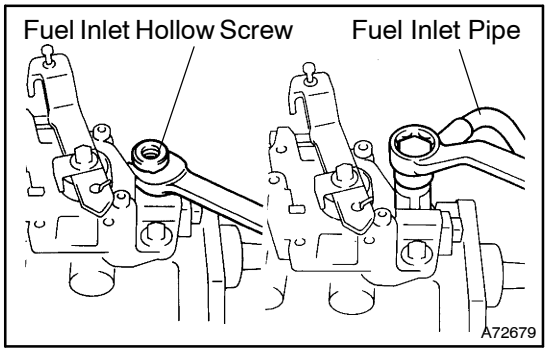
HINT:

Place a mark on the key groove portion of the coupling.



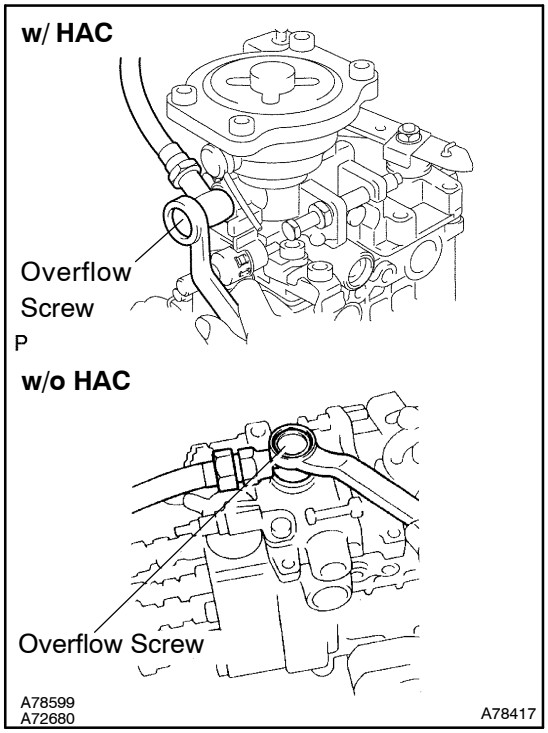
(e) Install an injection pipe with these specifications.

Outside diameter	6.0 mm (0.236 in.)
Inside diameter	2.0 mm (0.079 in.)
Length	840 mm (33.07 in.)
Minimum bending radius	25 mm (0.98 in.) or more



(f) Remove the fuel inlet hollow screw.

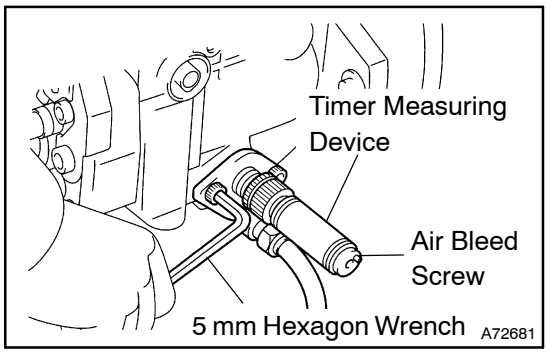
(g) Connect the fuel inlet pipe with an adapter.
Torque: 26.55 N·m (260 kgf·cm, 19 ft·lbf)



(h) Install an overflow hose with the 2 gaskets and an overflow screw.
Torque: 26.55 N·m (260 kgf·cm, 19 ft·lbf)

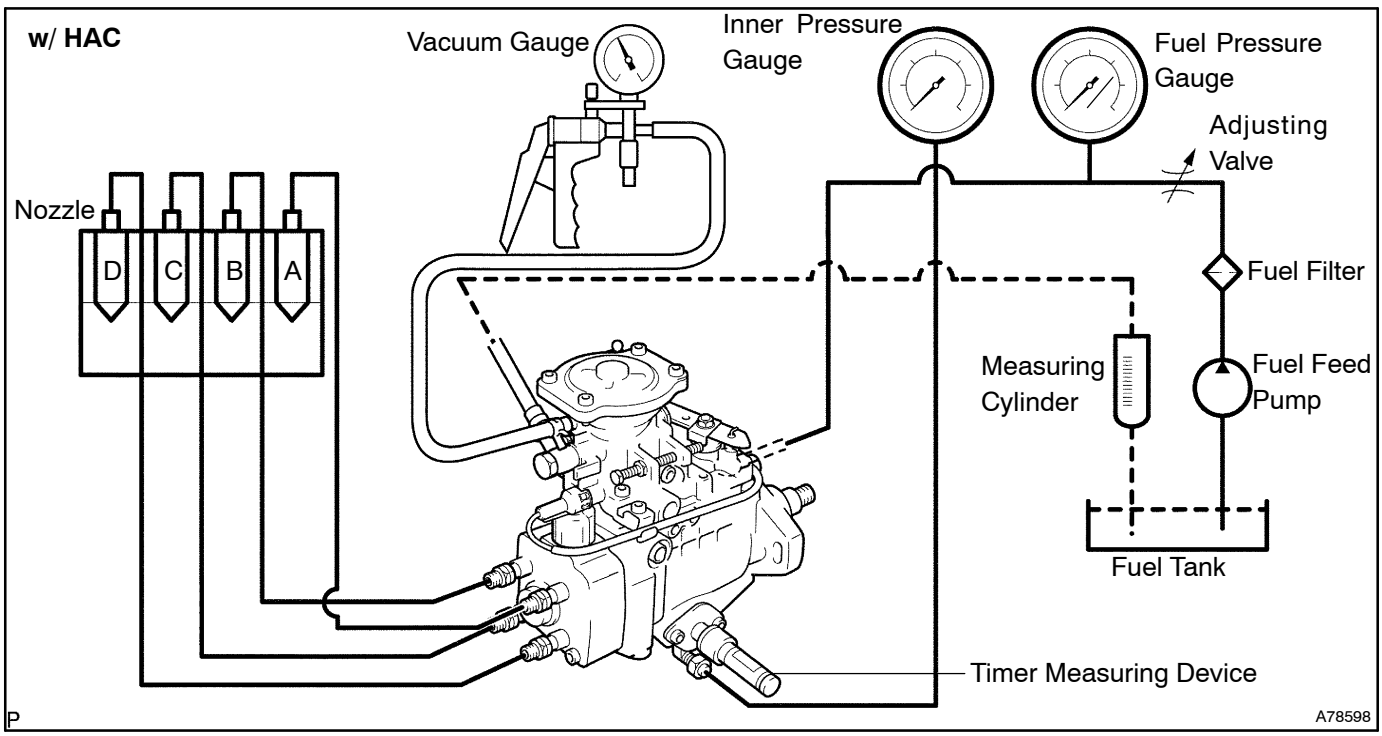
HINT:
Always use the overflow screw installed on the pump for adjustment.

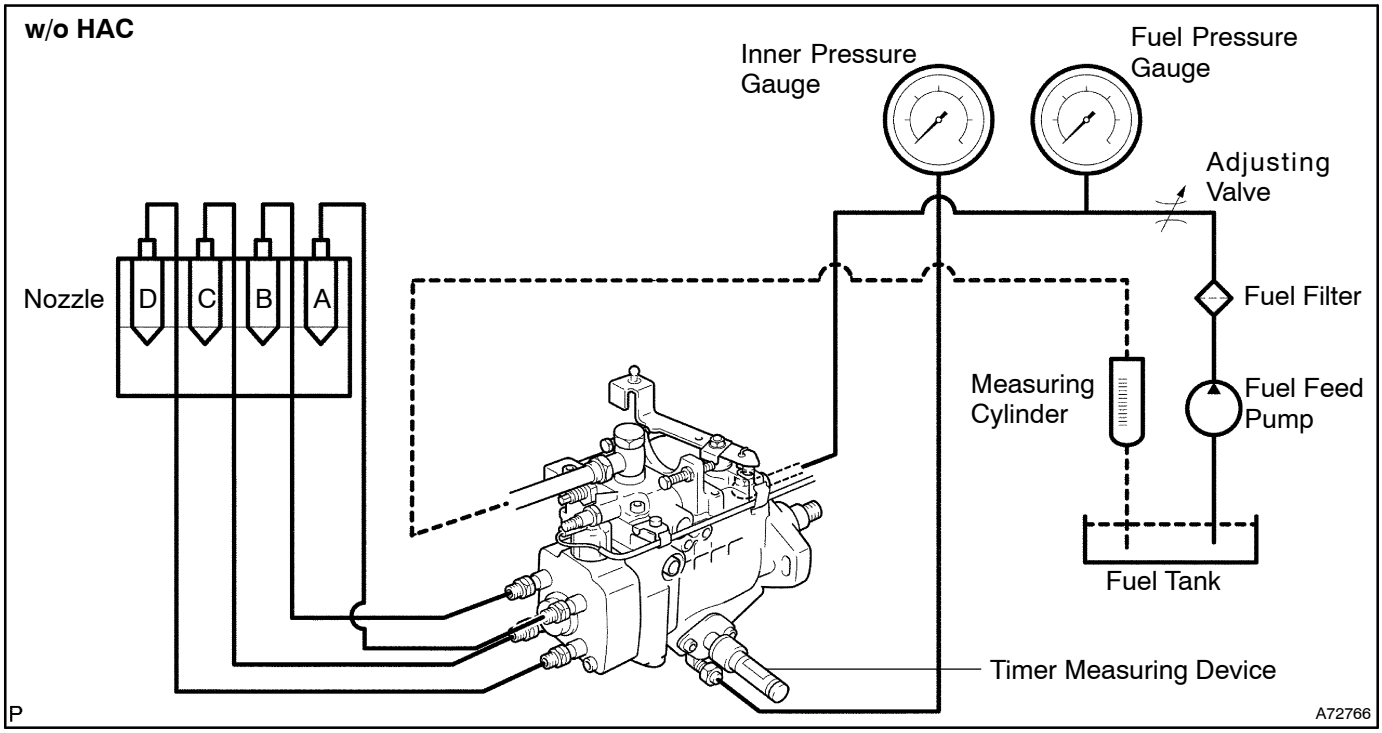
(i) Using a 5 mm hexagon wrench, remove the 2 bolts and RH timer cover.



(j) Install the inner pressure gauge with the timer measuring device.
Part No. 95095–10231, 95095–10480 (DENSO made)
Torque: 8.35 N·m (85 kgf·cm, 74 in.·lbf)

HINT:
Bleed the air by turning the air bleed screw.





(k) Apply about 6 V of DC power to the fuel cut solenoid.

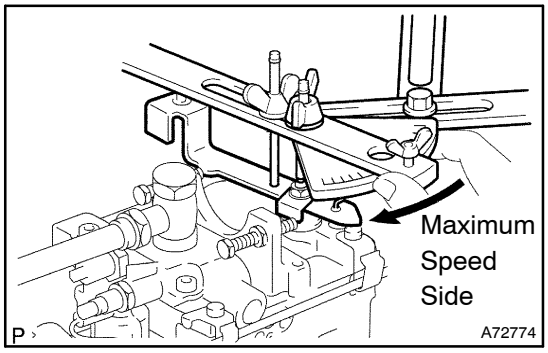
NOTICE:

- **When applying voltage to the solenoid, position the battery as far from the solenoid as possible so that spark does not occur.**
- **When connecting the battery cable, connect the solenoid side first.**

HINT:

Connect the battery through a 10 W bulb.

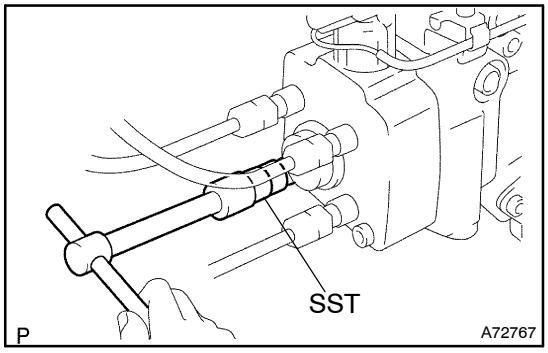
(l) Check that the pressure for feeding fuel to the injection pump is 20 kPa (0.2 kgf/cm^2, 2.8 psi) and that the fuel temperature for pump testing is 40 – 45°C (104 – 113°F).



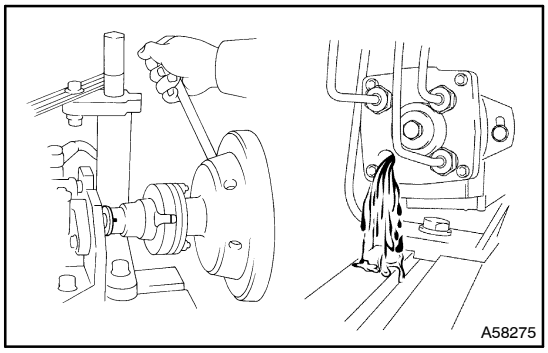
(m) Install an angle gauge to the stand, and set it to the adjusting lever.

Part No. 95095–10360 (Stand w/ angle gauge)

(n) Secure the adjusting lever fully on the maximum speed side.



(o) Check the installation direction of the camplate as follows:
(1) Disconnect the injection pipe from the position marked ”C” on the distributive head.
(2) Using SST, remove the delivery valve holder.
SST 09260–54012 (09269–54020)

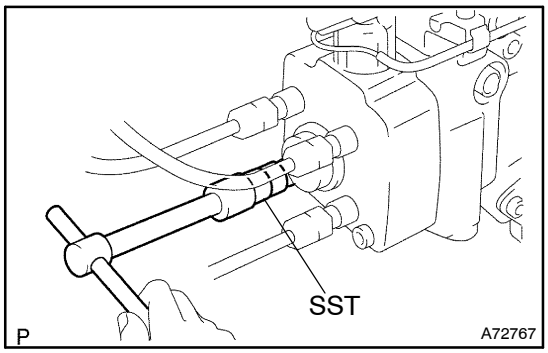


(3) Check that fuel flows out when the mark is in the position, as shown in the illustration.

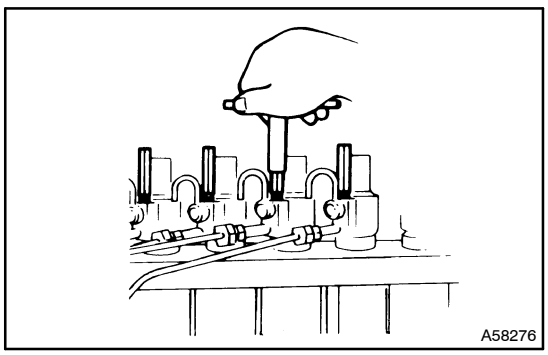
If not, it is improperly assembled.

(4) Disassemble and change the camplate position by turning 180˚ in the opposite direction.

HINT:
At this time, disconnect the fuel cut solenoid wire harness.



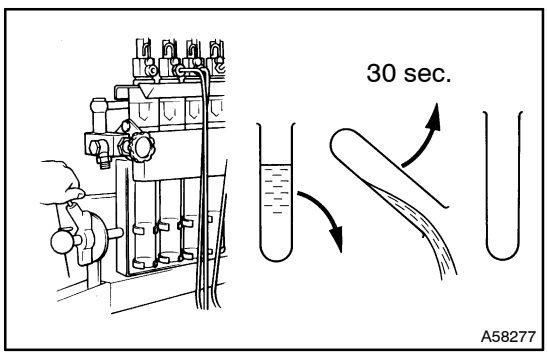
(5) Using SST, install the delivery valve holder.
SST 09260–54012 (09269–54020)
Torque: 58.85 N·m (600 kgf·cm, 43 ft·lbf)
(6) Connect the injection pipe.



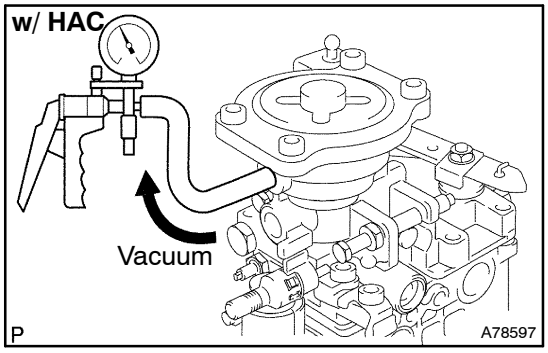
(p) Bleed air from the injection pipes.
(q) Race the injection pump for 5 minutes at 1,200 rpm.

HINT:
Replace the overflow screw with a hollow screw for this operation.

NOTICE:
Check that there is no fuel leakage or abnormal noise.



HINT:
- Using a measuring cylinder, measure the volume of each injection cylinder.
- Before measuring the injection volume, tilt the cylinder for at least 30 seconds to discard all the fuel.



2. INSPECT HIGH ALTITUDE COMPENSATOR FOR AIR TIGHTNESS

(a) Apply 73 kPa (548 mmHg, 21.56 in.Hg) of vacuum to the high altitude compensator.

(b) Measure how much time it takes for vacuum to drop to 72 kPa (540 mmHg, 21.26 in.Hg).

Vacuum drop: 5 sec. or more

3. SET FULL LOAD INJECTION VOLUME

(a) Set the adjusting lever to the maximum position.

(b) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

(c) Measure the injection volume.

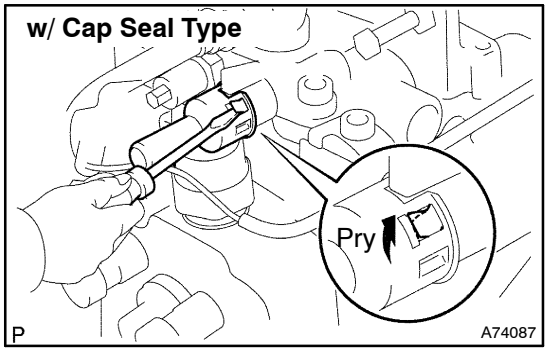
Injection volume:

w/ HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
1,100	200	13.0 – 13.6 (0.79 – 0.83)

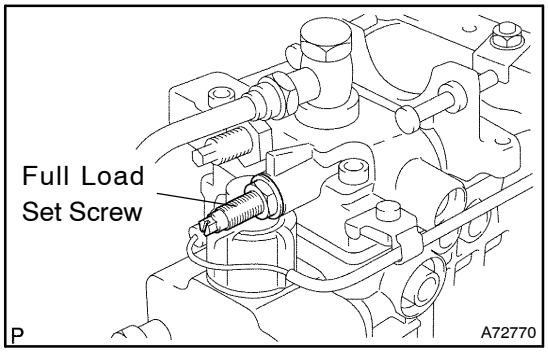
w/o HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
1,100	200	12.4 – 13.0 (0.76 – 0.79)



(d) w/ Cap seal type:
Remove the cap seal.
(1) Disconnect the dust cover from the fuel cut solenoid.
(2) Using a small screwdriver, pry the 4 claws.
(3) Remove the cap seal.

(e) w/ Wire seal type:
Cut off the wire seal.



(f) Adjust the injection volume by turning the full load set screw.

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

4. SET MAXIMUM SPEED

(a) Set the adjusting lever to the maximum position.

(b) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

(c) Measure the injection volume.

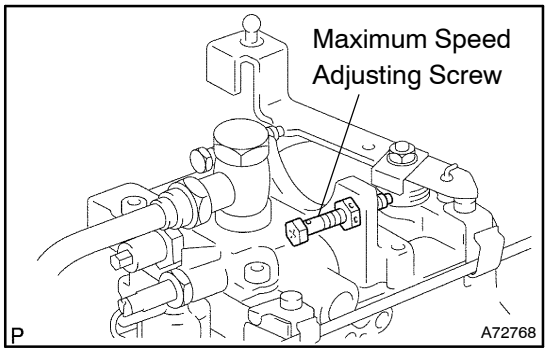
Injection volume:

w/ HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
2,075	200	3.4 – 5.8 (0.21 – 0.35)

w/o HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
2,075	200	1.8 – 4.2 (0.11 – 0.26)



(d) Cut off the seal wire.

(e) Adjust the injection volume with the maximum speed adjusting screw.

5. ADJUST PUMP INNER PRESSURE

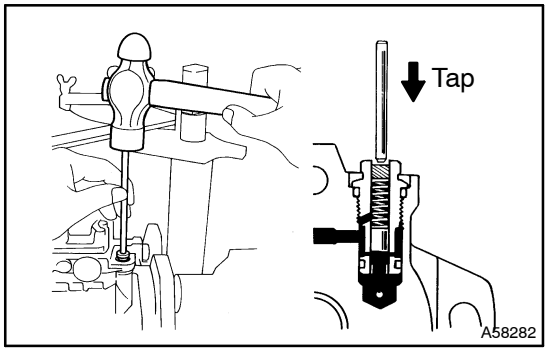
(a) Set the adjusting lever to the maximum position.

(b) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

(c) Measure the pump inner pressure at each pump rpm.

Pump inner pressure:

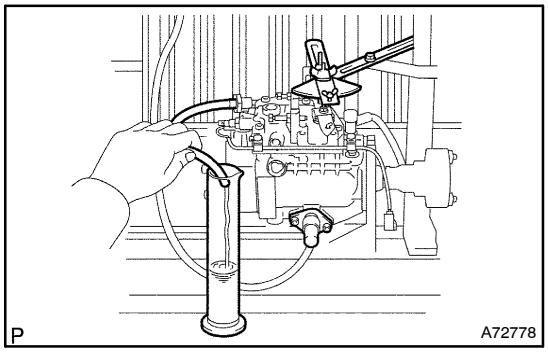
Pump rpm	Inner kPa (kgf/cm^2, psi)
400	216 – 275 (2.2 – 2.8, 31 – 40)
1,700	667 – 726 (6.8 – 7.4, 97 – 105)



When the pressure is low, adjust the pressure by lightly tapping the regulator valve piston while watching the pressure gauge.

HINT:

When the pressure is too high or the regulator valve is tapped excessively, replace the regulator valve.



6. INSPECT OVERFLOW VOLUME

(a) Set the adjusting lever to the maximum position.

(b) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

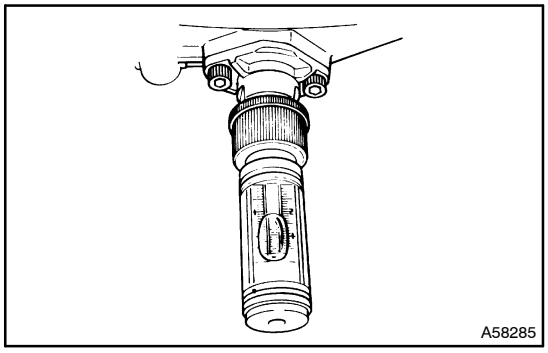
(c) Measure the overflow volume at the pump rpm.

Overflow volume:

Pump rpm	Overflow volume cc/min. (cu in./min.)
400	650 – 1,083 (39.7 – 66.1)

HINT:

Always use the overflow screw installed on the pump for adjustment.



7. ADJUST TIMER

(a) Set the timer measuring device at zero.

(b) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

(c) Measure the timer piston stroke at each rpm.

Timer piston stroke:

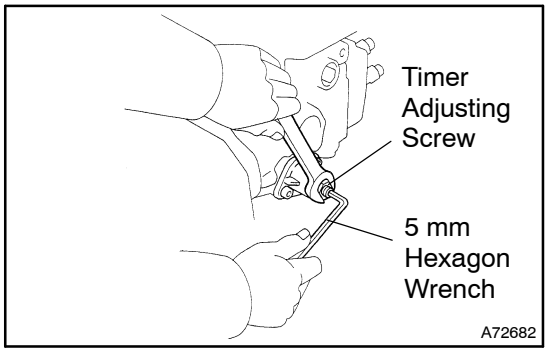
w/ HAC

Pump rpm	Piston stroke mm (in.)
1,000	0.20 – 1.20 (0.0079 – 0.0472)
1,400	3.20 – 4.20 (0.1260 – 0.1654)
1,700	4.76 – 5.24 (0.1874 – 0.2064)

w/o HAC

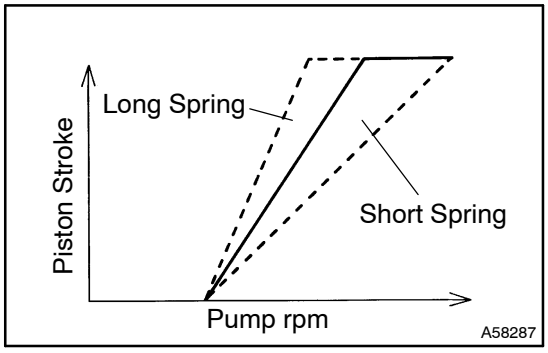
Pump rpm	Piston stroke mm (in.)
1,200	0.9 – 1.9 (0.0354 – 0.0748)
1,500	3.1 – 4.1 (0.1220 – 0.1614)
1,700	4.76 – 5.24 (0.1874 – 0.2064)

HINT:
Check that the hysteresis is within 0.3 mm (0.012 in.).

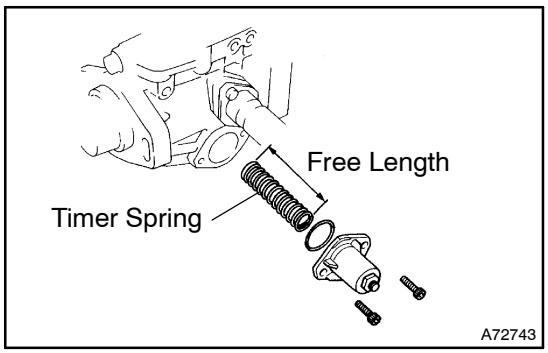


(d) Using a 5 mm hexagon wrench, adjust the timer by turning the timer adjusting screw.

HINT:
Turn the adjusting screw clockwise when reducing the stroke and turn it counterclockwise when increasing the stroke.



(e) Check the timer stroke for characteristic tendency.

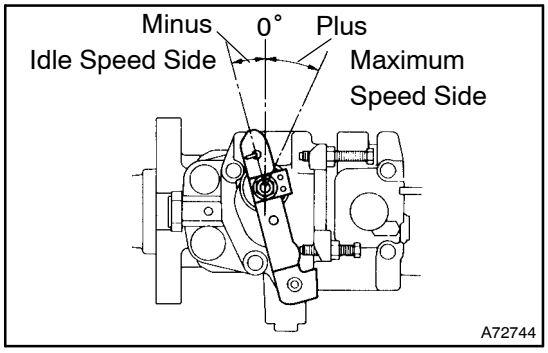


If the tendency is not as specified, select and replace the timer spring.

Timer spring free length:

56.5 mm (2.224 in.)	57.1 mm (2.248 in.)	57.8 mm (2.276 in.)

HINT:
The timer stroke increases with a long spring but decreases with a short spring.



8. ADJUST FULL LOAD INJECTION VOLUME

(a) Check that the adjusting lever angle for the adjustment below is as shown in the illustration.

Adjusting lever angle:

A (Maximum speed side)	B (Idle speed side)
Plus 21 – 31°	Minus 12 – 22°

(b) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

(c) Measure the full load injection volume.

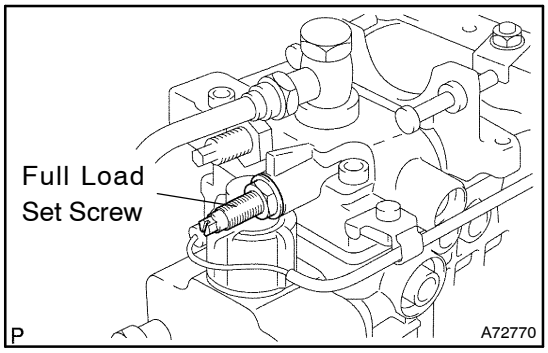
Injection volume:

w/ HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
1,100	200	13.0 – 13.6 (0.79 – 0.83)

w/o HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
1,100	200	12.4 – 13.0 (0.76 – 0.79)



(d) Adjust the injection volume by turning the full load set screw.

HINT:
The injection volume increases about 3 cc (0.18 cu in.) with each 1/2 turns of the screw.

9. ADJUST MAXIMUM SPEED

(a) w/ HAC:
Apply 97.3 kPa (730 mmHg, 28.73 in.Hg) of vacuum to the high altitude compensator.

(b) Measure the injection volume at each pump rpm.

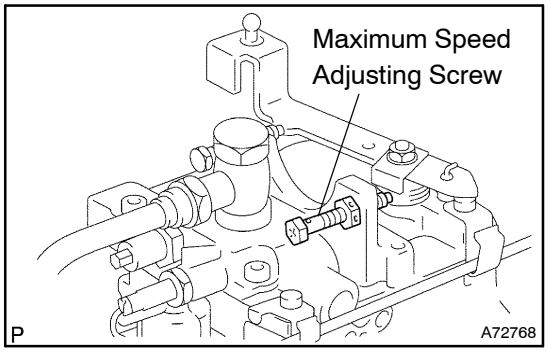
Injection volume:

w/ HAC

Adusting lever angle	Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)	Remark
Plus 21 – 31°	2,075	200	3.4 – 5.8 (0.21 – 0.35)	Adjust
	2,250	200	1.2 (0.07) or less	–

w/o HAC

Adusting lever angle	Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)	Remark
Plus 21 – 31°	2,075	200	1.8 – 4.2 (0.11 – 0.26)	Adjust
	2,250	200	1.2 (0.07) or less	–



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

10. INSPECT INJECTION VOLUME

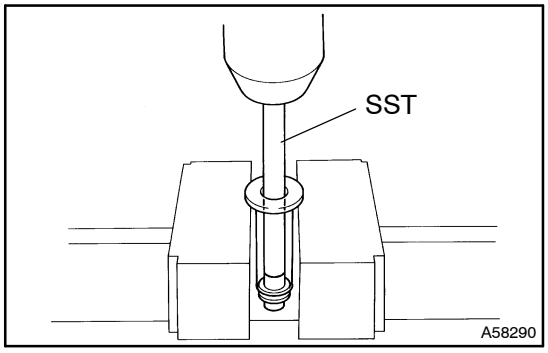
(a) Measure the injection volume at each pump rpm and HAC vacuum (w/ HAC).

Injection volume:
w/ HAC

Adjusting lever angle	Pump rpm	HAC vacuum kPa (mmHg, in.Hg)	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)	Variation limit cc (cu in.)	Remark
Plus 21 – 31°	100	97.3 (730, 28.73)	200	12.6 – 17.4 (0.77 – 1.06)	1.4 (0.09)	Volume during starting
	500	97.3 (730, 28.73)	200	9.3 – 10.9 (0.57 – 0.67)	0.7 (0.04)	–
	700	97.3 (730, 28.73)	200	10.6 – 12.2 (0.65 – 0.74)	0.7 (0.04)	–
	900	97.3 (730, 28.73)	200	12.1 – 13.7 (0.74 – 0.84)	0.7 (0.04)	–
	1,100	97.3 (730, 28.73)	200	13.0 – 13.6 (0.79 – 0.83)	0.7 (0.04)	Basic full load injection volume
		70.7 (530, 20.88)	200	7.8 – 9.8 (0.48 – 0.60)	–	–
	1,700	97.3 (730, 28.73)	200	10.0 – 11.6 (0.61 – 0.71)	0.7 (0.04)	–

w/o HAC

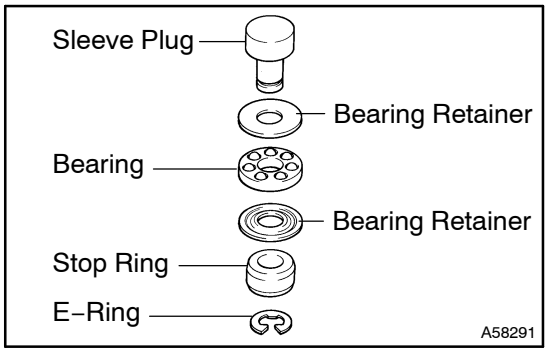
Adjusting lever angle	Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)	Variation limit cc (cu in.)	Remark
Plus 21 – 31°	100	200	12.6 – 17.4 (0.77 – 1.06)	1.4 (0.09)	Volume during starting
	500	200	9.1 – 10.3 (0.56 – 0.63)	0.7 (0.04)	–
	700	200	10.3 – 11.5 (0.63 – 0.70)	0.7 (0.04)	–
	900	200	11.7 – 12.9 (0.71 – 0.79)	0.7 (0.04)	–
	1,100	200	12.4 – 13.0 (0.76 – 0.79)	0.7 (0.04)	Basic full load injection volume
	1,700	200	10.5 – 11.7 (0.64 – 0.71)	0.7 (0.04)	–



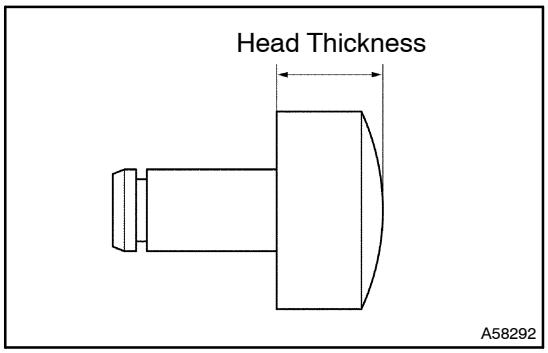
If the injection volume at 100 rpm is not as specified, replace the governor sleeve plus as follows:

(1) Using SST and a press, press out the sleeve plug assembly from the governor sleeve.

SST 09236–00101 (09237–00070)



(2) Remove the E–ring, stop ring, bearing and 2 bearing retainers from the sleeve plug.



(3) Measure the head thickness of the sleeve plug, and select a new sleeve plug.

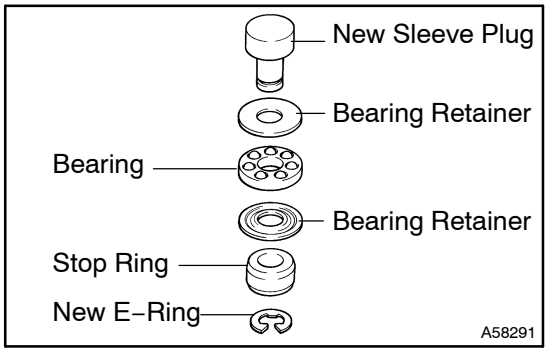
Governor sleeve plug head thickness:

3.0 mm (0.118 in.)	3.6 mm (0.142 in.)	4.2 mm (0.165 in.)
3.1 mm (0.122 in.)	3.7 mm (0.146 in.)	4.3 mm (0.169 in.)
3.2 mm (0.126 in.)	3.8 mm (0.150 in.)	4.5 mm (0.177 in.)
3.3 mm (0.130 in.)	3.9 mm (0.154 in.)	4.7 mm (0.185 in.)
3.4 mm (0.134 in.)	4.0 mm (0.157 in.)	–
3.5 mm (0.138 in.)	4.1 mm (0.161 in.)	–

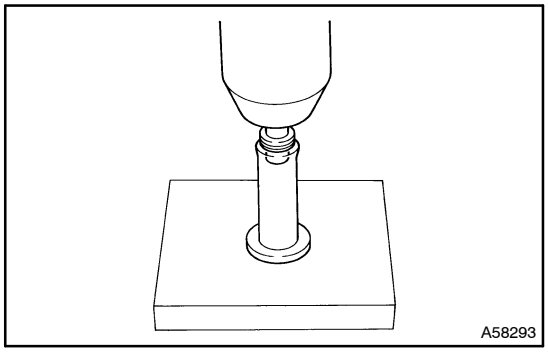
HINT:

Lengthening the plug by 0.1 mm (0.004 in.) will decrease injection volume by 0.6 cc (0.04 cu in.).

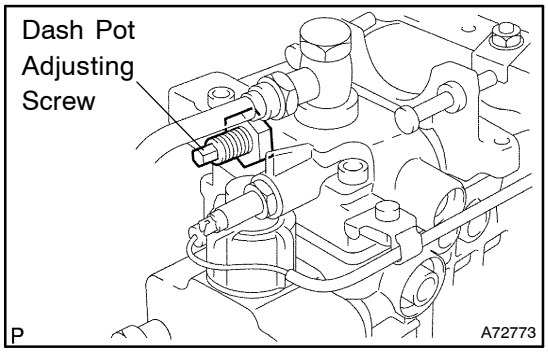
If the variation limit is greater than that specified, replace the delivery valve.



(4) Install the bearing, 2 retainers and stop ring to the new sleeve plug with a new E–ring.



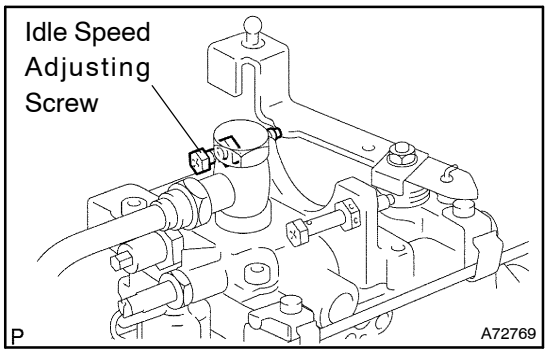
(5) Using a press, press in the sleeve plug assembly to the governor sleeve.



11. ADJUST IDLE SPEED

(a) Using pliers, remove the dash pot collar.

(b) Fully loosen the dash pot adjusting screw.



(c) Pre–set idle speed:
Adjust the injection volume by turning the idle speed adjusting screw.

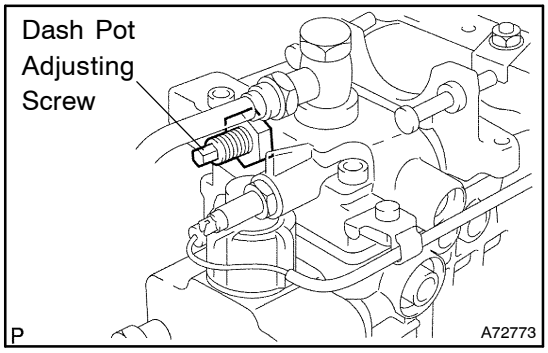
Injection volume:

w/ HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
325	200	q = 3.8 – 4.2 (0.23 – 0.26)

w/o HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
350	200	q = 4.0 – 4.4 (0.24 – 0.27)



(d) Adjust the injection volume by turning the dash pot adjusting screw.

HINT:

The stroke decreases with clockwise turn and increases with counterclockwise turn.

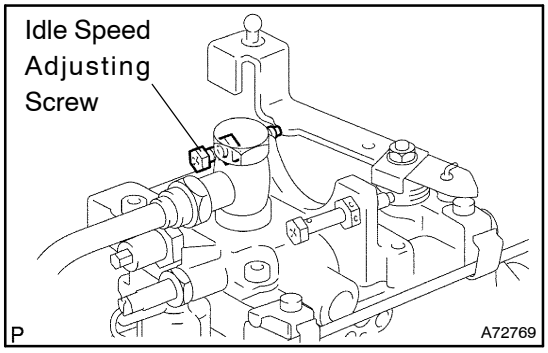
Injection volume:

w/ HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
325	200	q plus 0.14 – 0.46 (0.01 – 0.03)

w/o HAC

Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)
350	200	q plus 0.14 – 0.46 (0.01 – 0.03)



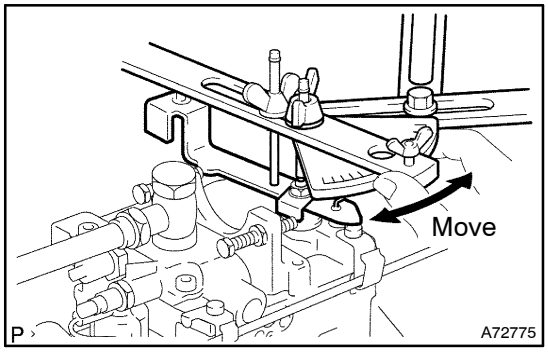
(e) Adjust the injection volume by turning the idle speed adjusting screw.

Injection volume:
w/ HAC

Adjusting lever angle	Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)	Variation limit cc (cu in.)
Minus 12 – 22°	325	200	1.1 – 2.7 (0.07 – 0.16)	0.5 (0.03)

w/o HAC

Adjusting lever angle	Pump rpm	No. of measuring strokes	Injection volume of each cylinder cc (cu in.)	Variation limit cc (cu in.)
Minus 12 – 22°	350	200	1.3 – 2.9 (0.08 – 0.18)	0.5 (0.03)

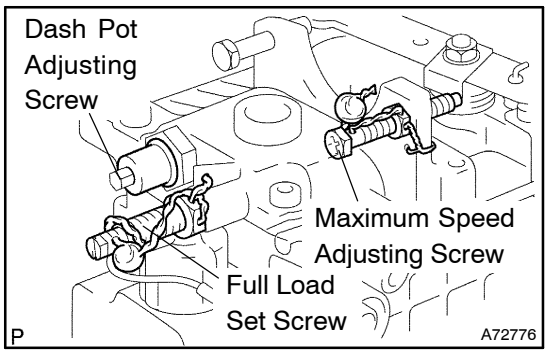


12. INSPECT ADJUSTING LEVER SUB–ASSY

(a) Check that the injection stops when the fuel cut solenoid harness is removed.
Pump revolution: 100 rpm

(b) Check the adjusting lever movement.
Adjusting lever angle: 38 – 48°

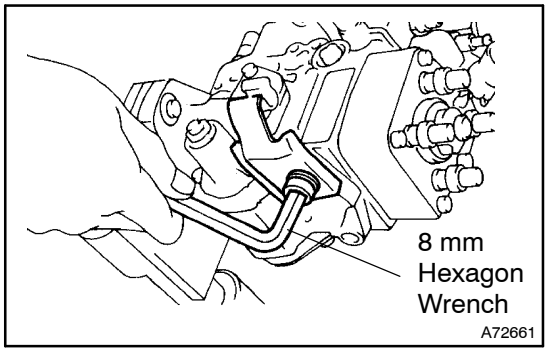
13. REMOVE INJECTION PUMP ASSY FROM TESTER



14. FIX PARTS

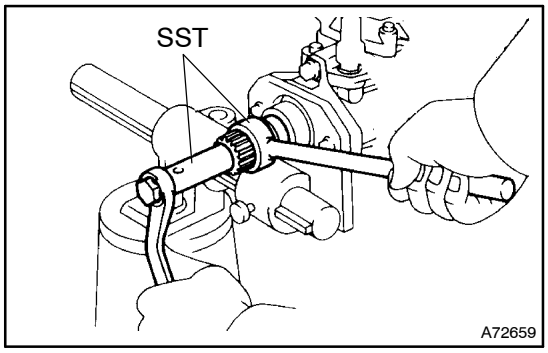
(a) Seal the full load set screw and maximum speed adjusting screw with new lead seals.

(b) Seal the dash pot adjusting screw with a new collar.



15. INSTALL FUEL PIPE CLAMP

(a) Using an 8 mm hexagon wrench, install the clamp with the plate washer and bolt.
Torque: 21.55 N·m (220 kgf·cm, 16 ft·lbf)



16. INSTALL SPLINE SHAFT

(a) Align the set key groove of the spline shaft with the set key.

(b) Using SST, install the spline shaft with the round nut.
SST 09260–58010 (09266–76011, 09278–46020)
Torque: 84.3 N·m (860 kgf·cm, 62 ft·lbf)