Installation and Adjustment (Cont'd)

(3) Turn crankshaft clockwise until No. 1 piston is set at T.D.C.

(4) Read dial gauge indication.

TD23:
0.54±0.02 mm (0.0213±0.0008 in)
(equivalent to 5° B.T.D.C.)

TD27:
0.65±0.02 mm (0.0256±0.0008 in)
(equivalent to 5° B.T.D.C.)

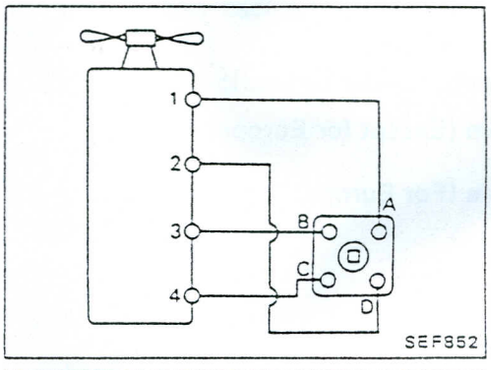
(5) If it is not within the above range, turn pump body until it comes within standard range.

a. If indication is smaller than the specified value, turn pump body counterclockwise.

b. If indication is larger than the specified value, turn pump body clockwise.

4. Tighten injection pump securely.

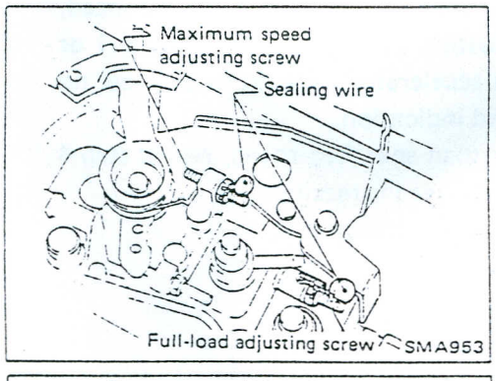
: Injection pump fixing bolt
19 - 25 N·m (1.9 - 2.5 kg-m, 14 - 18 ft-lb)
Injection pump to mounting bracket
30 - 41 N·m (3.1 - 4.2 kg-m, 22 - 30 ft-lb)



5. Disconnect dial gauge and reinstall plug bolt with new washer.
: 14 - 20 N·m (1.4 - 2.0 kg-m, 10 - 14 ft-lb)

6. Connect injection tubes.
: Flare nut
20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

7. Bleed air from fuel system.



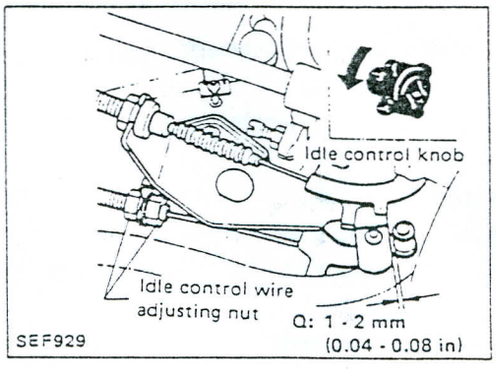
IDLE AND MAXIMUM SPEED ADJUSTMENT

CAUTION:

a. Do not remove sealing wires unless absolutely necessary.

b. Disturbing full-load adjusting screw will change fuel flow characteristics, resulting in an improperly adjusted engine. Readjustment of fuel injection pump should be done using a pump tester.

c. If maximum speed adjusting screw is turned in direction that increases control lever angle, engine damage may result.



Throttle control wire adjustment

1. Turn idle control knob fully counterclockwise.
2. Make sure that clearance between idle control lever pin and fuel injection pump control lever is within the specified range.

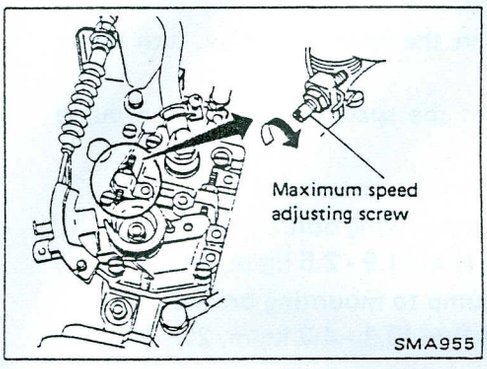
Clearance:
1 - 2 mm (0.04 - 0.08 in)

3. If not within the specified range, adjust with idle control wire adjusting nut.
4. After adjusting clearance, tighten lock nut.

Installation and Adjustment (Cont'd)

Idle adjustment

Refer to MA section.



Maximum speed adjustment

Maximum speed adjusting screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it becomes necessary to adjust it, the following procedure should be followed:

1. Start engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer's pick-up to No. 1 fuel injection tube.

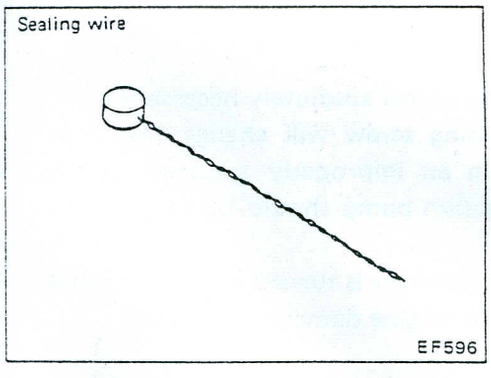
To obtain accurate reading of engine rpm, remove clamps that secure No. 1 fuel injection tube.

3. Depress accelerator pedal fully under no load and, at this point, read the tachometer indication.

Maximum engine speed (Under no load):

$5{,}100\ ^{+50}_{-150}$ rpm (Except for Europe)

$5{,}100\ ^{+50}_{-150}$ rpm (For Europe)



4. If indication is lower than specified maximum engine speed, turn maximum speed adjusting screw counterclockwise 1 or 2 rotations. Then depress accelerator pedal to floor under no load and, at this point, read indication.
5. If indication is still lower than specified speed, repeat step 4 above until specified engine speed is reached.
6. After adjustment, tighten lock nut securely.
7. Wind up with a sealing wire.

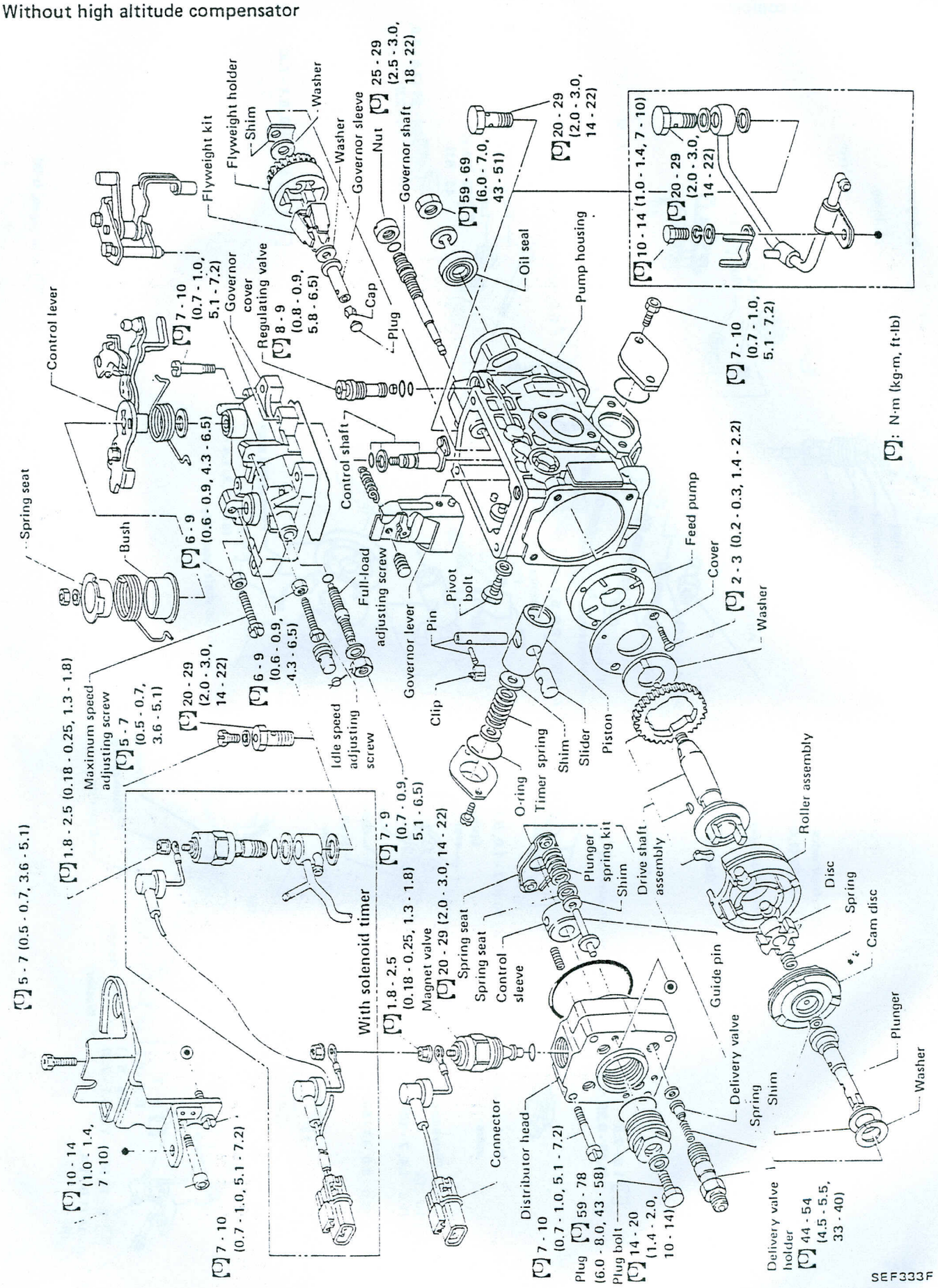
Disassembly

PREPARATION

- Before performing disassembly and adjustment, test the fuel injection pump and note test results.
- Prior to beginning disassembly of fuel injection pump, clean all dust and dirt from its exterior.
- Disconnect overflow valve and drain fuel.
- Clean work bench completely, removing all foreign matter.
- Collect only those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.

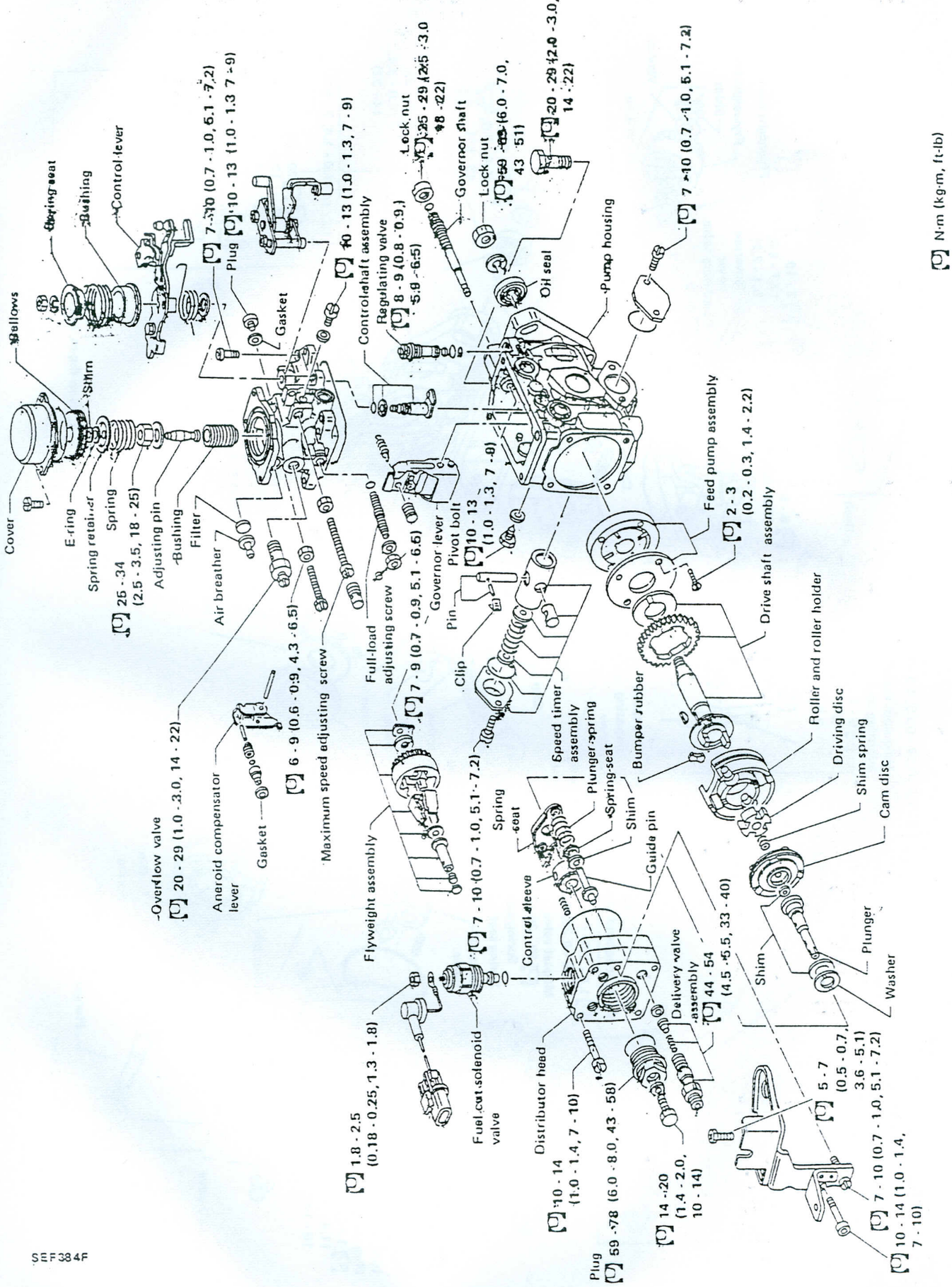
Disassembly (Cont'd)

Without high altitude compensator



Disassembly (Cont'd)

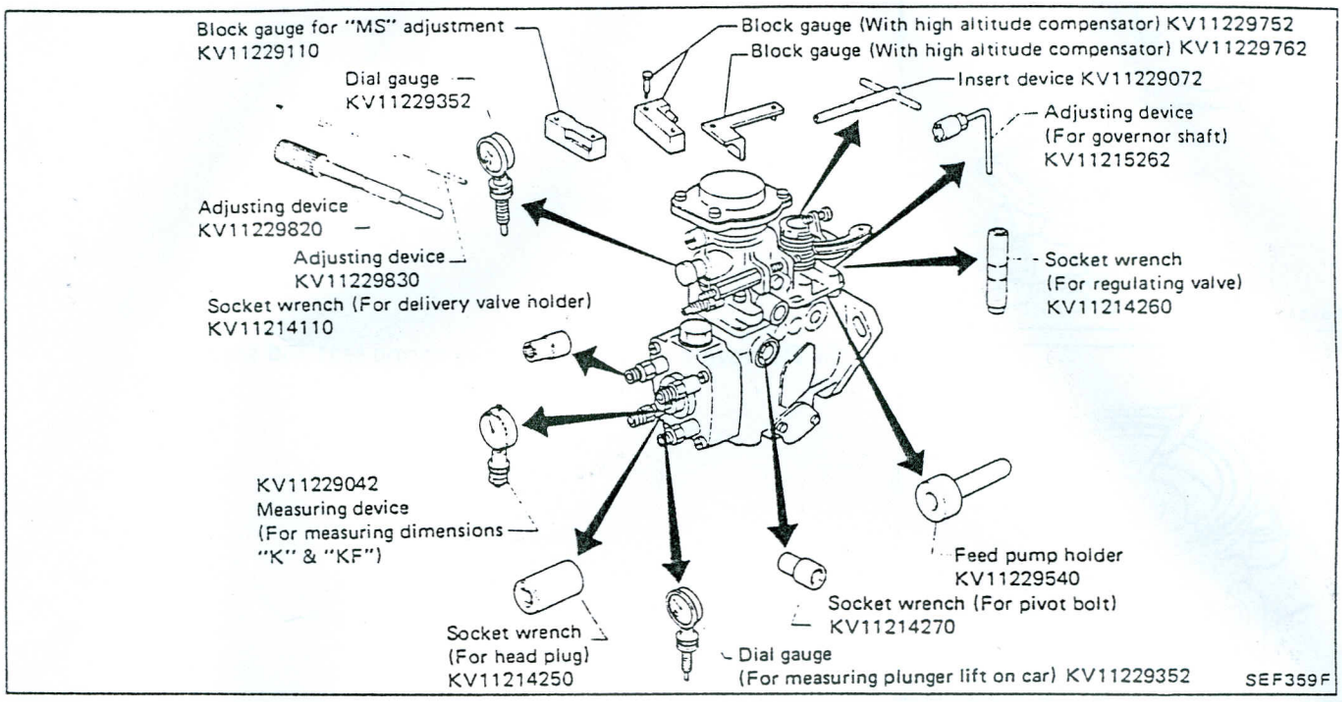
With high altitude compensator

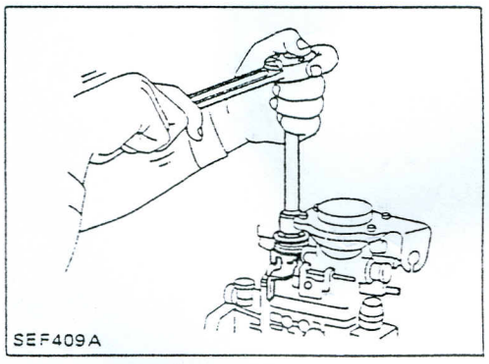


SEF384F

Disassembly (Cont'd)

SPECIAL SERVICE TOOLS

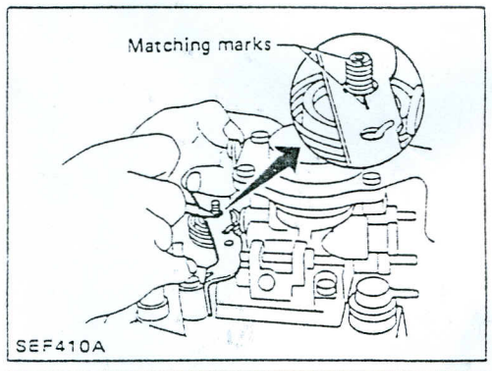




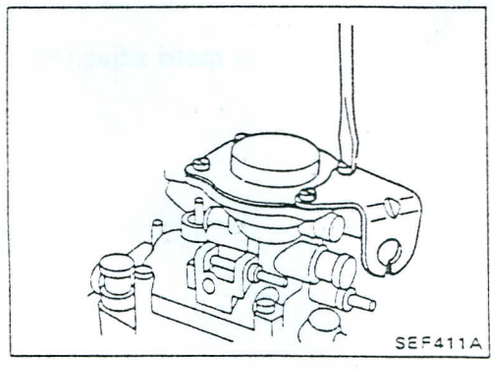
1. Remove pump cover.

With high altitude compensator

(1) Remove nut, spring washer, spring seat and spring from control lever.



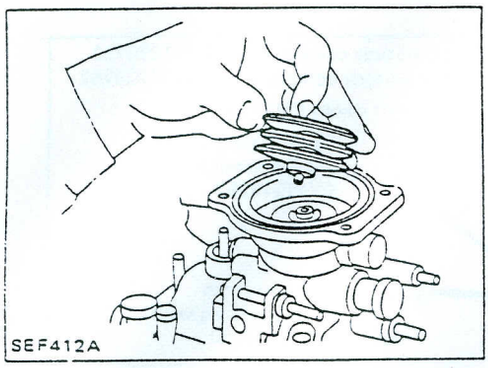
(2) Draw aligning marks on control lever and control shaft.



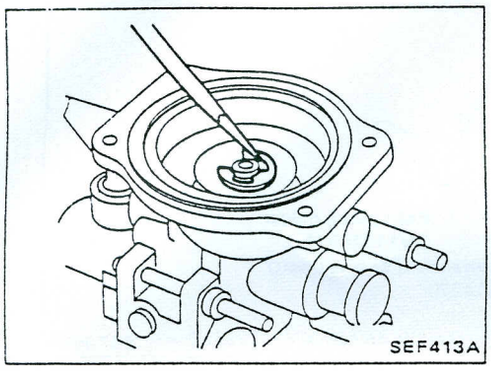
(3) Remove compensator cover.

Disassembly (Cont'd)

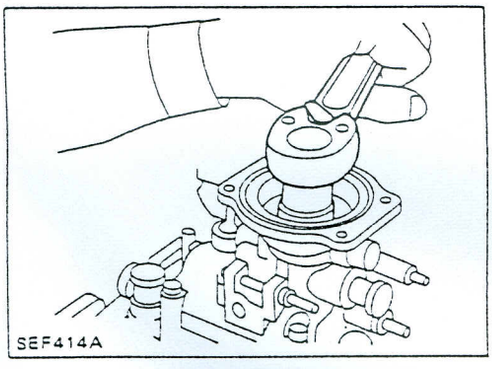
(4) Remove bellows and adjusting shim.


SEF412A

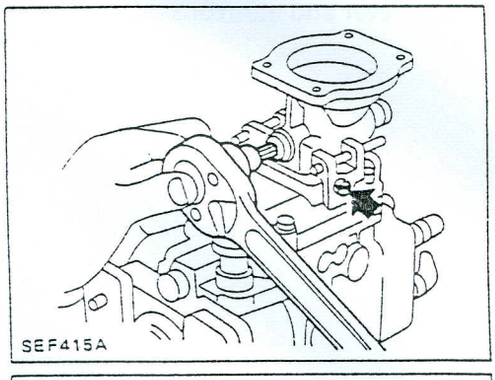
(5) Remove E-ring, then remove spring seat and spring.


SEF413A

(6) Loosen nut.

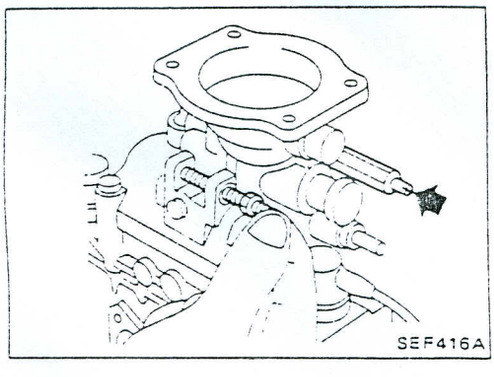

SEF414A

(7) Remove governor cover plugs.


SEF415A

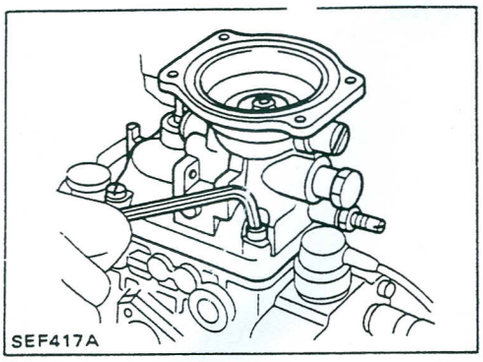
(8) Remove governor cover.

a. Remove sealing wire and idle and maximum speed adjusting screws.

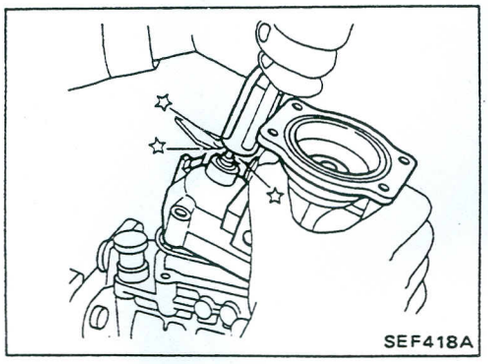

SEF416A

Disassembly (Cont'd)

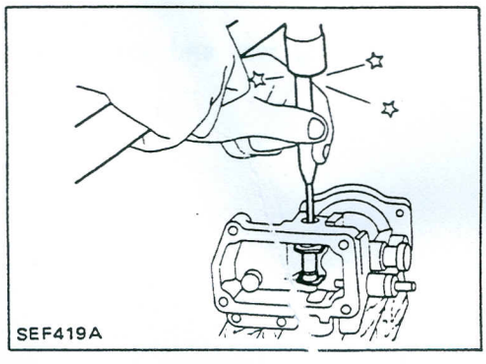
b. Remove governor cover fixing bolts and screws.
Use hexagon wrench.


SEF417A

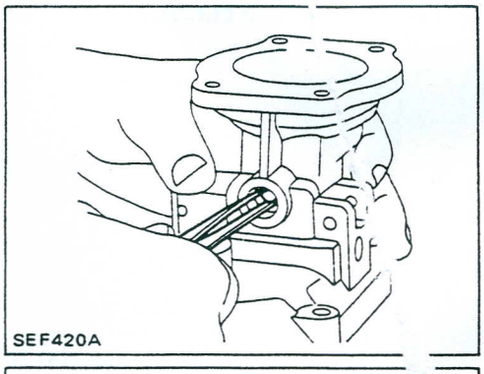
c. Move control shaft down by lightly tapping on the end with a wooden block.


SEF418A

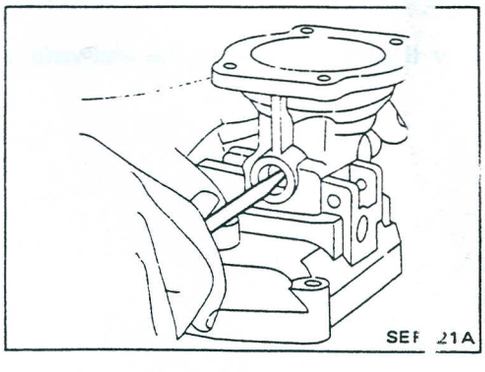
(9) Remove high altitude compensator parts.
a. Remove plugs.
b. Remove lever pin and lever using suitable drift.


SEF419A

c. Remove plug and pin.

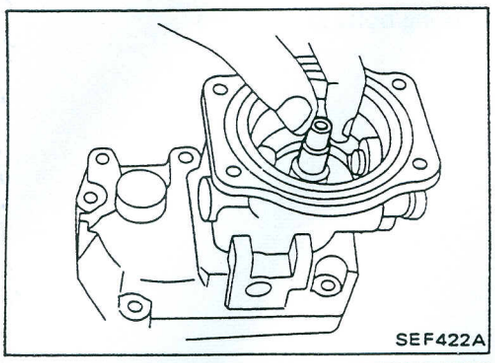

SEF420A

d. Remove retainer, sleeve and washer.
Use a suitable screwdriver to remove retainer.

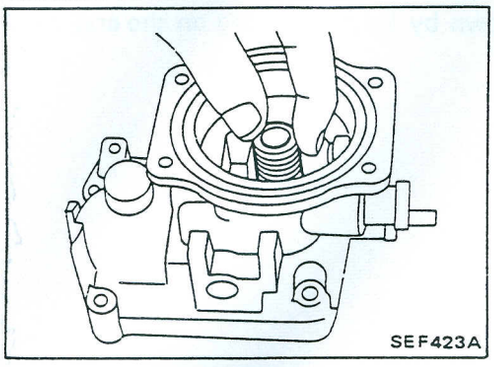

SEF421A

Disassembly (Cont'd)

e. Remove nut and adjusting rod.

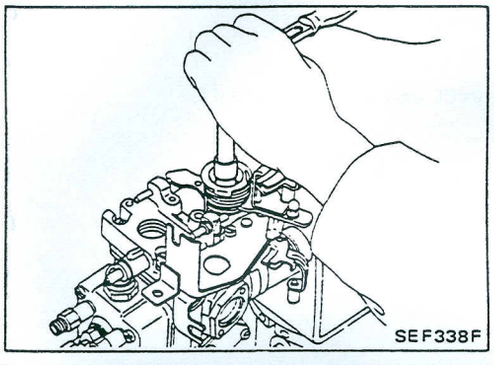

SEF422A

f. Remove bushing.

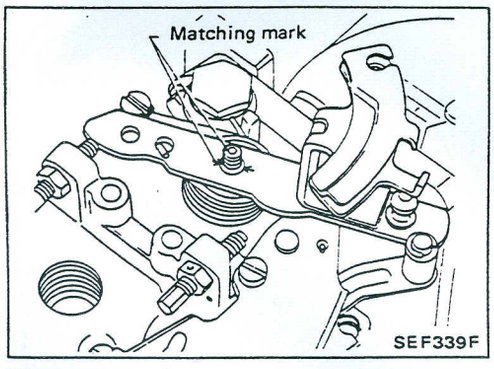

SEF423A

Without high altitude compensator

(1) Remove nut, spring washer, spring seat and spring from control lever.


SEF338F

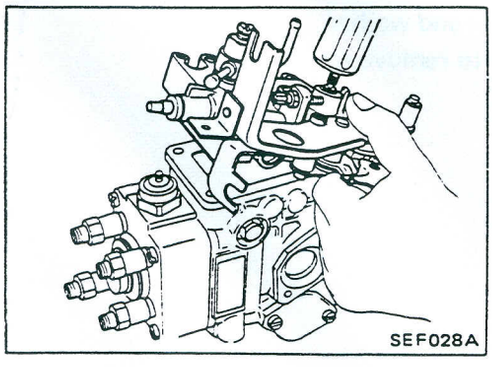
(2) Check aligning marks on control lever and control shaft.



SEF339F

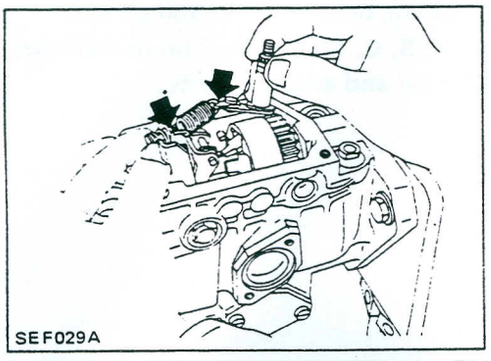
(3) Remove pump cover.

Move control shaft down by lightly tapping on the end with a wooden block.

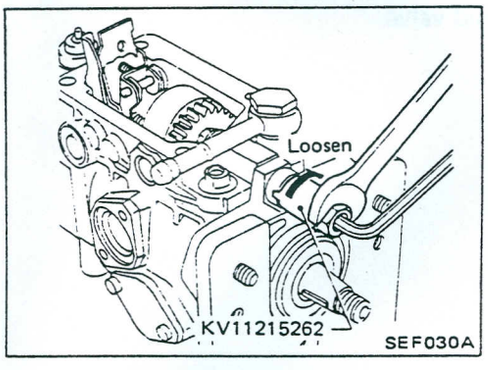

SEF028A

Disassembly (Cont'd)

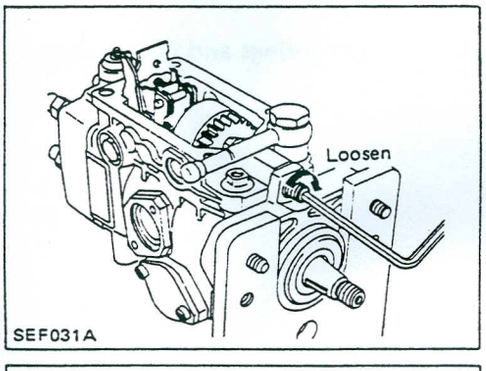
2. Remove control shaft from tension lever.


SEF029A

3. Remove governor shaft with special service tool.
Loosen lock nut by turning it clockwise.

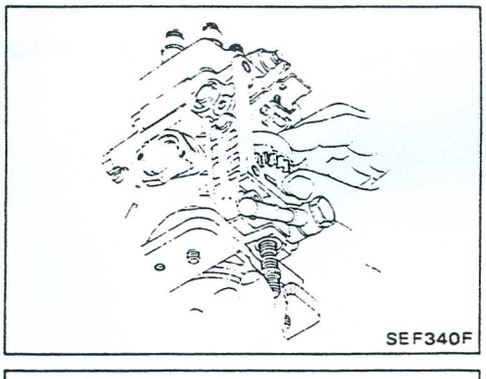


SEF030A

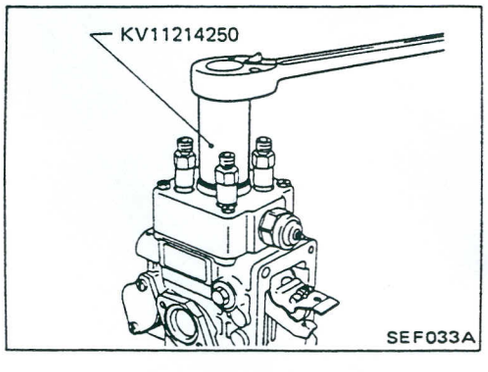


SEF031A

4. Remove governor sleeve, washer and flyweight, along with flyweight holder, then remove washer and shims.

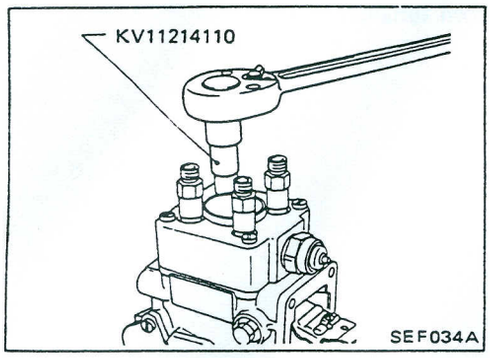

SEF340F

5. Remove plug with special service tool.



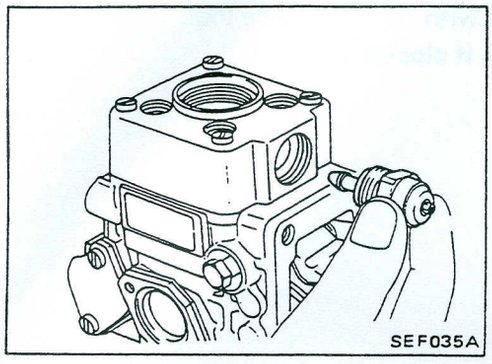
SEF033A

Disassembly (Cont'd)

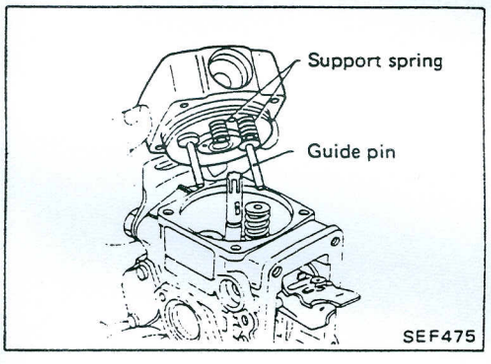


6. Remove delivery holder, spring, delivery valve and gasket.

Distributor head has letters (A, B, C, D) stamped on it. Remove lettered parts in alphabetical order and arrange neatly.

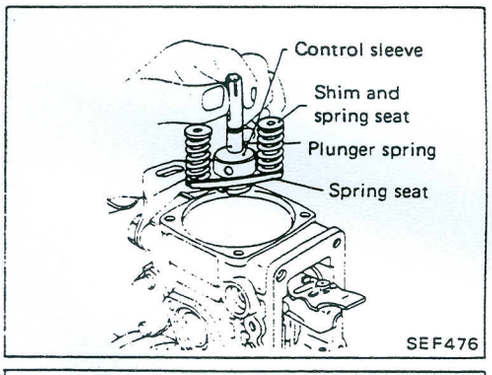


7. Remove fuel-cut solenoid valve.



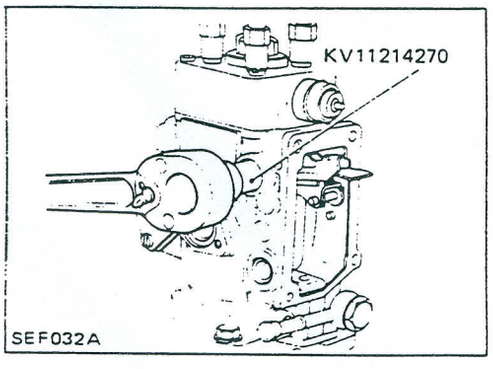
8. Remove distributor head.

Be careful not to drop the two support springs and guide pins.



9. Remove plunger assembly.

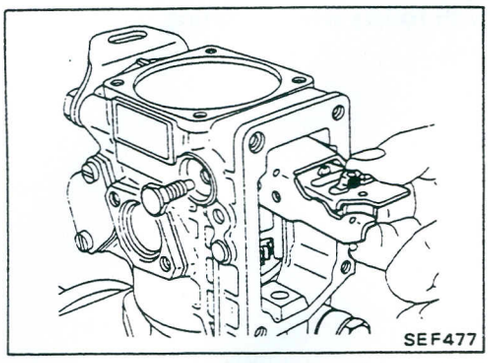
Lift plunger, along with control sleeve, shim, spring seat, plunger spring, washer and shim.



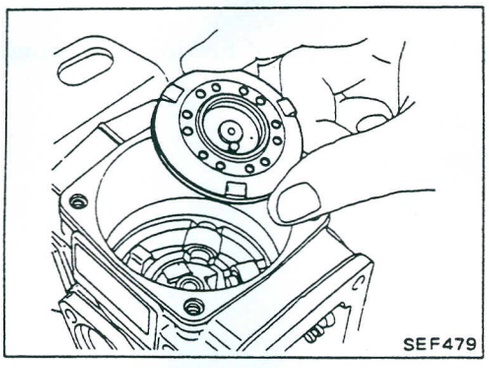
10. Loosen left and right governor pivot bolts.

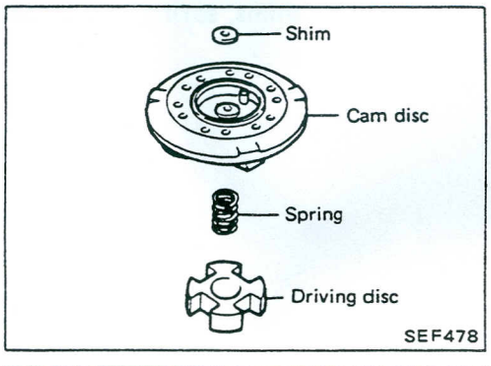
Disassembly (Cont'd)

11. Remove governor pivot bolts and lever assembly.
Avoid pulling on start spring and start idle spring.


SEF477

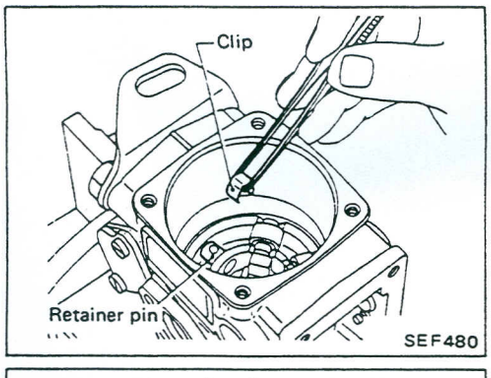
12. Remove shim, cam disc, spring and driving disc.


SEF479



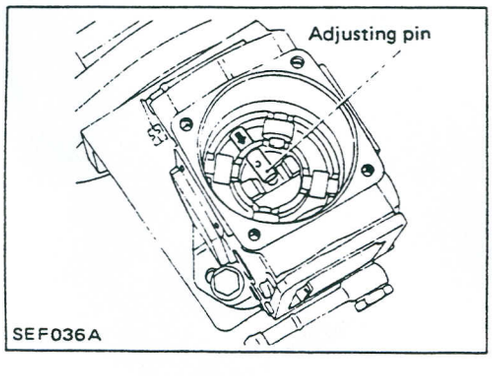
SEF478

13. Remove clips and pins.



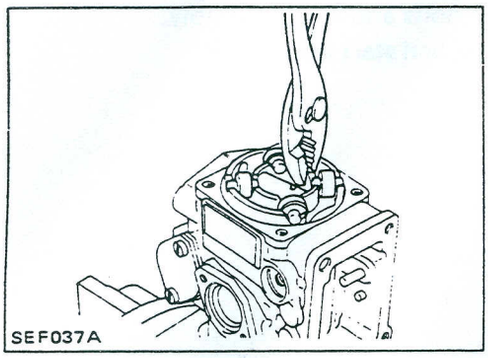
SEF480

14. Move adjusting pin to center of roller holder, as shown.

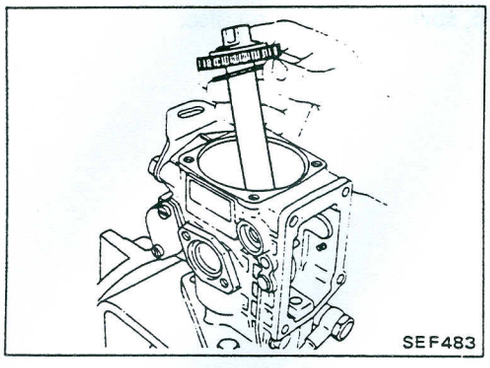


SEF036A

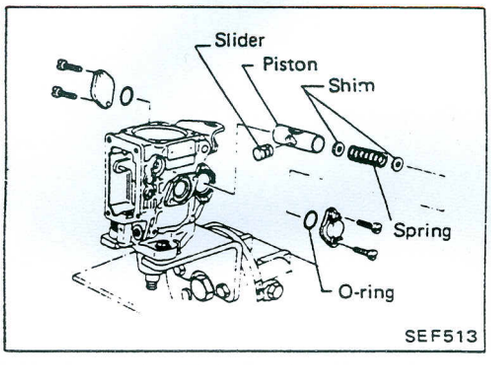
Disassembly (Cont'd)


SEF037A

15. Lift out roller holder with rollers without tilting.
Be careful not to drop rollers.

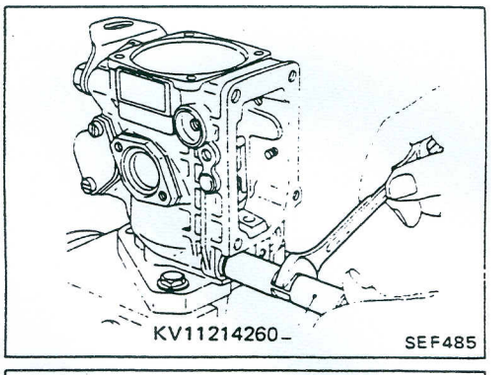

SEF483

16. Remove drive shaft.
a. **Be careful not to scratch inner surface of fuel injection pump body.**
b. **Remove drive gear side key.**
c. **Be careful not to drop the key.**



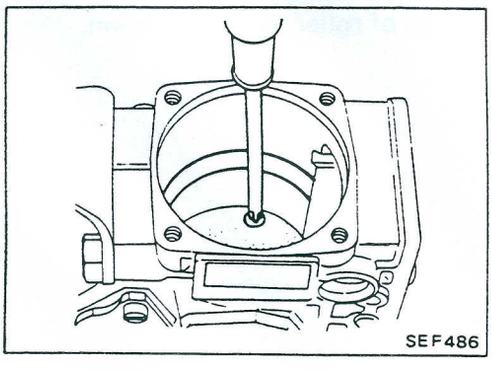
SEF513

17. Remove speed timer cover, O-ring, shims, spring, piston and slider.



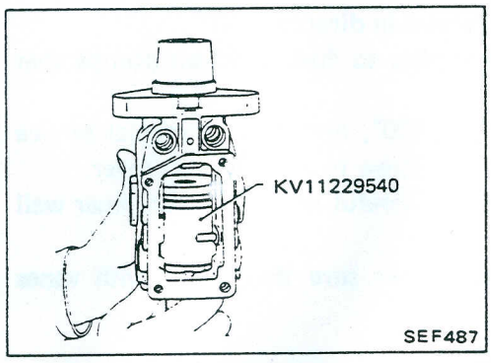
SEF485

18. Remove regulating valve with special service tool.


SEF486

19. Loosen screw from feed pump cover.

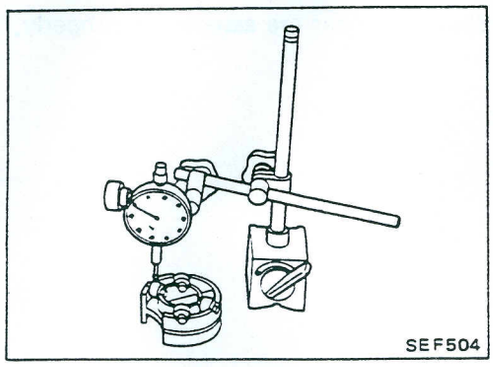
Disassembly (Cont'd)



20. Remove cover and feed pump assembly as a unit.
1) Insert feed pump holder (KV11229540) into fuel injection pump housing.
2) Turn injection pump upside down, as shown.
3) Remove cover and feed pump assembly as a unit.

a. If cover and feed pump assembly are hard to remove or stuck midway, strike the pump body lightly.

b. Do not change positions of vanes.



Inspection

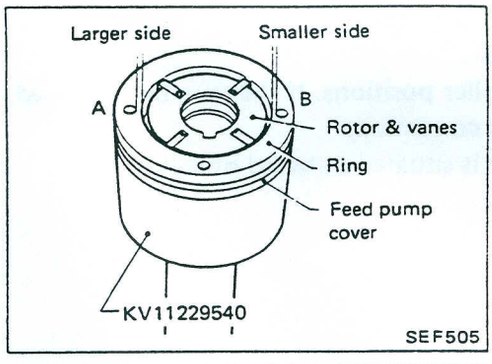
1. Wash all parts completely.
2. Replace worn or damaged parts.
3. Control edge of plunger must be sharp and contact surfaces must not exhibit any noticeable running tracks. If the condition is not good, replace plunger.
4. Check for height of all rollers.

Difference in maximum and minimum roller height should be less than 0.02 mm (0.0008 in).

Assembly

Always replace the following service parts as assembly units.

- Distributor head, control sleeve and plunger
- Feed pump assembly (pump impeller and vanes with eccentric ring)
- Plunger spring kit
- Roller assembly
- Flyweight kit
- Governor lever assembly

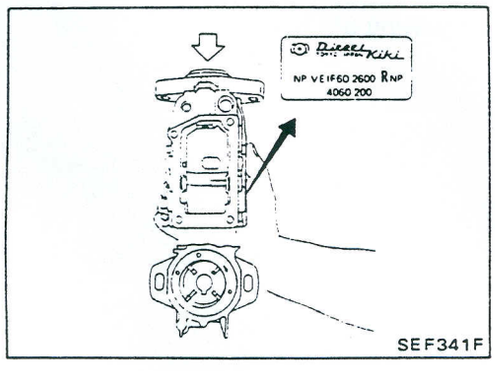


PREPARATION

Dip all movable parts and O-rings in test oil, then clean.

1. Set feed pump cover, rotor with vanes, and ring on special service tool KV11229540.

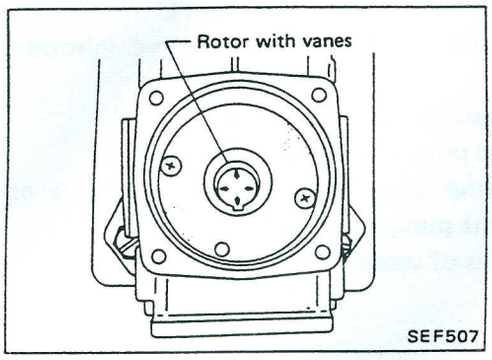
1) Align the three holes in feed pump cover and ring.
2) Do not change positions of vanes.
3) Holes A and B in ring are not equally spaced to inner wall of ring.



2. Install feed pump cover, rotor with vanes, and ring to pump housing.

Be careful to install ring correctly. If left and right are reversed, fuel will not be discharged from feed pump.

Assembly (Cont'd)



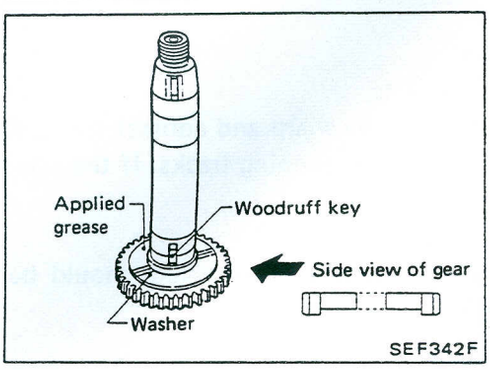
When fuel injection pump rotates in direction "R"

The following description applies to fuel injection pumps that rotate in direction "R".

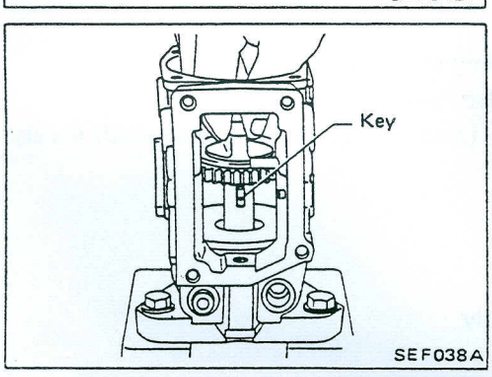
3. Turn fuel injection pump 180°, and remove special service tool KV11229540. Tighten screw to retain pump cover.

a. **When tightening screws, be careful not to scratch inner wall of pump housing.**

b. **After tightening screws, make sure that rotor with vanes moves smoothly.**

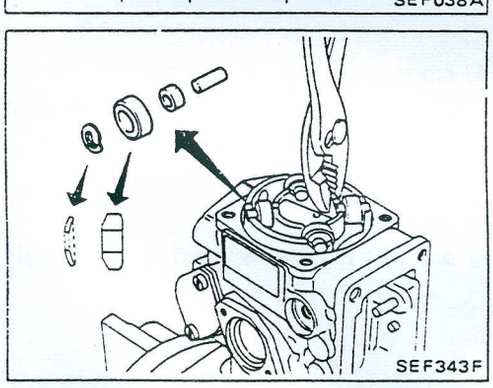


4. Make sure that drive shaft and gear are assembled properly, as shown.



5. Install drive shaft to housing while key in drive shaft engages with key groove in rotor.

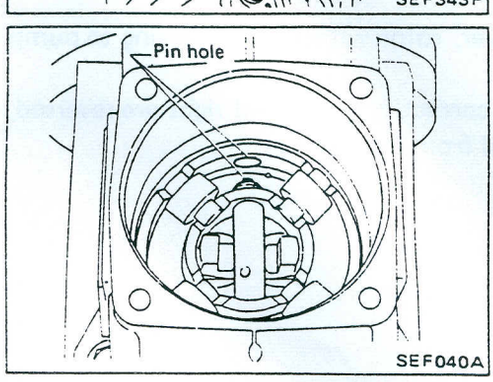
Be careful not to scratch oil seals and inner wall of housing.



6. Set drive shaft's nail parallel to timer.
7. Install roller and holder.

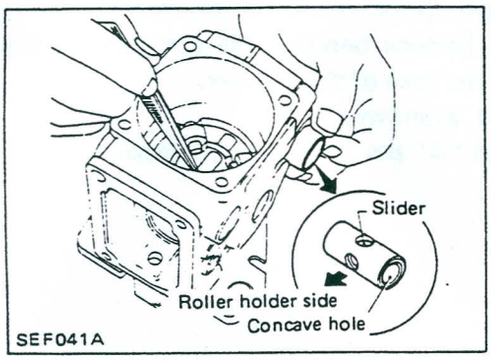
a. **Do not interchange roller positions. If they are interchanged, refer to Inspection for correction.**

b. **Make sure that washer is situated outward of rollers.**

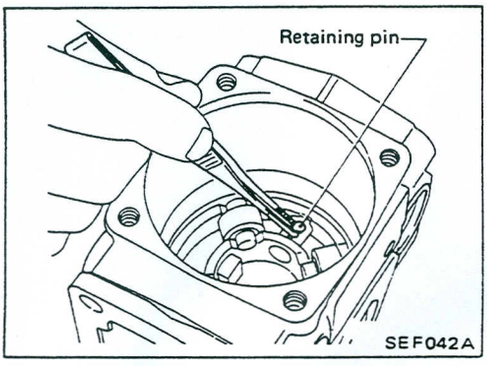


8. Align holder and timer adjusting pin holes.

Assembly (Cont'd)

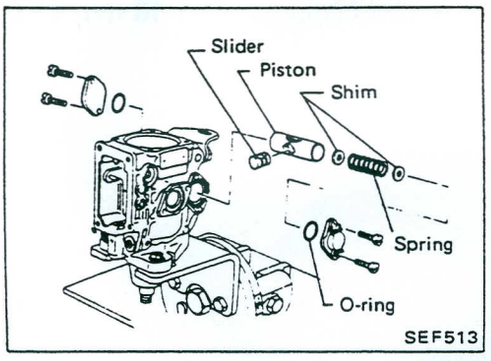


9. Install timer piston and slider as a unit.
a. **Make sure that hole in slider faces towards roller holder.**
b. **Make sure that concave hole in piston is on same side as return hole.**

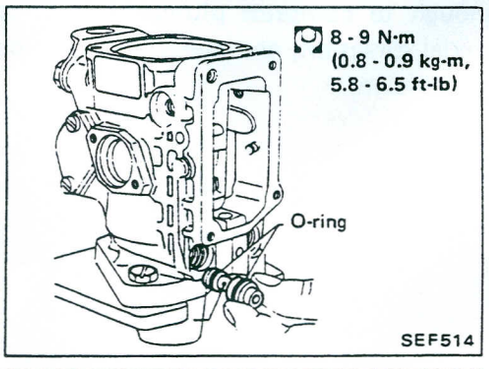


10. Insert timer adjusting pin into timer piston slider, and secure with retaining pin and clip.

Make sure that timer piston moves smoothly.

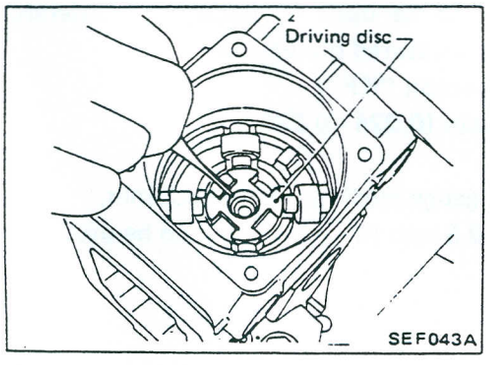


11. Install timer, using a 0.6 mm (0.024 in) thick shim, then install timer spring, shim, O-ring, and cover, in that order.
a. **Use at least one shim on each side of timer spring.**
b. **Use shims that were selected during bench test.**



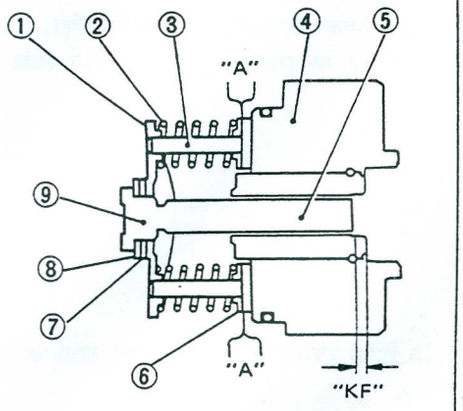
12. Install regulating valve.

Be careful not to scratch O-rings.



13. Install driving disc with its concave side facing up.

Assembly (Cont'd)



1 Spring seat
2 Plunger spring
3 Guide pin
4 Distributor head
5 Distributor barrel
6 Spring seat
7 Washer
8 Shim
9 Plunger

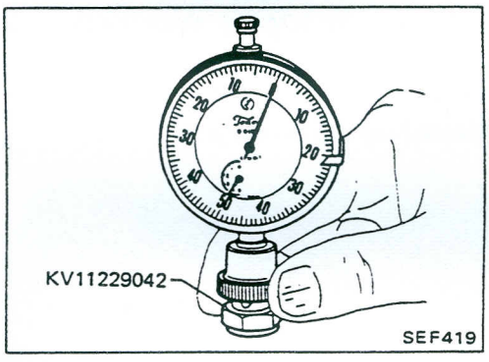
SEF362F

14. Measurement of plunger spring set length (dimension "KF")

Dimension "KF" is the distance between the end face of the distributor barrel and the end face of the plunger.

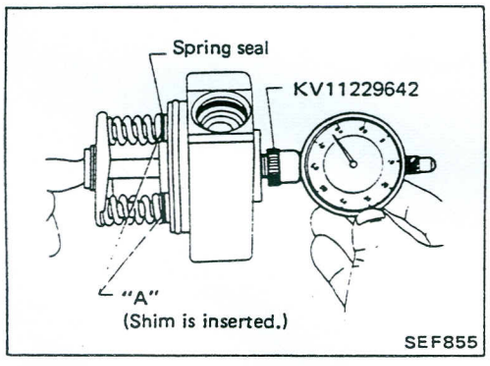
(1) Install distributor head, as shown.

- **Do not insert shim into "A" portion before measuring.**



SEF419

(2) Set dial gauge so that it can compress 0 to 10 mm (0 to 0.39 in), and reset to zero.



SEF855

(3) Apply force (not enough to compress plunger spring) to plunger's bottom in axial direction, and measure dimension "KF" with dial gauge, as shown.

(4) Determine the shim to be used by calculating difference between standard and measured dimensions.

Standard dimension "KF":

5.7 - 5.9 mm (0.224 - 0.232 in)

[Example]

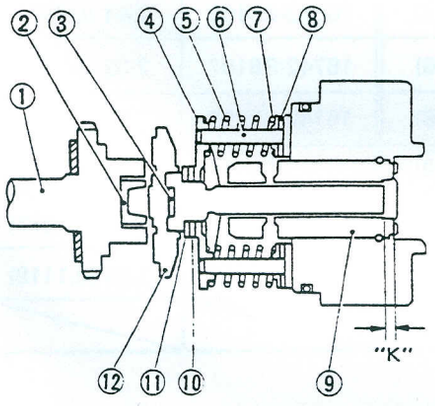
When measured (dial gauge reading) value is 5.2 mm,

5.7 mm – 5.2 mm = 0.5 mm (shim thickness to be used)

Assembly (Cont'd)

a. When there are no shims available of a thickness which matches specified dimensions, use slightly thicker shims.
b. Use selected shim with distributor head in step 14-(3) above.
c. Use the same size shim on each side of distributor head.
d. Shims are available in seven different thicknesses.

Part number	Thickness mm (in)
16882-43G00	0.5 (0.020)
16882-43G01	0.8 (0.031)
16882-43G02	1.0 (0.039)
16882-43G03	1.2 (0.047)
16882-43G04	1.5 (0.059)
16882-43G05	1.8 (0.071)
16882-43G06	2.0 (0.079)



1 Drive shaft
2 Driving disc
3 Shim
4 Spring seat
5 Plunger spring
6 Guide pin
7 Spring seat
8 Shim
9 Distributor barrel
10 Washer
11 Shim
12 Cam disc

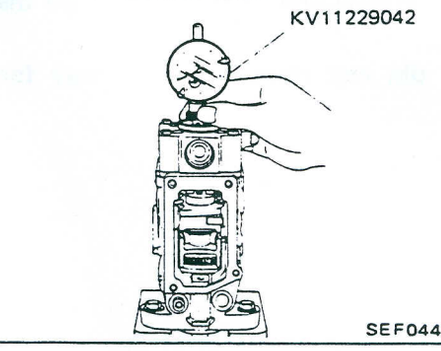
SEF370F

15. Adjustment of plunger dimensions (Measurement of dimension "K")

Dimension "K" is the distance from the end face of the distributor barrel to the end face of the plunger top, when the plunger is at the bottom dead center position.

(1) Install parts as shown.

a. **Do not install "spring" on driving disc.**
b. **When inserting plunger and shim into cam disc, make sure that drive pin is situated in groove at bottom of plunger.**

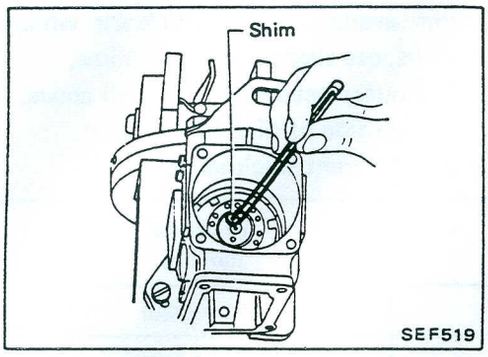


SEF044A

(2) Using a dial gauge, measure dimension as shown.

a. **Rotate drive shaft so that plunger is set at bottom dead center.**
b. **Securely mount distributor head with screws.**

Assembly (Cont'd)

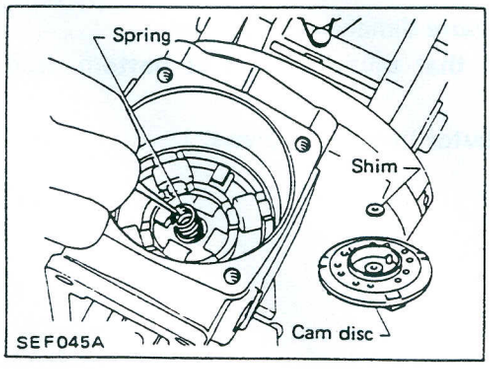


(3) Determine shim to be used by calculating difference between measured (dial gauge reading) value and standard dimension "K", and position that shim on plunger's bottom.

"K" = 3.2 - 3.4 mm
(0.126 - 0.134 in)

a. **When measured value is greater than standard dimension "K", use a thicker shim.**
b. **After shim has been positioned, measure dimension again to ensure that it is correct.**
c. **Shims are available in 25 different thicknesses.**

Part number	Thickness mm (in)	Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)	16742-R8100	1.96 (0.0772)
16884-V0701	2.00 (0.0787)	16742-R8101	2.04 (0.0803)
16884-V0702	2.08 (0.0819)	16742-R8102	2.12 (0.0835)
16884-V0703	2.16 (0.0850)	16742-R8103	2.20 (0.0866)
16884-V0704	2.24 (0.0882)	16742-R8104	2.28 (0.0898)
16884-V0705	2.32 (0.0913)	16742-R8105	2.36 (0.0929)
16884-V0706	2.40 (0.0945)	16742-R8106	2.44 (0.0961)
16884-V0707	2.48 (0.0976)	16742-R8107	2.52 (0.0992)
16884-V0708	2.56 (0.1008)	16742-R8108	2.60 (0.1024)
16884-V0709	2.64 (0.1039)	16742-R8109	2.68 (0.1055)
16884-V0710	2.72 (0.1071)	16742-R8110	2.76 (0.1087)
16884-V0711	2.80 (0.1102)	16742-R8111	2.84 (0.1118)
16884-V0712	2.88 (0.1134)		



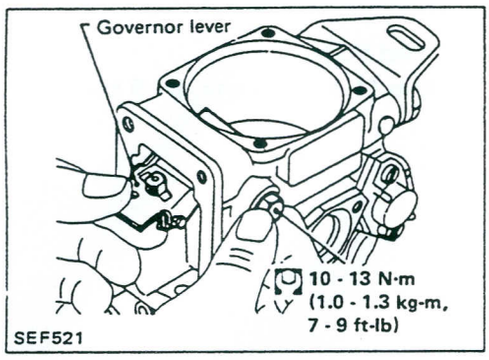
16. Install spring in top of driving disc, then install cam disc and shim.

Make sure cam disc drive pin and drive shaft key way face governor lever side.

Assembly (Cont'd)

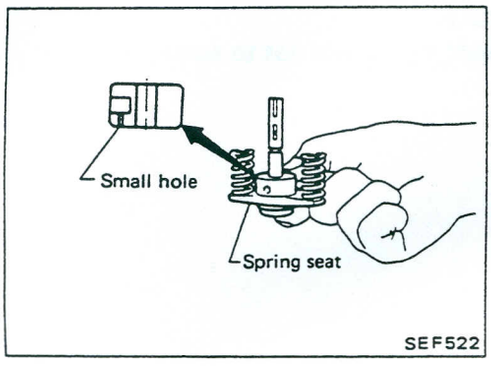
17. Install governor lever.

Avoid pulling on start spring and start idle spring.

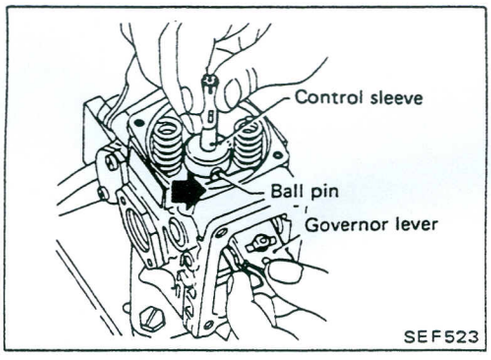


18. Install plunger assembly.

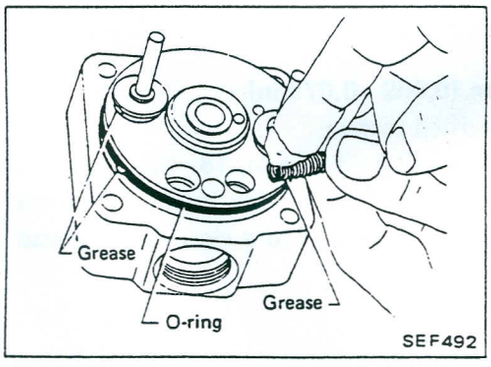
a. **Make sure control sleeve is installed with its small hole facing spring seat side.**



b. **Insert ball pin for governor lever into hole in control sleeve (shown by arrow).**

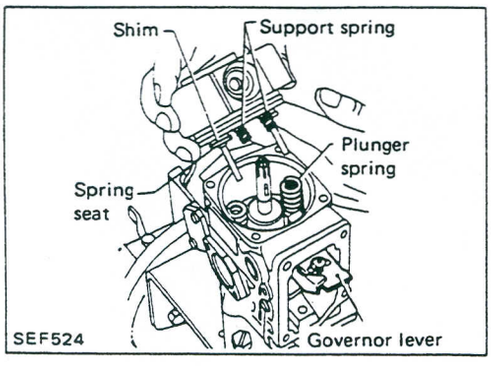


19. Apply a coat of grease to guide pin, shim and spring seat, and attach these parts to distributor head.

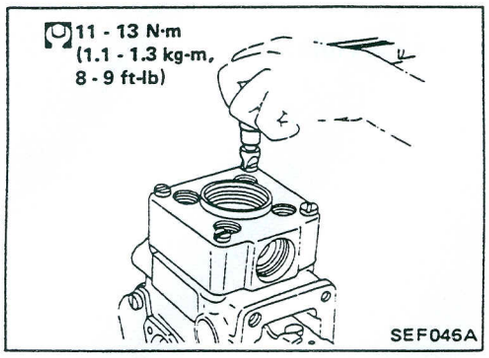


20. Install distributor head.

a. **Always face support spring toward governor lever.**
b. **Be careful not to drop spring.**
c. **Make sure that ball pin for governor lever is inserted properly into hole in control sleeve.**
d. **After installing distributor head, make sure that plunger spring is at guide pin in spring seat.**

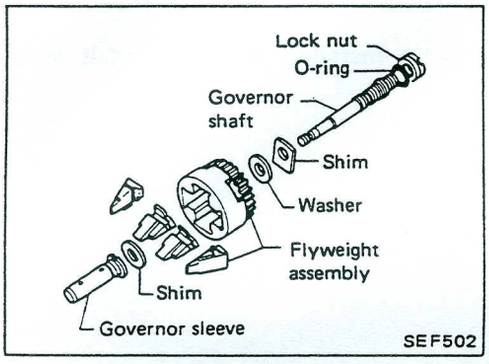


Assembly (Cont'd)



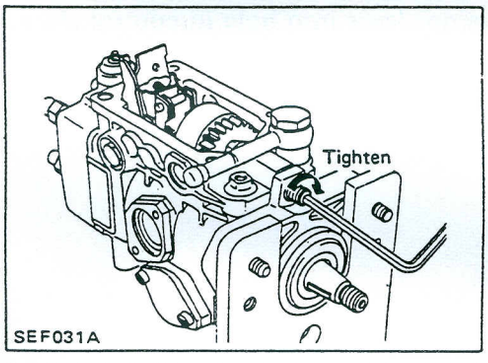
21. Tighten distributor head.

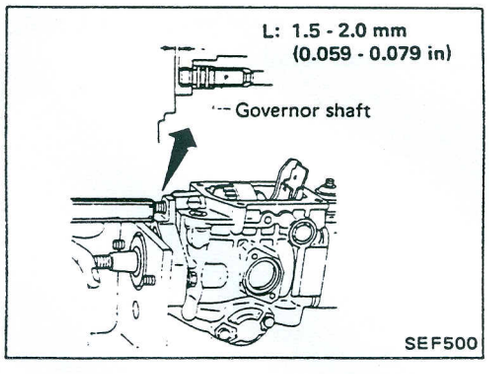
: **Distributor head bolts**
11 - 13 N·m (1.1 - 1.3 kg-m, 8 - 9 ft-lb)



22. Attach flyweight assembly.

When installing governor shaft, be careful not to scratch O-rings.





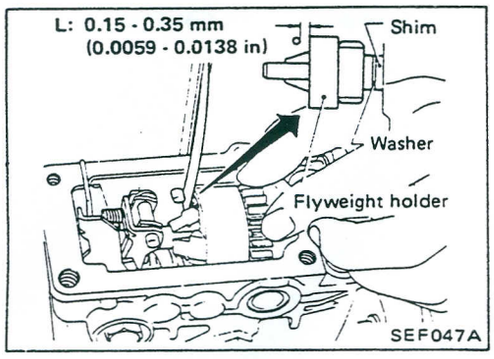
23. Adjust dimension "L".

"L":
1.5 - 2.0 mm (0.059 - 0.079 in)

a. **Tighten lock nut to specified torque.**
: **25 - 29 N·m (2.5 - 3.0 kg-m, 18 - 22 ft-lb)**

b. **Governor shaft has a left-hand thread for injection pumps designed to rotate in "R" direction, and a right-hand thread for those rotating in "L" direction.**

Assembly (Cont'd)



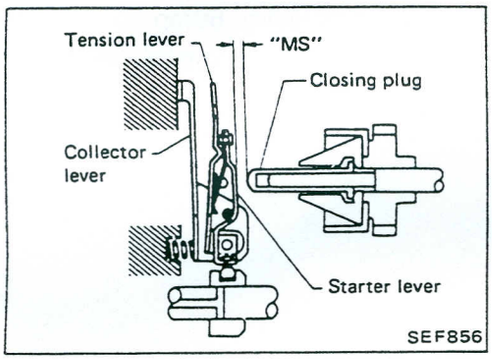
24. Measure axial play of flyweight holder. If it is not within specified range, adjust it by means of shims.

"L":

0.15 - 0.35 mm (0.0059 - 0.0138 in)

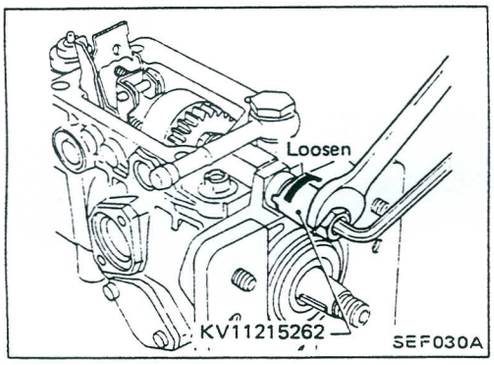
Shims are available in 5 different thicknesses.

Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)

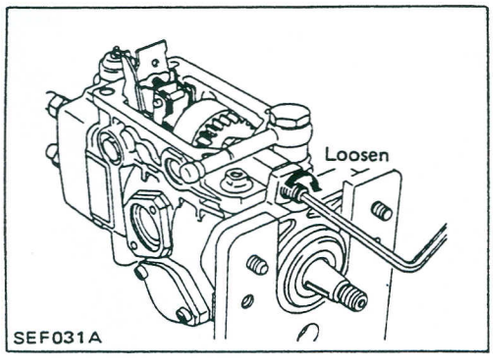


25. Measurement of dimension "MS" (for determining starting amount of fuel injection)

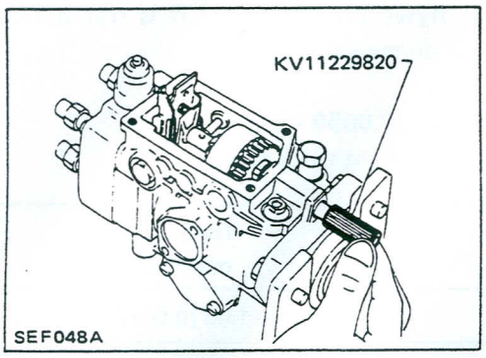
Dimensions "MS" is the distance between closing plug and start lever.



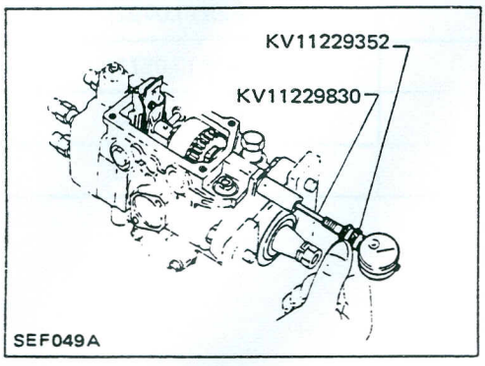
(1) Remove lock nut and governor shaft.



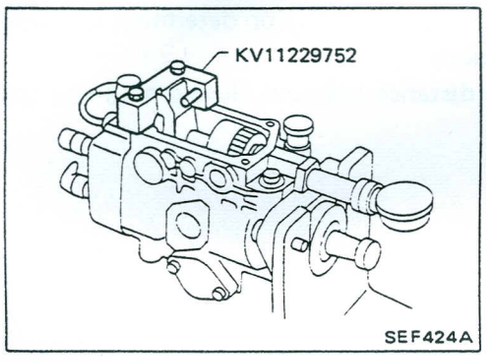
Assembly (Cont'd)



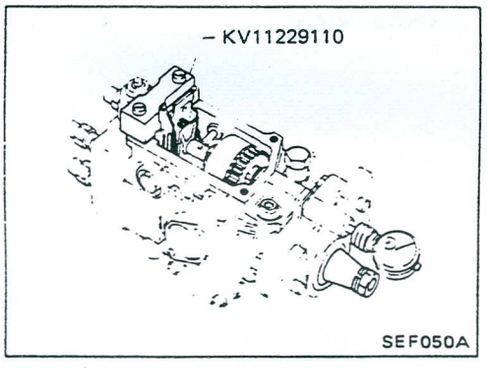
(2) Install special service tool at governor shaft position.



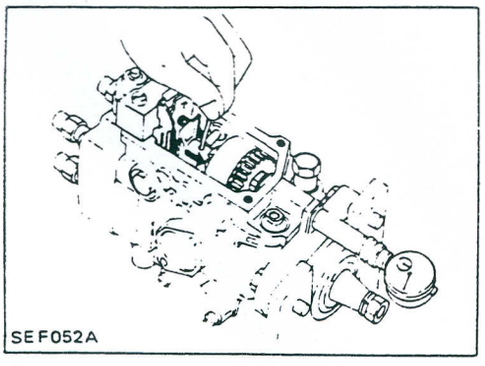
(3) Install special service tool (dial gauge) with rod.



(4) Install special service tool (block gauge) to pump housing.
KV11229752 is for pump with high altitude compensator.

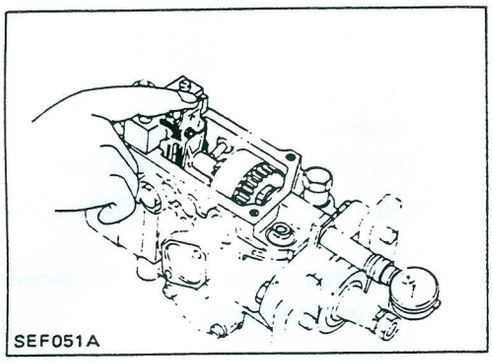


KV11229110 is for pump without high altitude compensator.



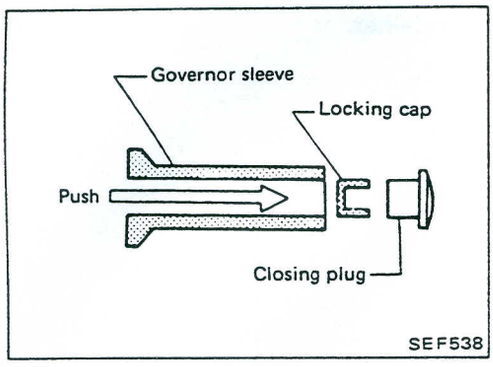
(5) Push governor sleeve against flyweight. Hold governor sleeve in that position and set dial gauge to zero.

Assembly (Cont'd)


SEF051A

(6) Push tension lever until it touches stopper pin. Back governor sleeve up until start lever touches tension lever. At this point read dial gauge.

MS: Refer to S.D.S.

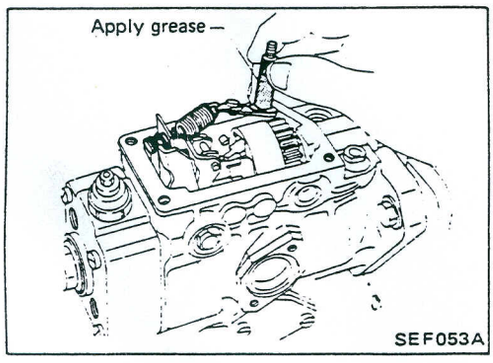


SEF538

(7) If dial gauge indication is not within this range, replace closing plug and adjust dimension "MS" to that range.

Closing plugs are available in 8 different lengths.

Part number	Length mm (in)
16268-R8100	3.10 (0.1220)
16268-R8101	3.30 (0.1299)
16268-R8102	3.50 (0.1378)
16268-R8103	3.70 (0.1457)
16268-R8104	3.90 (0.1535)
16268-R8105	4.10 (0.1614)
16268-R8106	4.30 (0.1693)
16268-R8107	4.50 (0.1772)

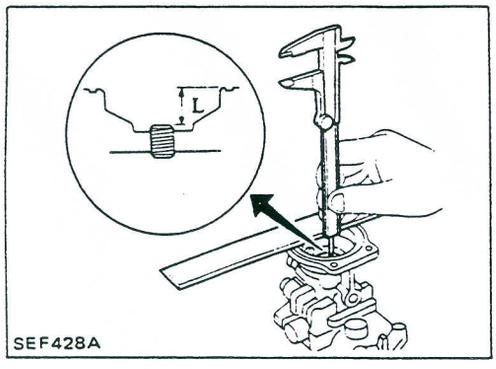


SEF053A

26. Install control lever shaft.

Apply a coat of grease to lever shaft end.

27. Install governor cover.



SEF428A

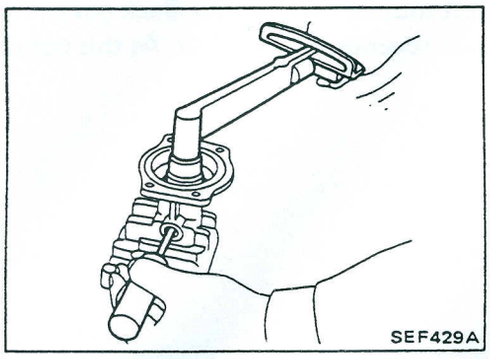
With high altitude compensator

(1) Position adjusting rod bushing so that its height above upper surface of governor cover is within specified range.

L = 20.5 ± 0.5 mm (0.807 ± 0.020 in)

Ensure that holes in adjusting rod bushing and governor cover are aligned properly.

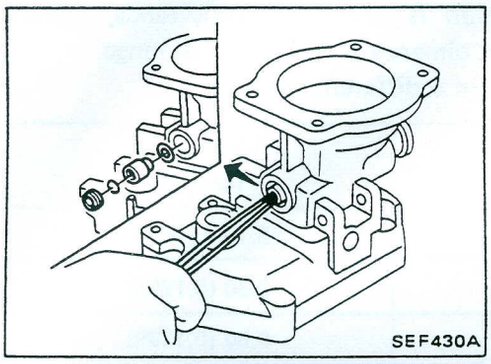
Assembly (Cont'd)


SEF429A

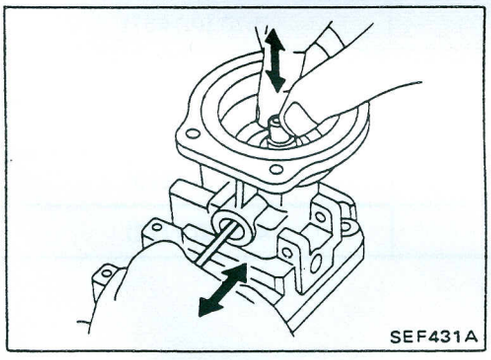
(2) Install adjusting rod.
(3) Install washer and nut.
(4) Tighten nut.

: Adjusting rod bushing lock nut
25 - 34 N·m (2.5- 3.5 kg-m, 18 - 25 ft-lb)

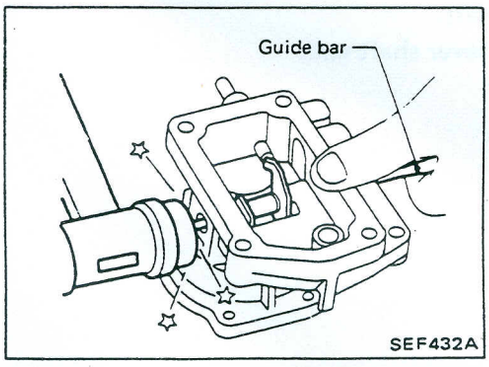
a. Prevent adjusting rod bushing from rotating by locking its nut.
b. If nut and bushing rotate together, bushing height above upper surface of governor cover is insufficient.


SEF430A

(5) Install washer, sleeve and retainer.

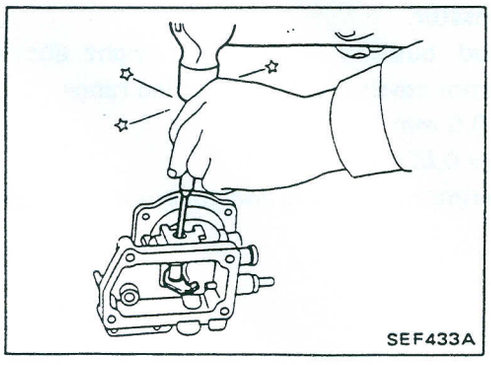

SEF431A

(6) Install pin.
Ensure that pin moves smoothly when adjusting rod is moved up or down.

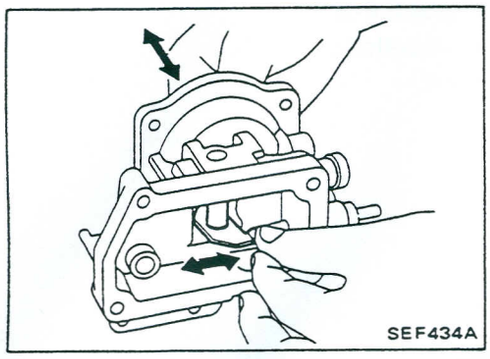


SEF432A

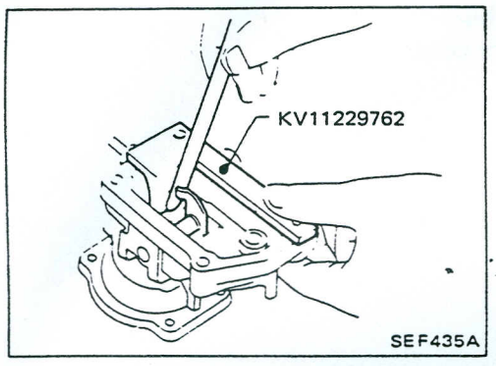
(7) Install lever.
Use a suitable bar as a guide to properly install lever.


SEF433A

Assembly (Cont'd)



Ensure that lever moves smoothly when adjusting rod is moved up or down.

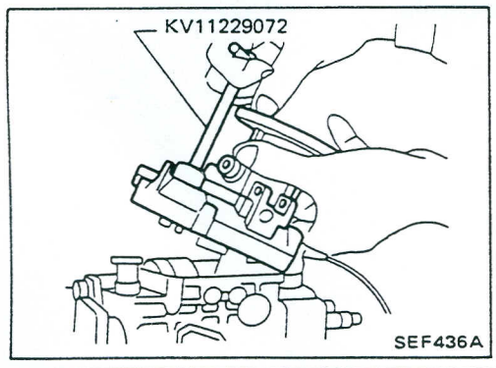


(8) Check clearance between block gauge and lever.
If not within specifications, change the pin.

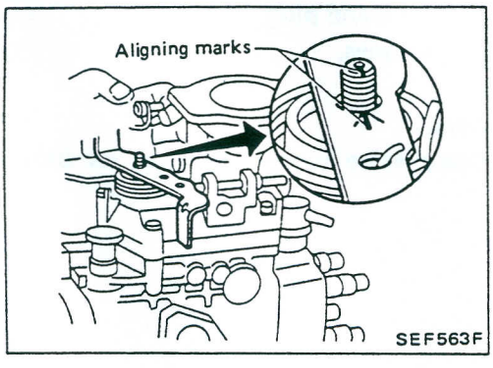
Clearance:
0.1 mm (0.004 in)

Pin

Part number	Length mm (in)
19276-W3300	24.6 (0.969)
19276-W3301	24.8 (0.976)
19276-W3302	25.0 (0.984)
19276-W3303	25.2 (0.992)
19276-W3304	25.4 (1.000)

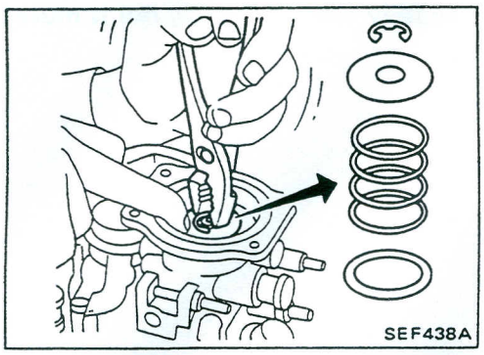


(9) Install governor cover.

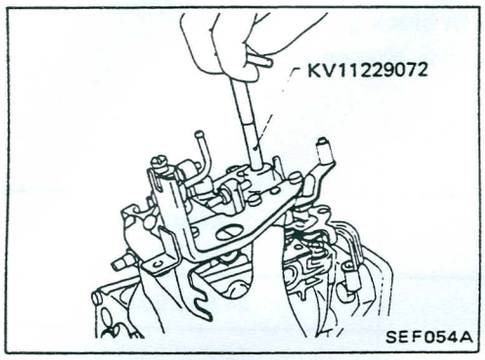


(10) Install control lever.
Align aligning marks of speed control lever and control lever shaft.

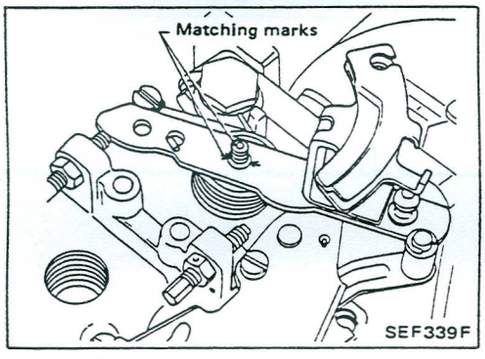
Assembly (Cont'd)



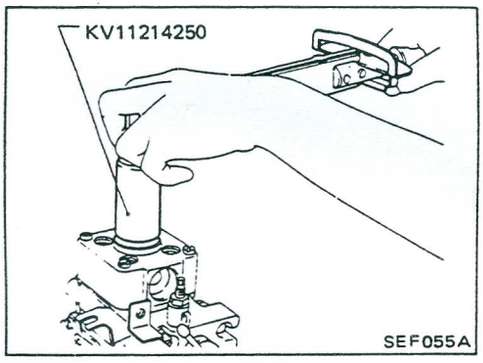
(11) Install spring seat, spring and E-ring.
(12) Install adjusting shim and bellows.
(13) Install compensator cover.



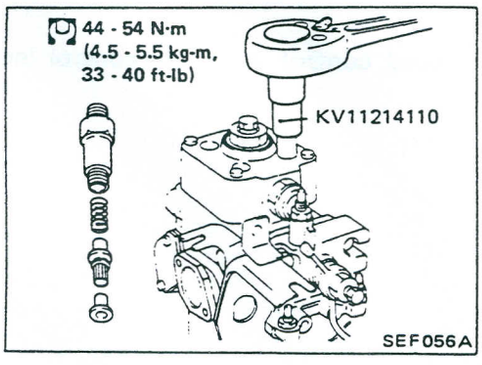
Without high altitude compensator
(1) Install pump governor cover.



(2) Install speed control lever assembly.
Align aligning marks of speed control lever and control lever shaft.



28. Install plug with new O-ring.



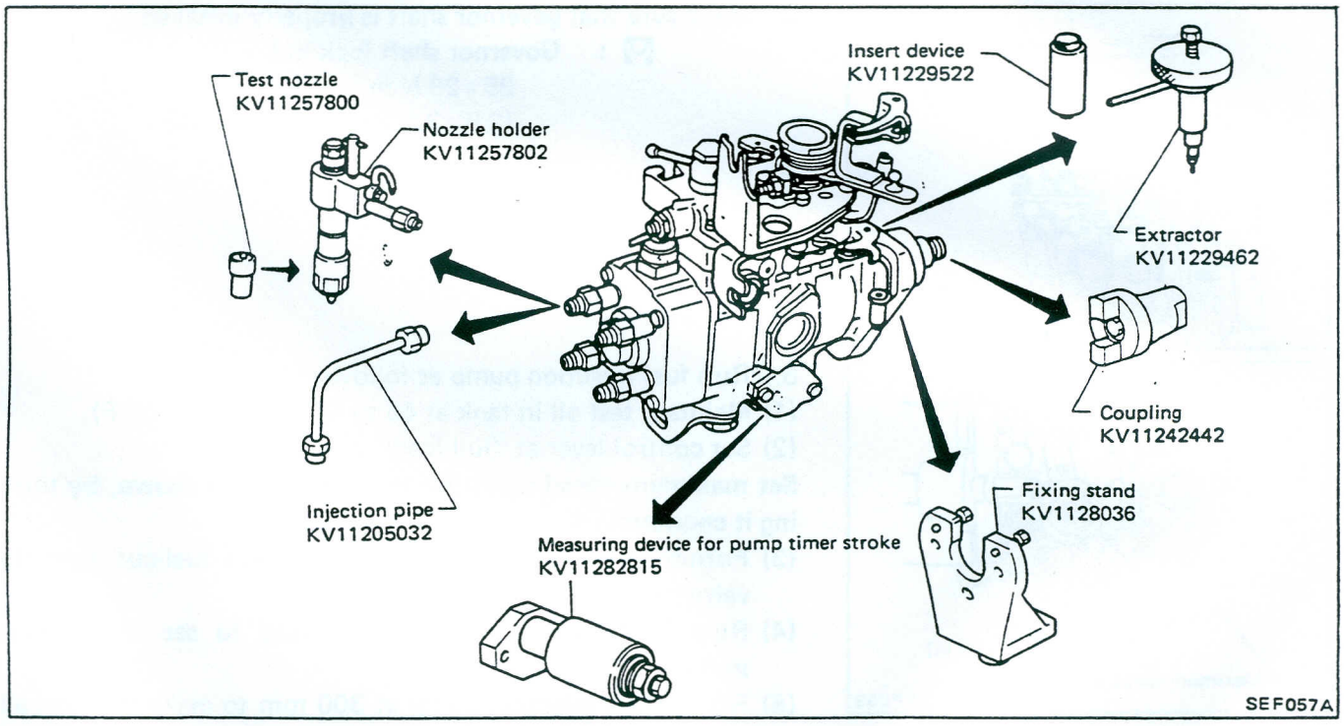
29. Install fuel-cut solenoid valve and plug.
Always replace plugs with new ones.
31. Install delivery valve.
a. **Always use new washers.**
b. **Make sure that delivery valve is reinstalled in its original position.**

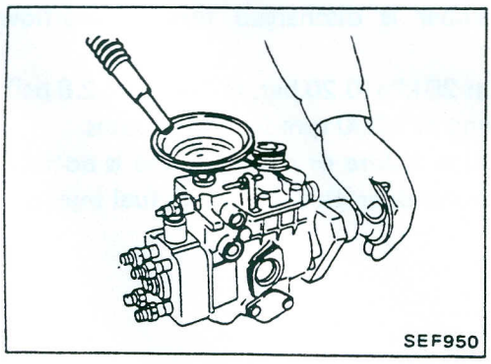
Test

PREPARATION

Nozzle		KV11257805
Nozzle holder		KV11257802
Nozzle starting pressure	kPa (bar, kg/cm^2, psi)	14,711 - 15,201 (147.1 - 152.0, 150 - 155, 2,133 - 2,204)
Nozzle tube Inner dia. x outer dia. x length	mm (in)	KV11257805 2.0 x 6.0 x 840 (0.079 x 0.236 x 33.07)
Fuel feed pressure	kPa (bar, kg/cm^2, psi)	20 (0.20, 0.2, 2.8)
Fuel (test oil)		ISO 4113 or SAE Standard Test Oil (SAE J967d)
Fuel temperature	°C (°F)	45 - 50 (113 - 122)
Rotating direction		Right (observed from the drive shaft)
Injection sequence		1-3-4-2

1. Prepare necessary service tools.

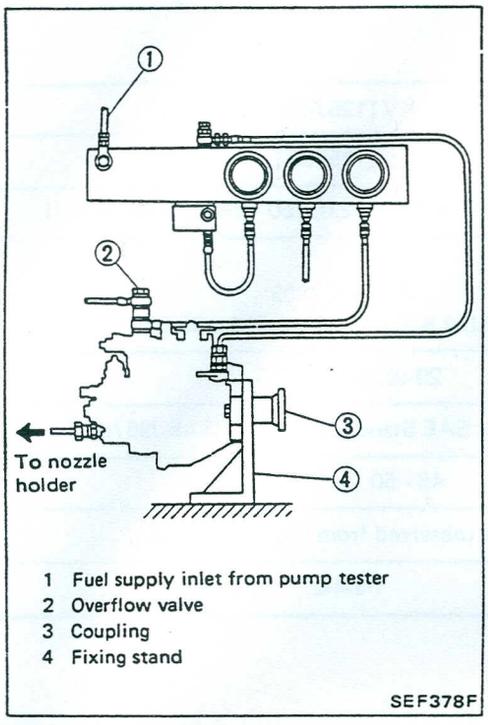




2. Pour test oil into fuel injection pump.
Test oil should be ISO 4113, SAE Standard Test Oil (SAE J967d) or its equivalent.

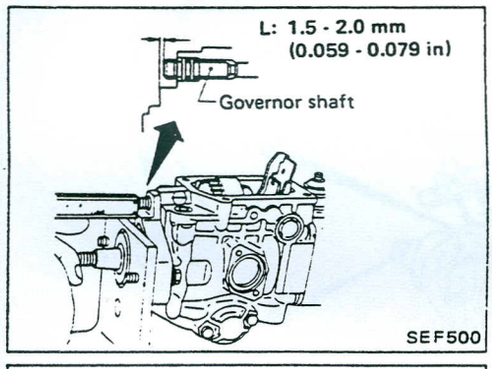
Test (Cont'd)

3. Install fuel injection pump to pump tester.
4. Connect necessary piping.



1 Fuel supply inlet from pump tester
2 Overflow valve
3 Coupling
4 Fixing stand

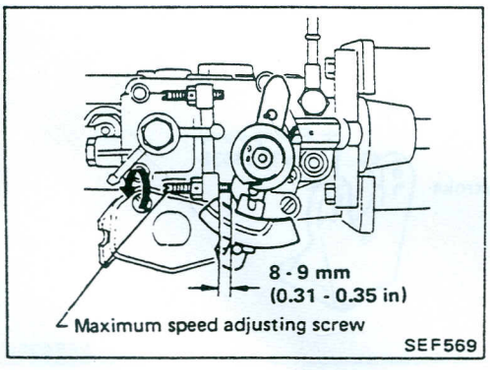
SEF378F



SEF500

5. Make sure that governor shaft is properly installed.

**: Governor shaft lock nut
25 - 29 N·m
(2.5 - 3.0 kg-m, 18 - 22 ft-lb)**



SEF569

6. Run fuel injection pump as follows:
(1) Maintain test oil in tank at 45 to 50°C (113 to 122°F).
(2) Set control lever at "full load" using a spring.

Set maximum speed adjusting screw in position shown, by turning it counterclockwise.

(3) Furnish specified voltage of 12 volts to fuel-cut solenoid valve to activate it.
(4) Rotate fuel injection pump by hand to see if it moves smoothly.
(5) Rotate fuel injection pump at 300 rpm to make sure that all air inside pump chamber is discharged through overflow valve.
(6) Set feed oil pressure at 20 kPa (0.20 bar, 0.2 kg/cm², 2.8 psi).
(7) Run fuel injection pump at 1,000 rpm for ten minutes.

If fuel leakage, fuel injection failure or unusual noise is noticed, immediately stop pump tester operation and check fuel injection pump for abnormalities.

Test (Cont'd)

ADJUSTMENT

Preadjust full-load delivery

If equipped with high altitude compensator, remove high altitude compensator cover, bellows and adjusting shim.

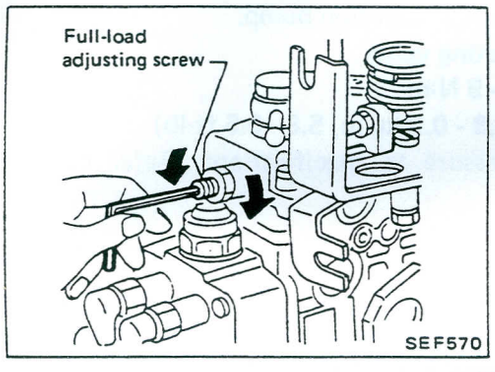
1. Set control lever at "full-load" using a spring.

Set maximum speed adjusting screw in position shown, by turning it counterclockwise. Refer to step 6-(2) in Preparation.

2. Furnish specified voltage of 12 volts to activate fuel-cut solenoid valve.
3. Rotate fuel injection pump at 1,100 rpm, and measure amount of fuel injection.

Standard fuel injection:

Refer to S.D.S.



4. If fuel injection is less than standard, adjust it with full-load adjusting screw.

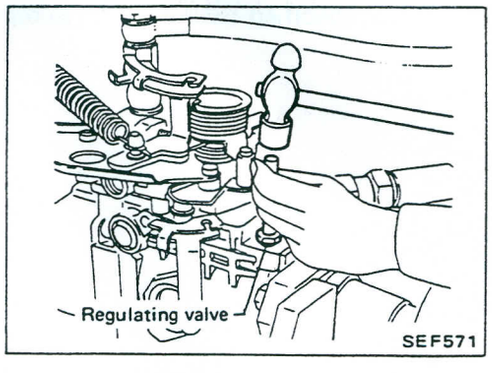
Turn adjusting screw clockwise to increase fuel injection.

Adjustment of feed pump pressure

1. Repeat steps 1 and 2 outlined under "Preadjust Full-Load Delivery" heading.
2. Measure feed pump pressure at specified fuel injection pump rpm.

Standard fuel injection:

Refer to S.D.S.

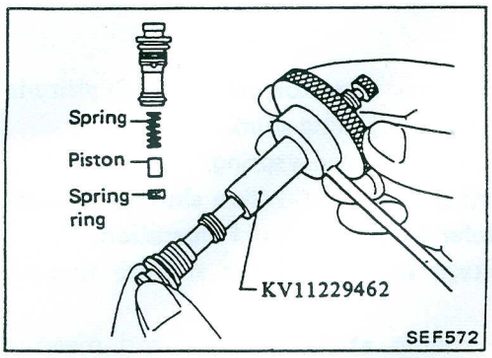


a. When measured pressure is lower than specifications.

Push in plug that is driven into regulating valve body.

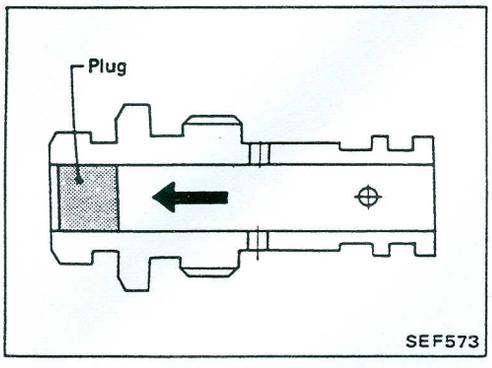
Be careful not to push plug in too far.

Test (Cont'd)



b. When measured pressure is higher than specifications.

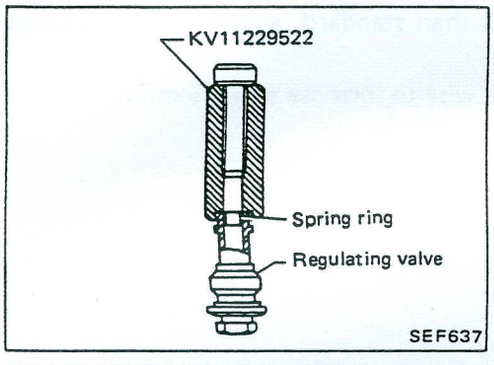
Remove regulating valve from fuel injection pump, and disassemble regulating valve using service tool KV11229462.



Drive plug out until it is flush with end face of regulating valve.

Install spring, piston and spring ring, in that order, to regulating valve.

Make sure that spring ring is flush with end face of regulating valve body when it is pushed in.



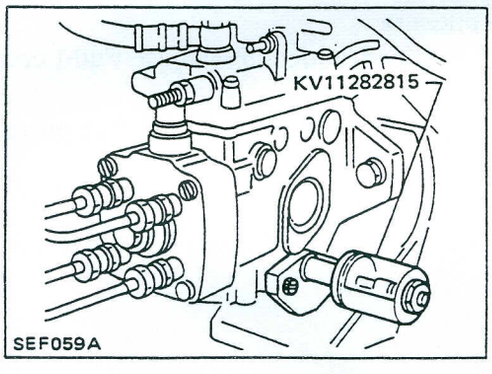
Attach regulating valve to fuel injection pump.

: Regulating valve

8 - 9 N·m

(0.8 - 0.9 kg-m, 5.8 - 6.5 ft-lb)

Adjust supply pump pressure to specifications. Refer to step 2-a.



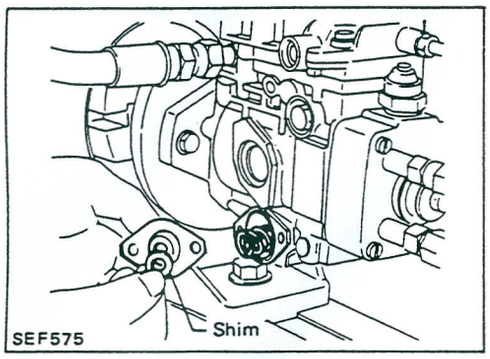
Adjustment of speed timer

1. Repeat steps 1 and 2 outlined under "Preadjust Full-Load Delivery" heading.
2. Remove cover from high-pressure side (side without spring) of timer, and attach service tool KV11282815 to that side.
3. Measure timer piston strokes at specified fuel injection pump rpm indicated below.

Standard fuel injection:

Refer to S.D.S.

Test (Cont'd)



4. If timer piston stroke is not within specified range, remove cover from low-pressure side of timer and adjust piston stroke by adding shim(s).

a. **Shims (service parts)**

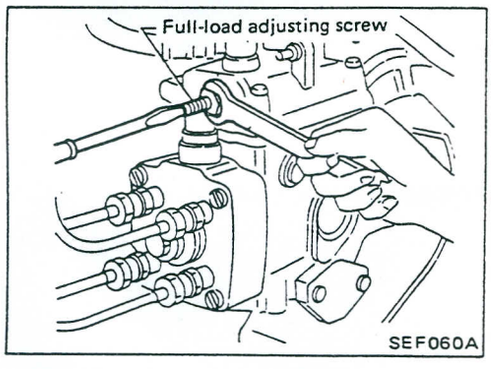
Part number	Thickness mm (in)
16880-02N00	0.6 (0.024)
16880-02N01	0.7 (0.028)
16880-02N02	0.9 (0.035)
16880-02N03	1.0 (0.039)
16880-02N04	1.2 (0.047)

b. **Make sure that at least one shim is used on each side of timer spring.**

Adjustment of fuel injection under full-load

1. Set control lever at "full-load" using a spring.
2. Furnish specified voltage of 12 volts to activate fuel-cut solenoid valve.
3. Measure fuel injection at each specified fuel injection pump rpm.

Standard fuel injection:
Refer to S.D.S.



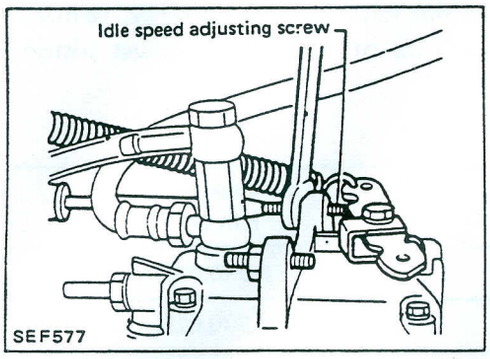
4. If fuel injection is not within standard range, adjust it using full-load adjusting screw.

Adjustment of fuel injection during idle

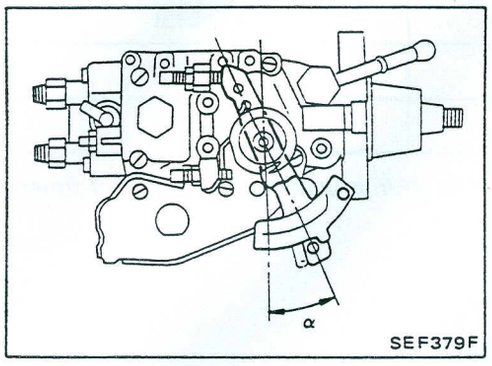
1. Pull spring until control lever touches idle speed adjusting screw.
2. Furnish specified voltage of 12 volts to activate fuel-cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

Standard fuel injection:
Refer to S.D.S.

Test (Cont'd)



4. If fuel injection is not within specified range, adjust using idle speed adjusting screw.



a. **Tightening this screw will increase fuel injection amount.**
b. **Make sure that control lever angle (α) is set at the specified range.**
   α: Refer to S.D.S.
   If control lever angle is not within specified range, adjust it by repositioning control lever on control shaft. (One serration pitch: 15°)
   After control lever has been repositioned, be sure to measure amount of fuel injection at idle speed again.

Adjustment of fuel injection during start

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel-cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

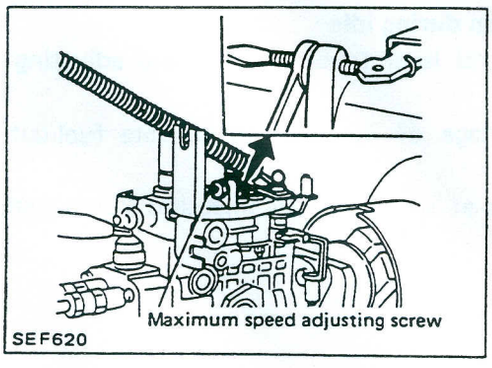
Standard fuel injection:
Refer to S.D.S.

4. If fuel injection is lower than standard; check, "MS" dimension. Refer to step 25 for Injection Pump Assembly.

Adjustment of fuel injection at maximum pump rpm

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel-cut solenoid valve.
3. Measure fuel injection at specified fuel injection rpm.

Standard fuel injection:
Refer to S.D.S.



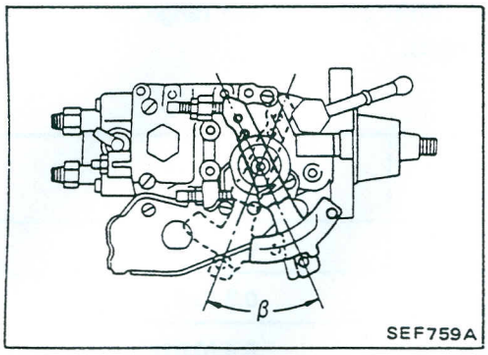
4. If fuel injection is not within standard range, adjust using maximum speed adjusting screw.

Test (Cont'd)

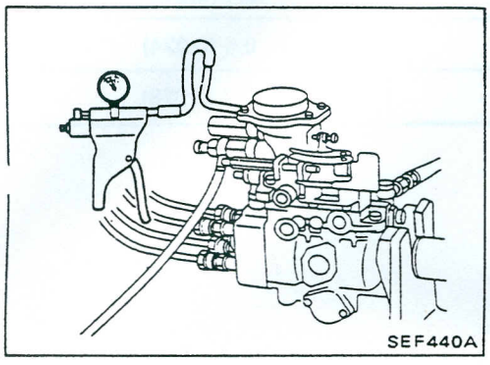
a. Tightening screw will increase fuel injection.

b. Make sure that control lever angle (β) is within the specified range.

β: Refer to S.D.S.



SEF759A


SEF440A

ADJUSTMENT OF HIGH ALTITUDE COMPENSATOR

1. Install bellows and adjusting shim.
2. Install a vacuum pump.

Check that there is no vacuum leakage.

3. Measure fuel injection volume.

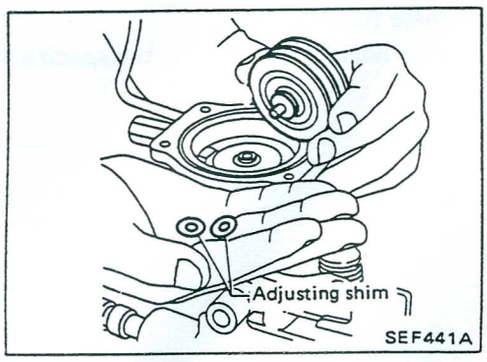
1) Below 2,000 m (6,562 ft)

Item \ Altitude m (ft)	0 (0)	250 (820)	500 (1,641)	750 (2,461)	1,000 (3,281)	1,250 (4,101)	1,500 (4,922)	1,750 (5,742)	2,000 (6,562)
Applied vacuum kPa (mbar, mmHg, inHg)	21.2 - 22.5 (212 - 225, 159 - 169, 6.26 - 6.65)	18.3 - 19.6 (183 - 196, 137 - 147, 5.39 - 5.79)	15.3 - 16.7 (153 - 167, 115 - 125, 4.53 - 4.92)	12.4 - 13.7 (124 - 137, 93 - 103, 3.66 - 4.06)	9.5 - 10.8 (95 - 108, 71 - 81, 2.80 - 3.19)	6.9 - 8.3 (69 - 83, 52 - 62, 2.05 - 2.44)	4.4 - 5.7 (44 - 57, 33 - 43, 1.30 - 1.69)	1.9 - 3.2 (19 - 32, 14 - 24, 0.55 - 0.94)	0 (0, 0, 0)
Fuel injection pump rpm	1,000								
Standard fuel injection mℓ (Imp fl oz)/ 1,000 stroke	29.4 - 33.4 (1.03 - 1.18)								

2) Above 2,000 m (6,562 ft)

Item \ Altitude m (ft)	2,250 (7,382)	2,500 (8,203)	2,750 (9,023)	3,000 (9,843)	3,250 (10,663)	3,500 (11,484)	3,750 (12,304)	4,000 (13,124)
Fuel injection pump rpm	1,000							
Standard fuel injection mℓ (Imp fl oz)/1,000 stroke	28.4 - 32.5 (1.00 - 1.14)	27.4 - 31.5 (0.96 - 1.11)	26.5 - 30.5 (0.93 - 1.07)	25.5 - 29.6 (0.90 - 1.04)	24.5 - 28.6 (0.86 - 1.01)	23.6 - 27.6 (0.83 - 0.97)	22.7 - 26.7 (0.80 - 0.94)	21.7 - 25.7 (0.76 - 0.90)

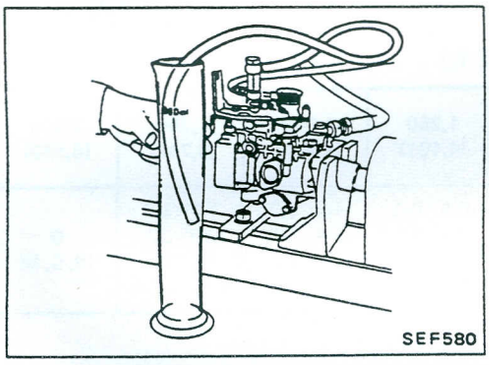
Test (Cont'd)



4. If fuel injection is not within the standard range, increase or decrease the adjusting shims.

Shims (Service parts)

Part number	Thickness mm (in)
19275-W3300	0.2 (0.008)
19275-W3301	0.3 (0.012)
19275-W3302	0.4 (0.016)
19275-W3303	0.6 (0.024)
19275-W3304	0.7 (0.028)



Measurement of overflow amount

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel overflow at specified fuel injection rpm.

Fuel overflow:
43 - 87 mℓ
(1.51 - 3.06 Imp fl oz)/10 sec. at 1,100 rpm

Operation check of fuel-cut solenoid valve

When engine is idling and fuel cut solenoid valve current is OFF, be sure there is no injection. This check has to be done for approx. 5 seconds.

Service Data and Specifications (S.D.S.)

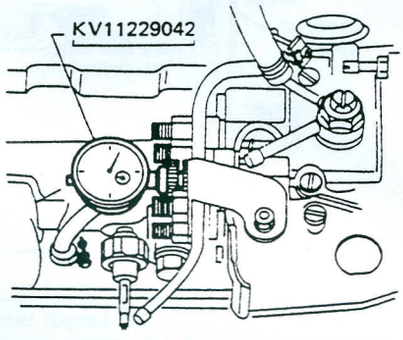
APPLICATION

Engine	Destination	Part No.	Pump No.	Applied model			Remarks
				E24	F22	H40	
TD23	Except Europe	16700-02N09	104740-9290	○	○	–	Without high altitude compensator
		16700-02N20	104740-9550				With high altitude compensator
		16700-02N14	104740-9340	○	–	–	For cold area
	Europe	16700-02N18	104740-9540	○	–	–	M/T
		16700-02N19	104740-9351				A/T
		16700-10T07	104740-9371	–	○	–	
TD27	Australia	16700-11T14	104740-9380	○	○	○	M/T without exhaust brake
		16700-11T15	104740-9390	–	○	○	M/T with exhaust brake
		16700-11T22	104740-9460	○	–	–	A/T

INSPECTION AND ADJUSTMENT

Injection timing

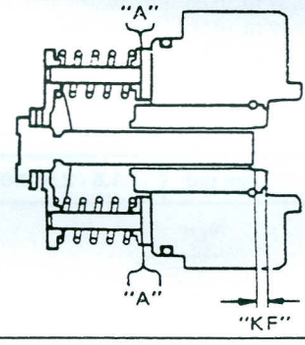
Engine	Plunger lift mm (in)
TD23	0.54±0.02 (0.0213±0.0008) (equivalent to 5° B.T.D.C.)
TD27	0.65±0.02 (0.0256±0.0008) (equivalent to 5° B.T.D.C.)



SEF016A

Use of adjustment value and adjusting shim when installing injection pump.

Dimension "KF" mm (in)	5.7 - 5.9 (0.224 - 0.232)



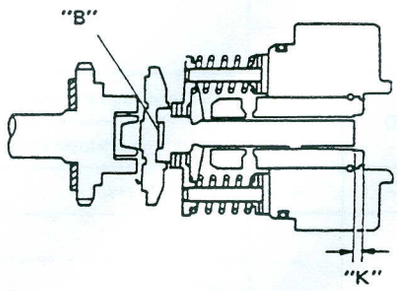
SEF638

Adjusting shim ("A" position)

Part number	Thickness mm (in)
16882-43G00	0.5 (0.020)
16882-43G01	0.8 (0.031)
16882-43G02	1.0 (0.039)
16882-43G03	1.2 (0.047)
16882-43G04	1.5 (0.059)
16882-43G05	1.8 (0.071)
16882-43G06	2.0 (0.079)

Service Data and Specifications (S.D.S.) (Cont'd)

Dimension "K" mm (in)	3.2 - 3.4 (0.126 - 0.134)

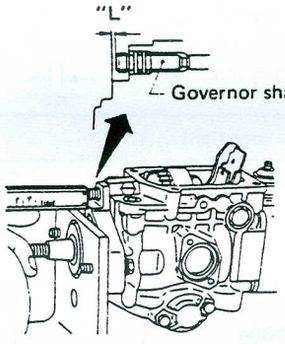


SEF639

Adjusting shim ("B" position)

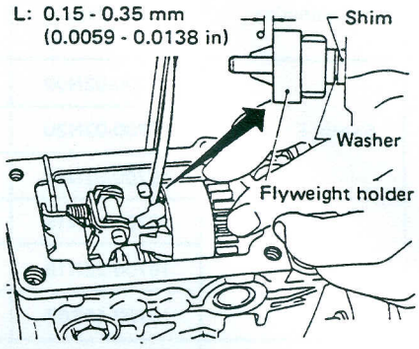
Part number	Thickness mm (in)	Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)	16742-R8100	1.96 (0.0772)
16884-V0701	2.00 (0.0787)	16742-R8101	2.04 (0.0803)
16884-V0702	2.08 (0.0819)	16742-R8102	2.12 (0.0835)
16884-V0703	2.16 (0.0850)	16742-R8103	2.20 (0.0866)
16884-V0704	2.24 (0.0882)	16742-R8104	2.28 (0.0898)
16884-V0705	2.32 (0.0913)	16742-R8105	2.36 (0.0929)
16884-V0706	2.40 (0.0945)	16742-R8106	2.44 (0.0961)
16884-V0707	2.48 (0.0976)	16742-R8107	2.52 (0.0992)
16884-V0708	2.56 (0.1008)	16742-R8108	2.60 (0.1024)
16884-V0709	2.64 (0.1039)	16742-R8109	2.68 (0.1055)
16884-V0710	2.72 (0.1071)	16742-R8110	2.76 (0.1087)
16884-V0711	2.80 (0.1102)	16742-R8111	2.84 (0.1118)
16884-V0712	2.88 (0.1134)		

Diemnsion "L" mm (in)	1.5 - 2.0 (0.059 - 0.079)



SEF500

Axial play of flyweight holder "L" mm (in)	0.15 - 0.35 (0.0059 - 0.0138)

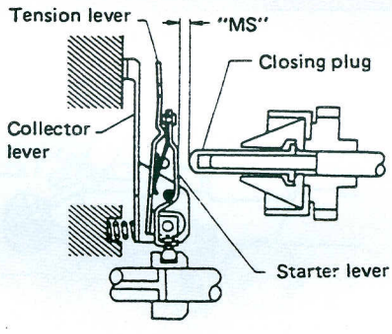


SEF047A

Adjusting shim

Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)

Dimension "MS" mm (in)	0.9 - 1.1 (0.035 - 0.043)



SEF856

Adjusting closing plug

Part number	Length mm (in)
16268-R8100	3.10 (0.1220)
16268-R8101	3.30 (0.1299)
16268-R8102	3.50 (0.1378)
16268-R8103	3.70 (0.1457)
16268-R8104	3.90 (0.1535)
16268-R8105	4.10 (0.1614)
16268-R8106	4.30 (0.1693)
16268-R8107	4.50 (0.1772)

Service Data and Specifications (S.D.S.) (Cont'd)

Model: TD23 except for Europe
Pump part No.: 16700-02N09, 16700-02N20, 16700-02N14

1. Adjustment value:

		Pump speed (rpm)	Adjustment value	Difference in delivery mℓ (Imp fl oz)
1 - 1	Timing device travel (Timer piston stroke)	1,700	4.4 - 4.8 mm (0.173 - 0.189 in)	–
1 - 2	Supply pump pressure (Feed pump pressure)	1,700	549 - 608 kPa (5.49 - 6.08 bar, 5.6 - 6.2 kg/cm², 80 - 88 psi) 481 - 539 kPa (4.81 - 5.39 bar, 4.9 - 5.5 kg/cm², 70 - 78 psi)*	–
1 - 3	Full load delivery without charge air pressure (Fuel injection quantity at Full-load)	1,100	45.1 - 46.1 mℓ (1.59 - 1.62 Imp fl oz)/1,000 st	3.0 (0.11)
1 - 4	Idle speed regulation (Fuel injection quantity at idle)	350	4.5 - 8.5 mℓ (0.16 - 0.30 Imp fl oz)/1,000 st	2.0 (0.07)
1 - 5	Start (Fuel injection quantity at Start)	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st	–
1 - 6	Full-load speed regulation (Fuel injection quantity at Max. speed)	2,350	28.3 - 32.3 mℓ (1.00 - 1.14 Imp fl oz)/1,000 st	–

*: For cold area (P/N 16700-02N14)

2. Testing value:

2 - 1	Timing device (Timer piston stroke)	Pump speed (rpm)	1,100	1,700	2,550
		mm (in)	2.0 - 3.0 (0.079 - 0.118)	4.3 - 4.9 (0.169 - 0.193)	6.4 - 7.4 (0.252 - 0.291)
2 - 2	Supply pump (Feed pump pressure)	Pump speed (rpm)	1,100	1,700	2,150
		kPa (bar, kg/cm², psi)	402 - 461 (4.02 - 4.61, 4.1 - 4.7 - 58 - 67) 343 - 402 (3.43 - 4.02, 3.5 - 4.1, 50 - 58)*	549 - 608 (5.49 - 6.08, 5.6 - 6.2, 80 - 88) 481 - 539 (4.81 - 5.39, 4.9 - 5.5, 70 - 78)*	647 - 706 (6.47 - 7.06 6.6 - 7.2, 94 - 102) 569 - 628 (5.69 - 6.28, 5.8 - 6.4, 82 - 91)*
2 - 3	Overflow delivery	Pump speed (rpm)	1,100		
		mℓ (Imp fl oz)/10 sec.	43.0 - 87.0 (1.51 - 3.06)		

*: For cold area (P/N 16700-02N14)

Service Data and Specifications (S.D.S) (Cont'd)

2 - 4 Fuel deliveries

Speed control lever	Pump speed rpm	Fuel delivery mℓ (Imp fl oz)/ 1,000 st
End stop (Full-load)	2,700	Less than 5.0 (0.18)
	2,550	5.3 - 12.4 (0.19 - 0.44)
	2,350	27.8 - 32.8 (0.98 - 1.15)
	2,150	36.9 - 41.1 (1.30 - 1.45)
	1,100	44.6 - 46.6 (1.57 - 1.64)
	600	42.1 - 46.1 (1.48 - 1.62)
Switch OFF	350	0 (0)
Idle stop (Idle)	350	4.5 - 8.5 (0.16 - 0.30)
	450	Less than 2.0 (0.07)

2 - 5	Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V

3. Dimensions

mm (in)

K	3.2 - 3.4 (0.126 - 0.134)
KF	5.7 - 5.9 (0.224 - 0.232)
MS	0.9 - 1.1 (0.035 - 0.043)

4. Control lever angle

degree

α	50 - 58
β	37 - 47

Service Data and Specifications (S.D.S) (Cont'd)

Model: TD23 for Europe
Pump part No.: 1670-02N18, 16700-02N19, 16700-10T07

1. Adjustment value:

		Pump speed (rpm)	Adjustment value	Difference in delivery mℓ (Imp fl oz)
1 - 1	Timing device travel (Timer piston stroke)	1,100	2.3 - 2.7 mm (0.091 - 0.106 in)	–
1 - 2	Supply pump pressure (Feed pump pressure)	1,100	343 - 402 kPa (3.43 - 4.02 bar, 3.5 - 4.1 kg/cm², 50 - 58 psi)	–
1 - 3	Full load delivery without charge air pressure (Fuel injection quantity at Full-load)	1,100	45.1 - 46.1 mℓ (1.59 - 1.62 Imp fl oz)/1,000 st	3.0 (0.11)
1 - 4	Idle speed regulation (Fuel injection quantity at idle)	350	4.5 - 8.5 mℓ (0.16 - 0.30 Imp fl oz)/1,000 st	2.0 (0.07)
1 - 5	Start (Fuel injection quantity at Start)	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st	–
1 - 6	Full-load speed regulation (Fuel injection quantity at Max. speed)	2,350	28.3 - 32.3 mℓ (1.00 - 1.14 Imp fl oz)/1,000 st	–

2. Testing value:

2 - 1	Timing device (Timer piston stroke)	Pump speed (rpm)	1,100	1,700	2,550
		mm (in)	2.2 - 2.8 (0.087 - 0.110)	4.1 - 5.1 (0.161 - 0.201)	6.4 - 7.4 (0.252 - 0.291)
2 - 2	Supply pump (Feed pump pressure)	Pump speed (rpm)	1,100	1,700	2,150
		kPa (bar, kg/cm², psi)	343 - 402 (3.43 - 4.02, 3.5 - 4.1, 50 - 58)	481 - 539 (4.81 - 5.39, 4.9 - 5.5, 70 - 78)	569 - 628 (5.69 - 6.28, (5.8 - 6.4, 82 - 91)
2 - 3	Overflow delivery	Pump speed (rpm)	1,100		
		mℓ (Imp fl oz)/10 sec.	43.0 - 87.0 (1.51 - 3.06)		

Service Data and Specifications (S.D.S) (Cont'd)

2 - 4 Fuel deliveries

Speed control lever	Pump speed (rpm)	Fuel delivery mℓ (Imp fl oz)/ 1,000 st
End stop (Full-load)	2,700	Less than 5.0 (0.18)
	2,550	5.3 - 12.4 (0.19 - 0.44)
	2,350	27.8 - 32.8 (0.98 - 1.15)
	2,150	36.9 - 41.1 (1.30 - 1.45)
	1,100	44.6 - 46.6 (1.57 - 1.64)
	600	42.1 - 46.1 (1.48 - 1.62)
Switch OFF	350	0 (0)
Idle stop (Idle)	350	4.5 - 8.5 (0.16 - 0.30)
	450	Less than 2.0 (0.07)

2 - 5	Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V

3. Dimensions

mm (in)

K	3.2 - 3.4 (0.126 - 0.134)
KF	5.7 - 5.9 (0.224 - 0.232)
MS	0.9 - 1.1 (0.035 - 0.043)

4. Control lever angle

degree

α	50 - 58
β	37 - 47

Service Data and Specifications (S.D.S) (Cont'd)

Model: TD27 for Australia
Pump part No.: 16700-11T14, 16700-11T15, 16700-11T22

Adjustment value:

		Pump speed (rpm)	Adjustment value	Difference in delivery mℓ (Imp fl oz)
1 - 1	Timing device travel (Timer piston stroke)	1,700	4.4 - 4.8 mm (0.173 - 0.189 in)	–
1 - 2	Supply pump pressure (Feed pump pressure)	1,700	549 - 608 kPa (5.49 - 6.08 bar, 5.6 - 6.2 kg/cm², 80 - 88 psi)	–
1 - 3	Full load delivery without charge air pressure (Fuel injection quantity at Full-load)	1,100	51.8 - 52.8 mℓ (1.82 - 1.86 Imp fl oz)/1,000 st	3.0 (0.11)
1 - 4	Idle speed regulation (Fuel injection quantity at idle)	350	4.5 - 8.5 mℓ (0.16 - 0.30 Imp fl oz)/1,000 st	2.0 (0.07)
1 - 5	Start (Fuel injection quantity at Start)	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st	–
1 - 6	Full-load speed regulation (Fuel injection quantity at Max. speed)	2,350	31.8 - 35.8 mℓ (1.12 - 1.26 Imp fl oz)/1,000 st	–

2. Testing value:

2 - 1	Timing device (Timer piston stroke)	Pump speed (rpm)	1,100	1,700	2,550
		mm (in)	2.0 - 3.0 (0.079 - 0.118)	4.3 - 4.9 (0.169 - 0.193)	6.4 - 7.4 (0.252 - 0.291)
2 - 2	Supply pump (Feed pump pressure)	Pump speed (rpm)	1,100	1,700	2,150
		kPa (bar, kg/cm², psi)	402 - 461 (4.02 - 4.61, 4.1 - 4.7, 58 - 67)	549 - 608 (5.49 - 6.08, 5.6 - 6.2, 80 - 88)	647 - 706 (6.47 - 7.06, 6.6 - 7.2, 94 - 102)
2 - 3	Overflow delivery	Pump speed (rpm)	1,100		
		mℓ (Imp fl oz)/10 sec.	43.0 - 87.0 (1.51 - 3.06)		

Service Data and Specifications (S.D.S.) (Cont'd)

2 - 4 Fuel deliveries

Speed control lever	Pump speed (rpm)	Fuel delivery mℓ (Imp fl oz)/ 1,000 st
End stop (Full-load)	2,700	Less than 5.0 (0.18)
	2,550	7.4 - 14.4 (0.26 - 0.51)
	2,350	31.3 - 36.3 (1.10 - 1.28)
	2,150	42.4 - 46.6 (1.49 - 1.64)
	1,100	51.3 - 53.3 (1.81 - 1.88)
	600	49.4 - 53.4 (1.74 - 1.88)
Switch OFF	350	0 (0)
Idle stop (Idle)	350	4.5 - 8.5 (0.16 - 0.30)
	450	Less than 2.0 (0.07)

2 - 5	Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14 V

3. Dimensions

mm (in)

K	3.2 - 3.4 (0.126 - 0.134)
KF	5.7 - 5.9 (0.224 - 0.232)
MS	0.9 - 1.1 (0.035 - 0.043)

4. Control lever angle

degree

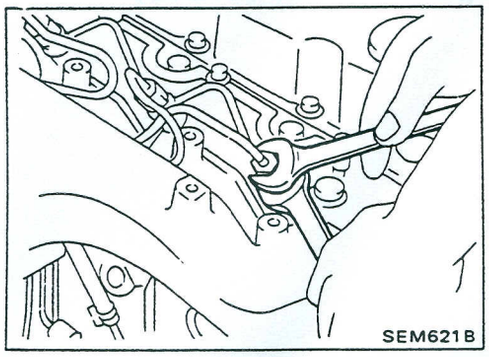
α	50 - 58
β	37 - 47

Service Data and Specifications (S.D.S) (Cont'd)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Distributor head to pump housing	11 - 13	1.1 - 1.3	8 - 9
Plug to distributor head	59 - 78	6.0 - 8.0	43 - 58
Delivery valve to distributor head	44 - 54	4.5 - 5.5	33 - 40
Pivot pin to pump housing	10 - 13	1.0 - 1.3	7 - 9
Regulating valve to pump housing	8 - 9	0.8 - 0.9	5.8 - 6.5
Control shaft to control lever	7 - 10	0.7 - 1.0	5.1 - 7.2
Injection pump drive gear nut	59 - 69	6.0 - 7.0	43 - 51
Injection pump fixing bolt	19 - 25	1.9 - 2.5	14 - 18
Injection pump to mounting bracket	30 - 41	3.1 - 4.2	22 - 30
Injection nozzle to cylinder head*	54 - 64	5.5 - 6.5	40 - 47
Injection tube flare nut	20 - 25	2.0 - 2.5	14 - 18
Spill tube nut	29 - 39	3.0 - 4.0	22 - 29
Feed pump cover to pump housing	2 - 3	0.2 - 0.3	1.4 - 2.2
Speed timer cover to pump housing	6 - 8	0.6 - 0.8	4.3 - 5.8
Governor shaft lock nut	25 - 29	2.5 - 3.0	18 - 22
Overflow valve	20 - 29	2.0 - 3.0	14 - 22
Maximum and idle speed adjusting screw lock nuts	6 - 9	0.6 - 0.9	4.3 - 6.5
Full-load adjusting screw lock nut	7 - 9	0.7 - 0.9	5.1 - 6.5
Fuel cut solenoid valve	20 - 29	2.0 - 3.0	14 - 22
Plug bolt	14 - 20	1.4 - 2.0	10 - 14
Adjusting rod bushing lock nut	25 - 34	2.5 - 3.5	18 - 25

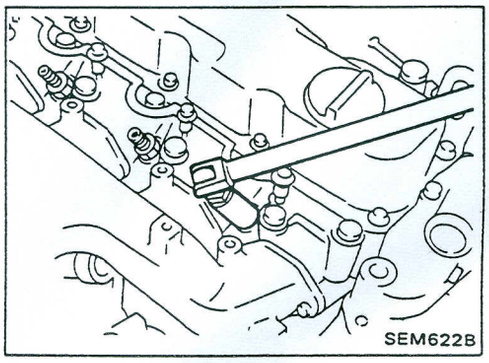
*: Part No. of injection nozzle: 16600-43G02


SEM621B

REMOVAL AND INSTALLATION

1. Remove injection tube assembly.
2. Remove spill tube assembly.

To prevent spill tube from breaking, remove it by gripping nozzle holder.

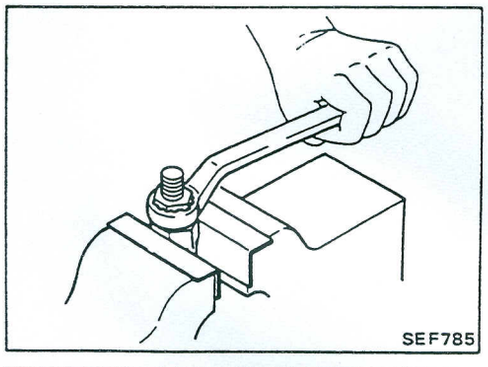

SEM622B

3. Remove injection nozzle assembly using deep socket wrench.
4. Install injection nozzle in the reverse order of removal.

Injection nozzle to cylinder head
54 - 64 N·m
(5.5 - 6.5 kg-m, 40 - 47 ft-lb)
Spill tube nut
29 - 39 N·m
(3.0 - 4.0 kg-m, 22 - 29 ft-lb)
Injection tube flare nut
20 - 25 N·m
(2.0 - 2.5 kg-m, 14 - 18 ft-lb)

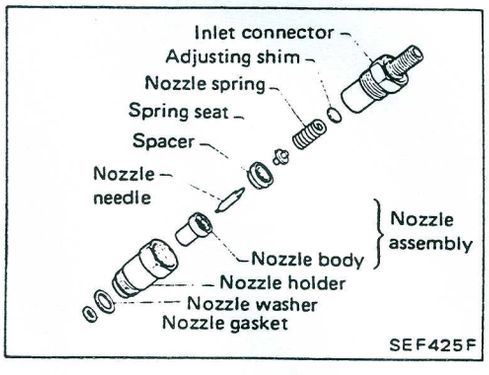
a. **Nozzle gaskets should always be replaced.**
b. **To prevent spill tube from breaking later, spill tube nuts should be tightened gradually in sequence.**

5. Bleed air from fuel system.
   Refer to BLEEDING FUEL SYSTEM.


SEF785

DISASSEMBLY

1. Loosen inlet connector while keeping nozzle top from turning.



SEF425F

2. Arrange all disassembled parts in order shown at left.

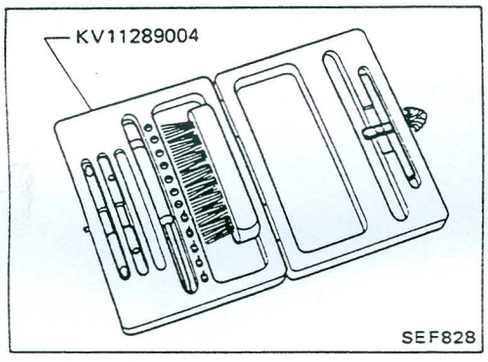
INSPECTION

Thoroughly clean all disassembled parts with fresh kerosene or solvent.

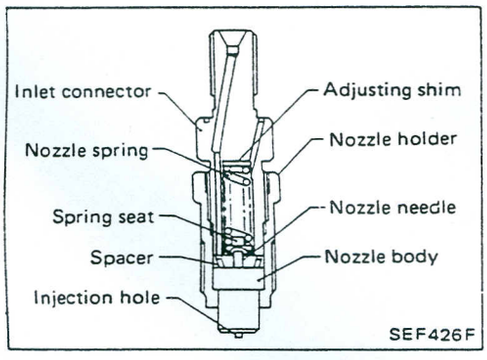
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or nozzle holder assembly.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace nozzle holder assembly.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace nozzle holder assembly.

CLEANING

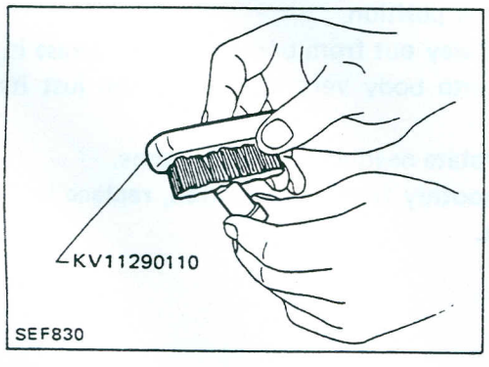
1. Clean nozzle assembly using the Nozzle Cleaning Kit.

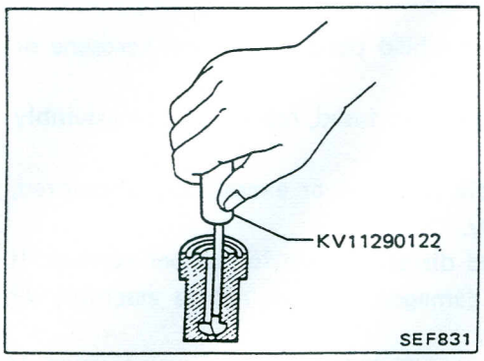


2. Portions which should be cleaned are indicated in the left figure.

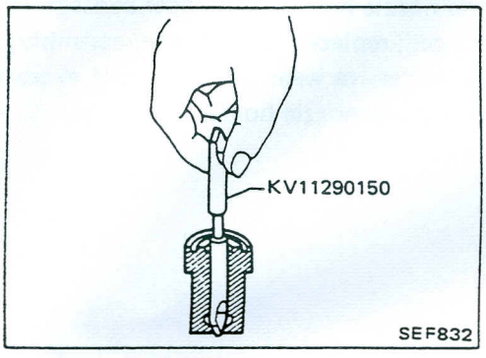


3. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.



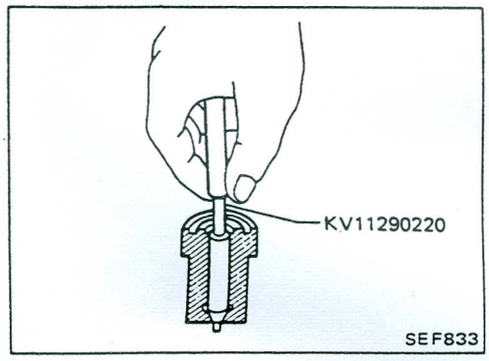


4. Clean fuel sump of nozzle body using Tool.



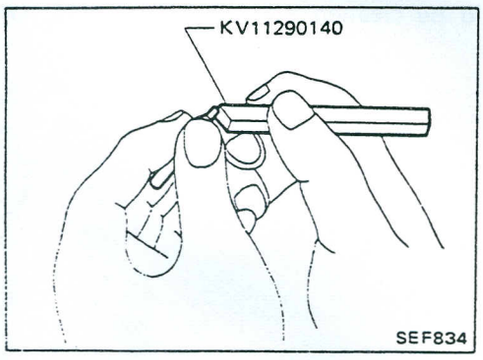
5. Clean nozzle seat by using Tool.

This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

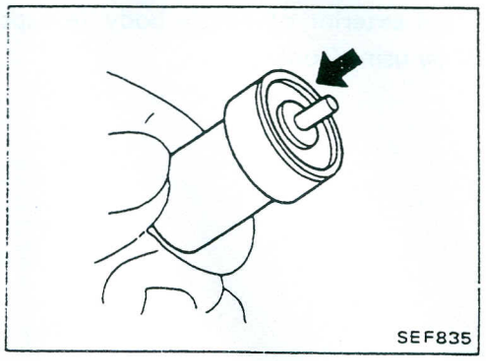


6. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.

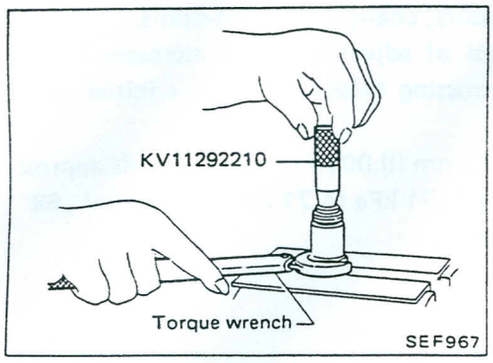


7. Decarbon nozzle needle tip by using Tool.



8. Check needle for proper position.
(1) Pull needle about halfway out from body and then release it.
(2) Needle should sink into body very smoothly from just its own weight.
(3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.



ASSEMBLY

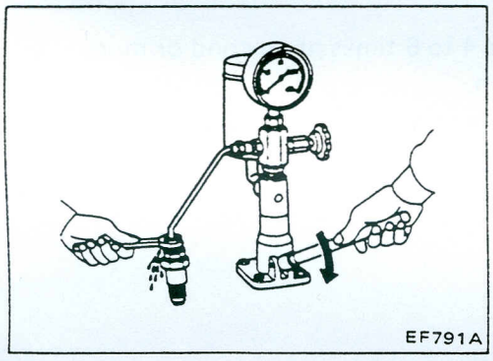
Assemble in the reverse order of disassembly.

: Inlet connector to nozzle holder
29 - 49 N·m
(3.0 - 5.0 kg-m, 22 - 36 ft-lb)

TEST AND ADJUSTMENT

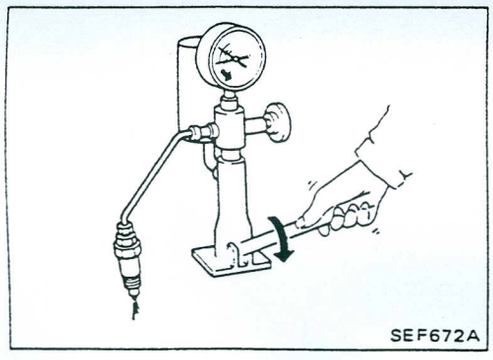
WARNING:

When using nozzle tester, be careful not to allow fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected with goggles.



Injection pressure test

1. Install nozzle to injection nozzle tester and bleed air from flare nut.



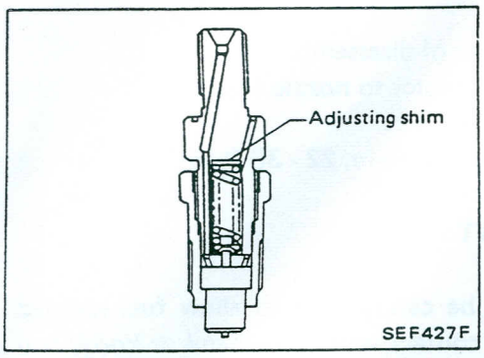
2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:

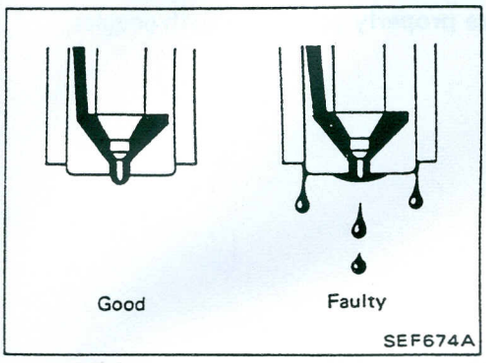
Used 9,807 - 10,297 kPa
(98.1 - 103.0 bar, 100 - 105 kg/cm^2, 1,422 - 1,493 psi)

New 10,297 - 11,278 kPa
(103.0 - 112.8 bar, 105 - 115 kg/cm^2, 1,493 - 1,635 psi)

New nozzle is required to always check initial injection pressure.

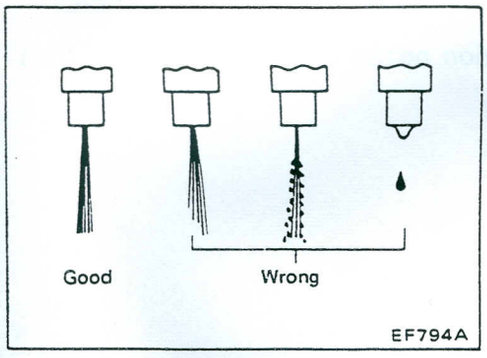


4. To adjust injection pressure, change adjusting shims.
a. **Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.**
b. **A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.71 bar, 4.8 kg/cm², 68 psi) in initial injection pressure.**



Leakage test

1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm², 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, clean, overhaul injection nozzle or replace it.



Spray pattern test

1. Pump the tester handle 4 to 6 times per second or more.
2. Check the spray pattern.
3. If the spray pattern is not correct, clean injection nozzle or replace it.

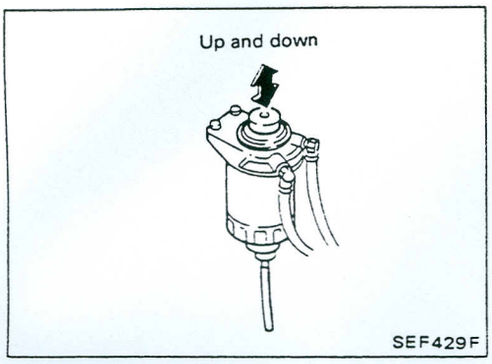
BLEEDING FUEL SYSTEM (Engine on vehicle)

Air should be bled out of fuel system when injection pump is removed or fuel system is repaired.

Protect pump and engine mounts from fuel splash with rags.

If engine will not start after bleeding air, loosen injection tubes at nozzle side and crank engine until fuel overflows from injection tube. Tighten injection tube flare nuts.

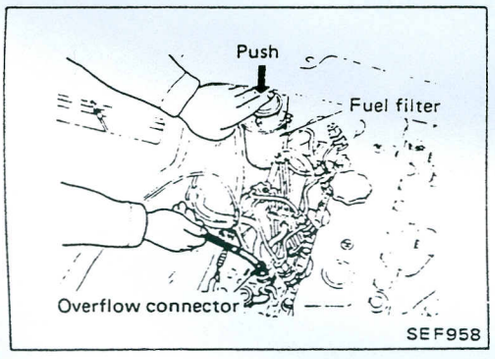
If the engine does not operate smoothly after it has started, race it two or three times.



VE pump

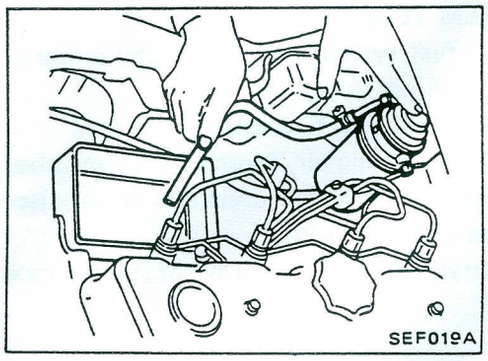
- **Method A**

Move the priming pump up and down until there is suddenly more resistance in the movement.



- **Method B**

1. Loosen injection pump bleeder screw/or disconnect return hose and priming.
2. Make sure that fuel overflows at bleeder screw/tube end, then tighten it/connect hose.



CHECKING PRIMING PUMP

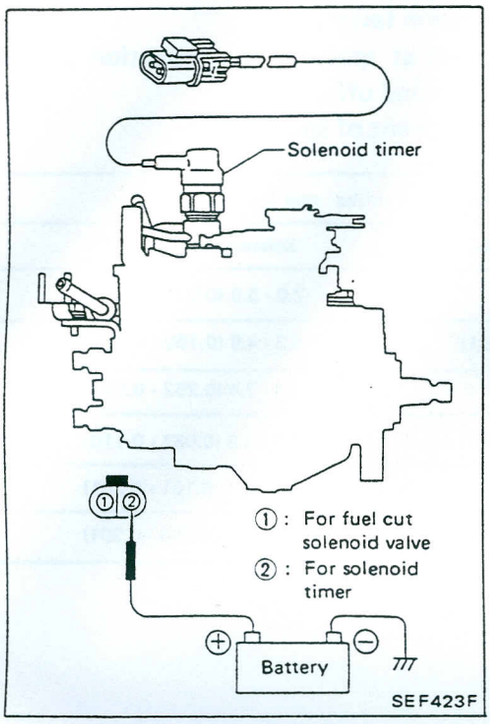
- **VE pump**

Before checking priming pump, make sure that fuel filter is filled with fuel.

1. Disconnect fuel return hose.

Place a suitable container beneath hose end.

2. Pump priming pump and check that the fuel overflows from the hose end. If not, replace priming pump.

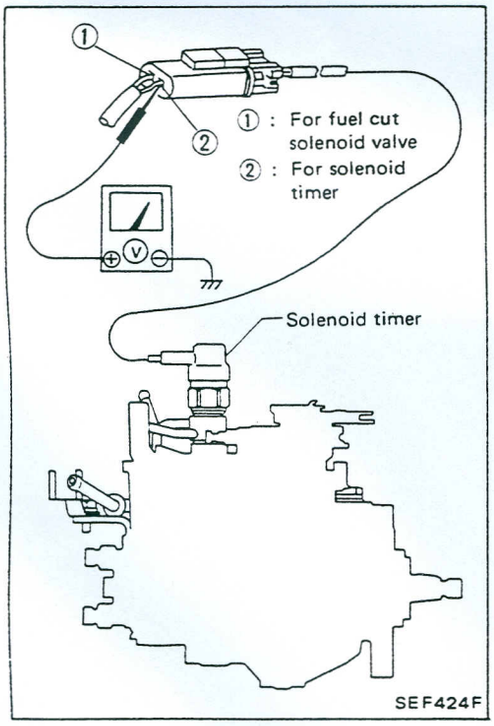


INSPECTION

Solenoid timer

1. Disconnect solenoid timer harness and check for "clicking" sound from solenoid when battery is connected and disconnected.
   If solenoid has malfunction, replace it.

After checking, reconnect the connector.



2. Disconnect water temperature sensor harness connector.
3. Start engine and check voltage between terminal ② and ground.

Battery voltage should exist for 30 seconds after starting engine.
If not, check harness and glow control unit.

Timer piston stroke (Using pump tester)

Measure timer piston strokes at specified fuel injection pump rpm when solenoid timer is on and off.

Refer to Section EF for adjustment of speed timer.

Part number	Fuel injection pump rpm	Timer piston stroke mm (in)	
		Solenoid timer is ON.	Solenoid timer is OFF.
16700-02N14	1,100	–	2.0 - 3.0 (0.079 - 0.118)
	1,700	5.5 - 7.4 (0.217 - 0.291)	4.3 - 4.9 (0.169 - 0.193)
	2,550	–	6.4 - 7.4 (0.252 - 0.291)
16700-10T0 16700-02N1[illegible] 16700-02N[illegible] 16700-02N21 16700-02N22	1,100	3.7 - 4.7 (0.146 - 0.185)	2.2 - 2.8 (0.087 - 0.110)
	1,700	–	4.1 - 5.1 (0.161 - 0.201)
	2,550	–	6.5 - 7.4 (0.256 - 0.291)