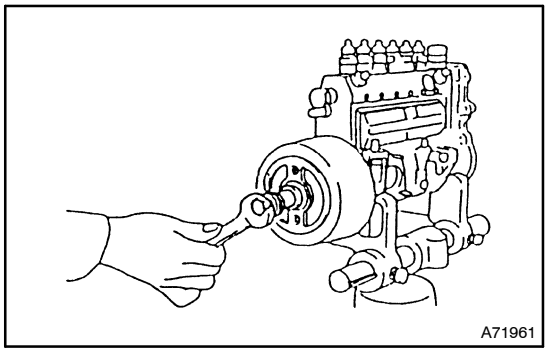
110JM–02

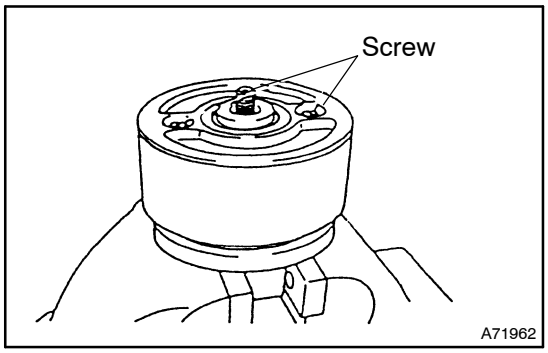
OVERHAUL



1. REMOVE TIMER FROM INJECTION PUMP

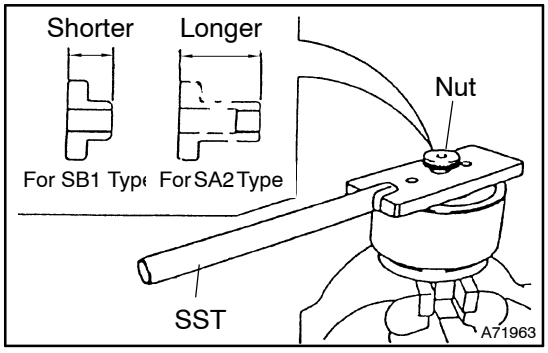
(a) Remove the timer round nut from the timer.

(b) Remove the timer from the injection pump.



2. REMOVE TIMER COVER

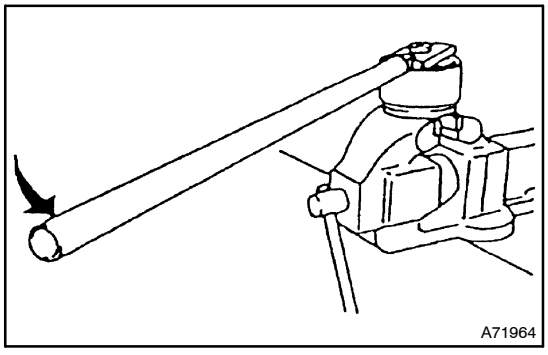
(a) Remove the 2 timer hub screws.



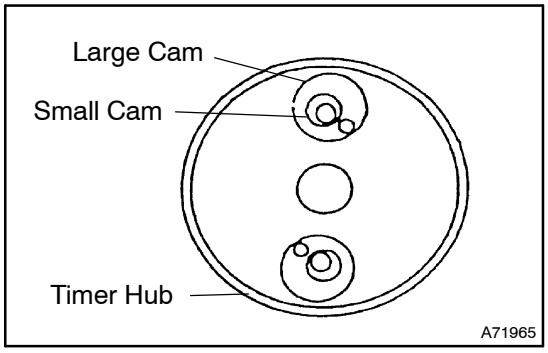
(b) Install the SST on the cover, and fix with the nut.
SST S0951–22210

NOTICE:

Do not tighten the nut but leave loosened.



(c) Set the extension bar on the timer wrench, then loosen and remove the timer cover.

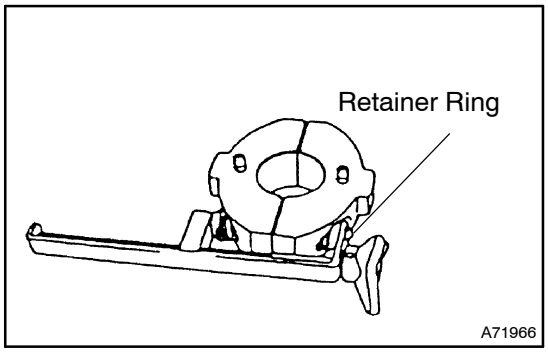


3. REMOVE TIMER WEIGHT

(a) Remove the timer weight (with spring, timer weight rod etc.).

NOTICE:

Leave timer cams on timer hub.

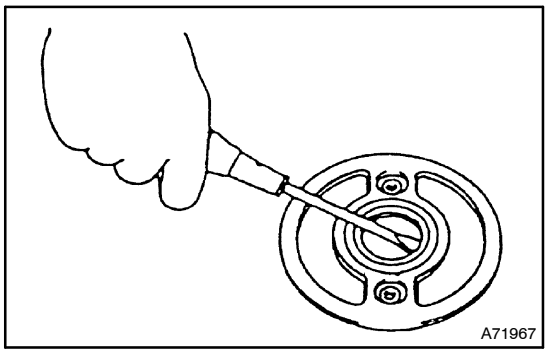


4. REMOVE TIMER CAMS AND TIMER HUB

(a) Compress the time spring, then remove the retainer ring.

NOTICE:

Remember the position of timer cams.

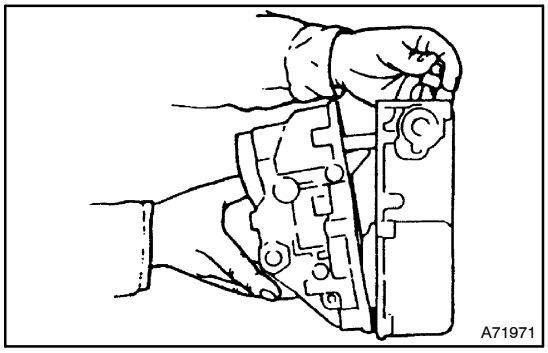


5. REMOVE OIL SEAL

(a) Using a screwdriver, remove the oil seals from the timer cover and driving flange.

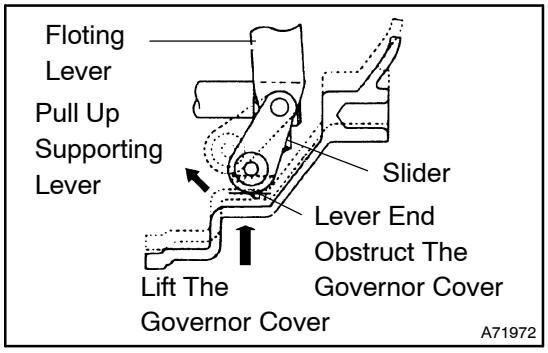
NOTICE:

- **Breaking of the lead seals or crimp caps by anyone other than pump manufacture authorized service stations to make these adjustments will void the warranty.**
- **If fuel pump or governor difficulties are suspected, consult only pump manufacture authorized service stations, where the problem can be corrected and the injection pump lead seals and crimp caps can be reinstalled as required.**

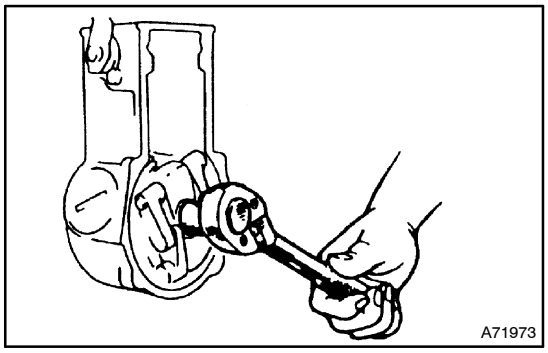


6. REMOVE GOVERNOR COVER

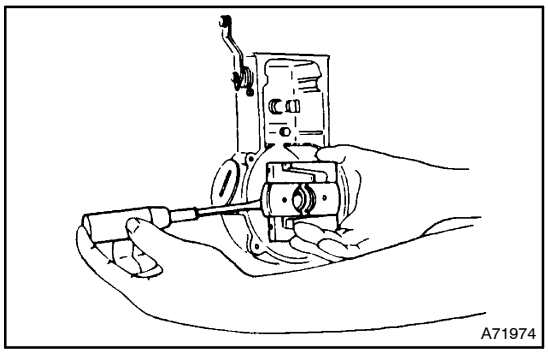
(a) With the adjusting lever held in its 'idling' position, detach the governor cover by lifting it up in such a way that the sliding block can slide out of the slit in the floating lever.



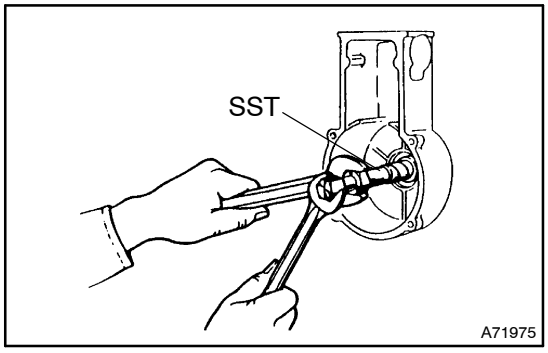
NOTICE:
Before lifting the governor cover, be sure to pull up the supporting lever as shown by dotted lines in the figure, so that its lower end may not obstruct the lifting of the governor cover.



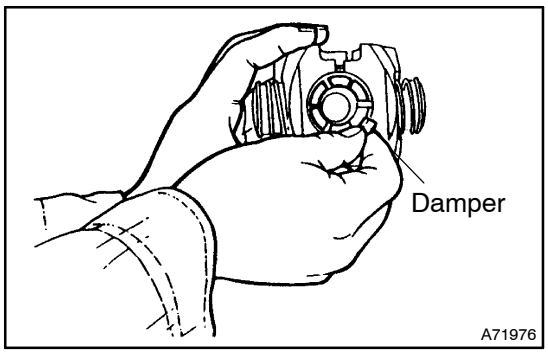
7. REMOVE FLYWEIGHT ROUND NUT
NOTICE:
Use the holding spanner to keep the camshaft from rotating.



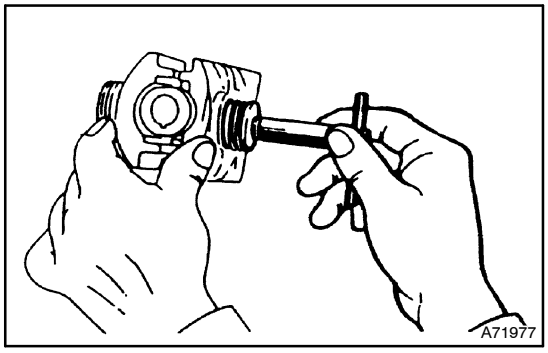
8. REMOVE FLYWEIGHT SUB–ASSY
(a) Remove the flyweight using a screwdriver to pull it out slowly.



(b) Remove the camshaft bushing.
SST S0951–21920



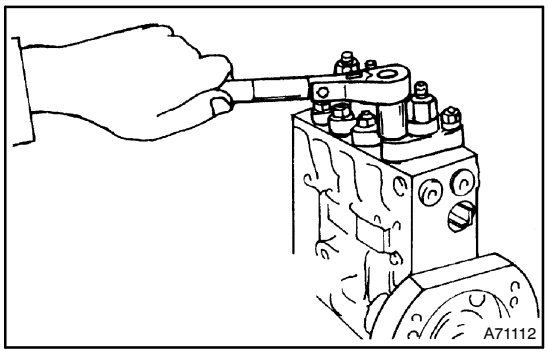
(c) Remove the damper from the flyweight.



(d) Remove the flyweight.
(1) Remove the adjusting nut with SST, and disassemble the inner parts of the flyweight.

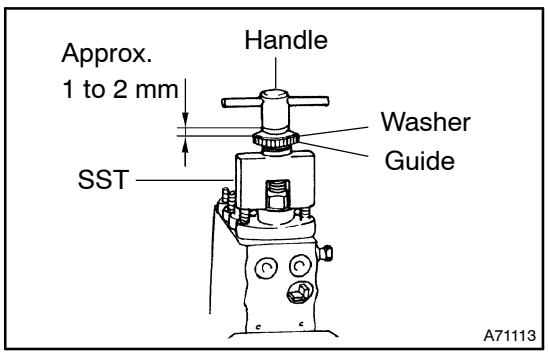
NOTICE:

- **Breaking of the lead seals or crimp caps by anyone other than pump manufacture authorized service stations to make these adjustments will void the warranty.**
- **If fuel pump or governor difficulties are suspected, consult only pump manufacture authorized service stations, where the problem can be corrected and the injection pump lead seals and crimp caps can be reinstalled as required.**
- **Measure and record the fuel delivery characteristics of the pump before disassembling it.**
- **Keep the parts for each cylinder in separate groups and in an orderly arrangement. Parts to be replaced and parts to be used again must be kept separately.**



9. REMOVE DELIVERY VALVE GROUP

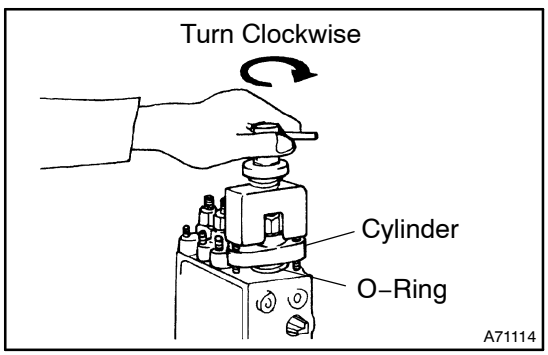
(a) Remove the nut that secures the cylinder.



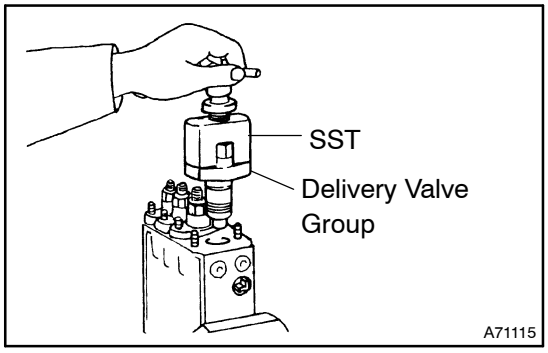
(b) Turn the guide until the clearance between the washer and the handle is approx. 1 to 2 mm (0.039 – 0.078 in.), to set the SST.
SST S0951–21920

NOTICE:

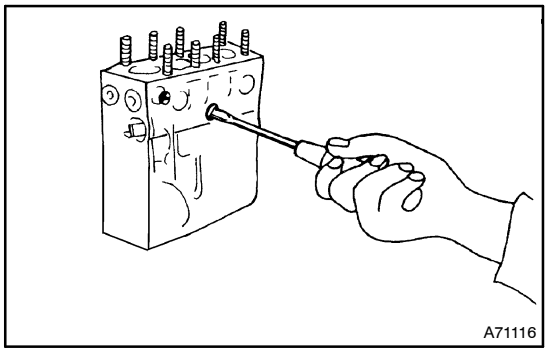
The guide of the SST is left–hand threaded.



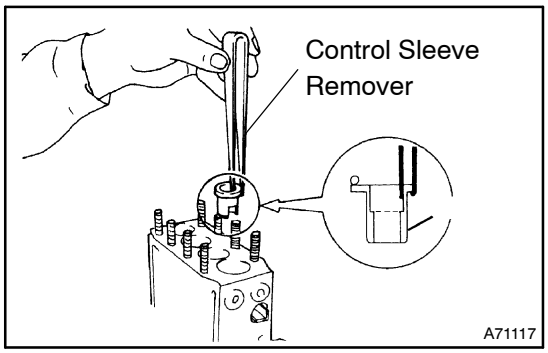
(c) Turn the handle clockwise into the deliver valve holder. Continue until the O–ring in the cylinder comes off the pump housing.



(d) Pull the SST upward to remove the delivery valve assembly.

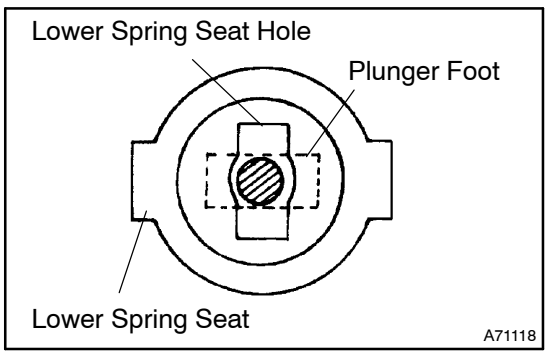


(e) Remove the rack guide screw.



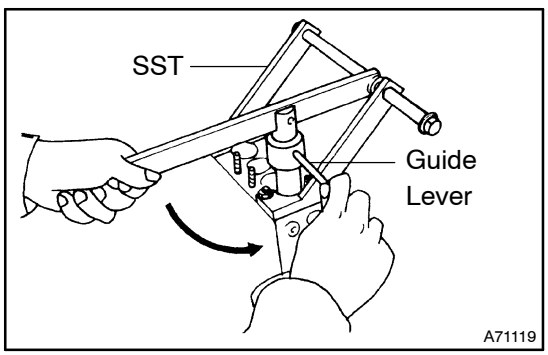
(f) Remove the control sleeve.
(1) Pull the control rack to the left (viewed from the feed pump) as far as it goes.
(2) Hook the end of the control sleeve remover onto the groove of the control sleeve and remove it.

NOTICE:
Set the camshaft at bottom dead center before removing the control sleeve.



(g) Remove the plunger.
Bring the camshaft of the cylinder to top dead center.

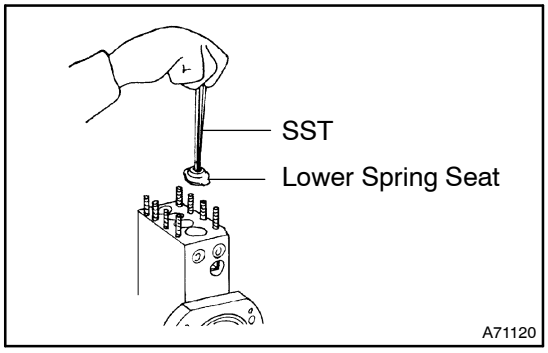
NOTICE:
- **Do not mix up the plungers since they must be put back into the same cylinders.**
- **Handle the plunger very gently, in order not to damage it.**
- **Keep the removed plungers in a pan containing clean diesel fuel.**



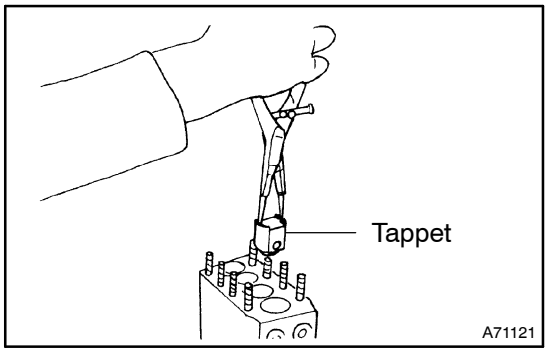
(h) Remove the upper spring seat.
Pushing the handle down to push in the plunger spring, turn the guide lever 90° (in either direction) to remove the upper spring seat from the stopper pin.
SST S0951–21930

NOTICE:
First bring the cam of the cylinder to bottom dead center.

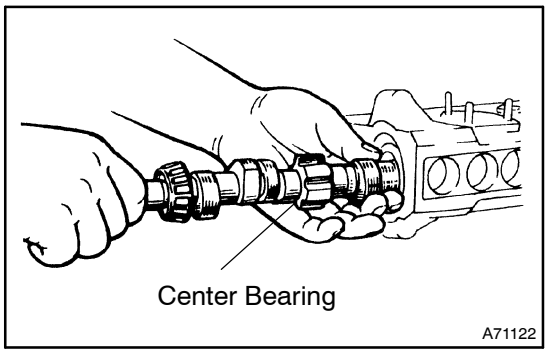
(i) Remove the upper seat and plunger spring.



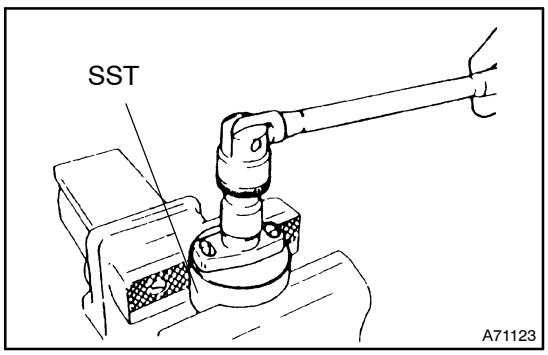
(j) Using SST, remove the lower spring seat.
SST 09269–54030



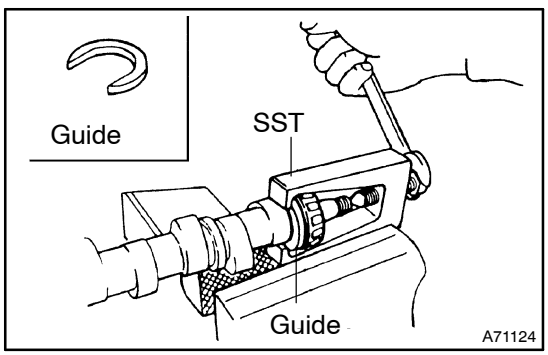
(k) Remove the tappet.



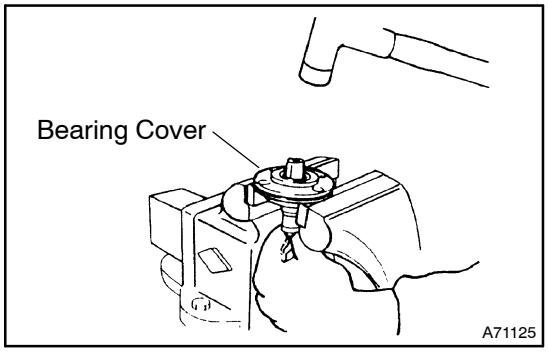
(l) Remove the camshaft from the injection pump body.
(1) Remove the center bearing two set screws.
(2) Loosen the bearing cover set screws.
(3) Lightly tap the camshaft with a plastic hammer from the governor side and remove the camshaft and bearing cove at the same time.



(m) Disassemble the delivery valve group.
Mount the delivery valve assembly in the SST, and remove the delivery valve holder.
SST S0951–21910



(n) Remove the taper bearing from the camshaft.
remove the taper bearing from the drive end of the camshaft using the SST.
SST 09287–58010
(1) Use the guide to remove the bearing at the governor side.



(2) Tap out the outer race in the bearing cover.

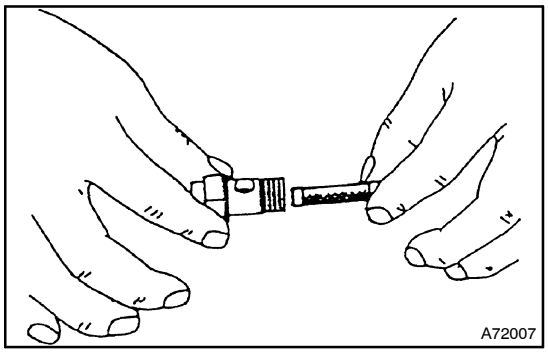
10. REMOVE PRIMING PUMP AND CHECK VALVES

(a) Unscrew the priming pump and remove the spring and inlet check valve.

(b) Remove the outlet check valve and spring.

11. REMOVE TAPPET

(a) Remove the retainer ring and pull out the tappet.



12. REMOVE FILTER FROM INLET PIPE JOINT

(a) Clean the filter with clean diesel fuel.

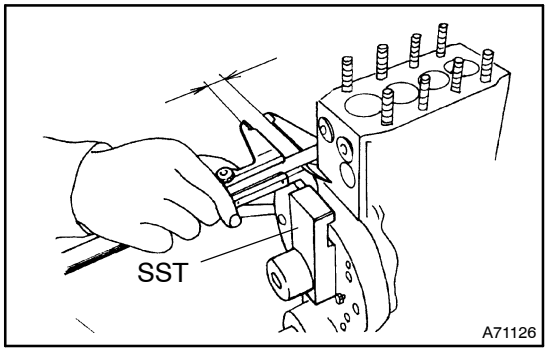
13. INSTALL TAPPET

14. INSTALL RETAINER RING

15. INSTALL PISTON

(a) Insert the piston and spring in the housing and screw on the chamber plug with a new gasket.

16. INSTALL PLUG AND CHECK VALVES

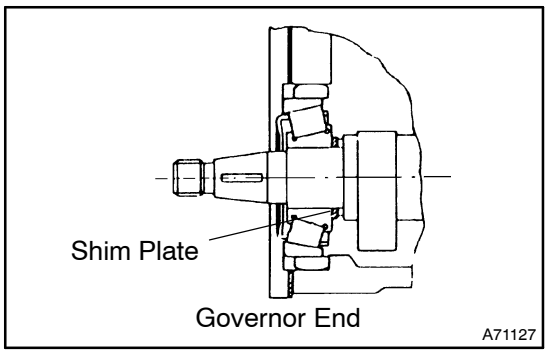


17. INSPECT CAMSHAFT PROTRUDING LENGTH

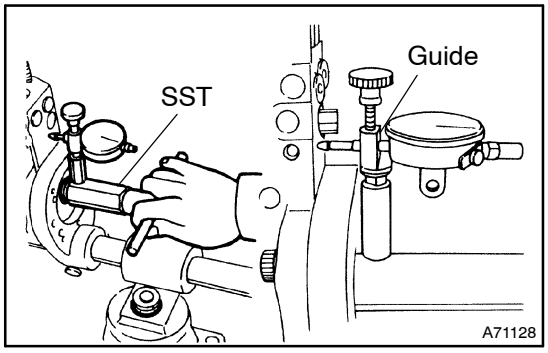
(a) Measure the distance from the surface of the end of the pump housing to the surface of the end of the SST (where the tapered section of the camshaft starts).

SST S0951–01170

Standard length: 16 – 17 mm (0.63 – 0.67 in.)

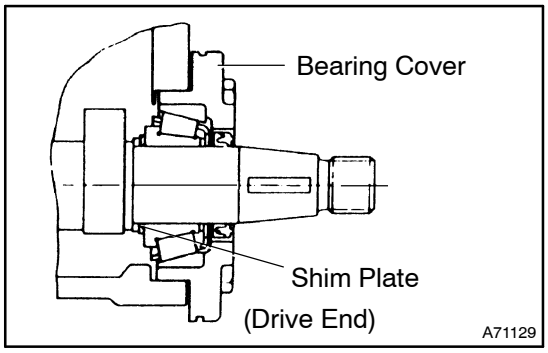


(b) If the specification is not met, use appropriate shim plates at the governor end of camshaft until the specification is met.

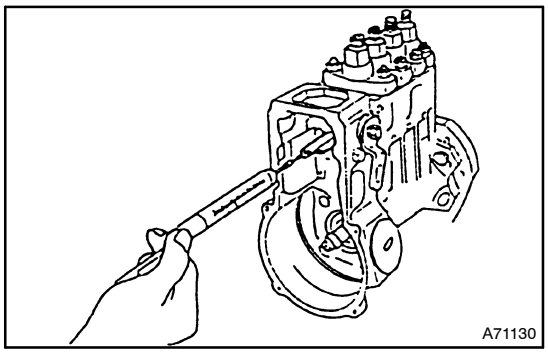


18. INSPECT CAMSHAFT END PLAY

(a) Using SST, measure the thrust clearance of the camshaft with a dial gauge.
SST S0951–21150
Standard end play:
0.03 – 0.05 mm (0.0012 – 0.0020 in.)



If the specification is not met, use, appropriate shim plates at the drive end of camshaft until the specification is met.

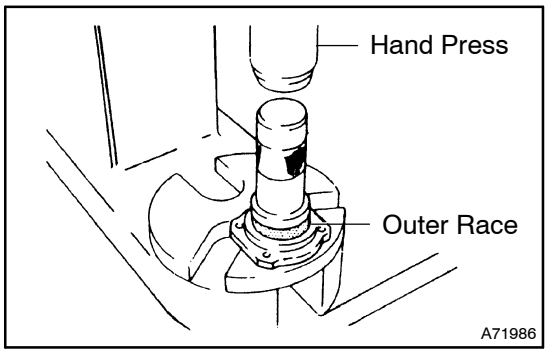


19. INSPECT SLIDING RESISTANCE OF CONTROL RACK

(a) After the pump body has been assembled, attach a spring scale to the control rack and check and check that the control rack slides smoothly through its entire stroke.
Assembly standard:
Less than 0.98 N (100 gf, 3.52 ozf)

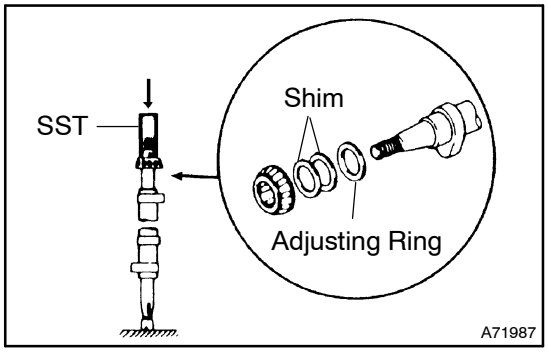
NOTICE:

- **wash all parts with clean diesel fuel before installing them, and any defective or damaged parts must be replaced.**
- **Do not allow dust or other foreign particles to enter the pump during assembly.**
- **Apply grease to O–rings and oil seals before installing them.**
- **Assemble the parts in correct order and to correct tightening torques, assembled dimensions etc.**
- **Reassembly takes place in the reverse order of disassembly.**



20. INSTALL BEARING

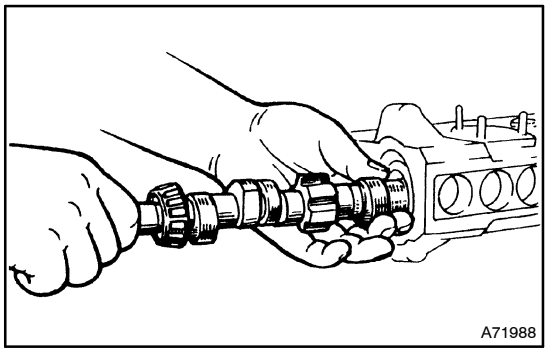
(a) Put on the bearing outer race, and press–fit it into the bearing cover using a hand press.



(b) Install the adjustment ring, shim and bearing, in that order, on the camshaft.

NOTICE:

Put a round nut on the other end of the camshaft to protect the threads.



21. INSTALL CAMSHAFT

(a) Place the center bearing on the camshaft and insert the camshaft into the pump housing, and tighten the center bearing setting screws.

Torque:

6.87 – 8.82 N·m (70 – 90 kgf·cm, 5.1 – 6.5 ft·lbf)

22. INSTALL BEARING COVER AND GOVERNOR HOUSING

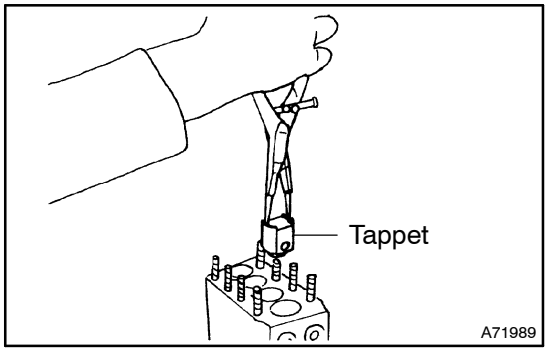
Torque:

Bearing cover:

15.7 N·m (160 kgf·cm, 12 ft·lbf)

Governor housing:

18.6 N·m (190 kgf·cm, 14 ft·lbf)

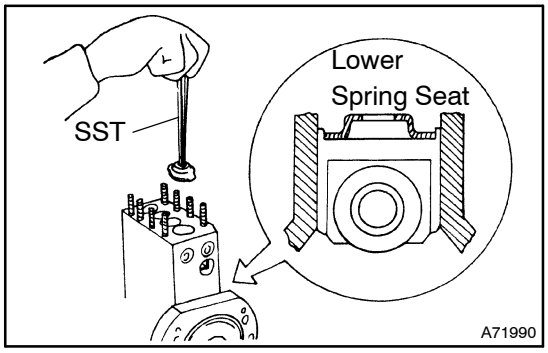


23. INSTALL TAPPET

(a) Install the tappet.

NOTICE:

Position the groove provided in the tappet in the axial direction of the camshaft, and position it accurately so that the tappet is retained in position by the tappet retainer pin which is driven inside the pump housing.



24. INSTALL LOWER SPRING SEAT

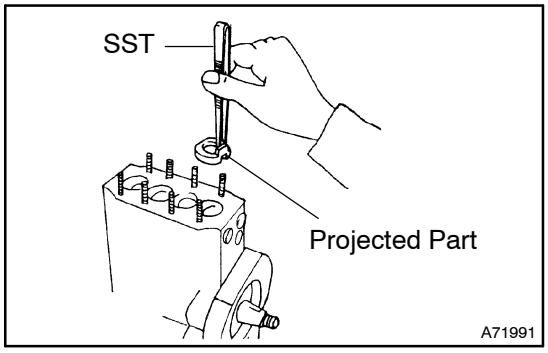
(a) Using SST, install the lower spring seat.

SST 09269–54030

NOTICE:

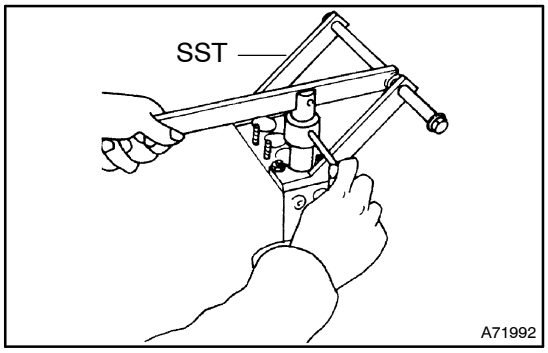
Be sure that the flanger of the lower spring seat is accurately seated in the grove of the tappet.

(b) This is very important since an inaccurately positioned seat may cause damage to the pump.

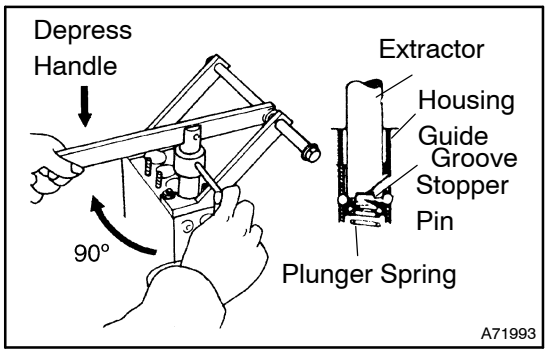


25. INSTALL UPPER SPRING SEAT

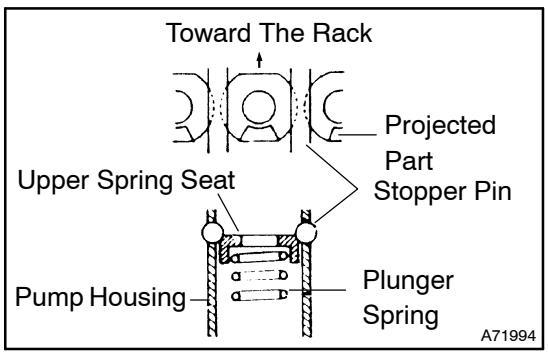
(a) Using SST, insert the upper spring seat with the projected part of the seat facing at the drive end of the housing.
SST 09269–54030



(b) Attach the upper spring extractor, and fit the guide groove on the extractor to the projected part of the upper spring seat.
SST S0951–21930

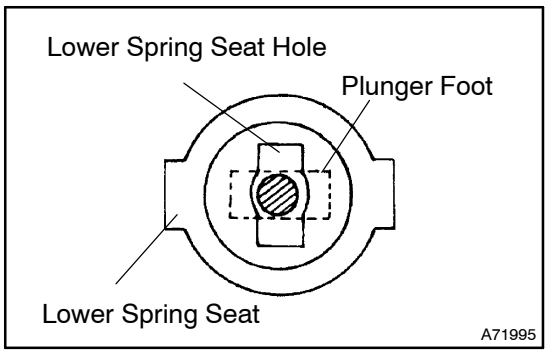


(c) Push the handle down to compress the plunger spring, turn the guide lever 90° towards you, and installing the upper spring seat underneath the stopper pin which is driven inside the pump housing.



NOTICE:

- **First bring the cam of the cylinder to bottom dead center.**
- **Check that the spring is accurately retained by the stopper pin.**
- **Check that the projected part of the upper spring seat faces away from the rack.**

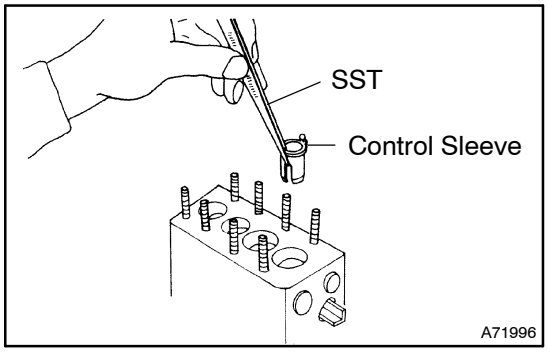


26. INSTALL PLUNGER

(a) Put the flange of the plunger leg through the hole provided in the lower spring seat, with the part number marking facing the spill side (away from the feed pump), then turn it clockwise 90°.

NOTICE:

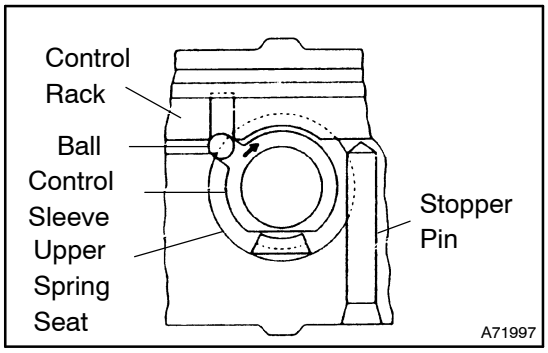
- **The plunger can be installed more easily if the cam of the cylinder is at top dead center.**
- **Grip the plunger at the top, and pull up to check that it does not come out.**



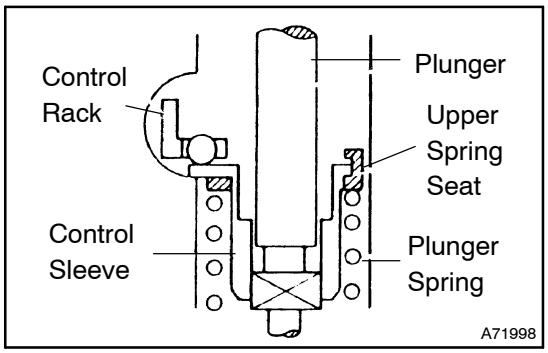
27. INSTALL CONTROL SLEEVE

(a) Insert the control rack.

(b) Using SST, install the control sleeve.
SST 09269–54030

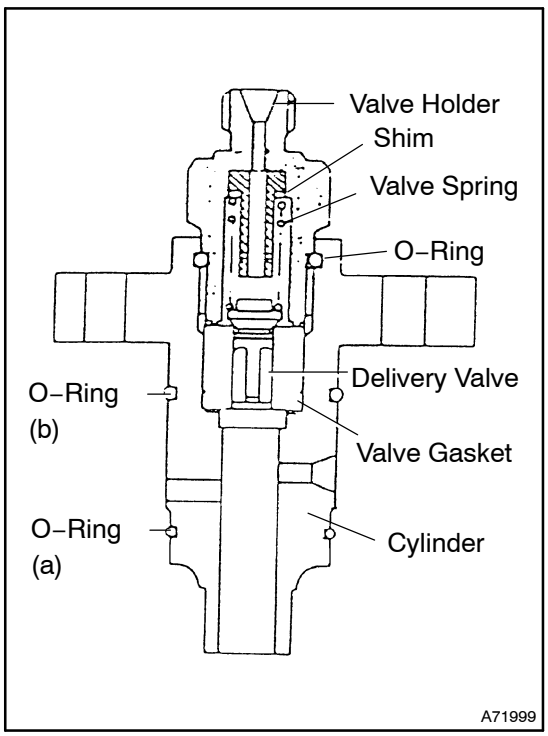


NOTICE:
Position the flanges of the control sleeve and the plunger, and the projected part of the upper spring seat correctly before inserting the control sleeve.



(c) Move the control rack until the ball in the control sleeve is accurately inside the groove provided in the control rack.

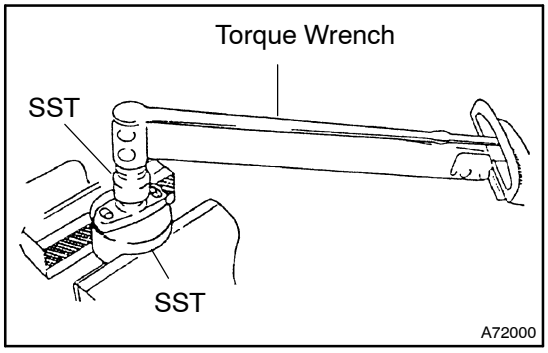
NOTICE:
- **The plunger may slip out of its position during installation. Check the following for a second time.**
- **The vertical groove of the plunger must face the spill side.**
- **The plunger must not come out when it is pulled up.**



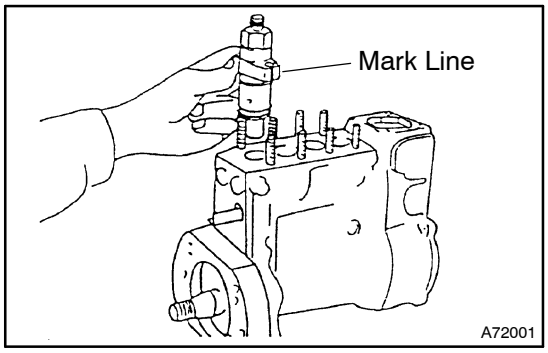
28. INSTALL DELIVERY VALVE GROUP

(a) Install the valve gasket, delivery valve, valve spring, shim, and the valve holder in that order inside the cylinder.

NOTICE:
- **Apply grease to each O–ring first to protect it from damage. Install O–ring (a) and (b) in that order.**
- **Use new valve gaskets and O–rings. Never reuse them.**

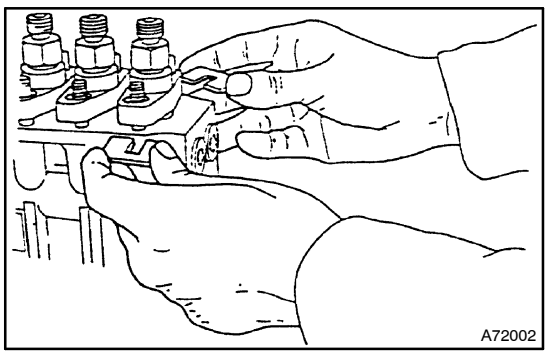


(b) Using SST, put the delivery valve, and tighten the delivery valve on the delivery valve group.
SST S0951–21910
Tightening torque:
88.3 N·m (900 kgf·cm, 65 ft·lbf)

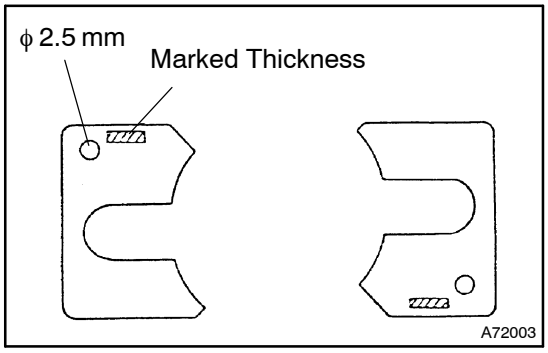


(c) Apply a small amount of grease to the O–rings and the outside of the cylinder, position the cylinder with the marked line on its flange facing the spill side of the feed pump, slip the cylinder over the plunger, moving the control rack in and out, and insert the delivery valve group inside the pump body.

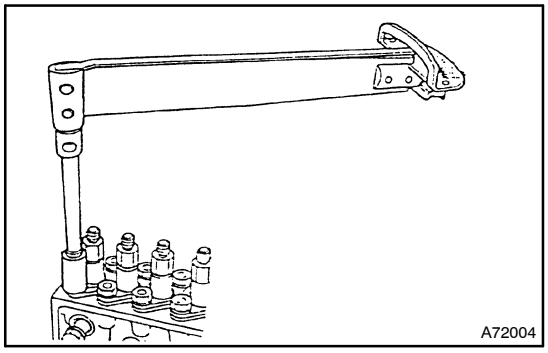
NOTICE:
- **Install the cylinder in the correct position. This is very important since, otherwise, the relative position of the feed hole and the spill port will be reversed and the characteristics of the injection volume will be different.**
- **Each time a cylinder is inserted, move the control rack to check that it slides smoothly.**



(d) Put pair of shims under the flange of the cylinder.



NOTICE:
- **Use a pair of shims of the same thickness at the sides of each cylinder.**
- **Install the shims with the thickness marking facing up (They cannot be installed upside down since the valve holder cover will be in the way).**
- **Push each shim completely in until it touches the cylinder.**



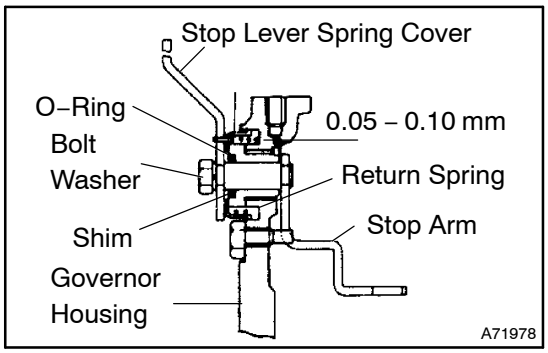
(e) Tighten the nuts finger tight. Then, tighten the nuts alternately to their specified torque.

Torque:

19.1 N·m (195 kgf·cm, 14 ft·lbf)

NOTICE:

- **Wash all parts with clean diesel fuel before installing them, and any defective or damaged parts must be replaced.**
- **Do not allow dust or other foreign matter to enter the pump during assembly.**
- **Apply grease to O–rings and oil seals before installing them.**
- **Assemble the parts in correct order and to correct tightening torque, assembled dimensions etc.**
- **Assembly takes place in the reverse order of disassembly.**



29. INSTALL STOP LEVER

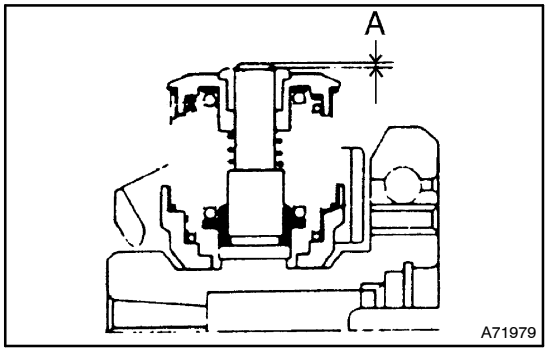
(a) Install the stop lever as shown.

(b) Measure the thrust clearance of the stop arm.

Thrust clearance: 0.05 – 0.10 mm (0.0020 – 0.0039 in.)

NOTICE:

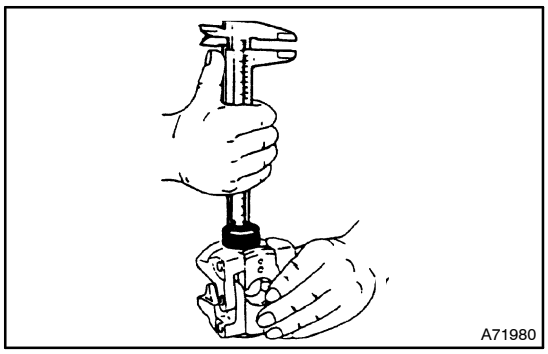
The O–ring should be coated with grease before being fitted.



30. INSTALL FLYWEIGHT

NOTICE:

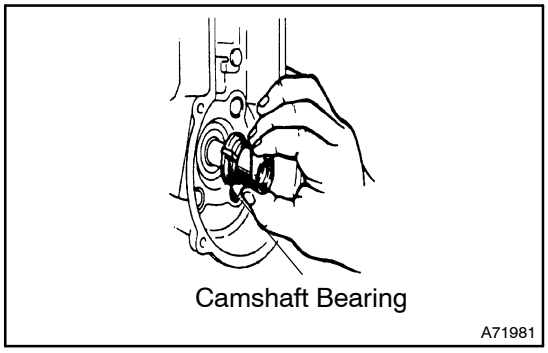
Be sure to install the spring inner seat correctly, its 'LAPPED' surface should face downwards.



(a) Tighten the adjusting nut.

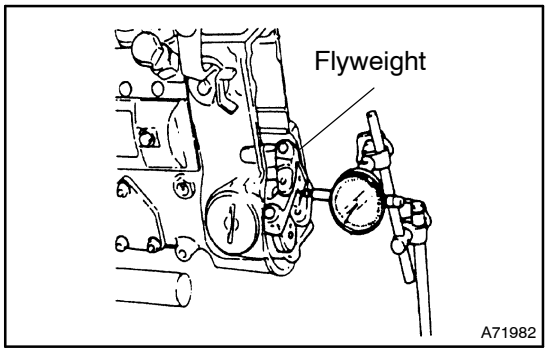
Protrusion of adjusting nut A:

–0.4 mm to 0.2 mm (–0.016 in. to 0.008 in.)



31. IF EQUIPPED WITH DAMPER, ADJUST DAMPER THRUST CLEARANCE

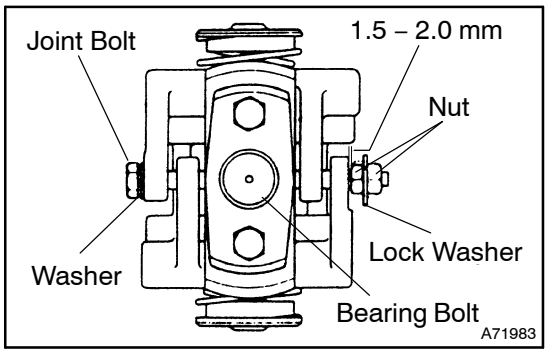
(a) This provides a clearance between the flyweight and the camshaft bushing.
  (1) Temporarily install the camshaft bushing on the camshaft.
  (2) Install the flyweight without the dampers.
  (3) Temporarily fit the governor round nut.



  (4) Apply a dial gauge to the end face of the flyweight, and measure the thrust clearance.

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

If not within specification, adjust the clearance by inserting shims between the camshaft bushing and the governor round nut.



32. INSTALL BEARING BOLT

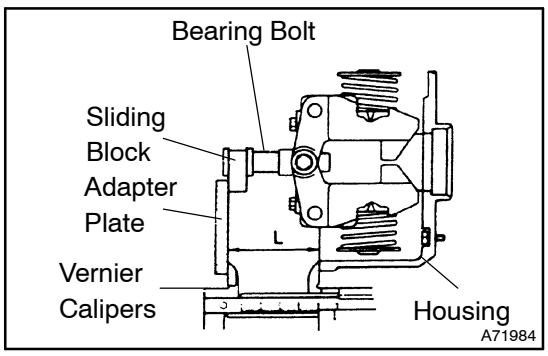
(a) Measure the free play of the jointing bolt along its axis.

Standard free play: 1.5 – 2.0 mm (0.059 – 0.079 in.)

NOTICE:

Make sure the bearing bolt can be moved smoothly through the guide bushing.

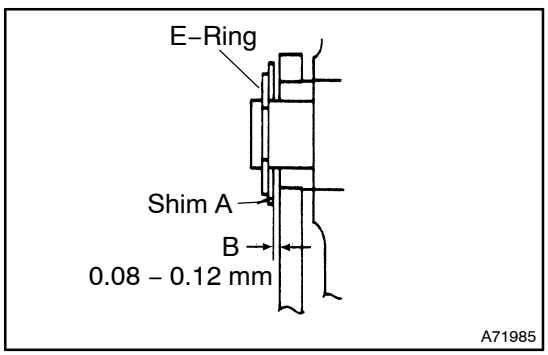
(b) Measure the fitting dimension of the bearing bolt.



  (1) While pulling on the bearing bolt, measure the dimension 'L' with calipers.

Fitting dimension:

49.7 – 50.1 mm (1.957 – 1.972 in.)

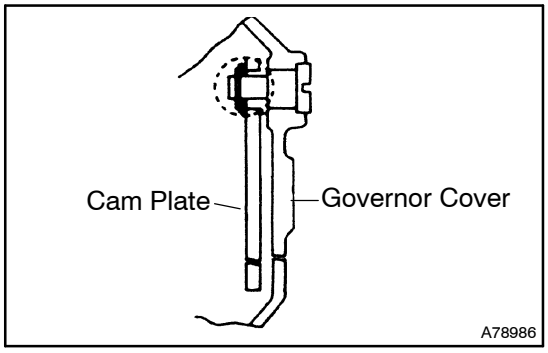


33. INSTALL GOVERNOR COVER

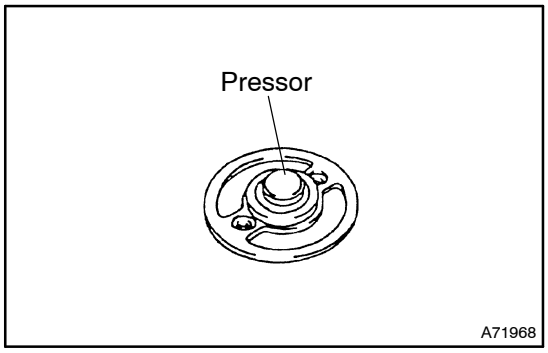
(a) Install the cam plate on the governor cover and shim with E–ring.

NOTICE:

Shim A about 0.5 mm (0.02 in.) in thickness should be installed with the E–ring.



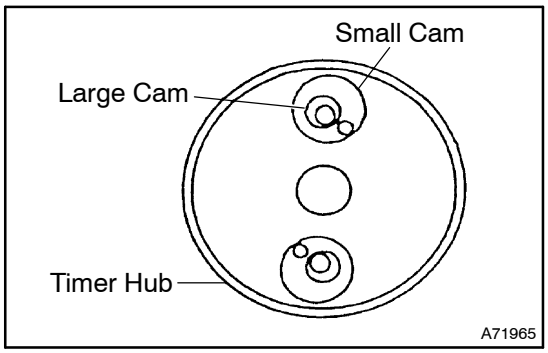
(b) Measure the cam plate thrust clearance B.
Thrust clearance B:
0.08 – 0.12 mm (0.0032 – 0.0047 in.)



34. INSTALL OIL SEAL

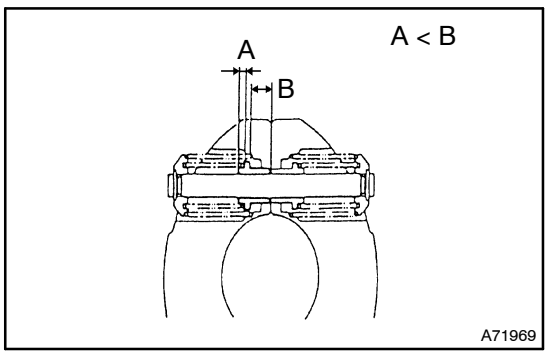
(a) Using the commercial tool (presser), push the oil seals into the timer cover and driving flange.

NOTICE:
The oil seals must be replaced with new ones.



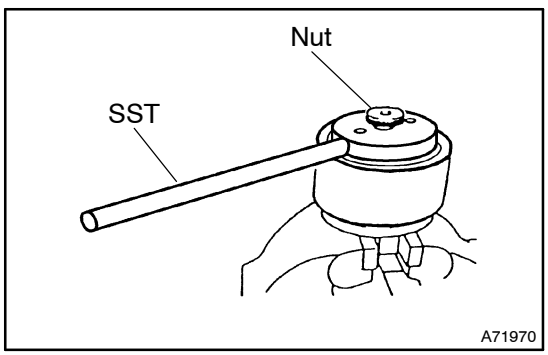
35. INSTALL TIMER CAMS AND TIMER HUB

(a) Install the timer hub and timer cams to the driving flange as shown in the illustration.



36. INSTALL TIMER SPRING TO TIMER WEIGHT

NOTICE:
Take care of the spring seat direction.



37. INSTALL TIMER COVER

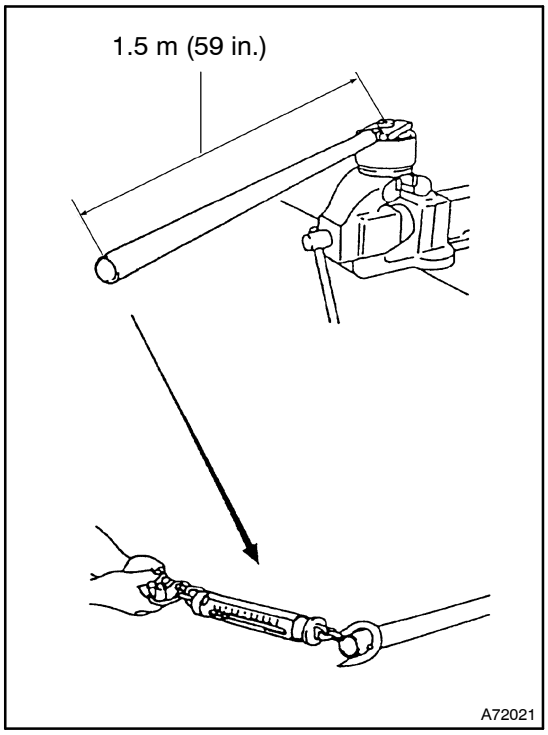
NOTICE:
The O–ring must be replaced with new one.

(a) Install the SST on the cover and fix with the nut.
SST S0951–22210

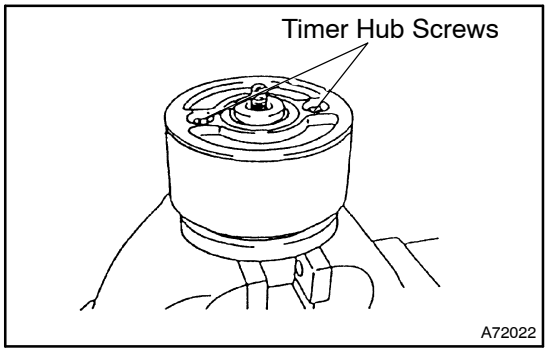
NOTICE:

- **Do not tighten the nut but leave loosened.**
- **Since a new timer cover is coated with adhesive, it is unnecessary to apply fresh adhesive to a new timer cover when replacing.**

- **If reusing the timer cover, apply 4 to 6 dot of adhesive to 2 or 3 threads of the screw of the flange.**
  Adhesive:
  Part No. 08833–00070, THREE BOND 1342 or equivalent
- **Since the timer cover is attached with adhesive, a torque of approximately 70 kgf/m is necessary when removing it.**
- **Fully remove the adhesive on the threads of the screw when overhauling. If too much adhesive is applied, excessive will stick to the O–ring, resulting in oil leakage.**



(b) Hook a spring balancer between the two socket bolts at the end of the extension bar, then pull the spring balancer until it shows 196.14 – 228.49 N (20 – 23.3 kgf, 45 – 51 lbf) to tighten up the timer cover.
Tightening torque:
294 – 343 N·m (3,000 – 3,500 kgf·cm, 217 – 253 ft·lbf)



38. FILL PUMP TIMER OIL INTO TIMER THEN TIGHTEN TIMER HUB SCREWS
Oil grade: SAE 90
Oil volume: 140 – 160 cm^3 (8.54 – 9.76 cu.in.)