



Service Repair Manual

Model

235C EXCAVATOR

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Product: EXCAVATOR

Model: 235C EXCAVATOR 3WG

Configuration: 235C EXCAVATOR 3WG00001-UP (MACHINE) POWERED BY 3306 ENGINE

Disassembly and Assembly 3306 VEHICULAR ENGINE FOR 235C & 235D EXCAVATOR

Media Number -SEN3833-01

Publication Date -01/12/1991

Date Updated -11/10/2001

Fuel Injection Pumps

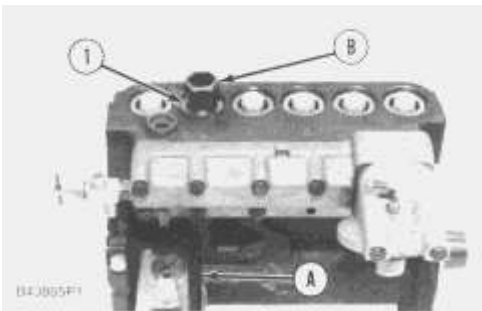
SMCS - 1251-011; 1251-012; 1251-017

Remove Fuel Injection Pumps

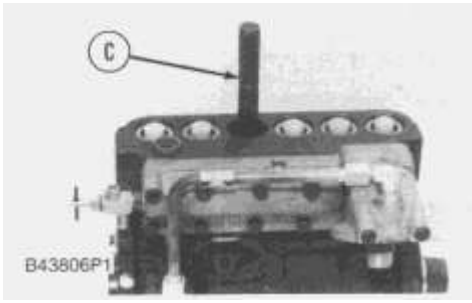
Tools Needed		A	B	C
6V4186	Timing Pin	1		
8S4613	Wrench		1	
8S2244	Extractor			1

Start By:

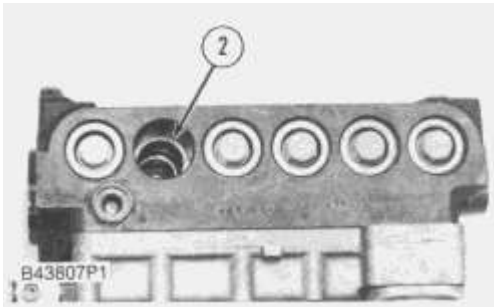
- a. remove governor *

 *See Governor, Disassemble & Assemble


1. Remove the bolts and the plate from side of the fuel injection pump housing.
2. Install tool (A) in the fuel injection pump housing. Move the rack until tool (A) can be installed to hold the rack in the center position. The rack must be in the center position to remove the fuel injection pumps.
3. Use tool (B) to remove bushing (1) from the fuel injection pump housing.
4. Remove the O-ring seal from the fuel injection pump housing.



5. Install tool (C) on the bonnet and remove the fuel injection pump.



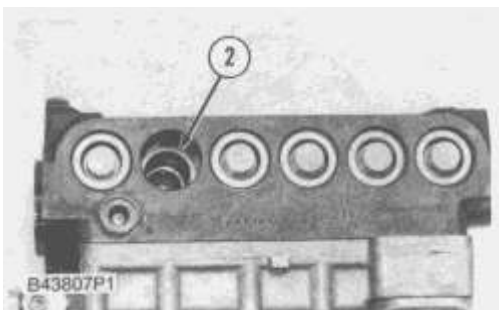
6. Remove spacer (2) from the fuel injection pump housing.

NOTE: Spacers (2) are the same thickness for each fuel injection pump so they can be mixed. The fuel injection pump plungers and barrels are in sets and can not be mixed.

7. Do Steps 3 through 6 to remove the other fuel injection pumps.

Install Fuel Injection Pumps

Tools Needed		A	B	C	D
6V4186	Timing Pin	1			
8S4613	Wrench		1		
8S2244	Extractor			1	
9S0228	Rack Position Tool Group				1
3S3270	1 in Contact Tip				1
	C-Clamp				1



1. Install spacer (2) in the fuel injection pump housing.

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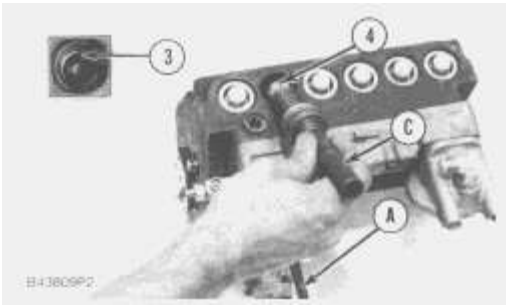
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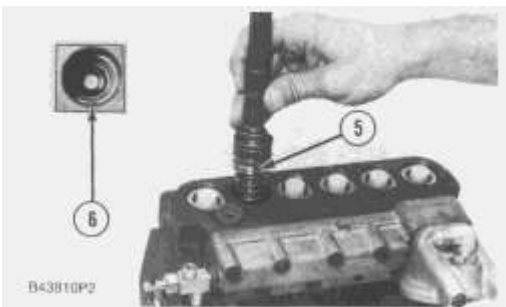
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2. Install tool (A) in the fuel injection pump housing. Move the rack until tool (A) can be installed to hold the rack in the center position. The rack must be in the center position to install the fuel injection pumps.

3. Turn camshaft until the lobe of the camshaft is down for the pump to be installed.

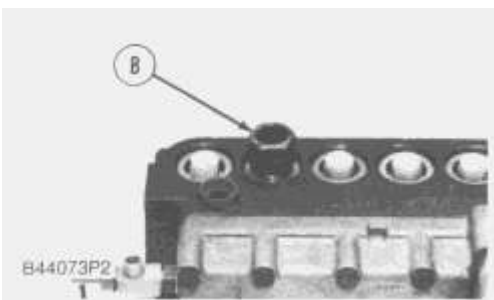
4. Install tool (C) on the bonnet of the fuel injection pump.



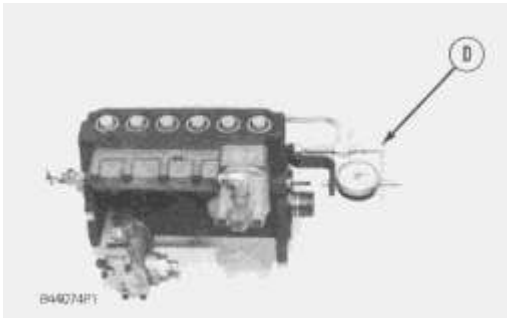
5. Install the fuel injection pump in the pump housing with saw cut (slot (4) in the gear in alignment with the small pin (3), and groove (5) in the barrel in alignment with dowel (6) in the pump housing.

6. Put clean oil on the O-ring seal and install it in the fuel injection pump housing.

7. Install the bushing by hand until the bushing is even with the top of the housing. If the bushing can not be installed this far by hand, remove it. Remove the fuel injection pump and put the pump in alignment again and install the bushing again.



8. Install tool (B) on the bushing and tighten the bushing to a torque of $190 \pm 14 \text{ N}\cdot\text{m}$ ($140 \pm 10 \text{ lb}\cdot\text{ft}$).



9. Install tooling (D) to measure total rack travel. Correct rack travel is **15.7 mm (.618 in.)**. A smaller measurement is an indication of wrong fuel injection pump installation.

10. Do Steps 1 through 9 again for installation of the other fuel pumps.

11. Install the cover and gasket on the fuel injection pump housing.

End By:

a. install governor *

*See Governor, Disassemble And Assemble

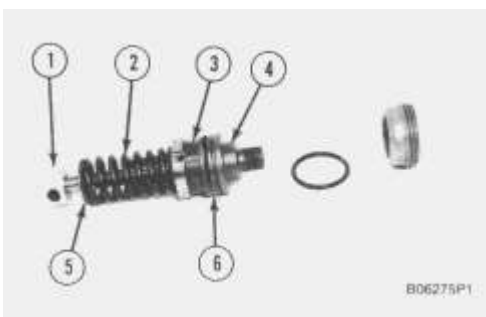
Disassemble & Assemble Fuel Injection Pumps

Start By:

a. remove fuel injection pumps

NOTICE

Be careful when the injection pumps are disassembled. Do not damage the surfaces of the plungers, barrels and bonnets. Any scratches will cause leakage inside the fuel injection pump. The plunger and barrel for each pump are made as a set. Do not put the plunger of one pump in the barrel of another pump. If one part has wear, install a complete new pump assembly. Be careful when the plunger is put into the bore of the barrel.

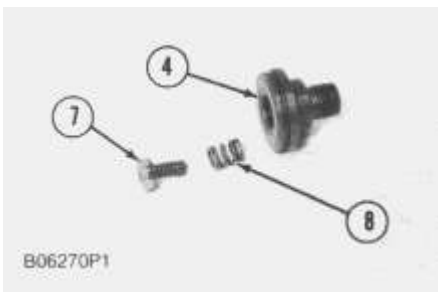


1. Pull plunger (1) and washer (5) out of barrel (3) and spring (2).
2. Remove washer (5) from plunger (1).

NOTICE

Do not remove the gear from the plunger. The gear and plunger are assembled and adjusted at the factory.

3. Remove spring (2) from barrel (3).
4. Remove ring (6) and make a separation of barrel (3) and bonnet (4).



5. Remove check assembly (7) and spring (8) from bonnet (4). If check assembly (7) is disassembled, do not mix parts with parts from another check assembly.

NOTE: The following steps are for the assembly of the fuel injection pumps.

NOTICE

Put clean fuel oil on all parts during assembly.

6. Install spring (8) and check assembly (7) in bonnet (4).
7. Install bonnet (4) on barrel (3) and install ring (6) to hold them together. Do not slide bonnet (4) across barrel (3) because check assembly (7) in the bonnet can cause damage to the face of barrel (3).
8. Install spring (2) on barrel (3).
9. Install washer (5) on plunger (1) with the flat side toward the gear on the plunger.
10. Install plunger (1) in barrel (3) until washer (5) is engaged in the spring.

End By:

- a. install fuel injection pumps
-

Previous Screen

Product: EXCAVATOR

Model: 235C EXCAVATOR 3WG

Configuration: 235C EXCAVATOR 3WG00001-UP (MACHINE) POWERED BY 3306 ENGINE

**Disassembly and Assembly
3306 VEHICULAR ENGINE FOR 235C & 235D EXCAVATOR**

Media Number -SEN3833-01

Publication Date -01/12/1991

Date Updated -11/10/2001

Fuel Injection Pump Housing

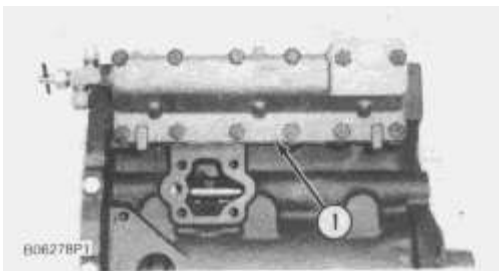
SMCS - 1253-015; 1253-016

Disassemble Fuel Injection Pump Housing

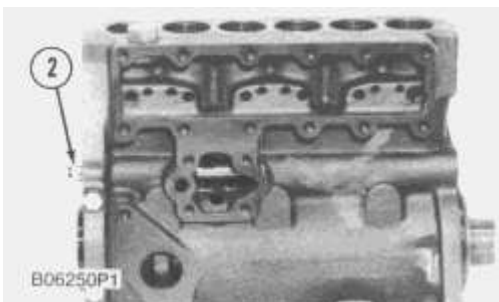
Tools Needed		A
1P1860	Pliers	1

Start By:

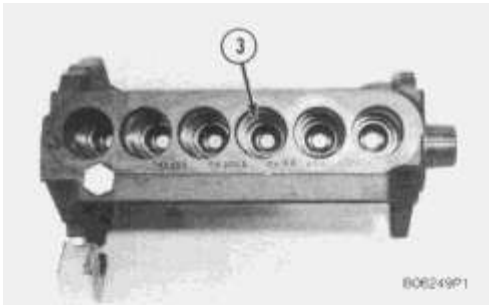
- a. disassemble governor
- b. remove fuel injection pumps



1. Remove cover (1) and gasket from the fuel injection pump housing.



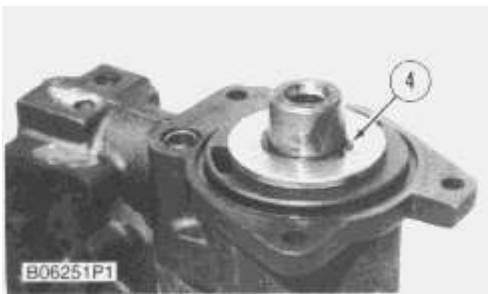
2. Remove rack (2) from the fuel injection pump housing.



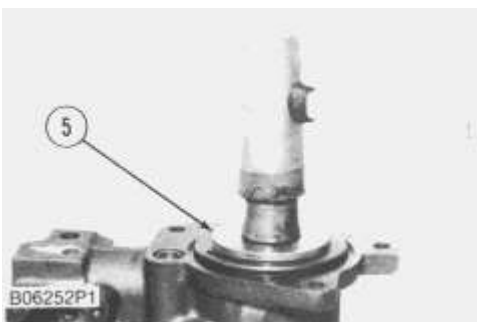
NOTICE

If the original lifters are to be installed in the fuel injection pump housing, put identification marks on them as to their location in the housing.

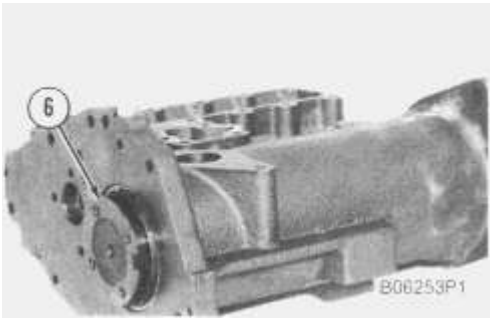
3. Remove lifters (3) from the fuel injection pump housing.



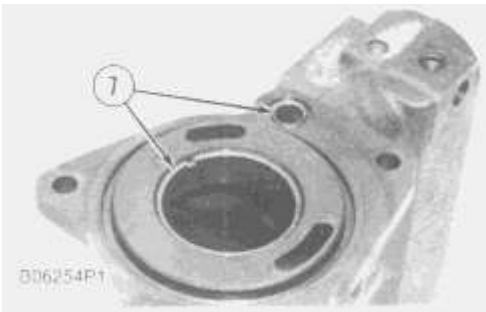
4. Put the fuel injection pump housing on end on blocks, and use tool (A) to remove snap ring (4) from the camshaft.



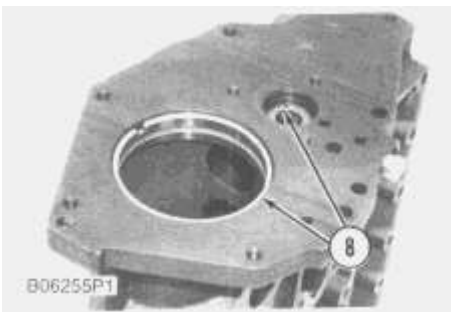
5. Use a soft hammer to push the camshaft toward the governor end of the fuel injection pump housing to loosen washer (5) on the camshaft. Remove washer (5).



6. Remove camshaft (6) from the fuel injection pump housing.



7. Remove bearings (7) from the drive end of the fuel injection pump housing.

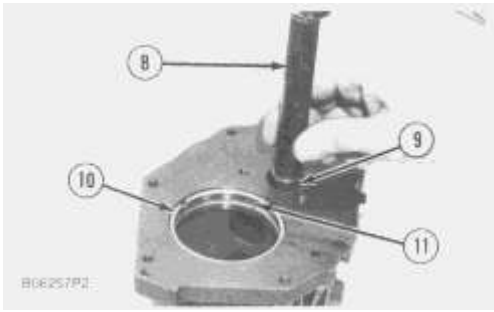


8. Remove bearings (8) from the governor end of the fuel injection pump housing.

Assemble Fuel Injection Pump Housing

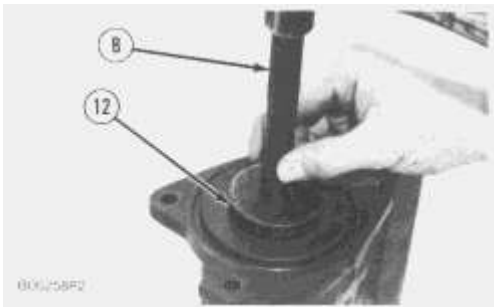
Tools Needed		A	B	C
1P1860	Pliers	1		
1P0510	Driver Group		1	
6V2016	Plate Assembly			1
S1594	Bolt (3/8 in - 16 NC x 1 in long)			2
9S6329	Driver			1

NOTE: Be sure all oil passages are clear, and put clean oil on all parts before assembly.

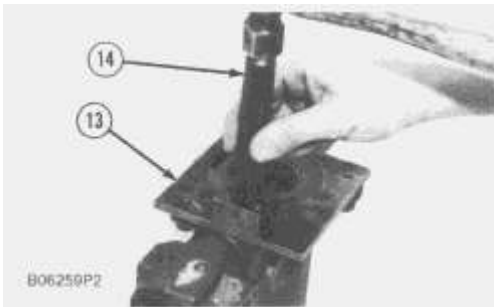


1. Use tooling (B) to install bearing (10) in the governor end of the fuel injection pump housing with junction (joint) (11) toward the top of the fuel injection pump housing. Install the bearing so it is **0.25 ± 0.20 mm (0.10 ± 0.008 in.)** below the surface of the housing.

2. Use tooling (B) to install bearing (9) in the governor end of the fuel injection pump housing so it is **7.16 ± 0.13 mm (0.282 ± 0.005 in.)** below the surface of the housing.

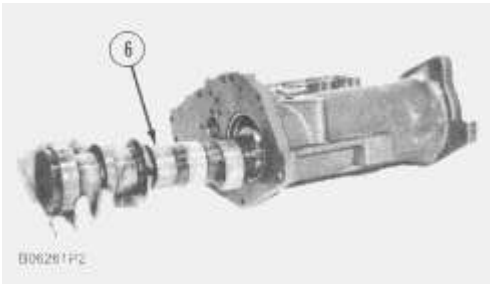


3. Use tooling (B) to install bearing (12) in the drive end of the fuel injection pump housing with the junction (joint) in the bearing toward the top of the fuel injection pump housing. Install the bearing so it is **1.00 ± 0.25 mm (9.039 ± 0.010 in.)** below the surface of the housing.



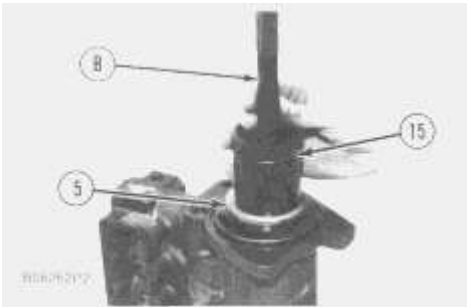
4. Install plate (13) of tooling (C) on the drive end of the fuel injection pump housing to install the bearing for the rack. Use clean grease to hold the new rack bearing on driver (14) of tooling (C). Install the driver and bearing in plate (13) with the groove in the driver in alignment with the pin in the plate and use a hammer to push the bearing into position. The bearing will be installed to the correct depth when the shoulder of the driver is against plate (13).

5. Remove tooling (C) from the fuel injection pump housing. The rack bearing must be installed so it is **0.25 ± 0.25 mm (0.010 ± 0.010 in.)** below the surface of the housing.

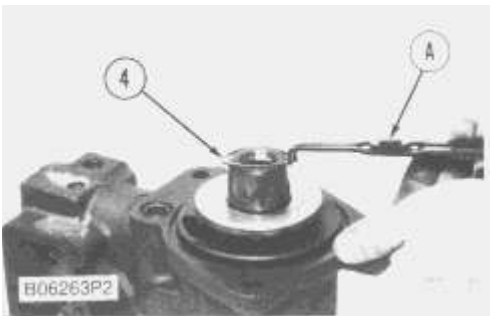


6. Install camshaft (6) in the fuel injection pump housing.

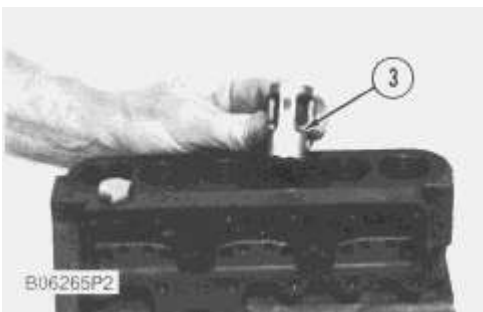
7. Put the fuel injection pump housing on end, and put a block under the camshaft.



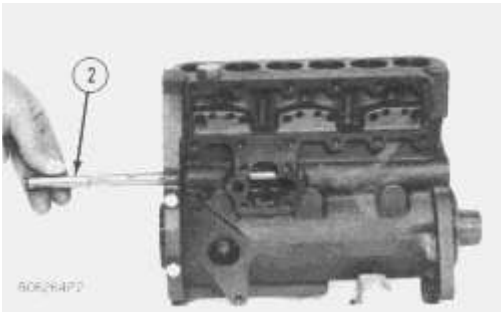
8. Put the washer (5) over the end of the camshaft and use tooling (B) and a spacer (15) that has an inside diameter of **38.1 mm (1.5 in.)** and a length of **31.75 mm (1.25 in.)** to push the washer against its seat on the camshaft. Camshaft must have **0.285 ± 0.235 mm (0.0112 ± 0.0093 in.)** end play when washer is pushed against cam shoulder.



9. Use tool (A) to install snap ring (4) in the groove in the camshaft.

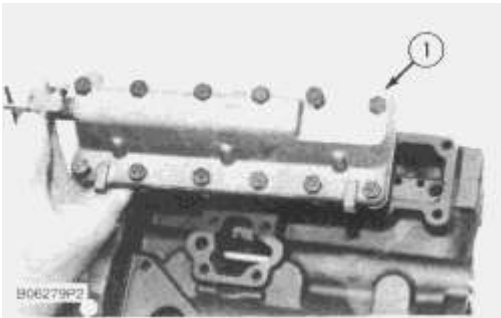


10. Install six lifters (3) in the fuel injection pump housing with the groove in the lifter in alignment with the pin in the housing.



11. Install rack (2) in the fuel injection pump housing, with the groove in the end of the rack in alignment with the ear (tab) of the rack bearing, at the drive end of the fuel injection pump housing.

NOTE: The six lifters are all the same and can be mixed.



12. Install the gasket and cover (1) on the fuel injection pump housing.

End By:

a. assemble governor

b. install fuel injection pumps

Previous Screen

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Configuration: 235C EXCAVATOR 3WG00001-UP (MACHINE) POWERED BY 3306 ENGINE

**Disassembly and Assembly
3306 VEHICULAR ENGINE FOR 235C & 235D EXCAVATOR**

Media Number -SEN3833-01

Publication Date -01/12/1991

Date Updated -11/10/2001

Governor

SMCS - 1264-015; 1264-016

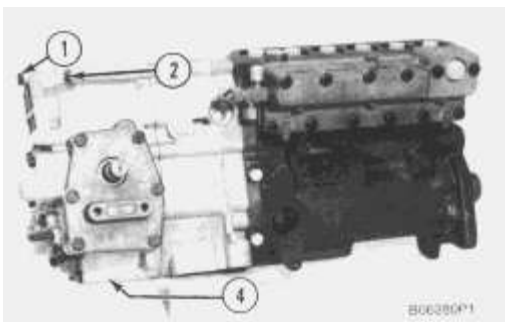
Disassemble Governor

Tools Needed		A	B	C
1P0510	Driver Group	1		
6V2163	Clamp Assembly-Spring Compressor		1	
1P1855	Snap Ring Pliers			1

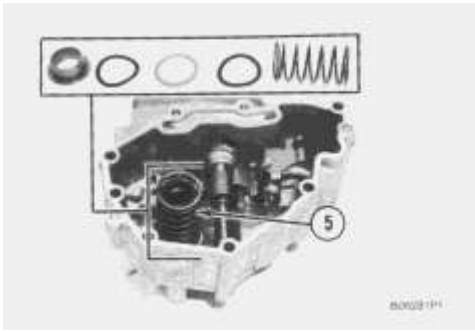
Start By:

- a. remove fuel injection pump housing and governor
- b. remove fuel transfer pump

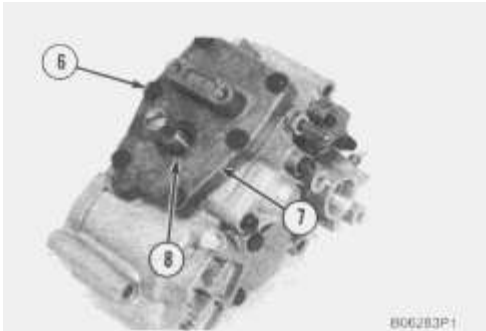
NOTE: If it is desired to only remove the governor so the fuel injection pump housing can be disassembled, do only Steps 1, 13, 19, 23-26, 29, 31, 32 and 35.



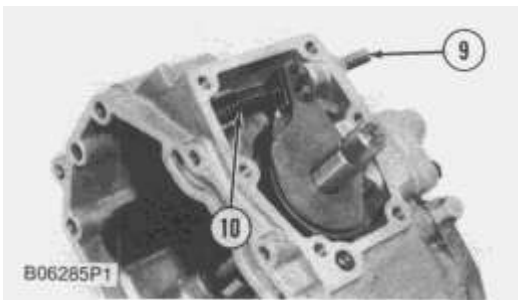
- 1. Remove bolt (1), six bolts (2), two top bolts, housing (4) and the gasket.



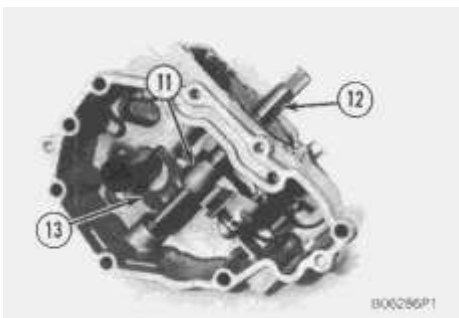
2. Remove governor spring (5), the two wave washers, one flat washer and seat from the guide in the housing.



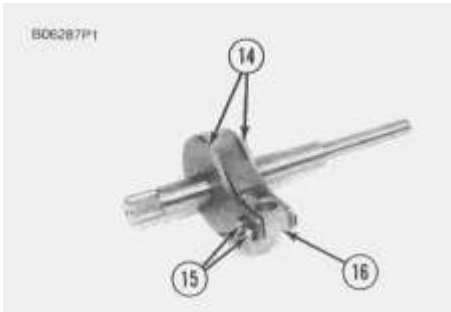
3. Remove bolts (6), cover (7) and the gasket from the housing. Use tooling (A) to remove seal (8) from the cover.



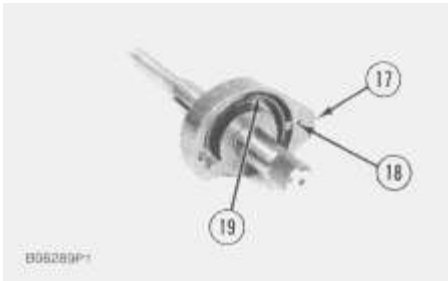
4. Remove low idle adjustment screw (9) and spring (10) from the housing.



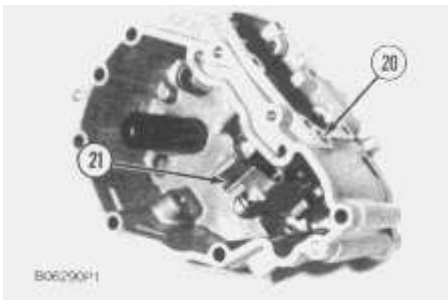
5. Remove shaft assembly (12), lever (11) and lever (13) from the housing.



6. Remove two snap rings from pins (15) and remove pins (15). Remove plates (14) and stop (16) from the shaft assembly.



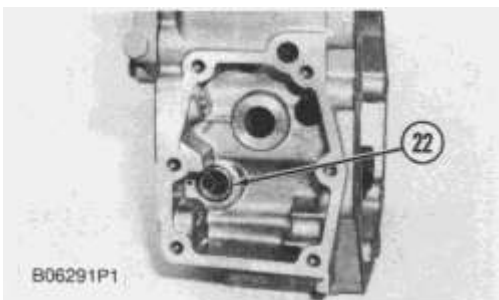
7. Remove pin (18), pin (17) and spring (19) from the shaft assembly.



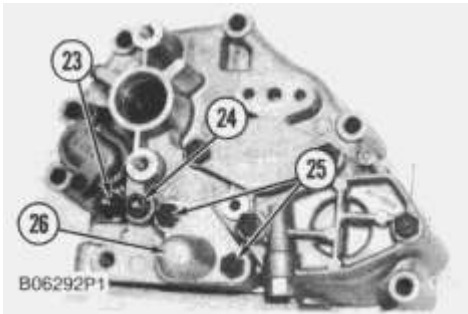
8. Remove shaft (20) and lever (21) from the housing.

NOTICE

Remove check valve (22) only if a replacement is necessary. The check valve will be damaged during removal.

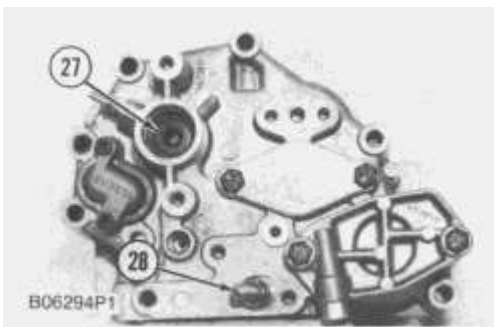


9. Remove check valve (22) if a replacement is necessary.



10. Remove contact (23) and body (24) for the governor dashpot adjustment screw from the housing.

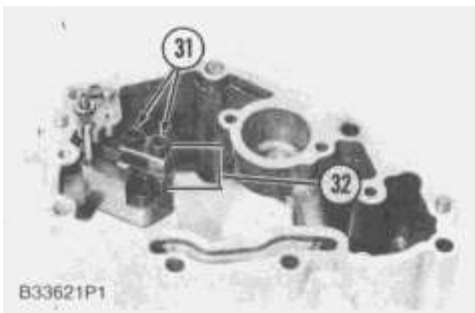
11. Remove bolts (25), cover (26) and the gasket from the housing.



12. Remove seal (27) and adjustment screw (28) for the high idle.

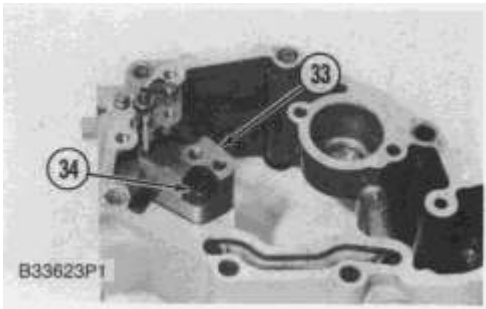


13. Remove two bolts (29), housing (30) and the gasket from the fuel injection pump housing.

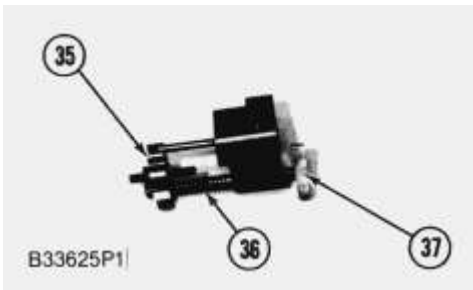


14. Remove bolts (31) and torque control group (32).

15. Disassemble the torque control group and inspect the spacer, spring and insulator for damage or wear.

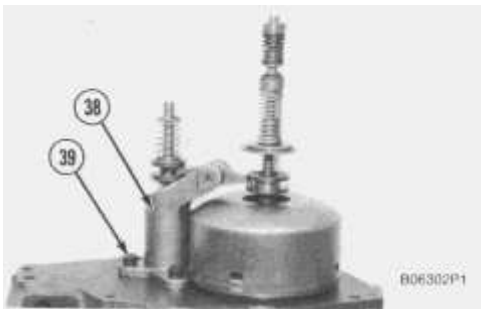


16. Remove bolts (34) and block (33) for the full load stop from the housing.

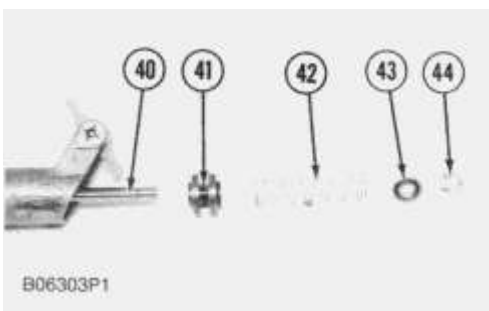


17. Remove the bolt that holds collar (35) to bolt (37). Remove collar (35) and spring (36) from bolt (37). Remove bolt (37) from the block.

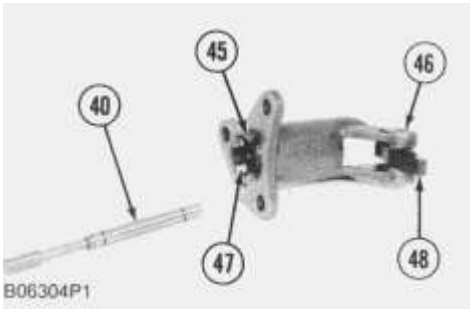
18. Remove the stop screw from collar (35), if a replacement is necessary.



19. Remove bolts (39) and governor servo (38) from the fuel injection pump.

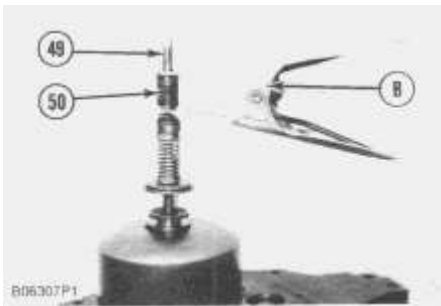


20. Remove locking (44), seat (43), spring (broken link spring) (42) and sleeve (41) from valve (40). Remove the other locking (44) from the groove in the center of valve (40).



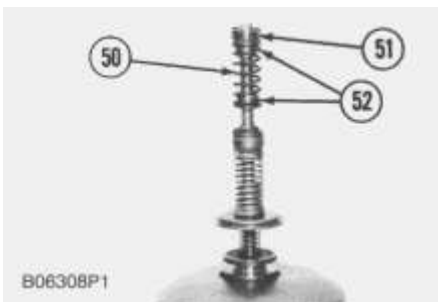
21. Remove valve (40), sleeve (45) and piston (47) from the governor servo. Remove the O-ring seal from sleeve (45).

22. Remove pin (46) and lever (48) from the governor servo.

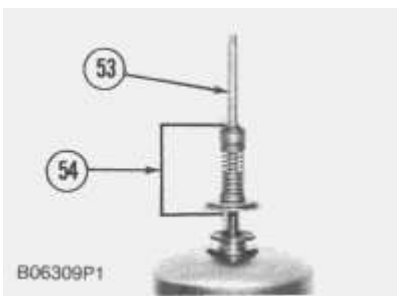


23. Use tool (B) to hold spring (50) in compression so ring (49) can be removed. Spring (50) is used to put a preload on the thrust bearing for the camshaft in the fuel injection pump housing.

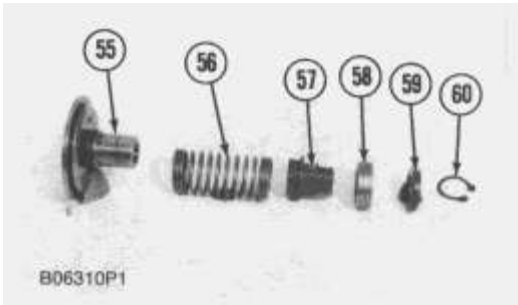
24. Remove ring (49) then remove tool (B).



25. Remove bearing (51), sleeves (52) and spring (50) from the governor shaft.

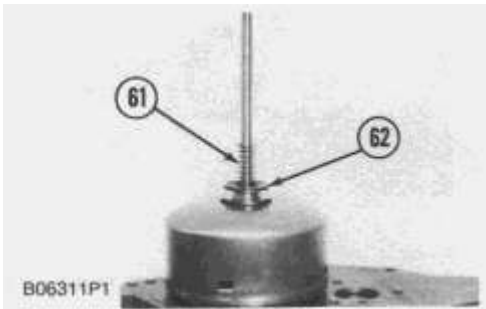


26. Remove ring (53) and dashpot assembly (54) from the governor shaft.

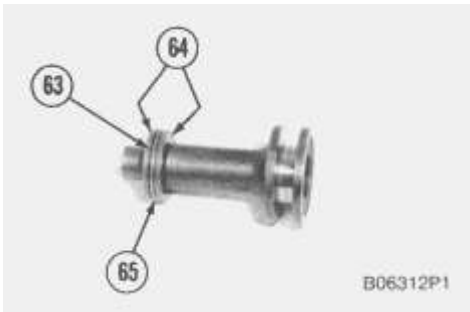


27. Use tool (C) to remove snap ring (60) from seat (57). Remove ring (59) and spool (58) from seat (57).

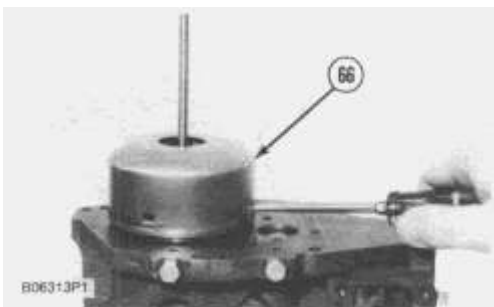
28. Remove seat (57) from spring (56) and remove spring (56) from seat (55).



29. Remove spring (overfueling spring) (61) and riser (62) from the governor shaft.

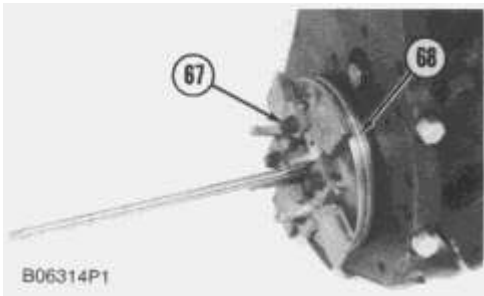


30 Remove ring (63), races (64) and bearing (65) from the riser.

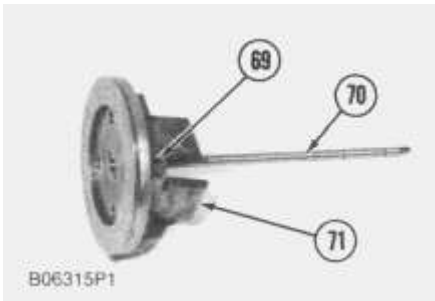


31. Use a screwdriver to remove shield (66) as shown.

NOTE: Make a replacement of shield (66) any time it is removed.

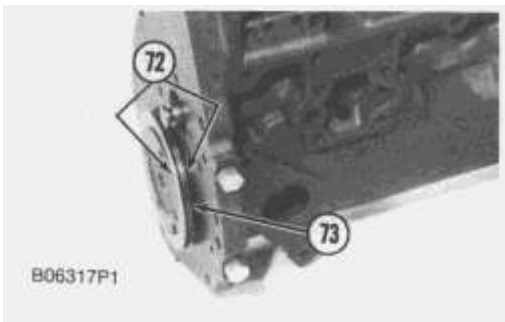


32. Remove bolts (67) and carrier (68) for the governor flyweights.



33. Remove dowels (69) and flyweights (71) from the carrier.

34. Remove shaft (70) from the carrier. Remove the dowel from shaft (70).

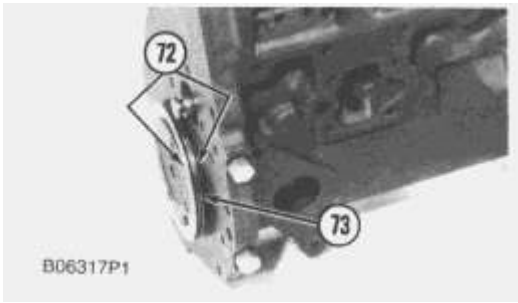


35. Remove races (72) and bearing (73) from the camshaft in the fuel injection pump housing.

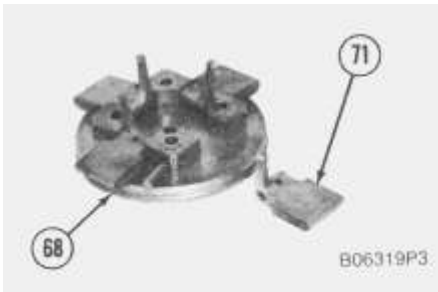
Assemble Governor

Tools Needed		A	B	C	D
1P0510	Driver Group	1			
6V2163	Clamp Assembly-Spring Compressor		1		
1P1855	Snap Ring Pliers			†	
6V2054	Shield Driver				1

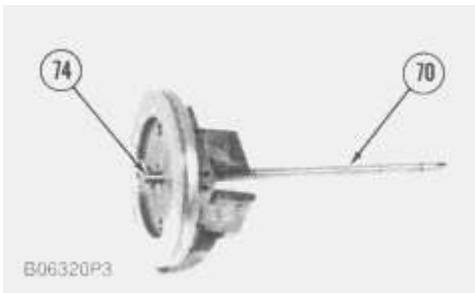
NOTE: Put clean oil on all parts before assembly. Be sure all oil passages are clear.



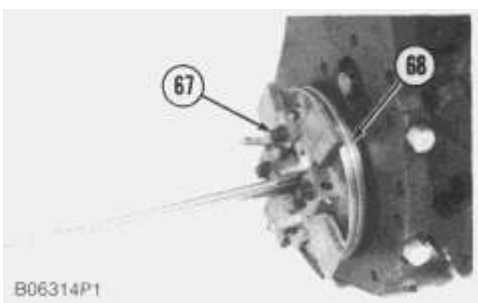
1. Install one race (72), bearing (73) and the other race (72) on the camshaft in the fuel injection pump housing.



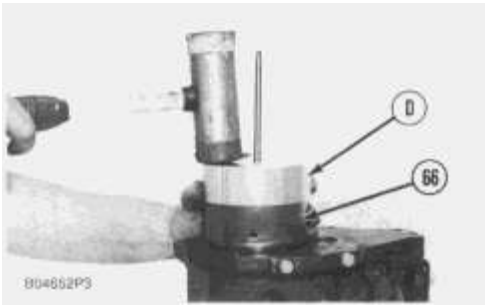
2. Put flyweights (71) in position on carrier (68) and install the dowels to hold the flyweights in place. The flyweights must move freely on the dowels and have **0.010 to 0.23 mm (0.0004 to 0.009 in.)** end play.



3. Install dowel (74) in governor shaft (70) and install the governor shaft in the carrier as shown.

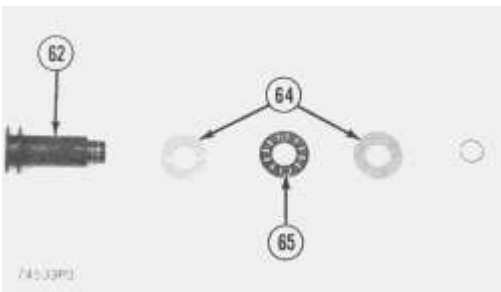


4. Put carrier (68) in position on the camshaft and install bolts (67) that hold the carrier in place.

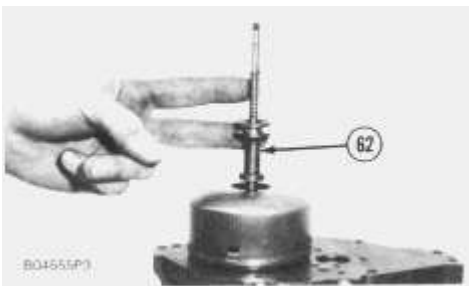


NOTE: Make a replacement of shield (66) any time it is removed.

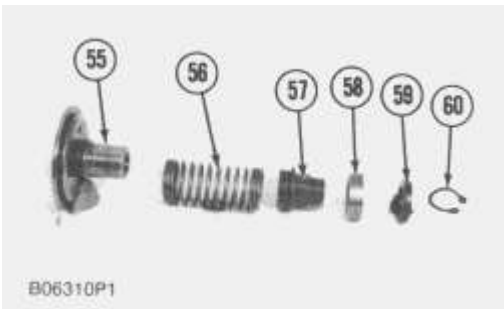
5. Install shield (66) on the carrier and use tool (D) to push the shield against its seat. Use a hammer and punch to move the metal (stake) two places on the side of the shield $180^\circ \pm 15^\circ$ apart next to the holes in the shield.



6. Install one race (64), bearing (65) the other race (64) and use tool (C) to install the ring on riser (62) as shown.



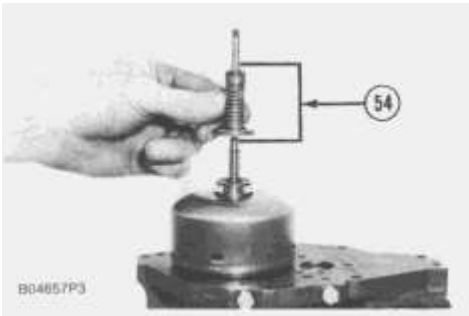
7. Install riser (62) and spring (overfueling spring) on the governor shaft as shown.



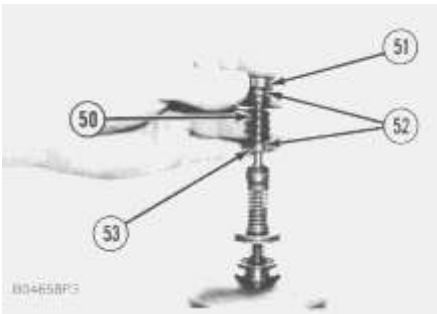
8. Assemble the dashpot as follows:

a. Install spring (56) on seat (55) and install seat (57) in spring (56).

b. Put spool (58) and ring (59) in position on seat (57) and use tool (C) to install snap ring (60) to hold them in place.

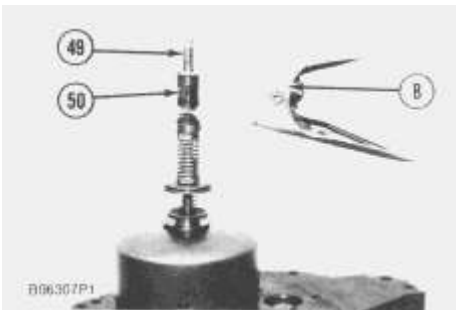


9. Install dashpot assembly (54) on the governor shaft as shown.

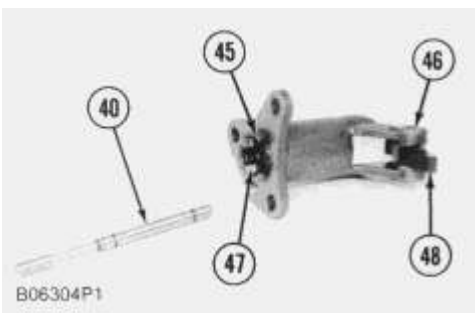


10. Install ring (53) in the lower groove in the governor shaft. Install one sleeve (52), spring (50), the other sleeve (52) and bearing (51) on the governor shaft as shown.

NOTE: Spring (50) is used to put a preload on the thrust bearing on the camshaft in the fuel injection pump housing.



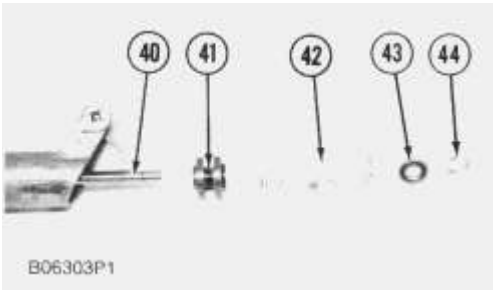
11. Use tool (B) to hold spring (50) in compression and install ring (49) in the groove in the governor shaft. Remove tool (B).



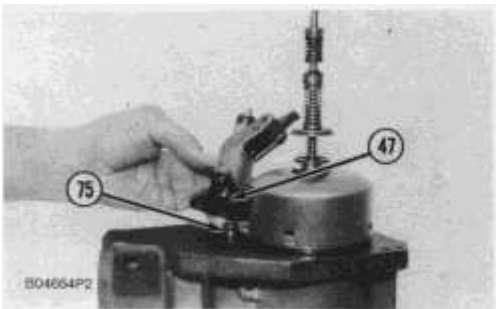
12. Put lever (48) in position on the governor servo and install pin (46) to hold the lever in place. Use a hammer and chisel to move the metal (stake) four places **90°** apart on the outside surface on both legs of the governor servo to hold pin (46) in place.

13. Install the O-ring seal on sleeve (45). Install piston (47) and sleeve (45) in the governor servo as shown.

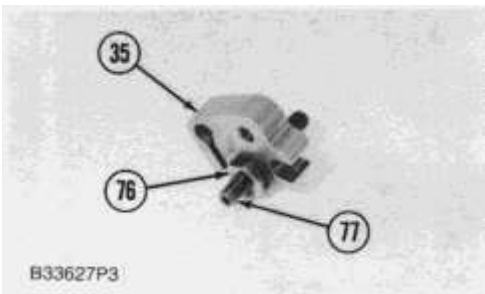
14. Install valve (40) in the governor servo as shown.



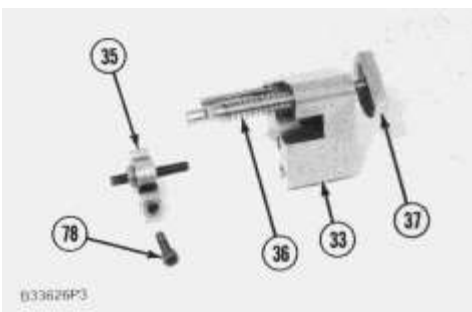
15. Install one lockring (44) in the groove near the center of valve (40). Put sleeve (41), spring (broken link spring) (42) and seat (43) in position on valve (40) and install the other lockring (44) to hold them in place.



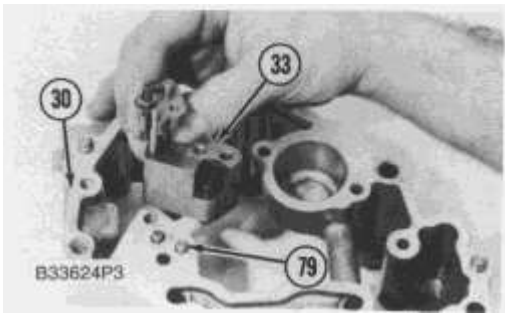
16. Put the governor servo in position on the fuel injection pump housing with piston (47) engaged over rack (75) and install the bolts that hold the governor servo in place.



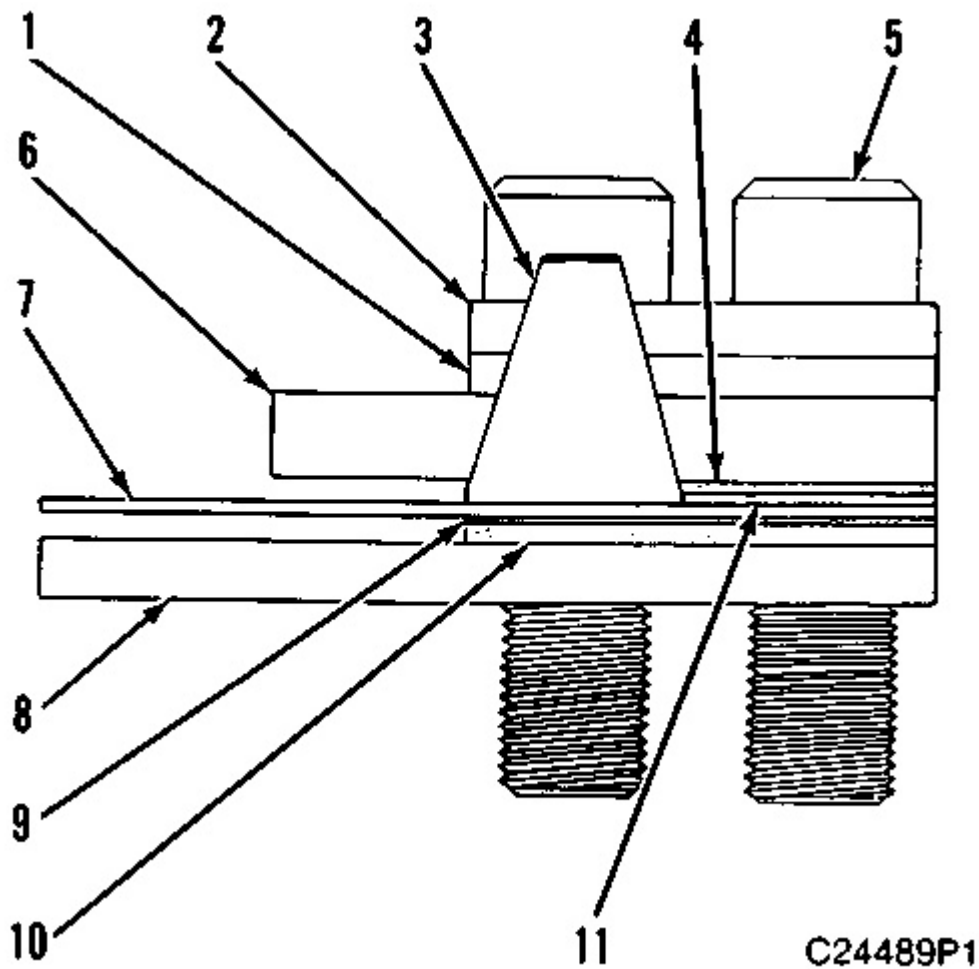
17. Install torque rise adjustment screw (77) in collar (35) as shown and install locknut (76) on the screw.



18. Install bolt (37) in block (33) as shown. Install spring (36) on bolt (37) as shown. Put collar (35) in position on bolt (37) with the hole in the collar in alignment with the notch in bolt (37) and install bolt (78) to hold the collar in place.

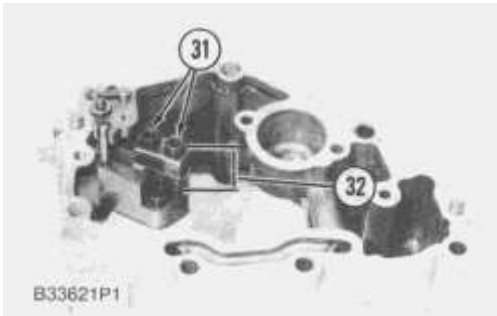


19. Put block (33) in position on housing (30) with the holes in the block in alignment with dowels (79). Install the bolts that hold the block in place.

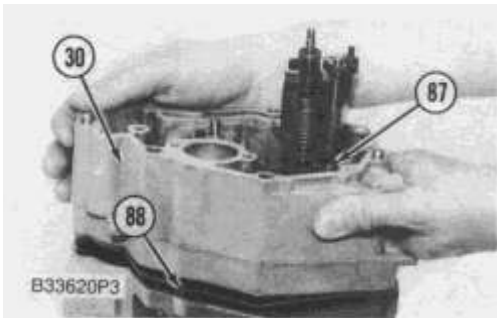


20. Assemble the torque control group as follows:

- a. Install shim (9), spring (7), spacer (11), contact (3) and spacer (4) on insulator (10) as shown.
- b. Install retainer (2), shim (1), bar (6), the insulator assembly and bar (8) on bolts (5).



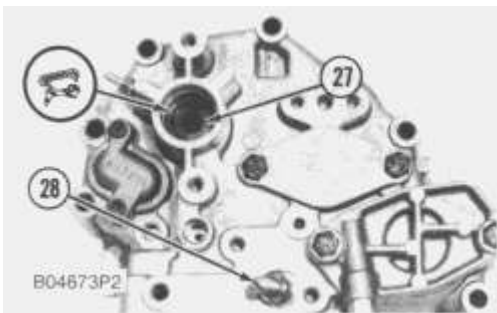
21. Install torque control group (31) on block (32) as shown.



WARNING

When housing (30) is installed on the fuel injection pump housing, the flange on bolt (87) must be behind the dashpot. If housing (30) is installed with the flange on bolt (87) on the wrong side of the dashpot, the riser in the governor will be held in the maximum fuel delivery position.

22. Install gasket (88) on the fuel injection pump housing. Put housing (30) in position on the fuel injection pump housing with bolt (87) behind the dashpot as shown. Install the bolts that hold housing (30) in place.



23. Use tooling (A) to install lip type seal (27) in the outer governor housing with the lip in as shown.

24. Install adjustment screw (28) and the locknut for the high idle adjustment.



Suggest:

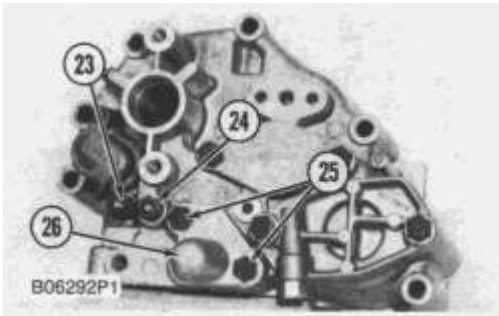
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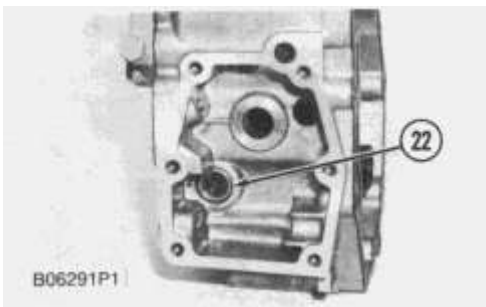
Thank you so much for reading



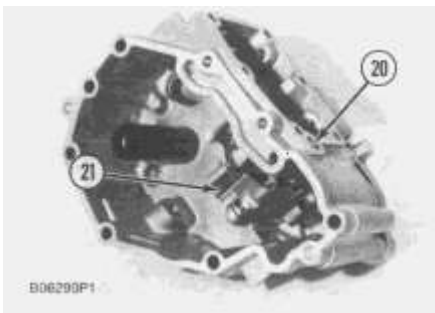
25. Install an O-ring seal on body (24) for the dashpot adjustment and install the body in the housing.

26. Install cover (26) on the housing with bolts (25).

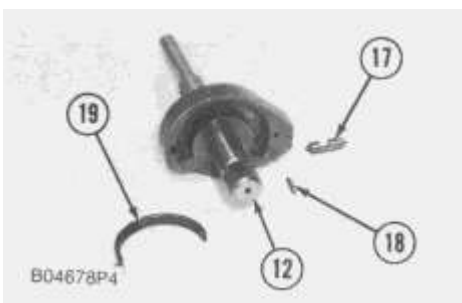
27. Install contact (23) in the housing and tighten to a torque of $4.5 \pm 0.6 \text{ N}\cdot\text{m}$ ($40 \pm 5 \text{ lb}\cdot\text{in.}$).



28. Install check valve (22) in the housing as shown.



29. Put lever (21) in position in the housing as shown and install shaft (20) to hold the lever in place.



30. Install spring (19) in shaft assembly (12). Install pin (17) in the shaft assembly (12) with the tip of the pin engaged in the hole in spring (19). Install pin (18) in the shaft assembly to hold pin (17) in place.

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