

**SERVICE  
INSTRUCTIONS**

# **Model 50 Diesel Fuel Injection Pump**

**AMBAC**®  
INTERNATIONAL

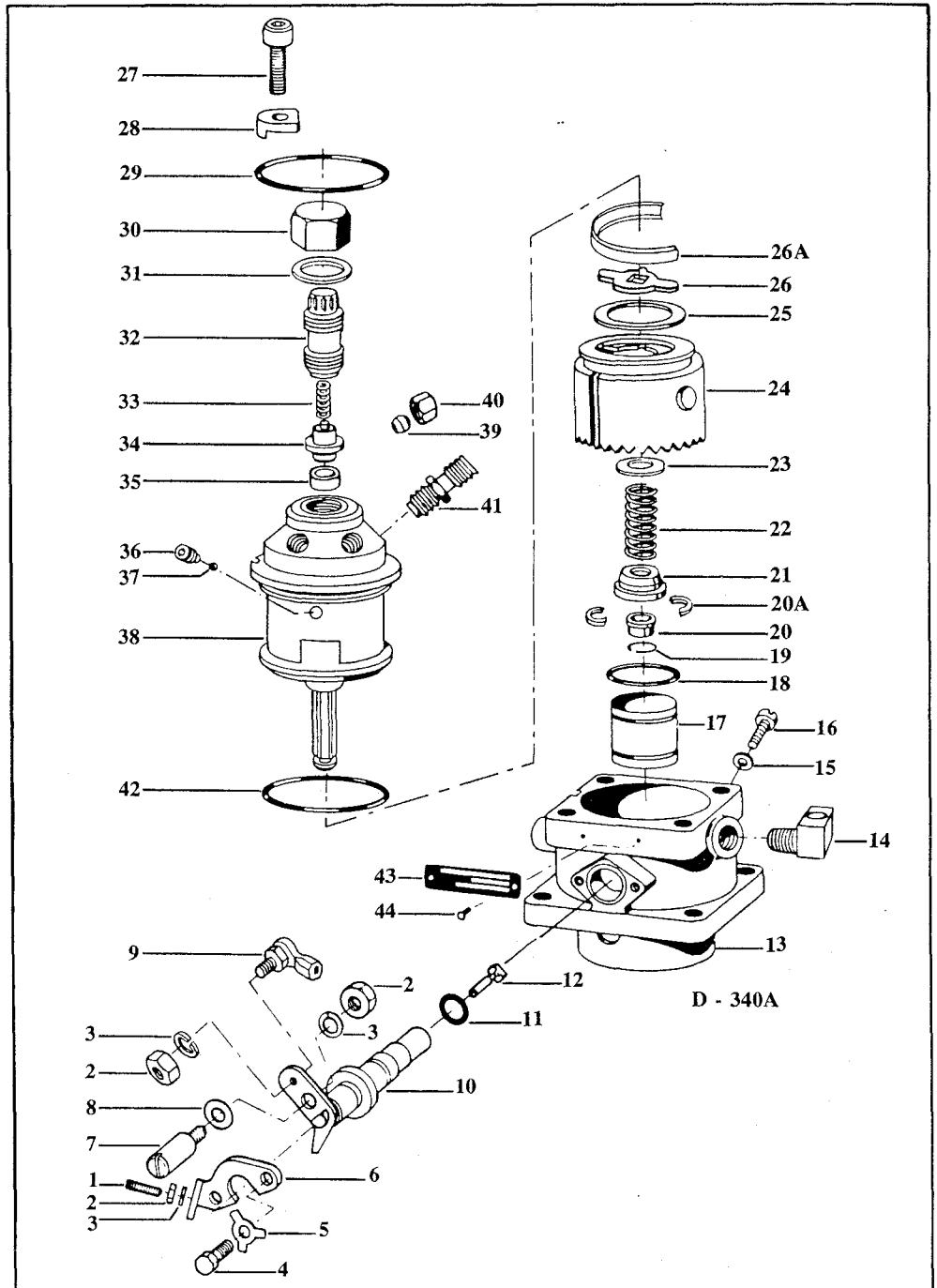


FIGURE 1

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# Section 1 - Description

The AMBAC International Model 50 fuel injection pump is a single plunger, multi-outlet unit designed to be driven at 1/2 crankshaft speed on 4 - stroke cycle engines. The hydraulic head contains a delivery valve assembly and a plunger which, in addition to being reciprocated by a multi-lobe engine cam, is rotated continuously to serve as a fuel distributor.

Fuel delivery is determined by the position of the plunger metering sleeve and this position is controlled by a control unit which is actuated by a remote governor.

Fuel quantity variations between discharge outlets cannot be readjusted. However, the pump's maximum average full fuel delivery can be adjusted with an external set-screw.

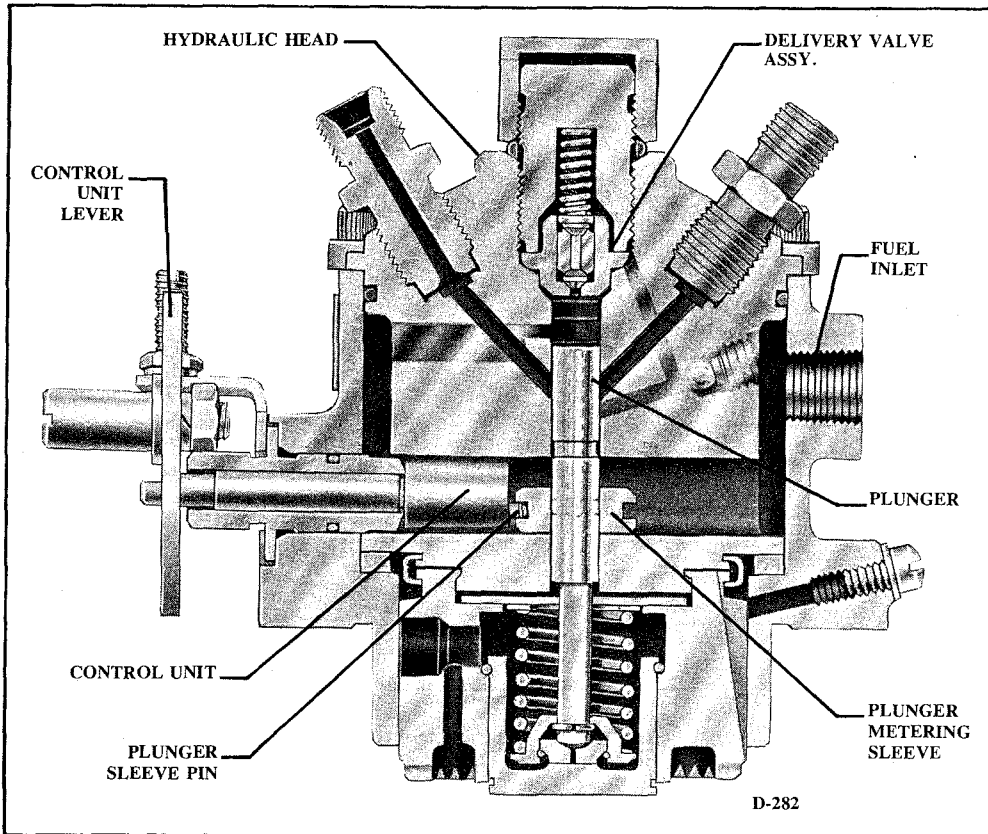


FIGURE 2 - MODEL 50 CUTAWAY VIEW

EXAMPLE: MODEL 50 4A 80A 9542A

- 50 - Indicates pump model type
- 4 - Indicates number of discharge outlets
- A - Indicates pump size
- 80 - Indicates plunger diameter (80 = 8.0mm)
- A - Execution-Indicates changes that affected interchangeability of parts

- 9542 - Variation no.-Denotes variation from basic pump
- A - Edition letter-Subsequent edition letters would identify minor part changes
- 1 - Indicates calibrating code

# Section 2 - Explanation of Model 50 Type Designations

# Section 3 - Disassembly

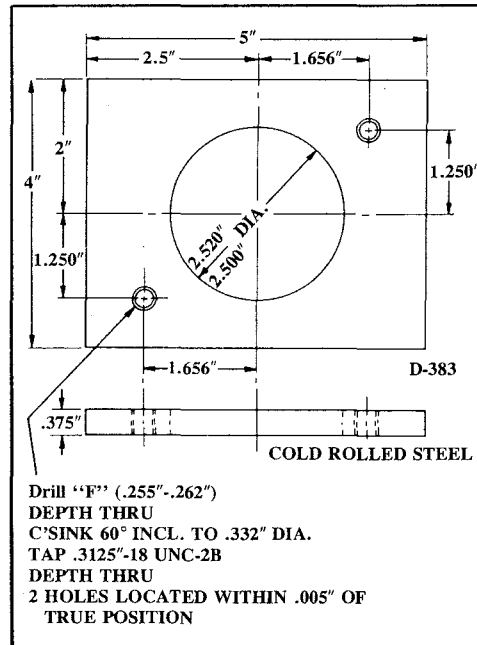
All work done on fuel injection equipment MUST be performed in the cleanest area possible. No filing, sawing, etc. should be done on the bench where repairs are to be made.

**Caution:** The pump housing must not be clamped in a vise.

(Numbers in parentheses refer to Fig. 1)

1. Clean all external dirt and grease from pump.
2. Clamp mounting fixture in a vise.

**Note:** A special mounting fixture (See Fig. 3) must be fabricated to adequately secure pump.



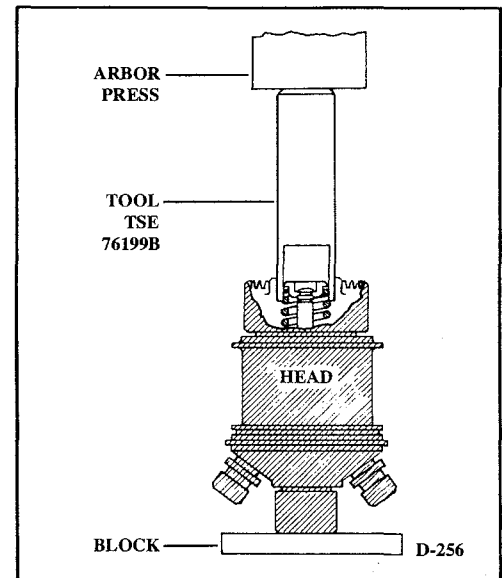
**FIGURE 3 - MODEL 50 MOUNTING FIXTURE**

3. Mount pump on fixture in an upright position and secure it in place with 2 bolts (.3125"-18 UNC).
4. Remove control unit retaining screws (4), tabwashers (5) and retaining plate (6). Use a 5/16" wrench.
5. Carefully remove control unit (10) from housing (13) with 2 screw drivers. Discard "O" ring (11). Occasionally the plunger sleeve pin (12) will remain in sleeve; remove pin with needle nose pliers or magnetic pencil.
6. Remove delivery valve cap nut (30) and gasket (31). Use a 1" wrench.
7. Remove delivery valve holder (32), delivery valve spring (33), delivery valve assembly (34) and spacer (35). Discard spacer. Use 5/8" box wrench to remove delivery valve holder. Use duck billed pliers to remove delivery valve assembly.

**Note:** The delivery valve is mated to the delivery valve body and, therefore, valves are not to be interchanged between bodies.

8. Remove head retaining screws (27) and clamps (28). Use a 7/32" Allen wrench.

9. Carefully remove hydraulic head (38) from housing (13). In some instances, it may be necessary to tap bottom of head with a rawhide mallet. Discard head "O" rings (29 & 42).
10. Use two screw drivers to remove tappet (17) from face gear bore. Discard "O" ring (18).
11. Remove spring ring (19) and plunger button (20).
12. Temporarily re-install delivery valve holder (32), cap nut (30) finger tight and place head in a vise in inverted position. With plunger in its highest position, assemble TSE 76199B pressing tool over lower spring seat (21) (See Figure 4), depress plunger spring (22) slightly with arbor press and remove plunger retaining rings (20A) with a magnetic pencil. Release and remove spring seat (21) with needle nose pliers. Remove cap nut (30) and delivery valve holder (32).



**FIGURE 4 - REMOVING LOWER SPRING SEAT**

13. Remove upper spring seat washer (23) and plunger spring (22).
  14. Carefully remove gear retainer (26A) and face gear (24) from head (38) and thrust washer (25).
  15. Remove plunger and metering sleeve from head.
- Note:** Plunger, metering sleeve and hydraulic head are mated parts and MUST be kept together.
16. Remove Oldham plunger guide (26) from plunger.
  17. Timing hole screw (16) and gasket (15) need not be removed except when gasket is leaking.
  18. Overflow fitting (14) need not be removed except for replacement.

(Numbers in parentheses refer to Figure 1)

Thoroughly clean all metal parts in Varsol, or an equivalent cleaning agent. Dry all parts with filtered, compressed air making certain that all hydraulic head ducts are thoroughly blown out.

## Section 4 - Inspection

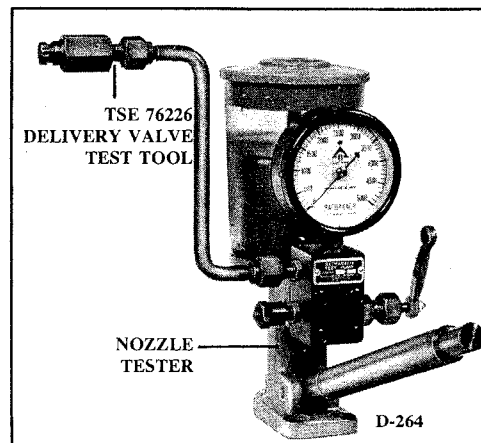
Part	Inspect For	Corrective Action
Hydraulic Head (38)	Cracks	Replace head
	Scored, pitted, eroded or damaged delivery valve seat with a magnifying glass	Refinish seat with TSE 7986 lapping tool and TSE 77103 lapping compound
	Loose set screw (36)	Apply Loctite #271 to screw threads and tighten screw to a torque of 120-130 lbs. in. (14-15 Nm)
	Damaged discharge fitting (41) threads	Replace fitting. Tighten fitting to a torque of 70-75 lbs. ft. (95-100 Nm)
Delivery Valve Assy (34)	Scored, pitted, eroded or damaged valve or body seat. Cracked body. Leakage (See Note 1)	Replace delivery valve assembly
Delivery Valve Spring (33) & Plunger Spring (22)	Cracks, nicks or wear (flat spots on coils)	Replace spring
Plunger & Metering Sleeve	Fine scratches, scuff marks or dull areas on lapped surfaces with magnifying glass (these conditions indicate contaminated fuel)	Advise customer that his fuel filtering system requires attention. Head should not be replaced due to physical appearance of plunger or sleeve - replace head only if test specifications cannot be met
Cap Nut (30)	Damaged threads or sealing surface Cracks	Replace cap nut
Delivery Valve Holder (32)	Damaged threads or lower gasket sealing surface	Replace holder
Cap Nut Gasket (31)	Scratches, scoring or damage	Replace gasket
Lower Spring Seat (21)	Wear or cracks	Replace guide
Oldham Drive (26)	Cracked, broken or worn (excessive play between Oldham drive and plunger shank)	Replace Oldham drive
Face Gear (24)	Damage, worn teeth or guide slot Cracks	Replace gear
Thrust Washer (25)	Scored, grooved or worn	Replace washer
Plunger Button (20)	Scored, worn or has an uneven wear pattern	Replace button (See Section 7, Pg. 10)
Plunger Retaining Rings (20A)	Bent, broken	Replace
Spring Ring (19)	Tight fit in ring groove	Replace a loose spring ring
Gear Retainer (26A)	Bent excessively	Replace retainer
Tappet (17)	See Note 2	Replace tappet

Control Unit (10)	Binding shaft (see Note 3), shaft loose on lever, broken flange	Replace control unit
Plunger Sleeve Pin (12)	Worn flats (see Note 4) scored shaft Sticking in control unit (must be snug but free to rotate and move in and out)	Replace pin
Pump Housing (13)	Cracks or broken flange  Damaged threads  Damaged overflow fitting	Replace housing  Repair or replace housing  Replace overflow fitting
Hardware	Damaged	Replace as necessary
Gaskets		Replace at each overhaul

**Note 1:** Test delivery valve assembly (34) for leakage and correct opening pressure as follows:

- A. Assemble delivery valve assembly (both body and valve), delivery valve spring (33) and delivery valve holder (32) to TSE 76226 test fixture. Tighten holder to a torque of 70-75 lbs. ft. (95-100 Nm).
- B. Attach test fixture to manually operated nozzle test stand (Bacharach #65-030D or equivalent) (See Fig. 5). Make certain that connection is tight and test stand is in good working order.
- C. Slowly increase pressure to 300 P.S.I. (2.0 MPa). A rapid pressure drop indicates leakage past delivery valve seat. A leaking delivery valve assembly can be corrected by lapping the valve's seat to the corresponding seat in the delivery valve body with a small amount of BM 10007 lapping compound.

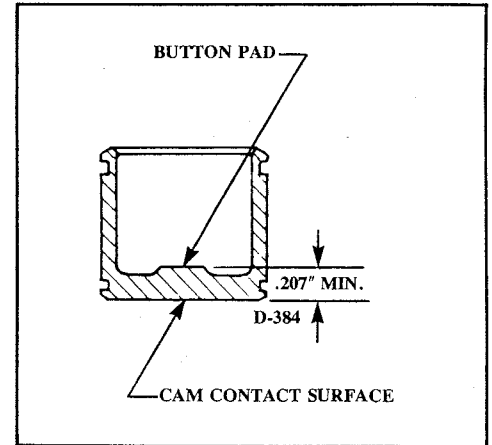
**Caution:** Lapping compound is to contact valve and body seats ONLY. Thoroughly clean valve assembly following lapping operation.



**FIGURE 5 - CHECKING DELIVERY VALVE**

- D. Slowly increase pressure until valve opens (indicated by sudden drop in pressure is usually also audible). Valve must open between 300 and 600 P.S.I. (2.0-4.1 MPa). If not, replace delivery valve spring and re-test assembly.

**Note 2:** Inspect tappet for wear at button pad and cam contact surface (See Fig. 6). Wear on cam contact surface must not exceed .002". Distance between button pad and cam contact surface must be .207" minimum as measured with a micrometer.



**FIGURE 6**

**Note 3:** Hold sleeve of control unit assembly and rotate lever; shaft must turn freely. If a binding condition exists, wash assembly in Varsol, or an equivalent cleaning agent. If binding condition is still present, replace control unit assembly.

**Note 4:** Check clearance between flat on plunger sleeve pin (12) and mating slot in metering sleeve. If clearance exceeds .0015", replace pin.

(Unless otherwise indicated, numbers in parentheses refer to Figure 1).

Note: Dip all parts in clean calibrating or lube oil.

1. If set screw (36) and sealing ball (37) were removed, a new sealing ball should be installed. Clean screw threads thoroughly and apply Loctite 270/271 or equivalent to screw. Install set screw (36) and torque to 120-130 lbs.-in. (14-15 Nm).
2. If discharge fitting(s) (41) was damaged and removed, install new fitting into head (38) and torque fitting to 70-75 lbs. - ft. (95-100 Nm).
3. Invert the hydraulic head (38) and place it on a clean bench.
4. Insert the plunger sleeve into the hydraulic head (38) with the identification dot on the sleeve facing upward. Refer to Figure 6A.

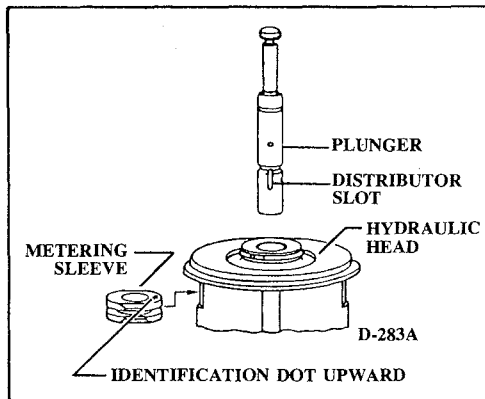


FIGURE 6A

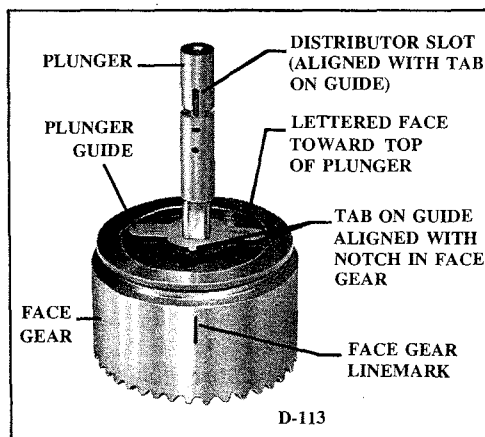


FIGURE 7 - ASSEMBLY OF HYDRAULIC HEAD

5. Dip the plunger in clean test oil, then carefully insert it through the lower head and plunger sleeve bores.

**Caution:** Do not use force. Slight relocation of metering sleeve is normally required to accomplish Step 5.

6. Apply a thin film of LU 3003 to thrust washer (25) and assemble to face gear (24).

Note: Verify that plunger guide (26) fits properly into mating slot in face gear (24) with stamped letters of guide facing up. Then, remove guide (26) from gear.

7. Assemble plunger guide (26) to plunger with stamped letters facing plunger top and with tab of guide aligned with plunger distributor slot. Position face gear and thrust washer over end of plunger and make sure that plunger guide (26) is aligned with and seats in mating slot in face gear. (See Fig. 7)

8. Connect face gear to hydraulic head with gear retainer (26A). Make certain that retainer (26A) snaps into mating grooves of head and face gear. Manually operate plunger up and down to make certain that face gear is assembled correctly.

9. Temporarily assemble delivery valve holder (32) and cap nut (30) finger tight and place head on an arbor press in the inverted position. Plunger must be at its highest position.

10. Assemble upper plunger spring washer (23), spring (22), and lower spring seat (21) to face gear bore.

11. Assemble TSE 76199B pressing tool on to lower spring seat (21) (See Fig. 7). Compress both with arbor press and install plunger retaining rings (20A) with a pair of needle nose pliers or small screw driver.

12. Assemble plunger button (20) to end of plunger and secure it in place with spring ring (19). Make certain that spring ring is fully seated in lower spring seat (21) groove.

13. Apply a thin film of LU 3003 grease to "O" ring (18) and assemble "O" ring to tappet (17) groove.

14. Insert tappet (17) into face gear (24) bore.

15. Apply a thin film of LU 3003 grease to head "O" rings (29 & 42). Insert lower "O" ring (42) into pump housing bore. Assemble upper "O" ring (29) to groove in head.

16. Clamp pump mounting fixture (See Fig. 3) in a vise, secure pump housing (13) to fixture and carefully insert hydraulic head (38) into head bore. Locating slot in head flange must be aligned with housing locating slot located on left side of housing.

17. Secure head to housing with retaining clamps (28) and cap screws (27). Tighten screws evenly to a torque of 13-15 lbs. ft. (18-20 Nm).

## Section 5 - Reassembly

18. Assemble timing hole gasket (15) and screw (16) to timing hole at rear of housing so that screw is finger tight. Final tightening is made at pump assembly to engine and screw should then be torqued to 20-25 lbs.-in. (2.2-2.8 Nm).
19. Assemble delivery valve spacer (35) to delivery valve assembly (34) and delivery valve assembly, delivery valve spring (33) and delivery valve holder (32) to head bore. Tighten delivery valve holder to a torque of 70-75 lbs. ft. (95-100 Nm) Loosen and retorqued to 65-70 lbs. ft. (90-95 Nm). — Must be done manually — no automatic tightening devices are to be used in this instance.
20. Assemble cap nut gasket (31) and cap nut (30) to delivery valve holder. Tighten cap nut to a torque of 50-55 lbs. ft. (70-75 Nm), loosen nut and retorqued to 60-65 lbs. ft. (80-90 Nm).

IN THE FOLLOWING PARAGRAPHS, NUMBERS IN PARENTHESES REFER TO FIGURE 8.

21. Assemble plain washer (8) and stop pin (7) to control unit lever hole that is closest to control unit shaft and secure in place with lockwasher (3) and nut (2). Tighten nut to a torque of 20-25 lbs. in. (2.2-2.8 Nm).
22. Apply a film of LU 3003 grease to control unit "O" ring (11) and assemble "O" ring to control unit (10).
23. Assemble sleeve pin (12) to control unit assembly.
24. Position control unit lever so that sleeve pin is at 6 o'clock position, flats are horizontal and electric pencil mark (dot) is up.
25. Make certain that head metering sleeve is at its lowest position and insert control unit (10) into pump housing.

**Caution:** Rotate control unit lever 360°. Failure to rotate 360° indicates that sleeve pin is not engaging metering sleeve slot.

26. With control unit lever positioned as shown in Fig. 8, assemble control unit retaining plate (6) and secure it in place with tab washers (5) and screws (4). Bend one ear of each washer over edge of retaining plate (See Fig. 8).

Tighten screws (4) to a torque of 20-25 lbs. in. (2.2-2.8 Nm) and bend one tab of each tab washer (5), against head of screw (See Fig. 8).

27. Assemble adjusting screw (1), nut (2) and lockwasher (3) to retaining plate (6). Tighten nut to a torque of 20-25 lbs. - in. (2.2-2.8 Nm).

**Note:** (For 9540 specification only) After calibration, fuel adjusting screw (1) should be lockwired tightly to control unit plate (6) starting at the screw. Crimp seal as closely as practical to the plate as the wire ends leave the plate.

28. For 9540 specification pumps only, plugs (39) and caps (40) must be assembled over two head discharge fittings before calibration. Assemble plugs and caps to the two fittings located at 2 o'clock and 8 o'clock (viewed from above and from control unit side of pump). Torque the caps (40) to 7-10 lbs.-ft. (9.5-14.0 Nm).

29. If ball joint link (9) was removed, reassemble to control unit (10) lever in position indicated on fig. (1). Install lockwasher (3) and nut (2) onto link (9) and tighten nut to 20-25 lbs.-in. (2.2-2.8 Nm).

**Note:** The overflow fitting (14), if removed, need not be reinstalled until after the pump has been pressure tested and timed (See Para. 22 under Testing and Adjusting, Section 6B).

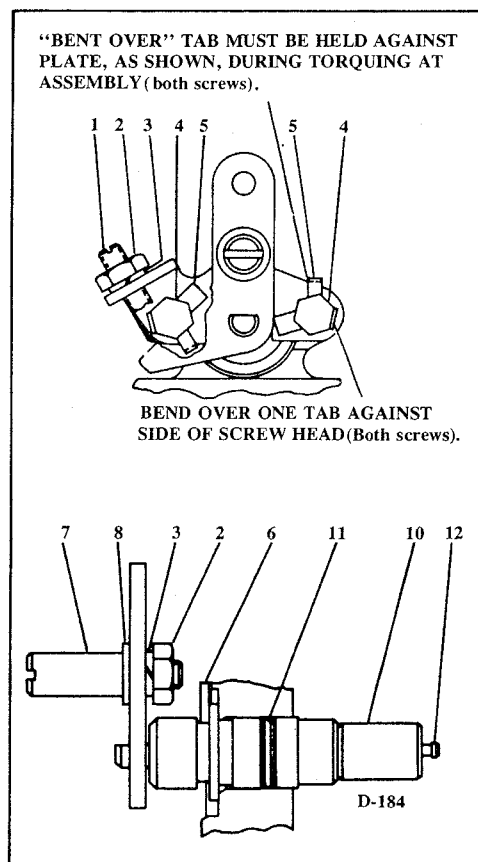


FIGURE 8 - CONTROL UNIT ASSEMBLY



# Section 6 - Testing And Adjusting

(Numbers in parentheses refer to Figure 1).

## A. PRESSURE TESTING

1. Replace overflow fitting (14) with a 1/4" (6.35 mm) pipe plug.
2. Connect a nozzle test stand (Bacharach #65-030D or equivalent) to fuel inlet hole. Make certain that all connections are tight and test stand is in good working order.

**Note:** Use a Bacharach #67-0741, or equivalent, high pressure tubing. A fuel inlet stud can be fabricated from an SD 7852 by rethreading the stud with a 1/4" - 18 NPTF pipe die.

3. Line up hole in face gear with hole in pump housing pilot.
4. Slowly operate nozzle test stand until pressure is 400 PSI (2.8 MPa) **MAXIMUM**. A rapid drop in pressure indicates that pump is leaking.
5. Inspect for leakage:

- a. At control unit (10). If present, replace "O" ring (11).

**Note:** Slight leakage by control unit shaft is normal and is necessary to lubricate shaft.

- b. Between top of housing (13) and head flange. If present, replace upper head "O" ring (29).
- c. Past lower head gasket (42). It will be necessary to remove tappet (use 2 screwdrivers) to observe leakage.

6. After a leak is corrected, re-test pump.
7. The overflow fitting (14) need not be re-installed until after pump has been pressure tested and timed (see Para. 22 of Section 6B).

## B. TIMING

**Note:** Internal pump timing is controlled by fixed dimensions and, therefore, cannot be adjusted. For accurate timing, pumping and test oil should be at room temperature.

1. With Model 50 drive fixture (Bacharach #167-7033) - See Fig. 9, connected to test stand drive, manually rotate test stand until a fixture camshaft cam lobe is at top dead center. Note angle indicated on test stand graduated degree wheel; then manually rotate test stand counterclockwise  $29^\circ \pm 1/2^\circ$ .

**Note:** Make certain that drive fixture is filled with lube oil to indicated level.

**Note:** When using B214 cam, use leading lobe with 2nd lobe  $90^\circ$  late.

2. Remove tappet (17), spring ring (19) and button (20). Use two screwdrivers to remove tappet.

3. Temporarily install a BO 853-11 button (identified by #11 stamped on O.D.), the spring ring (19) and tappet (17).

**Note:** DO NOT discard original button.

4. Remove timing hole screw (16) and washer (15).
5. Insert a 1 1/2" (38mm) long x .125"-.135" (3.2mm) diameter brass rod into timing hole and rotate face gear until rod engages face gear timing slot.
6. Secure injection pump to drive fixture so that control unit is toward end of fixture opposite drive end (See Fig. 9). Slight readjustment of camshaft may be necessary to align gear teeth.

**Note:** A non-compressible metal shim is required between pump and fixture. Shim must provide a dimension of  $1.139" \pm .001"$  (28.93mm) from cam base circle to top of shim. **DO NOT** use gaskets.

A shim pack (No. V7698) is available from the Bacharach Instrument Co.

7. Remove brass rod from timing hole and reinstall gasket (15) and timing hole screw (16). Tighten screw to a torque of 20-25 lbs. in (2.2-2.8 Nm).
8. Remove delivery valve cap nut (30), gasket (31), holder (32), spring (33) and delivery valve assembly (34).
9. Remove overflow valve (14) and install 1/4" (6.35mm) pipe plug (See Figure 9).
10. Assemble port closing adapter (See Fig. 10) to No. 1 head discharge fitting (See Fig. 9).

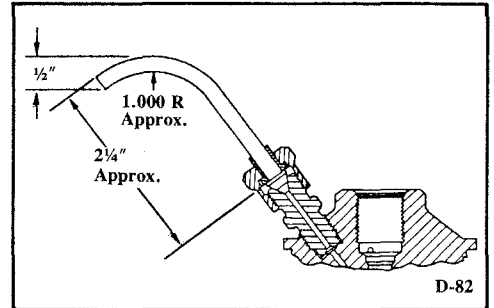
**Note:** No. 1 discharge fitting is always located above the control unit.

11. Connect a gravity feed test oil supply (Bacharach #67-5598 or Viscor #1487C) that will provide a 16"-20" (406-508mm) head at pump fuel inlet (See Fig. 9).
12. Place control unit lever in idle position (full counterclockwise) thus allowing sump to fill with oil. When sump is filled, re-install delivery valve holder (32) finger tight.
13. Lock control unit lever in full fuel position (full clockwise).
14. If necessary, manually rotate test stand drive counterclockwise until oil flows freely from port closing adapter.
15. Slowly rotate test stand drive **clockwise** until fuel flow is reduced to **one drop in 5-10 seconds**. This is port closing.

**Note:** Lock test stand drive in place. Do not move drive once port closing is obtained.

16. Carefully remove pump from drive fixture.

17. Measure distance from **highest** point of cam to top of shim with depth micrometer.
18. If dimension obtained is different than dimension stamped on pump housing flange (middle of flange on timing pin hole side) remove old dimension, and stamp new dimension in its place. Record old dimension.
19. Remove delivery valve holder (32).
20. Assemble delivery valve spacer (35) to delivery valve assembly (34), delivery valve spring (33) and delivery valve holder (32) to head bore. Tighten delivery valve holder to a pre-torque of 70-75 lbs. ft. (95-100 Nm). Re-torque to 65-70 lbs. ft. (90-95 Nm).
21. Install cap nut gasket (31) and cap nut (30). Tighten cap nut to a pre-torque of 50-55 lbs. ft. (70-75 Nm), loosen nut and re-torque to 60-65 lbs. ft. (80-90 Nm).
22. Remove 1/4" (6.35mm) pipe plug and reinstall overflow fitting (14). Apply liquid sealant (Loctite #277 or equivalent) to fitting threads and tighten with fitting positioned as follows:
  - a. For **9540** specification, outlet should be at 3 o'clock position as viewed from outlet side of pump.
  - b. For **9541, 9542** and **9543** specification, outlet should be 30° counterclockwise from upper vertical center line with outlet facing upwards.



**FIGURE 10 - PORT CLOSING ADAPTER**

**C. CALIBRATION**

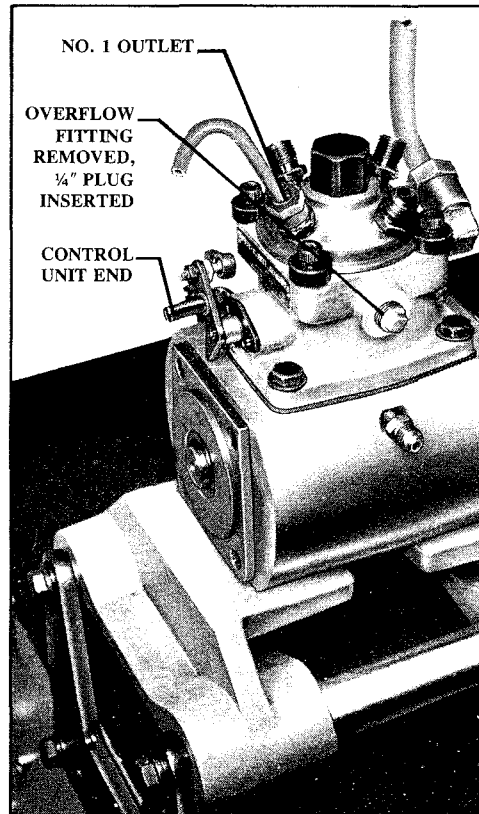
1. Follow procedure outlined in Para. 1 thru 7 under "TIMING", Page 8.

**Note:** Drive fixture (Bacharach #167-7033 - See Figure 11) contains a 2 lobe cam for calibrating 2 cylinder pumps. A 4 lobe cam (Bacharach #167-0548) is available for calibrating 4 cylinder pumps.

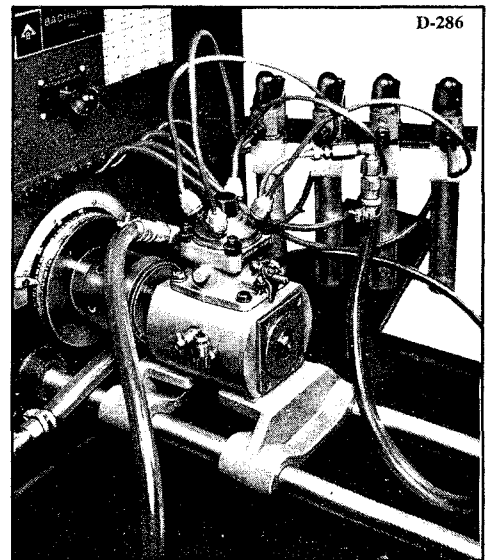
Also, a 2 lobe cam (Onan #147B214) is available for calibrating two cylinder (odd fire) pumps.

2. Install high pressure tubings (TSE 4500-123 or Bacharach #67-0996 - 1/4" O.D. x .084" I.D. x 20" long) between test stand nozzle holders and pump discharge fittings. Avoid sharp turns when bending tubings to fit.

**Note:** AKB 50 SD 3495B nozzle holders, with 2500 psi (17.2 MPa) opening pressure, and ADN 12 SD 12C nozzles are required in test stand.



**FIGURE 9 - TIMING A MODEL 50 PUMP**



**FIGURE 11 - CALIBRATING MODEL 50 PUMPS**

3. Connect test oil supply line to pump fuel inlet.

**Note:** Use Bacharach #67-5598 (Viscor #1487) calibrating oil. Test oil pressure of 10-12 psi (.68-.82 bars) is required at inlet and a test oil temperature of 110°-115°F. (43°-46°C.) must be maintained.

4. Connect test oil return line to overflow fitting.
5. Set test stand counter for 500 strokes.
6. Operate test stand clockwise at slowest speed possible and loosen a high pressure tubing nut to bleed air out of pump; then retighten nut.
7. Operate test stand clockwise at 600 RPM with pump operating lever in full fuel position (full clockwise) for at least 5 min. to bring pump up to temperature.

8. Refer to Model 50 Parts List & Calibration specs.

9. Remove pump from drive fixture.
10. Remove BO 853-11 plunger button and reinstall original button (See Section 7, this page).
11. Lockwire fuel adjusting screw (1-1) on **9540 specification** pumps only. (Make sure locknut (1-2) is properly torqued). Refer to Reassembly Section 5, Para. 27 for locknut torque and lockwiring information.

Due to wear during normal operation, the port closing dimension may change slightly thereby necessitating a button thickness change. Should the port closing dimension obtained during "TIMING" (see page 8) vary more than .001" from the dimension stamped on the pump housing below the timing pin hole, proceed as follows: Identify thickness of original plunger button and refer to Table I for plunger button thickness dimension.

2. **Add** plunger button thickness to old port closing dimension; then **subtract** new port closing dimension. The resulting dimension is the required thickness for the new button.

**Example:** Original button thickness is .107" (Code 5 or E) — Old port closing dimension was 1.109" — New port closing dimension is 1.094".

$$\begin{array}{r}
 1.109" (28.169\text{mm}) \quad 1.216" (30.887\text{mm}) \\
 + .107" (2.719\text{mm}) \quad - 1.094" (27.788\text{mm}) \\
 \hline
 1.216" (30.887\text{mm}) \quad .122" (3.099\text{mm})
 \end{array}$$

3. Refer to Table I to determine part number of button that has the thickness that is closest to the calculated dimension. In our example (Para. 2), the required button would be BO 853-12.

**Table I — PLUNGER BUTTONS**

Thickness	Part No.	Ident.
.089" (2.26mm)	BO 853-10	10 or L
.092" (2.34mm)	BO 853- 9	9 or K
.095" (2.41mm)	BO 853- 8	8 or J
.098" (2.49mm)	BO 853- 7	7 or H
.101" (2.56mm)	BO 853- 6	6 or F
.104" (2.64mm)	BO 853-11	11
.107" (2.72mm)	BO 853- 5	5 or E
.110" (2.79mm)	BO 853- 4	4 or D
.112" (2.84mm)	BO 853- 3	3 or C
.116" (2.95mm)	BO 853- 2	2 or B
.119" (3.02mm)	BO 853- 1	1 or A
.122" (3.10mm)	BO 853-12	12 or M
.125" (3.17mm)	BO 853-13	13 or N
.128" (3.25mm)	BO 853-14	14 or P
.131" (3.33mm)	BO 853-15	15 or R
.134" (3.40mm)	BO 853-16	16 or S

**Important:** Plunger buttons are not included with Model 50 pumps or hydraulic heads. The required plunger button must be selected when the new pump, or an old pump with a new head, is installed on an engine (see Service Bulletin #ENG 34 in Onan Service Manual).

## Section 7 - Selecting New Plunger Button

# Section 8 - Special Tools & Equipment

Part No.	Description	Refer To
BM 10007	Lapping Compound	Note 1, Para. C, Page 5
LU 3003	Grease	Section 5, Page 6
TSE 76199B	Pressing Tool	Para. 11, Page 6
TSE 7986	Lapping Tool	See Page 4
TSE 76226	Delivery Valve Test Fixture	Note 1, Para. A, Page 5
TSE 77103	Lapping Compound	See Page 4
*65-030D	Nozzle Test Stand	Note 1, Para. B, Page 5 & Para. 2, Page 8
*67-0741	High Pressure Tubing	Para. 2, Page 8
*67-0996	High Pressure Tubing (2 or 4 required)	Para. 2, Page 9
*67-5598	Calibrating Oil	Para. 3, Page 10, Section 6C
147B214 (Onan)	Two Lobe (Odd Fire) Cam	Para. 1, Page 9
*167-0547	Two Lobe (Even Fire) Cam	Para. 1, Page 9
*167-0548	4 Lobe Drive Fixture Cam	Note following Para. 1, Page 9
*167-7033	Pump Drive Fixture	Para. 1, Page 8 Section 6B) & Note following Para. 1, Page 9
277	Loctite	Para. 22, Page 9
*V 7698	Shim Pack	Note following Para. 6, Page 8, Section 6B
--	Pump Mounting Fixture	Para. 2 & Figure 3, Page 3
--	Port Closing Adapter	Para. 10, Page 8 & Figure 10, Page 9
271	Loctite Corp.	Page 4, Section 4

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