

Section I — Hydraulic Head and Related Components

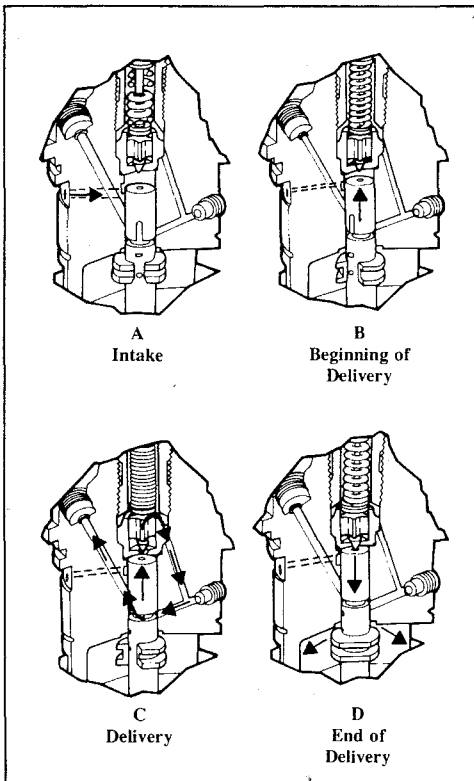


FIGURE 1-2
FUEL PUMPING OPERATION

Fuel Pumping

The Model 100 pump is equipped with a single-plunger, multi-outlet hydraulic head which pumps fuel to the injection nozzles. Fuel enters from the supply system through the pump housing inlet connection, into the hydraulic head sump area. It fills the sump area and head cavity between the top of the plunger and bottom of the delivery valve when the plunger is at the bottom of its stroke. (Position A above).

As the continuously rotating plunger moves upward as a result of cam action, it closes two horizontal galleries, which are connected to the inlet ports. (Position B). This traps the fuel above the plunger and builds up pressure, until the spring-loaded delivery valve is forced open. Further movement of the plunger forces the fuel through the delivery valve. The fuel then travels through the intersecting duct to the annulus and distributing slot in the plunger. The vertical distributing slot on the plunger then connects with an outlet duct as the plunger rotates.

The rotary and vertical movement of the plunger are placed in relation to the outlet ports so that the vertical distributing slot overlaps only one outlet duct during the effective portion of each stroke. (Position C).

After sufficient vertical movement of the plunger, its metering port passes the edge of the metering sleeve (Position D), and the high fuel pressure escapes down the center of the plunger into the sump surrounding the metering sleeve. This completes the pumping cycle and fuel injection for one cylinder.

Introduction — Fuel Pumping Principle and Delivery Valve Operation

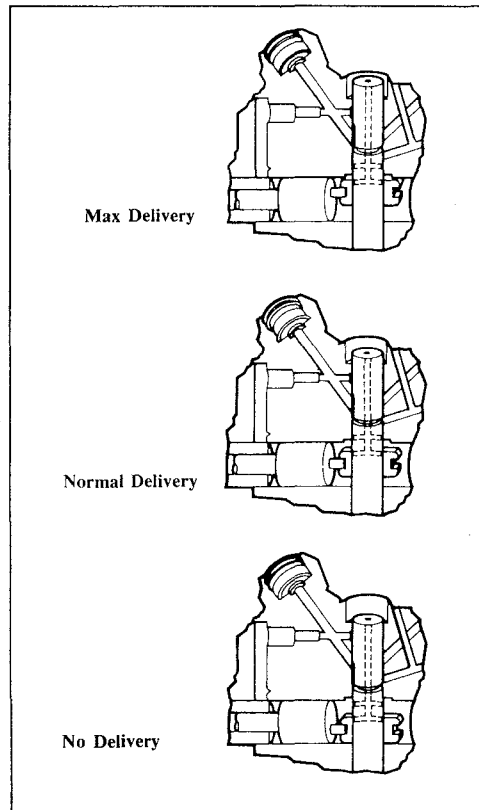


FIGURE 1-3
FUEL METERING SEQUENCE

Fuel Metering

The quantity of fuel delivery per stroke is controlled by the position of the metering sleeve, in relation to the fixed port closing position. That is the point at which the top of the plunger covers the top of the fill ports.

During the plunger stroke, as the horizontal plunger metering hole passes over the top edge of the metering sleeve, pumping pressure is relieved down through the center hole of the plunger, into the sump surrounding the metering sleeve. Fuel delivery is terminated despite the continued upward movement of the plunger.

When the metering sleeve is in its lowest position, the metering hole in the plunger is uncovered by the top edge of the sleeve before the upper end of the plunger can cover the horizontal galleries in the head. In this position, no pressure can be built up, even after the galleries are covered by the top of

the plunger. As a result, no fuel can be delivered. This is defined as shut-off position.

If the metering sleeve is moved to mid-position, the spill hole in the plunger is uncovered later in the stroke by the sleeve, therefore the plunger has an effective (or pumping) stroke and fuel is delivered. If the metering sleeve position is raised further, the spill hole in the plunger remains covered by the sleeve until relatively late in the plunger stroke, thereby increasing the effective stroke of the plunger and fuel delivery.

In essence, the upward movement of the metering sleeve increases and the downward movement decreases the quantity of fuel pumped per stroke.

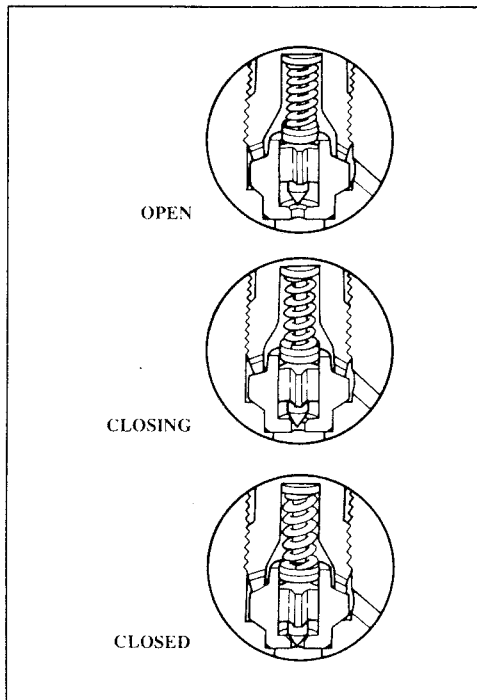


FIGURE 1-4
DELIVERY VALVE OPERATION

Delivery Valve Operation

The delivery valve assembly is located in the hydraulic head, directly above the plunger. This valve assembly assists in the injection of fuel by preventing loss of fuel from the delivery to the supply side of the system between pumping strokes.

The delivery valve assembly consists of a fluted valve with a retraction piston and conical seat, selectively fit to a valve body. Opening pressure is controlled by the delivery valve spring and spring seat, which sit on top of the valve. Spring seats of varying thicknesses are available to increase or decrease opening pressure.

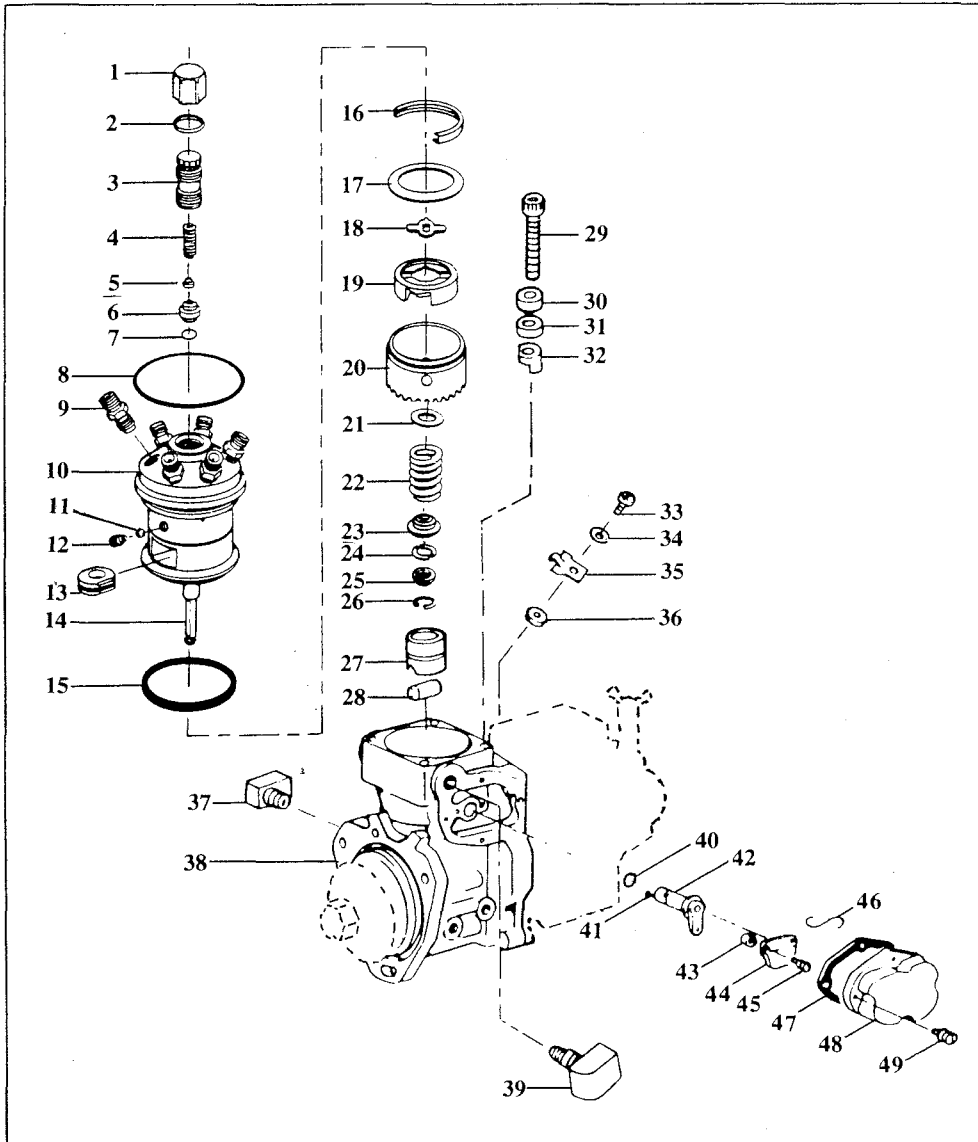
Fuel pressure is created after the plunger on the upward stroke closes the horizontal galleries (scallops) in the head which are fed by the fuel inlet ports. When the pressure

overcomes the force of the valve spring, the valve opens and fuel under pressure flows through the valve into the distributing passage of the hydraulic head and then into the injection tubing. Fuel is delivered into the engine cylinder when the injection line pressure is sufficient to open the valve in the injection nozzle.

When the horizontal spill hole in the plunger passes the top edge of the metering sleeve, there is a sudden drop in fuel pressure below the delivery valve. The force of the valve spring, combined with the differential in fuel pressure, starts to return the valve to its seat.

As the valve moves down into the valve body, the lower edge of the retraction piston enters the valve bore, stopping the flow of fuel to the bore in the head. Further downward movement of the piston increases the volume on the high pressure side by the amount of piston movement (its retraction or displacement volume). Consequently, there is a reduction in residual pressure in the affected injection tubing, nozzle and nozzle holder. This lowered pressure allows the rapid closing of the injection nozzle valve, and reduces the effect of hydraulic pressure waves that exist in the tubing between injections. The possibility of the nozzle opening before the regular delivery cycle is therefore reduced.

Exploded view of Hydraulic Head Assembly and Related Components



Parts List

1. CAP NUT, delivery valve
2. GASKET, cap nut
3. HOLDER, delivery valve
4. SPRING, delivery valve
5. GUIDE, spring
6. VALVE ASSEMBLY, delivery
7. SPACER, delivery valve
8. GASKET, "O" ring — upper
9. FITTING, discharge (6)
10. HEAD, hydraulic
11. BALL, sealing
12. SCREW, set
13. SLEEVE, plunger
14. PLUNGER
15. GASKET, "O" ring — lower
16. RETAINER, gear
17. WASHER, thrust
18. GUIDE, plunger (Oldham drive)
19. HUB, face gear
20. GEAR, face
21. WASHER, plunger spring
22. SPRING, plunger
23. SEAT, lower spring
24. RING, split — lower spring seat (2)
25. BUTTON, plunger
26. RING, retaining
27. GUIDE, tappet
28. ROLLER, tappet
29. SCREW, retaining — hydraulic head
30. WASHER, clamp — upper
31. WASHER, clamp — lower
32. CLAMP, retaining — hydraulic head
33. SCREW, head locating
34. GASKET, head locating screw
35. PLATE, head locating
36. GASKET, head locating plate
37. FITTING (VALVE), overflow
38. HOUSING ASSEMBLY, pump
39. FITTING, fuel inlet
40. GASKET, "O" ring — control unit
41. PIN, plunger sleeve — control unit
42. CONTROL UNIT ASSEMBLY
43. SPACER, C.U. retaining plate
44. PLATE, retaining — C.U.
45. SCREW AND LOCKWASHER, C.U.
46. WIRE, lock — C.U. screw
47. GASKET, C.U. cover
48. COVER, C.U.
49. SCREW, C.U. cover (3)
SCREW, C.U. cover — lockwire

FIGURE 1-5

Caution: All work on injection equipment must be performed in the cleanest possible location. No filing, sawing or scraping should be done on the bench where repairs are made.

- (1) Wash all external dirt and grease from the injection pump.
- (2) Remove protection caps and plugs, and drain all lubricating and fuel oil out of the pump.
- (3) Mount pump on bracket TSE 76193 and clamp lower end of bracket in a vise.

Caution: Never clamp pump mounting flange in a vise.

- (4) If pump is sealwired between control unit cover and governor top cover, remove wire. Remove the four control unit cover fastening screws and lockwashers and then remove the control unit cover and gasket. Refer to Fig. 1-6.

A. Hydraulic Head Removal