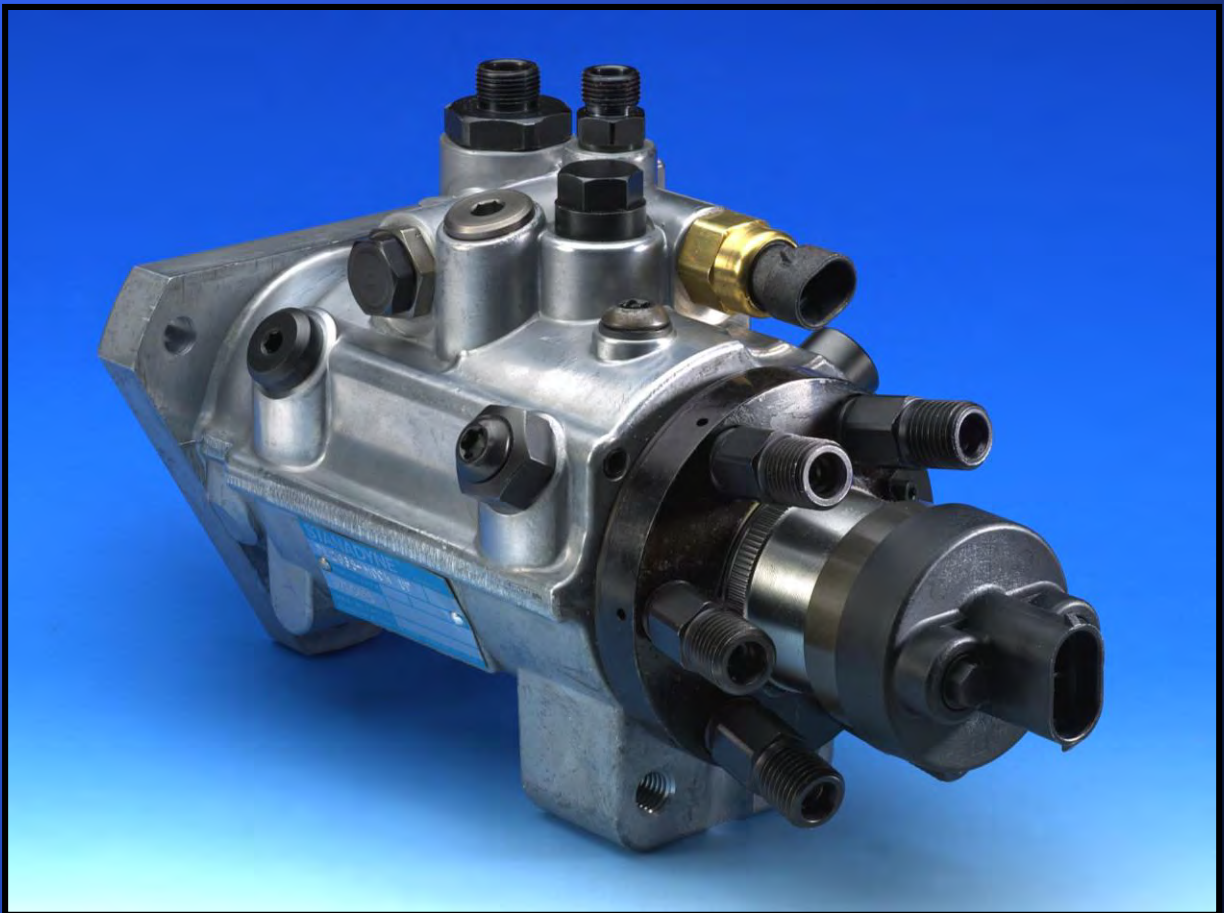




Model DE Electronically Controlled Diesel Fuel Injection Pump Operation and Instruction Manual



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GENERAL

A. Purpose Of The Manual

This manual is expressly intended to provide qualified, trained diesel fuel injection technicians the information necessary to disassemble, reassemble and prepare to test the Stanadyne DE electronic diesel fuel injection pump. In addition to this manual all special tools and test equipment as outlined herein are needed plus all service pertinent literature, the individual pump specification containing the calibration information and a parts breakdown.

This manual is not intended to be used by untrained, inexperienced persons to attempt to service the product. Such unauthorized service could result in violations of emission regulations, pump damage or possibly even engine damage. No service should be performed on the DE pump before studying this manual and becoming familiar with the principles and instructions which follow.

B. Model Number System

The following information appears on the DE pump nameplate.

1. Date Code – reference Service Bulletin 439



2. Model Number – See description that follows
3. Assembly Plant (J = Jacksonville, North Carolina)
4. Serial Number

5. Customer Part Number

The model number describes the DE pump as follows:

$\frac{a}{DE} \quad \frac{b}{2} \quad \frac{c}{4} \quad \frac{d}{35} \quad \frac{e}{5780}$

- a. DE = D series pump, E electronic
- b. 2 = two pumping plungers
- c. 4 = number of cylinders served
- d. 35 = abbreviation of the pumping plunger diameter. In this case - .350 inch
- e. 5780 = specification number. Determines the selection of parts and adjustments for a given application. Must be included in any reference to the pump

C. General Information

The model DE pump is described as an opposed plunger, rotary distributor, electronically controlled, spill solenoid type of pump. When the spill-pump-spill control strategy is employed by the equipment's Electronic Control Unit (ECU), the pump can be described as a variable beginning and ending of injection type.

SECTION 1 - CONSTRUCTION AND OPERATION

STANADYNE®

Model DE Electronic Fuel Injection Pump

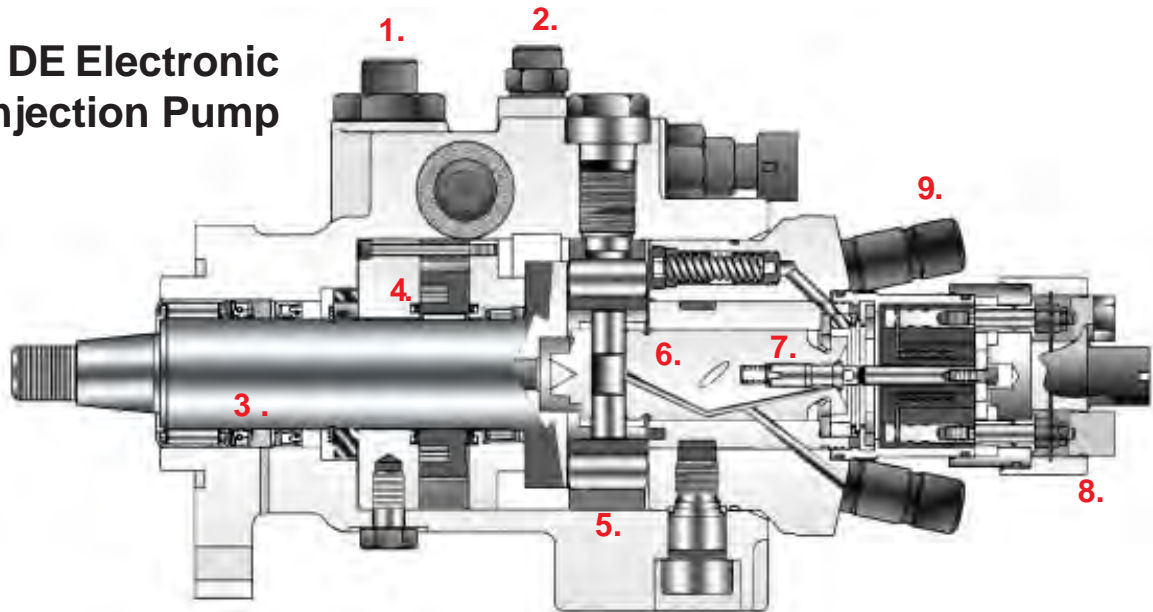


Fig. 1.1

A. Components and Functions (Figure 1.1)

The main components of the DE pump are pictured above in Figure 1.1. They include:

1. Fuel Inlet Fitting
2. Return Line Connector/Housing Pressure Regulator
3. Heavy Duty Drive Shaft
4. Transfer Pump
5. Cam Ring
6. Distributor Rotor
7. Poppet Valve
8. Fuel Control Solenoid
9. Discharge Fittings with Snubber Components

The main rotating components are the drive shaft, the cam roller shoes and cam rollers, transfer pump blades and their retainer, and the distributor rotor and poppet valve.

In the DE pump shown in Figure 1.1, the drive shaft is supported at both ends by needle bearings and carries the two cam roller shoes and cam rollers. It also incorporates a slot, which engages with a tang on the distributor rotor to drive the latter. As the drive shaft is rotated, internal lobes on the cam ring drive the cam rollers and shoes inward, simultaneously displacing the two opposed pumping plungers carried in the rotor. The number of cam lobes equals the number of engine cylinders being served.

The distributor rotor in the 4-cylinder design of the DE pump incorporates no charging ports whereas the six cylinder design incorporates one. Both designs incorporate one discharge port. In the four-cylinder pump all charging fuel must pass around the poppet valve that re-

mains open during the charging phase of the pump sequence

The DE hydraulic head assembly contains the bore in which the rotor revolves, and the charging and discharge ports, a high-pressure accumulator to absorb the pressure spikes from the fuel spilling event and a low-pressure accumulator to assist with rotor charging at high speeds. The head also incorporates discharge fittings each of which contains a snubber plate, snubber seat, snubber spring and retaining screw. The snubber plates are designed to control the injection pressure following and between each injection to prevent secondary injections or other undesirable injection line pressure characteristics.

to the pump solenoid on and off. On the early part of the pumping cam ramp the solenoid, in most situations, will remain un-energized allowing the plunger displaced volume to be spilled. At a precise moment in the discharge sequence the ECM energizes the solenoid moving the armature pin in contact with the rotor

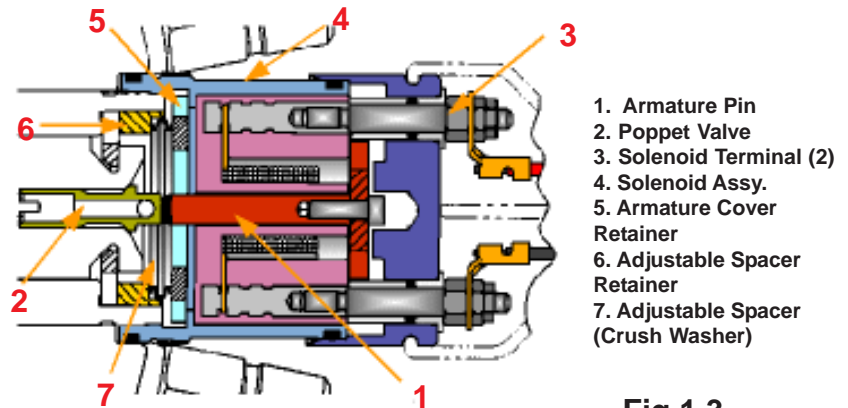


Fig 1.3

B. Electrical Circuitry (Figure 1.2 and 1.3)

The DE pump only incorporates one sensor, a thermistor that provides the Engine Control Module (ECM) with fuel temperature data.

The OEM's equipment ECM switches current

mounted poppet valve causing the valve to seat and seal. When the poppet valve seals, injection pumping commences. When the ECM program determines that the engine has received the correct amount of fuel, the current to the solenoid is interrupted allowing the poppet valve to unseat spilling the remainder of the fuel charge. Hence the DE pump has a spill-pump-spill fueling strategy.

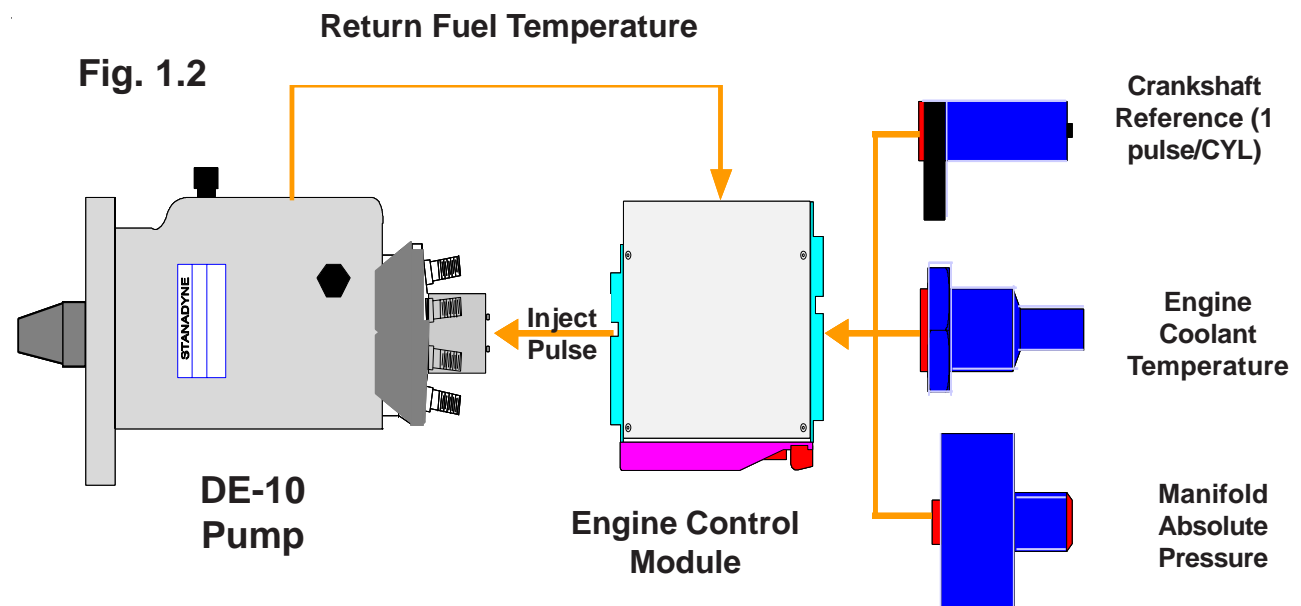
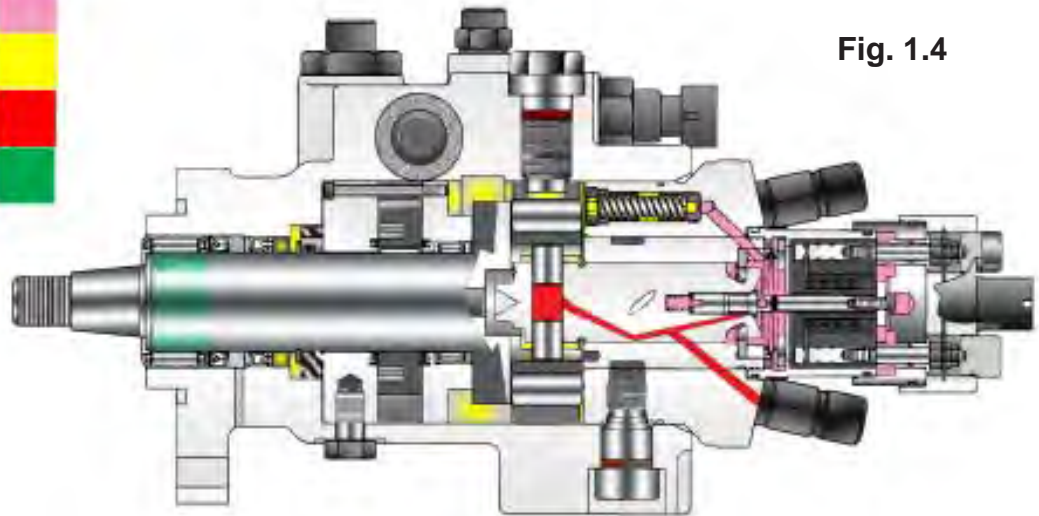


Fig. 1.2

Transfer Pump Pressure █
 Housing Pressure █
 Injection Pressure █
 Lube Oil █



The DE pump has no built-in governor. Governor regulation, high and low idle speeds, throttle progression and injection timing are all sensed and controlled by the ECM hardware and software. Injection pump adjustments are limited to transfer pump pressure and return oil quantity.

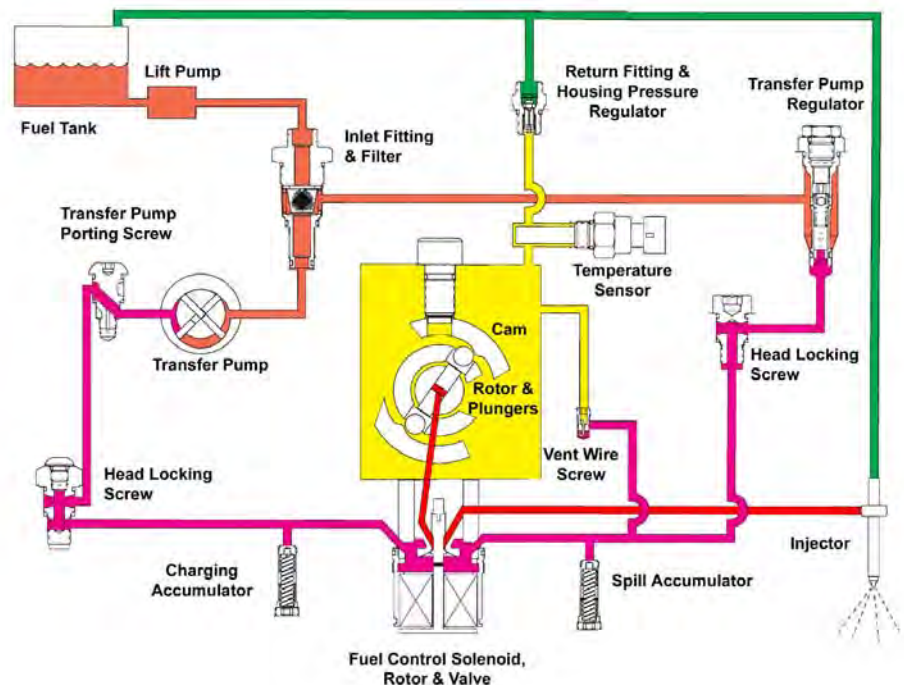
speed.

Pressurized fuel then flows from a transfer pump porting screw through a passage on the side of the housing, through the head locking screw to a passage through the hydraulic head to the spill chamber. (Pumps with charging ports also direct this fuel to the charging annulus in the hydraulic head.) Located between the head locking screw and the spill chamber is a passage way that allows fuel pressure to act on the charging accumulator.

C. Fuel Flow (Figures 1.4 and 1.5)

If so equipped, fuel is drawn from the tank by a mechanical or electric lift pump and flows through a fuel filter and water separator and then to the inlet of the injection pump. The lift pump produces a positive pressure, but of more importance, a solid column of fuel at the inlet of the injection pump.

The fuel then flows into the vane type transfer pump where it is pressurized from 0 to approximately 160 psi depending on pump



At high speeds the charging accumulator adds its volume of fuel to the volume of transfer pump supplied fuel insuring complete pumping plunger charging.

The hydraulic head also contains a passage, which connects transfer pump pressure to the interior of the housing. Located in this passage is a vent wire assembly which permits a small flow of fuel to be vented into the housing as well as purging any air entrained in the fuel. From the housing the air can be vented from the pump via the return line connector/housing pressure regulator and returned to the fuel tank. This flow of return oil to the fuel tank also serves to carry the heat from the pump during operation.

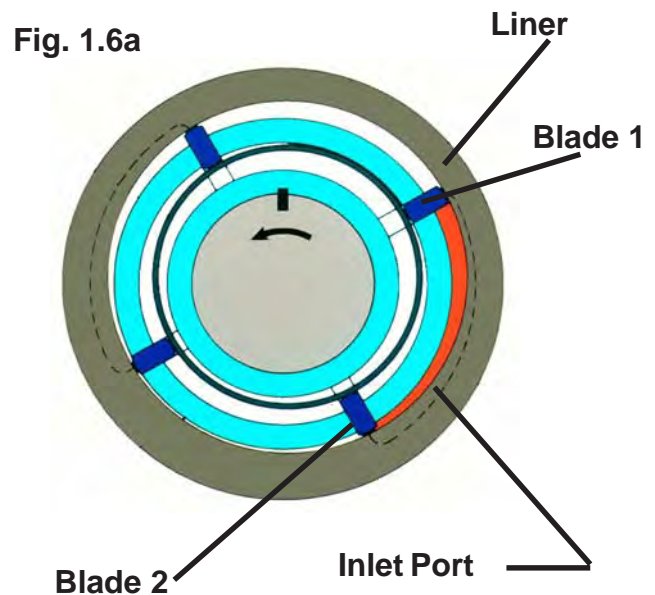
Fuel not used for injection and not internally leaked into the housing flows through a return passage in the hydraulic head. This fuel is also ported to a high-pressure spill accumulator that absorbs pressure spikes created by the spilling of injection pressure into transfer pump pressure at the end of each discharge pumping sequence. Another head locking screw connects this passage through the hydraulic head with a passage on the side of the housing, which is plumbed, to the back-side of the transfer pump pressure regulator piston. When this pressure becomes high enough to move the regulating piston against the force exerted by the transfer pump regulating spring, the piston's movement uncovers a regulator slot allowing this fuel to be bled back to the inlet side of the transfer pump.

D. Transfer Pump (Figures 1.6a, b, c)

The positive displacement vane type fuel transfer pump consists of a stationary liner and four spring-loaded blades that are carried in slots in a drive shaft driven blade

retainer. Since the inside diameter of the liner is eccentric to the drive shaft axis, rotation of the shaft, blade retainer and blades results in the blades moving up and down in their slots. This rotation and blade movement results in changes in volume between each adjacent pair of blades.

Figures 1.6a through 1.6c illustrate the pumping principle. Radial movement causes a volume increase in the quadrant between blades 1 and 2 (Figure 1.6a). In this position the increasing quadrant is in registry with a kidney shaped inlet slot in the porting plate. The increasing volume causes fuel to be drawn in from the kidney slot area. After blade 2 passes out of reg-



istry with the kidney slot and the volume between blades 1 and 2 no longer increases, the fuel between the blades is carried around to the top of the liner (Figure 1.6b).

Then, as blade 1 passes the edge of the outlet kidney slot, located 180° from the inlet slot, (Figure 1.6c) the charge of fuel begins to be pressurized and flows into the outlet slot. As the drive shaft rotates, the

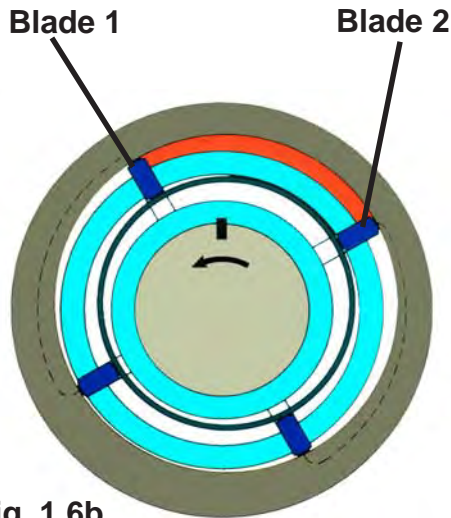


Fig. 1.6b

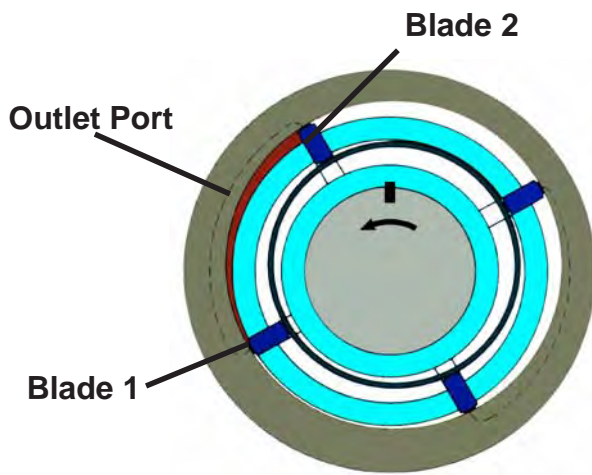


Fig. 1.6c

volume between blades 1 and 2 now begins to decrease forcing the fuel charge into the kidney slot. Pressurization continues until blade 2 passes out of registry with the outlet kidney slot.

A small drilling in the face of the porting plate allows transfer pressure to flow into the counter bore in the blade carrier where the blade spring is located. This provides equal pressure at both ends of the blade to provide pressure balancing.

E. Transfer Pump Regulator (Figure 1.7)

The DE pump utilizes a transfer pump pressure regulator similar to the type used in the DS and DB/DC pumps. It consists of a regulator sleeve that houses a regulating piston, piston stop, spring and an adjusting plug assembly. The sleeve also incorporates a regulating slot and has a filter screen before the piston stop to prevent debris from lodging in the regulating slot.

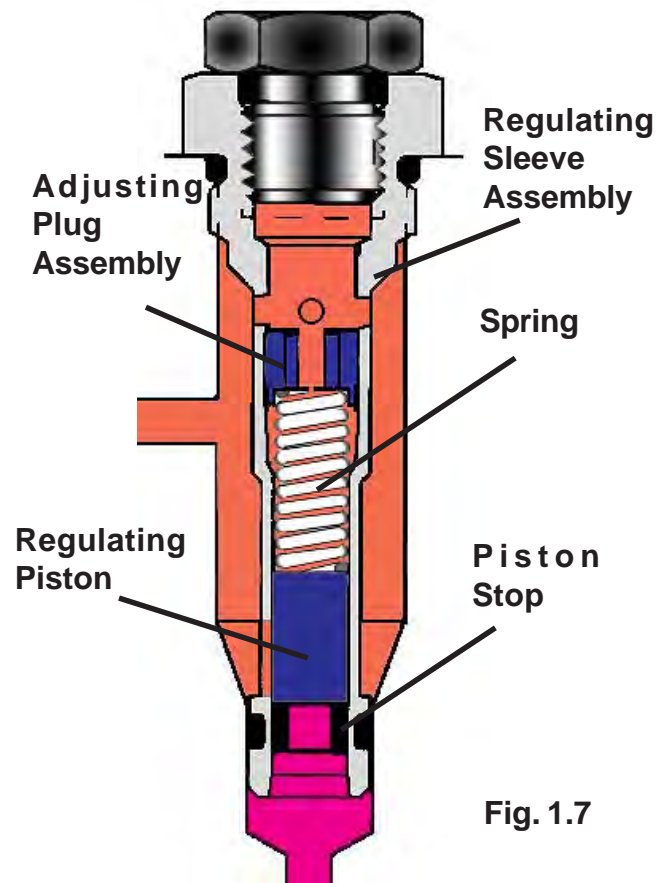


Fig. 1.7

As mentioned earlier, transfer pump pressure is regulated after passing through the DE and DS pumps as opposed to the other D series pumps where the pressure is regulated prior to flowing through the pump.

After filling the various circuits within the injection pump, the pressurized fuel passes through the end of the regulator sleeve

screen where it acts on the end of the regulating piston. The pressure overcomes the spring force on the piston and moves the piston in its bore uncovering the regulating slot in the sleeve. Fuel flowing through the regulating slot joins the fuel entering the pump and is recirculated. As pump speed increases, transfer pump output increases causing transfer pump pressure to increase.

The transfer pump regulator plug assembly (adjusting plug assembly) provides a means of changing the spring preload which adjusts transfer pump pressure.

A sectionally thin, sharp edge orifice, located in the transfer pump regulator plug assembly provides the DE2 with a viscosity compensation feature. Flow through this orifice is unaffected by changes in viscosity. With hot and/or low viscosity fuels, leakage past the regulating piston and bore clearances increases causing fuel pressure in the spring cavity to increase, since flow through the orifice remains essentially the same regardless of fuel viscosity. This increased fuel pressure serves to assist the regulator spring in resisting movement of the piston, this uncovering less of the regulator slot, when fuels are lower in viscosity. This in turn causes an increase of transfer pressure to offset the increased leakage throughout the pump when fuel viscosity is less than ideal.

F. Charging (Figure 1.8, 1.9, 1.10 and 1.11)

As the drive shaft and rotor rotate, fuel under transfer pump pressure flows out of the transfer pump porting plate, through the porting plate screw, down a passage in the housing and into the head locking screw.

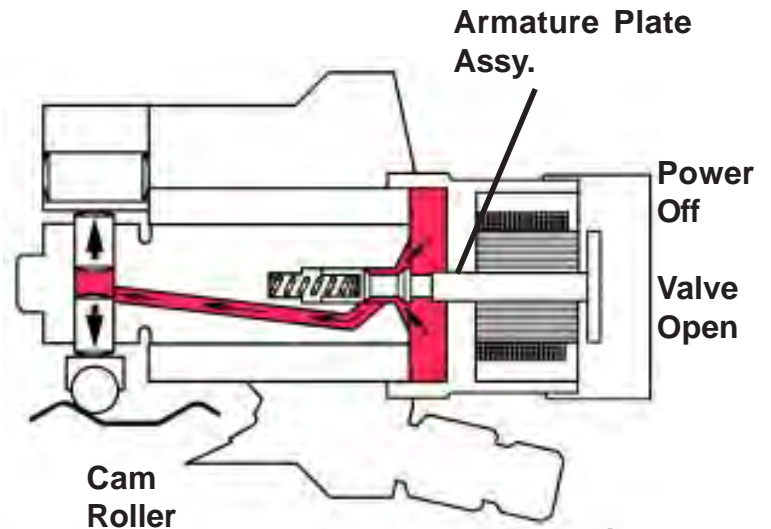


Fig. 1.8

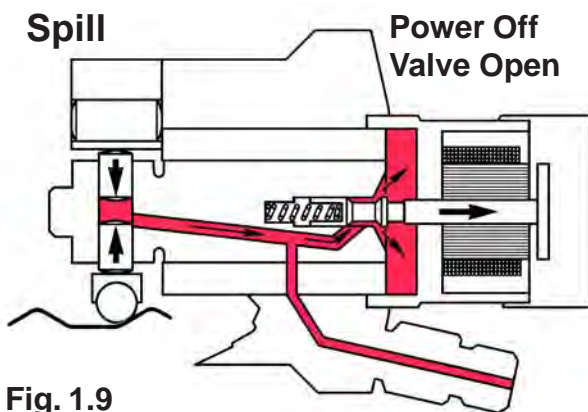
From the head locking screw this fuel then flows through two drillings in the hydraulic head and fills the area around the poppet valve and the fuel control solenoid armature. This fuel flows past the open poppet valve, down through the rotor into the pumping chamber filling the volume between the two pumping plungers, which are then forced outward.

On the six cylinder application, fuel from the head locking screw is also directed to a charging annulus in the hydraulic head and feeds charging ports in the sleeve. As the rotor revolves, an inlet passage in the rotor registers with one of the charging annulus ports allowing additional fuel to assist in charging the plungers. With further rotor rotation this charging port goes out of registry within the hydraulic head trapping the fuel charge in the pumping chamber.

With the DE pump the pumping chamber is filled completely between each injection regardless of the quantity of fuel to be injected into the engine. This differs greatly from previous inlet metered D series pumps where charging quantities were metered based on the amount of metering valve opening.

The operation of the high-speed fuel control solenoid during charging is pictured in Figure 1.8. During charging the cam rollers and shoes are riding down the cam lobes as the rotor rotates. The poppet valve is open and fuel at transfer pump pressure is pushing the pumping plungers outward. Even though filling ends shortly after the rollers reach the base circle of the cam, the solenoid is still un-energized and the poppet valve is unseated. In pumps also incorporating charging ports, these ports are in registry and are also supplying fuel at transfer pump pressure to the pumping chamber.

G. Discharging, Spill – Pump – Spill (Figures 1.9, 1.10, and 1.11)



Further rotor rotation causes the discharge port of the rotor to start to register with one of the outlet drillings in the hydraulic head. When the rollers start to ride up the cam lobes, the plungers are simultaneously displaced inward. Until current is switched on to the fuel control solenoid, causing the poppet valve to seat, displaced fuel is spilled back into the transfer pump circuit. As the rollers continue up the cam, the ECM energizes the fuel solenoid, causing the poppet valve to seat ending the initial **Spill** portion of the discharge event. Fuel now at

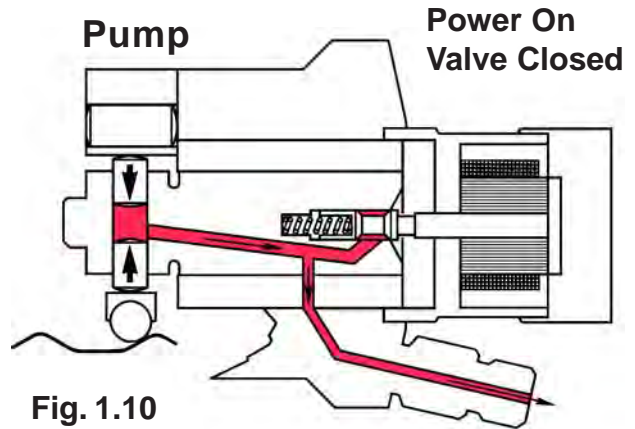


Fig. 1.10

injection pressure is forced out the discharge port and drillings in the hydraulic head, through the discharge fitting containing a snubber valve and on to the injection nozzle. The **Pump** portion of the discharge event ends when the ECM de-energizes the fuel control solenoid allowing the poppet valve to unseat and **Spill** the remainder of the displaced fuel back into the transfer pump circuit. The high-pressure accumulator absorbs the resultant pressure spike from this spill event.

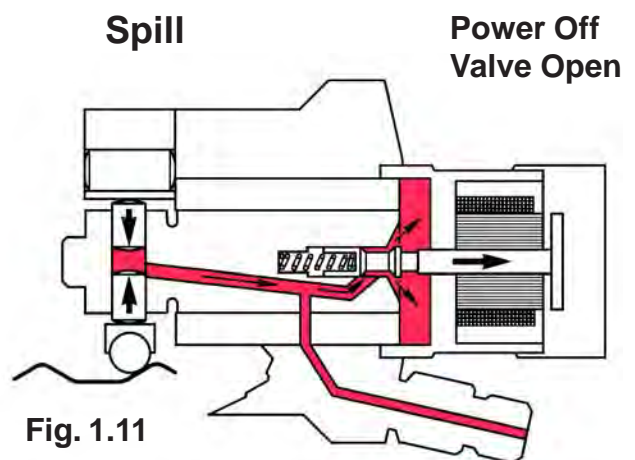


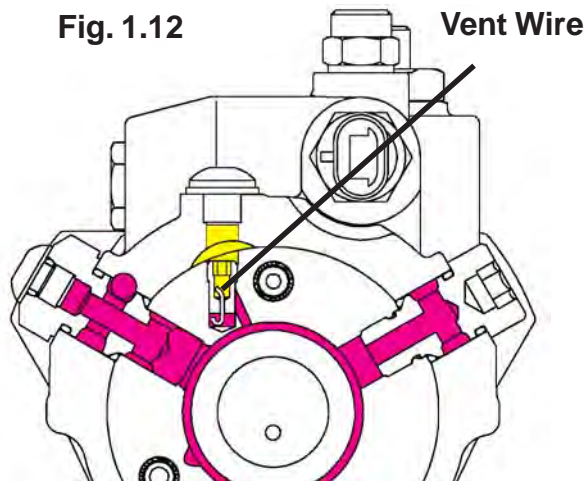
Fig. 1.11

H. Snubber Plates

Each DE discharge fitting contains a snubber plate assembly. The orifice plates are held on their seats by a light spring.

During discharge the pressure wave developed by the pump unseats the plate allowing unrestricted flow of fuel to the injector. At the end of injection the spring seats the plate. Any return waves due to the closing of the injector would need to pass through the orifice before entering the pump. The orifice causes an attenuation of the wave thus lessening the possibility of a strong secondary wave returning back to the injector which could cause an engine damaging secondary injection.

I. Return Fuel Circuit (Figure 1.12)



Fuel fills the DE pump housing due to leakage of transfer pump pressure plus injection pressure between fitted components within the pump such as the head and rotor assembly, and the pumping plungers.

To adjust this flow to a specific range for optimum pump operation, and provide a means of purging any air entrained within the fuel, a vent wire system is employed. Fuel under transfer pump pressure is directed into the vent passage at the top of the hydraulic head which connects with the housing cavity. Flow through the passage

is controlled by the vent wire assembly. The amount of return fuel can be adjusted by varying the wire size used in the vent wire assembly; the smaller the wire the greater the flow through the orifice and vice versa. The vent wire assembly is available in several sizes in order to provide adjustment of the return flow to the quantity called for on the specification. Note that this assembly is accessible by removing the button head cap screw between the two head locking screws. Since the vent wire assembly is located in the highest point of the transfer pump circuit any air entering the transfer pump gravitates to the vent passage. The air, plus a small quantity of fuel passes through the orifice and then from the housing through the return line connector and eventually back to the fuel tank.

Housing pressure is maintained by a spring loaded valve in the return line connector/housing pressure regulator located on the top of the pump housing.

The function of the return line connector/housing pressure regulator is only to control the pressure within the housing. The vent wire assembly on the other hand only adjusts the volume of return flow from the pump.

J. Dynamic Pump Timing Advancement (Figure 1.13 and 1.14)

In all pump-line-nozzle fuel injection systems, the actual beginning of fuel delivery at the nozzle follows, after a short period of time, the start of pumping. This difference between start of pumping and start of injection, (known as Injection Lag) is the result of the speed of the pressure wave through the length of the injection line. Since the speed of the pressure wave remains constant (1500 meters/second for diesel fuel) , injection lag

(when measured in time) remains constant over the full range of engine speeds. Because injection lag is a constant, as the engine turns faster, the injection event will become progressively more retarded if pump to engine timing is not advanced.

On most D-Series pumps a hydro-mechanical mechanism is typically used to rotate the cam ring against the direction of rotation to compensate for this inherent injection lag.

With the DE pump models however, both timing and delivered fuel quantity can be controlled with adjustments of the Spill-Pump-Spill events. Rotation of the cam ring is not necessary and with it the need for complex advance mechanisms.

Shown in Figure 1.13 is a hypothetical cam ring ramp. At 0 degrees of pump rotation, the ramp of the cam starts to rise (Line of Symmetry, LOS). From 7 degrees to 18 degrees from the Line of Symmetry the rise of the cam ramp remains constant creating a constant rate of delivery (20 mm³ per degree of pump rotation in this example). As shown the

pumping event starts at 12 degrees of pump rotation (Line of Symmetry Start of Pumping, LOSSOP). At 16 degrees the second spill event starts, ending the pumping event that lasted a total of 4 degrees delivering a total of 80 mm³ of fuel. With an increase in engine speed, to compensate for injection lag, pump timing needs to be advanced. Without a means of rotating the cam, advancing the injection event is accomplished by simply starting the pumping event earlier. For example, instead of starting at 12 degrees it now starts at 10 degrees. Now the injection pump is starting the pumping event 2 pump degrees (4 engine degrees) earlier. If the engine demand for fuel quantity has remained the same, in this example 80mm³, the start of the second spill event needs to start 2 pump degrees earlier to maintain the 4 degree pumping event. Also note that fuel quantity can be increased or decreased by shortening or lengthening the duration of the pumping event.

The OEM's ECM controls pumping and spill event timing. The only parameters that the pump communicates to the ECM are return fuel temperature and a current inflection

caused by the solenoid armature reaching the end of its travel. Pump to engine positional relationship in DE applications are fixed and since the cam is fixed to the pump housing, the engine to cam relation-

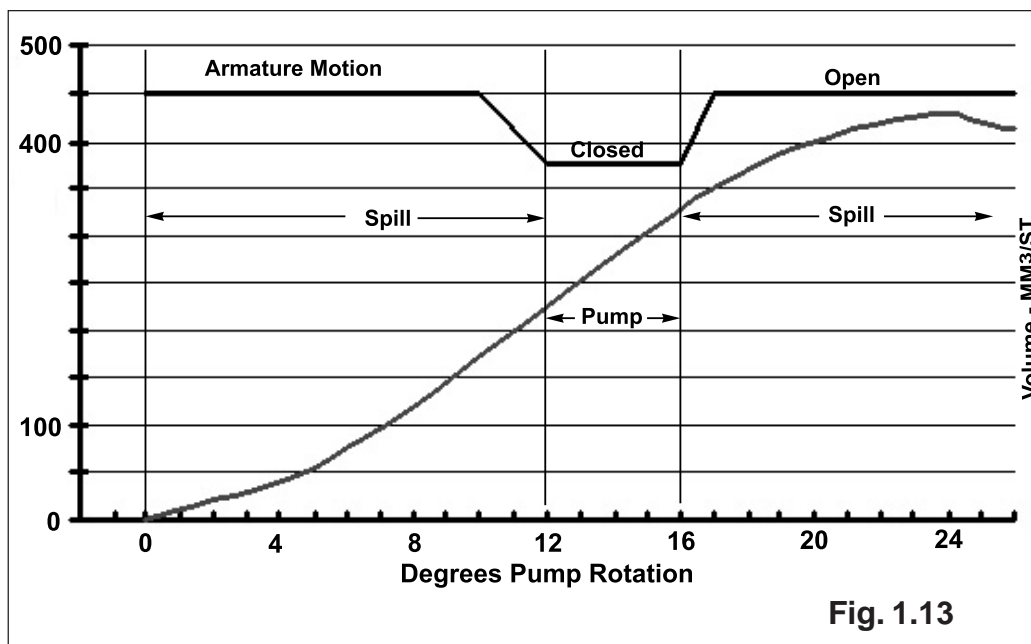


Fig. 1.13

ship never changes. Due to this fixed pump cam to engine relationship a means of communicating cam position to the ECM is not needed.

To control the pump a high current signal generated by the ECM, is sent to the pump's fuel control solenoid, this in turn controls the positioning of the poppet valve which creates the spilling and pumping events.

Figure 1.14 shows a cam profile, pumping events and ECM signals. On the cam profile there are two ranges, filling and pumping. The filling range, or the retraction ramp side of the cam profile, is where the plungers bores are completely filled with fuel at transfer pump pressure. The pumping range, or the pumping ramp side of the cam profile, is where the plungers are driven inwards; displacing the fuel in the plunger bores.

When the ECM receives a signal from the engine drive shaft Top Dead Center (TDC) sensor, it starts two internal clocks (counters). These clocks count off engine degrees of rotation. The first clock controls the timing of the pumping event by counting off an ECM determined amount of degrees of engine rotation before turning power on to the pump solenoid which forces the poppet valve onto its seat initiating the start of the pumping event.

To determine the length of the pumping period (fuel quantity) the ECM monitors various engine inputs and load demand information. Once the fuel quantity need is determined the ECM sets the number of counts (degrees) for the second counter.

The second clock controls when the pumping event ends by counting off an ECM determined amount of engine degrees before turning off the power to the pump solenoid, ending the pumping event by starting the second spill event. The difference between

the end of first and the end of second counter is the length of the Signal Pulse Width (SPW) (or the period during which the pump solenoid is energized).

To change pump timing the ECM either lengthens to retard or shortens to advance, the first counter's count. If fuel delivery is not to be changed, then the second counter count will have to be adjusted the same amount. If fuel quantity changes are needed without changes in pump timing, the first counter count will remain the same and the second counter count will be decrease to cutback on fuel or increased to increase fuel. A combination of changes in both timing and fuel delivery quantity are possible by changes in both first and second counter counts.

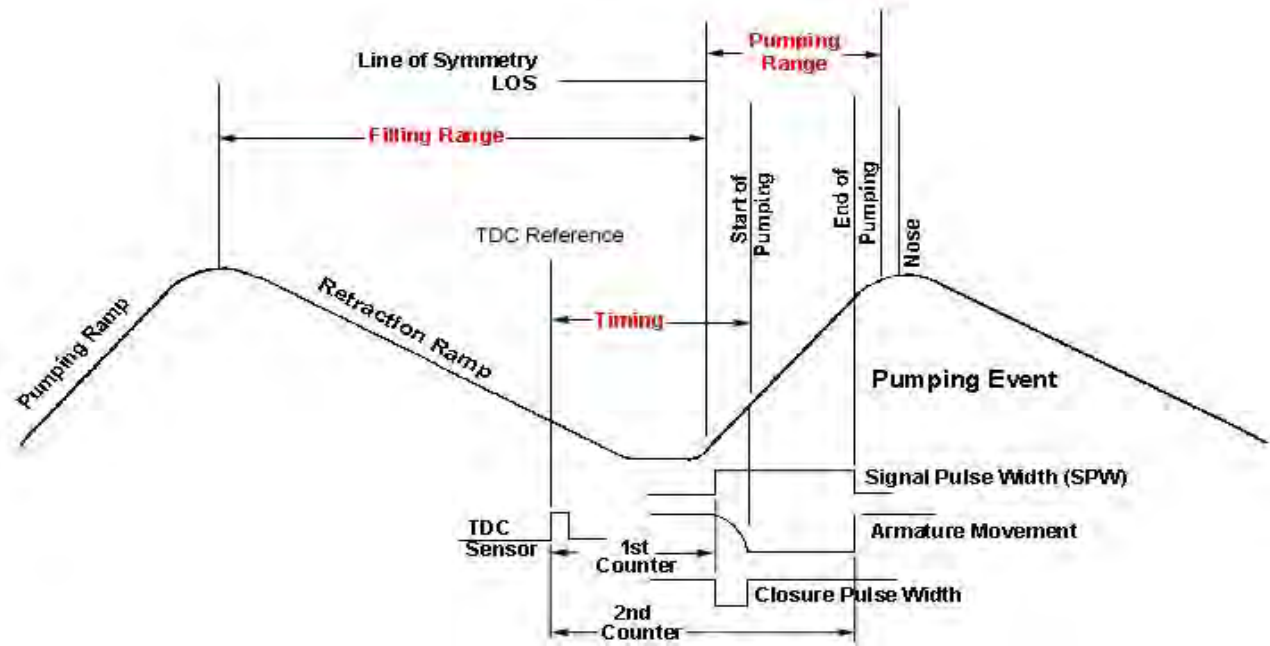


Fig. 1.14

SECTION 2 - DISASSEMBLY

Study the manual first. Before commencing with the disassembly of the pump, cover the fuel inlet, fuel outlets, and the return line connector and wash the pump with solvent and blow dry with filtered, compressed air. Keep in mind that dirt, dust and foreign matter are the greatest enemies of precision diesel fuel injection equipment. Therefore, it is essential that clean hands, work space and tool be used.

NOTE: All seals and gaskets and certain non-reuseable parts as noted herein should be discarded during disassembly. After cleaning, parts should be lubricated with calibrating fluid and placed in a parts tray.

Tool Requirements

For pump disassembly and reassembly, the following special service tools will be required:

Part

Number Description

13301	Brass Hook
13336	Hex Driver (5/32")
13337	Retaining Ring Pliers
16336	Hex Driver (1/8")
19965	Pump Holding Fixture
20044	Retaining Ring Pliers
23615	Pump mounting plate
28311	Drive Shaft Seal and Bearing Puller
30465	Lubriplate Grease
30848	Roll Pin Installation Tool
30853	Armature Cover Spanner Wrench
30855	Transfer Pump Assembly Clamping Fixture
31204	Poppet Valve Gap Setting Fixture
31206	Roll Pin Removal Pliers
31209	T-10 Torx Bit

31213	T-40 Torx Bit
31214	1/4" Drive Handle
31215	Seal Protection Tube
33038	40 IPR Torx Bit
33421	Drive Shaft Seal and Bearing Installer
36270	TP Insert Removal Tool
36271	Head & Rotor Installation Tool
36272	Drive Shaft Installation Protection Tube

In addition to the special tools, the following hand tools which must be obtained locally will also be needed:

1/4", 3/8", and 1/2" drive, torque wrenches
 3/8" Drive, 1/4", 3/16" and 1/8" Hex Bits
 1/4" Drive, 5/64" and 3/32" Hex Bits
 1/2", 9/16", 5/8", 3/4", 1" Combination Wrenches and Sockets
 15/16" or 24mm Socket
 3/4" Deep Socket
 9/16" Deep Socket
 1/4" Socket
 11/32" Nut Driver
 Tilt/Swivel Vise
 Needle Nose pliers
 Dental Pick
 2" Long, 6/32 Screw
 Soft Face Mallet

Step 1. Mount the pump in the 19965 pump holding fixture and clamp in a vise with the pump right side up.



Fig. 2.1

Step 2. Using a 9/16" deep socket loosen and remove the return line connector/housing pressure regulator. Remove and discard the o-ring seal.



Fig. 2.2

Step 3. Using a 3/4" deep socket Remove the temperature sensor. Remove and discard the o-ring seal.



Fig. 2.3

Step 4. Loosen and remove the vent assembly screw using a T-40IPR bit. Discard the sealing washer.



Fig. 2.4

Step 5. Loosen and remove the vent wire assembly using the 16336 hex driver (1/8").



Fig. 2.5

Step 6. With a 5/8" wrench loosen and remove the transfer pump regulator plug. Remove and discard the o-ring seal.



Fig. 2.8

Step 9. Loosen and remove the timing access hole plug using a 1/4" hex driver. Remove and discard the o-ring seal.



Fig. 2.9

Step 7. With a thin wall 3/4" socket loosen and remove transfer pump regulator assembly from the housing.



Fig. 2.7

Step 10. With a 1" socket loosen and remove the inlet fitting. Remove and discard the o-ring seal.



Fig. 2.10

Step 8. Using 5/32" hex driver 13336, remove the transfer pump regulator screw assembly from the transfer pump regulator assembly. Remove the transfer pump regulator spring and piston from the regulator assembly. Remove and discard all o-ring seals.

Step 11. Remove the inlet filter and transfer pump insert retaining spring. Remove the Transfer pump insert by pulling straight up on it with TP insert removal tool 36270. Remove and discard the 2 o-ring seals.



Fig. 2.11a

Step 12. Using a T-10 bit, loosen and remove the fuel control locking screw and plate from the hydraulic head assembly.



Fig. 2.12



Fig. 2.11b

Step 13. Using a 1/4" nut driver remove the two terminal caps from the solenoid connector assembly. Remove the solenoid connector assembly from the solenoid. Using solenoid spanner wrench 30853, loosen, but do not remove, the fuel control solenoid assembly.



Fig. 2.13

Step 14. Loosen and remove the transfer pump pressure tap screw from the head locking screw using a T-40 bit. Remove and discard the o-ring seal.

Step 15. Using a 3/4" socket, loosen and remove the head locking screw. Remove and discard the 2 o-ring seals.



Fig. 2.15

Step 16. Loosen and remove the other head locking screw using a 3/16" hex bit. Remove and discard the 2 o-ring seals.



Fig. 2.16

Step 17. Invert the pump and holding fixture in the vise and tip the pump forward so that the drive shaft is facing straight down. Loosen and remove the head locating screw with a 3/16" hex bit. Remove and discard the 2 o-ring seals.



Fig. 2.17

Step 18. Grasp the head and rotor and, using a twisting pulling motion, remove the assembly from the housing. Remove and discard the o-ring seal.



Fig. 2.18

Step 19. Remove 2 sets of shoes and cam rollers from the housing.



Fig. 2.19

Step 20. Using a 5/8" socket, loose and remove the cam pin screw. Remove and discard the o-ring seal.



Fig. 2.20

Step 21. Remove the cam ring from the housing.



Fig. 2.21

Step 22. Loosen and remove the transfer pump porting screw using a 3/16 hex bit. Remove and discard the o-ring seal.



Fig. 2.22

Step 23. Loosen and remove the transfer pump locking screw using a 1/2" socket.



Fig. 2.23

Step 24. Lightly tap on the end of the drive shaft with a soft faced hammer if necessary and remove the drive shaft/transfer pump assembly from the housing.



Fig. 2.24

Step 25. Using retaining ring pliers 20044 to expand and carefully remove the retaining ring from the drive shaft. Be sure to expand the ring sufficiently and guide it so as not to contact and possibly damage the surface of the drive shaft that the seals ride on.



Fig. 2.24

Step 26. Lift off the thrust washer and use diagonal cutters 31206 to remove the roll pin from the shaft.



Fig. 2.26a



Fig. 2.26b

Step 27. Loosen and remove 7 transfer pump porting plate screws using a T-10 bit.



Fig. 2.27

Step 28. Lift off the transfer pump porting plate and remove the sealing ring and o-ring from the plate. Discard the o-ring but retain the sealing ring for reuse if it is still serviceable.



Fig. 2.28

Step 29. Remove the transfer pump liner, blades and blade spring as an assembly. Separate the blades and spring from the liner.



Fig. 2.29

Step 30 Lift the blade retainer off the drive shaft and remove the woodruff key from the shaft.



Fig. 2-30

Step 31 Lift off the inner bearing retainer and remove the sealing ring and o-ring from the plate. Discard the o-ring but retain the sealing ring for reuse if it is still serviceable



Fig. 2-31

Step 32 Install the head and rotor into the 30851 fixture.



Fig. 2-32

Step 33 Using the brass hook, 13301 remove the 2 rotor plungers from the rotor. NOTE: Do not remove the set screw from the drive end of the rotor – it is not serviceable.



Fig. 2-33

Step 34 Unthread and remove the solenoid assembly. Remove and discard the o-ring seals.



Fig. 2-34

Step 35 While holding the solenoid in one hand loosen and remove the 4 armature cover retaining screws using a T-10 bit. Remove the armature cover retainer.



Fig. 2-35

Step 36 Using a 1/4" socket or nut driver, loosen and remove the 2 terminal studs.



Fig. 2-36

Step 37 Remove the armature cover from the fuel control solenoid assembly. Remove the 2 outer and inner terminal bushings and discard the o-rings.



Fig. 2-37

Step 38 Remove the armature pin assembly from the fuel control solenoid. Do not disassemble the armature pin from the plate – this is not a serviceable item. Remove and discard the 2 o-ring seals.



Fig. 2-38

Step 39 Remove the adjustable spacer retainer and adjustable spacer (crush washer) from the hydraulic head. Discard the adjustable spacer.



Fig. 2-39

Step 40 Remove the 2 rotor retainer locating pins using long nose pliers.



Fig. 2-40

Step 41 Push up on the end of the rotor from beneath the fixture while removing the 2 rotor retainers, then pull the rotor through the hydraulic head assembly to remove. Hold the rotor carefully at the ends so as not to handle finely

finished surfaces.



Fig. 2-41

Step 42 Remove poppet valve, poppet valve spring and poppet valve shims. Measure and record thickness of the shims. If shims are misplaced, it will be necessary to replace them with shims of the exact same thickness. Refer to Parts Inspection section and the individual specification for information on replacement shims.



Fig. 2-42

Step 43 Loosen and remove the 4 snubber plate retaining screws using a 1/8" hex bit

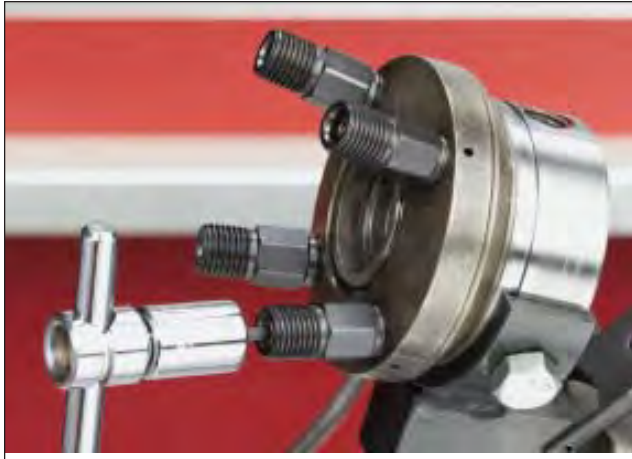


Fig. 2-43

Step 44 Remove the 4 snubber plate assemblies.



Fig. 2-45

Step 46 Remove 2 accumulator piston stops and springs. Remove 2 accumulator pistons. A 2-inch long 6-32 screw may be helpful for this.



Fig. 2-44

Step 45 Loosen and remove the 2 accumulator retaining screws using a 3/16" hex bit.



Fig. 2-46

Step 47 Clamp pump holding fixture 19965 with pump housing mounted to it in vise and drive end facing straight up. Loosen inner nut of 28311 bearing and seal puller to fully collapse the collet. Back out the outer nut until it is flush with the end of the jacking screw. Insert the 28311 puller into the bearing and seal bore.



Fig. 2-47

Step 48 While using a 9/16" wrench to hold the inner nut in place, back out the jacking screw with a 3/16" hex key or bit to expand the collet until it engages the steel case of the fuel side seal. **DO NOT OVERTIGHTEN!**



Fig. 2-48

Step 49 Rotate the outer nut clockwise using the 9/16" wrench to pull the 2 drive shaft seals and the bearing all together. **NOTE:** *Considerable force may be required to start all parts moving in the bore.*



Fig. 2-49

SECTION 3 – CLEANING AND PARTS INSPECTION

General

The Temperature Sensor and Fuel Control Solenoid should be wiped clean and placed in a parts tray. These items should never be submerged in harsh cleaning solvents or solutions.










The remaining DE pump components can be cleaned using standard cleaning practices and solvents that would be used for other Stanadyne D Series pumps. NOTE: *The DE pump contains many small components. If parts are put in a wire basket for submersion in cleaning solution, be sure that the mesh is small enough so parts will not fall through. After cleaning, blow-dry all components with clean, filtered, dry compressed air. Inspect components as outlined herein, replace as necessary and dip all parts in clean calibrating fluid and place in a parts tray.*

A. Component Inspection

Discard all o-rings seals, gaskets and adjustable spacers. Inspect springs for fretting, wear, distortion or breakage. Examine all moving parts for excessive wear, scoring, cracks and fretting. Replace damaged or excessively worn parts as necessary. Always check for signs of contamination. Communicate these findings with your customer so that he can improve fuel handling and filtration practices to better protect his equipment. NOTE: *The illustrations that follow depict typical locations where component wear might be observed in DE pumps. Damage and wear is not limited to these areas nor is the wear shown meant to indicate that these parts require replacement. The appearance of a part is but one measure of whether the part needs to be replaced. Another more important measure is whether the pump can be calibrated on the test bench.*

B. Poppet Valve Shims

During disassembly the poppet valve shim(s) should have been removed and their thickness measured and noted. If they are subsequently misplaced, replacement shims are available as noted and on individual specification. Always use the same thickness shim(s) as replacements. (The average shim stack up is between .048 and .050 inches.)

<u>Part number</u>	<u>Thickness (inches)</u>	<u>Configuration</u>
29653	0.010	
29654	0.012	
29655	0.015	
29656	0.018	
29657	0.020	
29658	0.022	
29659	0.025	
29660	0.028	
29661	0.0305	

C. Supplementary Inspection

1. Housing – Inspect the housing for cracks or signs of damage. Check head locking and locating screw holes for erosion or other signs of damage. Inspect the inside of the housing where

the transfer pump group, cam ring and head and rotor assembly fit for erosion, wear or cracks.

2. Distributor Rotor (Fig. 3.1) – Examine the shank of the rotor for wear or erosion around the discharge port area. Examine the poppet valve seat for cracking or erosion. The drive tang area may show polishing or wear in the corners which contact the drive shaft as illustrated but this is considered normal.

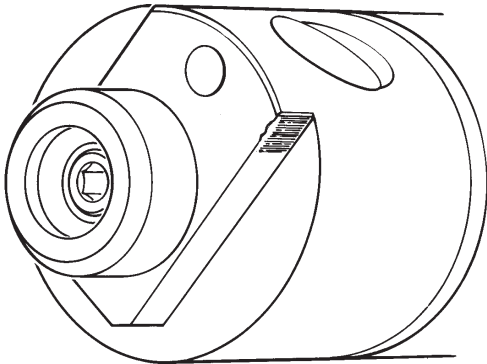


Fig. 3.1

3. Transfer Pump Regulator Piston and Adjusting Screw (Fig. 3.2) – Light scratches on the regulating pistons are considered normal. Examine the adjusting screw for adequate thread retention compound and for tightness of the orifice plate in the screw. Be sure that the orifice is not plugged with foreign material.



Fig.3.2

4. Transfer Pump Blade Retainer and Drive Key (Fig. 3.3) – Inspect the blade slots for scoring, burring or excessive wear. Check to see if oversize blades can be used. Examine the drive

key for damage and replace as necessary.

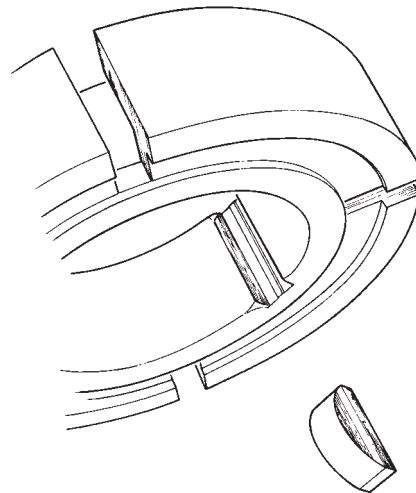


Fig. 3.3

5. Transfer Pump Blades (Fig. 3.4) - Examine the blades for wear on the rounded ends caused by contact with the liner or blade spring. Also inspect the blades for wear caused by contact with blade retainer. It is recommended that used blades be reinstalled in the same orientation that they were originally installed, that is with the same surface contacting the liner. Orientation of new blades is unimportant.

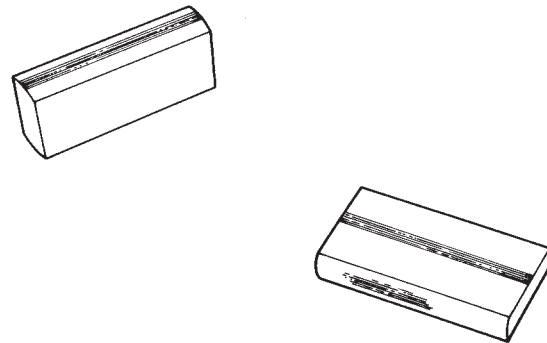


Fig. 3.4

6. Transfer Pump Liner (Fig. 3.5) – Inspect the inside diameter of the transfer pump liner for unusually heavy scoring.

wear, nicks or chips at the edges. Replace the rollpin if damaged or missing. Inspect the area where the drive shaft seals ride. Wear bands in these areas are considered normal and do not warrant shaft replacement. Inspect the transfer pump drive key slot for wear.

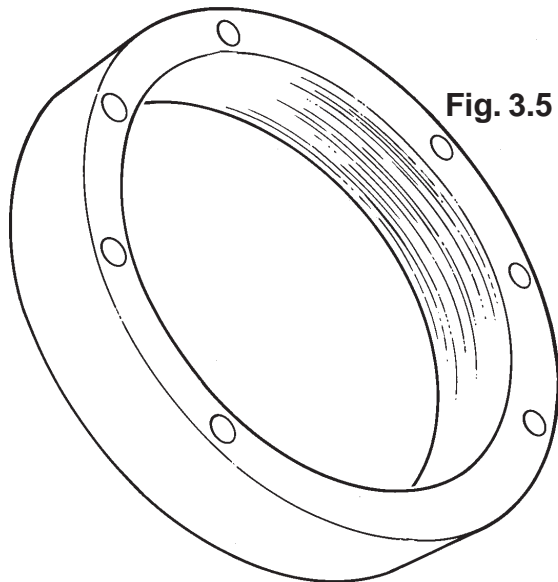


Fig. 3.5

7. Drive Shaft (Fig. 3.6) – Handle the drive shaft as you would a distributor rotor to prevent damage. Inspect the shoe slots for excessive

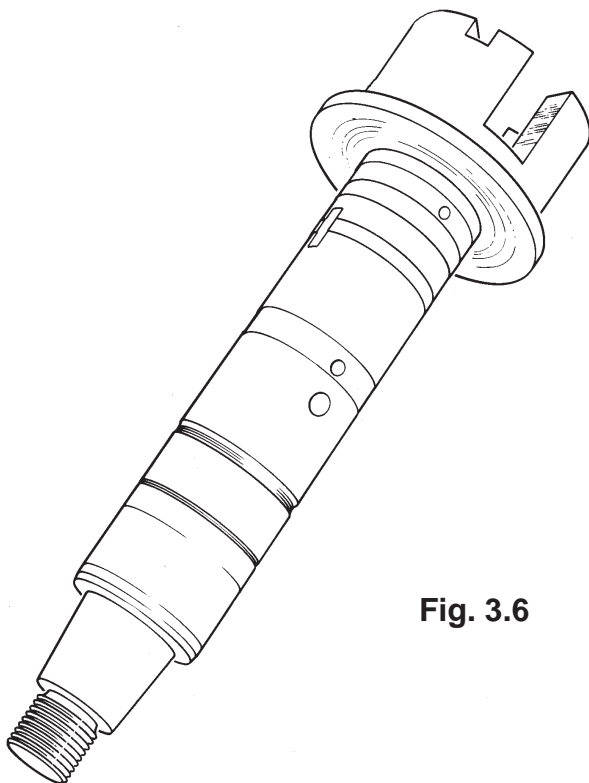


Fig. 3.6

SECTION 4 - REASSEMBLY

Step 1 Place pump housing on the arbor press with the mounting flange facing upwards. Drop the fuel side drive shaft seal into the drive shaft bore of the housing with the seal lip facing down. Do not lubricate seal or housing bore at this time. The fuel side seal is to be pressed in dry.



Fig. 4.1

Step 2 Insert drive shaft seal and bearing installation tool 33421, end opposite the removable collar first, into the bore. Press seal until tool bottoms on the housing.



Fig. 4.2

Step 3 Place the oil side seal onto the removable collar of the 33421 tool. Apply a light coating of 30465 grease to the bore.



Fig. 4.3

Step 4 Press seal in until the tool bottoms on the housing.



Fig. 4.4

Step 5 Remove collar from the 33421 tool. Place drive shaft bearing onto the tool where the collar was removed with the bearing part number facing the tool shoulder. Press bearing into housing bore until the tool bottoms on the housing.



Fig. 4.5a



Fig. 4.5b

Step 6 Install the bearing retainer onto the drive shaft so that the sealing ring will be facing up. Install a new o-ring seal and then the sealing ring into the groove on the inner bearing retainer. Be sure to orient raised section on the inside diameter of the ring with the notch in the bearing retainer.



Fig. 4.6

Step 7 Apply a small amount of Lubriplate grease to the woodruff key: then install the woodruff key into its cutout in the drive shaft.



Fig. 4.7

Step 8 Slide the transfer pump blade carrier, counter bore facing up, down over the drive shaft aligning it with the woodruff key.



Fig. 4.8

Step 9 Place the transfer pump liner, with the arrow facing down, onto the inner bearing retainer. Rotate the liner to align the seven holes in it with the seven holes in the inner bearing retainer.



Fig. 4.9

Step 10 Install the four transfer pump blades into the slots in the blade retainer. Push the blades out against the liner. Used blades should be reinstalled in the same orientation as they were removed. *NOTE: 0.001" oversize (blackened) blades are available and may be intermixed with standard size blades as necessary. If oversized blades fit the blade carrier slots in the blade retainer freely, they should be used.*



Step 11 Squeeze the transfer pump blade spring and insert it between the blades and retainer.



Fig. 4.11

Step 12 Apply a small amount of 30465 Lubriplate grease to the seal groove in the transfer pump porting plate. Install a new o-ring and the original sealing ring, if still serviceable, into the groove making sure to align the tab of the ring with the notch in the plate. Invert the plate and carefully slide it down the drive shaft. Be sure that the sealing ring and the seal do not become dislodged from the groove. Rotate the porting plate until its 7 holes are aligned with the 7 holes in the liner.



Fig. 4.12

Step 13 Install the 7 transfer pump assembly screws finger tight. DO NOT tighten screws at this time.

Step 14 Place the clamping ring of the 30855 compression tool around the transfer pump assembly and install the 30855 pliers. Squeeze the pliers to compress the ring which aligns the transfer pump components. Tighten the 7 screws in the sequence shown to 10 – 14 lbf-inches (1.1-1.5 N-m) using a T-10 bit. Repeat the tightening sequence a second time.

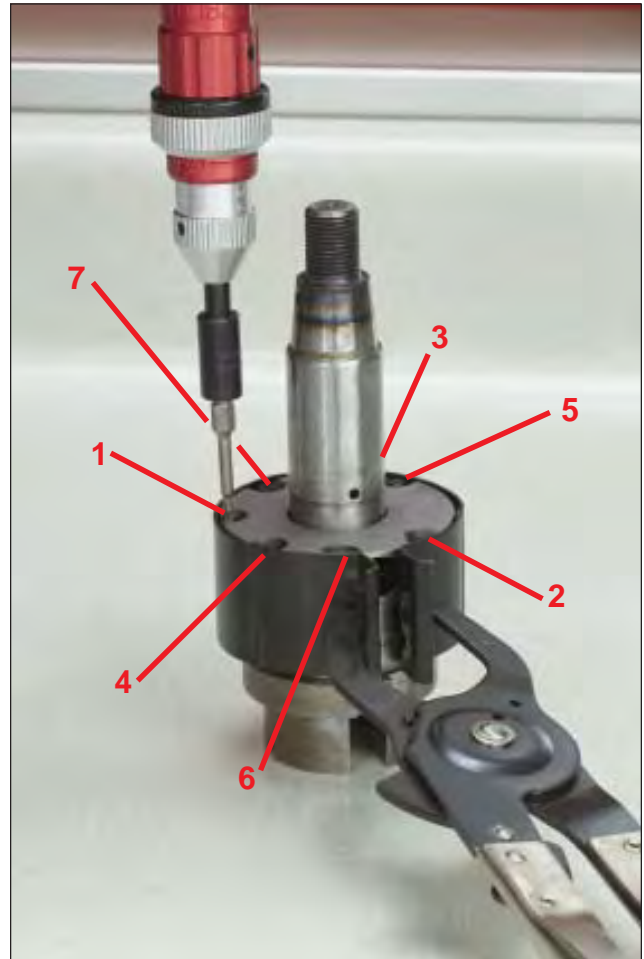


Fig. 4.14

Step 15 Using tool 30848 and a soft faced hammer, install the roll pin with the opening in the pin in line with the drive shaft but facing away from the transfer pump components.



Fig. 4.15

Step 16 Install the thrust washer with the cut-out over the roll pin.



Fig. 4.16

Step 17 Orient the transfer pump assembly group retaining ring with the sharp edge facing upwards. Using retaining ring pliers 20044, expand the retaining ring and carefully slide it down the shaft into its groove. *NOTE: Exercise extreme care not to allow contact possibly scratching the drive shaft in the area where the seals ride.*



Fig. 4.17

Step 18 Using the protection tube, 36272 on the end of the drive shaft slide the drive shaft/transfer pump assembly into the housing and align the transfer pump porting plate screw hole with the hole in the housing.



Fig. 4.18

Step 19 Remove the protection tube from the shaft and install the transfer pump porting plate locking screw on the underside of the pump finger tight .



Fig. 4.19

Step 20 Assemble new seals onto the transfer pump insert and lubricate with Lubriplate grease. Push insert into bore by hand then press the insert firmly in place using an 11/32" nut driver. A "popping" sound will be heard when the insert properly seats.



Fig. 4.20a



Fig. 4.20b

Step 21 Assemble 2 new seals to the transfer pump porting plate screw using protection tool 31215 for the upper seal. Lubricate both seals using 30465 lubricant.



Fig. 4.21

Step 22 Install the transfer pump porting plate screw and tighten to 140–160 lbf-inches (16.0–18 N-m) using a 3/16” hex bit.



Fig. 4.22

Step 23 Using a 1/2” socket, tighten the porting plate locking screw on the underside of the pump to 220-240 lbf-inches (25-27N-m).



Fig. 4.23

Step 24 Remove the dial indicator from the 31204 poppet valve gap setting fixture and clamp fixture in vise. Mount hydraulic head in the fixture using the two provided bolts – one in the head locating screw and the other in the head locking screw hole. Reorient head and fixture in the vise so that the fuel line connectors are facing upwards.



Fig. 4.24

Step 25 Insert the two rotor retainer locating pins into the head assembly.



Fig. 4.25

Step 26 Holding the rotor at the end, not by the finely finished center section, rinse the rotor in clean calibrating fluid. Lower the rotor, plunger end first, into the hydraulic head assembly. NOTE: ***Do not attempt to insert the rotor into the head, poppet valve end first.*** Then, while supporting the rotor from beneath with one fin-

ger, insert the two rotor retainers with the chamfered side down into the groove adjacent to the poppet valve seat area of the rotor.



Fig. 4.26

Step 27 Finally, lower the rotor with the retainers installed into the head, engaging the rotor retainers to the 2 locating pins.



Fig. 4.27

Step 28 Locate the poppet valve shims that were removed during disassembly or new shims totaling the identical thickness of those

removed. See the Part Inspection Section and the individual specification for replacement shim thickness, part numbers and configuration. Install the shims into the poppet valve bore ensuring that they are properly seated at the bottom of the bore.



Fig. 4.28

Step 29 Install the poppet valve spring.



Fig. 4.29

Step 30 Install poppet valve, notched end down, into its bore in the rotor, making sure to engage the notch in the valve with the cross pin in the bore. If necessary refer to the Parts Inspection Section and the individual specification for information on poppet valve replacement.



Fig. 4.30

Step 31 Install the adjustable spacer retainer, notches down, onto the head assembly with the holes engaging the rotor locating pins.



Fig. 4.31

Step 32 Install a new adjustable spacer (crush washer) into the counterbore of the adjustable spacer retainer. Radial location of the opening in the spacer is unimportant.



Fig. 4.32

Step 33 Assemble two new seals to the fuel control solenoid body and insert the armature pin assembly into the solenoid body. NOTE: alignment of the notches in the pin assembly to the terminal stud holes in the solenoid body.

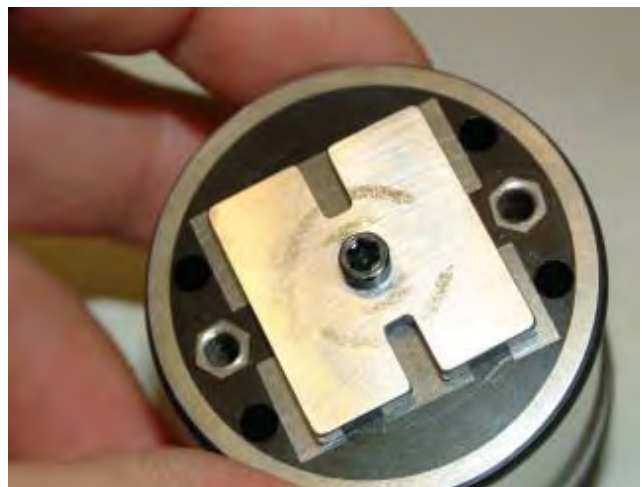


Fig. 4.33

Step 34 Install an outer bushing, new seal, and an inner bushing onto each terminal stud. Lubricate the seals with Lubriplate grease and assemble the two terminal stud assemblies to the armature cover.



Fig. 4.34

Step 35 Lubricate the seals on the solenoid body with Lubriplate grease and assemble the armature cover to the solenoid body. Tighten the terminal studs to 24-28 lbf-inches (2.5-3 N-m).



Fig. 4.35a



Fig. 4.35b

Step 36 Orient the armature cover retainer with the flat side against the end of the solenoid and with the holes aligned. Install new copper washers to the armature cover retainer screws and assemble the screws through the solenoid to engage the cover retainer. Using a T10 bit, tighten the screws to 15-18 lbf-inches (1.7-2 N-m). Check for freedom of movement of the armature pin assembly in the solenoid by shaking the assembly and observing armature pin movement.



Fig. 4.36a



Fig. 4.36b

Step 37 Thread the fuel control solenoid assembly into the hydraulic head hand tight.



Fig. 4.37

Step 38 Reposition the poppet valve setting fixture in the vise horizontally. Locate the two accumulator springs noting the difference in wire diameter of the springs. Install one accumulator piston, open end out, the spill accumulator spring (larger wire diameter) and stop into the bore adjacent to the vent wire bore. Install charging accumulator piston, spring (smaller wire diameter) and stop into the accumulator bore.



Fig. 4.38

Step 39 Install accumulator retaining screw plugs to bores and tighten to 90-110 lbf-inches (10-12 N-m) using a 3/16" hex bit.



Fig. 4.39

Step 40 Install dial indicator to the 31204 fixture and slide indicator in the bracket until it contacts the rotor and deflects the dial approximately 0.010". Tighten indicator mounting screw. Rotate dial indicator face to "zero" indicator and tighten the face clamping screw.



Fig. 4.40

Step 41 Using the 30853 armature cover spanner wrench slowly begin rotating the solenoid assembly clockwise as viewed from the fuel line connector end of the hydraulic head to tighten the solenoid down against the adjustable spacer (crush washer).



Fig. 4.41

Step 42 While tightening the solenoid, repeatedly deflect the rotor in and out of the hydraulic head using the lever on the fixture and observe the dial indicator reading. Continue to tighten the solenoid to reduce the dial indicator reading until the specified poppet valve lift is attained. (Refer to the individual specification) *NOTE: Never back out the solenoid to attain the correct lift. If the solenoid is rotated too far and a poppet valve lift below specification results, the solenoid will have to be removed and a new adjustable spacer installed and the setting procedure repeated.*



Fig. 4.42

Step 43 Install the fuel control solenoid locking plate and retaining screw to the hydraulic head. Tighten screw to 15-18 lbf-inches (1.7-2 N-m) using a T-10 bit.



Fig. 4.43

Step 44 Install the two pumping plungers into the plunger bores in the rotor.



Fig. 4.44

Step 45 Tilt vise so that the drive shaft is pointing straight down. Install the cam ring, arrow side up, into the housing and position with the cam locating screw hole facing the top of the pump. Install the cam locating screw into the hole in the housing and tighten to 880-920 lbf-inches (99-104 N-m)



Fig. 4.45b

Step 46 Assemble the rollers to the cam shoes and install them into the slots in the drive shaft. Make sure that the cam rollers/shoes remain in contact with the cam ring.



Fig. 4.45a



Fig. 4.46

Step 47 Carefully align the dot on the rotor drive tang with the alignment dot on the drive shaft and install the head and rotor assembly into the housing lining up the head locking and locating screw holes.



Fig. 4.47

Step 48 Place tool 30854 over the fuel control solenoid. Push on the tool and if necessary, rotate the drive shaft slightly to engage the rotor tang with drive shaft slot. NOTE: A firm push on the head and rotor assembly will be required to seat the head and rotor assembly in the housing.



Fig. 4.48

Step 49 Using protection tube 31215, assemble two new seals to the head locating screw and lubricate with Lubriplate grease. If necessary rotate head in housing slightly to align holes and install head locating screw finger tight.



Fig. 4.49

Step 50 Assemble two new seals to both head locking screws and lubricate with Lubriplate grease. Install the screw which incorporates the transfer tap and has a 3/4" hex head to the transfer pump regulator side of the pump finger tight. Install the remaining head locking screw to the opposite side of the pump finger tight.



Fig. 4.50

Step 51 Tighten the head locating screw on the bottom of the pump to 180-220 lbf-inches (20-25 N-m) using a 3/16" hex bit.



Fig. 4.51

Step 52 Tighten the head locking screw on the regulator side to 180-220 lbf-inches (20-25 N-m) using a 3/4" socket.



Fig. 4.52

Step 53 Tighten the remaining head locking screw using a 3/16" hex bit to 180-220 lbf-inches (20-25 N-m).



Fig. 4.53

Step 54 Install the vent wire assembly into the hydraulic head. Tighten to 25-30 lbf-inches (3-3.5 N-m) using a 1/8" hex bit. Five different vent wire assemblies are available to control the volume of return oil flow from the pump. Refer to the individual specification for part numbers. During reassembly it is recommended to reinstall the same vent wire that was removed during disassembly and then during calibration a different number wire can be installed as necessary to achieve the specified return fuel flow. Vent wire assemblies are marked with numbers 0 – 5 on the ends to identify them. The higher the number the less fuel flow through the vent wire assembly.



Fig. 4.54

Step 55 Assemble a new sealing washer to the vent wire assembly access screw. Install the screw into the housing and tighten to 60-70 lbf-inches (7-8 N-m) using a T40IPR bit.



Fig. 4.55

Step 56 Install a new seal on the transfer pump tap screw and install the plug into the head locking screw hand tight. The screw will be tightened to 110-130 lbf-inches (12.5-15 N-m) using a T40 bit during calibration.

Step 57 Install the snubber plates and springs into all the fuel line connectors.

Step 58 Dip the snubber valve retaining screws in clean calibrating fluid and install one in each fuel line connector. Tighten each screw to 40-60 lbf-inches (4.5-6.8 N-m) using a 1/8" hex bit.



Fig. 4.58

Step 59 Insert the transfer pump regulator piston, spring and adjusting plug into the transfer pump regulator assembly. Thread the adjusting plug until the top of the plug is just below the fuel flow passages. *NOTE: It may be necessary to hold the regulator assembly in a vise by its hex head in order to install the screw due to the thread locking compound on the plug.*

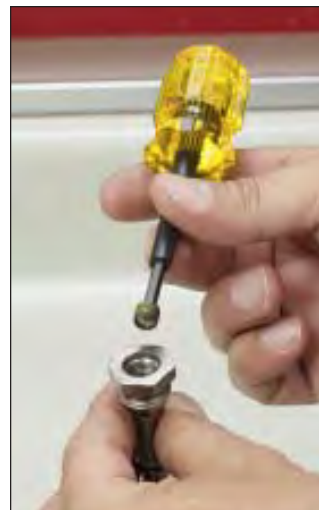


Fig. 4.59

Step 60 Assemble two new seals to the transfer pump pressure regulator and lubricate with Lubriplate grease. Install the regulator to the housing and tighten to 215-265 lbf-inches (24-30 N-m) using a 3/4" thin wall socket.



Fig. 4.60

Step 62 Place the transfer pump insert spring and then the inlet filter into the hole on top of the housing.



Fig. 4.62

Step 61 Assemble a new seal to the transfer pump regulator plug and lubricate with Lubriplate grease. Install into the regulator assembly and tighten to 180-220 lbf-inches (20-25 N-m) using a 5/8" socket.



Fig. 4.61

Step 63 Assemble a new seal to the inlet fitting and lubricate with Lubriplate grease. Thread the inlet fitting into the housing and tighten to 215-235 lbf-inches (24-26 N-m) using 1" deep socket.



Fig. 4.63

Step 64 Assemble a new seal to the return line connector/housing pressure regulator and install into the housing. With a 9/16" deep socket tighten to 120-160 lbf-inches (13-18 N-m).

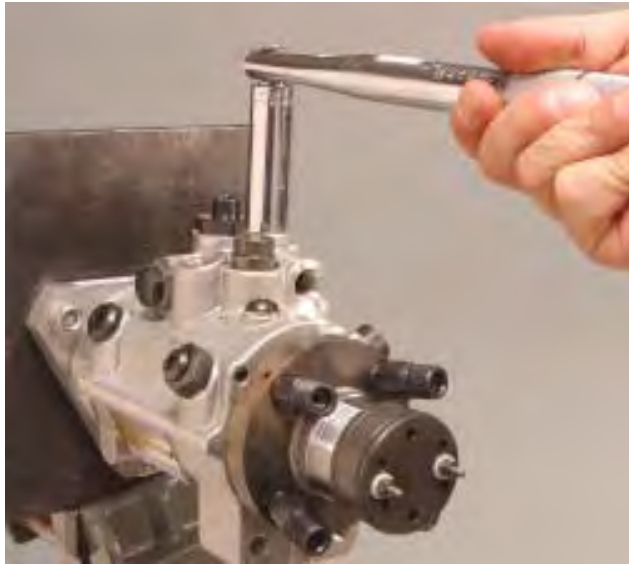


Fig. 4.64

Step 66 Install a new seal to the temperature sensor and install into the housing. Tighten to 120-160 lbf-inches (13-18 N-m).



Fig. 4.66

Step 65 Install a new seal onto the timing pin plug and install in to the housing. Using a 1/4" hex bit tighten to 75-100 lbf-inches (8-11 N-m).



Fig. 4.65

Step 67 Install new seals, to each terminal cap and using a 1/4" nut driver tighten both terminal caps to 12 to 18 lbf-inches (1.5-2 N-m).



Fig. 4.67

SECTION 5 - TEST BENCH REQUIREMENTS AND PROCEDURES

A. Special Test Equipment Requirements

To test the DE pump, the following special test bench accessories are needed in addition to a test bench meeting both ISO 4008 standards as well as Stanadyne's requirements as outlined in the Service Policies and Procedure Manual. DE pumps are tested with 0.5 mm orifice plate 36951 Low Dead Volume Calibrating Injectors, having a factory set opening pressure of 250 bar/3500 p.s.i.

Part

<u>Number</u>	<u>Description</u>
33497	Transfer Pump Pressure Tap
36260	Drive Adapter Kit
36263	Hall Sensor Kit
36269	Electronic Control Package
36274	Inlet and Return Fitting Kit
36275	Timing Pin
36464	Housing Pressure Tap
70340	High Pressure Pipes

The 36263 Hall Effect Sensor Kit contains a bracket assembly and a 36262 Hall Effect Sensor. Only the Hall Effect Sensor is available separately for service replacement. (Figure 5.7)

The 36260 Drive Adapter Kit contains a drive adapter, a 36258 Four Tooth Wheel and a 36257 Six Tooth Wheel. Both tooth wheels are available separately for service replacement.

The 36269 Electronic Control Package contains the following components:

Breakout Cable	36264
DAC Cable	36265
DE Pump Control Module	
Laptop Computer	
USB, External Floppy Drive	

Only the Breakout and DAC cables are available separately for service replacement.

Reference Instruction Manual 99851 for addi-

tional details on the 36269 Electronic Control Package contents and use.

B. Test Bench Mounting Instructions

Pump mounting plates are provided by the various test bench manufacturers, not by Stanadyne. DE pumps use a triangular mounting flange with a 98mm bolt circle and a 50mm pilot diameter (same as most DB4 pumps). The drive adapter is the same as used for testing DB2 pumps for the General Motors 6.2/6.5L applications.

Step1. Clamp the test bench 19965 pump holding fixture in a suitable vise and mount the DE pump to the fixture.

Step 2. Remove the timing access hole plug from the top of the pump. Insert the 36275 Timing Pin into the bore and slowly rotate the drive shaft until the pin engages with the slot in the drive shaft. Ref. Figure 5.1.



Fig. 5.1



Fig. 5.2

Step 3. Place the appropriate toothed wheel on the Drive Adaptor. Note that these wheels are marked “pump side” and “bench side”. The “pump side” marking must be placed against the drive adapter. (towards the pump when the adapter is installed on the pump). Install the four 8mm socket head cap screws and washers finger tight. Ref. Figures 5.2 and 5.3.



Fig. 5.3

Step 4. Install the drive adaptor assembly onto the pump drive shaft. Install the washer and 24 mm nut onto the drive shaft finger tight Ref. Figure 5.4.

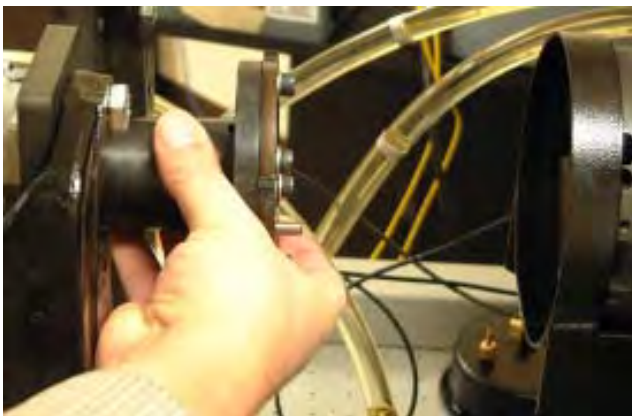


Fig. 5.4



Fig. 5.5

Step 5. Mount the test bench mounting plate and pump to the test bench pedestal per the manufacturers recommended procedure. Tighten the drive shaft retaining nut to 140-150 ft-lbs. (190-200 N•m) with the timing pin installed (prevents the drive shaft from rotating while tightening). Ref. Figure 5.5.

Step 6. Using a suitable 6.2/6.5L test bench drive adaptor, align the pin and holes with the DE pump drive adaptor. Install the mounting bolts and tighten to the test bench manufacturers recommended torque value.

Step 7. Loosen the two upper flange bolts. Remove the right side bolt (viewed from the fuel control solenoid end), but leave the left side bolt with a few threads of engagement. *NOTE: Due to the housing configuration, it may be necessary to use a slightly shorter mounting bolt in the left side flange hole.*

Step 8. Assemble the 36263 Hall Effect Bracket Assembly. Orientate the hall effect sensor over the toothed wheel. With the right side bracket mounting hole aligned with right side pump flange mounting hole, insert a pump mounting bolt and tighten finger tight. Ref. Figure 5.6.



Fig. 5.6

Step 9. Rotate the Hall Effect Sensor Bracket to engage the left side mounting bolt. Tighten both flange mounting bolts according to the test bench manufacturers procedures.

Step 10. Using the spring loaded timing spike on the Hall effect sensor bracket, accurately locate the correct rotational position of the toothed wheel. Tighten the four 8 mm socket screws to 20-30 lbf-in (2-3 N•m). Ref. Figure 5.7.



Fig. 5.7

Step 11. Remove the timing pin and install the 36464 Housing Pressure tap. Connect the hous-

ing pressure gage supply line to the 36464 Housing Pressure Tap.

Step 12. Loosen the two positioning screws on the top of the sensor bracket. Adjust the Hall effect sensor, placing the center of the sensor in line over the center of the toothed wheel. Tighten the positioning screws to 20-30 lbf-in (2-3 N•m).

Step 13. Loosen the Hall effect sensor locknut and adjust the sensor to achieve an air gap of .100 inch ($\pm .020$ inch) {2.5 mm ($\pm .40$ mm)} between the sensor and one of the teeth on the toothed wheel. Hold the Hall effect sensor while tightening the locknut to 20-30 lbf-in (2-3 N•m). Ref. Figure 5.8.

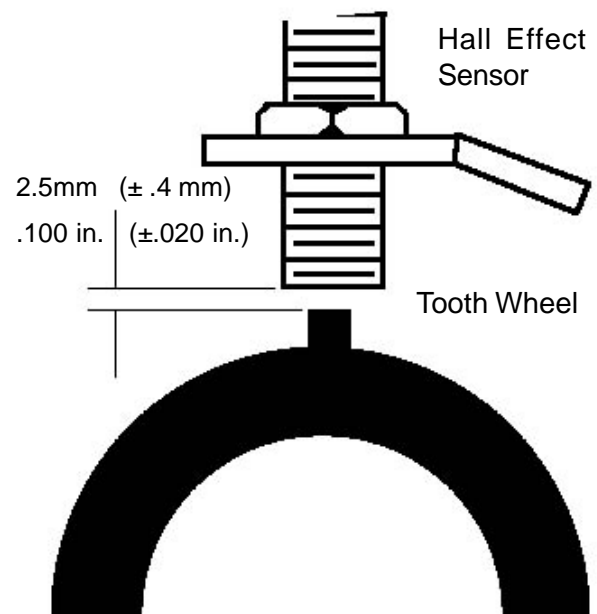


Fig. 5.8

Step 14. Remove the plug in the head locking screw and install the 33497 Transfer Pump Pressure Tap. Connect the transfer pump pressure gage line with a shut-off valve to the Transfer Pump Pressure Tap.

Step 15. Install the 36274 Inlet and Return Fitting Assembly on the pump. Tighten the tube

(large tube) and the return oil line to the return oil fitting (smaller tube).

Step 16. Connect the wire harness for the 36269 DE Calibration Package.

C. Special Test Bench Removal Instructions

Disassemble the drive and mounting hardware in the reverse order that was described in Test Bench Mounting Instructions. Use the 36275 Timing Pin to prevent the pump drive from rotating when loosening the drive retaining nut.

After removing the 24mm drive shaft retaining nut, use the 30856 puller to remove the drive adapter from the drive shaft.

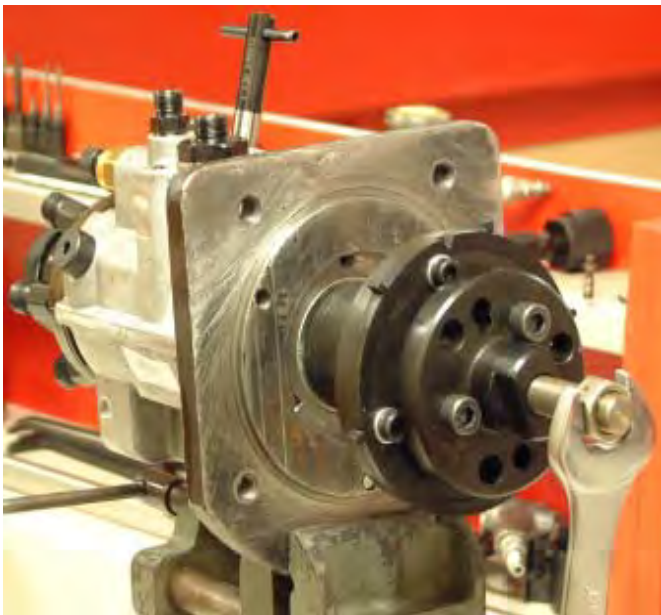
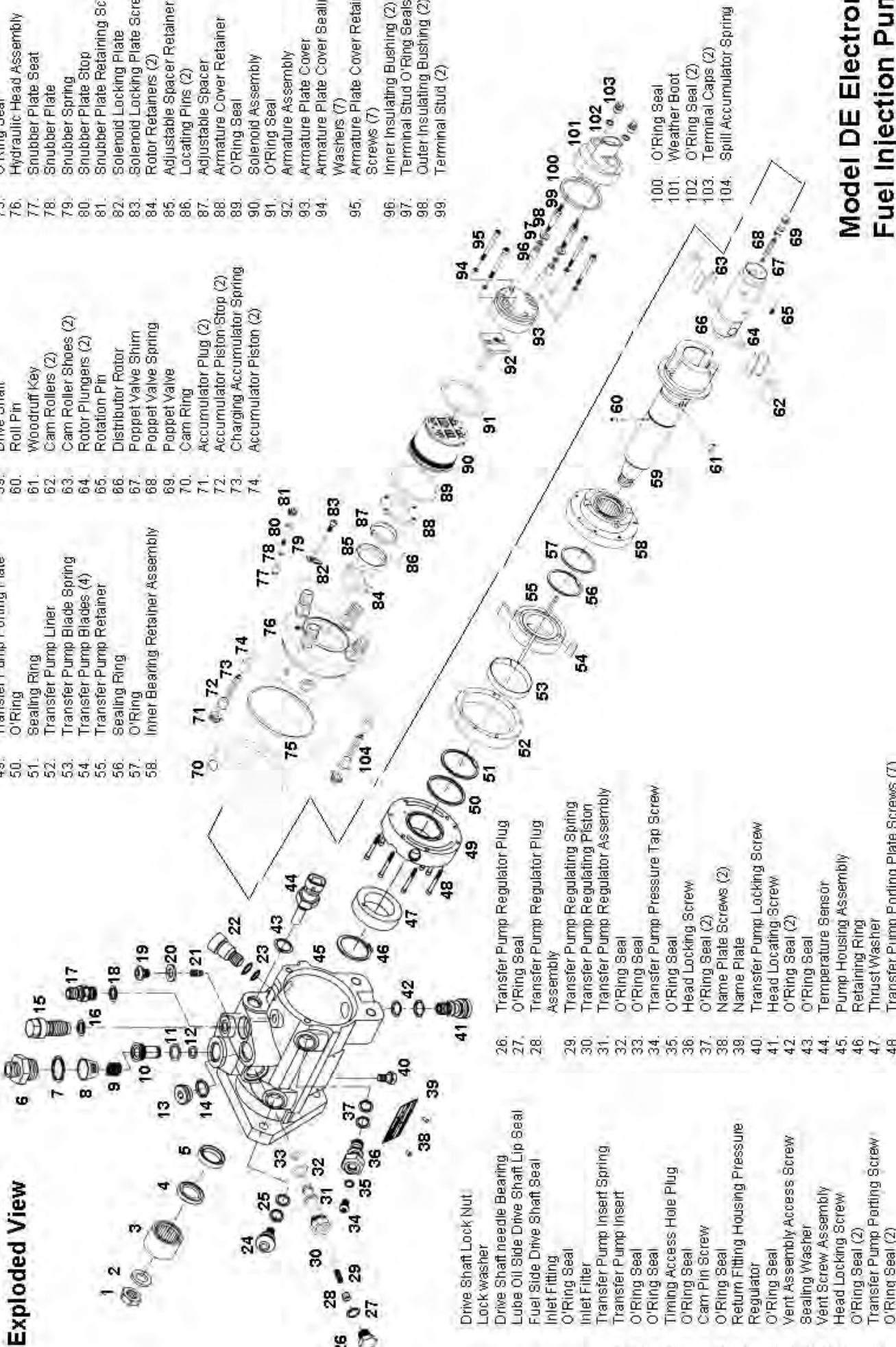


Fig. 5.8

Exploded View



- 1. Drive Shaft Lock Nut
- 2. Lock washer
- 3. Drive Shaft needle Bearing
- 4. Lube Oil Side Drive Shaft Lip Seal
- 5. Fuel Side Drive Shaft Seal
- 6. Inlet Fitting
- 7. O'Ring Seal
- 8. Inlet Filter
- 9. Transfer Pump Insert Spring
- 10. Transfer Pump Insert
- 11. O'Ring Seal
- 12. O'Ring Seal
- 13. Timing Access Hole Plug
- 14. O'Ring Seal
- 15. Cam Pin Screw
- 16. O'Ring Seal
- 17. Return Fitting Housing Pressure Regulator
- 18. O'Ring Seal
- 19. Vent Assembly Access Screw
- 20. Sealing Washer
- 21. Vent Screw Assembly
- 22. Head Locking Screw
- 23. O'Ring Seal (2)
- 24. Transfer Pump Porting Screw
- 25. O'Ring Seal (2)
- 26. Transfer Pump Regulator Plug
- 27. O'Ring Seal
- 28. Transfer Pump Regulator Plug Assembly
- 29. Transfer Pump Regulating Spring
- 30. Transfer Pump Regulating Piston
- 31. Transfer Pump Regulator Assembly
- 32. O'Ring Seal
- 33. O'Ring Seal
- 34. Transfer Pump Pressure Tap Screw
- 35. O'Ring Seal
- 36. Head Locking Screw
- 37. O'Ring Seal (2)
- 38. Name Plate Screws (2)
- 39. Name Plate
- 40. Transfer Pump Locking Screw
- 41. Head Locating Screw
- 42. O'Ring Seal (2)
- 43. O'Ring Seal
- 44. Temperature Sensor
- 45. Pump Housing Assembly Retaining Ring
- 46. Thrust Washer
- 47. Transfer Pump Porting Plate Screws (7)
- 48. O'Ring Seal (2)
- 49. Transfer Pump Porting Plate
- 50. O'Ring
- 51. Sealing Ring
- 52. Transfer Pump Liner
- 53. Transfer Pump Blade Spring
- 54. Transfer Pump Blades (4)
- 55. Transfer Pump Retainer
- 56. Sealing Ring
- 57. O'Ring
- 58. Inner Bearing Retainer Assembly
- 59. Drive Shaft
- 60. Roll Pin
- 61. Woodruff Key
- 62. Cam Rollers (2)
- 63. Cam Roller Shoes (2)
- 64. Rotor Plungers (2)
- 65. Rotation Pin
- 66. Distributor Rotor
- 67. Poppet Valve Shim
- 68. Poppet Valve Spring
- 69. Poppet Valve
- 70. Cam Ring
- 71. Accumulator Plug (2)
- 72. Accumulator Piston Stop (2)
- 73. Charging Accumulator Spring
- 74. Accumulator Piston (2)
- 75. O'Ring Seal
- 76. Hydraulic Head Assembly
- 77. Snubber Plate Seat
- 78. Snubber Plate
- 79. Snubber Spring
- 80. Snubber Plate Stop
- 81. Snubber Plate Retaining Screw
- 82. Solenoid Locking Plate
- 83. Solenoid Locking Plate Screw
- 84. Rotor Retainers (2)
- 85. Adjustable Spacer Retainer
- 86. Locating Pins (2)
- 87. Adjustable Spacer
- 88. Armature Cover Retainer
- 89. O'Ring Seal
- 90. Solenoid Assembly
- 91. O'Ring Seal
- 92. Armature Assembly
- 93. Armature Plate Cover
- 94. Armature Plate Cover Sealing Washers (7)
- 95. Armature Plate Cover Retaining Screws (7)
- 96. Inner Insulating Bushing (2)
- 97. Terminal Stud O'Ring Seals (2)
- 98. Outer Insulating Bushing (2)
- 99. Terminal Stud (2)
- 100. O'Ring Seal
- 101. Weather Boot
- 102. O'Ring Seal (2)
- 103. Terminal Caps (2)
- 104. Spill Accumulator Spring

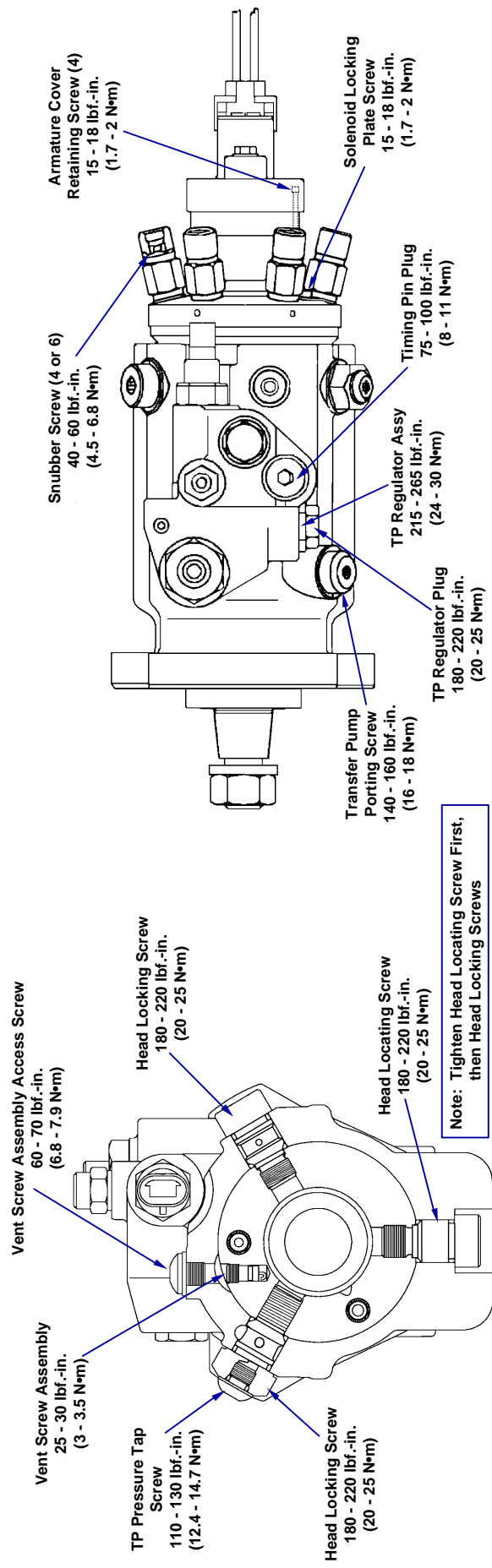
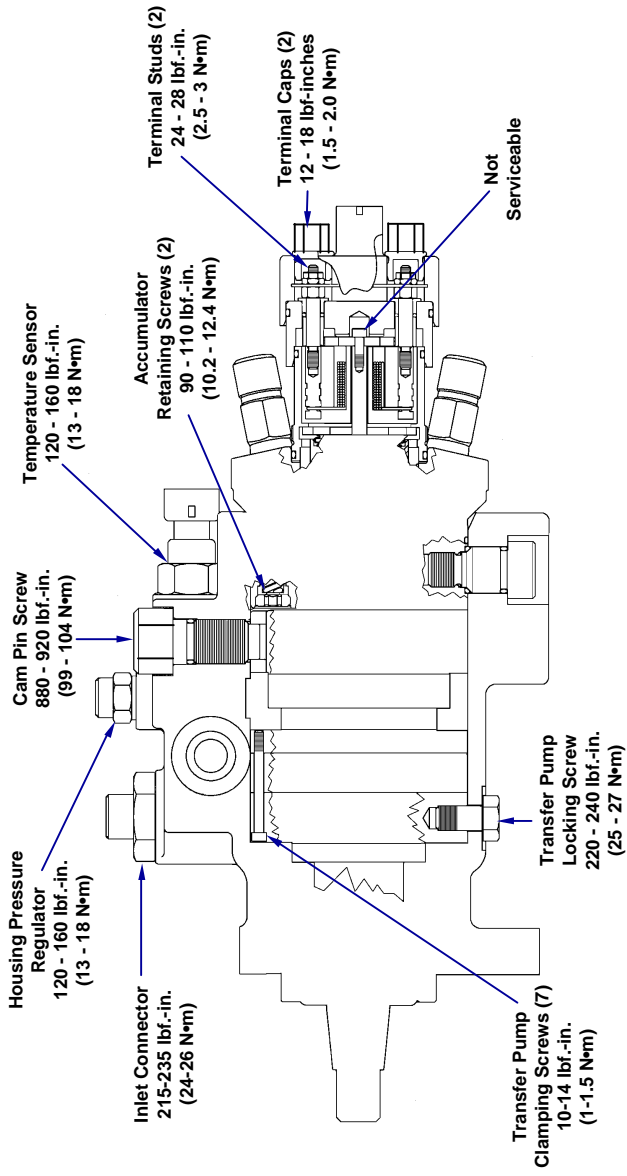
Model DE Electronic Fuel Injection Pump



TORQUE SPECIFICATIONS

Model DE

Electronically Controlled Diesel Fuel Injection Pump





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