

7.3L DIT Power Stroke - Part 4

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Part 4 of 4 in a series of articles outlining the Features, Description, and Unique Service Procedures of the original 7.3L DIT Power Stroke

7.3 DIT Power Stroke

Unique Service Procedures

- The purpose of this section is not to replace the service manual, but rather to highlight unique service procedures. The service manual is designed to be all inclusive.

Short Circuit (Oil Bypass)

- Inspect the ball and seat for erosion. Cleaning with a nylon brush will ensure cleanliness during engine rebuild.

Crankcase

- Cup plugs are used to seal the crankcase core clean out holes. This style of plug makes for easier removal and installation.
- Sealant should be used on the outer edge of the cup plug to ensure sealing.
- The installing tool, #OTC ZTSE-4309, will position the plug to the proper depth in the crankcase.
- The closed valley of the crankcase requires the cylinder head to be removed to access the valve lifters. The retainer and openings in the cylinder head will not allow lifter removal.
- The retainer holds the guide plates in place and is used to guide the push rods into the valve lifters.
- With the cylinder heads installed, the tappets cannot be removed.
- The camshaft thrust plate is located between the camshaft gear and #1 journal.
- The camshaft gear is pressed onto the cam.
- Camshaft gear removal and installation should not be attempted with the camshaft in the engine, since the rearward movement of the camshaft is not limited.

Cylinder Head

- Glow plugs are under the valve cover and can be removed without removing rocker arms.
- The glow plug connector is a bullet connector pushed onto the glow plug.
- The glow plug tip extends into the combustion chamber; consequently the plug is longer than the IDI engine's plugs.
- Remove glow plugs if heads are to be removed to avoid damage.
- Glow plugs must be tightened to a specific torque to insure proper combustion seal. See service manual for specifications.

- The UVC connector is removed from the injector by spreading the retaining clips and pushing down on the connector. Care must be taken so the retaining clips are not broken by spreading clips too far.

High Pressure Pump

- Prior to removal of the high pressure pump or reservoir housing, the reservoir must be drained. This is accomplished by using a vacuum pump with a one quart container to extract the oil from the reservoir.
- If the reservoir is not drained, about one quart of oil will leak into the engine valley when the high pressure pump or reservoir is removed.

Injector Removal (1)

- The high pressure oil gallery plugs must be removed to drain the oil. This will drain the gallery so when the injector is removed the oil gallery will not drain into the combustion chamber.
- The drain procedure recommended above will prevent the possibility of hydraulic lock, which will damage the engine when the starter is engaged.

Injector Removal (2)

- The fuel gallery must also be drained prior to injector removal. This must be done so when the injector is removed, the fuel does not drain into the combustion chamber.
- If the plugs at the front or rear of the engine are not accessible and any doubt exists whether liquid is on top of the piston, bar the engine over and use a vacuum pump to remove the liquid.

Injector Removal (3)

- Remove the injector oil spill spouts prior to injector removal. The spill spout is bolted to the hold down clamp.
- The spill spout directs the oil that has been discharged from the injector into the camshaft area of the crankcase. This allows faster oil return to sump.

Injector Removal (4)

- The outboard injector hold down bolt is removed to remove the injector. The inboard (towards valley) cannot be removed until the injector is out of the cylinder head.
- The injector hold down is slotted to facilitate disassembly.
- The inward bolt does not need to be removed or loosened.

Injector Removal (5)

- With the outboard bolt removed, the hold down clamp can now be pushed towards the valley. This movement will allow the hold down clamp to be lifted over the inboard hold down bolt.

Injector Removal (6)

- The injector removal tool, #T94T-9000-AH1, consists of two pieces.

Injector Removal (7)

- With the hold down pushed toward the valley, place the removal tool under the injector hold down and install the T-handle bolt.
- Turning the T-handle will push the injector from its bore.

Injector Removal (8)

- The injector can be lifted from the cylinder head. This same process is to be used for all injectors.
- The injector should be placed in the protective sleeve for protection from contamination and tip damage. The sleeve tool #014-00933-2 is held on the injector by the injector O-rings.

Injector Removal (9)

- Place injector and sleeve into holder tool, #014-00933-1, until ready for re-installation.

Injector

- The O-rings are color-coded for location.
- Engine oil should be used to ease O-ring installation.
- The O-rings are to be installed with the largest O-ring to the smallest (Top to Bottom).

| | |
|------------------------------|----------------|
| 1-Steel Back Up Ring | Upper Groove |
| 1-Back Up Rect. Section Ring | Upper Groove |
| 1-O-ring | Upper Groove |
| 1-O-ring | Middle Groove |
| 1-Back-Up Rect. Section Ring | Middle Groove |
| 1-O-ring | Lower Groove |
| 1-Copper Combustion Gasket | Bottom Surface |

Cylinder Head Injector Sleeve

- The injector sleeve penetrates the cooling system so prior to removing the sleeve; the cooling system must be drained.
- Plug the sleeve to prevent debris from entering the power cylinder if the sleeve is removed in the chassis. Tool # 014-00934-3.
- This tap tool, #014-00934-1, threads the sleeve, and then is attached to a slide hammer to pull out the sleeve. Use the pilot collar to keep the tap centered in the injector bore.
- Thread the slide hammer into the injector sleeve top and remove the injector sleeve from the cylinder head.

Cylinder Head

- With a wire brush clean up the injector sleeve bore in the cylinder head.

Important:

- Remove all residual sealant from the sleeve seat in the cylinder head being careful not to damage the sleeve seat, i.e., scratch with a sharp tool, etc.

Cylinder Head

- Use a rifle brush to clean out the high pressure oil galleries prior to installing new injector sleeve.
- Clean the fuel gallery prior to injector sleeve installation, to insure proper injector life.
- Special tool, #014-00934-4, is used to install the injector sleeve because it is formed to match the sleeve. This will not damage the sleeve during installation. There is an O-ring on the tool that retains the sleeve while it is being set into the bore.
- With the injector sleeve on the installation tool, LOCTITE® No. 609 sealant should be applied. Note the two locations of sealant application.
- Drive the sleeve into the injector bore until it bottoms in the cylinder head.
- The (non-essential tool) pressure test plate has a rubber gasket glued to it for sealing of the cylinder head. **This test should only be done when the cylinder head is suspected of leaking coolant.**
- With regulated air pressure applied to the cylinder head, inspect the valve port, injector hole, and glow plug holes for leakage, using soapy water solution.

Intake and Exhaust Valves

- The intake and exhaust valve heads are the same diameter but the valve seat angles are different. The intake valve has a dimple on it and can also be identified by the P/N stamped on the valve head.
- INTAKE P/N 1814424C1
- EXHAUST P/N 1814280C1

Valve Stem Seals and Rotators

- The valve guide seals fit over the guide and have the valve spring seat as part of the seal. A small spring around the seal maintains proper sealing to the valve stems for excellent oil control. The valve rotators are located on top of the valve spring.

Valve Recession

- A surface gauge is used to measure valve recession in the cylinder head. This dimension is important because it affects the compression ratio. Zero the surface gauge to the cylinder deck. Then measure on the valve head. The difference is the valve recession. Compare measured dimension to specifications in the service manual. Do this for both intake valve and exhaust valves.
- Valve recession is controlled by grinding seats and valves or replacing valves.

Cylinder Head

- The intake manifolds are sealed with Wacker® T-95 RTV sealant to the cylinder head. Place manifold on head and secure with cap screws by tightening to specified torque.
- The cylinder head lifting apparatus tool, #014-00932-2, simplifies handling the cylinder heads.

Injector Installation (1)

- Using a brush, clean the injector sleeve prior to injector installation.

Injector Installation (2)

- Check torque on inboard injector hold down bolts.
- Lubricate injector O-rings with clean engine oil prior to injector installation. Use grease on the copper gasket to retain it to the injector during installation.

Injector Installation (3)

- Set the injector in the bore and push the hold down towards the valley so it drops over the inboard hold down should bolt.

Injector Installation (4)

- By hand, push the injector in place. **Never pound or pry on the solenoid as this could damage the injector. Where space is limited, use the special tool to position the injector.**

Injector Installation (5)

- An installation tool, #T94T-9000-AH2, should be installed to properly seat the injector in the sleeve.

Injector Installation (6)

- With a wrench, tighten the installer bolt to bottom the injector into the bore, and then remove the tool. At this time, the hold down will fall into place, so the outboard bolt can be installed.

Injector Installation (7)

- Tighten the outboard injector hold down bolt to specified torque. Specifications are in the service manual.

Injector Installation (8)

- Install the injector oil spill spout. Tighten cap screw to specified torque. Injector must be tightened before tightening the oil spill spout.

Rocker Arm Assembly

- The rocker arm ball and socket should be inspected for wear. Removal of the retaining clip will allow disassembly of the rocker. After inspection, the parts are to be lubricated for re-assembly.
- Polishing is normal on these components but measurable wear requires replacement.
- Assemble the parts in proper orientation as rocker arm can either be an intake or exhaust. Good mechanical practice is to assemble these components in the same position as disassembled.
- The clip holds the parts together as an assembly.

High Pressure Pump

- To remove the high pressure pump, first remove the high pressure hoses to each cylinder head.
- Notice the location of the ICP sensor in the cylinder head gallery.
- **Important:**
Always use FORD specified hoses designed for this application.

High Pressure Pump Reservoir

- Remove reservoir once oil has been extracted. Note location of stud bolts for proper re-assembly.

High Pressure Pump

- After removing the front access cover plate, the retaining bolt for the high pressure pump gear to shaft can be removed.
- The gear is not keyed to the pump or timed to the camshaft.
- The high pressure pump is sealed to the front cover with a reusable gasket and attached with two bolts. The gear is not tapered or pinned to the pump shaft.
- The drive gear is not timed.
- The high pressure pump has a relief valve that will dump if pressure goes above 4,000 psi. This dumps into the gear train area of the front cover and returns to sump.

High Pressure Pump Installation

- Install the reusable gasket and bolt the pump to the front cover. Be sure the gear is in the front cover prior to installing pump.

High Pressure Pump

- Be sure the center of the gear is on the pump shaft and engaged to the cam gear before tightening the pump mounting bolts. If the gear is off-center, it could get jammed between the shaft and front cover.
- Tighten bolts to the proper torque. Specifications are in the service manual.
- Install the high pressure pump gear to shaft retaining bolt and tighten to specifications.

- Check the pump gear to camshaft gear backlash. Rock the gear one way and zero the indicator, then rock the gear the opposite direction and the indicator reading is the gear backlash. Specifications are in the service manual.
- Use Wacker® T-95 RTV sealant on the plate and retaining bolt threads to ensure sealing.
- The engine oil pressure side of the reservoir is sealed by an O-ring and the gear train side with Wacker® T-95 RTV sealant.
- The aluminum front cover requires the reservoir bolts (5) be tightened to specified torque. Specifications are in the service manual.
- To remove the regulator valve from the pump, remove the solenoid from the regulator valve. A retaining nut secures the solenoid to the valve body.
- This valve is used to regulate pressure in the high pressure lube system during engine operation. The valve is sealed to the pump housing by an O-ring. The reservoir does not need to be empty to replace this valve as long as it is installed in a timely manner.
- CAUTION: The IPR must be kept clean. The valve should be rinsed in clean solvent and blown dry.

Installing IPR

- The bore should be swabbed clean prior to installing the IPR.
- Be sure the valve starts into the threads squarely and can be turned by hand until the O-ring seal contacts the pump housing.

Tighten IPR

- This valve must be tightened to the specified torque into the aluminum pump housing. Over-tightening may distort the valve body and cause it not to function properly.

Installing IPR Solenoid

- The jam nut that holds the solenoid must be tightened to the torque specified in the service manual. If the jam nut comes loose the IPR will not function properly.

High Pressure Hoses

- **The hoses are made specially to withstand the pressure and temperature of this system. Use only FORD certified replacement hoses.**

Fuel Filter Assembly Removal

- To remove the fuel filter housing from the engine valley, the filter must be drained using the water drain lever (yellow), at the top of the housing. Then loosen the transfer pump to filter hose clamps, as well as the filter drain clamp.
- Remove the two mounting bolts from the engine valley and remove the filter assembly from the valley.

Transfer Pump

- The fuel line assembly for the cylinder heads is secured by a bolt and sealed by a coated aluminum gasket on each side of the banjo part of the assembly. The lines are sealed by square cut O-rings at each cylinder head.
- After removing the two mounting bolts that secure the pump to the crankcase the pump can be lifted from the valley. Care must be taken so that nothing falls into the open bore and onto the camshaft lobe.

Transfer Pump Installation

- Lube the O-ring and bottom side of tappet with engine oil prior to setting into crankcase. The pump bolts must be tightened evenly. If the cam lobe is at its highest point to the tappet, the pump will have to be drawn down to the crankcase mounting pad. If not drawn evenly by the two bolts, the nose of the pump could get broken.
- Install new square cut O-rings on the cylinder head ends of the fuel line. Be sure the tang on the banjo aligns with the flat on the transfer pump body. This tang and flat limit the twisting of the banjo while the fuel banjo nut is being tightened. Loosely assemble the banjo fitting with new seal rings. Start compression nuts on fitting on each head, and then tighten all three fittings to specified torque. Specifications are in the service manual.

Transfer Pump

- With hose clamps loose on the hoses, set the filter in the valley and align the hoses with the proper transfer pump port. Tighten the mounting bolts for the fuel filter base and then tighten the fuel line hose clamps.

Turbocharger

- Remove the Y-pipe from compressor outlet to the intake manifolds. A special O-ring is used to seal the Y-pipe to compressor housing.
- Remove the two nuts and two bolts that hold the turbine collector to the turbine inlet housing of the turbocharger. A gasket is used to seal this connection.
- The turbocharger and pedestal must be removed as an assembly.
- Remove the two rear turbocharger pedestal mounting bolts.
- Remove the front turbocharger pedestal bolts and lift from crankcase.
- The oil supply for the turbocharger is from the #5 main oil gallery. Oil is directed from the gallery up through a passage to the mounting pad. Oil returns to the crankcase rear plate area back to sump through the larger of the two holes.

Turbocharger Inspection

- To remove the EBP device housing from the turbine, first remove the actuator rod by sliding the collar and pushing the rod down the ball stud connection.
- The rod has some preload so it will move inward towards the base when released.
- After removing the three EBP device housing bolts, the device can be removed from the turbine housing. A metal to metal flange seal is used for this connection.

- When the four bolts are removed from the bottom of the turbocharger base the turbocharger can be separated from the mounting base. Two O-rings seal the turbocharger to base. Oil supply is the smaller hole, while oil drain is the larger.
- The EBP solenoid is used to restrict oil return from the actuator piston which activates the EBP device. This restricts the exhaust flow causing the engine to warm up fast creating cab heat sooner.
- The PCM uses the EBP sensor to monitor the pressure in the right manifold and make adjustments to the position of the EBP device as needed.

Turbocharger Pedestal Inspection

- To inspect and rebuild the EBP actuator piston, first remove the snap ring from the housing.
- By tapping on the actuator rod, the end plate will be removed from the housing. Note the O-ring used to seal the end plate to the housing.

Turbocharger Inspection

- The actuator piston can now be removed from the housing for inspection and repair. Inspect the housing bore for nicks or burrs that could damage the O-rings. Replace if necessary.

Turbocharger Pedestal Reassembly

- Lubricate O-rings prior to reassembly into the housing. Be sure all parts are clean. Install end plate and snap ring.

Turbocharger Assembly to Pedestal

- Using new O-ring seals between the turbocharger and turbocharger base, install and tighten the base bolts.

Turbocharger Inspection

- Mount the EBP device to the turbine housing and tighten the 3 retaining bolts to the proper torque. Never Seize® is required on these bolts.

EBP Assembly

- With the actuator rod connected to the EBP device, the tension to move the rod must be set. Using a spring scale, pull on the actuator rod until the rod begins to move and record this reading. To increase tension, disconnect the rod and turn the swivel in towards the base and connect to the device. Re-check. Thread the swivel away from the base to decrease the tension. Adjust to specifications shown in the service manual.

Turbocharger Installation

- After inspecting mounting surfaces, install new seal O-rings into the crankcase.

- Set turbocharger on crankcase and tighten the four mounting bolts. Install the turbine collector piping and the compressor outlet Y-pipe to the intake manifolds.

Front Seal/Oil Pump

- The damper incorporates a wear sleeve for the crankshaft front seal. The front seal is housed in the oil pump housing.
- The front seal can be removed without removing the oil pump housing. Insert the tool into the lip of the seal. Roll the front seal out of the oil pump housing.
- Four bolts attach the lube oil pump housing to the engine. The oil pump housing is centered to the crankshaft by dowel pins in the front cover.
- The outer gerotor is driven by the inner gerotor which is driven by the crankshaft. Oil is pulled into the oil pump at the lower slot and pressurized for delivery to the engine at the upper slot.
- Measure the clearance of the outer gerotor to housing using a feeler gauge. See service manual for specifications.
- Check oil pump gerotors axial clearance using a straight edge and a feeler gauge.
- Visually check gerotors for nicks, burrs, or excessive wear.
- Removal of the wear sleeve from damper without impacting the balance is accomplished by using the proper tool, #T94T-6379-AH1.
- Install the collars and the screw plate to remove the sleeve.
- After surrounding the collars, turn the bolt with a wrench to remove the wear sleeve.
- Prior to installing front seal wear sleeve, LOCTITE® No. 271 should be applied to the wear sleeve inside diameter to prevent oil migration.
- Install wear sleeve using the correct tool, #T94T-6379-AH2.
- The front cover is aluminum so it is very critical to properly tighten the oil pump mounting bolts to the proper torque. Specifications are in the service manual.
- Install front seal making sure hydraulic sealant, LOCTITE® No. 271 has been applied to the seal outside diameter.
- Install front seal until the tool, #T94T-6700-AH, until bottomed against the housing.
- Install damper using same tool as the front seal, driving with its opposite side.

Rear Seal

- Remove the five bolts which secure the seal carrier to the rear cover.
- Using a cutting tool, Rotunda #163-000DE, cut the sealant securing the seal retainer to the rear plate.
- Once the sealant has been cut, remove the rear seal.
- NOTE: A wear sleeve is used in production.
- Remove wear sleeve using tool, #T94T-6701-AH1.
- Removing wear sleeve using the proper tool prevents damage to the rear cover and crankshaft flange.
- To install the crankshaft rear seal wear sleeve correctly, use tool #T94T-6701-AH4.
- **Seal and wear ring are to be installed as an assembly and should not be separated to avoid damaging seal.**
- Apply a bead of LOCTITE® No. 515 sealant to the outside diameter of the crankshaft flange.
- Wear sleeve and seal are installed as an assembly with Wacker® T-95 RTV sealant on retainer.

- **Sealant must be applied around all bolt and dowel holes to seal properly.**
- Install wear sleeve and seal by aligning dowels with correct holes in seal retainer.
- Tool will bottom against crankshaft flange when wear sleeve is positioned correctly.
- Apply Wacker® T-95 RTV sealant to the five seal retainer bolts.
- The 2 lower bolts penetrate the rear cover and require sealant.

Oil Pan

- Remove oil pan using a cutting tool.
- Oil pick up tube removal is required to remove front cover. The oil pick up tube is sealed to the front cover by an O-ring.

Water Pump and Front Cover

- The water pump is sealed to the front cover by an O-ring.
- The front cover is sealed to the crankcase with O-rings and Wacker® T-95 RTV sealant.
- Four water pump bolts go through the front cover into the crankcase.
- Tighten the water pump bolts to the specified torque, keeping in mind the front cover is aluminum.
- Whenever re-installing the oil pick up tube, always install a new O-ring.
- Tighten oil pick up tube to front cover before tightening main bearing support.

Oil Pan

- Apply Wacker® T-95 RTV sealant to seal the oil pan to the crankcase.
- Inside of bolt holes.
- Heavier at front and rear.