Installation Instructions for 1998.5-1999 24v Predator Mechanical Lift Pump

Installation note: Some 24v trucks were either factory-equipped or dealer-retrofitted with an in-tank lift pump as an attempt to curb the reliability issues of the stock VP44 lift pump. The basic install version of this kit draws fuel through the factory fuel module. If an in-tank pump is present, it will be enough of a flow restriction to cause problems with the Predator system. If you are upgrading from stock and drawing fuel through the factory module, you must verify your truck does not have the in-tank lift pump or remove the pump from the fuel module before installing the Predator. If your truck is stock and does not have the factory lift pump mounted on the side of the block below the fuel filter canister, you have an in-tank pump. However, the presence of a lift pump on the block does not necessarily mean there isn't also one in the tank, as there have been a few reports of trucks being equipped with both simultaneously. Removing the tank filler cap and keying on the truck will allow you to hear an operating in-tank pump, but the only way to be 100% sure is to remove the module from the tank and visually inspect it. If you plan to use a sump or drawstraw, bypassing the fuel module, all that's needed is to disable the in-tank pump by removing the appropriate fuse or relay.

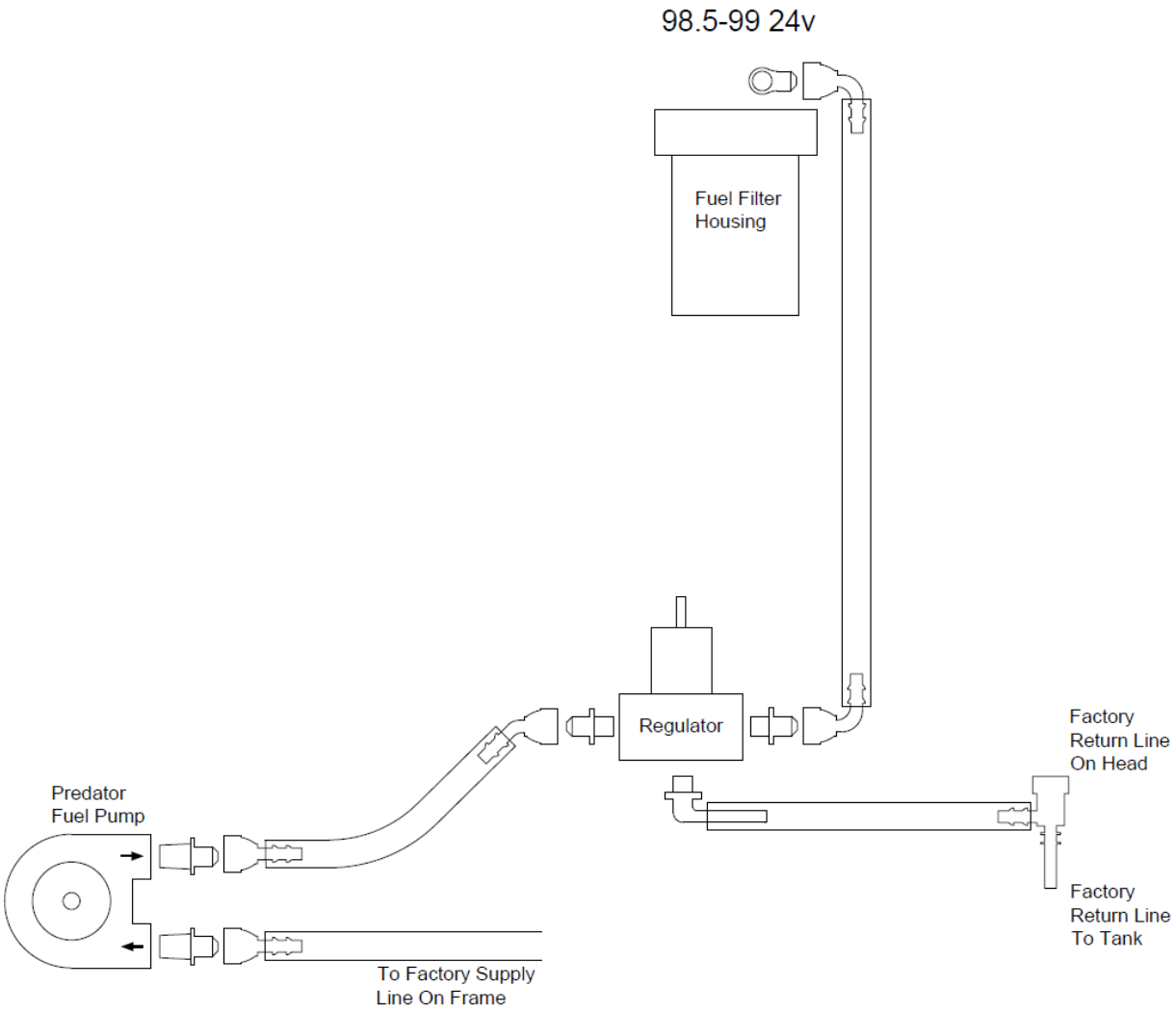
1) Install the drive hub:
    a. Install a barring tool or place manual-transmission vehicles in gear to keep the engine stationary.
    b. De-tension or remove the serpentine belt.
    c. Remove the factory damper bolts.
    d. Remove the damper and clean any loose rust or paint from the mating surfaces. For best results, clean the mating surfaces down to bare metal.
    e. Clean the crankshaft snout face and pilot until it is free of rust and foreign material. For best results, use a light abrasive scouring disc (similar to Scotchbrite) in an air tool.
    f. Replace the damper on the crankshaft snout and install the drive hub.
        i. Fluidampr users: Install the wave spring and pilot extension, cone-side out, into the bore on the back of the hub. Install the drive hub over the damper using the new bolts and washers provided.
        ii. Stock damper users: Install the drive hub over the damper using the new damper bolts and washers.
    g. Snug and then torque the new damper bolts to 92 ft-lbs in a criss-cross pattern.
    h. Install the drive sprocket on the hub.
        i. Fluidampr users: Install the provided shim between the sprocket and the hub. Apply a single drop of Loctite 242 or equivalent to the bolt threads, and torque to 96 in-lbs. **Do not overtighten!**
        ii. Stock damper users: Apply a single drop of Loctite 242 or equivalent to the bolt threads, and torque to 96 in-lbs. **Do not overtighten!**

2) If equipped with stock mechanical fan, verify clearance:
    a. Apply force to move the tip of a fan blade back and forth in a line parallel with the crankshaft. **If there is detectable play in the fan pulley bearing or clutch, STOP!** Do not proceed until the worn parts have been replaced.
    b. Manually pass each fan blade in front of the belt drive sprocket. Verify that the clearance is a minimum 1/4" across all blades. **If individual blades have less clearance than this, STOP!** Do not proceed until the fan is repaired or replaced.
    c. If your clearance is less than 1/4", or not consistent, **do not bend the fan blades to achieve this clearance!** When the fan is under heavy load, the blades twist along their centerline. This deflection restores the blades to their original position, and contact between the drive sprocket and fan blades can result.
    d. If additional clearance is required, use one of the provided spacers. Remove the fan clutch nut from the pulley to install. The flat washer will add .125" of clearance. The threaded spacer will add .900" of clearance. If using the threaded spacer, verify there is enough clearance between the radiator and fan clutch to prevent contact and radiator damage.
    e. The serpentine belt may now be reinstalled at any time.

3) Install the lift pump:
    a. Install the lift pump on the bracket using the supplied M6 flange bolts and flange locknuts. Install the bolts so the threads face away from the sprocket.
    b. For easier access, remove the sway bar mounts from the frame and move the sway bar aside.

c. Remove the four front oil pan bolts.
d. Clean any loose debris from around the bolt holes.
e. Place the two upper mounts into their mating slots on the intermediate mount. The radiused end of the key must point towards the radiator.
f. Thread the four new M8 oil pan bolts in and tighten the two inboard bolts just enough to remove vertical movement of the mount. Leave the outboard ones loose and threaded out enough that you can visually compare the position of the bolt in the slot to ensure it is consistent on both sides.
g. Use a straightedge on the front faces of the sprockets to determine a starting alignment.
h. Tighten the pan bolts to 18 ft-lbs.
i. Install the pump assembly onto the intermediate plate using the supplied M10 flange bolts and flange locknuts. Leave the bolts loose enough to allow the pump bracket to slide, but tight enough there is not significant play.

4) Install the regulator:
   a. Install one -6 ORB x -6 JIC fittings into each side port on the regulator. Lubricate the o-rings before installation.
      i. **Tech Tip: ORB fittings seal via the o-ring. This connection is made without thread sealant.**
   b. Install the -6 ORB 90-degree hose barb fitting into the port opposite the adjuster stud. Align the barb to point the same direction as the nipple on the top of the regulator.
   c. Delete the factory (block-mounted) lift pump, if equipped.
   d. Using the supplied bolts, install the regulator onto the factory lift pump bracket.
   e. Unclip the quick-connect fitting on the return line and install the quick-connect tee.
   f. Use the supplied 5/16” hose and hose clamps to connect the 90-degree barb on the regulator to the barb on the quick-connect tee.



5) Install the plumbing:
    a. Slip the supplied Push-Lok hose over the factory hard suction line where it terminates at the frame rail, just behind the starter and secure with hose clamp. This will be the larger of the two hard lines.
    b. Route the line appropriately, cut it at the suction (bottom) port of the pump, and install a straight -6 hose end.
        i. **Tech Tip: JIC fittings seal via metal-on-metal contact at the flare face. This connection is made without thread sealant.**
    c. For best results installing the Push-Lok hose onto the fittings, soften the rubber hose with a heat gun or hairdryer and lubricate the fitting barbs with clean oil or diesel fuel.
    d. Route the next section of line between the discharge (top) port of the Predator and the side port on the regulator closest to the radiator. Install a straight -6 hose end into the pump end of the line, and a 45-degree hose end onto the regulator end of the line.
    e. Route the next section of line between the other side port on the regulator and the fuel filter inlet port. Install a 90-degree -6 hose end into the line at the regulator. Attach the other end to the fuel filter inlet port using the supplied banjo fitting and 90-degree -6 hose end (1998-1999 model years) or metric-to-JIC adapter and straight -6 hose end (2000-2002 model years).

6) Prime the system:
    a. Loosen the fuel tank filler cap.
    b. Install a 4mm hex bit in a cordless drill/driver.
    c. Remove the lift pump assembly from the intermediate plate.
    d. Using the driver, on its highest speed setting, spin the pump clockwise as viewed from the front. There will be a distinct change in the speed and load on the drill/driver when fuel reaches the pump. Continue priming for approximately 20-30 seconds after fuel has reached the pump.
    e. Reinstall the pump assembly onto the intermediate plate.
    f. Tighten the fuel tank filler cap.

7) Install the belt and perform final drive setup:
    a. Slip the drive belt over both sprockets.
    b. Slide the pump bracket toward the passenger side until all slack is removed from the belt. When making a tension adjustment, be sure to index the pump bracket against the alignment shelf on the intermediate plate before tightening. Failure to do so may result in improper drive alignment.
    c. Tighten the tension adjustment bolts.
    d. Prohibit the engine from starting by unplugging the fuel system relay (located in the Power Distribution Center on the driver's side fender) and crank the engine for 5-10 seconds.
    e. Observe how the belt tracked.
    f. If there is significant contact between the belt and sprocket flanges, make an adjustment to minimize this contact and repeat steps 7d and 7e.
    g. Once the drive is aligned, check the belt tension. Belt tension is correct when all slack is removed. Grab the pump sprocket and turn it against the stationary crankshaft. If slack develops, readjust the tension so no slack can be produced by twisting the pump against the crankshaft. **Under no circumstances should a prying tool be used to tension the belt. Doing so will result in excessive tension and drive failure.**

8) Verify fuel pressure:
    a. Start the engine and observe fuel pressure. The regulator is pre-set to the lowest setting. Variation can be expected from truck to truck, but pressure should be approximately 10-12 psi on initial startup.
    b. Fuel pressure can be adjusted using the adjustment stud on the top of the regulator. The fuel pressure change will be most pronounced at idle and less pronounced at higher RPMs.
    c. After an adjustment, test peak system pressure by revving the engine to redline and abruptly releasing the throttle. Fuel pressure should not exceed 22 psi while the engine revs down.
        i. **Tech Tip: Use a known-accurate mechanical gauge to verify fuel pressure settings. We have observed error of up to 20% on commercially-available monitors and tuners.**

d. VP44s respond very well in terms of both reliability and performance to higher fuel pressure. Our recommendation is to adjust the fuel pressure up until 20-22 psi is reached on the rev-down test as detailed in step 8a.
e. **Under no circumstances should system pressure be allowed to exceed 22 psi.** Exposure to higher pressures can compromise the VP44 shaft seal, leading to fuel contamination of crankcase oil.

9) Finish up:
   a. Check all fuel connections for signs of leakage before driving. Correct any leaks found.
   b. Reinstall the sway bar. Torque bolts to 40 ft-lbs.

Post-Installation

Test drive the vehicle. The belt tension may relax slightly in the first several hours of operation. Check and adjust as necessary. Check all fasteners for signs of loosening and correct immediately. Check all fuel line connections for leakage and correct immediately. Properly installed, the drive is essentially maintenance-free until belt replacement is required. There is no specific interval for replacing the drive belt. A lifespan comparable to that of the serpentine belt can be expected. Inspect periodically for signs of wear or deterioration and replace.