



928 Owners Club

PSD FLUID FLUSHING PROCEDURE

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This is a step-by-step procedure for flushing the hydraulic fluid of the Porsche limited-slip differential (PSD). The computer-controlled PSD unit is standard equipment on all model year 1990 and newer Porsche 928s. It is not found on any 1989 or older 928s.

Porsche's maintenance schedule requires flushing the PSD's hydraulic fluid every two years. As with the brake and clutch systems, it's a good idea to replace the fluid and bleed the system at least that often.

I Disclaimers and Warnings

All risk and responsibility associated with any aspect of the procedure, information, or statements contained within this article lie with the reader. Neither the authors nor the 928 Owners Club are responsible for any consequence, specifically any injury or damage, that results from the use or misuse of the procedure, information, and statements contained herein.

This article only addresses flushing of the PSD system. It is not a replacement for the diagnosis and troubleshooting procedures detailed in the factory service manuals. Flushing the PSD is a periodic maintenance procedure. Thus, if the PSD system is non-functional or functioning poorly, the failure mode should be diagnosed according to the factory procedures using the 9288 System Tester.

This procedure bypasses maintenance operation of the PSD by the 9288 System Tester and provides a means to operate the hydraulic pump and output lock solenoid valve manually to flush the hydraulic fluid without the need for that special tester, but this requires care. Damage to the PSD solenoid can result if it is manually activated for too long a period. The PSD unit generates very high pressure and extreme care must be taken to insure that none of the high-pressure lines or connectors is loosened while pressurized.

Before attempting this procedure, review the PSD sections of the factory service manuals:

- Vol. II, Transmission
D39 - 206i
 - Vol. III, Transmission
D39 - 201 through 202b
D39 - 257 through 260
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II Overview

The PSD system consists of several components:

- wheel speed sensors (also used for ABS)
- ABS/PSD control unit
- hydraulic pump
- hydraulic pressure accumulator
- fluid reservoir
- lock solenoid valve
- slave cylinder.

The hydraulic pump and the lock solenoid valve are normally under control of the PSD control unit or 9288 System Tester. In this procedure, they will be disconnected from the control unit and operated manually.

The mechanical portion of the PSD system operates fairly simply. The electric hydraulic pump supplies pressurized brake fluid to the hydraulic accumulator, which stores the fluid under pressure until it is needed. An electrically-operated lock solenoid valve controls the flow of fluid from the accumulator to the slave cylinder (actuating cylinder) mounted high on the right side of the final drive (differential) housing. When the pressure in the accumulator falls, the pump refills the accumulator.

III Tools

You will need the following tools:

- jack and jack stands to lift and support the rear of the car.
- wrench to remove the left rear wheel.
- 8 mm socket to remove the left rear fender liner.
- 7 mm wrench for the bleeder valve on the PSD cylinder.
- 11 mm wrench for the bleeder valve on the lock solenoid.
- flat screwdriver
- two- or three-foot length of approximately 6 mm interior diameter flexible tubing to fit over the cylinder bleeder fitting.
- container to catch the old fluid.
- two lengths of 18 or 20 gauge stranded wire about six feet long, or suitable test leads.
- Mity-Vac or similar to remove old fluid and pump in new fluid.
- Multimeter to measure resistance and voltage.
- two one pint containers of new brake fluid (e.g. Castrol GT LMA DOT 4.)
- creeper so you can get under the car (optional)
- safety glasses.
- rag for cleaning top of reservoir.

It will help if the tubing and the used fluid container are clear so you can see the flow of used fluid.

IV Preparation

1. Read the instructions completely before starting.
2. Remove the spare tire.

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3. Open the battery box.
 4. Raise the rear of the car (both sides) and support safely.
 5. Remove the left rear wheel.
 6. Remove the rear wheel well liner to expose the PSD unit.
 7. Put on your safety glasses.
 8. Clean the top of the reservoir and area with a rag and/or compressed air. This is very important. Take your time and make sure the reservoir and area above are clean. *Make sure the inside of the fender is clean before you proceed.*

**Bleeder Valve
on Locking
Solenoid**

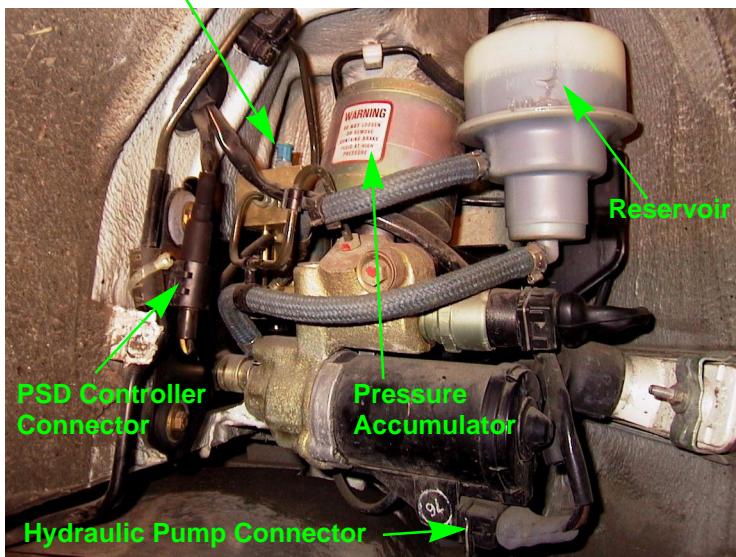


FIGURE 1

PSD Components

9. Remove as much as possible of the old fluid from the PSD reservoir with the Mity-Vac or other method. Remember that brake fluid can remove your beautiful German paint. Take care not to spill or touch your car with brake fluid. Carefully take out the plastic screen in the reservoir filler neck before trying to put a tube into the opening. Lay the screen aside while removing the fluid; keep the screen clean. Note: Do not remove any hoses or lines from the PSD unit to remove the old fluid.
10. Replace the reservoir screen and add new brake fluid. It's OK at this point to fill the reservoir nearly full, within $\frac{3}{4}$ " or so from the top. Replace the reservoir cap after each fill in order to keep everything clean.

11. Unplug the control unit from the PSD lock solenoid valve. The connector is located at the left end of the PSD pump/accumulator unit (as you are facing the PSD unit from the left wheel well). See "Figure 2" on page 4..

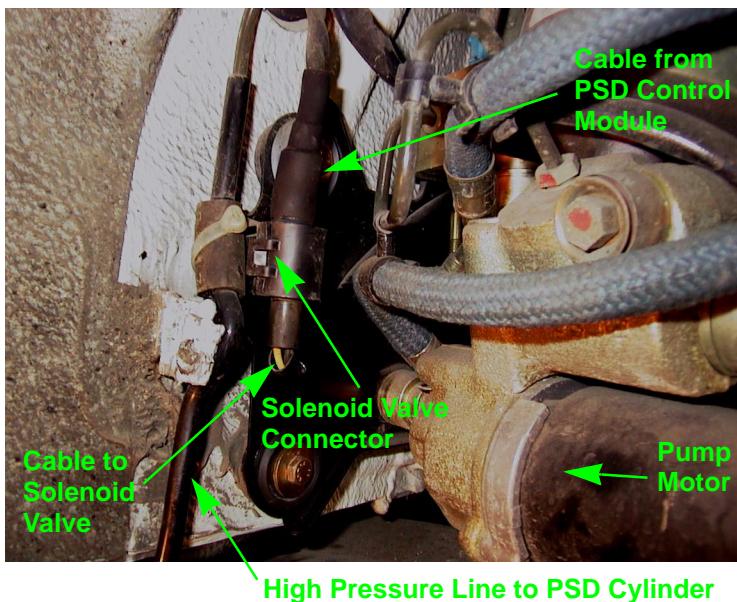


FIGURE 2

PSD Connector Detail

The lock solenoid valve connector has a sleeve around it to hold it together and keep it located. Unlatch and remove the sleeve with a flat screwdriver. Figure 3 below depicts the connector. The end going to the lock solenoid valve (front facing) is the end you will be working with latter. Ignore the other end.

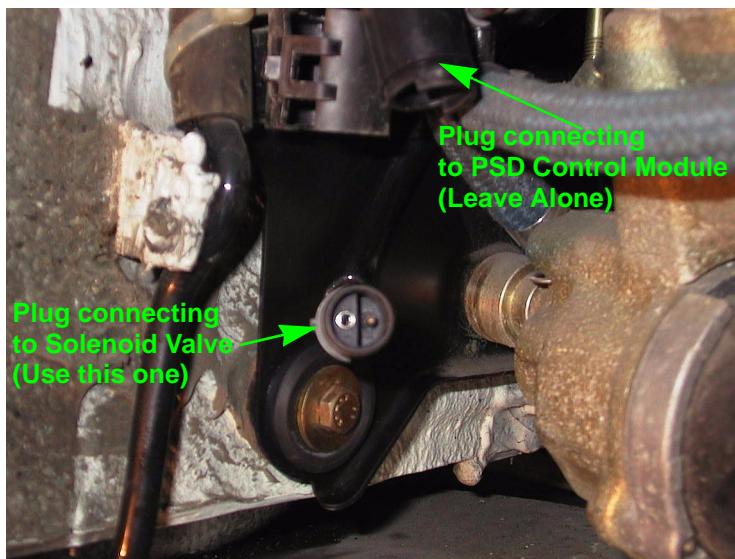
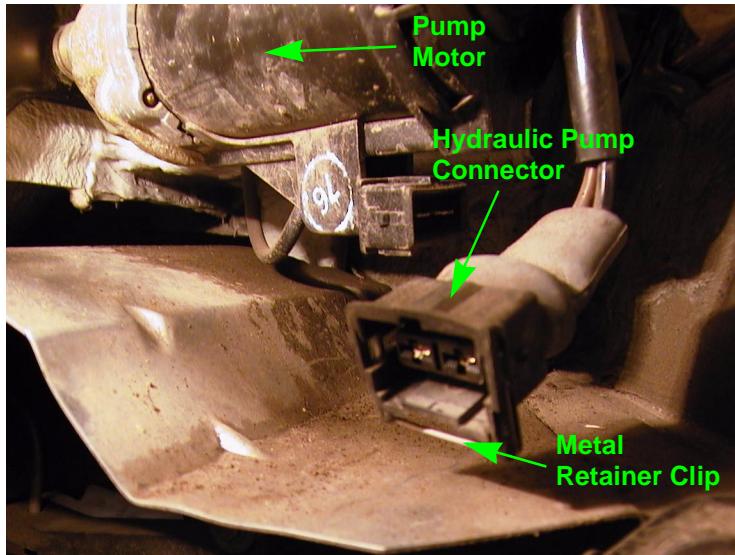


FIGURE 3

PSD Solenoid Connector

12. Locate and disconnect the electrical connector on the hydraulic pump. See "Figure 4" on page 5..

**FIGURE 4**

**Hydraulic Pump
Connector Detail**

13. Remove the metal retainer clip located on the end of the connector and disconnect the connector. This procedure requires that you disconnect and replace this connector several times. Removing the retainer clip makes this task easier. For now, leave the connector disconnected from pump.

V Bleed the pressure accumulator

In this phase of the procedure, you will repeatedly run the hydraulic pump to charge the pressure accumulator, bleed old fluid from the system, and when all old fluid has been flushed, pressurize the accumulator one final time.

14. Locate the bleeder screw on top of the locking solenoid. It may be covered by a dust cap. See "Figure 1" on page 3.

Secure one end of the flexible hose over the bleeder screw and run the other end in to a collection container. Note: Make sure that the hose is secured to the bleeder screw and that the hose is not kinked.

15. Open the bleeder screw slowly. The system operates at very high pressures (up to 180 bar /2600 psi). Let the fluid drain into the collection container and leave the bleeder open.
16. Turn the ignition key to the 'on' position (known as position 2). Do not start the car.
17. Reconnect the electrical connector to the hydraulic pump. The pump will start and fluid will flow into the collection container. When the fluid is clear and free of bubbles, disconnect the electrical connector to the hydraulic pump and close the bleeder. NOTE: While the pump is operating, watch the reservoir



level. Do not allow the level to become too low. If necessary, disconnect the electrical connector and refill the reservoir.

18. Refill the reservoir with fluid.
19. Bleed the old fluid from the accumulator.
 - Reconnect the electrical connector to the hydraulic pump. The pump will start and charge the pressure accumulator.
 - Disconnect the electrical connector when the pump stops.
 - Check and fill the reservoir.
 - Open the bleeder valve slowly (see step 14) until fluid stops flowing, then close the valve.
20. Repeat the steps in 19 (above) until the fluid is clear and free from bubbles.
21. Reconnect the electrical connector to the hydraulic pump to charge the pressure accumulator with fresh hydraulic fluid. Disconnect the electrical connector when the pump stops.

VI Flush the PSD lock slave cylinder and pressure line.

22. Locate the PSD slave cylinder on the upper right side of the differential.

**Bleeder Valve
(Hidden by Pressure Line)**

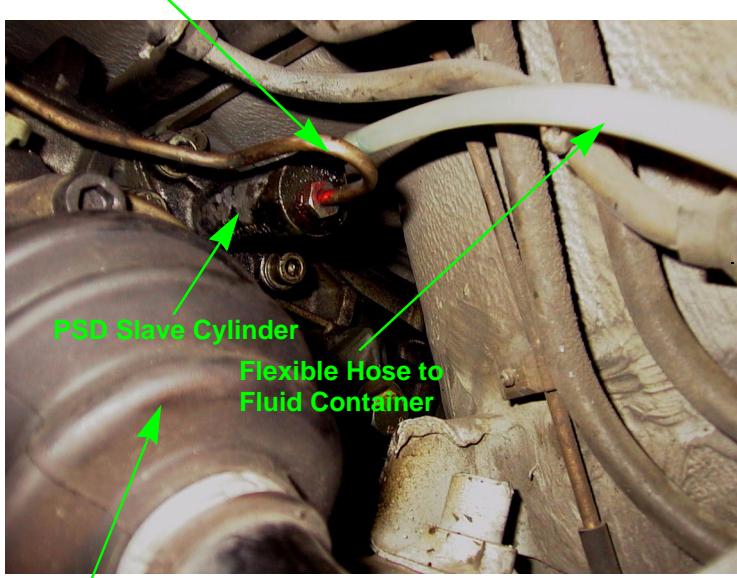


FIGURE 5

Slave Cylinder

**Right Side Inner
CV Joint Boot**



23. Slightly loosen the bleeder fitting (one-quarter turn max), and secure the flexible tubing to the fitting.
Note: The fluid will not be under pressure in the line and cylinder at this time.
24. Place the used fluid container where it can be seen when you are working on the left side of the car.
Make sure it cannot fall over.
25. Locate the lock solenoid valve connector from step 11. See "Figure 3" on page 4.
26. Since you will be putting 12 volts into this plug to energize the solenoid, verify that it is the correct end of the plug and not the end going to the PSD control unit. Visually insure that the cable goes toward the rear of the PSD unit and not up the side of the fender well.
27. If the visual check is positive, check the resistance between the two pins of the plug with your multimeter. The resistance should be about 2.4 ohms. This check will positively verify that you have the correct plug; the one that connects to the lock solenoid valve.
28. Take one of the 18 or 20 gauge wires, or test leads, and connect the female plug receptacle to vehicle ground. It will be easiest to poke the wire end or test lead into the female connector so it will stay attached and then connect the other end of the wire to ground.
29. Use the other 18 or 20 gauge wire and connect one end to battery positive. The other end of this wire will be touched to the other (male) pin of the solenoid plug whenever we want to energize the solenoid. Take care to ensure that the positive wire end doesn't accidentally touch any part of the car.
30. Flush the PSD Slave Cylinder
 - Touch the 12-volt positive wire to the male pin of the lock solenoid valve connector. Since the female receptacle of the plug was connected to ground (step 28), you should hear the lock solenoid valve click open. After a few seconds, old fluid should start draining from the PSD cylinder bleeder fitting. A few drops of fluid may drain from a small black plastic tube. This tube vents fluid that leaks past the lock solenoid valve seal.
 - Disconnect the 12-volt positive wire from the solenoid connector pin when the flow of fluid slows down or after roughly 7 seconds. The lock solenoid valve consumes approximately 60 watts of power. Therefore, leaving it on too long could cause it to overheat.
 - If you get no fluid from the bleeder fitting, the accumulator may have been empty, or the bleeder screw not opened enough.
 - Reconnect the electrical connector to the hydraulic pump. The pump will start and charge the accumulator.
 - Disconnect the electrical connector when the pump stops.
 - Check and fill the reservoir as necessary. Again, a little over the maximum-level line is ok. Do not accidentally run the reservoir dry.
31. Repeat the steps in 30 until the fluid is clear and free of bubbles.



32. Close the PSD cylinder bleeder screw.
33. Connect the hydraulic pump motor connector and metal retainer clip. The pump will start and fill accumulator. When the motor stops fill the reservoir to the maximum level line and replace the reservoir cap.
38. Turn ignition key off.
34. Congratulations! You are finished. Restore everything back to normal. Don't forget to tighten the PSD cylinder bleeder fitting and reinstall the dust caps.
35. Now the fun part: go drive the car!