Testing the Rolls-Royce/Bentley SY Series [Shadow/T & Shadow II/T2] Hydraulic System

The following is a quick test of how your accumulators are performing in terms of their nitrogen charge and holding reserve pressure. It is commonly referred to as the ***Brake Pedal Test.*** If the indicator light for either system comes on in less than 30 pumps you can be almost certain that the nitrogen charge in that system's accumulator is less than 1000 PSI and that the accumulator should be recharged or rebuilt. If the indicator light comes on in under 10 pumps, you may very well have a ruptured diaphragm [which means that were the engine to stall you immediately have no brakes for that system. ***NOT GOOD.***]

1. Make sure the system is **completely** depressurized. The easiest way to do this is to turn the key to the RUN position *without starting the car*. Pump the brake pedal 50 to 70 times until the Brake 1 and Brake 2 pressure warning lights come on. (If only one warning light comes on after 70 pumps, you probably have a bad pressure sensor switch for the system that hasn't lit. If neither light up **both** are probably bad. That, or the lights themselves are burned out, and you should know whether this is the case or not when you use the lamp test button on the early cars or, for the later cars, when cranking the starter the warning panel does its "light all the lights to show you they're working" bit.)

2. Start your engine and observe your brake warning lights. Ideally they should extinguish after 10 to 15 seconds. They sometimes take longer, though, but should be no more than 30 to 45 seconds at most.

> **a**. If a light goes out in just a few seconds, it's almost certain that you have a ruptured diaphragm and the accumulator is being brought up to pressure by being filled with fluid by the pump and reaching cut-out pressure. However, you have no compressed nitrogen charge pushing against the fluid. If this is the case, ***you have no braking in that system in the event of an engine stall!!*** A ruptured diaphragm requires that a full rebuild of the accumulator be performed.
>
> **b**. If they go out after longer than about 30 to 40 seconds you probably have a depleted nitrogen charge. You may choose to try recharging the accumulator or do a full rebuild.

If either condition **a** or **b** presents itself, you need to have your accumulators serviced. Condition **b** is suboptimal and condition **a** is poses a potentially life-threatening danger.

To Test the Accumulators by More Formal Measures

1. Depressurize the system using the same technique in step 1 of the *Brake Pedal Test*. After you are certain the system is completely depressurized, slowly turn and remove the bleed screw on the accumulator you are testing and screw in a proper pressure gauge. (For instructions on how to make one, download ***Building Your Own Hydraulic Pressure Gauge***.) Make sure that this gauge has been used **ONLY** on RR363 based systems. Mixing even the smallest amounts of RR363 and the Hydraulic System Mineral Oil (HSMO) used on select late SY cars and all the later SZ series cars will create a BIG mess that is hellish to get out of the system.

2. Start the car. In a **perfectly functioning** system:

- The gauge should quickly go right up to 1000 PSI. This is called the "flick-up pressure" and directly relates to the amount of nitrogen charge captured by the diaphragm in the lower half of your accumulator.

- After the initial flick-up the gauge should start rising higher and higher until it reaches approximately 2500 PSI and stops climbing. This is called the "cut out pressure".

- The gauge should then drop by about 100 to 150 PSI and then stay steady between 2350 and 2400 PSI. This is called the "fall back pressure."

3. Turn the car off. The pressure should now remain steady. If the pressure drops at this point you have a leak somewhere in the system that could be internal (some internal valve not closing when it should) or external (a leaking o-ring in a valve somewhere or insufficiently tightened connection. You may see dripping or a crust that has formed over time where there is a tiny, slow leak.) If you've got a leak, find it and repair it before starting this whole process again.

4. Start the car again and pump the brakes or activate the height control to begin using accumulated pressure. The gauge should drop slightly each time. When the decreasing pressure drops to between 1750 and 1850 PSI the accumulator valve will activate to begin pressurizing the accumulator again. The pressure at which the valve opens again is called the "cut in pressure."

5. The gauge will then begin rising and continue until it reaches the cut out pressure you observed in previously then drop back down to the fallback pressure you observed previously. ***If you observe any loss of pressure*** when there ***has been no activation of the brakes or height control*** indicates the presence of a leak somewhere in the system. If the signs of a leak are

observed, you will need to keep isolating the different components of the system until you find the problem. Consult the workshop manual for further details on detailed steps for doing this.

Some examples of possible problems:

A) System is depressurized to 0 PSI, you start the car and the gauge rises slowly and steadily to 2500 PSI, then falls back to 2350 and holds steady. You turn the engine off and the pressure continues to hold steady.

Your accumulator is completely lacking its nitrogen charge. You know this because no flick-up pressure to 1000 PSI was observed. It is possible that the flick-up pressure may be lower than 1000 PSI if the accumulator has a somewhat depleted nitrogen charge, but a flick-up pressure should always be observed, never a slow and steady rise from zero to cut-out pressure.

B) System is depressurized to 0 PSI. Engine started and gauge goes quickly to 600 PSI [flick-up present, but low] then rises slowly to 1900 PSI and stays there. Turn off the engine and the gauge slowly falls back.

You have a partially depleted nitrogen charge in your accumulator ***coupled with*** *a malfunction of the accumulator control valve (ACV). The ACV is not regulating pressure accumulation to anywhere near to the typical cut-out pressure. The accumulator must be recharged or rebuilt and the ACV must be rebuilt.*

C) System is depressurized to 0 PSI. Start engine and a quick rise on the gauge to 1000 PSI [correct flick-up] then steadily rises to 2500 PSI at which point it settles back to 2350 PSI [correct fall back]. When driving the car you feel a clunking sensation that seems like a misfire (but you know the engine isn't misfiring).

You are feeling the rear brakes activating when they should not, since you're not applying the brakes. A possible cause is that the solenoid valve that controls the speed of leveling in the height control system is energized at the wrong time, resulting in fast leveling during driving when it should be in slow leveling mode. A more likely cause, though, is that you have a clogged restrictor valve that's causing fluid back pressure to the brake pistons when the fluid would normally be returning to the reservoir.