Testing the ATE T50 Brake Booster on your Car

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The first time I opened the hood on a Ponton, what first caught my eye was the complex looking brake booster. (1) I was intrigued. Given its unusual outward appearance, some owners of 190 SLs may have difficulties deciding on the proper tests to determine if their booster is working as it should. The purpose of this technical article is to enable the owner to evaluate and test the performance of the booster on the car.

These boosters were widely used by Mercedes and other European car manufacturers. ATE however, is not responsible for the initial design. The American company Bendix first penned the design and later sold rights to ATE, allowing it to produce their version. A unique feature of these boosters, when compared to brake boosters produced years later, is the fact that they are not mechanically connected to the brake pedal or the master cylinder. Because of the design, this booster can be mounted remotely.

Despite the exterior, the basic functions of the booster are not complicated. To simplify, there are three sections to the booster:

- **Vacuum power cylinder (air and vacuum)**
- **Hydraulic slave cylinder (brake fluid)**
- **Hydraulically actuated poppet valve. (2-3)**

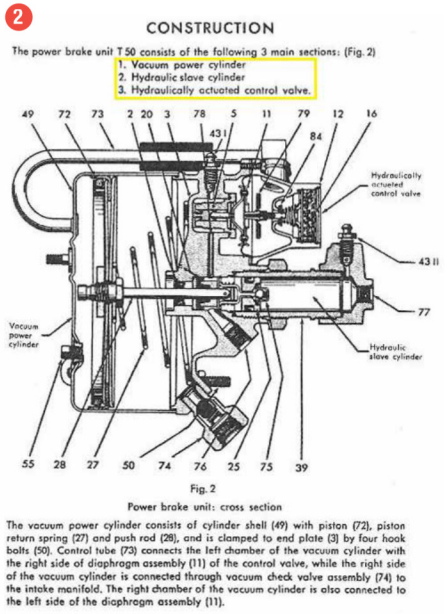
The vacuum and the hydraulic circuits work in tandem to provide a boost in hydraulic pressure to the brake cylinders when the brake pedal is applied. If the booster is in good working order, the air and hydraulics remain completely separate and do not ever mix.

From the time they are new, the T50 boosters are in a constant state of slow decline. The good news is that catastrophic failures are rare and these boosters will last many years. The bad news is that the booster will slowly lose its ability to boost, making it difficult to determine when it is time to rebuild. So let's look at some tests and evaluations you can do on the car to determine if your booster may be a good candidate for a rebuild.

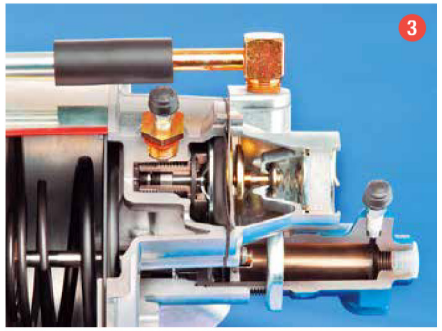
Booster Performance

There are a few very simple tests that can be done on the car to give you an idea if the booster is doing its job.

The first test is to determine if the booster is actually increasing the force to the brake cylinders from the brake pedal. This simple test is accomplished by comparing the difference in the force required to apply the brakes ***with and without*** the vacuum line connected. The force required to move the brake pedal should be substantially less when the vacuum line is attached to the booster. If the difference is marginal, the booster is ready for a rebuild.

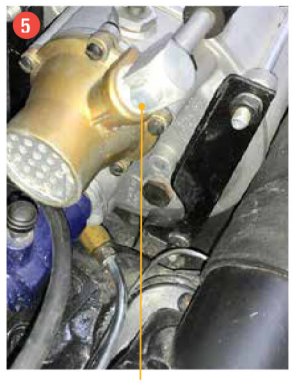


To do this test, disconnect the vacuum line as in picture **(4)** and plug the line. Start the engine, press the brake pedal and note the amount of force required. If you can do so safely, reconnect the vacuum line to the booster; otherwise turn the engine off first. With the vacuum line reattached, there should be a very noticeable difference in the required force to move the pedal.



Another more quantitative test is to measure the vacuum at the test port. The test port uses a 5mm cap screw to seal the vacuum on the vacuum air pipe elbow. **(5)**. ***Note: Most original boosters have this test port, however newer productions may not.*** The booster in picture **(6)** is an example of a newer production version and does not have the test port. Remove the test port screw and place a vacuum gauge in the opening. With the engine running and brakes NOT applied, there should be normal engine vacuum around 16 to 18 inches of hg. When you step on the brake pedal, the vacuum should go to zero. This is normal booster function. If the change in vacuum differs from this, that indicates a problem exists in the booster and possibly the poppet valve. Another related test is to see if the manifold vacuum is the same as the vacuum reading at the test port when the brakes are not applied. The manifold vacuum reading and test port vacuum reading should be roughly the same and if not, this indicates a vacuum leak within the booster.

Vacuum Hose to Booster
As seen from under dash - disconnect hose



Test Port

Later model booster without Test Port

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Leaky Booster

A booster leaking brake fluid will cause issues and these leaks can be either external or internal. External leaks are obviously the easiest to find. Check the bleed screws and fittings on the booster as shown in picture **(7)**. These leaks should be able to be sealed without much effort. If however, the leaks at a bleeder screw or fitting cannot be stopped, it may be a clue that dirty brake fluid has caused corrosion on these seats and repair may be needed.

Most boosters have a very small weep hole located at the base of the slave cylinder snout which will begin to leak brake fluid if one of the internal seals is failing **(8)**. This will appear as an external leak, but is actually an internal seal failure. Fluid will eventually start leaking into the vacuum side of the booster and will be drawn into the intake manifold. This is a sure sign that a rebuild is needed.

A continual loss of brake fluid in the reservoir that cannot be accounted for anywhere else on the car, may be originating at the booster. Checking the insides of the vacuum hose from the engine to the booster **(4)** will sometimes reveal an internal booster leak. Brake fluid will get sucked into the hose and into the engine where it burns off. The inside of the hose should always be dry. If it is wet, that is an indication of an internal booster brake fluid leak.

Poppet Valve

The poppet valve is located inside the cast housing that has an air filter and screen on the front. **(9)**. The original valve is not a serviceable part and cannot be removed without destruction. Over time, these valves will deteriorate and start leaking with little notice. Luckily they are very easy to test. This quick test is done with the engine running and the brake pedal NOT applied. Place your hand (or sheet of rubber) over the poppet valve housing opening (air filter) to seal it. You should NOT be able to feel any suction with the engine running. If there is suction, the poppet valve is leaking. This can cause poor booster performance as well as poor engine running at idle. To remedy this, a recently available refurbished poppet valve housing can be installed.
NOTE: The test done under ***"Booster Performance"*** above, may also indicate a failed poppet valve.

A normal poppet valve will seal with the brake pedal not engaged, but will create a suction at the opening when the pedal is engaged.

Booster Inactivity

Has the booster been at rest for long periods of time? This could either be due to the car not having been driven for many years or the booster was in storage.

Because DOT3 and 4 brake fluids do not store very well, the brake fluid itself can cause untold amounts of damage to metal components, and the seals and gaskets. Brake fluid will also absorb water and congeal over time. On the air side of the booster, UV will attack pliable seal materials causing them to harden and crack. Sealing materials will also compression set over time from lack of use and will lose their ability to flex and create a seal. If you are concerned about part degradation from lack of use or storage, you can use the tests above to determine if the booster is still functioning.

One of the early signs that a booster has been dormant for too long is that the internal moving parts begin to stick. This will make it appear as if the brakes are grabbing when the brakes are applied. Normally if the brake pedal is applied slowly and evenly, the brakes will stop the car smoothly. When internal booster parts begin sticking, the braking force from the booster will unexpectedly and abruptly increase, making it feel as if the brakes are grabbing. An easy test for this issue is to disconnect the vacuum line to the booster and see if the condition changes. If the booster is at fault, brakes should return to a smooth, even feel with the hose disconnected. Note: Of course with hose disconnected, the braking force will be significantly higher, but should be smooth and even.

Over a period of time, the hydroscopic brake fluid will drain away from the inside of the booster slave cylinder. The inside of the cylinder is raw steel (unless it has been sleeved with stainless steel) and the piston that goes inside the cylinder is also raw steel. Eventually they will rust together. This also applies to the mini-piston behind the poppet valve housing.

If there is any question of its condition, the booster can be sent in for testing, cleaning and only have the failed or damaged parts replaced. It is also recommended that if the booster has been sitting for 5 years or more, it should be sent in for testing. The conclusion here is that time and inactivity are not friends to this booster.

Restoration

Many owners may just want to cosmetically restore their booster to the appearance it had when it rolled out of the factory regardless of its operational condition. This typically will require that the unit be removed from the car and torn down. Worn parts and wearable items can be replaced at this time.

Resources

There are many ways to approach rebuilding your T50 booster. If you feel you can tackle this job yourself, parts for rebuilding the booster are available from many known 190 SL parts sources. One critical replacement part that has been unavailable for many years is the poppet valve and housing. A refurbished unit is now available as a core exchange which incorporates a newly designed valve in a modified housing. Two sources currently carrying this rebuilt housing are S&S Imports and Miller's. If you feel this is too big of a job to tackle, there are many shops that rebuild these and can even offer an exchange program. Again check the 190 SL vendors, many of which advertise in this newsletter.