Restoration Corner | Bruce L. Adams

The ATE 150 Brake Booster

Fifty percent less pedal force

A completely rebuilt ATE brake booster ready for reinstallation.

In most of the models of the 1950s and 1960s, Mercedes-Benz provided a power brake booster manufactured by ATE. The booster does not provide additional braking capacity, a common misconception, but rather reduces the pedal force required for braking.

The power brake is a vacuum-assisted hydraulic component using the pressure difference between engine intake manifold vacuum and atmospheric pressure for its operation. The power unit increases the pressure created physically in the brake master cylinder so that the same braking effect can be produced with less pedal effort. With a brake booster installed, the pedal force required for braking is reduced by 50 percent.

The ATE T50 Brake Booster used vacuum to "boost" the hydraulic brake-line pressure. The booster contained a hydraulic cylinder, a large vacuum piston that pressed against the hydraulic cylinder, and a control circuit that regulated the vacuum flow based on brake-line pressures. This technology had been well proven since the early 1900s, and the T50 was exceptionally reliable over many years of use.

The Booster in action

The power booster is a very simple design requiring only a vacuum source to operate. In gasoline-engine cars, the engine provides a vacuum suitable for the boosters. Because diesel engines do not produce a vacuum, diesel-powered vehicles must use a separate vacuum pump.

A vacuum hose from the intake manifold on the engine pulls air from both sides of the diaphragm when the engine is running. When the driver steps on the brake pedal, the input rod assembly in the booster moves forward, blocking off the vacuum port to the backside of the diaphragm and opening an atmospheric port that allows air to enter the back chamber. Suddenly, the diaphragm has vacuum pulling against one side and air pressure pushing on the other. The result is forward pressure that assists in pushing the input rod, which in turn pushes the piston in the master cylinder.

The amount of power assist that's provided by the booster depends on the size of the diaphragm and the amount of intake manifold vacuum produced by the engine. A larger diaphragm will increase the boost.

The power booster needs a good vacuum supply from the engine, and a good diaphragm. A vacuum supply hose that's loose, leaky, collapsed, or restricted may not allow the booster to receive enough vacuum to provide the usual amount of power assist. Consequently, the driver will have to depress the brake pedal harder to get the same braking as before. Mercedes-Benz uses a special hose in its cars that is cloth-covered and wire-reinforced, so hose failure is uncommon. The condition of the diaphragm inside the booster is also equally important. If cracked, ruptured, or leaking, it won't hold vacuum and can't provide much power assist.

Checking brake booster operation.

The brake booster has a unique sound that all drivers can recognize. A combination of a short hiss and a sucking sound can be heard easily when the hood is open, the brake is depressed, and the engine is not running. The hissing results when air bleeds through the small air filter and into the back of the pressure cylinder. This sound is normal and indicates that the unit is working properly.

To check the vacuum booster, pump the brake pedal with the engine off until you've bled the entire vacuum from the unit. Then hold the pedal down and start the engine. You should feel the pedal depress slightly as the engine vacuum sucks air from the booster and pulls on the diaphragm. No change? Then check the vacuum hose connection and engine vacuum. If okay, the problem is in the booster, which needs to be rebuilt.

ATE boosters also have an external one-way check valve at the hose inlet that closes when the engine either is shut off or stalls. This traps vacuum inside the booster, so it can still provide one or two power-assisted stops until the engine is restarted. The valve also helps maintain vacuum when intake vacuum is low (when the engine is under load or is running at wide-open throttle). You can check the valve by removing it and trying to blow through it from both sides. It should pass air from the rear but not from the front.

The early T50 boosters used a leather seal ring in the power piston. The leather required mineral-oil lubrication to keep the leather supple and to provide a good seal between the power piston and the case. A lubrication plug was located on the back of the booster unit, where mineral-oil lubricant could be added.

Later boosters, and all rebuilt boosters, have a hard rubber-seal ring that does not require periodic lubrication, so the lubrication plug was removed from later units.

Brake booster problems

Difficulties with brake-booster operation are normally associated with the failure of the internal shaft seal, which allows brake fluid to leak into the vacuum cylinder. If the leak is large, the loss of brake fluid will be apparent, and white smoke may be observed from the tailpipe. A slow leak, accompanied by occasional use of the car, can cause a gummy buildup in the vacuum chamber and will inhibit the free sweep of the piston. If this condition continues, the vacuum piston may freeze in place and the unit will no longer provide braking assistance. Mercedes-Benz recommends replacing the air-cleaner element every 10,000 miles.

Rebuilding brake boosters is a common practice here in our workshop. Our component rebuild specialist, Todd Prevatte, rebuilds approximately 15 annually. The pictures illustrate the sequence we use, including bench testing the brake booster before shipping back to our customers, to ensure proper operation.

Trivia
Question: What does the ATE letters refer to?

Answer: In 1906, Alfred Teves established the firm in Germany that still bears his name today.

1. Typical brake booster upon arrival
2. The disassembled booster
3. Note the brake fluid that leaked into the vacuum chamber. This will result in loosing brake fluid and finding its way into the engine. Result, low brake fluid in the reservoir and white smoke burning from the exhaust.
4. Rear seal failure is common
5. Todd Prevatte assembling the booster
6. Booster now ready for assembly with M-B rebuild kit and parts cleaned and plated.
7. Booster on test stand before shipping .
8. Readings indicate input pressure and output pressure. There are 300 lbs of input pressure and 600 lbs of output pressure indicating what the booster is producing. Generally we look for output pressure to be double that of the input pressure.

Bruce Adams, a member of the Triangle Section, has owned and operated B.L. Adams, LLC, specializing in restoration of the 190SL model Mercedes-Benz, for 33 years. www.bruceadams-190sl.com