



Tech Tip

BRAKES 117

BRAKE ROUGHNESS AND PEDAL PULSATION A Factory Solution for the Grand Cherokee's Pedal Pulsation

Getting the pulse out of a brake pedal is one issue; keeping it out is another. In the case of a 1999–2002 Grand Cherokee, it will take a factory solution to alleviate the problem. Some problems are not fixable, at least without some factory modifications. Identifying these early on can save you and the customer much frustration.

The pressure is always on the technician to perform a perfect job. He may replace a part or repair a system and suddenly his integrity is in jeopardy. In the case of brakes, it may involve a set of disc pads that are too noisy, wear out prematurely or emit too much brake dust, contaminating a set of custom wheels, all of which can infuriate a good customer.

Do your customers listen to and follow your recommendations, or look for a less expensive solution? Often a technician or shop owner is subjected to criticism when the customer fails to respond to the technician's recommendations. For example, a technician may recommend a complete brake system overhaul and the customer will only authorize a disc pad replacement. When the friction wears out prematurely or emits an unwanted noise, it is almost always blamed on the technician or the quality of the parts installed. Pressure is placed upon the supplier to provide a product that is not susceptible to those aforementioned symptoms, even though they may be characteristic of the original equipment parts. It doesn't matter—the last person working on the vehicle and the parts installed are expected to correct the problem. The fact is, you may perform a by-the-book complete system overhaul, install premium parts, and still encounter brake performance complaints.

PULSATION AND PEDAL ROUGHNESS

For symptoms of pedal pulsation or pedal roughness, the technician would normally explore the following:

Rotor Runout: Allowable runout varies between vehicle manufacturers and sometimes platform types. Most vehicle manufacturers compromise on a maxi-

imum of .005 inch runout. Runout in excess of this amount exceeds the ability of the caliper to track some rotor wiggle and can promote pedal pulsation and noise. Measuring for runout should be performed with the rotor mounted on the vehicle and the lug nuts inverted and torqued to spec. A rotor may run true on a brake lathe and be out of spec when installed on the vehicle. Stacked tolerances often result in the rotor runout exceeding the allowable limits. Indexing the rotor to the hub can often bring a rotor back into spec. Most will not invest the time required to properly match the rotor to the hub to achieve minimal runout, even though a .007 to .010 inch runout can often be corrected, via the indexing process.

Parallelism: Parallelism is defined as a thickness variation in the rotor. While technicians check for runout, few check for a thickness variation in the rotor. A variation in the thickness as minimal as .0005 inch can promote pedal pulsations. While a caliper can compensate for some runout, it cannot compensate for thickness variations. The solidity of the hydraulic column transfers the uneven pressure through the hydraulic cylinders and into the brake pedal assembly, creating a pulsating sensation. The parallelism of the rotor can be affected by runout as minimal as .002 inch. When this occurs, the rotor wipes the pads, promoting an uneven wear pattern and a thickness variation in the rotor. Further, a transfer of friction material to the rotor can occur, promoting the same pulsating sensation or a slip/stick condition.

Machining or replacing the rotors for a pulsating sensation could be a short term fix. Failure to diagnose the problem may result in the condition reoccurring within a few thousand miles. And when it does, the customer will expect you to take care of the problem at your expense.

THE GRAND CHEROKEE ENCOUNTERED A REOCCURRING PEDAL PULSATION

The 1999–2002 Jeep Grand Cherokees have been plagued with reoccurring brake pedal pulsations and

brake roughness. The symptoms have eluded the efforts of many independent and dealer technicians. The pulsation may be corrected by machining or replacement of the rotors, but the condition returns within a few thousand miles.

First Attempt: The vehicle manufacturer addressed the issue, stating that the customer may experience vibrations in the steering wheel, floorboard, seat, instrument panel and in the brake pedal, during light to moderate braking. This condition may be due to variations in the rotor thickness. To address this issue, the manufacturer released a disc pad repair kit that incorporated an adhesive backing. The theory was the residual drag of the disc pads resulted in a thickness variation in the rotors. The adhesive backing was supposed to pull the brake pads away from the rotor during caliper release. Prior to installing the disc pad kit, it was recommended that the rotors be turned with an on-car lathe. While an off-car lathe would correct the thickness variation in the rotor, it could not compensate for variations in other rotating components whose stacked-up tolerances, when assembled, could result in excessive lateral runout. Unfortunately, the result was much less than desired, and the brake roughness and pulsation returned.

Second Attempt: The second attempt by the vehicle manufacturer to resolve the braking concerns involved some major design changes in the braking system. And according to the dealer technicians, the modification has corrected the reoccurring brake system complaints.

The revised procedure includes the replacement of both front caliper assemblies, to include new disc pads and new rotors. The solution to the problem was actually in the caliper redesign. The original equipment calipers were made by ATE. The replacement calipers were designed by AMBRAKE.

FACTORY REPAIR PROCEDURE

- 1) Raise and support the vehicle with safety stands.
- 2) Remove both front tire and wheel assemblies.
- 3) With a suction device, remove a small amount of brake fluid from the master cylinder.
- 4) Bottom the caliper pistons into the caliper by prying the calipers over.
- 5) Clean the banjo fittings at the end of the brake hoses and remove from the calipers. Discard the copper washers, as new ones are supplied with the caliper update.

- 6) Remove the caliper mounting bolts that secure the caliper mounting brackets to the steering knuckle. The calipers, mounting brackets and attaching bolts should be discarded.
- 7) The brake rotors should be removed and discarded.
- 8) The surface of the hub where the rotor seats to the hub should be thoroughly cleaned. This step is imperative, as debris can promote runout once the wheels are installed and the lug nuts torqued to spec.
- 9) Inspect the new brake rotor's mounting surfaces for any contamination that would prevent them from making full surface contact with the hub's mating surface.
- 10) With a dial indicator, match the hub to rotor (index) until the lateral runout of the new rotor is .001 inch or less. If the runout exceeds this amount, the cause must be determined and corrected before continuing.
- 11) The calipers are stamped with "L" and "R" to insure proper installation. Make certain they are secured to a clean knuckle mating surface. The caliper mounting bolts should be torqued to 66–85 ft. lbs.
- 12) Once the brake hoses are attached and the system properly bled, install the wheels and torque the lug nuts to 100 ft. lbs.

Like independent repair shops, aftermarket suppliers cringe at the thought of sending their customers back to the dealer. However, we have a responsibility and obligation to provide you with any information necessary to repair a problem vehicle. The mentioned applications have established an identity with brake pulsations and roughness, and you cannot eliminate the condition without the redesigned caliper. Currently, the only source for the caliper is from the dealer, as the entire production is being consumed by the vehicle manufacturer. Eventually, the system will work through this and the parts will be readily available. Until that time, you have access to the solution, as you can obtain the necessary parts. When a dealer makes the repair, they install a caliper kit #05093174AA, which includes two loaded caliper assemblies and they install (2) #52098672 rotors. It's the only solution to keep the pulse out.

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