

Advanced Technical Information

All
1605 4636 **4**

Binder – 4 – Chassis

Brake Squeal

Vehicle Type: All

Model Year: All

Information: Understanding and addressing brake squeal complaints

Disc brake squeal is the most common brake noise complaint received from customers. This bulletin will help you understand what disc brake squeal is, and how to address it.

Remember that brake squeal is a normal result of different factors acting on the brake system and does not constitute a defect.

Porsche Brake systems are high performance brake systems engineered to perform on Porsche vehicles. Due to the stresses to which Porsche vehicles are oftentimes subjected, Porsche vehicles sent in for brake service may exhibit exceptional wear at earlier than expected times compared to wear found typically on other vehicles. All of the conditions described below are the result of normal brake system wear and are therefore not warrantable.

The Owner's Manual states: (Driving and Driving Safety section)

Brake pads and brake discs

Wear on the brake pads and brake discs depend to a great extent on the driving style and the conditions of use and therefore cannot be expressed in actual miles on the road. The high-performance brake system is designed for optimal braking effect at all speeds and temperatures. Certain speeds, braking forces and ambient conditions (such as temperature and humidity) therefore might cause the brakes to squeal.

Component Inspection Guidelines

Fluid

- Fluid replacement is recommended every two years in the workshop manual.
 - o WM 470855 Changing the brake fluid.
 - o There is also a section in the Owner Maintenance booklet dedicated to recording the brake flushes every 2 years.
- Moisture in the fluid is heavier than the fluid, and accumulates in the calipers. Moisture affects the viscosity of the fluid and its ability to lubricate.
- The right rear caliper is the farthest from the reservoir and may be affected more than the other calipers.
- This is due to the larger volume of fluid in that circuit and therefore a larger amount of moisture can settle in that caliper.
- If squeal is occurring on one wheel in particular, fluid condition is likely to be a part of the problem.

Countermeasure: Flushing the fluid is necessary to get rid of the moisture accumulation.

Tip: Warming the fluid by driving and braking before flushing it, can help get a more thorough flush of the fluid.

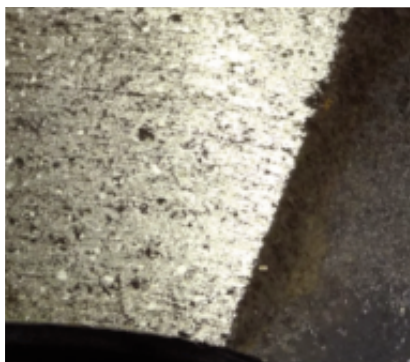
Brake Pads

- Glazed surface
- Dust buildup at edges

Countermeasure: Sanding the pad and chamfering the edges.

- Wear at contact points with caliper and hardware
- Correct shims / dampers; look for wear at contact points with pistons and edges of pad.

Countermeasure: Lubricating contact points with optimol grease and insuring proper fit of shims/dampers.

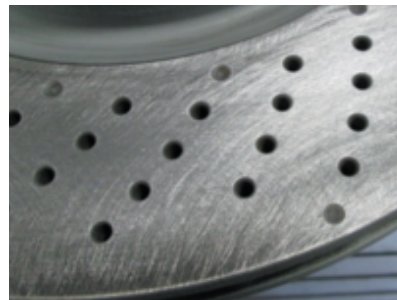
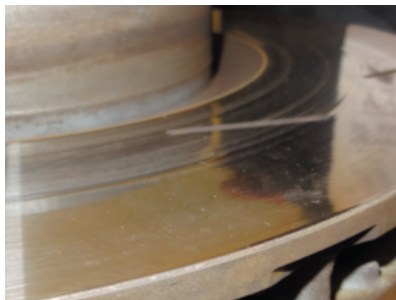


Rotors

- Glazed surface
- Lips develop at outer and inner edges of pad contact area



- Corrosion
- Contamination by sprays, fluids, road salt, grime, and small particles becoming embedded between the pad and rotor.



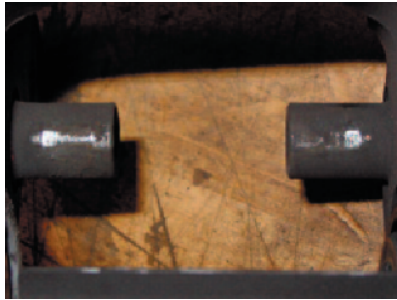
Countermeasure: Sanding the rotor to create a non-directional finish, remove corrosion and reduce/remove the lip around the edges.

Glazed pads and rotors are the fingerprint of the normal, light footed, slow speed brake squeal. Replacement of the pads and rotors with the same pads and rotors that are already on the vehicle, will not fix the situation. As soon as the new parts are subjected to the same conditions, the squeal will return.

Deglazing the pads and rotors needs to be done so the noise will be gone for as long as possible. A brake rotor hone can be used to get a non-directional finish on the rotor.

Calipers

- Pins – movement between pad and caliper



Countermeasure: Lubricating contact points with optimol grease and insuring proper fit of components will quiet the contact points.

- Tension spring – Movement between spring and pads will vary as spring tension varies. The witness marks will reflect this. Replacing the spring and hardware will restore proper tension on the pads.



- Caliper pistons – Wear marks from movement of pad against piston. This is an indication of pressure distribution from the piston to the pad. Brake squeal is affected by pressure distribution.

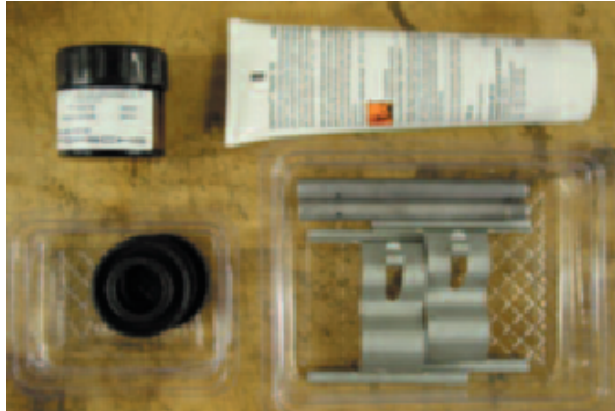


- Inspect pistons to see if there are any that may not be returning completely. Moisture in the fluid can have an effect on this.
- Exercising the caliper pistons can restore the movement of the piston to normal operation.

Exercising Brake Caliper Pistons

- Remove brake caliper
- Remove pads and hardware

- Have the following parts on hand:
 - Caliper paste 000.043.117.00
 - Optimoly paste 000.043.020.00 (the 100g tube should last through several repairs)
 - New hardware kit
 - New dust seals



- Clean brake caliper so that there are no contaminants present when the dust seals are removed.



- Remove dust seals from the caliper pistons



- Extend the pistons against a block of wood to keep them from coming out of the caliper. (It may be necessary to retract and extend the pistons several times to free up the movement)
- Apply brake caliper paste to the piston and install new dust seals on the pistons
- Retract the pistons and seat the dust seals
- Install pads and new hardware
- Install caliper on vehicle
- Flush brake fluid
- Test drive the vehicle.

In cases where additional help is needed please file a TLAR and contact your FTM.

What is Disc Brake Squeal?

Disc brake squeal is a noise that is the result of friction induced minute vibrations. As the pad travels over the surface of the rotor, minute vibrations are produced, just like a record player.



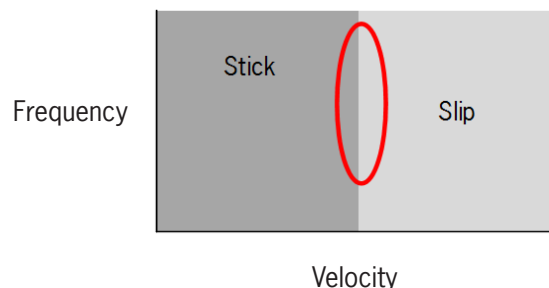
The noise (squeal) produced by the vibrations are radiated out by the rotor (the rotor is acting like a speaker).



The condition producing the minute vibrations is called a “stick-slip” condition. A common stick-slip noise is a squeaky door hinge. Unlike a squeaky door hinge, we cannot lubricate the contact surfaces to fix the problem.

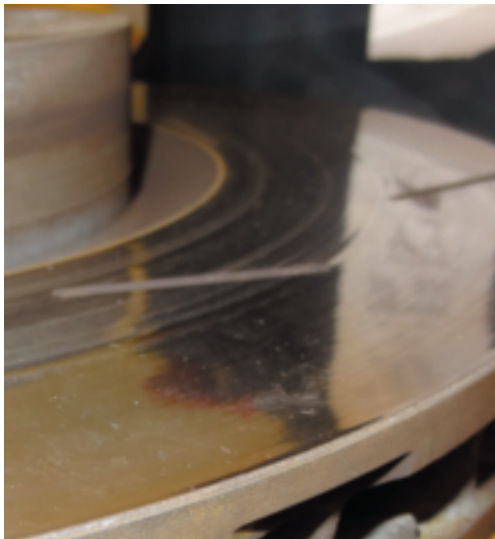
This stick-slip condition is the result of light footed braking. When pads and rotors are seated, or bedded in, material transfer from the pad to the rotor establishes a working coefficient of friction between the two surfaces. Light footed braking abrades this material transfer, and smooths the rotor & pad surfaces. The conditions for stick-slip are now optimized.

The squeal that we are familiar with occurs in the transition between stick and slip. Light footed braking at low speed is the optimal time for this to occur. The squeal will not occur if the brake sticks more or if the brake slips more. We don't want it to slip though.



Some clear indications that a normal brake squeal from the conditions described above are:

- When the squeal occurs, applying more brake pressure makes it go away.
- The rotor has a polished mirror like finish on it.
- The pads have a smooth surface finish, like a glaze.



Other Contributing Factors

There are other factors that contribute to brake squeal as well. All components (even the bolts) have what are called “bending and twisting modes”. As force is applied to a component (as it is excited) it will bend and twist in different ways. The bending and twisting modes change as brake pressure changes.

The amount of bending and twisting is not visible to the naked eye. It is a normal characteristic of all components that can be determined through Frequency Response testing.

This is one of the reasons why proper torque on fasteners is critical. Other factors would include things such as component temperature, mass, geometry, insulation, and lubrication. Weather and driving conditions are also major factors.

Countermeasure Limitations

Brake squeal can fall into a very wide frequency range. The range is divided into three groups.

1. Low Range 1 - 3 KHz
2. Mid-Range 3 – 6 KHz
3. High Range 6 – 20 KHz

The frequency of the noise will determine what countermeasure to use in an effort to quiet the noise. Some common countermeasures are listed below.

- Pad Chamfers
- Various slot configurations in the pad
- Pad slippers
- Shims of various types
- Tuned mass dampers
- Fixed calipers

Countermeasures are limited on a given brake system due to limitations with space and performance. Testing must be performed to determine if a countermeasure is effective without deteriorating performance.

The Society of Automotive Engineers published an engineering text on the subject of brake squeal. This is a quote from that text.

"However, disc brake squeal remains an elusive problem, and there is not yet a method to completely suppress it."

(Disc brake squeal: mechanism, analysis, evaluation, and reduction/prevention /
[edited by] Frank Chen, Chin An Tan, and Ronald L.Quaglia. SAE)

What can we do?

1. We can assure the customer that we will perform a test drive to verify the concern.
2. We can perform a thorough visual inspection of the brakes to see if any abnormalities exist and repair them.

Dealership Distribution Routing	Service Manager _____	Shop Foreman _____	Service Technician _____	_____	_____	_____	_____
	Asst. Manager _____	Warranty Admin. _____	Service Technical _____	_____	_____	_____	_____

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