Shake & Brake

Those of us who live where they salt the roads like giant French fries are accustomed to seeing crusted, coated brake parts. Shaking and braking go hand-in-hand when salt saturated brake rotors start looking like the surface of the moon, caliper pistons seize in their bores, and brake hardware turns to an oxidized powder.

There are other, more subtle disc destroyers lurking out there, however, waiting to turn every stop into a bone-shaking experience. We have given this shaking/braking annoyance different names. Some refer to minor cases as "brake pulsation." More severe cases are often referred to as "brake shudder." Many OE manufacturers use the term "brake judder."

Brakes are one of those repair jobs that seem uncomplicated. New friction linings are installed, rotors and drums resurfaced, and that's the end of it. Or is it? What about the car that comes back, time and time again like a bad penny, with the same old shake and brake syndrome?

Bad From Day One

Even in this day of improved manufacturing procedures and closer tolerances, it's possible that a car from any manufacturer may leave the factory with the makings of shake and brake built into it.

All parts are made to a tolerance. You know, so many millimeters thick, plus or minus so many hundredths of a millimeter. But what happens when there is an accumulation of tolerances? What happens when a group of parts who've never seen one another before get thrown together in an assembly, only to find out after they get acquainted that they are all suffering from tolerances that favor the high limit—and that the sum total of these imperfections adds up to enough runout to cause an early case of brake judder?

Normal wear and tear also damage components over time, and result in runout and brake judder. We need to identify and eliminate this runout condition, whatever the cause.

And finally, improper repair procedures and failure to eliminate the obvious can make new problems never dreamed of by the factory or your average pothole.

To eliminate brake judder once and for all, we have to go beyond pads, shoes, rotors, and drums, and include other elements like loose suspension parts, loose wheel bearings, and warped drive hubs and road wheels.

If a car with this type of problem has its rotors removed for resurfacing on a conventional brake lathe, or has new rotors installed, the runout that caused the original judder will cause a recurrence of the problem. We have to spend some time eliminating the cause of the original problem unless we want to do the same job over and over again.

Diagnosing Judder

• **We've all heard about the dangers of overtightening lug nuts until we're tired of hearing it.** So why does it continue to be such a common problem? If the nuts are REALLY overtightened, not only the brake rotor, but the drive hub and the road wheel can also be permanently distorted.

Most of the time, we simply replace the old rotors with new ones. But now, when we tighten the lugs to proper specs, we force the new rotor to conform to the warp already built into the drive hub or road wheel. Like it or not, we're about to ruin a new rotor.

• **Another commonly overlooked problem has to do with rear brake drums that are out-of-round.** Most of us have done the old hand brake pull in a moving car to check for rear brake judder. This works some of the time.

We need to remember that the hand brake cables are a mechanical device connected to only two wheels of the car. If the drums are shaped like the track at Indy, pulling the hand brake may produce a noticeable judder. But the hydraulic connection between the rear wheel cylinder and the front caliper on a dual diagonal system is a different matter. Minor out-of-round conditions at the rear drums can cause pulsation at the *front* calipers.

An out-of-round condition that doesn't show up when you pull the hand brake may still be bad enough to transmit vibration through the hydraulic line to the caliper on that circuit. Hand brake cables may stretch, but for practical purposes, brake fluid does not compress.

As the rear shoes compress and expand in the out-of-round drum, the wheel cylinder becomes a mini-master cylinder and sends a pulsing hydraulic vibration through the uncompressible brake fluid to the front caliper.

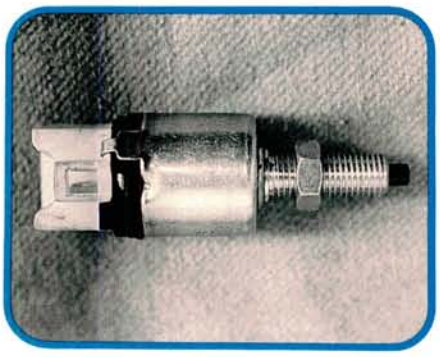
Your Mileage May Vary

After our last article on a Honda brake job, we received letters from one or two shops who suggested that they never, ever resurface rotors on Hondas for any reason. And the thought of taking a skin cut on new rotors to true them to the hub assembly may seem like a terrible sin. But the fact remains that truing the rotors to compensate for minor runout or distortion may be your only cost-effective alternative when you've had a bellyful of shake and brake.

—By Ralph Birnbaum

1

Warm the brakes by making several hard stops. With the brakes still warm, raise the car and see if all the brakes are dragging. If they are, remove the clevis pin at the brake pedal push rod. If the brake drag goes away, there isn't enough free play between the rod and master cylinder, causing the brakes to drag and overheat.



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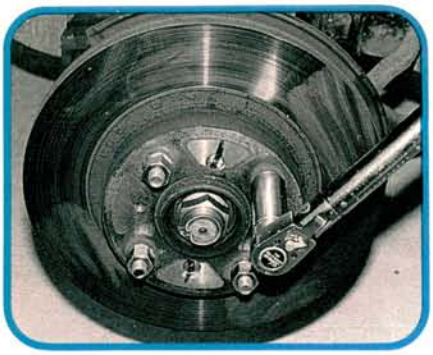
Another potential cause of brake overheating is an improperly adjusted brake light switch. Since Honda uses the brake light switch to set the upper limit for brake pedal travel, a switch that's screwed in too far can keep pressure on the pedal, causing the brakes to bind, heat, and warp.



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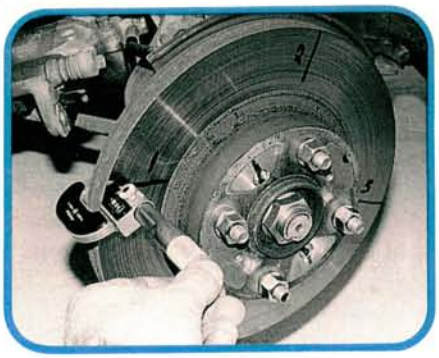
Check for looseness in the front suspension or wheel bearings. Check the tires for uneven wear or ply shifts. Then remove the wheel. Install and torque the lug nuts to hold the rotor tight against the hub. Check and adjust the steering rack tension if needed. While a loose rack may not cause judder, it will make it more noticeable.



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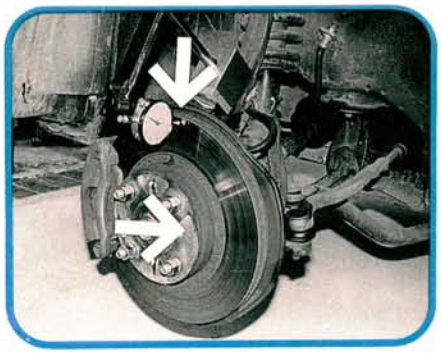
Measure the rotor and compare your measurements to minimum thickness specifications. If the rotor is thick enough to resurface, continue measuring with your micrometer at four equally spaced places around the rotor. We're checking for uniform rotor thickness or parallelism.

5

Measure the rotor face for runout using a dial indicator. Runout should be no more than 0.10 mm (0.004 in). Check for runout close to the hub, and near the edge. A rotor that passes this test with the dial indicator riding near the hub, may fail the same test as you move outward toward the edges of the rotor's braking surface.



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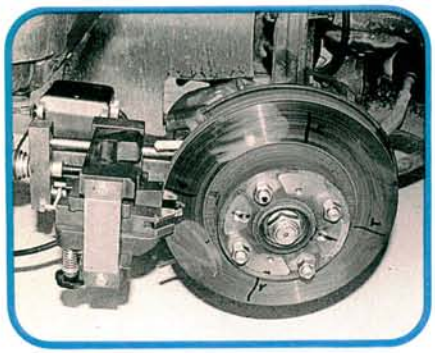
If the car showed up with overtightened lugs, the drive hub may be distorted. Try this test. Match mark the hub and rotor where you got your highest reading. Remove the rotor, turn it 90 degrees, and reinstall the lugs. If the dial indicator reading is the same, but the location moves 90 degrees, the rotor is the culprit, not the drive hub.



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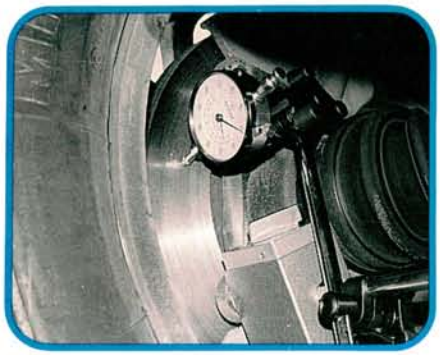
Machining rotors on the car trues the rotor surface to the drive hub. If a car has returned to your shop with a repeat case of judder a short time after its last brake job, simply replacing the rotors again is risky business. You may need to skin cut the new rotor on the car to true the assembly components and eliminate the runout problem once and for all.

8

Honda recommends the Kwik Way lathe. Honda techs suggest that the best way to run the lathe is to block the opposite wheel and run the disc being turned at a speed of about 12 MPH with the lathe set on the medium or slow feed. This gives a nice smooth finish. Avoid the dreaded "record finish" at all costs.



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Since previously distorted rims or hubs can distort a new rotor, or ruin a resurfaced one, we want to make sure our freshly turned rotor will still turn true with the wheel in place. Here's one way to check. Temporarily install the wheel, but leave the caliper off. Tighten the lugs to specs. Mount a dial indicator as shown.

10

Checking the rotor with the wheel bolted in place tells us about assembly runout. If warped components are rewarping the rotor before it even leaves the shop, we're already in trouble. Look for a maximum 0.10 mm (0.004 in). If you're off by more than that, the source of the runout will have to be eliminated.

11

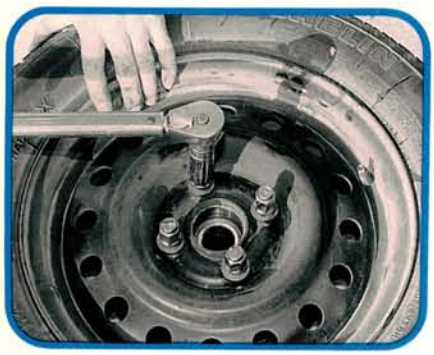
Honda techs suggested that stamped steel wheels distort more easily than these alloy wheels. They were also quick to note that an impact gun set at "twist off," will warp the alloy wheels as well. Make sure all corrosion and debris are removed from the inner face of all road wheels before installing them.

12

Brake hardware won't always eliminate all brake noise due to different friction compositions, but leaving the hardware off, or using old worn hardware is just asking for trouble. Honda recommends the use of Dow Corning Moly Kote 77 on the backs of the pad shims as added insurance against unwanted brake noise.

13

For cars with four-wheel discs, the test procedures are the same, although conventional off-the-car refinishing seems adequate for Honda rear rotors. For rear drums, check the drum for overall diameter and runout using a brake drum micrometer. If drum runout is greater than 0.05 mm (0.002 in), resurface the drum to true it.



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Bolt the wheel to the drum and recheck runout. If the wheel is warping the drum, reindex the drum and wheel and check again. Still no luck? Replacement of the road wheel may be the only lasting cure. Turning the drum/wheel as a unit may eliminate the runout, but it's dangerous, and that warped wheel will cause problems after the next tire rotation.