

The Complete Brake Job



A leading source of comebacks is pedal pulsation caused by rotor thickness variation, a result of warped rotors due to improperly tightened or over-torqued lug nuts. No brake work is complete until the lug nuts have been carefully torqued to factory specs. (Note: With new alloy wheels, it may be necessary to recheck torque after 50 miles of driving.)

‘One size fits all’? Nope

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There could be as many kinds of brake jobs as there are cars on the road. Let’s examine a common brake procedure - friction replacement - and see what goes into making the job complete.

You hear the phrase ‘complete brake job’ mentioned often but you rarely hear it defined. That’s probably because there is no ‘one-size-fits-all’ definition. After all, a technician’s work varies depending on the consumer’s complaint and/or conditions found during an inspection. What matters most, though, is that any work required is done thoroughly. Anything less is an incomplete job likely to result in an unhappy customer.

As a parts professional, suppliers shouldn’t be lured into thinking their role is limited to merely supplying parts. There’s more to it than that. By talking with technicians and taking an interest in their repair challenges, suppliers/warehouse distributors can help them do a complete job and understand opportunities for cross selling and/or up selling. It may even be smart to suggest some labor- and money-saving parts and/or procedures. If suppliers know what jobs installers are performing - which often can be told by the parts ordered - they could be a valuable partner and earn the installer’s genuine loyalty. To do this, though, they need to understand the installer’s work.



Left: Anytime a rotor has been removed, the job shouldn't be considered complete unless mating hub/rotor surfaces have been thoroughly cleaned. Otherwise, foreign material between the two items may cause runout, leading to a complaint of pedal pulsation.

Getting a complete picture

Whenever a technician is tearing his hair out trying to get to the bottom of a brake problem, suppliers should walk through the troubleshooting procedures with him.

Most installers understand it's their job to evaluate a vehicle's braking system and recommend repairs, but it's actually good practice to include the consumer in the troubleshooting process. This goes beyond merely asking for their complaints. Often, a test drive with the vehicle owner behind the wheel can be revealing. Technicians may spot a motorist doing something that causes the condition they were complaining about.

For example, a perfectly good antilock braking system may shut down, store a trouble code and a driving mistake like this may also prompt the technician to look for other symptoms and problems. The fastest way to zero in on a driver-induced brake problem is to let the consumer do the driving.

Forget hang-and-turn

'Hang-and-turn' refers to a procedure that thankfully is moving into the history books - routinely 'hanging' a set of brake pads or shoes and turning the rotors or drums used with them. Hang-and-turn jobs may be among the worst forms of incomplete brake work. They trust luck, not skill, and may lead to loads of comebacks.

A hang-and-turn job may result in passable brake performance. However, unless a full inspection verifies that worn friction material is a vehicle's only brake problem, and that the rotors or drums are still worthy of resurfacing, it's gambling with safety. I'll address several important steps that need to be included when replacing brake pads or shoes in a moment. But first, it's important to stress that routinely resurfacing rotors and drums may be unnecessary work that, in fact, could lead to a consumer comeback.

Breaking in the new

If an installer complains to a supplier about poor initial brake performance with new pads - especially after having resurfaced the rotors - chances are a vital step was skipped: pad break-in. If bad habits or driving conditions cause the car owner to get the brakes too hot before proper break-in is complete, the new pads may take a long time to feel right - if ever. Warehouse distributors may have to ask their customers who repeatedly encounter 'poor stopping ability' complaints if they break in new brakes. Chances are they don't.

The word about break-in is finally getting out. Many new-vehicle owners' manuals are now telling motorists that new brake pads require a break-in period. The 2000 GM owner's manual states that break-in is necessary "every time you get the brakes relined." The following words from the 2000 BMW 3-series owner's manual refers to both new car brakes and subsequent replacements: "Brake pads and rotors do not achieve their optimum wear and surface-contact patterns until you have driven at least 300 miles."

For some consumers, 300 miles of normal driving and stopping will properly break in new brakes. For others, the process may take more or less time. In any event, leaving it up to the motorist to break in new brakes is leaving it up to chance. For example, many drivers cling to the notion that several aggressive stops will 'seat the new brakes.' That's wrong. Actually, hard braking early on may interfere with proper pad break-in, leading to poor stopping performance, noise and/or rapid wear.

Pad replacement cannot be called 'complete' unless at least one of the following conditions is met:

1. A member of the service staff breaks in the new pads;
2. Properly-conditioned used rotors are reused 'as is;'
3. New pads are installed with surface coatings designed to aid in or eliminate the need for traditional break-in.

What does it take to break in a standard set of semi-metallic brake pads? It's not complicated, but some time is required.

The following procedure - recommended for the current-model Ford Taurus with four-wheel disc brakes, semi-metallic pads and ABS - is typical: Make 15-20 slow stops from 30 MPH, using light-to-moderate pedal pressure and allowing 30 seconds between stops for cooling.

One more note about installers who experience 'poor stopping ability' complaints after replacing pads and turning rotors: Normal stopping capability may return as soon as they install another set of new brake pads. The reason is that some friction material from the previous set of pads has become embedded in the rotors, helping the next set of new pads to get a grip.

To turn or not to turn

Many conscientious technicians make it their practice to verify that each rotor is not warped and meets the legal minimum specifications for safety. They take every rotor that is within specs and turn it on a lathe, then sand both sides to deliver a smooth, non-directional finish. This is the right kind of resurfacing for rotors that need to be machined and these professionals reasonably state that sticking to this procedure lets them know exactly what kind of working surfaces they're getting.

The irony is that by turning every rotor that measures up, they often throw away a very valuable commodity - pre-conditioned rotor surfaces.

All new brakes need breaking in (see sidebar). Break-in allows pad and rotor surfaces to conform to each other and - even more importantly - causes some friction material from the pads to transfer to the rotor surfaces. This transferred material makes it possible for the brake pads to achieve their maximum possible grip on the rotor. Resurfacing removes this valuable conditioning. Not only that, resurfacing a perfectly good rotor lessens its service life by making it thinner, faster.

Loaded calipers save time

Warehouse distributors can save their professional customers time by recommending loaded calipers when they order hydraulic caliper parts along with new brake pads. Timesavings may be especially great on rear brakes of imports with complicated piston-retraction and parking brake adjustment procedures.

Loaded calipers help make complete brake servicing faster and easier because fresh hardware and lubricant are already installed, as well as new pads. Installers may realize further timesavings; however, because they won't come across bleeder screws that have rusted stuck or become partially or fully blocked on a remanufactured, loaded caliper.

Installers save more time and ensure a balanced, long-life job by installing loaded calipers in pairs. In cases where only one is installed, they need to be sure the pads they get for the other side exactly matches the ones in the caliper. Suppliers should also strongly suggest installers replace all related hardware on the other side, too.



Surveys show that brake hardware is usually not replaced until it's so worn that it may lead to erratic brake operation. Installing fresh hardware at each friction replacement is part of a complete job that helps ensure proper brake performance and long service life.

Many manufacturers are on record stating rotors should not be resurfaced on their vehicles as a routine matter. General Motors and Ford both recommend reusing rotors 'as is' if they meet specifications for minimum thickness, thickness variation, parallelism and runout, no pulsation is present and they aren't badly scored. GM goes on to state that scoring up to .060 inch is acceptable.

None of this means suppliers or technicians will be discarding their lathes anytime soon. Many rotors will still be found scored, warped or with thickness variation beyond manufacturer's specs but with sufficient thickness to allow for resurfacing. Also, there is one situation in which even a perfectly conditioned rotor should be turned: when its partner on an axle requires resurfacing. Otherwise, using one rotor with already-conditioned surfaces opposite one with fresh surfaces is likely to cause a comeback for brake-pull symptoms.



Renewing pads or shoes: complete, step-by-step

The complete procedure installers should use for replacing friction material and renewing the performance of a pair of front or rear brakes isn't rocket science, but there is more to it than hang-and-turn. And the few extra items and minutes it takes are a good investment because they should virtually eliminate comebacks. Here is a look at what should be done:

1. **Q&A:** Ask the motorist if he has any complaints about the vehicle's brake operation.
2. **Test drive (if possible):** If the customer does have specific complaints, he should drive with the technician present. Otherwise, the technician should take the wheel to determine if pulls, pulsations or other abnormal conditions are present.
3. **Inspect:** Technicians should look closely at all parts related to the job. If servicing disc brake pads measure rotors and check for runout, look for signs of caliper leakage and check caliper mounting. Visually check hoses for cracks and look at the brake tubing and master cylinder. (Brake components at the other axle deserve a look-see also. This may warn the consumer of possible upcoming problems and provide more work for the installer.)
4. **Dismantle:** With disc brakes, remove the caliper and hang with wire if the hose remains attached. Remove old pads and hardware. Inspect caliper piston and boot (or wheel cylinder) closely for signs of leaks. If rotors meet requirements for reuse, leave undisturbed. Remove rotors requiring resurfacing or replacement. With drum brakes, measure the drum diameter and check for step-worn backing plate ledges, which may require backing plate replacement if too severe to file-dress.
5. **Make room:** If reusing the caliper, retract the piston into the bore. Avoid fluid back up into the master cylinder reservoir by opening the bleeder or loosening the hose connection at the caliper. (Note: If ABS-equipped, it may be necessary to depressurize the accumulator before opening the fluid circuit. Check vehicle manufacturer's recommended procedures.)

Companion parts

Seasoned, alert counter salespeople can be like gold to technicians - even experienced ones. Often, it's simply by reminding them of something they already know.

For example, brake hardware is notoriously overused. Several jobbers we know always ask their customers buying pads and shoes if they want new hardware - a subtle reminder that the job isn't complete without these low-cost parts. After all, something as simple as a fatigued anti-rattle clip can lead to a comeback.

One jobber I know actually keeps a file of 'companion parts' certain models often need, based on the experiences of his customers. The anti-rattle clips used with the D52 series of disc brake pads (certain large GM cars and light trucks) are on his list. He's learned they almost routinely break or deform upon removal. This jobber automatically ships new clips with these pads. He's no doubt saved his customers numerous comebacks as a result.

6. **Rotor indexing:** If a rotor was removed, clean the hub flange and rotor hat section. Install the slip-on rotor, using at least two lug nuts to hold it in place while checking for runout. If runout is excessive, 'index' the rotor by removing it, rotating clockwise one lug position at a time and checking the runout reading. If the lowest runout reading is within specs, the rotor and flange may be used in that position.
7. **Part installation:** Install new pads/shoes and hardware, applying approved brake lubricant with care where needed. Don't forget shims with disc brake pads and clinch, if required; or install a loaded caliper to save time. Replace the brake hose if the inspection showed cracks or abrasions.
8. **Bleed:** If any hose or tubing was disconnected, bleed according to service manual. (Note: Many vehicle makers recommend every-other-year fluid flushing and replacement. This may be an ideal time to suggest this procedure to the customer.)
9. **Wheels on:** Install wheels and torque lug nuts to manufacturer's specs.
10. **Complete the job:** Inspect/adjust fluid level in master cylinder. Test drive and perform break-in procedure.

