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## How To

## Heel and Toe Downshift

By [Brent Romans](#)

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If you have heard of the term "heel-and-toe" downshift before, but you've never known what it means, you've come to the right place. It is the mission of this article to make you a heel-and-toe master, a proverbial Jackie Chan of downshifts. Hi-yah!

A heel-and-toe downshift refers to a specific technique used to downshift a manual transmission car. It might seem bizarre to the general populace, but racecar drivers use it all the time. Once mastered, the heel-and-toe downshift offers the benefits of reduced vehicle wear-and-tear, better driver control and faster lap times on a racetrack.

The heel-and-toe downshift is a rather complex action involving both of the driver's feet, the driver's right hand, all three vehicle pedals and the gear shift lever. The purpose of the heel-and-toe is to smoothly match engine speed to wheel speed. Here is a generalization of how a normal person downshifts a manual transmission car.

Let's say Frank is driving his '01 Volkswagen Passat around town. He is approaching a right-hand corner while in fourth gear at 50 mph. He is going too fast to make it around the corner safely, so he starts braking until he drops the Passat's speed to about 25 mph. Frank sees on the tachometer that his engine revs are dropping too low, so he pushes in the clutch as he goes around the corner. As Frank thinks about accelerating, he realizes that the Passat is still in fourth gear, which isn't suitable for strong acceleration at such slow speeds. So he moves the shifter from fourth to second gear, lets out the clutch and motors away.

The problem with Frank's technique is that when he lets out the clutch, it is not going to be a smooth shift. The Passat is going to buck a little. Why? Because when Frank goes around the corner with the clutch pushed in, the engine revs drop to idle speed. When he releases the clutch, the mechanical locking effect between the engine and the front wheels (the wheels powered by a Passat) forces the engine revs to match the rotational speed of the rear wheels. In this case, 25 mph in second gear would mean the engine has to be at roughly 2,600 rpm. When Frank lets out the clutch after moving the shifter to second gear, his car's engine must instantly go from idle to 2,600 rpm. This sudden change causes the car to buck, as well as causing undue wear-and-tear on the clutch, transmission and engine mounts.

The simple solution for Frank would be to give the car some throttle before he lets out the clutch. Specifically, he should raise the engine speed to 2,600 rpm. This way, the engine speed is equalized to the wheel speed for second gear, making the shift much smoother. For racecar drivers, however, this technique is too slow and also means that when the car is going around the corner, the clutch is pushed in, a serious no-no in a racecar.

The racer's answer is the heel-and-toe downshift. The technique combines braking and downshifting at the same time. Using our example again, if Frank used a heel-and-toe downshift, he would have downshifted while he was braking for the corner. This way, he would have had power while he was going

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Position 5 (Photo by Brent Romans)



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Position 6 (Photo by Brent Romans)

around the corner and he could have quickly applied more throttle once he exited the corner. These are critical elements to a racecar driver, but they can also be useful to any driver on the street.

Here is a step-by-step guide on how to heel-and-toe downshift. It will explain how to shift from fourth gear to third gear, though the technique will work for any downshift.

1. Begin braking for the corner with your right foot. The location of the pedals and the size of your foot will dictate where you position your foot on the pedal, but most likely it should be canted a little to the right, closer to the throttle pedal.
2. Push in the clutch with your left foot.
3. Move the shifter from fourth gear to neutral
4. This is the hard part. With your right foot still applying pressure to the brakes, roll the outside edge of your foot outward and downward to touch the throttle pedal. The pedal design on some cars makes this easier to do than on others. Use the outside of your right foot to blip the throttle. Blipping the throttle means temporarily raising the engine rpms to match the wheel speed. The exact amount of revs needed is dependent on a variety of factors, but it is usually between 1,000 rpm to 2,000 rpm more than the current engine rpm for a one-gear downshift.
5. Move the shifter from neutral to third gear.
6. Release the clutch with your left foot.

As you can see, "heel-and-toe" is a misnomer. It actually involves the ball of your foot and the side of your foot. We'll be the first to tell you that heel-and-toe downshifts aren't easy. We've found that a good way to practice is to just sit in your car in your garage and pretend you are doing a heel-and-toe downshift with the engine off. Keep repeating the steps until you are familiar with the process. Once you are ready, try it out for real. Most likely, your early attempts will be botched. Keep trying, though. Practice each step slowly and then work your way to making them all one, fluid motion. Skilled drivers can execute a heel-and-toe downshift in less than one second.

The trickiest part is getting the correct amount of rpms to match the new gear. If you blip the throttle too much, the engine has too much speed compared to the wheels and is forced to drop down to the wheel speed when you let out the clutch. If you don't blip the throttle enough, the engine rpms are forced to rise up. Either way, you know you didn't do it right as the car will jerk a little.

You'll also know it when you did it right. A proper heel-and-toe downshift is so smooth and so satisfying that, once done correctly, you'll find yourself using the technique all the time. The great thing is that you don't have to be a racecar driver or be on a racetrack to use it. Additionally, using the heel-and-toe downshift technique on the street can improve safety. In certain emergency situations, you might be required to brake heavily and then accelerate quickly. By heel-and-toe downshifting, your car will be in the best gear to achieve maximum acceleration.

So, let's recap. It's fun to do. It improves driving safety. It reduces the amount of powertrain wear on your car. Other than the amount of time it takes to learn, there is no downside. What more could you want?

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