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94 f150 manual transmission fluid

If you drive a stick-shift car, then you may have more questions floating in your head. How does the funny H pattern like I move this shift button through any relation to the gears inside the transmission? What moves inside the transfer when I move shifter? Ad When I messed up and hear that terrible grinding sound, what exactly is grinding? What would happen if I accidentally shifted to reverse while driving down the highway? Would the whole transfer explode? In this article we will answer all these questions and more as we explore the interior of a manual transmission. Cars need transmissions because of the physics of the gasoline engine. Firstly, any engine has a red line - a maximum speed value that the engine cannot go over without exploding. Secondly, if you've read How HorsePower Works, then you know that the engines have narrow rpm ranges where horsepower and torque are at their maximum. For example, an engine can produce its maximum horsepower at 5500 rpm. The transmission allows the gear ratio between the engine and the drive wheels to change as the car increases speed and slows down. You change gears so that the engine can stay under the redline and close to the rpm band of its best performance. Ideally, the transmission would be so flexible in its conditions that the engine could always run at its single, best performance rpm value. That's the idea behind the continuously variable transmission (CVT). We'll talk about the next thing. Content A continuously variable transmission (CVT) has an almost infinite range of gear ratios. Previously, CVTs could not compete with four-speed and five-speed transmissions in terms of cost, size and reliability, so you didn't see them in production cars. These days, improvements in design have made CVTs more common. The transmission is connected to the motor through the clutch. The input shaft in the transmission therefore fluctuates at the same speed as the engine, which improves both output power and fuel economy. CVTs became common in hybrid cars because they are significantly more efficient than both manual and traditional automatic transmissions, and their popularity exploded from there as automakers competed for the best possible fuel economy ratings. As of the end of 2016, one in four cars sold in the United States was equipped with a CVT. CVT has its drawbacks; especially it can be slow to drive, since it is designed for efficiency instead of fun. However, as many drivers choose to move away from manual transmission, resulting in fewer manuals on offer, CVT continues to increase its presence. CVT also works best in small cars with small engines, which is why most trucks and large SUVs continue to use traditional automatics. You can read How CVTs work for even more information about how continuously variable transfers Now let's look at an easy transfer. To understand the basic idea behind a standard transfer, the chart on the left shows a very simple two-step transfer in neutral. Let's look at each part of this diagram to understand how they fit together: The green shaft comes from the engine through the clutch. The green shaft and green equipment are connected as a single unit. (The clutch is a device that allows you to connect and disconnect the engine and transmission.) When you push the clutch pedal, the motor and gearbox are disconnected so that the motor can run even if the car is stationary. When you release the clutch pedal, the motor and the green shaft are directly connected to each other. The green axle and gear rotate at the same speed as the engine. The red shaft and gears are called layshaft. These are also connected as a single piece, so all the gears on layshaft and layshaft even spin as a device. The green shaft and the red shaft are directly connected through their meshed gears, so that if the green shaft spins, then the red shaft is. In this way, layshaft receives its power directly from the engine when the clutch is engaged. The yellow axle is a splined axle that connects directly to the drive shaft through the differential of the drive wheels of the car. If the reels spin, the yellow axle spins. The blue gears ride on bearings so that they spin on the yellow shaft. If the engine is off but the car is coasting, the yellow axle can swing inside the blue gears while the blue gears and layshaft are motionless. The purpose of the collar is to connect one of the two blue gears to the yellow drive shaft. The collar is connected, through splines, directly to the yellow shaft and spins with the yellow shaft. However, the collar can slide left or right along the yellow shaft to activate one of the blue gears. Teeth on the collar, called dog nos, fit into holes on the sides of the blue gears to engage them. Let's see what happens when you change to first gear. Ad The image on the left shows how the purple collar, when moved to the first gear, engages the blue gear on the right. As the graphics demonstrate, the green shaft from the engine turns layshaft, which makes the blue equipment on the right. This equipment transfers its energy through the collar to drive the yellow drive shaft. Meanwhile, the blue equipment on the left is turning, but there is freewheeling in the bearing, so that it has no effect on the yellow shaft. When the collar is between the two gears (as shown in the figure on the previous side), the transfer is in neutral. Both blue gears freewheel on the yellow shaft at the different prices controlled by their relationship to layshaft. Ad From this discussion, you can answer more questions: When you make a mistake while changing and hearing terrible grinding sound, you do not hear the sound of giving teeth mis-meshing. As you can see in these charts, all gears are all fully masked at all times. The grinding is the sound of the dog teeth trying unsuccessfully to engage the holes in the side of a blue device. The transfer shown here does not have synchros (discussed later in the article), so if you used this transfer you need to double-clutch it. Double-clutching was common in older cars and is still common in some modern race cars. In double-clutching, you first push the clutch pedal in once to release the engine from the transmission. This takes the pressure off the dog teeth so you can move the collar to neutral. Then release the clutch pedal and turn the motor to the correct speed. The correct speed is the rpm value that the engine will run in the next gear. The idea is to get the blue gear to the next gear and the collar rotates at the same speed, allowing the dog teeth to engage. Then push the clutch pedal back in and lock the collar into the new gear. With each gear shift, you need to press and drop the clutch twice, hence the name double-clutching. You can also see how a small linear motion in the gear shift button allows you to switch gears. The shifting button moves a rod connected to the fork. The fork pushes the collar of the yellow shaft to activate one of two gears. In the next section, we take a look at a real transfer. Four-speed manual transfers are largely outdated, with five- and six-speed transfers taking their place as the most common options. Some performance cars can offer even more gears. But they all work more or less the same, regardless of the number of gears. Internally, it looks something like this: There are three forks controlled by three rods engaged by the gear lever. Looking at shift rods from the top, they look like this in reverse, first and second gears: Advertising Remember that the gear lever has a rotation point in the middle. When you push the knob forward to insert the first gear, you actually pull the rod and fork for the first gear back. You can see that when you move shifter left and right you engage different forks (and therefore different collars). If you move the knob forward and backward, move the collar to insert one of the gears. Reverse is handled by a small idler gear (purple). At all times, the blue reverse gear in this diagram above turns in a direction opposite all the other blue gears. Therefore, it would be impossible to throw the transmission in reverse while the car moves forward; the dog teeth would never engage. But they will make a lot of noise. Synchronization Manual transfers in modern passenger cars use synchronisation, or synchros, to eliminate the need for double-clutching. A synchro's purpose is to collar and equipment to make frictional contact before the dog teeth come into contact. This allows the collar and gear to synchronise the speeds before the teeth need to be engaged, as follows: The cone of the blue gear fits into the cone-shaped area of the collar, and the friction between the cone and the collar synchronizes the collar and gear. The outer part of the collar then slides so that the dog teeth can engage the equipment. Each manufacturer implements transfers and synchros in different ways, but this is the general idea. The automated manual transmission is perhaps better known and more accurately described as dual-clutch automatically, and it is an increasingly popular option. Although dual-clutch automatic transmissions became popular on high-end performance cars, such as Porsches and Audis, it is increasingly available on more mainstream models. Dual-clutch automatically operates via two clutches, which are controlled by the car's computer network and require no input from the driver. As we discussed, when the clutch in a manual transmission is activated, it disconnects the engine from the transmission to activate the shift. Dual-clutch automatically operates two different gears at once, which completes the shift while bypassing the power-connect stage. It allows a dual-clutch transmission to complete shifts much faster, since there is no break while the engine and transmission are trying to match up again. Ad The car is faster since there is no interruption in power, the trip is smoother since it is all but impossible to determine the moment of gear shift, and the fuel economy is better because there is no power lost to inefficient shifts. You can read about dual-clutch transfers in more detail here. It's worth adding that some cars with dual-clutch automatics offer a manual shifting mode, usually via steering wheel-mounted paddle changers, but the experience isn't the same. Some performance enthusiasts may regret the loss of the row-it-yourself experience, since manual shifting is a pleasant skill to practice and perfect, but if speed is the ultimate goal, it is difficult to argue with the results of an automated manual transmission. As of the end of 2016, only 5 percent of new cars were sold with manual transmissions, according to US News & World Report. That's down from a peak of around 25 percent in 1987. Even if you are among the rare car buyer who prefers to run a manual, you will have a hard time finding one the next time you go to a dealership. Some manufacturers keep the manual around as an excuse to charge more for an automatic or CVT, but the back of it is difficult to get a well-equipped car with manual transmission. For options such as engine upgrades or four-wheel drive, these features often only come on models or trim levels that don't offer manual transfers. Sports cars, which to be sure fire ways to get manual transfers, is also turning towards faster and more efficient automatic options. Advertising Automakers says that automatic transfers are simply better in every way, especially cvt and dual-clutch options we covered on previous pages. Actual interest in owning a car with manual gearbox is on the decline, too, especially as American drivers spend more time sitting in heavy traffic, where constantly suspension a clutch pedal can get tiring. As US News reported, as drivers encounter several of these excellent modern automations, fewer are interested in learning how to run a manual. Originally published: 01.04.2000 2000