Car manual gear system

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Book Descriptions:

Car manual gear system

It uses a driveroperated clutch, usually engaged and disengaged by a foot pedal or hand lever, for regulating torque transfer from the engine to the transmission; and a gear selector that can be operated by hand.Higherend vehicles, such as sports cars and luxury cars are often usually equipped with a 6speed transmission for the base model. Automatic transmissions are commonly used instead of manual transmissions; common types of automatic transmissions are the hydraulic automatic transmission, automated manual transmission, dualclutch transmission and the continuously variable transmission CVT. The number of forward gear ratios is often expressed for automatic transmissions as well e.g., 9speed automatic.Most manual transmissions for cars allow the driver to select any gear ratio at any time, for example shifting from 2nd to 4th gear, or 5th to 3rd gear. However, sequential manual transmissions, which are commonly used in motorcycles and racing cars, only allow the driver to select the nexthigher or nextlower gear.A clutch sits between the flywheel and the transmission input shaft, controlling whether the transmission is connected to the engine clutch engaged the clutch pedal is not being pressed or not connected to the engine clutch disengaged the clutch pedal is being pressed down. When the engine is running and the clutch is engaged i.e., clutch pedal up, the flywheel spins the clutch plate and hence the transmission.This is a fundamental difference compared with a typical hydraulic automatic transmission, which uses an epicyclic planetary design. Some automatic transmissions are based on the mechanical build and internal design of a manual transmission, but have added components such as servocontrolled actuators and sensors which automatically control the gear shifts and clutch; this design is typically called an automated manual transmission or a clutchless manual transmission .http://ammarcomplex.com/fckimages/dyson-vacuum-manual-pdf.xml

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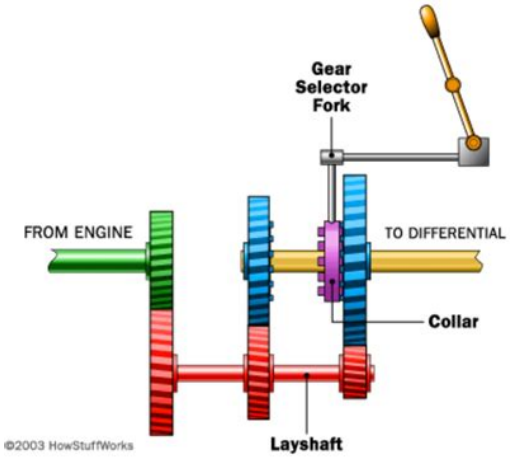
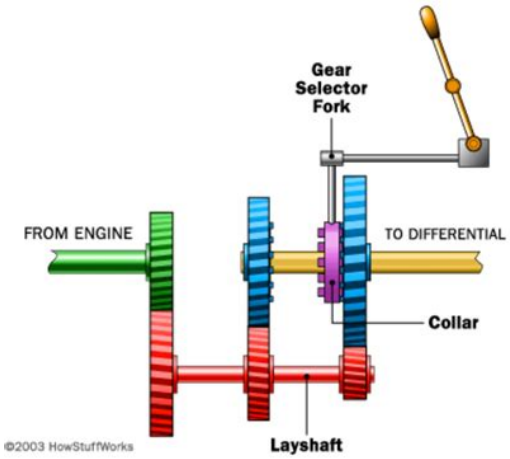


Operating such transmissions often uses the same pattern of shifter movement with a single or multiple switches to engage the next sequence of gears.The driver was therefore required to use careful timing and throttle manipulation when shifting, so the gears would be spinning at roughly the same speed when engaged; otherwise, the teeth would refuse to mesh.Fivespeed transmissions became widespread during the 1980s, as did the use of synchromesh on all forward gears.This allows for a narrower transmission since the length of each countershaft is halved compared with one that contains four gears and two shifters.For example, a fivespeed transmission might have the firsttosecond selectors on the countershaft, but the thirdtofourth selector and the fifth selector on the main shaft. This means that when the vehicle is stopped and idling in neutral with the clutch engaged and the input shaft spinning, the third, fourth, and fifthgear pairs do not rotate.For reverse gear, an idler gear is used to reverse the direction in which the output shaft rotates. In many transmissions, the input and output shafts can be directly locked together bypassing the countershaft to create a 11 gear ratio which is referred to as direct drive.The assembly consisting of both the input and output shafts is referred to as the main shaft although sometimes this term refers to just the input shaft or output shaft. Independent rotation of the input and output shafts is made possibly by one shaft being located inside the hollow bore of the other shaft, with a bearing located between the two shafts.The input shaft runs the whole length of the gearbox, and there is no separate input pinion.When the dog clutches for all gears are disengaged i.e. when the transmission is in neutral, all of the gears are able to spin freely around the output shaft.https://flothmeier.com/userfiles/dyson-vacuum-manual.xml

When the driver selects a gear, the dog clutch for that gear is engaged via the gear selector rods, locking the transmissions output shaft to a particular gear set.It has teeth to fit into the splines on the shaft, forcing that shaft to rotate at the same speed as the gear hub. However, the clutch can move back and forth on the shaft, to either engage or disengage the splines. This movement is controlled by a selector fork that is linked to the gear lever. The fork does not rotate, so it is attached to a collar bearing on the selector. The selector is typically symmetric it slides between two gears and has a synchromesh and teeth on each side in order to lock either gear to the shaft. Unlike some other types of clutches such as the footoperated clutch of a manualtransmission car, a dog clutch provides nonslip coupling and is not suited to intentional slipping.These devices automatically match the speed of the input shaft with that of the gear being selected, thus removing the need for the driver to use techniques such as double clutching.Therefore, to speed up or slow down the input shaft as required, coneshaped brass synchronizer rings are attached to each gear. In a modern gearbox, the action of all of these components is so smooth and fast it is hardly noticed. Many transmissions do not include synchromesh on the reverse gear see Reverse gear section below.This is achieved through blocker rings also called baulk rings. The synchro ring rotates slightly because of the frictional torque from the cone clutch. In this position, the dog clutch is prevented from engaging. Once the speeds are synchronized, friction on the blocker ring is relieved and the blocker ring twists slightly, bringing into alignment certain grooves or notches that allow the dog clutch to fall into the engagement.The latter involves the stamping the piece out of a sheet metal strip and then machining to obtain the exact shape required.

These rings and sleeves have to overcome the momentum of the entire input shaft and clutch disk during each gearshift and also the momentum and power of the engine, if the driver attempts a gearshift without fully disengaging the clutch. Larger differences in speed between the input shaft and the gear require higher friction forces from the synchromesh components, potentially increasing their wear rate.This means that moving the gearshift lever into reverse results in gears moving to mesh together. Another unique aspect of the reverse gear is that it consists of two gears— an idler

gear on the countershaft and another gear on the output shaft— and both of these are directly fixed to the shaft i.e. they are always rotating at the same speed as the shaft. These gears are usually spur gears with straightcut teeth which— unlike the helical teeth used for forward gear— results in a whining sound as the vehicle moves in reverse.To avoid grinding as the gears begin to the mesh, they need to be stationary. Since the input shaft is often still spinning due to momentum even after the car has stopped, a mechanism is needed to stop the input shaft, such as using the synchronizer rings for 5th gear.This can take the form of a collar underneath the gear knob which needs to be lifted or requiring extra force to push the gearshift lever into the plane of reverse gear.Without a clutch, the engine would stall any time the vehicle stopped and changing gears would be difficult deselecting a gear while the transmission requires the driver to adjust the throttle so that the transmission is not under load, and selecting a gear requires the engine RPM to be at the exact speed that matches the road speed for the gear being selected.In most automobiles, the gear stick is often located on the floor between the driver and front passenger, however, some cars have a gear stick that is mounted to the steering column or center console.



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Gear selection is usually via the left foot pedal with a layout of 1 N 2 3 4 5 6. This was actuated either manually while in high gear by throwing a switch or pressing a button on the gearshift knob or on the steering column, or automatically by momentarily lifting the foot from the accelerator with the vehicle traveling above a certain road speed.When the crankshaft spins as a result of the energy generated by the rolling of the vehicle, the motor is cranked over. This simulates what the starter is intended for and operates in a similar way to crank handles on very old cars from the early 20th century, with the cranking motion being replaced by the pushing of the car.This was often due to the manual transmission having more gear ratios, and the lockup speed of the torque converters in automatic transmissions of the time.The operation of the gearstick— another function that is not required on automatic transmission cars— means that the drive must use take one hand off the steering wheel while changing gears. Another challenge is that smooth driving requires coordinated timing of the clutch, accelerator, and gearshift inputs. Lastly, a car with an automatic transmission obviously does not require the driver to make any decisions about which gear to use at any given time.This means that the drivers right foot is not needed to operate the brake pedal, freeing it up to be used on the throttle pedal instead. Once the required engine RPM is obtained, the driver can release the clutch, also releasing the parking brake as the clutch engages.Please help improve it by rewriting it in an encyclopedic style. June 2020 Learn how and when to remove this template message Multicontrol transmissions are built in much higher power ratings but rarely use synchromesh.Usual types areThe first through fourth gears are accessed when low range is selected.

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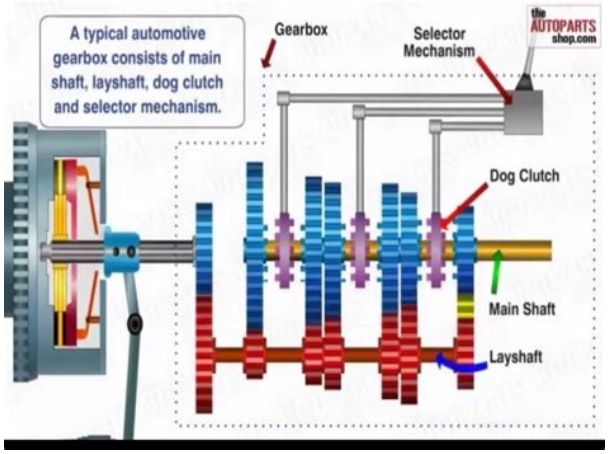

To access the fifth through eighth gears, the range selector is moved to high range, and the gear lever again shifted through the first through fourth gear positions. In high range, the first gear position becomes fifth, the second gear position becomes sixth, and so on. This allows even more gear ratios. Both a range selector and a splitter selector are provided. In older trucks using floormounted levers, a bigger problem is common gear shifts require the drivers to move their hands between shift levers in a single shift, and without synchromesh, shifts must be carefully timed or the transmission will not engage. Also, each can be split using the thumbactuated underoverdrive lever on the left side of the knob while in high range. L cannot be split using the thumb lever in either the 13 or 18speed. The 9speed transmission is basically a 13speed without the underoverdrive thumb lever.Transmissions may be in separate cases with a shaft in between; in separate cases bolted together; or all in one case, using the same lubricating oil. With a third transmission, gears are multiplied yet again, giving greater range or closer spacing. Some trucks thus have dozens of gear positions, although most are duplicates. Twospeed differentials are always splitters. In newer transmissions, there may be two countershafts, so each main shaft gear can be driven from one or the other countershaft; this allows construction with short and robust countershafts, while still allowing many gear combinations inside a single gear case.One argument is synchromesh adds weight that could be payload, is one more thing to fail, and drivers spend thousands of hours driving so can take the time to learn to drive efficiently with a nonsynchromesh transmission. Since the clutch is not used, it is easy to mismatch speeds of gears, and the driver can quickly cause major and expensive damage to the gears and the transmission.

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Since few heavyduty transmissions have synchromesh, automatic transmissions are commonly used instead, despite their increased weight, cost, and loss of efficiency.Diesel truck engines from the 1970s and earlier tend to have a narrow power band, so they need many closespaced gears. Starting with the 1968 Maxidyne, diesel truck engines have increasingly used turbochargers and electronic controls that widen the power band, allowing fewer and fewer gear ratios. A transmission with fewer ratios is lighter and may be more efficient because there are fewer transmissions in series. Fewer shifts also make the truck more drivable.Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. June 2020 Learn how and when to remove this template message Gear oil has a characteristic aroma because it contains added sulfurbearing antiwear compounds. These compounds are used to reduce the high sliding friction by the helical gear cut of the teeth this cut eliminates the characteristic whine of straight cut spur gears .Retrieved 10 March 2020. By using this site, you agree to the Terms of Use and Privacy Policy. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed.In an automatic transmission equipped vehicle, a similar device is known as a gear selector. A gear stick will normally be used to change gear whilst depressing the clutch pedal with the left foot to disengage the engine from the drivetrain and wheels. Automatic transmission vehicles, paddleshifted automated manual transmission, older semiautomatic transmission vehicles, like VW Autostick, and those with continuously variable transmission gearboxes do not require a clutch pedal.Some vehicles have a column shift where the lever is mounted on the steering column —this arrangement was almost standard practice in American vehicles from about 1939 until relatively recently.

It had the added benefit of allowing for a full width benchtype front seat though some models with bucket seating as an option include it. A dashboard mounted shift was common on certain French models such as the Citroen 2CV and Renault 4. Both the Bentley Mark VI and the Riley Pathfinder had their gear lever to the right of the righthand drive drivers seat, alongside the drivers door, where it was not unknown for British cars to also have their handbrake. Lefthand drive models received a column shift.Typically the gear knob includes a diagram of the shift pattern of the gear selection system, i.e. the positions to which the gear stick should be moved when selecting a gear. In some older manual transmission vehicles, the knob may incorporate a switch to engage an overdrive; in some automatic transmission vehicles it may incorporate a switch to engage a special mode such as a sports mode or to disengage overdrive. Both of the abovementioned switches may also be found on the console or on steering column stalks instead.Therefore, novice drivers are taught to rock the knob of a manual gearbox from side to side before starting the engine to confirm that the gearbox is in neutral. For the same reason, modern cars require the clutch pedal to be

depressed before the starter will engage though some modern vehicles have a button that disables the clutch start requirement if held down when starting, for rare situations when starting the car in gear is necessary. The latter practice is also useful in extremely cold conditions or with a weak battery, as it avoids the starter motor also having to turn over a gearbox full of cold and highly viscous oil.The Land Rover Freelander introduced a button for that companys Hill Descent Control system feature, which uses the brakes to simulate the function of a lowratio gearbox in steep descents.In a typical manual transmission car, first gear is located to the left, and forwards.

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There is usually a springloading to return the stick to the central position. Reverse gear is commonly positioned in the best choice of location to avoid accidental engagement.Some vehicles have a special button to prevent accidental engagement of reverse. Others require that the lever be lifted, pressed down, or moved with extra force to engage reverse. In transmissions with reverse directly below fifth, there may be a mechanical lockout preventing selection of reverse other than from neutral, thus preventing a driver used to a sixspeed transmission from engaging reverse while trying to select sixth. Some transmissions also have an electronically controlled errorprevention safeguard that blocks the first and sometimes the second gear from being selected if the vehicle is moving fast enough to exceed the engines maximum RPM.This layout is reasonably intuitive because it starts at the upper left and works left to right, top to bottom, with reverse at the end of the sequence and toward the rear of the car.The name derives from the upandover path between first and second gears. Its use is common in race cars and sports cars, but is diminishing as sixspeed and sequential gearboxes are becoming more common. Having first gear across the dogleg is beneficial as first gear is traditionally only used for getting the car moving and hence it allows second and third gears to be aligned fore and aft of each other, which facilitates shifting between the two. As most racing gearboxes are nonsynchromesh there is no appreciable delay when upshifting from first through the dogleg into second.Six speeds is the maximum usually seen in single range transmissions, however many semitrucks and other large commercial vehicles have manual transmissions with 8, 16 or even 20 speeds, which is made possible due to multirange gearboxes.

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Higher number of speeds in automobiles are rare occurrences, although examples do exist, such as the Porsche 911, which is equipped with a sevenspeed manual transmission.Found like this in Peugeot 403 and 404 until September 1967.This can be useful in snow or dirt conditions, where it may be necessary to start from second gear.This has allowed designers to replace the gear stick completely with either button, rotary knobs current Jaguar, Land Rover and Ford models are good examples of this, or a miniaturized gear stick on the center console. This can be seen in some Audis, BMWs and the Lincoln Continental. Japanese finger shift is another example. It is a revival of an approach used in the 1950s by the Chrysler pushbutton PowerFlite and the Packard Touchbutton Ultramatic.Made of many materials from simple plastics through to platinum it comes in many shapes sizes and weights. Generally, spherical in shape the OEM versions tend towards the conservative, and the automotive aftermarket versions can be found to be of the very original design.Please help improve this section by adding citations to reliable sources. Unsourced material may be challenged and removed. May 2010 Learn how and when to remove this template message Initially designed to be used in tandem with a short shifter, it is increasingly being purchased for stock stick shifts. The weight generally varies between 400 and 600 grams or more, depending on the material used. The principle of the weighted shift knob is to make the stick shifter topheavy, thus increasing the throw momentum in order to decrease the time between shifts. Weighted gear knobs are offered for sale by a variety of North Americanbased manufacturers in many shapes and finishes, though they are significantly more expensive than the commonly available aftermarket shift knob.By

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The lower the gear, the slower the road wheels turn in relation to the The synchromesh unit, splined the the mainshaft, rests near by.Friction surfaces synchronise the shaft speeds, and synchromesh and gear lock together.The selector rods lie parallel with shafts carrying the gears. It has three shafts the The layshaft rotates the gears on the mainshaft, but these rotate freely until they are locked by means of the synchromesh device, which is splined to the shaft. It prevents engagement of a gear until the shaft speeds are synchronised. Drive is transmitted through the input shaft to the layshaft and then to the mainshaft, except in direct drive top gear when the input shaft and the mainshaft are locked together.The gears on the output shaft revolve freely around it, while those on the layshaft are fixed. No drive is being transmitted.The ratio is ideal for climbing very steep hills.There is no increase in torque.Reverse gear is usually not synchronised.The baulk ring also has dog teeth; it is made of softer metal and is a looser Clearly and easily explained. I dont really have adverts here its funded by wonderful people buying the Car Mechanics Video Course. If youre into design, go and check them out. What would happen if I were to accidentally shift into reverse while I am speeding down the freeway. Would the entire transmission explode First, any engine has a redline — a maximum rpm value above which the engine cannot go without exploding. Second, if you have read How Horsepower Works, then you know that engines have narrow rpm ranges where horsepower and torque are at their maximum. For example, an engine might produce its maximum horsepower at 5,500 rpm. The transmission allows the gear ratio between the engine and the drive wheels to change as the car speeds up and slows down. You shift gears so the engine can stay below the redline and near the rpm band of its best performance. That is the idea behind the continuously variable transmission CVT.

Well talk about that next. In the past, CVTs could not compete with fourspeed and fivespeed transmissions in terms of cost, size and reliability, so you didnt see them in production automobiles. These days, improvements in design have made CVTs more common. The input shaft of the transmission therefore turns at the same rpm as the engine, which improves both power output and fuel economy. CVTs became common in hybrid cars because they are considerably more efficient than both manual and traditional automatic transmissions, and their popularity skyrocketed from there as automakers competed for the best possible fuel economy ratings. As of late 2016, one out of every four cars sold in the United States was equipped with a CVT. However, as many drivers choose to move away from the manual transmission, which results in fewer manuals being offered, the CVT continues to increase its presence. The CVT also works best in small cars with small engines, which is why most trucks and large SUVs continue to use traditional automatics. Now lets look at a simple transmission. Lets look at each of the parts in this diagram to understand how they fit together The green shaft and green gear are connected as a single unit. The clutch is a device that lets you connect and disconnect the engine and the transmission. When you push in the clutch pedal, the engine and the transmission are disconnected so the engine can run even if the car is standing still. When you release the clutch pedal, the engine and the green shaft are directly connected to one another. The green shaft and gear turn at the same rpm as the engine. The red shaft and gears are called the layshaft. These are also connected as a single piece, so all of the gears on the layshaft and the layshaft itself spin as one unit. The green shaft and the red shaft are directly connected through their meshed gears so that if the green shaft is spinning, so is the red shaft.

In this way, the layshaft receives its power directly from the engine whenever the clutch is engaged. The yellow shaft is a splined shaft that connects directly to the drive shaft through the differential to the drive wheels of the car. If the wheels are spinning, the yellow shaft is spinning. The blue gears ride on bearings, so they spin on the yellow shaft. If the engine is off but the car is coasting, the yellow shaft can turn inside the blue gears while the blue gears and the 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 the 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 engage either of the blue gears. Teeth on the collar, called dog teeth, fit into holes on the sides of the blue gears to engage them. As the graphic demonstrates, the green shaft from the engine turns the layshaft, which turns the blue gear to its right. This gear transmits its energy through the collar to drive the yellow drive shaft. Meanwhile, the blue gear on the left is turning, but it is freewheeling on its bearing so it has no effect on the yellow shaft. Both of the blue gears freewheel on the yellow shaft at the different rates controlled by their ratios to the layshaft. As you can see in these diagrams, all gear teeth are all fully meshed at all times. The grinding is the sound of the dog teeth trying unsuccessfully to engage the holes in the side of a blue gear. Doubleclutching was common in older cars and is still common in some modern race cars. In doubleclutching, you first push the clutch pedal in once to disengage the engine from the transmission. This takes the pressure off the dog teeth so you can move the collar into neutral. The idea is to get the blue gear of the next gear and the collar rotating at the same speed so that the dog teeth can engage.

Then you push the clutch pedal in again and lock the collar into the new gear. The gear shift knob moves a rod connected to the fork. The fork slides the collar on the yellow shaft to engage one of two gears. Some performance cars may offer even more gears. However, they all work more or less the same, regardless of the number of gears. Internally, it looks something like this Looking at the shift rods from the top, they look like this in reverse, first and second gear When you push the knob forward to engage first gear, you are actually pulling the rod and fork for first gear back. Moving the knob forward and backward moves the collar to engage one of the gears. At all times, the blue reverse gear in this diagram above is turning in a direction opposite to all of the other blue gears. Therefore, it would be impossible to throw the transmission into reverse while the car is moving forward; the dog teeth would never engage. However, they will make a lot of noise. A synchros purpose is to allow the collar and the gear to make frictional contact before the dog teeth make contact. This lets the collar and the gear synchronize their speeds before the teeth need to engage, like this The outer portion of the collar then slides so that the dog teeth can engage the gear. Drivers can use the selector lever or shift paddles on the steering wheel to shift themselves. Audi Though the dualclutch automatic transmission became popular on highend performance cars, such as Porsches and Audis, it is increasingly available on more mainstream models. As we discussed, when the clutch in a manual transmission is engaged, it disconnects the engine from the transmission to enable the shift. The dualclutch automatic operates two different gears at once, which completes the shift while bypassing the powerdisconnect stage.You can read about dualclutch transmissions in more detail here.

Some manufacturers keep the manual around as an excuse to charge more for an automatic or CVT, but the flip side of that is its difficult to get a wellequipped car with a manual transmission. If you want options such as engine upgrades or allwheel drive, those features often come only on models or trim levels that do not offer manual transmissions. Sports cars, which used to be surefire ways to get manual transmissions, are also turning toward faster and more efficient automatic options. Why a CVT Is Basically the Perfect Transmission Why Are Manual Transmissions Disappearing. Why Audis Performance Models Dont Have Manual Transmissions We also share information about your use of our site with our social media, advertising and analytics partners who may combine it with other information that you've provided to them or that they've collected from your use of their services. You consent to our cookies if you continue to use our website. It connects the engine to the drivetrain and governs how much power you use from moment to moment. Yet for most people, it's a complete mystery how it works. The prominence of automatic transmissions has lessened the need to understand how this magical box beneath our feet functions. We're more than willing to let the computers handle it so we can keep our focus elsewhere hopefully on the road itself. In many instances, it can help you take better care of your vehicle, which hopefully means it will last longer.

In this series, we’re going to teach you the basics of how a transmission works. First we’ll cover how a manual transmission works, then we’ll talk about how automatic transmissions work, and finally we’ll compare the two, discussing the pros and cons of each. These are the two inputs by which a driver operates a manual transmission, though if we’re being technical the shifter is the only piece of this whole puzzle that is operated manually i.e. by hand. All you have to do is break it down into its basic components.