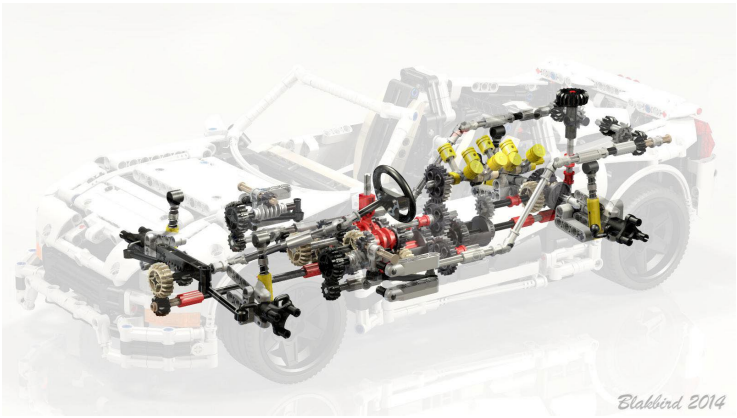
Gearbox

Text and images by Paul Boratko

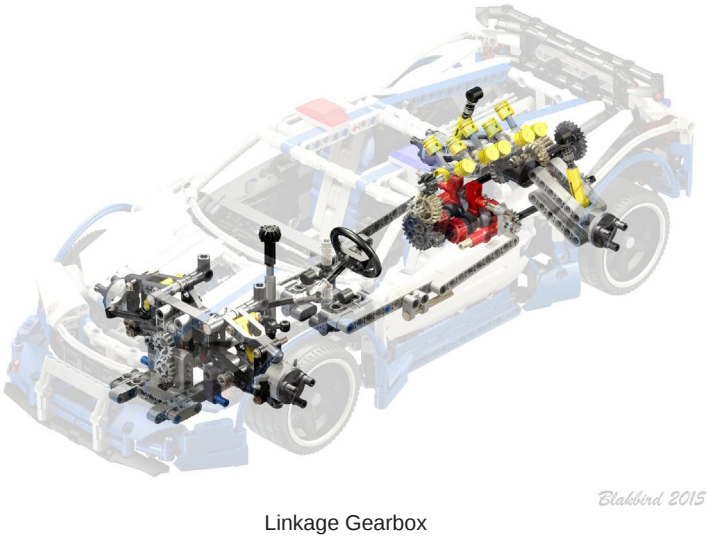
For some builders, when creating a new Technic supercar, designing the gearbox can be the most enjoyable part, or the most frustrating.

When I start building a new car, I normally start with the gearbox and try to come up with something that is different from my previous one. First you have to decide what type of gearbox you want to implement in your car. A standard pattern shifter (similar to set 8448), a linkage style mechanism, or a sequential shifting system.



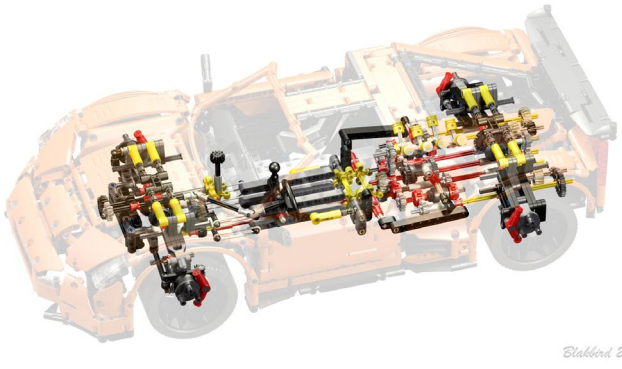
Standard Gearbox

Standard shifting systems are the easiest ones to develop as your own hand movement controls the gear that the car is in and you can select any gear you want. While this is one of the more reliable gearboxes used, one disadvantage is that it can take up quite a bit of room between your seats resulting in a somewhat disproportionate interior.



Linkage Gearbox

Linkage style mechanisms offer more of a challenge as the gearbox is in a different location to your standard gearbox and a series of steering links or liftarms are used in coordination with a shift stick that pivots in various directions. These steering links and liftarms are then moved by the shift stick to engage and disengage the driving ring into the desired clutch gear. Linkage style gearboxes are great because they minimize the room between the seats giving a more natural look to your model's cabin. One downside of this system is that if you are very aggressive shifting gears it could be possible to engage 2 gears at once resulting in some problems. Installing a fail-safe into your linkage system is recommended to prevent this from happening.

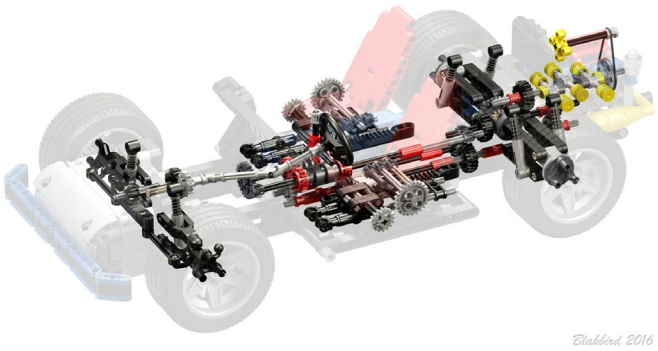


Sequential Gearbox

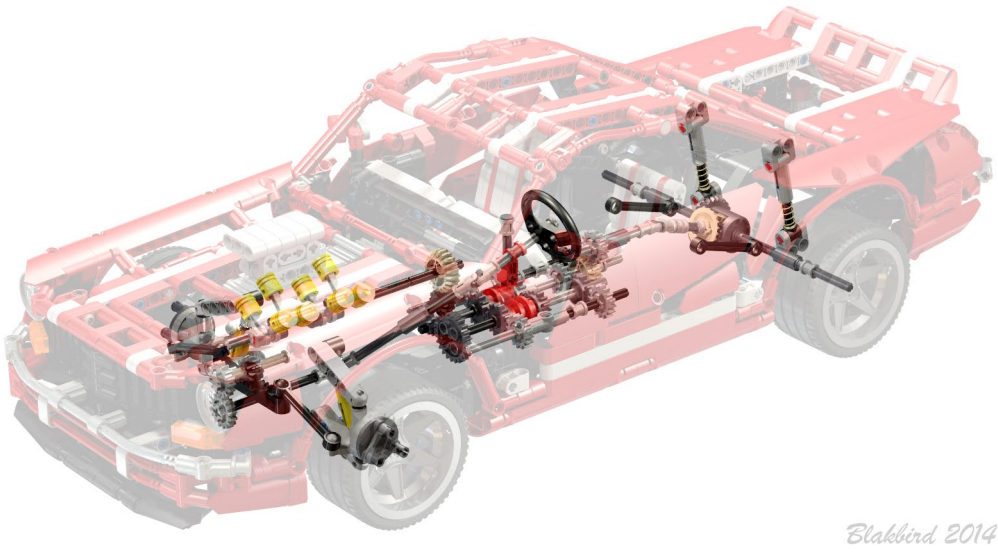
Sequential shifting systems are probably the most difficult as the gears change both up and down one at a time in a sequential order by a single movement. There are numerous ways that the gears can be changed, such as turning a knob, pressing a button, or pulling a lever. One of the more popular sequential mechanisms used by AFOLs is a stepper system (similar to the one used in set 42056). However, many builders have discovered other ways to build sequential transmission mechanisms that work well enough to suit their needs.

Once you have chosen the type of gearbox you want to use, the next step is deciding how many different speeds you want it to have. Keep in mind that the more speeds you have, the more gears are going to be used. This in turn is going to lead to more friction which can possibly cause issues like gears slipping, working themselves loose from axles, or possibly breaking over time. Usually it is 1st gear in a non-motorized model that when pushed along has the most resistance. Something else to keep in mind is that while your gearbox may seem to work perfectly fine, adding a fake engine also adds further friction.

The key to building a smooth gearbox is to reduce friction as much as possible and keep everything true. One thing I recommend when building your gearbox is to try as much as possible to avoid using perpendicular connectors mounted on axles to support the axles that your gears and driving rings are using. This is because perpendicular connectors on axles are not true and can cause your gears to slightly bind up. This leads to having to monkey around trying to line up these connectors ever so slightly on the axle to match the opposite side. You can try this out for yourself by placing five normal perpendicular connectors on a 5L axle and then take a 5L Liftarm and try to line up each of the five holes against each other. You'll see that the holes don't all line up true with each other. However, if you use only liftarms, you will not run into this problem since the holes in liftarms are true with one another.



Opposite Running Gearbox



Linear Gearbox

Unfortunately LEGO® gearboxes turn out to be much more complex than necessary due to limitations with the amount of engageable clutch gears that are available. Sometimes you need to be very creative with how you set your gearbox up. I've created a few standard linear 4-speed gearboxes to avoid an upper and lower level of gears and save depth with the chassis. I've also made gearboxes that run in a non traditional way with the axle from the drive wheels running through the selectable clutch gears first and then to the various gears that create the speed ratios and then to the fake engine. It is fun to be creative and try new things that you've never seen before. You never know when you might even surprise yourself.
#

Constrictor by Paul Boratko