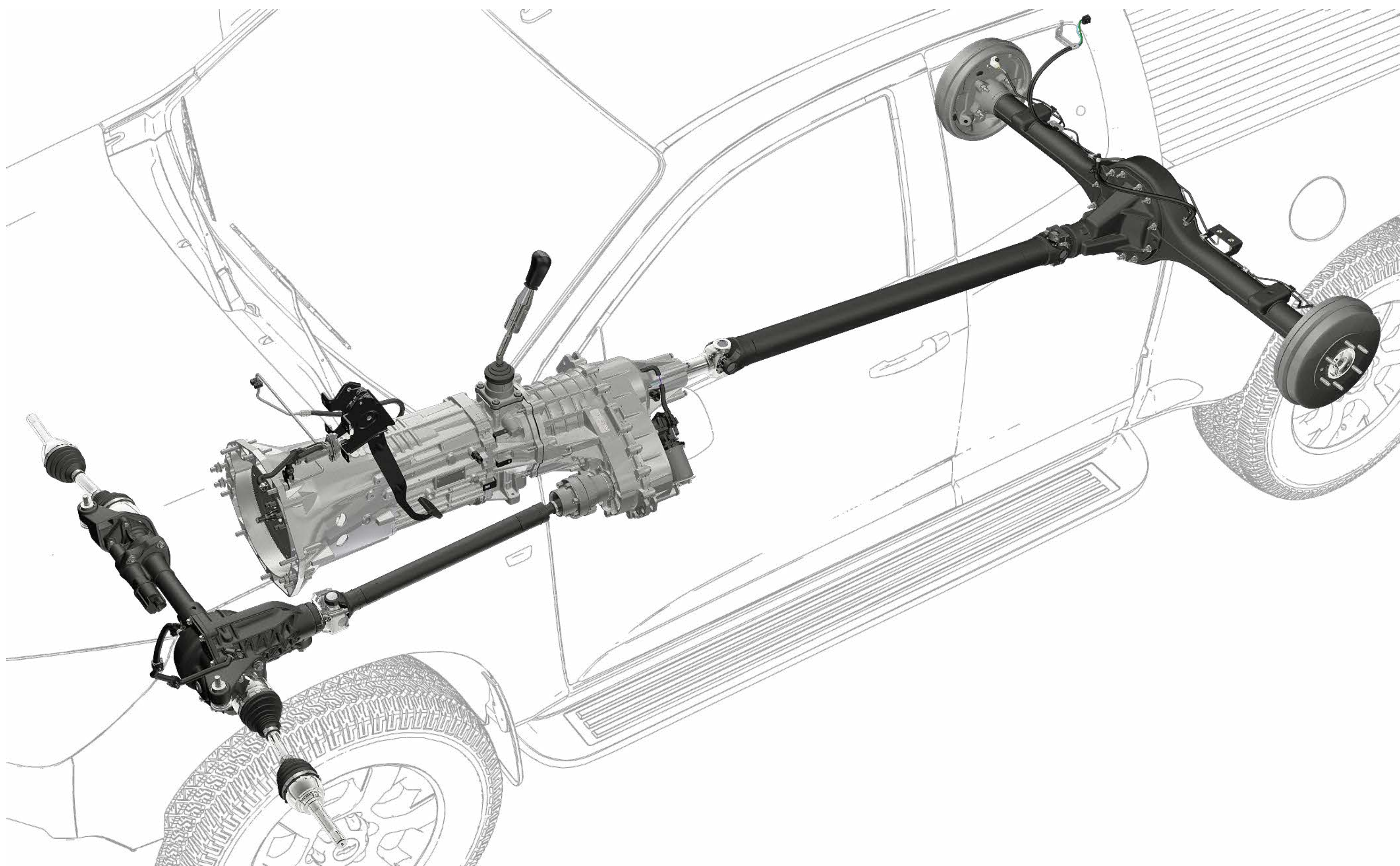


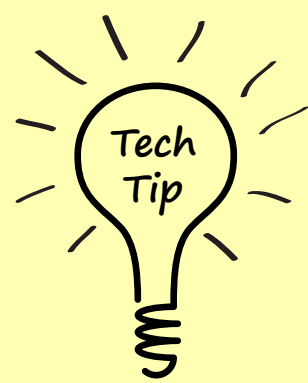
Manual transmissions and transaxles provide the driver with manually selectable gear ratios. The numbers of ratios depends on manufacturer, but anywhere from 3 to 7 gear ratios are found in cars and light trucks. The difference between a transmission and transaxle is the latter has the final drive or axle differential incorporated within the transmission housing. The individual ratios use a pair of gears, one is splined to a shaft and the other is riding on needle bearings (speed gear) on a separate shaft, a synchronizer which matches speeds and couples the speed gear to the transmission shaft. The torque is then transferred from the engine to the input shaft via a driver operated clutch. The clutch allows the driver to engage and disengage the engine from the transmission or transaxle. Torque from the input shaft travels through the gear pair to the output shaft and finally out to the driveline. The driveline encompasses the propeller shafts, transfer case (AWD/4WD vehicles) and axles. The driveline transfers the torque from the transmission to the drive wheels.



Clutch Pressure Plate

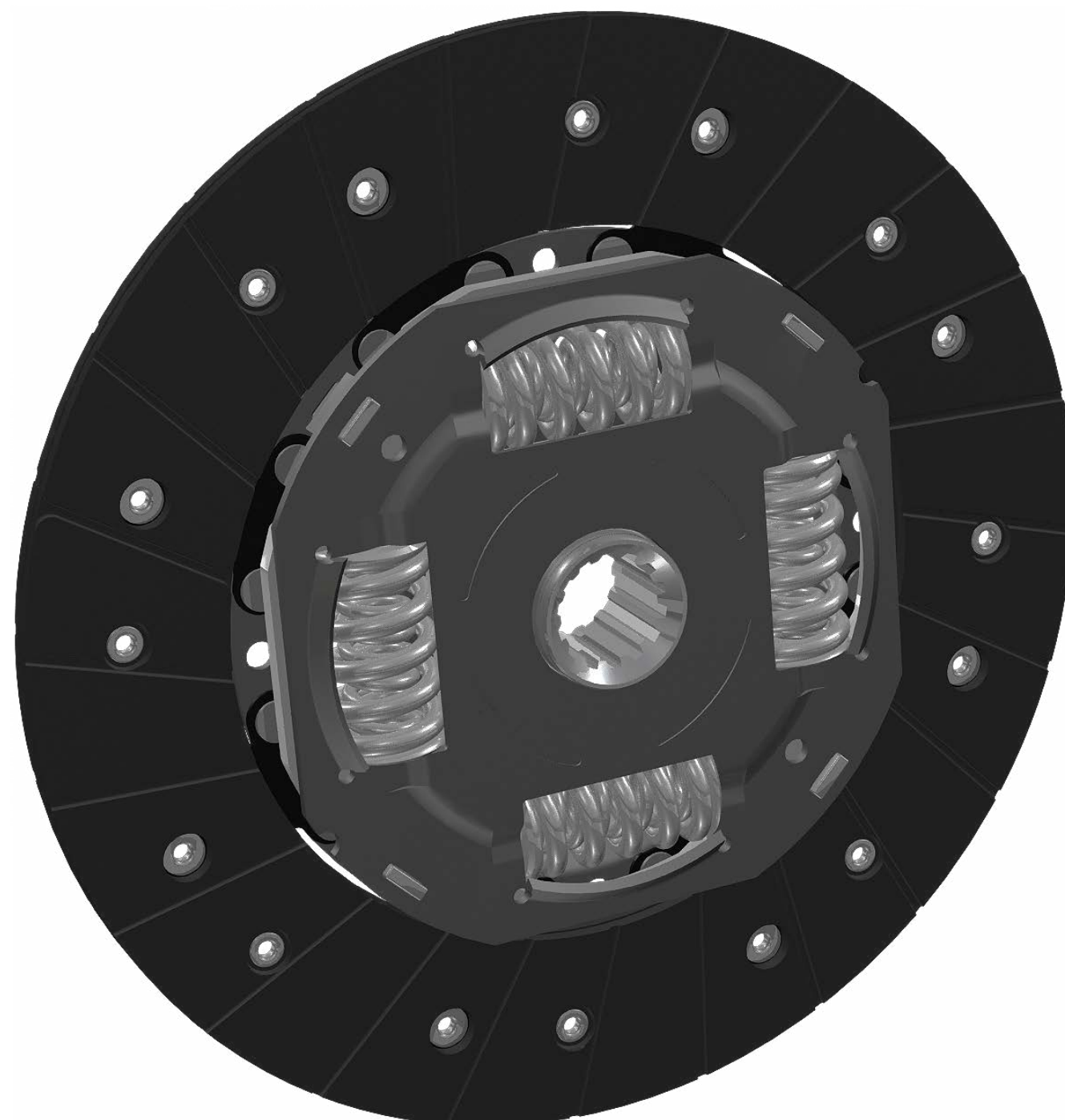
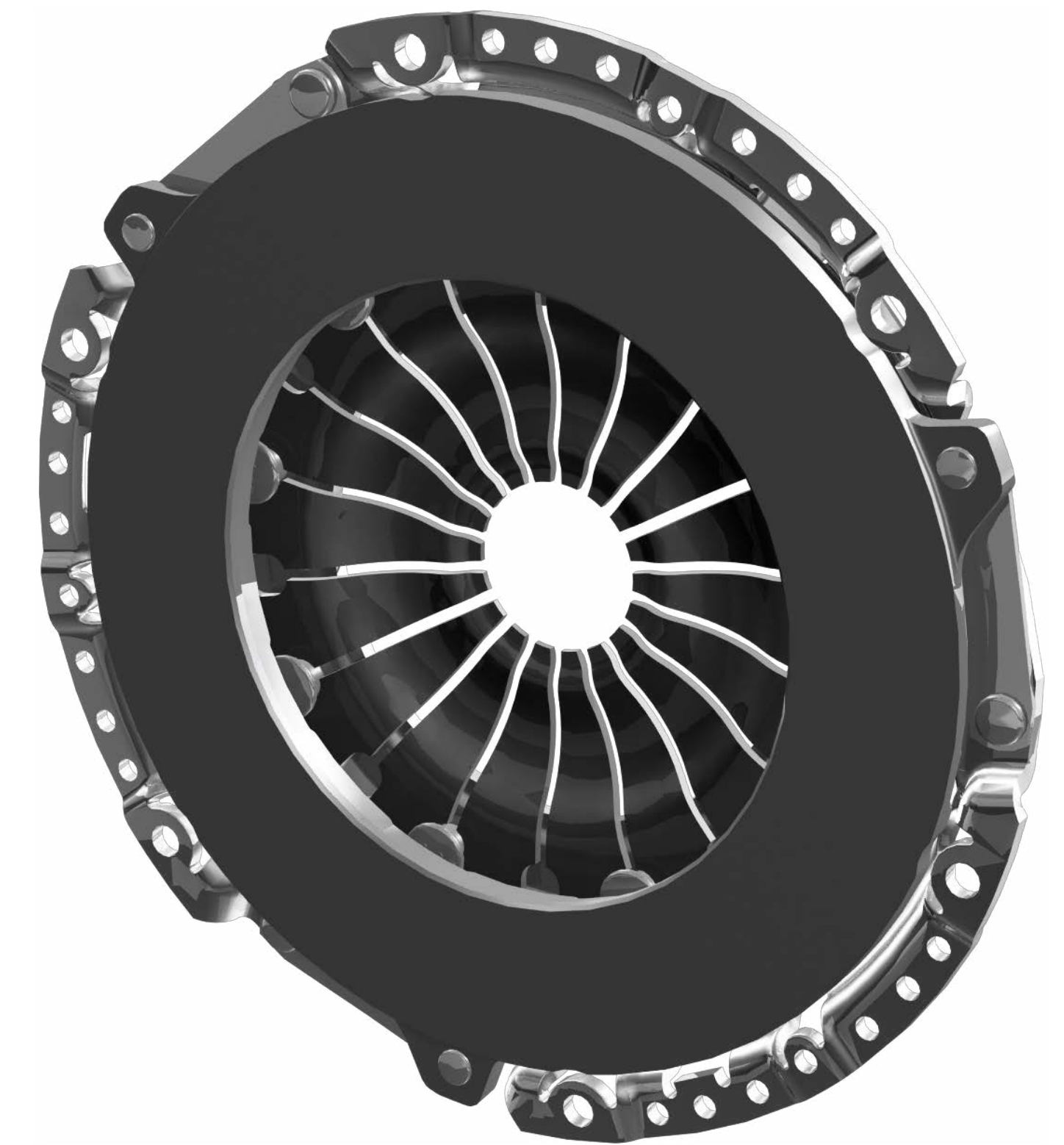
Description/Function: The clutch pressure plate provides the clamping force within the clutch assembly. The pressure plate contains either a diaphragm spring or a series of coil springs to apply pressure to the friction disc. The pressure plate is bolted to the flywheel.

Faults/Symptoms: Symptoms include: clutch chatter/shudder, slipping clutch, abnormal odor, heavy clutch pedal. Faults include: distorted friction surface, broken or damaged springs, corrosion, binding, overheated.



Assemble clutch to flywheel, centering clutch disc with appropriate centering mandrel.

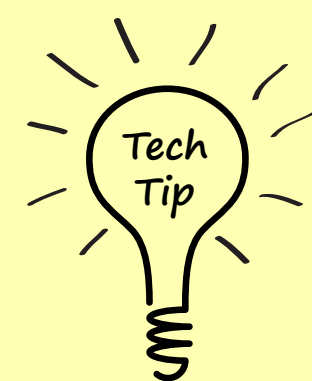
Tighten pressure plate mounting bolts evenly in a crisscross pattern to the specified torque.



Clutch Friction Disc

Description/Function: The clutch friction disc has friction material bonded and/or riveted to both sides of the disc; the center of the disc hub is splined to the transmission/transaxle input shaft. The friction disc is clamped by the pressure plate against the flywheel to transfer torque to the transmission/transaxle.

Faults/Symptoms: Symptoms include: clutch chatter/shudder, slipping clutch, abnormal odor, low pedal clutch take-up. Faults include: worn or damaged friction material, broken or damaged damper springs, oil contamination, overheated.



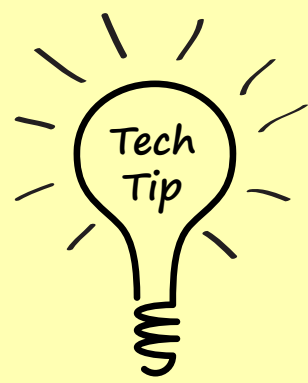
Clutch disc hub splines should be lubricated with high-temp lubricant.

If friction disc material is contaminated with engine or transmission oil, the disc should be replaced.

Flywheel

Description/Function: The flywheel is bolted to the engine crankshaft, providing mass for damping engine vibration and facilitate engine starting. Additionally it provides one half of the clamping surface for the clutch.

Faults/Symptoms: Symptoms include: clutch chatter/shudder, slipping clutch, abnormal odor. Faults include: distorted friction surface, uneven wear, overheated.



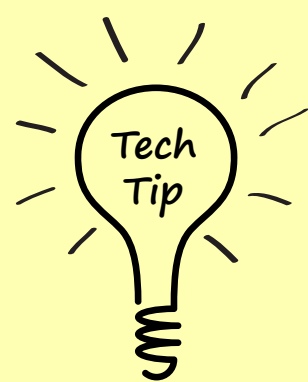
Flywheels should be resurfaced when replacing a clutch for best performance, stepped flywheels require surfacing both the friction surface and the pressure plate mounting surface to maintain correct clamping force (always check manufacturers specifications for flywheel resurfacing).



Clutch Release Bearing

Description/Function: The clutch release bearing is a sliding bearing that releases the clutch by pressing on the pressure plate diaphragm spring or release levers. The bearing is attached to a clutch release fork that is hydraulically or mechanically operated by the drivers clutch pedal.

Faults/Symptoms: Symptoms include: abnormal noise when clutch pedal depressed. Faults include: worn bearing, overheated, loss of lubrication, corrosion.



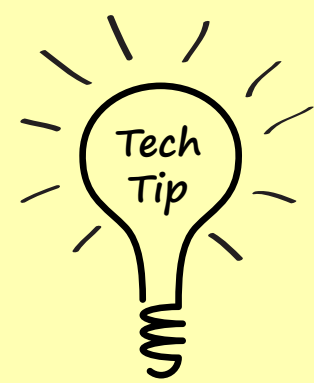
Replace the clutch release bearing whenever servicing the clutch.
Lubricate clutch fork pivot points with manufacturer recommended lubricant.



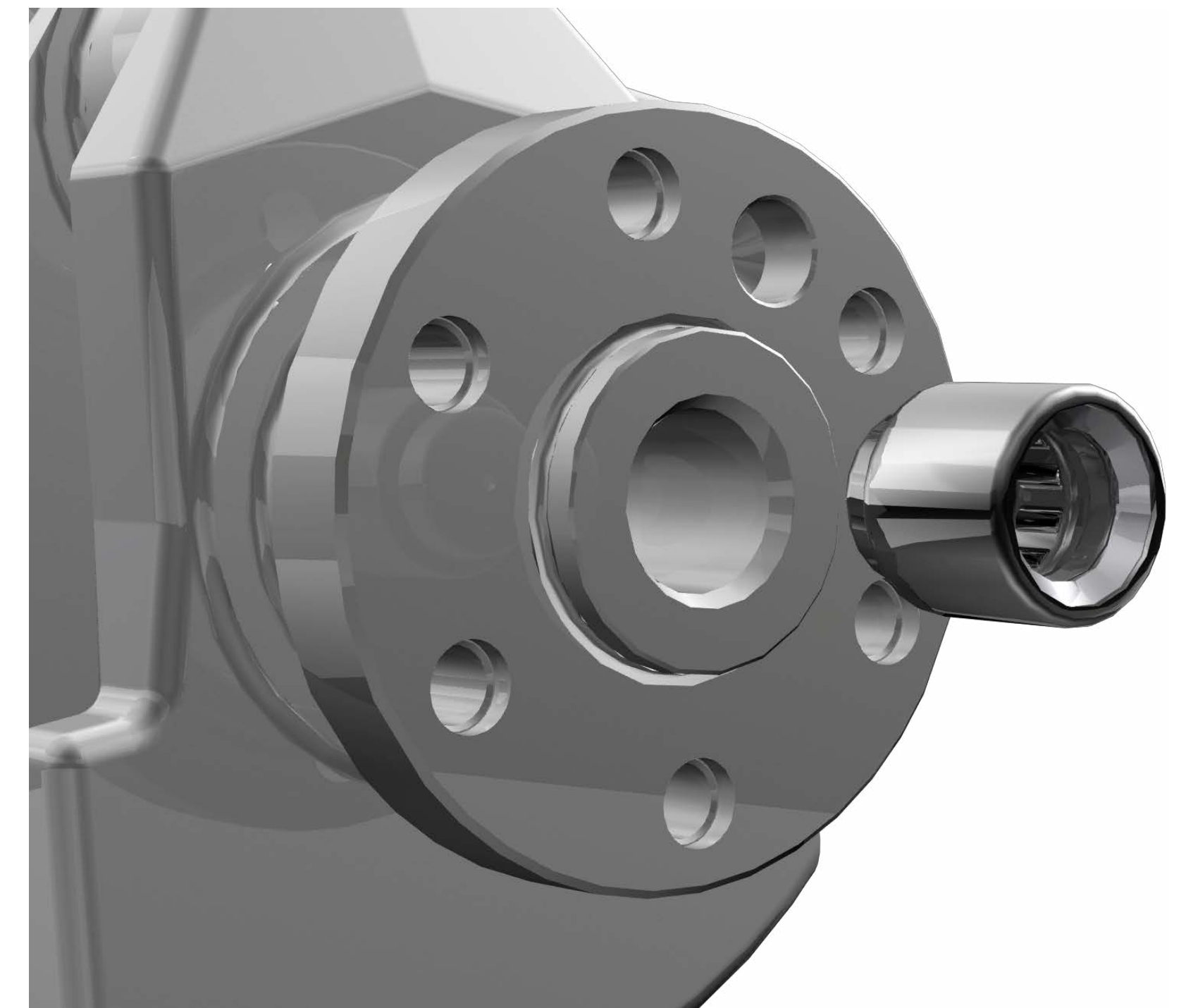
Clutch Pilot Bearing or Bushing

Description/Function: The clutch pilot bearing or bushing is located in the center of the flywheel in the crankshaft flange. It supports the end of the transmission input shaft while the clutch is disengaged.

Faults/Symptoms: Symptoms include: abnormal noise with clutch depressed and gear selected, gear grinding when selecting 1st gear and clutch depressed.
Faults include: worn bearing, loss of lubrication, overheated, corrosion, seized.



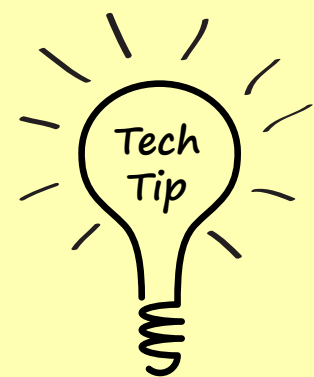
Replace pilot bearing or bushing whenever replacing the clutch.



Bearings and Bushings

Description/Function: The manual transmission and transaxle, transfer case and axles all have bearings and bushings to support rotating components with low friction. Bushings are sleeves made from self-lubricating materials such as bronze. Bearings come in roller, ball and needle designs.

Faults/Symptoms: Symptoms include: abnormal noise, whirling noises. Can be louder when certain gears are selected. Faults include: worn bearing, loss of lubrication, overheated, corrosion, seized.



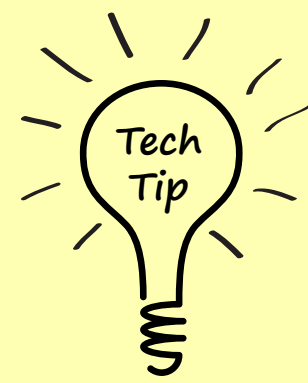
Do not spin bearing with compressed air, the high speeds can cause bearing to come apart causing personal injury.



Seals and Gaskets

Description/Function: The gaskets and seals on and in the manual transmission or transaxle keep the lubrication in and dirt out.

Faults/Symptoms: Symptoms low fluid level, abnormal noise. Faults include: worn or damage seal, fluid leaks.



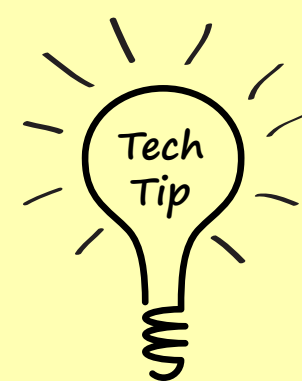
Use appropriate installation tools when replacing seals.

When replacing gaskets, ensure mating surfaces are clean and oil free.

Constant Velocity Joints

Description/Function: Constant Velocity or CV joints found in most front wheel and most all-wheel drive vehicles are universal joints that allow the angle of the drive-axle to vary with suspension travel and steering angle. Common designs are the Rzeppa and Tripod. The CV joint does not impart velocity change to the shaft speed, unlike standard cross-style universal joints.

Faults/Symptoms: Symptoms include: abnormal noise, knocking noise on acceleration or when turning. Faults include: worn joint elements, lack of lubrication, overheated, corrosion, binding.



Shudder or vibration on acceleration is typically caused by worn/binding inboard CV joints.

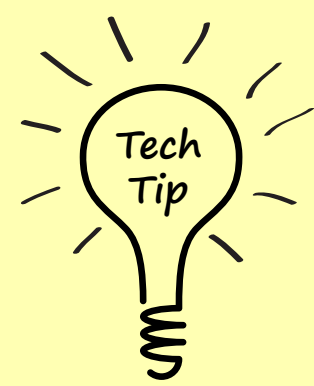
Knocking/clicking during turns is typically caused by worn/binding outer CV joints.



U-Joints

Description/Function: Universal Joints are commonly referred to as a U-Joints; the design is the cross-type cardan joint. Commonly used in 2WD and 4WD trucks in the propeller or driveshaft. The joint has a cross with 4 caps riding on needle bearings. The shaft yokes connect to a pair of caps opposite each other. This allows the shaft to transfer torque at varying angles. To increase the operating angle a double cardan joint is used, it combines two joints in a short housing; this can be found on 4WD trucks in the front propeller or driveshaft.

Faults/Symptoms: Symptoms include: abnormal noise, squeaking noise at low speeds, vibration. Faults include: worn needle bearings, lack of lubrication, overheated, corrosion, binding.



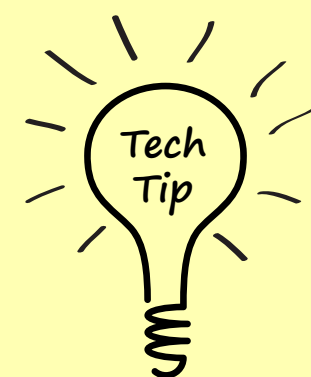
Use appropriate tools to remove and install u-joints, hammering joints can damage caps or result in lost bearing needles.



Gear Oils

Description/Function: Manual Transmissions, Transaxles, Transfer Cases and Differentials require lubrication. Various oils, fluids and additives are used to ensure correct operation and longevity. The fluids lubricate the bearings, bushings and gears, reducing friction and wear.

Faults/Symptoms: Symptoms include: abnormal noises: howling, whirling, abnormal odors. Faults include: fluid leaks, contaminated fluid, over filled.



Always use the manufacturer's specified fluid for the application. Mixing fluids or using non-approved fluids can result in vehicle damage.