

# **PERFORM PERIODIC MAINTENANCE OF DRIVE TRAIN**

After completing this module, you are expected to be capable of:

- Know how car clutches work and how to maintain them.
- Explain the difference between manual and automatic transmissions.
- Describe the operation and upkeep of transaxles and manual transmissions.
- Diagnose and fix problems with transaxles and manual transmissions.

## **Transmission System**

The power train, often known as the transmission system, is an essential component in the intricate mechanics of a car that transfers power from the engine to the wheels. This system makes sure that the engine's raw power is effectively transformed into motion, enabling the car to run smoothly. The clutch links and disconnects the engine from the gearbox, allowing this power to flow through manual transmission or transaxle systems.

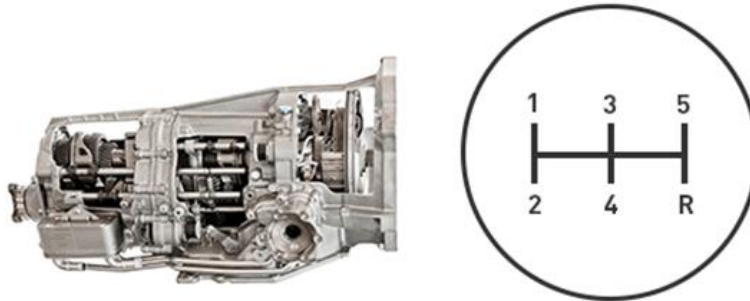
## **The Purpose of a Transmission**

The main job of a gearbox is to control speed and torque while transferring engine power to the driveshaft and wheels. This system adjusts to various driving circumstances by using a number of gears.

## **Manual Transmission**

Gear shifts can be manually operated by the driver using a manual transmission, sometimes referred to as a standard transmission. A network of gears and synchronizer components make up this system, which distributes power along several channels that each correspond to a certain gear ratio. Using a gear lever in tandem with the clutch is necessary to shift gears.

## Manual Transmission

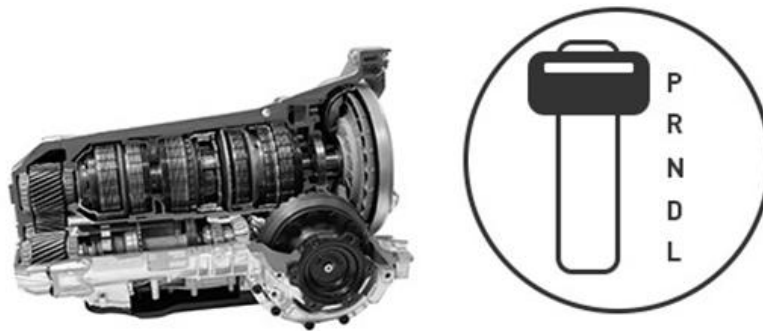


Source: drivparts.com

## Automatic Transmission

An automatic gearbox automatically changes ratios in response to driving circumstances and speed. It has a variety of shafts, gears, and bearings that cooperate to choose the right gear ratio without the driver's input, making driving easier and more comfortable.

## Automatic Transmission



Source: drivparts.com

## Essential Components of a Transmission System

- Gear Lever – Used to manually shift gears.
- Speedo Drive – Measures the vehicle's speed.

- Reverse Idler – Engages to reverse the direction of the main shaft, enabling reverse movement.
- Cluster Gear – Works with the main gear drive to provide different gear ratios.
- Input Shaft – Transfers power from the engine into the transmission system.
- Input Gear – Connected to the input shaft, distributing power to other gears.
- Main Shaft Gear – Engages different gears as needed.
- Main Shaft – Connects to the differential, ensuring power reaches the wheels effectively.

## **Clutch**

The clutch, which is located between the engine flywheel and the gearbox or transaxle, engages and disengages power flow to enable seamless gear changes. Some clutches have power-assist devices to lessen effort, while more sophisticated types may have electronic controls for autonomous operation. Clutches are normally operated by the driver's foot.

Controlling the flow of power between the engine and transmission is a critical function of the clutch. Its primary duties consist of:

- Disengagement (Pedal Down): This permits engine cranking by allowing the engine to run freely without transferring power to the gearbox.
- Gear Selection (Pedal Down): This feature enables the driver to seamlessly change gears and choose the best gear for the road.
- Engagement (Pedal Moving Up): This feature briefly slides to guarantee a seamless transition and lessens the strain on the powertrain and gears as soon as the car moves.
- Full Engagement (Pedal Up): This removes slippage by transferring all of the engine's power to the gearbox.

As the link between the engine and transmission, an automotive clutch facilitates power transfer and permits the driver to turn off the engine for seamless gear changes. The clutch disc, compression plate, release bearings, and flywheel are important parts. Checking for wear, making sure the pedal is adjusted correctly, and replacing parts as needed are all part of proper maintenance. Slipping, pulling, and chattering are frequent problems.

## Clutch Defects Troubleshooting (from Schaeffler's LuK brand)

### CLUTCH DOES NOT DISENGAGE

*This is not necessarily a clutch fault, but often relates to the release system. It is vital to a successful installation that vehicle manufacturer specifications and instructions are strictly adhered to.*

SYMPTOM	CAUSE	SOLUTION
Tangential leaf springs are bent	Clutch pressure plate dropped Tip-in back-out clunk	Replace clutch pressure plate Check powertrain
Cover is bent	Centring pin not utilised Incorrect installation/mishandling/ damaged in transit	Replace pressure plate
Excessive clutch disc lateral runout	Mishandling/damaged in transit Lateral runout not checked (max 0.5mm)	Align or replace disc
Lining seized with rust	Vehicle left unused for extended time in high humidity	Remove rust on seized parts (including lining surface)
Linings sticking	Linings contaminated with oil/grease	Replace clutch disc and seal area around clutch
Clutch disc sticking on transmission shaft	Deformed hub profile Hub is seized with rust Incorrect grease applied Worn hub profile/transmission shaft	Rework hub profile Check lubrication (using correct grease) Replace clutch disc, transmission shaft or both
Clutch disc dimensions not aligned	Incorrect disc installed	Install correct parts
Torsional damper fouling other components	Clutch disc installed incorrectly Incorrect clutch disc	Install correct disc in line with vehicle specifications
Worn guide sleeve	Incorrect release bearing installed Incorrect pairing of components Incorrect lubrication (metal to metal)	Replace guide sleeve Use correct parts Use correct lubrication
Worn/defective pilot bearing	Worn bearing Engine and transmission misaligned	Replace pilot bearing
Release travel too short	Air in the system Defective/worn master or slave cylinder	Bleed system Replace defective/worn components

Source: [cvwmagazine.co.uk](http://cvwmagazine.co.uk)

### CLUTCH SLIP

*The release system may also be at fault here, as well as the more normally associated worn or defective disc or pressure plate. Fitting the wrong parts or an incorrectly machined flywheel can also cause slip.*

SYMPTOM	CAUSE	SOLUTION
Overheating pressure plate	Thermal overload Incorrect parts Broken diaphragm spring Oil contamination	Replace clutch pressure plate Check powertrain
Worn clutch linings	Normal wear and tear Allowing the clutch to slip Low clamp load	Replace clutch
Contaminated clutch linings	Leaking rotary shaft seal Excessive lubrication Release bearing grease loss (due to overheating)	Replace worn seal Replace clutch
Flywheel side friction lining scored	Flywheel running face damaged	Reface flywheel/replace if necessary
Flywheel friction surface deeper than mounting surface	Mounting surface not reworked to account for flywheel reface	Reface flywheel/replace if necessary
Worn guide sleeve	Deformed hub profile Hub is seized with rust Incorrect grease applied Worn hub profile/transmission shaft	Rework hub profile Check lubrication (using correct grease) Replace clutch disc, transmission shaft or both
Stiff operation	Worn release shaft bearing Insufficient lubrication on release shaft/bearing Worn guide sleeve	Replace bushes Lubricate correctly

Source: [cvwmagazine.co.uk](http://cvwmagazine.co.uk)

## NOISY CLUTCH

*A whistling clutch is often caused by irregular contact of the release lever, a worn pilot bearing or an eccentric transmission input shaft. Incorrect part installation is also an issue, whilst clutch discs with first stage dampers can cause 'dicking noises' when the load changes (without impairing functionality).*

SYMPTOM	CAUSE	SOLUTION
Vibrations when engine running	Bent/buckled tangential leaf springs	Replace clutch pressure plate Check powertrain
Incorrect clutch disc	Torsional damping not to vehicle specification	Install correct clutch disc
Torsional damper broken	Incorrect clutch disc installed Excessive play in powertrain (universal shafts) Poor driving behaviour (e.g. speed does not match gear)	Replace clutch
Worn/defective release bearing	Grease loss from overheating Faulty release system	Replace release bearing Repair release system
Worn/defective pilot bearing	Worn/missing pilot bearing	Replace pilot bearing
Diaphragm spring fingers have run in	Incorrect release bearing preload	Replace slave cylinder Replace clutch

## STIFF CLUTCH

*The most commonly occurring cause of stiff clutch operation is the release system or related components.*

SYMPTOM	CAUSE	SOLUTION
Incorrect clutch pressure plate	Release load too high	Install correct pressure plate
Worn guide sleeve	Worn release bearing Insufficient/incorrect lubrication	Replace guide sleeve Use correct lubrication
Worn release shaft bearing	Worn bushes Bearings not lubricated	Replace release shaft bearing Lubricate correctly

Source: [cvwmagazine.co.uk](http://cvwmagazine.co.uk)

## Manual Transmission Gear Indications

- Noise Neutral**

Hearing noise from the transmission gear while it is in neutral and the clutch is engaged, it may indicate misalignment between the transmission and the engine. Another potential reason could be a flaw in one of the rotating parts. Typical problems include worn or dry bearings, damaged gears, a bent or worn transmission gear, or excessive movement of switching gear.

- Transmission Reverse**

Hearing noise when engaging the reverse gear could indicate that the reverse gear, bushing, or countergear is worn or damaged. Additionally, a faulty shift mechanism can also produce noise during reverse operation.

- **No Power**

If the transmission is not receiving power, it could result from various problems. A clutch that isn't engaging may require repair, and stripped gear teeth would necessitate gear replacement. Moreover, a loose or broken shift fork should be replaced, and any damage to the input or output shaft will also require a replacement.

- **Transmission Oil Leaks**

A common issue that signals potential problems in a vehicle that oil spots or a drop in transmission fluid indicate of worn seals, gaskets, or even a damaged case. Avoiding these leaks can prevent from long-term damages in the transmission gear.

## **Manual Transmission Service**

- **Transmission Maintenance**

Manual transmissions typically require minimal maintenance, but those with external linkage might need a shift linkage adjustment. This process involves disconnecting the rods from the transmission levers, setting both the gearshift and transmission levers to neutral, and adjusting the linkage until it aligns properly. It's essential to periodically check the lubricant level, as a decrease may indicate a leak. To check, park the vehicle on a level surface, turn off the ignition, and inspect the fluid level.

- **Transmission Removal**

In preparation for removing the component requires the proper tools. In taking consideration, disconnecting the battery is one of the crucial part to secure electronic components in order to disconnect safely all electronic connectors. Furthermore, to have more work space if needed, one may remove the exhaust system while adding indicators to locate exactly the position of each components to prevent complexity of arrangement and reposition of such components. Moreover, it is important to take note that following the manufactures guidelines to ensure a safe and efficient removal procedure. Detaching the clutch and following with a supporting jack to remove necessary bolts to access the transmission component.

- **Cleaning Transmission**

In order to prevent further damage to some components, ensure that using an appropriate solvent in cleaning transmission parts, to eliminate the excess dirt or grease from the bearings, casings, and more. After washing it up, dry every parts with compressed air for more effectiveness. Ensure all components are dry after reassembly procedure to prevent contamination.

- **Transmission Assembly**

Before considering all transmission parts are cleaned, make sure to verify any damage from each component to inspect for casing cracks or worn out materials. Following guidelines to indicate mechanical components whether it should be repaired or replaced for new parts. For instance, shift rails and gears if teeth are cracked or have burn marks, make sure to replace to prevent mechanic system errors.

- **Installation**

Ensuring to align the mechanic parts to its proper positions through aligning from its transmission seats, while shifting the transmission into gear and rotate the output shaft; adjust the input shaft splines as needed to guarantee a complete fit. Remove the guide pins before installing the correct bolts and tightening them to the manufacturer's specified torque.

## **Wrap-up**

For correct operation and maintenance, it is essential to comprehend the many parts of the automotive powertrain system, from clutch to four-wheel drive mechanisms. The longevity and functionality of the system are guaranteed by routine examination, prompt servicing, and respect to manufacturer instructions.

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