



WORDS BY BRYAN GRANT PHOTOGRAPHY BY ANTHONY WARRY →

# GRIPPING STUFF

Your manual vehicle's clutch is one of its most stressed components. So what goes wrong with a clutch and how can you upgrade it to avoid failure?

**A**utomatic transmissions have their place, but for ultimate vehicle control, a manual transmission can't be beaten. In order to deliver the torque from the engine to the transmission, a vital piece of equipment is required – the clutch. Most of us know it as the third pedal on the left that permits us to select the appropriate gear for the task ahead. It is worth knowing what's happening every time you use the clutch.

A clutch system is comprised of a series of components to provide a mechanism that will transmit positive drive to the transmission (without slip) and allow disengagement of drive when a change of gear is required.

The clutch also allows the driver to accelerate from rest, be it forward or reverse. We enlisted the aid of Exedy to help explain the intricacies of a 4WD clutch, as we installed one of its Safari Tuff clutches to our GU Patrol coil-cab.



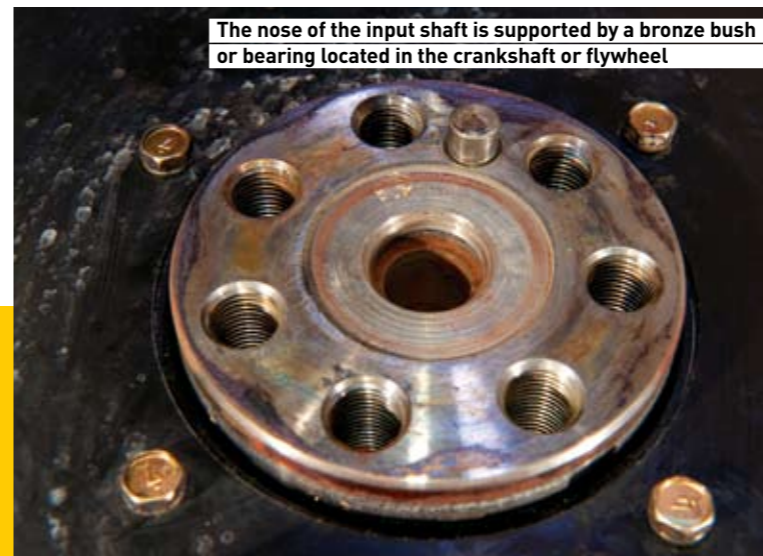
## CLUTCH COVER ASSEMBLY

The clutch cover assembly is bolted to the flywheel. The clamp load of the assembly provides sufficient force on the clutch plate to permit positive drive. This load is generated using a diaphragm or coil springs, depending on the design.

When the clutch pedal is actuated, the pressure plate within the assembly lifts away from the clutch plate, resulting in the drive being interrupted. Conversely, during clutch engagement, the pressure plate is forced against the clutch plate resulting in positive drive to the gearbox.



The nose of the input shaft is supported by a bronze bush or bearing located in the crankshaft or flywheel



## CLUTCH ACTUATION

On depression of the clutch pedal, the clutch release bearing reacts with the diaphragm via a cable or hydraulic actuation to disengage the clutch. There are two (2) designs of release mechanisms. Push or pull type.

The push type, as the name implies, has the release bearing pushing on the diaphragm to operate the clutch. The pull type has the release bearing pulling on the diaphragm.



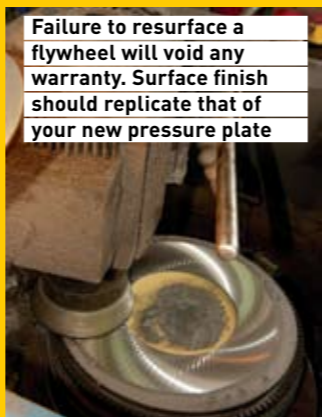
## FLYWHEEL

A typical flywheel is a solid rotating disc that is mounted to the crankshaft. The flywheel has provision to locate a ring gear used in association with the starter motor to start the engine. It also allows the clutch cover assembly to be securely mounted to the friction face.

The mass of the flywheel also provides a heat sink that helps dissipate heat away from the friction face during engagement

and disengagement of the clutch. In an effort to improve NVH, (Noise, Vibration and Harshness), some vehicles are fitted with a dual mass flywheel. These, as the name implies, are manufactured using a primary mass mounted on the crankshaft and a second mass secured via a damping mechanism to the primary mass. There have been examples of suspect durability of these flywheels, and Exedy offers Solid Replacement kits as a viable alternative.

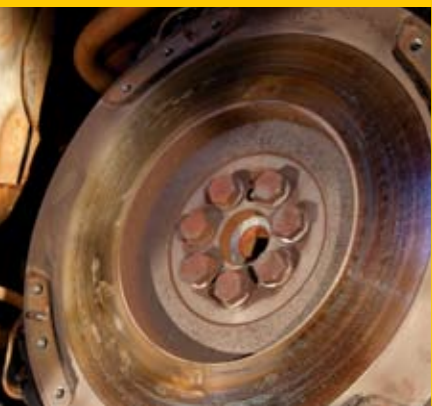
Failure to resurface a flywheel will void any warranty. Surface finish should replicate that of your new pressure plate



## CLUTCH DISC (PLATE)

The clutch plate (disc) is the mechanism that transfers the drive from the engine to the gearbox. It is mounted on the transmission input shaft and is fitted with non-asbestos friction material. As the plate is clamped to the flywheel via the cover assembly, torque from the engine is transmitted to the driveline.

The damping mechanism in the centre of the plate is designed to absorb the torsional vibrations generated from an internal combustion engine. The friction material is riveted to a series of cushion segments that help modulate engagement, ie, reduce the chance of shudder.





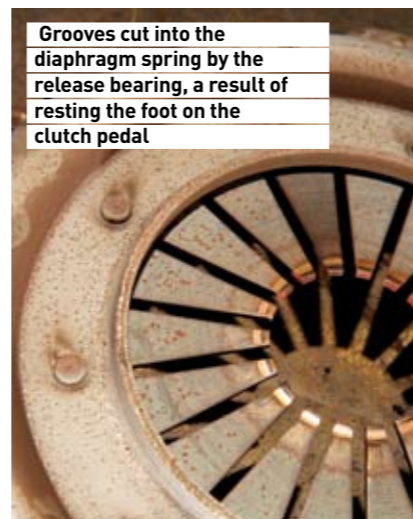
### CLUTCH WEAR

The durability (life) of a clutch can be influenced by many factors, namely the type of terrain, the gross load of the vehicle, and last but not least, driver technique. How long is a piece of string?

A worn clutch will be evident when positive drive cannot be achieved, ie, slip and the inevitable odour.



Grooves cut into the diaphragm spring by the release bearing, a result of resting the foot on the clutch pedal



Here you can see the hot spots, a result of excess clutch slipping



### OPERATOR ERROR

Poor driver technique is a major contributor to reduced clutch durability (life). Excess slipping of the clutch, which generates heat, is the bane of clutch durability.

Do not use the clutch to hold the vehicle stationary on a hill. Do not overload the vehicle. When bogged, consider winching rather than run the risk of 'burning' the clutch, which will result in an expensive repair bill and the inconvenience of recovering a vehicle well off the road. By the time you smell the clutch burning, damage has already been done.

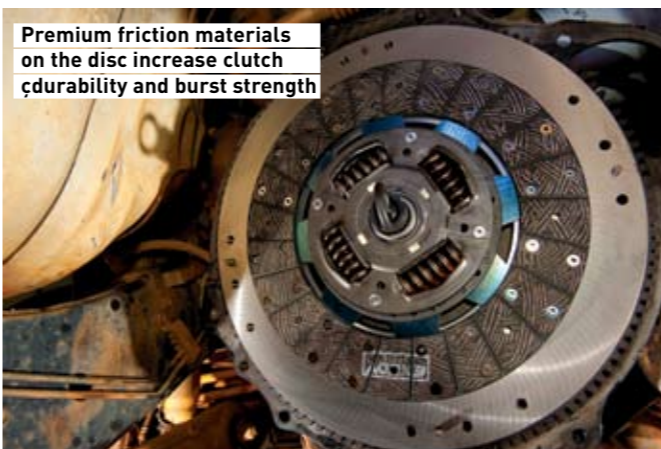
## ANY CLUTCH CAN ONLY TAKE SO MUCH ABUSE



Upgraded pressure plate damper springs to cater for higher torque capacity.



Premium friction materials on the disc increase clutch durability and burst strength



Spheroidal graphite anti-burst casting gives a high burst strength and cooler operation

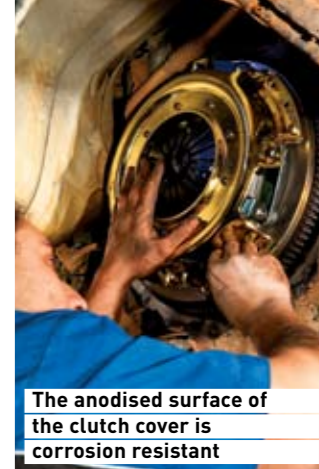


Clamping pressure is usually 30% above standard, giving strong performance without sacrificing a comfortable pedal

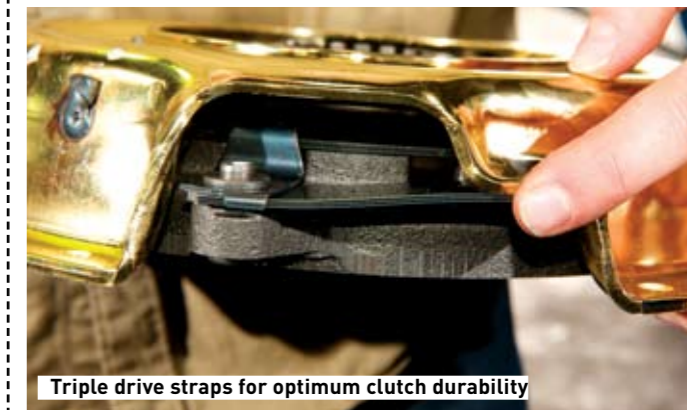
### TOUGHEN UP

Like any part of a 4WD, the clutch itself can be upgraded to suit the tough conditions encountered within a heavily loaded 4WD, or one that has had power upgrades and requires a clutch to suit.

Exedy Safari Tuff clutches offer a much higher clamp load (clamping pressure) than standard, which increases the torque the clutch can transmit before slipping.



The anodised surface of the clutch cover is corrosion resistant



Triple drive straps for optimum clutch durability

Rear main seal leaks are a common cause of clutch contamination. Replacing the rear main while the box is out is generally considered a must



# CLUTCH PRESERVATION TIPS



You can help get more life from your clutch by following these five simple tips.

- 1 - Do not overload the vehicle.
- 2 - Do not use the clutch pedal as a foot rest.
- 3 - Use the lowest gear when accelerating from rest. Use first gear, not second to start.
- 4 - Do not excessively slip the clutch. Slip generates heat that is the enemy of clutch durability.
- 5 - Use the appropriate gear when ascending or descending an incline. 'Lugging' the clutch can lead to failure of the damper mechanism.

To prevent contamination of the clutch, use minimal grease



Flywheel bolts should be torqued up in a criss-cross pattern

## PARTING THOUGHTS

The clutch is engineered to exacting specifications. Once you start to modify your 4WD

with engine upgrades or larger tyres, then serious consideration should be given to a suitable clutch. *4WD*

## THANKS

Thanks to Julian and Rohan at Exedy Clutch for their expert technical advice.  
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www.exedy.com.au

Thanks also to the crew at: Accurate Brake and Clutch Service  
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Julian from Exedy sharing his knowledge

