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# CLAMPING PRESSURE

Has your clutch seen better days? Let's take a look at how to swap one out in your shed or driveway

## DIY DIFFICULTY



## DIY

**TIME REQUIRED:** 4-6 hours

**TOOLS REQUIRED**

Sockets  
Extension bars  
Spanners  
Clutch-alignment tool  
Trolley jack, gearbox stand  
or engine hoist  
Manual oil pump



Considering the weight of a typically modified 4WD and the punishment we like to put them through when we go off-road, it's no wonder that we need to replace some of the major components every now and again. It's easy to forget how much load is placed on your 4WD's clutch, especially in steep terrain towing a camper trailer, or when you're trying to negotiate rocky hills at low speeds. This type of punishment, along with all the extras we bolt onto our 4WDs, contributes to premature clutch wear and tear.

The question on the back of most people's minds is that of trying to determine when a clutch needs swapping. It's not as simple as going off the kilometres on the

speedo, as it will depend on your own driving style. If you purchased the vehicle second-hand, it's impossible to tell how it was treated by the previous owner.

Typically, you won't be able to tell that a clutch is wearing until it starts to slip (where the engine revs increase without any road speed increase). There are a couple of small tell-tale signs to keep your eye out for, such as gear selection becoming difficult, or a shudder through the driveline when trying to take off from a standing start. There is another way to check the condition of your clutch – pull the handbrake on tight, and while the engine's running, select 5th gear. Let the clutch out without any throttle – a good condition clutch will stall the engine, while one

that slips will allow it to keep running for longer.


If your clutch is due for replacing, deciding what to replace it with means considering the type of use required. For instance, a vehicle with an aftermarket turbo fitted will need a better clutch than standard to cope with the increased power production.

There are different styles of clutches to choose from, ranging from standard replacements right through to heavy-duty versions that can put up with more abuse. One common misconception is that a heavy-duty clutch requires the left leg of a body builder just to engage and disengage. The truth is, the correct clutch will not only have a smoother operation, but one

that requires no more pedal force than standard.

The vehicle that we will be fitting a clutch to is a 100 Series 'Cruiser that has done over 100,000km on the current clutch. In this time there's been a bucket-load of off-road driving, and a great deal towing a camper trailer. The vehicle is showing signs of driveline shudder when taking off in first gear (a common problem with this model), so it's the perfect candidate for a DIY clutch swap.

Note, though, that it's definitely not a one-person job – you'll need one or two people to help, so put a slab on ice, fire up the BBQ and invite a couple of mates around to give you a hand.

Let's take a look at what's involved! 



## THE CORRECT CLUTCH WILL REQUIRE NO MORE PEDAL FORCE THAN STANDARD



1



1 Make sure that your clutch kit comes with all the parts needed for a complete swap. This includes a new spigot bearing (the bearing that centres the input shaft of the gearbox on) and an alignment tool.

Speaking of the flywheel, it'll need to be machined to a perfectly flat surface before you mate it to the pressure plate, otherwise it will prematurely wear the friction material out. It is recommended to contact a brake and clutch specialist a couple of days before you intend to install the clutch, and organise a time for the flywheel to be machined.

Another option is to purchase a flywheel from a wrecker and have it machined beforehand, so you don't have to stop the job

2 In this LandCruiser, we needed to remove the two front seats and the vinyl flooring to gain access to the base of the gearsticks. These seats are held in place with four 14mm-headed bolts at the base of each seat. Some vehicles just need the centre console to be removed

3 Remove the gearknobs and the rubber boot from the base of the gearsticks. The main gearstick needs to be removed – this is done at the point that it enters the gearbox, by pushing the small ring inside the opening down and giving it a twist anti-clockwise at the same time. Some models will hold the gear shifter in place with a locking nut – this is where a workshop manual is a great help.

You will feel when the shifter becomes loose – remove it from the vehicle and place a rag around the greasy ball at the bottom of the stick. This will stop the grease from getting contaminated

4 Now for the underside of the vehicle! Disconnect both tailshafts from the transfer case (they can stay connected to the diffs – just tie them up securely out of the way). On this vehicle, they were held in place with 14mm-headed nuts and required the transfer bash plate to be removed to gain access to the rear shaft

5 There is a wiring harness that wraps around the top of the gearbox that needs to be disconnected. Before doing, so disconnect the battery's negative terminal. Then disconnect all the plugs that are attached to the gearbox and transfer case – these all have a small tab that needs to be depressed to enable removal

6 The gearboxes in most 4WDs are extremely heavy, so it is strongly recommended to remove the transfer case off the gearbox. Start by draining the oils from both gearbox and transfer case, then remove the bolts from the rear of the transfer case as well as those from above the front output shaft.

Disconnect the small gear link rod that travels from the gear stick to the lever coming out of the transfer case. Then with a mate helping, wiggle the transfer case back and forth, sliding the transfer backwards off the rear main shaft. Remove from under the vehicle so you don't have to work with it in the way. Hire places will be able to rent you a transmission jack, or you can possibly get away with a trolley jack if yours has enough of a throw

**7** Disconnect the clutch slave cylinder from the side of the bell housing (the adapter between the gearbox and engine). It is a good idea to loosen the bleeder nipple so the thread isn't under load when undoing the bolts. Once it's off, tighten the nipple back up so you don't lose all the clutch fluid

**8** Placing a jack under the centre of the gearbox (a trolley jack would be preferred) to hold the weight of the box, remove the gearbox crossmember. This is held in place with bolts on either side chassis rail – make sure to undo the gearbox mount bolts as well.

It is recommended to remove the gearbox mount off the box, that when it's lowered onto the ground the threads will not be damaged. Another option for supporting the box once the crossmember's off is via an engine hoist through the vehicle's front doors, with the chain running down through the gear shifter hole

**9** The gearbox will then need to be disconnected from the engine, which means removing the bolts that hold it to the back of the engine block. To get to the bolts at the top of the bellhousing, it is recommended to have a couple of long extension bars so you can undo these from the rear of the gearbox. To make extra room, you can lower the jack slightly

**10** This is a tricky point; you will need a mate at one end of the jack while you are underneath the vehicle. Wiggle the gearbox back and forth to release the box backwards off the engine's output shaft, and then while you balance the box on the jack get your mate to lower it slowly. You will most likely need to fiddle with the gearbox to get it out of the chassis rails and lowered down onto the ground

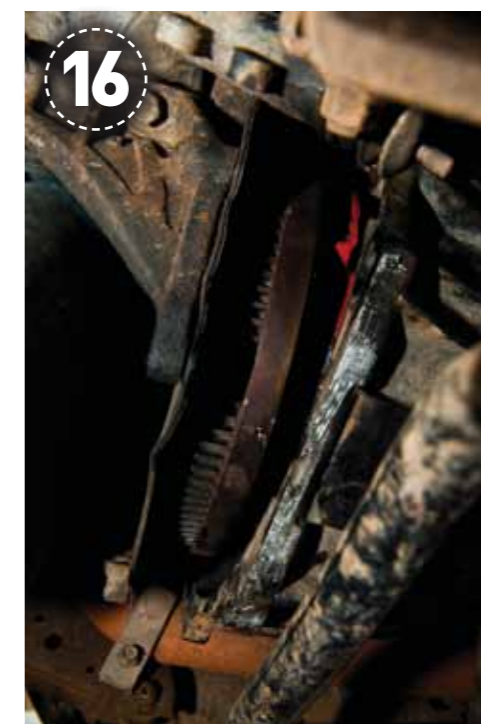
**11** Undo the clutch from the flywheel. This will be held in place with bolts around its circumference. Make sure you have a good hold on the pressure plate as you undo the last couple of bolts, and be aware that the clutch plate will fall out from behind once the last bolt drops out

**12** Remove the flywheel by undoing the locating bolts. To do this, you will need to either use a rattle gun or place a bolt back into the back of the engine block and have a mate hold a large flat-headed screwdriver between the bolt and in the gears that the starter motor runs on.

Mark a line over the end of the crank and onto the flywheel so you can put it back on in the same position. Now's the time to either tank the flywheel down to the machine shop, or swap it for your freshly-machined spare. The bonus with using your own flywheel is that you know it's condition – assuming you haven't abused the life out of it yourself!



## THIS DEFINITELY ISN'T A ONE-PERSON JOB, SO FIRE UP THE BBQ!



- COSTS**
- High Torque Organic Clutch: \$615.00
  - Spigot bearing: \$25.00
  - Clutch alignment tool: \$15.00
  - Flywheel machine: \$55.00

**Total costs: \$710.00+ Labour (normally approx. \$550)**



**13** Remove the small spigot bearing from the rear of the crank of the engine; this is best done with a small gear puller or a slide hammer as shown. Replace by tapping the new one in with a copper drift

**14** Now it's time to reassemble with the new clutch. Replace the flywheel, ensuring you line up the same marks you made when removing it. After the flywheel has been machined, they spray a resin over it to protect the surface from rusting. You'll need to wipe the coating off with metho

**15** The clutch we're using is a high-torque organic unit from Direct Clutch Services. It's a heavy-duty Dakin clutch that's had the clutch plate modified to give an extra 25% clamping ability without the need for any more pressure at the pedal.

Position the clutch plate in position using a clutch aligning tool (available for \$15), and then place the pressure plate over the top, lining it up with the dowels in the flywheel. Then bolt it on using the original bolts – they'll all need to be torque to the correct setting, which is where your workshop manual again saves the day. Grease the input shaft of the gearbox and fit the new thrust race, this is held in place with a wire clip

**16** Refit the gearbox by reversing all the steps that were used to remove it, and be sure to remove the clutch-aligning tool before reassembling. This will require one person on the jack while the other person guides the box up into position.

Once it's up high enough, both people will need to get under the vehicle to shuffle the box back onto the motor. Then bolt it into position using all the same hardware. Follow the same steps to refit the transfer case, wiring harness, gearbox crossmember and gear leavers.

**17** Refill the gearbox and transfer oils, top up the clutch master cylinder and bleed the clutch. This is done by pumping the clutch pedal three times, holding down on the last pump. While the first person is holding pressure on the pedal, a second person under the vehicle loosens the bleeder nipple to release the fluid and any air that may be in the system then tighten the nipple.

Repeat this over a couple of times until a good amount of pressure is felt at the clutch pedal. Then take for a test drive – job done!

## CONTACT DETAILS

Thanks go to Direct Clutch Services for supplying the heavy-duty clutch kit we used in this article.  
(07) 3862 2680  
[www.directclutchservices.com.au](http://www.directclutchservices.com.au)