

# Replacing a differential



Words & photos: Ben Sale



Here is my guide to swapping a diff out of a NA6 MX-5.

This guide focuses on swapping a NA6 diff for another NA6 diff, however I see no reason why this guide isn't applicable to all NA and NB series MX-5s as the differentials are interchangeable.

I apologise in advance and am a little embarrassed by the amount of mud on components in the photos ... the joys of a motorkhana in a muddy field!

After having done the swap once by myself and swearing never again, this time I was lucky enough to have fellow Club member Cheyne Toomey drop by to give me a hand. Aside from turning up to my house with coffee and taking a lot of the photos it was fantastic to have him helping, especially when it came to putting the diff back in the car and in saving me from getting out from under the car ... much easier than doing it alone, thanks so much mate!

**1. The first step is pretty simple: get the car jacked up.** You want to do this properly as you're going to be working under there for a long time. I had wheel chocks at the front, jacked the car up by the diff and then had stands on each side. This is really the *minimum* requirement for this job. Before you jack the car up, crack off the wheel nuts as you'll need to remove them later.

**2. Remove the exhaust.** As my mid pipe and muffler can be separated this is quite easy to do on my car without removing the chassis bracing. If you have an OEM exhaust and factory or aftermarket bracing you'll probably have to remove that too. If the exhaust hasn't been removed on your car before, using silicone spray on the rubber hangers works wonders.

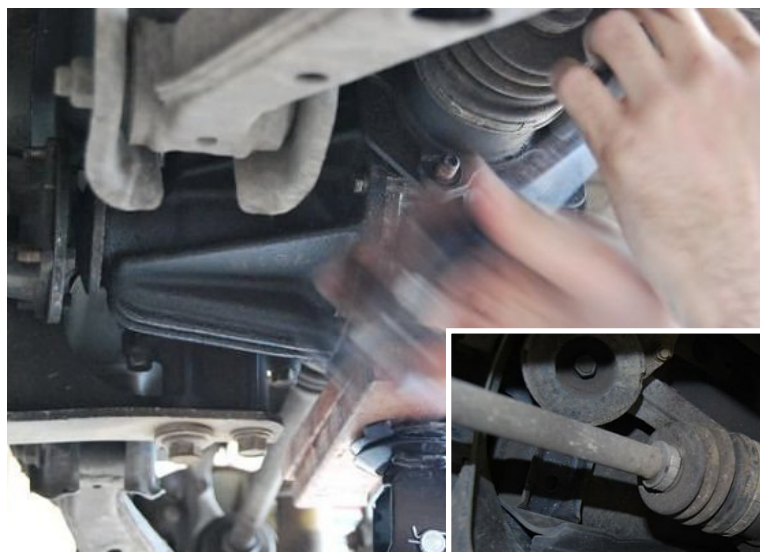
**3. Start the epic un-bolting process.** There are four bolts connecting the diff and tail shaft on each side and another four connecting the half shafts. You have to have the handbrake engaged to loosen the half shaft nuts. You can't access all of them at once so you have to take the handbrake off to rotate the shaft to allow access to the other nuts. Similarly to undo the tail shaft nuts you have to have the car in gear, but to access all of them you have to put the car into neutral to rotate the shaft. Having a second person saves



1. Jack up the car



2. Remove the exhaust



3. The unbolting process ...



a lot of time here as you don't have to get out from under the car six times.

**4. Remove the half-shaft from the diff.** Remove the rear wheels. The trick to doing this is by unbolting the top mounting bolt for the hub and loosening the bottom one which allows the hub to sit at a 45° angle. This pulls the half shaft far enough back that they are easy to remove from the diff. You might find the bolt holding the hub in place a bit hard to remove; I just tapped it out with a punch which was quite easy. Once you've removed the shafts from the diff it helps if you move the half shafts out of the way. I got Cheyne to cable tie them to the upper control arm.

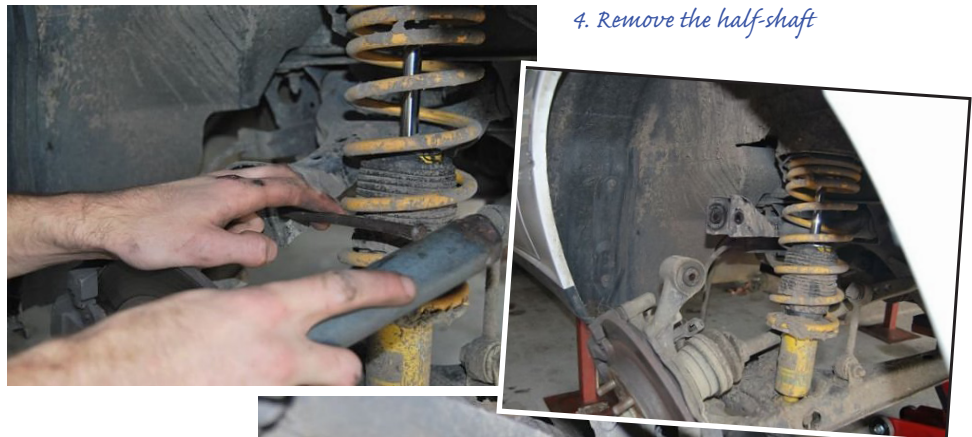
**5. Remove the bolts which connect the diff to the power plant frame (PPF).** They have a 17mm head and are extremely long and can be hard to remove if they've been there a while. You'll also notice two 14mm bolt heads on a little block connected to the diff and the PPF. Unbolt these too as otherwise you won't be able to pull the diff out of the PPF.

**6. Remove the bolts which actually hold the diff cradle to the car.** Before you do this you should make sure the trolley jack is under the diff to support it when you undo these bolts. The diff will still be held in place by the PPF too, but you don't want to put all the weight of it on the PPF. An extension bar is handy for this step. As well as the two main bolts you'll also have to remove two 12mm nuts which hold the bush in place. The second photo is the carrier with the bolt and bush removed.

**7. Get the damn thing out of the car ...** I hate this step. Basically you need to lower the diff and then slide it backwards out of the PPF. It's easier said than done and will take a bit of fiddling as it doesn't want to come out (the diff is practically fused to the spacer in the PPF). I found sliding each side backwards and forwards, easing it out of the gap worked best. Be mindful that when you do get it free of the PPF it will drop and it is heavy, so be careful. When it's out you can smile ... !

**8. Remove the spacer in the PPF** which will have stayed there when you removed the diff. It has two holes which the long bolts go through and the hole towards the front of the car has a press fitting which holds the block to the PPF. The only way I could think to remove this was with a hammer... Clarkson would be so proud..! Basically I tapped the rear of it to pivot

*4. Remove the half-shaft*



*5. Remove the diff bolts*



*6. Remove the diff cradle bolts*



*8. Remove the spacer in the PPF*



### 9. Fit the spacer to the diff

it around and then tapped it up until I popped the spacer out of the press fitting. Then I hammered the press hitting down enough so that it was sitting flush with the PPF, but not enough to remove it. In the photos the first photo shows the spacer and the second shows the PPF without the spacer. In both you see the press fitting sitting as it should after you hammer it flush.

**9. Fit the spacer to the diff you are installing** and fasten with the bolts you removed from the old diff earlier. I then drained the diff oil out of the diff I was putting in as I wanted to use fresh oil and to make it lighter to lift. One trick when doing this is to undo the filler plug before you undo the drain plug as you don't want to drain all the oil out if you can't put any back in because of a seized bolt!

**10. Putting the diff back in** is a simple matter of sliding it back into the PPF. Sounds easy ... not really. This where it really helps to have a second person to assist in getting the location and angle of the diff correct in order to slide it into position. Once you have it in place get the trolley jack to support the diff and save your arms. I first put the bolts back into the PPF and then tapped the press fitting back in. Next was to bolt up the chassis mounts at the top of the cradle. When those bolts are in you can remove the trolley jack.

**11. Re-attaching the hub** is quite easy, the trick is to raise the whole assembly up by the LCA with the trolley jack and then bolt it back together.

From here you simply re-attach the half shafts and the tail shaft and fit all the nuts and bolts. Installation is the reverse of removal. (I have developed a habit with my car, after having numerous issues with seized bolts, that everything I take apart gets put back together with a good coating of copper grease. Works wonders.)



10/11. Putting it all back



12. Put some oil in the new diff



**12. Remember to put some oil in the diff.** It's quite easy to forget, I nearly did and I know of one case where a club member destroyed a diff because they forgot. Fill until oil starts to dribble out of the filler hole.

Then you are ready to remove the axle stands and take the car for a test drive. ■



12. And you're there!