Introduction

Why carry out this conversion? Firstly, it's a well known fact the Land Rover state the 'The [E-diff] cannot be retro-fitted to the Discovery3'. Unfortunately, such statements tend to have a similar effect on me as a red rag does to a bull, so I had to see if it was indeed possible.

Secondly, my last car (a Td5 Discovery 2, converted to Manual Transmission) had TrueTrac limited slip diffs fitted both front and rear and, along with the re-instated centre diff lock, was extremely capable. I remember the satisfying feeling when the car crawled over an obstacle that similar vehicles couldn't cross (even when using the momentum method), as well as the lack of mechanical trauma I was inflicting on the car as it did so.

There was a reason the Land Rover offered the locking diff as an option – it made the car more capable, and used less effort on the more difficult situations. Why else do you think that ALL the Land Rover Experience vehicles were so equipped?

Identifying the Parts required

Before undertaking such a major project on what is my only car, I like to make sure that I have ALL the necessary parts on hand, so that the job goes as smoothly as possible. This involved considerable hunting through Microcat, particularly in the electrical wiring category.

The parts that I would need were as follows:

1) The locking diff itself – I quickly realised that there are three different ratios available for the D3 – 3.54:1 (TDV6 Auto), 3.07:1 (TDV6 Manual) and 3.73:1 (for V8-engined vehicles).
2) Half-shafts – There were separate part numbers listed, depending upon whether the car had the e-diff or not.
3) ECU – The e-diff is controlled by its own ECU, located behind the rear trim on the passenger side of the car.
4) Chassis Wiring Loom – As well as the Air Suspension option, the e-diff spec led a completely separate loom for the chassis.
5) Main Body Wiring Loom – Again, this is a separate part number. The listings in Microcat suggested that if a car had rear air-con, it also had the e-diff. This would (hopefully) make identifying a suitable donor vehicle easier.

The other items in the traction control chain (transfer box ECU, Terrain Response controller etc) were the same for both e-diff and open diff versions of the D3.

The Great Parts Hunt!

Armed with the above information, I trawled through various Forums as well as that well known supplier of second-hand parts and general tat – E-bay.

The first success was the e-diff itself – there was one with the correct ratio listed on E-Bay. After a few e-mails between myself and the seller, I was able to obtain not only this, but the chassis loom and the half shafts as well! That was an extremely lucky result, and the price seemed very reasonable.

Upon collection, the seller stated that the half shafts were the same length as my existing items (he had some available for comparison), but that the ones fitted to the e-diff equipped cars had larger CV units fitted. This surprised me; from my generic engineering understanding, I believed there would more strain on the shafts of an open diff vehicle, due to the shocks imposed by the constant application of the brakes as the ETC kicked in – surely these cars should have the stronger CV joints?

My next result was the ECU. Again, this was an E-bay find, and it came all the way from California! The cost for a new, unused item was very reasonable (even with the shipping).

That left the main body loom – there were a couple on the Bay, but the 'Buy it Now' prices were, quite frankly, ridiculous. I believe they are still available as I write this, suggesting that everyone else thought so, too. Eventually, I asked Richard Knapp (aka 'Knappster') to have a look for me when he carried out one of his 'routine' visits to a large 4x4 breaker close to where he lives. He identified four possible vehicles, so I decided to follow this up by visiting myself when I was passing fairly close.

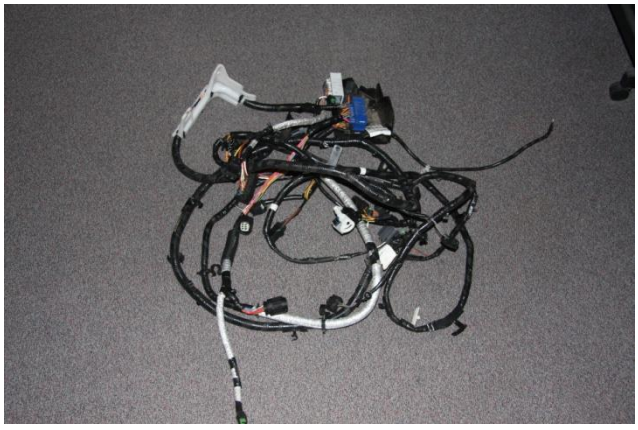
Colin White Services, or 'CWS', located at Glastonbury proved to be a veritable 'Aladdin's Cave' of Landy parts. One vehicle in their yard had rear air con but no e-diff wiring, whilst another (a LHD SE which had been removed from its chassis) had e-diff wiring, but no rear air con. My previous theory about cars with rear air con also having the e-diff was well and truly blown out of the water!

Anyway, although the ECU had been removed, the necessary cabling was still present, so I was able to extract the required part from the loom. To attempt the removal of the complete loom would have taken many hours and would have been pointless anyway, bearing in mind the car was a Left Hooker...

Planning the Job

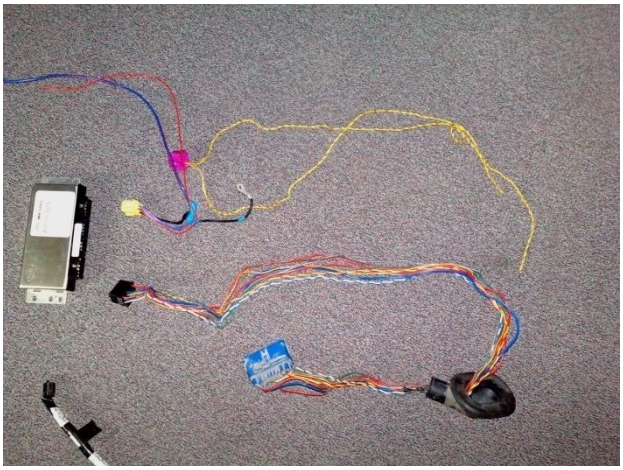
I now had all the necessary bits. All I now had to do was work out how I was going to fit it all; the mechanical side looked like it was going to be fairly straightforward, but the electrics had the potential to be an absolute nightmare!

First up – the chassis wiring. I had the complete loom, and I really didn't want to have to swap this over with the loom already fitted to my car, especially seeing as I currently had no wiring faults. I'm a great believer in the old saying, 'If it aint broke, don't fix it!'

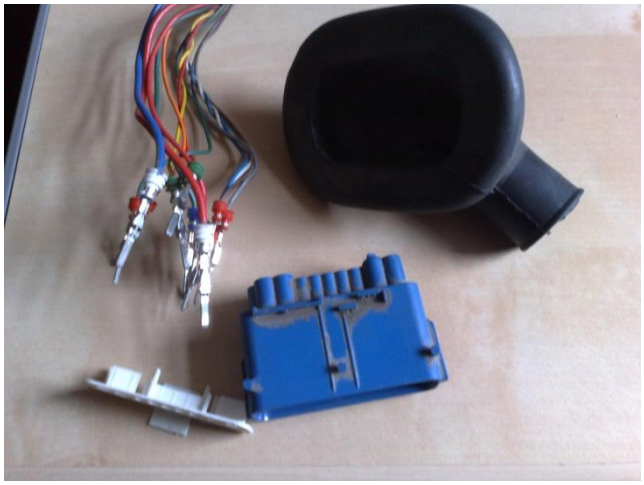


A little investigation revealed that I would probably be able to separate the e-diff wiring from the rest of the chassis loom. This was indeed the case – I now had a small wiring loom approx three feet long, rather than the snake's honeymoon that was on the floor previously! The big question is why didn't Land Rover supply the loom like this, rather than going to the expense of having a completely different loom for e-diff equipped vehicles?

Next – the body loom. Here I only had part of the wiring, although it included the three plugs that connected the body loom to the chassis. I was only interested in the blue plug. After excavating all the sealant from where the wiring passed through the large grommet, I disposed of the unwanted wiring, leaving the bits shown in the photo.

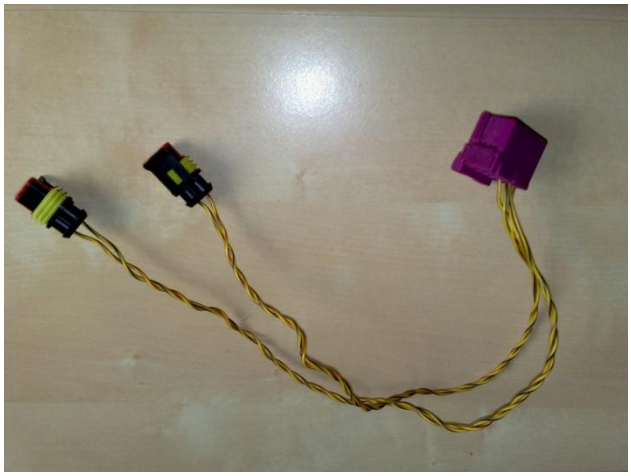


A big issue was how I was going to get the multi-plugs through the grommet when I fitted this wiring to the car. All attempts to extract the pins from the black plug failed. Eventually I turned to the large blue plug, from which the pins came out fairly easily.



Working out which pin went to which position in the plug wouldn't be an issue, as I had the wiring diagrams from GTR.

Also part of this loom was the CAN bus wiring – the ECU communicates on the high-speed bus, and is in the 'network' between the EPB ECU and the engine management ECU. The problem was that all high-speed CAN wiring within the car was the same colour (yellow/brown and yellow/black), so which way would the signal need to pass through the new ECU to maintain the network? I had a 50/50 chance on this, as the CAN wiring passes the e-diff ECU location in both directions; to and from the EPB ECU mounted within the EPB unit itself. I decided to temporarily fit some connector plugs to the CAN wiring from the ECU; these would enable me to reverse the data flow if I got it wrong when fitting. These would then be replaced with permanent crimps once the system was proved to be working.



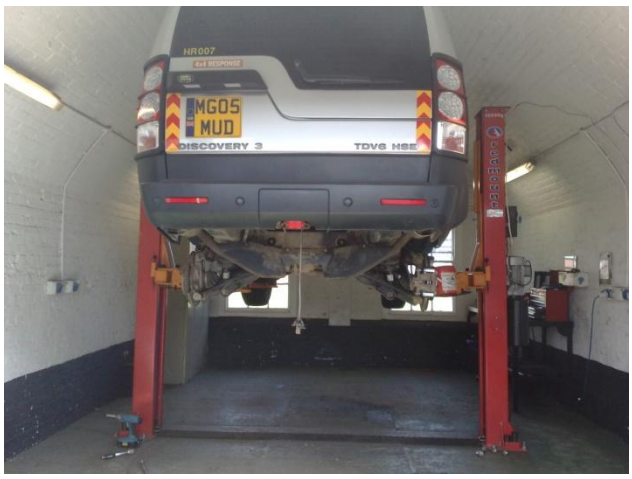
The other connections to the ECU are the main power, ground and the ignition 'wake up' lines – these would have to be sorted once the ECU was fitted to the car.

The ECU mounting bracket was already fitted to the car (the parking distance unit is fitted to the same bracket). The only other preparation work was to ensure that all necessary instructions for the mechanical fitting had been downloaded from the GTR website and printed off.

Shortly before I was due to start the job, I gave the car its 90,000 mile routine service and pre-MOT check. During this I discovered some 'play' in the rear prop. Seeing as this was going to have to be removed anyway for the diff swap, I decided to obtain another. CWS came up trumps again! Additionally, I decided to obtain a pair of new halfshaft oil seals to fit to the diff; these were duly purchased from my local dealer.

Fitting the E-diff

The day dawned; all parts, oils, instructions and the world's supply of tools were loaded into the car.



I am fortunate in that I have access to some very good facilities, including a two-poster ramp. I'll be the first to admit that this job would have been much more difficult (if not impossible) if I was doing it on the driveway or at the side of the road.

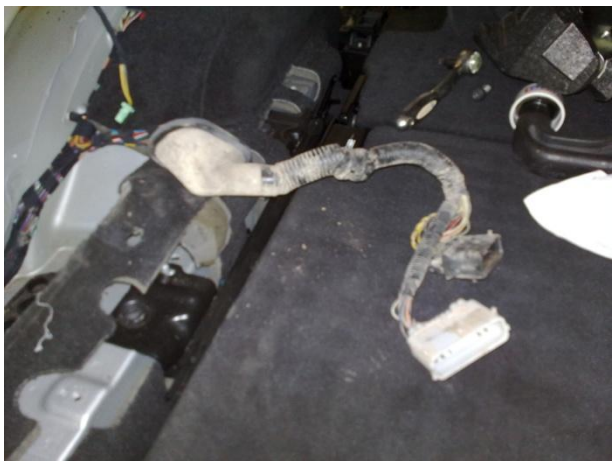
The actual swap of the diffs went fairly smoothly in accordance with the guidance given on the GTR site. The only major snag was the half shafts – they just didn't want to separate from the hubs! They eventually shifted, after some major persuasion in the form of a 7lb sledge hammer! Even the exhaust

came apart easily; a surprise, bearing in mind that it's probably been on there since new. Eventually, after about 5 hours of (fairly) blue language, the diff was removed. After a quick 'side by side' comparison, I called it a night.

The following day, the e-diff was fitted, along with the replacement half shafts and prop. This took place with absolutely no trauma at all – everything progressed as the GTR printouts said it should, much to my amazement!

Doing the Tricky Part – the Electrics!

Attention now turned to the electrics. Firstly, I concentrated on the wires from the ECU to the main chassis/body connecting plug, including passing through the large grommet.

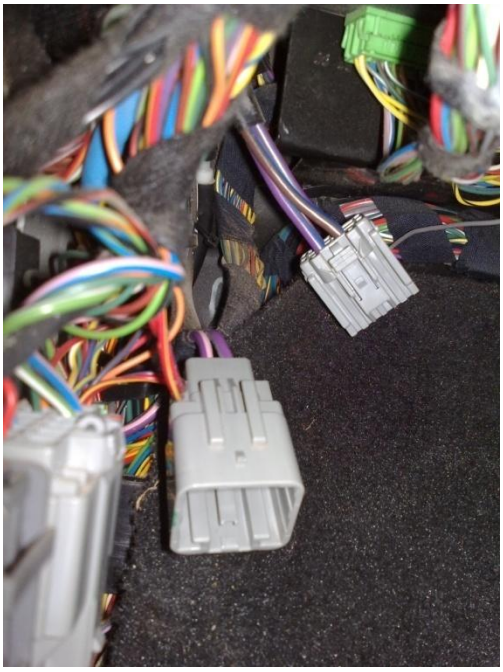


The two existing plugs were disconnected, and the wiring pulled back into the car, once I'd removed the left side trim from the luggage area. Again, I excavated the sealant, then fed the wires through the grommet before re-inserting the pins to the blue multi-plug in accordance with the wiring diagram.

I then re-sealed the cable access through the grommet, using some black gutter sealant. This has the advantage of remaining flexible, so should be as good as the original sealant used by Leoni Systems (the loom manufacturer). After taping the loom up, the plugs were then passed back through the floor and the grommet refitted. This allowed the extra chassis loom to be fitted, thus connecting the e-diff motors and sensors up. All three multi-plugs were then connected back up.

At this point, the wheels were refitted and the car driven from the ramp; this improved access via the passenger side doors. At least there were no horrible grinding noises!

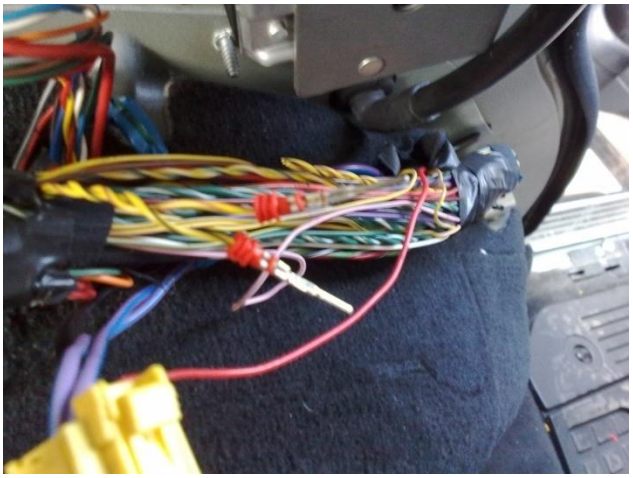
After disconnecting the battery, the next item on the 'agenda' was the power supplies to the ECU. This has a main supply, fed via a 40 Amp fusible link in the battery fuse box, and an ignition 'wake up' line, fed from fuse 24 behind the glovebox. Finding the plugs and wires associated with these supplies was a game in itself!



Because the loom in my car was not the one for the e-diff, the main power line (purple/blue) was not fitted. However, the connection from the battery box to the passenger cabin is, and was located just below the glovebox (upper plug in the picture). I ran a wire from this to the ECU.

As to the 'wake up' line, this also feeds the Terrain Response controller, via a cabling joint. This joint is where the supply for the e-diff ECU would be connected on suitably-equipped cars. However, this joint was located (even though there's no real need for it; the wire could have gone direct to the Terrain Response unit) near the bottom of the n/s rear door aperture. It was a simple job to run a wire from this to the e-diff ECU. The ground wire simply used the ECU bracket bolts to find a suitable 'earth'.

This left the CAN wiring. I identified the 'twisted pair' yellow/black and yellow/brown wires of the high speed bus, cut it (deep breath time!), then added the temporary terminals to allow testing. These were then connected to the plugs fitted at the 'planning' stage.

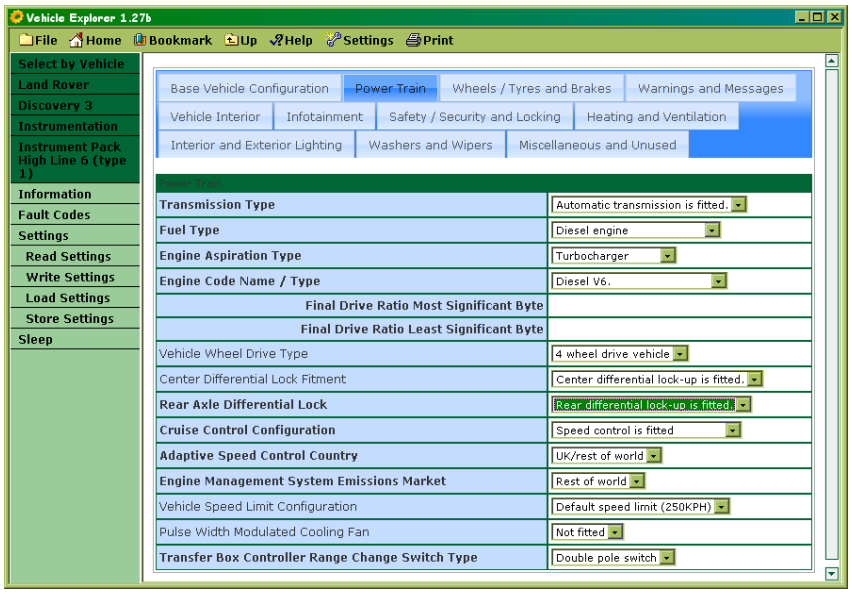


After fitting the ECU to its bracket, the three multi-plugs were connected and I was now ready to set-up and test.

Time to re-connect the battery!

Setting the Car Configuration File

As is frequently the case with the D3, nothing will work if you don't tell the car that it's there! This is where you need a diagnostic system. I use the Faultmate as does 'Wiggs', although the Autologic system as used by '10forcash' will do the job just as well. Alternatively, a Land Rover Dealer could hook up their T4 system, switch it on, have a cuppa and charge you an absolute fortune for the privilege...



All that needs to be done is to set the 'Rear Axle Differential Lock' to 'Fitted', then write the CCF back to the car. After that, cycle the ignition twice, clear any error codes for good measure, and all should be working, *provided* the CAN bus is connected the correct way around! If you're still showing errors, now is the time to swap the temporary connections (once you've turned the ignition off, and allowed the car to 'go to sleep').

Testing

It is now time to test. I did this *before* I put the interior back together. Find a suitable bank, select 'Low' and 'Rock Crawl' – this will allow the e-diff to lock up once you are cross-axled. I had to 'prod' the throttle slightly to get the red 'fully locked' symbol. If all goes to plan, you should have display shown on the right. The one on the left is where we started!

← from this

to this →

All that remains to be done now is to replace those temporary connections with permanent in-line crimps, then reassemble the interior!

Conclusion

So, was it worth it? Although I have yet to test the car for real (that'll be happening over the first weekend in July), the ease which it climbed my test bank (the ETC didn't cut in at all, despite having two wheels 'hanging') would suggest that the job will prove to be worthwhile in the long run.

Total Cost	Parts	£600
	Oils	£30
Time taken	Planning	6 Hrs
	Fitting	13 Hrs