

Mercedes W168 2002 A160 Classic – K1 Clutch Pack Replacement

Overview

I was driving out from my work one afternoon and as I was accelerating out of the driveway the engine revved significantly and the car appeared to lose forward traction. Over the period of getting home with a number of stop starts the shuddering on start-off progressively worsened to the point that it felt un-safe to drive.

Having just had my son's Mitsubishi Lancer Cedia transmission fail with a similar set of symptoms, I figured out fairly quickly that the K1 clutch in the transmission had probably failed (i.e. cracked housing preventing enough hydraulic pressure being applied to the friction disks for the clutch pack to work properly).

I rang a transmission repairer the next day and was quoted \$5000 NZ to repair i.e. the value of the car. Given that the car was now effectively worth scrap value, I decided to give replacing the K1 clutch a go as driving it would be too dangerous i.e. effectively the car had next to no first gear.

I thought that I would document the steps (as best as I can remember) to show that a reasonably major job such as this is possible for the "home mechanic". The only device that I had borrow-in was an engine lifting frame. All the other tools used were hand tools that a typical "home mechanic" would probably already have or were inexpensive to purchase.

Parts, Cost and Time

I purchased a complete K1 clutch pack from the UK for around \$500 NZ from Chris @ Autolink Automatics Ltd via uk.ebid.net (**Note:** This clutch pack is the newer design and looks significantly more sturdy than the original removed from the car). The dealer pricing was \$1500 for the same part. While the car was disassembled, I decided to also replace the V-Belt and idler pulleys and I brought these direct from the dealer. Post assembling the car and after driving it for 100km with the original transmission fluid, I also changed the transmission filter and fluid.

All up the repair cost around \$1200 NZ and took me around 50hrs of effort spread out over a period of around 1 month.

Mercedes 722.7 Forward Clutch Drum Complete



Product ID: 101HP01
Description: Mercedes 722.7 Forward Clutch Drum Complete

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Pulling It Apart

- By way of note first. I taped up any pipe, openings or joints where it looked like fluid could escape or dirt should not enter. Throughout the entire operation there will be plenty of opportunities for fluid to escape. You need to be prepared to mop up radiator coolant and transmission oil as this will tend to escape at the most inconvenient times. Most of the work can be done on your own. I needed help with the following tasks:
 - Jacking the sub-frame with motor/transmission down onto the dolly
 - Pulling the transmission off the engine
 - Pulling the gear assemblies out of the transmission and also replacing these
 - Putting the transmission back on the engine
- Apply the handbrake, make sure the gear selector is in "Park", chock the rear wheels and disconnect the negative terminal of the battery.
- Remove the front bumper – This is needed so that you can get better visibility and get at things that the bumper obscures as you pull the car apart (also you will need to lift the car body using the structural member located behind the bumper). The bumper has 6 bolts (2 at the bottom, 1 in each wheel well and 2 on the top). There are also two plastic clips in each wheel well – I found these difficult to get out and needed to use a fine blade screw driver to prise the central pin out before being able to pull the entire clip out.

- Jack up the car each side at a time and remove plastic cover that obscures the bottom rear of the sub-frame on each side of the car. The passenger side is a relatively small piece of plastic, and the driver side a larger panel (you should be able to lie beside the car and reach all the bolts without needing to get under the car – for safety sake, since the car is only supported by a jack). When finished let the car down again.
- Slightly loosen the wheel nuts on each wheel (**Note:** This was the only operation that I needed to use a rattle gun for as my tyre shop had way over torqued the nuts and I could not move them using a hand bar and socket. No other bolts/torx screws/torx head bolts were overly tight throughout the entire dismantle/re-assemble process and I was able to use only hand tools).
- Jack up each side of the car at a time and place an axle stand at the rear and at the front of the sub-frame to support it. Be sure to keep the axle stands clear of the holes in the sub-frame as these are the access for the sub-frame to car body attaching bolts (see photo below for a rough guide to placement).



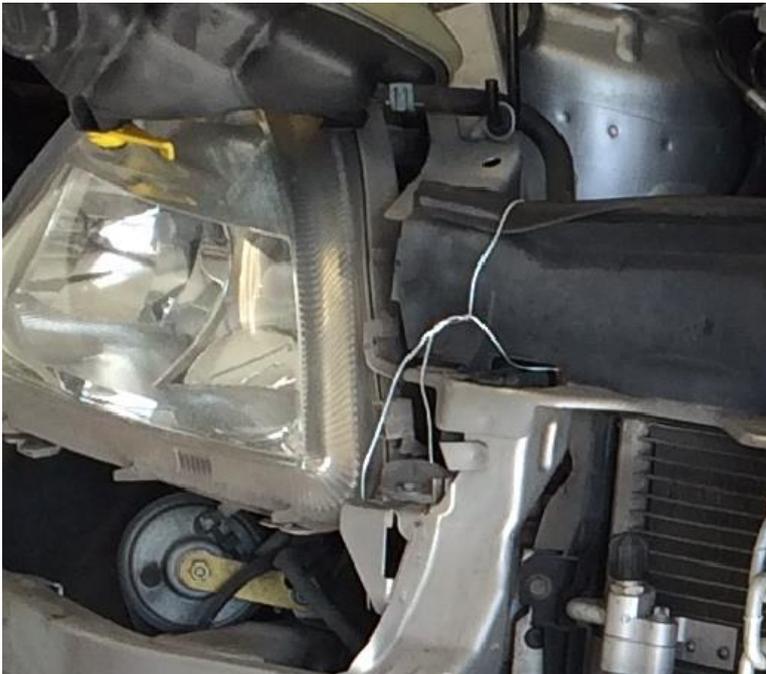
- Remove the wheels from the hubs. These should be clear of the ground now as the car will be supported by the 4 axle stands under the sub-frame.
- Remove the brake calliper, brake disk wear indicator (if fitted) and ABS sensor from the driver's side. Un-clip the brake disk wear indicator and ABS sensor cables from the driver's side front suspension strut. I used some small gauge garden wire to hold the brake calliper up so that it was not hanging from the brake line (see photo below). Repeat the process for the passenger side (no brake disk wear indicator on this side).



- Undo the plastic cover that covers the underside of the car from the rear of the sub-frame back (around 8 M8 screws from memory) and let it drop down to the floor. It is hinged on one side, so you can't remove it without lifting the whole car to a decent height to allow it to swing clear of the ground). Once the cover is undone, you can remove the brace that runs from the back of the sub-frame on the driver's side (two torx head bolts). You can do up the plastic cover again as it will only get in the way down the track – you might need it undone to give you more room to unbolt the compressor, but this was not an issue for me. Remove the brace on the passenger side as well.
- Undo the plastic cover on each side that obscures one of the sub-frame bolts on each side. Remove the torx head bolts from each side of the sub-frame (3 bolts). I lay directly under the sub-frame and eye-balled each bolt prior to removing as they are slightly difficult to get at.
- Undo the exhaust pipe from the catalytic converter (2 spring loaded torx screws).
- On the driver's side remove the torx head bolt that attaches the air conditioner compressor line to the sub-frame.
- On the passenger side, cut the cable tie that secures the control cable going to the transmission to the car body (this is important as not enough slack on this cable is the first snag you will encounter on starting to lift the body away from the sub-frame if you fail to cut the cable tie).
- You are finished under the car for the time being.
- Just below the driver's side of the front bumper area, remove the "pointed sensor" from its holder (this has a relatively short cable and will be a snag stopping you lifting the body – caught me out). See photo below.



- Drain the radiator by first undoing the cooling fluid reservoir cap and then using a blade screw driver to undo the red valve at the bottom of the radiator. Do up the red valve again once the radiator has drained. Partially secure the driver's side of the radiator so that it stays in place when the body is lifted from the sub-frame (see photo below).



- Undo the 3 screws holding the two halves of the air intake housing together. Disconnect the control cable plug at the back, the sensor plug in the front and the rubber pipe attached to the motor air intake. Pull this part of the housing away (store it safe way from dust etc).
- The remaining section of the air intake housing is secured with three pins that slide horizontally into mounts on the top of the engine. Remove the air intake hose that comes from above the radiator from the housing. Using a rubber mallet tap the passenger side of the housing towards the driver's side to remove it. **Note:** Removing the air intake housing just provides more space to work in so that you can get to other stuff in the engine bay and see down the engine as you raise the body.

- Remove the hoses from the radiator top and bottom. Remove the heater hoses on bulk head (these may be very tight and will require quite a bit of jiggling/twisting to free after you have moved the hose clips out of the way). Remove the hose and the sensor from the radiator supply reservoir and remove it.
- Disconnect the engine earth straps from the body on the driver's and passenger sides.
- Lift the windscreen reservoir out of its mount and pull the pump out of it. Remove the reservoir completely and store it.
- Undo the electric power steering pump cables from the terminal block mounted on top of the air pump mounting bracket.
- Disconnect the pipe from the engine to the air pump at the engine. Undo the bolt holding the electric power steering terminals from the air pump mount and remove the terminals. Undo the three bolts holding the air pump and remove the air pump. Cut the cable tie holding the cable and pull out the cable from the pump. Note: You may be able to get away without removing the air pump, but as it was an easy operation, I chose to do this. Photo below shows the air pump. Had to empty quite a bit of water from it when removing.



- Remove the pipe that runs from the front of the motor to the brake booster housing. The right angle joint just pulls out from the motor.
- Undo the bolt holding the steering joint together. Remove the bolt and lift off the cabin side of the joint. This joint can really only go back together one way, so no need to mark anything. Obviously, not moving the steering wheel while the joint is apart will help when you come to re-assemble it.
- Pull the black cover of the thin cable going to the transmission and separate the joint. It is under tension so you will need to pull it from both ends and then twist the white collar out of the housing.
- Cut the rubber fuel pipe and tape the ends. If you can figure a way to release the clips at either end without damage, you could remove the pipe. I couldn't and ended up using a brass jointer with hose clips to re-connect it during the re-assembly process.

- Drain the transmission. The drain plug is a hex socket and you need an allen-key to remove it. Around 3 litres of fluid should come out. I put this into a sealed container straight away as it was the same fluid I used to perform the transmission flush (driving first 100km after the clutch replacement).
- Undo the two transmission oil cooler lines from the radiator (Yes – fluid will come out and will need to be mopped up).
- Remove the 2 torx head bolts on each suspension strut. I found that using a long nose plier to compress the retaining clips enabled me to lower each strut down away from the mount. Once the car was raised all the way up, I wired the struts to the sub-frame to stop them moving around and placing too much pressure on the smaller suspension joints.
- You should now be in position to start raising the body. I used a 1 ton motor lifting frame and attached the chain to the front structural member just behind where the bumper mounts. You may want to wrap a cloth around the chain to protect the structural member from damage. The photo below shows the setup.



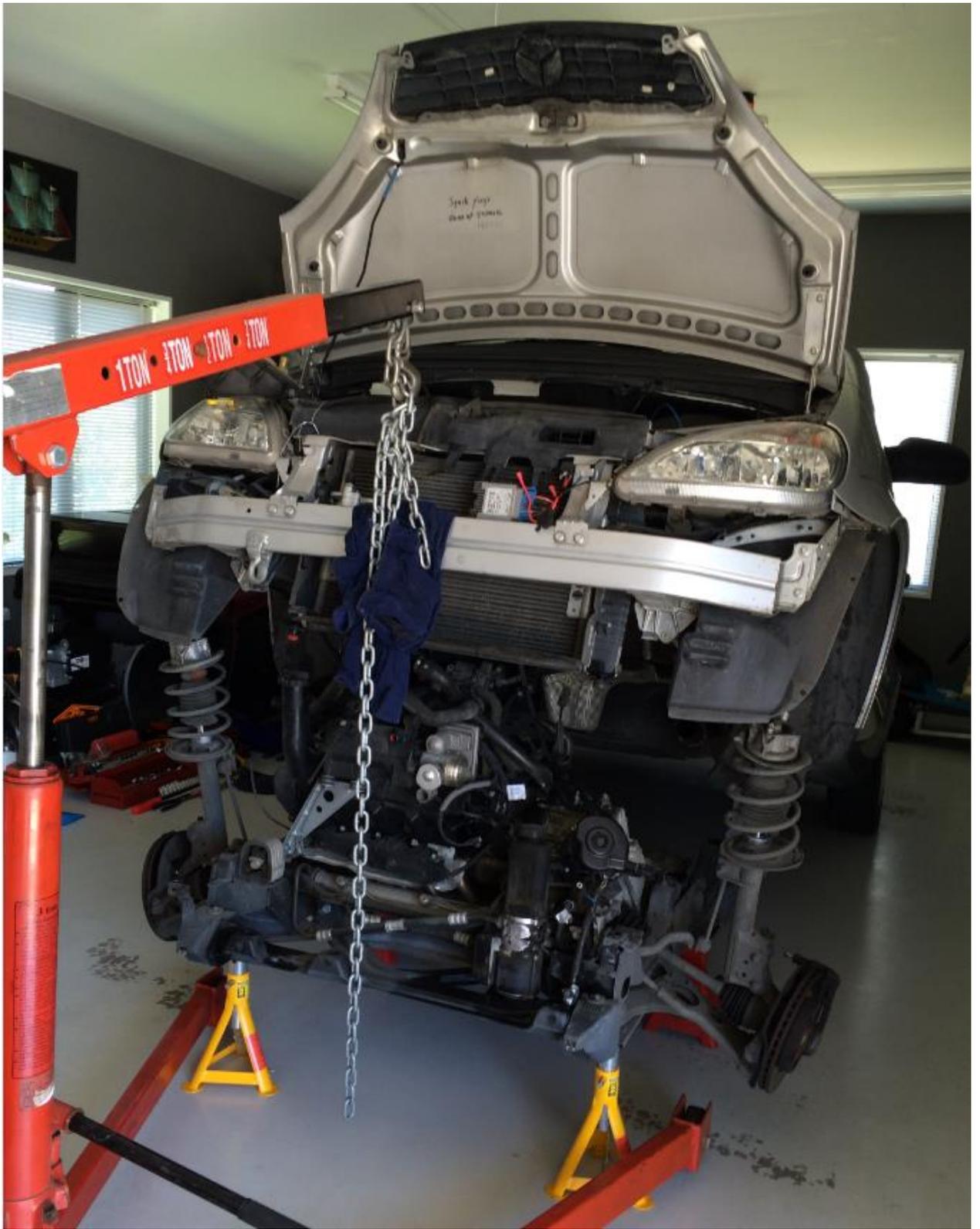
- The Mercedes documentation says that you can raise the body from the sub-frame by 90mm initially without issues. Run a check around the car to ensure that there is nothing not left undone that will prevent the body being raised (I might have forgotten something in my description so far, or else

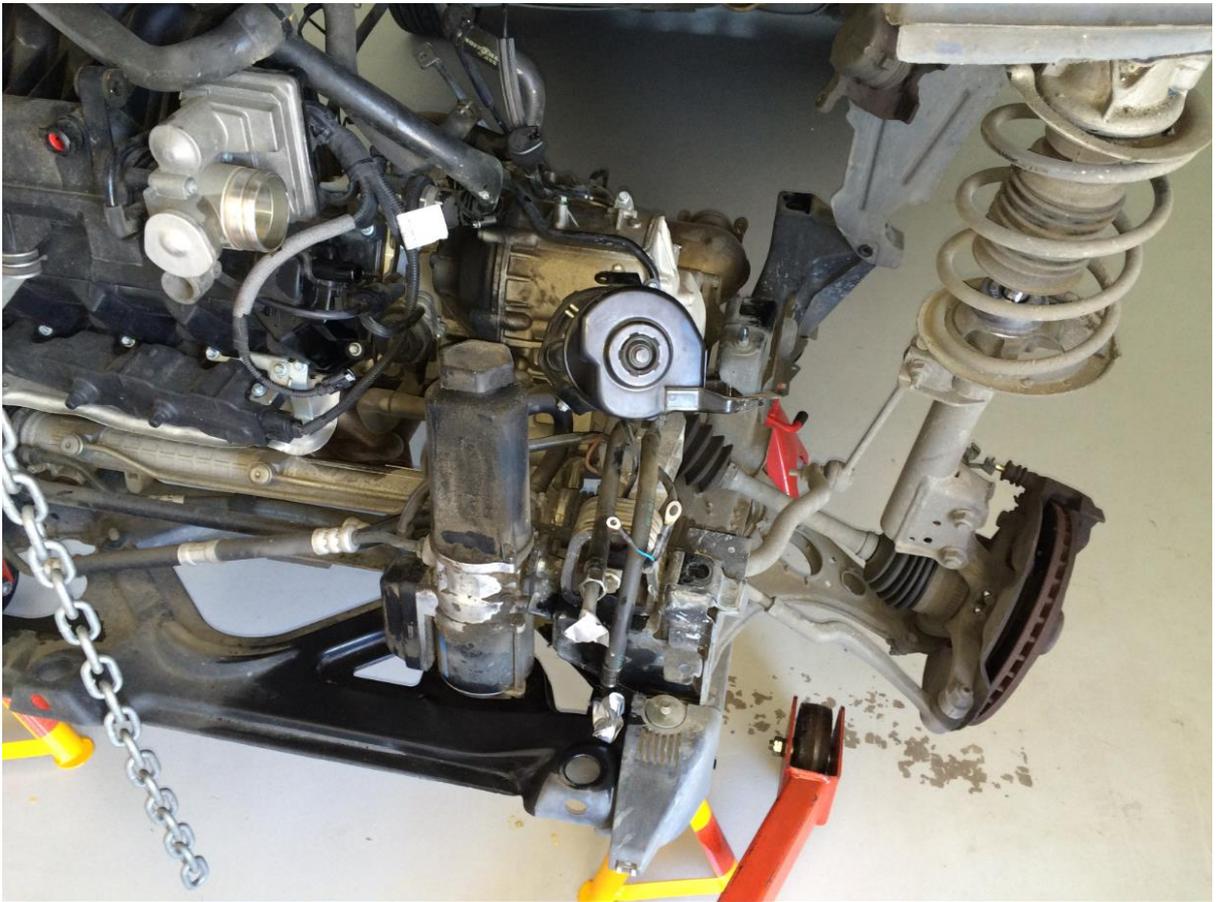
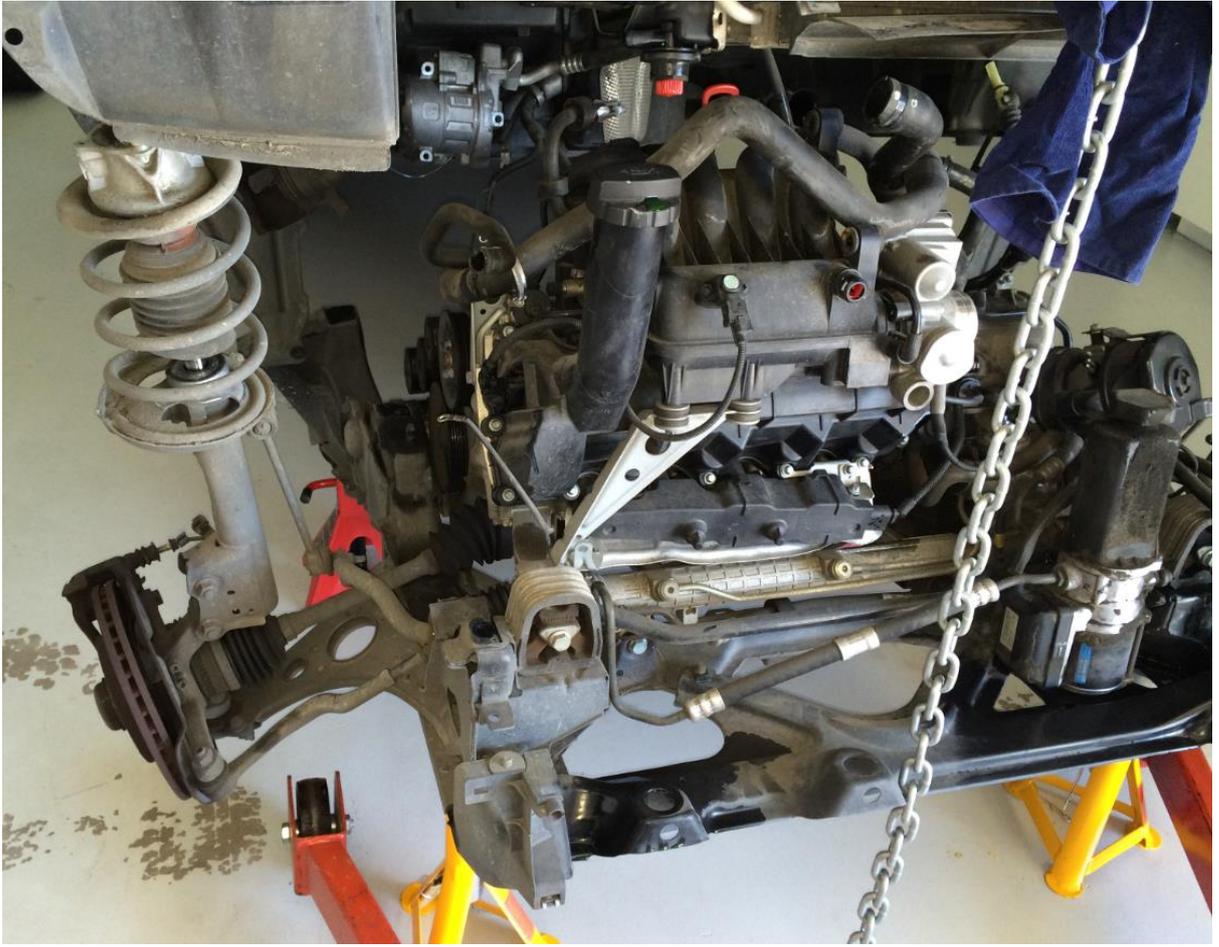
you have a different model with more stuff needing undone/removed). Once happy raise the body 90mm.

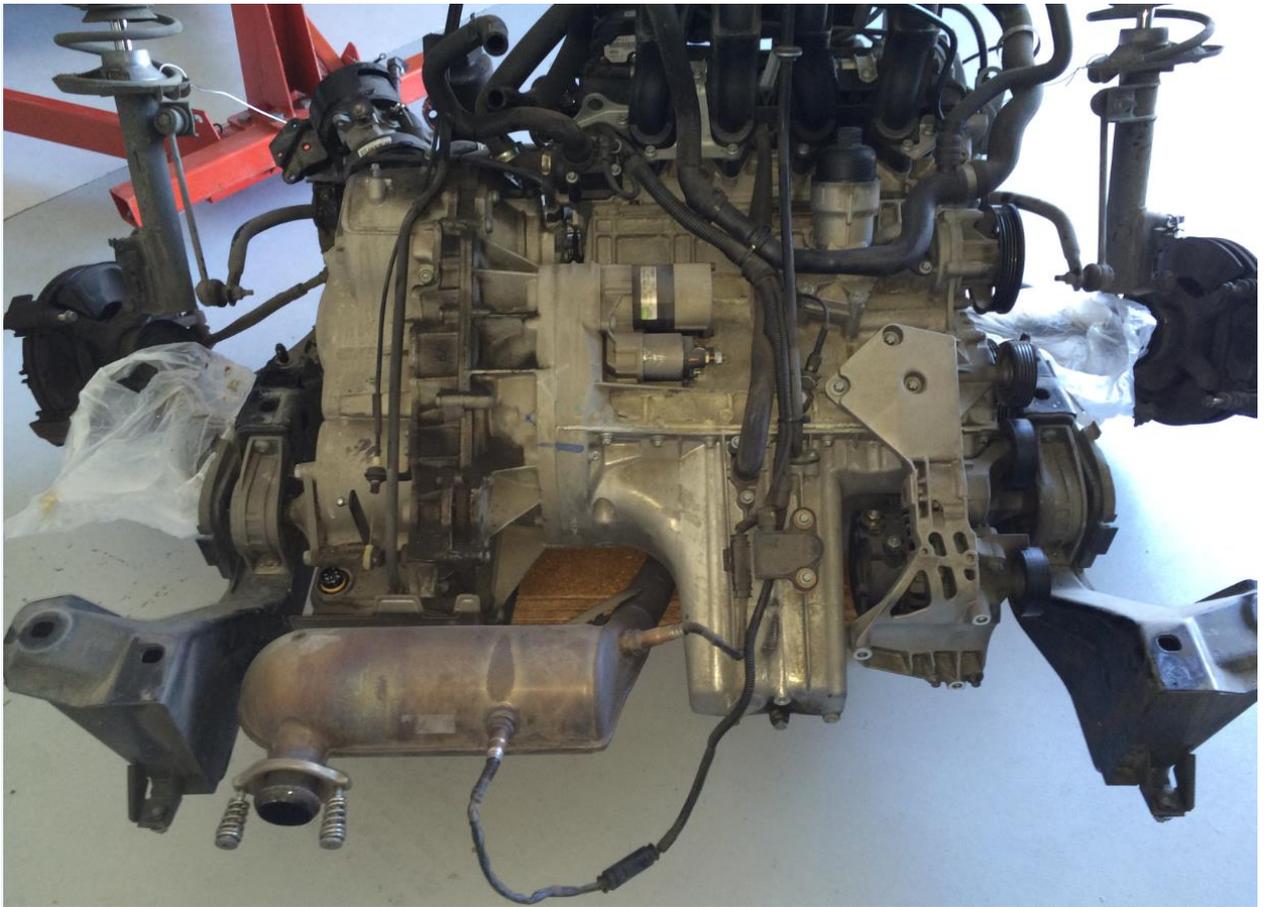
- Unplug the cable going to the air conditioner compressor. Unbolt the air conditioner compressor and end bracket from the rear of the engine. There are 3 long torx head bolts attaching the body of the compressor to the mount. The end bracket has 3 shorter torx head bolts. As I planned to replace the V-belt, I used a screw driver to prise the V-belt from the air conditioner compressor pulley. If you want to keep the belt, you will need to use a suitable spanner to move the tensioner clock wise while you work the belt free of the pulley. Wire up the compressor to the body of the car as this needs to move up with the body (see photo below).

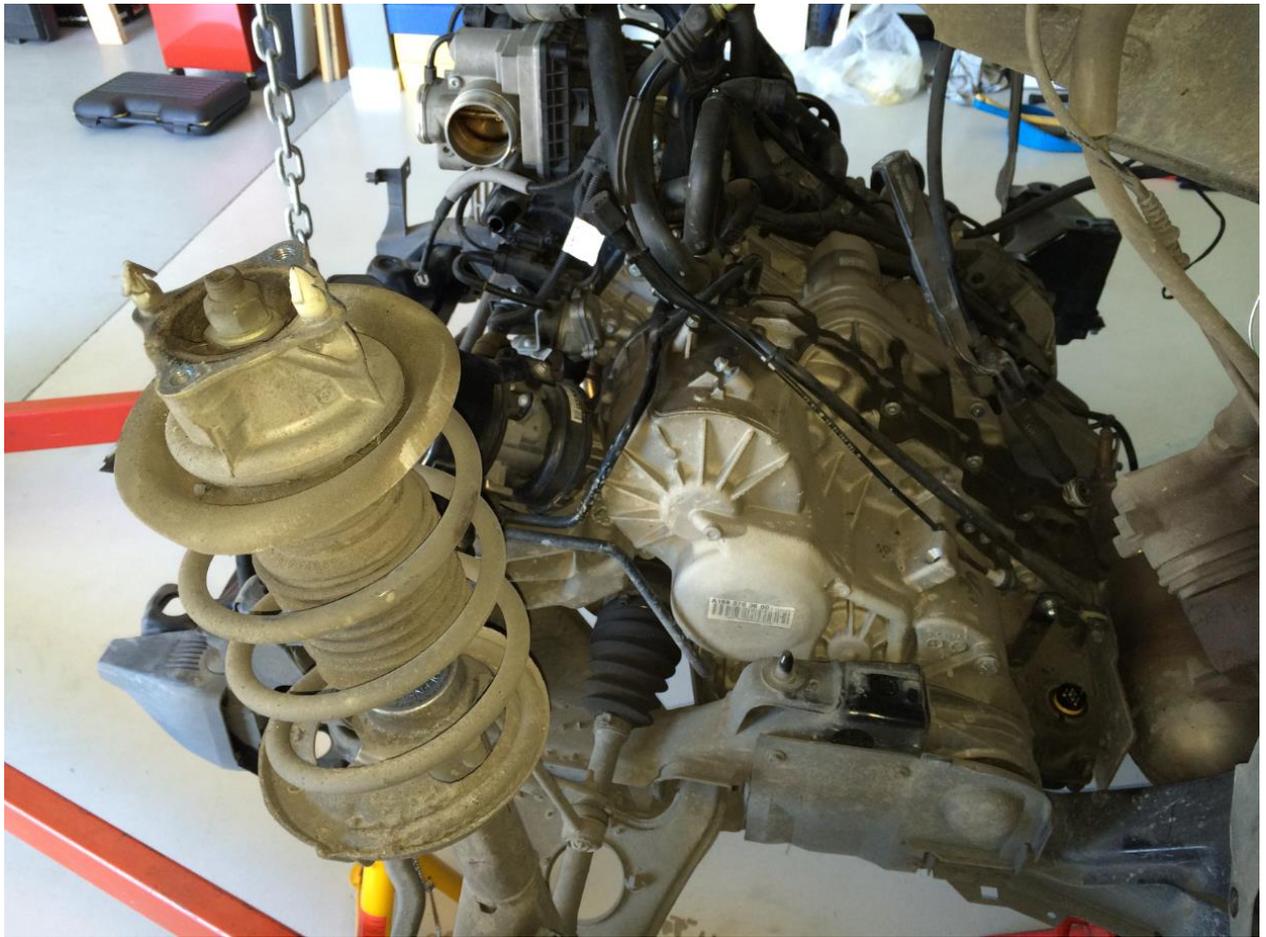


- If you can get to it, unplug the cable going to the transmission. The plug has a screw on collar which needs to be released before the plug can be removed from the transmission. If you can't get at it with the vehicle raised 90mm, complete the operation once you have raised the car further. You will also need to work the air conditioner pipe clear of the sub-frame so that it does not catch on the frame as the body is raised. The cables going to the sensors on the catalytic converter will need to be detached from the body as well.
- You are now in a position to raise the body another 300mm or so. Once raised you can disconnect the connections to the alternator, the starter motor, the earth strap at the rear of the motor and the transmission (if you were not able to do this with the car body raised 90mm). You can also disconnect the thick gear shift selector cable going to the transmission at the transmission. This has a torx head bolt to remove and a ball joint to prise apart. The ball joint has a plastic socket and the joint can be separated quite easily using a screw driver.
- You should now be able to raise the body all the way up to clear the motor/suspension struts (see photos below showing the lifted body, four views of the engine/transmission & sub-frame and the evacuated engine bay).



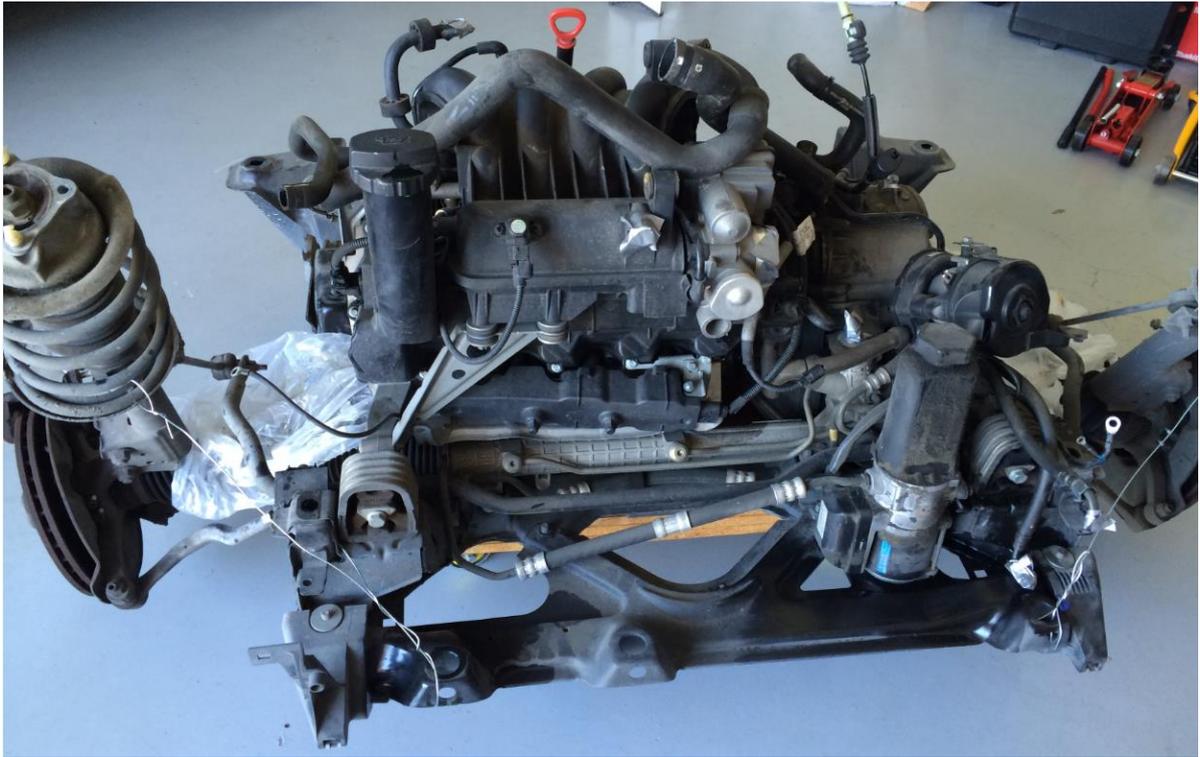






- With the body fully raised you are pretty much in a position to jack the motor/transmission/sub-frame down onto a dolly made previously using 3 pieces of 20mm particle board and 150kg rated castors (see photo below). I was able to balance the entire assembly on the dolly and move it as a complete unit.

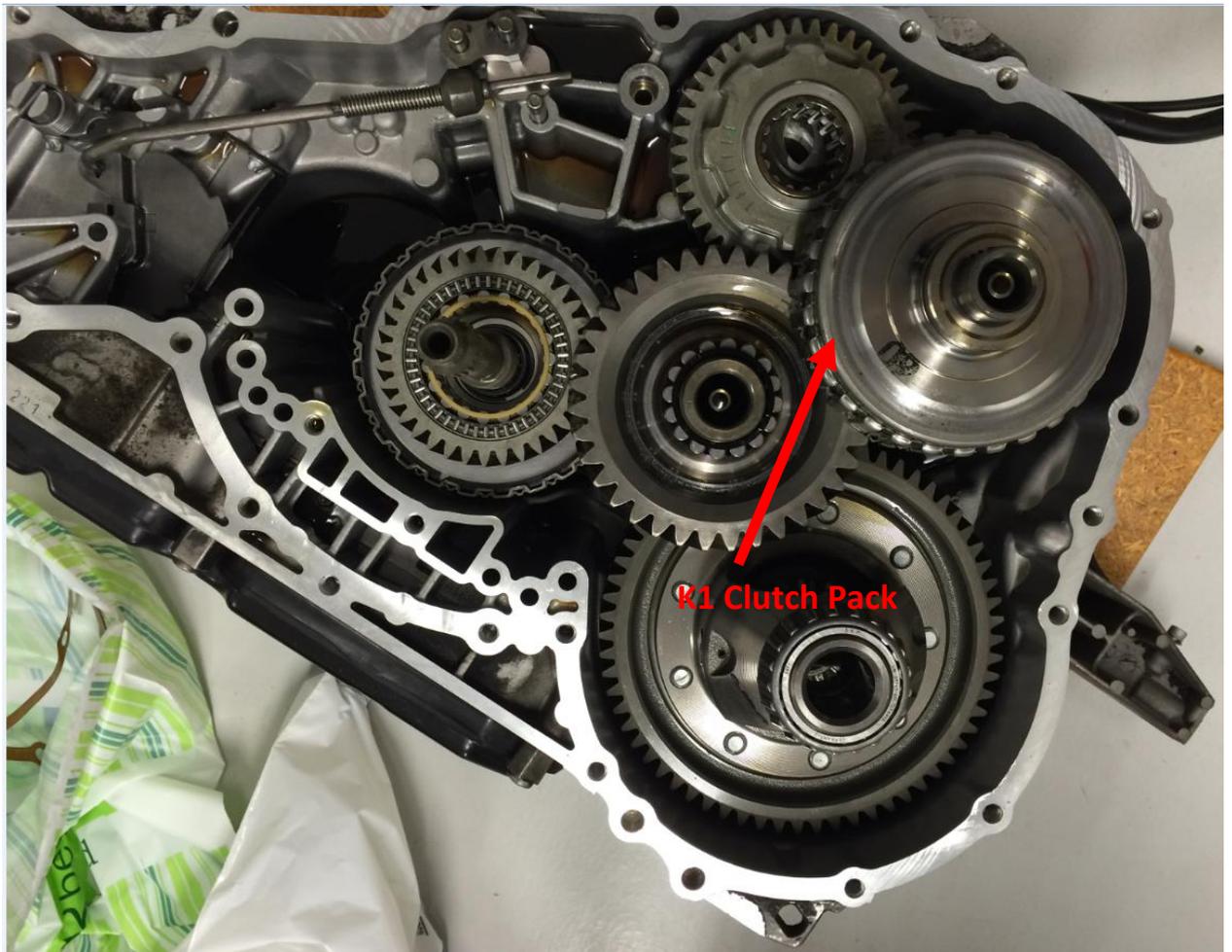




- The next step is to separate the inner CV joints in preparation for separating the motor/transmission from the sub-frame. I had to file the catch on each CV band in order to break it away from the rubber boot. Once the band is off the CV joint comes apart very easily. There will be lots of liquefied grease leaking all over the place, so be prepared for this. You might be able to eject the half shafts from the transmission using a pry bar while the engine/transmission is on the sub-frame, but I decided against this.
- Undo the 4 torx head bolts on the motor mounts (2 bolts are obscured by plastic panels with 3 screws each to be removed). Also undo the transmission oil cooler pipes from the transmission. Undo the bracket on the engine mount arm and remove the pipes. You should be in a position to lift the motor/transmission free of the sub-frame now (see photos of lifted engine and evacuated sub-frame below)



- With the engine/transmission in the air, remove the bracket supporting the exhaust piping from the transmission base and the catalytic converter.
- Place the engine/transmission back on the dolly.
- Using a pry bar (or large flat blade screw driver) insert the bar between each inner CV joint and the transmission case and jerk the bar to pop the CV spline out of the differential in the transmission.
Note: The CV spline has a wire ring inserted into a groove at the end of the spline that retains it in the differential. You need to jerk the CV joint to pop it out of the transmission.
- Remove the starter motor (two torx screws). Undo all the torx head bolts attaching the torque converter housing of the transmission to the motor. With assistance pull the transmission off the motor. Be prepared for heaps of transmission fluid to spew out of the torque converter.
- With the transmission clear of the motor, undo all the torx screws attaching the torque converter housing to the base transmission housing. There also one torx screw on the side of the transmission to be undone.
- Using a pry bar separate the two halves of the transmission case. **Note:** As the pin retaining the park brake remains in the torque converter housing, the park brake & the associated spring may fall into the base of the transmission.
- With assistance lift the 3 gear shafts out of the transmission far enough to remove the differential and the park brake gear. Then lift the 3 gear shafts out and place them safe. I found it a good idea to empty the remaining oil out of the transmission with the shafts removed. See photo below of transmission gear/clutch sets looking down on the opened transmission.



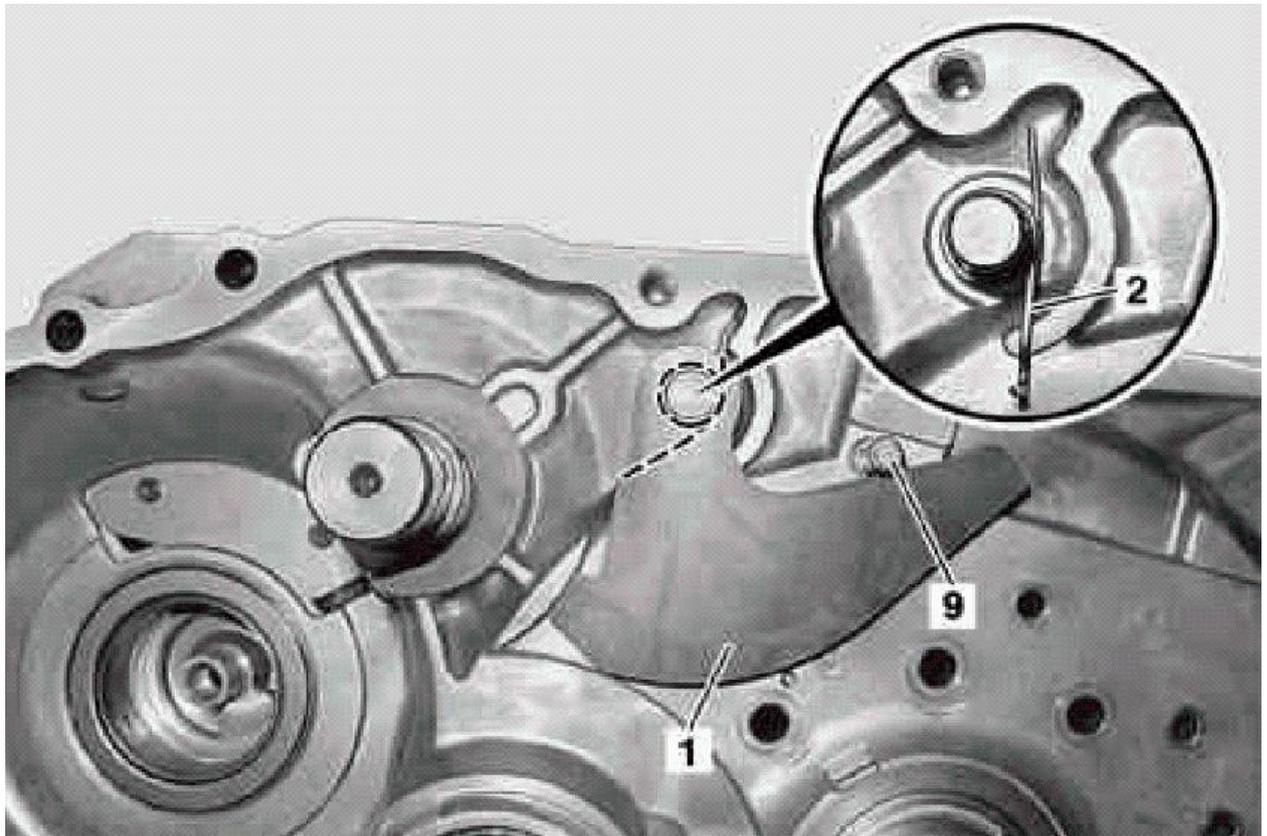
- The shaft containing the K1 Clutch Pack is called the “Counter Shaft”. I used a gear puller to remove the K1 clutch pack intact (after using circlip pliers to first remove the circlip like ring retaining the clutch pack on the counter shaft). It was not pressed on to the counter shaft all that tightly so came off easily. The photo below shows the damage to the clutch pack (the crack extends nearly half way around the circumference of the clutch pack shell).



- Be sure to note where everything in the transmission should return as you pull it out. There a number of spacers, roller bearings, pins and other bits that are pretty easy to lose track of where they belong when you come to re-assemble. Once the transmission is open it is **VERY** important to keep dirt out of it. I cleaned around the two halves of the housing to make sure that dirt did not ingress when the housing was separated. I also made sure that my work area was very clean and inspected the transmission thoroughly for dirt before restoring the torque converter housing. I did not open the valve block cover during the repair process (there should be no need to do this).

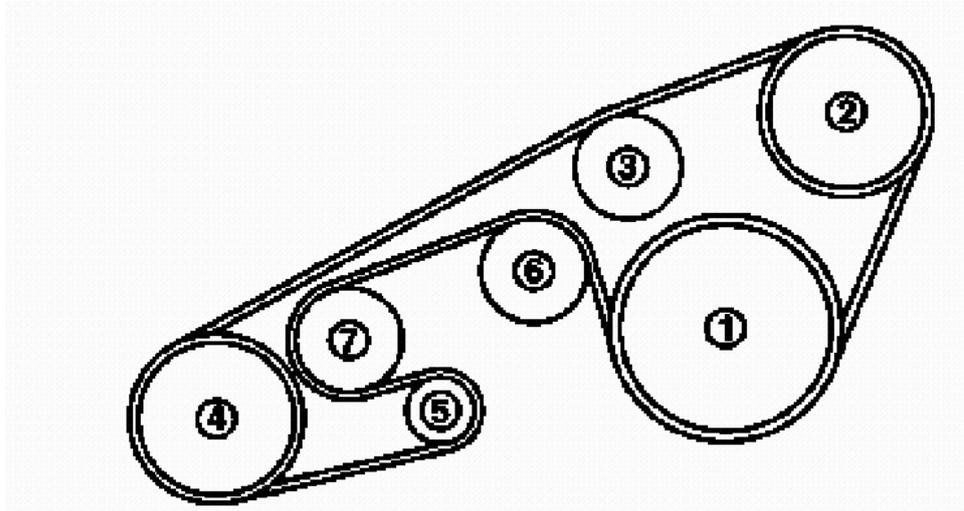
Repairing It and Putting It Back Together

- **Note:** Every bolt has a torque setting and is meant to be tightened as such. I admit to not looking up these settings, rather just tightening everything as I considered appropriate.
- It is important to soak (fully immerse) the new K1 clutch pack in transmission fluid for a number of hours prior to installing it. If the friction disks in the clutch pack are too dry, you will risk friction damage on first use.
- As I did not have a press available to press the new K1 clutch pack onto the shaft I did the following. Placed the counter shaft base on a wooden block. Placed the new K1 clutch pack on the counter shaft. Inverted the old K1 clutch pack and placed this on top of the new K1 clutch pack. Placed a wooden block across the inverted bottom of the old K1 clutch pack and using a mallet drove the new clutch pack onto the shaft. You can insert the back side of the circlip like ring into the slot on the counter shaft to confirm that you have driven the clutch pack all the way home. Once the clutch pack was all the way home, I inserted the circlip like ring.
- Next insert the park brake(1) back onto the pin in the torque converter housing. Attach the spring (2) and insert the retaining pin (9). Note: The spring end locks against the torque converter housing. See picture below.



- With assistance hold the 3 gear/clutch shafts back in the transmission while the differential and park brake gear are returned to the correct locations. Work the 3 gear/clutch shafts home (the output shaft has a spacer and a roller bearing sitting on its housing at the bottom of the base of the transmission). You should be able to turn all three shafts smoothly to verify that they are back in their housings properly.
- Place the gasket on the base half of the transmission case. I purchased a new gasket as the original was damaged (Mercedes part number: A168 371 05 80).
- Gently work the torque converter housing down onto the base housing. You need to be careful that the park brake & spring don't dislodge from the torque converter housing and that the gasket does not move out of place. Restore bolts (including the one in side of the base housing) and tighten.
- With assistance (I needed 3 people including myself – myself and one other jiggling the transmission input shaft into the torque converter and the remaining person holding the crank shaft pulley) insert the transmission back onto the motor. Do up the bolts and mount the starter motor.
- Replace the oil cooler pipes back onto the transmission and do up the retaining bracket on the sub-frame mount arm attached to the transmission.
- Lift the engine/transmission back into the sub-frame and attach the 4 mounts with the torx head bolts. While the engine is in the air, restore the bracket that attaches to the bottom of the transmission and the catalytic converter (alternatively you can attach this once the sub-frame is back on the car).

- Pack the inner CV joints with new grease and insert into the differential on each side (they should just snap into place if you first slide them into the differential and then give them a good shove). Assemble each joint and do up each rubber boot with a new tie.
- At this point, I un-did the 3 idler pulleys associated with the V-belt and replaced these (two of the idler pulleys are Mercedes part number: A266 202 00 19, one is part number A166 202 06 19 and the V-belt is part number A0139971592). I also threaded the new V-belt around all the pulleys (alternator (5), 3 idlers (3,6,7), crankshaft (1) and water pump (2)). The picture below shows the correct path.



- Lift the car body back up and slide the sub-frame (with motor/transmission back in place) into location under the body. Jack the sub-frame up and place the 4 axle stands. Lower the body down to within approximately 300mm of home.
- You should be able to attach the leads for the starter motor and alternator. Re-attach the gear selector cable and housing to the transmission and snap the ball joint back into place. If there is enough slack on the transmission control cable, re-connect this.
- I then lowered down to around 200mm so that there was enough clearance on the driver's side between the body and the sub-frame to clearly get at the water pump pulley. When lowering to this level make sure that the suspension struts are in the right position on each side. Also check the engine bay for any obstructions.
- Attach the air conditioning compressor to the motor with the 3 long torx head bolts. Attach the small triangular bracket to the engine and the rear of the compressor. You also need to attach a cable clamp to this bracket. Remove the V-belt from the water pump pulley and wind it over the air conditioner compressor pulley. There should be enough slack to attach the air compressor pipe to the sub-frame. Attach the earth strap to the rear of the engine. Plug the electrical cable into the air conditioning compressor.
- Using a long spanner with a swivel head force the spring loaded tensioner that pulley 6 attaches to all the way clockwise. You should be able to wind the V-belt onto the water pump pulley by turning the crankshaft pulley. This process was much easier than I expected and I was able to do it on my own – some help would have made it easier again.

- You should now be able to lower the body down onto the sub-frame. I lowered by around 50mm a time checking for obstructions around the sub-frame and in the engine bay. Watch that the suspension struts are in the right place and that the radiator does not catch. The radiator ultimately sits on the rubber mounts at the bottom. When you get the body within 20mm or so of the sub-frame, you should be in a position to line up the locating pins on the sub-frame with the appropriate holes in the body. I found that the front of the sub-frame needed to be jacked up a little higher than the rear to allow the body to align along the sub-frame properly.
- Insert and tighten the 3 large torx head bolts that secure the body to the sub-frame. Undo the plastic cover under the car to the rear of the engine and attach the sub-frame brace on the driver's side to the sub-frame and the body. Do up the plastic cover again. Attach the passenger side sub-frame brace to the sub-frame and the body. While under the car, cable tie up the transmission control cable to the body and tidy the wiring associated with the catalytic converter, starter motor, alternator and air conditioner compressor. Attach the exhaust pipe to the catalytic converter.
- Re-assemble the driver's side brake calliper, ABS sensor and brake disk wear indicator. Attach the cables to the clips on the suspension strut as needed. Do the same for the passenger side.
- Force each suspension strut home and tighten the two torx head bolts on each side of the car.
- Put the wheels back on.
- Re-attach the plastic panels that cover the rear of the sub-frame on both sides of the car.
- Re-attach the pointed plastic sensor in the driver's side front bumper area.
- Re-attach the transmission oil cooler lines to the radiator housing.
- Re-attach the air pump and power steering pump terminal strip. Attach the air pump pipe to the motor. Wire up the power steering pump. Plug in the cable to the air pump and cable tie it to the air pump.
- Attach the engine coolant hoses to the radiator and coolant reservoir. Attach the heater hoses to the bulkhead.
- Re-insert the pipe from the brake booster housing into the front of the engine.
- Re-assemble the thin cable joint going to the transmission.
- Re-assemble the steering wheel joint.
- Join the cut fuel pipe with a bronze joiner and pipe clamp both sides of the join.
- Re-assemble both sections of the air intake housing. Connect the pipe to the intake from the radiator and the pipe to the engine intake. Plug in the cable to the sensor at the front and plug the control cable into the rear.
- Do up the engine earth straps to the body on the driver's and passenger sides.
- Return as much coolant as possible to the system via the coolant reservoir.

- Fill the transmission with fluid (Note: You might need to snap off the top of the red clip on the top of the filler cap to remove the filler cap). The transmission takes around 5litres completely empty. I found that around 4.5litres needed to be added as there was still some fluid left in the valve block area.
- Reconnect the negative terminal of the battery.
- Re-attach the bumper (6 hex head screws and 4 plastic clips). Insert the pump into the windscreen washer tank and restore this.
- You should now be in position to start the motor. Do this and leave to run for a few minutes to allow all fluids to circulate. You will need to add more radiator coolant. Once engine is up to temperature, check for coolant leaks and then take for a test drive. The first time the transmission changes up gears the changes may not be as smooth as expected while the fluid gets to all the places it needs to be.
- I ran the car for around 100km (several trips) before draining the fluid, removing the valve block cover and replacing the transmission filter – Mercedes part number: A168 377 03 95 (**Note:** The valve block cover has a pretty sturdy rubber gasket which should not need replacing. If you do need to replace it the Mercedes part number is: A1683710280). The ATF spec sheet is Mercedes 236.10. You will probably have two options with respect to ATF. You could buy the really expensive Mercedes supplied fluid in 1litre bottles (you will need 4 of these as a re-fill takes around 3.5litres – spec is 3.3litres) or you can purchase the Valvoline equivalent – Maxlife Fully Synthetic ATF in the 4litre red container for around the same price as 1 litre of genuine Mercedes fluid. I did the later.

By way of note. When I replaced the fluid with Valvoline Maxlife ATF, the transmission appeared to run much smoother than I had been used to. I did wonder if the workshop that I had previously used to service the transmission had been putting CVT fluid into the transmission (the fluid I drained out of the transmission did have that CVT oil smell to it). CVT fluid in the 722.7 transmission is a definite no-no. The friction modifiers in the CVT oil are designed for belt drive and won't do the 722.7 any favours.

Well that's it. Hope that I have not missed too much and that this will be a good guide to those of you out there that want to give this repair a go.

Robin Donovan

New Zealand

January 2015