

# Engine and transmission removal Mercedes 1985 500SL

[hchaugli@gmail.com](mailto:hchaugli@gmail.com), 31 January 2015

Updated 30 October 2015

## 1. Introduction

Removing the engine and transmission is a major job, but can be done by a single person. This tutorial summarizes the steps for removing the engine on a 500SL without catalytic converter and with air-conditioning. I was not able to find any step by step procedure on Google Academy, but lots of useful tips were found. The job is not difficult, but entails many steps. This is not a job that should be rushed. The engine and the transmission should be removed as one unit.

It is not possible to remove the engine and transmission without a 2 ton hoist and a heavy duty engine leveler.

The estimated time spent was 40 – 50 hours, this includes several hours cutting rusted exhaust manifold bolts, hard to reach engine damper nuts, removing wrong parts, finding the right tool to remove a part, preparations and cleaning.

The 2<sup>nd</sup> time was done in about 1/2 the time. Experienced mechanics can probably do the job in a day.





## 2. Tools needed:

Standard handtools

Spanners (7, 8, 10, 13, 14, 17, 19, 21, 22, 27, 29, large adjustable and 46 mm for driveline)

A C-shaped 19 mm spanner is useful to remove flexdisk bolts

Sockets (8, 10, 13, 17, 19, 27 mm)

3/8" 13 mm sockets on long extender (downpipes)

10 mm socket on long extender (battery bracket)

Allan keys (3, 5, 6, 8, 10 mm)

Allan sockets (long 10, 14 mm)

Phillips screwdriver

Flat screwdriver

Sidejaw cutter for tiewraps

Vicegrips

Engine hoist (2 ton)

Engine leveler (the engine/transmission has to be tilted about 45 degrees for removal)

Chocks

Floor jack and a block of wood for transmission support

Rope to prevent engine from rotating

Ramps (4) to raise front and rear to provide space for tilting the engine and transmission

Masking tape to prevent dirt ingress into hoses

Duct tape to fix lines and hoses out of the way

73x 42 cm plywood used to protect AC condenser, I would have done serious damage to the AC condenser without it.

## 3. Service parts

Engine oil (9 l)

Oil-filter

Automatic transmission fluid (8 l)

Transmission filter

Transmission pan gasket

Coolant (10 l)

Front exhaust seals (2x)

Exhaust captive nuts 8x A000 990 2552

Refrigerant drier/reservoir A107 830 1183

Front engine mount bolts (2x)  
Tie-wraps for cables and lines  
Loctite antiseize  
Engine degreaser  
Sparkplugs (8x)

#### **4. Parts that should be checked/changed**

Driveshaft center bearing  
Flex discs  
Shifter bushings on both the transmission and shifter  
Rear engine seal  
Transmission seals  
Heating hoses  
Transmission shift-rod clips (2x) A0009942960  
Transmission shift-rod bushings A115 992 0310+ A115 267 1250

#### **5. Step by step procedure**

##### **Step 1: Preparation**

Drain engine oil (14 mm Allan socket), 9 litres  
Drain automatic transmission fluid from transmission oil pan (5 mm Alan key)  
Drain torque converter  
Drain radiator, 6 litres (19 mm drain bolt on LHS bottom)

##### **Step 2: Disconnect hoses and remove radiator**

Remove the four fan bolts (10 mm spanner)  
Remove both ends of coolant hoses  
    Top  
    Overflow  
    Bottom  
    Reservoir  
Drain and disconnect transmission cooling hoses from radiator, cover holes (19 mm spanner)  
Remove radiator shroud (10 mm bolts on top), pull up  
Remove clips on side of radiator (P shaped)  
Remove radiator (held in place with rubber wedges on the side, push from below)  
Protect AC condenser with 73x42 cm sheet of plywood

##### **Step 3: Disconnect engine mechanical, vacuum, fluid and electrical connections**

###### **5.3.1 From the top of the engine**

Remove air-filter (10 mm bolts), pull off hose at rear, cover air intake with cardboard and tape  
Remove battery (13 mm spanner for connections, 10 mm long socket for clamps)  
Remove battery tray (10 mm socket)  
Remove coolant tank (Phillips screws) and bottom hose (8 mm)  
Remove RHS exhaust top shield (Phillips screw, clip in front)  
Remove windscreen washer tank (Phillips screws)  
Disconnect heating hoses  
    The RHS one is easiest to undo at the circulation pump  
    The second is located near the middle of the firewall  
Disconnect vacuum lines:  
    From rubber intake manifold at LHS behind hood hinge (grey), free hose from firewall, keep it connected to rubber hose connected to manifold  
    Remove engine vacuum control line (blue) at vacuum manifold

- Remove brake-vacuum line at booster (14 mm open spanner)
- Cover openings with tape
- Disconnect fuel lines, (14+17 mm open spanners) cover with tape
- Disconnect ignition wires:
  - TDC sensor cable (green) to Ignition Control Module
  - High voltage cable to coil
- Disconnect diagnostic socket lines
  - Unscrew socket and remove plug at underside of socket
  - Remove plug in wiring loom
- Disconnect engine transducers and free line attachments from engine:
  - Idlespeed Control Valve (front of engine)
  - 42C temp switch RHS close to firewall
  - Coolant temperature sensor on water-pump
  - Auxiliary fan switch on water-pump, mark line to prevent mixup
  - Oil pressure sensor RHS bottom rear
  - Warm-up regulator front of engine
  - Cold-start valve at front of engine
  - Time/temperature sensor front left, the u-shaped metal clip should be pushed out in the middle using a flat screwdriver
- Disconnect starter cables at terminal strip next to battery, mark the two cables and where they connect on the terminal strip (different lug sizes)
- Disconnect generator
  - Remove clip at rear
  - Disconnect plug at rear
  - Remove bottom nut at rear of bracket, counter-hold bolt at front (2x 17 mm spanners)
  - Remove 13 mm bolt on top of bracket
  - Remove bracket
  - Loosen 13 mm bolt swing the generator as close to engine as possible
- Disconnect power steering pump
  - Drain oil
  - Disconnect hoses (17+19 mm open spanners),
- Disconnect cruise control actuator
  - Plug (6 pin) in front of ABS pump, remove ABS black plastic cover to get access (flat screwdriver)
- Disconnect AC compressor clutch wiring
  - Pull out plug on side of compressor
- Disconnect accelerator linkage
- Remove engine shock absorbers top nuts, cup and rubber bushing
  - Pin rubber top with flat screwdriver to prevent pin from rotating, remove 10 mm nuts
  - Remove both heatshields
- AC system hoses
  - Discharge AC system according national regulations
  - Disconnect compressor input and out line (22, 29 and 32 mm open spanner)
  - On some cars it may be possible do remove the compressor from the engine without evacuation the system.
- Raise hood to vertical position
  - Remove clips at bonnet arms and disconnect arm
  - Support bonnet with pole
- Place vehicle on 4 ramps to get ground clearance for under car work
- Position hoist
  - Attach leveler (1 ton arm length)
- Install leveler
  - Install leveler with swivel at rear of engine
  - The engine has two eyelets at the rear and one in front, attach chain with shackles to the rear, do not pinch fuel distributor lines

Attach front with two shackles to obtain a very steep angle during removal  
Raise hoist arm to tension the chains

### **5.3.2 From the underside of the vehicle**

Remove exhaust (12 and 13 mm spanners)  
Support rear end during removal, remove rubber rings and bolts (12 and 13 mm)  
Remove balance pipe (13 mm)  
Remove both downpipes (13 mm on long 3/8" extender), avoid upward pressure on the bolts to prevent the captive nuts from rotating  
Disconnect engine grounding strap, next to power-steering box on LHS (13 mm spanner)  
Remove heatshield protecting idler (10 mm spanner)  
Remove both exhaust shields next to transmission tunnel (8 mm wrench)  
Remove left and right front exhaust shields (8 mm wrench)  
Remove heatshield below tunnel to get access to driveline joint  
Support transmission pan with block of wood and jack  
Remove tunnel front brace (13 mm spanner)  
Remove both tie-wraps from LHS of transmission  
Remove neutral safety switch plug (LHS)  
Push white lever up until end stop using flat screwdriver  
Use two flat screwdrivers and wiggle the connector off  
Remove kick-down solenoid connector (LHS rear, single wire)  
Pry out connector  
Remove electronic speedometer sensor rear LHS of transmission (10 mm wrench)  
Wiggle out by hand  
Remove clip at gearstick end of shift-rod using flat screwdriver  
Tie rod to the transmission cooling line  
Remove driveline flexible disk  
Support rear of transmission with jack and block of wood  
Remove front and rear braces (17 mm socket)  
Put gear lever to neutral  
Loosen 46 mm nut at driveline  
Mark position of flange and flex disk (e.g. spray paint)  
Remove bolts at rear of transmission (3 driveline flange bolts, 19 mm spanner and socket, new bolts use 10 mm Allan head, use small spanner at flange to separate from driveshaft, you may have to remove one additional bolt to get access to the top nut, a C-shaped 19 mm closed spanner worked well)  
Mark all wires and hoses, and make sure they won't get pinched during removal  
Undo rear engine mount (13 mm socket)  
Undo the two front engine mounts  
From below (10 mm long Allan socket (3/8 "set)  
Hidden in the holes next to lower wishbone hinge  
The engine damper are attached at the outer end of and arm with the engine mount nut welded to the other end  
The engine rubber mounts are covered by shields that come loose when the bolts are removed (pinched between arm and mount)

### **Step 6: Verify that engine is not attached to any part of the vehicle**

Visual inspection

### **Step 7: Remove engine and transmission**

Raise hoist  
Slowly lower jack supporting transmission  
Adjust leveler and remove jack under transmission  
Remove engine from the car  
Adjust leveler and hoist arm

Move engine forward  
The engine front has to be lifted at a steep angle  
If needed remove ramp and lower left front wheel to clear front of car  
Make small adjustments  
Make sure the fuel and brakelines on firewall are not pinched

## **6. Tasks that should be done with the engine out**

Clean engine and transmission  
Check and replace driveshaft center bearing  
Renew driveline flex discs  
Renew shifter bushings on both the transmission and shifter  
Adjust shift rod: MB job 27-120  
Grease parking brake adjustment lever above exhaust shield plate  
Check flywheel cogs, replace if starter occasionally grinds: MB job 03-430  
Refurbish starter, grease moving parts with high temp paste  
Replace old engine mounts  
Replace engine oilfilter

## **7. Separating transmission from engine**

Position engine and transmission so that the transmission rests horizontally on a flat surface. The front and rear should both carry weight.  
Remove sparkplugs to make it easy to rotate the engine  
Remove covers on lhs and at bottom of transmission (2x 10 mm)  
Disconnect starter cables at starter (13 mm) and Phillips screw  
Remove starter (2x 10 mm Allen bolts)  
Rotate engine clockwise as seen from the front until a pair of bolts (13 mm) are visible  
27 mm socket on extension to turn engine  
Remove all three pairs (13 mm)  
Remove the eight 19 mm bolts on bell-housing  
Gently separate transmission and engine  
Use spanners to get enough force

## **8. Changing the flywheel**

Lock balancer with vice grip to prevent engine turning  
Remove 19 mm bolts  
Note direction of ring gear  
Remove shim and flexible plate/ring-gear assembly, use anti rust if tight  
Move vice grips to prevent engine for rotating anti-clockwise  
Install new assembly and shim  
Note that one hole is offset  
Torque bolts to 30-40 nm  
Tighten bolts 90-100 degrees  
Sparingly grease ring-gear with high temp paste (Castrol TA)

## **9. Installation**

Install engine/transmission  
Make sure that no lines or hoses can be pinched  
Place engine 1 cm above engine mount  
Place jack and block of wood under transmission oil pan, level engine  
Insert engine mount bolts from above and use as guide pins  
Install transmission brace  
Install rear engine mount

Reconnect transmission electrical and mechanical lines

- Install power steering pump
- Install AC compressor
- Install V-belts
- Reconnect engine mechanical, vacuum, fluid and electrical connections
  - Starter
  - Transmission kick-down solenoid
  - Transmission neutral safety switch
- Install drive line disks, tighten propeller shaft bolts (46 mm)
- Install battery
- Install coolant reservoir
- Install screen wash tank
- Install radiator and reconnect hoses
- Install exhaust system
  - Sand manifold and downpipe connecting surfaces and grease with exhaust installation paste
  - The downpipe captive copper nuts fall out easily and makes installation difficult
  - Make a loop at the end of an arm (e.g. brazing wire) to position nuts.
  - A long  $\frac{3}{4}$  arm with 13 mm socket makes life a lot easier
- Install hood
- Change filters
  - Engine oil
  - Automatic transmission and gasket
- Fill fluids and check levels
  - Transmission oil
  - Engine oil
  - Coolant
  - Power steering
  - Windscreen washer tank

## Removing and installing the transmission

### 1. Separating the transmission from the engine

I kept the engine in the hoist and lowered the transmission on a working table. The transmission is not heavy and can be handled by one person.

Remove vacuum line

Remove control cable (Bowden) at top

Remove starter

Remove bottom shield

Remove RHD starter shield

Remove oil cooling lines

Remove oil dip stick

Remove spark plugs

Remove 6 bolts attaching torque converter to driven plate, rotate engine clockwise to get access

Put transmission and engine on level surface

Remove 8 bolts from bellhousing

Split engine from transmission

Remove knob preventing the torque converter from falling out

Remove torque converter

Place transmission with input shaft up

Attach improvised lifting device to TQ using existing bolts

Lift up

Install torque converter

Place the transmission upright, slowly lower the TQ, raise and lower TQ until it drops 5 mm. Install the plastic knob, spacing shall be 5 mm. Make a 5 mm thick strip of paper, place this strip between the plastic knob to keep TQ in position.

When attaching the transmission to the engine, make sure both are level, the transmission shaft knob should slide in easily. Remove paper holding the TQ in position.

### Issues

My only issue was installing the torque converter and the primary pump incorrectly. The primary pump has two "dogs" that has to engage with slots in the driveshaft. When not done correctly, the clearance of the TC in the bellhousing increases by about 5 mm, compared to the correct position. The "dogs" will eventually break and without primary oil pressure, the transmission will lose all functions. See advice below.

Benzworld Ctaylor738 advice

When you put the TC back in the transmission, it's critical that the TC and the drive gear "engage." Best done with the transmission upright and with three flywheel bolts installed and a wire harness between them so that you have good feel as you lower the TC into the transmission. When the TC is all the way in, hold it up just a bit and rotate it until you feel the dogs on the pump engage the slots on the TC. Then secure the TC with a piece of strap or wire so that it stays in place.

Also critical is installing the engine on the transmission. I suggest that you put a floor jack with a piece of wood under the transmission pan. Use wooden wedges under the pan to align the transmission with the back of the engine and use the jack to get the transmission perfectly level with the engine. Put some grease on the "snout" of the TC, then remove the strap/wire holding the TC and put the two together, making sure the TC does not slip out. You can use the bolts as guides, but NOT to pull the transmission up to the engine. The two have to go together without force. When they are joined, you can tighten the bolts. Be sure that the TC turns easily when the bolts have been tightened.

BTW, one thing I did when putting the trans and engine together. Run a piece of thin wire across the face of the TC securing the ends in the holes where the bellhousing bolts go. When you are maybe 2 mm from having the trans and engine together, remove the wire so the bellhousing can go the rest of the way.

