

Arcane and previously unpublished knowledge regarding replacement of a MBenz (107) SL's engine ... with a **BIGGER** MBenz engine

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Selection of replacement engine type. Perhaps the best replacement engine candidates are the relatively plentiful MBenz **5.0 liter** and **5.6 liter** engines from the 500SEC, 500SEL, 560SEC, 560SEL, and, of course, the more expensive 560SL. Interestingly, the 560SL engine has 4.8% less horsepower and 2.8% less torque than the other 5.6 engines - the reason is unknown to me, but the difference in air cleaner intake tubes may be part of it (more about that in the Air Cleaner section below).

A few recommend the **6.9** (though it's in a cost league of its own), and Bob Sanigar has even transplanted a [6.3 liter engine into a 350SL](#) but it required a [747-like hood bulge](#) for clearance.

There are also occasional questions about putting a **4.5 liter engine in a 380SL**. This is usually not feasible for two reasons: 1) the 380SL's years of manufacture may require that they undergo smog (exhaust emissions) tests that the 4.5 engine will not pass, and 2) any engine performance advantage would be offset by the languid gear ratios of the 3-speed AT that would have to be used.

In the remainder of this document, I will focus on what I've learned while **transplanting an '86 560SEL engine and transmission** into my **'72 350SL**. Your situation may be slightly different.

And for those with **ecology concerns**, let me offer this rationale: Even without the smog air pump and catalytic converter it came with, a good 5.6 liter engine should have a cleaner exhaust than the early engine it is replacing.

Selection of a specific replacement engine. Once the replacement engine *type* has been determined, the actual engine you'll use must be selected. Common **indicators of wear** are odometer mileage (if verified), service records, compression tests, leakdown tests, checking inside the air cleaner for signs of blowby, and hearing the engine run (so you can listen for bad bearings and other costly problems), but I'd still prefer to have a prospective replacement engine "checked out" by a reputable shop prior to purchase (ideally prior to being removed from the donor car).

When you find a suitable engine, make sure you get all the many **components** you will need to actually run the engine! This not only includes everything bolted to the engine, but also the computer, fuel injection pump/accumulator/filter, all engine relays, etc., and - if you are replacing a 4.5 engine - the matching 4-speed transmission.

Replacement of any leaking **engine or transmission seals** will be easier while the engine and transmission are out of the car (I had the rear engine seal and both transmission seals replaced while the engine was "between cars" although none had developed leaks).

According to *Road&Track*

'72 350SL (4.5) - 230hp,
0-60 in 10.5 seconds.
'80 450SL - 160hp,
0-60 in 11.7 seconds.
'84 380SL - 155hp,
0-60 in 10.9 seconds.
'86 560SL - 227hp,
0-60 in 7.5 seconds.

Engine and transmission mounts. All sources agree that the engine and transmission mounts that came with your SL will bolt right up to a 5.6 without modifications, but this is an ideal time to replace the rubber parts if, like my engine mounts (trans mount was good), they appear to be thirty years old and significantly disintegrated.



Engine oil pan. The engine oil pan from a sedan will not clear the crossmembers of a SL. If the replacement engine is a 5.6, an oil pan from a **late 380SL** (early 380SL pans won't fit without modification) or **560SL** can be used. The bolt pattern on the pan from a 450SL or 350SL is not the same as on a 5.6 engine.

We took "a road less traveled" by having wider flanges welded onto an early 380SL pan, and cut the rear engine support section off a sedan oil pan to bridge and support the area between the oil pan and transmission case.

Engine oil filter. The filter on a 560SL hangs down; the filter on a 560SEL points up. We intended to use the filter mount off our 4.5 engine since it would point downward, but found it had different mounting holes. We then considered using the oil filter mount already on the 5.6 engine,

but there was insufficient clearance between that arrangement and the SL's inner fender, so we had to buy a used 560SL oil filter mount.

Engine management system and related wiring. Consensus is that the replacement engine's newer **computer** and entire **fuel injection** and **ignition systems** should be used, even if you aren't required to pass smog tests in your location. Newer systems are reportedly more fuel efficient and easier to adjust. If there's no need for smog test, though, there's no need for the power robbing air pump or catalytic converters, and there will never be a need for the hydraulic suspension pump from the sedan in an SL. The amount of horsepower saved by removing these items is not known, but I suspect it would be significant and, best of all, free!

One of the wiring issues inherent in using a sedan engine in a SL chassis is that the **location** of the ECU, coil, amplifier, and other engine management components dictated by the SEL **wiring harness** dimensions won't allow placement of those components in the usual SL locations (not important to me, but it could be to purists), and your older SL harness probably can't be used, either, because it won't have all the connections needed by a later engine's modules, relays, etc. While this isn't a "deal breaker," it does take a considerable amount of time to sort out, even for a professional Mercedes mechanic who recognizes the various connectors when he sees them. The extent of the difficulty can be inferred from the advice of one independent MB shop:

"I would not recommend (putting a late '80s engine in an early SL) unless you enjoy pain and suffering.

That engine will have way too much electronic wiring you will have to deal with (too many black boxes)."

Accelerator linkage. At first, it looked like we could use either the 4.5 or 5.6 linkage intact, but after installing the engine in the bay, it became apparent that the link that goes forward from the firewall would need to be between the length of the 350/450SL piece and 560SEL piece. As a result, we cut part of the center out of the 560SEL piece and they welded the ends together. We presume an alternative would be to use the piece from a 560SL, but didn't have one to check.

Air cleaner. If your replacement engine came from a sedan, its twin snorkel air cleaner may not fit within the SL engine bay (e.g., the 560SEL's engine passenger side snorkel would occupy the same space as the radiator overflow bottle in your SL).

There are also differences between various SL air cleaners. **"Round"** air cleaners on early 4.5 engines with electronic fuel injection are obviously not interchangeable with later **"D-shaped"** air cleaners (as viewed from the passenger side of the engine compartment) on engines with CIS mechanical fuel injection. There are also important differences between 380SL and 560SL air cleaner housings, not the least of which is the difference in the size of the hole in the bottom that fits over the air flow sensor.

Wanting the engine to get fresh air that hadn't passed through the radiator, I purchased a complete **560SL air cleaner assembly** (*snorkel shown to the right*), but I believe merely removing the passenger side snorkel from a 560SEL air cleaner (and then covering the resultant hole) would have worked well enough.



Radiator and hoses. Even the earliest SL's seem to have enough **capacity** for a larger engine - the '72 SL's coolant capacity (15 liters) is greater than that of the '86 560SEL (13 liters).

As in the case of motor mount replacement, this is an ideal time to replace all of your radiator and heater hoses - MUCH easier to do with the engine out! And a small point, perhaps, but I found that once the smog air pump was removed from the 5.6 engine, a stock 4.5 lower radiator hose could be used to connect the 5.6 engine to the 4.5's radiator. The (top) radiator inlet is on the opposite side in a 450SL as a 560SL, however, so you will need either a quite long "S" hose or, as we did, to have a radiator shop move the inlet from the driver side to the passenger side.

Also, the engine cooling fan needed extra washers to space it away from the 560SEL's double groove crankshaft pulley.

Exhaust system. In most cases, it's best to use your original SL exhaust manifolds, resonator, catalytic converter(s) if fitted, muffler, and pipes in between. That's because the SEL/SEC crossover pipe from a sedan engine won't fit in the SL engine compartment. One respondent described a 4.5 sedan engine as about 2" wider than the 450SL engine - he believed as the result of cam tower/cover differences. His "cure" was minor grinding of interference points (bumping the SL's inner fenders out of the way might be an alternative). I've received no data comparing the width of other sedan engines to SL engines.

In my case, I simply reused the **4.5 engine's exhaust manifolds** - they bolted right up to the 5.6 engine

and had no clearance problems. A **bung** for the 5.6 engine's O² sensor was welded into the exhaust pipe right after the manifold.

Transmission. If you compare the transmission ratios of an early 3-speed AT and a later 4-speed AT, you'll see that the top three ratios are about the same. What's different is that the 4-speed AT has a 1st gear that's much lower than the 1st gear in a 3-speed. The effect of this is that - when used - **a 4-speed car will accelerate much faster** from a stop than a 3-speed car of the same torque and horsepower. I say "when used" because these Mercedes transmissions are designed to start from a stop in 2nd gear unless the driver takes a positive action to use 1st.

The US-delivered iron block 4.5 liter V8 (and the European delivery 3.5) must use a 3-speed AT, and all US-delivered aluminum block engines (3.8, 5.0, and 5.6) must use a 4-speed AT. Within those limitations, transmissions seem to be interchangeable, although the **shift gate** in the console is not the same across models.

I chose to reuse the **shift lever and gate** from my SL even though that means I will not have the "B" position to manually engage 1st gear. With the BergWerks 1st gear module, however, that will pose no loss of function.

Driveshaft. The driveshaft from my '72 bolted right up to the transmission from the '86 560SEL, so it appears that all **flanges** within the 1972-89 timeframe are interchangeable.

The length of the 4-speed AT case is an inch or so shorter than the length of the 3-speed AT case, however. As a result, the **driveshaft splines** have less overlap than they did with the original engine and trans. There appears to be adequate engagement, but this will be watched as miles are accumulated. If it does cause a problem, a longer front driveshaft may need to be substituted.

Differential. Although not a part of most engine and transmission swaps, the choice of differential is important as different **final drive ratios** will effect different driving experiences. All MBenz transmissions' top gear is 1.00:1, so for maximum acceleration and no worse gas mileage than you had before, leave the higher rear end (in my case a 3.07:1) in place; for maximum highway gas mileage but somewhat sluggish acceleration, use the rear end from the same car the replacement engine came from (in my case a 2.47:1).

All 560SL's came with a **limited slip differential** (earlier 107 differentials could have an optional limited slip, but not many do), but I've also been told that the 560SL differentials may require the rear suspension from a 560SL - if true, the additional changeover cost would be substantial.

Speedometer. Early MBenz speedometers were driven by a **mechanical cable**, but later ones were **electronically triggered** by a magnetic (Hall effect) sender on the rear of the transmission. I'm not positive, but the change appears to have coincided with the change from 3-speed to 4-speed

Why not just buy a 560SL?

Top 10 reasons:

10. Older 107's are \$10k cheaper
9. No smog testing
8. Lower license fees
7. "Classic" insurance
6. "Euro" bumpers
5. Chrome-edged horn buttons
4. Stylish front blinkers
3. Flush hatch cover
2. No termite bait
1. The challenge!

transmissions. In my case, I located a used 380SL speedometer because 1) it fit correctly in the 107 chassis gauge cluster (the same across all years, but a sedan's speedo will not fit), and 2) it operated from the electrical signal generated by the 560SEL transmission.

I could have it **recalibrated** at a speedometer repair facility, but I decided to install what is called an **electronic ratio adjuster** instead (my 3.07:1 rear end ratio is 24% taller than the 2.47:1 ratio of the donor car, so without recalibration it would read, for instance, 100mph when I was really only going 80mph). The ratio adjuster can be **programmed** (by flipping DIP switches) to address the difference in rear ratios, and I can also **reprogram it later** to address any smaller changes from new tires or the like.

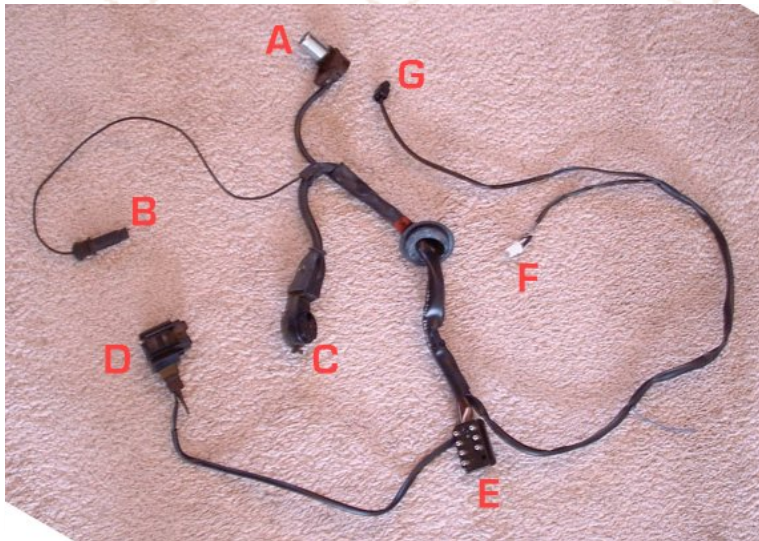


Notice that the **380SL speedo (left)** and **560SL speedo (right)** are similar in appearance and interchangeable in operation, but there are a number of **differences** when you know what to look for (tick marks after 160mph or not, location of shift point dots, 260kph versus 240kph top speed, etc.).



To make the new speedo work in an SL that originally had a mechanical speedo, you will need additional wiring (or at least the connectors from that wiring):

1. The **harness that plugs into the new transmission and terminates inside the passenger cabin** - the parts in the transmission harness photo are as follows:



- A - speed sensor, plugs into left rear of transmission
- B - single female bullet connector (kickdown output?)
- C - 4 live female bullets + 5 locating holes, plugs into left side of transmission
- D - kickdown switch, goes under accelerator pedal
- E - 7 male bullets, connects to other cabin wiring (not all are needed for most swaps)
- F - small light bulb
- G - dual female bullet, one side square, one round (lockout switch for certain gears?).

G - signal from transmission speed sender
 15 - 12v+ when key is on
 31 - ground

The **round connector** to the right has a single female connector - it drives the cruise control circuitry.

3. **Wires to connect the transmission harness to the speedo harness.** Any 16ga wire with a female bullet connector on one end can be used to connect the appropriate pin on the E connector (of the transmission harness above); the other end is then spliced to the G pin wire (in the partial harness on the back of the speedometer). The 12v+ and ground for the speedo can be spliced in from any convenient location.



Other gauges. Early 107-chassis SL's used a "direct" oil pressure gauge - that means that a **high pressure oil line** connected the gauge to the engine. Later SL's used an oil pressure **sending unit** on the engine and electrical wires to the (electrical) oil pressure gauge. Consequently, if the replacement engine

and receiving SL are on opposite sides of that dividing date (I don't know what year that change occurred), you'll either need to add a high pressure oil line from the engine to your SL's gauge as I did, or replace your SL's combination gauge with a later one that has an electrical oil pressure gauge.

Fortunately, the rear of the driver side head on the 560SEL engine had a **threaded plug** in the same location that my 4.5 engine had a fitting for the oil line to the gauge; replacing the plug with the fitting allowed continued use of my direct oil pressure gauge. Unfortunately (if you plan to use a later combination gauge), the later gauge clusters had a silly and failure prone **Economy gauge** added to the oil pressure, fuel, and water temperature gauges.

One respondent thought there may be a need to change out the **tachometer** (because of the increased voltage of the HEI-type ignition in later engines), but most people disagree. Any SL **fuel gauge** and **water temp gauge** will work with any engine, but not all "**idiot lights**" used by the engine-donor car may be present in your earlier gauge cluster.

Other issues to consider.

- If the replacement engine requires higher fuel pressure than your original SL engine did (true in my situation), you may need to upgrade the **fuel pump, filter, and accumulator** by using the units from your engine-donor car; this is also a good time to inspect and/or replace your **fuel lines - don't just assume** they're "good enough."
- The **alternator** on a 5.6 engine has substantially greater output than the one from an early SL (80 amp versus 55 amp), so it makes sense to use it if one came with your 5.6 engine.
- Your donor engine may come with other "stuff" you don't need, and **sale** of those things (e.g., smog air pump, hydraulic suspension pump, and exhaust manifolds) can partially offset the cost of the swap. Alternatively, **keeping** some of the extras (e.g., power steering pump) can provide you with "breakdown insurance" because nothing you have a spare of will ever fail.
- State **laws** about engine swaps vary considerably, so check those that apply to you.



In conclusion. If transplanting a newer, more powerful Mercedes Benz engine into an older SL sounds too easy, there's always the "all American" alternative: doing a [Chevy or Ford V8 swap!](#)

*To see the rest of my plans for our '72 350SL,
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NOTES:

1. Information presented here was gathered via correspondence with others who have done the swaps (or paid to have them done by independent repair shops), and from my own experience with putting the drivetrain from a '86 560SEL into my '72 350SL.
2. Unless specified otherwise, the context for the comments below is US-delivered cars; for information on a myriad of European exceptions (e.g, the 500SL and 450SL 5.0), contact [Todd Knutson](#).
3. Many thanks to all who provided input: Ben, Brock, Ed, Lee, Simon, Mark, John, and Bjorn.