00 Miscellaneous Reference Articles

Table of Contents

240D Conversion (Auto to Stick)

by Len

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Len,
Do I remember correctly that you converted your car to a manual transmission? If not, you can stop reading.

A friend, John Wallace, found two 115 240Ds with manual transmission and we are stripping them, planning to convert his 240D and my 300D (both 115s) to manuals. While perusing MB manuals and before disabling working cars, we have a question on mating clutch/transmission to engines configured for automatic. I understand there is some piece that must be changed. What, exactly, is not clear from the manuals-- maybe it's there and I missed it. Must we change flywheels or crank- shafts (neither an option for my 300D--with the parts available) or is it a part bolted (press fit?) on end of crank we must change?

We are carefully removing pedal assemblies, hydraulic lines, etc and taking pictures to aid in re-assembly adventure and are confident we have addressed all other potential issues. Of course, my life has proven that such confidence is almost always misplaced. If you have time, we would appreciate any tips, potential problem areas or reminiscences about your process you might want to pass on.
Thanks in advance,
Sam

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Okay, here is the story about my conversion of my 240D from an automatic to a manual transmission as several have asked. This might be a little long, so hit the delete key if you're not interested or scroll down to find something interesting. I'll try to include all key points in the story, but if I leave something out, please let me know and I'll do my best to answer your question.

My '83 240D had an automatic transmission with almost 293K miles on it. I am the original owner of the car and have had the transmission serviced every 30K miles as suggested by the manual. The transmission has been relatively reliable with a modulator problem here or there. Shifting has been reasonable, but there have been times when there was a little hard shifting or slight flaring. I hope that is all ancient history now with the stick shift.

In early July, all of a sudden the transmission just appeared to give out. It would not shift out of first or second gear and the engine would rev to very high rpm's as the car slowed to a crawl with the transmission flaring very badly. I looked for advice on this list and the wiser minds told me that it was time to junk this transmission and get a new/rebuilt one since all the seals were probably hard as rocks by now anyway. Of course I still was trying to search for a $20 fix but finally realized that it was not to be.

I started looking into a rebuilt automatic and found that the prices ranged from about $1400 to $1800 for parts only. Installation would set me back another $600 or more. I called Dave at Atlanta Stuttgart Auto Parts to ask if he had any good used auto transmissions. He said they go out the door as fast as he can get them in and that he did not have any autos in stock. He suggested that I consider a Euro auto or maybe convert mine to a stick shift. That peaked my curiosity and we discussed the manual conversion. He said that it was basically just a bolt in operation and he could sell me the parts I needed for $600. After some input from a few other list members, I decided to go with the conversion.

I used Rick Ellinger at RC Imports in Rockville, MD. Rick owns his own shop and is active in our local MB Club as a technical advisor. He also owns and races a 190, so he is quite knowledgeable about tearing down, rebuilding and modifying MB's. He estimated that it would cost me about one day's worth of labor to do the job, approximately $480.00 +/-.
So I had my car towed over to him on a Thursday, had Atlanta ship the parts to arrive on Friday and expected to pick the car up the following Tuesday. Well, it is now almost three weeks past that Tuesday I was supposed to have had the car done and I just got my car yesterday. Several things happened to cause the delay, all frustrating, some of which no one anticipated, but stuff happens. If this was my only car, I'd have been much more upset, but I was able to get by without it for almost two months, so I lived with it. So, my biggest recommendation to any of you who consider this conversion is to expect a couple of weeks of not having your car available.

Rick did say that the conversion was pretty much a bolt in operation as Dave indicated. The brake/clutch pedal unit just bolts in place although Rick said this

was the hardest part of the job just because of the lack of work room and all the wires that were in the way.

The following are the parts I got from Atlanta Stuttgart as much as I can remember: manual transmission, drive shaft, speedometer cable, reverse light switch, clutch/brake pedal assembly. The first transmission turned out to have a bad third gear, so Dave shipped another one at no cost. The second one was good, but then it turned out that there was a problem with either the clutch pressure plate or the clutch release bearing. After Rick and Dave talked, Dave shipped both parts to Rick to make sure the problem got corrected. These were new not used parts. All of these problems caused delays in my getting my car back and added to my labor cost because the transmission got R&R'ed more than once. But I must say that Atlanta Stuttgart did their very best to make sure things were fixed at their cost. I did not have pay anything additional for parts.

In addition to the used parts Dave and others recommended that I replace some other parts just because new would be better than used in this situation. I bought about $200 worth of new parts from my MB dealer and shipped them with my car to Rick. The list included both flex disks, a new pilot bearing, new pedal pads, new shift boot, new rear transmission mount, and a few miscellaneous new hydraulic lines where it made sense to replace 20 year old lines with new.

So, my total cost was - $650 for used parts ($50 shipping) $200 for new MB parts +/- $689 for installation (original $480 estimate plus an extra $120 for a second R&R plus a few small parts and fluid)

Total cost -$1539 or about the same cost as parts only for an automatic would have been.

So far, after only one day of having the car in my possession, my wife and I are extremely happy with the feel of the car now. It seems like it has more power. The feel of the manual transmission is excellent and easy to shift. I hope that the mpg number improves and that after a couple of months I feel the same way about it. The installation also looks like it came from the factory this way. One would have to be very knowledgeable about these cars to be able to recognize this as non-original. Maybe the only way to tell would be to look at the VIN number. I am looking forward to smiling when all of you talk about your automatic transmission problems and saying, "I don't have that problem anymore." :) I am also looking forward to the easier maintenance requirements of the manual transmission.

Sorry for the long post, but I wanted to try to answer everyone's questions.

Oh, and for those interested here are the phone numbers of the two gentlemen

involved with this conversion:
Dave Quay, Atlanta Stuttgart Auto Parts, 800-653-1445 x110 Rick Ellinger, RC Imports, 301-762-4205

Len '83 240D 293,000 miles manual transmission :)

BACK to TOP

Air Conditioning Problems

by Marshall Booth

The system is VERY complicated and not easy or fun to diagnose. There are several possible problems that your description brings to my attention. When the engine speed and the compressor speed get out of a narrow acceptable range, even for a few hundred milliseconds, the compressor IS shut down and will not restart until the engine has been shut off and restarted. This is the serpentine belt saving circuit and prevents the serpentine belt from self-destructing if the compressor locks up. ANYTHING that causes the logic to read that the engine and compressor are slipping compared to one another, WILL trigger this circuit. Now, this can be due to:

1. Slipping serpentine belt (improper tensioner adjustment or bad tensioner, oil on belt, worn belt, belt driven accessory is binding)
2. Slipping compressor clutch (worn, oil on it, more then 0.5 mm play, electrical failures here are not uncommon)
3. Compressor speed signal degraded (poor contacts, defective sensor)
4. Engine speed signal degraded (the connector near the inner rear corner of the battery of diesels MAY corrode)
5. Compressor is binding and perhaps is about to self destruct (these Nippondenso compressors seem to average maybe 150 kmi of service though I had one go past 230kmi) and maybe a thing or two I HAVEN'T remembered.

There are also sensors that measure temperature in the cabin and at the evaporator. If proper air velocity isn't maintained (by the little fan located under the passenger's side air vent near the door) over the in-cabin sensor (and the sensor MUST work correctly too) the cabin temp control will be erratic (but if the fan speeds up - it is responding to the temp discrepancy so the cabin sensor IS probably working correctly). The evaporator temp sensor is defective in one

direction (reading the temps as to high), then the temperature can drop to freezing and the moisture from the air WILL freeze blocking the evaporator (and threatening to damage it as well $$$$) and temps WILL rise and will not return properly until the ice melts (this has SOME of the characteristics you describe). If the evaporator temperature sensor reports the temperature as too low, the compressor will shut off at too high a temperature and you will NEVER get properly cold airflow from the vents (I don't think this is you primary problem).

Gasoline cars have at least one engine temp sensor that diesels don't and I always forget these - if bad the compressor is not allowed to engage until the temp signal gets into a sufficiently low range and that can be almost never if the sensor is bad.

Then there is the possibility that there are a couple or several different problems.

These things are all pretty straight forward to diagnose, but it's time consuming and you MUST have the heating/AC manual, the electrical manual and the chassis manual to be assured you have all the available information (it IS all contained on the CD as far as I can tell). Then it's just a matter of testing it part by part. Even for someone familiar with the system an hours diagnostics is usually needed for common problems (there are one or two that I can find in 5 minutes ;-) and if it's a rare problem, much more diagnostic time (hours!) may be required.

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If the compressor doesn't turn by hand (you should feel a little resistance in steps but not a lot) then the compressor is frozen and almost sure requires replacement. You will also need to replace the dryer, and perhaps the expansion valve (not at all fun in a Model W126) and possibly even the manifold hoses if the old compressor chewed up metal parts. It will likely require the system be flushed as well (to clean out any metal fragments). This is NOT a minor job!

With a little luck, you might get by for $500 with a very knowledgeable tech doing ONLY the absolute minimum that was required, or it could cost well over $1000 to do what SHOULD be done for the best chance of the fix lasting and giving really good service.

Marshall

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Good morning, Listers - -

With summer fast approaching, I thought that it would be a good time to relate a recent repair on my 1990 300TE wagon (W124).

Last weekend, I replaced the blower motor and the blower regulator (see next post for discussion on this). These are accessed through the engine compartment and require removal of the wiper motor and quite a few pieces of weather stripping and plastic.
[See: <http://members.cox.net/jslabotsky2/w124_blower_motor.htm> for pictures that are a nice addition to the workshop manual.]

Clearly, after a period of years, the evaporator is going to be dirty and maybe even clogged with debris from deteriorating foam, etc.
[See: <http://www.mercedesshop.com/shopforum/showthread.php3?s=&threadid=74964&high light=fuji> for an example of a dirty evaporator from a W123.]

When the blower motor and the blower motor regulator are removed, you have virtually an unobstructed view of the evaporator on a W124. I took advantage of this fan/regulator R&I opportunity to clean my evaporator and the results are well worth the minimal effort.

Here's how:
1. Vacuum all loose debris from around the evaporator, using a long thin wand.
2. Then, spray the evaporator liberally with an appropriate cleaner. [[Normally, I will have a couple of cans of A/C evaporator/condenser spray cleaner in stock at home for my home system, but I was out on the day that I did this repair work. So, I used Simple Green instead, in a spray bottle.]
3. Next, using a garden hose with a pistol grip, rinse the evaporator liberally with water, using a setting that will clean, but doesn't exert too much water pressure on the evaporator. [Note that if your system is working properly, there are two drain hoses at the bottom of the HVAC box that will let the water quickly drain from the system.
4. Repeat 2 & 3 as much as needed. [You will quickly be able to tell when you have cleaned the evaporator: it will turn from a nasty gray/black to a shinier aluminum color.
5. After completing the above, take an air gun with reduced air pressure, and blow the evaporator and surrounding areas dry.
6. Also at this time, use a cloth and cleaner and wipe the exposed plastic surfaces clean. You will be surprised at how much grime has accumulated over the years.
7. Take the removed plastic parts and scrub them and dry them before re-install.

Results:
1. My HVAC system is now very "fresh" smelling, as in "neutral." This procedure removed virtually all traces of any smells.

2. The car *appears* to cool down much quicker. [Could be wishful thinking, but I don't think so. My guess is that the system first had to "cool the grim," then cool the car. With the grime gone, it now cools much faster.
3. I believe that there is much more air being moved through the system at each fan speed. Though I don't have a car to compare to, it makes sense, just like #2 above.

Problems with this procedure? I don't think that there are any problems. I did wonder about essentially "flooding" the HVAC system with water, even for a short period of time, but I assumed that the drain hoses at the bottom + using the air gun to blow out the residual water would take care of that. I am assuming that the water would not hurt either the evaporator or the heater core, if it received any water.

Finally, if the techs on the list agree that this is a safe procedure *and* you don't do DIY work, I would *highly* recommend that you pay your shop an hour extra labor to do this procedure when it comes to either blower or regulator replacement.

Richard Easley
Waco, Texas

BACK to TOP

Aux Fan Removal and Installation

On Sunday, July 6, 2003, Neil Chandler wrote:

A week ago I requested help on how to remove the auxiliary fans on a Model W124 E420. Thanks to the this wonderful list, and the people who are members, within hours I received four replies. I would like to publicly thank Richard McGinnis, Mike Yox, Kevin Kenner, and Marshall Booth. The instructions worked just as described, and I have replaced the faulty fan. There are a few variations an E420, so I thought that I would describe them.

-Before you start, buy some new plastic rivets for the fan housing. P/N 123-990-00-92, 70 cents each at the dealer. The fan P/N is 000-500-85-93, $138 from Caliber.

-Remove the bumper, which is held on by 7 bolts, all visible and easy to reach. This lets you see everything, and avoids working below the car. You will also have to remove the license tag, and the carrier that holds it. In my case, I found that the carrier fits onto a metal strip, which was badly rusted, and needed replacing anyway. Remove the clip that holds the outside temperature indicator sensor in place, and poke it back into the bumper through the large hole. For a big piece, the bumper is surprisingly light and easy to handle. One person can do it easily.

-Remove the right headlamp if you have to remove the right fan. (No need if it is the left fan). The two 8mm bolts, which hold the outside edge of the right fan, are almost impossible to start unless you can get at them. The head-lamp cannot be removed until you first remove the associated indicator assembly, released by a spring clip inside the black plastic air duct on the back of the head-lamp. The metal trim rail immediately below the lamp is secured with an 8mm bolt at each end. If you have headlamp wipers, remove the arm, but leave it hanging on the water supply tube. Remove two more 8mm bolts visible inside the indicator housing, the upper clip (turn it 90 degrees), and the inner 8mm screw, next to the condenser, and the headlamp can be wiggled out. If the wiper motor gets stuck, slide the rubber cover up the shaft, and loosen the 17mm nut holding the motor to the bottom of the lamp assembly. It will come out and go back in all in one piece.

-As Richard said, remove all 6 spring clips that hold the fan shroud, radiator, and condenser in place, and push them all back gently against the thermo-clutch. NB - Put a piece of cardboard between the fan and the radiator.

-Remove the horns and unplug them, and remove the reusable tie-wrap that holds the loom to the brace..

- Working in between the condenser and below the upper chassis cross-brace, using an offset ring wrench, remove the bolt, which holds the top of the brace. There is not enough room to use a ratchet. Remove the bolt on the front of the upper chassis rail, which also holds the power steering cooling loop. Remove the bolt that secures the bottom of the cooling loop to the body. Remove the screw holding the cooling loop to the chassis, behind the left headlamp. This allows the loop to move a little more. Working from behind the bumper frame, remove the bolt that holds the bottom of the brace, and lift out the brace.

- Remove the air-tube to the left headlamp air duct, unplug the sensor, and lift out the duct. (Do not forget to reinstall the sensor before you start the engine to test, because if you leave it off, it will set the red engine trouble light).

-On top of the chassis rail behind the headlamp, you will see a clip holding the male and female plug for the power supply to the fans. Pull off the clip, and separate the two halves of the plug. Remove the tie-wrap holding the end of the fan loom. (If you did not already do so, this is the time to function-test the fans, but use a direct line to a battery, as the fans draw a lot of current.)

-The fans are bolted onto the condenser, and are covered by a plastic molding. The molding is held in place with 6 plastic rivets. There are four across the top, easily visible and accessible, but the lower two are only reachable from below. The center pins may be brittle and break off in place. In this case, just push them inward, through the rivet, and then remove the outer part of the rivet.

- Remove the fan molding. This takes a lot of pulling and pushing, but the molding is flexible, and comes out upwards.(When it is re-installed, there are three lugs which fit into the condenser, which are only visible when the bumper has been removed)

-The fan power harness is actually two separate cables inside one sheath. Each fan has a power lead coming off it, which is held on a bracket attached to each fan. The harness ends in two female two-pin plugs, with side clips, which must be depressed to separate the plug assembly. If you want to test or repair the harness, there are two clips securing it to the condenser, but there is no need to remove them otherwise. It is not easy to remove them without breaking them. Unplug the plugs, at which point you can also test each fan one by one if you want. Be sure to securely reseat the plugs when replacing them. It is a lot of work to fix a loose plug!

-The fans are held to the condenser brackets with a total of 6 ea 8mm bolts. As Richard said, the upper right and the lower left, on the outer edges, are bolts with a loose nut (which is hard to find if you let it drop by mistake!). The other four are all threaded directly into the fan outer housing ring.. The outside 4 are all visible, but very difficult to get at, as there is only1/2 inch of clearance. A ratcheting gear-wrench is the ideal tool for this. The two center bolts can be reached through one of the larger gaps in the fan blades, using a 1/4-inch ratchet. If you only want to

remove one of the fans, leave the outside bolts in place for the fan to be left in place.

-Remove the fans upwards, wiggling the loop as you do so.

-Remove the clip, which holds the wiring plug from the old fan, and re-use on the new fan.

-I found that the most difficult thing to do was to start the 8 mm bolts on the outer edge of the fans, simply because there is no access to get at them.

-Clean out the space between the radiator and the condenser, and at the bottom of the front of the condenser.

-When you replace the bumper, be sure to re-align the ventilation ducts and the upper rubber moldings, and don't forget to run the temperature sensor back through the hole first. Replace the right headlamp.

-Test the fan functionality with a separate power supply at the main harness plug, then reinstall the head-lamp duct and back cover, and air tube, with the air temperature sensor put back in place.

Neil Chandler

BACK to TOP

Battery Cradle Inspection and Cleanup

by Hank van Cleef

Subject: [MB] Battery cradle inspection and cleanup

Shades of the Beech Bonanza! (Which also had its battery at the right rear of the engine compartment, just above a bunch of stuff).

A couple of weeks ago, my weekly under hood inspection revealed a hint of white corrosion at the outside (fender) end of the battery cradle. I recall that a recent article in the "Star" said "attend to this NOW." So today, a relatively dry nice warm Colorado day, I got a "round tuit."

For those not familiar with the drill, here are the steps on a 126.

1. Unlock the car, to disable the alarm system.
2. Remove windshield washer fluid, using the "not used for cooking" turkey baster (certainly, you have one of *these* don't you?). The reservoir holds over a gallon (4 liters). An old gallon milk container came in handy here.
3. Disconnect the two (with headlight washer) connectors (pull off), the washer fluid warning sensor (squeeze tabs and pull off) and any heater connectors (my car has none).
4. Remove the hose tie-wrap. To free up this D-B style, rock the stop tab back with a small pair of pliers, and use a screwdriver to start unwrapping the long tab. Finish the job with fingers.
5. Lift out the windshield washer reservoir and put it aside for cleanup before reinstallation.
6. Disconnect the battery, negative terminal first. Remove the positive cable tie-wrap near the battery, to get more clearance.
7. Remove the hold-down plate(s) attaching nut and plate. Set aside for cleanup. NOTE: My car (which originally came with a smaller battery), has one plate on the front, although there are studs for two. Do the big-battery cars have two plates here? What's in there now is a Very Large Interstate, which fills the whole cradle.
8. Lift out the battery.
9. Vacuum out the area. I have a large wet-or-dry shop vacuum, which is unbeatable for things like this.
10. Remove the nut and washer at the right front of the tray, and three bolts holding the tray in place. Note the location of the bolt with a flange on it (fender bracket). If you've got rust on the nut, soak it with penetrating oil first, and work it loose carefully. That stud would be easy to snap, and looks like a terror to replace.
11. Lift up the cradle and remove the tie-wrap at the front. Remove cradle from car and set aside for cleanup.
12. Vacuum out the area under the cradle and inspect. Unfasten tie-wraps as needed to get a good view of things and gain access for a wash down.

Reassembly is the reverse of the above. Refasten all tie wraps under the cradle and double check wiring harness dress and windshield washer harness and hose locations before putting the cradle back in place. Vaseline on the nut, washer, and stud on the right front corner of the cradle is a good idea. Also, be sure to clean the battery terminals thoroughly before reconnecting.

Wash down:
What I used under the cradle was a solution of baking soda in warm water, which will neutralize any battery acid corrosion products. I followed this with a good detergent solution wash, using brushes and sponges to get everywhere. Then flush the area with water. The wet-dry vacuum comes in handy for hastening drying. Get all the old leaf mold, sand, and other dirt out of there. Use Naval Jelly applied with a Q-tip on any surface corrosion, flush thoroughly, allow to dry, and prime and paint with appropriate products (Rust-Oleum paint is good for this). Note that the area is not normally visible, so color mismatch on the fender inner pan is not a serious consideration.

Right now, my cradle has been washed off with a baking soda solution, and is going through the dishwasher as I write this. I don't normally recommend putting car parts through a dishwasher, but this is one part that will tolerate it. Once it is dried, the cradle will get the Naval Jelly treatment, a good rinse with a stiff bristle brush, and be repainted black.
The windshield washer reservoir can be washed down on the outside with dishwasher detergent and a stiff brush. Rinse off an allow to dry. Don't drown the heads of the two pump motors while rinsing---they want to stay dry.
I'm surprised at the quantities of plumbing and wiring that runs under this area, and there is a big torsion bar mount under there. Tremendous opportunities for serious damage if neglected. I now see that an annual inspection of this area is a good idea.

-- Hank van Cleef
++++++++++++++++++++++++++++++++++
From: Jack A Stafford <miscjas@phylum.rsc.raytheon.com>
Subject: [MB] Model W123 coupe rust abatement and prevention
I removed my battery tray and eliminated its rust. Removed the flakes of rust with a wire brush and Dremel tool. Then applied 'Rust Mort' to convert the remaining rust. Followed by primer and 2 coats of paint. It looks great now.
While I was in there, I noticed some potential problem areas that encourage rust. The front body drains get clogged and hold a wet mulch in the cowl/fenders. May apply to all Model W123 series cars.
There are water drain holes in the cowl, just below where the hood hinge pivots attach to the body. Mine were clogged with mud, damp dead leaves and 'mulch'. I cleared this out and found one 5mm dia spot of rust shortly after I bought my car 20 months ago. At that time, I did a half vast job and didn't completely clear ALL the water drains. I finally got around to doing it right this weekend.
When I recently had the battery tray out, I could see another drain, just below the upper one. There is a similar drain on the left side, in the area below the fuse block. These drains were also clogged with dried mud, etc. I could not clear these drains due to an unseen obstruction below.

Inside the front fenders are plastic covers with their rubber seals. There is a part of this plastic which acts like a cup, just below the lower drain holes. This was the obstruction to clearing the lower water drain holes. I removed the 8mm sheet metal screws that hold the plastic cover to the fender and removed the plastic cover.

Now that this part was removed, I could see and clear the water drains from below. I also gained access to the inside of the fenders. The part of my front fenders that are just above the jacking point were full of (fortunately bone-dry) leaves and dirt. Lots of leaves and dirt, like 2 cups full on each side! If this stuff gets wet and stays wet, inside the fender or front rocker panel area, it will eventually rust the car from the inside out.

I'm glad that I took the time to clean that debris out and search for any rust formation. It was a filthy job removing the plastic covers, my hands were black with road grime after the task was done. I recommend wearing gloves.

BACK to TOP

Blower Motor Removal and Installation

by Ian Read

Date: Mon, 26 Nov 2001 13:46:35 -0500 (EST)

Here is the process that I followed since I could not find the instructions on the CD. Note all fastener lengths and locations, they are all different.

1. Remove the arm cover and hex screw from the wiper arm
2. Remove the two rubber strips from each side of the lower windshield by pulling them straight out.
3. Pull off the rubber weather-stripping that runs right across the inner firewall area.
4. Remove the top outer left and right plastic covers. Each are held in place in with two Philips head screws and are also joined to the top inner two covers with white plastic clips. Pull slowly to remove these fragile clips, ask me how I know. Remove the inner four Philips screws holding the inner top two covers down.
5. Remove the 4 screws holding the C shaped rubber grommet, which is below the wiper arm mechanism
6. Pull off the engine side firewall weather-stripping.
7. Just below the weather-stripping there are 4 plastic fasteners, which hold the sound insulation to the firewall, the inner two have a flower shape while the outer two are flat with two little holes. All four need to be loosened, the outer two will

come right off.
8. After step 7 you can pull the insulation forward slightly and find two Phillips screws, which hold the center plastic housing down. Remove these two screws.
9. Remove the upper left in right inner plastic covers.
10. The center grate cover should now come straight out.
11. The wiper assy has four 10mm nuts holding it in place, two are on the far right, and one each under the rotating center piece. Remove these nuts carefully and make sure you don't drop them like I did as they can fall into the center black hole, which is not accessible. (MIA one hex screw.) I found a similar one holding the A/C pipe on the left side of the inner firewall near the fuse box, which I used to replace the lost nut
12. Move the wiper assy to the right, it is not necessary to disconnect the power cable.
13. Remove the outside temp sensor from the blower motor cover.
14. Pry loose with fingers the blower motor harness on the left of the housing.
15. Unclip the 6-8 metal fasteners holding the blower motor cover down, a couple may require a small screwdriver, but be careful again. Remove the cover.
16. Unplug the motor, and release the hold down strap using a pointed tool.
17. Oil bearings with ATF. Check brushes.
As in Haynes (reassemble in reverse of above.)

Ian

See also: <http://members.cox.net/jslabotsky2/w124_blower_motor.htm>

BACK to TOP

Brake Caliper Rebuild

by Allen Sheldon

Date: Mon, 5 Feb 2001 12:39:03 -0500 (EST)
Subject: RE: [MB] DIY rebuild brake calipers 123

Date: Sun, 4 Feb 2001 20:45:20 -0500 From: "Mark Capozzoli" <>
> Has anyone ever attempted to rebuild brake calipers from a 123? Is it possible with standard
> tools? Any special tools required? I have a leaky rear caliper on the wagon. Cost

of new caliper is
> around $175. Cost of a rebuilt unit is $60-$70.
> Thanks, Cap

Hi Mark, I have done the rebuild on the brakes and maybe you can learn from my experience. The rear calipers are smaller but similar to the front calipers. I did mine on a 116 but you should find them to be similar. The Haynes manual for the 123 was actually pretty informative on the process.

You should do both sides at the same time so you don't end up with uneven braking (so I'm told). It's also likely that the other one will start leaking soon.

Remove the wheel and undo the brake line. The top connection will come off first by unscrewing the collar nut. Have a pair of good vise grips to do this since it seems to be soft metal and is round off easily. Remove the caliper bolts on the backside of the caliper and slide off the caliper and brake pad assembly. Remove the pins for the brake pads and the anti-rattle springs.

For the rebuilding part, a large flat pan is good to catch all the fluid and cleaner. Using a small air pump (like a bicycle pump) pump air into the caliper to force the pistons out. You can do this by attaching to the bleed fitting and putting a finger over the brake line port. Keep your fingers out of the way because they come out forcefully. Once one comes out you can put it back gently and hold it against the seal to force the other one out. The O-rings will come out if you prick them with a needle or something. Don't scratch anything. Use brake cleaner fluid for get all the sludge out. On the backside of the piston, use a little emery paper to knock the ridge off the backside. It's usually made up of corrosion. This ridge will make the process of replacing the piston difficult and will likely take a sizable chunk out of the new O-ring (at $35 a set), leaving you with a leaking caliper (precisely what you are trying to fix). Lubricate the piston bores and O-rings with new brake fluid. Put the O-rings in. Replace the pistons by pressing them in. I usually use the flat side of crescent wrench to press them in. A LITTLE rocking and twisting action can help. Once you get the pistons all the way seated, you need to fit the rubber boots and the heat shields over the pistons. Everything needs to be clean and it is a tedious process to get the rubber boot into place. Remember the position of the heat shields and put the new ones on the same way. Replace the pads and anti-rattle springs. The whole assembly slips over the rotor and you need to bolt it back on with new caliper bolts (locktite included).

If it leaks, remove and repeat process with new o-rings. After doing this twice on each caliper, you should have no leaks. Your hands will be very raw since brake fluid and cleaner dissolves oil very well and has removed all the oil and fat from your hands to about a quarter inch skin depth. A couple days of coating your

hands with triple antibiotic ointment and vitamin E oil should fix the problems. Or maybe you should wear latex gloves.

It might be worth it to purchase rebuilt calipers since the kit is so expensive and all the chemicals are carcinogenic.

Does this count as a BB award?

Allen Sheldon 1980 300SD

BACK to TOP

CIS Systems - Testing and Adjusting

by Peter Kurzenhauser

Date: Wed, 17 Jan 2001 17:40:40 -0500
Subject: [MB] Info on testing and adjusting CIS systems, save for reference

Listers, Lurkers, and other denizens: Over the past couple months I've been experimenting with the CIS system in my '87 190E-16V. It was running unevenly from time to time, and using Techron, or several tanks of Chevron fuel (which has Techron additive), generally resulted in improvements in drivability. After checking other systems and sensors, I narrowed down to the fuel system, particularly the fuel distributor and injectors.

The results of my tinkering and testing are applicable to all CIS systems (most gas cars before 1993)

Earlier last year I had kludged together a fuel delivery test apparatus, which I used to check the fuel delivery rates and injector patterns. For those of you familiar with the Bosch fuel delivery tester, it is an electro-hydraulic device that measures fuel flow in ccs per minute or some similar units. However, it is expensive and not readily available. I went to my local MB shop and 16V racer/expert (Rick Ellinger's RC Imports) and wheedled some leftover steel fuel lines from him (the ones that go from the fuel distributor to the injectors). I straightened and bent them to get a set of four that screwed onto the top of the fuel distributor, went up about 6 inches, then hooked down, in a line of four, so I could screw the injectors onto the ends pointed down. I then got 4 test tubes of 15 cc capacity and drilled 4 holes in a

block of wood to hold them aligned and spaced with the fuel injectors. This way, I could collect the output of the injectors into the test tubes and measure how much was delivered in a period of time, or (what's really important) how much fuel was delivered through each injector relative to the others.

To use the setup, I put a jumper into the fuel pump relay socket to run the pump, and pressed down on the airflow plate to replicate idle, part-throttle, and WOT fuel flows. By swapping injectors to different fuel lines, and testing at different flow rates, I determined there was almost 10% variation in the fuel delivery to the cylinders. Swapping the injectors did not make an appreciable difference in fuel flow, which is to be expected, because the differential pressure valves should minimize the effects of variations in injector opening pressures. Therefore, variations in fuel flow were isolated to differences in the 4 circuits of the fuel distributor. By testing different air sensor openings, I determined that the differences in fuel flow were significantly the same for both low, medium, and high flows (idle and WOT and in between). That is to say, if one cylinder was rich at idle, it was also rich throughout its range.

The Mercedes Manual for the 16V and the regular 190E say that up to 10% variation in fuel delivery is within tolerance. I have a hard time with this spec, because a 10% variation in the resulting mixture makes a significant difference in power and emissions. For example, if the leanest cylinder is at 15.4:1 (lambda=1.05), it may miss or have an incomplete combustion occasionally, especially when cold. It will also make less power than stoichiometric (14.7:1) and have higher NOX. If the richest cylinder is at 13.9:1 (lambda = .95) then it will run smoother, and make more power and be more fuel efficient, although it will have higher CO and HC. This info, by the way, comes from Bosch's own technical books and charts, in addition to other sources.

I figured that less than 5% variation was a much better figure to shoot for.

One of the other things I borrowed from Rick was a spare fuel distributor, which was gummed up (he was saving it as a core for a rebuild). I took it mostly apart (I did not split the two halves, but removed everything else) and cleaned it out well with Gumout spray and soaking, and got it working again. I carefully measured the depth of the gland nut around the plunger and the depths of the 4 adjusting screws (see below) in order to put it back together with the same adjustments. I put it on my car and drove it for a week to be sure it was working. Then I started fiddling with it.

The manual does not indicate how the fuel distributors are adjusted, it only says to replace them if the flow rates are out of spec, but it's actually pretty simple. ON the bottom of the distributor are four 3mm Allen screw caps. Under the caps are

2.5mm adjustment screws. These screws adjust the spring pressure against the differential pressure valve diaphragms, and thus the differential pressures, and thus the fuel flows. I found by testing with the delivery apparatus that a 1/4 turn in leaned the mixture on that circuit about 5%. By testing and adjusting a half-dozen times, I got the flow rates within 5%. I drove the car again with the adjustments, and it ran a little better.

Having proved out the procedure with the spare fuel distributor, I applied it to my original distributor and tweaked it to within 5%. Car ran a little better afterwards, specifically, smoother power on very light throttle and low speed operation. It also passed emissions inspection for the first time!!!

This apparatus and procedure will apply to any CIS car. Therefore, as I said in the subject line, save this for reference, unless you have something better, in which case share the wealth with the rest of us!

Pete K.

BACK to TOP

Cooling System Diagnostics

by Hank van Cleef

Some thoughts on diagnosing cooling system questions:

Relying on absolute indications of electrical temp gauges is risky. I have a nice Fisher Scientific dial thermometer with a long probe that I use to test top tank temp in cars that have the filler cap on the radiator (side tank jobs always have it on the upper hose tank). Not too sure how will this would work with the M-B reservoir filler.

You should be able to see the thermostat opening on the temp gauge. >From cold, drive the car at about 35-40 mph while keeping an eye on the temp gauge. It should come up fairly quickly, then stop moving and hold that temp with light throttle moderate speed running. On my car, that is about 83C indicated. Do this with the air conditioning turned off.

Now, kick the car up to 60-70 mph and go up a couple of hills. Some small temp rise is normal, depending on the outside air temp. On my car, it will hold the

indication at 30C/80F outside temps. If the temp walks up, let it coast down (downhill is best) to around 30 mph. over a half-mile or so, and resume the light throttle running. If the temp comes back and stops, you've probably got poor coolant flow.
After this (car is nice and warm now), slow down to 20-25 mph, and do some city driving (30-40 second waits at stop lights every quarter mile). If outside air temp is above 80F, A/C off, my car will wander up into the 85C range. Resuming 30-40 MPH will lower temp to the thermostat point. If the temp goes up (you need a high outside temp for this), you should look for airflow problems. These may be fan-related, but don't ignore dirt and bugs in the radiator and A/C evaporator fins.

Repeat the above tests with the A/C on and cooling. For this you need enough outside air temp and humidity to assure that the evaporator temp sensor is not shutting off the compressor most of the time. This should produce a fair amount of temp rise in the "city driving" test. With outside air temp at 30C/80F and dew point above 10C/50F, my car will walk up to about 100C, engage the fan clutch, and turn on the electric aux fan. Operation of both is pretty obvious. The engine fan will make a lot of noise at 1500-2000 RPM, and you can open the hood with the temp indicating high and tweak the throttle linkage if in doubt. The fan will speed up with the engine at moderate RPM, blow lots of air, and roar, if working properly. You can check aux fan operation very quickly by disconnecting the sensor connectors and grounding each with a clip lead. On my car, the A/C sensor makes the fan run at reduced speed, and the coolant sensor makes it run at full speed.

Keep in mind that the thermostat does not snap open and shut at the rated temp, but has about a 10C range where it is throttling, between fully closed and fully open. Thus, a variation of 10C on the gauge around the point where you can see the thermostat open during warm up is normal.

As outlined, in general, loss of cooling control at high speed is generally related to coolant flow problems; at low speed, airflow problems. Dirty fins will act like high-speed troubles. If you can't see an obvious "thermostat is opening" point, which is your reference point for all other tests, then the thermostat may be failed open.

While I've outlined a bunch of tests, these probably can't be conducted on the same day, or on the same stretch of road. However, since you are driving the car regularly, you should be able to find suitable times and places for observing behavior under various conditions.
A couple of things to remember, and use while testing:

The heater adds about 10% more cooling when operating at full tilt. The air conditioner adds about 20% more heating when operating at full tilt. Keep in mind

that the worst heat load condition for the air conditioner is high humidity.

Proper refilling of the cooling system, if it has been drained, can have its tricks. In particular, you have to "burp" the system when refilling it by waiting until the thermostat is open before topping it off. My car recently had the engine out and the cooling system about as completely empty as you can get it. I had plenty of heater gurgling and water sipping for the first 100 miles or so after getting the car back. Also, holding residual pressure when cold seems to be a "feature" of Mercedes Benz cooling systems.

-- Hank van Cleef

More Information:

Oil Cleaner in cooling system: disodiumtrixosilicate-pentahydrate.
Part number is A 001 986 21 71 (500 g)

Descaler in cooling system: citric acid.
Part number is 000 989 10 25 (500 grams. Use at 100 grams per liter)

BACK to TOP

Cruise Control Amp Repair

* Test Procedures

Table of Contents

BACK to TOP

Troubleshooting Your Cruise Control

by George Murphy

The factory-installed cruise control provided on Mercedes-Benz automobiles works very well for the first 4 to 5 years of operation. It is rock steady up hill and down and really a leg saver on long trips. But with time, the components in the system age and begin to cause trouble. The first indication can be intermittent loss of control or even total failure. In this article I will cover common problems I have encountered in the 8 years I have owned my 1978 300D and the experience of other owners who have contacted me with cruise control (CC) problems.

NOTE: The repair technique outlined below for the printed circuit board has been successful in about 2/3 of the cases I have encountered - but it is worth a try before replacing this outrageously expensive device.

There are three major components in the CC system: the control unit, the transducer, and the throttle servo unit.

Control Unit: this device compares the actual speed of the car and the selected speed. In the event of a deviation from the selected speed the control unit sends pertinent control signals to the vacuum- or electrically- actuated throttle servo unit until the actual and selected speeds are again in agreement.

Transducer: a speed sensor mounted on the speedometer cable (early version) or on the speedometer (later version). The transducer sends the actual speed signal to the Control unit.

Throttle servo unit: (early version) a vacuum-actuated servo, which positions the engine throttle to attain the selected speed. Later versions utilize an electric servomotor.

In order to trouble-shoot the system, you should have a digital volt-ohm meter, some test leads with alligator clips, plus straight and Phillips-head screwdrivers, metric wrenches, and a trouble light. But first of all, check the obvious - is the fuse blown?

1. Locate the throttle servo unit in the engine compartment. The vacuum unit is similar to that shown in Figure 1. Check the vacuum and vent lines - replace the small rubber hose couplings if they are cracked. Age and heat can cause deterioration of these rubber parts - as well as other couplings under the hood (and throughout the car). The electric unit looks like a small metal box with a linkage connected to the throttle. Check that the linkage is secure.

2. (Vacuum units only) pull the 2-pole connector from the throttle servo unit. Connect an ohmmeter to the servo unit pins. The resistance should be between 10 and 22 ohms; if not, replace the throttle servo unit.

3. (Vacuum units only) follow the actuating cable from the servo to the engine throttle linkage. Check that the end of the actuating cable is just touching the throttle lever with the least possible free play, but not exerting any force on it (otherwise the engine idle could be increased). If the end of the actuating cable is not touching the linkage, turn the adjusting nut (Figure 2) in such a manner that the end of the actuating cable just touches the throttle linkage. CAUTION: on diesels, turn the idle speed adjuster knob completely to the right and hold the emergency stop lever (on the throttle linkage) all the way to its stop before adjusting the nut. This adjustment assures that the vacuum-operated throttle servo unit is operating in the middle of its range, which gives the best control and response.

4. To check the speed transducer, remove the left hand cover under the instrument panel. On early models the transducer is located in line with the speedometer cable. On later models, it is a small black box about 1" square mounted on the back of the speedometer head. (You may have to push the instrument cluster out of the dashboard to reach the backside of the speedometer). Unplug the 2-pole connector from the transducer. Connect an ohmmeter to the transducer. Early models should read 50 to 106 ohms; later versions should read 650 to 1370 ohms. If these values are not attained, replace the transducer.

If the above steps do not solve your CC problem, then the control unit could be at fault. In order to do any repair on the control unit, you will need a soldering iron of not more than 25 watts, plus a small amount of fine resin core solder wire. (These can be obtained at Radio Shack for a few dollars)

1. Remove the left hand cover under the instrument panel. The control unit is contained in an aluminum box about 1" by 4" by 7" and is secured by a single bolt to the brake pedal bearing bracket. Remove the bolt, unplug the electrical coupling from the unit, and remove the unit from the car.

2. Carefully bend back the crimps on the aluminum housing so the printed circuit board can be withdrawn from the box.

3. Inspect both sides of the printed circuit board for burned or melted components. If there are any, the unit will have to be replaced. If the board does not show any obvious signs of overheating, it may be repairable.

4. Look at the two sides of the printed circuit board - mounted on the component

side are various transistors, diodes, and integrated circuits; and on the "foil" side is a confusing pattern of thin copper foil "wires" soldered to the wire leads of the various parts on the opposite side. The control unit generally fails whenever one or more of the soldered connections on the foil side become loose due to vibration or heat. If you are very careful, it is possible to re-solder these connections and get the unit working again. For this task, you will need a steady hand and the 25-watt soldering iron (and possibly a magnifying glass to inspect your work).

5. Solidly position the printed circuit board foil side up in a well-lighted work area. Starting at one end of the board, carefully apply heat with the tip of the soldering iron to each solder joint on the board. CAUTION: Apply only enough heat to cause the solder around the connecting wire or lug to momentarily melt, then remove the soldering iron and allow the soldered joint to "freeze". Make sure no solder flowed to an adjacent connection or you will have a short circuit. You may add a small amount of solder if the joint appears to be lacking enough for a good connection. The solid-state devices cannot tolerate excessive heat, so use care with the soldering iron.

6. After you have re-soldered each connection on the board, closely inspect for solder "bridges" between connections that can cause a short circuit. The connections may appear slightly discolored from your re-soldering efforts, but no harm should occur if you were careful with the heat.

7. Replace the printed circuit board in its housing and carefully re-crimp the sides of the box. Reinstall the unit in the car and make sure all connections are secure. Be sure to check the fuse for the unit in the fuse enclosure.

8. IMPORTANT: If you are not sure, check that the brake light bulb in each tail light unit of your car is an original equipment OSRAM or BOSCH bulb. DO NOT USE U.S. TYPE 1157 BULBS - THEY CAN DAMAGE THE CONTROL UNIT BEYOND REPAIR! The correct bulbs are available from your M-B parts supplier.

9. Take the car out for a road test and actuate the CC in accordance with the owner’s manual to make sure it works properly.

BACK to TOP

How to Remove Dash Vents in Model W124 Models

by George Murphy, Technical Committee Chairman, Director at Large

LEFT & RIGHT VENTS: There are four spring clips that secure the vent to the dash. They are located inside the vent louver assembly. Using a flashlight, look inside the vent at the lower and upper surfaces - you'll see spring clips with a small hole just protruding above the surface of the vent - 2 on the bottom and 2 on the top. The trick is to use a small pointed tool inserted into the hole in the clip. Lift the clip upward (or downward for the upper ones) while applying an outward pulling force on the assembly - I use needle nose pliers padded with a cloth on the jaws so as not to mar the vent vanes. Don't pry against the dash - it's soft and can be torn or dented. Just maintain an outward pull on the assembly while you lift each spring clip in turn - the vent assembly will ease on out. It is then a simple matter to unplug the illumination bulb and replace it. DO NOT USE MORE THAN 0.4 WATT BULBS - the excess heat will distort the plastic bulb holder and make it impossible to ever get the bulb and socket out again. The correct bulb is part no. 000 825 00 99 - a tiny push-in type bulb with gray plastic sleeve and straight contacts. The bulb wattage is marked on the gray sleeve.

CENTER OUTLET: In this case, first release the operating lever inside the vent using a metric Allen wrench (about 2 or 3 mm) to unscrew the flap link from the wheel. Shine a light inside the vent along the right side of the wheel - the Allen screw is visible inside - unscrew (turn counter-clockwise) the screw to release the link. On the right side, there is a Phillips-head screw accessible when the glove box door is open. As above, look inside for spring clips to retract that will allow the assembly to move outward. Use same size bulb as above. When re-assembling, after the unit is seated, re-attach the wheel link to the flap lever by engaging the Allen screw and rotating it clockwise. Tighten the screw only enough so that the wheel closes the vent with slight resistance. (If you over tighten it, you get to buy a new assembly...)

BACK to TOP

How to Remove the Door Panels in Model W124 Models

by Unknown

While this subject has been covered before, I thought I would share a couple of reminders.

The door check straps were original and creaking. I had done this same R&R on my 1990 model. When I began to remove the trim pieces on the 1992, I realized that I couldn't remember where the clips attached etc. Hopefully, this will save someone some fractured plastic.

1. The triangular shaped molded pieces at the front of each door are tricky. There is a male plastic piece that presses into a plastic female receptacle. This is on the leading edge (Front of Car) towards the top. There is also a small pin on trailing edge about 2/3rds up from bottom. Suggest sliding a blade underneath the piece find these locations. The molding has a hook at the bottom, so you need to pry at the top near these two pins. I managed to break the small pin on each side and the other pin on one side. 10-year-old plastic is brittle.

2. The two plastic molding pieces that surround the door pull and the electric seat controls are a press in fit. However, the piece surrounding the door pull has a hook at the bottom. Pry from the top.

3. Remember to remove the plastic C-clip that surrounds the shaft for the seat control. It is not obvious, unless you know it's there.

4. Remember to remove the door lights at the bottom of each door panel.

5. Removal is an upward push. Re-attachment is the reverse, but will require a few unsuccessful attempts.

6. After removal of the door panel, check for loose nuts on the shafts attached to the wood trim strips. All of mine were loose.

The R&R of the check straps is very simple. Window up, three bolts and the door pin, goodbye creaking.
Hope it helps,

BACK to TOP

Fuel Tank Gauge Sender Removal & Installation

by Dan Penoff

Replace the tank sender with a variable resistor and varying it from max to min

and the needle hangs or doesn't hang - answers a question. When the sensor is in the full position the resistance should be about 2 ohms. When the tank is empty the sensor should read ~80 ohms. The kind of fluctuation you report after the level drops to the 1/2-1/4 mark is TYPICAL of a fatigued fuse or dirty contact in the circuit. YOU HAVE REPLACED (not just visually inspected) THE FUSE for the instrument gauges HAVEN'T YOU? Dan Penoff wrote a nice description of cleaning the immersion tube transmitter assembly and I've included it below.

Marshall

- -

Tools Needed:

1-13/16" socket

8mm socket or wrench to remove seat back bolts Lots of clean shop towels or rags.

Plenty of room around car for seat bottom and back to clear doors while removing.

Fuel tank as low as you dare to go with it.

Procedure:

1.) Remove rear seat bottom by releasing 2 red clips on forward bottom edge of seat frame. Pull to one side on the clips while lifting up - you'll feel the seat frame come up as soon as they release. Lift up on the forward part of the seat bottom and pull towards the front of the car. Carefully remove seat bottom from car.

2.) In the center of the seat back below the armrest is an 8mm screw. Remove it. On either side at the lower corners of the seat back are metal brackets with 8mm screws in them. Remove these as well. Climb into the center of the back seat area and lift the seat back straight up. There's a metal lip on the back of the seat that hooks on two "ridges" just below the parcel shelf. Lift the seat back off of these and carefully set it down in the back of the car. CAUTION: Use two people for the next step!!

3.) With another person's help lift the seat back and remove it from the car. Why two people? Because if you try to do this yourself the seatback is too heavy. You'll end up dragging one of the corner brackets across the top of the wheel well or somewhere else around the door area. I have the scars to show for it. Now is a good time to apply some Leatherique to the seat back and bottom while you have the whole thing out.

4.) After wading through the spare change, candy, Cheetos, etc, you'll find some black insulating/sound deadening material draped down the back of the seating area. On the left rear (driver's side) there will be a cutout just below the parcel shelf. Carefully pull this portion back. underneath is a large (3"-4") diameter plastic plug. Pry it out of the opening it seals.

5.) You are now looking at the top of the gauge sender. Carefully remove the electrical connector and move it out of the way. Place your socket on top of the sender and turn it counterclockwise. Once unscrewed all the way, get ready with some shop rags/towels.

6.) Carefully and SLOWLY lift the sender assembly out of the hole. As you lift, fuel will be draining out of the cylinder. There are two holes in the side, one near the top, another near the bottom, with still a third in the base. Look down into the tank as you get close to the bottom of the sender or listen carefully to tell when the fuel has stopped draining from the sender. Have some towels or rags ready, as when you remove the sender from the tank there will still be fuel dripping from it. Be patient! Too many of us have pulled the sender out prematurely and gotten baptized with #2 diesel. Yuck! Take the sender to a clean work area where you can disassemble it and lay the parts out.

7.) Start by wiping the outside of the sender with a clean towel. You'll be amazed at the nasty black stuff all over. get used to it -you're going to see more . . . On the bottom of the cylinder is a small round "nut". Carefully unscrew this with a pair of pliers and put it aside. Gently twist on the bottom of the sender and it will start to come apart. Be prepared for more fuel! Here's what you will find:

A.) Flat metal disc that covers the bottom of the plastic plate and acts as the "floor" for the maze.

B.) Plastic disc that is the closure plate for the bottom. Lots of convoluted grooves in it, like a little maze. Make sure these are cleaned out, as they act as a damper for fuel to flow in and out of the sender cylinder.

C.) Outer tube of the sender. Two small holes in the side, both should be open and unclogged. These allow fuel to flow in and out of the sender so the float will register properly. The inside will be messy as well. Clean it. I pass paper towels (or better yet, a non-fuzzy shop rag) through it.

D.) Sender float and guide rod/wires. Here's where the fun begins

8.) Clean all the individual pieces, saving the float/guide rod assembly for last. You can use any number of solvents for this, just use them in accordance with proper safety practices.

9.) Take the float/guide rod assembly and carefully clean it, using a cotton swab or something appropriate. Handle it carefully, as the fine copper wires on the sides are very important as you will discover! On the bottom is a disk that lines up with two copper "arms" on the float. This is your low fuel light circuit. Make sure the contact on both the float and the disk are clean. You can burnish them with some emery cloth if necessary, as they will probably be pretty nasty. I like to use electrical contact cleaner to clean the low fuel contacts as well as the wipers and wires on the float.

10.) You may find one of the fine copper wires is broken, which will account for no low fuel light. If this is the case you can re-solder the wire using a low wattage soldering iron and the correct solder (60-40 electronic solder form someplace like Radio Shack.) It has been my experience that the wires typically break at the connection point where the original solder joint was, so no patching is necessary.

11.) Now that you're done, carefully reassemble the pieces, paying close attention to the placement of the plastic end cap and metal disk. Once you have the sender reassembled don't place it in the tank - plug it into the harness and use a jumper

clip (wire with alligator clips on both ends) to ground it. Turn on your ignition to see if you have your low fuel level light lit.
12.) After this test, remove the connector, carefully replace the sender in the tank, remembering to put the sealing ring on it, and tighten with the socket. No need for brute force here, just make sure the sealing ring is slightly compressed.
13.) Replace rear seat and related goodies
14.) Get a cold beverage of your choice and enjoy a snack from the remnants that lie under the rear seat! Ahh! Life is good!

Dan "Our Lady of Blessed Acceleration" Penoff

BACK to TOP

Multimeter 101

by Richard Hattaway

The following is the result of several requests to the list or to me privately for information on how to use a multimeter or VOM while troubleshooting a car's electrical system. It is not meant to be all encompassing, but instead a concise summary of how I have used a meter to my benefit..
Multimeter 101

There are basically four tests that can be performed with the standard handheld Multimeter. Resistance, continuity, voltage and amperage. I have to make some assumptions. The tester you own has a multi-scaled analog meter, or possibly a digital meter, and a large knob in the middle. It has two or three places to plug in the wires, and it has red and black probes. It may also have a knob that says "zero". It may have a switch that says AC/DC.. if it does put it in DC. The places to plug in the red and black probes will have little symbols over them making no sense, and are impossible to recreate in ascii.. One will be ground/negative/-/common or some such.. black wire goes here. The second will say V/Volts/OHMS/MA or an omega sign, and the red wire goes here. If there is a third it will say 10A or something like that. Ignore it.. it only causes heartache..

Measuring Resistance (Ohms).. there will be settings on the switch.. like RX1, RX10, RX1000.. and a scale on the meter that is non-linear, starting with very low values , but the point is that it is the ONLY scale on the meter that is non linear. With the test leads plugged into the meter as described above and the big switch

placed in the RX1scale, you will find that shorting the black and red test lead produces a movement of the meter. It should be toward zero on the non linear (usually red) scale. While the leads are shorted, you should be able to adjust it to zero using the zero knob. If it wont go, there is a battery inside that is weak,, probably a 1.5 volt AA or something.. the RX1 scale means you multiply the meter reading by 1. RX10 multiply by 10.. etc. but you have to zero it first. After zeroing it, put it on the highest scale, probably RX10K, and you should be able to measure the surface resistance of your skin. hold the probes in each hand and watch the meter move. squeeze tight, sweat, put them both in the same hand, etc.. it should read.. the original lie detector, this is..
Resistance (on glow plugs).. Remove the wire from the top of the plug.. put the black test lead on the shell of the glow plug. Put the meter on RX1, because you are going to be reading very low ohms, and zero the meter. Then put the red test lead on top of the plug. You should read the 0.5 or so ohms I hear Marshall talking about. This tests the resistance of the plug.

Measuring Continuity...Continuity is low resistance and is measured the same way.. If the path exists between two electrical points because there is a wire there, it has continuity, indicated by the low resistance (~0 ohms) between the points. Set the meter up on the RX1 scale and make your measurements. I must be quick to point out that you NEVER measure ohms or continuity on a circuit that has power on it. If you don't know, pull the negative lead on the automobile's battery. Power will destroy an ohmmeter in a millisecond.

Measuring Volts (Voltage).. there will be scales on the meter that correspond to ranges on the big round knob.. there will be ACV and DCV ranges on the big knob.. you will use the DCV (DC volts) ranges on the car in every application (very very rare exceptions do exist to this rule). Hopefully you have a 15 VDC scale. This is most useful in automotive service work, since you seldom see anything over 15 and seldom fewer than 8. So the readings are put in the upper half of the scale, increasing the accuracy. On the meter you will find a linear scale that corresponds to the knob setting. Full scale is 15, bottom is zero. With the meter in 15 VDC range, you should be able to read the voltage across your battery in the car. Put the red lead on the POS terminal and the black lead on the NEG terminal. If you feel nervous about messing around with the car battery, try a flashlight battery out of the kitchen drawer. It should read 1.52 volts if it is really good... 1.2 if it is discharged pretty badly.. zero if it is like most of the ones in our drawer... If the meter goes downscale, you have the polarity hooked up backwards. The red lead should be on the + or POS pole of the battery, and the black lead should be on the - or NEG pole of the battery.

If you want to see the charging system work in the car, and have become comfortable with making voltage measurements, put the meter across the battery,

set it up for 15VDC scale, and have your helper start the car while you watch the meter.. observe the steady state battery voltage before the start.. it will be something like 12.0 volts.. as the car is cranking, you will see the voltage drop to maybe as low as 8 volts. Make a note of this voltage with a good battery so you will know how low it goes.. this is an excellent full load test for a battery, and will point out a bad cell in a heartbeat.. When you have a bad cell, (each of which contribute about 2 volts to the system) you have two less full load volts than you had when the battery was good. But the voltage during startup varies from car to car.. so make a baseline note for your own use... OK, so the car starts.. now you will watch the voltage rise to somewhere around 13.70 volts. Maybe more.. sometimes less but not much less.. 13.2 volts is about the bottom end.. This is a number that is debated about as much as synthetic/dyno oil but you get the idea. Anything over14.5 is probably indicative of a battery with a problem or a charging regulator gone amuck. If it reads 12.0 or slightly lower you can bet your alternator is not charging. Stop the car, and let the battery sit for a minute. Measure the voltage across the battery, then turn on the lights. Watch the voltage drop slightly. Turn off the lights, start the car, and measure the voltage at slightly above idle rpm. Turn on the lights again, and watch the voltage remain constant, indicating that the alternator is carrying the load of the lights. (OK, Stu, it won't work on your "rising sun headlight system" <VBG>) But you can watch it happen with your very own multimeter and as long as you use the same meter, the numbers are all quasi-relative and you will become familiar with what to expect. PLEASE do not get the leads hung in the fan or belts while doing these experiments.

Looking for that "bad ground"?? Well, you can disconnect the battery negative and measure resistance, but that is not always the best solution. A voltage drop will develop across a bad ground connection. You can measure the drop under full load conditions (not possible with an ohmmeter, because the power has to be off) and sometimes full load conditions change things. Lets say the headlight is dim and you suspect a bad ground. Turn on the headlight, put the negative lead of the multimeter on the negative battery terminal, and measure the voltage at the ground terminal of the headlamp. It should be zero. Ground is supposed to be ground. But if there is a "bad ground" then there will be a voltage drop created across that bad spot, and you are wasting some of your voltage there instead of delivering it all to the headlamp. You will see this value on the meter. Following the ground path back toward the battery will reveal the culprit. When you get on the "battery side" of the bad ground point with your read lead, the voltage drop will disappear.

Measuring Current (amps or milliamps).. If there is a third hole on the meter for a test lead, it probably says something like 10A or 20A on it. This is for measuring high current. It is risky, in my opinion, unless you understand well the goings on of the meter and the circuit you are playing with. I would leave it alone. The

standard multimeter is not capable of measuring charging current or starting current. I use the cutest little device I got bout 20 years ago for this.. it is an ammeter that you simply lay on the cable to the battery. The current flow is so large that the field produced makes the needle measure the correct (approximate) current.

There is probably an OFF position on the big knob. The meter does not use much power from the battery (none, mostly) but it is a very good habit to put the meter in off when not in use, or even between measurements.. This habit causes you to look at what scale the meter is on and set it each time.. this keeps you from thinking you are measuring volts when indeed you have the meter in ohms.. result is a toasted meter, usually popping an internal fuse that is impossible to find..

There are many other test that can be performed. Most require expensive meters and plug in accessories. There has been a real good thread about Fluke meters in the past and all the amprobes, thermocouples and such that can be plugged into them. These are fine instruments, but beyond the scope of most DIY's test equipment budget. I have found a simple meter that measures Volts, Ohms, Amperage (limited as above), and DWELL ANGLE.. (yes, diesel heads, that is something that only us old gas car guys worry about <VBG>), and believe it or not, Griot's garage has the best price I have found.. don't remember what it was but it was under 50 bucks.. I recommend it. If that is out of the budget, then I recommend a trip to Radio Shack or your favorite building supply (Lowes has them here) and do some shopping. Remember that the main thing you are looking for is a 0-15 volt or 0-25 volt DC Voltage scale, and an RX1 resistance scale (they all have that).. I bet you can find a good starter for fewer than 10 bucks.

Have fun and be safe! == Richard Hattaway Salisbury North Carolina USA 1974 280 1964 230SL Visit the 113 Home Page http://113.mbz.org MBCA

BACK to TOP

Paint Chip Repair

Also see http://www.paintscratch.com/automotive-paint-tips.htm

The repair of a scratch and a chip are the same. A scratch is merely a chip on uni-

directional steroids. The only problem with a scratch is that it takes more time to be able to blend in the new paint. Items you need:

1. Touchup or color matched paint
2. Compatible primer - I like Wurth Rustop primer
3. Organic cleaner - P21S Total Auto Wash or Wurth Citrus Degreaser
4. Solvent - Rubbing Alcohol or Prepsol or Enamel Reducer
5. 3M Imperial Hand Glaze
6. Meguiar Finesse Sanding Block 2000 grit
7. Car wash
8. 600 grit wet/dry sandpaper
9. Round undyed wooden toothpicks
10. Large lightweight cardboard boxes (large shoe box or bigger)
11. Several 100% cotton towels
12. Magnifying glass - help for we with older eyes
13. New Pencils with unused erasers
14. Rubber glue
15. Several heavy clean plastic cups
16. Roll of quality paint masking tape

Realize that paint chip repair is a learned skill and should be practiced on an area of the car that is not that visible. The hood and nose are two areas that should be tackled last. Test all cleaners or solvents on the paint prior to usage. I like to use the seam underneath the rocker panels. Apply a little cleaner or solvent to a cloth and rub the seam. If you do not get any color on the rag, then the cleaner/solvent should be safe for the paint. If you do get color on the rag, then you may wish to consider another solvent.

CHIP REPAIR STEPS:

1. At least 24 hours before you want to start, use the rubber glue to attach small 600 grit sandpaper circles (the diameter of the eraser) onto several new pencils. The eraser must be unused and flat on top.

2. Step #1: Wash the car with a quality car wash and dry thoroughly.

3. Paint chips come in two flavors. The worst case has exposed the bare metal, while the less severe has left the original primer intact. Clean the area thoroughly with the P21S or Wurth Citrus degreaser. If there is rust on the exposed metal, clean off with the pencil eraser. Use a toothpick to gently probe the area and make sure that the edges of the chip are secure and not waiting to fall off and destroy your work. This is an optional step! If you do not feel comfortable with sanding or your paint is one of the new clear coated finishes, you should jump to step number

5. Take a new pencil/sandpaper tool, dip into clean water and put a few drops of water on the chip area. *SLIGHTLY* rough up the chip and a small portion of the surrounding paint. Lightly turning the pencil will rough up an area the diameter of the eraser and this should be more than enough. Keep the roughed up area as small as possible, the object is to give the new paint approximately 1 mm of old paint to "grab" around the perimeter of the chip and not dig scratches.

4. Move onto the next chip and repeat the above. Depending upon the amount of time available, you may wish to tackle 10-20 chips at one time. Try to stay within the area that may be covered by your box(es).

5. When finished sanding all your chips you are tackling at this time apply a small amount of Alcohol or Prepsol or Enamel Reducer to a rag and wipe each chip and surrounding area to remove any sanding dust and grease/oils. Use additional solvent and new area of the rag for each chip. Allow to dry (these are highly volatile and will evaporate quickly with no residue).

6. If the original primer is intact, and "pencil sanding" does not disturb the primer, then skip the next step and go directly to painting (# 9)

7. Make sure that the chip and surrounding area is clean. If not, re-clean with the Prepsol, Alcohol or Enamel Reducer. Pour or spray a small amount of primer into a clean plastic cup. Dip the point of a wooden toothpick into the primer to get a thin coating on the first 1-2 mm of the toothpick. If there is a blob on the end, gently scrape it back into the cup. Place the tip of the toothpick against the center of the chip and allow capillary action to literally flow a *THIN* coat of the primer into the depression of the chip. Move onto the next prepared chip. If you have finished priming all your prepared chips before two hours are up, cover with a box, taped down with masking tape and go have a beer. The key is to allow the first coat of primer to dry at least two hours. Dispose of your cup and start with a fresh cup and toothpick. Apply another thin coat of primer to each repair that needs primer. Priming is completed when no metal is visible and the level of the primer is *BELOW* the level of the surrounding paint. This is important! Cover and allow to dry for two hours or until dry.

8. Apply a small amount of Alcohol or Prepsol or Enamel Reducer to a rag and wipe the chip and surrounding area to remove any sanding dust and grease/oils. Allow to dry. Repeat for all the chips that are on today's list of victims.

9. If you are using a touchup, shake the bottle thoroughly. If you are using color matched paint, mix thoroughly and pour a small amount into a clean plastic cup.

10. Dip the point of a new toothpick into the paint to get a thin coating on the first

1-2 mm of the toothpick. If there is a blob on the end, gently scrape it back into the bottle. Place the tip of the toothpick against the center of the chip and allow capillary action to literally flow the paint into the depression of the chip. Repeat for each chip. The key is not to use too much paint. Do not re-dip the toothpick. Use only the amount that will flow from one dip. Temptation to add more paint with each application will be almost overwhelming. Fight it!

11. Cover with your paint box and allow to dry 2 hours and repeat 8-12 times till the depression is filled with paint and bulges slightly upward and covers the roughed up area with a thin coating of paint. The first 2-3 coats may not completely hide the primer. This is fine because you have many more coats to go. Fight that urge!

12. The paint application is completed when the new paint bulges slightly upward (a fraction of a millimeter) and had covered the roughed up area with a thin coat of new paint. Allow the paint to dry for at least a week.

13. The touchup paint has been applied to the surface and allowed to dry for at least 1 week, and resembles a minute mound (__o__) (this is exaggerated) on the flat plane of the existing paint. The object is to remove the mound and make the surface of the paint one continuous flat plane. The Finesse Block offers the ability to gently remove only the high spot of the repair. Unlike sandpaper or polish on a rag, the five usable sides of the block are flat and act like a "wood plane" to remove only the elevated areas of the repair. The 2000 grit will not leave scratches.

14. Soak the Finesse Block in clean water for 24 hours prior to use. Put a small drop of car wash on the chip repair. This acts as a lubricant for the sanding block. Then gently "plane" the high spot on the paint. I prefer to "plane" in one direction (usually back to front - drawing the block towards me). If the block dries out, re-wet and continue use. When the new and existing paints are blended (smoothed to the flat plane) to your satisfaction, clean the area using a quality car wash and lots of water and then use a quality glaze to restore the high gloss finish. I prefer 3M Imperial Hand Glaze. Don't use a machine on your car, as it deserves to be caressed by hand. Use a machine on your Yugo or SO.

15. When applying either a glaze or a wax, apply to your soft cotton cloth or applicator pad (don't squirt the stuff on the car) and work in one direction only. Don't go around in circles like dear old dad . Circles are many times the cause of "swirl marks." A front-to-back, back-to-front motion (the way the air flows over the car) will help minimize swirl marks or at least make them less visible. Buff out with a soft cotton cloth. If it looks good, wax with a quality hard wax and you are done.

16. Tip for applying wax. If you are using a quality Carnauba based wax, try applying it with your fingers instead of a pad or cloth. Hold your fingers together and use your finger tips as an applicator pad. The tactile feedback from your fingers will tell you when the wax has been worked into the paint. If grit should lodge under your fingers, you will know immediately and not grind it into the paint. A pad will not allow this tactile feedback and these devil grits become sandpaper. A circular motion of the pad will make a 360 degree swirl mark. All marks on paint are most visible at a 90 degree viewing angle. Thus the front to back marks are most visible from the sides, whereas a circle stands out from any viewing angle.

The question was also asked if clear touchup should be used as a final coat to repair chips on a clear coat paint. There are two view points to this question. The purist will say yes, the paint has a clear coat and thus, the repair should also. The process is the same as previously described, except the clear coat is substituted for the last 2-3 coats or paint. The practical world says no. The touchup paint is different from the original paint and is formulated only as a touchup paint. Once it is applied it should, according to the manufacturer, match well enough to be all but invisible. I have found this to be the case with the numerous repairs on the many cars/colors, I have completed. If you are using the original paint as a touchup (I have not done this with a clear coated car), then my understanding is that you should use the clear as a topcoat. The color coat of some paints will many times be relatively dull in appearance. These paints rely on the clear coat to provide the "shine."

Try one chip in an area that is not that visible. If the process works, then continue with the rest. If not, try the clear coat top layer.

BACK to TOP

Power Steering Fluid

by Marshall Booth

Date: Sat, 29 Dec 2001 11:47:11 -0500
Subject: Re: [MB] Recommended PS Fluid?

How VERY weird Howard, my owner’s manuals for ALL of my cars specify ATF and

MB continued to list and recommend ATF as approved for cars built at least 'til '88 (when cars started coming to the US with MB fluid in them and they changed from listing 236.2/237 fluid to listing 236.3). My '87 300TD came NEW with ATF (red stuff) in it and has never had anything else. I'm sure the '84s and '85 190Ds did too. I don't know for sure about the '87 W201s, but my non-turbo has ATF and the turbo has MB PS fluid. The problem (as I understand it) is that these systems were designed to use MB spec ATF (essentially type A ATF). My Dec '88 TDM (so covers '89 MY cars) list 236.3 as the approve fluid, but my '85 TDM (covering '86 cars lists 236.2/237 fluid which is somewhat "thicker" and refers to it also as ATF). Eric Chowanietz covered the basics rather completely in a series posted to this list back in 5/98:

talking with the Castrol engineer it turns out that MB's PS fluid 'Sheet no. 236.3' is actually old-style 'Type A Suffix A' ATF but minus the red dye. However, the Castrol engineer did say that Dexron II/III is a perfectly acceptable alternative for MB PS applications. The key issue, it seems, is not to top-up with non-MB fluid during the warranty period.

The power steering fluid MB 236.3 is a slightly lowered viscosity version of Type A Suffix A - ie, they start with a slightly thinner mineral oil and then friction modify it. I would think that the low-viscosity fluid is required because the steering system operates with a low fluid volume (0.6 liters) and high flow rate. When the engine is at high rpm the fluid is really moving quickly. Dexron is a fair bit thicker that the MB 236.3 fluid - in very cold conditions with a high engine speed I imagine that there could be risk of cavitation in the pump if Dexron were used - maybe this is why MB introduced their own fluid in '86?

In summary, if the car is not in a cold climate I'm sure Type A fluid would be quite satisfactory for the PS, most likely Dexron also. In terms of 'anti-wear' properties, Dexron is likely to be better than the MB fluid. In a cold climate I'd be certain to use the MB stuff to avoid possible viscosity-related problems.

Stu makes it a point that ALL cars with the single belt SHOULD use the less viscous MB fluid. The only factor I notice is that with ATF, the steering gets pretty stiff in near zero temps. Mobil 1 ATF completely eliminates that. It MAY lubricate better then the MB PS fluid too, but that's speculation on my part.

BACK to TOP

Installing Shocks

by George Murphy

Here's how I did my old '86 300E:

I strongly advise that you obtain the MB 124 Chassis Manual - call 800-367-6372 to order . . .

The MB manual assumes you will be removing the steering knuckle for other work, hence the spring compressor.

Here's how I did my 300E:
Jack up the left (or right) front of the car at the factory jack support just behind the front wheel until the wheel is off the ground. Block up the front end by placing a jack stand or similar support under the lower control arm so it is supported as it would be with the car sitting on its wheels. (VERY IMPORTANT) Allow the weight of the car to rest on the stand. Remove the wheel - check that the car is securely supported as it would be with the wheel on the ground. This assures that the spring is retained as it is when the car is sitting normally on its wheels.

Directions for strut change
Undo the upper strut mount bolt - use a counter hold on the shaft with a metric hex wrench.. Remove the three lower strut mount bolts. Support the steering knuckle on a block of wood so it does not swing downward and pull on the brake hose. Remove the strut from the car.

Transfer the buffers and dust shield to the new strut. Replace the upper rubber mounts if they appear worn or badly cracked. (No torque given) Install the upper new strut into the upper bushing - do not tighten yet. Make sure mating surfaces in the steering knuckle are clean. Install all three lower bolts, then torque the two lower ones first to 110 Nm Then torque upper bolt at lower end to 110Nm. Toque upper mount to 60 Nm but use a counter hold on the shaft with a metric hex. Replace the wheel, jack up the car and remove stand, lower car onto the wheel . . .

Repeat for other side

Have front end aligned by a knowledgeable MB front end alignment mechanic - bring your own alignment specs with you as most specs supplied with wheel alignment equipment is usually wrong . . .

BACK to TOP

How a Starter and Solenoid Works

by Henry van Cleef

Date: Sat, 23 Dec 2000 23:26:36 -0700 (MST)

Subject: Re: [MB] '83 300D - hesitation on starter

The esteemed Bob Warasila has said:
> For a couple of weeks now I've noticed a very slight hesitation before the
> starter kicks in. This morning temps were down around 20 and the starter
> didn't kick-in at all. The glow plugs lit so I doubt the battery (which as 2
> year old Interstate) is the problem. In addition after 3 unsuccessful
> tries, the starter kicked in and the engine started promptly.
> One other clue. When I released the key the starter kicked in momentarily.

Your "one other clue" makes me suspect that the ignition switch starter contacts are in trouble. On diesels, there is a junction block under the hood that you can jump across. If that gives reliable starter action, then I'd suspect the switch. A voltmeter to ground from the starter terminal at the junction block should tell you everything. If you don't get full battery voltage when asking for a start, then your problems are in the ignition switch, neutral switch, or wiring ahead of that point. If you get full battery voltage, but no action, then the trouble is at the starter end.

> When the car is warm the problem is only present as the slightly
> hesitation, so I doubt if the problem is the ignition switch. I'm thinking
> starter solenoid. Has anyone else ever experienced this symptom?
> Failure of the starter solenoid to pull in reliably is often an early warning
> that the starter (not just the solenoid) is asking for attention.

The solenoid has two windings: a heavy "pull-in" winding, and a light "hold-in" winding. Current from the ignition switch starter contacts goes through the neutral safety switch (auto trans) to the starter solenoid control terminal, where it connects to both the pull-in and hold-in windings in parallel. The hold-in winding is grounded in the solenoid. However, the pull-in winding is connected to the starter feed. Pull-in action comes when current flows through the pull-in winding, then through the starter brushes, armature, and field coils. When the solenoid starter contacts close, energizing the starter from the battery, the pull-in winding has 12 volts at both ends, so doesn't draw current. Of course, this comes only when the solenoid plunger is pulled in for start. If the brushes are not making

good contact, you won't get full pull-in current.

I would not pull a starter off and replace the solenoid without taking the starter motor apart and inspecting brushes, bushings, and connections. 99% of starter overhauls are brushes and bushings in the motor, and maybe a file dressing of the contacts in the solenoid, on most cars.

- Hank van Cleef
1986 420SEL

BACK to TOP

Timing Chain and Checking Stretch

by Marshall Booth

Here is the procedure for checking the timing chain stretch submitted by the esteemed Dr. Booth some time ago.

With the valve cover off, turn the engine clockwise (viewed from the front) using the crankshaft bolt (27 mm or 1 1/16" deep socket) - don't use the cam bolt! - until the scribed mark right behind the camshaft sprocket lines up precisely with the molded line on the front cam tower. This alignment is critical as an error here (say from parallax) will translate into twice the error in reading the timing chain stretch. If you miss - run the crank around again twice to bring the marks back into line - don't back up.

Then read off the flywheel damper the amount of chain stretch. There is a pointer and it will be pointing to the damper somewhere between the "0T" mark and the "10" mark (unless your chain is REALLY in terrible shape). A reading between 0T and 3 degrees is fine. Between 3 and 5 degrees indicates modest wear and anything beyond about 5 degrees should be a suggestion to change the chain. At 7 or more degrees the chain should be changed NOW! At about 10 degrees the pistons and the valves can begin to collide! Injection pump timing will be off by about 1/2 the amount that cam timing is off so if the chain is stretched 5 degrees, the pump will be off about 2 1/2 (if it hasn't been adjusted to compensate for the chain stretch - not usual, but some people do it). Setting the pump timing is a bit more involved.

BACK to TOP

Trailing Arm Bushing Replacement

by Nathan Goodlet

Subject: [Model W126 Coupe] Replacing trailing arm bushings
Date: Friday, July 5, 2002 4:37 PM

Reply-To: mbcoupes@mbcoupes.com

OK Trailing arm bushing job is rain delayed!! Time to start the write-up.

Attached find pix of the bushings and the tool I rented.

The usual disclaimer applies that working under a car will crush you, be sure you have enough tools, experience and sense to do this kind of work safely. This was not an easy job, it should be left to the medium to high skill or experience level of DIY'er.

I did come up with a great safety procedure during this project, I have several old rims w/ mounted inflated tires around, and after I had the car all lifted high enough to work on and as usual, any proper point to use for the jack stand is obstructed, I decide the mounted rims could be a last stop lifesaver. I placed a pair of rims w/tires under the trunk floor on the ground. At the height where I wanted to stabilize the car, the two wheels I was using would not fit without kicking them in tightly, but once they were in place, they were out of my way, in a position to support the weight of the car if it tried to fall on me, and were even spreading out the weight well so the usual concern about whether a jack stand will damage the thing it is going to press against was not a concern. Be assured I am not recommending you don't use jack stands, and I never used the wheels and trunk floor for the primary support, but if you're working on the grass or gravel drive, jack stands aren't safe/steady anyway, the wheel and tire support idea will work on unsteady surfaces. This little trick will become a regular part of my under the car safety routine. No doubt in this case it was safer than jack stands.

The most frequently called on tool in lots of this bushing work has been a 12" piece of 5/8" all thread rod, a few nuts and some very heavy washers, and a proper sized support tube to pull the bushing through. I used the smallest metal tube from the kit I rented, and the proper cap to go over it. In this case, another perfect

tube support to pull the bushing out into would be a white PVC "Coupling" fitting for 1Ä " pipe, even better if you can use a file or grinder to remove the center shoulder inside the PVC coupling. The shoulder may not matter, see if the new bushings will fit into the sleeve up to the shoulder, and try it first. The threaded rod is passed through a big washer first, then the PVC sleeve, then the trailing arm bushing itself, and then put a nut on behind it. When a nut is drawn tight against the washer, the bushing is pulled out by the nut on the other end and into the PVC sleeve. You do have to cut off the rubber shoulder of the bushing, so what is left is only the rubber sleeve inside. That shoulder prevents the sleeve from having footing on the trailing arm. I cut through the rubber with a combination of small hacksaw, box cutter and big knife. Even when it is cut through to the metal center, you will still have to cut and tear the rubber flange off, side cutters and stout needle nose pliers might help. When there is nothing larger than the old bushing's sleeve part itself, it will pull through into the PVC sleeve easily. An added benefit is that the bushing will pull through from either direction when the shoulder is cut off. In order to prepare to do ball joints I bought/borrowed AutoZone's ball joint press, picture enclosed, they put $107 on my card, when I take it back, whenever, they will give me a full credit. Damn fine tool too, $107 would be a good price on it. Anyway, it turns out for the trailing arm bushings the all-thread rod and nuts and washers have done most of the work, BUT without the selection of spacers and sleeves from the press kit, it would not have been as easy. I would recommend renting it even if all you wanted to use was the covers, tubes and spacers. It would still be easier than the PVC sleeve, use that approach if the kit isn't available.

All through this job you'll be moving and changing the support points for the subframe and trailing arm. Best if none of the supports is also holding the weight of the car. The spring is still there and tightly compressed, but the hydraulic strut is the limiting factor, with the car supported, if you disconnect the subframe or trailing arm, the spring can't cause the assy to sproing out of control because the strut is in it's center and will not extend beyond it's full length. This all assumes the strut is still firmly connected at the top.

The simplest way for me to work on the car was drive the rear wheels up on the rhino ramps, then support the side I was working on further with an assortment of jacks. Leave the opposite side with the tire on and sitting on the ramp for stability.

BIG NOTE:: You will disconnect the drive shaft while the car is on the ramps. This is a big hazard point if you overlook the fact that the transmission's park position only stabilizes the car when the drive line is tight. You will also need to rotate the rear wheels during the disassembly. That means neither the parking brake nor the park position in the trans will be available to you to steady the car while it is on the ramps. YOU MUST SECURELY CHOCK THE FRONT WHEELS both fore and aft on BOTH sides. Double check, kick the chocks in tightly, and keep checking on them

during the job. DO NOT take this lightly.
If you back the car up the ramps, then the ramp itself is in the way of your primary rear lift and jack port. I backed up the ramps, then used a bottle jack under the rear of the trailing arm assy, always use wooden or plywood blocks to cushion the aluminum. Break loose the wheel lugs first, then lift the car enough to remove the ramp on the side you're working. Remove the wheel. I used a 4" thick block of wood about 1 foot long so the factory screw jack could sit on the outer end of the wooden pad, and a small bottle jack can sit under the front corner of the trailing arm and the subframe on the other end of the same block.
Each trailing arm bushing has a thick pivot pin bolt to remove. Both are obstructed, The subframe must be lowered to get to them. With the small bottle jack and wooden pad support the subframe and remove the subframe bushing cover and bolt. That is the big as a saucer bushing at the front corner of the rear subframe. Lower the subframe, I used a second bottle jack with pad and thick base block to provide some support at the wheel, but it really wasn't stressed, just in place in case. When the subframe comes down you should be able to get to the bolt and nut, the metric size is bigger than any I have, 21 mm maybe, but 15/16" fit great w/o any looseness.

You will have to remove both trailing arm pivot bolts to get the trailing arm to move one end or the other clear of it's subframe brackets far enough to pull out the bushing. Disconnecting the drive shaft and flex disk appears to be necessary in order to push out the trailing arm pivot bolt on the inner bushing on the right side. The head of the bolt hits the flex disk before it can be pulled out enough to clear the bushing or bracket, so you're stuck. The flex disk has three bolts through from each side, rear end flange and drive shaft flange. Remove the three bolts that connect the rear end flange, leave the shaft connections tight. Mark the flange and the disk in some way so the flange gets reassembled in the same position. There is an alignment pin sticking out of the rear end flange, into a sleeve in the flex disk, the manual says "force the shaft off the pin." Since up, down, right left and back were all out of the question, I pried the shaft toward the front a good bit, must be the front flex disk giving up the slack, but by prying the shaft forward about an inch!!, the shiny pin can be cleared and the shaft walked and wobbled off to the side. The alignment pin will continue to fight you, and it seems to be abusing the flex disk, but it seems ok, that rubber is TOUGH!! Anyway once the pin is clear of it's race or sleeve, the shaft can be swiveled around enough to clear the bushing pivot bolt without moving the shaft or flex disk assy very far, just an inch or two off center, you may have to raise or lower the subframe or rear of the trailing to get the right clearance. This is a much bigger deal on the right side of the car, the left side is not nearly as close.

When bolts are out and the bushings are free, you can pry them clear of the subframe mount, or try lifting or lowering the bottle jack supporting the trailing

arm. All these parts are under some tension, but can be pushed and pulled and pried apart some. You'll need clearance to use the 5/8 all thread rod. A long thin wooden rod or board, a broom handle or such, will be handy separating the units for clearance to work.

Note both bushings pull in from the outside of the Y shape of the trailing arms, the bolts also go in from the outside. The manual refers to "slide lube" I used bar soap goo. When using the threaded rod to pull the new bushing in, you should try to accommodate the shape of the bushing where you are pushing on it. A flat washer would not be the best tool to back up the bushing with, unless you can find another thin one with a larger center hole that will support the second metal support on the bushing end. Observe the rubber shoulder view of the bushing pix. The raised ring that surrounds the sleeve through the center of the bushing is really a solid metal tube, and there is really a bushing within a bushing. You would ideally like to push on both the center sleeve and also on the raised ring outside it evenly. To push very hard on either point alone looks like it would be stressing the new bushing badly. Use the sleeve again, rather than a big washer alone so the small amount of the bushing that pulls all the way through won't bottom out.

When trying to get the holes lined back up to push the bolts through, a tapered punch or small screwdriver is handy to stick into the hole and persuade everything to line up.

Questions or suggestions to make this more clear or complete will be welcomed. Nathan

BACK to TOP

Vacuum Line Filters

by Dave Cavner

Subject: Re: [MB] weird happening

Here's an old post from my personal archives, which can help with early detection in the future. I use the vacuum line filters noted below in all my diesels. They're cheap insurance.

There is a repair kit available to repair the pump - depending upon engine

number, so be sure to give it when you order.
Up to engine # 108987: about $25 Above engine # 108988: about $60

Make sure shutoff diaphragm isn't leaking - does car shut off OK? Look for oil in shutoff line that goes through "ignition" switch...also check for oil inside brake booster...if found, you may be able to clean it out before damage is done. That's why I advocate the use of those little vacuum telltale filters in the vacuum lines to stop oil migration through car systems when vacuum pump diaphragm leaks...

Copy of article follows:

by George Murphy

On diesels, if the line from the vacuum pump to the air cleaner is fouled with engine oil, the vacuum pump diaphragm may be leaking. If so, engine oil will eventually migrate throughout the vacuum systems in the car, causing the rubber parts to rapidly deteriorate. If you see oil dripping from the "ignition" steering lock switch on your diesel, the vacuum pump diaphragm may be leaking or the engine shut-off actuator on the injection pump may be leaking (and the engine may not shut off). The lubricating oil in a diesel can eat away the rubber parts in the brake booster, door lock actuators, vacuum cruise control actuator, and climate control flap actuators. So it is a good practice to check the system from time to time.

Fortunately, M-B has come up with a neat little device to help you monitor the condition of your (diesel) vacuum pump and system. It is a small in-line transparent air filter that can be installed in the vacuum line where it connects to the T in the line to the brake booster (71). Simply cut the rubber vacuum line about 2 inches from the T (where it says "Diesels*" in Figure 2) and insert the filter. The filter paper in the strainer should be away from the vacuum pump. See The STAR, January/February 1992 for more on this handy device. (Gasoline engines do not need this filter)

Now, if the diaphragm in the vacuum pump should begin leaking, oil will be clearly visible in the filter, alerting you to the problem and preventing oil from entering the vacuum systems.

The filter is part number 000 078 06 56.

George Murphy MBCA Technical Committee

BACK to TOP

Model W123 Central Locking

by Michael McDuffie

Thu, 16 Sep 1999 13:32:10 -0700

Diagnosis and repair of vacuum leaks in 240D door and trunk locks. Written by Nathan Carter, summer 1999. ncarter@satie.arts.usf.edu <or> mega@avatar.walrus.com

<disclaimers: I'm not a certified mechanic; however, I have owned two 240D's, which have been my primary cars for the past eight years. All the following information is more or less accurate for my 240D and may or may not be the same for other models. Also, I'm writing this from my desk and not from inside the car; it's as accurate as I can remember without looking at the car.>

I know this is long, but if you've got the door lock problem you'll want to read the whole thing, even print it out and stick it with your service manuals. The most valuable information is near the end, but go ahead and read the whole thing

Everything in the car is controlled by the vacuum system - brakes, engine shut-off, air vents, door/trunk locks, etc. There's a vacuum pump in the engine, vacuum reservoir in the trunk, and about four thousand feet of vacuum lines running all over the car.

Also, for some unknown reason, most of the vacuum lines throughout the car are made out of a semi-hard yellow plastic. After a number of years, the plastic becomes brittle and cracks or outright breaks, especially in the corners where the lines feed into the doors (and therefore have to flex every time the door opens or closes).

The mechanisms in the doors that cause the doors to lock and unlock are prone to failing. They each have two (or four?) little rubber diaphragms that will eventually rot and split, causing loss of vacuum. I've found that these seem to fail all at once, or thereabouts. I've replaced three of the four of mine over the past three years, and have a spare ready for when the fourth fails.

If the lock in your doors only work intermittently, or only work while the car is running, or will only work once, immediately after you shut the car off and get out, then you've got a vacuum leak. Generally, it's one of the following: a leak in one of

the vacuum lines (semi-likely), a leak in one of the vacuum-powered door lock mechanisms (very likely), a leak in the reservoir itself (very Unlikely), a failing vacuum pump (very Unlikely, and knock on wood that this isn't it).

While the car's running, you probably won't have any vacuum problems. The vacuum pump is powerful enough to generate enough vacuum to overcome small leaks in the system; when the pump is not running, the vacuum pressure will (relatively) quickly dissipate because of the leak, and you'll have problems such as doors not locking.
If you're the type to want to fix this yourself, you'd be well-advised to invest in a few tools to aid your battle against the vacuum system: - A small air vacuum/pressure meter - a hand-held vacuum pump - some rubber tubing of the appropriate size (Note: a kit containing all of the above can be had from IMPCO for $60) - some wooden golf tees. The golf tees are for sticking into the end of a piece of rubber tubing to seal off that section of the vacuum line from the rest of the system. It works!

The first thing to check, and generally the most likely cause of the problem, are the vacuum-powered door lock or trunk lock mechanisms. Here are some diagnosis steps (do all three):

A. Sit in the car with the doors unlocked and the car running. Do the doors lock and unlock properly? Does the trunk lock and unlock properly? If there is one door (or trunk, or fuel-fill cover lock) that does not work at all, even with the car running, then you've got a huge leak in that area and should be able to find it relatively easily. If it's a big enough leak, you may even be able to hear it leaking. If this is the case, then you should do a little happy-dance because it's rare that finding a vacuum leak is that easy.

B. Sit in the car with the doors unlocked and the car running. Shut off the car and wait for a minute or two, then lock the driver's door. Do the rest of the doors/trunk lock? If the other doors don't lock, then the leak MAY be in one of your many unlock lines, or in the unlock side of one of the locking mechanisms. This test alone doesn't tell you much.

C. Sit in the car with the doors locked and the car running. Shut off the car and wait for a minute or two, then Unlock the driver's door. Do the rest of the doors/trunk unlock? If the other doors don't lock, then the leak MAY be in one of your many lock lines, or in the lock side of one of the locking mechanisms. Again, this test alone doesn't tell you much.

Now, with the data you got from tests B and C, you should be able to figure out roughly where your leak is.

Case 1: If both tests B and C failed (i.e. no locking OR unlocking after a few minutes of the car being off) then it's most likely that the vacuum leak is somewhere else in the system besides the door locks. There are other systems in the car that are also controlled by the vacuum. Engine shut-off, brakes, climate control ductwork, probably more. I've never had a problem with these systems, though, so can't really be of any help here. (okay, well, I DID have a problem once where, while doing an oil change, I accidentally clamped some vacuum lines under the cover for the oil filter canister, but that's an unrelated story)

Case 2: Test B fails, but Test C succeeds. After shutting off the engine and waiting for a few minutes (doors locked), you're able to unlock the doors, but then can't lock them again; after shutting off the engine and waiting for a few minutes (doors unlocked) you're not able to lock the doors.

While sitting there waiting with the doors unlocked, there is constant vacuum to the Unlock lines (and the Unlock side of the locking mechanisms); your vacuum reservoir quickly empties due to a leak in one of the unlock lines and you're unable to lock the doors because you've got no vacuum.

While sitting there waiting with the doors locked, there's constant vacuum to the lock lines; since there is no leak, your vacuum is reserved. When you unlock the doors, as soon as there is vacuum to the unlock lines it is expended by unlocking the doors and leaking out the leak. You can't lock the doors again because there is no vacuum in your reservoir.

Case 3: The exact opposite of Case 2. Doors stay locked; you can't unlock them because there is a leak in the lock lines and no vacuum pressure.

Now, for actually finding the leak! I realize this is a long, long process, but the vacuum lines are really obnoxious to work on. I'm going to assume that you did all the tests and came up with Case 2 as your problem. You need to find and fix a leak in the unlock lines.

If there is one door (or the trunk) that seems to unlock more slowly than the rest, start checking there first. You should find two vacuum lines running to each locking mechanism, one for vacuum-lock and one for vacuum-unlock. In my car they are yellow with red stripe and yellow with green stripe, but I can't remember which is which, sorry.

***Method to narrow down your search: This is correct for my 240D, but may be different for other models.

You can find the vacuum lines for various parts of the car running underneath four floor mats. Pull out the floor mats, then the sub-mats, and you'll be staring at the metal bottom of the car. There are plastic covers that protect the vacuum lines (and some electrical lines? can't remember). These can be pulled aside pretty easily and you'll find the yellow vacuum lines. Search around until you find a rubber connector in the vacuum line; there are probably several Y-shaped splitters.

Disconnect these (**REMEMBER where they all go!) and seal them off With your rubber tubing and golf tees. Now go repeat tests A, B, and C (as described above) and see if you've made any difference. If some of the locks work properly and your vacuum is reserved, then the problem is in a section of the line that you've disconnected from the rest of the system. You've just narrowed down your search significantly.

Repeat as desired until you don't have any more places to disconnect and seal off, or until you've narrowed your search enough to start checking out one of the doors or the trunk.

***Examining the vacuum-powered lock mechanism. These WILL fail sooner or later, so go ahead and check them out.

For the trunk, it's essentially the same steps as for the door, but the mechanism may be locked in a slightly different place, and you have to know how to take the rear wall of your trunk apart.

For the door: Take off the door panel and disconnect all electrical lines (power windows, speakers, etc. You should have a thin sheet of plastic covering the metal door frame; GENTLY pull it aside (you'll need to reattach it later with some spray adhesive). Inside the frame will be the window hardware and (voila) near the bottom, the vacuum door lock mechanism. It looks like this (side view):

thin metal rod to door lock knob

two _ | _ vacuum | -+- | lines -> =====|____|

It'll probably be black or blue plastic with a lot of rubber parts on it, and will be bolted or screwed into the metal door frame. It's easier to work with if you take it out, but getting it back in is sometimes a pain.

Disconnect both vacuum lines but **REMEMBER which is which!!** Mark with masking tape if you have a bad short-term memory. Use your rubber tubing and golf tees to plug the end of these lines.

Two routes of diagnosis, both useful and easy: Method #1: easier but less information. With those two vacuum lines sealed off, go crank up the car again, give It a few minutes to depressurize (vacuum-ize?) the vacuum reservoir, then shut it off again. Try locking and unlocking the doors. If they work properly, then you've found the problem to be that locking mechanism. Call your dealer or IMPCO and get a replacement. (I managed to find TWO Working replacements in a junkyard! yahoo!)

Method #2: More work but more information. Connect your vacuum hand pump to one of the vacuum inputs for the lock mechanism. Pump it and see what happens. Now plug it into the other one; pump it and see what happens. Make a thorough visual inspection of the two rubber diaphragms on the top of the mechanism; if these are cracked, rotten, or split, then that's probably your problem; the vacuum will leak out from the broken part of the diaphragm.

If the locking mechanism seems to lock and unlock properly (alternating the hand pump between the two lines going in), and the rest of the car shows no improvement with these lines disconnected and sealed off, then.. well, you didn't find the problem yet. Sorry.

Now to check the yellow plastic vacuum lines:

If you had sealed this part of the vacuum line off from the rest of the system, then it's entirely possible that the yellow plastic vacuum line is cracked or broken.

If you've got the hand pump and the vacuum gauge (or if you have a hand pump with a gauge built in), then examining the individual lines is pretty easy. If you don't have both of these tools, then it's next to impossible.

Connect the gauge to one end of the line (probably the end that's in the door, the end that you disconnected from the locking mechanism). Now go scrounge around in the floorboard and find the other end of the same line; it's one of the ones that you sealed off from the rest of the system. Connect your hand pump to this end of the line.

Pump it up enough to achieve a good vacuum, then see if the vacuum leaks out. If you can't get any vacuum at all, then the line is either completely broken or you put your gauge and pump on different lines (oops). If you get a good vacuum and it stays, then the line is good. If you get a good vacuum but then it leaks out slowly, then you've found the leaking line.

If you find a line that's leaking, you've got two options: replace or repair. Replacing the line will be more expensive and more work; repairing it is probably just as good (explain in a minute) but cheaper and possibly less work.

If you want to replace the line, you have to first go get a new piece of vacuum line

(make sure you get the right color), then pull out the old line and pull the new line through to the right place.

If you want to repair the line, first find the section that's leaking (listen for a hiss? visually inspect?), cut it completely in half, and slip a piece of rubber tubing around it. Now, this may be more reliable, especially in a place like the door jamb, where the line has to continually flex back and forth anyway. The rubber will flex more easily than the plastic tubing.

======== OR! the REALLY easy way ==========
If you don't want to deal with all this, just drive your car to the dealer and say "I've got a vacuum problem, please fix it." They'll either repair it for you (for a modest fee, plus your first-born child) or they'll happily escort you off the lot, because they don't want to go through all this trouble either.

Hope this helps.
- Nathan '83 240D, 241,000 miles, and a working vacuum system

/----------\
|Nathan Carter email: ncarter@reality.cse.fau.edu |
|FAU Network Computing Florida Atlantic University, Boca Raton |
\----------/
Ronnie Kyle wrote: I looked through the archive but couldn't find any real clues for the following, any advice welcome.

My 1976 W114 280CE has just returned from the garage where the central locking was being fixed. The service manager, who I trust, said that the c/l was working 5 times without exhausting the vacuum tank.

I got in tonight and c/l worked unlocking the car, drove off and there was a high pitched whistle from behind the dash on the right of the steering wheel (RHD). I depressed the driver’s lock and the c/l worked and the whistle went away.

However when I got out of the car the c/l failed to work and I had to manually lock the passenger side, I now wish I hadn't depressed the lock.

Does anyone have any suggestions? Can I reset the c/l somehow, it appears that when I pressed the drivers lock I screwed it up. Anyone suggest a plan for testing operation of c/l, without tearing panels / manually priming system. I'll probably get there but this is really starting to piss me off.

The good news is that the car appears to be running brilliantly apart from this, next the stereo.... still looking for anyone to tell me if they have fitted 2 3.5"

speakers in the dash grille (and retained the factory grille) as per www.crutchfield.com fitment guide.

Thanks in advance, Ronnie

What is wrong with my 123/126 central locking system?
123/126 Chassis Central Locking Troubleshooting (applies roughly to other models):
1.) Get a MityVac or other similar hand vacuum pump.
2.) Remove carpet from forward passenger foot well
3.) Carefully pry up cover from wire gutter on floorboard.
4.) You will find 2 sets of vacuum lines connected with a 4-way vacuum tee:
Yellow/Red stripe - locking
Yellow/Green stripe - unlock
Yellow/Gray strip - vacuum pump & reservoir
5.) Remove each line one at a time and apply vacuum. Every one should hold vacuum. You'll see a corresponding action from the related door/trunk/fuel door actuator.
6.) If you don't, or if a particular line will not hold vacuum, trace it down. It's pretty obvious where they go.
7.) The one thing that might make this a little tougher is the trunk and fuel door actuators, as they share the same circuit in the 126. If this line does not hold vacuum you'll need to pop the inspection cover off the trunk lock and remove the liner on the passenger side of the trunk to get at the respective actuators. Once exposed, remove the flexible lines from each actuator and test both ports. They should hold vacuum in both directions.
8.) If you trace the leak to a door you will have to remove the door panel to access the actuator. As in # 7, test both sides of the actuator. If it holds vacuum, plug the end of the line in the passenger foot well and attach your vacuum pump to the end in the door. If it won't hold vacuum you have a leak in the line, most likely inside the rubber bellows that protects the wires and lines at the door hinge. You can do a quick fix by removing the line part way and using a piece of flexible (rubber) line to "patch" the leaking area. Hard plastic vacuum line (clear, not yellow) is available as a stock item from most MB suppliers.
9.) Occasionally the rubber bushing that seals the line to the vacuum reservoir can dry out and crack. This will allow locking while the engine is running (on a 123) but no operation once it is shut off. Check the reservoir by applying vacuum from your hand pump to the yellow line in the engine compartment that has the gray stripe. It will take a fair amount of pumping to build up vacuum, as you're trying to evacuate a large reservoir with a little hand pump, so be patient. If after 30-60 seconds of vigorous pumping it still does not hold vacuum you can assume there is a leak in the line or the reservoir is leaking. Plug the line on one end and apply vacuum from the other. If it holds vacuum the reservoir or seal is leaking.

10.) On a 126 the vacuum is provided by a reversible pump that has a pressure operated snap switch to reverse operation when it reaches full vacuum/pressure. With the car turned off lock the doors from the inside or with the key. You should hear a quiet whirring noise coming from the trunk. If not, the pump may not be working. Lift the spare tire cover and remove the spare. In the 4 o'clock position of the spare tire well is a metal cover. Remove the screw on the end of the cover and lift it off. Underneath is a large black foam "football" that contains the pump. Remove the pump and unplug it from the wiring harness. Plug it back in. If it runs and shuts off after 20-30 seconds it's timing out due to the inability to develop maximum pressure/vacuum in the system. (You have a leak!) Unplug and plug it back in again. If it runs and shuts off after the delay the pump is probably good. Unplug the vacuum line from the pump and plug the port coming out of the pump. Plug the pump in again. If it runs and shuts off after a few seconds each time you unplug and plug it back in it's good.

Keep in mind that an actuator may hold vacuum in one direction and not the other, so you MUST check both sides of the system to be sure to isolate the problem.

Piece of cake.

BACK to TOP

Water Pump Removal and Installation

by John Morrison

Date: Mon, 5 Feb 2001 17:39:28 -0000
Subject: RE: [MB] W 124 water pump

Hi Bernhard
> Can't be all that difficult to change the water pump.
AAAAAAAARRRRRRRRGGGGGGGGGGGGGHHHHHHHHH!!!!!!!!!!!!!
Estimated parts required - Water Pump and Gasket, Anti-freeze

I've recently taken on the task of replacing the water pump on my Model W124 1991, 200E 2.0 Liter Petrol, Automatic, 4cyl etc. I've run into trouble along the way as you may have seen from my postings to the list but it's almost sorted now (I've been waiting 3 weeks for a bolt that I broke while doing the job)

Here are the steps that I followed from my Haynes manual.

Drain the cooling system - there's a drain plug at the bottom left of the radiator looking at it from the front If the coolant is good you could try to save it, mine wasn't.
Remove the "springy" bit from the air intake duct - it will give you a bit of room to work.

Remove the fan shroud by releasing the clips (4) and rest over the fan blades (Mine was a one piece, I think the split shroud can be removed from the engine bay at this point)

Remove the rubber hoses to the radiator and also, if automatic transmission, remove the transmission fluid pipes from the radiator. The manual says to clamp these hoses before removing. I couldn't get at them to clamp on so I prepared a "plug" with a pencil and some PTFE tape. If you remove the top one first it isn't that messy i.e. no fluid escapes and you will see the size of plug that you will need.

Next remove the plastic screws from the panels at the sides of the radiator

Remove the 2 large clips that secure the top of the radiator and remove the radiator

Remove the fan shroud from the engine bay.

Next, remove the fan - this is where the fun started.

I tried all sorts of things to try and stop the engine rotating while trying to loosen the fan bolt but to no avail

Eventually, I fixed a vice-grips firmly in place on the bolt and gave it a sharp blow in the opening direction with a hammer, while placing as much pressure in the water pump as possible with my hand (to stop it from rotating) and the bolt loosened.

This method I reckon, could well be replaced with the use of an impact driver. !!

Also, when the bolt loosened, the vice-grips took flight at Mach II and proceeded to bury itself in the windshield washer reservoir tank. This should also be avoided unless being videotaped for one of those home-video shows ...

Estimated parts now required - Water Pump and Gasket, Anti-freeze AND new windshield washer reservoir tank

Now would be a good time to loosen/remove the auxiliary drivebelt. The tensioning device is located at the bottom right-hand side of the engine. There's a nut located at the center of the of the tensioning device which should be loosened 1/4 to 1/2 a turn Loosen the "tensioning bolt" which is located to the rear of the thermostat housing until the belt can be slipped off the pulleys. Remove the drivebelt.

Gee, that drivebelt looks a bit worn and shiny on the outside Estimated parts now required - Water Pump and Gasket, Anti-freeze AND new windshield washer reservoir tank AND new auxiliary drivebelt

Next there are four screws/bolts (Torx heads I think they are called I think) retaining the water pump pulley. After trying the "nice" way with "Torx" tip - no move After further treatment with bolt loosening sprays, tapping with hammer, heating with blow torch and much praying I eventually reverted to method described above with vice-grips. I think an impact driver would have helped here also.

No need to break the windshield washer reservoir at this point as it is already broken.

Estimated parts now required - Water Pump and Gasket, Anti-freeze AND new windshield washer reservoir tank AND new auxiliary drivebelt AND 4 new "torx" bolts for water pump pulley

Next remove the thermostat housing along with the hose to the water pump. It must be really difficult to break anything here as I managed this procedure without doing any damage However, one will probably require a new thermostat to engine gasket when replacing the housing.

Estimated parts now required - Water Pump and Gasket, Anti-freeze AND new windshield washer reservoir tank AND new auxiliary drivebelt AND 4 new "torx" bolts for water pump pulley AND new Thermostat housing gasket.

Remove the electromagnetic fan coupling thingy by undoing the three small nuts at the rear of the unit and disconnect the wiring. No problems here.

Remove the remaining hoses from the water pump, Remove the alternator from the mounting bracket, top bolt and second from bottom I think. The top bolt just screws out, the bottom one has a nut at the rear, which has to be undone. It's probably better to remove the bottom bolt first as it's easier to support/hold the alternator while undoing the top one. I left the wiring on the alternator and rested

it on the bottom of the engine compartment. Again, no problems here.

You should now have access to all the bolts retaining the water pump, which in my case all came out easily enough.

Now wait a week for the "Special order" water pump

Refitting is a reversal of removal as they say. Make sure to clean the mating surfaces on the water pump and thermostat housing and remove any "gunk" from the threads of the bolts.

Torque the water pump bolts to 8 ft/lbs (more on that later)

Refit the alternator, EM fan coupling, water pump pulley and auxiliary drivebelt.

Tension the belt by tightening the "tensioning bolt" (located to the rear of the thermostat housing) I'm a bit hazy on how to do this properly, some have said that you should not follow the guidance in the haynes manual. I did, and broke a part of the tensioning device, so I'll be judging by feel after installing the replacement part. Once the belt is tight enough, tighten the center bolt on the device. I forget the torque setting for that one.

Estimated parts now required - Water Pump and Gasket, Anti-freeze AND new windshield washer reservoir tank AND new auxiliary drivebelt AND 4 new "torx" bolts for water pump pulley AND new Thermostat housing gasket AND new part for the tensioning device.

By the way, I mentioned torquing the water bolts to 8ft/lbs. After I broke the tensioning device I decided to give a final check to the water pump bolts and managed to shear one of them.

So, off with the auxiliary drivebelt, thermostat housing, water pump pulley, em fan coupling, alternator and water pump again (much more speedily, I might add). Luckily, the sheared bolt was protruding from the engine so it was easy enough to remove.

Hold on a minute, the rest of those bolts don't look too healthy!!!

Estimated parts now required - Water Pump and Gasket, Anti-freeze AND new windshield washer reservoir tank AND new auxiliary drivebelt AND 4 new "torx" bolts for water pump pulley AND new Thermostat housing gasket AND new part for the tensioning device AND new set of bolts to re-mount water pump.

Re-fit the fan, insert the shroud, re-fit the radiator, attach the shroud to the radiator, attach all hoses including the Automatic Transmission fluid pipes, re-fill cooling system and top up transmission fluid (while at running temperature) if required.

Go for a drive - a long relaxing drive.

It's been 4 weeks now since I started the job. I had to wait 3 weeks for the new bolts from my Mercedes dealer, the rest of the stuff seemed to be hassle for them to get as well - I've got a Temperature sender/EM switch on order from them for 4 weeks also and they as of yet haven't got it in.

I got my pump bolts on Saturday but haven't had a chance to put the whole lot back together yet.

Good Luck

I hope the above doesn't put you off. If it's of any help, things usually go wrong for me even if it's just changing a wheel.

The help and advice I got from this list was great, I would really have given up somewhere along the line without it.

I was fortunate enough that a friend of mine was able to lend me a vehicle for the last couple of weeks. A Land Rover Discovery, which I am enjoying driving....

John Morrison Fermoy, Co. Cork Ireland

BACK to TOP

Bad Wheel Bearing??

by George Murphy

Date: Wed, 17 Jan 2001 23:24:35

Subject: Bad wheel bearing??

> I haven't posted in a while, as the Benz has been

> running fine. That is until my commute home from work
> tonight. While on the highway, I suddenly hear a
> scraping sound, like something was dragging. I pulled
> to the shoulder and had a look-see, but found nothing
> out of place. I drive it slowly (40mph) the 15 more
> miles to home. The scraping noise quickly gave way to
> a dull growling noise. I suspected a bearing. I jack
> up the right front and grab the top and bottom of the
> tire, and discovered quite a bit of play. I have the
> service CD, and it appears a relatively simple task to
> replace the inner and outer bearings. Any words of
> wisdom from anyone who has done this, before I dig in?

Richard Easley has LOTS of experience with front wheel bearings . . .

WHEEL BEARING REPLACEMENT TIPS

Here's a few things to consider:

First, get the MB Chassis manual for your car so you can do the job right.

In my experience, the grease should be changed at the 90,000-mile service - I found my OEM grease was getting a little stiff by this mileage.

Use MB wheel bearing grease part no 001 989 23 51 10 or a good grade of lithium high temperature bearing grease - Kendall Blue comes to mind. Of course, buy new inner hub seals.

Pull a bearing cap and look at the grease - if it is stiff and wax-like, it is long past time for bearing re-pack. Anyway, I do bearing grease at 90,000 miles interval (third 30,000 mile service) since MB now uses that new green high temp grease in all cars since 1986.

If your bearings are OK, but if the hubs are coming off anyway for rotor change, change bearing grease and install new seals. Thoroughly clean the hub and bearings of ALL old grease. DO NOT SPIN BEARINGS at high speed with air gun to dry them - be gentle with the air. Some mechanics like to have fun by making that high-pitched whine¶. using compressed air to spin and dry out cleaned bearings - it is really hard on the bearings to do that.

Next, pack bearings by hand with MB grease - save all excess - weigh out correct # of grams and pack it into hub IAW the MB chassis manual. There's a reason for the specified grams of grease for the bearings and inside the hub. Too much leads

to overheating and too little starves the bearings of grease. The grams specified for inside the hub and the bearings just fills the hub cavity such that centrifugal force during rotation forces the grease outward in both directions to continually pressurize the bearings and keep them lubricated. It has been shown that the grease actually "circulates" inside the hub and through the bearings to keep them lubricated - that's why properly lubricated MB front wheel bearings can last so long, and that is the reason for that 45 grams of grease.

Use the rest of the grease to fill the hubcap. In this manner the inside seal stops the grease from leaving the bearing due to centrifugal force, and the cap, being full of grease, keeps the grease inside the hub/bearing area.

The 150 gram tube of MB grease will do both front wheels - about 60 grams per hub plus 30 grams for bearings - simply follow the MB factory chassis manual procedure.

Here's data from Tech Data Manual:

For a 150-gram tube of MB wheel bearing grease, here's how it breaks down: (From TDM Section 33) (All weights are approximate)

107, 124, 201.03 models: total 65 to 70 grams - 50 in the hub with bearing; 15 to 20 in the hubcap

116, 123, 126: total 60 grams - 45 grams in the hub; 15 grams in the hub cap

201.02/1: total 50 grams- 35 grams in hub; 15 grams in the hub cap

Be sure to maintain the specified charge. Suitably weigh entire charge prior to starting assembly of front wheel hub. Weigh quantity filled into hub. Fill roller cage of tapered roller bearing well with grease. Also provide roller faces with grease. Fill hubcap approx to beaded rim.

Starting 12/88 all models use 150 gram tube - green grease part no. 001 989 23 51/10 DO NOT MIX GREASE TYPES - unexpected results may occur.
As to setting the free play, certainly the dial gauge method is preferred.

Here's how I did it ON A 107 before I bought a dial gauge: (N/A for 126 and those w/o washer)

Re-assemble the washer and adjust nut and tighten it about 25 to 30 Nm while spinning the wheel. Back off the adjust nut just enough so that you can barely rotate the washer behind it by hand - that should be as close as you can do it by

feel. Tighten the lock bolt and check that the washer can still be rotated by hand - it should be a little stiff, but movable.

If you replace the bearings and races, you should repeat the above after a few hundred miles to assure that adjustment is correct. I've always had to re-adjust after bearing race change, so plan on doing it anytime you replace bearings and races . . .

Hint: If changing bearings, put the new bearing races in the freezer. Put the hub in the oven at about 250F. Drive out the old races while the hub is hot. After a few hours in the freezer, the races will almost drop into the hub without a driver - but use a wood or plastic driver to assure proper seating of the bearing races.

Regards,

BACK to TOP