

**Subject:** [MB] 1987 W126 intermittent climate control (w/SOLUTION!) LONG  
**Date:** Wednesday, May 8, 2002 11:30 PM  
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Good evening all. I have been meaning to write this for the past week or so, but hadn't gotten around to it. After I wrote that last climate control message, I thought I'd sit down and just write it up. It's a bit long, but I think it will be useful to anyone who has a "modern" climate control system (W124, W201 & 1986-up W126).

Basically, my Type III (IIA?) climate control would oscillate from working perfectly to blowing hot air out of the defrost vents. The car would stay cool, but it would be fighting itself and I found it really annoying and obtrusive.

This is kind of long posting, because I'll be going through the diagnosis in a kind of narrative style. You can skip to the bottom if you just want to see the answer and the reason behind it.

The story starts about three weeks ago when I was getting ready to drive from San Diego to Phoenix in order to attend my brother's wedding. Since I was also going to be driving my parents too, the 420SEL was the mandatory choice for travel. Having been recently inspired by Marshall Booth's posting saying that he needed to drive each car in his fleet at least 100 miles/week in order to keep them in fighting trim, I decided to take the 420SEL out of its cocoon in order to shake it down prior to the big trip. Normally, I drive my other Benzes and the W126 only gets driven occasionally: about 20-30 miles per week.

So here I am taking the cats for a drive and everything is great. Then all of a sudden, the vents are no longer putting out cold air. I play with the switches and nothing changes. Even the fan speed switch has no effect. Then I feel around the vents and note that \*hot\* air is coming out of the defrost vents. And it's 90 degrees out (32C for you metric folk).

A little later, the AC kicks on full blast and the cabin cools down again. Five minutes later, it goes into heat mode. Then cooldown. Again, the buttons have no effect -- even the fan speed. But, the fan speed isn't the full-blast speed that the defroster goes into. The astute reader will realize that that is a CLUE!!, but said CLUE was lost on me at the time.

I had visions of myself trying to drive across the Arizona desert with the ACC in defrost mode. And my parents would be withering in the back seat. This is clearly unacceptable. So I make an appointment at the local independent shop to look at it Tuesday morning. [That's about t-minus 48 hours for departure to PHX.]

Tuesday comes and the car is in the shop. I stress the need for speed as I need to start my drive to PHX on Thursday morning. Given the symptoms, they diagnose it to be the climate control unit and replace it. (I had discussed this with them before hand and was prepared for this.) I get the car back and it does indeed work. So I'm happy.

I depart for phoenix on Thursday at noon. I'm on the road twenty minutes and it goes into heat mode again. I'm about to abort the trip and take my cramped coupe because of flakey climate control. This means buying plane tickets for the parents because there's no way to fold them into the back seat of the coupe.

Back to the shop. We discuss it a bit and it occurs to me that wild temperature fluctuations are often caused by little airflow across the temperature sensor in the ceiling. I blow on the sensor and the system decides to blow cold again. Now that I have a temporary fix, I decide that I can risk a drive across the desert in the car.

So I'm on my way... and whenever I notice that the car is no longer blowing cold air, I blow some hot air of my own into the temperature sensor and it gets the message. It still bugs me, but I can live with it.

So on Friday, in between some pre-wedding festivities, I pull the glove compartment out of the car and try to see why the air is not flowing over the sensor. The aspirator fan is always powered whenever the ignition is on, so it's not electrical. And the hose seems solid: if it had a leak the temperature control would never be stable, not be intermittent. So I rule out that cause and put the glove compartment back together.

Is it air currents that accidentally blow a snootful of cold air into the sensor and cause it to go into heat mode? Blocking direct airflow into it doesn't affect it. That theory shot down.

Fast forward about a week. Through the wedding, the drive back, and shuttling the ancestors around San

Diego that week....

One evening before bed, I read through the MB shop manual for the climate control and memorize the schematic diagrams for the 126.0xx system. And I ponder some more. It's got to be an intermittent sensor... but which one?

So, I'm driving down the expressway (because how else do you get around in California?), and I have the recirculate switch on just to keep the cold air in the car. And I notice: whenever the system goes on the blink the indicator light in the recirc switch goes out. CLUE!!! "Aha," says I. The system is losing its ground, all the sensors take on unusual values and the system goes haywire. Well, if it's an intermittent ground, then I have something to look for -- even though I don't relish digging around behind the dash looking for a loose wire.

But, when the system comes back, the recirculation light comes back on. If we truly were losing ground, then the control unit would be reset and the recirc light should have stayed off. CLUE!

So I go back and read through the MB climate control manual again. And I come across the following passage on page A15:

All output signals are switched off (except the blower control) in case of a short circuit. Outputs are switched on again within 30 seconds after the short circuit has been eliminated.  
Mercedes Benz, ACC Service Manual, Model 126

CLUE! CLUE!!

So the next day, I'm driving around and I ask my dad to look at his watch and time the interval between when the recirc light goes out and when it comes back on. Whadaya know? It's approximately 30 seconds. CLUE! CLUE!! CLUE!!!!

So, it's back to the schematics to see how many output sources there are and which ones could be causing this problem. There are several:

1. Monovalve
2. Seven vacuum actuator solenoids
3. Aux water pump
4. Blower motor control
5. Compressor control (Klima relay)
6. Recirculation switch LED

So, I pull the control unit and start probing the resistances of the output connections.

1. Monovalve: 12 ohms -- in spec
2. vacuum actuators: 58 ohms -- in spec
3. aux water pump: 5 ohms no spec(??)
4. blower motor control goes to a solid state module with high impedance and draws negligible current. Besides it's not part of the short circuit protection logic.
5. KLIMA relay. Another high impedance solid state input with negligible current draw and also above suspicion.
6. recirc LED draws so little current it too is above suspicion.

So everything looks normal. But there's an overcurrent condition. And everything meets spec -- those that have specs. But... an electric motor that is 5 ohms would draw about 3.0 amps (neglecting back-EMF), but the book says 1.0 amps. But why would that be a problem when the car reaches optimum temperature and not sooner? Nonetheless, since it's common wisdom that these things are troublesome in their old age, I decide to unplug it as a test. I'm sure my Dad thought it was strange that I was going to fix the A/C by unplugging something under the hood. But it's an easy thing to try, so I go ahead....

SO I UNPLUG THE AUXILLIARY WATER PUMP AND IT WORKS PERFECTLY.

I take it for a victory drive and the ACC works as it should. It reaches the optimum temperature and the fans go to their lowest speed setting just like they're supposed to. And it keeps working.

Why?

It has been covered before that the electrically driven Aux water pump starts drawing more current as it ages. And this is what happened. The device is only supposed to draw about 1.0 amperes in normal operation. But as it gets older, it starts blocking up and takes more current to operate. If it truly was stuck, then that 5 ohm load would be drawing almost 3.0 amps.

Now the climate control unit is all electronic and all the output signals are really transistors arranged as open collector drivers. Each of these NPN power transistors have their emitters connected to a common "ground" rail which in turn passes through a current measuring shunt resistor prior to being connected

to the real ground. When the current measurement gets too large, the climate control unit cuts out all the outputs (since it can't know which output is shorted) for 30 seconds and retries.

What was happening was that the aux water pump was drawing 3.0 amps. Keeping the monovave in the "cold" position takes another amp. Each of the vacuum actuator solenoids take about 1/5 amp each. So the water pump plus the monovalve, plus "a few" flap closures ran the current right up near the limit. As the cabin cooled down and neared the correct temperature, the control unit tried to close "one more flap," which added even more current to the mix. That last 200 mA was the straw that broke the camel's back so to speak. The climate control unit shuts down all the outputs. Thirty seconds later, it retries -- since the car has warmed up significantly in the heat, the system goes into max cool mode which requires less flaps closed (and hence less current), everything seems to work perfectly. Again as the car cools down, it tries to close "one more flap" and cuts out again.

The moral of the story: keep an eye on the aux water pump, especially on a 10+ year old car. Years ago Richard Easley suggested wiring a 1.0 amp fuse inline with the pump. I had the kit in the glove compartment but hand't gotten around to it yet. If you live in the warmer climes, you may want to disconnect the aux water pump entirely: it's only used to circulate extra hot water through the heater core when you're idling at a stoplight.

\*\*\*\* This is expecially important to those with the non-electronic Type II climate controls W123 & pre-86 W126. In those cars, an overcurrent situation could burn the printed circuit trace in the electromechanical climate control unit. If you have a pre-1985 ACC, you'd be better off just unplugging the water pump.

That's my story.

chris pikus  
1995 E320 coupe  
1987 420SEL  
1977 240D

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