

Objective: Explain my experiences with and thinking about fan clutches and air deflectors for the radiator - why you should install air deflectors if you don't already have them. And, about fan clutches - why they engage when they shouldn't, why I think they break prematurely, why some make more noise than others, and why you don't need a noisy one.

- Steve's presentation – "Cooling System Basics"
- Steve's testing shows how the different fan clutches act when disengaged but, when engaged he could only measure up to the electric motor's speed. He couldn't see what happens at higher engine RPMs.
- We all know (?) that the more noise a fan is making, the faster it must be turning.
- The AC Delco 15-4644 is the noisiest fan clutch so, that means it turns the fan at the highest speed of all the fan clutches. Fans make less noise with the other fan clutches so that means that they are turning slower. If this all happens at the same speed and engine RPM then the lighter-duty clutches must slip more than the heavier-duty ones.
- The other piece of the puzzle is the question of why the fan clutch engages at highway (50-60 MPH and more) speeds when they shouldn't be needed.

My engine cooling story

- Fat, dumb and happy – OEM gauge and sender and no apparent problems
Previous trips the OEM gauge normally read $\frac{1}{4}$ to $\frac{1}{3}$ of the range
Preparing for trip to Calif. And it was going to be hot so I wanted better data on temps so...
- I installed the NAPA sender recommended by others who know
 - Drove the coach 1 mile and it was already near the end of the range so...
- I installed a calibrated mechanical temperature gauge
 - I calibrated it accounting for altitude and barometric pressure
 - The trip to Calif. Is across the Mojave Desert at 110 degrees.
 - Engine temps ran very high, frequently as high as 240 degrees
 - I figured this was SOP for this engine since I have owned it and OK so far
 - Planning for cross-country trip for summer so wanted to fix this problem so...
- I installed an aluminum radiator, new (fail-open) 195-degree thermostat and a Delco 15-4644 fan clutch and we left home on August 1st in 110 degree temperatures heading east through the desert with Kansas City as our first destination
- Our first problem was noise – the fan noise threatened our trip

- The new radiator, thermostat and fan clutch easily kept the engine cool but...
 - Even at highway speed the fan was on much of the time and sounding like an airplane – at 90 degrees outside air temp the fan was on 70 percent of the time (I measured), at 105 degrees outside air temp it was on virtually (off for only seconds at a time if off at all) 100 percent of the time.
 - Then engine temp went from 195 degrees when the fan finished turning and then climb to 210 degrees in about 30 seconds before the fan came on again. The noise was deafening but it was very hot out and this was apparently normal but Carol was saying she didn't know if she could take it much longer.
 - In Albuquerque I removed one of the fender liners to see if improved air flow would change anything – it didn't.
 - We drove all the way to Kansas City with that noise – it was hot all the way so no noise relief.
- In Kansas City I replaced the Delco 15-4644 with a Hayden 2797 which was much quieter than the Delco.
 - The fan was on the same amount of time as with the Delco clutch but was much quieter because it doesn't turn the fan as fast at highway speed.
- Somewhere along the way in the time it took to get this far the thermostat broke and became stuck open so only acted as a flow restrictor.
 - How do I know it was open? Because, once the weather improved and it was cool in the morning, the engine ran at 150-180 degrees or less and would only climb as the outside air temp climbed.
 - Sometimes it would stay well below 150 degrees for quite a while – 10-15 miles – and I actually worried about it. Our heater didn't work so no effect there.
- The strange but true thing was that now that I could see the actual temperature of the engine unmanaged by the thermostat, and the outside air temperature (on my mirror), I could see (hear) that the fan was turning on when it was not needed.
 - The fan would be on when I first started the engine but quickly (15-30 seconds) turned off as it is supposed to do.
 - Strangely, it would also turn on at highway speed (45-60 mph) when it was not needed. The engine would be at 150 degrees or less and the outside air would be in the low 70's and the fan would turn on.
- We were in Texas on our way to Lubbock to visit the Buddy Holly Museum there when the Hayden 2797 failed after only about 3,000 miles. Over a period of about a day or two the fan clutch stayed engaged longer and longer until it remained

- engaged continuously. The speed of the fan was probably still the same as normal because the amount of noise being generated didn't change – it was just on all the time.
- When we got to Lubbock I couldn't find an o'reilly so I could collect on the life-time warrantee and get a new one so I went to an Autozone instead. I had read that someone was using a lighter-duty clutch with success and I wanted to try it. I bought and installed an Autozone Torqflo 922747 – I don't remember how I got that number but I think they found it by cross-reference from one of the numbers in the GMCMI book (Hayden 2705 “standard duty”?).
 - The Torqflo 922747 has been in my coach since then and, if and when it fails, I'll replace it with another one. So far, as of this trip, I have used it for about 13,000 miles through lots of hot weather without any problems and barely any noise. It is really hard to tell if it is engaged or not.
 - My guess about why fan clutches fail on GMCs is because they are engaged a lot more of the time than they were intended to be and at much higher engine RPMs than is normal for cars.
- There is still the problem of the fan turning on at highway speeds – 50-60 MPH. This should not be happening. There should be enough air passing through the radiator to eliminate the need for fan. That is why there is a clutch on the fan in the first place.
 - The answer, I believe, to why the fan clutch is engaging with outside air temperature in the low 70's and the engine running at 140 degrees lies in the answer to this question: “What, in a relatively cool engine compartment, is hot enough to make the fan clutch engage?”
 - The only possible answer to that question is the exhaust manifolds or headers.
 - Somehow, the air in the engine compartment is being heated by the exhaust manifolds or headers and then getting in front of the engine and triggering the fan clutch.
 - The reason that the air is swirling around the engine compartment long enough to be heated to that temperature (the fan clutches are even engaging at lower temps these days) is that the air is not directed through the radiator and out the bottom of the engine compartment.
 - The 1973 to 1976 coaches did not have any air deflectors to force the air coming through the grill to also go through the radiator. Sometime in 1977 GMC started adding those.
 - It is possible that the flat surfaces in back of the engine compartment should be softened to facilitate air movement.
 - Air dams or spoilers were designed to cause a vacuum under race cars and help hold them onto the road. They were then added to street cars as style enhancements but probably also contributed to air movement through the

radiator. I took an idea that a fellow GMCer had (JR Wright) and modified it because I could and because I thought that a rigid spoiler would catch on the road too easily (and I am correct).

- Now that I have the air deflectors and air dam installed, I have a new radiator, replaced the thermostat, use a 'standard duty' fan clutch I have no hot weather issues.
 - The fan comes on when I slow in traffic or stop
 - The fan turns off when I get to about 40 MPH (I think)
 - The engine temperature stays steady and only climbs and falls gradually
 - My engine runs at 195 degrees until the outside air gets to about 100 and then it will run a little hotter up to about 205 unless climbing and towing
 - If climbing and towing the temperature can get to about 225 and have seen it as high as 240 up a severe hill but no overheating
 - The fan is very difficult to hear – **for both of us**

- Why I think that fan clutches break when used on GMCs.
 - They are on too much and at too high RPMs. They are not intended to turn on at highway speeds – maybe the AC Delco 15-4644 is?