

# Improved air flow thru radiator

I have done a number of things to try to keep the engine temperature within certain limits. The thermostat is a 180 degree thermostat and for the most part when the outside ambient is 75 degrees or lower AND we are less then 2000 foot elevation, the temperature will stay right at 180-185, doesn't seem to matter weather going up or down grades, or just steady flat driving.

At higher elevations, where we go most of the time, and higher outside ambient temperature, where most of our activities seem to happen, the engine temperature will climb and in some cases I have had to reduce steady state speed to keep the engine temperature below 200 degrees. It is not uncommon to see 220 degrees going up some rather steep grades, which requires down shifting to keep the engine RPM as high as possible to improve the effects of the pusher fan and reduce the workload of the engine. I monitor the EGT very closely and when I see it getting to 950-1000 degrees, I throttle back. My EGT probe is aft of the turbo so I use a reduced maximum limit to compensate for the temperature loss in the turbo, I use a 250-300 degree cushion.

Things done:

I added two fans on the side air inlets to try to encourage air into the engine compartment from a higher level which should be a bit cooler then the air directly off the road. These are controlled by a switch and switch on about 190 degrees engine temp.



I added heat wrap around the exhaust pipe from turbo exit all the way to the muffler, trying to lower the air temperature that would be sucked up from the road and going passed the pipe and turbo. I also added an aluminum barrier along the muffler so that the muffler heat would be funneled toward the back of the coach rather then up into the engine compartment.



Finally, I added two large puller fans on the back side of the radiator to improve the air flow. I had done some yarn tufting and saw that there were areas of very poor airflow coming out of the radiator and the fans were positioned to improve the air flow in these areas.



All these mods helped a lot but still when the outside ambient gets up over 85 degrees, I still have to watch the engine temperature. During my trip earlier this year to the South and Southeast showed that I still needed to do something (besides slowing down!!) to keep the engine temps a bit lower.

I had noticed when I tufted the rear of the radiator; the airflow was the highest at the bottom of the radiator door. I also noticed a good 4 inches of the radiator was below the door opening, been thinking about this for some time.



There is a piece of aluminum trim that goes from the bumper to the body to close off the area between the bumper and the body. I found that some of the pop rivets had failed and it was easy to push this trim piece down right below the radiator. I did this once while the engine was idling and debris flew up out of that area!! Lots of air was trying to escape but it had to go back to the bumper and then down---HMMMM---, could this be an area of concern during operation on the road. No real way to test or confirm, but because the trim piece was now loose because of the failed pop rivets, I thought I would redesign this area to try to improve the air out let from the radiator.

It is very clear that the bumper could have an influence on the airflow of the lower portion of the radiator. It may have an even bigger influence if there is turbulence introduced by the bumper picking up road air and throwing it back up to the radiator lower area creating a high pressure area and blocking airflow thru the radiator.



The starting point:



Here is a look at the area once the bumper has been removed:



Original trim piece



Modified trim piece



New area to allow the air to be directed upward and out into the low pressure area behind the coach



Completed mod



With bike rack installed



# Tuft test

Engine idling for all tests



It is clear that there is a lot of air flow thru the new opening. I removed the bottom grill piece as it was directing the air downward toward the newly created opening. I had to remove the enter piece when I added the puller fans because of interference with the fan motor body. What I will do to close this off is not yet decided but want to do something that will provide some protection but not add significantly to airflow restriction.

I have a trip to Nevada next week and this will be a great opportunity to see if any benefit from this work has happened. It will be hot there and I will have to make a FAST run from Virginia City NV to Wendover NV, which will be at elevations up to 6500 feet, lots of cruising on I80 so the speed test will be a good one. I have made this run many times before under similar conditions so the test should be meaningful.

Will report back in a couple of weeks after the run!







Ed  
MWrench  
06-18-2010