CONGESTION CONDITIONS

From Chrysler's service reference book "Taking the heat off the cooling system."

Of the various conditions that can affect the circulation of water in the cooling system, let's consider the thermostat first, since it is the valve which permits the water to circulate either within the engine or through the engine and the radiator.

The by-pass type thermostat has by-pass ports in it which allow the water to circulate from the block to the pump when the thermostat is closed. This internal circulation is to provide a uniform warm-up of the engine block during the warm-up period. As soon as the water reaches a temperature of from 157 to 162 degrees (approximately 160 degrees), the vapor pressure in the bellows increases and overcomes the effect of the partial vacuum within the bellows, and the valve begins to rise off its seat. Attached to the valve shzft is an apron which, of course, rises with the valve. This apron gradually closes off the by-pass ports of the thermostat so that by the time the valve is wide open, the apron has completely blocked off the ports so the water no longer goes from the head to the pump but goes directly to the radiator.

Right here is a good spot to point out that the thermostat is almost never to blame for cases of overheating. you may hear fellows say that the thermostat could be stuck closed, and that would cause overheating. Sure, it would if the thermostat STAYED closed, but as soon as something happens to affect the normal operation of the bellows, the valve will immediately open. From then on there is nothing to get in the way of the water passing to the radiator, so the thermostat won't cause the engine to overheat.

(Editors'note: This article, extracted from a Chrysler publication as indicated above, was copyrighted in 1948. It is important that you not consider it as totally applicable to the Airflow, however, the principles and diagnosis of problems do apply and with summer coming on you would be well advised to thoroughly check your cooling system very carefully. Do replace any aged hoses before they actually fail. Generally, if one hose needs replacing, they all do. Check your fan belt too. These are cheap insurance items when compared with burning up an engine or being stranded 40 miles from nowhere)

If the thermostat should fail so that it stuck open, you'd find the warm-up period would be much longer than normal because the water would start circulating through the radiato immediately.

And don't let anyone tell you that the thermostat should be removed during the summer months. Actually, if you take the thermostat out, some of the water will be constantly circulating through the by-pass opening in the cylinder outlet fitting and back through the block-so the engine will actually run hotter than it would if the thermostat is left in.

If you have a thermostat out for any reason, it's a good idea to test it to be sure it is opening when it should, and that it is wide open at about 180 degrees. When wide open, the valve should be about 5/16 inch off its seat. To test the thermostat, suspend it in a pan od water, and heat the water. Place a thermometer in the water so you can tell the temperature at which the valve starts to open, and the temperature at which it is wide open. And another thing- when you put the thermostat back in the elbow, be sure the rubber gasket is in place between the shoulder of the thermostat and the flange in the elbow. If it isn't, some of the water will leak past the thermostat to the radiator all the time, and the warm-up period will be much longer than it should.

By far the most common cause of engine overheating is a clogged system. This can be caused by rust forming in the cylinder block, or scale can form because of the presence of minerals in the water used. Any foreign material which may get into the system is pumped into the radiator, and soon the narrow water passages in the core becp,e plugged so the water can't circulate through them and be properly cooled.

You can tell whether the core is plugged or not without removing the radiator. Just disconnect the top and bottom hoses and plug up the radiator inlet and cutlet fittings. Fill the radiator with water and leave the filler cap off. Then pull the plug out of the bottom fitting--if the water spouts out in a column five or six inches high you will know that the core isn't plugged; but, if the column of water is only an inch or so high you can be sure the core IS plugged. Then you'll have to clean it out.

Dear Jim and Paula,

Can anyone help me with a problem concerning my C-9 Airflow? Will my Airflow run cooler with or without a thermostat? At present I have a low temperature thermostat installed and find that it runs hot. Will it run cooler if I remove the thermostat and plug the radiator bypass? I will be anxious to hear from anyone that has experienced this problem.

Airflowingly yours,

Glenn Snagel
Evanston, IL

Your editor had a similar problem with our S-2 DeSoto some years ago. There are we understand, a number of things that will cause our cars to run hot. Among them are excessive spark retard and a rusted out water distribution tube. The first is easy to remedy while the second can be a real tough job. I eventually did replace my water distribution tube when I rebuilt the engine. But what we did first that cured the problem was to have the radiator boiled out.

The thermostat in the Airflows is a two way valve which both closes the bypass and opens the passage to the radiator at the same time. This forces all the water through the radiator when the thermostat is open. If it is simply removed part of the water will go through the bypass which would make the engine run hotter, rather than cooler. Also this would make it slow in warming up and run too cool in cold weather. The Service Standards in my Maintenance Manual says that hte thermostat should begin to open at 155 degrees and be fully open by 175 degrees F. Motor's Auto Repair Manual shows the Chryslers to use the same temperature range.

Airflow

Basics

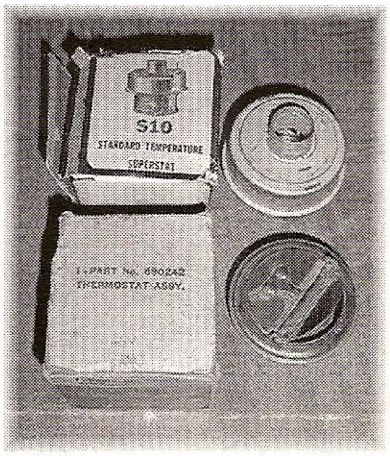
by John Heimerl, Club Historian

Basically, it's the Airflow that makes the difference! (Or, is that the Waterflow?)

Now, what did I say about using the C-2 as a guinea pig of sorts? Now it's too cool in Virginia to be sure, so maybe we'll call this the annual article on overheating, and do it again next summer! In any event, enough info has been gathered to start on it.

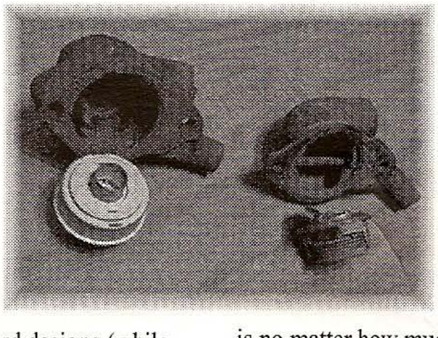
For a variety of reasons, Airflow eights seem to be increasingly prone to overheating. DeSotos are somewhat immune, two less cylinders, lighter car, etc. being some of the reasons. Things that will be discussed include bypass blockage, thermostat removal, radiator re-coring, antifreeze percentage, pressurized systems, block flushing and water pump impellers, placement of the vanes in the block, and pulley size.

These and other concepts are being tried by various Airflowers who have found their straight 8's running 190 and over (and for some, I mean boiling over!). Funny, those six cylinder engines seem to be much less prone to run hot. Another reason to own a CY or a DeSoto. And another thing, we can't find too many stories of these engines running hot way back then, compared to now…..Hmmmmm. Global warming?



There are some basic flaws in the Airflow cooling system: reduced cooling holes near the rear of the block and the cylinder head, a partial cooling jacket on the distributor side of the block, pockets at the base of the jacket which trap scale, limited flow in the sides of the radiator which eventually sediments the cores at the edge, and thermostat housing design including overly-large bypass. This is the risk of a newly designed vehicle. The engineers at Chrysler, along with Bishop & Babcock of Cleveland, who supplied the thermostats, tinkered with the design for three out of four years of production. That should tell you something!

Just to get you thinking, I've included pictures of two of the three types of Chrysler Airflow thermostat housing designs. Note that the earlier one (1934) uses a thinner casting and a thermostat with a bent gate valve. There is a division in the housing that accommodates the bent valve. It covers a full third of the passageway! When the thermostat is cold, it shunts coolant back to the water pump through the bypass and back into the engine; warm, the bypass is supposedly blocked as the thermostat opens. This was intended to keep coolant circulating when the engine is cold, to avoid hot spots and speed warm-up by bringing the coolant from the block across the thermostat bellows.



The newer thermostat and housing (1935) takes a bit better approach by centralizing the by-pass valve in the middle of the housing and the thermostat. The third design (1936/37) is similar to the second but has a larger hole for better by-pass circulation. But the first design blocks a great deal of flow to the radiator, and the second and third designs (while improved), are still restrictive. Bad Airflow! And if you use a modern thermostat without the special bypass blocker, the bypass is always open and recycling hot water back into the engine. Bad Airflow Mechanic! No cool running engine!

OK, I'll get serious. Look for the later housing(s), which uses the centralized scheme with the bypass in the center of the thermostat. Block or reduce the bypass using a non-rust-able device such as a nickel in the pump connector hose.

You may want to drill a small hole up to a quarter inch in it so air won't be trapped in the passage and there will be some flow. Get a modern 160° thermostat, same diameter. Drill a couple of 1/4" holes in it to allow some flow even when closed. You have made your own bypass; it just runs through the radiator. Pop it in the housing (bellows to engine) and seal it up. Your engine will still circulate some during warm-up (and your warm-up will be slower), but you will now have less restriction in the housing when the engine is hot, and a head start on overheating (credit here goes to the late David Askey, among others). This is preferable to simply removing the thermostat, which also leaves the bypass to pull hot water back into the engine unless you block it. As more experienced mechanics will tell you, the thermostat does serve more purpose than just warming up the engine; its most important duty in modern engines is to modulate the flow of water through the radiator so it is neither too fast nor too slow. Too fast, there is no time to cool in the radiator. Too slow, not enough cool water gets back into the engine.

Which brings us to the next topic, radiator design flaws, or slow flow due to plugged radiators, a common Airflow malady. The top inlet takes the water provided at the thermostat-housing outlet, and dumps it into the upper tank, where it (supposedly) distributes across the tubes and goes down to the bottom tank. The top of the Airflow tanks tends to dump water down the middle. Why? There is an internal deflector (at least on '35 radiators) that tosses the water sideways, but the pump does not have enough throw to get all the way to the other side before suction pulls the water down. Result: slower flow on each side equals eventual clogging of the side tubes. Take an infrared thermometer and point it at your Airflow radiator. The center will be hot, the sides cooler or even way cool, which means way badly plugged side cores. Add to this the fact that the fan only really covers the bottom 2/3rds of the radiator, and it's another way to get hot! Solutions: Check radiator for plugged cores, rod or replace (**Ray Jackson** and **Rex Barrett** can point you to one shop experienced in making new cores), and verify that the deflector is still in place. I had one radiator with the deflector broken loose covering a bunch of core tubes.

While 50/50 coolant is preferred, and gives the best antifreeze heat transfer ratio, it does not have the best heat transfer coefficient. Plain water does. If your climate allows, add only rust inhibitor to plain water and enjoy a few more degrees of headroom. And if you require antifreeze, get 50/50 premix. In these old cars it is too easy to calculate the mix wrong due to reduced radiator capacity or scale in the water jacket. OK, you can keep pouring coolant out and water into the containers, but depending on your local water source, who knows the deposits you are adding…. I have had quite a few folks say they are not having good luck with extended life coolants. I've been running the heavy-duty pre-mix I get from my Cummins diesel dealer, and so far, no problems with rust or clogging.

Another design flaw is the water pump. Over the years, many Airflowers have been experimenting with and rebuilding them, such as **Harold Irwin** and his family. Some ideas include replacing the two blade impeller with six blades (Chrysler went to six by the late 40s and **Ray Seiler** has cast some Airflow versions of these), adding a "sealing plate" to the impeller (a recent project for **Bill Butler**), and changing pulley sizes, something else Bill is looking into. I have tried the multiple blade impellers in the past, and while the car ran no warmer, it ran no cooler either. But that was before I knew what I know now, and that is no matter how much you improve that pump capacity, if the basic cooling path is not right, the extra capacity will be mostly lost in the restrictions, which add up as you examine the cooling loop. And Bill's discovery about the "seal" of the pump impeller in the block is important. The way the block is cast, the pump impeller should go in just deep enough to match the circle you see in the casting when you look into the block. Too far in, and coolant can blow by the impeller and remix in the block. Too far out, and the pump spins in the cavity, but can't build pressure. Bill and I measured the depth of seven pumps and they were **ALL** different! Some by a lot, some a little, but about half would not line up with the block enough to make a "sealed" cavity. Needless to say, Bill came up with a scheme to fix that by mounting a plate to the back of the impeller with brass screws and sizing the thickness of the pump gasket just right, which positions the thicker impeller to perfectly fill the round hole in the block casting. We are both waiting for warm weather to try this out. And to also try using a DeSoto (smaller) pulley to speed the pump up.

The infamous radiator "half-shroud" is another minor cooling improvement. It is used on Chryslers from '35-'37, but not on '34s, and DeSotos had a flat bottom plate in '35 (and '36, I believe, again, nothing in '34). That's how they came about; in 1934, service people came dangerously close to injury when running the cars on a lift, due to the fan rotating on the crankshaft. The old story goes that at the Detroit meet in 1965, **Carl Breer** saw the shroud on a nice original car, and noted that they discovered by accident that the shroud, intended as a safety device, actually improved cooling by several degrees. It's missing on many cars since it is such a pain to install; I have reproduced a few, but they are all gone now and my sheet metal shop does not want to do any more, something about it being too "time-consuming." I do have the drawings, and maybe **Gary Hoover** will build a few if there is demand. It won't drop your coolant temperature by 10°, but maybe more like five.

When servicing your radiator, pop the side freeze-plugs out and dig down in the jacket to see how deep the deposits are. If significant, pressure-flush it with the freeze plugs out; you'll be amazed at how much bad stuff can accumulate in a 60-year-old engine. Once the new freeze plugs are in, you may be better set to run a pressurized cooling system.

Yes, you have to change the radiator top flange to run pressure, but you won't boil anymore and you won't blow your radiator seams. But you will lose a few points on judging if there is a pressure cap.

Finally, in an overheat situation remember the all-important phrases:

- Never open a hot cap!
- Never put cold water in a hot radiator!
- Check your levels frequently.
- Open the heater valve if it isn't already.
- Keep the engine running at about 1400 rpm until it slowly cools off; it's easier on the castings. *Don't do this if you suspect your water level is too low; bite the bullet and shut down.*

So these are a few (by no means all) of the ways to preserve your old Airflow engine and yourself. I hope your car will run cooler, maybe even much cooler. They add up, a few degrees here, a few degrees there. If overheating persists, also check the timing, as these engines can run on a wide range of settings, and with the low compression and long stroke, they do it pretty well. If your timing is too retarded, there's another five degrees or so to gain.

Till next time, when we try to give brakes a boost!

JH