Jaguar V12 cooling system maintenance explained.

This is written in response to many claims of V12, mainly XJS, running hot.

BUT, if you are relying on the dash gauge, SORRY, you will get better results at the horse races. However, as a “guide” it is OK, and should be taken as such. It can be made more reliable, extra earth wire to the cluster, cleaning the PCB contact points, (many of them), actual sender unit may be the WRONG one.

I suggest that if the cooling system is an unknown to YOU, then treat it as a disaster zone, and read on.

An Infra Red thermo gun “may” help with very basic diagnosis, but at the end of the day, the V12 cooling system needs attention, so man up, and do it. The cost of a HE overheat is simply not worth it.

A couple of things first and foremost:

This is what I did to all my V12 cars a very long time ago, before Forums etc etc.

This is written PRIMARILY for the 5.3Ltr V12 HE cars. The preHE is similar, but with slight differences, which are easily identified by any competent DIY enthusiast.

The FACTORY system is just fine, and will keep this beast cool, BUT, it suffers from maintenance, or lack of, and that is NOT Jaguar’s fault people.

I am NOT a fan of bonnet vents, alloy radiators (they were not around when I did this), BUT, Efans were, and all mine got them. The Aussie Ford fanpack basically slides straight in, as if made for the car.

Some sections covered later will refer to specific separate write ups on that subject, and those write ups will be at the end of this paper.

The beginning:

If the history of the cooling system is unknown, or doubtful, to you, DO NOT mess around, do it all, and repeat in 15 years or so.

You are smart enough to skip things you know are CORRECT for your car, and need no attention.

1) Radiator out. Professionally cleaned inside and outside, or simply recore it. The latter is what I do, no exceptions.
2) Metal tank INSIDE the engine bay is removed, 3 nuts from the wheel side, and thoroughly cleaned of the mud etc inside it. This tank does NOT drain when the system is drained, UNLESS you have a PreHE car, so Pre 1982ish.
3) Atmospheric plastic tank. Based on my 1085 cars, it is in the aperture aft of the LHF wheel, and the closing panel needs to be removed (5 screws from memory), and equally cleaned of more mud etc. When refitting this tank PRE FILL it about ½ way with coolant.
4) The hose that travels between these 2 tanks needs to replaced with a clear, reinforced, hose, the reason will be cleared up later. The end that dangles in the atmospheric tank needs to cut at about a 45 degree angle, no need to measure the angle, just as long as the end is not square cut, AND touches the bottom of said tank.

5) All the belts need replacing.
6) Water pump should be replaced, and while its off, flush the block as best you can with the garden hose.
7) ALL, and I mean ALL the coolant hoses need replacing including NEW clamps.
8) Replace the heater tap.
9) Flush the heater core, remember the “normal” coolant flow here is Bottom to Top.
10) Blow out the A/C condensor and the engine oil cooler below it. Blow from the engine side, TO the front of the car. All sorts of surprises will blow out of those suckers.
11) The small steel cross pipe that is on top of the radiator support panel needs to internally clean, and the banjo bolt needs to be clean also. There is a modification to that Banjo bolt that “should” be done. That is to elongate the cross drilled holes 2mm TOWARDS the threads. This will allow considerably better air purging of the whole system.
11A) On the top of each cylinder head is a water tube. It runs between the front and rear water manifold housings. These tubes have “top hat” seals at each end, and should be replaced. The tubes themselves are crappy, and new tubes are cheap, so I always fit new tubes. One end housing needs to be removed to do this, so take care, and remember new gaskets for those housings.
12) New radiator caps.
13) Fan hub/clutch needs to be checked, and is possibly very lazy with age. New ones are available, BUT, recent reports claim they are slightly different where the fan attaches. All my V12’s run Ford Efans, and that has been so since I first purchased the cars, and the reason is clear in #14.
14) The plastic fan. If its a Yellowish colour, it is TOAST, and will have serious cracks at the hub. Black is the latest and greatest, BUT, again, claims are that they do not sit on the original clutch correctly, and it is to do with the “dish” of the fan metal section. That is the reason mine all got Efans back in the mid 1990’s.
15) Radiator rubber mount bushes, there are 2 on top and 2 on the bottom, they are the same part #, and should be replaced.

16) The small rubber bush style mounts for the A/C condensor, 4 in total should be replaced.
17) Thermostats, you have 2, one on A bank, one on B bank. They need replacing, and there is a separate write up on this, as the wrong stats are often supplied, so please pay attention. It is to do with the “open length” of the stats. The wrong length, and you will never cool the beast, no matter how many fans etc you install.
18) When reinstalling the hoses and clamps, look at the orientation of the clamps, and think about YOUR access to that clamp once ALL the stuff is refitted, so take care, and orientate the clamps so that you can get at them in a few hours time and tighten them ALL that extra ½ turn that they WILL require.
19) The lower chin spoiler MUST be installed and fitted correctly.

Refilling the system:

This is simple enough, but some time spent “thinking” will reap rewards later.

1) Raise the LH corner of the car about 6”, it helps some cars to burp the air. Mine are OK flat on the ground.
2) Remove both radiator caps, and the bleed plug from the LH top of the radiator.
3) Remove the small vac hose from the heater tap, just because, OK.
4) Fill the system via the filler spout adjacent to the A/C compressor, and SLOWLY. Listen as the air GURGLES out, and when it’s silent, add some more coolant SLOWLY. Fill it too fast, and trapped air will never get burped, so you will need to drain it again, and start over.
The coolant will flow out of the metal tank spout first, so cap it, then continue filling SLOWLY until it runs freely from the radiator bleed hole, then plug that. Continue SLOWLY until the filler spout is full and cap that, You are DONE.

The reason I suggest the clear hose from the metal tank to the plastic tank is simple. When the thing is cool, after running, and you wish to check the coolant level, lifting the caps allows air IN, so you need to bleed it again, BUT, with that clear hose, simply look at the hose, and if there is Green Coolant in that hose, the system is full.

Now start it, and allow it to run, look for leaks, and so forth. Once up to temp, shut it down and allow it to cool.

Once cool, refit the heater tap vac hose, and look at that clear hose. It should contain coolant, meaning all is well with the world. If that clear hose is clear, then you have a leak, either coolant OUT, or AIR in, when it cools, and needs to be investigated, and fixed.

Go around ALL those clamps that you orientated “just right” and nip them up as needed, and do this again after a few hours of use, AND the engine is cold.

After ALL this work to ALL mine, including the PreHE, and with 82C stats fitted, the temp gauge sits just shy of the bottom of the “N”, and never rises above the “N” in any condition. Since mine all have Efans, the LH fan is A/C controlled, and the RH is thermo controlled via the factory 85c switch in the water pump inlet elbow. With the A/C ON, the LH fan is running, and under those conditions, the thermo (RH) fan NEVER comes on. The system is that efficient, fact.

V12 thermostat fiasco explained

This is my findings, AND the solution to temperature gauge “floating syndrome”, that many people are frustrated by.

Remove both your thermostats.

Note the by-pass disc on the bottom, THIS IS THE MOST IMPORTANT PART OF THE THERMOSTAT.

Look up inside the housing you just removed the thermostat from, and note the ‘spigot hole” that is facing you. This is the by-pass port, and its face is prone to pitting. I have never seen a pitted one, but check it anyway.

Now comes the fun bit.

Measure the distance from the mounting face to that spigot face. It will be approx 41mm.

Test your thermostats, boil them, use a heat gun, whatever, you are going to replace them anyway, but do this just to humour yourself. My old units, Jaguar brand, only opened 39mm, YOU SURE, hell yes. Did it too many times, 39mm flat out. Now this is 2 mm at least too short to close that by-pass port 100%, and that port needs to be closed 100% for the cooling system to work anywhere near correctly.

Just to clarify what a thermostat does, I know, you know all this stuff, but just humour me for a few lines, PLEASE.

The thermostat has an opening temp, and a fully open temp, now anywhere in between these 2 temps is where the thermostat is constantly operating, it is constantly opening and closing, it is never satisfied, so in real terms, IT WORKS BLOODY HARD, and it wears out.

Just to clear up another “story” that persists out in mechanic land, the opening temp of a thermostat is in fact its “crack temperature”, meaning that is the temp at which the thermostat actually STARTS to open, hence the terminology known as the “crack temp”, and the thermostat is “fully open” 12degC above that. So, an 82c stat will

crack open at 82c, and be fully open at 94c, follow, good, it is simple. Now if your cooling system does not do as it should, the engine temp can get above 94c, which causes the stat to “fully open” and stay there, IT HAS NOW LOST CONTROL OF THE COOLING SYSTEM, and overheating is just up the road.

Further to that, the radiator is expected to lower the temp of the fluid by approx 12-15c, so the bottom hose temp is about 80c +/-, and that is why the temp switch on the HE in the bottom hose housing is set at 85c, and brings on the auxiliary fan to assist cooling the beast down. Bottom hose sensing is much more accurate than top hose sensing.

The thermostat/s are constantly opening and closing to keep the cooling system at a happy medium, which is usually around 90c +/-, and does a good job at it, BUT, yes there is a BUT, that by-pass port MUST be closed, or else about 30% of the coolant NEVER sees the radiator, do the maths, simple as.

I purchased 2 new Jaguar units, same thing, too short. I was employed as the Spare parts manager for a Jaguar dealer at the time, and raised this with Jaguar Australia. No idea was the response, maybe there is something wrong with your car, politician in the making hahaha. NO, this is the case with 5 cars I have at my disposal, so I reckon Jaguar have messed up somewhere.

I never got an answer, gave up, retired from the dealer.

I searched on my o, and found a Tridon cooling system catalogue, very informative, and found in their listings a 54mm diameter thermostat, which was 35mm “closed”, and 43mm “open”, perfect.

This is a Tridon No is TT228-180, Dayco No is DT18A, and fits Ford cars down here and some others. I have used this thermostat now in some 12 odd V12’s, both Pre HE, and HE, and the cooling system is so well behaved it is downright scary, and I mean that seriously.

NOTATION 31/8/2015: The Dayco website NOW lists this DT18A as the correct thermostat for the V12 engines. Maybe my emails finally got read, who knows.

I replace all my Jaguar thermostats every 3-5 years, coz as I said, they do work hard, they are cheap, and engines are NOT.

I have attached 4 pages from the Tridon paper I studied back then in my search for the correct unit, which explain the operation of the cooling system, and thermostat operation very simply. This is a general system overview, and is NOT V12 specific, but the principles are the same no matter what badge is on the car.

Using the Correct Thermostat

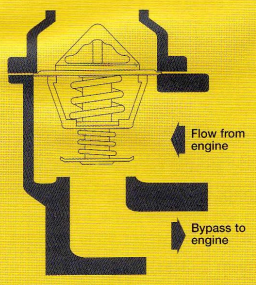

Figure 1 – Bypass Thermostat in correct position. On start up cold position restricts flow to radiator

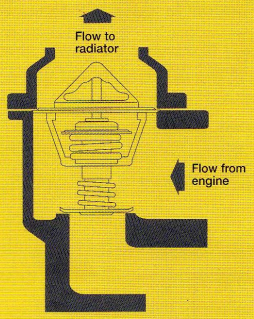

Figure 2 – Bypass Thermostat in correct position at normal operating temperature allows flow to radiator

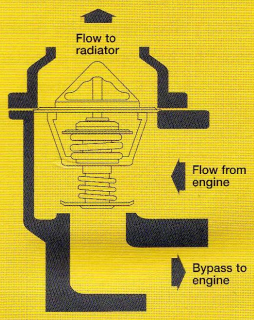

Figure 3 – Wrong Bypass Thermostat used engine runs hotter

Use the Correct Thermostat

For today's engines to operate at maximum efficiency in terms of performance, fuel economy and emission levels it is important for the engine to get to the correct operating temperature as soon as possible and ensure that temperature is maintained during all operating conditions.

In order to do this manufacturers have redesigned their engines to utilise what is called a reverse poppet or bypass style thermostat. This style of thermostat has two valves instead of the one valve that is seen on a non-bypass thermostat. The primary valve operates exactly the same as the non-bypass thermostat and opens allowing coolant to flow to the radiator when the engine is at normal operating temperature. The secondary valve allows coolant to be circulated back through the engine during its warmup stage. The temperature of the engine is able to rise more evenly, minimising hot and cold spots in the engine. The primary valve begins to open and the secondary valve closes when the engine temperature rises. All coolant is then directed through the primary valve to the radiator ensuring that the correct operating temperature is maintained.

A vehicle fitted with a bypass style thermostat must always have the correct bypass thermostat fitted. Vehicles fitted with non-bypass thermostats must always be fitted with the correct non-bypass thermostat. The fitting of an incorrect thermostat will cause the engine to run differently to how it was designed. Overheating and subsequent engine damage can be caused by using an incorrect thermostat.

Correct Bypass Thermostat in the Correct Application

Figure (1) shows the installation of the correct bypass style thermostat. When the engine is cold the primary valve is closed preventing the flow of coolant to the radiator. The secondary valve is open and directs the flow of coolant back through the engine allowing it to warm up faster. As the engine warms up the primary valve begins to open and the secondary valve begins to close. Figure (2) shows the secondary valve completely closed when the engine is up to proper operating temperature. The primary valve is then also completely open allowing full flow of coolant from the engine to the radiator.

Tridon page 2

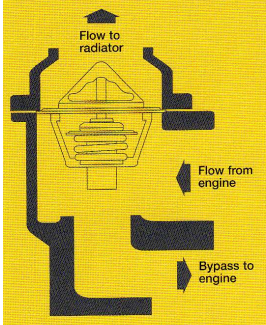

Figure 4 – Wrong Thermostat used in an engine requiring a Bypass Thermostat, Engine runs hotter

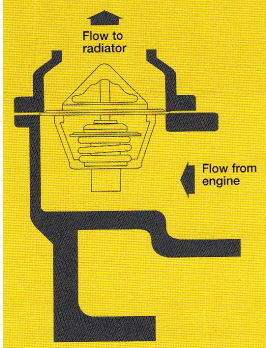

Figure 5 – Correct application for non Bypass Thermostat

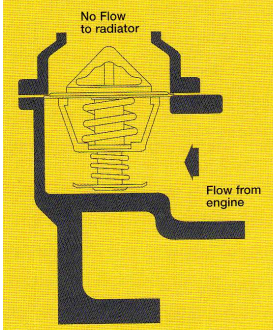

Figure 6 – Wrong application for Bypass Thermostat

Incorrect Bypass Thermostat in the Correct Application

Figure (3) shows the use of an incorrect bypass thermostat in a bypass application. If the secondary valve is incorrect it may not close completely and coolant continues to flow through the bypass port even though the primary valve is fully open. This will cause hot coolant to return to the engine before it has been cooled. The engine temperature will be hotter than required and may cause premature failure of other components in the cooling system.

Non-Bypass Thermostat in a Bypass Application

In this situation there is no secondary valve that will block off the bypass port when the engine warms up (Figure 4). This will cause hot coolant to continue to circulate through the engine without going to the radiator. The engine will run hotter than required and may cause a failure of other components in the cooling system.

Correct Non-Bypass Thermostat in the Correct Application

In engines with no bypass port a non-bypass thermostat must be used (Figure 5). No coolant flows until the thermostat opens. An incorrect non-bypass thermostat used in these applications will normally not physically fit or will be loose in the housing. Correct opening temperatures must also be used.

Bypass Thermostat in a Non-Bypass Thermostat Application

This is the worst possible combination as the secondary valve of the thermostat will hit the bottom of the housing (Figure 6) and prevent the thermostat from opening, as no coolant whatsoever will circulate and the engine will overheat and boil. Major engine damage may be caused as a result of this situation.

Selecting the Correct Thermostat

The best way to ensure that no problem occurs when fitting a new thermostat is to make sure that it is the same style as the one being replaced. The following should always be checked prior to installing a new thermostat.

- Thermostat style (Non-bypass or Bypass).
- Thermostat dimensions.
- Correct operating temperature.

All thermostats in this catalogue are correct for the vehicle applications listed in relation to operating temperature, thermostat style and dimensions. Please use the vehicle application guide in this catalogue to determine the correct thermostat for your vehicle.