With a little help from a colleague, **Ian Blakeman** *analysed some often-expressed shortcomings in the standard cooling system for a K-series engined Seven... and came up with some straightforward and cost-effective revisions.*

Modifying the K-series coolant circuit

The problem:

Recently, *BlatChat* regulars may have seen a *TechTalk* thread asking for installation details of a remote engine coolant thermostat kit such as the one supplied by QED to fix what was referred to in the thread as "the age old stat-in-the-wrong-place issue".

Working in vehicle design and development, as I do for the day job, I can find that a minor detail on an otherwise sound system can cause a disproportionate amount of hassle. Sometimes, however, this can easily be rectified. I urged the original poster of the thread (*My other car's a 2CV*) to think of it more as a case of poor attention to detail in the design of the cooling circuit, but that it works OK once it's bled through. Remember, all the thermostat does is modulate the coolant flow through the radiator. Provided there is adequate, and appropriately responsive, control of the temperature, it is irrelevant whether it is located in the flow or the return.

I received a number of requests for more information by *BlatMail*, so here it is as an open ramble to the readers of *Lowflying*!

The research:

To provide a bit more background, a work colleague who specialises in vehicle cooling system design let it slip a couple of years ago that in a former life he had worked for MG Rover in product development. Not only that but he also admitted that he knew the K-series engine cooling system quite well. Very well. In fact, it transpired that he was directly involved in the development and testing of a K-series cooling system for installation on the MG TF.

As you might imagine, once I found out about this history I wasn't shy in asking him to have a look at the Caterham coolant circuit and seek his opinion as to any changes which could be made to improve performance and reliability; for example, remote thermostats, or PRRT (Pressure Relief Remote Thermostat) which regularly appear as topics of discussion on the *TechTalk* forum.

I sketched out the Caterham circuit for a quick design review and my colleague commented that it was basically a copy of the original Metro circuit–which, in his previous experience, was difficult to fill in a production environment due to airlocking (sounds familiar?). It also had other issues once filled, such as inconsistent pressurisation of the header

Rover K-series cooling circuit for Caterham installation

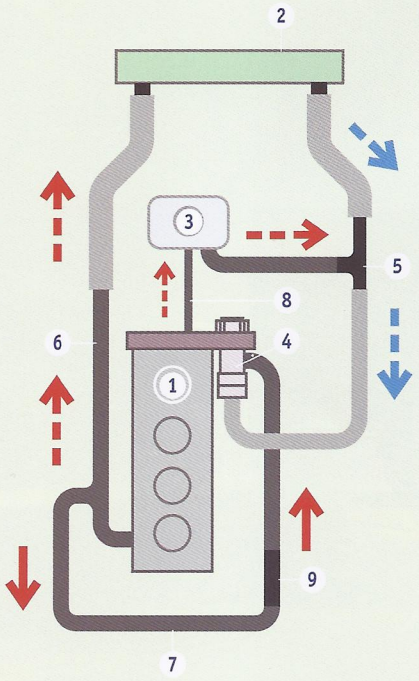
1. Rover K-series engine
2. Engine coolant radiator
3. Coolant expansion bottle
4. Thermostat housing
5. 'Submarine' pipe
6. Coolant rail
7. Coolant bypass (*optional cockpit heater is fitted into this line – not shown*)
8. 1/4" hose to inlet manifold
9. Inline hose joint
10. Tee joint

Hot coolant flow, continuous

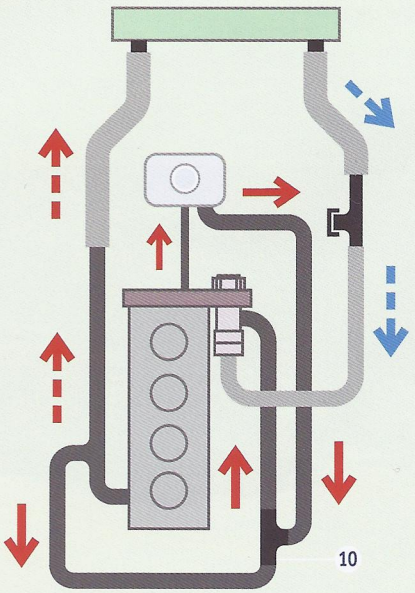
Hot coolant flow, thermostat modulated

Cold coolant flow, thermostat modulated

original layout



revised layout



tank and varying pressure at the water pump inlet. His view was that the remote thermostat or PRRT was not worth the hassle and expense. What he proposed was a simple modification to greatly improve the existing system; not necessarily the best possible, no-expense-spared solution but more of a 'best improvement for least change and lowest cost if you are starting from here' philosophy.

What the changes sought to achieve:

The revised circuit allows an additional, restricted bypass flow from the head, via the expansion bottle to the bypass side of the thermostat housing under all conditions (instead of into the modulated flow of the bottom hose, which is blocked when the thermostat is closed), thus maintaining responsive thermostat operation and a more consistent pressure at the water pump inlet.

The big bonus is that on first filling the system through the expansion bottle, the coolant can flow directly through the open side of the thermostat and provide reliable priming of the water pump and filling of the block from the bottom upwards due to the head of fluid in the expansion bottle. This means that you can just fill the expansion bottle until the level doesn't drop any more. At this point you can vent air from any bleed points on the radiator etc. if fitted), then start the engine, run at idle with the expansion tank pressure cap removed and add coolant until the level doesn't drop any more and the engine reaches operating temperature. Painless!

And so to the nitty gritty – how did I modify my car?

I left the expansion bottle where it was under the nosecone (my car has the later style, spherical tank and a dedicated bracket which bolts to the chassis). The ½″ hose to the throttle bodies (or inlet manifold on a plenum-equipped engine) remains unchanged.

I removed the moulded hose which goes from the base of the expansion bottle to the stub on the steel 'submarine' pipe by the steering rack. I plugged the stub on the submarine pipe with a ⅝″ turned plug into a short length of ⅝″ heater hose. (Maybe one day I'll get around to finishing the job properly and just fit a plain pipe with beaded ends.)

I used a new length of ⅝″ heater hose to connect the base of the tank to a T-piece which I fitted to the end of the shaped hose which runs from the thermostat housing to a connector at the back of the engine block (which connects to the heater if you have one).

The T-piece replaces the existing inline connector. The new hose runs under the throttle bodies and is secured to the bypass hose with cable ties to keep it neat.

I made the connection here as the moulded silicone hose on my car tapers in profile along its entire length. Ideally, this connection should be as close as possible to the thermostat housing (at the water pump inlet), but in practice it works just fine connected at the normal location of the joint (diagram item 10). The joint is lower than the base of the header tank in order to achieve reliable filling of the coolant.

I have made no recommendations of where to source these materials from as I had already had them lying in the garage. If you have been sufficiently interested to read this far without going to sleep, and feel the need to make this modification, I'm sure that you will find something suitable at the local motor factor or the usual specialist mail order suppliers without too much trouble.