Keeping things cool(er)

At a Play Day at Pukekohe earlier this year I noticed the oil and water temperatures were getting a bit high. Ambient air temperatures around 30°C probably didn't help but the front of the TG is a lot narrower than the MX5 meaning that there is not the same radiator surface area as in an MX. I also have a 19 row oil cooler mounted in front of the radiator which probably doesn't help either.

Another problem is the way Mazda have designed the cooling system for the MX5. The heads actually have a coolant port at the front and the back. In the front wheel drive configuration, the cool water is pumped from the bottom of the radiator into the front of the block and hot water is pumped out through the thermostat at the rear of the head. On the MX5, the water is still pumped in at the front, but the hot water exits the head at the front. The only flow at the rear is what flows through the heater core. This means that the water at the rear of the head is not getting the same level of cool water as the front. And on the BP, that is where both the temperature sensors are.

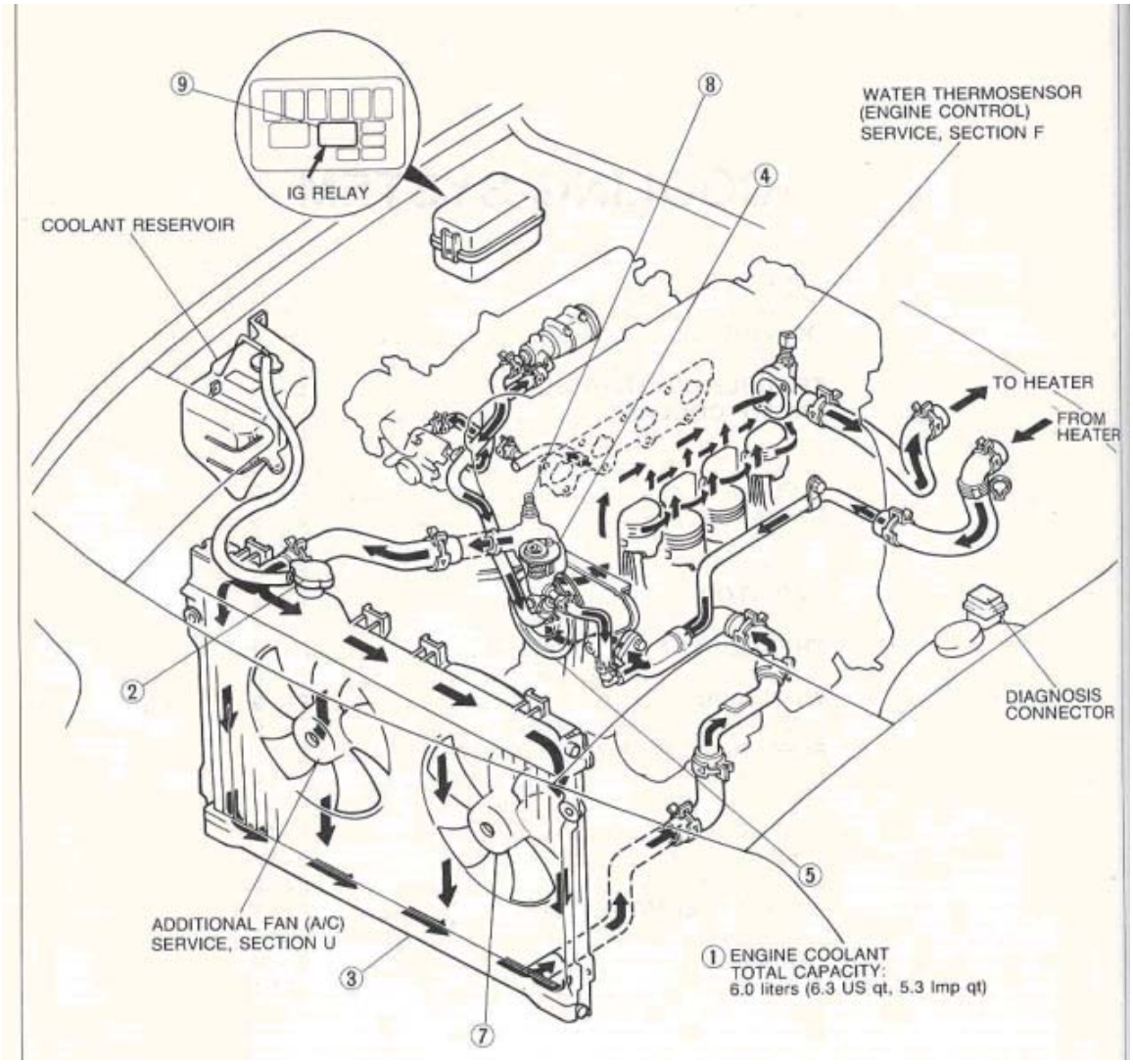

Figure 1 – BP MX5 Coolant routing

One of the mods I had looked at on Miata.net and also on MiataTurbo.net was the coolant reroute. This is quite popular with the forced induction brigade to help keep water temps down. What the reroute involves is shifting the water outlet and thermostat to the rear of the head. Although my engine is normally aspirated, I am running 11:1 pistons and revving it quite high.

This modification involves acquiring a few bits and pieces to complete. There are a few ways to do this and the following is how I did it. I ran the return pipe on the hot side of the engine but it is also possible to run it down the cold side under the intake. This is probably a better arrangement for a MX5 as the top radiator inlet is on that side of the car. Please note that this is based on a 1800 BP engine. Most of the description applies to the 1600 B6 as well however there are a few differences. I have not gone into detail on procedures that are covered in a service manual. I would recommend you have one available to ensure that you get torque settings and cam timing reset correctly.

Ingredients
(these are the bits I used)

1 x 1.6l NA MX thermostat cover (if you are doing this on a 1600 you already have this. If your engine is a BP then you need to get one.
1 x Moss Motors thermostat spacer (051-046) (more details later)
1 x hose barb for the heater hose (3/4" tube, 3/8" BSPT)
1 x 30mm frost plug
1 x M8 x 50 bolt, (preferably a flange bolt)
1 x M8 x 60 stud
1. M16x1.5 grub screw or bolt
Approx 600mm of 32mm/1 ¼" aluminium pipe.
2 new thermostat gaskets
1 new thermostat (recommended)
New hose clamps (you will probably need at least 2 extras)

The hoses needed will depend on which route you take and the angles to couple into the rear flange and the radiator.

After draining the radiator and removing the top hose, you have to remove the cam cover and front cambelt covers to access the bolts that hold the thermostat neck to the head. This involves removing the cam pulleys as well so make sure that you know how to refit them without stuffing up the cam timing. Remove the thermostat neck and plug the hole in the head with the frost plug. I sealed this in with an RTV gasket maker just to minimize the risk of leaks. All the front bits can now go back as we have almost finished this part.

Figure 2 – Thermostat neck removed with new frost plug in place

Now that the thermostat neck has gone, there is nowhere for the 2 small hoses that previously connected onto the double hose barb under the thermostat. I trimmed these 2 hoses and joined them with a short length of 3/8" stainless steel pipe. The picture below shows the joined hose. Although it looks close to the belt there is good clearance. Cam cover and pulley cover are off an old Astina but it really tidies things up at the front.

Figure 3 – Join in throttle body coolant feed

At this point, it is a good idea to remove the coils and the cam sensor from the back of the head to give you room to work back there.

Next, remove the computer temperature sensor from the heater outlet at the rear of the head. Then remove the heater outlet and clean any residual gasket from the head. The stud protruding from the head should be removed as well. This will be replaced by the new 60mm stud. The easiest way to remove the stud is to screw on 2 nuts and tighten them against each other. Then, providing the 2 nuts are tight, hang a spanner on one of the nuts (better on the inner one) and unscrew the stud.

On the BP, next to the hole in the head there is a hex bolt (17mm head) screwed into the head. Remove this bolt and replace it with the computer temperature sensor. Make sure that you have the aluminium washer on the sensor before you screw it in..

To allow connection for the heater hose on the correct side of the thermostat I purchased a spacer block from Moss Motors. This is a block of aluminium shaped like the thermostat housing. The downside of this block is that Moss have not bothered to machine a rebate into it for the thermostat. You also have to drill and tap it for the hose barb for the heater hose and, if you have a B6, for the temperature sensor. If you are fitting the B6 sensor in the spacer, make sure that the sensor does not foul on the thermostat when it is all bolted together.

Figure 4 – Spacer block with thermostat rebate and 3/8 BSP thread

This spacer block is about 26mm thick which is why you need a new longer M8 bolt and stud. The new bolt is quite straight forward. It is M8 x 50mm. If you don't want to introduce 13mm spanners into your tool kit, see if you can find a flange bolt. Repco used to stock a range of high tensile metric flange bolts, otherwise I am not sure where you would find one apart from a wreck.

For the stud, I cut the head off a 70mm M8 bolt and tapped the end of it. Alternatively you could find a piece of studding or a M8 x70 machine screw that is tapped along its full length. Using a bolt with an untapped section in the middle is preferable as it will help locate the spacer and cap more positively.

After cutting the thermostat rebate on my neighbours lathe and drilling and tapping the hole for the hose barb I mounted it all up to check for hose requirements.

Next phase is the MX5 1.6l thermostat housing. Once you have cleaned it up and got rid of any residual gasket you have to plug the hole where the old temperature sensor was. If you have a B6 engine it may be possible to retain the sensor in this hole but I am not sure if there is enough clearance to the firewall. This hole is tapped M16 x 1.5mm. Depending on how much clearance you want you can either screw in a short machine screw or use a grub screw. I chose the latter option but ended up having to make it myself. I just cut about 20 mm of thread off a M16 bolt, cut a slot in it for a screw driver blade and screwed it in with plenty of Loctite to stop it falling out. I then sealed the inside with RTV.

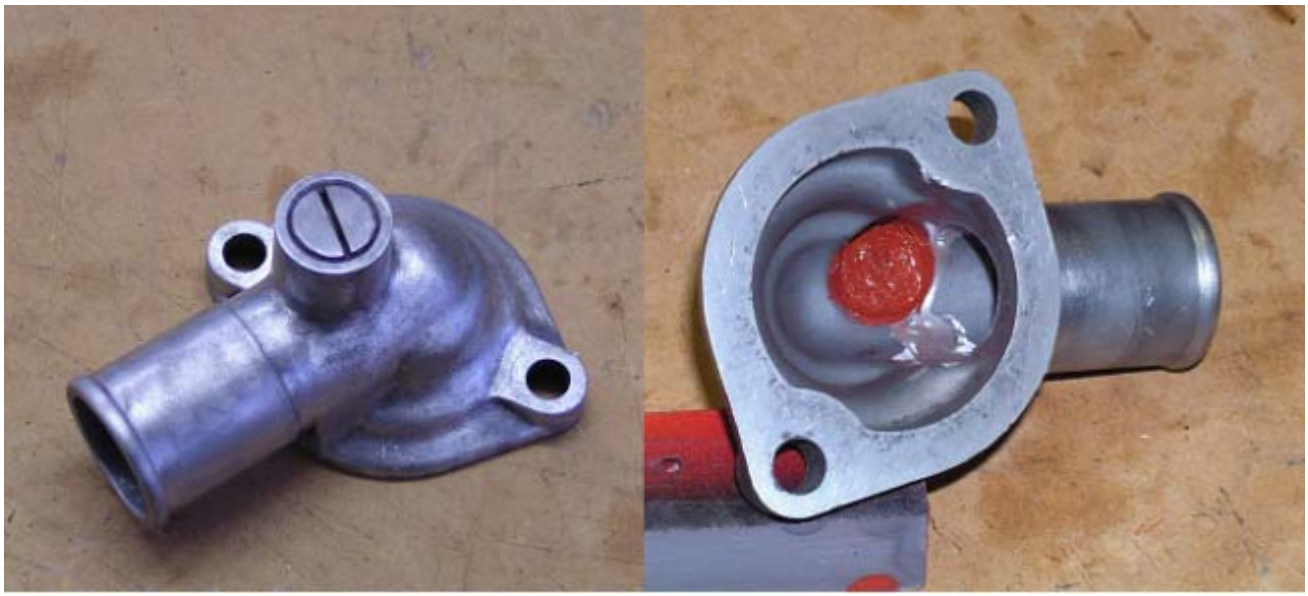

Figure 5 – B6 Thermostat housing

Fit your gaskets, fit the thermostat (with the hole at the top) and bolt it all together.

Next phase is fitting the heater hose. If you have the hose barb in the right place you should be able to get away with using a standard hose as the position of the barb is very similar to original.

As I was bringing the return to the radiator along the exhaust side of the engine, I needed a length of aluminium pipe. This was 32mm diameter, 1.6mm wall thickness. To make it fit I had it bent about 30° downwards at the back so that it would align with a right angled hose coming off the thermostat housing. I also had “crox” flares swaged into the ends to stop the hoses blowing off the end of the pipe. At the front I used a standard top hose however as mentioned before, my radiator has the top coupling on the left. The pipe was supported by an aluminium bracket which is anchored to the bolt on the head that is used for the front lifting eye.

Figure 6 – Finished installation

Once it was all connected up and tightened I did a leak check before road testing.

Once I got up to temperature on the road I noticed that the gauge was reading 5-10°C lower than previously under similar conditions. The fan, which would usually kick in while sitting at the lights was no longer running as much as previously.

Further proof came at the Sports Car Club sprint on Easter Sunday. The ambient temperatures weren't as hot as in February however the water and oil temps were lower than I had seen on Targa NZ in October when the temperatures were even lower.

For me I think that the key item for the project was the spacer plate. The only 2 problems I had with it were the lack of the thermostat rebate and the general machining finish left a bit to be desired. It required quite a bit of polishing to get the machining marks out of the mating surfaces. The gaskets may have filled the holes but I didn't want to take the risk. If you want to order one from Moss, you have to order it by the part number (see above), it is not listed on their online catalogue as a discrete item. I have spoken to a local fabricator about making these in NZ so if anyone is interested please drop me a PM through the

Forum. Price will depend on quantities but the Moss one ended up costing about NZ$50 including freight.

There are a number of threads on forum.miata.net and also on miataturbo.net, just search on “Coolant Reroute”, but one of the best is actually off forum from Frank Devocht in Belgium.
http://users.telenet.be/miata/english/coolant/my_coolant_reroute.htm