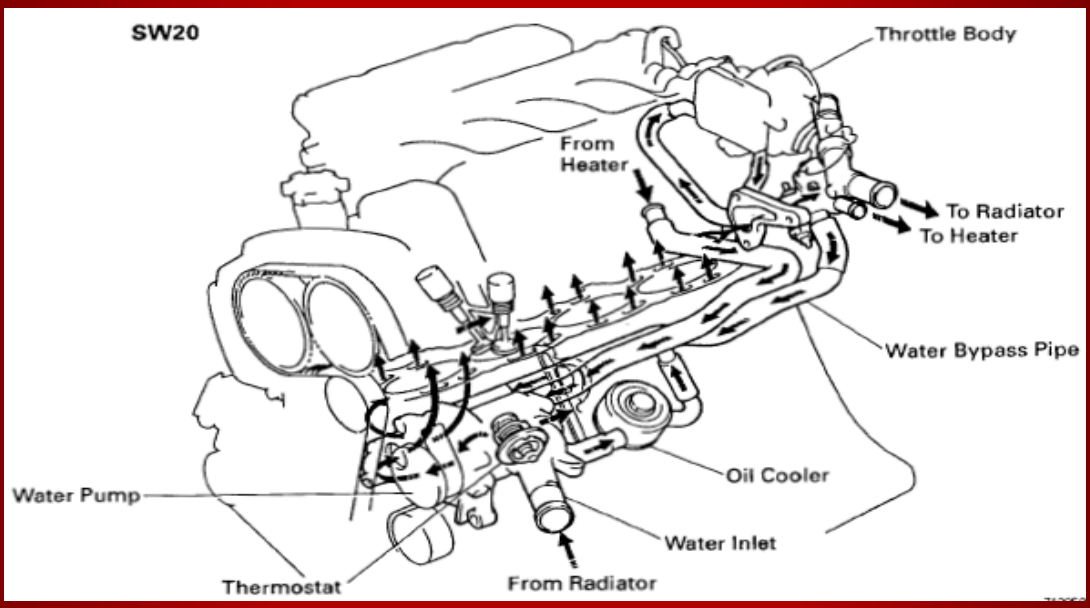
# SW20 Coolant System Maintenance.

**This article contains information on how to change and bleed the coolant, as well as flushing the system. It is based on information in the service manual, tips gathered from various other sources, as well as experience with my own car, a 1990 model 3SGE NA. Although the turbo models have more plumbing around the motor, this information should generally apply to them as well.**

## Cooling system design

The engine utilizes a pressurized forced circulation cooling system, which includes a thermostat equipped with a bypass valve mounted on the inlet side of the motor. The pic shows the engine plumbing.

When the motor is started from cold, the bypass circuit operates to allow for a quick warm up. At about 85 degrees centigrade the thermostat **opens** the main cooling circuit through to the radiator, simultaneously **closing** the bypass circuit.




## Common problems with the SW20 coolant system.

1. The service manual recommends replacing the coolant every two years to maintain the system in good condition, however to do this job properly requires considerable time and patience, and can take a lot longer than the average front-engined car. That may explain why this job is often neglected on MR2's, resulting in a build up of sludge in the system, and possible radiator blockage that may require removal and separate flushing to clear.

2. With the mid engine layout, if the system is not bled properly air can easily remain trapped in the system causing major engine damage. ( Blown head gasket, warped, cracked head)

3. Using the wrong coolant can also cause a build up of silicates on the engine internals reducing the coolant's effectiveness. You should have no problems using the genuine Toyota concentrate.

## Draining the system

The car will need to be raised enough to work underneath safely, and the car should be level. Before opening any drain points (or adding any liquid to the system) the motor should be switched off and cold.

According to the service manual there are 4 drain points, a drain tap at the bottom of the radiator on the driver's side, two plugs in the coolant pipes under the center of the car, and the service manual also mentions a drain plug on the engine block rear passenger side, however some cars definitely do not have one, including my 90 model NA. You should also empty the plastic overflow bottle, which will have to be siphoned out.

Even though the manual says the whole system should hold about 13 liters, I have found that only about 8 liters will drain out. I assume this is because the overflow bottle needs about 1-2 liters and my motor does not have an engine block drain plug so perhaps 4 liters will remain in the block /water pump/thermostat housing.

Anyway I believe that if you flush the system, any old coolant still left in the block will be diluted enough so it should not matter anyway.

To drain the old coolant out open the drain points, and carefully catch it all in plastic dishes and measure how much comes out. That way you can easily check its condition as well as knowing exactly how much new coolant must go back in to completely fill the system so that no air is trapped. (That of course assumes the system had been functioning ok previously). Trapped air in the MR2 coolant system quickly can kill your motor.

## Flushing the system

For cars that have had regular coolant changes using the correct coolant mix, flushing may not be necessary. However if the old coolant is badly discolored or if there is sediment present, it may be advisable to completely flush the system before you refill with the new coolant mix.

The way that I prefer to do this is that after the old coolant has been drained, close the drain points, and completely refill the system with de-mineralized water by following the instructions below for 'refilling and bleeding the system'. It is important that you manage to refill with close to the same amount that you measured when you drained the old coolant, to be sure there is no air left in the system.

Then run the engine until the water-temp gauge reaches the middle position, about which time the thermostat will start to open, allowing the flush water to circulate through the whole system from the motor to the radiator and back. (That can't happen until after the thermostat opens, before which the flush will only go through the engine block).
You could feel the coolant feed pipes in the frunk to check that they are hot, so you can be sure the flush is going through the whole system, and then after a few minutes stop the engine and wait until it cools down completely before attempting to remove the filler cap or opening the drain points to drain out the de-mineralized flush water.

Once again catch and measure how many liters drain out and check the color to determine it's effectiveness.

At this point you will realise why I said this job needs considerable time and patience to do properly, however in the end it should all be well worth the effort.

## Refilling and bleeding the system

For the coolant I would recommend using a 50/50 mix of Toyota red concentrate and de-mineralized water. You can get the concentrate from Toyota dealers, and it doesn't cost much more than other premium brands of concentrate anyway. It comes in 4-liter containers, so you will need to buy two of them to allow for the overflow bottle and top ups later.

On my own car after I have flushed the system, because I can only get 8 liters back in for the refill, I use a slightly higher level of concentrate in the mix to allow for the flush water still left in the block.

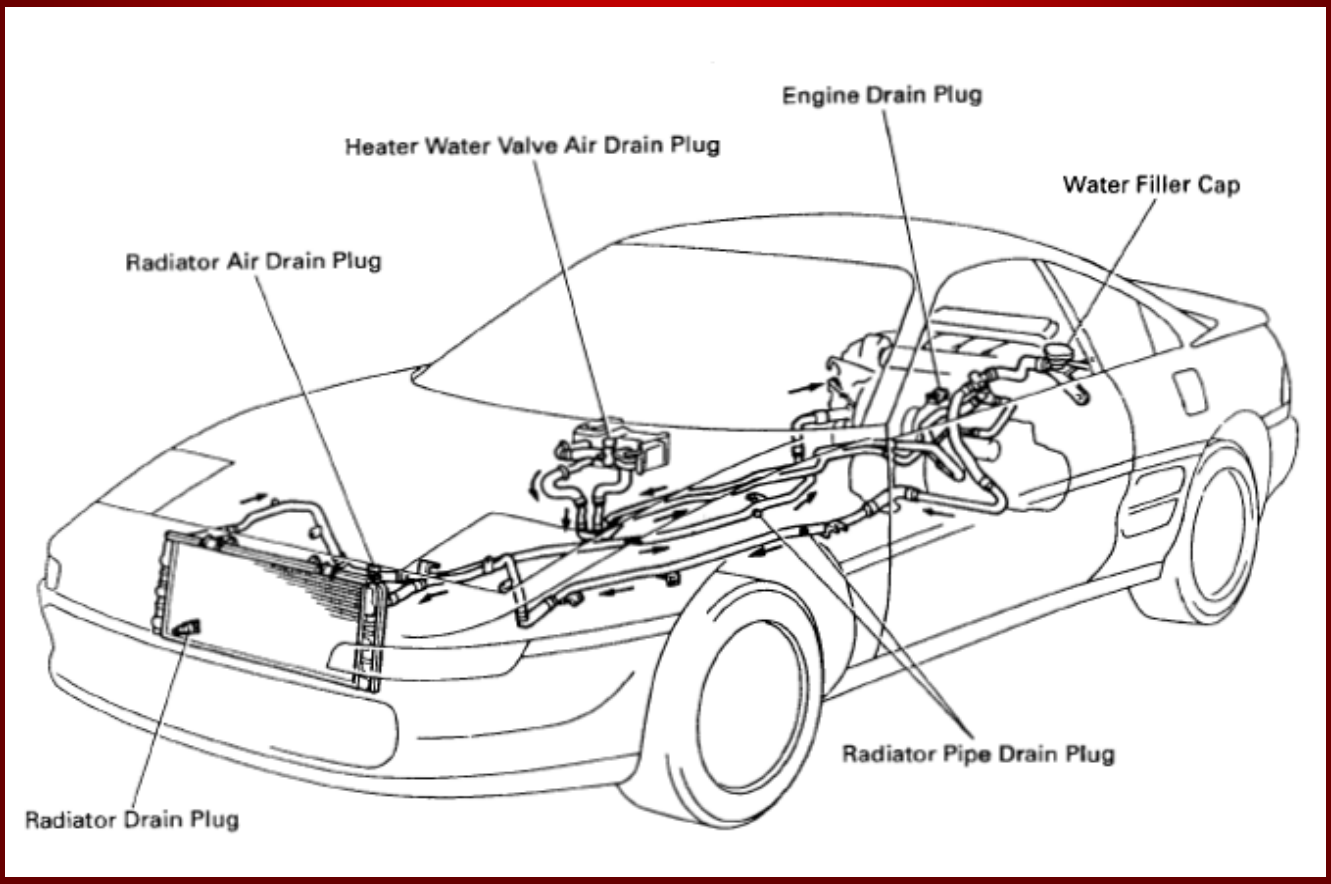
Another advantage in measuring exactly how much old coolant was drained out, is that you can easily make up exactly the right amount of new coolant mix for the refill.

When re-filling, all air pockets in the system need to be removed. To assist with this there are two bleed valves that need to be opened, (see picture) one on top of the radiator on the passenger side, accessed by removing the plastic top cover.

The other is on the heater, which is right up just below the windscreen in the frunk. You'll have to remove the spare and the plastic cover below it for access, and to bleed the system you'll need service hoses. (Two lengths of 7/16-inch clear plastic tubing about 5 feet long to fit over the bleed valve outlets).
You might have to put the ends in hot water to get them on the bleed valve taps, and the other ends should be clipped up as high as possible under the frunk lid without any kinks.

After attaching the service hoses, open the bleed valve taps two or three turns.

**Important!** Set the heater to 'hot'. It should stay that way till the job is finished.

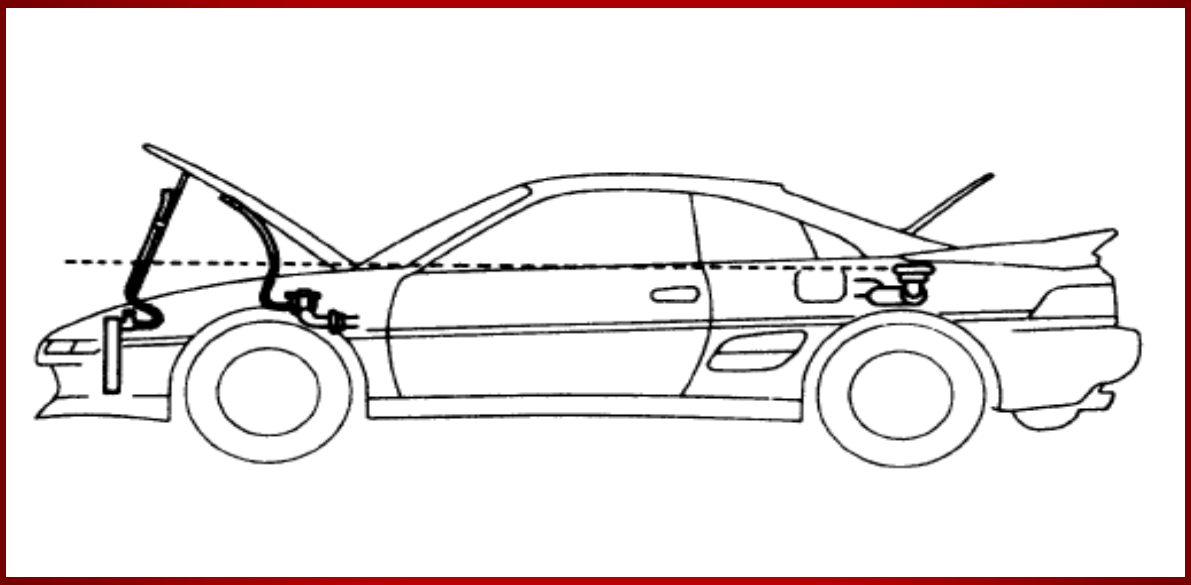


As mentioned before, to be able to add coolant to the motor it should be switched off **and cold.**

**Do not attempt to run the motor while you are adding coolant!!** Place a tight fitting funnel in the filler neck to help with filling and slowly pour new coolant into the filler hole until no more will go in.

This may take some time and you may start to wonder if all that coolant you measured when draining out will ever go back in. But remember it needs to work it's way in to fill all of that plumbing, especially through the bleeder rivet in the thermostat, so just stick with it and have patience.

You should eventually see coolant in the bleed hoses at the front and some air bubbles. If not, open the bleed valves a bit more until you see coolant. The coolant level in the hoses should come up to the same level as the coolant level in the filler cap. (See pic below)
On my car I noticed that the bleed screw on the passenger side top of the radiator was leaking coolant while I was trying to bleed the system, however I found that by removing the screw and wrapping Teflon tape around the threads fixed the leak.



When there are no more bubbles and no more coolant will go in, go away and have a cup of coffee. When you come back, you may find the level has dropped further.

With the system full, close both bleed valves, replace the pressure cap and tighten it to the first click only. (do not completely tighten)

Start the engine and let it idle for about 2 minutes. Then stop the engine, take off the pressure cap, open the bleed valves again and top up while checking for bubbles in the service hoses.
On my car air seems to stay the heater hoses in the front trunk, and squeezing the hoses a few times will dislodge the air bubbles that otherwise might stay there.
When there are no more bubbles in the service hoses, close the bleed valves and repeat the previous sequence again with the pressure cap still on the first click.

Do this as often as required until you reach the stage where you have added almost the same amount that you originally drained out, (in my case only about 8 liters) then fully tighten the pressure cap, and take the car for a run for at least ten minutes.

You will need to switch the motor off and wait for it to cool down before taking the pressure cap off to check the level, but at this stage if you have managed to refill the same amount as was originally drained out you can be fairly sure that it will be close to full.

Top up at the filler cap as required, and check the level for the next week or so topping up if needed, and eventually the level should stabilize.

The coolant in the plastic overflow bottle is sometimes overlooked, and as mentioned earlier it should be siphoned out and refilled with new coolant up to the 'full' mark on the side of the bottle.

The mark is approx 300 mm below the top of the filler neck, but it is normally difficult to see, so I made a special dipstick that I keep in the engine bay to make it easy to check he level, but you could just use the rubber feed hose instead.

The procedure described here may seem a bit tedious and time consuming, but I believe it is well worth the trouble if you want the cooling system of your MR2 to work properly without any problems.

**Ian Morrison**

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