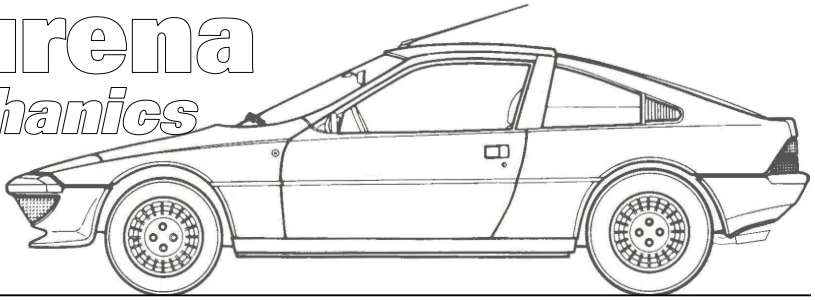
Murena mechanics



Roy Gillard

Maintenance & Cooling

The Murena engine, in that mid-location, being so enclosed probably gets less cooling airflow than most conventional front engined cars. If the car is stood either in heavy traffic or simply left to idle for any length of time, like all engines, it will heat rapidly and overheat if the cooling system is not in the best condition, or the cooling fan doesn't cut in for any reason.

When writing this, we'd been experiencing one of our occasional, really hot weather periods here in the U.K. They tend to be short unlike many European countries but can be just as harmful. No doubt you have seen a few cars sitting on the side of the road, bonnets raised and steam rising from their engine compartments.

This can be due to something having broken - a belt or a split hose, or a water pump failure, but often these and other things could be spotted and rectified long before they caused this road side distress if only we took a little more care and inspected the car more often. We tend to take things for granted until a disaster occurs. Maintenance is often ignored and we pay for that as a result.

Regular weekly maintenance should be to check the lights and tyres as well as fluid levels. However, I doubt many car owners even do regular monthly checks any more! The car has become generally so reliable that I suspect most owners ignore things until they go wrong... and then they complain, when it is really their own fault.

Similarly a car service should not be just changing the oil, filters and topping up fluids. You should be looking carefully at all things to see if you can spot potential problems. You look for signs e.g. a hose that's getting weak; a coolant level that has dropped in a sealed system, which should **never** happen; an unusual noise and/or something loose and rubbing something else because a fastening has broken; which are all signs of a probable failure soon.

Spotting small rusty metal filings may indicate a metal part is wearing away and will probably fail. These are the things mechanics are taught to do, which DIY owners sometimes completely miss. I'm not saying all mechanics do this visual check correctly either, but it is one of the items of a maintenance that can be just as important as the actual things changed.

The one big difference between a standard front engined car and these mid-engined cars is that the engine and radiator are quite a distance apart leading to a small drop in temperature between the two and some lag in the cooling process.

Thermostat rating
The Murena when new and sold in France was fitted with an 81/83°C thermostat, which was probably fine for their warmer climate. However, in the U.K. in our colder weather, the system was often not warm enough to provide a good internal heater.

So when I bought my 2.2 back in 1983, I fitted an 88/89°C thermostat, and this improved the internal heating without causing any engine problems. If you do the same, the engine is now slightly closer to its upper temperature limit, and you must pay attention to your cooling system and the temperature gauge because if it starts to creep above the normal fan cut-in level **without** the fan cutting in, you need to stop quickly, and find out why. Owing to that lag in the system it takes longer to react and bring the temp. down again, and by the time it has, the damage may already be done.

I have said before, and repeat now, if the cooling system is in good condition and working properly, it can cope with almost anything, just like any other car. I have driven mine in France in 35° with a radiator partly blocked by a piece of clear film which had blown in there, yet it still coped although the fan was running all the time, alerting me to the fact that something was not right. I have also been stuck in London stop-start traffic on a very hot day (about 30°) for nearly two hours, and again it coped with no problems. Yet I had an 88° 'stat, and I didn't have an over-ride switch at the time, it wasn't fitted till a little later... but I watch my gauges like a hawk!

Type of use
Now the cars are much older, if you only take yours on the road in the finer weather, and don't require a hot heater, you may prefer to keep the lower temperature thermostat in permanently, if you are not already. (Since the chassis is galvanised, you could use the car all year round, and you could swap to the lower rating just for the hotter weather, but if you wish to save the hassle of changing it and bleeding the system twice a year, if you leave the higher rated thermostat in all year, then you **must** pay careful attention to the cooling system) Even with a lower temperature thermostat though, you cannot afford to let your attention drop too much as the radiator fan switches are known to be unreliable. One minute they are cutting in and out fine, and the next, just when you are not paying attention, they will fail to cut in and the engine can overheat!

Over-ride control
If you have fitted an over-ride switch, which I seriously recommend everyone does, then you should use it whenever you see the traffic ahead is going to cause a lengthy hold up, or switch the engine off once stopped. In other words, don't even let the system build up temperature in the first place. Switch the fan on and keep it cool from the start. If you can see the traffic is such that the fan will be required, why wait and allow it to get hotter at all.

Leave the radiator switch to do its job when the traffic or conditions mean that the hold ups are small and intermittent, maybe lots of traffic lights in a built up area, where the fan may only be required for a minute or so and then movement and natural airflow takes over again.

Cylinder heads & the Vacuum system
These engines are known to crack their cylinder heads and it is generally thought this was because they became overheated

possibly because of a loss of coolant. However, from long experience I would say there is a greater likelihood that a leak in the head light lifting and lowering vacuum system is causing weak fuel mixtures, and consequently the combustion chambers are running too hot. So please rectify any vacuum leak on the head light system. Either way though, with the cylinder heads being costly and difficult to obtain, you do not want to crack them.

Since the radiator switches are known to fail, you need to allow for the fact that they may not work at some time. But having an over-ride is only a saviour if you watch your gauges and react accordingly! You should **never** leave the engine idling for long periods especially if you are not watching things, always switch off. Warn the garage of this when having an M.o.T.

M.o.T.

The reason I say to mention the cooling to the garage when having an M.o.T. is the engine will need to be hot for them to check the emissions and there is a period when it is up on the ramp and they are checking underneath, particularly checking the steering and braking system, where they need the engine idling to give servo assistance for the brakes, etc. There may be no one watching the temp. gauge!

If you are going to leave the car and not be there when they do the test, make it very clear to them that the radiator switches can be temperamental and that they must use the over-ride to run the fan. If you suggest that they will be liable if they overheat and crack a head and they will have to pay for the damage, I think you will find they will prefer to run the fan manually rather than be faced with a large bill!

One final point here is that if the fan has not cut in by around 98°C, then you must stop as soon as possible and check the coolant level because if you have a leak, the reason the switch may not have worked could be there is no coolant near the switch to activate it. Even if you switch on an over-ride switch the fan won't save you if there is no coolant in the system!

Radiator fan switching

The radiator switches on the Murena were also fitted on many other cars (in fact the Series I Espace uses the same one) and they were always known to be unreliable - it is not just our Matra that suffered from this problem. I have seen these fail on many cars and TVR where I worked was another good example. We were required to replace them **every** major service.

One reason they may be unreliable is that they are switching the current to the fan motor directly. It would be better if they used a relay, taking the load off the switch contacts. That should be your first system improvement modification.

Today all the manufacturers use engine computers and engine temperature sensors to collect coolant temperature data and then it is the computer that switches the radiator fan(s) on via relays. This system has proved far more reliable, which is one reason why neither car owners nor mechanics check the instruments as often as they should! They just expect them to work... You can now have a similar system on your 2.2 Murena.

Engine Fan Switch

During one of my improvements to the cooling system I realised there is an ideal place to fit an engine temperature switch, so

with a switch there and in the radiator too you have a system backup.

There is usually about a 2-3°C drop between the engine and the radiator owing to the distance and cooling airflow underneath. Therefore the fan will now activate with engine temperature, as well as radiator setting, and therefore the system is further improved.

Having an engine temperature switch as well, I think you can rest assured the system will work more reliably. The odds on both switches failing together is tiny.

System Improvements

What improvements can we make? The first thing here is to realise I am talking mainly about the 2.2 model of which I have more experience. The 1.6 being a smaller unit has more air space around it and has probably less benefits from modifications.

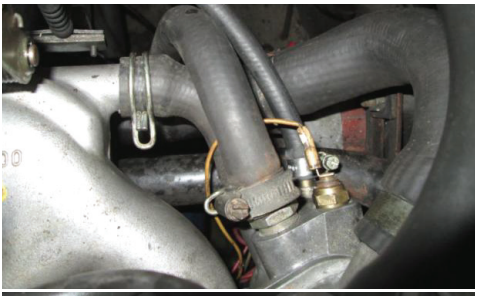
There are several areas of concern that we can address. First is the radiator fan switching which we have just covered. Then there is the bleed hose with the plastic reducer between the two different hoses, plus that tight 180° bend at the end on to the thermostat housing. Another is the water pump which can fail after long periods unused, such as being laid up during the winter. Finally, the ability to monitor the coolant level remotely.

Reducer and 'U' bend

The circulation bleed hose from the engine thermostat housing to the header tank is made with two different size hoses and a plastic reducer joining them. This reducer is just above the starter motor and often breaks once it gets old and brittle. Yours may have already been changed by now. I recommend this is replaced with a metal one, which is easy to obtain or have made.

The second fault with this hose, which runs from the header tank, down under the inlet manifold (either down-draught or twin side-draught carbs.) is that extremely tight 'U' bend at the end where it is attached to the thermostat housing. This connection is on the right hand side and really should have been blanked off. There is another connection point directly below the temperature transmitter. This port should have been used for this small hose. The hose would then have had a final bend of less than 90°, which is much more gentle and should be far more reliable. You can see the difference in the above photos; the first being as originally installed (left), and the second (*right*) with my modification.

Obviously the small hose will now have to loop around under the carbs. and not be attached to the water pipe running under the inlet manifold. That is not a problem, but you must support it securely so it will not rub anything. The previous two photos show this on an engine I have just repaired, and you can see how much better it is now. (*photos top of page 5*) You can also see in the lower photo, the blanking plug on the right hand side of the thermostat housing.

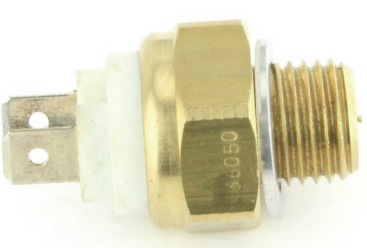


This is the position where a new engine temperature switch (as *on the right*) for activating the radiator fan, can fit. It has exactly the right thread (M14 x 1.5mm) for these switches! If you use an 81/83°C thermostat, the one you want has a 87/82°C setting. At the same time replace the 95/86°C radiator switch for an 86/81°C switch. This will match the engine switch.

Coolant Level Sensor

If the above mods. have improved the cooling system, there is one other critical item that really needs to be fitted to give you peace of mind when driving. That is a coolant level sensor in the header tank.

You may start a journey knowing the system is fine, but if a leak develops *en route* then you need to be able to detect this as soon as possible, and long before the lack of coolant will lead to any cylinder head damage. A header tank level sensor is the only real way to alert you to any drop in the coolant level.



Engine temperature switch

Without any level sensor, you would have to stop and check the coolant level frequently which is tedious and impractical. You may watch your gauges carefully and you might notice a rise in the temperature, but sometimes even this can be too late.

Best of all though is that the Murena already contains a warning light system, so it is easy to fit a level sensor to the car and connect it to that system. The system normally only monitors the brake fluid level and the pad wear of one front and possibly one rear pad. (if these are still connected!)

Most brake pads these days usually have the aural warning button, (even though they are often fitted on the wrong side and need to be refitted correctly!) so you don't need the pad warning part of the system and there is one 'spare' connection at the rear originally for the right rear pad warning connection. You can now use that for the level sensor. You simply extend the wiring from the right hand side across to the header tank on the left and use it for the level sensor instead.

A simple level sensor *FLSW* is available from Car Builder Solutions for around £12: **www.carbuilder.com/uk/black-float-switch**

This is a simple two wire switch which you would wire up as follows: one wire goes to earth and the other wire connects to the

spare wire that was for the right hand rear brake pad warning. Now when the float drops it will connect this wire to earth and bring on the dash warning light.

I have one of these fitted and wired exactly as described and it has made a huge difference already. After disturbing the cooling system there was an air pocket still remaining but unknown at the time. As soon as this worked its way out, the level in the header tank dropped and I was alerted to it by the sensor and dash warning light.

2.2 Water pumps

First a warning about the 2.2 water pump. I have found some Dolz T158 pumps with incorrect curved 7-vane alloy impellers fitted to them (*as here*) which can't circulate the coolant at idle & therefore your engine will overheat even if the fan is running! They should never have been fitted but Dolz then compounded the error by fitting smaller diameter pulleys to speed up the pump at idle, which means they need a smaller fan belt, and the pump will overspeed at high revs! The correct pulley diameter is 120mm. These pumps should have a flat 6-vane steel or maybe an 8-vane alloy impeller. (*as seen here*) Assuming you have the correct pump the next problem is that it normally has a sprung carbon seal that rubs against the impeller hub face. These carbon seals will crack or the hub face becomes worn or corroded and then the carbon seal gets damaged and cannot seal the pump.

After years of experience I've found that they commonly fail when the car is unused for long periods and starts to be used again. Typically the car gets restored or sold and the owner, or new owner, eventually puts it on the road again and starts using it. Unfortunately, shortly after getting the car back on the road, the pump starts leaking. So the pump needs overhauling.

Improving the pump

Why talk about overhauling the pump? Why not simply buy and fit a new one? Whilst 1.6 pumps are still available, the 2.2 pump has become very difficult to source. Simon Auto do have some, but at a cost of over £250 on an exchange basis from Germany, with P&P both ways, they have become very expensive!

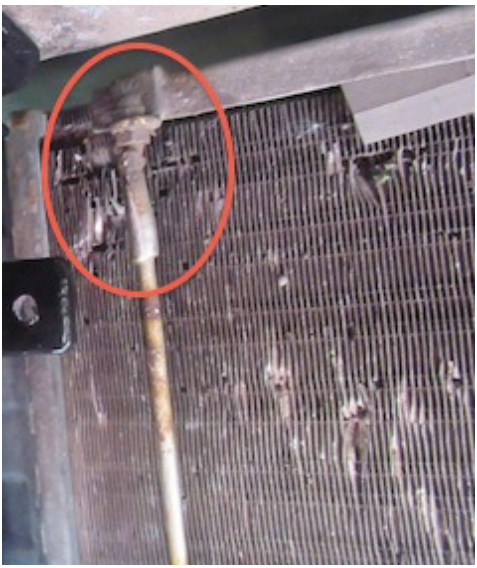
We can now get an overhaul kit with a modified seal assembly. This has a ceramic to carbon face seal and the impeller face condition is no longer important. The hub does need 5mm machining off it (*as in this*

next photo) to allow for the longer seal assembly, but you end up with a better pump which will withstand being left unused for long periods unlike the original.

Radiators and Fans

The radiator appears to be basically the same one as used in the Citroën Visa 1.4GT. (which is another rare beast; when did you last see one of those?!) For the Murena it had a top and bottom steel bracket crimped to the alloy core to mount the cowling, electric motor and fan.

This 6-bladed fan and motor, draws quite a heavy current as can be seen from the drop on the instrument panel charge meter reading when the fan is running, suggesting quite a bit of torque is produced. Now I have weighed one of these cooling fan assemblies - it is 2.35 kg and all this weight and torque is loaded directly onto the alloy core, and owing to differential metal corrosion between the steel bracket and aluminium core, the bottom fan bracket often drops off, leaving the fan cowling unattached at the bottom! One way to prevent this is to attach the bottom bracket to the top one with small rods at each end and each side of the matrix. This will hold the bottom bracket in place even if the crimping is no longer sufficient.



These radiators are no longer available, and even getting them re-cored is very difficult if not impossible. Simon Auto have had some copies made in aluminium, with stainless steel brackets for the fan housing, but that still leave the motor and cowling loaded onto the alloy core and fins. These radiators are now over £300 like many custom alloy radiators, but at least he has got rid of one potential leak point. The original radiators had a small outlet bottom left that wasn't required on the Murena, so it is no longer fitted to these custom ones.

Radiators and Switches

Now you could mount the original fan assembly back on if you wish or you could fit one of the newer 12" universal fan assemblies such as those on Car Builder Solutions website, which weigh only 1 kg. (*see next page*) You could even mount two 9" fans which will still be lighter than the

Re-cored radiator with 12", light, modern, 8-blade fan

original, like one owner has done! With two, (*as below*) he has connected the radiator & over-ride switches to one and the new engine fan switch to the other.

With a relay controlling one 6A cooling fan motor, you can connect the manual over-ride to this as well, plus the engine switch if you have one fitted. If you have two 4A fans as in the example below, these could be electrically coupled together in which case you should definitely use a relay, or you could use them separately wired.

Periodic Replacements

You should replace your thermostats now and again as they don't last forever. Since they operate in the same area for much of their life they have a habit of becoming worn and sticky in that same spot and don't function as well as they should. Many people think that they open fully once you get to the set temperature. That is not so. They still have some extra opening available when running normally. So when the temperature first starts to creep up as you stop in traffic, or on a very hot day,

Aluminium radiator with two 9", light, modern, fans

they should open up more to increase the coolant flow to maximum. Similarly if the outside air is particularly cold, they may close a little compared to when the ambient temp. is mild. As thermostats get old and sticky they can no longer regulate the opening or flow smoothly, which is why it is useful to replace them occasionally. The time to do this is when you are replenishing the system anti-freeze.

Thermostat small by-pass

A note here about thermostats. You might remember that many have, or used to have, a 'jiggle pin' in the thermostat flange. The reason is that as you fill any system if the flange was totally closed off, any air underneath the cold and therefore closed thermostat would get trapped there. The jiggle pin hole allows that air to pass through. When the system is full and there is no air below the thermostat, the float ball at the bottom of the jiggle pin, would lift the pin up and the ball would seal against the hole.

Now this is fine if the thermostat is horizontal as on a 2.2 engine, but what if the housing is at an angle as on the 1.6 or Bagheera engines? In these cases the thermostat should be fitted so the jiggle pin is at the highest point.

Today they have done away with the jiggle pin (on cost grounds as usual!) but they still need a small passage for the air to escape. If you look carefully at your modern thermostat (hold it up to the light and look through from underneath) you will see that there is a small opening left for this air to pass through the thermostat whilst closed. Where the thermostat is fitted on an angle as with the 1.6 you should make sure this passage is at the highest point.

Hoses, core plugs and matrices

Whilst replenishing the anti-freeze (Blue IAT anti-freeze only, now there is also Red OAT anti-freeze for the newer cars) that is also the time to check all the hoses, core plugs, heater, radiator etc. for any signs of corrosion, perishing, cracking, etc. If you have to change any of them, you will not have to disturb the system again. Bleeding the system of air is relatively easy if you follow the procedure I have outlined below. But always monitor the system carefully for a short while afterwards as it is when things have been disturbed that you often get problems. Once it has settled down it should remain trouble free.

Bleeding the Cooling System

Since the top of the radiator is high and the outlet and pipes under the car very low, when filling the system, you will trap air in the radiator. It simply cannot go down to the bottom of the radiator to flow back to the engine or header tank, even if you lift the rear of the car. You would have to have the car practically vertical for air to flow out of the radiator bottom hose connection!

Consequently Matra provided a bleed connection at the top of the radiator which connects back to the header tank with a small bore hose. To bleed the system you will need to remove this hose from the header tank and cap off that header tank outlet first. Now you can connect a vacuum pump to that bleed hose, with a clear hose section. Normally I leave the thermostat out at this stage since that gives the new coolant a large easy passage to the front and the radiator.

As you fill the system the air can be drawn from the radiator, allowing it to fill completely. Once you see the coolant in the clear section arriving back at the vacuum pump, without any air bubbles, you can remove the header tank outlet cap and refit the bleed hose to it. Top up the header tank and put the pressure cap back on.

Now start and run the engine so that the pump will circulate the coolant, bringing any remaining small air back to the header tank and top of the engine and fill the system. You should see the tank level drop. If it gets near the bottom you will have to switch the engine off, carefully remove the cap and top it up again.

Then restart the engine and repeat this until the level remains constant. With the spare wheel removed, you can check if the coolant is circulating by feeling the metal feed and return pipes in the front compartment, and both sides should get hot as the engine warms up, because the fan should not have cut in yet to draw any air through the radiator and cause any cooling.

A bleed screw was fitted in the top hose from the thermostat to bleed any remaining air from the top of the engine. If all is OK you can now refit the thermostat, top up the system and re-check everything again.

Some part numbers, or check my website:
Metal hose reducer Simon Auto 06061
Radiator cap 80kPa/12 psi AC RC56
Water pump
1.6 pumps easily available in U.K. various part numbers like QCP 977 or equivalent
2.2 pumps are not generally available.
Simon Auto 2.2 pump: 06037
Simon Auto Ceramic seal repair kit part number: 06037Rep

Fan belt (1.6 can have 3 possible lengths (775, 760 or 788mm) so measure it first!
Gates belts easily available in U.K.
1.6 Simon Auto 06041
2.2 Simon Auto 06035
Gates 6272MC (913mm) or equivalent

Radiator switch 95/86°C M22x1.5
FAE 37330 or Simon 06005 **Alternatives:**
92/87°C FAE 37310 or Intermotor 50200
86/81°C Intermotor 50090
(Possibly 88/80°C FAE 37390)

Thermostat
1.6 and 2.2 81/83°C (originally fitted)
Quinton Hazell QTH165K or equivalent
1.6 and 2.2 88/89°C Simon Auto 06044
Quinton Hazell QTH153K or equivalent

Engine temp. switches M14x1.5
95/90°C FAE 36010
87/82°C FAE 36050 or CBS #FANSW

Temperature sender M14x1.25
2.2 FAE 31370 or Simon 06042
1.6 FAE 31280 or Simon 06053

A suggestion is to use the 83°C thermostat with an 87/82°C engine switch and 86/81°C radiator switch. The coolant should run around 85°C with the fan cutting in if it climbs above 87°C at the radiator or 86°C at the engine, which is perfectly acceptable.

For slightly hotter running, use the 89°C thermostat with a 95/90°C engine switch and 92/87°C radiator switch.

Always check that when the cars is standing idling that not only does the fan cut in correctly, but that the coolant then begins to cool again, proving the coolant is circulating properly.

Roy Gillard