

CSCC RX-8 Trophy Maintenance Advice, Hints and Tips, December 2021



To assist drivers in the CSCC RX-8 Trophy class within the Motorsports School Turbo Tin Tops Series the following maintenance advice, hints and tips have been collated for your information.

Let's be realistic!

The Mazda RX-8 Series 1 is at best an 11-year-old vehicle and in most cases, over 15 years old. The ravages of time, mileage, elements, maintenance and past owners are bound to take their toll, as they do on any car. Thousands of track miles have been collectively covered by the RX-8 race cars. Some have enjoyed 100% reliability, whilst others have failed, this is to be expected in any car at any price, but particularly as the base Mazda's we are racing are often less than £1000 to buy. These tips may help you see the chequered flag more often, but are of course no guarantee.

Cooling

FL22 Coolant Fluid

Mazda and many of the associated rotary specialists all recommend the usage of Mazda FL22 Coolant Fluid, over and above traditional coolant fluids used on piston engines. It has been proven that the use of FL22 can reduce engine temperatures and improve the efficiency of your cooling system.

Top Tip: Ensure your car is using FL22 Coolant Fluid.



Radiator Cap

The RX-8 OEM (and even aftermarket) radiator caps are known to decrease their pressurisation with time and thus lose effectiveness. Any loss in pressure from the radiator cap can dramatically reduce engine cooling and cause overheating, especially in more extreme weather conditions such as those experienced at Brands Hatch in 2019.

If you are experiencing cooling issues you may wish to replace your radiator cap in the first instance or at the least have it pressure tested.

Top Tip: Keep an eye on your radiator cap.



Cooling Fans

As with any vehicle, cooling fan failures can happen and when combined with radiator cap (and/or thermostat issues) can cause overheating in extreme circumstances. You can check that one of the cooling fans operate by running the car on idle until hot (98C), when the fan will automatically cut in. Getting the second fan to come on is difficult in normal operation due to the high temperature needed to switch it on (101C).

<https://www.rx8club.com/series-i-tech-garage-22/how-test-cooling-fans-166524/>

Top Tip: Check the operation of BOTH of your cooling fans.

Front Grill

During the hot Brands Hatch meeting in 2019 the question of removing or drilling the front grill was raised by several drivers to aid cooling. The RX-8 features 2 openings in the front bumper to aid airflow to the radiator, the first being the obvious large 'mouth' opening and the second the lower opening above the front splitter. It is the latter that actually provides the majority of airflow to the radiator; however, improvements can be made to the upper 'mouth' grill.

The grill itself not only provides an opening for airflow, but also blocks the unsightly front bumper crash bar (which cannot be removed). There is also a small rubber 'flap' located between the two. This 'flap' CAN be removed under the Series Regulations. In addition, you ARE PERMITTED to drill holes in between the hexagonal pattern on the front grill – although note that only 2-4 rows will give any benefit due to the 'blockage' of the front bumper crash bar.

For the interest of clarity the front grill CANNOT be removed in its entirety.

Top Tip: Remove the 'flap' and drill holes in the front grill if you are concerned about cooling.



Air Conditioning

The air conditioning components may be removed from within the engine bay only, including radiator/condenser, compressor pump, drive belt and pulley. This removes a small amount of weight but more importantly by removing the AC radiator it allows a little more air to enter the engine bay. A/C components within the car must not be removed. Personally I (David) kept my AC in my race car, it makes for a considerably more pleasant place to be when not racing and my car has had no issues with heat in testing or in races. If you choose to remove your AC system please think of your health, eyesight and the environment and have the AC gas removed professionally.

Temperature Gauge

Contrary to usual vehicle behaviour and common sense, the Water Temperature Gauge is pretty much useless and displays only 3 settings. Cold, Operating Temperature and Hot. The gauge is most likely to run in the operating temperature zone (around 12 o'clock) once warm and ready to race. If the gauge moves to a 1 o'clock position, then the engine is getting VERY HOT.

As previously detailed, it is NOT a common fault of the RX-8 to run HOT or to overheat and is usually a sign of other issues such as fluid, cooling fans or radiator cap issues, or a very hot ambient temperature combined with following close behind another car. If this happens you need to adopt F1 style heat management tactics: lower the rpm at which you change gear to 8000 rather than 9000 and move out of the slipstream of the car in front on the straights. Doing this for a lap will lower your temperatures.

Top Tip: Only worry about the Water Temperature Gauge if it moves to the 1 o'clock position!



Clutch

We soon discovered that cheap 'Blue Print' clutches don't last under race conditions. Buy a quality Mazda, Exedy or similar OEM unit, but not a race specific/paddle clutch which is not permitted in the regulations.

CSCC sponsor <https://coordsport.com/> keep the correct Exedy kit in stock and can bring them to each UK round.



Engine Performance & Exhaust

Heat

As mentioned above, the small displacement and high engine RPM of the rotary engine naturally generates heat, more than would be associated by an equivalent piston engine. Clean airflow both in and out of the engine is important for performance and engine temperature. The fitment of a quality, OEM panel air filter and good condition catalytic converter combined with a healthy cooling system is essential.

Sports Cat

The biggest restriction to any RX-8 is the flow of exhaust gases which get stuck by the restrictive and emissions friendly catalytic converter (as a driver you can feel this by the heat generated in the conveniently located cat by your left leg!). The re-design of the rotary engine (specific to the RX-8 Renesis) changed the exhaust porting to side ports (with a 90° angle) and in doing so restricted the power outputs achievable from a stock engine.

Therefore, it is now recommended that a Toyosport/Japspeed/Ebay sports Cat, as per the Series Regulations is fitted to reduce the heat 'stuck' between the catalytic converter and engine and to help expel the exhaust gases quickly, thus promoting an albeit negligible, increase in power and efficiency.



Panel Filters

A quality panel air filter is recommended, but don't be tempted to fit a performance variant such as a K&N, they are not allowed. It must be genuine Mazda or an OEM equivalent, where the reason for fitting one is for cost or availability reasons only.

Top Tip: Check your air filter if you ever experience an 'oil burp' (see later in this guide)



Oil System

Oil & Changing

By design, rotary engines consume small amounts of engine oil to lubricate internal engine components such as rotor tip seals. The amount of oil used depends upon how hard the engine is driven; therefore, you can expect to use more oil than the road-going equivalents, this is normal, not a fault.

Standard, road-going RX-8s use the semi-synthetic oil in the sump, this was a reason for an engines early demise as owners frequently forgot to top this up! You can continue to use this standard set up for your race car, alternatively the regulations

permit the fitment of a SOHN kit. This recommended kit draws its oil from a separate container filled with fresh 2 stroke oil (that burns cleanly) so you can then use fully synthetic oil in the sump.

Regular fresh oil changes and replacement oil filters are highly recommended, as per all cars that are raced.

When checking the oil:

- Ensure the engine is warm (up to normal operating temperature – you will hear the exhaust note drop once warm).
- Stop the engine and allow the oil to settle for approximately 60 seconds.
- The distance between the 'Low' and 'Full' indicators is approximately 1.7 litres.

The road cars use a 5W-30 grade oil, but many specialists regard this as too thin at racing temperatures, with a 5w40 or 10w40 more commonly recommended.

<https://www.rx8ownersclub.co.uk/forum/viewtopic.php?f=25&t=50814>

Top Tip: Use a SOHN oil kit

Pre-mixing

This is common practice among many owners, where a small amount of 2 stroke (2T) oil is added to each tank of petrol, read the link above. This adds extra lubrication, but may increase blue smoke slightly and decrease the petrols knock rating. It is permitted to add 2 stroke oil to the petrol, within our regulations, it is a sensible precaution, look for a grade FC or ideally FD when choosing a brand.

<http://www.essexrotaryspecialists.com/technical/premix/>

Oil Levels & Surge

Several RX-8 owners who regularly track or race their cars have experienced oil surge, otherwise known as an "oil burp", don't panic, there are simple solutions. It's extremely obvious when this occurs as you'll glance in your rear-view mirror to see nothing but a thick, dense smokescreen and a misfire. Initially your heart will sink, CSCC RX-8 Trophy representative Antony Weeks had the added complication of releasing the entire system onto his rear tyres during an 80mph corner, whilst CSCC Director David Smitheram experienced this after just two corners of qualifying, immediately following an oil service when the level was at full on the dipstick.

It is important to note that not all cars/owners have experienced it and there is no firm evidence as to what causes or why despite much investigation. However, there are several methods that are known to help to prevent this, the simplest of which are outlined below:

1. DON'T FILL TO THE 'FULL' LEVEL

Running the oil system between $\frac{1}{2}$ and $\frac{3}{4}$ seems to be most effective at preventing the 'burp'. It is important to check your oil levels after each session when running this method.

2. FIT AN OIL CATCH TANK

Whilst many people haven't ever experienced a 'burp', the fitting of a Motorsport UK compliant 2-litre OBP rectangle can with fill-indicator, combined with using the $\frac{3}{4}$ full method will prevent this. This of course is a preventative measure should you be concerned and is permissible under the Series Regulations.

Top Tip: Run the oil level between $\frac{1}{2}$ and $\frac{3}{4}$ 'full'.

Oil Warning Lights & Indications

From factory and for added safety, an engine oil level warning light on the instrument panel will indicate low engine oil level. If the engine oil level is illuminated, the ECU will automatically cut power to the engine, reducing the oil usage until supply can be replenished.

On significantly cambered or graduated circuits, when using the $\frac{3}{4}$ full method, there is a slight possibility that the warning light "may" illuminate – although this is rare and usually caused by the position of the oil sensor and the lower operating oil levels, weight of the oil under temperature and of course variances in yaw and tilt of the car.

If the light does illuminate and you do NOT suffer any loss in power, then this is not usually a cause for concern and is at your discretion. If the warning light illuminates AND there is a loss of power, you will need to back off the throttle and try to navigate the car to a level (flat) location. If the light extinguishes then this usually confirms the sensor has established an oil level and you can continue at your discretion. If it does not extinguish DO NOT drive at high speed and keep the engine revs low until you are able to stop in a safe place. You can normally continue back to the Pit Lane without further concern.

Of course it goes without saying that a sudden oil warning light should still be treated with caution, especially on more level circuits and could be caused by a sudden loss of oil into either the exhaust (denoted by the volume of smoke you will be emitting) or from the sump leaving a slippery trail behind you. This can happen in any cars of course, not just RX-8!

Oil Cooler Grills

Not all cars run protective grills in front of the left and right positioned oil coolers. Whilst the fitment of grills is not mandatory, it is recommended in order to protect these fragile units from damage especially due to the large bumper cut-outs and susceptibility to damage from picked up gravel and tyre rubber marbles on track. It is extremely common for the RX-8 oil cooler fittings to become seized into the coolers and require cutting to remove which adds an additional cost to any oil cooler repairs.

Top Tip: Protect your oil coolers!

Fuelling

Fuel Surge & Prevention

The RX-8 has been known to suffer from fuel surge/starvation, most apparent on long, left-handers such as those at the Snetterton Circuit or Graham Hill/Surtees at Brands Hatch. Fuel surge is easily diagnosed as a spluttering, loss of power when on full throttle, usually during or immediately after an affecting corner. If this occurs, it usually clears whilst on track, if you use a partial throttle and retire to a place of safety/to the pits, although depending on the severity of the surge will depend on the length of time it takes to clear.

The Series Regulations currently allow for a later-spec Series 2 (R3) Fuel Pump and Assembly to be fitted which when fitted in combination are known to improve any on-track issues. To date, we are not aware of any RX-8 Trophy competitors suffering fuel surge whilst on track (provided you don't run the fuel level too low) and it appears to be more common when updated suspension components are fitted, which of course are NOT PERMITTED in the current Series Regulations.

Top Tip: Ideally don't run below 1/4 tank of fuel.

Electrical

Cartek Fitting Tips

The Cartek system has proved reliable, although during extreme temperature conditions it has been found that locating them in less than optimum locations has caused a temporary problem. It is important to ensure these are fitted correctly, in line with the manufacturers guidelines and checking they fully disable the vehicle in operation.

When mounted, the Isolator must have ample earthing to ensure operation. When fitted to the body of the vehicle, ENSURE you REMOVE any paint from the mounting location so as to provide sufficient earth. Additional mounting plates or washers can also be used to ensure airflow behind the unit thus preventing any overheating. Mounting to the drivers side wing acts as a good heat sink and is further away from radiated engine heat than when mounted above the battery or fuse box.

You can also fit an additional earthing cable from a mounting bolt directly to a known chassis earth to ensure sufficient earthing. Any earthing straps MUST NOT be wired back to the battery negative under ANY circumstances.

Top Tip: Ensure adequate earth and airflow on the Cartek Battery Isolator.

Working Windows

Entrants are reminded that the removal of ANY electrical components NOT EXPLICITLY SPECIFIED in the Series Regulations is NOT PERMITTED. This includes electric door window motors, which MUST remain in operation at all times.

Coil Packs & Leads

There has been some discussion amongst competitors regarding coil packs and ignition leads. To clarify, there is significant evidence to suggest that the later Mazda OEM 'C-Spec' coils and D585R (Chevrolet LS2) coils provide greater longevity and consistency of spark and in most cases the D585R's don't need replacing (in fact some suppliers provide a lifetime warranty). Adjustments to the dwell timings are neither a necessity nor are they permitted under current Series Regulations. Therefore, if you would prefer, the alternative is to fit the OEM Mazda 'C' Spec coils from a known and reputable supplier. We are aware of several auction sites and social media groups/pages selling non-genuine items, even at retail prices so please be mindful of your source as the differences between genuine and non-genuine are night and day.

For information, poor coils are known to lead to a larger than normal amount of unburnt fuel which promotes carbon build up and blocked catalytic convertors – both of which can over time cause severe damage to the engine which would require a rebuild to resolve – this is the most common fault of Mazda RX-8's and is the major cause in the well-publicised 'faults', caused by misinformation and poor maintenance of the vehicle.

Tyre Pressures

Optimum settings

The RX-8 Trophy uses the Nankang NS-2R control tyre, available from Adams & Page. This is essentially a performance road tyre and should be treated as such.

For the benefit of racing novices, your tyres will heat up once you start driving on track, so the air within the tyre will expand, this in turn increases pressures. For the NS-2R tyres, the optimum hot pressures are normally within the 32-36psi range, therefore you should work backwards and set your tyre pressures in the paddock at a lower level. We would normally recommend working with a base-line pressure setting of around the 25-28psi mark depending upon circuit, ambient and track temperatures. It is a good idea to slowly increase your pace for your first few laps in qualifying, then come in to the pits and check your tyre pressures, dropping them all to the same pressure (between 32 and 36psi all round, for example). This guide should not be deemed as 'gospel' as numerous variations come into play and in some circumstances such as when you have a cold/damp morning qualifying and a hot, dry race, cold pressures as low as 22psi are not uncommon, just be careful on cold (therefore underinflated) tyres.

Adjustments per corner

Being a rear-wheel-drive vehicle, you may find some benefit in running offset and in some cases completely different tyre pressures for each corner of the vehicle. The rear tyres are sometimes set lower than the front for example and for right-handed circuits. Bear this in mind when testing and/or setting up your desired tyre pressures which may well be different for each driver. All circuits in the UK are clockwise, so if your aim was to achieve even, hot tyre pressures all round you *might* choose starting, cold pressures of: FL 24psi, RL 24psi, FR 25psi, RR 26psi. This may appear odd to have different cold pressures on most corners, but after a few laps at a circuit with predominantly right hand bends the hot pressures will become more equal.

Top Tip: Consider using offset cold tyre pressures and consider different pressures for each driver.

Driving Style & Driver Aids

Traction Control System (DSC)

This is more of a reminder as to the procedure to disable the factory DSC (Dynamic Stability Control) system – something which you should consider doing before each race. It is important to note that this system WILL REACTIVATE EVERY TIME the engine is switched off and back on again, for example at the pit stop. The Mazda DSC system has TWO stages of operation. The process to disable the system is as follows:

1. **OFF1 – SINGLE BUTTON PRESS**

Suspends the DSC function but retains the 'brake LSD' attitude control during braking, thus still providing a small degree of driver support. DSC can be re-activated by the pressing the control button once more.

2. **OFF2 – HOLD THE BUTTON FOR 7 SECONDS**

This completely disables the DSC system and can only be re-activated by switching off and restarting the engine. This is the function most drivers will choose during a race.

Top Tip: Fully disable the DSC before each run AND after a driver change!

Steering Sensor Reset

After the Scrutineer has asked you to demonstrate that the electrics are isolated using the external Cartek cutout you will notice that you have a yellow steering warning light on the dashboard. This isn't a problem if you are going to completely switch off the DSC when racing, but personally I don't like to see a distracting warning light. To reset, it is best to park on grass or somewhere that is easy to turn the wheels. Turn the ignition on (lights on dash) but don't start the car, turn the wheel all the way to the left, then all the way to the right then turn the key to the off position. When you restart the car, the light will be off.

Rev Ranges & Limits

The construction of the Mazda RX-8 rotary engine enables a high rev limit. Whilst the ECU regulates this limit based on factory settings, the displayed reading on the tachometer can vary between 8,500rpm and in some cars, well over 9,500rpm. However, this difference is not usually caused by the ECU and its actual limit, but the tachometer itself (in a similar fashion to the Water Temperature 'gauge' as described previously).

On the subject of the RX-8's rev ranges, from my own personal testing and results, the RX-8 produces it's 'power' between 5,500rpm and 9,000rpm. Any drop below 5,500rpm such as on slow corners, will induce a period of 'lag' whilst the engine builds its RPM back into the 'sweet spot'. The peak torque is usually delivered between 8,000rpm and 8,500rpm with peak power around the latter 8,500rpm region. Therefore, the advice here is to maintain the engine revs between 5,500rpm and 8,800rpm at all times to maximise performance.

Top Tip: Ideally keep the engine revs between the 5,500rpm and 9,000rpm window at all times

Heel & Toe

Being a rear wheel drive car, the RX-8 benefits from being driven using the Heel & Toe technique. Not only does this help to prevent the rear wheels from locking under heavy braking and downshifts pre turn-in, but also helps to balance the car mid-corner (it sounds great when you get it right too!). Without heel and toe you may notice a chirp when the rear tyres momentarily lock when down changing and braking heavily.

With the RX-8's torque being delivered within the aforementioned small rev-range window, the Heel & Toe technique also helps to ensure the revs are maintained within the 'window' thus providing faster and smoother exit speeds. Most drivers learn by carefully practicing on the road, manual cars only!

Top Tip: This is a 'free mod' that can reduce lap times and increase confidence under braking.

Brakes

The road legal Mintex pads and plain discs perform well on track. Do check the inner, rear pads as we have had a report of them wearing at a faster rate compared to the outer pair, as well as to a taper. We don't believe this is a fault, more a characteristic of a single piston calliper and something to check, rather than relying on a visual check of the pad material thickness you can see on the outer pads only.

