



SPORTSCARS

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Dear Radical Owner

Many thanks for purchasing a Radical SR3 sportscar.

Whether you intend running your car at trackdays, entering it in sprints and hillclimbs, or competing in the wide range of circuit racing available to you, one thing remains constant. A well-maintained and prepared sportscar will ensure that you get the maximum performance and reliability that Radical is renowned for the world over.

Radicals have covered hundreds of thousands of trackday, test day and racing miles. This manual highlights many of the lessons and tips we have learned. Do not start your car until you have read it.

Your Radical has been designed with one objective – to give you the ultimate driving pleasure!

Happy driving

Mick Hyde

Mick Hyde.

For Radical Motorsport Ltd



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Preparation for Shake-Down

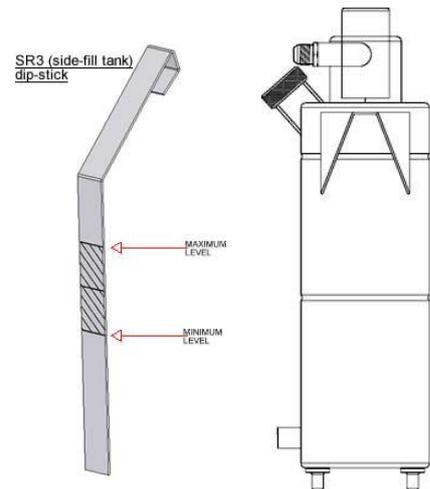
Before taking to the track, it is important that you carry out a thorough spanner check, paying particular attention to all hoses, connections and suspension fixings, brake bias etc.

Check all fluid levels

The oil level on cars fitted with the **standard wet sump** should be *no lower* than three quarters up the sight-glass, with the car on level ground and the *motor warm and running*. The sump is baffled and the oil takes some time to settle.

NB: Some wet sump engines are fitted with a dip stick to aid checking oil levels.

For cars fitted with a **dry sump system** the oil level must be checked using the dip stick supplied. The level must be maintained between the top two marks when hot, and between the bottom two marks when cold. **The level should be checked AFTER running the engine, and holding the revs at 4,000rpm for ten seconds, to allow the oil to be scavenged back. The engine should be turned off, to check the level.** (The sight glass in the side of the engine should be ignored.)



Only use Radical recommended oil, i.e. Silkolene Pro 4 synthetic-based racing oil, which is formulated to run in the integral gearbox, and clutch as well as the engine (see running in).

Warning

Do not rev the engine more than 4,000rpm (one yellow light on the dash) until the oil is warm. When cold the oil can run at 100psi, which may damage the oil cooler.

In the brake and clutch master cylinders, use only high temperature racing brake fluid.

The engine cooling system uses a 50:50 anti-freeze / water mixture. The level should be to the top of the swirl pot.

The Powertec gear drive system should be filled with Silkolene Silktran SYN5 oil to the level of the side inspection plug.

Driving Position

The combined driver and passenger seat may be adjusted forward and backward to suit individual drivers. Please note: The seat belt crutch strap will also need adjusting.

The position of the pedals can also be adjusted by a) adjusting the pedal face, b) adjusting the pedal angle and c) by moving the pedal pivot shaft. Please note that c) will require changing the master cylinder push-rods.

Manual Sequential Gear Change

The SR3 is usually supplied with the gear selection set to “pull back on the gear lever to shift up the box” and “push forward to shift down the box”. By moving the gear linkage rose joint from the lower fulcrum to the upper fulcrum in the engine bay, the gearshift direction will be reversed.

If your SR3 is fitted with a Powertec PS2 pneumatic power shifter, please refer to the separate manufacturers operating instructions.

Starting The Engine

Motors with flat-slide carbs – depress the throttle fully 2-3 times, then depress it a small amount and start the engine. Allow the engine to warm before depressing throttle further.

Motors with electronic fuel injection - Start the engine with the throttle closed. When the engine is warm, depress the throttle a small amount and start the engine.

WARNING

The starter clutch may be damaged if the engine is turned over slowly. Only start with fully charged battery, or battery jumper kit

Power Seating

After the motor has been brought to working temperature, it should be driven off, short shifting through the gears until you are in top gear. Drop the speed down to the lowest it will reasonably pull away in top gear. Then accelerate hard for a few seconds and then snap shut the throttle and coast for a few seconds. Do this fifteen times as a minimum. Accelerating hard, but only using low revs, pushes the rings hard onto the bores. By snapping shut the throttle, oil is dragged up to wash the bores clean. Keeping the revs low will eliminate the chance of glazing the bores.

Running-In

Now the motor needs to be run in for at least two hours. You must not use more than 80% of the engine revs. Vary the speed, short shift, and do not hold it at constant revs. The engine is supplied from the factory with mineral oil for running-in purposes.

Change to Radical-recommended synthetic based racing oil when running-in is complete.

Watch the temperature and pressure gauges, return to the pits regularly, and thoroughly check all hose fittings for leaks.

Running the Engine

Do not run the engine under load if:-

- a) oil temperature is below 60°C
- b) oil temperature is above 120°C
- c) water temperature is below 60°C
- d) water temperature is above 100°C
- e) oil pressure when up to temperature at 4,000rpm is under 50psi.

The oil pressure when the engine is started from cold should run at 90psi at 4,000rpm when up to temperature the oil pressure should read 60psi at 4,000rpm.

Maximum engine revs:- 10,500rpm

If over-revved from 10,500rpm–12,000rpm for more than 2 seconds per hour, in any 1 hour of operation the engine will require stripping for inspection and repair, at the customers cost, prior to any further running. (Any over-rev will be recorded on data logger or ECU histogram, if fitted.)

If revved to over 12,000rpm for any length of time, the engine will require stripping for inspection and repair, at the customers cost, prior to any further running. (The yellow button on the Radical dash will recall the maximum revs recorded.)

The rev limiter is set to 10,500rpm. Persistent use of the rev limiter will damage the engine.

It is important to log the number of hours the engine is run. The engine should run for no more than 30 racing hours before being returned to the factory for a rebuild. If the engine is stressed less (i.e. trackday

or road use) the car should be returned to the factory every 30 hours for a rolling road dynamometer test. Engines which are not raced, regularly cover 90 hours without requiring attention.

Bedding-In Brakes

The car comes fitted with carbon metallic brake pads. To bed in the brakes and achieve maximum stopping power, a film of carbon must be transferred to the discs

Gently apply brakes 6 to 8 times at medium speed. Increase speed to simulate race conditions, and apply brakes hard a further 6 to 8 times.

Allow brakes to cool for 15 minutes. Do not apply brakes whilst stationary during cooling down period.

Use only Radical recommended brake pads.

Fuel

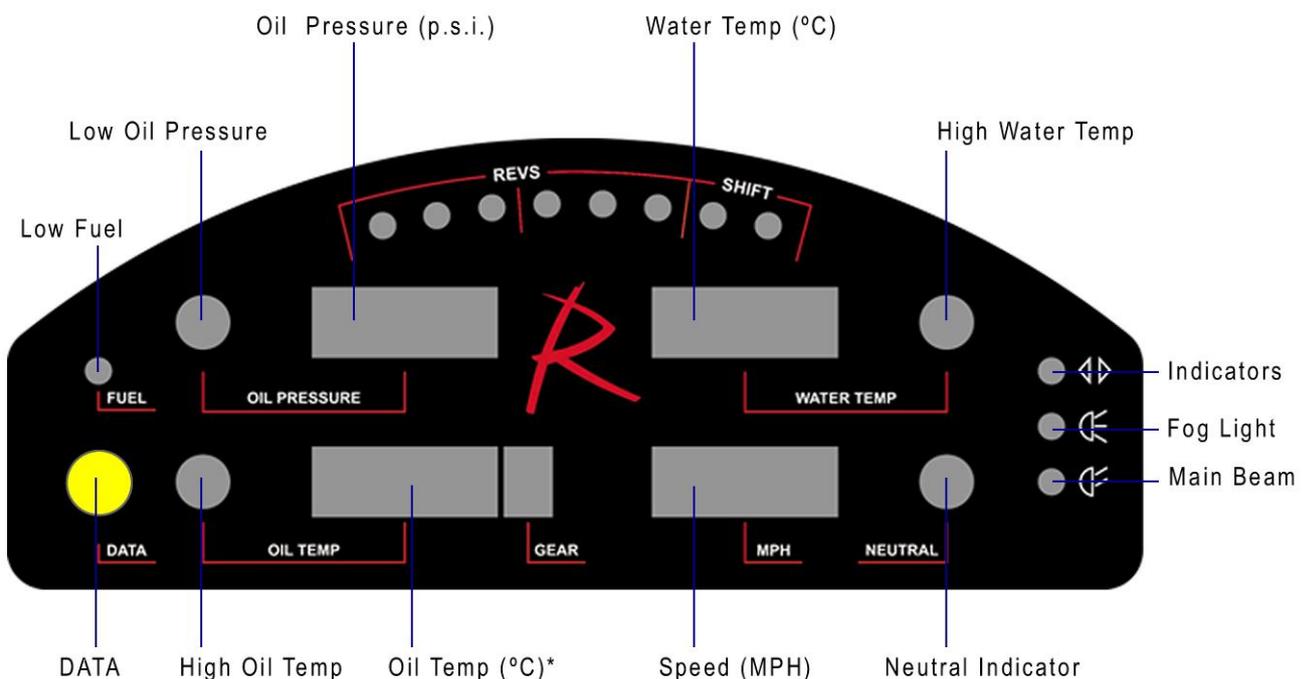
Standard Powertec Suzuki 1300 engines may run on 95 octane regular fuel. Tuned Powertec Suzuki 1300, 1400 & 1500 engines should only be run on Super Unleaded 98 octane, or 100 octane race fuel.

Tuned engines in the USA should only be run on racing fuel such as cam2, or a minimum of 108 octane. We do NOT recommend mixing octane boosters with pump fuel.

WARNING

The fuel filter will require changing after the initial run. It is located to the left of the fuel tank. The left-hand side pod will require removal to gain access.

Dashboard



Rev Indicator

Yellow 4 – 5 – 6, Green 7 – 8 – 9, Red 10 - 10½

* Temperatures are not displayed until the fluids reach 45°C.

When ignition is switched on, the dash runs through a test display.

High temperatures or low pressures will trigger a large warning light adjacent to the gauge it is indicating.

With ignition on, press the data button to show maximum revs to date (last two digits not shown). The maximum recorded revs display may be reset by the factory, or by an approved Radical distributor.

To set gear indicator following a gear ratio change.

With data button pushed, switch on ignition and the top two displays will scroll through the gear ratio options. Remove finger from data button when it displays the gear ratios fitted.

For cars fitted with alternative dashes / data loggers, please refer to the manufacturers manual.

Gearing

The Powertec gear drive system incorporates a reverse gear system, a torque biasing limited-slip differential and changeable gear ratios.

RADICAL GEAR DRIVE RATIOS

												Standard factory-fitted ratio (UK cars)			
Ratio:				3.594:1		3.409:1		3.235:1		3.071:1		2.917:1		2.770:1	
No. Teeth / Part No.:		32	A-3R1-20	33	A-3R1-22	34	A-3R1-24	35	A-3R1-26	36	A-3R1-28	37	A-3R1-36		
No. Teeth / Part No.:		46	A-3R1-21	45	A-3R1-23	44	A-3R1-25	43	A-3R1-27	42	A-3R1-29	41	A-3R1-37		
Gear	No.Teeth (input)	No.Teeth (output)	Ratio	Rev drop at 10,500 RPM	Speed in MPH drop										
1st	13	34	2.615:1	2721.50 2228.35 1655.17 1219.70 858.26	49.61	52.30	55.10	58.05	61.13	64.36					
2nd	16	31	1.938:1		66.96	70.59	74.38	78.36	82.51	86.88					
3rd	19	29	1.526:1		85.00	89.61	94.42	99.46	104.74	110.29					
4th	21	27	1.286:1		100.91	106.38	112.09	118.08	124.34	130.92					
5th	22	25	1.136:1		114.17	120.36	126.82	133.60	140.69	148.13					
6th	23	24	1.043:1		124.34	131.08	138.11	145.49	153.21	161.32					
Max. Revs:				10,500 RPM											
Rolling tyre circumference:				1.901m (0.605m dia.)											
Primary reduction ratio:				1.596:1 (83/52)											

Please note: If the car is intended for endurance racing, or long, hard use on trackdays, a gear drive oil-cooler is recommended.

Gear Drive Unit – Ratio Change

Tools required:- 5mm allen key, 34mm socket, 42mm socket, long extension bar or impact wrench, torque wrench, electric heat gun (optional), 28mm spanner, gasket sealant, gasket scraper and Loctite 243.

- a) Drain oil from unit through lower drain plug. (Found on right hand side of unit.)
- b) Remove level plug from gear cover plate (left-hand side).
- c) Remove the eight M6 cap screws and washers from the gear cover plate and separate from the unit. Care must be taken not to damage the 'O'-ring seal located in the groove in the main case. The gear ratios can now be accessed.

It is important to note at this stage that the front 34mm retaining nut is a conventional right-hand thread and is removed in a counter-clockwise direction. The rear 42mm retaining nut is left-hand thread and is removed is a clockwise direction.

- d) Both the retaining nuts are treated with a medium strength thread-lock such as Loctite 243. It may be necessary to lightly heat the nuts with a heat gun. (Do not use a blowtorch or other high temperature heat source as this may damage the shafts.)
- e) The nuts can now be removed with the correct size socket and a long extension bar or an impact wrench on a low setting. It may require some force to overcome the locking tabs on the nuts, a good tip is to carry out the removal whilst the car is on the floor which stops the gears from spinning.
- f) Once the nuts have been removed the front and rear gears, the roller bearing and the spacer can be removed from the shafts. (Note the orientation of all these parts for re-fitting.)
- g) Select the new ratios and install on the shafts (the shoulder on each gear towards the centre-line of the unit) and re-fit the spacer and roller bearing.
- h) The threads on each shaft should be clean and coated in Loctite 243 or equivalent before the nuts are fitted. Both the 34mm and the 42mm nuts should be torqued to 45ft/lb before the locking tabs are punched into the respective grooves.
- i) Clean the surfaces between the cover plate and the main unit. Fit the rubber o-ring seal into the groove on the main case. Apply a thin film of gasket sealant to both surfaces, this also helps to hold the seal in place during the fitting process. Allow time for the sealant to cure.
- j) Re-fit the cover plate and tighten the M6 cap screws and washers evenly.
- k) Replace the lower drain plug, remove the upper plug and refill the unit with synthetic transmission oil until it runs from the level plug on the cover plate. An empty unit will hold about 1 litre of oil. If a gear oil cooler is fitted the system will need about 1½ litres from empty.
- l) Re-fit the level plug and the upper plug and check all bolts and fittings for tightness. Check the unit for leaks after the first short period of running. If a cooler is fitted, it is necessary to remove the cooler return pipe (top fitting) and check the oil is being pumped round the system as the wheels turn.

Centre-Lock Hub Nuts

Anodised **RED** for left-hand side,
 Anodised **BLUE** for right-hand side.
 Torque Setting – 200 ft lbs

Air Jacks

Cars fitted with air jacks are supplied with an air lance, which is inserted into a valve at the rear of the car. The lance requires connection to a bottled air supply, and the pressure should be regulated to 250-300lb

Suspension Guide – Dry Setup

The car is set up at the factory but, the final settings should be arrived at by testing for the particular driver's preference and the particular circuit. Try to check the tyre temperatures for balance across the contact patch within one minute of a fast lap. The inside edge can be 10°-15° higher than the outer edge on radial ply slick tyres.

Front:

Ride Height:	85mm
Splitter/diffuser height:	40mm (minimum) – splitter 55mm (minimum) - diffuser
Pre-load (no. of turns):	0 (splitter) 6 (diffuser)
Shock settings:	Avo: 6 Intrax: centre of range

Tyre pressure:	Hot:	22psi (24-28psi for 2006 high-downforce aero package cars)
	Cold:	16-18psi
Spring rate:		7" × 300lb
Camber:		-2½° to -3½°
Toe in:		2mm - 3mm overall
Nik-link:		Medium

Rear:

Ride Height:		75mm
Pre-load (no. of turns):		0
Shock settings:	Avo:	8
	Intrax:	centre of range
Tyre pressure:	Hot:	22psi (24-28psi for 2006 high-downforce aero package cars)
	Cold:	16-18psi
Spring rate:		7" × 350lb
Camber:		-2° to -3°
Toe in:		2mm - 3mm
Nik-link:		medium

Note: Measure the ride height at front of the chassis and at the seat back bulkhead, (below rollover bar) with the driver seated and three gallons of fuel in the tank.

Ride Height

The ride height may need increasing when carrying a passenger. The ride height may be increased to 100mm at the splitter/diffuser, by adjusting the spring platforms.

Corner weights

For maximum performance, the Radical should have the corner weights accurately set with the driver in situ. The procedure is as follows:-

1. Position the car on a flat, horizontal surface.
 2. Equalise all tyre pressures to hot setting, say 20 psi.
 3. Take all readings with driver in car, or equivalent weight in the seat.
 4. Remove bolt from one end of the front and rear Nik-Link, and adjust shocks to full soft.
 5. Set ride height front & rear, then camber front & rear and finally toe-in front & rear.
 6. Put car on weight scales, and set corner weights by adjusting spring platforms*. It is usually difficult to achieve identical settings on each corner to within 10%. Ensure that the sum of the diagonal weights are as near as possible.
- * When using pre-load, adjustable push rods are used to set ride height and corner weights
7. Re-check ride height and splitter height with the body on.
 8. Lock spring platforms.
 9. Refit Nik-Links, rear anti-roll bars, reset shocks, remove driver or similar weight, and reduce tyre pressures.
 10. You are now ready to "rock & roll".

Note: If you intend carrying a passenger for the majority of the time, the above procedure should be carried out with him/her in the car.

Brake Bias Settings

Set central to two turns towards front (clockwise on the dash adjuster). Further adjustment can be made to suit individual circuits and tyre configurations. Adjust bias to the rear in wet conditions.

General Car Preparation

To keep your Radical looking at its best the fibreglass and carbon fibre items can be quickly and effectively cleaned with polish, while all chassis, suspension and panel parts can be kept looking new and corrosion-free by wiping them down with a cloth sprayed with WD40.

Driving Technique

If you are unfamiliar with a sequential shift car, it is recommended that you change gear using the clutch when going both up and down the gearbox. Once you have become familiar with the technique, changing gear going up the box can be achieved by lifting the throttle slightly and simultaneously 'snicking' the gear in, without depressing the clutch. On down-changes it is imperative the driver depresses the clutch and raises the engine speed before engaging the gear. Smooth gear changes can be best achieved by using the 'heel and toe' technique. Only change down one gear at a time.

As with any dog-engagement gearbox, aggressive gearchanges will damage the gear dogs which will result in gear engagement problems. Only use a maximum of 7,000–8,000rpm while getting used to driving your SR3. If you accidentally down-change instead of an up-change you are less likely to over-rev the engine. If you do over-rev the engine, make your way slowly back to the pits and check the yellow recall button on the dash. If you have revved the engine over 12,000rpm, switch off and return the engine to Powertec for inspection immediately.

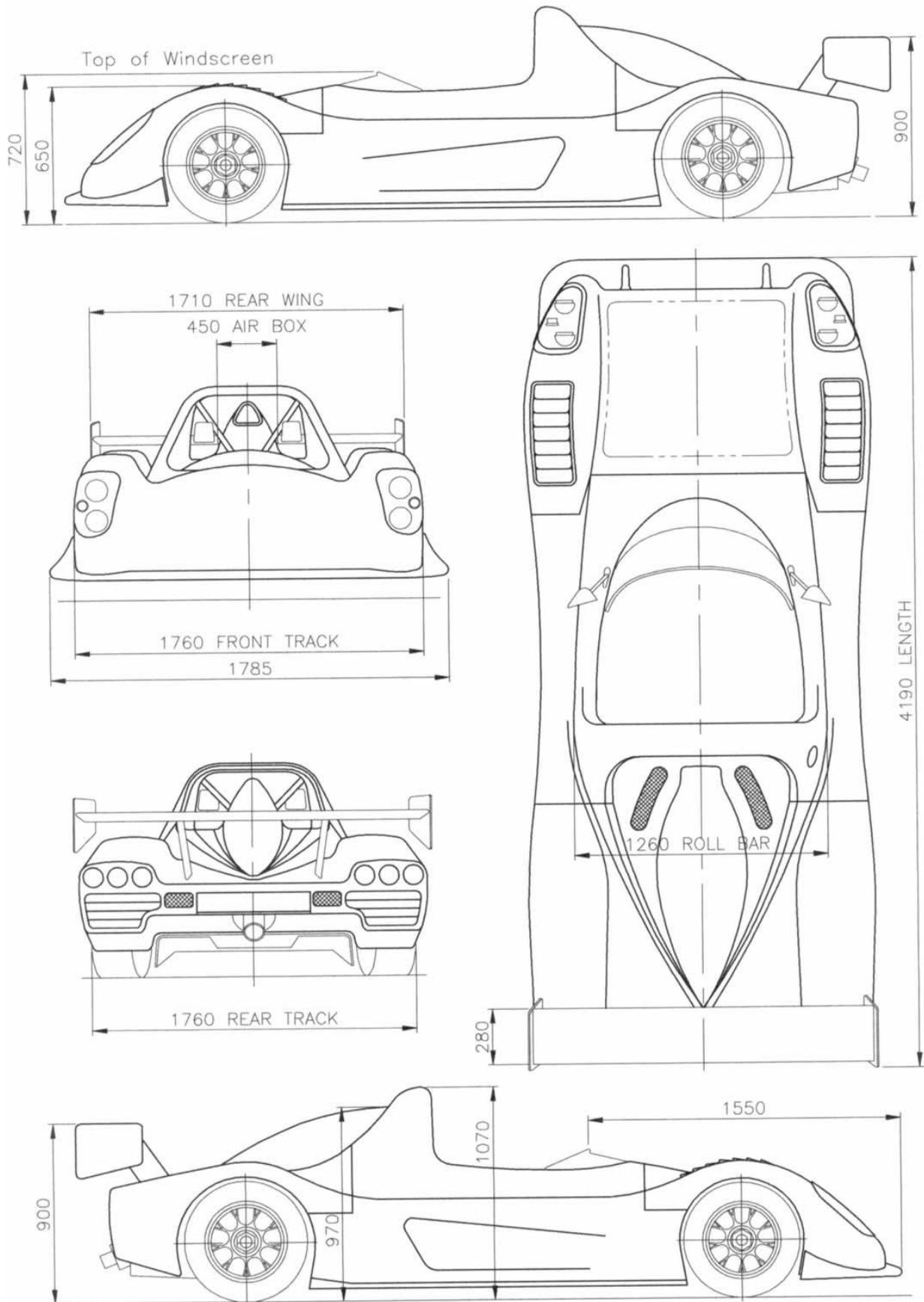
Ensure that the tyres and brakes are fully up to temperature before pushing hard.

The Radical SR3 has phenomenal braking performance and will carry considerable speed into a corner. Practice braking hard, but come off the brakes smoothly and concentrate on carrying speed into a corner. On exiting the corner, the throttle should be fed in progressively.

Driving smoothly is the secret to quick lap times.

One final tip: **CHECK YOUR OIL LEVEL BEFORE EVERY RUN!** The SR3 can pull over 2.5g when cornering. If you do not have the correct oil level, even with a dry sump motor, you risk starving the engine of oil, with expensive consequences.

SR3 Decal Design Sheet



Component 'Lifing' Chart –

As the performance of our cars increases and the number of hours racing the cars complete grows, we are able to more accurately predict the lifespan of a car's components. Please see below, the revised 'Radical Component Lifespan Chart'.

The chart gives the recommended life expectancy of components under 'normal, on-track racing conditions'. If some of your racing time is done 'off-track' or you hit kerbs, pot holes or other cars – hard, then you will need to consider reducing the timescales recommended. On the other hand, more 'gentle' trackday use will obviously extend the recommended time!

One new addition to the list is the wing support stays, the life of these is greatly shortened if the wing is used to push, and particularly pull the car around in the pit lane, garages and trucks. It works perfectly to support the wing and the downforce generated in the direction intended, and not at an angle to the centre-line of the vehicle.

<u>Model</u>	<u>SR3 pre-2006 (hours)</u>	<u>SR3 High downforce (hours)</u>	<u>Action</u>
Engine	30	30	Rebuild
Gearbox	30	30	Inspect/rebuild
Gear Drive Unit	50	50	Inspect/rebuild
Suspension Bushes	50	30	Replace
Suspension Rose Joint	30	30	Replace
Front Upright including Hub	60	50	Replace
Front Wishbones	90	60	Inspect/replace
Rear Upright	60	50	Replace
Rear Hub	60	50	Replace
Rear Wishbone	90	60	Inspect/replace
Drive Shafts	60	30	Replace
Calipers	60	60	Rebuild
Brake Discs	10	10	Inspect/replace
Shock Absorbers	60	60	Rebuild
Steering Rack	60	50	Inspect/rebuild or replace
Brake Master Cylinder	60	60	Inspect/replace
Wing Support Stays	60	60	Inspect/replace
Fuel Tank			remove & inspect annually

If you own and drive the car, but do not prepare or run it yourself, it is your responsibility to be sure that the engineer who does has a copy of this manual, and has read it.