RADICAL SPORTSCARS

RACE MECHANICS HANDBOOK

VERSION 1 – SEPTEMBER 2012

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FOREWORD

This Race Mechanics Handbook has been created to guide all engineers - irrespective of ability or experience – through the procedures and services that are required to maintain the entire range of Radical cars to a standard we believe customers demand and deserve.

These pages contain expertise from our fifteen years of production, testing and racing the cars, as well as information direct from partners and suppliers. If this book is followed diligently and sympathetically it will improve our customer's appreciation and satisfaction of our world leading product range.

This book is therefore also designed to be used by car owners as well as technicians.

Our aim is to ensure every customer is happy and they all enjoy our products, this book will help see that goal realised.

Phil Abbott
Founder and Managing Director

MECHANIC'S JOB RESPONSIBILITIES OVER RACE/TEST:

PRE-EVENT PLANNING

- Departure and travel plans should be finalised, with all others involved knowing purpose of test/race.
- Mechanic who is charge of running the car should find out:-
  - Noise limits, and take the necessary silencers to pass noise tests.
  - Session times and where and when signing on is to direct the driver when necessary.
- All spares should be checked and packed, with the person who is in charge of the car taking responsibility for test parts and any extras that may be required.
- Mechanic running the car should have all of the cars history and specific car parts, such as fuel dump tanks, dive planes and have tyres sorted for test/race.
- As and when possible have structured test plans for track time available.

MECHANIC'S RESPONSIBILITIES AT CIRCUIT:

- Follow timetable as closely as possible.
- Make sure car is noise tested as soon as possible.
- Ensure car is warmed up and ready to go 10 minutes prior to session (Oil at 50°C min and water at 70°C min).
- Ensure driver(s) is where they should be - signed on, briefings attended and ready in good time for the session.
- Ensure driver is fully aware of any new parts on the car, whether it is brake pads, discs, tyres or development parts.
- Ensure driver knows the procedure for running any new parts, whether or not they needed bedding in, and if so how it should be done and for what length of time.
- Ensure driver knows what is expected of them, whether its testing of new parts, bedding in new parts or setting the car up.
- Ensure a full log of car history is kept, including fuel used, parts used and replaced, running time of car and development parts, and reasons for changing parts.
- Make sure any failed parts are kept for inspection, with technical staff notified where possible.
- With parts failures and development parts, and any other issues, be sure to follow correct channels and report to correct people as soon as possible – i.e. technical team notified.
- Make sure the car is downloaded, and check all critical values are within parameters, including:-
  - Oil temp between 70°C and 120°C
  - Car is charging at 13V to 14V

- Water temp between 60°C and 95°C
- Fuel pressure around 3 bar etc

Make sure this information is available when necessary.

- Ensure all number 2 mechanics have a structured job list to work to, and involve them as much as possible on decisions to make changes to the car so that they have a better understanding of how the car works.
- Appear as professional at all times, such as keeping work areas tidy as possible, directing drivers to where their kit should be stored (i.e. not in working areas)
- Once own car is prepped for next session, and all aspects of car are working, i.e. data logger, radio systems etc., help out others within the team to get cars ready and out on time.
- Try to communicate with others around you so as many people as possible are aware of a situation.
- Any extra jobs, other than standard prep, required when the car returns to the factory should be noted, so that whoever preps the car will be aware of the required work.
- Above all, carry out procedures with the Radical Team in mind, acting as a single team and representing the team in as professional a manner as possible, whether conducting private tests or away assisting overseas clients and/or distributors.

PRE SESSION CHECKS:

1. Tyre pressure set on all wheels, including spares (and wets)
2. Levels – Oil, water and brake/clutch fluid
3. Wheels tight
4. Correct setup for conditions
5. Oil temp above 50oC
6. Gearbox warmed up (SR8 only)
7. Fire extinguisher active/pin removed
8. Correct amount of tape on the radiators
9. Correct fuel level
10. Check for fluid leaks – Fix or Report

TAKE TO PIT LANE:

1. Spare wheels and wets if required
2. Radio if required
3. Tyre pressure gauge
4. Tyre temperature gauge
5. Lap time sheets and stop watch
6. Pit board and numbers
7. Jump battery (SR8 only)
8. Tools bag – Allen keys, spanners, tank-tape etc
9. Air-line(s), lance, air gun
10. Spare dive planes and roll bars
11. Spare wheel nuts and clips
12. Water for the driver

WHEN CAR COMES INTO PITS:

1. Is driver ok? (Any setup changes etc…)
2. Tyre Pressures
3. Tyre Temperatures
4. Oil & Coolant Temperatures
5. **Check for fluid leaks – Fix or Report**
6. Blockages in intake grilles/ducts

Collect data

Description Complete
Ask Driver If There Were Any Issues ☐ Check With A Senior Engineer If Unsure Of Corrective Action ☐
Remove Front & Rear Bodywork ☐ Inspect Bodywork For Damage ☐ Inspect Front Diffuser And Rear Diffuser ☐ Inspect Underneath Of Side Pods ☐
Check Engine Oil ☐ While Oil Is Still Over 70°C, Rev Engine To 4000rpm for 4seconds, Then Check Engine Oil On Max, Or More Depending On Track ☐ Check The Alternator Is Charging And The Starter Works Correctly At The Same Time ☐
Shake Test Check All Corners For Play In Wheel Bearings And Joints ☐ Lightly Shake Wing And End Plates ☐ Check Steering For Excessive Play ☐
Remove Wheels And Clean: ☐ Inspect For Cuts, Flat Spots And Punctures ☐ Inspect For Uneven Wear ☐
Check Data On Engine For:- Oil Surge ☐ TPS ☐ Charging ☐ Paddle Shift Faults ☐ Sensors ☐ Temps ☐ Low Oil Pressure (Oil Temp At 100° With 9000+ Rpm ☐ (Oil Pressure Should Be Between 70-85 Psi)
Remove Rear Diffuser & Clean (If Required) ☐
Bleed Brakes & Check Condition Of Braking System, Also Check For Excess Movement In The Bias Bar ☐
Inspect For Cracks And Clean Corners ☐ Clean And Lube Wheel Nuts ☐

Description
Spanner Check:
Upright, Wishbones, Pushrods, Rockers ☐
Engine Frame Bolts ☐
Oil Fittings ☐
Fuel Line Fittings ☐
Shifting Mechanism Bolts & Bearing In Actuator ☐
Exhaust Bolts ☐
Temp Sensor ☐
Wing Frame And End Plates ☐
Pedals/Pads ☐
Mirrors – Check With Driver If Altered ☐
Braking System ☐
Drive Unit Bolts ☐
Hose Clips ☐
Engine Checks:
Throttle Bodies Working Correctly ☐
Throttle Cable Not Too Slack Or Tight + Full Throttle OK ☐
HT Leads Are Secure ☐
Engine Frame For Cracks ☐
Water Level ☐
Coat Engine Bay In Water Dispersant (i.e. WD40) If Car Has Run In Rain ☐
No Play In Drive Coupling And Lube (SR3 Only) ☐
Alternator Belt Tensioner & Bolts (SR8 Only) ☐
Check Engine Frame Bushes For Play ☐
Drain Catch Tank If Required ☐
Check Alternator Is Charging When Cold ☐
Gearbox Or Drive Unit And Paddle Shift Checks
All Gears Work ☐
No Air Leaks On Paddles ☐
Check Actuator ☐
Check Clutch Clears ☐
Check Magnet For Debris (SR8) ☐
No Leaks ☐
Refit Race Wheels To Car:
Fill Out Tyre Form ☐
Check Valves Are Not Leaking By Using Soapy Water ☐
Fit Valve Caps ☐
Torque Wheels To 240lb/Ft And Fit Wheel Clips ☐

DESCRIPTION	COMPLETE
Vacuum Cockpit, Pedal Box & Side Pods	
Transponder Fitted And Number Given To Race Control	
Check Fire Extinguisher Is Armed	
Drain Fuel And Refill To Correct Amount	
Fit Body Work & Clean	
Check Lights Are Working (Brake And Fog)	
Make Sure You Know Where The Drivers' Kit Is Ready For Scrutineering	
Charge Battery (SR8 Only)	
Make Sure Your Pit Trolley Is Loaded With Everything You Need	

HANDLING & SETUP GUIDE

For ALL handling issues the first and most important thing to check is TYRES:-

- **Pressure**
- **Condition**
- **Temperature**

Pressure for Dunlop tyres, should be in the range of 28psi to 30psi hot, the working temperature is minimum 70°c and ideally around 90°c. Temperature spreads, across the tyre tread **must not exceed** 15°c on the front tyres and 10°c on the rear tyres. Over 110°c and the tyre is beginning to overheat. The condition can be more complicated; if you know that the tyres have a lot of miles or have had many heat cycles then, before anything else, try another set.

Also look at the tyres for:-

- **Graining or heavy wear**
- **Unusual colouring**
- **Is there a lot of 'pickup'?**

All these are a good indicator of what is causing problems.

The next priority is to talk with the driver and make a circuit map, if possible, with information on each part of every corner. You can then decide if the problem is slow, medium or fast corners or everywhere, and if it is entry, mid corner, or exit. There are always various options to rectify any handling issue and all will have a downside, but we have to try and chose the best for each corner bearing in mind which the most important corners are, and which problems are caused by the nature of the circuit.

It is important to understand the difference between understeer and oversteer.

- **Understeer** is when the front tyres have insufficient grip to make the car turn so more steering lock is applied.

- **Oversteer** is the rear tyres not having enough grip.

If you have entry and mid-corner understeer, you will probably get exit oversteer, as you will have applied too much lock and then when the 'G-force' and speed have dropped and you start to apply power it will make the car snap to oversteer, and this is what the driver remembers so if you try to cure the oversteer it will probably get worse.

This is why it is very important to ask the driver a lot of questions before deciding what to do.

SOME EXAMPLES OF DRIVER FEEDBACK

Driver Feedback	Cause
"Slow speed entry understeer"	The most common cause is too soft front Nik Link or springs, or front ride height too high, also it could be too little front rebound.
"Slow speed entry oversteer"	If braking from high speed to a slow corner the problem is probably caused by the car pitching too much, so more rear toe in or lowering the rear ride height will help.
	Increasing the rear rebound, if it is entering from medium or low-speed then softer rear 'Nik-link' *or* maybe springs.
	Reducing rear camber will increase rear grip at slow-speed, so check the rear tyre temps.

- **With all medium to high speed entry and mid-corner problems**, you should first try to solve with an increase or decrease in front or rear downforce. This can be achieved with dive planes and rear wing flap or with ride-height adjustment. In general, a lower ride height gives more downforce, and will also increase mechanical grip.

- **If downforce or ride height is not the answer**, then try an increase in camber to increase high-speed grip, but this in-turn will decrease slow-speed grip.

  For example: **If you have high-speed mid-corner oversteer**, then increasing the camber should help, but it will decrease traction out of slow corners.

- **Corner exit problems at all speeds** are generally a result of what has happened in the mid-corner. However, out of slow-speed corners, traction can be improved by reducing rear camber (as above) or softening the rear 'Nik-link' or springs. Reducing rear compression damping, can help as well.

  If you make the opposite change to the front of the car it will also have a similar effect.

In fast corners going stiffer with springs and maybe bars will generally increase grip.

- **Increasing 'toe-out' at front and 'toe-in' at the rear** will increase stability and tyre temps. Increasing spring rates and tyre pressure will also increase tyre temperatures and tyre wear.

- **Damping** has many functions, but primarily it is used to keep the tyre in contact with the track by controlling the spring and chassis movement frequencies, so in general you want to keep the springs and dampers as soft as possible, but stiff enough to control the roll and pitch of the car. Then, the balance is controlled by the roll and spring rate differences front to rear and aero levels.

- The adjustments on the dampers are called low or high speed compression and rebound. Low or high speed refers to damper piston speed, <u>not</u> car speed.

For example; on entry to a high-speed corner, the lateral load transfer is relatively slow as you gradually apply more lock, so the damper movement is slow. Whereas if you go over a kerb at any speed the damper movement is fast, braking and turn-in to a slow corner is much more aggressive than in a fast corner, therefore the damper movement is faster, but usually not as fast as over kerbs.

The damping force increases with the speed of the piston:-

- If you make the high-speed adjustment too stiff, the damper will not move fast enough and the car will bounce rather than ride the kerb.

- If you have the low-speed adjustment too soft, the car will not respond to driver inputs quick enough in the corners.

- **Increasing rebound is a good way to increase grip**, but it will also increase ride 'harshness', which can make the car skip across the track. There are no simple answers, but damping adjustments are quick to do in the pit lane and will give you more information to help resolve the issues later.

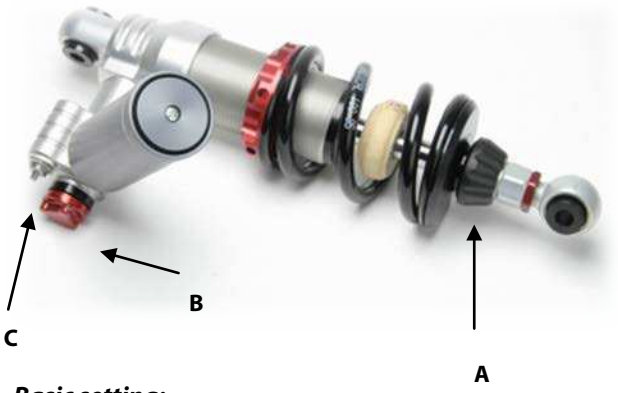
DROP HEIGHT SHEET

FRONT				REAR	
Measuring to Rocker Pivot				To front bush of RTWB	
Front Drop Height	**Ride Height**	**Calculated Ride height under lowest point on chassis**		**Rear Drop Height**	**Ride Height**
153mm	90mm	70mm		185mm	80mm
154mm	89mm	69mm		186mm	79mm
155mm	88mm	68mm		187mm	78mm
156mm	87mm	67mm		188mm	77mm
157mm	86mm	66mm		189mm	76mm
158mm	85mm	65mm		190mm	75mm
159mm	84mm	64mm		191mm	74mm
160mm	83mm	63mm		192mm	73mm
``	82mm	62mm		193mm	72mm
162mm	81mm	61mm		194mm	71mm
163mm	80mm	60mm		195mm	70mm
164mm	79mm	59mm		196mm	69mm
165mm	78mm	58mm		197mm	68mm
166mm	77mm	57mm		198mm	67mm
167mm	76mm	56mm		199mm	66mm
168mm	75mm	55mm		200mm	65mm
169mm	74mm	54mm		201mm	64mm
170mm	73mm	53mm		202mm	63mm
171mm	72mm	52mm		203mm	62mm
172mm	71mm	51mm		204mm	61mm
173mm	70mm	50mm		205mm	60mm
174mm	69mm	49mm		206mm	59mm
175mm	68mm	48mm		207mm	58mm
176mm	67mm	47mm		208mm	57mm
177mm	66mm	46mm		209mm	56mm
178mm	65mm	45mm		210mm	55mm
179mm	64mm	44mm		211mm	54mm
180mm	63mm	43mm		212mm	53mm
181mm	62mm	42mm		213mm	52mm
182mm	61mm	41mm		214mm	51mm
183mm	60mm	40mm		215mm	50mm
184mm	59mm	39mm		216mm	49mm
185mm	58mm	38mm		217mm	48mm
186mm	57mm	37mm		218mm	47mm

Chassis rake will be the difference between "Calculated Ride height" and Rear "Ride Height".

SIMMS' MEDAL WINNER

NORDSCHLEIFE LAP RECORD HOLDER



Basic setting:

Front:	A. Rebound	-22
	B. High speed comp.	23
	C. Low speed comp.	12
	D. 4th L. Housing	-2 turns

A – Rebound:

When the damper is in the car, first turn clockwise the clicker to the left, this will close the rebound fully. After this, start opening click by click. We close the rebound first to be sure all dampers are working from the same starting point. When you close the rebound this will make the car move (come back) slower to normal position.

B – High speed compression:

Turn anti-clockwise the until adjuster stop, this is the softest position. With high speed compression hardness of the car can be controlled in a way you can assist spring rate and make the car stiffer (±40 clicks)

C – Low speed compression:

By turning clockwise low speed damping will increase. With low speed the roll in the car can be controlled and when in softer position small bumps will be taken easier (smoother drive) (±20 clicks)

D – 4th Adjustment

Caution - This is very fine adjuster. Only use this if you need a significant change to the car AND you have access to a damper dyno to equalise all dampers on the car.

Low speed total damping curve adjustment, by turning the height of the housing from the low-speed adjuster it is possible to change the start and finish of the total damping curve/force.

By opening anti-clockwise the low speed curve will be softer over all clicks. Undo contra nut with key 14 and turn house with key 9. Always have the adjuster needle fully open when adjusting housing.

Wet track:- decrease all damping settings by -5 to -10 clicks for best performance.

DUNLOP

- Ensure minimum hot pressures are adhered to! (see tables below)
- Calibrate your pressure gauges with ***DUNLOP*** personnel.
- Do not bleed hot pressures on the car without consultation with ***DUNLOP*** personnel.
- Fit valve dust caps throughout.
- Cold pressures should only be set on tyres that have been shaded from direct sunlight. Do not bleed tyres as the ambient temperature rises!
- Temperature spreads across the tyre tread **must not exceed:** ☒ **15°C** on the **left front** tyre and ☒ **10°C** on the **left rear** tyre. (Temperature measurements to be made at the centre of the tread and 25-30 mm from each edge.)
- Please identify your rims, clean them and remove any centre caps before bringing them for fitting.
- Avoid hitting kerbs with cold tyres as pressures are still building up.

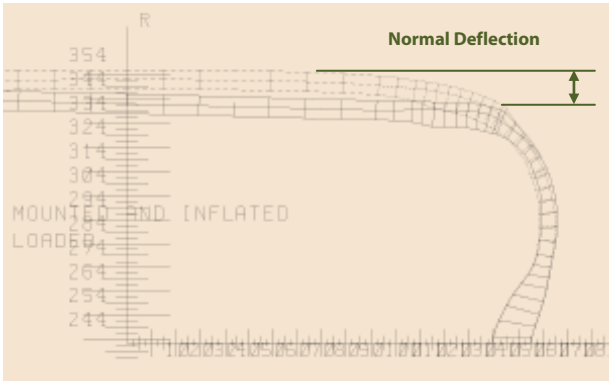
Prosport / PR6	**Cold (guide only**		**HOT (minimum)**	
	PSI	**BAR**	**PSI**	**BAR**
Dry - front	**19**	**1.3**	**28**	**1.9**
Dry – rear	**18**	**1.2**	**28**	**1.9**
Wet – front	**22**	**1.5**	**28**	**1.9**
Wet – rear	**22**	**1.5**	**28**	**1.9**

Radical SR3	**Cold (guide only**		**HOT (minimum)**	
	PSI	**BAR**	**PSI**	**BAR**
Dry - front	**22**	**1.5**	**29**	**2.0**
Dry – rear	**21**	**1.4**	**29**	**2.0**
Wet – front	**25**	**1.7**	**29**	**2.0**
Wet – rear	**24**	**1.6**	**29**	**2.0**

Radical SR8	**Cold (guide only**		**HOT (minimum)**	
	PSI	**BAR**	**PSI**	**BAR**
Dry - front	**25**	**1.7**	**32**	**2.2**
Dry – rear	**23**	**1.6**	**32**	**2.2**
Wet – front	**26**	**1.8**	**32**	**2.2**
Wet – rear	**25**	**1.7**	**32**	**2.2**

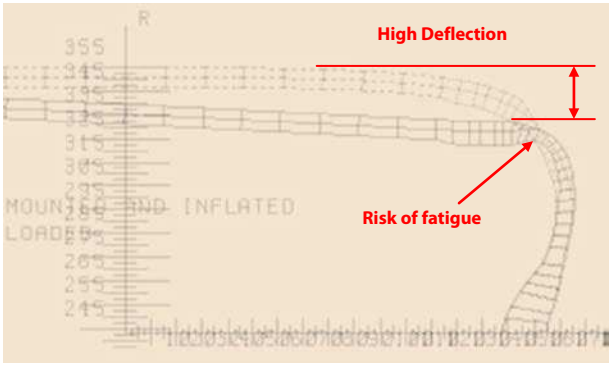
Please respect this advice to avoid excessive sidewall distortion and the risk of deflation.

TYRE SAFTEY ADVICE – DEFLECTION



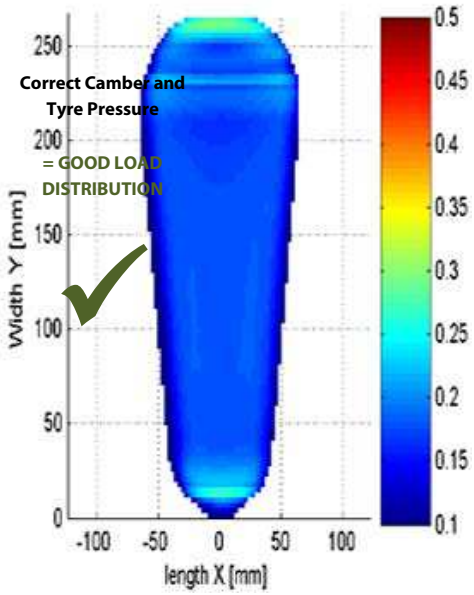
Correct Camber and Tyre Pressure

= SAFE TYRE SHAPE



Too Much Camber and/or Too Low Pressure

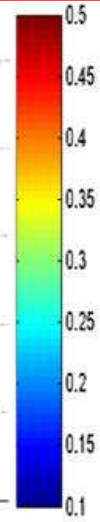
= POOR TYRE SHAPE



Correct Camber and Tyre Pressure

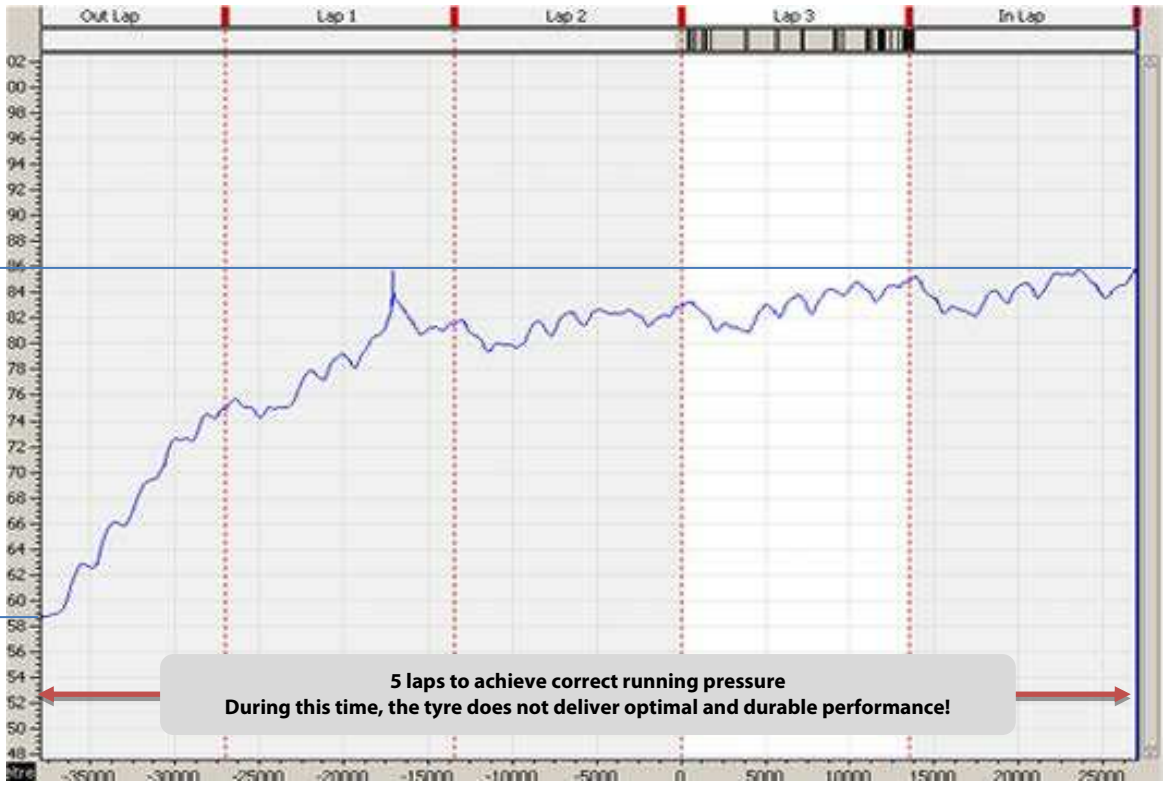
= GOOD LOAD DISTRIBUTION

Risk of Fatigue



Too Much Camber and/or Too Low Pressure

= TOO MUCH LOAD ON INSIDE SHOULDER


Out Lap
Lap 1
Lap 2
Lap 3
In Lap
Hot pressure at end of run
Cold pressure at start of run
5 laps to achieve correct running pressure
During this time, the tyre does not deliver optimal and durable performance!

TYRE WEAR PATTERNS

Conversations and judgements about grip and handling should always be preceded with thorough examination of tyre working surface.

Lots of information and indicators are contained within the whole picture of the tyre and should never be ignored. Not only grip but also longevity can be estimated, which may be more important. It is the only connection between the tyre and the road! There must be information for your "Engineer's Library" in there. Use computer data and visible indicators to get the best all round view of car and tyre behaviour.

Measure tyre temperatures and pressures as often as possible straight after a fast lap, easily done by getting a driver to do a full pace "in" lap, in order to get the best readings. However, be sure not to read the temperature of the pickup on the tyre.

GOLDEN RULES

1. Watch and ask an expert how to take temperatures properly (Dunlop personnel) and practice as often as possible

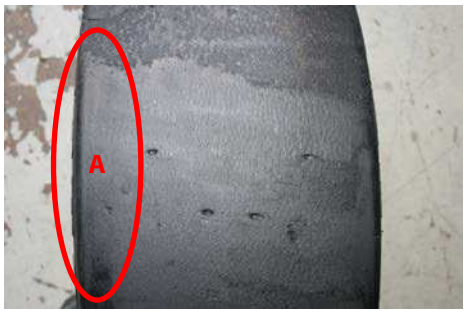
2. When examining a tyre, always check both sides, as the unloaded side can drag the inner wheel into excessive negative camber and over heat the inner edge.

3. Do the loaded side first inner edge to outer edge.

The following is only a guide to make you think more about the subject.

Pretty good rear tyre.
If rear grip is good then it's ok. If rear grip is low, more camber can be added before the tyre is damaged.

Pretty poor front tyre.
Not enough negative camber (A). This car was understeering, looking at the wear depth indicators. The amount of graining is just about okay for a hard worked tyre.

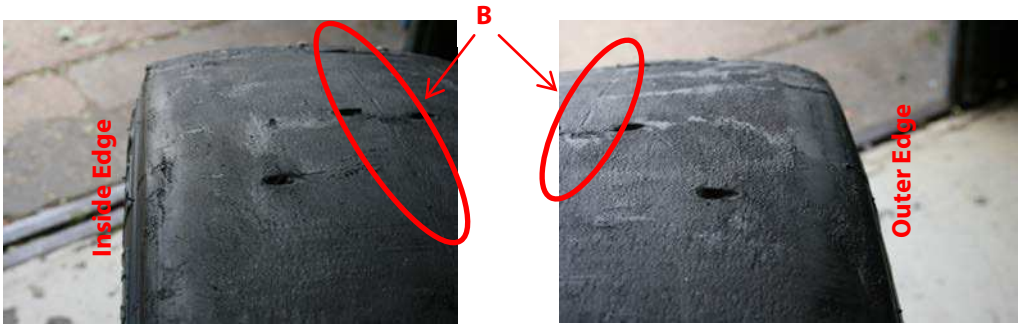


COLD TEAR

This tyre has only done a qualifying session. It shows signs of something known as "*cold tear*" (B), which occurs around the seam of the tread in the centre of the tyre.

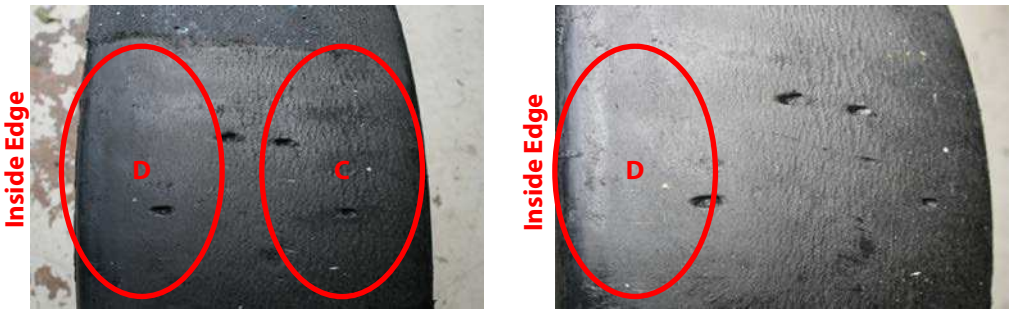
Cold Tear is caused by the rubber been torn away rather than grained or rolled. This happens when a driver pushes too hard, too soon, and with no heat in the tyre. If the driver were to wait one more lap, the tyre would be in much better condition. The driver may have had a good result in qualifying from this, but the tyre will struggle during race distance.

This is dependent on track type, track temperature, air temperature etc.



Rear Tyre showing evidence of cold tear.
Looking at wear holes there has been slight over inflation with not enough camber.

Very well used front tyre.
Graining is on the outside only (C) with a nearly new tyre on the inside edge indicating nowhere near enough camber (D), resulting in lots of understeer.



Tyre worn so badly that the tread surface has tapered on the inside edge (E) due to excess camber. Has very little pick up on so cleaning never looks good.

SPRING RATES

SR3	Ride frequencies																			
Hz	**3.5**	**3.6**	**3.7**	**3.8**	**3.9**	**4**	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**4.9**	**5**	**5.1**	**5.2**	**5.3**	**5.4**	**5.5**
Spring Rate Front	80	47	50	53	56	58	61	64	68	71	74	77	81	84	88	91	95	99	103	107	111
N/mm																					
Spring Rate Rear	124	68	72	76	80	84	89	93	97	102	107	112	116	121	127	132	137	143	148	154	159
SR8	**Ride frequencies**																				
Hz	**3.5**	**3.6**	**3.7**	**3.8**	**3.9**	**4**	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**4.9**	**5**	**5.1**	**5.2**	**5.3**	**5.4**	**5.5**
Spring Rate Front	49	52	55	58	61	64	67	71	74	78	81	85	89	92	96	100	104	109	113	117	121
N/mm																					
Spring Rate Rear	85	90	95	100	105	111	117	122	128	134	140	147	153	160	167	173	180	188	195	202	210
PR6	**Ride frequencies**																				
Hz	**3.5**	**3.6**	**3.7**	**3.8**	**3.9**	**4**	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**4.9**	**5**	**5.1**	**5.2**	**5.3**	**5.4**	**5.5**
Spring Rate Front	42	45	47	50	52	55	58	61	64	67	70	73	76	79	83	86	90	93	97	100	104
N/mm																					
Spring Rate Rear	50	53	56	59	62	66	69	72	76	79	83	87	90	94	98	102	107	111	115	119	124
SR5	**Ride frequencies**																				
Hz	**3.5**	**3.6**	**3.7**	**3.8**	**3.9**	**4**	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**	**4.7**	**4.8**	**4.9**	**5**	**5.1**	**5.2**	**5.3**	**5.4**	**5.5**
Spring Rate Front	51	54	57	60	63	66	69	73	76	80	84	87	91	95	99	103	107	112	116	120	125
N/mm																					
Spring Rate Rear	72	76	80	84	89	93	98	103	108	113	118	124	129	135	140	146	152	158	164	170	177

Ideally front ride frequency should be 10% greater than the rear, and the range is 3.5Hz to 5.5Hz for Radicals.

For example; a bumpy track with no fast corners would not require much downforce and would need soft springs so for an SR3 maybe 4Hz front and 3.6Hz rear.

For a normal track such as Silverstone GP quite high downforce and not too bumpy, you would look at 5Hz front and 4.5Hz rear or stiffer.

ROLL BAR SIZE CHART

FRONT

SOFT	5/8"	15.8mm	
MEDIUM	3/4"	19mm	
HARD	7/8"	22.2mm	GOLD
EXTRA HARD	7/8"	22.2mm	BLACK

REAR

SOFT	1/2"	12.7mm	
MEDIUM	5/8"	15.8mm	
HARD	3/4"	19mm	
EXTRA HARD	7/8"	22.1mm	GOLD
SUPER HARD	7/8"	22.1mm	BLACK SR8

BRAKE BIAS SETTINGS

FRONT BRAKE PRESSURE	PERCENTAGE BRAKE BIAS								
	51	52	53	54	55	56	57	58	59
	REAR BRAKE PRESSURE								
20	19.2	18.5	17.7	17.0	16.4	15.7	15.1	14.5	13.9
25	24.0	23.1	22.2	21.3	20.5	19.6	18.9	18.1	17.4
30	28.8	27.7	26.6	25.6	24.5	23.6	22.6	21.7	20.8
35	33.6	32.3	31.0	29.8	28.6	27.5	26.4	25.3	24.3
40	38.4	36.9	35.5	34.1	32.7	31.4	30.2	29.0	27.8
45	43.2	41.5	39.9	38.3	36.8	35.4	33.9	32.6	31.3
50	48.0	46.2	44.3	42.6	40.9	39.3	37.7	36.2	34.7

WET START POINT DRY START POINT

To adjust brake bias, press the brake pedal and observe the front and rear pressure shown on the dash. Then move the adjuster after releasing the pedal to give the required percentage. Then re-check the setting on the dash.

The yellow highlighted values are a good starting point for DRY, while the blue are for WET.

For example - If the dash is showing 35bar front and 26.5 rear, using the chart above this is about 57%. This means you have too much front brake bias, and you must turn the adjuster to the rear (approx. 1 full turn = 1%), and then recheck the reading on the dash. Final adjustment will be made by the driver on track to suit their style of driving

BRAKE DISC BEDDING

All cast iron brake discs for competition use need to be bedded-in to ensure heat stabilization and improve resistance to cracking.

Cracks, or even disc failure can occur during the first few heavy stops if careful bedding-in is not carried out.

- If brake ducts are fitted, they should be ¾ blanked off.
- Use previously bedded-in brake pads.
- For a minimum of 15km, use bakes gently at first from low speeds, progressively raise speed to normal racing pace but still use gentle applications.
- For the final 2 or 3 applications, brakes can be used quite heavily (above 20 bar pressure).
- If AP Racing thermal paints are used, then only the **GREEN** paint (430°C) should have finally turned to white (maybe also just the **ORANGE** paint (560°C) on the outside edges of the disc, during the bedding-in procedure.
- If fitted, brake pressure sensors can be used to monitor the bedding-in procedure.
- During this process, brake pressures should not exceed 20 bar during warm-up procedure.

PRE-SESSION WARM-UP

With cast iron discs, brake pressures should not exceed 20 bar during the out laps from cold, even with pre-bedded discs.

This includes the start of each trackday session, practice session and warm-up laps of a race.

SERVICE SCHEDULE

SR3 1500

• Drive Unit	Every 40 Hours
• Engine Refresh	40 Hours
• Fuel Filter	Every Engine Refresh
• Service Injectors	Every Engine Refresh
• Caliper Seals	Every 6 Months
• Spark Plugs	90 Hours
• Driveshafts (Standard)	80 Hours

SR8 2.7

• Gearbox	Every 40 Hours
• Engine Refresh	40 Hours
• Fuel Filter	Every Engine Refresh
• Service Injectors	Every Engine Refresh
• Spark Plugs	90 Hours
• Caliper Seals	Every 6 Months

WORKSHOP CHECK SHEET

REF.	DESCRIPTION	COMPLETE
1	**CHECK BODYWORK FOR DAMAGE INCLUDING:**	
	LOUVRES	☐
	INFILL PANEL	☐
	UNDERSIDE OF PODS AND SIDE SKIRTS	☐
	THREADS IN BI-WING	☐
1	**REMOVE AND CLEAN REAR DIFFUSER**	☐
1	**PUT CAR ON STAND**	☐
1	**DISARM FIRE EXTINGUISHER**	☐
2	**SHAKE TEST**	
	CHECK ALL CORNERS FOR PLAY IN WHEEL BEARINGS AND JOINTS	☐
	CHECK STEERING FOR EXCESSIVE PLAY	☐
	ROCKERS/SPHERICAL BEARING	☐
	FRONT DIFFUSER	☐
2	**REMOVE WHEELS & INSPECT TYRES FOR:**	
	FLAT SPOTS	☐
	CUTS	☐
	PUNCTURES OR LEAKING VALVES	☐
	FIND OUT IF NEW TYRES ARE NEEDED	☐
	CLEAN AND FIT VALVE CAPS	☐
3	**CHECK DATA FOR:**	
	ENGINE HOURS	☐
	OVERREVS	☐
	OVER HEATED	☐
	FUEL PRESSURE	☐
	OIL SURGE	☐
	LOW OIL PRESSURE (Oil temp at 100° with 9000+ RPM	☐
	OIL PRESSURE SHOULD BE BETWEEN 70-85 PSI)	☐
	PADDLE SHIFT FAULTS	☐
	CHARGING	☐
	TPS SET TO 4.0 AND WORKING CORRECTLY	☐
	FAULTY SENSORS	☐
4A	**SR3 - CHECK DRIVEUNIT AND DRIVE TRAIN:**	
	INSPECT AND GREASE DRIVE SHAFTS	☐
	CHECK IF DRIVE UNIT IS READY FOR REFRESH (30-40 HOURS)	☐
	CLUTCH WORKING CORRECTLY	☐
	CHANGE RATIOS OR NOTE WHAT THEY ARE	☐
	CHECK FOWARD GEARS FOR TEETH MISSING AND PITTING	☐
	CHECK FOR CRACKS IN CASINGS	☐
	CHECK BREATHER IS STILL COMPLETE	☐
	CHECK MAGNET FOR DEBRIS	☐
	HAS CORRECT OIL LEVEL	☐
	REVERSE WORKS CORRECTLY	☐

REF.	DESCRIPTION	COMPLETE
4B	**SR8 - CHECK GEARBOX AND DRIVETRAIN:** CHECK IF GEARBOX IS READY FOR REFRESH (40 HOURS) ☐ INSPECT CROWN WHEEL AND PINION (EVERY 15 HOURS) ☐ INSPECT AND GREASE DRIVE SHAFTS ☐ CHECK CLUTCH ADJUSTMENT IS 49MM GAP BETWEEN PEDAL AND STOP ☐ CHECK GEARS FOR MISSING TEETH AND PITTING ☐ CHECK DOGS FOR WEAR ☐ CHECK SELECTOR FORK PIN AND THAT THE DOG MOVES FREELY IN THE FORK ☐ MAKE SURE THE FORKS MOVE FREELY ON THE SELECTOR SHAFT ☐ VISUALLY CHECK THE PINON PLATE BOLTS ARE TIGHT ☐ CHECK SELECTOR BARREL MOVES FREELY ☐	
5	**CHECK CONDITION OF BRAKING SYSTEM:** CHECK PADS ABOVE 5MM ☐ BRAKE BALANCE BAR NOT TOO LOOSE OR TIGHT ☐ FRESH TEMP PAINT IF REQUIRED ☐ CHECK FOR ANY HEAT CRACKS THAT GO TO THE TOP OF DISC ☐ CHANGE CALIPER SEALS EVERY(6 MOUTHS IF NECESSARY) ☐ PRESSURE BLEED BRAKES, CLUTCH IF NECESSARY ☐	
6	**CLEAN CORNERS WHILE CHECKING FOR CRACKS:** DO NOT USE BRAKE CLEANER ON THE SHOCKS UPRIGHT ☐ WISHBONES ☐ NIK LINKS ☐ CHASSIS ☐ WISHBONE PICK UP POINTS ☐ CLEAN AND LUBE WHEEL NUTS ☐ MAKE SURE THE CORRECT PRE LOAD IS WRITTEN ON THE TOP OF THE SHOCK ☐	
7	**SPANNER CHECK:** UPRIGHTS, WISHBONES, PUSHRODS ☐ ROCKERS ,STEERING ,CALIPER ☐ ENGINE FRAME BOLTS ☐ OIL FITTING ☐ FUEL LINE FITTINGS ☐ TEMP SENSOR ☐ PEDALS AND STEERING ☐ DRIVE UNIT BOLTS/GEARBOX BOLTS/DRIVE SHAFT BOLTS ☐ HOSE CLIPS ☐ LOCATING BOLTS ON DISCS ARE NOT WORN OR LOOSE ☐ FRONT DIFFUSER STAYS ☐ AIR JACKS AND NOT LEAKING ☐ BRAKES SYSTEM ☐	

8A	**SR3- CHECK & CLEAN ENGINE BAY:** CRACKS IN ENGINE FRAMES & BUSHES FOR WEAR ☐ CRACKS IN ENGINE CASES ☐ NO PLAY IN DRIVE COUPLING OR CRACKS THEN LUBE ☐ EXHAUSTS ARE TIGHT ☐ DRAIN CATCH TANK ☐ CLEAN OUT AIR FILTER CHECKING NUTS ARE TIGHT IN AIR BOX ☐ THROTTLE CABLE NOT TOO SLACK AND GETS FULL THROTTLE ☐ COOLANT PIPES ARE NOT WEARING THROUGH ON ANYTHING ☐
8B	**SR8- CHECK & CLEAN ENGINE BAY:** CRACKS IN FRONT ENGINE & BUSHES FOR WEAR ☐ CHECK ALTERNATER BELT + TENSIONER + BOLTS ☐ CRACKS IN ENGINE CASES ☐ EXHAUSTS ARE TIGHT ☐ DRAIN CATCH TANK ☐ CLEAN OUT AIR FILTER CHECKING NUTS ARE TIGHT IN AIR BOX ☐ THROTTLE CABLE NOT TOO SLACK AND FULL THROTTLE ☐ COOLANT PIPES ARE NOT WEARING THROUGH ON ANYTHING ☐
9	**CHECK WIRING AND PLUGS:** UNDER DASH (IGNITION SWITCH/MASTER SWITCH) ☐ ENGINE BAY ☐ HT LEADS ☐ CONNECTORS ☐ SPEED SENSOR (CORRECT ADJUSTMENT AND TIGHT) ☐
10	**CHECK PADDLE SHIFT:** CHECK FOR LEAKS ☐ GREASE ACTUATOR BEARING ☐ CHECK CORRECT LENGTH OF ACTUATOR ☐ AIR COMPRESSOR FOR EXCESSIVE NOISE ☐ GO THROUGH ALL THE GEARS ☐ CHECK SPACING ON GEAR POSITION SENSOR (QTEC ONLY) ☐
11A	**SR3 - CHANGE OIL AND FILTER** REMOVE MAIN FEED PIPE ☐ REMOVE 17MM DRAIN BUNG AND CHECK MAGNET FOR DEBRIS THEN RELOCK WIRE BUNG WHEN FINISHED ☐ REMOVE FILTER BY SLACKENING THE HOSE CLIP ☐ FILL ENGINE WITH OIL AND REMOVE SPARK PLUGS FOR DRY CRANKING, CHECKING THE PLUGS ARE OK AT THE SAME TIME ☐
11B	**SR8 – CHANGE OIL AND FILTER** REMOVE THE 4 10MM BUNGS ON BOTTOM OF CRANK CASE ☐ REMOVE 17MM DRAIN BUNG ON THE SIDE OF THE SUMP AND CHECK MAGNET FOR DEBRIS THEN RELOCK WIRE THE 4 M6 BOLTS ☐ REMOVE FILTER BY SLACKENING THE HOSE CLIP ☐ FILL ENGINE WITH OIL AND REMOVE SPARK PLUGS FOR DRY CRANKING CHECKING THE PLUGS ARE OK AT THE SAME TIME ☐

12	**RUN ENGINE UP, CHECK OIL LEVEL:** CHECK COOLANT LEVEL ☐ START ENGINE CHECK TPS AND BALANCE BODIES ☐ WARM OIL TO BETWEEN 30°C & 40°C ☐ REV TO 4000RPM FOR 4 SECONDS TO SCAVENGE OIL ☐ QUICKLY SHUT OFF AND CHECK OIL ☐ OIL LEVEL SHOULD BE IN THE MIDDLE OF MIN AND MAX ☐ **SR8 ONLY RUN THE CAR THROUGH THE GEARS WITH IT RUNNING** ☐
13	**CHECK AIM SYSTEM:** DOWNLOAD DATA ☐ CHECK ALL SENSORS ☐ ZERO SENSORS ON FLAT PATCH ☐ MAKE SURE LATEST UPDATE DASH STILL WORKS AFTERWARDS ☐ ZERO DASH –MILES AND HOURS ☐ BEACON POINTING THE RIGHT WAY FOR THE TRACK ☐
14	**DRAIN FUEL TO MEASURE AMOUNT** ☐
15	**SAFETY CHECKS** CHECK THAT BELTS ARE SECURE AND NO TEARS, WEAR MARKS AND WITHIN EXPIRATION DATE ☐ CHECK FIRE EXTINGUISHER IS IN DATE AND NOT EMPTY ☐
16A	**SET DOWN ON CAR** WRITE DOWN THE SETTINGS ON THE CAR AS IT FINISHED THE LAST RACE ☐
16B	**SET UP CAR FOR NEXT TRACK** **IF THE DRIVER IS HAPPY WITH THE SET UP OF THE CAR THEN LEAVE THE SETTINGS AS THEY ARE**
17A	**VACUUM COCKPIT AND PEDAL BOX AND SIDE PODS** ☐
17B	**REFIT DIFFUSER AND BODYWORK, ENSURING LIGHTS ARE CONNECTED AND WORKING** ☐
	FINAL CHECKS CHECK BODYWORK IS SECURED BY ALL PINS ☐ REAR TAIL PINS ADJUSTED CORRECTLY ☐ REAR TIE DOWNS ARE FITTED ☐ EVERYTHING THAT CAME OUT OF THE CAR IS BACK IN THE CAR ☐

4 CYLINDER RACE CAR

Engine Oil (7 Litres From A Dry System)	**Pro R 15W-50**

8 CYLINDER RACE CAR

Engine Oil (10 Litres From A Dry System)	**Pro R 15w-50**
Gearbox Oil	**Neo**
GDU Oil	**Neo/Syn 5**
(SR3: 1.5 Litres From A Dry System) (SR8: 3.7 Litres From A Dry System)	
Brake Fluid	**Dot 4**

SR3 GEAR RATIO CHART

				Ratio	3.594:1	3.409:1	3.235:1	Standard factory fitted ratio (UK cars) 3.071:1	2.917:1	2.770:1
				No. Teeth/ Part No.	32 A-3R 1-20	33 A-3R 1-22	34 A-3R 1-24	35 A-3R 1-26	36 A-3R 1-28	37 A-3R 1-36
				No. Teeth/ Part No.	46 A-3R 1-21	45 A-3R 1-23	44 A-3R 1-25	43 A-3R 1-27	42 A-3R 1-29	41 A-3R 1-37
Gear	**No. Teeth (input)**	**No. Teeth (output)**	**Ratio**	**Rev drop at 10,500 rpm**	**Speed in MPH drop**	**Speed in MPH drop**	**Speed in MPH drop**	**Speed in MPH drop**	**Speed in MPH drop**	**Speed in MPH drop**
1st	13	34	2.615:1	2721.50	49.61	52.30	55.10	58.05	61.13	64.36
2nd	16	31	1.938:1	2228.35	66.96	70.59	74.38	78.36	82.51	86.88
3rd	19	29	1.526:1	1655.17	85.00	89.61	94.42	99.46	104.74	110.29
4th	21	27	1.286:1	1219.70	100.91	106.38	112.09	118.08	124.34	130.92
5th	22	25	1.136:1	858.26	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 **10,500RPM**

Primary reduction ratio Rolling tyre circumference **1.596:1 (83/52)**
1.901m (0.605m dia)

SIMMS' MEDAL WINNER

NORDSCHLEIFE LAP RECORD HOLDER

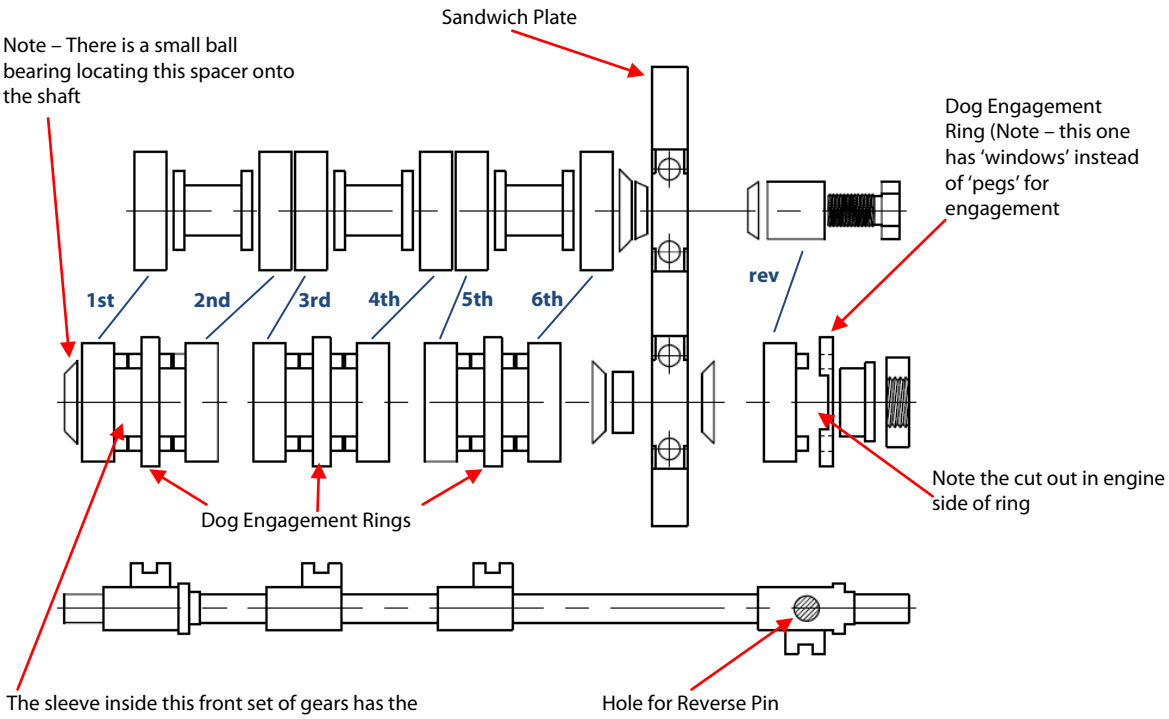
SR8 GEAR CHART – HYPOID GEARBOX

	Ratio	SHORT	MEDIUM	LONG	EXTRA LONG
Gear	**Rev drop at 10,500 rpm**	**Speed in MPH**	**Speed in MPH**	**Speed in MPH**	**Speed in MPH**
1st	2824 1714 1413 1050 1167	71	71	71	71
2nd		98	98	98	98
3rd		112	117	117	117
4th		126	135	135	135
5th		140	150	156	156
6th		154	169	178	183

Mini Q-Tek HYPOID Gear

Radical part #	Quaife Input	Quaife Output	Gear	Input	Output	Short	Med.	Long	Ex Long	SR3 Ford	Ratio	MPH Std	KPH Std	MPH Std	KPH Std
TQ0300	E-72G1-60	E-72G1-66	1st	12	34	1	1	1	1	1	2.83	69	111	49	78
TQ0301	E-72G1-61	E-72G1-67	2nd	14	29	1	1	1	1	1	2.07	95	152	67	107
TQ0302	E-72G1-72	E-72G1-76	3rd	16	29	1					1.81	109	174		
TQ0303	E-72G1-62	E-72G1-68	3rd	15	26		1	1	1		1.73	114	182		
TQ0304	E-72G1-73	E-72G1-77	4th	18	29	1				1	1.61	122	196	75	119
TQ0305	E-72G1-63	E-72G1-69	4th	18	27		1	1	1		1.50	131	210		
TQ0306	E-72G1-74	E-72G1-78	5th	18	26	1					1.44	136	218		
TQ0307	E-72G1-64	E-72G1-70	5th	20	27		1				1.35	146	233		
TQ0308	E-72G1-75	E-72G1-79	6th	19	25	1					1.32	150	239		
TQ0309	E-72G1-80	E-72G1-81	5th	20	26			1	1	1	1.30	155	248	106	170
TQ0310	E-72G1-65	E-72G1-71	6th	20	24		1				1.20	164	262		
TQ0311	E-72G1-45	E-72G1-51	6th	22	25			1			1.14	173	277		
TQ0312	E-72G1-82	E-72G1-83	6th	19	21				1		1.11	178	285		
TQ0410	E-72G1-11	E-72G1-12	5th	22	23					1	1.05			132	212
TQ0411	E-72G1-13	E-72G1-14	6th	23	20					1	0.87			159	255

RPE 6 SPEED TRANSAXLE GEAR RATIOS FOR RADICAL SR8 (NON-HYPOID)



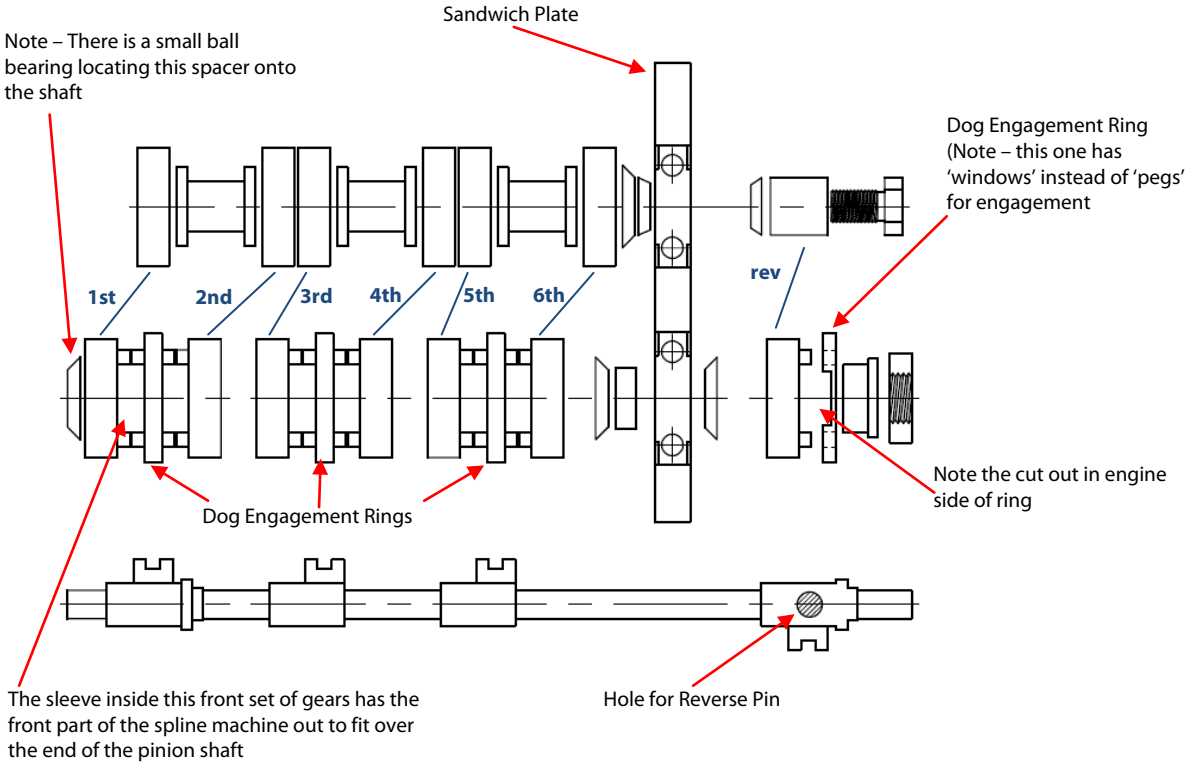
SHORT RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	10:26	TQ0164	Same on all three sets
2nd	13:25	TQ0165	Same on all three sets
3rd	17:28	TQ0152	
4th	17:25	TQ0153	
5th	19:25	TQ0154	
6th	20:24	TQ0163	
MEDIUM RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	10:26	TQ0164	Same on all three sets
2nd	13:25	TQ0165	Same on all three sets
3rd	17:27	TQ0159	
4th	16:22	TQ0160	
5th	21:26	TQ0150	
6th	18:20	TQ0151	
LONG RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	10:26	TQ0164	Same on all three sets
2nd	13:25	TQ0165	Same on all three sets
3rd	17:27	TQ0159	
4th	16:22	TQ0160	
5th	20:24	TQ0163	
6th	23:24	TQ0161	

A COMPLETE SET OF GEAR RATIOS COMPRISES:-

Gear	Ratio	Part No	Notes
1st	10:26	TQ0164	Same on all three sets
2nd	13:25	TQ0165	Same on all three sets
3rd	17:28	TQ0152	Short ratio set
3rd	17:27	TQ0159	Medium and long sets
4th	17:25	TQ0153	Short set
4th	16:22	TQ0160	Medium and long sets
5th	21:26	TQ0150	Medium set
5th	19:25	TQ0154	Short set
6th	23:24	TQ0161	Long set
5th + 6th	20:24	TQ0163	Long and short sets
6th	18:20	TQ0151	Medium set

RPE 6 SPEED TRANSAXLE GEAR RATIOS FOR RADICAL SR8 (HYPOID)

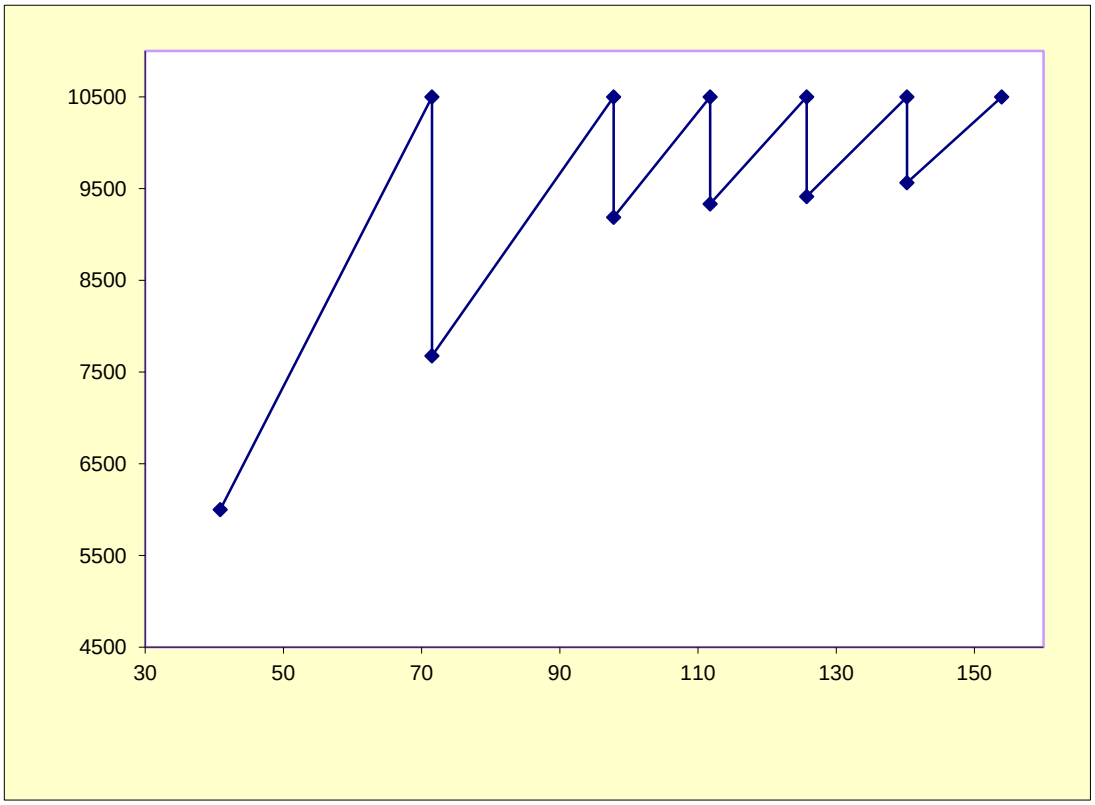
Hypoid Gearboxes Have an 'H' Prefix After The Gearbox Number On The Tag



SHORT RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	12:34	TQ0300	Same on all sets
2nd	14:29	TQ0301	Same on all sets
3rd	16:29	TQ0302	
4th	18:29	TQ0304	
5th	18:26	TQ0306	
6th	19:25	TQ0308	
MEDIUM RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	12:34	TQ0300	Same on all sets
2nd	14:29	TQ0301	Same on all sets
3rd	15:26	TQ0303	Same as 3rd long & 3rd extra long
4th	18:27	TQ0305	Same as 4th long & 4th extra long
5th	20:27	TQ0307	
6th	20:24	TQ0310	
LONG RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	12:34	TQ0300	Same on all sets
2nd	14:29	TQ0301	Same on all sets
3rd	15:26	TQ0303	Same as 3rd long & 3rd extra long
4th	18:27	TQ0305	Same as 4th long & 4th extra long
5th	20:26	TQ0309	Same as extra long
6th	22:25	TQ0311	
EXTRA LONG RATIO SET			
Gear	**Ratio**	**Part No**	**Notes**
1st	12:34	TQ0300	Same on all sets
2nd	14:29	TQ0301	Same on all sets
3rd	15:26	TQ0303	Same as 3rd long
4th	18:27	TQ0305	Same as 4th long
5th	20:26	TQ0309	Same as 5th long
6th	19:21	TQ0312	

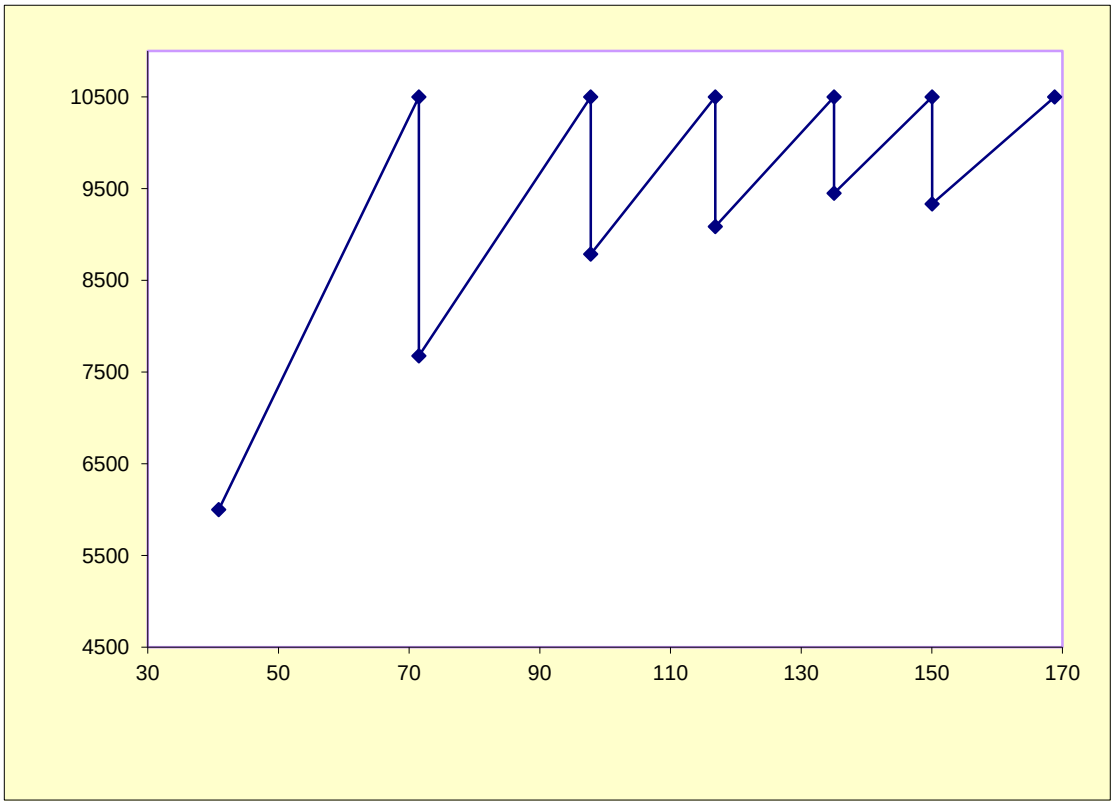
GEAR RATIO CHART – HYPOID – SHORT

Final Drive	8	30	0.2667	**Hypoid Type**	
Bevel Gear	1	1	1.0000		
Transfer gear	1	1	1.0000	**Short**	
Tyre Diameter	0.614	Dunlop			
Max RPM	10500	Max 6th	10500		
Ratio				Speed	Drop
1st	**12**	**34**	0.3529	**71**	
				1363	**2824**
2nd	**14**	**29**	0.4828	**98**	
				724	**1313**
3rd	**16**	**29**	0.5517	**112**	
				724	**1167**
4th	**18**	**29**	0.6207	**126**	
				752	**1086**
5th	**18**	**26**	0.6923	**140**	
				711	**935**
6th	**19**	**25**	0.7600	**154**	



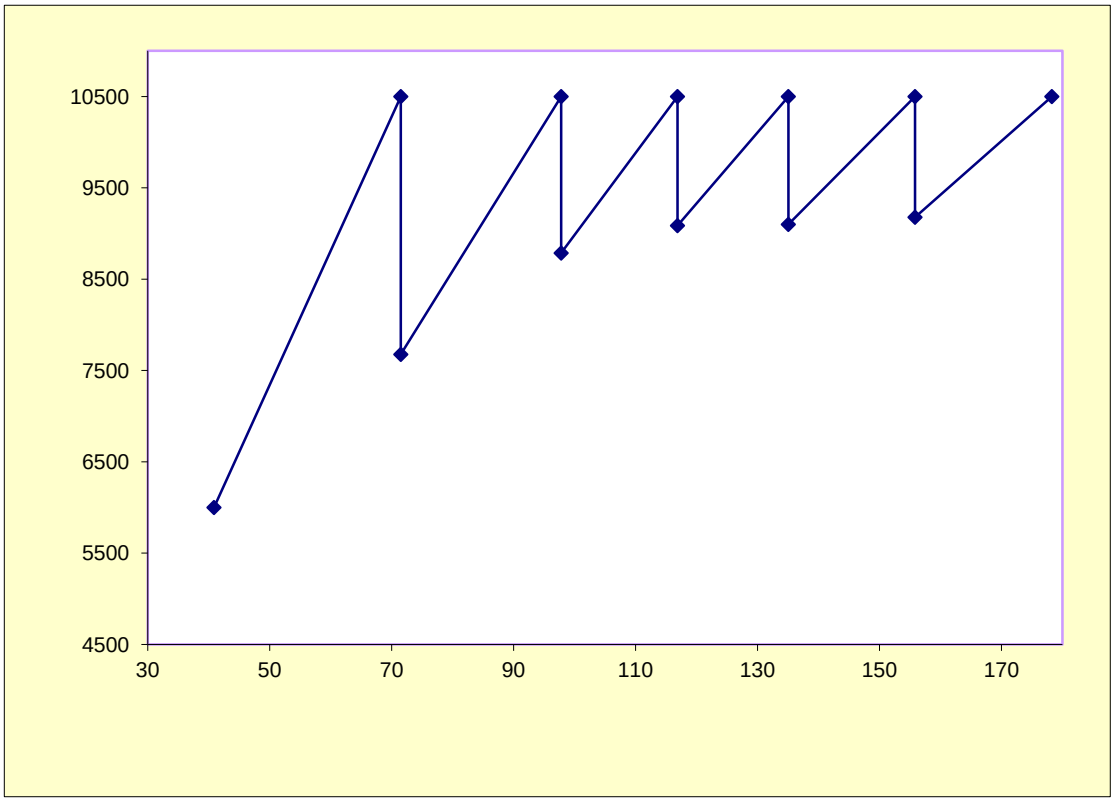
GEAR RATIO CHART – HYPOID – MEDIUM

Final Drive	8	30	0.2667	**Hypoid Type**	
Bevel Gear	1	1	1.0000		
Transfer gear	1	1	1.0000	**Medium**	
Tyre Diameter	0.614	Dunlop			
Max RPM	10500	Max 6th	10500		
Ratio				Speed	Drop
1st	**12**	**34**	0.3529	**71**	
				1363	**2824**
2nd	**14**	**29**	0.4828	**98**	
				989	**1714**
3rd	**15**	**26**	0.5769	**117**	
				942	**1413**
4th	**18**	**27**	0.6667	**135**	
				778	**1050**
5th	**20**	**27**	0.7407	**150**	
				972	**1167**
6th	**20**	**24**	0.8333	**169**	



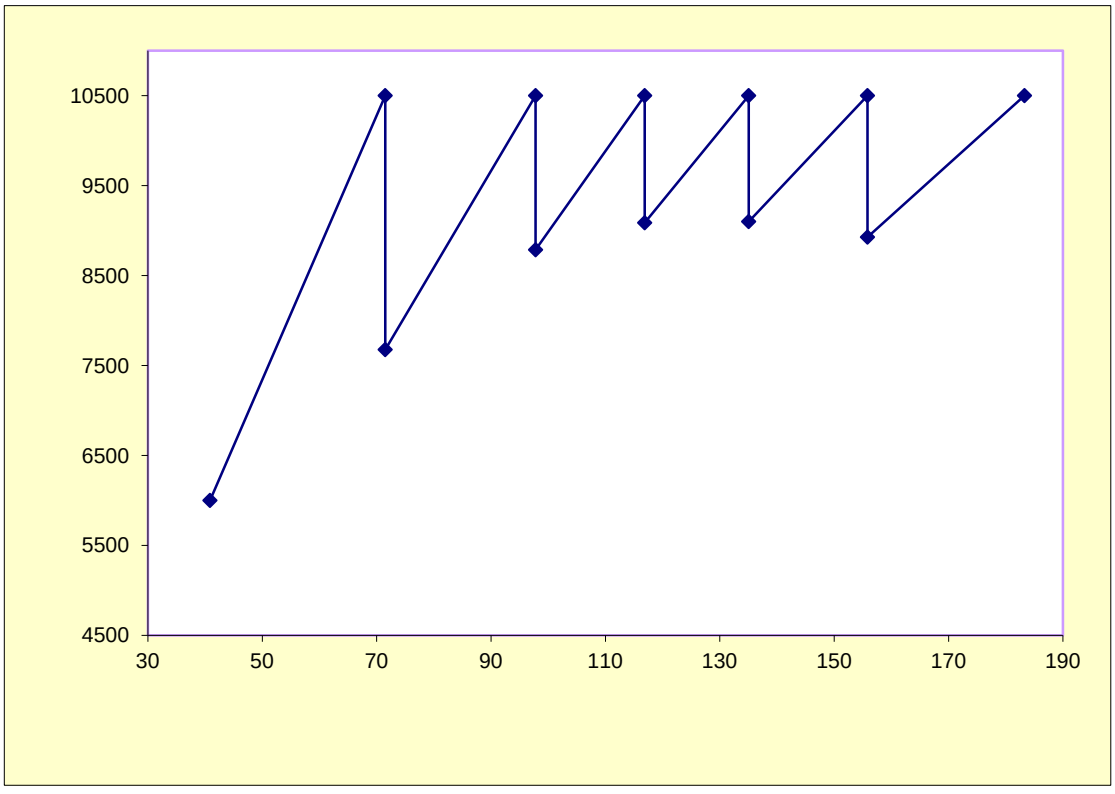
GEAR RATIO CHART – HYPOID – LONG

Final Drive	8	30	0.2667	**Hypoid Type**	
Bevel Gear	1	1	1.0000		
Transfer gear	1	1	1.0000	**Long**	
Tyre Diameter	0.614	Dunlop			
Max RPM	10500	Max 6th	10500		
Ratio				Speed	Drop
1st	**12**	**34**	0.3529	**71**	
				1363	**2824**
2nd	**14**	**29**	0.4828	**98**	
				989	**1714**
3rd	**15**	**26**	0.5769	**117**	
				942	**1413**
4th	**18**	**27**	0.6667	**135**	
				1077	**1400**
5th	**20**	**26**	0.7692	**156**	
				1163	**1322**
6th	**22**	**25**	0.8800	**178**	

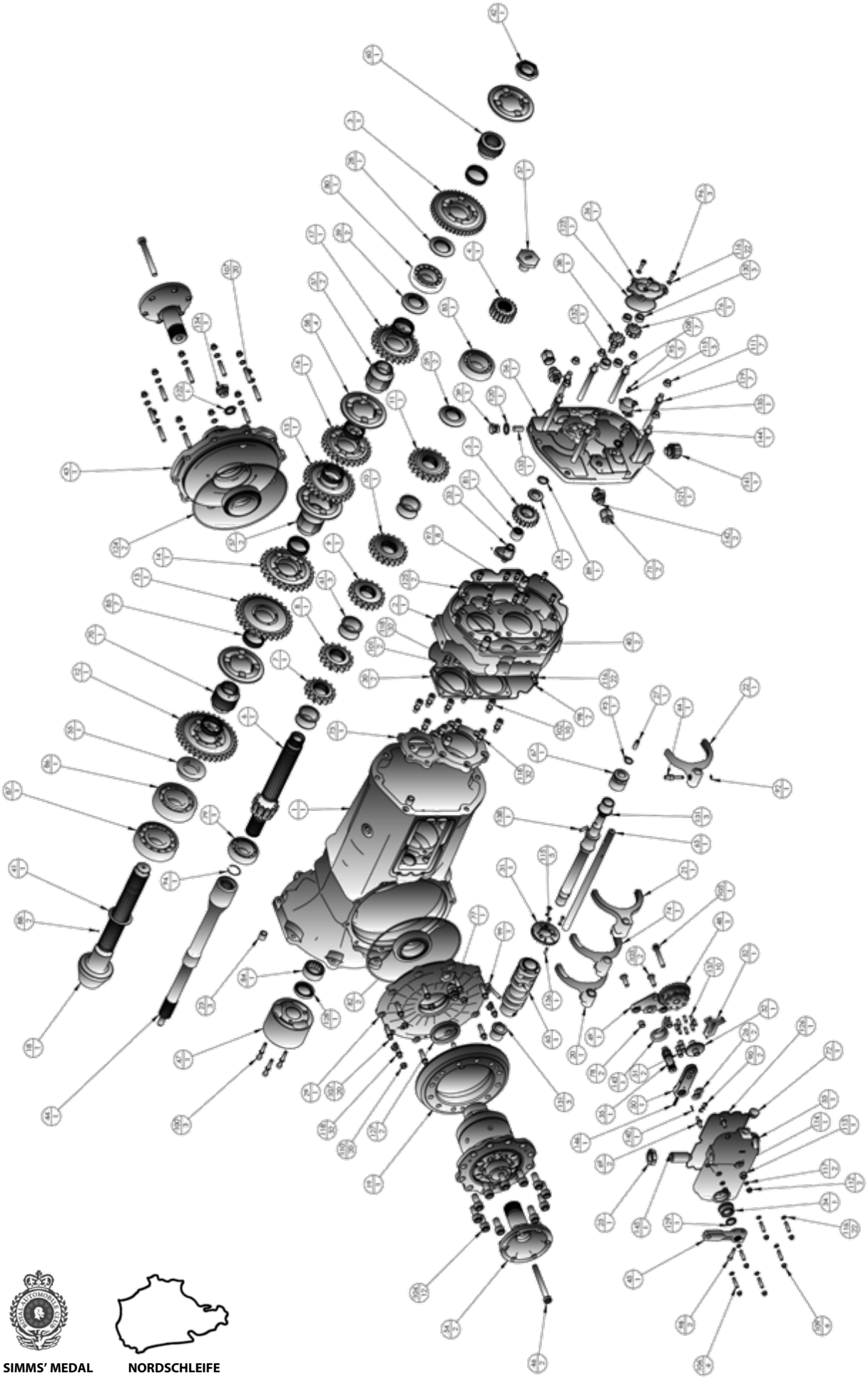


GEAR RATIO CHART – HYPOID – EXTRA LONG

Final Drive	8	30	0.2667	**Hypoid Type**	
Bevel Gear	1	1	1.0000		
Transfer gear	1	1	1.0000	**Extra Long**	
Tyre Diameter	0.614	Dunlop			
Max RPM	10500	Max 6th	10500		
Ratio				Speed	Drop
1st	**12**	**34**	0.3529	**71**	
				1363	**2824**
2nd	**14**	**29**	0.4828	**98**	
				989	**1714**
3rd	**15**	**26**	0.5769	**117**	
				942	**1413**
4th	**18**	**27**	0.6667	**135**	
				1077	**1400**
5th	**20**	**26**	0.7692	**156**	
				1423	**1573**
6th	**19**	**21**	0.9048	**183**	



SR8 (HYPOID) GEARBOX – EXPLODED DRAWING



SIMMS' MEDAL WINNER

NORDSCHLEIFE LAP RECORD HOLDER

Item #	Radical Part #	Supplier Part #	Description	Qty
1	TQ0316	E58G103	Bearing Plate	1
2		E58G105	End Cover	1
3	TQ0164	E58G140	1st Gear - Input (R.2600:1)	1
4		E58G141	2nd Gear - Input	1
5	TQ0159	E58G142	3rd Gear - Input	1
6	TQ0160	E58G143	4th Gear - Input	1
7	TQ0163	E58G144	5th Gear - Input	1
8	TQ0161	E58G145	6th Gear - Input	1
9	TQ0164	E58G246	1st Gear - Output	1
10		E58G247	2nd Gear - Output	1
11	TQ0159	E58G248	3rd Gear - Ouput	1
12	TQ0160	E58G249	4th Gear - Ouput	1
13	TQ0163	E58G250	5th Gear - Ouput	1
14	TQ0161	E58G251	6th Gear - Output	1
15	TQ0186	E58G252	Reverse Gear - Output	1
16	TQ0199	E58G153	Reverse Gear - Input	1
17	TQ0223	E58G181	Pinion - Spiral Bevel (R.4111:1)	1
18	TQ0325	E58G3102	Inner Track (Splined Hub)	2
19	TQ0162	E58G2103	Drive Disc (Dog-ring)	4
20	TQ0323	E58G1104	Thrust Washer	2
21	TQ0193	E58G2106	Inner Track (Reverse Gear)	1
22	TQ0352	E58G1107	Spacer - Input Shaft	3
23	TQ0168	E58G2108	Selector Fork - 5th/6th	1
24	TQ0274	E58G2110	Camdrum Spindle	1
25		E58G2112	Reverse Track (Normal Rotation)	1
26		E58G2112A	Reverse Track	1
27	TQ0170	E58G1113	Selector Fork Support Rod	1
28	TQ0191	E58G2115	Reverse Fork Pin	1
29	TQ0192	E58G2116	Selector Fork - Reverse	1
30	TQ0270	E58G1119	Camdrum (6 Speed Reverse Rotation)	1
31	TQ0249	E58G1126	Index Screw	1
32	TQ0240	E58G1128	Ratchet Claw Stop	2
33	TQ0215	E58G1129	Selector Fork - 3rd/4th	1
34	TQ0317	E58G1130	Inner Track (Splined Hub)	1
35		E58G1EX02	Flare Cap - (5929-06)	2
36	n/a	n/a	n/a	n/a
37	TQ0132	E6G169	Hollow Dowel (M10)	3
38	TQ0341	E15G121	Thrust Washer - Reverse Idler	1
39		E18G164	Housing - Guide Tube	1
40		E18G165	Guide Tube	1
41		E18G466	Slider/Piston	1
42		E18G1176	Fulcrum Ring	1
43		E25G1181	Clutch Unit Spacer	1
44		E32G1118	Washer	2
45	TQ0241	E33G173	Interlock Housing Cap	1
46	TQ0272	E34G144	Sensor Drive Plug	1
47	TQ0268	E34G1112	Thrust Washer - Reverse Gear O/P Shaft	1
48	n/a	n/a	n/a	n/a
49		E42G203	Main Casing	1
50		E42G1093	Crown Wheel - Spril Bevel R4.111:1	1
51	TQ0351	E42G1108	Bearing Retainer Cap	2
52	TQ0214	E42G2111	Selector Fork - 1st/2nd & 3rd/4th	1
53		E42G1115	Drum Bush Flange	1
54	TQ0271	E42G1119	Drum Bevel Gear	1
55	TQ0236	E42G1121	Spool Geal Spindle	1

Item #	Radical Part #	Supplier Part #	Description	Qty
56	TQ0198	E42G2122	Reverse Idler Spindle	1
57	TQ0366	E42G2123	Bush - Gear Change Spindle	1
58	TQ0230	E42G1124	Operating Spindle	1
59		E42G2128	Crownwheel Bearing Retainer Plate	1
60	TQ0227	E42G1183	Cable Operating Arm	1
61	TQ0383	E42G1132	Oil Pump Cover	1
62	TQ0217	E42G3135	Shaft Clamp Screw	1
63	TQ0237	E42G1139	Interlock Plunger Neutral	1
64	TQ0220	E42G2140	Pump Gear Drive	1
65	TQ0355	E42G1152	Threaded Dowel	2
66	TQ0282	E42G1151	End Case Bung	1
67	TQ0371	E42G1153	Pinion Spacer	1
68	TQ0228	E42G1154	Nut - Output Shaft	1
69		E42G1162	Cover - Diff Retainer	1
70	TQ0208	E42G1165	Ball Bearing	1
71		E42G1167	Cover - Diff Retainer	1
72	TQ0298	E42G2179	Input Shaft	1
73		E42G1187	Flange Retaining Bolt	2
74	TQ0234	E42G1203	Bevel Gear Spool	1
75	TQ0239	E42G1213	Clamp Plate Return Spring	1
76	TQ0251	E42G1214	Ratchet Arm Lever	1
77	TQ0235	E42G1215	Ratchet Pin	2
78	TQ0224	E42G1216	Ratchet Claw	1
79	TQ0233	E42G1218	Gear Change Cover	1
80	TQ0197	E43G1017	Reverse Idler Gear	1
81		E52G155	Thrust Washer 1st Gear Output	1
82	TQ0324	A3R142	Oil Pump Gear (Driven)	1
83	n/a	n/a	n/a	n/a
84	TQ0242	F5F107	Hollow Dowel	2
85		QDF2Q	Differential	1
86	TQ0356	209	Bolt	11
87	TQ0134	225	Ball Bearing	2
88	TQ0171	317	Circlip 18mm	1
89		389	Bolt	2
90		442	Bolt	3
91	TQ0026	450	Roller Bearing	1
92	TQ0246	455	Circlip	2
93		471	Bolt	2
94	TQ0219	475	Gearbox Oil Seal	2
95		480	Bolt	1
96		507	Bolt	5
97	TQ0255	519	Bolt	7
98	TQ0218	584	Gearbox Oil Seal	1
99		595	Sellock Pin	1
100		609	O-Ring Seal	1
101		684	Bolt	10
102		758	Nut - Nylock M6	2
103		775	Bolt	2
104	TQ0295	797	Bush	2
105		801	Bolt	2
106		817	Washer	1
107	TQ0245	831	Dowel	12
108	TQ0221	838	Roller Bearing	1
109	TQ0201	842	Roller Bearing	1
110	TQ0229	870	Taper Roller Bearing	2

Item #	Radical Part #	Supplier Part #	Description	Qty
111	TQ0143	879	Schnorr Washer M6	22
112	TQ0144	880	Schnorr Washer M8	30
113		881	Schnorr Washer M10	15
114	TQ0283	883	Magnet End Case Bung	1
115	TQ0202	939	Dowel	1
116		971	Nut - Nyloc M8	1
117		988	Bolt	1
118	TQ0200	1003	Gearbox Bearing	1
119	TQ0294	1013	Bearing	1
120		1022	Circlip - Internal	1
121	TQ0039	1035	Gearbox Oil Breather	1
122		1070	Washer	2
123	TQ0287	1071	Oil Seal	1
124		1109	Schnorr Washer M4	7
125	TQ0247	1124	Washer	2
126	TQ0205	1156	Roller Bearing	7
127	n/a	n/a	n/a	n/a
128	TQ0203	1240	Circlip	1
129		1261	Washer	1
130	TQ0344	1271	Bush	3
131	TQ0296	1295	Bush	2
132	TQ0273	1296	Dowel	1
133	TQ0361	1297	Bush	1
134		1310	Bearing	1
135	TQ0243	1389	Bolt	2
136	TQ0244	1399	Bolt	1
137	TQ0348	1441	Dowty Seal	1
138	TQ0209	1451	Roller Bearing	1
139	TQ0276	1454	Plug	2
140	TQ0326	1460	Stud	20
141	TQ0248	1463	Stud	6
142	TQ0211	1465	Stud	7
143		1466	Nut - Kaylock M10	7
144		1467	Nut - Kaylock M8	20
145		1468	Nut - Kaylock M6	6
146		1469	Washer	2
147		1488	O-Ring	1
148		1489	O-Ring	1
149		1490	O-Ring	1
150		1584	Hose Union	2
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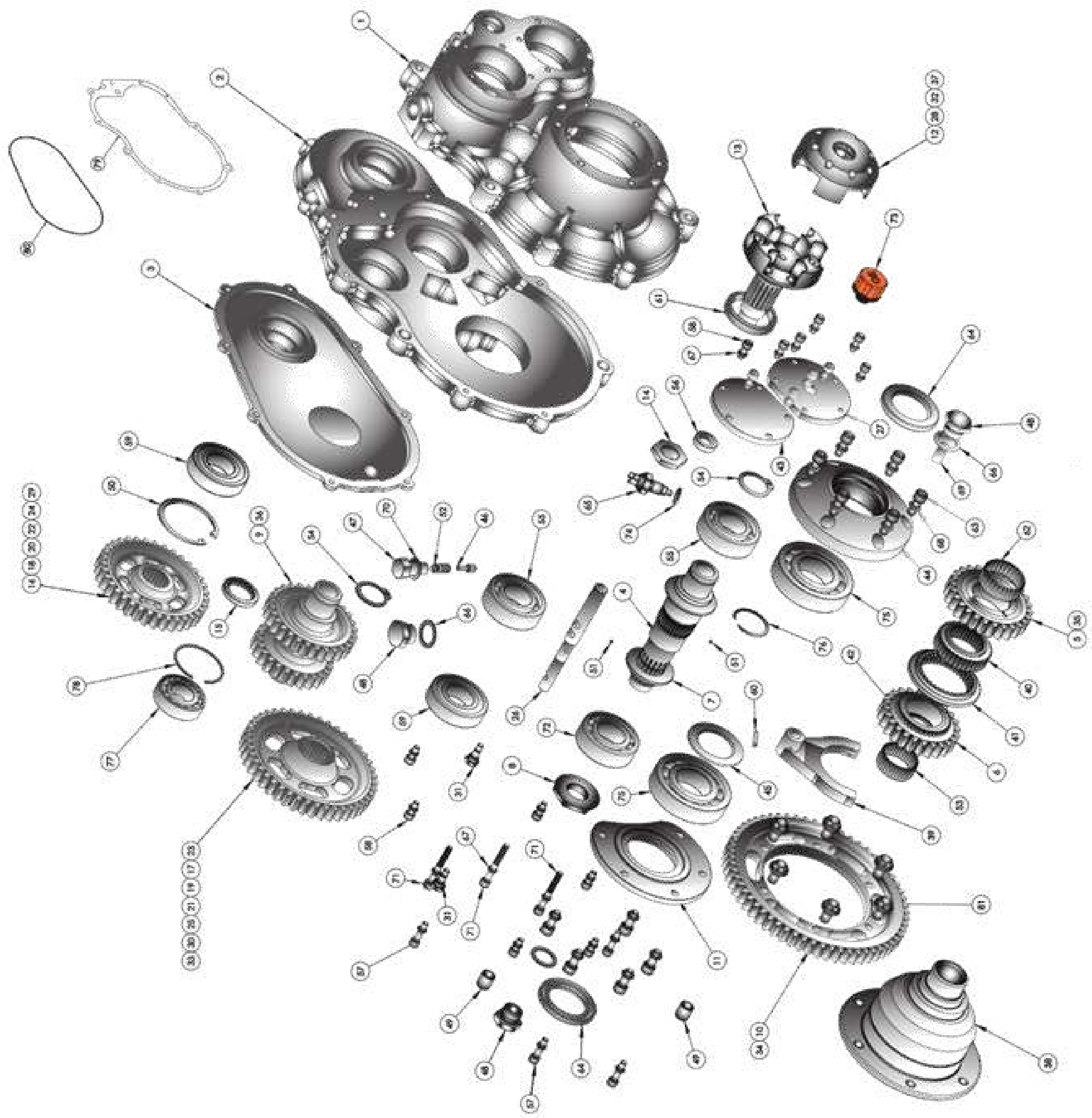
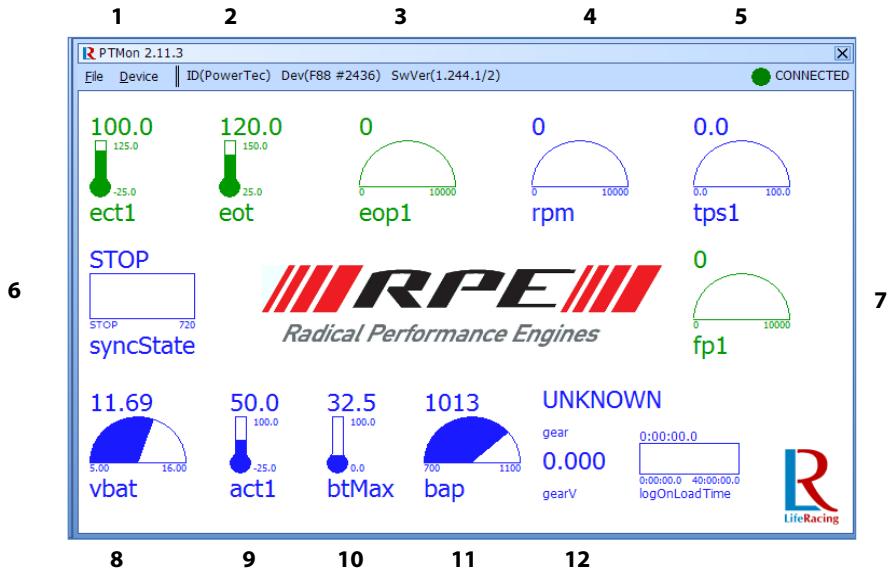
164				
165	TQ0225	1641	Ratchet Spring	1
166	TQ0194	1732	Circlip External	1

SR3 GEAR DRIVE UNIT – EXPLODED DIAGRAM



No.	Part Number	Serial No.	Description	Qty.
1	TQ0111	A3R105	Rear Case	1
2	TQ0112	A3R105	Front Case	1
3	TQ0050	A3R107	Gear Ratio Cover Plate	1
4	TQ0040	A3R108	Main Shaft	1
5	TQ0115	A3R109	Reverse Gear - Main Shaft	1
6	TQ0014	A3R110	Forward Gear - Main Shaft	1
7	TQ0116	A3R111	Thrust Washer - Main Shaft	1
8	TQ0037	A3R112	Locknut - Main Shaft (Left-hand Thread)	1
9	TQ0117	A3R113	Idler Shaft (incorporating 24T & 28T GEARS)	1
10	TQ0002	A3R114	Crownwheel R2.500:1	1
11	TQ0118	A3R115	Differential Bearing Retainer	1
12	TQ0035	A3R116	Coupling (K7 Engine)	1
13	TQ0036	A3R117	Coupling/Input Shaft	1
14	TQ0038	A3R118	Locknut - Input Shaft (Right-hand Thread)	1
15	TQ0073	A3R119	Spacer - Input Gear	1
16	TQ0049	A3R120	Gear Ratio - Input Shaft, R3.594:1	1
17	TQ0049	A3R121	Gear Ratio - Main Shaft, R3.594:1	1
18	TQ0048	A3R122	Gear Ratio - Input Shaft, R3.409:1	1
19	TQ0048	A3R123	Gear Ratio - Main Shaft, R3.409:1	1
20	TQ0047	A3R124	Gear Ratio - Input Shaft, R3.235:1	1
21	TQ0047	A3R125	Gear Ratio - Main Shaft, R3.235:1	1
22	TQ0046	A3R126	Gear Ratio - Input Shaft, R3.071:1	1
23	TQ0046	A3R127	Gear Ratio - Main Shaft, R3.071:1	1
24	TQ0045	A3R128	Gear Ratio - Input Shaft, R2.917:1	1
25	TQ0045	A3R129	Gear Ratio - Main Shaft, R2.917:1	1
26	TQ0119	A3R230	Selector Rod	1
27	TQ0120	A3R134	Rear Bearing Cover, (Input & Idler)	1
28			Coupling Heavy-duty(K7 Engine)	1
29	TQ0044	A3R136	Gear Ratio - Input Shaft, R2.770:1/ R2.508:1	1
30	TQ0044	A3R137	Gear Ratio - Main Shaft, R2.770:1	1
31	TQ0121	A3R139	Stud - Gear Ratio Cover Plate	2
32			Coupling Heavy-duty (K8 Engine)	1
33		A3R148	Gear Ratio - Main Shaft, R2.508:1	1
34		A3R149	Crownwheel, R2.32:1	1
35		A3R150	Forward Gear (Synchro) - Main Shaft.	1
36		A3R151	Idler Shaft (incorporating 25T & 28T GEARS)	1
37	TQ0187	A3R152	Coupling (K8 Engine)	1
38	TQ0122	F7Z501	Differential	1
39	TQ0054	A1R203	Selector Fork	1
40	TQ0123	A1R115	Drive Hub	1
41	TQ0124	A1R116	Drive Disc (Synchro Engagement)	1
42	TQ0125	A1R120	Dog Ring (Synchro) Forward Gear - Input Shaft	1
43	TQ0126	A2R109	Bearing Cover	1
44	TQ0127	A2R114	Differential Bearing Retainer Long	1
45	TQ0128	A2R124	Spacer - Differential Front End	1
46	TQ0129	E3U128	Index Plunger	1
47	TQ0130	E3U127	Index Plunger Housing	1
48	TQ0131	E2G127	Filler Plug	3
49	TQ0132	E6G169	Hollow Dowel (to suit M10)	2
50	TQ0133	0042	Circlip - Internal	1
51	TQ0134	0225	Ball Ø 1/8	2
52	TQ0113	0242	Spring - Compression	1
53	TQ0135	0245	Bearing - Roller 35x40x17	1
54	TQ0145	0280	Circlip - External	2
55	TQ0136	0304	Bearing - Ball 30x62x20	2
56	TQ0057	0378	Oil Seal - 14x24x7	1
57		0389	Socket Head Capscrew M6x1.0x25 LG	4
58		0442	Socket Head Capscrew M6x1.0x16 LG	16
59	TQ0137	0546	Bearing - Ball 30x62x16	2
60		0596	Sellock Pin Ø 4x22 LG	1
61	TQ0030	0616	Oil Seal - 42x55x8	1
62	TQ0138	0665	Bearing - Roller 40x45x17	1
63		0684	Socket Head Capscrew M8x1.25x20 LG	11
64	TQ0033	0748	Oil Seal - 40x62x7	2
65	TQ0053	0836	Reverse Light Switch	1
66	TQ0031	0861	Washer - 20mm bore, with oil seal	3
67	TQ0143	0879	Washer - Schnorr type M6	23
68	TQ0144	0880	Washer - Schnorr type M8	11
69	TQ0283	0883	Magnet - Cylindrical Ø 10x20 LG	1
70	TQ0149	0972	Washer - Ø 14mm bore with oil seal	1
71		0991	Socket Head Capscrew M6x1.0x50 LG	3
72	TQ0139	1009	Bearing - Roller 30x62x20	1
73	TQ0039	1015	Breather 3/8 BSPTx19 TPI	1
74	TQ0148	1069	Washer - Ø 12mm bore with oil seal	1
75	TQ0140	1184	Bearing - Ball 1.500x3.250x0.750	2
76	TQ0142	1206	Circlip - External (plain)	1
77	TQ0141	1209	Bearing - Roller 25x52x15	1
78	TQ0146	1210	Circlip - Internal (plain)	1
79	TQ0019	1362	Gasket - Paper (Front/Rear Casing Seal)	1
80	TQ0028	1363	O-Ring - (Gear Ratio Cover Plate)	1
81	TQ0110	1476	Crownwheel Bolt	6

PTMON – SCREEN LAYOUT



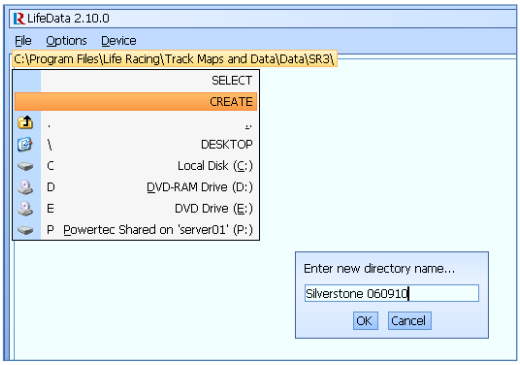
1. Engine coolant temperature (ect1) – changes from red to green when in correct range of 60°C to 95°C
2. Engine oil temperature (eot) – changes from red to green when in correct range of 50°C to 120°C
3. Engine oil pressure (eop1) – At idle, 70 psi when cold /20 psi when hot
4. Engine rpm (rpm) – Engine should idle between 1500 and 1800rpm
5. Throttle position sensor (tps1) – needs to be set to 4% at idle
6. Engine sync state – should be at 720° when engine is running, turns green when correct
7. Fuel pressure (fp1) – changes from red to green when in correct range 2.8 bar to 3.2 bar
8. Battery voltage (vbat) – above 12.5 volts when engine is running
9. Air charge temperature sensor (act1) – air inlet temperature
10. Engine ECU temperature (btMax) – temperature of the engine ECU
11. Baro sensor pressure (bap) – below 1030 mBar
12. Gear Indicator – Should be Neutral when starting. Gear position voltage displayed for technical use

Life Data is used to download the engine data from the ECU's internal memory to a PC. The instructions below explain how to do this.

1. Connect a computer to the ECU/car and turn both the ignition and master switches on to power up the ECU.
2. A working directory now needs to be created. This selects the folder in which the data will be stored once it has been downloaded, and sets a route to find the information. It contains the name of the driver and/or car number etc. For example C:\Program Files\Life Racing\Track Maps & Data\SR3 (SR5, SR8)\Customer\ Track & Date.
3. Open the Life Data icon on your desktop.
4. Select F for file, then W for working directory.
5. At the top of the screen, below the toolbar will be;

   C:\Program Files\Life Racing\Track maps & Data

   If not, correct this part by selecting the full stop button… it goes back one section. Then by selecting "create", a box comes up with "enter new directory name". Enter the appropriate information, such as car type, chassis number, circuit and date. Once this is done, press Enter.



   If on the other hand this has been set up the next part will be in the drop down box i.e. Track maps & Data, SR3 or SR5 or SR8, customer name, track & date. All you then need to do is select the appropriate item until it is complete.

6. Highlight "select" & press return.
7. A box comes up with "there is no LR directories config file at: - Create one – select Yes.
8. Another box with "place shortcut on desktop" select No.
9. Then select D for device and R for read data.
10. In the next box select ok. If this data needs to be looked at, load up Life View, click on File, Load and then find as above the appropriate file. Once you have loaded up a data file, the channels will be listed down the right hand side of the screen, to display a channel highlight it using the arrows on the keyboard and press enter.

    If the data needs to be e-mailed go through My computer, Program Files, Life Racing, Track maps & Data, sr3/sr5/sr8, customer, track & date select file or files to be e-mailed.

Act1

Air charge temperature.
This is the sensor in the airbox. This should be a constant line without large variations in reading (spiking). If this sensor has failed it will read 10°c.

Bap

Barometric air pressure.
This sensor is mounted near the engine ECU. It measures atmospheric pressure and compensates the calibration for altitude and air pressure. This should be a constant line also without large variations in readings (spiking). If this sensor has failed it will read 1013

Btmax

ECU internal temperature.

Clutch switch.

This is the button mounted onto the steering wheel. (Neutral button)

Ect1

Engine Coolant Temperature.
Minimum temperature before driving should be 50°c. When the car is running on the track, a minimum temperature of 70°c should be seen. If required, tape should be placed over a section of the radiator to increase the temperature. If this is required, then the temperature throughout the day should be monitored to ensure the engine temp is around 85°c. Maximum driving water temperature should not be over 95°c.

Engineenable

this is used to show when the eop1trip has stopped the engine. (Or any other trip)

Eop1

Engine Oil Pressure
The oil pressure trace should follow a similar profile to engine rpm. With the engine on power and above 9000rpm the oil pressure should not go below 50psi. If the oil pressure drops against engine revs, Powertec should be contacted and data sent.

If a drop is seen, then it is generally indicating low oil level in the oil tank or oil loss.

Eopt1trip

this shows where the threshold is for the oil pressure trip. If the oil pressure drops below this line for more than 1 second, the engine will turn off automatically.

Eot

Engine Oil Temperature
Minimum on load oil temperature should be 50°c and a maximum of 130°c. Normal running temperature should be around 105c.

Fp1

Fuel Pressure
This should be no higher than 3.5 bar and no lower than 2.5 bar with the engine running.

Gear

this shows what gear the gearbox is in at the time.

Gearbliprequest

this shows the request sent from the ECU to blipper solenoid.

Gearblipstate

this shows what signal the calibration is sending to the blipper solenoid.

Gearcutdogkickcount

Shows the number of times the ECU has had to briefly re-instate the power to "kick" the gear off the dogs.

Gearcutrequest

this shows when the paddle switch has asked for a gearcut to change gear. If you experience gear changing problems, then this can be monitored to ensure that the LIFE engine ECU is receiving a gear cut signal.

Gearcutstate	this show what state the cut is in, in relation to what has been set in the calibration.
Geardownshiftoutput	This shows the output signal from the ECU to the downshift solenoid.
Gearshiftdecision	This is a good thing to check if you are having gear change issues, as this show you if the shift has been ignored by the ECU, and shows you why it ignored it.
Gearupshiftoutput	This shows the output signal from the ECU to the downshift solenoid.
Gearshiftstate	Shows you what state the gearshift is in, in relation to the calibration.
Gearv	this shows the voltage that the gear position sensor is seeing, in relation to the selector barrel movement.
Gsp	Gear system pressure. This shows the pressure in the air tank.
Gspcontrol	this shows the signal from the ECU to the compressor motor.
Lam1	this shows the reading from the exhaust lamba sensor (if fitted)
Paddleswitch	this shows the input signal from the steering wheel paddles. I.e. which paddle the driver has used.
Revlimitactive	this shows when the rev limiter has been activated.
Rpm	engine speed If constant over-revs are seen (over 10,500 rpm), then the driver needs to be advised to adjust his driving style as this is causing damage to the engine. An over-rev should be no more than 10,800 maximum. Anything over this, then Powertec should be contacted.
Runmode	this shows whether the engine is running, stopped, cranking etc.
Runtime	this show the engine run time per session i.e. from when the engine is started, to when it is turned off.
Syncstate	This shows the state of the injector firing. It can also be used to check whether the crank and camshaft position sensors are working. If the camshaft sensor is not working, then the syncstate will show 360.
Tps1	throttle position sensor This should be constant in relation to the driver's throttle input. Also at idle, this should be set to 4.0
Tpsclosed	this shows when the tps is in it closed position.
Vbat	battery voltage. This shouldn't drop below 11 volts when on load.

Life View is used to view engine data which has been downloaded from the ECU to a PC.

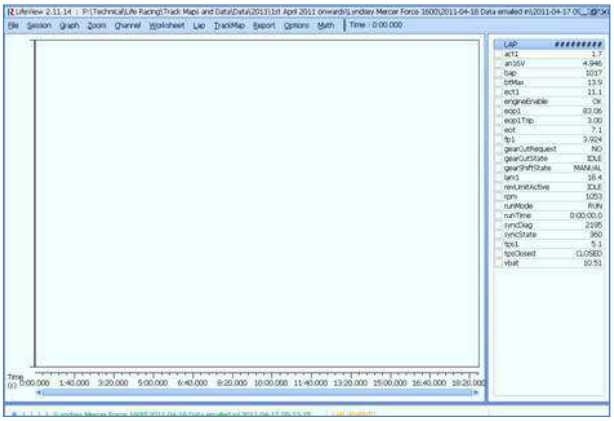
Once you have downloaded the data using LifeData following the download instructions on the previous page, the data which is extracted from the ECU will be saved in the 'Working Directory' folder you set up.

There are two types of files that the computer extracts from the ECU. These are session files which have the extension .LRD and logbook files which have the extension .LB.

The session files contain the data from a particular run or outing (from when the engine is started to when the engine stops). The time and date that the session began is in the name of the session file. The session files contain a trace of all the channels recorded, such as oil pressure, coolant temperature, throttle position etc.

To view the data, load LifeView. Once it has loaded, press F for file and L for load. Then find the data you are trying to open (which will be in the working directory you set up before you downloaded it). When you get to the data, you should see a list of session files. Highlight the one you want to load up and press enter to load it.

When the session file opens, you should see a screen like this:



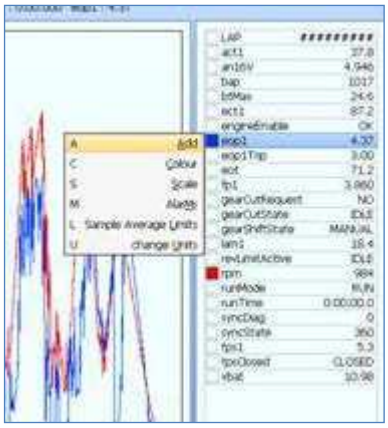
The logged channels are listed down the right hand side. To display a trace of a channel, scroll down the list to the channel you want to view using the up and down arrow and then press enter to display a trace of the channel.

Some of the names are abbreviated;

eop1 = *Engine oil pressure,*
ect1 = *Engine coolant temperature etc.*

You can load up as many of these channels as you like, in order to overlay them on each other.

The colour of the trace and scale of the channels axis can be changed by right clicking on the channel in the list on the right hand side, as shown to the right.



The logbook file contains quite a lot of information. It has an overall record which records some important minimum and maximum values that the engine has reached and the total time the engine has been running for since it was built or re-built.

The logbook also records some important minimum and maximum values for each session that the engine has run.

Loading up a logbook is similar to loading up a session file. When in LifeView, press F for File and B for LogBook. The logbook will be stored in the same folder as the session files, so navigate to that folder. When you get there, the logbook will not show up in the menu but if you scroll to select using the up and down arrows, details of the logbook will come up, as shown in the picture below. Press Enter to load the logbook.

AIM DATA SOFTWARE

To download data from your AIM data logger you must first have the Race Studio 2 Software package installed on your laptop. This package should include Race Studio 2, Race Studio Analysis and SmartyManager.

RACE STUDIO 2

The Race studio 2 is used primarily to download the data from the data logger and save it on your PC for later analysis in Race Studio Analysis. Race Studio is also used to configure and calibrate your data logger. Configuration shouldn't need to be carried out once the system is initially set up unless additional sensors are added (eg, brake pressure sensors, suspension potentiometers). Calibration should be carried out before each race weekend or trackday meeting.

NOTE: If you are getting a message "Impossible to connect to Data Logger" this is probably due to not having the USB Drivers installed for Aim properly. If this occurs please refer to the AIM Manual.

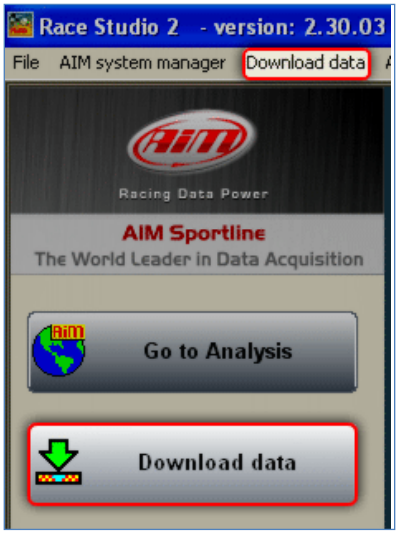
RACE STUDIO ANALYSIS

The Race Studio Analysis software is where you can view all of the "runs" that you have downloaded from your AIM data logger.

Smart Manager (only applicable if AIM SmartyCam is installed)

Smart Manager is used to configure the SmartyCam to display various outputs from the data. For example the throttle position, brake position, RPM, Speed, Lap times etc. You also carry out firmware updates for the SmartyCam through SmartyManager.

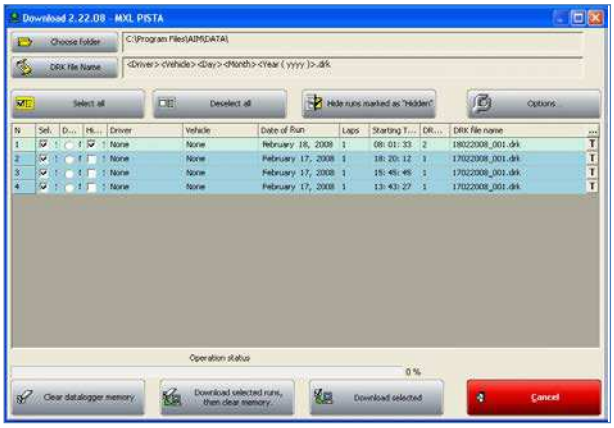
DOWNLOADING DATA FROM THE AIM DATA LOGGER (MXL PISTA DASH)



As stated above you must have Race Studio 2 installed on your PC. The following steps will talk you through how to get the data downloaded onto your PC.

1. Connect your laptop to the car via a data download cable and power on the device (turn on the master switch)
2. Open Race Studio 2 and click on the "Download Data" icon on the left hand side. This will open the pop-up download window.

3. This pop-up download window displays all of the runs currently stored on the logger with the date and time of each run.



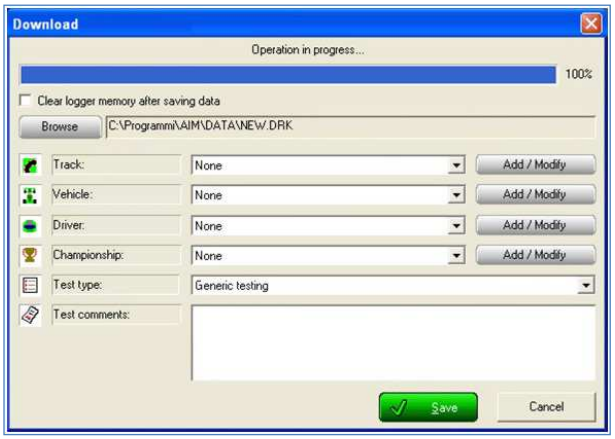
4. Previously downloaded runs will not be selected automatically so you should be able to click on "Download selected" or "Download selected runs, then clear memory". It is recommended that you "Download selected" and leave a backup on the logger until you have backed up the data from your PC to another storage device (e.g., a USB key).

5. The progress bar at the bottom indicates that the data is being downloaded.

6. When the download progress bar reaches 100% another window opens with the option to input some details about the session to make it easier to identify which session to look at later on in Race Studio Analysis. This is an important step so identify as many variables as possible (eg, vehicle, driver, track, test type and add a comment). The name for the file is automatically generated.

7. Click the OK or Save button and the progress bar indicates when the saving is complete.

8. The data is now downloaded and saved on your PC for analysis in Race Studio Analysis.

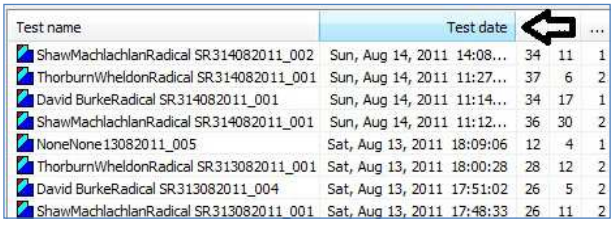


VIEWING PREVIOUSLY DOWNLOADED AIM DATA IN RACE STUDIO ANALYSIS

Having downloaded the data from your device using Race Studio 2 you can now view it and analyse it in Race Studio Analysis.

1. Open Race Studio Analysis.

2. The data that you have downloaded is automatically put into the "**Test Database**". The test database can be arranged by any of the variables, but the most useful one is to arrange by date so that the latest downloaded data is at the top. Click on the **Test Date** shown here



3. To open a particular test simply double click on the test you wish to open.

Test name	Test date	...	...	...
ShawMachlachlanRadical SR314082011_002	Sun, Aug 14, 2011 14:08...	34	11	1
ThorburnWheldonRadical SR314082011_001	Sun, Aug 14, 2011 11:27...	37	6	2
David BurkeRadical SR314082011_001	Sun, Aug 14, 2011 11:14...	34	17	1
ShawMachlachlanRadical SR314082011_001	Sun, Aug 14, 2011 11:12...	36	30	2
NoneNone13082011_005	Sat, Aug 13, 2011 18:09:06	12	4	1
ThorburnWheldonRadical SR313082011_001	Sat, Aug 13, 2011 18:00:28	28	12	2
David BurkeRadical SR313082011_004	Sat, Aug 13, 2011 17:51:02	26	5	2
ShawMachlachlanRadical SR313082011_001	Sat, Aug 13, 2011 17:48:33	26	11	2

4. The blue icon on the left turns yellow on tests that are open.

5. This opens up the test and shows various options along the bottom of the screen that can be selected by clicking on them. As shown below:-

6. The **Test Database** tab takes you back to the Test Database and enables you to open more tests or close open tests

7. The **Lap Manager** tab will show laps times including in and out laps.

8. The **Measures Graph** tab is used to compare variables such as Speed, Throttle Position, Brakes Pressures etc between 2 or more laps

9. The **Channels Report** tab is used to look at Maximum and Minimum values for certain variables. This is a useful tool for assessing the engines temperatures and pressures.

RECOMMENDED GEAR RATIO CHART

Circuit	SR8 Rx 2.7 Quaife	SR3 1500cc Gear Drive	PR6 1500cc Sprockets	Aero	Note / Warning
Almeria	Short	3.071:1		H	
Anglesey	Short	3.235:1		H	
Ascari	Medium	3.071:1		M	Hard on tyres
Barcelona	Medium	3.071:1		M	Abrasive, hard on tyres. If warm, reduce camber
Brands Hatch Indy	Short	3.235:1	16/49	H	
Brands Hatch GP	Short	3.235:1		M	
Cadwell Park	Short	3.40:1		H	Lots of droop, no rebound
Castle Combe	Medium	3.071:1		M	Very bumpy, soften damping
Croft	Short	3.235:1		M	
Dijon Prenois	Long	2.917:1			
Donington GP	Short	3.235:1		M	Brakes!
Donington National	Short	3.235:1		M	Brakes!
Estoril	Long	2.917:1		L	Quite bumpy
Hungaroring	Medium	3.235:1		M	
Imola	Long	3.071:1		L	Raise ride height for last chicane
Laguna Seca	Medium	3.071:1			
Mallory Park	Short	3.235:1	16/49	H	
Monza	Long	2.917:1	16/46	L	Rear camber – max 1½°
Nürburgring GP	Short	3.235:1		M	
Oulton Park Int'l.	Short	3.235:1		M	
Oulton Park Island	Short	3.235:1		M	
Paul Ricard	Medium	3.071:1		M	
Pembrey	Short	3.235:1	16/49	M	
Portimao	Medium	3.071:1		L	Very bumpy, soften damping
'Red Bull' Ring	Medium	3.071:1		M	
Rockingham	Medium	3.071:1	16/47	M	
Silverstone Arena	Medium	3.071:1	16/46	L	
Silverstone Int'l.	Medium	3.071:1		L	
Silverstone National	Short	3.235:1	16/49	L	
Snetterton 200	Medium	3.071:1		L	
Snetterton 300	Medium	3.071:1		L	
Spa-Francorchamps	Medium	3.071:1	16/47	M	Rear camber – max 1½°
Thruxton	Long	2.917:1	16/46	L	Rear camber – max 1½°
Valencia	Medium	3.235:1		M	Abrasive
Zandvoort	Medium	3.235:1		M	Very low grip circuit

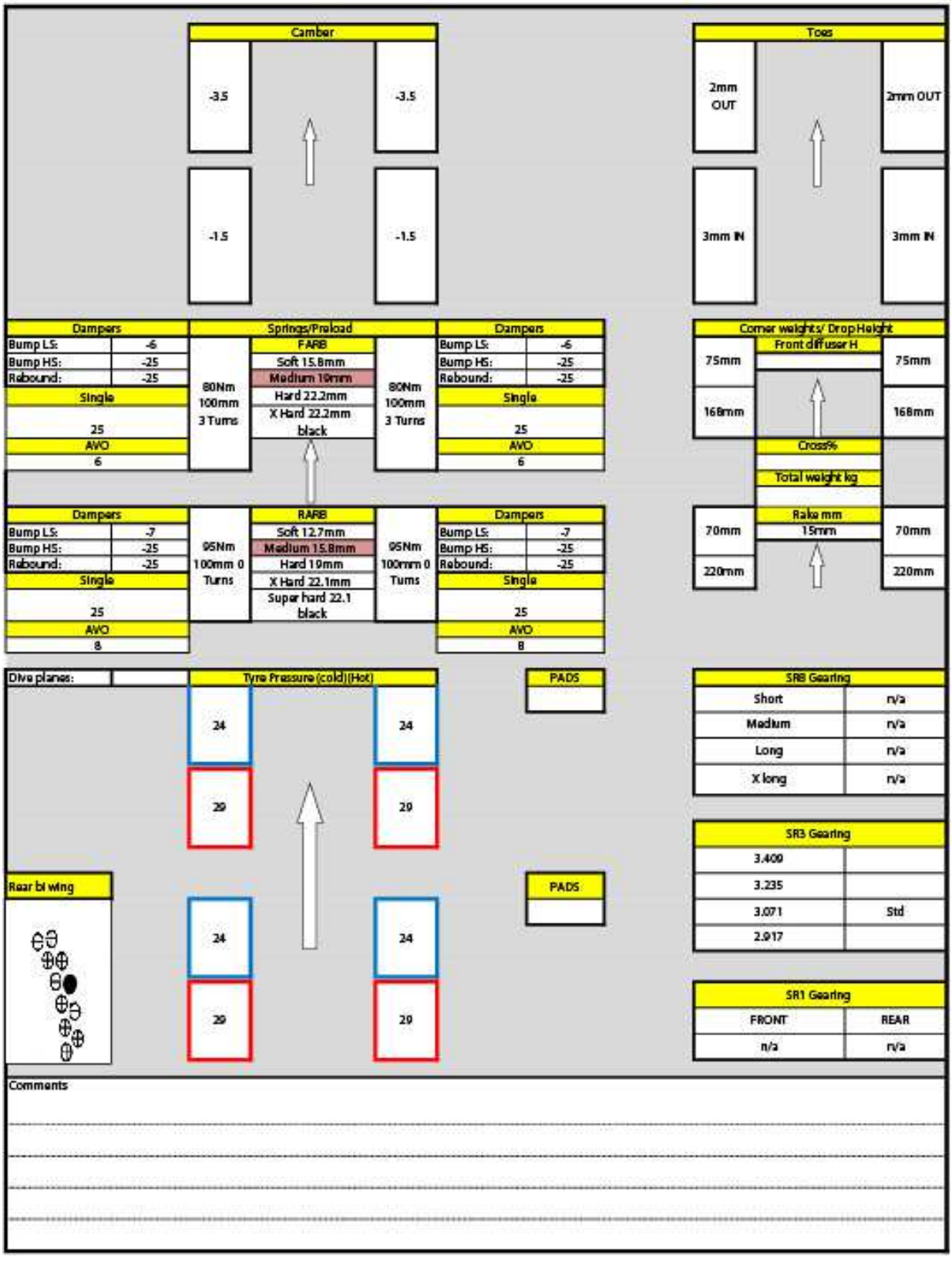
FASTEST RADICAL LAPS

(NOT Qualifying)

Date	Track	Car	Time	Driver
10/09/2011	Anglesey	PR6	01:27.001	Mark Boot
10/09/2011	Anglesey	SR3	01:26.088	James Abbott
15/09/2012	Brands Hatch GP	SR3	01:24.953	Matthew Bell
04/06/2011	Brands Hatch GP	SR8	01:22.572	Alex Brundle
15/09/2012	Brands Hatch GP	PR6	01:25.557	Mark Abbott
14/08/2010	Brands Indy	PR6	00:46.482	Darren Luke
14/08/2010	Brands Indy	SR3	00:45.192	Alex Kapadia
14/08/2010	Brands Indy	SR8	00:44.029	Ross Kaiser
02/09/2012	Cadwell Park	SR3	01:23.323	Matthew Bell
02/09/2012	Cadwell Park	PR6	01:26.033	Ben Dimmack
17/07/2010	Castle Combe	PR6	01:05.241	Darren Luke
17/07/2010	Castle Combe	SR3	01:04.180	Rob Wheldon
17/07/2010	Castle Combe	SR8	01:01.980	Ross Kaiser
25/09/2010	Donington Park National	PR6	01:06.653	Darren Luke
25/09/2010	Donington Park National	SR3	01:06.532	Rob Wheldon
25/09/2010	Donington Park National	SR8	01:02.974	Rob Huff
21/08/2010	Hungaroring	SR3	01:49.407	Marco Cencetti
21/08/2010	Hungaroring	SR8	01:45.906	F. Rouvier
02/07/2011	Imola	SR3	01:48.703	Stuart Moseley
02/07/2011	Imola	SR8	01:43.620	Per Staaf
27/06/2010	Nurburgring	SR3	02:00.568	Marco Cencetti
27/06/2010	Nurburgring	SR8	01:57.469	Jamie Patterson
14/05/2011	Oulton Park International	SR3	01:36.143	Stuart Moseley
28/07/2012	Oulton Park International	PR6	01:38.479	James Breakell
28/07/2012	Oulton Park International	SR8	01:33.328	Stuart Moseley
31/05/2010	Oulton Park Island	SR3	01:21.876	Stuart Moseley
26/05/2007	Oulton Park Island	SR8	01:18.350	Stuart Moseley
21/07/2012	Paul Ricard	SR8	02:05.421	James Littlejohn
21/07/2012	Paul Ricard	SR3	02:09.790	Rob Wheldon
26/06/2010	Pembrey	PR6	00:55.236	Darren Luke
26/06/2010	Pembrey	SR3	00:54.484	Colin Millar
26/08/2012	Red Bull Ring	SR8	01:30.128	Stuart Moseley
26/08/2012	Red Bull Ring	SR3	01:36.743	Rob Wheldon
10/04/2010	Rockingham	Clubsport	01:24.918	Andrew Harwood
10/04/2010	Rockingham	PR6	01:19.219	Jonathan Wright
10/04/2010	Rockingham	SR3	01:18.274	Rob Wheldon
10/04/2010	Rockingham	SR8	01:15.947	Ross Kaiser
16/04/2011	Silverstone Arena	SR3	02:03.692	Stuart Moseley
16/04/2011	Silverstone Arena	SR8	01:57.151	Alex Sims
10/09/2010	Silverstone GP	PR6	02:04.980	Ben Jackson
10/09/2010	Silverstone GP	SR3	02:04.592	Marco Cencetti
10/09/2010	Silverstone GP	SR8	01:59.957	Jamie Patterson
12/05/2012	Silverstone National	SR3	00:55.222	Bradley Smith
12/05/2012	Silverstone National	PR6	00:56.663	Ben Dimmack
09/05/2010	Snetterton	PR6	01:07.212	Gary Cane
09/05/2010	Snetterton	SR3	01:08.073	Colin Millar
16/10/2011	Snetterton 300	SR3	01:49.381	Stuart Moseley
10/03/2012	Snetterton 300	SR8	01:44.730	Bradley Ellis
10/03/2012	Snetterton 300	PR6	01:50.583	Martin Brooks
08/05/2010	Spa	PR6	02:25.465	Per Staaf
08/05/2010	Spa	SR3	02:26.385	Marco Cencetti
08/05/2010	Spa	SR8	02:16.774	Ross Kaiser
28/08/2010	Thruxton	PR6	01:13.518	Darren Luke
28/08/2010	Thruxton	SR3	01:11.943	Stuart Moseley
28/08/2010	Thruxton	SR8	01:09.175	Ross Kaiser
24/07/2010	Zandvoort	SR3	01:40.945	Marco Cencetti
24/07/2010	Zandvoort	SR8	01:37.748	Dean Stoneman

SR3 SETUP SHEET

Date		Circuit		Length	
Car		Lap Record		Conditions	



SIMMS' MEDAL WINNER

NORDSCHLEIFE LAP RECORD HOLDER

SR8 SETUP SHEET

Date		Circuit		Length	
Car		Lap Record		Conditions	

Camber

-3.5	-3.5
-1.0	-1.0

Toes

2mm OUT	2mm OUT
3mm IN	3mm IN

Dampers		Springs/Preload	Dampers	
Bump LS:	-6	FARB	Bump LS:	-6
Bump HS:	-25	Soft 15.8mm	Bump HS:	-25
Rebound:	-25	Medium 19mm	Rebound:	-25
		Hard 22.2mm		
95Nm 100mm 3 Turns		X Hard 22.2mm black	95Nm 100mm 3 Turns	

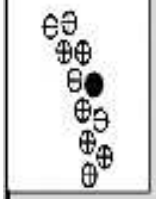
Dampers		RARB	Dampers	
Bump LS:	-7	Soft 12.7mm	Bump LS:	-7
Bump HS:	-25	Medium 15.8mm	Bump HS:	-25
Rebound:	-25	Hard 19mm	Rebound:	-25
		X Hard 22.1mm		
110Nm 100mm 0 Turns		Super hard 22.1 black	110Nm 100mm 0 Turns	

Corner weights/ Drop Height

	Front diffuser H	
75mm		75mm
168mm		168mm
	Cross%	
	Total weight kg	
70mm	Rake mm 15mm	70mm
220mm		220mm

Dive planes:		Tyre Pressure (cold)[(Hot)		PADS
		24	24	
		30 to 32	30 to 32	
		24	24	
		30 to 32	30 to 32	

Rear bl wing



PADS

SR8 Gearing

Short	
Medium	Std
Long	
X long	

SR3 Gearing

3.409	n/a
3.235	n/a
3.071	n/a
2.917	n/a

SR1 Gearing

FRONT	REAR
n/a	n/a

Comments

SIMMS' MEDAL WINNER

NORDSCHLEIFE LAP RECORD HOLDER

VERY WET SETUP GUIDE

Camber		
½° less negative		½° less negative
¼° less negative		¼° less negative

Toe		
Do NOT change		Do NOT change
Do NOT change		Do NOT change

Dampers		Springs / pre-load			Dampers	
Bump LS	5 softer	Front anti-roll bar			Bump LS	5 softer
Bump HS	10 softer	5Nm softer, same P/L	Next softest	5Nm softer, same P/L	Bump HS	10 softer
Rebound	5 softer				Rebound	5 softer

Corner Weights / Ride Height		
Do NOT change		Do NOT change

Dampers		Rear anti-roll bar			Dampers	
Bump LS	5 softer	10Nm softer	Next softest	10Nm softer	Bump LS	5 softer
Bump HS	10 softer				Bump HS	10 softer
Rebound	5 softer				Rebound	5 softer

Do NOT change	Do NOT change

Dive Planes	Plus 1	Tyre Pressure (cold)		
		Hot slick minus 2psi		Hot slick minus 2psi
Rear Wing		Hot slick minus 2psi		Hot slick minus 2psi
Main				
Flap	Up 1 hole			

Brake Balance
3 turns to rear

OVERNIGHT CHECKLIST

Damper Settings		
	FRONT	**REAR**
Rebound		
High Speed Bump		
Low Speed Bump		

ALL SHOCKS TO BE SET AT FULL SOFT OVERNIGHT

Damper Platform Set Up

Pushrod Length

Trackrod Length

Brake Bias

How many turns from full forward?

Rear Wing Settings

Main Plane - Lowest=1, Highest=4

Flap - Lowest=1, Highest=11

Mark Fuel Cap

Use PTMon to help diagnose your fault (see page 42)

Engine trip (cuts out on track)

Check:

- Oil pressure
- Fuel pressure
- Water temp.
- Oil temp.
- Battery voltage

Engine turns but will not start

Check Spark

Good/strong spark

Check Fuel Pressure?

LOW (<2.5bar)

Check:

- Car has more than 15l fuel in tank?
- Faulty regulator?
- Faulty fuel pump?
- Fuel filter – either blocked or fitted wrong way round
- Fuel filter seal not swollen
- Fuel pump wiring

GOOD (3.0-3.2bar)

Check:

- TPS is set to 4.0 on idle & working
- Throttle bodies open & close correctly
- Throttle bodies not fully shut or open too far
- Check engine compression

Spark weak/absent

Check:

- Battery voltage is over 10V under cranking
- Crank sensor connected
- Power supply (at battery terminals / master switch)
- Earth connections on engine & chassis
- ECU has power (if not, no reading on dash)
- Coil plug has 12V
- Faulty coils?
- Faulty ECU wiring harness
- Check circuit breakers

Engine will not turn over

Check:

- Battery voltage
- Starter motor
- Starter solenoid (SR3)
- Wiring connections all secure (battery/engine/chassis)
- Circuit breakers
- Engine fault – contact R.P.E.

If engine still won't start, download data for emailing to Radical / R.P.E. technical support:-

Ted Hurrell ted@RadicalPerformanceEngines.com
Rich Webb technical1@RadicalPerformanceEngines.com
Derek White technical@RadicalSportscars.com

TROUBLE-SHOOTING GUIDE – ENGINE MIS-FIRE

Use PTMon to help diagnose your fault (see page 42)

Which Cylinder is mis-firing?

If not one specific cylinder, or mis-fires is just at high revs

Check:

- Master Switch connection, ignition switch a& battery connections
- Fuel is not contaminated
- TPS is working & set at 4.0 at idle
- Water Temp sensor has not failed
- Main battery has 12V under load (SR3 with 24V starting only)

Check Spark

Good/strong spark

Check:

- Fuel Pressure is good
- Injectors plugged in properly & functioning
- TPS is working & set at 4.0 at idle
- Throttle bodies not fully shut or open too far
- Cylinder compressions
- Spark plug gaps are correct

Spark weak/absent

Try:

- Replacing spark plug
- Replacing HT lead

(If the coil is faulty, two cylinders will have no spark i.e. 1&4, or 3&4)

Check:

- Main battery has 12V under load (SR3 with 24V starting only)
- Coil wiring is not faulty
- Download data and check BTMax parameter (ECU temperature reading) to check for spike in temps recorded

If engine still won't start, download data for emailing to Radical / R.P.E. technical support:-

Ted Hurrell ted@RadicalPerformanceEngines.com
Rich Webb technical1@RadicalPerformanceEngines.com
Derek White technical@RadicalSportscars.com

As of 2010, all radical cars that have the paddle shift option fitted new from the factory, will be fitted with a closed loop paddle shift system that is controlled by the engine ECU.

This system relies on a magnetic gear position sensor fitted internal on SR3 Hayabusa engine, and on the end of the gearbox, nearest the rear of the car, on the SR8, and SR3 SL

Most gear change problems can be diagnosed by downloading the engine management data, and viewing the items listed below -

paddleswitch this parameter shows when the switch has been operated by the driver, and which paddle the driver pulled.

gear this shows what gear the gearbox is in

gearv this shows the signal that the sensor is sending back to the ECU. It is in direct relationship to the movement of the selector barrel. This can be used to check for interference to the sensor

It can also be used to determine gear change actuator operation. If the **paddleswitch** has been operated but this channel shows no signs of change, then the gear change actuator isn't moving or there is a fault with the mechanic side of the gearbox i.e. selector mechanism is jammed.

tps This shows throttle position. This can be viewed to determine whether the throttle is being blipped on the downshift.

If there is no jump in the **tps** trace when the downshift paddle is being pulled, then 95% of the time, it won't downshift.

gearshiftdecision This is a vital parameter to view when diagnosing paddle shift problems, as this shows you if the ECU has disallowed a gearshift.

There a number of settings in the ECU that are used to control the operation of the shift system.

An example is **TPS**. If the throttle is over 20% when the downshift paddle is pulled, then it won't change down. This is to prevent over-revving the engine.

gsp This shows the pressure of the paddle shift system. If this is too low, the system won't operate. (This will show up in the **gearshiftdecision** data).

It can also be used to determine a fault with one of the actuators. For example, if the **gsp** value drops when the paddle shift is operated, it indicates that the distribution valve block is operating. If the **gsp** doesn't drop, then the valve block is not operating. (

gsp control this shows when the ECU has asked for the compressor to be turned on. If this is showing "on", but the compressor is not operating, then there is a problem with either the compressor relay, the connections, or the compressor itself is not operating.

rpm is the rpm is over 9200, the gear will disallow a downshift. This is to prevent damage to the engine.

vehicle speed/ flspeed/ fr/speed

These three channels are used to determine vehicle speed. On some models, the system is programmed to disallow downshifts into neutral while the car is moving. This is to prevent accident mis-shifts into reverse

vbat this channel is viewed to check the electrical supply to the system. (complete car electrical system). If the charging system is not working, the paddle shift system (and many other systems on the car) won't operate correctly.

Below are listed some other common problems that will affect the shift operation

DOWNSHIFT

wiring to steering wheel paddles this can be caused if the driver removes the steering wheel aggressively without disconnecting the dash plug

throttle cable is slack this must be kept adjusted as the blipper actuator pulls on the cable to achieve the throttle blip

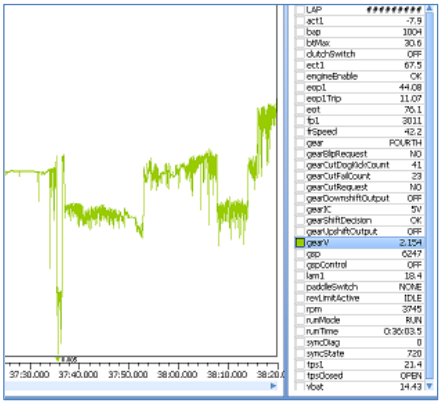
gear shift actuator operation the gear change actuator must be able to rotate freely on the bearings at both ends, but must have NO movement in the horizontal direction. i.e play in the bearings

gear change actuator adjustment This must be set so that the actuator shaft has the same amount of travel in both directions.

This can be set using a jig that can be obtained from Radical, or by using a steel ruler to measure the amount of travel. Adjustment is made using the rod end on the end of the shaft.

valve block faulty this unit controls both the downshift part of the gear change actuator operation, and also operates the throttle blipper actuator.

interference or damage to gear sensor At right is an example of inference of the gear position sensor. This can affect both upshift and downshift.



wiring to steering wheel paddles	this can be caused if the driver removes the steering wheel aggressively without disconnecting the dash plug
	gear change actuator adjustment (as described above)
	system leaks
	gear change valve block faulty
	paddle switch wiring on steering wheel damaged

system changes gear without paddle operation this can be caused by damage to the steering wheel paddle wiring.

Both upshift and downshift will affected by bad electrical connections, poor battery voltage, air leaks in the system, and interference or damage to the gear position sensor.

Any problems that are related to a specific gear i.e. works 3rd to 4th, but not any others, would usually indicate a mechanical fault within the gearbox.

Above all, any gear change issues should be addressed immediately, as failure to do so will cause gearbox and potentially engine damage and invalidate the engine warranty.

IF YOU REQUIRE ASSISTANCE WITH ANY GEAR-SHIFT RELATED PROBLEMS, YOU CAN EMAIL THE DOWNLOADED ENGINE DATA TO:

technical@RadicalSportscars.com and / or technical1@RadicalPerformanceEngines.com