



RADICAL SR10 OWNERS MANUAL



**24 Ivatt Way Business Park
Westwood
Peterborough
PE3 7PG
United Kingdom**

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Dear Radical Owner,

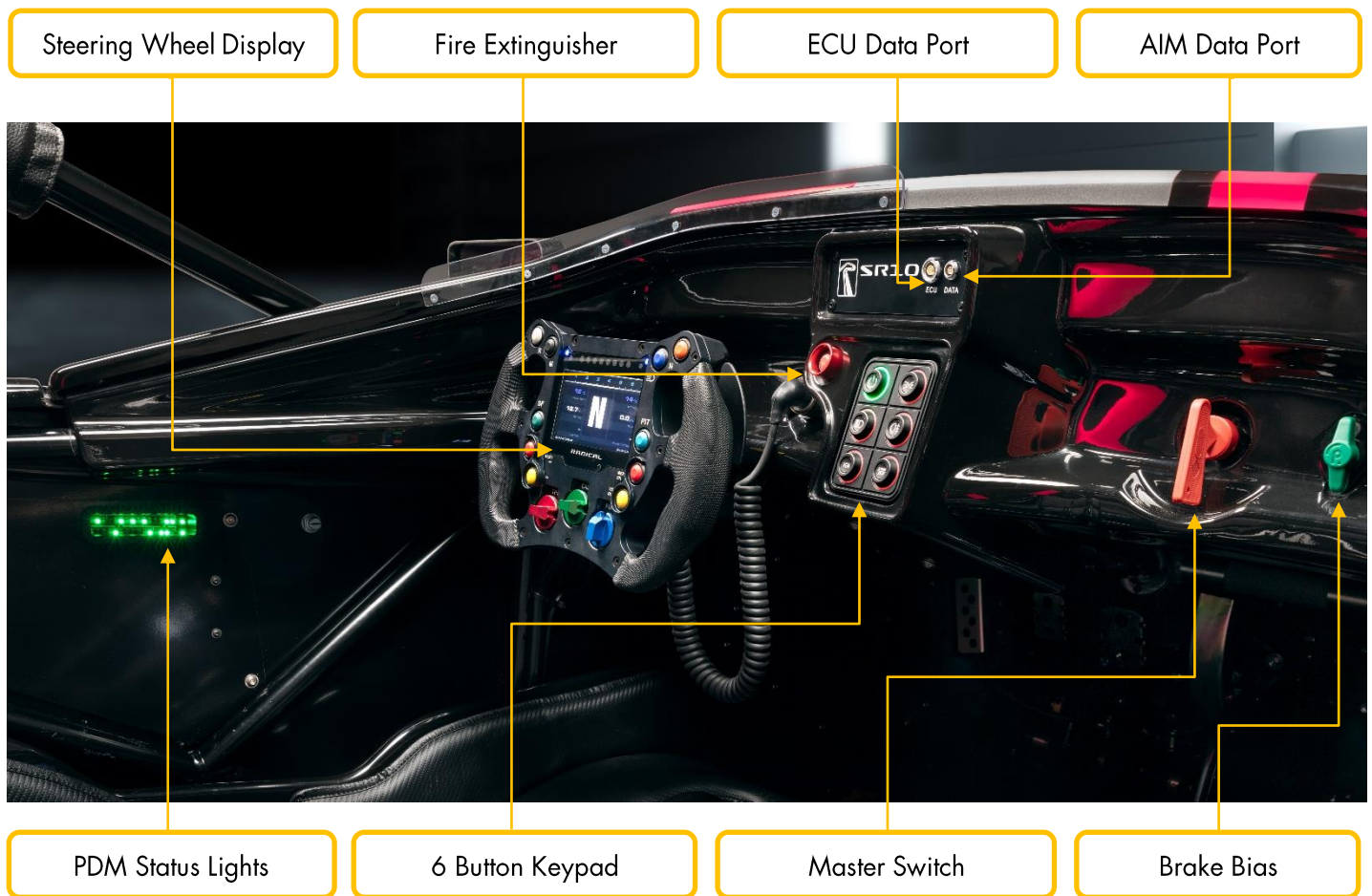
Thank you for purchasing your Radical SR10 and 'welcome' to the worldwide Radical family.

If properly maintained your SR10 will give you an amazing driving experience, every time you head down the pit lane. Although your car has been built and thoroughly inspected at the Peterborough factory prior to you reading this, please take the time to read through this manual to expand your knowledge of the car. This manual aims to guide you through every aspect of running and maintaining your car.

You will find any further help and support via our website www.radicalsportscars.com or alternatively please contact your local dealer. Parts and consumables can be purchased through our online store, whilst any race series information, sales or technical advice you may need is just an email away.

1. INTRODUCTION TO YOUR CAR

1.1 COCKPIT LAYOUT



1.2 STEERING WHEEL CONTROLS

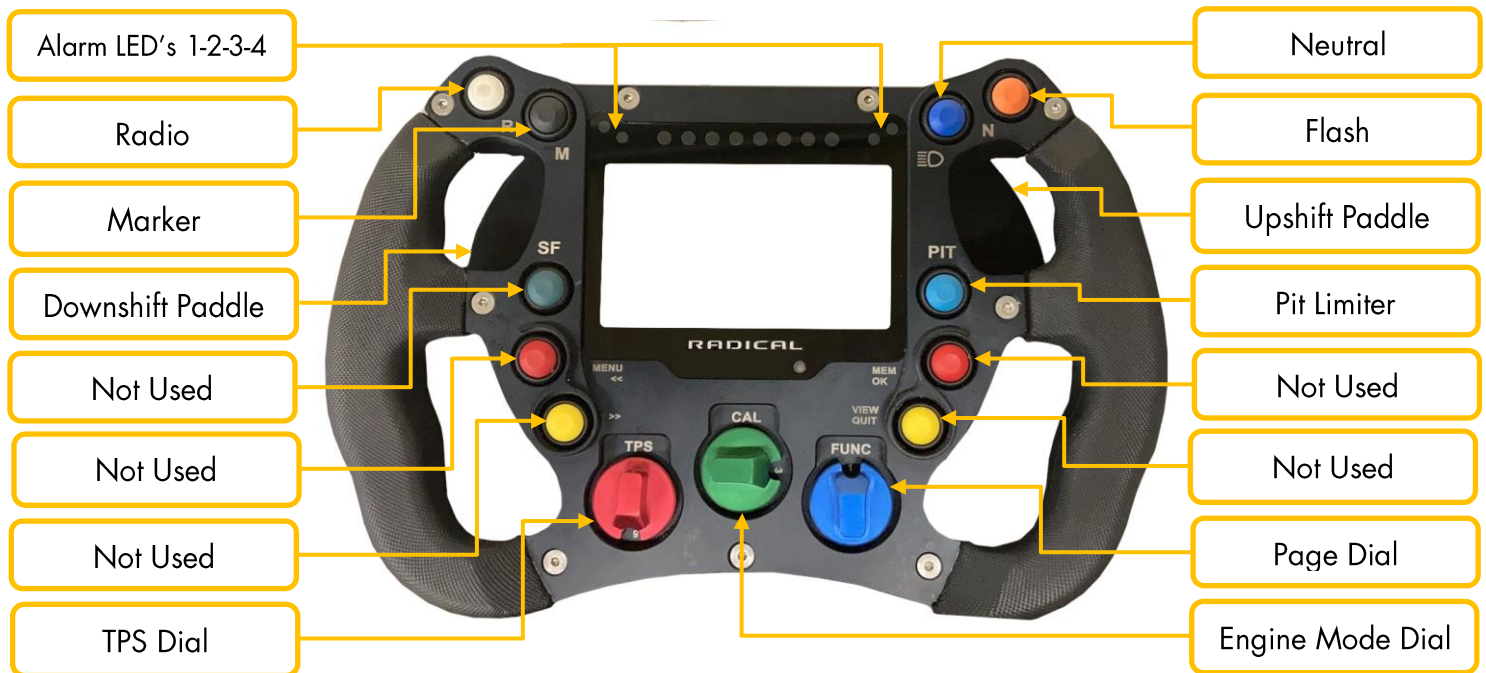
The steering controls are shown below:

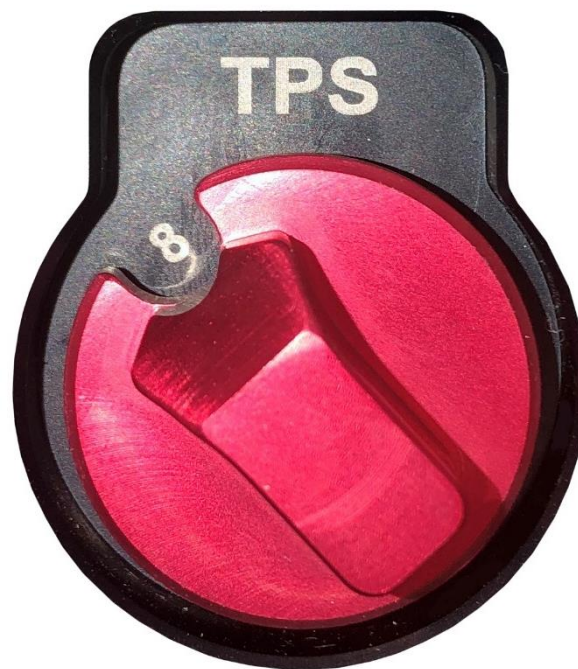
Radio: Push to talk

Marker: Creates a marker in the data to highlight a handling or running issue e.g.

Flash: Momentary flash of the DRL's

The dials are explained on the next few pages.





The TPS dial is an 8-position switch, the first four positions limit the maximum throttle that can be achieved. The last four will change the throttle response. The drive by wire motor gives full control, giving the driver an opportunity to adjust the sensitivity of the pedal to throttle body opening, to suit their preference or driving conditions.

For example, when driving in the rain, switching from Map 7-8 to Map 5 would make the car a lot more driveable, reducing the chance of losing traction when applying the throttle.

The switch positions are explained below:

- 1.** 50% Power Reduction
- 2.** 37.5% Power Reduction
- 3.** 25% Power Reduction
- 4.** 12.5% Power Reduction
- 5.** Progressive Throttle Map
- 6.** Linear Throttle Map
- 7.** Aggressive Throttle Map
- 8.** More Aggressive Throttle Map

1.4 CAL DIAL



The CAL dial is an 8-position switch, this dial is simply used for adjusting the engine power. Position 8 is full power. Power is reduced by 25bhp with every position down from there.

This could be used to save fuel, or to reduce the power output if the car is being driven by an inexperienced driver.

The switch positions are explained below:

- 1.** 250bhp
- 2.** 275bhp
- 3.** 300bhp
- 4.** 325bhp
- 5.** 350bhp
- 6.** 375bhp
- 7.** 400bhp
- 8.** 425bhp



The FUNC dial is an 8-position switch, this dial is used for cycling through the display pages on the wheel.

When warming up the car pages 7-8 can be viewed to monitor all the channels to check for any issues. Switching to page 3, brake bias can be viewed on the fly and adjusted for the conditions.

The pages are explained below:

- 1.** Running page +/-
- 2.** Running page predictive
- 3.** Brake Bias
- 4.** Tyre Pressure
- 5.** Alternate running page 1 +/-
- 6.** Alternate running page 2 +/-
- 7.** Warm up page 1
- 8.** Warm up page 2

1.6 COCKPIT CONTROLS

Once the master switch has been turned on, the PDM is operated using the 6-button keypad in the centre of the dash, **all these buttons are momentary switches, they will not function correctly if held down.**

To dry crank for oil pressure, ensure the IGN is off. Then hold the start/stop button until you see oil pressure.

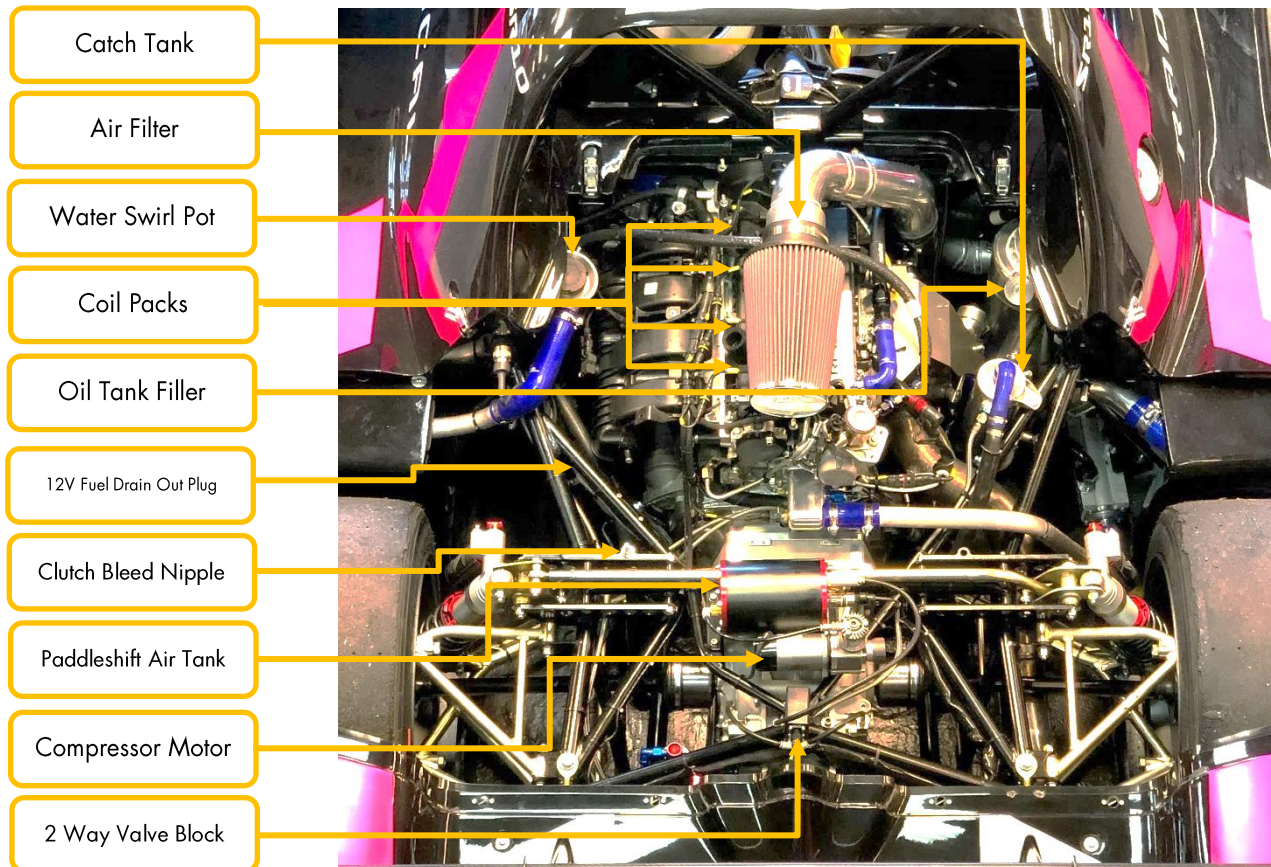


1.7 ALARMS

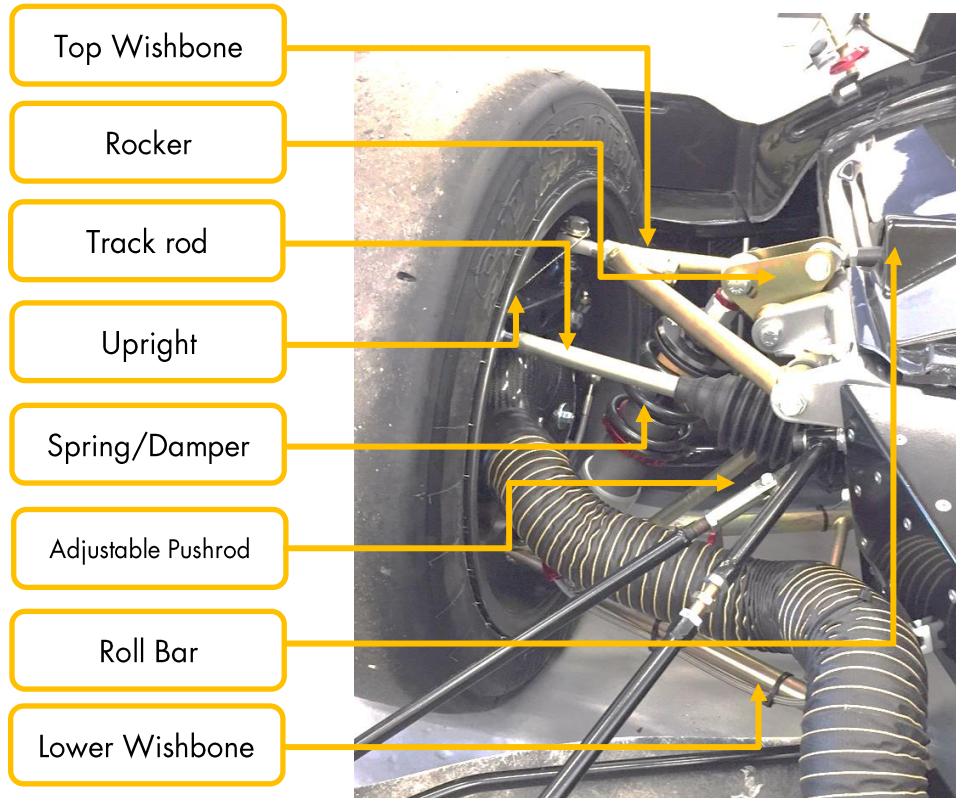
The table below shows the alarms that can show on the display on the wheel, see page 25 for more information on ECU parameters, trips etc.

Dash Alarms		
Alarm	Condition	Warning Lights
High Water Trip	engineEnable = ECT Trip	LED 1+2+3+4 Flashing Red
Engine Cold	EOT<45 & RPM>3000	LED 1+4 Continuous Blue
Fuel Press Trip	engineEnable = FP Trip	LED 1+2+3+4 Flashing Red
Oil Pressure Trip	engineEnable = EOP Trip	LED 1+2+3+4 Flashing Red
Pit Limit	PitLimActive=On	LED 3+4 Continuous Green
PDM Fault	PDM Fault Warning = On	LED 2 Continuous Yellow
High Water Temp	ECT1>100	LED 1 Continuous Red
High Oil Temp	EOT>120	LED 4 Continuous Red
Low Fuel Pressure	FP1<5.0 & RPM>50	LED 3 Continuous Yellow
Low Oil Temp	EOT<50	LED 4 continuous Blue
Low Water Temp	ECT1<60	LED 1 Continuous Blue
Low Battery V	VBAT<11.9	LED 3 Continuous Cyan
Flash	Flash = On	LED 1+2+3+4 Continuous Cyan

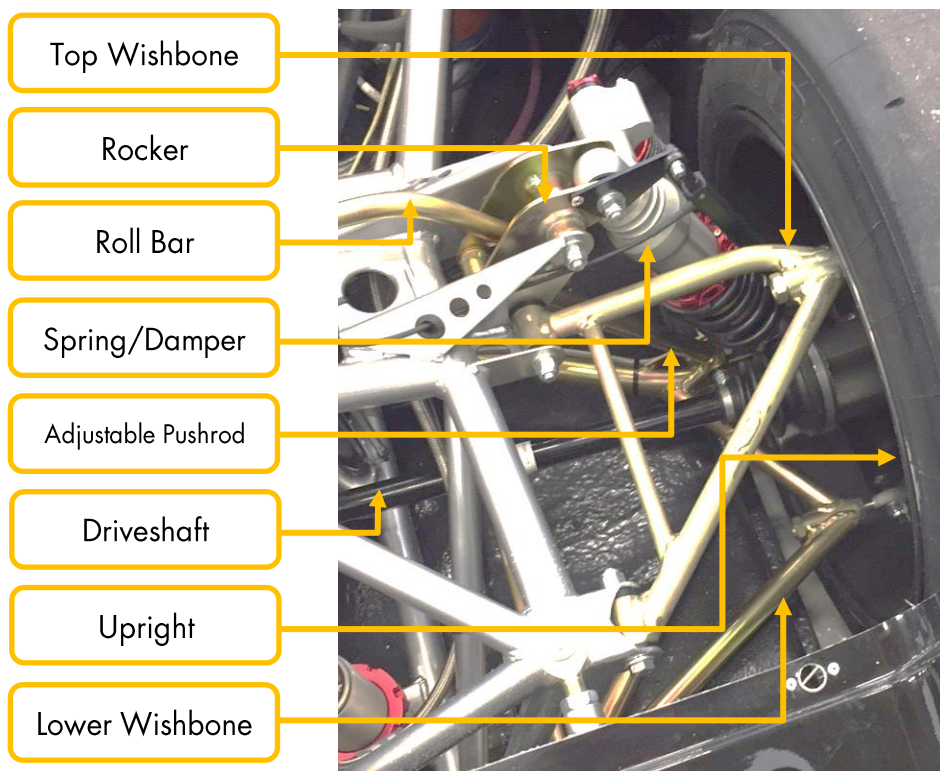
1.8 ENGINE BAY LAYOUT



1.9 FRONT SUSPENSION LAYOUT



1.10 REAR SUSPENSION LAYOUT



ECU/PDM LOCATION:

On the left-hand side of the SR10 cockpit you will find an access panel, behind this are the following items:

- ECU
- PDM

To remove the ECU, undo the M6 bolts holding the plate on, then the remove the M5 bolts to release the two units.



Remove the two large connectors on the PDM, then remove the main power wire and USB connection. Then pull the silver clip on the ECU upwards to an upright position. The connecting hairbrush can then be rotated off the ECU, and both units can then be removed. To refit repeat these steps in reverse. This should not be removed unless there is an issue, or the engine is being returned for rebuild.



BATTERY LOCATION:

On the right-hand side of the SR10 cockpit you will find another access panel, identical to the one on the left-hand side of the car. Behind this panel are the following items:

- Battery
- Alternator Fuse

To remove the battery, undo the M6 bolts to release the plate.

If the car is fitted with a trickle charger loom it will sit just next to the seat where the arrow is. The Anderson plug for the jump battery is located underneath the right hand side of the dash, only use a lithium battery to jump start if necessary.



Then the battery strap and cover can be removed. Remove the battery terminals, the earth should always be removed first. When re-fitting the terminals, fit the positive terminal first.

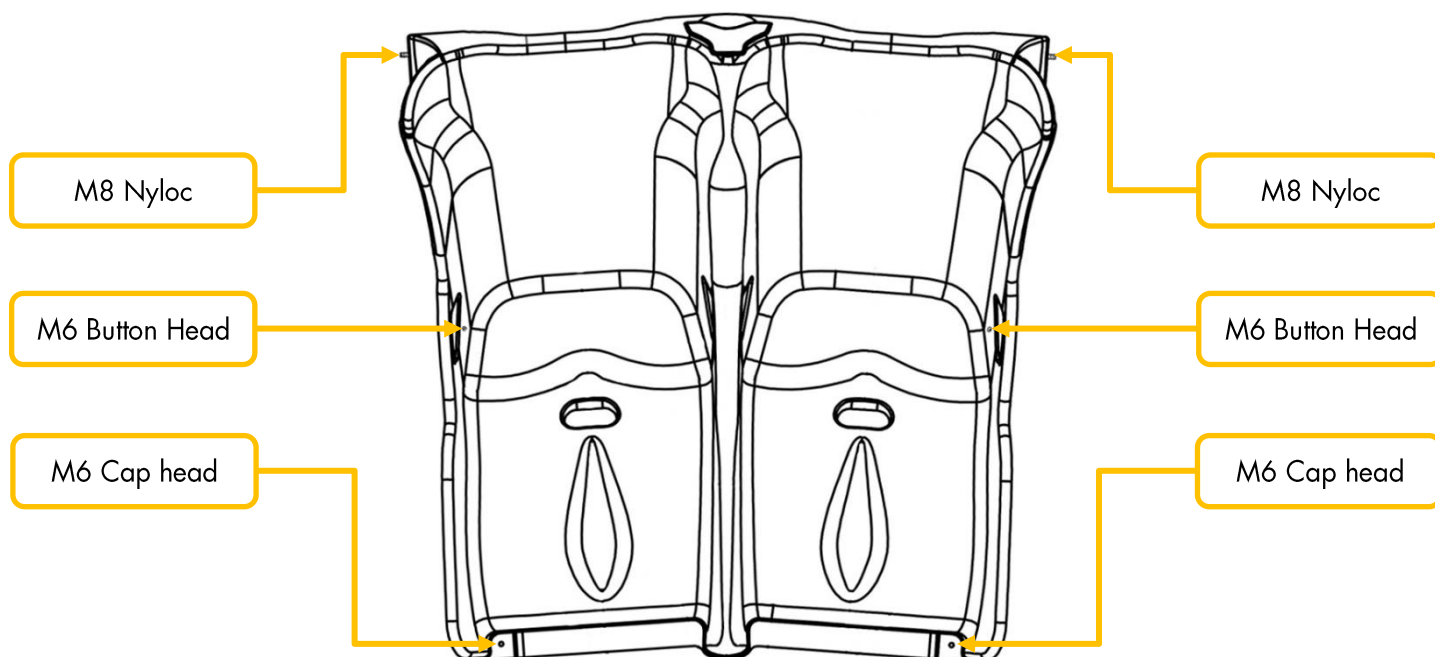
ALTERNATOR FUSE

The 60A fuse and battery are shown below, they can both be accessed by removing the panel on the right-hand side of the car. If any charging issues occur, this fuse should be checked.



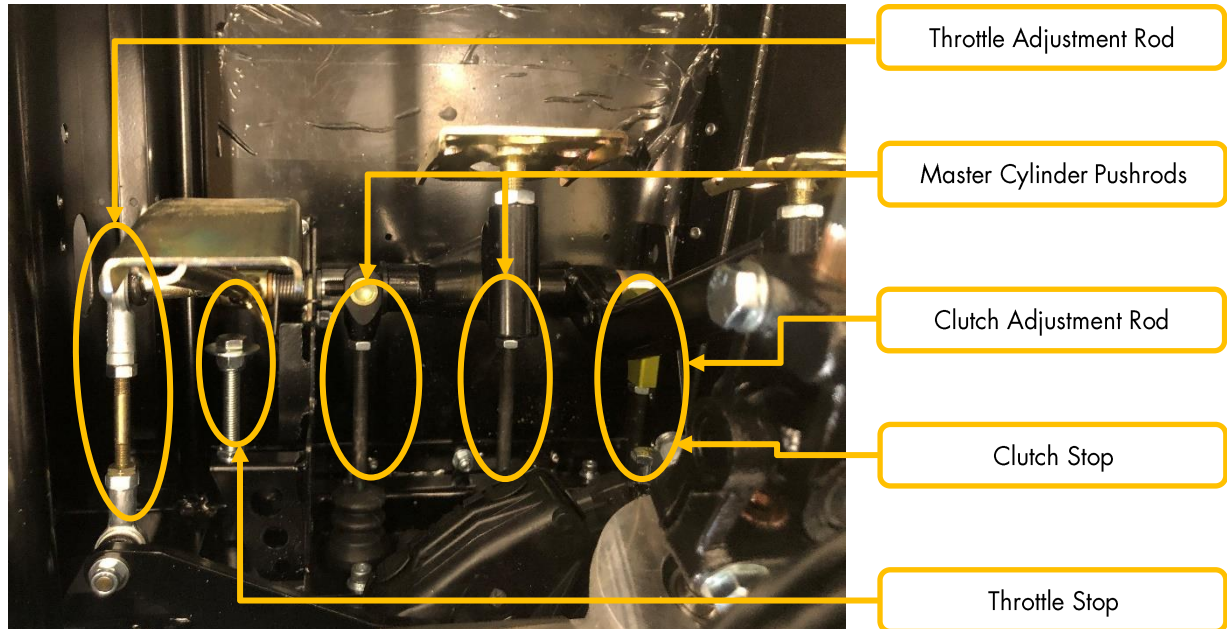
SEAT ADJUSTMENT:

The seat is fitted on sliding rails which can be adjusted by loosening the 6 bolts on the seat. There are two M8 Nyloc's, one either side at the top of the seat between the chassis, two M6 button heads at the base of the seat and two M6 cap heads at the front lip of the seat. Once these are loose simply pull the seat forward or back whichever is desired, then tighten all six fixings.



PEDAL ADJUSTMENT:

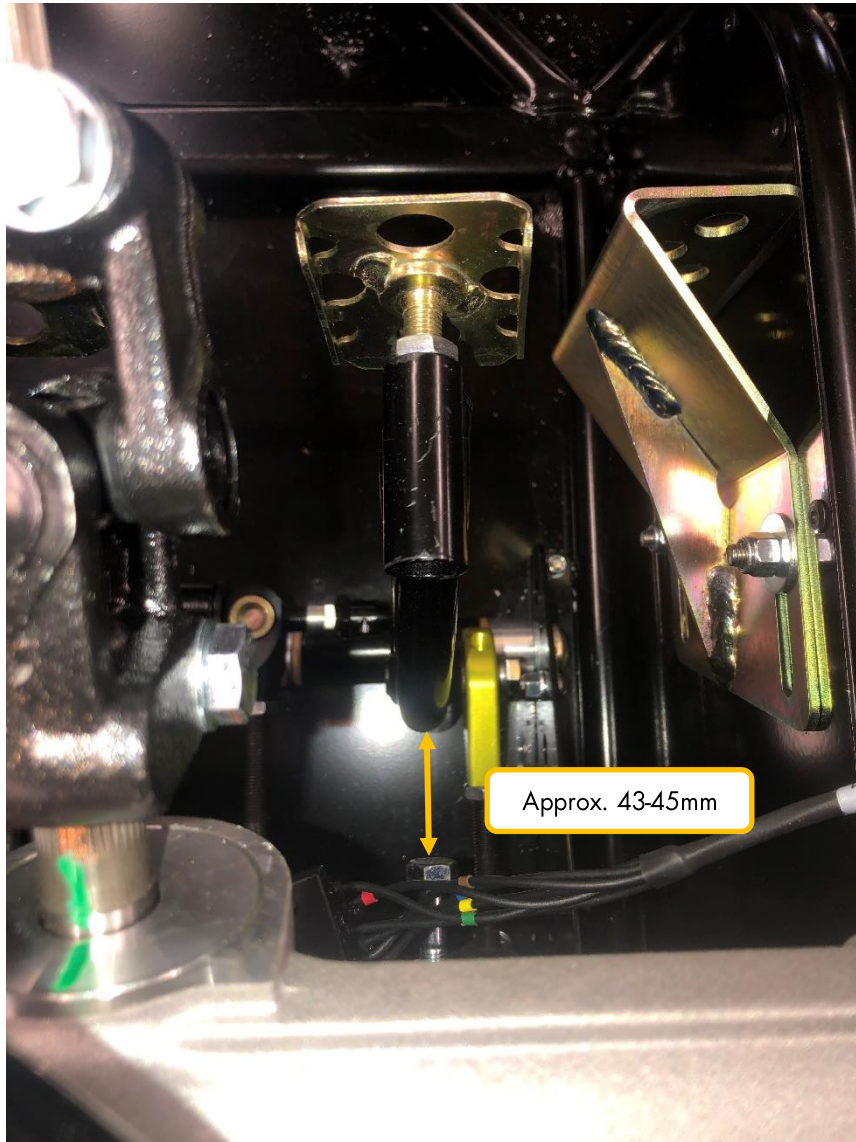
The pedals can be adjusted by either loosening the locknuts on the pedal pad, or by loosening the locknuts on the **master cylinder pushrods**, then turning the rods to move the pedal. The pushrods must be moved evenly as this will affect the brake bias. The throttle pedal can be adjusted by lengthening or shortening the **throttle adjustment rod**. The throttle position must be checked after adjusting, the PPS should sit at -0.5% when idling, you must then make sure at least 102% can be achieved at full throttle, if not the **throttle stop** must be adjusted.



If any further adjustment is required, pedal extension kits are available. Contact our stores department: stores@radicalsportscars.com

CLUTCH PEDAL THROW:

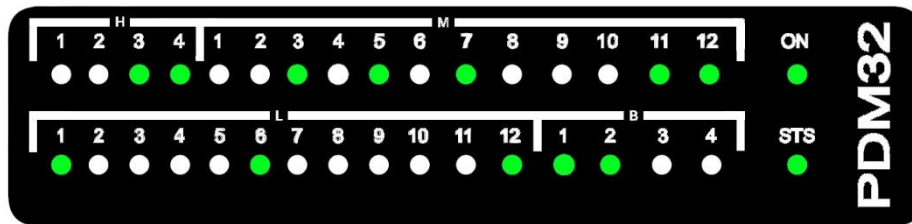
If the clutch pedal has been adjusted, the pedal throw should be checked. The distance between the clutch pedal and the stop should be approx. 43-45mm as shown below on a brand-new clutch. You should always check the clutch clearance with the engine running on stands afterwards and adjust accordingly. The biting point should be approx. 5mm away from the clutch stop. If the clutch is moved the footrest must be moved, you should be able to rest your foot comfortably on the footrest, without touching the clutch pedal.



2. PDM

2.1 STATUS LED'S

The PDM 32 has 32 status LEDs, one for every power output:



Below applies to all the output status LED's:

- **Green:** the output is enabled, and its status is OK
- **Red:** the output status is in alarm mode i.e., short circuit, open load, etc...
- **Off:** the output is not active.

There are also 2 additional LEDs: ON and STS (Status).

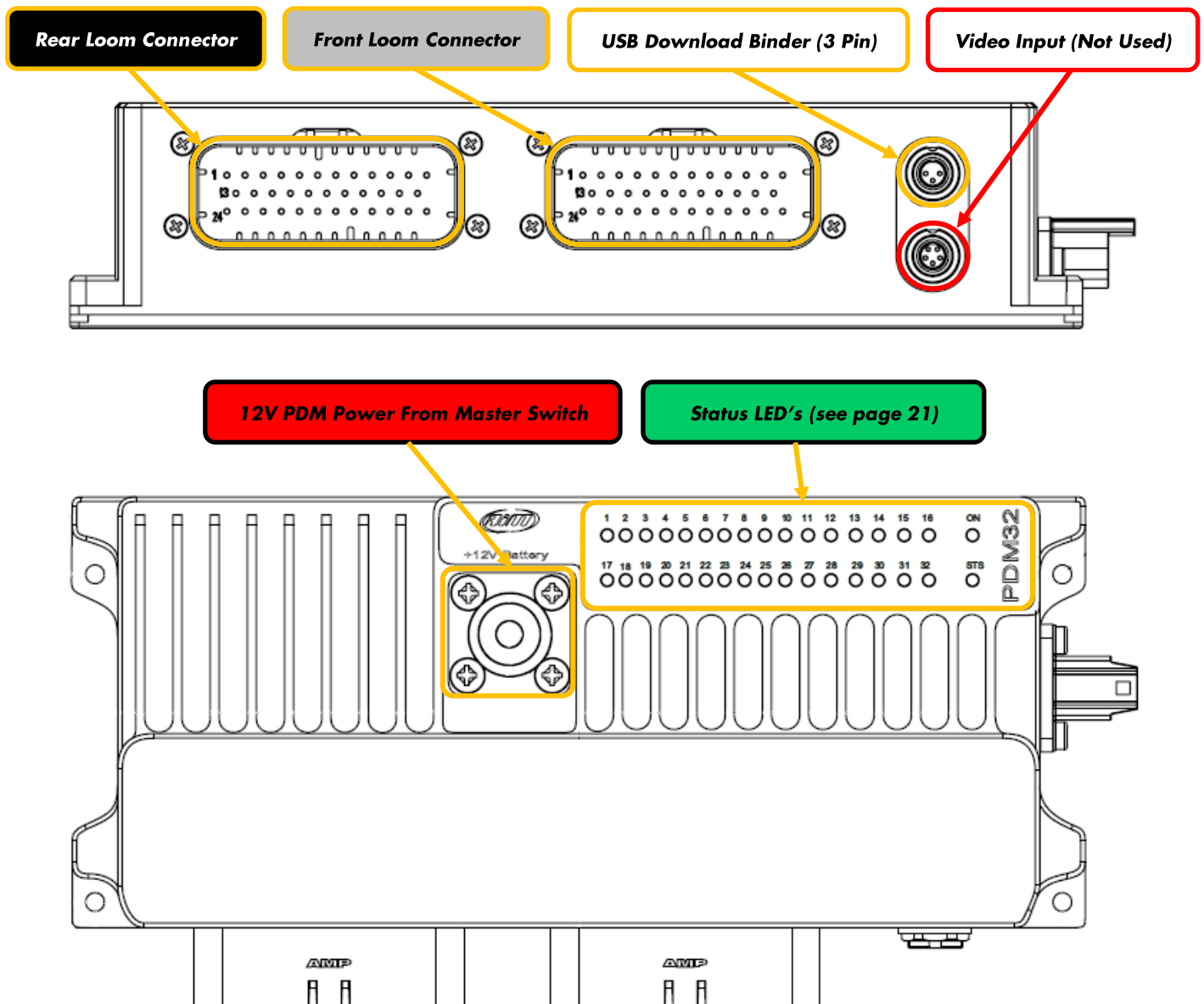
ON is green when PDM is active.

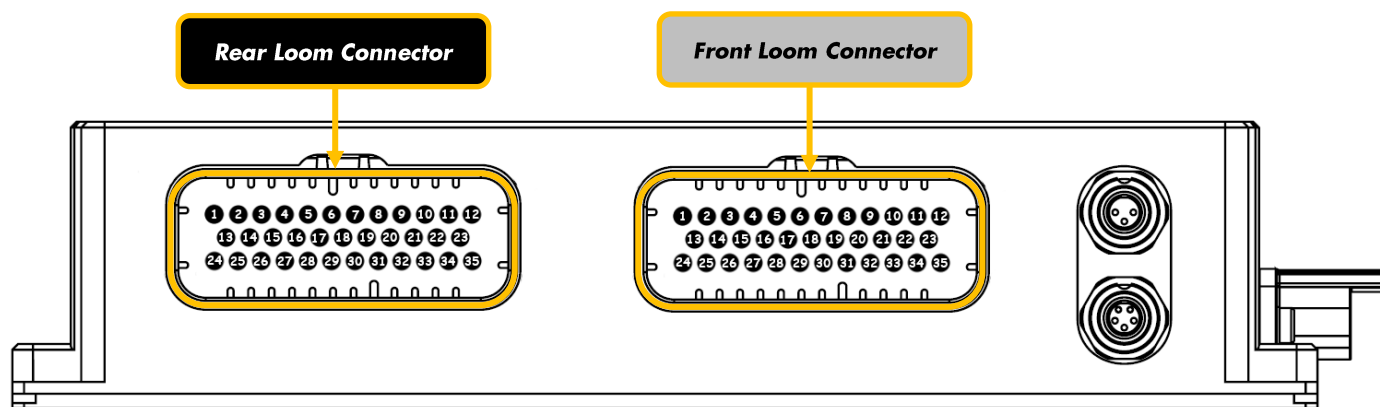
STS may be:

- **Green:** everything is OK.
- **Yellow** (Solid):
 - Ext battery voltage value is between 9V and 11V or between 15V and 16V
 - Internal temperature of PDM is between 70°C and 85°C
- **Red** (Solid):
 - Ext battery voltage value is between 8V and 9V or over 16V
 - Internal temperature of PDM is over 85°C
 - Any of internal peripheral not working properly
- **Red** (Blinking):
 - Ext battery voltage value is under 8V. This causes power outputs to be disabled to avoid system malfunction.

2.2 PDM PIN OUT

The PDM connects to the chassis loom using the two large 32 pin connectors, the rear connector is black, and the front loom connector is light grey. The USB cable that runs to the centre of the dash to download data, and program the PDM plugs in to the 3 pin Binder connector as shown below:





Loom Connector Status Lights/Pin Out			
Status Light	Function	Pin	Max Load
H1	Starter Solenoid	R1/R13	20A
H2	Fuel Pump	R12/R23	20A
H3	ECU Main	R24/R25	20A
H4	Gear Compressor	R34/R35	20A
M1	Not Used		
M2	Radiator Fan	R3	15A
M3	Lambda	R4	10A
M4	IGN 12v	R5	10A
M5	ECU 12v	R6	15A
M6	Not Used		
M7	Tyre Pressure Monitoring System	R8	5A
M8	Brake Light	R9	5A
M9	Main Beam LH	F4	10A
M10	Main Beam RH	F5	10A
M11	Radio Power	F8	5A
M12	Transponder	F9	5A
L1	Alternator Exciter	R14	5A
L2	Not Used		
L3	Not Used		
L4	Rain Light	R17	5A
L5	Tail Light	R18	10A
L6	Alternator Battery Reference	R19	5A
L7	Not Used		
L8	Not Used		
L9	Not Used		
L10	DRL LH	F6	10A
L11	DRL RH	F7	10A
L12	Touchpad (6 Button)	F10	2A
B1	12V Auxiliary	F1/F2	30A
B2	Steering Wheel Display	F11/F12	5A
B3	Not Used		
B4	Not Used		

2.3 PDM STATUS CHANNEL

If one of the status LED's turns red the PDM will tell you why this has happened. Find the output that has gone red in the status window using the table on page 21, then find the status channel using the live measures function in race studio 3 or looking back through the AIM data. It should display a number, it will display '0' if the output is working normally.

If the output has seen an issue, it will display one of the following:

Status Legend							
Value	0	1	2	4	8	16	32
Label	ok	sc	open	htemp	ovcur	unvol	ovvol
Description	OK	Short Circuit	Open Circuit	High Temperature	Over Current	Under Voltage	Over Voltage

This will give you an indication of where to look for the issue, for e.g. if the output says short circuit then you should look for a damage to the wiring loom.

3. EPAS

3.1 PDM EPAS CONFIGURATION

When installing EPAS or replacing a PDM unit always make sure the latest recommended PDM32 – SR10 EPAS config is loaded to allow power into EPAS control unit.

3.2 STEERING WHEEL CONFIGURATION

When installing EPAS or replacing a Steering Wheel always make sure the latest recommended Steering Wheel EPAS config is loaded to re-allocate blue function rotary switch from page dial to EPAS map switch

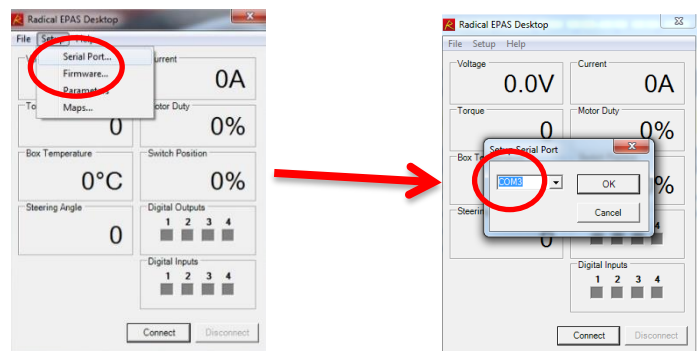
3.3 EPAS SOFTWARE

Install EPAS Desktop Pro software to your computer.

3.4 EPAS CONFIGURATION AND TROUBLESHOOTING

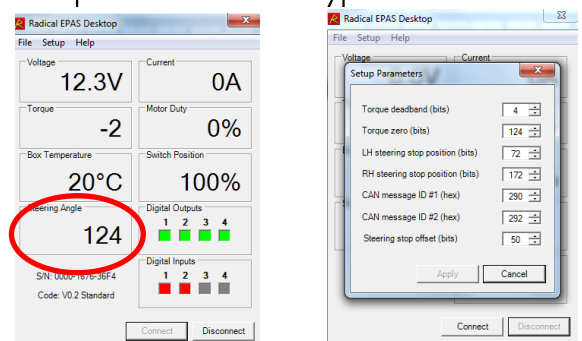
CONNECTING TO THE EPAS UNIT:

1. Plug the cable into the power steering plug located under the dash on the passenger side. Turn on the master switch and power on the Key pad.
1. Then press **'Setup'** then **'Serial Port'** then select the open COM port then press **'OK'** now press **'Connect'**



CHECKING THE PARAMETERS:

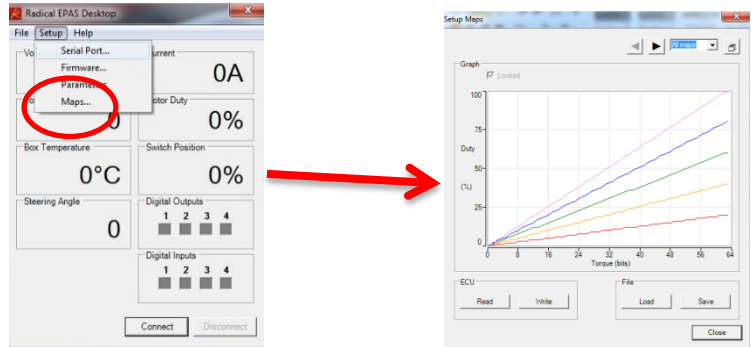
1. With front wheels off ground check that the torque reads zero when the steering wheel is in straight position. To reset the zero torque position, repeatedly cycle the power switch on Keypad four times only allowing EPAS ECU to power up for 1 second then leave it turned ON after the fourth time. To make sure that EPAS ECU is powering up, listen to the relay opening and closing sound from inside the EPAS ECU.
2. Now apply full left lock and note the steering angle. Repeat with full right lock and note. Then press **'Disconnect'**
3. Press **'Setup'** then **'Parameters'**



4. Set the LH and RH steering assistance stop position 8 units from the noted number. This will disengage the steering assistance at full lock and prevent motor from terminal damage. The **'Torque Deadband'** wants to be 4.

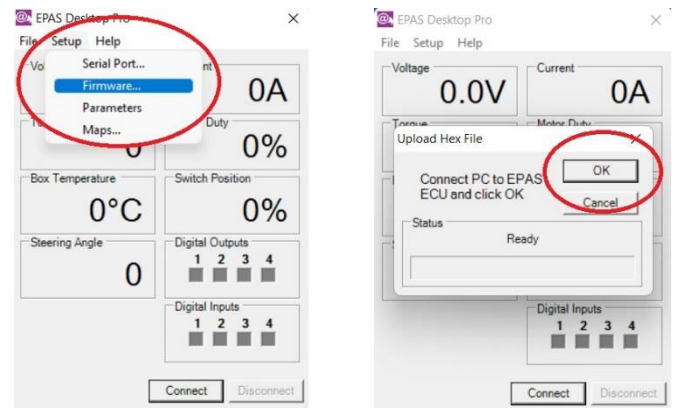
LOADING A NEW MAP:

1. Press **'Setup'** and then **'Maps'**
2. Select **'Load'** Under **'File'**. Locate the map that needs to be loaded.
3. Select **'Write'** then press **'Close'**



LOADING A FIRMWARE

1. Ask member of Radical staff for latest SR10 EPAS Firmware and save it on your computer
2. Press **'Setup'** and then **'Firmware'**
3. Locate the firmware on your computer and select it.
4. Turn the keypad power button OFF, press **'OK'** to "Upload Hex File" and turn the power button back ON
5. The Firmware will now load automatically



FUNCTIONAL TESTING

Make sure the EPAS is working correctly, and the amount of assistance is changing in accordance with the switch position

Position 1 on rotary switch = EPAS Off

EPAS assistance starts at position 2 on rotary switch and graduates.

Note, there is only 5 different EPAS settings available per map

4. RUNNING YOUR CAR

Upon delivery of your new car, it is recommended you check the following items:

- If the car has been shipped, be sure to check the tracking of the front and rear wheels, it is possible that the securing straps may have been overtightened and pulled the car out of alignment.
- Make sure the master switch wasn't left on during transit and the battery hasn't run flat.
- Check that the driver is comfortable in the car. The seat can be adjusted forwards and backward by pulling the lever at the front of the seat. The pedals stops can also be adjusted.
- Remove the fire extinguisher safety pin prior to starting the car (if fitted).
- Check all fluid levels, coolant, brake, clutch, and engine oil. Fluid specifications can be found later on in this manual.
- Ensure there is enough fuel in the car, the capacity of a bag tank is 76L.

Minimum Fuel Octane Rating		
RON (Europe)	MON	PON or R+M/2 (USA)
95	87	91
96	88	92
98	90	94
100	91	96
105	95	100

The SR10 requires the use of premium grade unleaded fuel with the minimum octane ratings of:

RON, 98. Oxygen, 2.9%. Less than 5% ethanol

Radical recommends use of Shell V-power (UK spec), or Sunoco 260GT (available globally). If your local fuel does not meet these minimum criteria, please send the full specification of your fuel to engines@radicalsportscars.com for review. If the fuel used does not meet the minimum rating, this could lead to internal engine damage which is not covered by Radical.

Customers are advised to pump out their fuel tanks at the end of each day, between periods of use. Phase separation can occur in some fuels, resulting in a high concentration of some substances which can cause damage to the bladder material or components. Whilst not infallible, draining the system will minimise this risk.

To ensure the reliability of your car and engine we would strongly recommend following this procedure every time you start running your SR10:

Starting the car – to start the car, turn the master switch to the on position. Press the power button on the 6-button keypad, then the ignition button. Ensure the car is in neutral or the clutch is depressed, then press the start button momentarily. Keep an eye on the dash to check for oil pressure being displayed.

Warming up the car – Check the water level then start the engine and allow it to idle until the water gets above 80°C and the oil has started to warm up. The car is fitted with a thermostat, so the water temperature should maintain itself at around 85 when warm, while the water around the entire system is heated up. If the high-water temperature alarm comes on when first warming the car up, it is likely the water level is too low.

Oil Check - When the oil temperature is over 50°C raise the RPM to 4,000 for 5 seconds to fully scavenge the oil, then switch the engine off. Using the dipstick, check the oil level; the oil level should be in between the minimum and maximum marks of the dipstick. If the car requires oil, it is recommended to follow the same process of holding the RPM at 4,000 for 5 seconds, to re check the oil level.

Running On – After the car comes in after a long run it is important to leave the car running for a few minutes. The car is fitted with a mechanical water pump only, so when the engine is switched off, the water stops being circulated. This can cause the engine to heat-soak and more importantly the residual heat from the turbine housing will not be being dissipated, which can cause permanent damage to the bearings in the turbo.

4.1 PRE-SESSION CHECKS

Despite all the thorough checks which are carried out on all our cars before they leave the factory, it is important you also do some basic checks before you take the car to the track for the first time.

- Torque the centre lock wheel nuts to 260lb/ft. Fit the safety retaining clips.
- Set the cold starting tyre pressures and ensure these are set correctly.
- Double check the fire extinguisher system is set to active (electrical specification) and the pin is out of the lever.
- Ensure the mirrors are all in the correct position for the driver.
- Due to the thermostat, you will not need to run any radiator tape regardless of the outside temperature. The thermostat opens at approximately 85deg.
- The gearbox can be warmed up, with the car on stands and the rear wheels off.

Target engine running temperatures:

Parameter	Temperature (C°)
Oil Temperature (EOT)	90° – 110°
Water Temperature (ECT)	70°– 90°

4.2 WARMING THE GEARBOX

Although not mandatory, the car can be raised up on a stand or air jacks the gearbox can be warmed up. Ensure the engine oil temperature is above 50deg, then depress the clutch, pull for first gear and slowly let out the clutch. Hold the RPM at 2000 and shift up to 6th gear, then hold this RPM for a few minutes to get some heat into the gearbox. Alternatively, if you warm the car early and allow the car to sit with the engine cover on, this will cause some of the heat to soak into the gearbox.

Whilst warming up the gearbox you can also use this time to check the paddleshift system on the car, make sure the engine oil is above 50deg, then shift up the gearbox with raised RPM (4000) ensuring the shifting is smooth, then shift down to first with no throttle, check the car is getting a sufficient blip on the down changes (Approx. 20% TPS). Repeat this process a few times.

The first few laps of the day on track should be taken at a reduced pace, this is when the gearbox is properly on load and the heat starts to build up. Once the gearbox has been warmed on track, it should hold residual heat for the rest of the day.

STARTING THE CAR

To start the car, turn the master switch to the on position. Press the power button on the 6-button keypad, then the ignition button. Ensure the car is in neutral or the clutch is depressed, then press the start button momentarily, do not hold the start button or it will not start. Keep an eye on the dash to check for oil pressure being displayed.

IMPORTANT NOTE

As with any race car, it is important to put the car in neutral and release the clutch when stationary. This will significantly reduce clutch bearing wear. Ensure the car is always started in neutral.

The car is also fitted with a lithium battery, only use the lithium battery charger supplied. If the car is fitted with an Anderson plug, do not connect a lead acid battery for prolonged periods, just to start the car if required.

PADDLESHIFT CONTROLS

- To pull away, depress the Clutch, and pull the up paddle to get to first. Once you have pulled away in first gear you can then shift up as normal all the way to 6th.
- The SR10 is fitted with an automatic blipper with fuel and ignition cut controls. This allows you to flat shift up the gearbox and means you **do not** have to blip the throttle on the way down the gearbox.
- The paddleshift system has safety controls that can override paddle requests help to reduce damage to the engine caused by overrevs. Because of this the system may deny shift requests if the rpm is too high for a downshift or you are still applying throttle whilst trying to downshift. These safety overrides are explained in more detail in the Radical Data Manual.

The gear order is shown below:

R → N → 1 → 2 → 3 → 4 → 5 → 6

STOPPING THE CAR

Once the car has been allowed to cool off by idling for a few minutes, the car can be turned off by pressing either the ignition or start stop button on the 6-button keypad. Do not turn the car off via the master switch, unless in an emergency. Keeping the master switch and ECU power turned on after the engine has stopped running allows the cooling fan and to continue to run if required to prevent heat soak. After 120 seconds they will automatically turn off and the master can be switched off.

BRAKE BIAS

The brake bias can be adjusted to suit the drivers needs dependant on the circuit, driving style and weather conditions. As a starting point, we recommend starting at 57%, which is 7% biased towards the front. During wet conditions it is advisable to move the bias rearwards at around 5% (see wet setup guide).

4.4 ENGINE CONTROL PARAMETERS

General Running Parameters	
These are some of the engine vitals, they should remain within the range listed below.	
Fuel Pressure	5.8 – 6.2bar
Oil Pressure	70psi @ 90°C
Battery Voltage	13.8v – 14.2v
Oil Temperature	80°C – 110°C
Water Temperature	70°C – 90°C
Direct Injection Pressure	180bar
Throttle Position	0.5% – 102%
Gearshift Decision	
Rev Limit	7250rpm
TPS	>10%
The rpm must drop below a threshold before a downshift can be allowed; these are shown per gear below.	
2nd to 1st	5500rpm
3rd to 2nd	5650rpm
4th to 3rd	5750rpm
5th to 4th	5800rpm
6th to 5th	5800rpm
Outputs	
The following outputs will be powered, when these conditions are met.	
Coolant Fan On (Fan 2)	93°C
Coolant Fan Off (Fan 2)	88°C
Gearshift Compressor On	6.75bar
Gearshift Compressor Off	7.00bar
Fuel Pump	15sec Prime, Runs Constant when Engine is running
Engine Trips	
The engine will be turned off by the ECU if any of these conditions are met. The master switch will have to be recycled to restart the engine.	
High Coolant Temperature	120°C
Low Fuel Pressure	4.5bar
Low Oil Pressure	65psi @ 6,000rpm (RPM + Temperature Dependant)
Limp Mode:	
The rpm will be limited to 4000rpm if any of these conditions are met. If they fall back into specification the limp mode will be turned off automatically.	
Low Battery Voltage	-10.0v
Lean On Load	+5000rpm, +80% TPS, +13.67 AFR
Low Oil Temperature	-50 °C
Air Charge Temperature	+65°C

5. NEW CAR SHAKEDOWN

At Radical, we pride ourselves on our quality control and rigorous testing procedures that we have in place for every new car. All new cars are subject to a 100 point post production inspection and track simulation on our rolling road dynamometer prior to delivery. However, it is not possible to replicate the forces exerted driving round a racetrack. The first time you drive your new SR10 round a track is the first time the car has experienced the G-force you feel through the seat of the car. For this reason, we recommend our 'shakedown' procedure is followed for all new cars.

5.1 SHAKEDOWN GUIDE

Warm the car up and complete the pre-session checks. The first track session for a new car is also the first time the brakes have been used under load. All cast iron brake discs for competition use need to be bedded-in to ensure heat stabilisation and improve resistance to cracking. Cracks or warping can occur during the first few heavy stops if careful bedding is not carried out.

Your 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. Additional notes on brake bedding can be found in the following section.

To help with brake bedding initially blank the brake cooling ducts off up to $\frac{3}{4}$ to increase temperature build up, depending on ambient temperature.

RUN 1 (OUT & IN)

Driver:

- For the driver this is a good way for you to start to learn about the car. It is important to try and run through every gear if possible; it is advised to change gear at 3,000 rpm. During this run only use light pressure on the brake pedal. (See 'Bedding in Brakes' below)

Technician:

- Remove the engine cover and check for leaks and for any components rubbing

RUN 2 (3 LAP RUN)

Driver:

- Now the engine bay has been checked, it's time to start building up the temperature and speed. Be mindful that the brakes and tyres are still new and won't have reached their peak performance yet. Start to build up brake pressure and roll some more speed into the corners. Bring the RPM up to 5,000 before shifting up through the gears.

Technician:

- Check the tyre pressures
- Check the running temperatures of the oil and water and adjust any coverings in order to ensure the car runs at target temperatures
- Again, remove the engine cover and inspect the engine bay for leaks
- Re check the wheel torque (260ft/lb)
- Allow the brakes to cool for a few minutes before heading back out on track.

RUN 3 (5 LAP RUN)

Driver:

- During this run build up to full brake pressure and use the full rev range before shifting (7250rpm).

Technician:

- Check the brake discs, they should now have started to 'blue' near the bell showing they have heated up sufficiently. Allow the brakes to cool once again and remove the blanking on the ducts for the next session
- Check the tyre pressures
- Check for play in the wheel bearings
- Recheck wheel nut torque for a final time (260ft/lb)

RUN 4 (NORMAL SESSION)

The car can now be run as normal. After this session is complete it is recommended to spanner check the whole car, again pay final attention for potential leaks and a give the car a good general inspection. When spanner checking the car, ensure suspension components are not overtightened as this will restrict the movement of these components.

5.2 BEDDING IN THE BRAKES

This procedure should be followed each time new discs are fitted to your car:

- The brake ducts should be $\frac{3}{4}$ blanked off in order to allow the brakes to warm up through the bedding in period, previously bedded pads should be used if possible.
- 3 lap run - use the brake lightly (<20bar application) on the in lap and allow brakes to cool for 5 mins (stay off brake pedal in pits when stationary!)
- Next run 5 laps – increase brake pressure to build up temperature in the discs if the conditions permit (above 40 bar pressure). The braking potential of the car will start to fade, and any potential vibration will surpass; this is a sign that the bedding procedure is complete.
- It is possible to pick up a vibration or 'judder' through the brake pedal. This is due to the disk bell and disk becoming aligned for the first time; this is not a process that can be simulated in the build of the car. It is therefore very important that if the driver feels they have brake judder they continue to build up brake pressure and heat in the disk. And not to stop or decrease pedal pressure, to do so has the potential to make the vibration worse.
- Complete a cooling down lap with moderate brake pressure before stopping the car. Allow the brakes to cool for 15 minutes. Do not apply brakes whilst stationary during the cooling down period.
- We strongly advise AP Racing thermal paint is used; if so then only the green paint (430°C) should have fully turned to white and the orange will have slightly turned (560°C) on the outside edges of the discs during the bedding procedure. If fitted, brake pressure sensors can be used to monitor the bedding in procedure.

IMPORTANT NOTES

With cast iron discs, brake pressures should not exceed 20bar during the out lap, even with pre-bedded discs. This is to prevent heat shocking which causes the discs to crack, this occurs when the disc is taken from ambient temperature up to 600°C very rapidly such as heavy braking on the out lap. When stationary never hold pressure on the brake pedal, this can cause warping and/or the discs and pads to bind.

6. TYRE MANAGEMENT

The table below shows the suggested running pressures and pressures for race tyres:

Hankook Cold Starting Pressure			
Slicks		Wets	
22	22	22	22
21	21	22	22

Hankook Hot Pressure			
Slicks		Wets	
28	28	28	28
28	28	28	28

- Please note that the starting pressures are to only be used as a guide; conditions on the day will alter where you should start your pressures. Hot conditions will increase the pressure rise over the same period of time.
- Fit valve caps when running
- Temperature spreads must not exceed 15°C across the front and 10°C on the rear.
- Measure tyre temperature spreads, 3cm in from each edge of the tyres and in the centre, make sure you are not measuring the temperature of any pickup on the tyre.
- Avoid kerbs on the out-lap when the tyres are cold.
- It is important to take advice from your tyre manufacturer to ensure you are following their recommended setup parameters.

TYRE PERFORMANCE ANALYSIS

- Decisions based on handling should always be preceded with thorough examination of tyre working surface.
- Use the temperatures, pressures, data and driver feedback with the visuals of the tyre to get the best all round view of car and tyre behaviour.
- Measure the tyre temperatures and pressures as often as possible straight after a fast lap, get the driver to do a full pace in-lap, in order to get the best readings.

TYRE CONDITION FEEDBACK



Outer Edge

When examining a tyre, always check both sides. The unloaded side can drag the inner wheel, causing excessive negative camber and overheating in the inner edge.

When measuring the temperature spreads start from the inner edge then work to the outer edge.

The picture on the left is an example of a rear tyre in good condition, more camber can be added if the rear is lacking grip.



Outer Edge

This is an example of a well-worn front tyre, judging by the wear indicators and the level of graining it suggests the car has been suffering with understeer. This could also be run with more camber. If a tyre is graining on either side, this can be used to judge whether the right level of camber is being used.

7. WORKSHOP INFORMATION

After every day the car has run on track the car should be inspected thoroughly in a workshop environment.

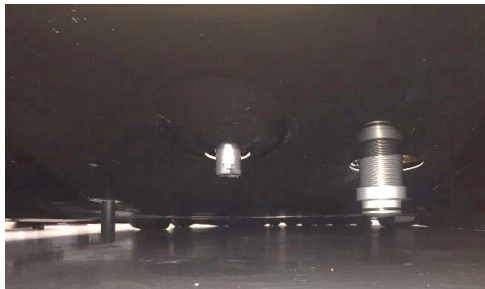
7.1 LIFTING YOUR CAR

JACKING POINTS

The front jacking point is in the centre of the front diffuser, just under the front chassis rail. As shown in the picture.



The rear jacking point is under the rear diffuser in the centre of the car, a welded bar protrudes the diffuser around the mid-point.



LIFTING POINTS

To lift the car onto a high stand we recommend lifting the car with a crane, rated to at least the weight of the car. To lift the car, mount a strap around the very top of the forward-facing stays, as shown. Be careful not to damage the bodywork.



8. CAR SETUP

When the car leaves the factory, it will have a base setup on the car which is shown on the next page. This is a setup which has shown to work over the years it has been adapted to suit various drivers' needs as they feel more comfortable with the car.

8.1 HOW TO SET UP THE CAR

Setting up the Radical may seem a daunting task at first; however, adjustments are incredibly simple with everything being of easy access allowing for fast setup changes whenever you feel the need to adjust certain areas. Below is a step-by-step guide of how to work with the car on the flat patch.

1. Check front pushrod lengths are equal & front springs have the correct turns of pre-load. The front pushrods should be the same length.
2. Ballast with 80Kg (10Kg in footwell by the pedals, 70Kg in seat) unless specific driver weight is known.
3. Lock steering to straight ahead using dummy steering wheel.
4. Set tyre pressure to hot pressure from setup sheet.
5. Disconnect front & rear anti-roll bars.
6. Check dampers are set to minimum all round.
7. Bounce & roll car to settle suspension.
8. Check drop heights and adjust average of front & rear to be within 1mm of target.
9. Set cambers (+/- 0.1° from target).
10. Set toes (+/- 0.5mm from target).
11. Roll car off platform, turn on scales and zero.
12. Roll car back onto platform, repeat bounce & roll.
13. Check corner weights. Target is within 10Kg across front, and within 2% for diagonals.
14. Adjust to correct using rear pushrods only.
15. Re-adjust drop heights equally on front and rear pushrods to achieve target. (The drop height will probably not be equal, due to the offset seating position, so target drop height should be an average of the left & right readings.)
16. Re-connect anti-roll bars making sure there is no pre-load.
17. Set dampers, they should always be set from fully closed.
18. Turn off scales.
19. Ensure the diffuser is level front to back and side to side.

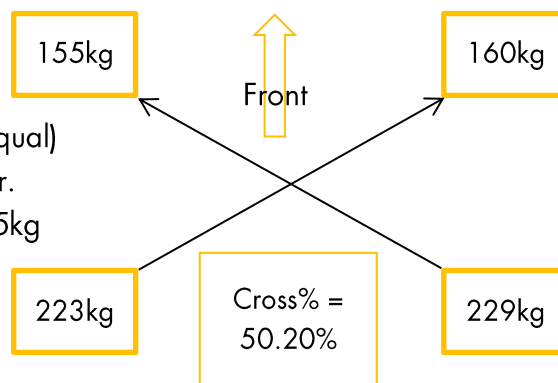
8.2 CORNER WEIGHTS

One of the most important setup factors is to ensure that the front corner weights are as equal as possible. The cross weight is not as crucial in comparison. (The offset driving position of the driver will usually mean that the weight cannot be made exactly equal)

To adjust the front corner weights, raise or lower the diagonal rear.

The maximum difference in front weights should be no more than 5kg (11lb)

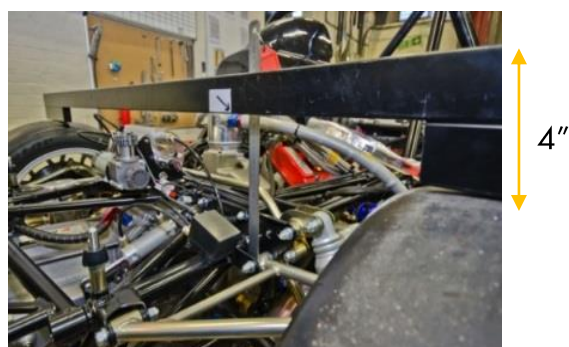
The 10kg at the front should always be put on the inside tyre. So if the circuit is anti-clockwise the heavy corner should be the front left.



<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;"> <h2 style="margin: 0;">SR10 - Factory setup sheet - Hankook</h2> <p style="color: red; font-size: 0.8em; margin: 0;">Note: When carrying out set-up on flat-patch, set tyre pressures to hot pressure. Ensure that they are returned to cold pressures after setup is complete.</p> </div> </div>											
Date				Chassis #				Job #			
				Technician		1		Technician			
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Camber</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">-3.2</div> <div style="font-size: 4em; color: white; margin: 0 10px;">↑</div> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">-3.2</div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">-1.4</div> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">-1.4</div> </div> </div> <div style="text-align: center;"> <p>Toes</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">2mm out</div> <div style="font-size: 4em; color: white; margin: 0 10px;">↑</div> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">2mm out</div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">3mm IN</div> <div style="border: 1px solid black; padding: 10px; width: 40px; text-align: center;">3mm IN</div> </div> </div> </div>											
Triple Intrax		Springs/Preload				Triple Intrax		Ride		Front Diffuser H	
Bump LS:	-10	Rate	FARB		Rate	Bump LS:	-10	78mm	40mm	78mm	
Bump HS:	-30	130	Soft 15.8mm		130	Bump HS:	-30		Ballast Weight		
Rebound:	-5		Medium 19mm			Rebound:	-5	Drop	80kg	Drop	
		Length	Hard 22.2mm	✓	Length			162mm	Cross%	162mm	
		100	X Hard 22.2mm		100			Weight	Total weight	Weight	
		Preload			Preload			kg	kg	kg	
		4 turns			4 turns						
Triple Intrax		Springs/Preload				Triple Intrax		Ride		Rake mm	
Bump LS:	-4	Rate	RARB		Rate	Bump LS:	-4	79mm	18mm	79mm	
Bump HS:	-20	130	Soft 12.7mm		130	Bump HS:	-20	Drop		Drop	
Rebound:	-30		Medium 15.8mm			Rebound:	-30	212mm		212mm	
		Length	Hard 19 mm	✓	Length			Weight	LHD	RHD	
		100	X Hard 22.2mm		100			kg		kg	
		Preload			Preload						
		0			0						
Tyre Pressure (PSI) (Cold & Hot)		PADS				Rear Wing		Upper Dive planes:		Y / N	
28	Hankook	28			01			Lower Dive planes:		Y / N	
20		20			01						
28		28			01						
19		19									
<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p>Comments:</p> <div style="border: 1px solid black; height: 30px; margin-top: 5px;"></div> </div> <div style="width: 40%; text-align: right;"> <p>QD166-1</p> </div> </div>											

8.4 DROP HEIGHTS (IN-DEPTH)

The drop heights are measured with a 4" bar, the bar is inverted for the front, as shown in the picture. Chassis rake will be the difference between 'Calculated Ride Height' and 'Rear Ride Height'.



FRONT		
Measuring to Rocker Pivot		
Front Drop Height (mm)	Chassis Height (mm)	Calculated Ride height under lowest point on chassis (mm)
153	87	67
154	86	66
155	85	65
156	84	64
157	83	63
158	82	62
159	81	61
160	80	60
161	79	59
162	78	58
163	77	57
164	76	56
165	75	55
166	74	54
167	73	53
168	72	52
169	71	51
170	70	50
171	69	49
172	68	48
173	67	47
174	66	46
175	65	45
176	64	44
177	63	43
178	62	42
179	61	41
180	60	40
181	59	39
182	58	38
183	57	37
184	56	36
185	55	35
186	54	34

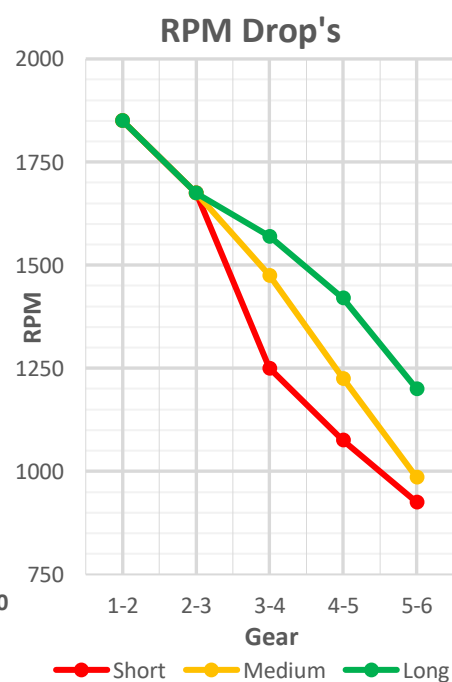
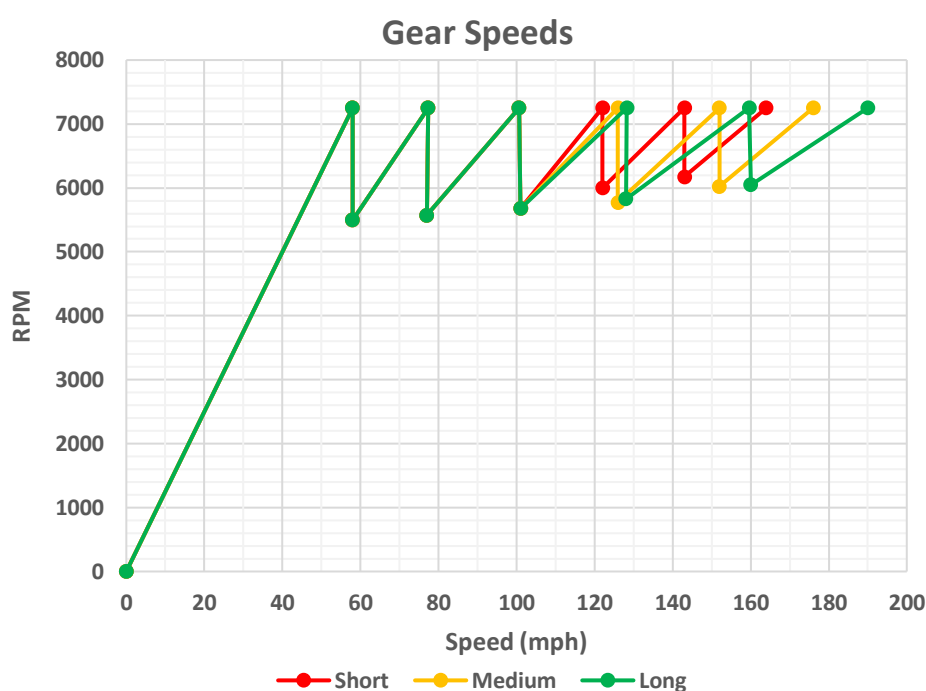
REAR	
To Front Bush on Rear Top Wishbone Bolt	
Rear Drop Height (mm)	Chassis Height (mm)
209	79
210	78
211	77
212	76
213	75
214	74
215	73
216	72
217	71
218	70
219	69
220	68
221	67
222	66
223	65
224	64
225	63
226	62
227	61
228	60
229	59
230	58
231	57
232	56
233	55
234	54
235	53
236	52
237	51
238	50
239	49
240	48
241	47
242	46

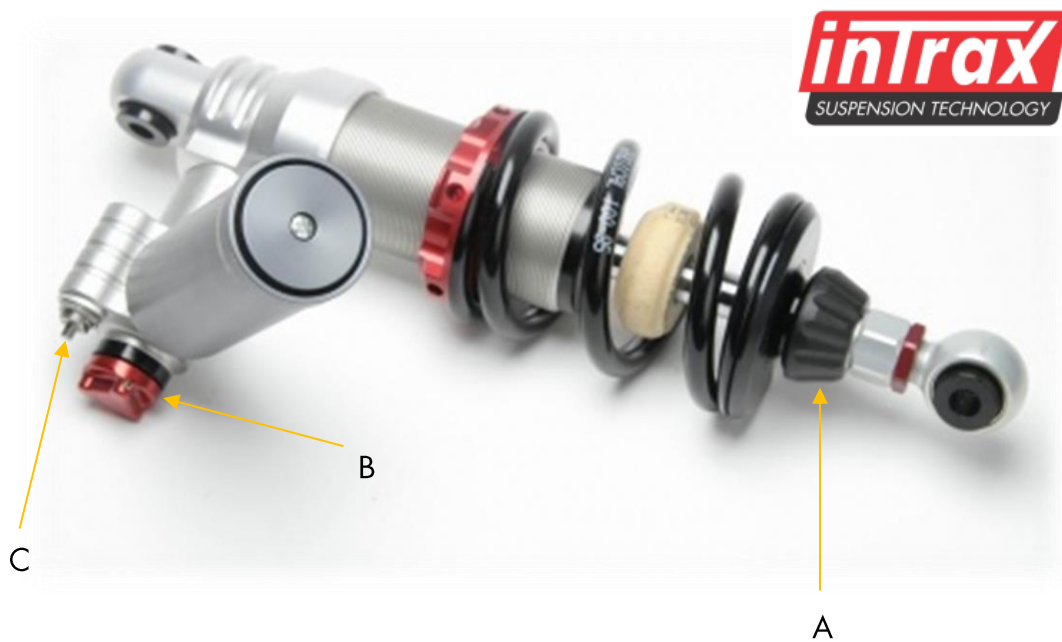
8.5 GEAR RATIOS

Part Number: TH0362		Long Ratio's			
Gear	Teeth No*	Speed (mph)	Speed (kph)	Drop	RPM
1	12:38	58	93	N/A	N/A
2	14:33	77	124	1850	5400
3	16:29	101	162	1675	5575
4	19:27	128	206	1570	5680
5	21:24	160	257	1420	5830
6	25:24	190	306	1200	6050

Standard		Medium Ratio's (Standard)			
Gear	Teeth No*	Speed (mph)	Speed (kph)	Drop	RPM
1	12:38	58	93	N/A	N/A
2	14:33	77	124	1850	5400
3	16:29	101	162	1675	5575
4	18:26	126	203	1475	5775
5	20:24	152	245	1225	6025
6	27:28	176	283	985	6265

Part Number: TH0361		Short Ratio's			
Gear	Teeth No*	Speed (mph)	Speed (kph)	Drop	RPM
1	12:38	58	93	N/A	N/A
2	14:33	77	124	1850	5400
3	16:29	101	162	1675	5575
4	18:27	122	196	1250	6000
5	18:23	143	230	1075	6175
6	26:29	164	263	925	6325





A – Rebound:

The rebound controls the speed of the damper's extension. The more rebound resistance you add, the slower the damper will return out. This can be used on the front to fix mid-corner understeer, and on the rear to aid traction. This adjuster has approximately 50 clicks from fully closed.

B – High speed bump compression:

High speed bump compression (refers to the speed of the piston rod into the damper) controls the high frequency compressions of the damper. In simple terms it controls how the car reacts to small bumps and curbs. This adjuster has approximately 50 clicks from fully closed.

C – Low speed bump compression:

Low speed bump compression controls how slow or fast the damper reacts under compression. Increasing the low-speed bump will have a similar (though smaller) effect to increasing the spring rate. This adjuster has approximately 15 clicks from fully closed.

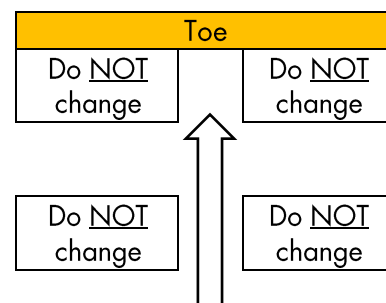
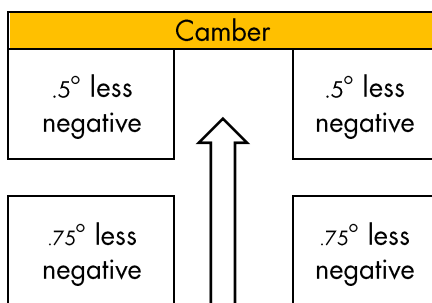
8.7 ROLL BAR SIZES

Front				
Soft	5/8"	15.8mm	Gold	SN0006
Medium	3/4"	19.0mm	Gold	SN0005
Hard	7/8"	22.2mm	Gold	SN0004
Extra Hard	7/8"	22.2mm	Black	SN0071

Rear				
Soft	1/2"	12.7mm	Gold	SN0018
Medium	5/8"	15.8mm	Gold	SN0017
Hard	3/4"	19.0mm	Gold	SN0016
Extra Hard	7/8"	22.1mm	Gold	SN0066
XX Hard	7/8"	22.1mm	Black	SN0073

8.8 WET WEATHER SET-UP

When you venture into the wet conditions, the car setup can be altered in order to give the driver the best chance of staying on the circuit. Shown below is a guide to the changes to make to the car in the wet. You may not have time to apply all these changes during a race weekend, reducing camber and rebound will have the biggest impact, the rear anti roll bar should be disconnected if you are limited on time.



Dampers		Springs / preload			Dampers	
Bump LS	5 softer	Front anti-roll bar			Bump LS	5 softer
Bump HS	10 softer	5Nm softer, same Preload	Next softest	5Nm softer, same Preload	Bump HS	10 softer
Rebound	10 softer				Rebound	10 softer

Corner Weights / Ride Height		
Do <u>NOT</u> change		Do <u>NOT</u> 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	10 softer				Rebound	10 softer

Do <u>NOT</u> change	Do <u>NOT</u> change
----------------------	----------------------

Dive Planes	Plus 1	Tyre Pressure (cold)	
		21psi	21psi
Bi-Plane	Up 1 hole	20psi	20psi
Main	No Change		

Brake Balance
2 full turns to rear

9.1 FILTER SERVICING

Engine Oil Change - Radical recommends changing engine oil every 6 hours, to do this remove the large oil pipe in the sump that runs from the bottom of the oil tank, located on the left side of the sump.

Engine Oil Filter Change - When the oil is changed, we recommend changing the oil filter at the same time to comply with our engine warranty conditions. Remove and discard the old filter. A thin film of oil should be applied to the o-ring on the new filter, use the oil filter tool to torque the filter to 20Nm. Fill the engine back up with fresh oil to the correct level. A jubilee clip should be fitted as shown to prevent it from coming loose.



Fuel Filter - The fuel filter should be changed every 40 hours; it is in the fuel regulator housing which is on the left-hand side of the car underneath the engine cover. The unit also houses the pressure sensor and the regulator itself which is in the centre of the unit. The filter is located on the right as shown in the picture, it is secured by a circlip that when removed, the fuel filter can be removed. The o-rings must be replaced every time.

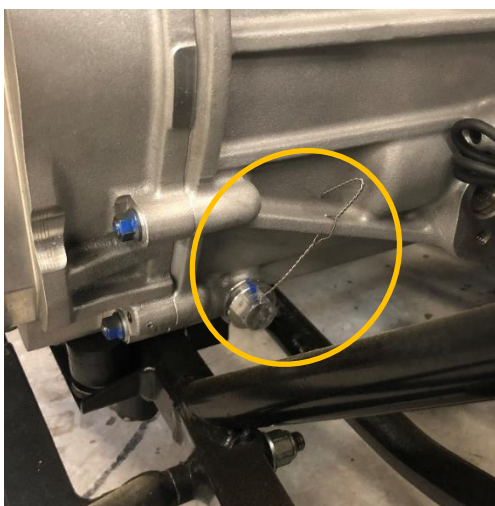
Fuel Filter: FF0005

Fuel Filter O-Rings: FR0006 x 2



Air Filter - The air filter should be inspected and cleaned before each race weekend/test day. When cleaned it should be oiled to the manufacturer's **instructions**.

Gearbox Oil Change - To remove the gearbox oil, remove the (17mm) oil drain bung on the right-hand side of the back casing and let the oil drain out. Lockwire must be fitted to the bung as shown when the bung is tight. When re-filling use 2.5 litres of Motul Gear 300 gearbox oil. 3 litres must be used if the gearbox and radiator is totally dry. Remove the (1") filler bung on the top of the gearbox back casing, then use a funnel to fill the gearbox.



9.2 WHEEL SPEED SENSOR SETUP

Use the jig for setting the wheel speed sensor (AT0042). Using a pair of 13mm spanners, set the wheel speed sensor no closer to the pickup point than the thickness of the Wheel Sensor Gauge (2mm). The pickup point is the end of the brake disc bolts on a SR10. In billet upright assembly the pickup point is the crown of the hub nut. Use slotted 13mm deep socket to secure sensor in desired position. When fitted, check the sensor is working by ensuring it is plugged in, then turn the power on and spin the disc, the sensor should light up when it sees each disc bolt. This is shown in the image below.



9.3 GEARBOX INSPECTION

We recommend the gearbox to be inspected every six hours, the teeth should be inspected for excessive wear and pitting. Check the condition of all the dog rings for rounding.

9.4 REPACKING DRIVESHAFT GREASE

The driveshafts should be stripped, cleaned, and re-greased every 6 hours of running. To do this, remove the driveshafts from the car, then remove the CV boot clips and slide them back away from the housing. Remove both housings and clean all the old grease in a wash tank. When re-assembling the driveshafts a set amount of grease should be applied to each end of the driveshaft, the amount is listed below. New clips should be fitted to the CV boots to prevent them from coming off. The inner CV housings stay in the gearbox when removing the driveshafts.

SR10 Driveshaft Grease (Per Joint): 100g

Total Lithium EP2 400g Driveshaft grease Part Number: TO0008

9.5 REPLACING CALIPER SEALS

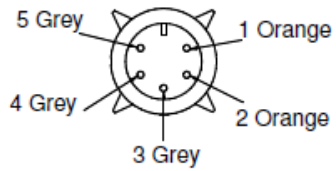
The following guide is the supplier's recommendation for replacing the seals in their calipers:

1. Extend pistons for easy removal – unbolt callipers, take out brake pads and place a block in the caliper to prevent pistons from falling out. Then pump the pedal until all pistons are extended 10-15mm (or carefully use an airline in the fluid inlet if the callipers are off the vehicle).
2. Remove calipers from vehicle.
3. Remove pistons by hand – do not use pliers or any kind of tool that could damage the outside of the piston.
4. Remove old seals from the caliper body.
5. Clean and inspect the pistons. You are looking to remove all contaminants from the outside of the pistons and ensure that there is no scratches/damage. You can polish the pistons to get the surface perfect.
6. Thoroughly clean the calipers – use an airline to blow out any contaminants from piston bore and fluid ways,
7. Grease the new seals and pistons with a thin layer of grease, the recommended product for this is: Rocol Sapphire Aqua-Sil
8. Install the new seals in the caliper body – ensure that the seal is seated correctly to prevent damaging them when pushing the pistons in.
9. Push the pistons in by hand, the seal should offer minimal resistance when the piston goes in square. If resistance is high, the seal is not seated correctly.
10. Install calipers and bleed brakes. Make sure the outside of the calipers are dry then leave overnight. Check brake calipers after they have been left overnight for any leaks.

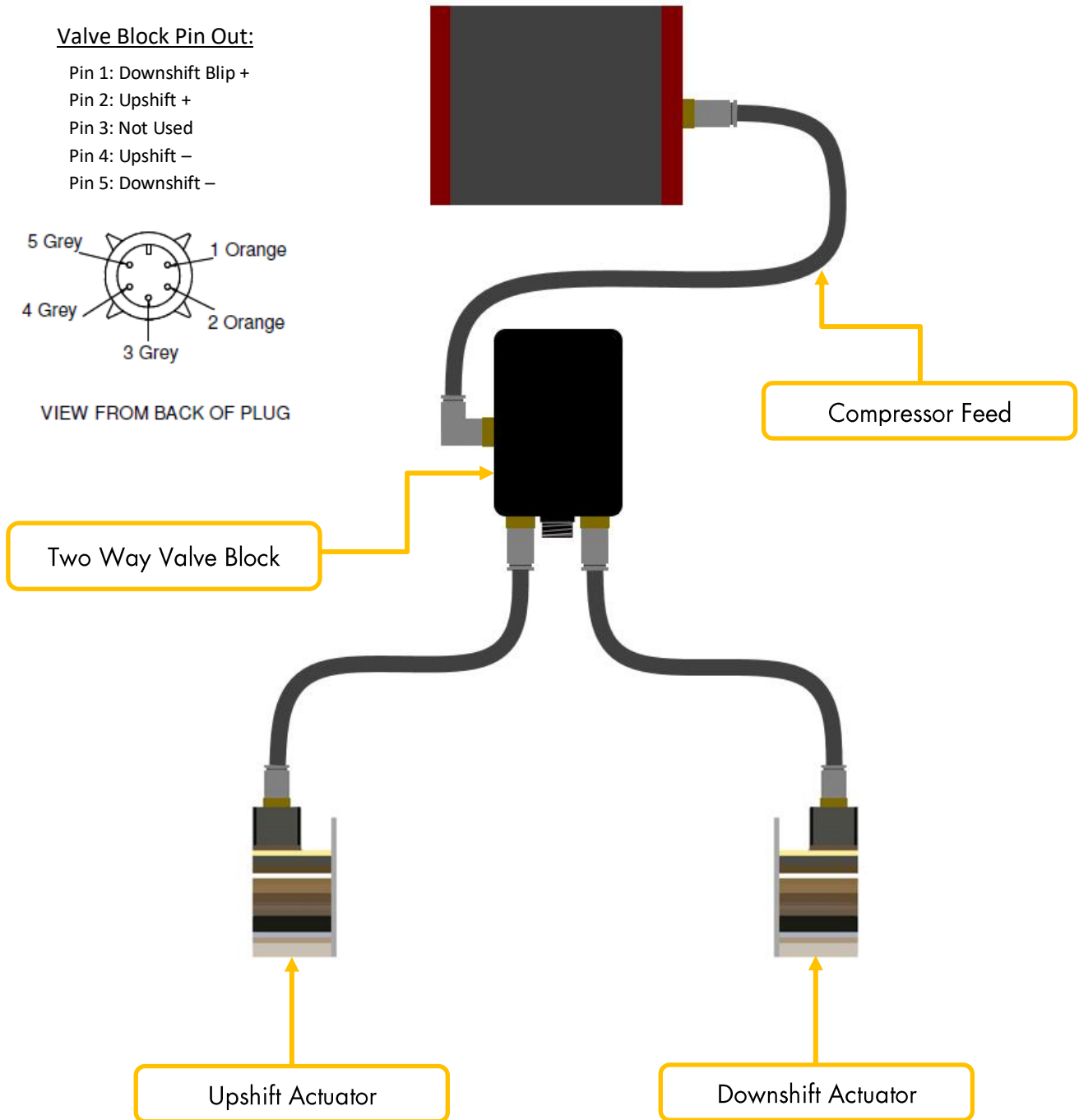
9.6 VALVE BLOCK ROUTING

Valve Block Pin Out:

- Pin 1: Downshift Blip +
- Pin 2: Upshift +
- Pin 3: Not Used
- Pin 4: Upshift -
- Pin 5: Downshift -

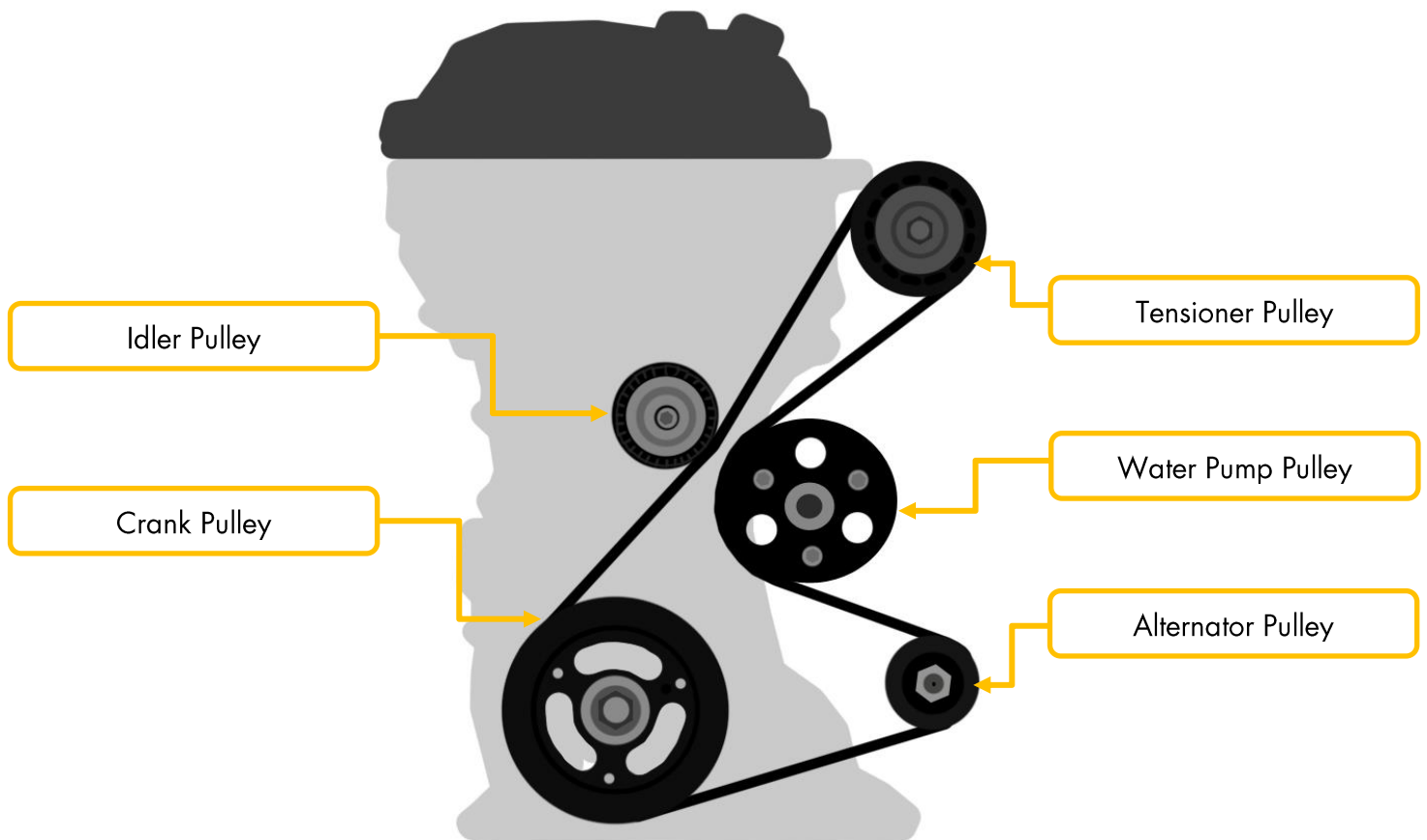


VIEW FROM BACK OF PLUG



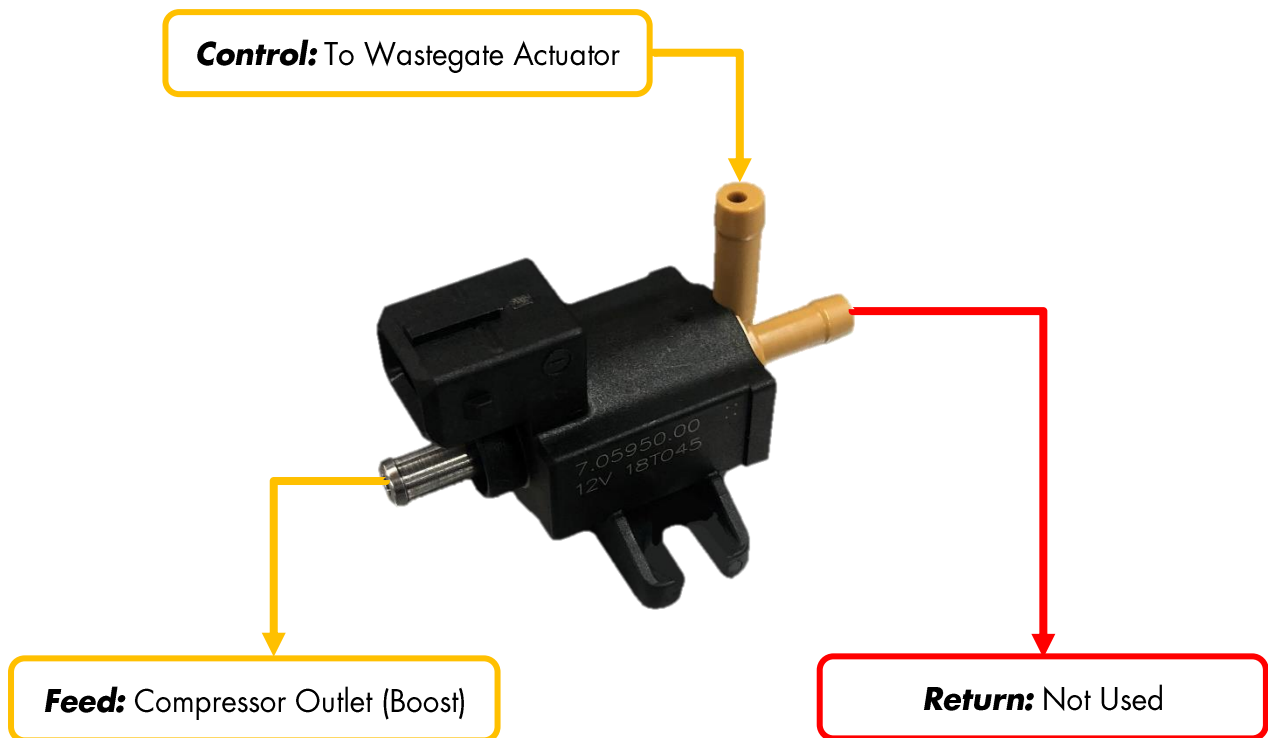
9.7 ALTERNATOR BELT ROUTING

The alternator belt routing is shown below: the belt also runs the mechanical water pump; it utilizes a tensioner pulley at the top which is visible from above the cam cover when fitted in the car. An idler pulley is also used to keep the pulley taught. It is imperative if changing the pulley, that it is central on the idler pulley and the water pump pulley as there are no ridges to locate the belt onto the pulley. To change the pulley, use a 21 mm spanner to move the tensioner pulley towards the exhaust side of the engine, this will create enough slack in the belt to remove it. An example is shown to the right.



BOOST SOLENOID:

The boost solenoid is fixed onto the bulkhead on the right-hand side of the engine bay. The solenoid is controlled by the ECU and determines how much pressure gets diverted to the wastegate actuator. Boost pressure is fed to one side of the solenoid, when opened by the ECU, it passes through to the back of the wastegate actuator which opens and reduces the amount of boost pressure that is being achieved, by releasing it through the internal wastegate port and out through the exhaust.

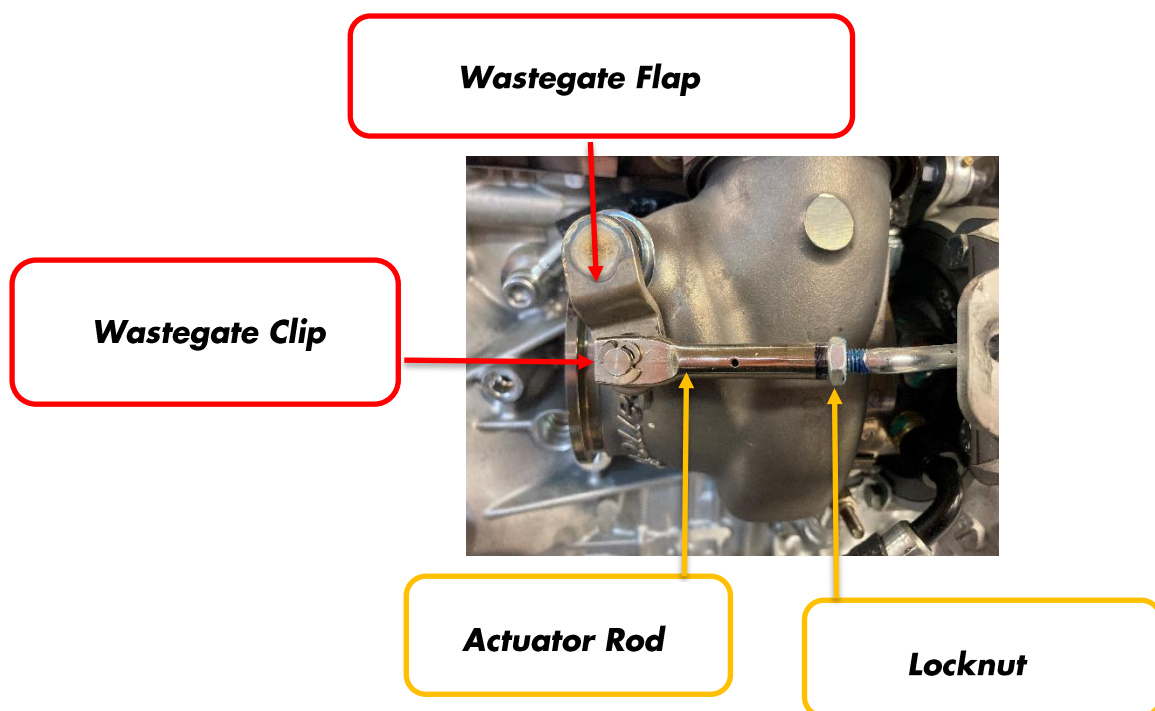


WASTEGATE ACTUATOR PRELOAD:

In case of installing a new turbo charger the person installing it is responsible for wastegate preload adjustment. Radical motorsport recommends 2 turns of preload as a default. This could be adjusted further if necessary.

The wastegate rod end is a universal part and must be modified prior fitting to achieve required setting. Modification requires shortening of the rod by 15mm.

Find a neutral position where the wastegate rod fits onto wastegate flap without any great preload. Minor bit of tension is acceptable. From this position shorten the length of wastegate actuator rod by screwing it in (turning right) by two full turns. Mount the wastegate rod onto wastegate flap and secure its position against rotation with locknut. Use new wastegate clip to secure wastegate rod in position.



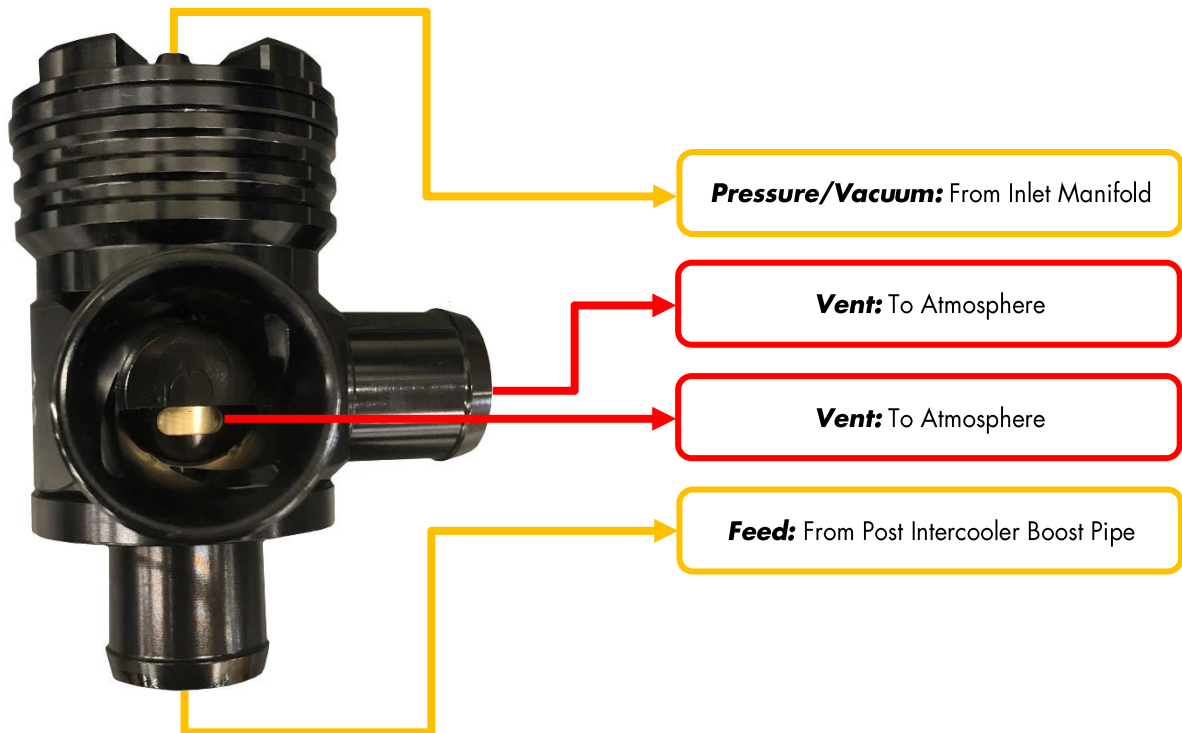
BLOW OFF VALVE:

The blow off valve is fitted on the right-hand side of the engine bay behind the oil tank in the boost pipe from the intercooler to the engine.

When on throttle, positive pressure is applied to the top of the valve to force the spring closed and retain the boost pressure inside the pipe. This comes from a small pipe fitted to the inlet manifold, that connects to the top of the valve. When the throttle is closed, there is a vacuum generated in this pipe, which helps open the valve to release the boost pressure that is not being consumed by the engine, through the ports on the side of the valve, this stops any compressor surge.

There is an adjuster on the top of the valve, this should be set at the mid-point (25 clicks from fully closed).

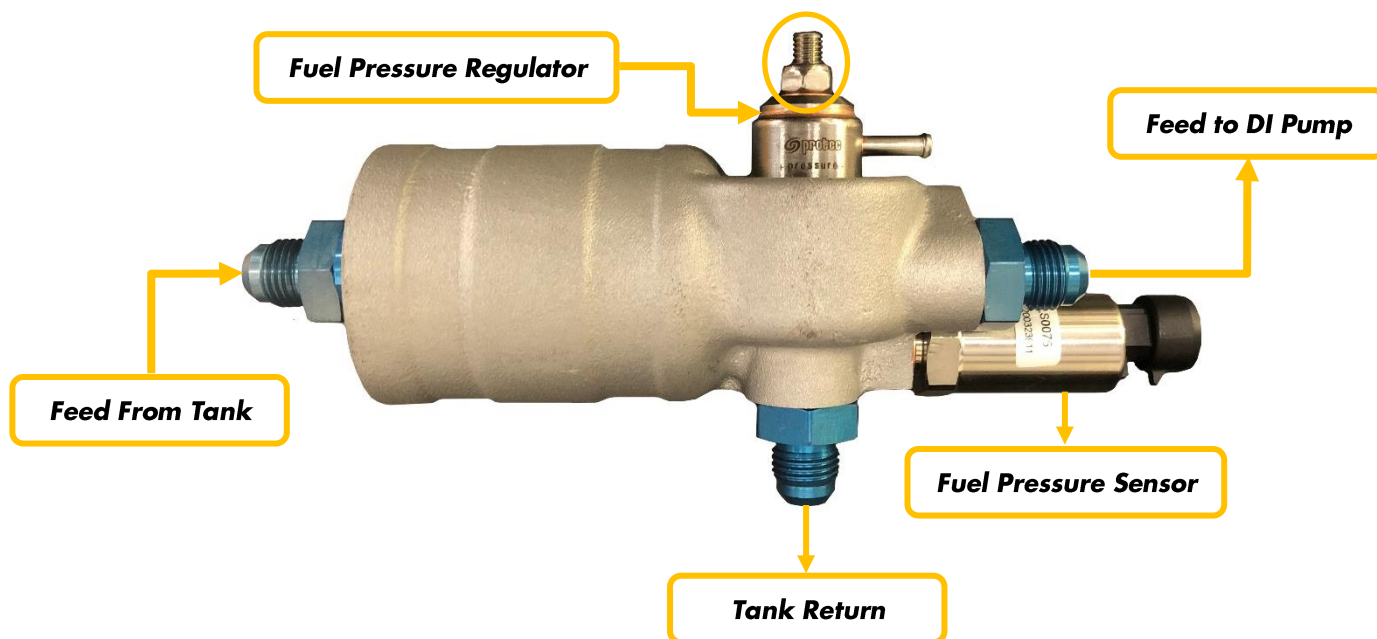
Some valves may only have one port to vent, this is not an issue.



9.9 FUEL REGULATOR

The car is fitted with an adjustable fuel regulator to achieve the 6bar that feeds the direct injection pump.

The fuel regulator can be adjusted to meet 6bar by loosening the locknut then turning the grubscrew. Turning the grubscrew clockwise will increase the pressure, anti-clockwise will decrease the pressure. This should be adjusted when the engine is off, use the 15 seconds of prime time to monitor the fuel pressure. Off load the fuel pressure should read 6.4, when on load it should then drop to 6bar. Ensure the locknut is tightened sufficiently when the pressure is set.



9.10 EXHAUST V-BAND CLAMP TORQUE

There are three V-Band clamps fitted to the car:

- Turbo Cartridge to Turbine Housing
- Turbine Housing to Exhaust
- Turbine Housing to Manifold

There is a torque for the V-Band nuts to avoid overtightening the clip and causing it to stretch. The correct torque procedure is shown below:

Torque the clips to **18Nm**, back the clip off 1-2 turns, then re torque to **15Nm**. To prevent the nut coming loose, a 1/4" lock nut should be fitted on top of the V-Band nut.

These nuts should be checked every time the car is prepped.



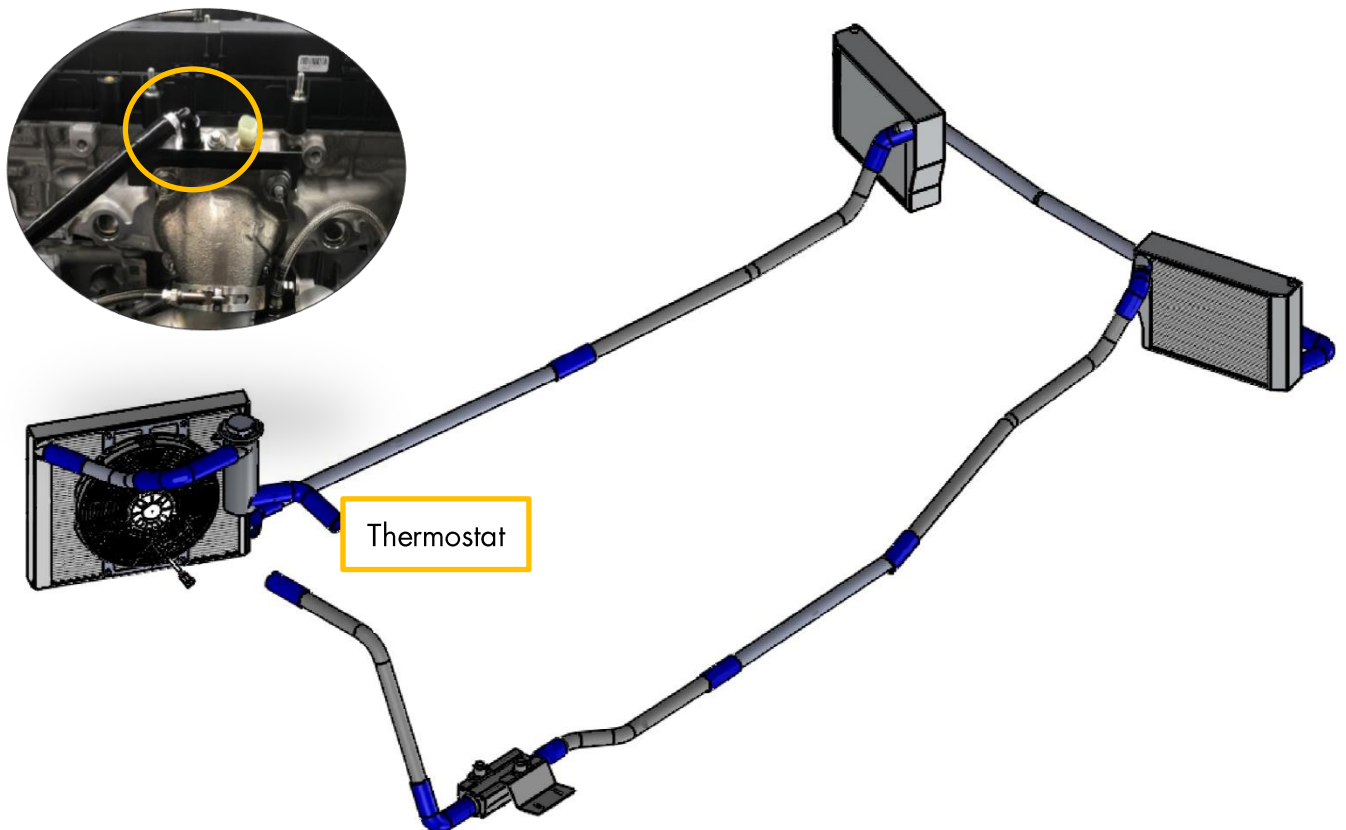
COAT THREADS PRIOR TO ASSEMBLY WITH JET-LUBE SS-30 COPPER ANTI-SEIZE COMPOUND (JET-LUBE INCORPORATED: HOUSTON, TEXAS (USA) OR EQUIVALENT. TIGHTEN TO 18.1 N·m APPROXIMATE TORQUE. LOOSEN 1-2 TURNS. RETIGHTEN TO 12.4-14.7 N·m OF TORQUE.

9.11 WATER FILL PROCEDURE

Due to thermostat, the water system is naturally harder to bleed. To aid the bleeding process when the system has been fully drained, it helps to fill the engine using the sequence below. Follow the steps below when filling the car from empty with coolant:

The total capacity for the cooling system is 13.5L.

1. Remove the head return pipe, shown below.
2. Crack off both front radiator banjo bolts.
3. Remove the 90deg pipe from the top of the swirl pot and rotate it so it is facing upright.
4. Fill the water system with a long funnel until it comes out of the front left radiator banjo bolt.
5. Tighten the banjo bolt on the front left radiator.
6. Continue filling the water system until it begins to come out of the front right radiator banjo bolt.
7. Tighten the front right banjo bolt.
8. Continue filling the water system until it begins to come out of the head return fitting.
9. Fit the head return pipe and top up the water system.
10. Re-fit the water pipe to the swirl pot.



9.12 GEAR POSITION SENSOR SETUP

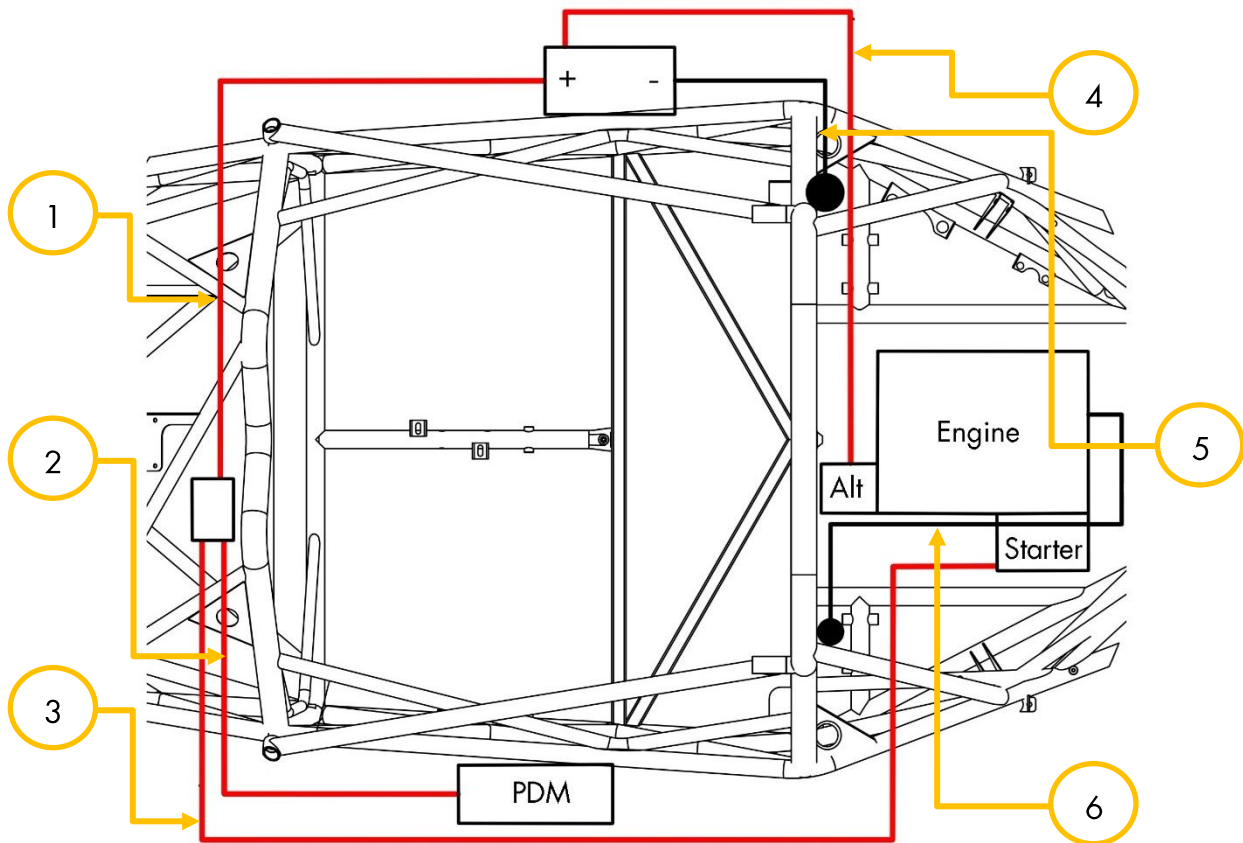
The gear position sensor should read 3.631v when in neutral. The sensor is located on the back of the gearbox, between the back casing and the exhaust silencer. The M5 bolts can be loosened and the sensor will rotate, which will change the voltage. When setting the sensor, it should read on target $\pm 0.05v$.

The in-gear voltages are listed below:



R:	4.144v
N:	3.631v
1:	3.150v
2:	2.650v
3:	2.155v
4:	1.655v
5:	1.165v
6:	0.670v

9.13 MAIN BATTERY WIRING ROUTING



SR10 Main Battery Wires				
#	Description	Handed	Part Number	Qty.
1	Battery to Master Switch	LHD/CHD	LH0117A	1
		RHD	LH0013	1
2	Master Switch to PDM	LHD/CHD	LH0370	1
		RHD	LH0367	1
3	Master Switch to Starter Motor	LHD	LH0116A	1
		RHD	LH0120B	1
4	Alternator to Battery	Both	LH0375	1
5	Battery to Chassis GND	Both	LH0119	1
6	Engine to Chassis GND	Both	LH0360	1

OVERVIEW:

Each wheel sensor is coded to an individual car receiver.

Each sensor is also coded to a specific position (FL, FR, RL, RR).

Wheels need to always be fitted to the programmed corner for the system to work.

You can use alternative wheels on each corner, but they need to have sensors fitted with the same programmed ID for that corner.

TO PROGRAM AN ADDITIONAL SENSOR:

Step 1 – Hold the programmer next to a working sensor you want to replicate (set 1).

Step 2 – Press POWER to power on

Step 3 – Press READ to read the ID number from the sensor.

Read ok

ID:XXXXXXXX: Y.YV

P:Z.ZBar T:WW°C

Note down this ID number.

Step 4 – Press EXIT

Step 5 – Hold TX for 5 seconds, this takes you to the programming screen.

Step 6 – Enter the ID number you have just taken down.

In D1 enter **13**

In D2 enter the **first two numbers/letters** of the ID

In D3 enter the **3rd and 4th numbers/letters** of the ID

In D4 enter the **5th and 6th numbers/letters** of the ID

In D5 enter the **7th and 8th numbers/letters** of the ID

Leave D6 blank.

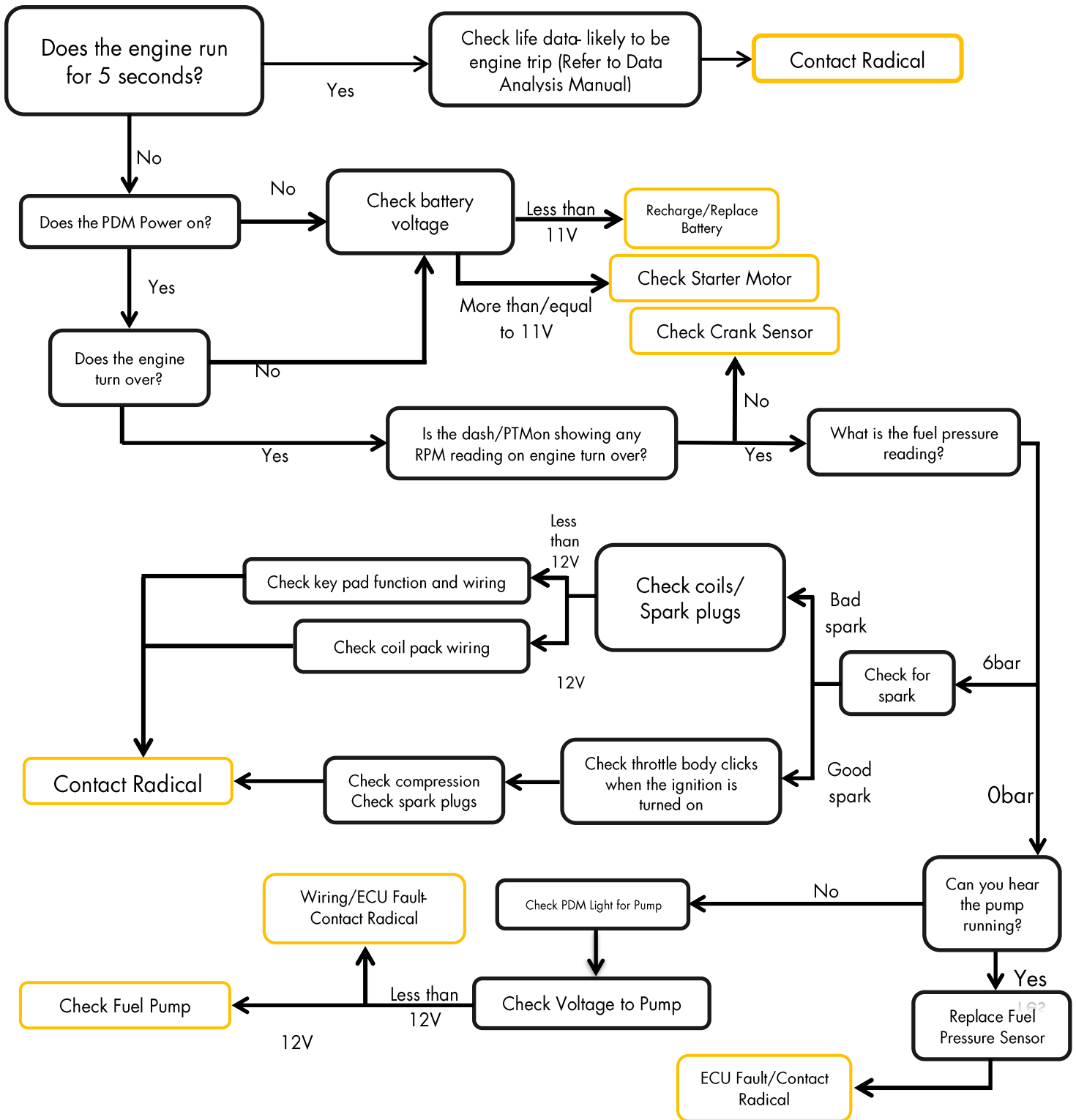
Step 7 – Hold the programming tool next to the new sensor you want to program (set 2) and press the TX button. It will say reading but it means transmitting! Once transmitted the screen will change to show the programmed ID.

Step 8 – Press Exit to exit this screen and exit again to get to the home screen.

Step 9 – Check the ID is programmed correctly by re-reading the new sensor.

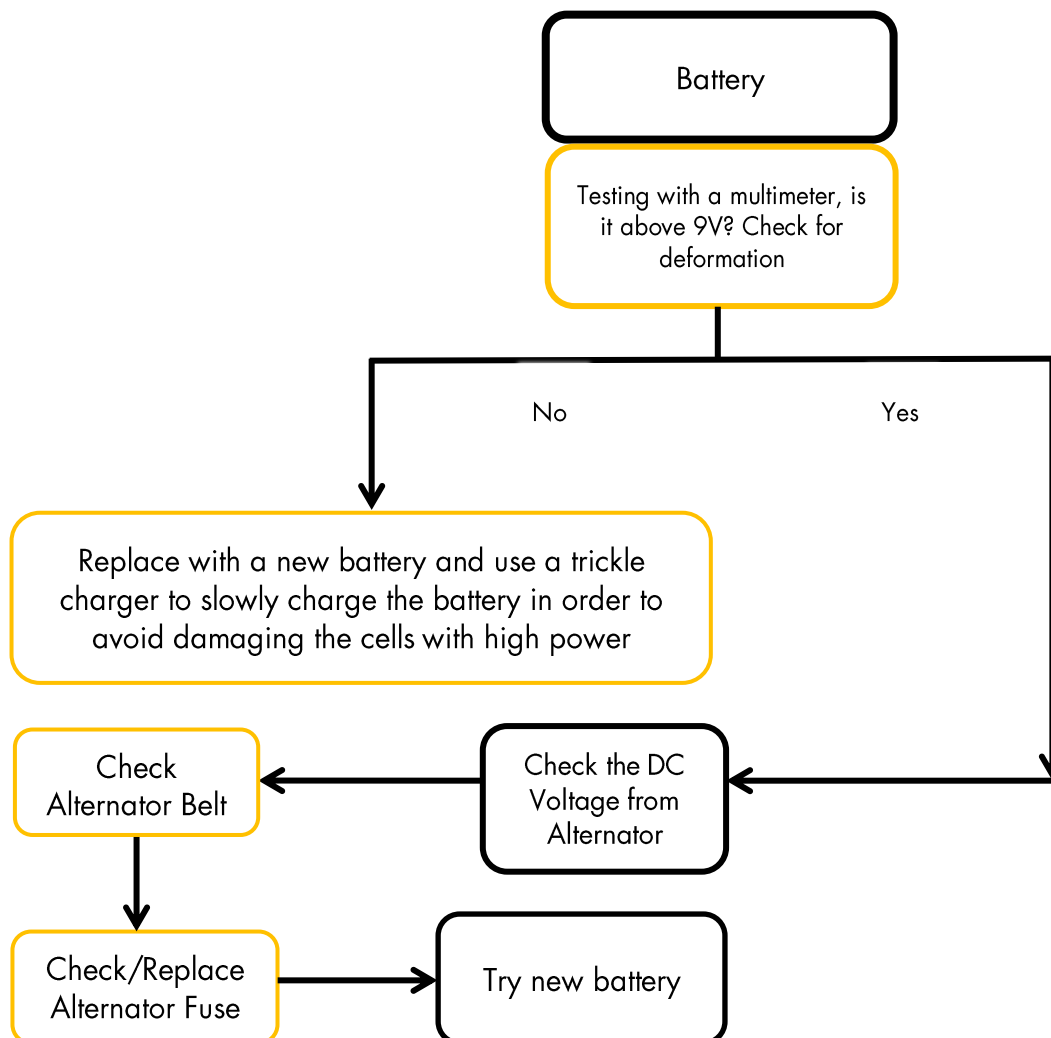
10. TROUBLESHOOTING

10.1 NON STARTING



10.2 CHARGING ISSUES

The SR10 should be charge between 13.5-14.5 V when running on circuit. If you see it running below this, it is likely you have some sort of issue with the charging of your car. After each run it is important to check the data on all areas with "vbat" being included; you will notice the charging voltage in this section. Follow the below guide on how to diagnose the problem and deciding on the solution.



When first discovering a gear shifting issue, it is important to first follow a few steps before attempting any remedy for the issue.

1. First of all, plug into the car and using the 'Data Analysis Manual' as a reference and download the data. Once the data has been downloaded, review the 'GearShiftDecision' channel to see if any shifts have been disallowed due to a breach in the cars normal parameters, TPS Too High/RPM Too High etc. The shift will not be allowed if it sees any of these, and 'GearShiftDecision' will tell you if there have been any dis-allowed shifts.
2. Next step is to open up LifeMon and check whether there is any output from the paddles. Do this by viewing the 'PaddleSwitch' channel, this will give a live reading of the paddle inputs, check the switches are registering on this channel by displaying up/down. If there is no output, check the wire from the steering wheel is still plugged in and has no breaks or tight bends.
3. Is it shifting through all gears? Or just having trouble with one specific gear? If the issue is just in a specific gear, this suggests it may be a mechanical issue and it is strongly advised to contact Radical HQ using the given contact details for more advice on what to do. If you have carried out the first two steps and are still having issues shifting through all gears, take a look below for more help, or contact the factory.

DOWNSHIFT ISSUES

Check the pipes going onto the actuator caps. Check the TPS is blipping when a downshift is requested. Check 'GearShiftDecision' for any dis-allowed shifts. Check the valve block.

ISSUES GETTING OUT OF NEUTRAL

Come off of the clutch then press the clutch down again and try to shift. Check the clutch switch is sending a signal, check the clutch clearance is correct at the pedal.

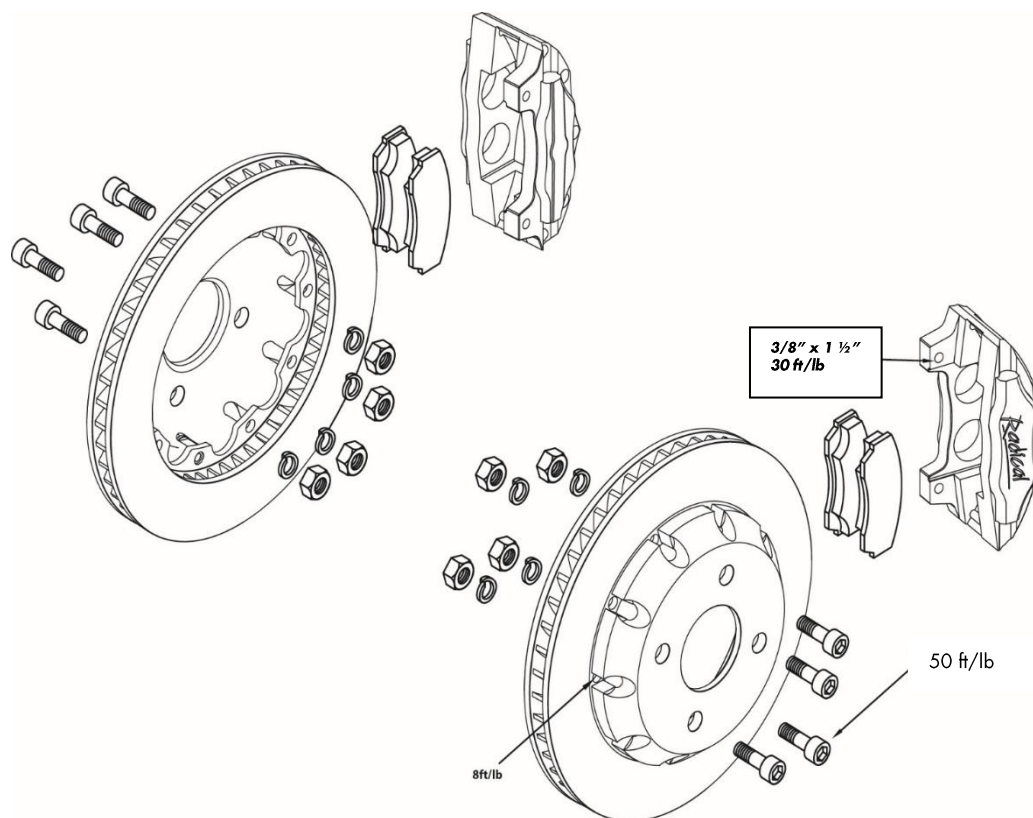
UPSHIFT ISSUES

Check the pipes going onto the actuator caps. Check the TPS is operating normally, check 'GearShiftDecision' for any dis-allowed shifts.

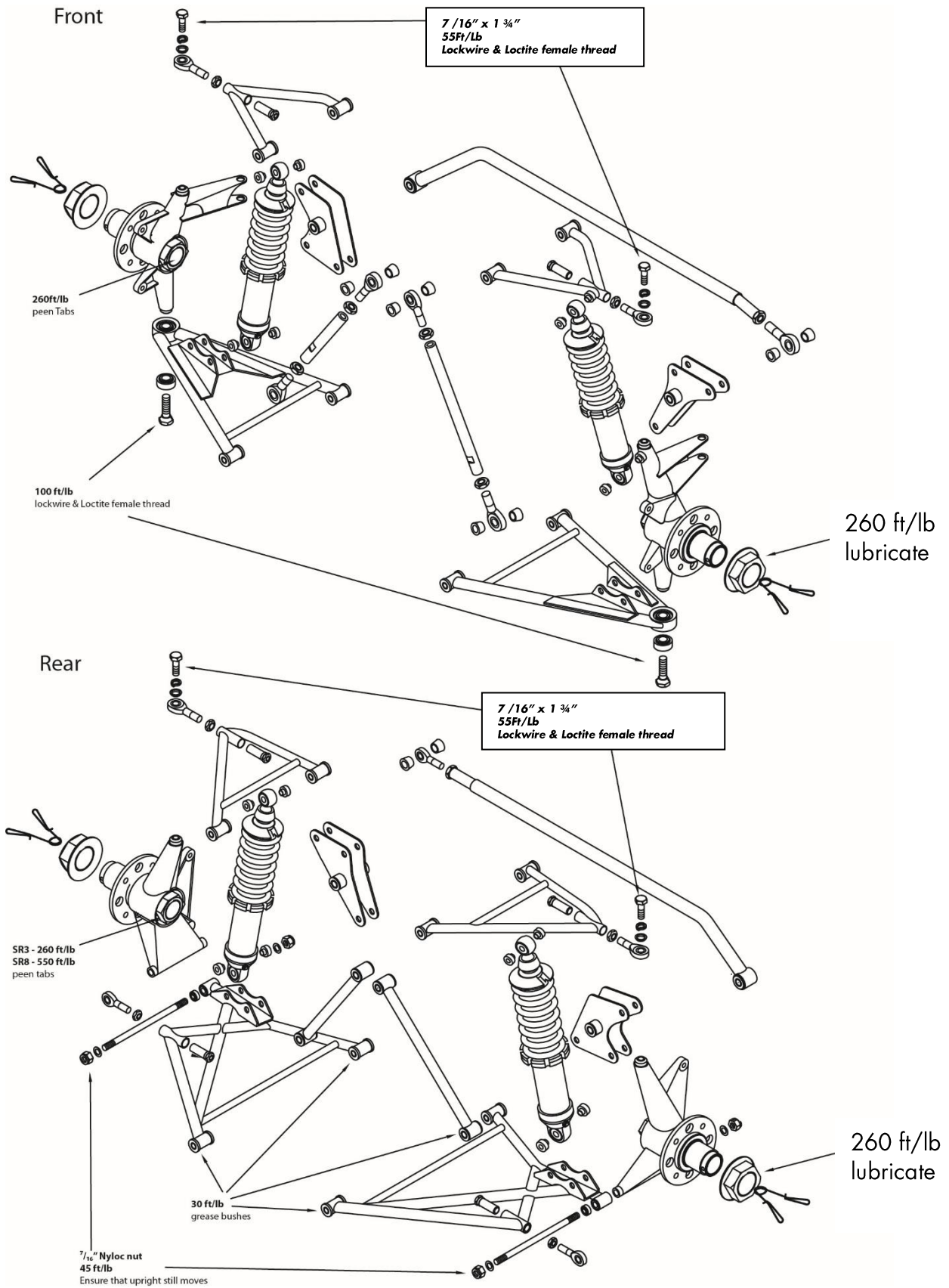
11. TORQUE FIGURES AND DIAGRAMS

11.1 BRAKING SYSTEM

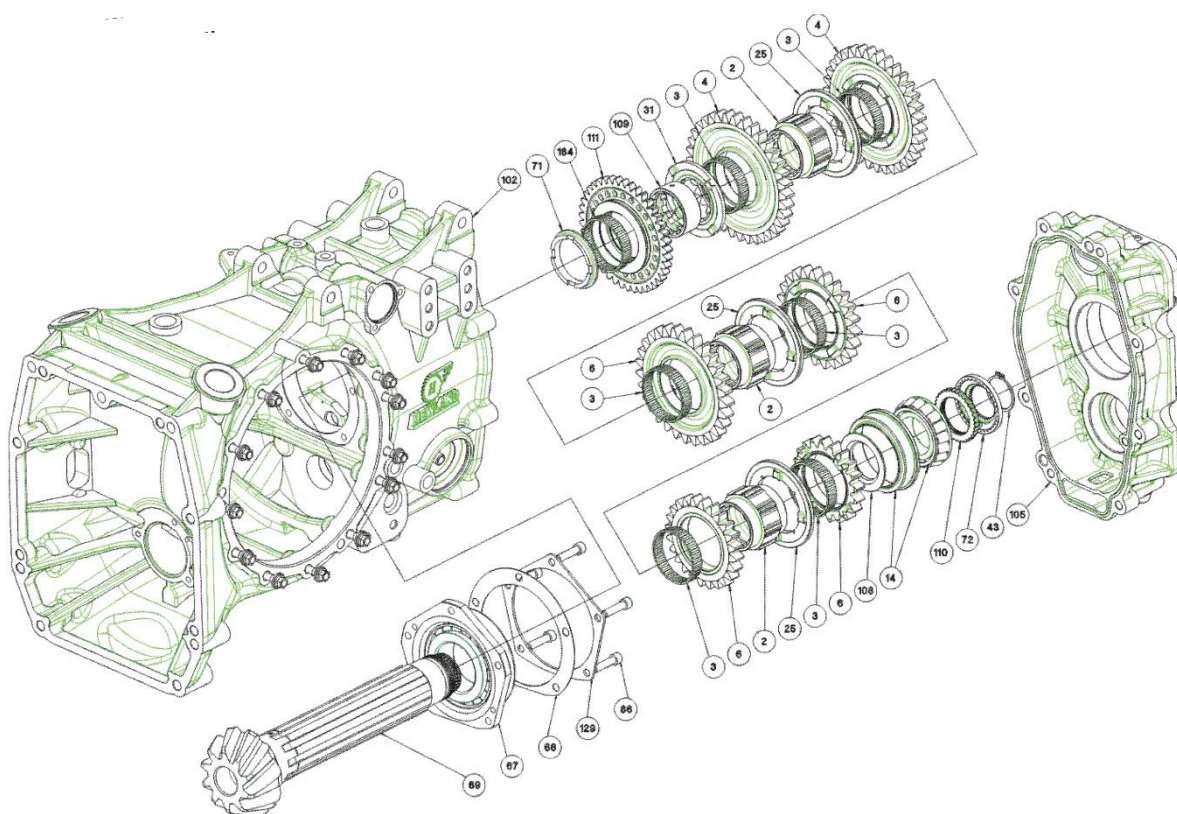
*K-Nuts are fitted at the rear due to clearance to the wheel bearing.



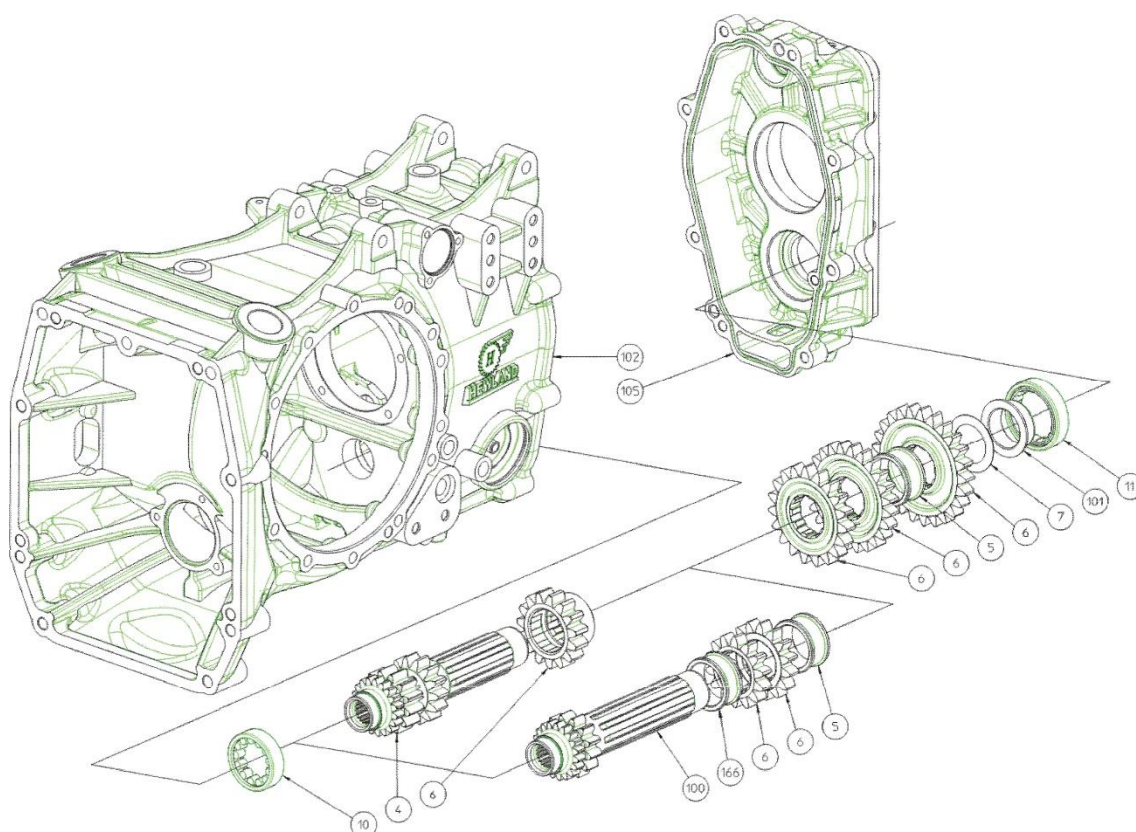
11.2 SUSPENSION COMPONENTS



OUTPUT SHAFT:



INPUT SHAFT:



SUSPENSION:

To be used as a guide only, nuts and bolts should be checked often and tightened, as necessary.

Wheel Bearing/Hub		
Front	Nyloc	180 Ft/Lbs
Rear All Models	Peened	180 Ft/Lbs
Wheel Nuts		
Centre Lock Nuts	Retaining Clip	260 Ft/Lbs
Welded Uprights		
Front/Rear Upper Bolts	243 Loctite/Lockwire	55 Ft/Lbs
Front Lower Bolt	243 Loctite/Lockwire	100 Ft/Lbs
Braking System		
Floating Disc To Bells	Plane Washer and Nut	8 Ft/Lbs
Brake Disc To Hub Bolts	Spring Washer and Nut	50 Ft/Lbs
Caliper Bolts	Spring and Plane Washer	30 Ft/Lbs
TPMS Sensor Nut	Nut	3 Ft/Lbs
Billet Uprights		
Steering arm to upright	M10 K-nut and bolt	37 Ft/Lbs
Front upright to top rose-joint	7/16" UNF Nylock and bolt	47 Ft/Lbs
Brake caliper bracket to upright	M8 Cap head bolt into aluminium upright (Loctite 270)	15 Ft/Lbs
Front upright lower stud into upright	M16 (Loctite 270)	100 Ft/Lbs
Front upright lower stud locknut (rose-joint)	M12 K-nut (split pin)	59 Ft/Lbs
Rear upright upper stud into upright	M16 (Loctite 270)	100 Ft/Lbs
Rear upright upper stud locknut (rose-joint)	7/16 K-nut (split pin)	47 Ft/Lbs
Hub bearing assembly into upright	M12	81 Ft/Lbs
Rear upright lower spindle	7/16" UNF Nylock	47 Ft/Lbs

Engine:

Engine (RPE)		
Flywheel	ARP Grease	85 Ft/Lbs
Clutch Housing Nuts	K-Nuts	29 Ft/Lbs
Alternator Bracket Bolts	-	8 Ft/Lbs
Spark Plugs	-	8 Ft/Lbs

Advisory generalized bolt torques:

Bolt size/Thread pitch	Grade 2	Grade 5	Grade 8
1/4 UNF	3.5 FtLbs	8.25 FtLbs	11.6 FtLbs
5/16 UNF	7	16	23
3/8 UNF	13	30	42
7/16 UNF	20	47	66
1/2 UNF	31	72	102
9/16 UNF	44	103	146
5/8 UNF	61	144	204
3/4 UNF	107	253	357

Bolt size (mm)	Grade 4.6	Grade 8.8	Grade 10.9	Grade 12.9
6	2.6 FtLbs	6.6 FtLbs	9.4 FtLbs	11 FtLbs
8	6	16	23	27
10	12	32	45	53
12	21	55	79	92
14	34	88	126	147
16	53	137	196	229
18	73	189	270	316
20	104	267	382	446

*All settings above are listed in Ft/Lbs.

12. PART NUMBERS AND COMPONENT LIFING

12.1 PARTS LIST

Part	Part Number	Qty.
Engine/Gearbox		
RPE Ford 2.3 Engine	EE0146	1
Hewland Gearbox	TH0354	1
Short Ratio Kit	TH0361	1
Long Ratio Kit	TH0362	1
Electronics/Sensors		
F88 GDI4 ECU	LE0087	1
Lithium Battery	LB0155	1
Lithium Battery Charger	LB0156	1
Engine Loom	LH0374	1
Steering Wheel	SC0120	1
PDM	AD0203	1
Alternator	LB0147	1
Starter Motor	LM0044	1
Spark Plugs	LP0021	4
Chassis Loom (Front)	LH0365	1
Chassis Loom (Rear)	LH0366	1
Light Loom (Front)	LH0340	1
Light Loom (Rear)	LH0347	1
Master Switch to PDM Cable (RHD)	LH0367	1
Master to Starter Cable	LH0120	1
Battery to Master Switch Cable	LH0117	1
Alternator to Battery Cable	LH0375	1
Alternator Fuse	LF0006	1
Master Switch to Starter Cable (RHD)	LH0120B	1
Engine to Battery Earth Cable	LH0360	1
Battery to Chassis Earth Cable	LH0119	1
SR10 Compressor Feed Extension Loom	LH0376	1
Master Switch	LS0009	1
Brake Light Switch	LS0030	1
Paddleshift Compressor Assembly	TP0100	1
Paddleshift Compressor Motor	TK0004	1
Coil Pack	LE0088	4
Gear Position Sensor	LS0231	1
Water Temperature Sensor	LS0028	1
Oil Temperature Sensor	LS0028	1
Front Left Wheel Speed Sensor	LS0080	1
Ambient Air Temperature Sensor	LS0093	1
Lambda Sensor	LS0064	1
Exhaust Gas Temperature Sensor	LS0196	1
Oil/Fuel/Gearshift Pressure Sensor	LS0075	1
6 Button Keypad	AD0204	1
Valve Block	TP0110	1
PPS Sensor	ET0072	1
Rain Light	LL0131	1

Drivetrain		
Driveshaft (Complete)	TH0357	2
Clutch	ERW0033	1
Flywheel	ERX0027	1
Outer CV Housing	TJ0016	2
Clutch Release Bearing	BM0139	1
Clutch Master Cylinder	BM0141	1
Clutch Slave Cylinder Spacer	TH0355	1

Suspension/Steering		
Upright LF	SU0028	1
Upright RF	SU0029	1
Upright LR	SU0040	1
Upright RR	SU0041	1
Billet Upright LF	SU0196	1
Billet Upright RF	SU0197	1
Billet Upright LR	SU0200	1
Billet Upright RR	SU0201	1
Billet Upright Camber Shim 0.25mm	SU0206	N/A
Billet Upright Camber Shim 0.5mm	SU0178	N/A
Damper LF	SS0182	1
Damper RF	SS0183	1
Damper LR	SS0204	1
Damper RR	SS0205	1
Rocker LF	SN0035	1
Rocker RF	SN0036	1
Rocker LR	SN0025	1
Rocker RR	SN0026	1
Wishbone Front Lower	SW0013	2
Wishbone Front Upper	SW0015	2
Wishbone Rear LH Lower	SW0039	1
Wishbone Rear RH Lower	SW0040	1
Wishbone Rear Upper	SW0038	2
Wheel Nut LH	WN0003	2
Wheel Nut RH	WN0004	2
Trackrod	ST0001	2
Front Pushrod	SP0012	2
Rear Pushrod	SP0032	2
Camber/Toe Adjuster	SW0004	6
Steering Rack	SR0010	1
Steering Column	SC0056	1
Steering Universal Joint	SJ0011	1
Front Wheel	WC0019	2
Rear Wheel	WC0020	2
Braking System		
Brake Disc Front Pair	BD0135	1
Brake Disc Rear Pair	BD0068	1
Brake Caliper LF	BC0121	1
Brake Caliper RF	BC0122	1
Brake Caliper LR	BC0068	1
Brake Caliper RR	BC0069	1
Brake Disc Bolt	SH0026	16
Front Master Cylinder	BM0092	1
Rear Master Cylinder	BM0093	1
Brake Duct LH	BE0055	1
Brake Duct RH	BE0056	1
Brake Pads	BD0011	2
Brake Bell	BD0060	4

Cooling System		
Intercooler	FI0180	1
Laminova Heat Exchanger	HR0042	1
Water Radiator Front LH	HR0085	1
Water Radiator Front RH	HR0086	1
Water Radiator LH Sidepod	HR0079	1
Gearbox Oil Cooler	GC0029	1
Radiator Fan	HF0008	1
Swirl Pot	HS0043	1
Fuel System		
76L ATL Fuel Cell	FT0180	1
Adjustable Fuel Regulator	FR0024	1
Fuel Roll Over Valve	FD0004	1
Fuel Pump	FP0032	1
Fuel Filter	FF0005	1
In Tank Fuel Filter	FF0017	1

Engine/Oil System		
Turbo	EX0367	1
Air Filter	EF0014	1
Air Filter Bracket	FI0177	1
Air Filter Bracket Small	FI0178	1
Oil Filter	EF0023	
Oil Tank	GT0049	1
Oil Dipstick	GT0052	1
Oil Catch Tank	GT0050	1
Intake Pipe	FI0181	1
Intake Hose	FI0186	1
Exhaust Downpipe	EX0371	1
Loud Exhaust	EX0354	1
Turbo to Intercooler Pipe	FI0183	1
Blow Off Valve	FI0187	1
Engine Mount Bush	EM0075	4
Bell Housing Bush	EM0073	2
Turbo to Manifold V-Band Clamp	EX0374	1
Turbo to Exhaust V-Band Clamp	EX0375	1
V-Band Nut	EX0376	3

Bodywork		
Cockpit	MC0130	1
Cockpit Upper	MC0123	1
Wind Deflector	MX0009	1
Nose	MN0093	1
Front Splitter	MD0058	1
Front Splitter Stay Lower	MU0081	2
Front Splitter Stay Upper	MU0101	2
Front Splitter Stay Rear LH	MU0084	1
Front Splitter Stay Rear RH	MU0085	1
Wear Pad Front	MU0004	2
Wear Pad Front Centre	MU0078	1
Rear Light Section	MR0074	1
Engine Cover	MR0073	1
Sidepod LH	MP0115	1
Sidepod RH	MP0116	1
Sidepod Wear Strip LH	MU0060	1
Sidepod Wear Strip RH	MU0061	1
Main Plane	MW0087	1
Bi Plane	MW0088	1
Endplate LH	MW0101	1
Endplate RH	MW0102	1
Rear Wing Support Frame	CW0039	1
Front Crashbox	CC0036	1
Towing Eye Front	CT0029	1
Towing Eye Rear	CT0018	1
Rear Diffuser	MD0048	1
Rear Diffuser Vane	MU0086	2
Sideskirt LH	MA0007	1
Sideskirt RH	MA0008	1
Sidepod Scoop LH	MP0117	2
Headlight Bucket LH	MH0057	1
Headlight Bucket RH	MH0058	1
Headlight Lens LH	MH0053	1
Headlight Lens RH	MH0054	1
Splash Cover	MC0017	1
Dive Plane Lower LH	MA0093	1
Dive Plane Lower RH	MA0094	1
Dive Plane Upper LH	MA0103	1
Dive Plane Upper RH	MA0104	1
Dash RHD	LD0123	1
Double Seat	MS0075	1
Mirror LH	AM0059	1
Mirror RH	AM0060	1

12.2 FLUIDS

Below is a list of all the fluids that you will need to run your SR10, including part numbers and quantities required:

Type	Part Number	Packaging	Brand	Viscosity/Type	Required
Engine Oil	EO0067	5L	Motul 8100 X-Power	10W/60	6.75L
Brake/Clutch Fluid	BF0006	1L	Castrol SRF	Dot 4	1L
Gearbox Oil	TO0022	1L	Motul Gear 300	75W/90	3L (Dry)
Coolant	HW0009	5L	Motul	Inugel Optimal Pre-Mix	13.5L
Aluminium Paste	AC0040	Can	Tygris	Aerosol	N/A

12.3 COMPONENT LIFING

As the performance of our cars increases and the number of hours, we log racing the cars grows, we are able to more accurately predict the lifespan of a car's components. Please see below the 'Radical Component Lifespan Chart'. Contact technical@radicalsportscars.com for the automatic lifing tracker excel sheet.

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, or other cars, then you will need to reduce the timescales recommended and immediately replace damaged parts.

The recommended life expectancies in no way represent a parts warranty, due to the unpredictable and uncontrolled use of these racing car components Radical will not be held responsible or accountable for any parts failure. This information is provided solely as a guide to increase the safety of the cars.

Component	Action	Interval	
		Hours	Distance (km)
Engine	Rebuild	80	N/A
Gearbox rebuild	Inspect/ rebuild	-	4000
Injectors	Service	80	-
Spark plugs	Replace	80	-
Valve block	Check/Tighten	-	4000
Calipers	Rebuild	-	4000
Dampers	Dyno check	-	4000
Driveshafts Outer Housing	Replace	-	4000
Driveshafts (complete)	Rebuild	6	-
Suspension bushes	Replace	-	2000
Suspension rose joints	Replace	-	6000
Front Upright Bearings	Replace	-	6000
Rear Upright Bearings	Replace	-	6000
Wishbones	Inspect/ replace	-	8000
Master cylinders	Replace	-	8000
Battery	Replace	Annually	-
Fuel tank	Inspect	Annually	-
Steering rack	Rebuild	Annually	-

12.4 SERVICE SCHEDULE

The below intervals are intended as a guide to assist in components achieving full life and reliability of your engine and gearbox. These intervals are based on Radicals recommended oils which can be found in the fluid specifications section of this manual.

Component	Action	Interval track (hours)
Engine oil	Replace	6
Engine oil filter	Replace	6
Gearbox oil	Replace	6
Engine air filter	Clean	40
Fuel filter	Replace	40
Gearbox inspection	Inspect	6

12.5 STANDARD PRE-RACE/TEST CHECKLIST

The below checklist is intended as a guide only. This checklist is an expansion of the prep sheet which is on page 65.

1. Bodywork	
Check all bodywork for damage	
Check all the lights function	
Check the underside of the sidepods, diffuser and front splitter skid blocks	
Put the car on a stand	
Disarm the fire extinguisher	
Drain the fuel and measure the amount	
2. Shake Test	
Check all corners for play in wheel bearings and rose joints	
Check all steering components for play	
Check rockers and dampers for play	
Check the front diffuser	
Fit new tyres if necessary, clean and fit valve caps	
3. Data Check (See Data Manual for further information)	
Check engine hours and overrevs	
Check the data the following:	
High water temperature	
Oil surge, Low oil pressure	
Gearshift decision's	
Charging trace	
PPS Full throttle, 0.5% on idle	
Faulty sensors	
4/5. Differential and Driveshafts	
Inspect and grease the driveshafts	
Check the clutch is working correctly	
Check the gearbox oil level	
Check the ratio's for pitting etc.	
6/7/8/9. Suspension and Brakes	
Clean the corners whilst checking for cracks on the following components:	
Uprights, wishbones, nik-links	
Chassis	
Wishbone pick up points	
Wishbone bushes	
Clean and lube wheel nuts	
Bleed the brakes and clutch	
Check the condition of the brake pads	
Check the balance bar	
Repack the silencer if needed	
10. Engine Bay	
Clean the engine bay	
Check wiring for signs of heat or chaffing	
Check all oil pipes	
Check all fuel lines	
Check engine mounting bolts	
Check all hose clamps	
Check gearbox mounting bolts	
Check exhaust primary bolts	
Drain the catch tank	

Clean the air filter and check the airbox bolts	
Check the throttle wiring DBW.	
Check all coolant pipes	
Check turbo pipes	
Check turbo v-band clamps	
Check turbo water feed lines	
Check turbo oil lines	
Check wastegate actuator and bracket	
11. Wiring	
Check wiring in the engine bay for chaffing and signs of heat	
Check coil wiring	
Check the condition of all connectors	
Check the wheel speed sensor, gap (all four lights)	
Check wiring behind the dash	
Check all wiring is away or shielded from the exhaust	
12. Paddleshift	
Check paddleshift piping.	
Check compressor for leaking.	
Tighten valve block	
13. Oil Filter	
Drain the oil and remove the filter	
Fill the car with new oil and fit new filter, re-Lockwire the bung when finished	
Ensure the hose clip is fitted correctly onto the new filter	
Dry crank the car to circulate the new oil	
14. Run Up	
Check coolant level	
Start the engine check TPS and balance bodies	
Warm the oil to 50deg	
Hold the rpm at 4000rpm for 5 seconds and then turn engine off	
Check the oil level and top up if needed	
Check for any other signs of leaks	
15. Spanner Check	
Check all the following components:	
Uprights, Wishbones, Pushrod's, Rocker's, Steering, Caliper's, Pedal Box	
Front Diffuser	
Hose clips, Oil lines, Fuel lines, Water pipes	
Air Jacks (Check for leaks)	
16. Safety Systems	
Check the seat belts are in date and are free from cuts and tears	
Check the fire extinguisher is in date and full	
17. Set Down/Set Up	
Measure the car as it left the previous track and record	
Set up the car for the next circuit	
18. Clean The Car	
Clean the interior, Hoover the pedal box	
Clean the bodywork	
Polish the car	
19. Re-fit Bodywork	
Fit diffuser and bodywork ensuring lights are connected and working	
Check cockpit controls	
Check all the latches and Dzus fasteners on the bodywork	
Fit the rear tie downs	



Technician:

Customer:

Chassis Number:

Engine Hours:

Mileage:

Pre/Post Event:

Date:

SR10

SR10 | WORKSHOP PREPARATION SHEET

SR10						
Description	Faults/Advisory	Parts Fitted	Initials	Hours	+ Hours	
1. Check for any loose bodywork or damage	----- ----- -----			0.5		
2. Shake Test remove wheels inspect for damage	----- ----- -----			0.75		
3. Check Life Data	----- ----- -----			0.5		
4. Inspect gearbox and change ratios if necessary	----- ----- -----			2.5		
5. Check and grease CV joints				1		
6. Check condition of braking system	----- ----- -----			0.5		
7. Bleed Brakes and Clutch				0.5		
8. Clean corners, checking for cracks and worn out bushes	----- ----- -----			1		

Note: When carrying out set-up on flat-patch, set tyre pressures to hot pressure. Ensure that they are returned to cold pressures after setup is complete.

Date		Chassis #		Job #	
		Technician 1		Technician	

Camber	
-3.2	-3.2
-1.4	-1.4

Toes

2mm out


2mm out

3mm IN

3mm IN

Triple Intrax		Springs/Preload			Triple Intrax	
Bump LS:	-10	Rate	FARB	Rate	Bump LS:	-10
Bump HS:	-30	130	Soft 15.8mm	130	Bump HS:	-30
Rebound:	-5		Medium 19mm		Rebound:	-5
		Length	Hard 22.2mm	✓	Length	
		100	X Hard 22.2mm		100	
		Preload			Preload	
		4 turns			4 turns	

[illegible]

Tyre Pressure (PSI) (Cold & Hot)			
28	Hankook	28	PADS
20		20	01
			
28		28	PADS
19		19	01

Rear Wing	
Holes (from the bottom)	
Main	3 out of 4
Bi-wing	7 out of 9

Comments:

QD165-9

12. VERSION HISTORY

2021-03-03 V1.0 Initial public release.

2021-03-22 V1.1 Oil Specification Correction.

2021-04-20 V1.2 Fuel Specification Clarification, TPMS Amp Limit Update.

2021-05-04 V1.3 Gearbox Oil Specification Correction.

2021-06-03 V1.4 Cal switch changed from WHP, tyre valve torque added.

2021-07-26 V1.5 PDM pin out update, PDM status channel added (page 22)

2022-01-05 V1.6 Coil pack part number corrected.

2022-03-18 V1.7 Torque requirements change.

2022-08-03 V1.8 ATL recommended practice, Wastegate preload, EPAS installation

