CR7 Manual

Contents

CR7 General Details

Drive Side: Left hand side

Dry weight: 2010kg (55% front, 45% rear)

Wheel base: 3000mm

Width, Length, Height: 2200mm, 4430mm, 1830mm

Engine: Audi DECA 2.9l Twin Turbo

Power: 264 kW - FIA Specification

Gearbox: SADEV SC924 6 speed sequential

Clutch: AP triple plate CP7373

Flat Shift (up/down): Yes

Side Shaft: Walterscheid

CV Joint: GKN 128mm (33 splines)

Fuel Tank: FIA FT3-1999 (500L cell)

Fuel Pump: 2 x WELDON 600A immersed

Wheel: Wheel Pro forged 17in

Tyre: BF Goodrich 37x12.5R17 (Front and Rear)

Spare Wheels: Carries 2 (one each side)

Brake Caliper: Power Brake 6 pod water cooled

Brake Disc: AP Racing, ventilated 343mm floating

Pedal Box: Titon floor mount swivel type

Seat: Fibreglass (OMP/Sparco)

Dampers: R53 suspension, 4 Front ST55 and 4 Rear ST55, Double piston, 3-way adjustable, 350mm Wheel Travel

ECU: Motec M142

PDM: PDM 30 x 3

1 Pre-Drive Inspection

1. Check all wheel nuts torqued to 130 Nm.
2. Check tire pressure set correctly.
3. Check and ensure both fuel caps are properly closed and tightened.
4. Ensure steering wheel is fully engaged.
5. Check engine water level halfway in bottle when engine is cold before startup. Use 1 bottle water wetter, without anti-freeze or coolant.
6. Check power steering fluid halfway in bottle just above the baffle plate.
7. Switch on ignition.
8. Switch on main fuel pump. Check fuel pressure is above 4 bar. Switch on reserve pump and switch off main pump and check pressure again. Look for any fuel leaks. Switch off reserve pump.
9. Start car.
10. Do not rev engine.
11. Allow engine to idle and engine oil to warm up to a minimum of 60℃ and oil pressure increases above 3 Bar.
12. Ensure water pressure increases to a minimum of 0.5 Bar and the water temperature increases to a minimum of 60℃+.
13. Set your brake bias 16 clicks from the rear. Tap your foot on the pedal while adjusting to prevent it from getting stuck.
14. Check gearbox oil pressure is active.
15. Check steering is free and easy.
16. Do not jack the car up until engine oil is above 60℃. Jack the car on one side and see that it is lifting all the way on idle.
    (Never jack car on a downhill)
17. When jacked shake wheel and check play on wheel bearings and side shafts.
18. Repeat steps 16. And 17. for the other jack and wheels.
19. Ensure both jacks are fully retracted.
20. Inspect CV boots and Mudflaps
21. Check oil level is 130% on dash with engine off, 1 minute after running.
22. Reset fuel meter. Check fuel level and add fuel. Work on 1.2 km/l for race stage and 4 km/l for liaison. When possible try use 102 Octane fuel or AVGAS. The engine map needs to be changed for 95 fuel or 102 fuel. Do not use the 102 map with 95 fuel as this will cause detonation and damage the engine.

23. Set speed limiter to correct setting.
24. Activate Anti Lag during Race stage only.
25. Check Water temps are stable during Liason
26. Ensure correct tools are onboard the car:

Sockets 1/2 (6 sided)	**Sockets 3/8 (12 sided)**	**Spanner**	**Ratch Spanner**	**Allen key (long with ball end)**	**Allen sockets 3/8 (gedore/king tony)**
22	17	30	19	10	10
19	13	28	17	8	8
17	10	25	13	6	6
13	8	24	12	5	5
Ratchet handle 1/2	Ratchet handle 3/8	22	10	4	4
Long extension 1/2	Long extension 3/8	1/2 inch	8	3	3
Short extension 1/2	Flexi Knuckle 3/8 king tony	9/16 inch			
Flexi Knuckle 1/2 king tony		11/16 inch			

Special tools	
Hammer ball pein 1kg	Hub spigot tool
Pliers long and short (quality)	Hub lock nut tool
Side cutters (quality)	Wheel inflation hose
Waterpump pliers (quality)	
Vice grip	Tow Rope
Flat screwdriver big	Medical Kit
Flat screwdriver small	Survival Kit
Shifting spanner (250mm)	Shovels
Flexi Hose clamp tool 7mm	Sand Ladders
Circlip pliers universal internal and external 45mm	
Makita DTW300 impact wrench, 5Ah Battery and 19 socket	

2 Maintenance

2.1 Oils, Fluids and Lubricants

Application on the CR7	Specification	Recommended Brand	Recommended Model	Product Code	Qty:	Notes:
Engine:	5w40	Motul	300 V Competition	110817	10 L	Check level on dash @120% .12 L when new.
Gearbox:	75W140	Motul	Gear Competition	105779	1.8 L	Check Fill line after running. 2.6l when new.
Brake Fluid:	DOT 4	Motul	RBF 700	109452	250ml +-	Check Fill line after running. Don't overfill
Clutch Fluid:	DOT 4	Motul	RBF 700	109452	125ml +-	Check Fill line after running. Don't overfill
Power Steering Fluid:	ATF	Motul	Multi ATF	105784	3L +-	50mm from top of bottle. 4L when new. Alternative, Liqui Moly ATF 1200
Differential Front:	75W140	Motul	Gear Competition	105779	3L +-	Check Fill line after running
Differential Rear:	75W140	Motul	Gear Competition	105779	3L +-	Check Fill line after running
Differential Sprag:	10w30	Motul	300V Offroad	112536	250ml +-	Check Fill line after running
Radiator Additive:	Coolant	Red line	Water Wetter	80204	355ml	Good for very hot race events. Check water level 70mm from top of bottle
	Anti Freeze	Liqui Moly	KFS12	21145	3L	Check water level 70mm from top of bottle
CV Joints:	CV grease	Walterscheid	HT1LF/NG 120g	9004328	180g	Alternative is NEO HPCC1
Propshaft Joints:	CV grease	Walterscheid	HT1LF/NG 120g	9004328	120g	Alternative is NEO HPCC1
Wishbone bearings:	Grease HT	Liqui Moly	LM50 400g	3406		Pack rollers
Wheels Bearings:	Grease HT	Liqui Moly	LM50 400g	3406		Pack roller well. Grease nipple topup.
Steering Ball Joints & Rod Ends:	Grease HT	Liqui Moly	LM50 400g	3406		Grease after shimming/cleaning

2.2 Components milage (replacement and service intervals)

Service Interval Cr7					
Description	**Notes**	**500km**	**1000km**	**2500km**	**5000km**
Wheel Bearings	Check Play, If Loose Then Re Shim	Check Play	Grease		
CV Boots		Check Cracks		Replace	Replace
Mud Flaps	Essential To Protect CV Boots	Check Damage			
CV's			Grease	Replace	Replace
Sideshafts					Replace
Propshafts			Grease		Replace
Air Filter	Bang Upside Down, Don't Use Compressed Air	Clean	Replace		
Fuel Filter				Replace	
Fuel Pick Up Sock				Clean	Replace
Clutch	Depending On Wear			Clean	Replace
Engine Oil			Replace		
Gearbox Oil			Replace		
Power Steering Filter	Change With Worn Pump			Replace	
Damper Oil				Replace	Replace
Ball Joints Cups Steering	Depending On Wear	Shim			Replace
Alternator				Replace	
Turbo's	Check Play And Blade Condition				Replace
Power Steering Pump	Depending On Km			Check Wear	Replace
Main Belt		Check Play	Replace		
Air Conditioning Belt	Depending On Km	Check Play	Replace		
Exhaust Wrap	Depending On Condition				Replace
Silencers	Depending On Wool State				Replace
Brake Discs and Bobbins	Check Float & Wear				Replace
Bleed Brakes			Bleed		
Steering Rod Ends	Check Float & Wear	Check Play			Replace
Front Wishbones	Depending On Km/Cracks				Replace
Rear Wishbones	Depending On Km/Cracks				Replace
*Distances Are Based on Racing Km, Not Liason					
*Distances Are Interval Based, I.E. Grease Wheel Bearings Every 1000km					

3 Tire Inflation

Tire Inflation Settings for Various Terrain:

		Operating Temperature [T]			
		Cold	Cool	Warm(after liason, before stage)	Hot (during stage)
		T < 10℃	10℃ < T < 20℃	25℃ < T < 40℃	T > 40℃
Terrain	Rocks (Liason)	1.4 Bar	1.5 Bar	1.7 Bar	2.0 Bar
	Hard Pack	1.3 Bar	1.4 Bar	1.6 Bar	1.8 Bar
	Sand/Soft	1.2 Bar	1.3 Bar	1.4 Bar	1.6 Bar
	Pure Dunes	1.1 Bar	1.2 Bar	1.3 Bar	1.5 Bar

Front and rear tires set to the same pressures.

Pressures based on KDR 3 BF Goodrich

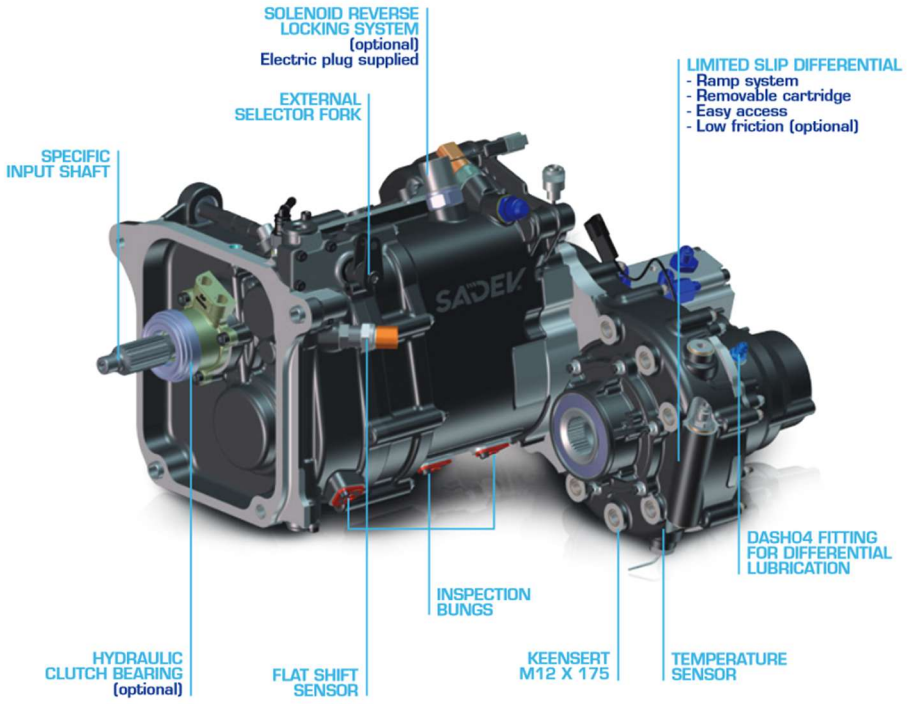
4 Drivetrain

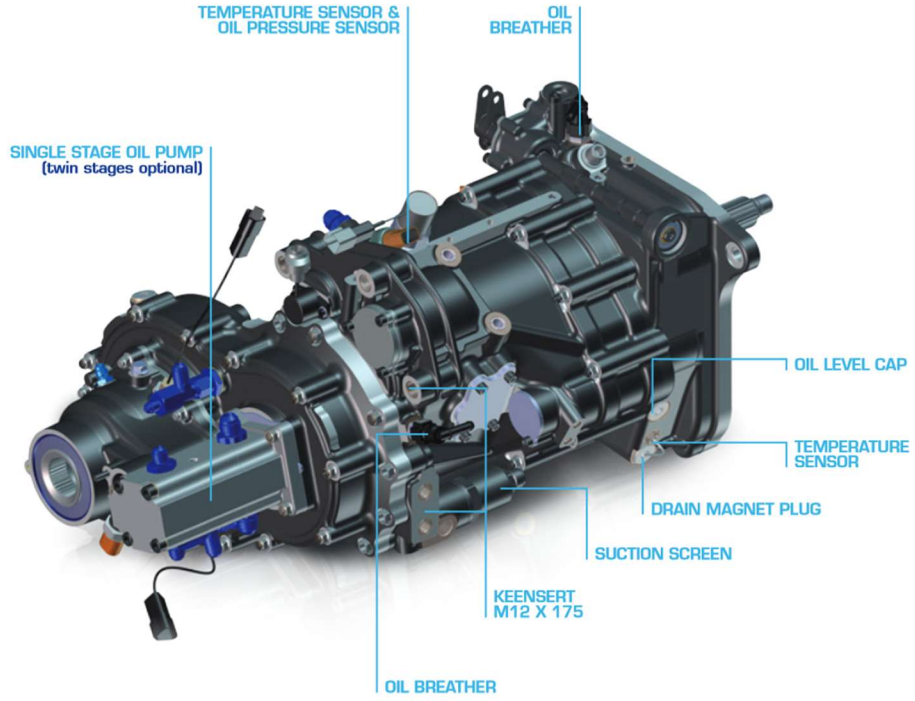
4.1 Engine

Audi DECA 2.9L Twin Turbo

4.2 Gearbox

The CR7 is equipped with a SADEV SC924 6 speed sequential gearbox.

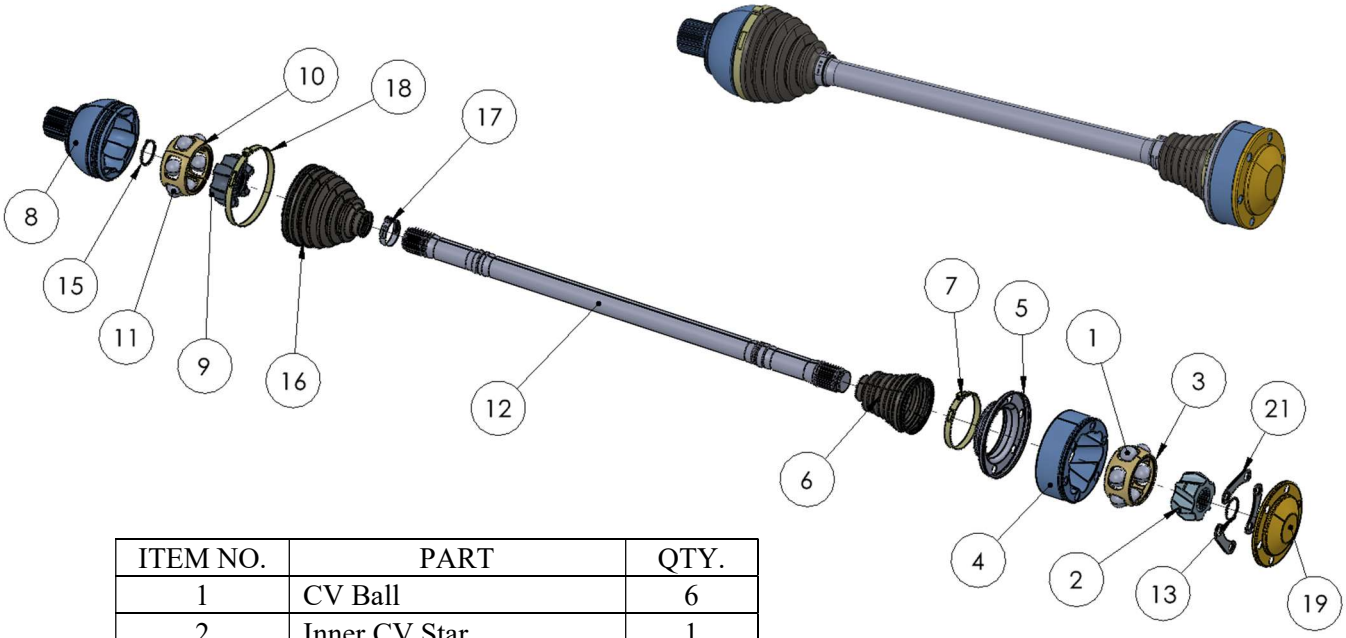




Gear Ratios:

Gear Ratio's SC924														
V1 - Medium(std)	Pinion	Gear	Ratio	Part Number	V2 - Short	Pinion	Gear	Ratio	Part Number	V3 - Long	Pinion	Gear	Ratio	Part Number
1st Gear:	11	35	3.18	J9020U1135915F	1st Gear:	11	35	3.18		1st Gear:	11	35	3.18	
2nd Gear:	15	33	2.20	I9020U1533915F	2nd Gear:	15	33	2.20		2nd Gear:	14	29	2.07	I9020U1429915FB
3rd Gear:	17	28	1.65	C9024R1728605F	3rd Gear:	16	27	1.69	C9024R1627915F2	3rd Gear:	21	33	1.57	C9024R2133915F
4th Gear:	21	28	1.33	C9024R2128605F	4th Gear:	21	29	1.38	C9024R2129605F	4th Gear:	18	23	1.28	C9024R1823915F2
5th Gear:	26	29	1.12	C9024R2629915F	5th Gear:	19	22	1.16	C9024R1922915F2	5th Gear:	22	24	1.09	C9024R2224915F2
6th Gear:	25	24	0.96	C9024R2524915F2	6th Gear:	25	25	1.00	C9024R2525915F2	6th Gear:	25	24	0.96	
GB Transfer case:	29	41	1.41	G14025294191	GB Transfer case:	29	41	1.41		GB Transfer case:	29	41	1.41	

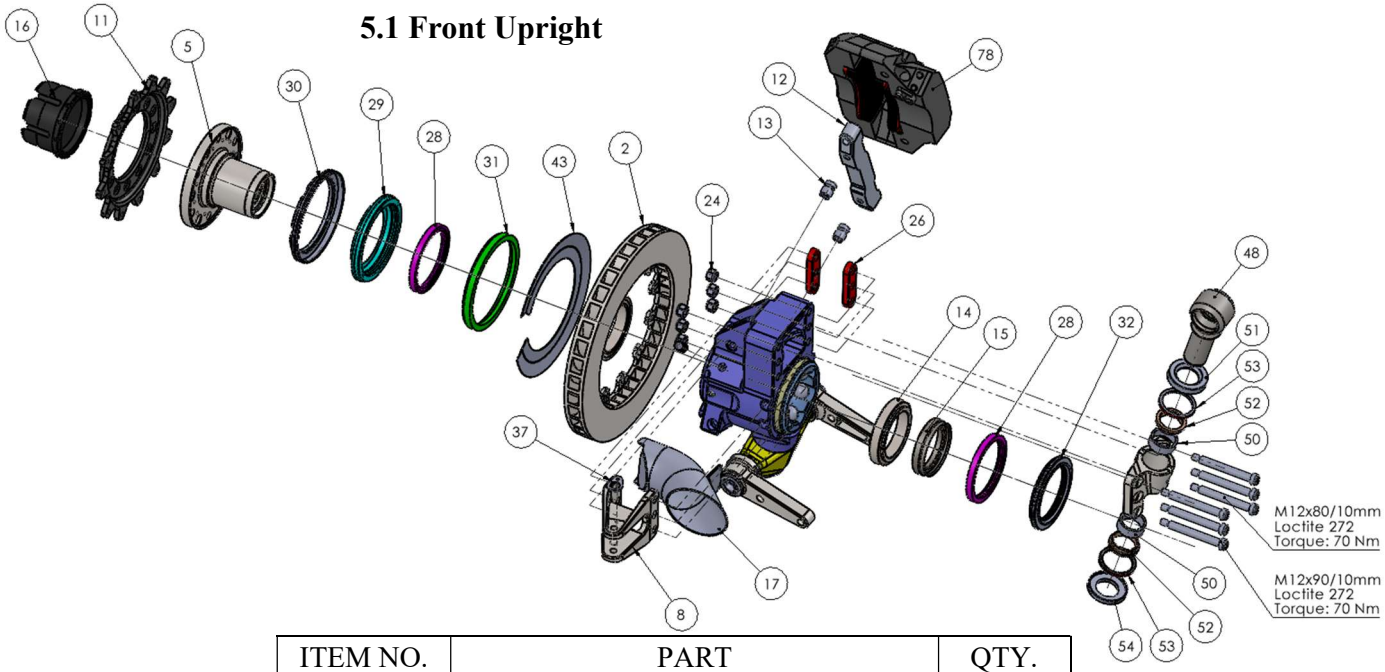
4.3 Side Shafts



ITEM NO.	PART	QTY.
1	CV Ball	6
2	Inner CV Star	1
3	CV Cage	1
4	CV Outer	1
5	CV Boot Flange	1
6	Inner CV Boot	1
7	CV Boot Clamp	1
8	CV Outer with Spline	1
9	Outer CV Star	1
10	CV Cage	1
11	CV Ball	6
12	Side Shaft	1
13	Circlip 30 mm	1
15	Circlip 34 mm	1
16	Outer CV Boot	1
17	Outer CV Boot Clamp 1	1
18	Outer CV Boot Clamp 2	1
19	CV Cover Plate	1
21	CV Plate	3

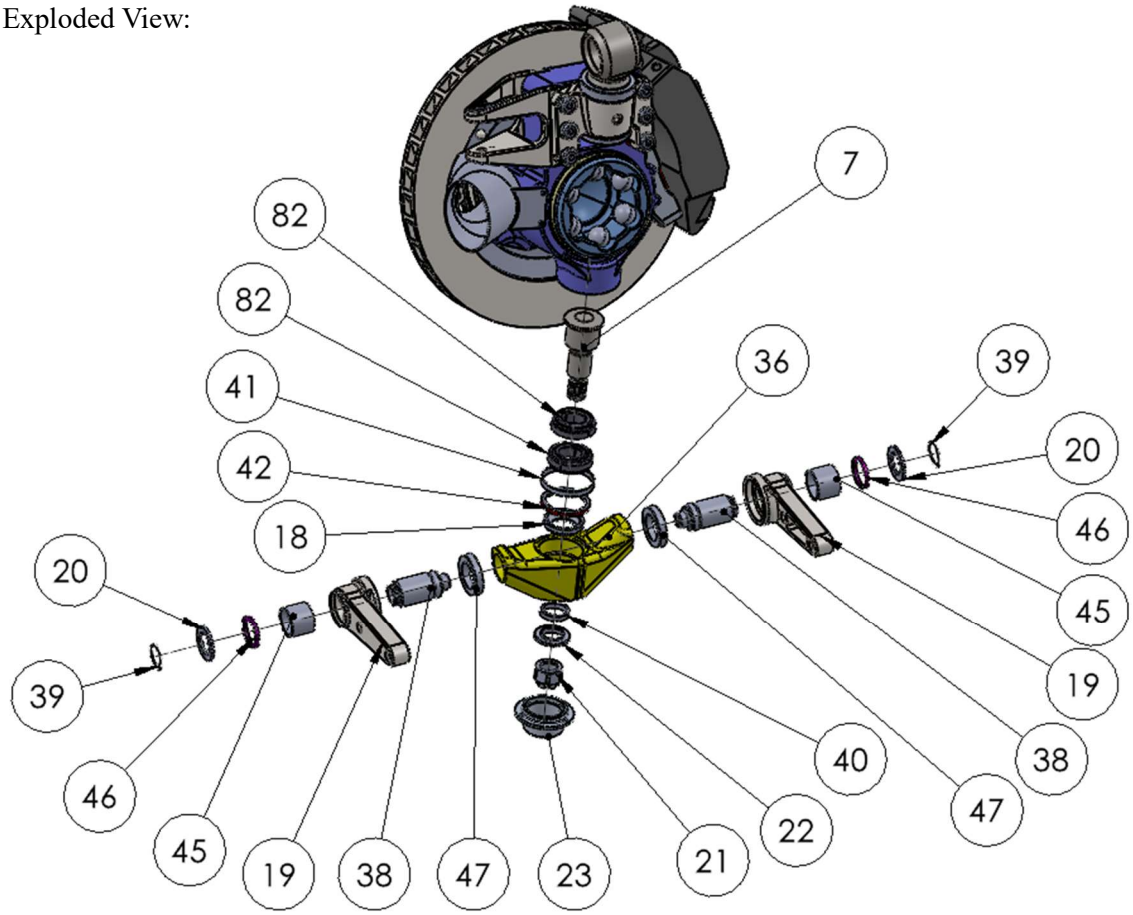
5 Suspension

5.1 Front Upright



ITEM NO.	PART	QTY.
2	AP Disc	1
5	Spindle	1
8	Steering Arm	2
11	Front Brake Bell	1
12	Front Calliper Bracket	1
13	Front Caliper Bracket Spacer	2
14	DIN 720 - 32915 - 32,SI,NC,32	2
15	Spindle Lock Ring	1
16	Front Hub Spigot	1
17	Air Duct	1
24	M10 Nut	6
26	Upright Tower Spacer	2
28	Vitton Modified Lip Seal HP800	2
29	Rear Outer Seal Carrier	1
30	External Dust Blocker	1
31	Dust Seal Acetal Outer	1
32	Internal Dust Blocker Front	1
37	Steering Arm Lock Plate	1
43	Disc shield	1
48	Upright Clevis Front 6deg	1
50	Needle Bearing HK35x42x16	2
52	Tower Bush	2
53	Seal 48x58x4	2
54	Tower Bottom Seal Carrier	1
78	R6ISW Brake Caliper Water Cooled	1

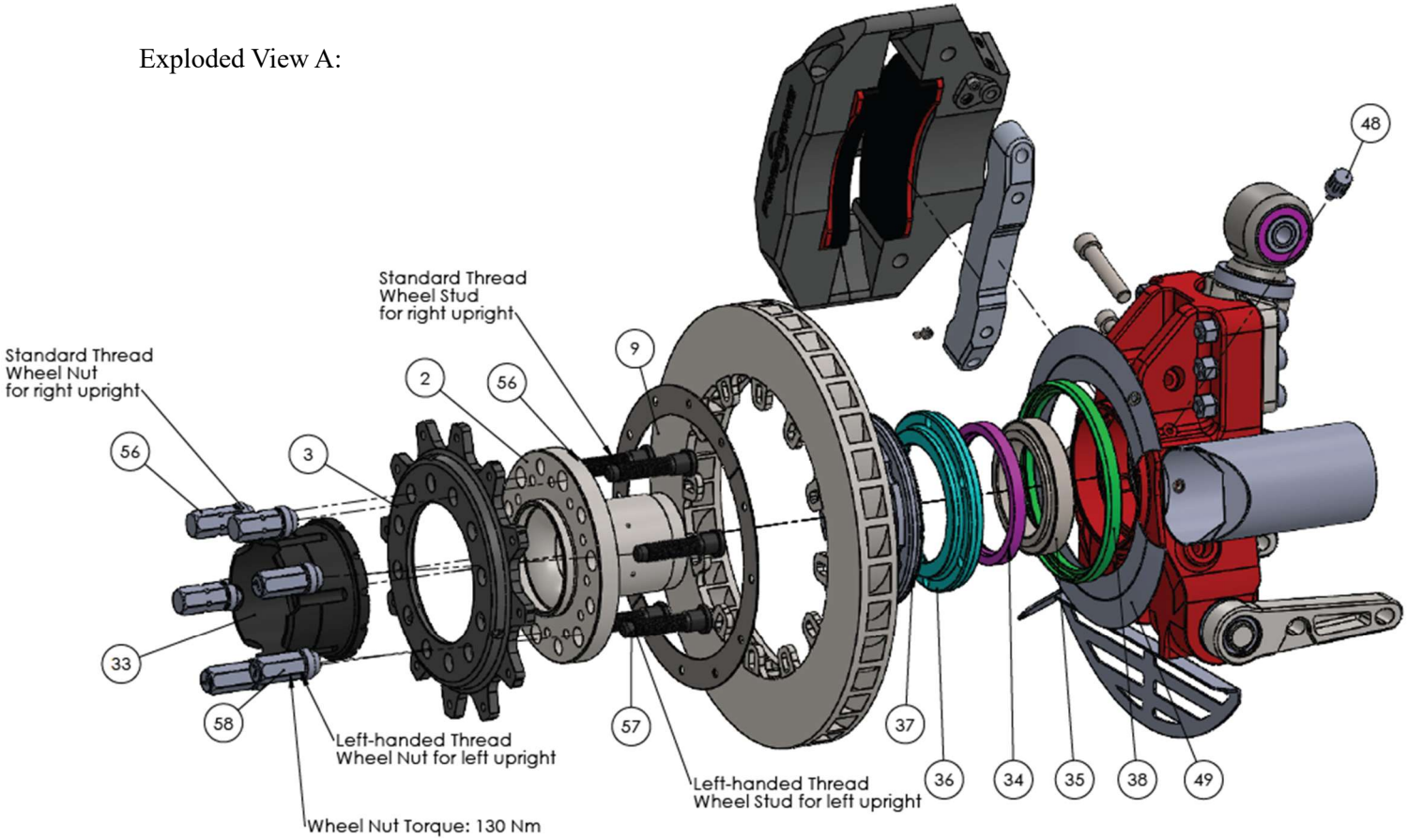
Yoke Exploded View:



ITEM NO.	PART	QTY.
7	Bottom Pin	1
18	Yoke Spacer	1
19	Front Wish Link	2
20	Yoke Washer	2
21	M20 Castle Nut	1
22	Bottom Pin Washer	1
23	Yoke Cap	1
36	Yoke	1
38	Yoke Pin	2
39	Circlip 24 x 1.2	2
40	Tapper Roller Bearing Spacer	1
41	Yoke Top Ring	1
42	Seal 45x55x4	1
45	Needle Bearing K303527	2
46	Seal SD30x37x4	2
47	Ball Bearing NSK 6906 30x47x9	2
82	07100-07196 Timkin Bearing	2

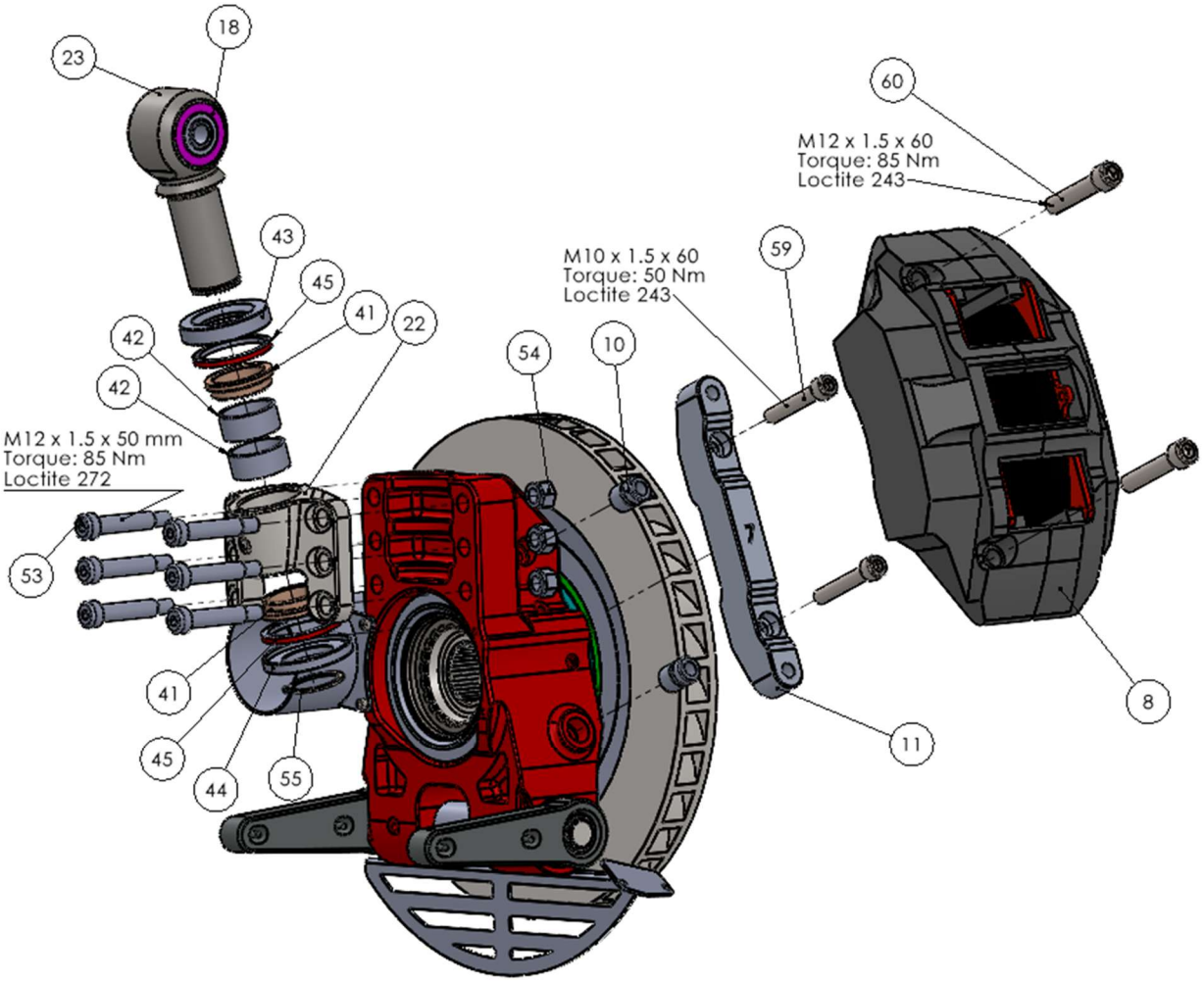
5.2 Rear Upright

Exploded View A:



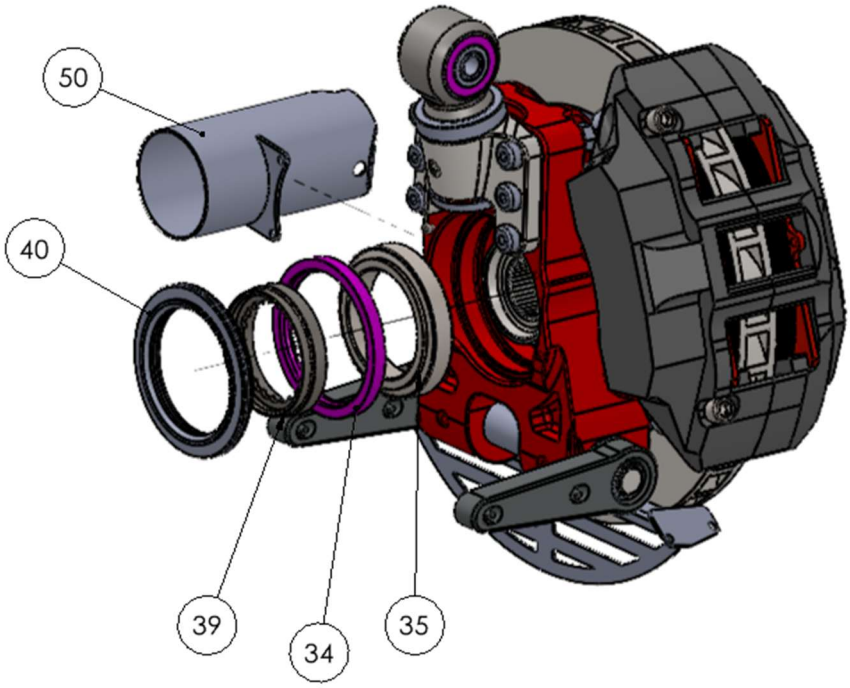
ITEM NO.	PART	QTY.
2	Spindle	1
3	Front Brake Bell	1
9	AP Disc CP3581-564 343x32	1
33	Front Hub Spigot	1
34	Vitton Modified Lip Seal	2
35	DIN 720 - 32915 - 32,SI,NC,32	2
36	Rear Outer Seal Carrier	1
37	External Dust Blocker	1
48	Grease Nipple Cap	1
49	Disc shield	1
52	Friction Plate	1
56	Wheel Stud Rear Left Hand Thread	6
57	Wheel Stud	6
61	Wheel Nut	6
62	Wheel Nut Left Hand Thread	6

Exploded View B:



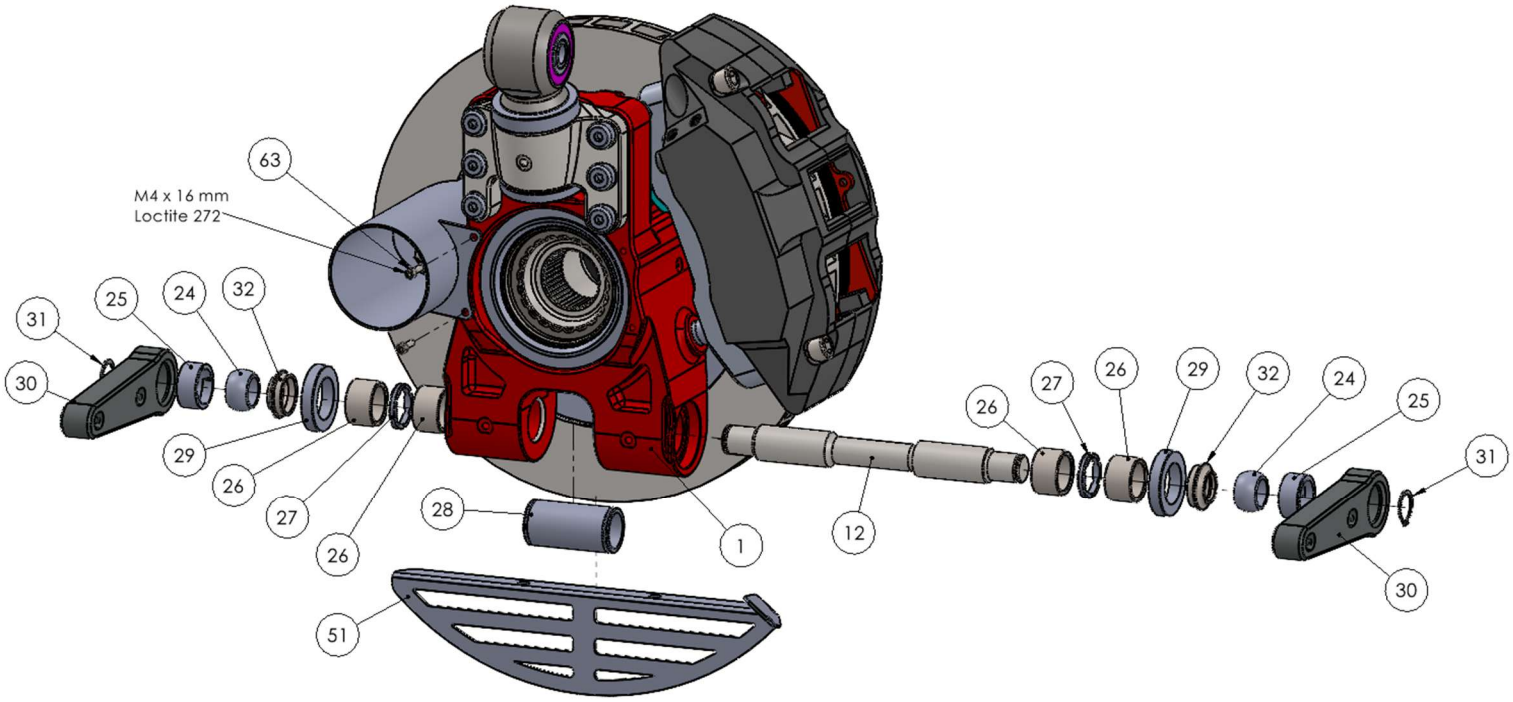
ITEM NO.	PART	QTY.
8	R6ISW Brake Caliper Water Cooled	1
10	Front Caliper Bracket Spacer	2
11	Front Calliper Bracket	1
18	Seal CR30x44x7	2
22	Upright Tower	1
23	Upright Clevis	1
41	Tower Bush	2
42	Needle Bearing K35x40x17	2
43	Tower Top Seal Carrier	1
44	Tower Bottom Seal Carrier	1
45	Seal 45x55x4	2
53	Shoulder Bolt 12x50mm	6
55	Circlip 35 x 1.5	1
59	M10 x 1.5 x 60	2
60	M12 x 1.5 x 60	2

Exploded View C:



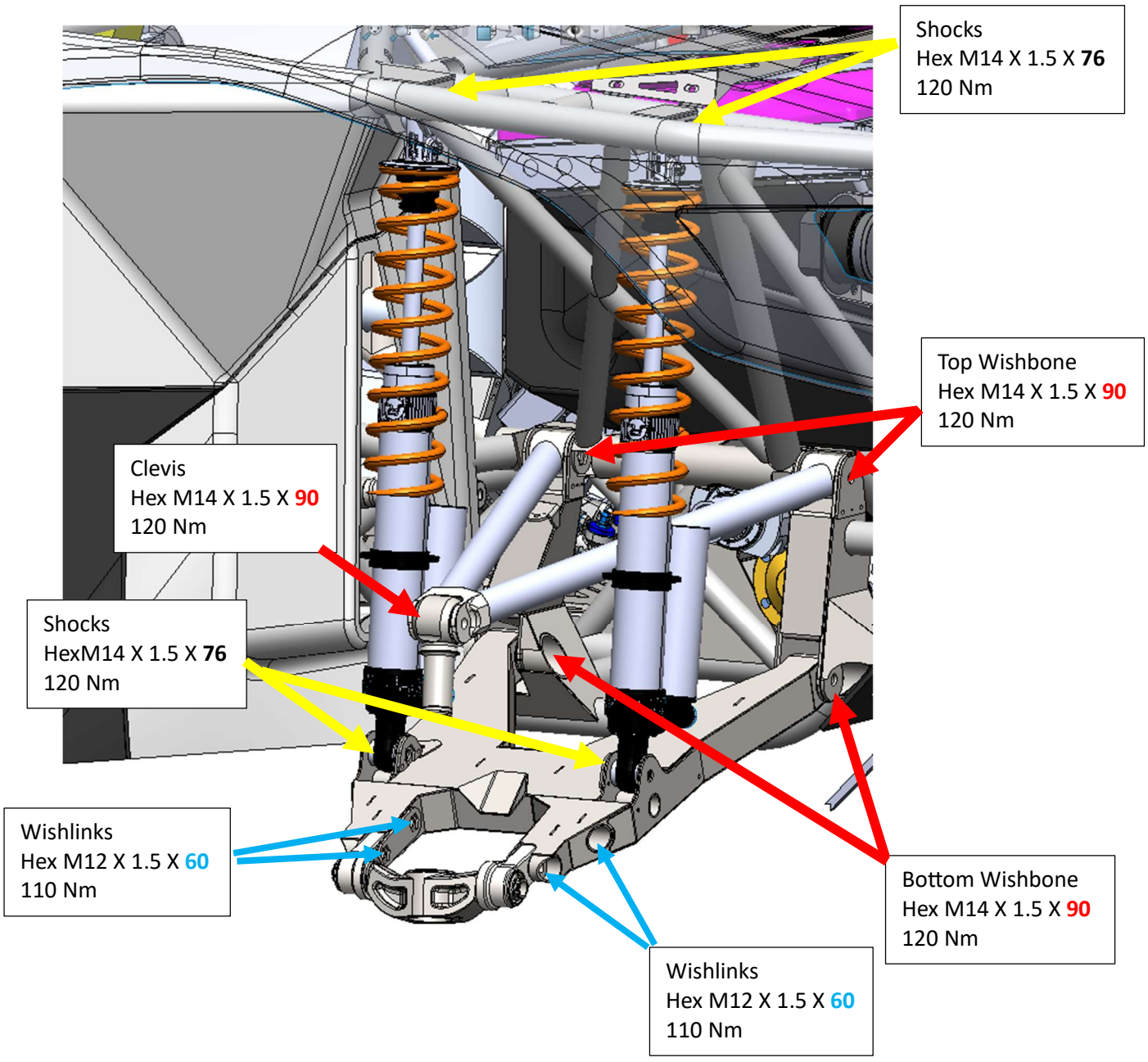
ITEM NO.	PART	QTY.
34	Vitton Modified Lip Seal - HP800	2
35	DIN 720 - 32915 - 32,SI,NC,32	2
39	Spindle Lock Ring CR7	1
40	Internal Dust Blocker Front CR7	1
50	Rear Air Duct	1

Exploded View D:



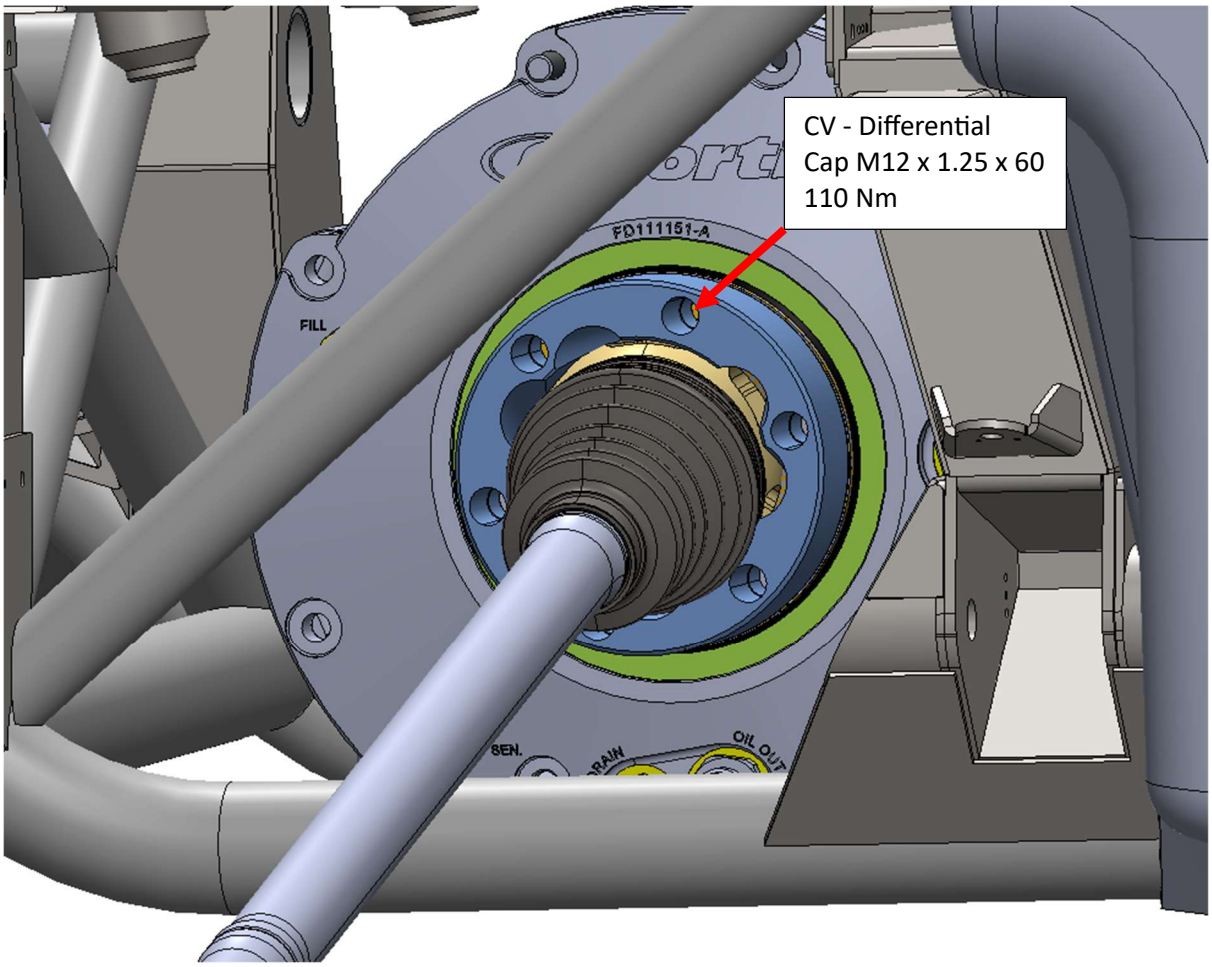
ITEM NO.	PART	QTY.
12	Rear Upright Bottom Shaft	1
24	32mm Spherical Inner Race Rear	2
25	32mm Spherical Outer Race	2
26	SKF - HK 2520 - 24,SI,NC,24	4
27	Needle Bearing Spacer	2
28	Bottom Sleeve	1
29	Ball Bearing NSK 6906 30x47x9	2
30	Rear Wish Link	2
31	Circlip 20 x 1.2	2
32	Bottom Shaft Spherical Spacer	2
51	Brake Guard	1
63	M4 x 16	2

Suspension Corner Bolt Lengths and Torque Settings



Bolt	Quantity Per Corner
M14 x 1.5 x 90	5
M14 x 1.5 x 76	4
M12 x 1.5 x 60	4

* Use same lengths and torque settings on rear corners


CV - Differential
Cap M12 x 1.25 x 60
110 Nm
FD111151-A
FILL
OIL OUT

5.3 Dampers

R53 Suspension: 4 Front ST55 and 4 Rear ST55

Springs: 40Nm - 450mm

5.3.1 Settings Dakar 2025

Tables based on:
40Nm-450mm Springs
Fuel level above 80%

		Front				
		Low Speed Compression	High Speed Compression	Rebound	Hydraulic Bump Stop	Spring Height (mm)
Description	**Valving F**	**FL**	**FH (+)**	**FR**	**FBS**	**FS**
Dakar 25 Fast/Rocky	XC100	10	4	19	15	160
Dakar 25 Dunes/Kamel Grass	XC100	10	5	12	19	165
Hard Pack/CC/Baja	XC100	10	3	20	15	150

		Rear				
		Low Speed Compression	High Speed Compression	Rebound	Hydraulic Bump Stop	Spring Height (mm)
Description	**Valving R**	**RL**	**RH (+)**	**RR**	**RBS**	**RS**
Dakar 25 Fast/Rocky	XC105	6	4	17	18	145
Dakar 25 Dunes/Kamel Grass	XC105	7	5	15	17	150
Hard Pack/CC/Baja	XC105	6	2	17	20	135

R53 Suspension Settings CR7:

5.3.2 R53 Damper Bleed Procedure

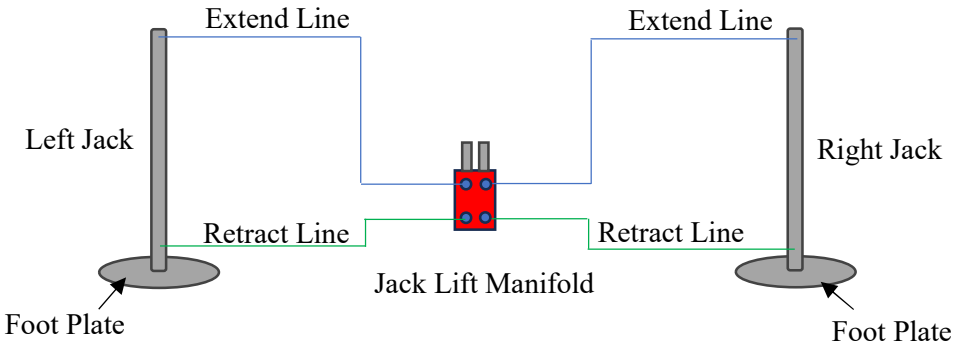
1. Fully build damper and attach bleed hose to damper and machine.
2. Gas damper to 10 Bar.
3. Vacuum for 100 seconds.
4. Fill for 100 seconds at 3 Bar.
5. Let bleed machine drop back to atmospheric pressure.
6. Disconnect bleed hose from machine.
7. Check the syringe does not have free play if it does redo steps above to remove air.

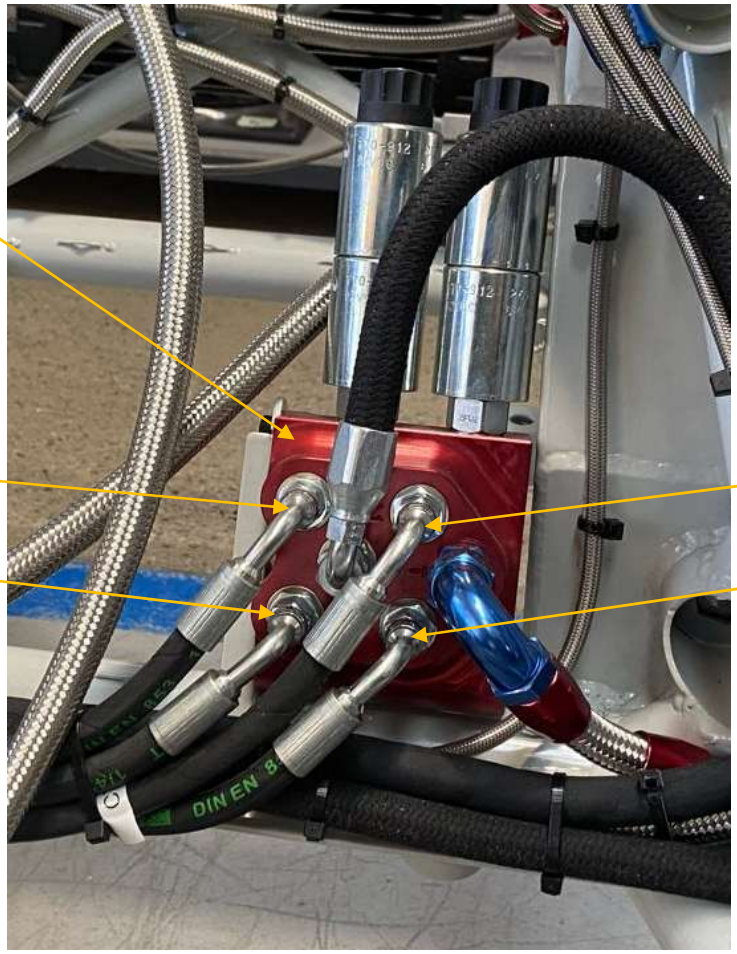
If syringe is solid:

8. De-gas damper.
9. Use 100mm syringe to set piston height.
10. Fit bleed bolt to 2.5 Nm.
11. Gas damper to 10 Bar.
12. Fit gas cap bolt to 1.1 Nm.
13. Tighten Seal head cap to 35 Nm.
14. Tighten grub screw to 2.5 Nm.

6 Jack System

Jack System Schematic:

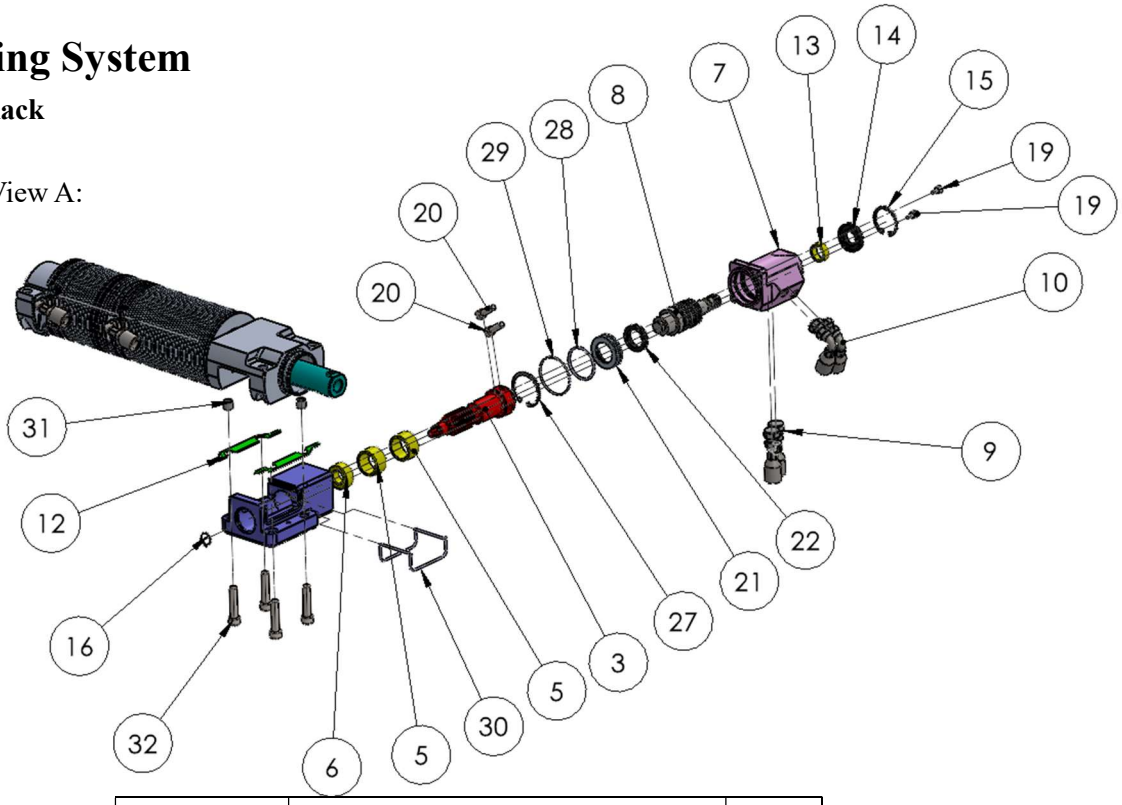




7 Steering System

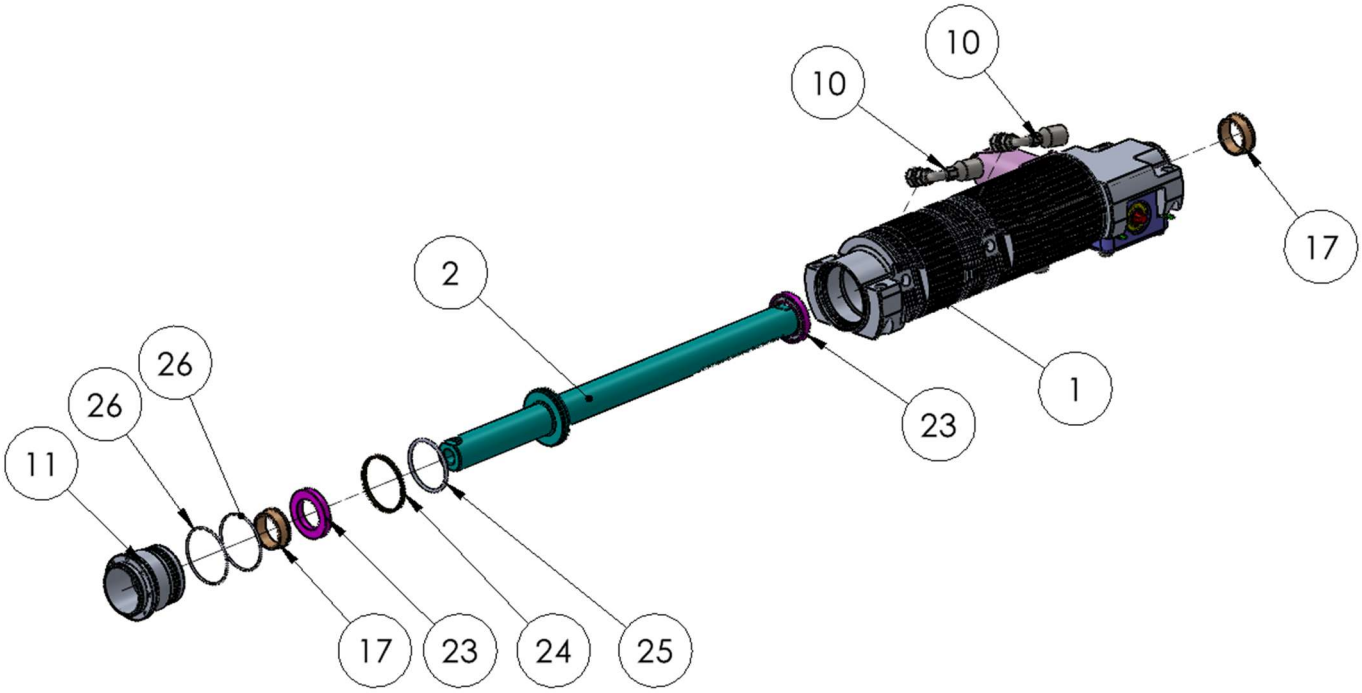
Steering Rack

Exploded View A:



ITEM NO.	PART	QTY.
3	Pinion Shaft	1
4	Pinion Housing	1
5	Needle Bearing BK3020	2
6	Ball Bearing 63003	1
7	Control Valve Housing	1
8	Control Valve 210	1
9	Dash 6 Straight	2
10	Dash 6 90deg	4
12	Shim	2
13	Needle Bearing HK2010	1
14	Seal Control Valve	1
15	Circlip 40 x 1.75	1
16	Circlip 16 x 1	1
19	M6 x 10	2
20	M8 x 25	2
21	Control Valve Seal Housing	1
22	Seal Control Valve Internal	1
27	Circlip 47 x 1.75	1
28	O-ring Ø42x3 VF	1
29	O-ring Ø50x2 VF	1
30	Seal Pinion Housing	1
31	Steering Rack Dowel Sleeve	2
32	M10 x 45	4

Exploded View B:



ITEM NO.	PART	QTY.
1	Rack Main Housing	1
2	Rack Bar	1
10	Dash 6 90deg	4
11	Steering Rack Nut	1
17	Rack Guide Bush	2
23	Seal S 35x56x8	2
24	Wear band 65mm	1
25	O-ring Rack Bar d3.53	1
26	O-ring Ø60x2 VF	2

Pinion Free-Play:

- Use a 10mm spanner to check pinion play by turning the end of the pinion shaft on the rack itself.
- Please take care of feeling if there are any movement in the rack bar itself. Play can be adjusted in place and without removing the pinion housing.

Adjusting Play:

- Loosen all 4 M10 cap screws holding the pinion housing onto the main rack housing.

- By turning the steering wheel, the pinion action onto the bar will force the 2 housings apart and allow the removal of both spacer shims between the two.
- Depending on the amount of play, select the correct shim thickness to be re-installed (typically 0.2mm) and after tightening the 4 M10m cap screws, check the pinion free play again.

Hydraulic Fluid Leak:

There are three main possibilities and it is important to diagnose where the leak is before stripping everything off the car. Two of the leaks can be fixed in place and the third one will require the replacement of the main housing. Due to the hollowness of the rack bar, a leak on the left hand side can show ATF being present on the right hand side dust boot, and in order to determine which of the two main seals is damaged, the steering wheel needs to be held into the full lock position, engine running, while the dust boots are off. The third possibility is a leak from the steering column knuckle side and that can be inspected visually.

Shimming the steering rack ball joint:

- Remove internals and record the position of the tightened lock nut with a white pen.
- Add shims incrementally while always tightening the lock nut to the correct white mark. The ball joint should always be too stiff to move by hand, but free enough to move with a short extension place on it.

8 Air Conditioning

Vacuuming the AC system:

After connecting both low and high pressure lines to the car, ensure the vacuum pump is left on for at least 40min. Once off, verify that the system is holding vacuum. Any increase in pressure will mean that the system has a leak.

Gassing the system:

Use R134A refrigerant only. With a new compressor fitted, it is not necessary to add oil into the system. If the system was left open for more than 20min it is good practice to replace the dryer/receiver unit situated in the right and side of engine compartment. With the engine running, AC on and fan turned on, open the low pressure tap (blue line) and allow gas to be sucked into the system. Watch the high pressure gauge (red one) climb until above 12 bar (for an ambient in the 20-30deg range). By then the system should start producing cold air. Note: for safety reasons, the AC will stay off until the 3 bar threshold has been attained while filling the gas in. With both taps closed and engine RPM maintained at 2500, the high pressure should be in the 12-16 bar region, and the low pressure should be close to 2 bar. At rest and with the car fully at ambient temperature the pressure in the system should be between 6 and 7 bar. It is irrelevant to give an indication of the mass of gas used in the system as the sophisticated scaled gassing equipment rarely find their way to races. We therefore recommend working with pressure gauges only.

System freezing:

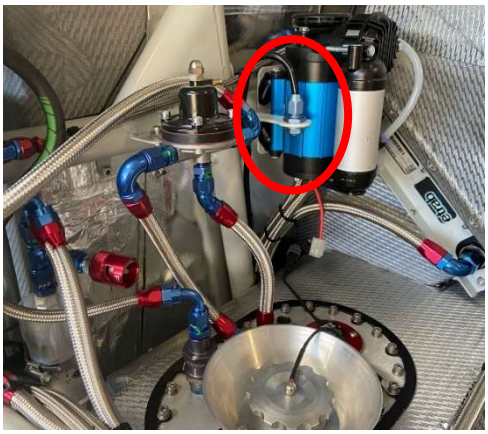
In some very humid climate (driving on the beach for example), it is possible to experience freezing or icing inside the evaporator. The tell-tale signs are a lack of cold air and a diminishing air flow into the cabin as the ice blocks the evaporator core. Cure: increase the temperature setting on the keypad or switch the AC off momentarily while leaving the cabin fan on to melt the ice.

9 Fire Extinguishing

9.1 Automatic Extinguishers

Powder Extinguishing

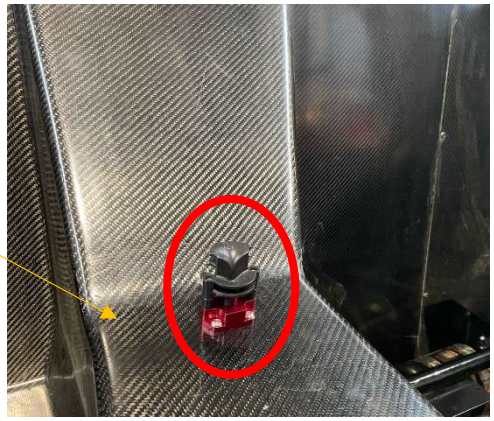
Fuel Tank Extinguisher Nozzle Placement:



Fuel Tank LHS

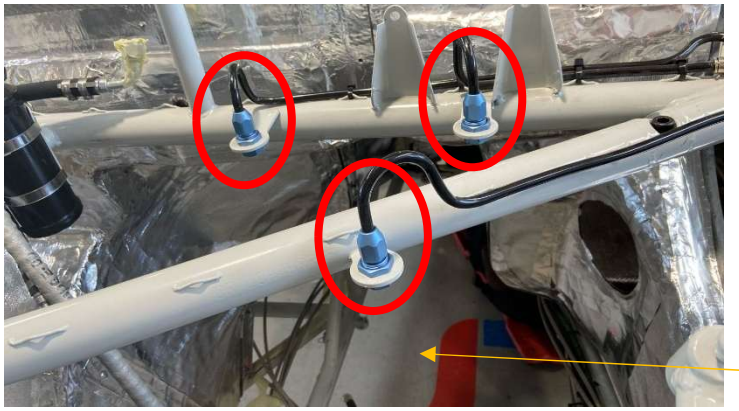
Fuel Tank RHS

Cockpit Extinguisher Nozzle Placement:

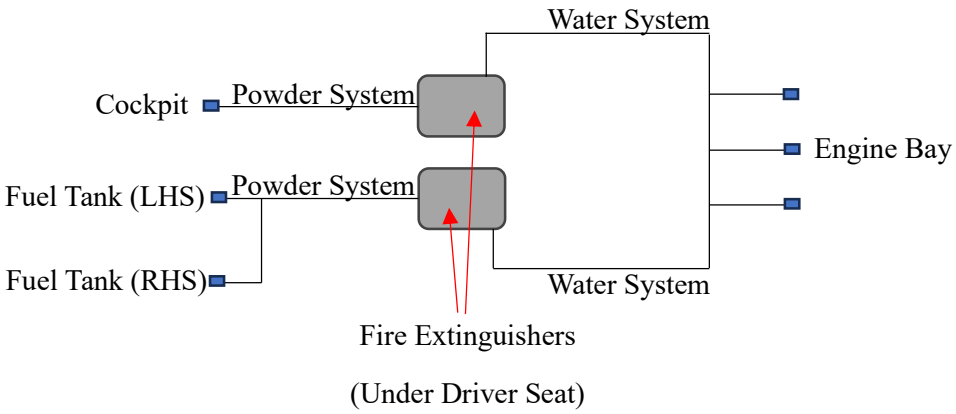


Water Extinguishing

Engine Bay Extinguisher Nozzle Placement:



Automatic Fire Extinguishing Schematic:



10 Differentials Torque Settings

Component	Torque	Loctite
Ring Gear Bolts	150 Nm	Red 271
Pinion Nut	250 Nm	Red 271
Drop Gear Cover and all other 5/16” fasteners	35 Nm	Blue 241
Drive Flange Retainer 5/16” Bolts	35 Nm	Red 271
All 3/8” studs, bolts and nuts	45 Nm	Blue 271
3/8” nuts for drop gear housing	45 Nm	Red 271
Oil pump bolts	User judgement	Blue 241

Use your judgement on torque specifications for smaller fasteners.

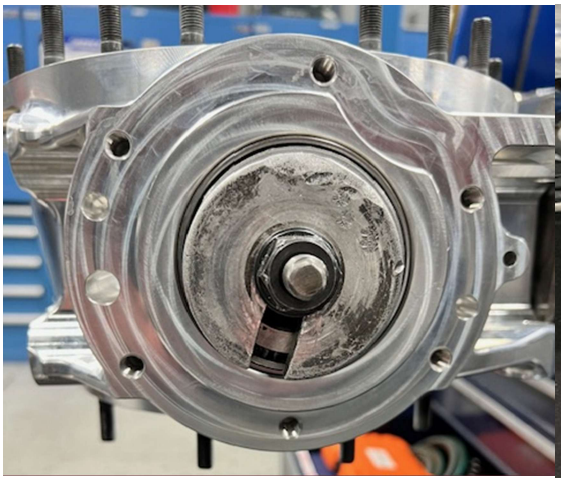
Installing New Pinion Bearings and Races:

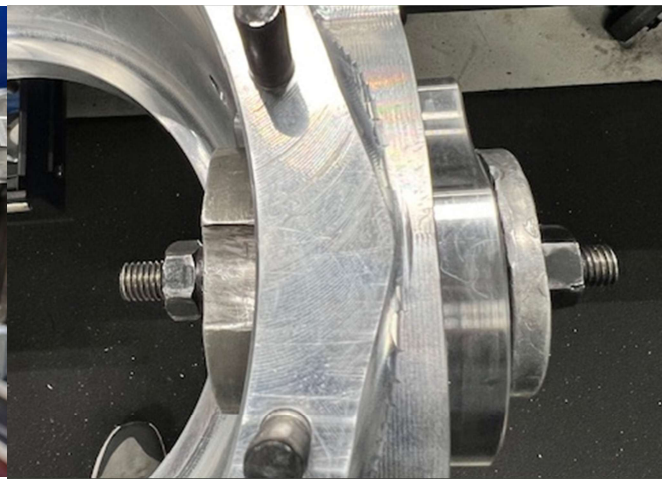
Removing Old Races:

- Heat case to expand and remove old races.
- There are shims under the main pinion bearing race to set pinion depth which must be reused or replaced when installing new bearings
    - Shims can get damaged during removal, however can be repaired using a hammer to flatten out again. If damage is too severe, replace shims.

Installing New Races:

- Heat case with oxygen/acetylene torch until bearing slips in.
- Use a piece of threaded rod, aluminium caps and nuts with the old bearing cones to seat the new bearing races:





- The shims are 0.635 mm in total. Some use 5 x 0.127mm and others a single 0.635 mm shim