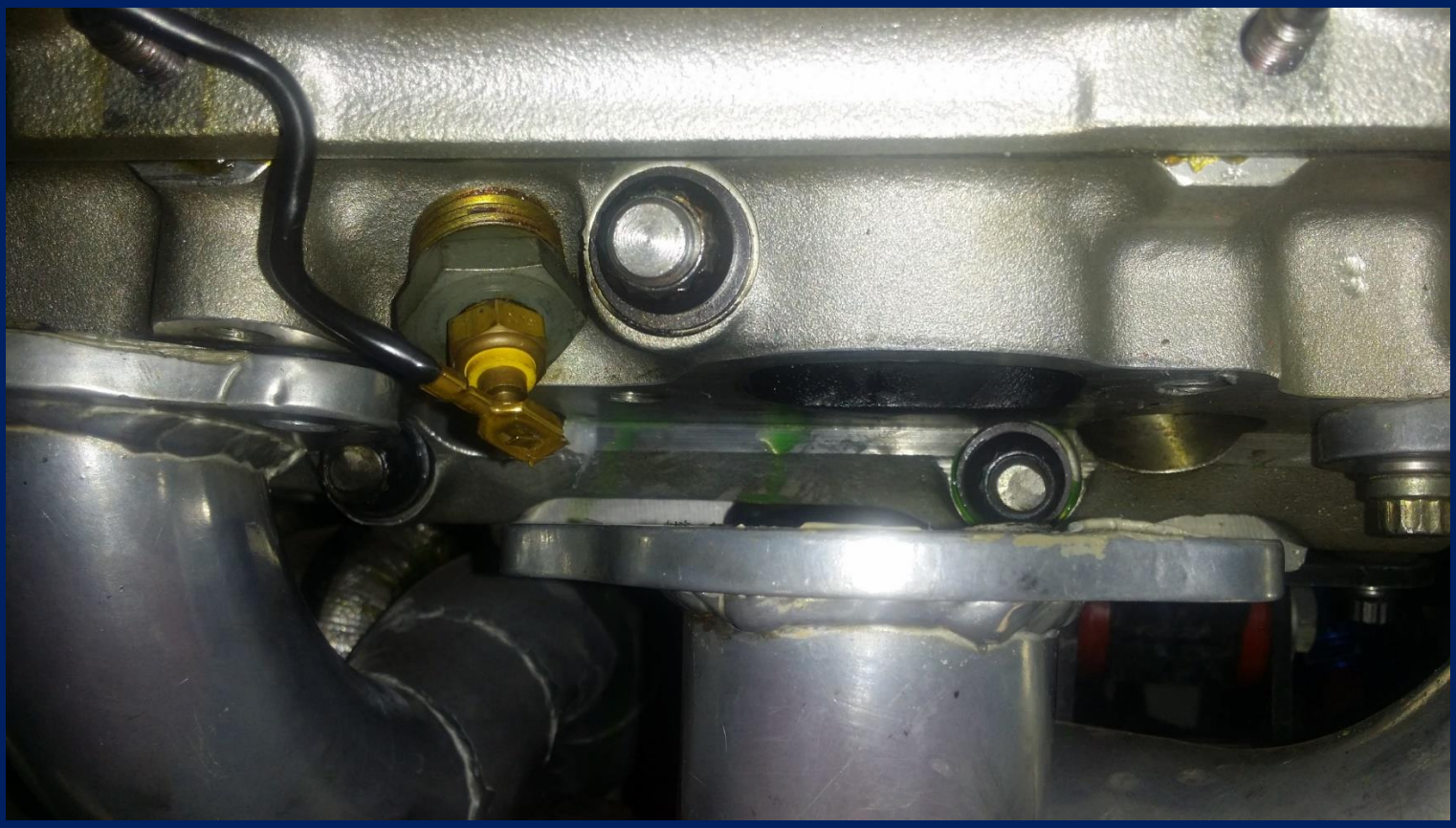
Litre 8: The Mark III Rebuild – Updated 23rd June 2022

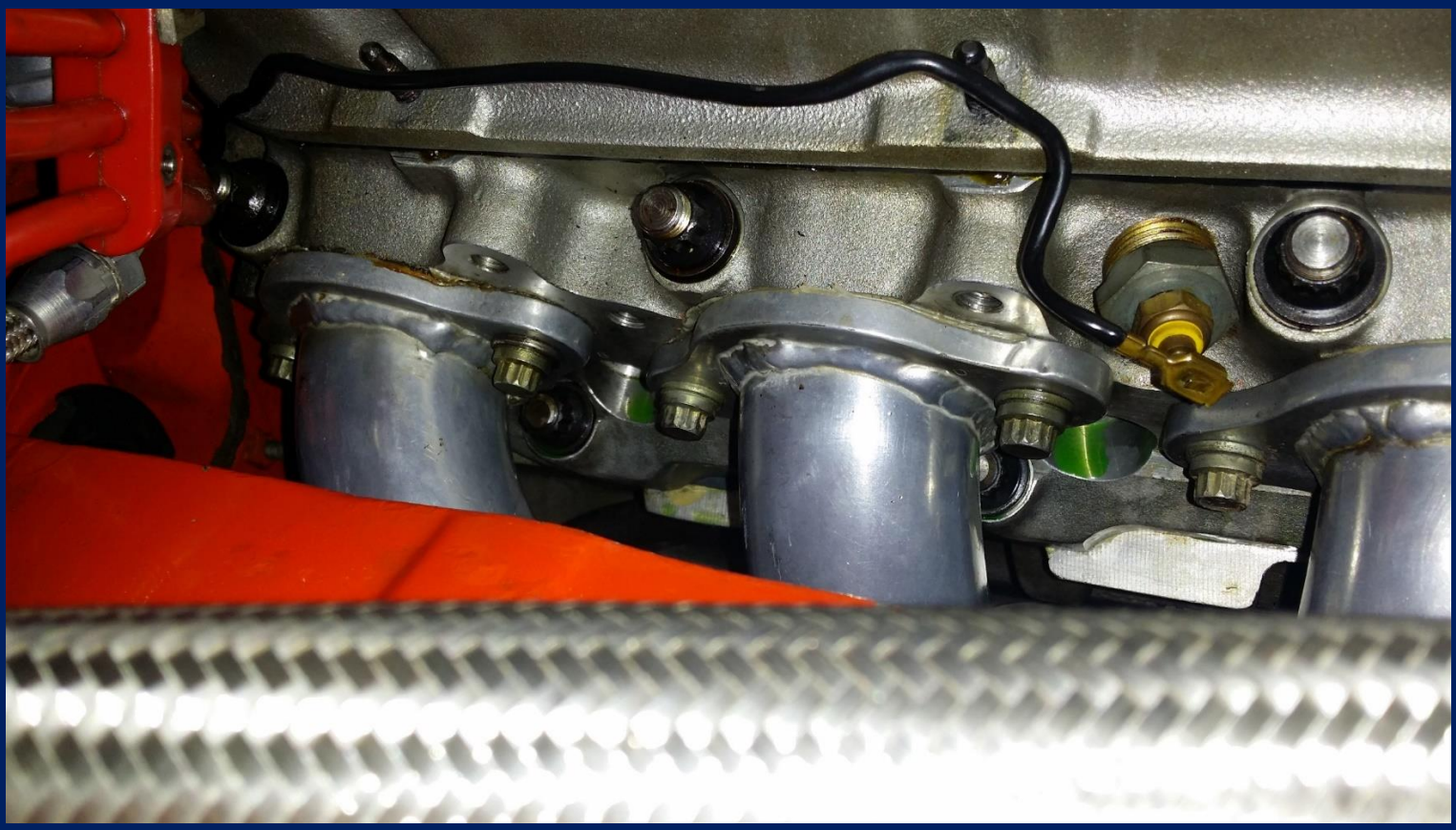
Why:

An enjoyable track session at Winton Raceway in January 2018 turned pear shaped the next day when I investigated a trail of green coolant slowly trickling from the trailer (car was still loaded).

My initial thoughts, that this was just a loose radiator connection, evaporated once I put Litre8 up on the hoist.

From below it *looked* like the coolant was leaking as the result of a compromised head gasket but no, it was worse than that. Close examination showed that the coolant was leaking from a crack in the Edelbrock Performer RPM cylinder head…





At this stage we thought this is “only” a cracked cylinder head, let’s remove both heads (only cylinder bank 2-8 was leaking) and check the damage up close.

With the heads off other issues became apparent…

The pistons in the 4 centre cylinders (3,5 & 4,6) all show damage on the top ring land and the culprit was deduced to be pre-ignition.
The damage is more apparent in the image below:

Regarding the cracked cylinder head, the crack is clearly visible below and it extends between cylinders 4 and 6,

Project Starts – Engine removed late March 2018:

So the rebuild just got a whole lot bigger (and more expensive).

First step was to remove the remaining short engine and discuss options with Nankervis Performance Boats who are legendary for their ability to build BBC power with endurance.

Many thanks to neighbours Wendy and Laurie for their assistance in lifting out the short engine and gearbox as a single unit.

I was (and remain) skeptical of the long term viability of welding this cylinder head. The last thing I needed was for another crack to appear sometime down the track (these particular heads are vintage 1996 and possibly not the greatest casting consistency with respect to internal wall thickness).

So the decision was made to go with some AFR 315 CNC heads along with new pistons and a minimum over bore to ensure good wall integrity while still giving optimum piston ring sealing. The old Edelbrock Performer RPM heads had much work done on them with respect to porting and valves so going back to out-of-box versions of the same cylinder heads would be a big step backwards.

As discussions progressed it became obvious that this was going to be a big dollar project, so how much extra would it take to grow the engine capacity to make all the effort and $$'s worthwhile?

As it turned out, not that much in the big scheme of things. I was running Crower forged crank (3.76" stroke) and Crower forged conrods (6.135"), the same stroke/conrod combo for a 427 BBC. These are top of the shelf items, big dollars back in 1990 for the Mark I build. There are so many other quality offerings around now, at very reasonable prices, that the opportunity to on-sell the current crank and rods (to another 8 litre BBC rebuild) and step up (capacity-wise) to a 4.375" stroke Manley

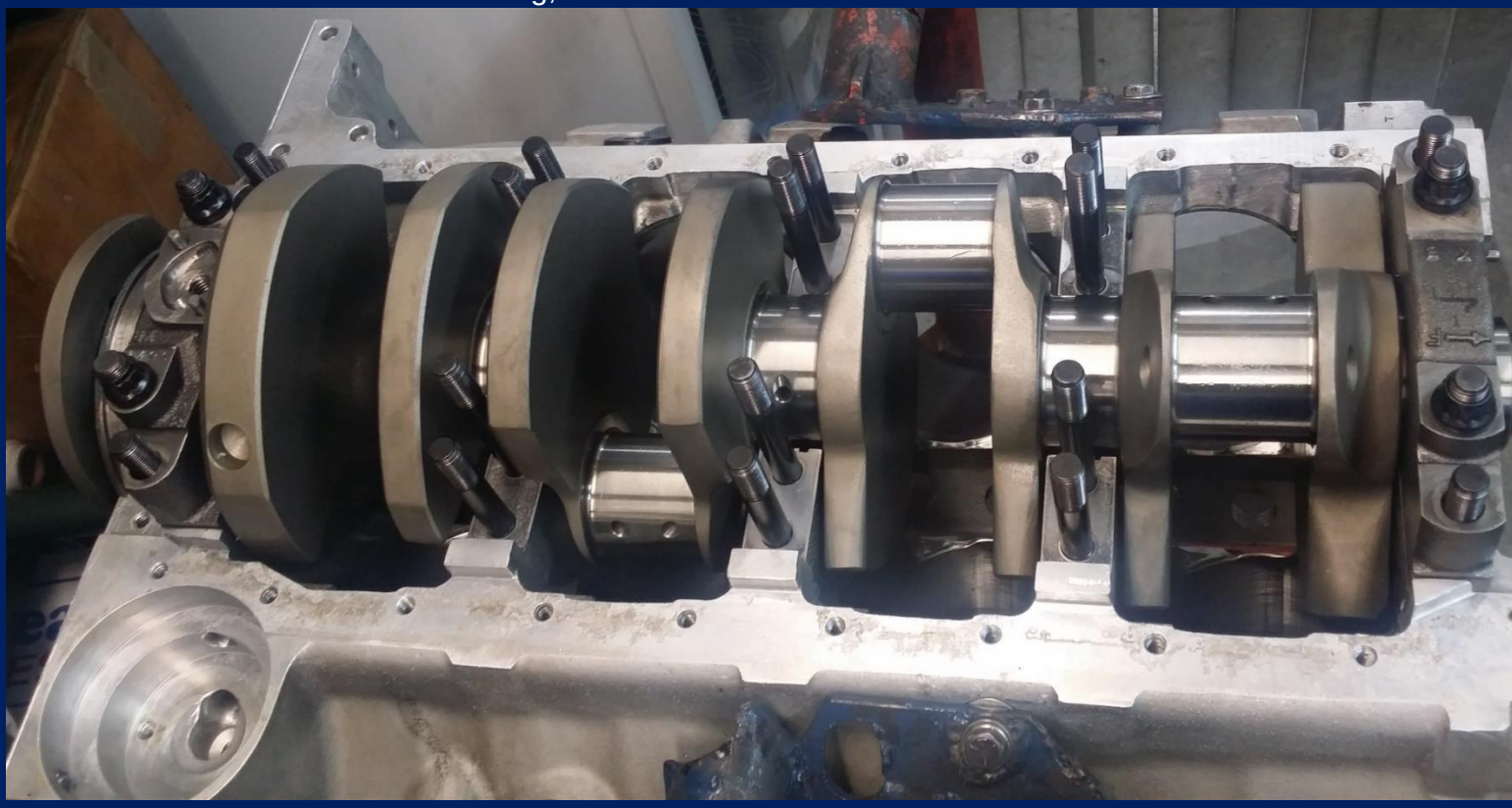
forged crankshaft (8 counterweights) and 6.48” Molnar forged H-beam conrods, giving a capacity of 564ci (with .030” overbore), was too good to pass up.

Nankervis have been using this specification crankshaft very successfully in a twin turbo’d BBC so there was no question of its durability and reliability and the Molnar rods come with a great reputation. We had to buy new pistons regardless of our rebuild path so some off the shelf JE forged pistons were procured.

The Litre8.com website has a complete list of the engine specification (see Details -> Engine) and a list of all the car specification changes from the 1991 Mark 1 incarnation (see General -> Overview -> Mark 1 vs Mark 3).

Parts Procurement starts May 2018:

Crank trial fitted for clearance checking, no issues.

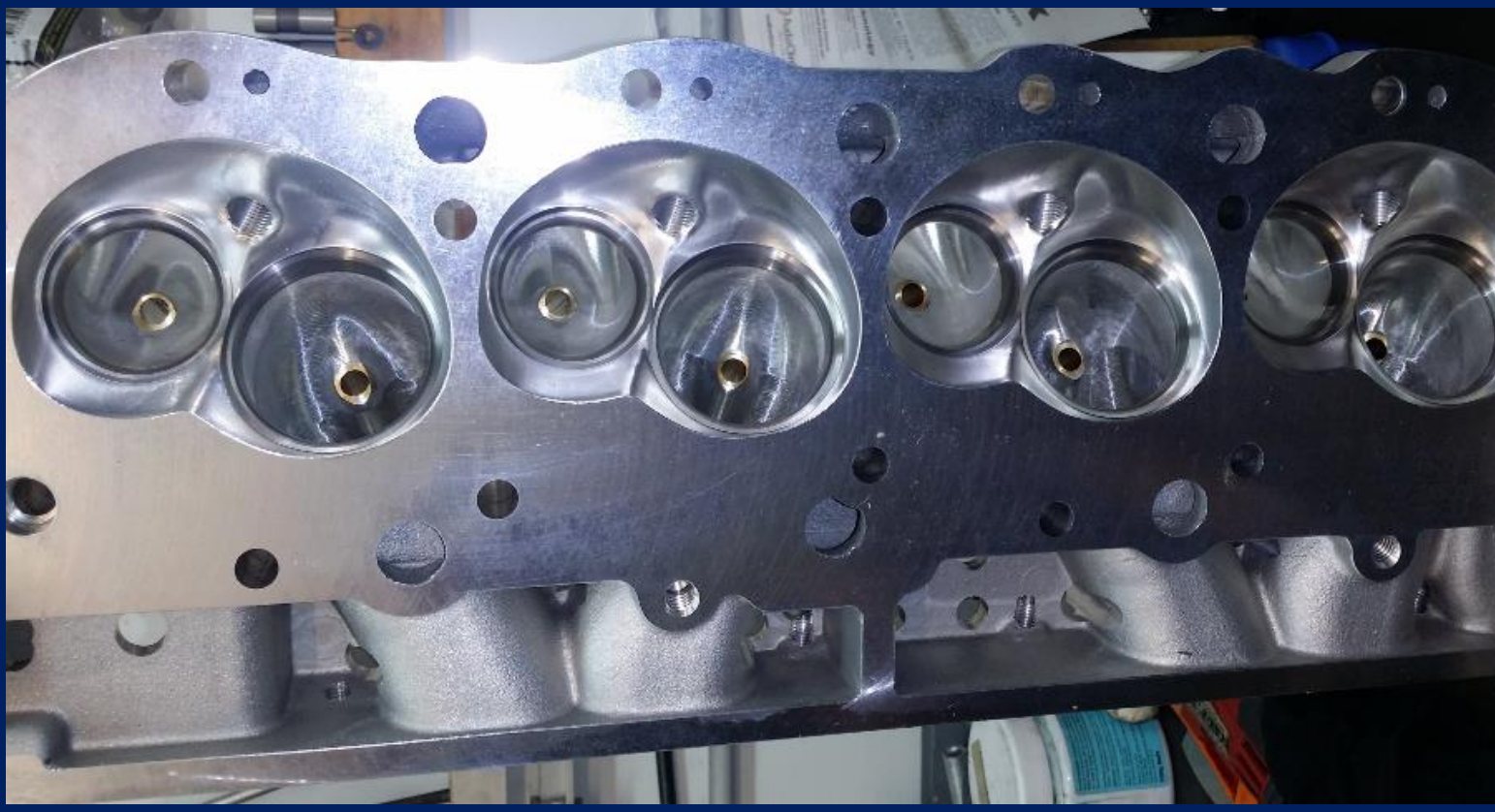


The JE Forged Lightweight FSR Pistons have a very short skirt and a 1.120” Compression Height.


Henkel


MOLNAR

With the increase in cubic capacity we elected to step up to AFR 335 cnc cylinder heads.



It was recommended to go with a 4-7 timing swap as this works very well with larger capacity BBC.

This necessitated a new cam, suitably spec'd:

P/N	129994		**NET VALVE LIFT INT.**	.7430
GRIND	ROLLER		**NET VALVE LIFT EXH.**	.7430
ENG	BBC		**INT OPEN**	43.5
ROCKER RATIO INT.	1.7		**INT CLOSE**	73.5
ROCKER RATIO EXH.	1.7		**EXH OPEN**	83.5
CAM LIFT INT.	.4500		**EXH CLOSE**	37.5
CAM LIFT EXH.	.4500		**OVERLAP**	81
L/C (LSA)	109		**INT PHASE**	105
ADV OR RETARD	4		**ANGLE or LC**	
INT. DUR	297			
EXH. DUR	301		**EXH PHASE**	113
INT. DUR @ .050	265		**ANGLE or LC**	
EXH. DUR @ .050	269			
INT. DUR @ .200	182		**INT O @ .050**	27.5
EXH. DUR @ .200	188		**INT C @ .050**	57.5
CUSTOMER	4&7 SWAP		**EXH O @ .050**	67.5
			EXH C @ .050	21.5
LASH INT	0.022		**OVERLAP @ .050**	49
LASH EXH	0.022			

Other goodies:

The Rebuild Starts – August 2018:

All the parts have arrived so it all starts coming together. I had to do a bit of work replacing all the 25+ year old braided lines (-16, -12, -10, -8, -6) as well as doing some work in the engine bay so there was no urgency to get it back together quickly.

The engine arrives home, mid December :

Back on the ground, safe and sound:

I decided it was easier to install the engine and gearbox onto the K-frame and then lower the body onto that as I was fairly sure I would need to do some work to the current headers (new heads have a higher exhaust port location) so the K-frame was dropped out.

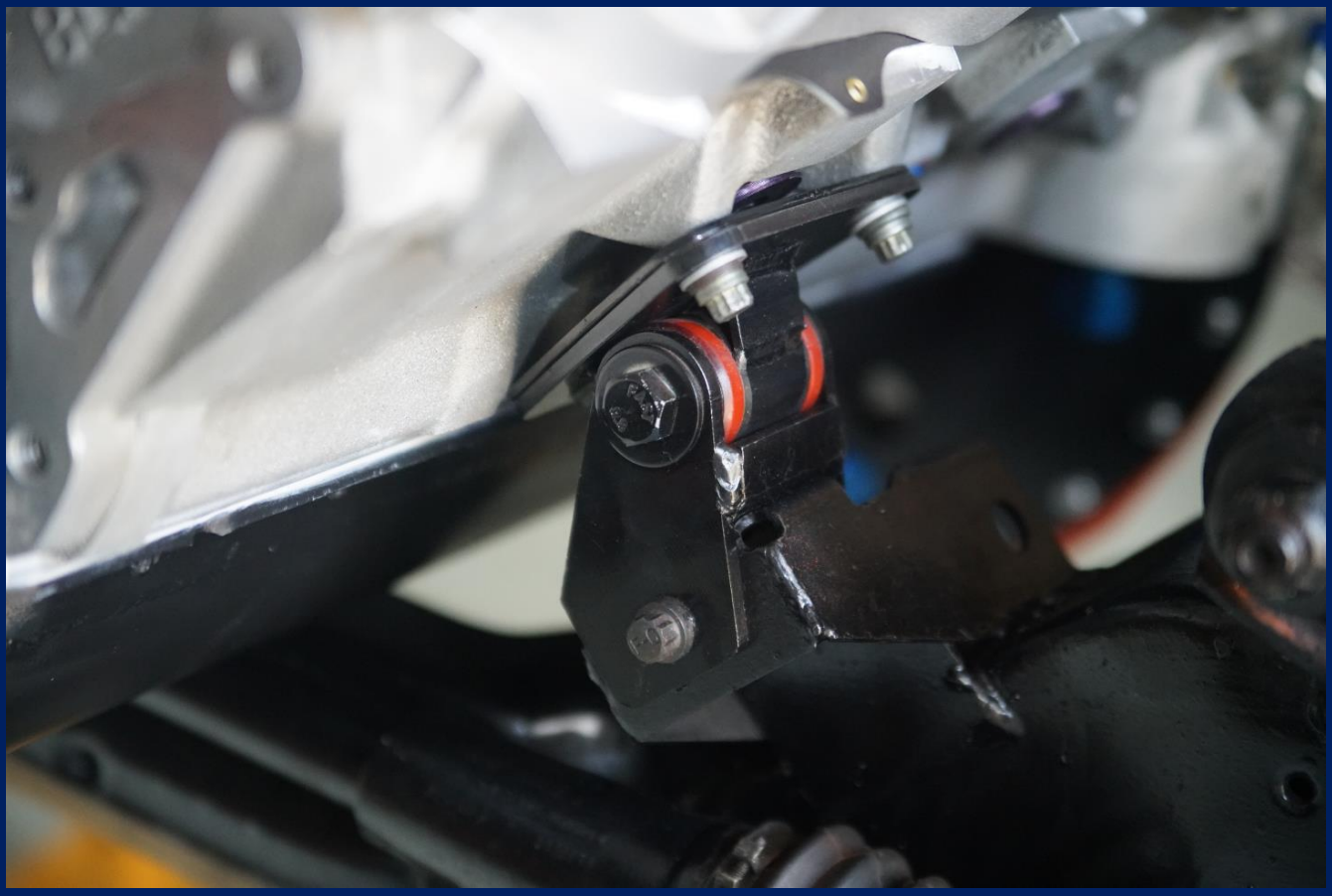
A major surprise was the condition of the Nolathane Subframe, Outrigger and Steering Rack bushes. They were like **new** even though they were installed 28 years ago!!!! I had already purchased Super-Pro replacements and I will install these except I will retain the Nolathane 2 –piece Outrigger bushes, they just look a nicer part than the 1-piece Super-Pro items.

Next step was to mount the engine to the K-frame:

.and voila, with the Lakewood scattershield attached. Ready for the gearbox to join the party:

And we now have the gearbox mounted:

The TuffMounts were reused, still in perfect condition:



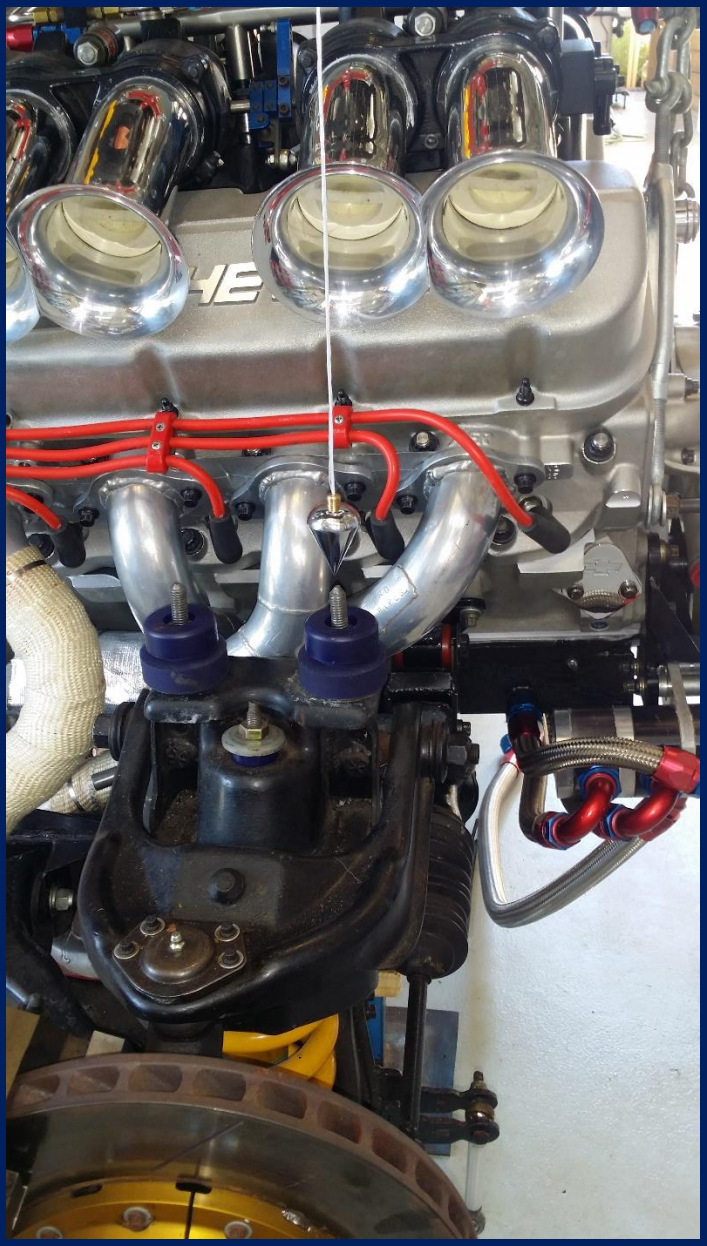
And next, the headers:

I was very pleasantly surprised that I did not have to do any significant work to the headers (except #8) to get them to fit and clear everything! You have to win some……

Next is install the starter motor and finalize the header fitment (tidy up a few places on the scatter shield rim lip where I had to grind some header pipe clearance).

Then it's time to plumb the dry sump to pump connections. After that we are close to reuniting the K-Frame and attachments to the body!

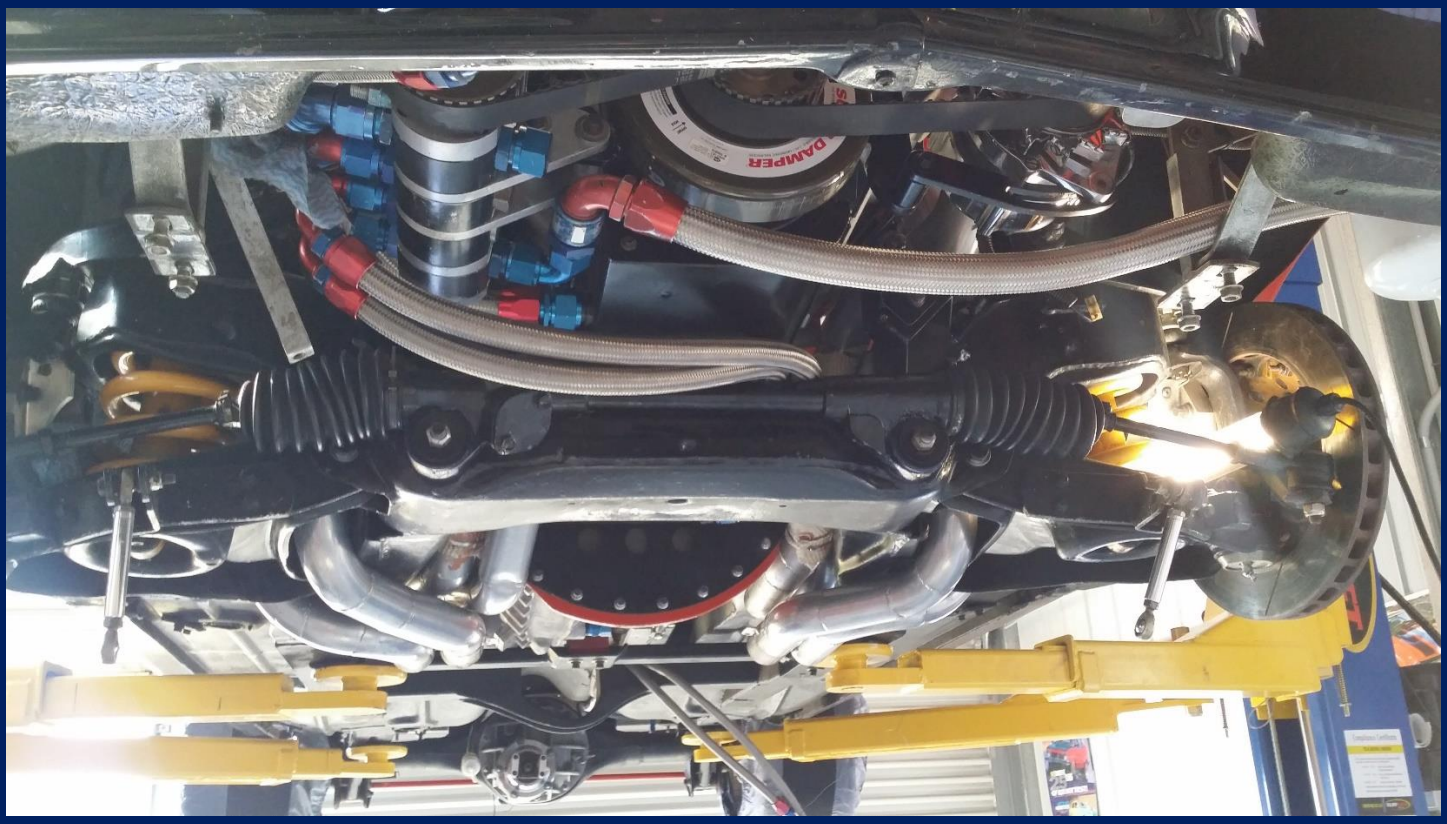
Lining up the K-Frame with the front most mounts..

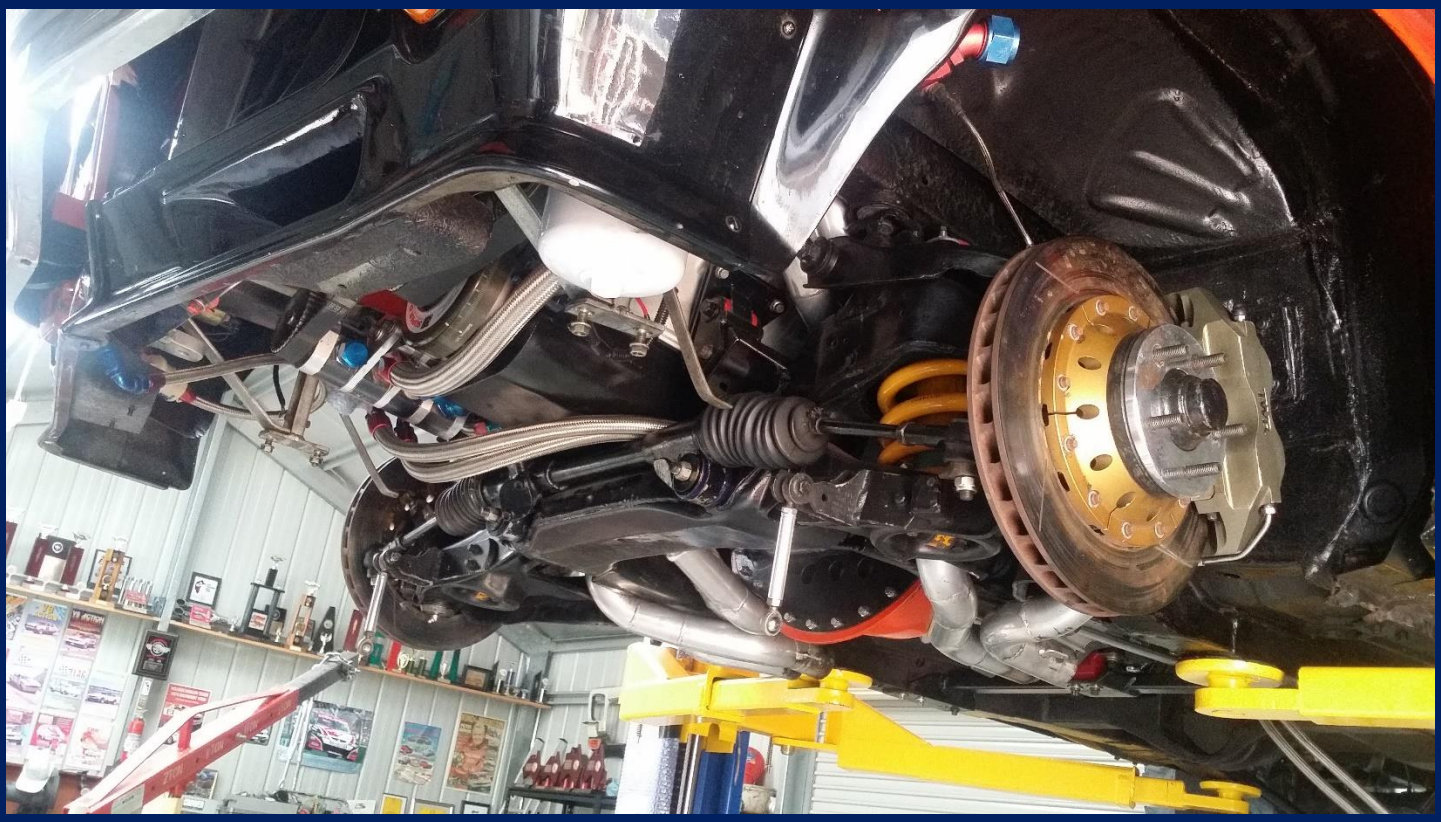


Bringing it all back together….

Just need to work on the angle and it’s in…

After quite a bit of maneuvering, and some creative language, the K-frame and engine are now re-united with the body. This was the last big install task, now it’s on to re-plumbing the fuel system, completing the dry sump plumbing an reconnecting the electrics plus a multitude of other ‘minor’ tasks.






MOLNAR
JE
PISTONS
HELL'S BELLS

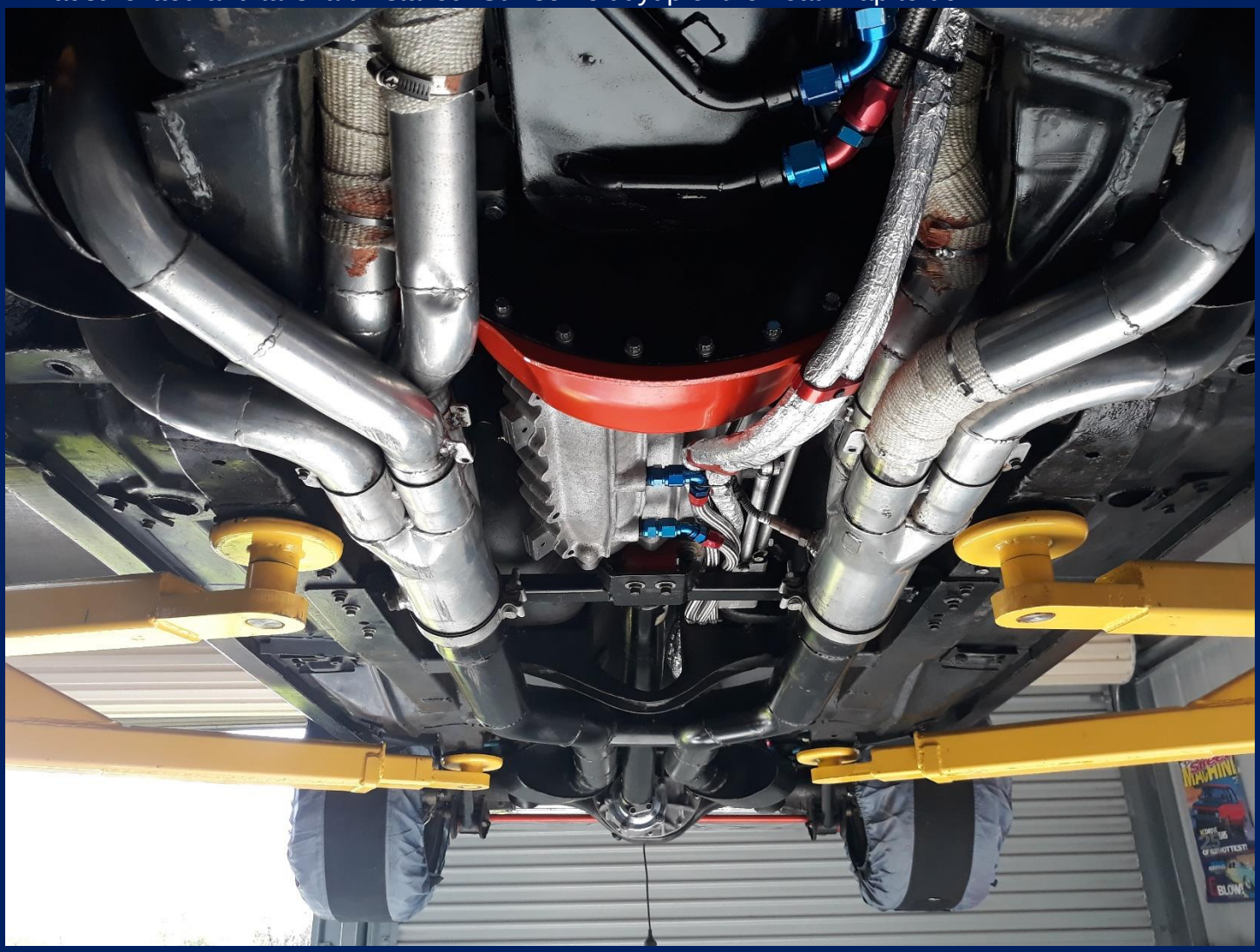
Engine bay starting to take shape again

Oil and fuel lines replaced and re-routed for a tidier look. Still some paint cutting and polishing needed before the K-Frame polishd plugs and polished ram tubes are refitted.

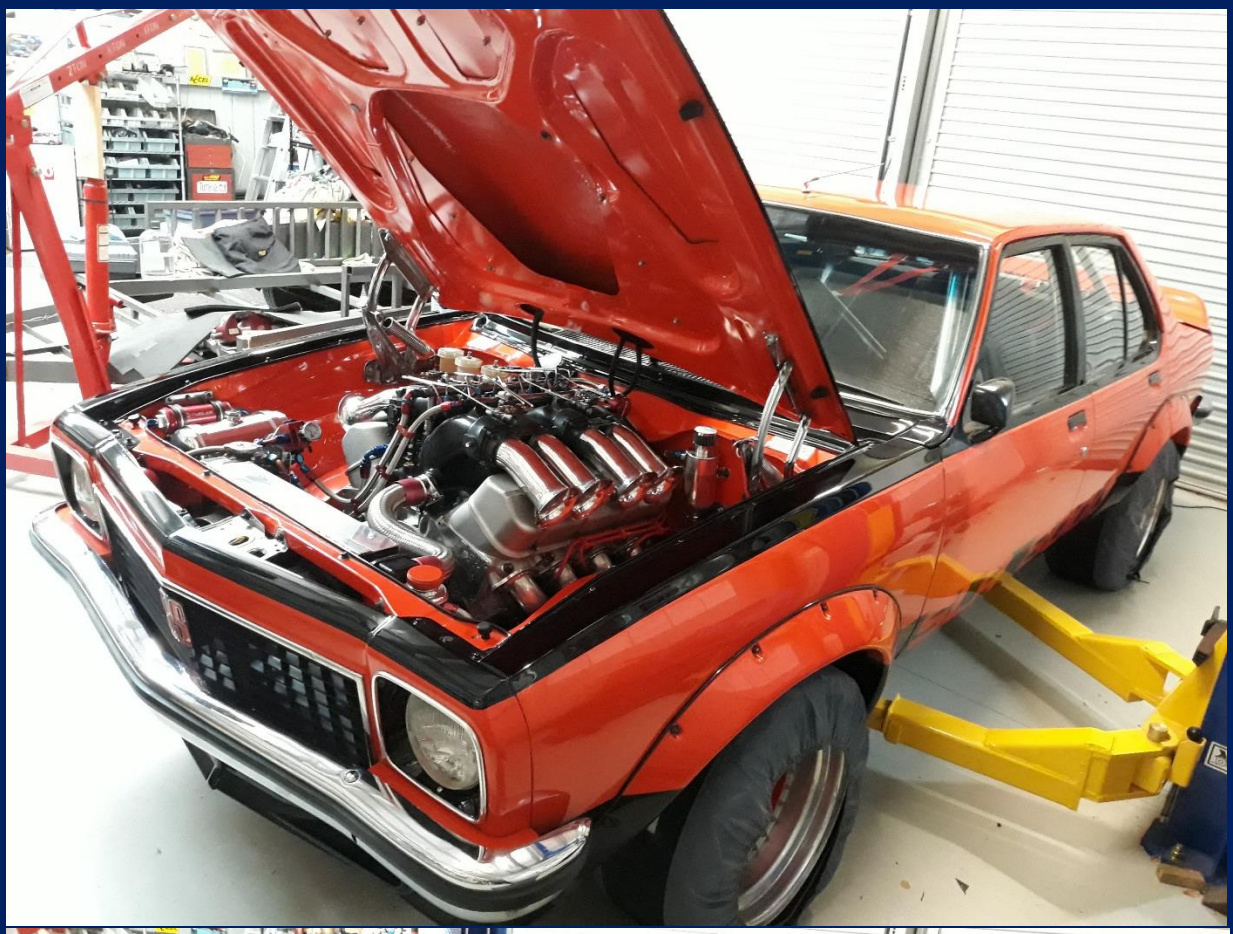
All plumbing finished, lines flushed (to be sure), engine bay cut&polished and now ready for ignition.

Timetable is the engine builder, Brad Nankervis, will appear early in June to do some final checks and then oversee the startup.

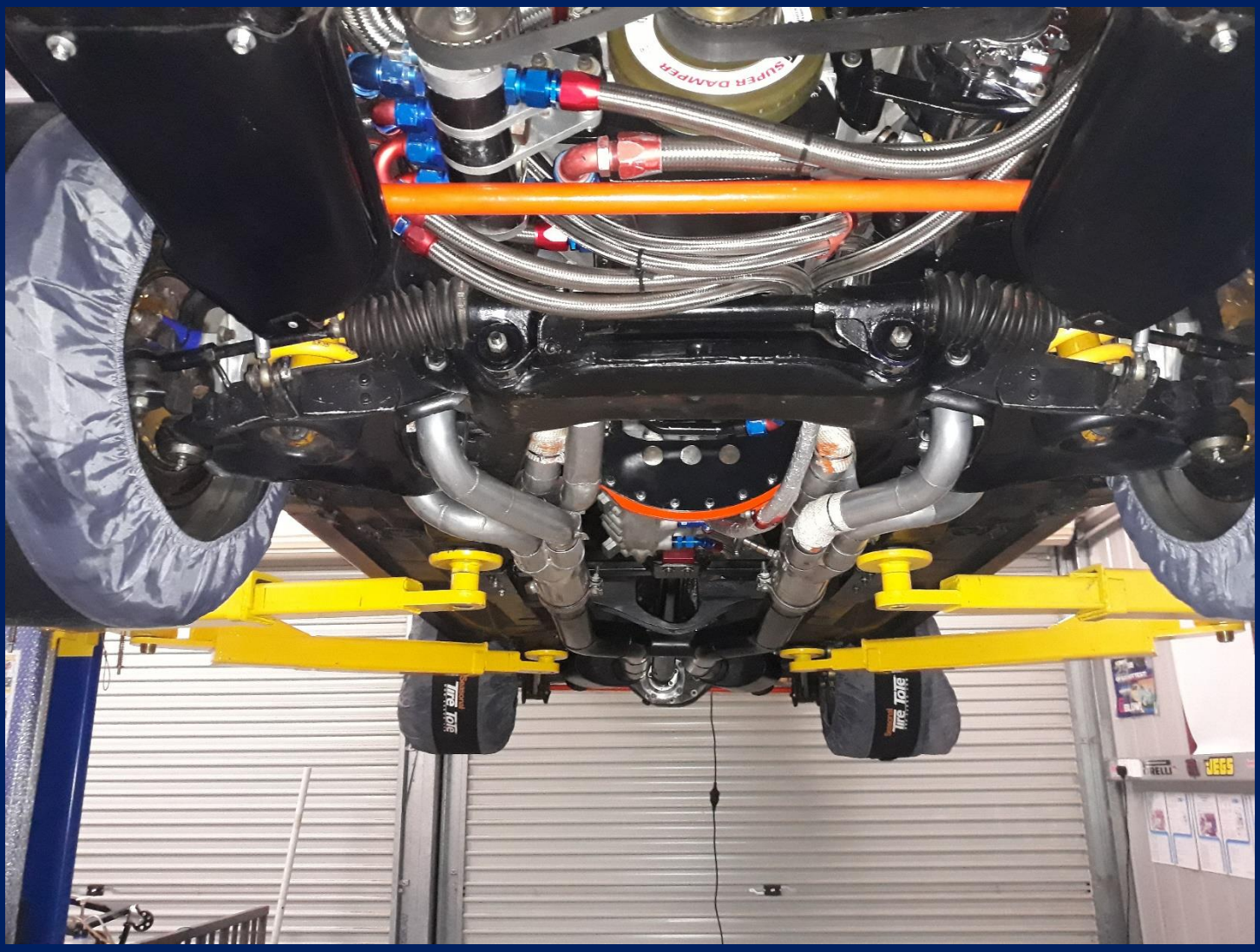
Exhaust refitted and tailshaft installed. Still some tidyup of the heat wrap to do.




BAD ATTITUDE
25 YEARS
Genuine Parts
CHEVROLET



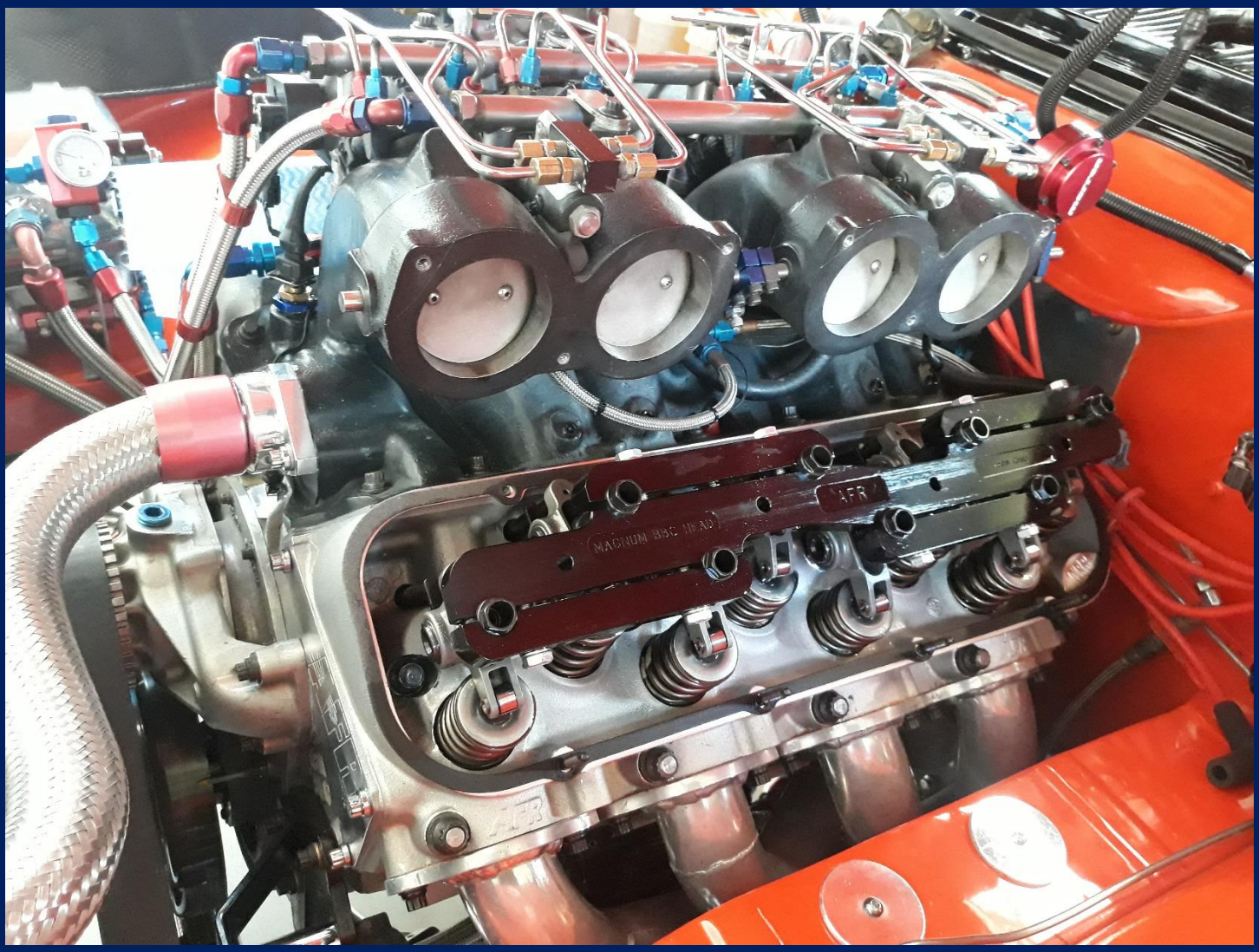

HOLDEN



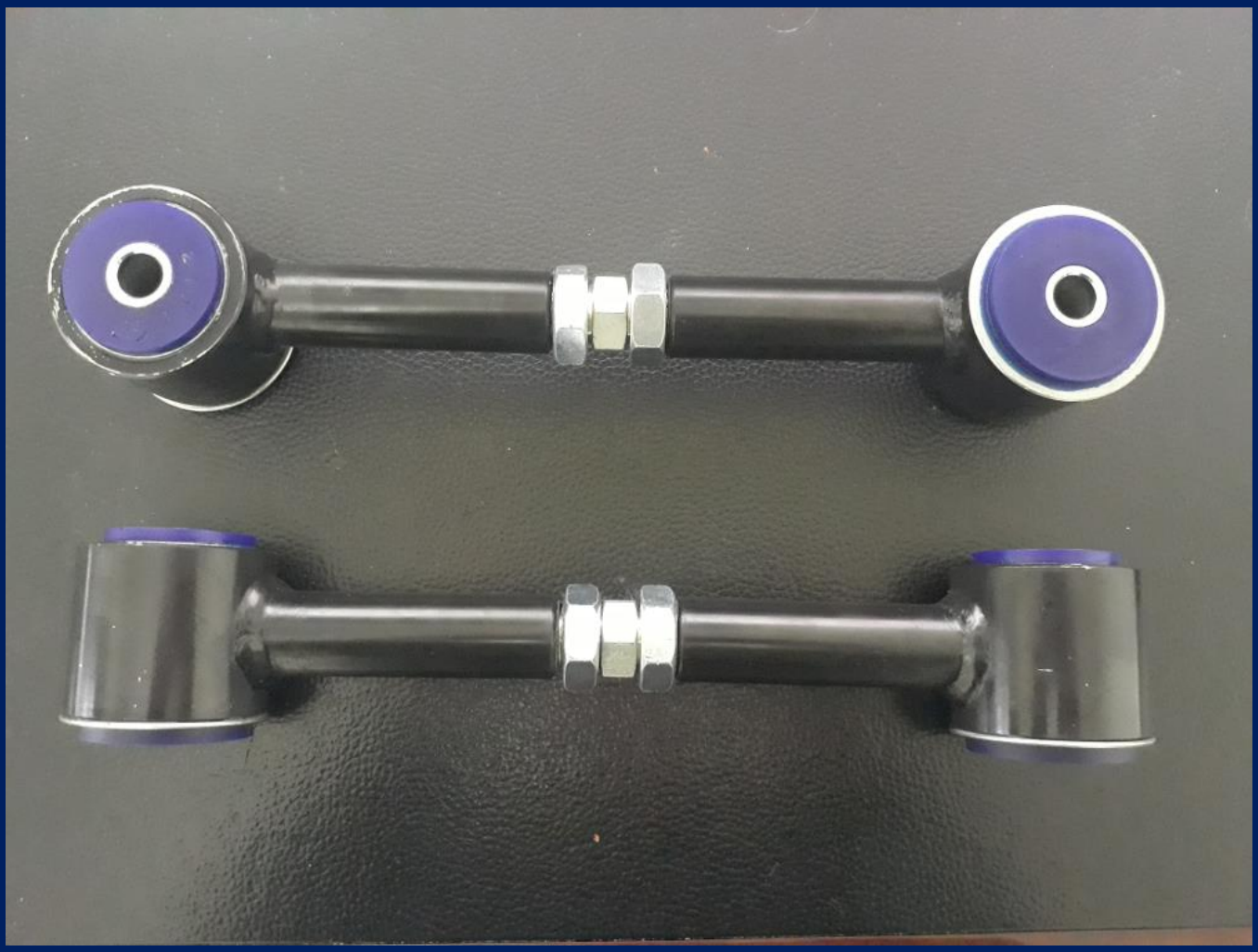
All done, brake ducts reinstalled, electronic speedo sensor reinstalled, startup within a few days now!

Startup was uneventful, after some time spent doing a sanity check of the MoTeC M48 we had ignition!

Checking the tappets after initial startup..



I added some McDonald Bros Adjustable Upper Trailing arms to get back to the correct pinion/gearbox output shaft alignment.



Dyno Time at Melbourne Performance Centre..

Not your average dyno shop…..

MELBOURNE PERFORMANCE CENTRE
22-24 RESEARCH DRIVE,
CROYDON SOUTH, VIC.
Ph: +613 9761 7775

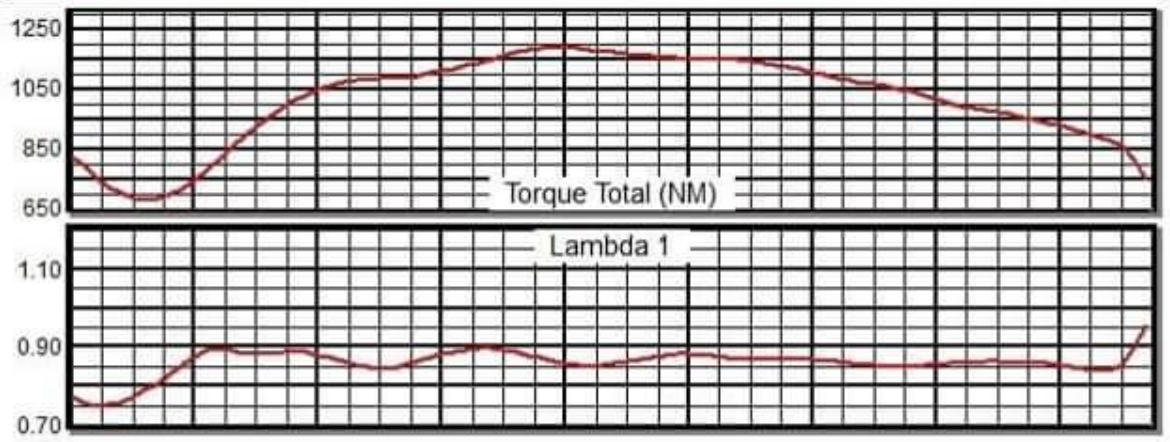
Mainline DynoLog Chassis Dyno Report

Test ID: **FINAL TEST**
Customer:
Test Date: **22-Aug-2019 14:52**
Test #: **562.20** Operator: **Troy/Lee**
Rego No: VIN:
Vehicle: **A9X TORANA 564BB**
Capacity: **0.0 CI** Air Density: **96.8%**
Correction: **2.86 SAE J607** (24.3°C, 1012mBrA, 32%)

Heads: **ALLOY**
Camshaft: **CUSTOM**
Exhaust: **TWIN 3.5**
Manifolds: **EXTRACTORS**
Induction: **CROSS MRAM**
Odometer: **0**
Cylinders: **8**

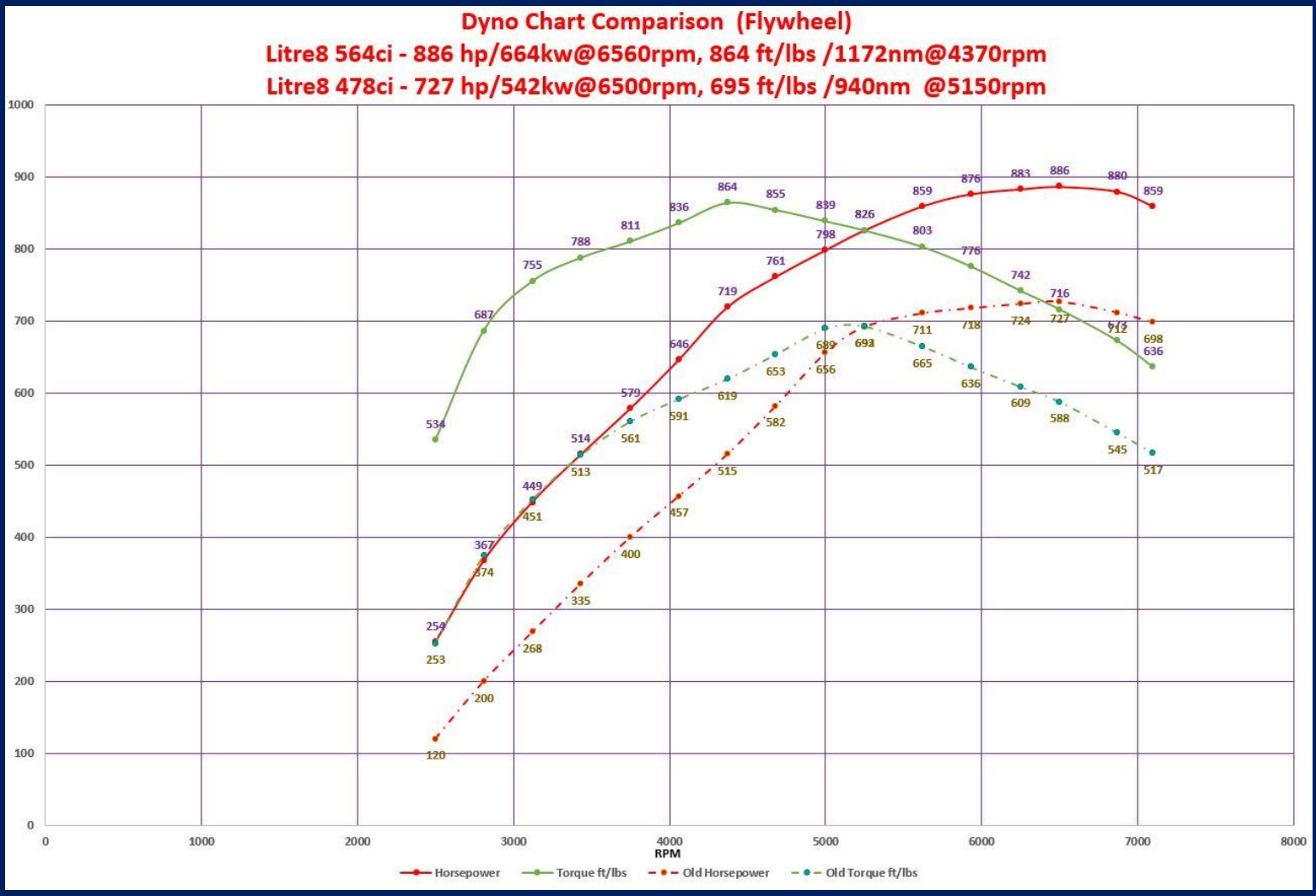
Fuel: **ELF RACE102**
RPM/KPH: **31**
Gear: **4**

Max: dTorque= **927.0**NM @ **138**KPH Power= **523.8**KW @ **214**KPH Motive Force= **10921**N @ **138**KPH

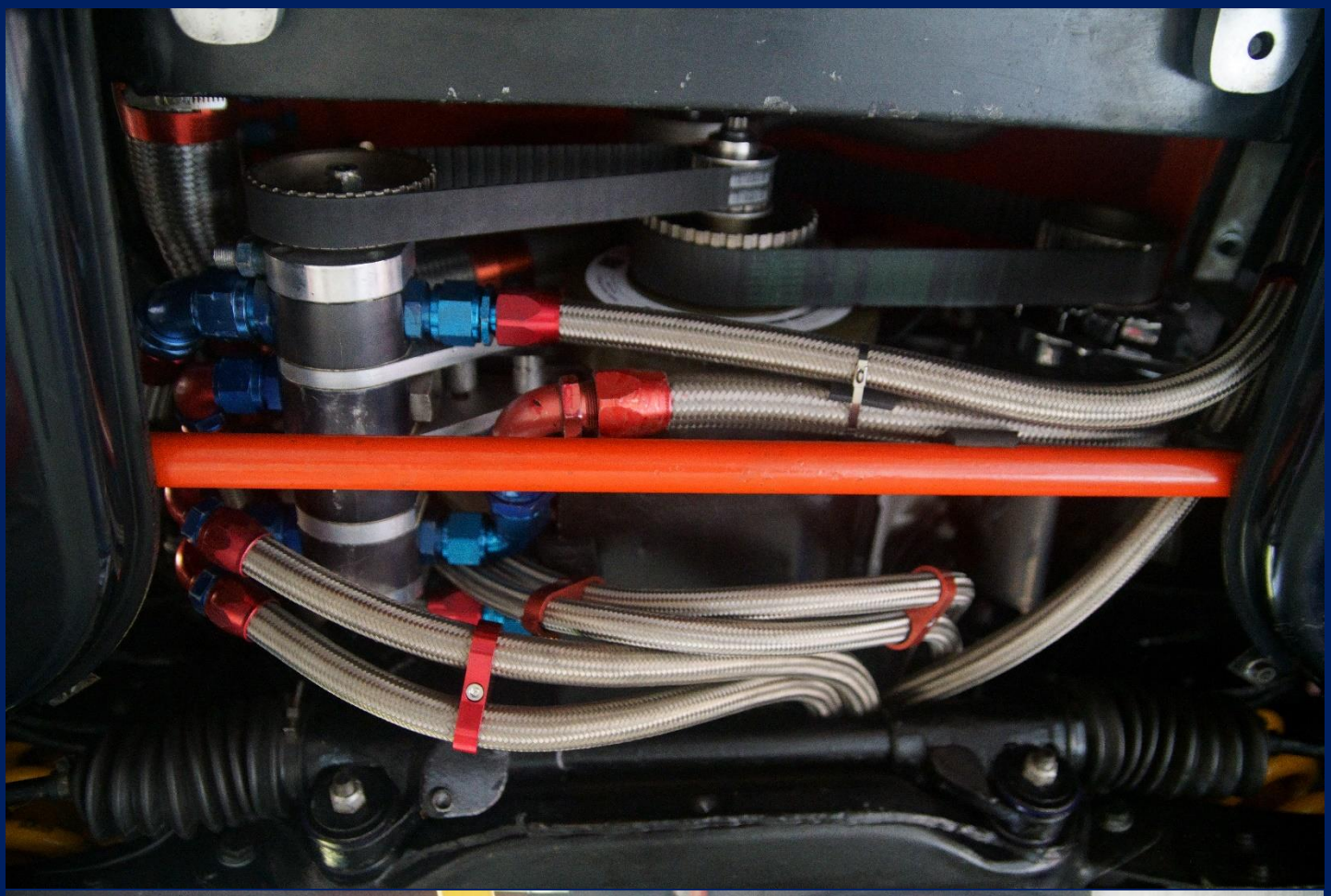


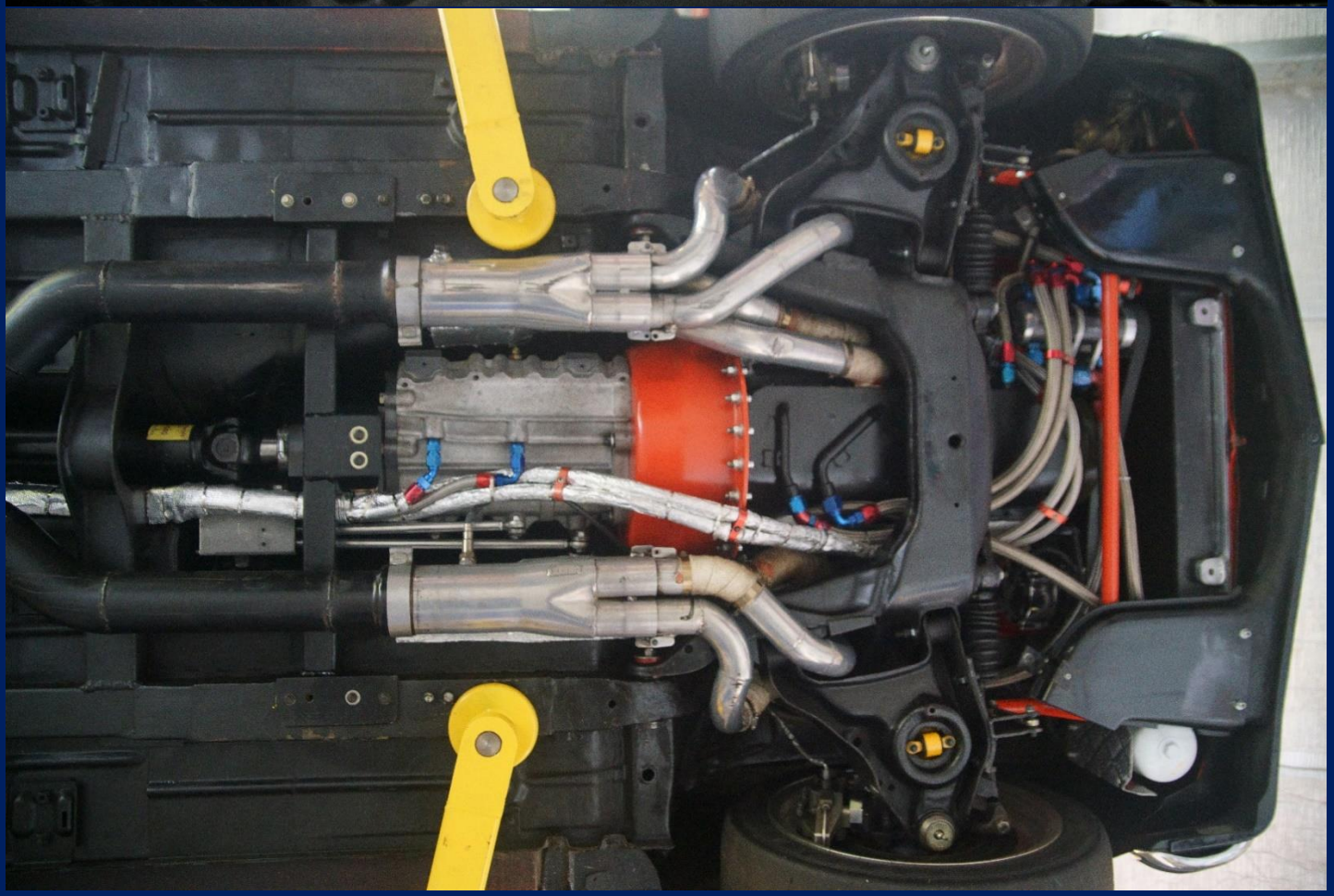
And you can view the dyno video here

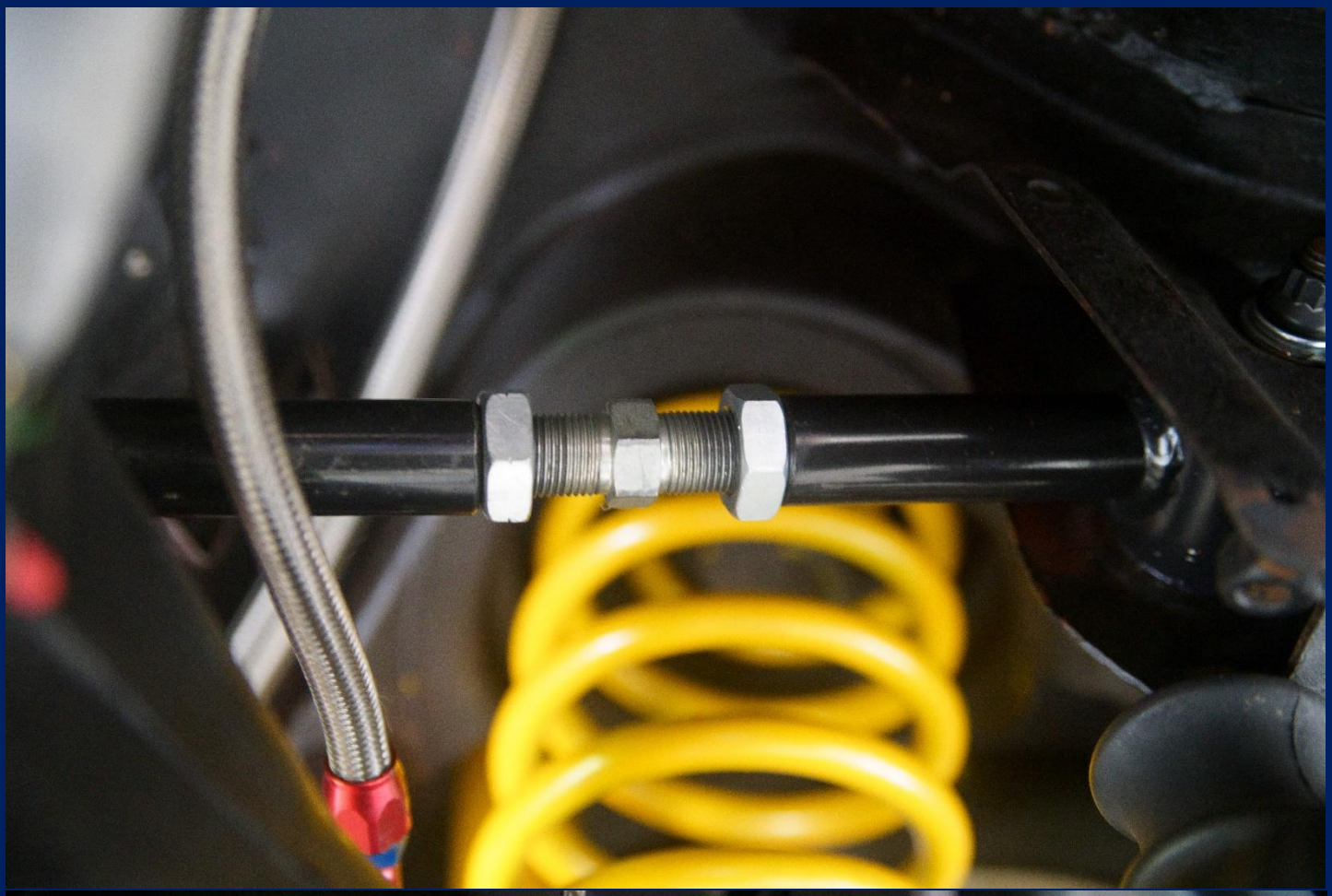
Adjusted Flywheel HP and Torque chart on the following page…

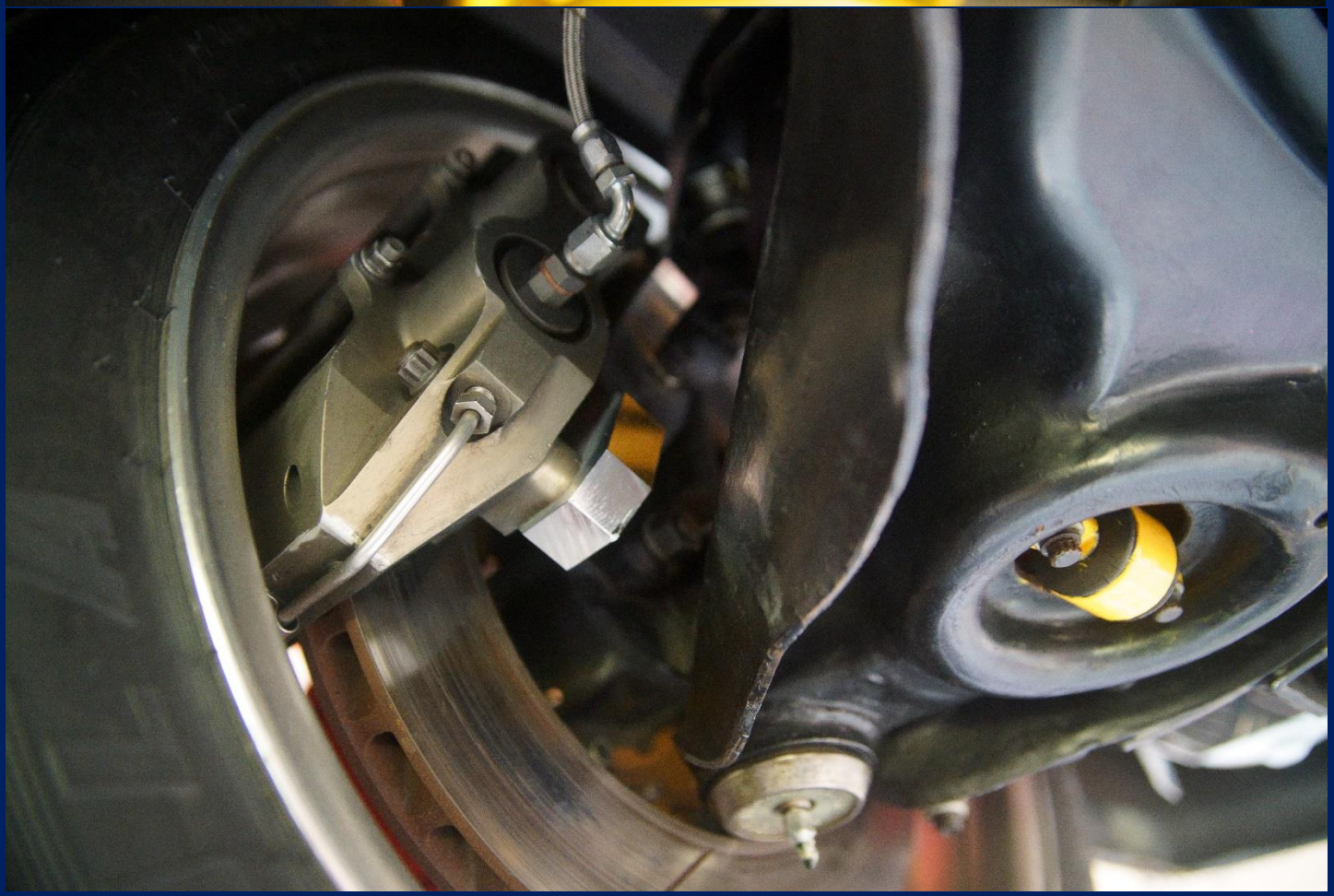

Dyno Chart Comparison (Flywheel)
Litre8 564ci - 886 hp/664kw@6560rpm, 864 ft/lbs /1172nm@4370rpm
Litre8 478ci - 727 hp/542kw@6500rpm, 695 ft/lbs /940nm @5150rpm
RPM
Horsepower
Torque ft/lbs
Old Horsepower
Old Torque ft/lbs


9240










20 BEST EVER!


TORANA
SS


HOBANA

Update: February 2022

A ruptured pressure line to the hydraulic clutch release bearing bought an early end to proceedings at a Winton test session in May 2021. Post mortem revealed it had a minor rub with the pressure plate housing resulting in the failure after a few laps.

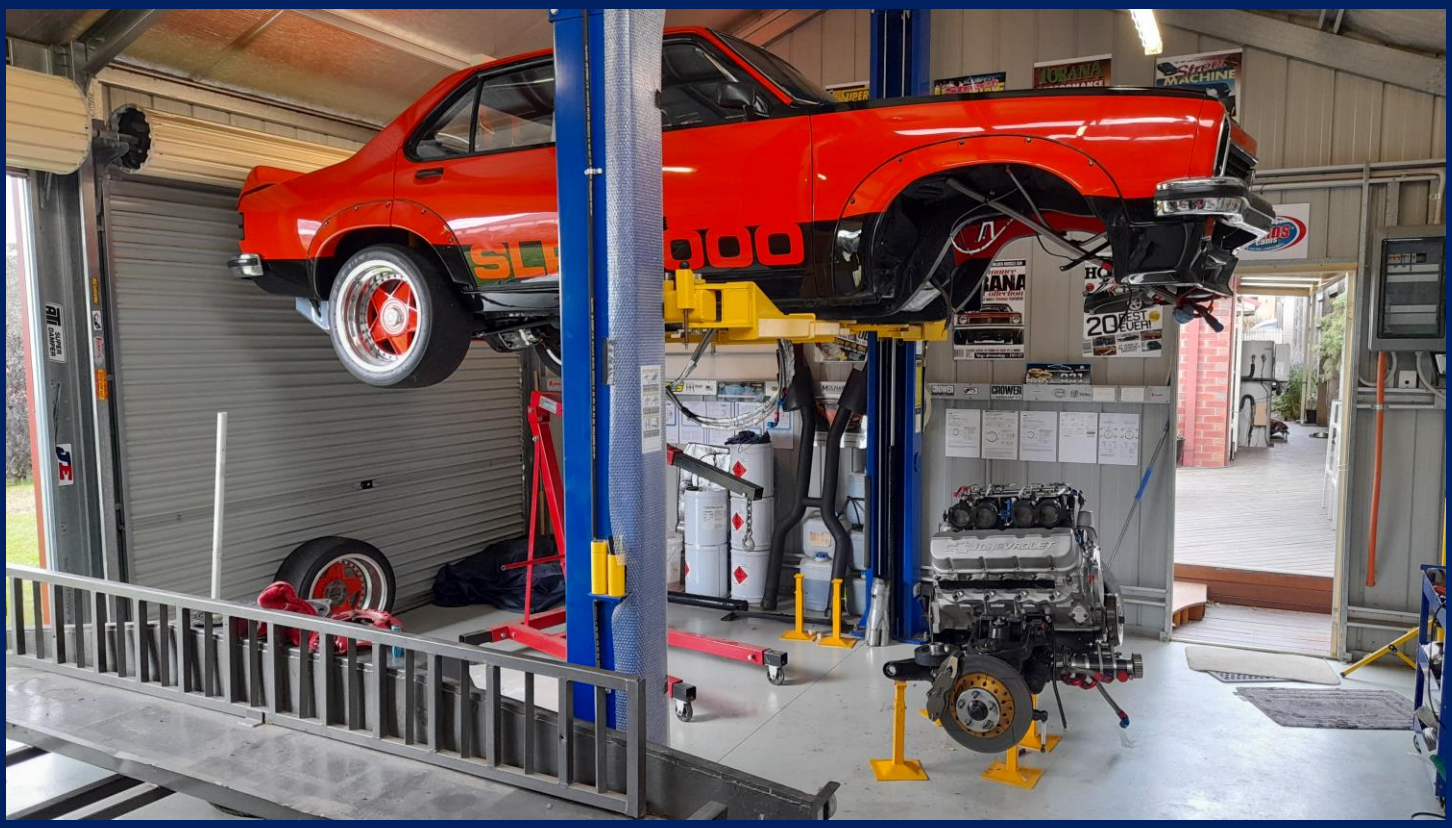
To investigate fully any collateral damage to the clutch assembly meant the enging and gearbox assembly had to come out on the k frame .. rats!

A few covid lockdowns meant that I was unable to get the flywheel & clutch assembly checked by the clutch guru, Les Heintz, until around November. Then I had some delays in getting some chroming done (alternator mount brackets and dry sump mount brackets).

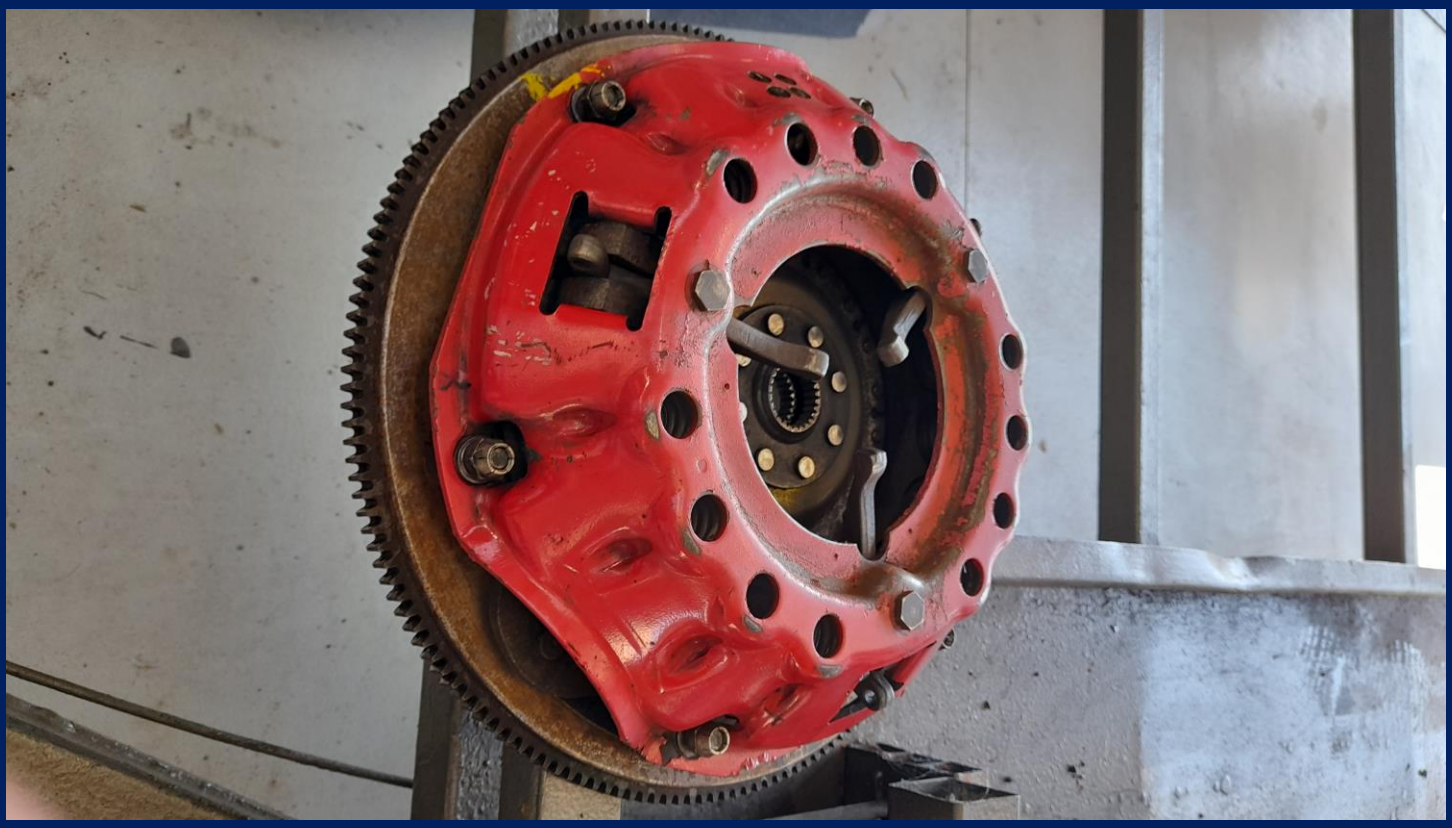
So it was not until late January that the engine and k-frame were reunited with the body.

My brief time during the Winton session also convinced me that on such a tight circuit power steering would really be an advantage…..

I didn't expect to have to part the k-frame and body again…..



I added some bling with a bit of chrome on the custom alternator brackets..

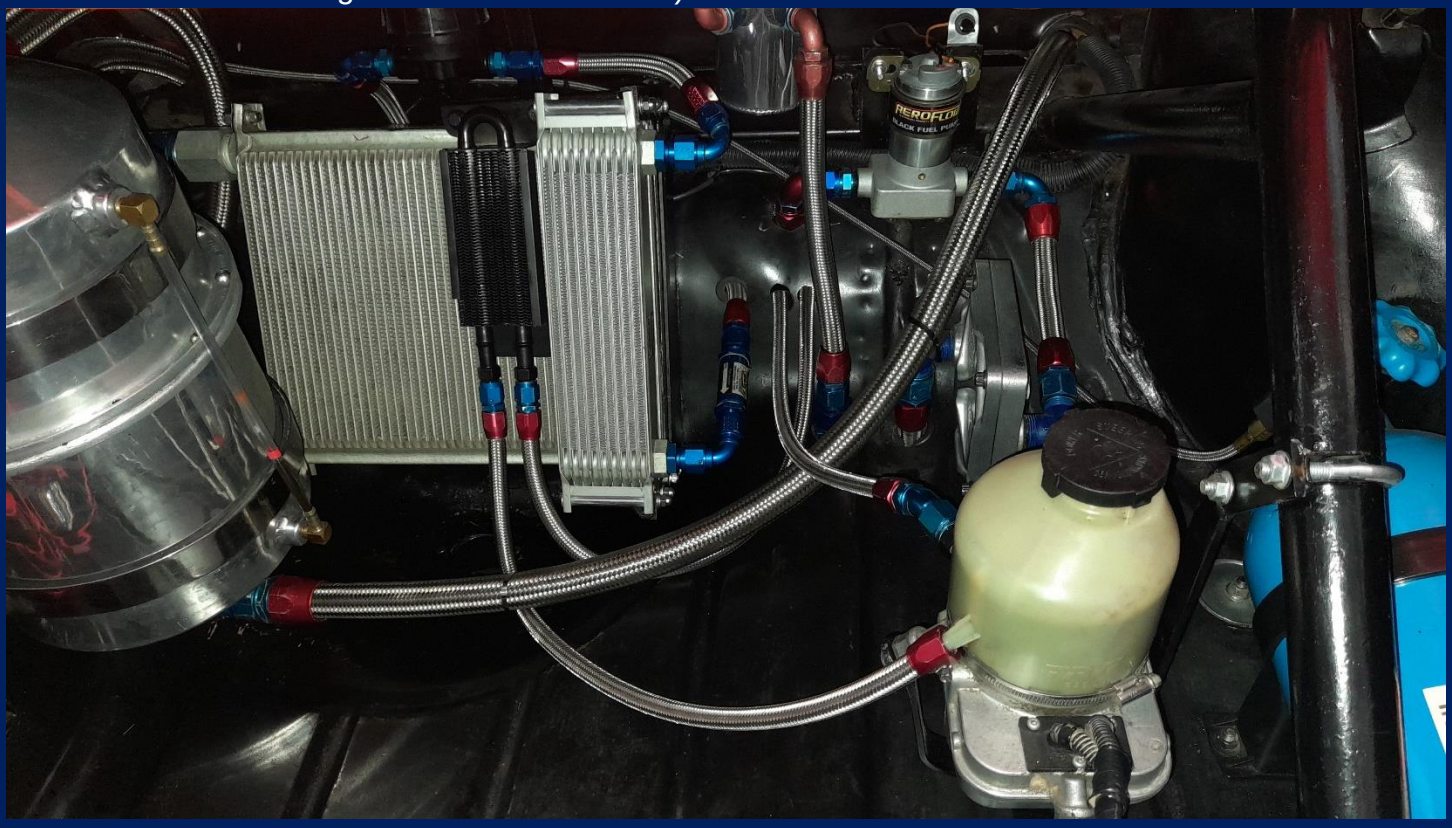

Clutch assembly and flywheel ready for some expert inspection. Luckily all was in great shape, another 20+ years left in the clutch plates (based on current wear rate)!

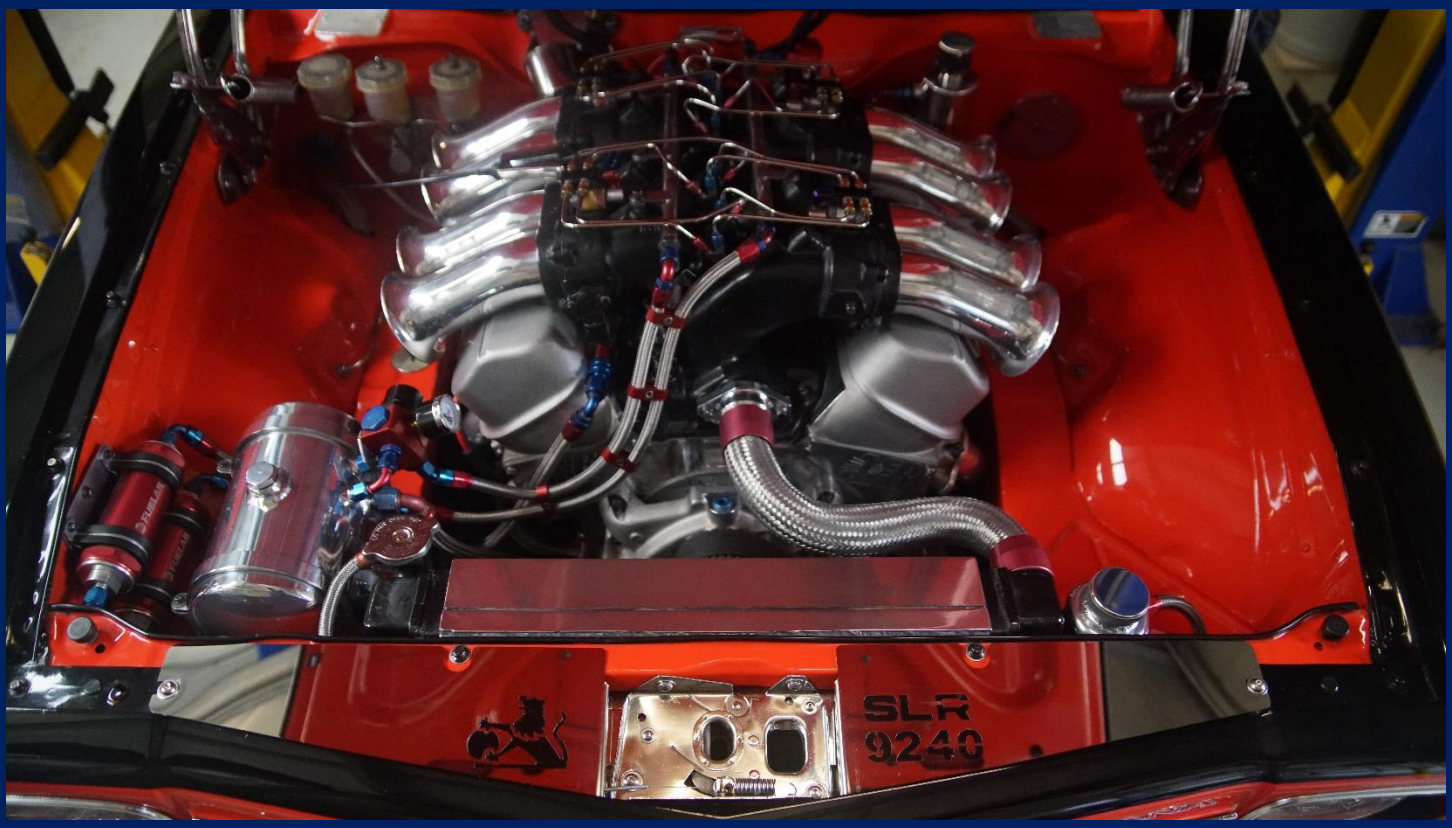
Apart from a new braided pressure line it was apparent that the earlier clutch release bearing was the wrong size for the B&B diaphram fingers so we replaced it with the correct one.

Finally re-united after a long period of inactivity (Covid waiting…….)

The AXIS TR power steering rack is hidden back there behind the oil and fuel lines

Astra Power Steering Pump and associated cooler located in the boot (along with AeroFlow electric efi priming fuel pump & Oberg filter, gearbox pump and cooler, dry sump and oil cooler – all ventilated to above the diff housing with electric fan assist) .





New S/Steel custom infill panel

New HURST Shifter handle

NOS K-Mac Competition Variable Rate Rear Springs (450 lb/in)