

STORY AND PICS BY FRANK ZAPPIA
FOR ANYONE WANTING TO PUNT THEIR LS1-
POWERED COMMODORE AROUND A TRACK, THIS
POWER-STEERING SOLUTION MAY BE FOR YOU

PRO STEER

There are only a few certain things in life – taxes, some say nurses and the fact that if you take your LS1-powered Commodore out to the circuit you will definitely blow your power-steering pump.

Suffering from a lack of 'hardcore engineering', the power-steering system of the VT II-VZ Commodore is the car's Achilles heel when used under any extreme performance conditions.

ADRAD low-restriction core keeps the restriction on the pump outlet down and flow rates up



Fabricated aluminium power-steering bottle complete with screw-on cap and much larger capacity than factory to avoid the dreaded 'bottle meltdown' scenario

CORE

The heart of the cooling system is the unique power-steering cooler core developed specifically for transmission and steering cooling duties by cooling giant ADRAD.

So effective is this core compared to traditional transmission-cooling technology that V8 Supercar teams such as HRT have jumped on board and utilised the ADRAD core.

Calculating the correct amount of core to use was the hard part, a balance of meeting the minimum requirement for cooling while still fitting in the nose of the vehicle.

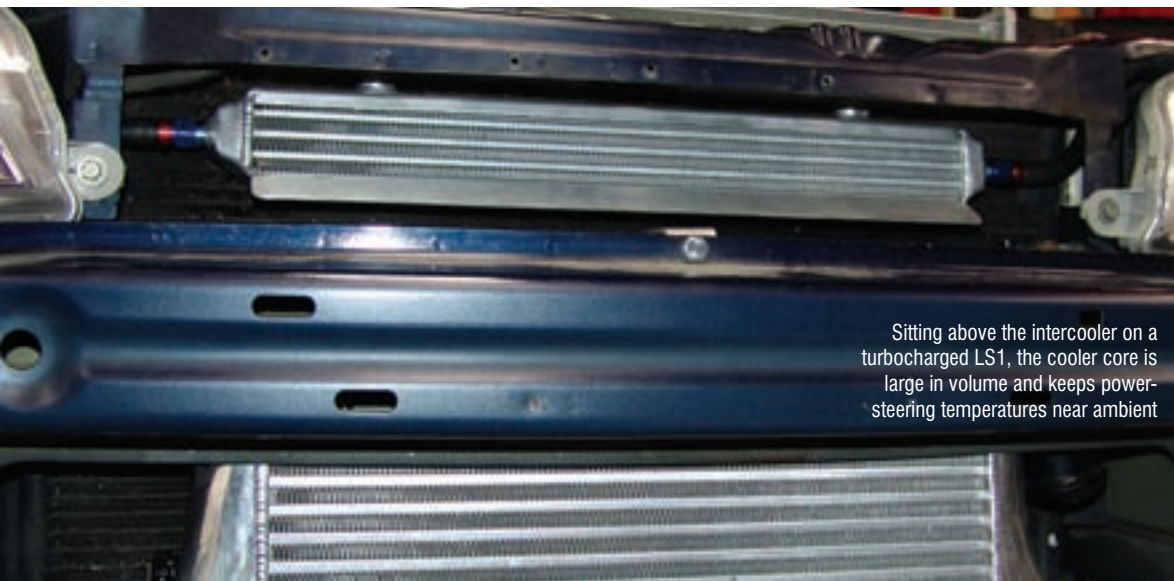
The final core dimensions of 400x50x36 show the low-restriction core is capable of handling a massive amount of power-steering fluid and, most importantly, can throughput that fluid without putting a massive pressure drop across the outlet of the pump.

Most conventional power steering or auto-transmission coolers are extremely restrictive by nature of their design and, as such, cause a massive slow-down in the flow rate of the fluid, which in turn makes the pump work harder and build more heat.

Tying the whole Pro Series Power Steer Cooler system together are proper motorsport-style screw fittings and kevlar-reinforced hose on the low-pressure side. All of which sounds really good in theory, but just how well does it work in practice?



Poor-quality plastic power-steering fluid bottle is prone to melting under the high temperatures experienced in a stock power-steering system



Sitting above the intercooler on a turbocharged LS1, the cooler core is large in volume and keeps power-steering temperatures near ambient

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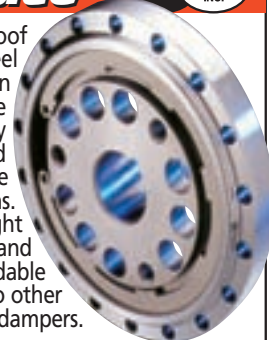


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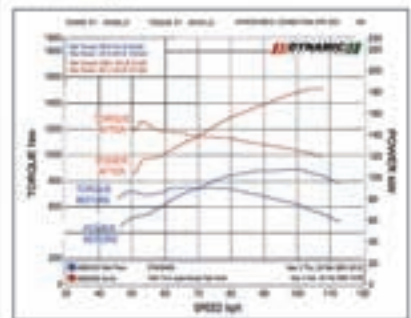
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PROBLEM

Heat is the worst enemy of any fluid-handling system in a vehicle. From the coolant system to the auto transmission, things start to go wrong when the temperatures go through the roof. The power-steering system is no different in this regard.

The problem is that while most of the fluid systems have their own adequate cooling systems, the power steering has only a tiny bent tube at the front of the car that struggles to knock any temperature out of the system at anything greater than parking speeds.

Darren 'Justice R8' Park, a well-known racer in tarmac rally circles and generally urbane Commodore expert explains.

"You only need a couple of hard-driven laps around Eastern Creek in a stroker VX like mine, and the standard power-steering system will fail. The problem is that when it does, boiling hot power-steering fluid sprays everywhere, and if you aren't lucky, the whole shooting match catches fire."

There are several different reasons the power-steering systems fail under track conditions, and all of them relate to temperature control. First and foremost is the dreaded 'melting stick' syndrome.

The power-steering fluid can get so hot that the dipstick, which is part of the cap assembly, actually melts off and blocks the inlet to the power-steering pump. This highlights the major problem with the reservoir assembly and points to low-grade plastics being used.

The second problem is with the seals in the power-steering pump body. Not being rated to withstand temperatures much over 100°C, the seal material can collapse and cause a high-pressure leak.

Last but not least is the rubber piece of hose that runs on the high-pressure outlet of the pump down to the power-steering rack. Temperature affects this rubber section over a period of time, eventually causing a split that leaks 500psi-plus of power-steering fluid all over the extractors.

Tools of the trade. High-quality thermocouple sensors were used to log temperature data



The short burst of a quarter-mile pass is rarely enough to trouble the power-steering system with over-temperature. Rather, it's the sustained punishment of a track day

HOW HOT?

To cause this mechanical mayhem, the power-steering fluid needs to get to a phenomenal temperature, and it does, with our initial testing showing that 100°C, and in one case 140°C, was only a couple of hard laps of high rev work in a new SV8.

While you might not see over 60–80°C on the road, the track introduces a whole new problem, with sustained high RPM doing all the damage from a temperature viewpoint.

Twelve or 13 seconds standing on the throttle at the drag strip isn't enough, but keep the tacho needle hovering between 4000 and 6000rpm for any period of time, and the temperature of the steering fluid will go through the roof within a couple of minutes.

It is obvious then that for any spirited driving, some sort of power-steering cooler is required, with many taking the simple approach of cutting the steel cooler line in front of the radiator and fitting a small transmission cooler. This works – to a degree.

PROFESSIONAL

We wanted to do something different, though, and go a couple of steps further, addressing every single aspect of the LS1 power-steering-system weakness and come up with the ultimate solution known as the 'LS1 Pro Series Power Steering Cooler'.

Any track-day junkies or hardcore backroad thrashers take note, as you may need to consider something along these lines to ensure the complete reliability of your car.

First up was the process of designing a new power-steering reservoir that would remain totally oblivious to any sort of temperature loading you could throw at it. This is why plastic was not considered to be a viable option. Instead, aluminium, which has an extremely high melting temperature, was used.

Where the plastic could look like failing at anything over 120–140°C, the alloy bottle would stand fast to over 300°C – at which point the power-steering system would be the least of your worries.

Rather than use a conventional dipstick to check the level of the power-steering fluid, a completely sealed aluminium screw-on cap has been used, complete with matching O-ring to ensure that nothing can physically drop into the top of the pump and block the inlet.

The downside to all of this is that the power-steering fluid level needs to be manually checked by removing the lid from the reservoir and having a visual inspection. If the fluid level is low, you will plainly see that this is the case.



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Testing on a coolish day, but giving the engine and power-steering system hell, resulted in temperatures under half of previously recorded numbers

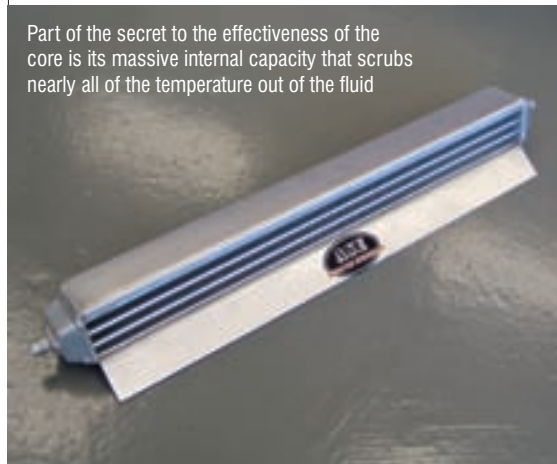
TO THE TEST

The first thing you notice when you are fitting the Pro Series Power Steering Cooler is that you need to add a lot more fluid to the system.

Between the larger size of the reservoir and the additional volume of the ADRAD cooler core, there is something like an extra 1.5L of fluid that need to be added to fill the power-steering bottle to within 2cm of the filler neck (which is the recommended level).

Initial start-up shows the pump groaning as it fills

Part of the secret to the effectiveness of the core is its massive internal capacity that scrubs nearly all of the temperature out of the fluid



with its new supply of Holden power-steering fluid, before settling down to a quiet conventional whirr at idle.

There is none of the shuddering and shaking normally caused when disconnecting the power-steering rack, as there are no air bubbles present in the high-pressure side of the system.

Steering effort remains identical, so at first thought you haven't really changed anything... until you get out and feel the bottle after a hard series of laps.

Where the standard plastic bottle gets to the point where it is so hot you simply cannot touch it, the aluminium replacement stays cool enough that you can quite literally touch it with your bare hand.

However, enough of the touchy-feely and on to the real testing. Our thermocouple pick-up (which gets jammed under the lid and then taped into position, which isn't particularly neat, but is effective) shows that on an 18°C day, the power-steering temperature would not exceed 42°C.

This was regardless of how many RPM the engine was spun to (we used 6700rpm) and is under half of what most standard Commodores see in the steering bottle at idle.

As a cooling solution, the Pro Series Steer Cooler system is a trick piece of gear. Whether you need to go to this level of cooling and expense for a daily-driven street car is arguable, but if you do, the system is available either in a complete kit or single component form from www.1s1turbo.com.au. **SC**



With the engine cover in place, the aluminium power-steering reservoir is barely noticeable