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B4 and After

A monumental improvement for the Australian-spec Subaru Liberty B4 twin-turbo.

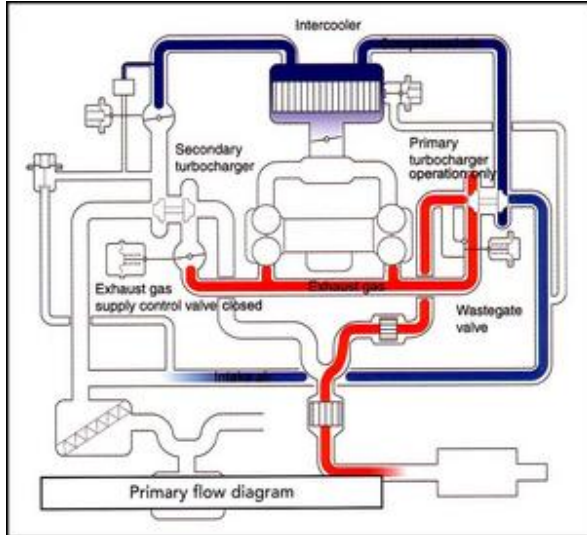
Words by Michael Knowling, Pix by Julian Edgar

At a glance...

- ECU tuning for the Subaru Liberty B4
- Much improved drivability
- Flattens the mid-range torque dip
- 32 percent more top-end power
- AUD\$1550 total cost

The Australian-delivered Subaru Liberty B4. Few vehicles have been so eagerly awaited yet so disappointing. Well, here's the fix that so many disgruntled owners have been waiting for!

The B4 Twin-Turbo System (and its Problems)



The Subaru B4 employs a sequential twin-turbo arrangement where a relatively small primary turbocharger is used to deliver boost in the low-to-mid rev range. At around 4500 rpm, the sequential control system then begins to feed a proportion of exhaust gas to a secondary turbocharger. Once the secondary turbocharger is spinning fast enough, it provides additional charge-air. In other words, the primary and secondary turbochargers work in parallel at high rpm and load.

The biggest advantage of a sequential twin-turbo system is the generous spread of torque that it delivers - the primary turbo gives strong bottom-end and the secondary turbo chimes in to help achieve the 190kW top-end.

Unfortunately, as discussed at [Subaru Liberty B4 Twin-Turbo](#), the standard Australian-spec B4 is plagued by a significant mid-range torque drop-off that occurs when the secondary turbocharger is being brought up to speed. It's not unusual to see boost fall away by about 4 psi or more during this stage. For the driver, this means the rate of acceleration is far from linear - something completely at odds with what is otherwise a very refined vehicle.



In terms of outright performance, the standard Australian B4 is also no ball of fire. Sure, it holds a definite low-rpm torque advantage over its single turbocharged 2.0 litre stablemates but at no point does it really feel *fast*. Subaru claims 6.5 second 0 - 100 km/h performance - but only with an ideal launch, 98 RON fuel and favorable conditions.

The B4 Solution

Up until now, the only way we've heard of tackling the B4's mid-range torque drop-off is to fiddle with the pneumatics of the twin-turbo actuation system. But now there's a much more elegant and effective approach - an EcuTeK ECU reprogram.

We recently visited Sydney's MRT Performance where we had the opportunity to back-to-back test a Liberty B4 in standard and EcuTeK reprogrammed guise. The only modification to this car was an atmospheric venting blow-off valve.



Flashing the new program to the ECU is a 5-minute operation. A laptop (which must contain EcuTeK software) is plugged into the OBD-II connector and the check connector is bridged. Both of these connections are under the dash - there's no need to pull away trim panels to access the ECU.

When off-the-shelf maps are being loaded (which is usually the case) the tuner enters the EcuTek Utility Mode via the laptop. Once the appropriate file has been selected from the laptop hard-drive, the tuner clicks 'Program ECU' and the new data is transferred into the ECU. Once this is completed, the ECU is the reset.

Next, the car needs to be taken for drive and - within an hour - the ECU will have fully learnt its new parameters.



MRT tells us the standard tune in the Australian-spec B4 is very lean and with excessive ignition advance across the rev range. This means the engine is often on the verge of detonation - as many owners can attest to. In a standard or near-standard vehicle, MRT adds extra fuel at wide-open throttle and pulls out 4 or 5 degrees of timing in a number of load/rpm zones.



And what about boost pressure, you ask? Well, due to reliability issues, MRT is reluctant to spin the relatively small turbochargers – particularly the primary turbo – any faster. (Note that the life of the primary turbo can be a real concern if an undeveloped high-flow exhaust is installed.)

Interestingly, the EcuTeK program also allows the tuner to alter the rpm at which the B4's active rear muffler switches into straight-through mode. By moving this activation point forward from about 3500 to 2000 rpm, the engine feels more responsive.



Results

After being EcuTeK reprogrammed, our demo B4 showed an improvement that was obvious, literally within the first 50 metres of driving.

Part-throttle performance has been revolutionised to the point you'd swear there was a good multi-valve V6 under the hood. Interestingly, the aftermarket blow-off valve fitted to the car audibly confirmed that the primary turbocharger was now boosting much earlier than previously. A big sneeze could be heard after backing off the throttle - at just 2000 rpm...

But what about the B4's mid-range hole? Well, in short, it's 90 percent gone. You no longer feel yourself falling forward as the secondary turbocharger tries to come up to speed - all you get is a firmer push in the back from about 4250 rpm.

Outright performance is also improved massively - the B4 now accelerates the way we always dreamed it would! Our guess is 0 to 100 km/h performance in flat 6s - and that's without being too brutal on the gearbox. The only on-road deficiency that remains is a lack of torque for the first few metres off the line - even the little primary turbocharger needs some engine rpm before it can give boost.



This dyno graph (obtained from MRT's DynaPack hub dyno) shows the gains achieved. The black and red plots represent 'before' power and torque respectively, while the green and blue plots represent the 'after' power and torque curves. Each run was conducted in fourth gear. As you can see, torque is increased by a massive 30 percent at just 3000 rpm. At the top of the rev range, peak power has been elevated from 150 to 183kW at around 6000 rpm. That's a 32 percent gain.



Interestingly, the on-road improvement that we felt during the secondary turbo transition is not seen on this graph. We are told that a roller-type chassis dyno (such as a Dyno Dynamics) shows this improvement more distinctly.

Another graph (not shown) reveals that the primary turbo now comes on boost earlier but peaks at just 11.5 psi - 1.5 psi less than standard. When working at high rpm, the primary and secondary turbochargers now combine to give up to around 16 psi boost - a modest 3.5 psi increase over standard.

And what about cost?

New maps from your local EcuTeK reseller will set you back AUD\$1500 (including GST), plus an extra

AUD\$50 to load the file and road test the vehicle. Note that there are ready-to-go maps for standard B4s as well as those with basic breathing mods. At this stage, nobody in Australia has gone beyond this level of modification. Regardless of existing modifications, any necessary tuning adjustments can be made during the final road test.

At AUD\$1550 the MRT reprogram is not cheap, but we can certainly recommend it to any B4 owners who are currently feeling disappointed with their car. Give it an ECU reprogram and the B4 is (finally!) a car that we'd be happy to own.

Further Mods?

MRT has recently introduced a cold air intake and dyno tested high-flow exhaust system to suit the Liberty B4. These retail for AUD\$295 and AUD\$1950 respectively.

We hope to test these products in the future - visit the MRT website for more details.

Contact: MRT Performance +61 2 9809 2110 www.MRTrally.com.au