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WHO WANTS TO DRIVE A V8?

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Re-Tuning the XR6Turbo with MRT's Ford re-flash software

Much has been said and written about the BA Falcon since its release, and on paper its advanced 4.0ltr Double Overhead Cam turbo six engine seems capable of far more than its rated 240KW at the flywheel even in standard trim. This equates to a specific power output of only 60Kw per litre of engine capacity, which is no better than what a Corolla manages – hardly anything to get excited about. Perhaps it was a case of Ford powertrain engineers being politically correct, keeping the turbo six's power output less than that of the Quad-Cam 5.4ltr V8 Boss engine series.



**Pic shown:
all that data to watch and log!**

At the same time all the major aftermarket performance players (and more) have been working overtime developing and marketing power upgrades for the DOHC six at an unprecedented rate, whipping up a frenzy of horsepower claims, counter claims and just about anything else you can care to think of. Even Ford Performance Vehicles have weighed into the fray with their factory enhanced 270Kw Typhoon, (despite shooting themselves in the foot with a batch of poorly engineered twin plate clutches), being probably the most believable of all power numbers being tossed about.

Using MRT's recently released Ford ECU Re-Flash software, our development engineers were given the goal of developing and testing an entry level power upgrade kit for the Turbo 6 that is totally reversible and only requires a bare minimum of mechanical modifications. With this in hand, a five-speed manual series one XR6 Turbo was reversed into MRT's state of the art engine performance test cell for some baseline engine power testing and data acquisition. All of the XR6's vital signs such as boost pressure, fuel flow, air-fuel ratio and inlet temperatures were monitored and recorded.

**Pic shown:
The car on the Dynapack Chassis Dyno**

First up the Falcon was put through a series of four power tests on MRT's Dynapack hub dyno this way we can simulate accelerating the car at full throttle from low speed right up to the rpm limit, within the comfort of our workshop, (without having to run the gauntlet of traffic and break local speed limits.) Each power test was started at 2000 Rpm, with the engine taking six seconds to accelerate to the 5500 Rpm finishing point. A break of 30 seconds separated each test. At the start of the series of tests engine coolant temperature was 88 Deg C with an inlet temp of 24 Deg C

Results were surprising, on its very first power run the Turbo Ford punched out an not too shabby 230Kw at the rear wheel hubs at 5300Rpm, along with an impressively flat torque curve that spanned all the way from 2900 to 5200 Rpm all at a very modest boost pressure of 0.40bar. This compared very favourably in power terms to a Boss 260Kw V8 which pulled similar power numbers, (see separate report) but was out-torqued by the six that had it beat just about everywhere in the Rpm range. Less encouraging were the turbo sixes subsequent power tests, which started to degrade at a great rate of knots with each additional dyno run. **Test No 2** returned 220Kw, **Test No 3** 210Kw, and worst of all the XR6 T struggling to break 200Kw on its fourth and final run. Torque took a similar beating, as did boost pressure which plummeted from 0.40 bar to 0.25bar – a drop of almost 50%!





Pic shown:
The Factory fuel pump, pre filter and in tank kit

What happened? Careful analysis of collected data again confirmed that both engine coolant and oil temperature did not get excessively hot, with coolant temp peaking at 105Deg C and oil temp just breaking 100Deg C. Fuel flow and air fuel ratio were all within normal limits. For anything but a standard car, fuel flow looked a bit suspect, with the standard fuel pump delivering a flow volume of 2.8 litres per minute, a bit on the skinny side for a forced induction engine, (especially at a fuel pressure approaching 5 bar). Inlet temperatures were not an issue either, as they had only risen two degrees over the span of four power tests, thanks to the hurricane-like winds generated by our dyno cell extractor fan system.

Pic shown:
On the Dyno, showing the factory intercooler.

Ultimately the answer lay within the programming of the factory computer. Ford boasts that the XR6 Turbo can be run on standard unleaded, and in order to achieve this some pretty harsh constraints have been programmed into the ECU. *We would like to go into more detail as to how and why, but this data is what we work hard to diagnose, so we cant divulge details here. Be reassured though, when we program your car, you can rely we do know. (not all people who read document are our clients!)*



This relatively conservative approach to mapping meant that we were confident that with a diet of 98 Octane unleaded and some careful re-calibration of the numbers quite a few more horses could be liberated out of the big six without compromising reliability. Before diving in and making big changes, the fuel flow rate issue was fixed by fitting a new direct replacement 500hp fuel pump that boosted total delivered volume to 3.5 litres per minute even at 5 bar of fuel pressure. At the same time a set of colder heat range spark plugs were fitted as a safety precaution, as any increase in power will increase plug temperatures, which can be a contributing factor in causing detonation.

Pic shown:
Factory std and new high flow pump

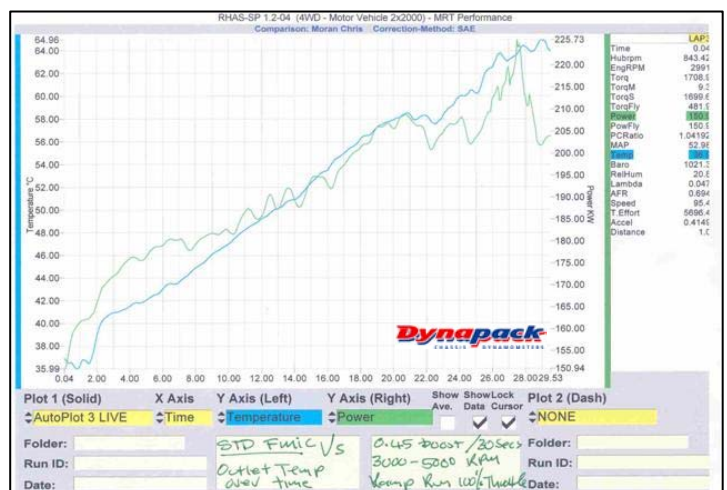


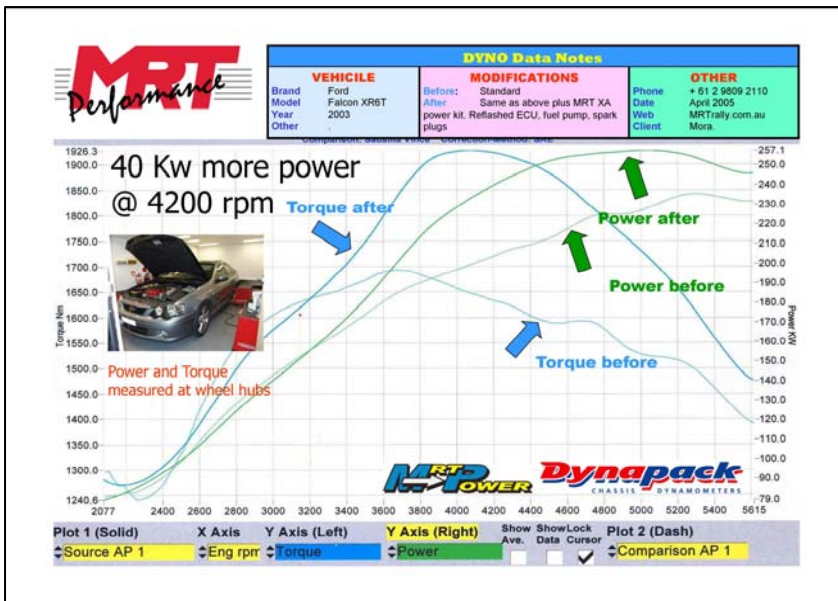
Painstaking is the word to describe the re-mapping process. Optimising the original Ford map is a time consuming procedure consisting of incremental changes to the base fuel and ignition maps, uploading it into the factory computer, with results then tested by a set of Dyno runs. Logged data from those completed Dyno Tests are examined for traces of (ignition) knock, along with Power, Torque and Air Fuel Ratio curves. Based on this analysis of collected data another round of carefully chosen mapping changes are made followed by yet another set of Dyno tests. One major limiting factor was found that could not be avoided, the flow capacity of the fuel injectors. Ford use exactly the same sized injector as is fitted to the naturally aspirated six for its turbocharged model, but with increased operating fuel pressure. This meant that maximum boost pressure had to be adjusted carefully within specific limits

so that the engine didn't run out of injector capacity and run dangerously lean.

Pic shown:
Factory Intercooler test. Power Vs inlet temperature

Traditionally such a gruelling program on a conventional roller dyno would leave the vehicle's Tyres decidedly second hand. Modern high performance "sticky" tyres are particularly easy to overheat and grip characteristics can often be permanently affected even after only a short session on a roller dyno. MRT's Dynapack Dyno is not like traditional chassis dyno's, we connect directly to the wheel hubs of the car, leaving valuable road rubber carefully stacked up in the corner of the workshop, in exactly the same condition as before. On the wheel rims, not as dust on the dyno room floor!





**Pic shown:
Dyno graph before and after**

In addition to changes in Fuel and Ignition mapping, our tuners also made some very specific changes to parameters such as idle speed to prevent stalling. (a problem that Ford is yet to fix) modest increases in the RPM limit and removal of throttle based "soft" RPM limiting. Soft RPM limiting makes for a soggy feel around the edges of the RPM limit and effectively reduces total engine RPM operating range.

Other significant changes included modifications to open and closed loop fuel scheduling, changing both the point and speed at which the factory computer switches from an ultra-lean economy map to a slightly richer more

performance orientated map. This improves

Using the Ford Re-Flash unit from MRT

New to most owners is the flexibility of being able to program up to three different tunes into their Ford ECU by using a special interface box, that stores the different calibration maps as supplied by MRT.

Changing the calibration program into your car is an easy job, requiring the owner to plug into the vehicles OBDII connector (under the dash) and punching a couple of buttons.

Normally there are two different performance programs for 98 and 95 RON Octane fuel, along with a 3rd valet program, that restricts RPM for those times you have to lend your car to someone you may not completely trust.

Or alternatively a fuel economy program designed to save you real money that can often still provide more power than standard! Other custom tunes are available on request. Simply ask MRT Performance.

mid-range power, torque and throttle response. Calculated adjustments were also made to some of the correction maps contained within the Ford computer that control turbo boost and ignition timing in relation to oil and coolant temperature. This was done to improve consistency, while at the same time keeping a comfortable operating safety margin.

Final power and torque numbers justified the huge amount of dyno time invested, and showed substantial gains throughout the entire engine operating range. Peak power increased from 230Kw to 255kw with a huge gain in torque, which jumped 25% over stock! The engine far more consistent when retested over the same set of four power tests. On the road the car was transformed to drive, with a nice big fat lump of torque around 3800 Rpm that effortlessly propelled the car along in any gear, while top end performance was similarly improved. All with only an ECU re-flash, a fuel pump and a set of spark plugs, and without an expensive set of fuel injectors. Fuel mixtures were still kept conservative, with maximum boost pressure fixed at 0.55 bar tapering off at the RPM limit to 0.40 bar so as not to overstress fuel delivery.

Once road-testing was completed, the fuel tank was re-filled with 95 Octane unleaded and the whole re-map and dyno process was repeated. Further adjustments were made to suit the lower quality fuel, including changes to ignition timing and boost pressure. (peak boost was lowered from 0.55 bar down to 0.50 bar compared to the 98 Octane program). Peak power was slightly reduced at 248Kw, while torque came in at an improvement of around 18% over stock. At no time does MRT recommend the use of 92 Octane fuel with either of the two performance tunes supplied, but advises instead for the computer to be re-flashed back with the standard factory calibration file if standard unleaded is to be used.

MRT's Ford Re-Flash software gives the XR6Turbo a new lease of life, boosting power and torque to near Typhoon levels, with impressive consistency, while at no time compromising the standard cars refinement.

MORE INFORMATION:

www.MRTrally.com.au

- Complete tuned suspension kits available.
 - Refer the MRT web site under "products"
- Ready made bolt on parts such as:
 - Exhausts
 - Airfilter kits
 - Fuel pumps
 - Intercoolers

For discussion on this model, refer the www.MRTrally.com.au/forums



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