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Subaru Forester XT MY04 - MY06

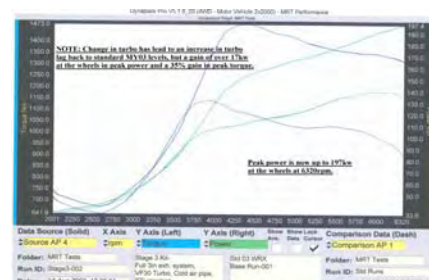
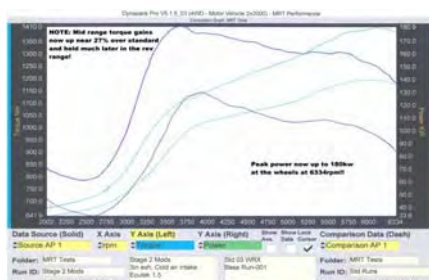
THE STORY SO FAR

Back in 2003, after months of dedicated testing, we released a set of kits suitable for MY99 onwards WRX owners aimed at giving the best bang for buck possible. Involving a combination of ECU retuning and bolt on modifications, various levels of guaranteed power gains became available at a highly competitive cost.



Many hundreds of happy customers later, these kits are still going strong and are still available in the same form today. Testimony to the strength of the original kit design is that to date there has not been any customers not receive the gains promised. Nor, should we add, have there been any engine failures attributed to an XA, XB or XC kit.

Just to refresh some memories, results of the MY03 WRX vehicle used in the original article (and repeated on many more MY99-on models since!) were as follows:



XA Kit (20kw at wheels gain)

XB Kit (40kw at wheels gain)

XC Kit (55kw at wheels gain)

All testing, development, tuning and verifications of results has been (and continues to be) completed on our 4WD Dynapack Chassis Dyno. We won't go into full detail here as many readers will already know the benefits of this type of dyno through our prior articles. However, if interested you can see further information on the dyno we use at <http://www.mrtrally.com.au/performance/dynapack.htm>.

THE SUBARU FORESTER XT – What makes it different?

The Subaru Forester XT is a great base package, and works very well as designed by Subaru. Essentially it is a soft off road vehicle designed for people who:

- have a family and need the additional space
- need the additional carrying/towing capacity over a WRX
- wish to go off road occasionally and need increased ground clearance
- prefer an easier riding more compliant/comfortable option to the WRX

It uses a combination of gearing, 2500cc engine capacity and relatively small turbo to give better low down torque and improved drivability throughout the rev range in comparison to a WRX. For the technically minded:

- The turbo is a TD04L as seen on the MY01-on WRX.
- Variable cam timing and tumble generator valves are fitted.
- Interestingly a cat converter is fitted in the uppipe (leading up into the turbo) on the MY04-05 XT, but NOT on the latest MY06 model XT.
- Engine utilizes a semi closed deck block
- MY04-05 are quoted at 155kw @ 5600rpm (peak target boost of 11.6 PSi and compression ratio of 8.2:1), while MY06 is quoted at 169kw at 5600rpm (same peak target boost of 11.6 PSi, however slight compression ratio increase to 8.4:1).

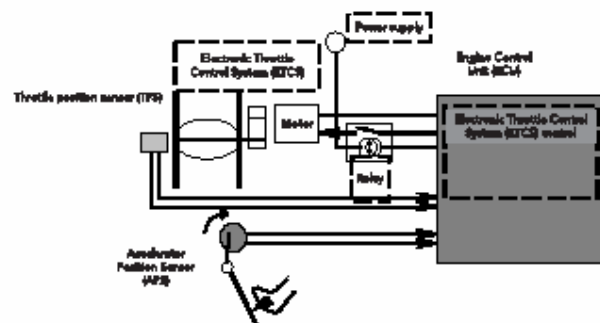


In the handling department it is a lot softer than the WRX, with higher ground clearance, higher centre of gravity and significantly softer spring/shock rates used. The wheel/tyre combination used on the factory car are ok for day to day driving, but combined with the suspension can leave a lot to be desired when considering the car as a performance vehicle (more on this later!).

Braking is fairly mild given the performance potential of the car. 2 pot calipers up front (with 294mm dia rotors) are well down on the WRX's 4 pot setup (and a mile away from the STi's Brembo package).

The XT Forester was also the first Subaru to be delivered locally with Electronic Throttle Control (now also seen on the latest Liberty GT and MY06 WRX/STi models):

Electronic Throttle Control System (ETCS)



Also known as Drive By Wire, rather than the accelerator being connected physically to the throttle butterfly, the ECU uses a series of inputs to determine how much the throttle butterfly should be opened (via an electronic servo attached to the butterfly). Done primarily for emissions reasons, it also has advantages in responsiveness and performance. Just remember that when you have your foot to the floor the ECU may not necessarily be giving you 100% throttle, and when you are only using light inputs to the pedal you may be getting comparatively far more at the engine!!

Why is all of this important? Because the people buying the Forester are doing so because of the advantages it offers over the WRX – this means that modifications made also need to be in the same spirit and not adversely affect the reasons that the car was originally purchased. For most people, low to mid range torque is a high priority and modifications made must be designed with these factors in mind.

WHY ECUTEK?

The general benefits of retuning your existing factory ECU don't need to be repeated in detail here (more available on the website at <http://www.ecutek.com.au/> if you need further information!). Quickly for the uninitiated, EcuTeK is a software upgrade which is performed to your standard computer, allowing us (and your local authorised MRT/EcuTeK Distributor) the ability to adjust ALL parameters of the factory ECU.

There are no wiring changes, no additional hardware changes and **most importantly**, NO loss of factory features such as variable cam control, electronic throttle control, etc. This is important because:

- Variable cam timing is a key in giving strong mid range performance and the best peak power results available from any modifications made. At the time of writing, we are not aware of ANY aftermarket interceptor type system coming even remotely close to accurately and consistently controlling this type of setup (on either the Forester OR WRX for that matter). The only other alternative is expensive high end aftermarket replacement engine management systems (such as Motec, Autronic, etc).
- With the advent of Electronic Throttle Control the ability to retain and directly adjust the factory ECU is critical from both a performance AND safety point of view. With the ECU in control of the throttle (using the throttle position sensor as only one of many inputs) we are yet to see ANY aftermarket interceptor type ECU modification have any ability to influence or accurately control this type of setup. Again, high quality replacement aftermarket management systems such as Motec have the ability, just not within the budgets of most owners.

And of course, cold starts and factory (or BETTER than factory in most cases) drivability remain when simply adjusting what the manufacturer has already spent hundreds of hours tuning. ☺

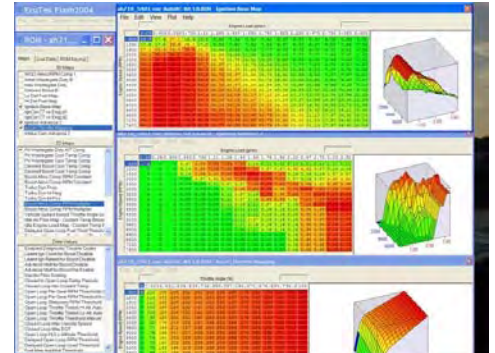
LET THE MODIFICATIONS BEGIN!

The standard Forester XT as delivered from Subaru is available in either 4-sp Auto or 5-sp Manual versions. The model used in this article (and in dyno testing shown) is a 5 speed manual, however we have also completed the XA and XB Kits on an Auto version with similar outright power results.



(Interestingly as a side note, the standard Auto model XT is clearly slower on the road, yet once modified it feels faster through the torque converter doing its thing off the line, and with no drop in boost through gear changes under hard acceleration..!)

3 dyno runs were performed to get an average base line result for comparison purposes. Peak power was shown to be 132kw at 5800rpm, with peak torque shown at 3800rpm. According to Subaru standard peak target boost pressure is 11.6 PSi (compared to 13.5 PSi in the WRX), but in many models we have tested 11.0 PSi is closer to the mark in reality.



The XA Kit is designed as an entry level starting point for those on a budget looking for a boost in performance over what was delivered from the factory. As with the WRX, minor modifications give noticeable gains in performance and responsiveness around town. The modifications listed in this kit option are designed to focus on the key areas to give the best possible bang for buck! The following modifications are completed with the XA Kit:

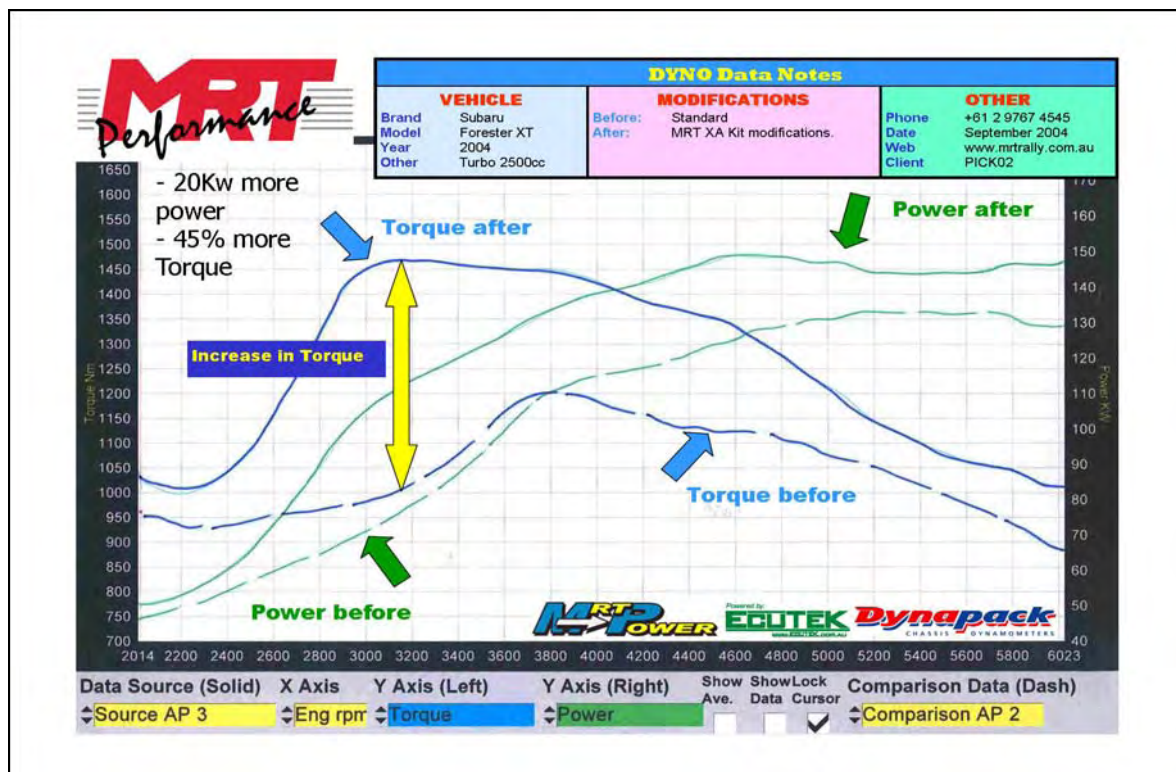
~ Replacement of the standard muffler with a new stainless steel high flowing 3" muffler from the rear flange back. With the use of a specially designed adaptor flange, the new muffler is fitted up to the standard mounting points with no modifications and fits to the standard Forester exhaust (at centre pipe).

~ A new reusable flat panel filter (either K&N or Unifilter) is used inside the standard airbox, and the resonant box inside the inner guard is removed to allow more air to reach the factory airbox.

~ To take advantage of the improvements in air flow, the factory ECU was remapped with alterations made to fuel, ignition timing, boost, electronic throttle control settings and more. It is important to note that gains are NOT made simply by winding up the boost!! Factory peak target boost is 11.6 PSi – our revised tuning only takes this to a maximum of 12.0 PSi, barely any change at all!!



With the above modifications, the following gains were achieved (and have been repeated many times on other Forester XT models since):



Note the big gains in mid range torque (45% more at 3000rpm with peak torque coming in 800rpm earlier!) and the solid increase in power throughout the rpm range.

On the road this translates into a more lively feeling Forester with strong improvements in throttle response and good torque available in almost any gear. Driving in city traffic is easier with less gear changes required. Overtaking is now also a breeze, with no need to change back gears at freeway speeds, and towing ability has also been enhanced.

As previously stated, the above was achieved with less than a 0.5 PSI increase in peak boost pressure!!

The gains so far were already ahead of our expectations, so where to from here? Now the real fun begins...

On the day of dyno testing it was a typical Spring day in Sydney with ambient temps in the dyno room of around 26 Deg C, and low humidity. Fuel used was 98 RON Shell Optimax (although 98 RON Mobil Synergy 8000 can also be used with similar results).

FORESTER XT – XB Kit

Of the many possible modifications, the XB Kit has been the biggest seller on the WRX due to the strong performance gains achieved for minimal cash outlay. With the results on the Forester so far, we were all looking forward to what could be achieved with a similar level modifications on the XT.

Similarly to the WRX, the XB kit on the Forester XT consists of the following modifications:

~ Full 3" exhaust system from the turbo back, including high flow catalytic converter and specially designed housing with splitter utilized in the dump pipe off the back of the turbine housing for improved response and minimal lag. The test XT was also equipped with a centre resonator to keep max dB and resonance levels down and ensure that it remained a comfortable long distance tourer as Subaru intended.

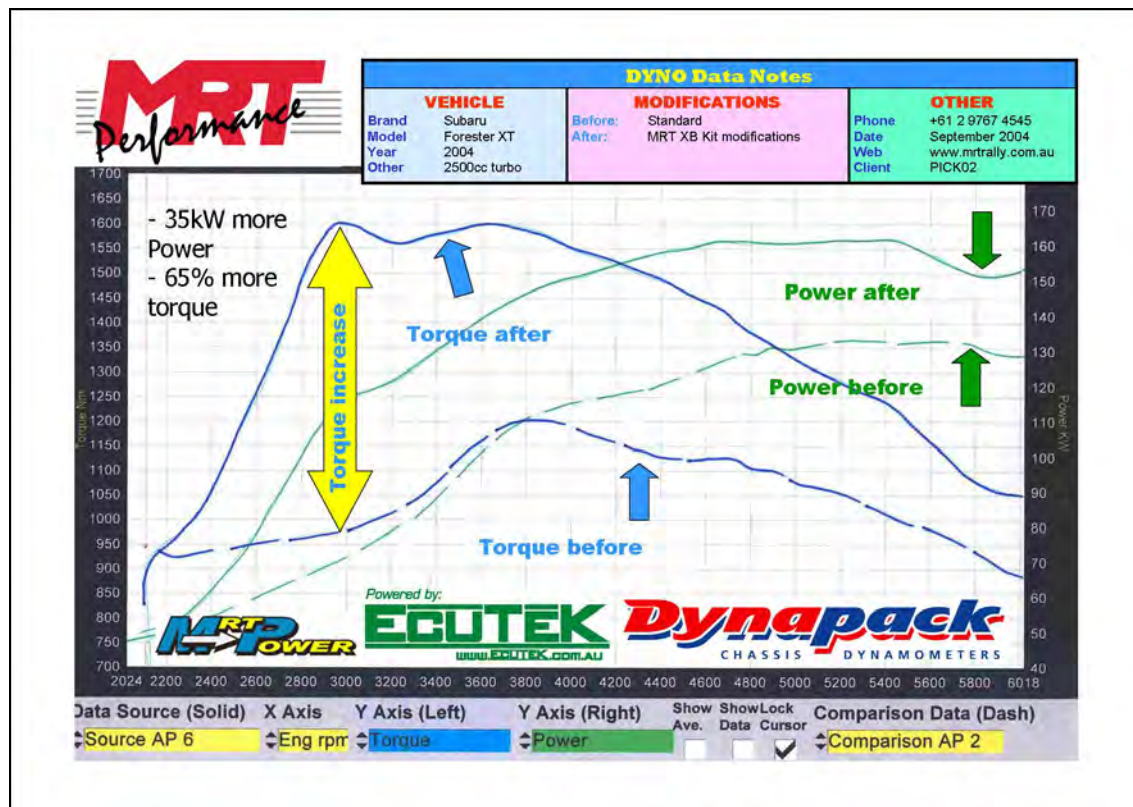
~ The standard airbox was removed (along with the resonant box as per the XA kit) and a polished alloy cold air pipe was fitted, locating a pod type filter inside the inner guard for a better flowing supply of cool air. A Unifilter reusable foam filter was utilised, however a K+N filter has also been tried in later testing with the same results.

~ Factory ECU was remapped with a more aggressive level of tune to take advantage of the additional air flow and efficiency made possible with the exhaust/intake modifications. This included further changes to the fuel and ignition timing, with peak target boost now set to 13 PSI.



Ambient temp in the dyno room was still around 26 deg C, and fuel was still 98 RON as per the XA Kit testing done earlier in the morning.

The results here even surprised us, with low to mid range torque now up by as much as 65% over the factory car!! Peak power was up through much of the rev range by around 35kw, although above 5000rpm it was now clear that the turbo simply couldn't flow any more air and was too small to achieve further peak power gains.



And before you ask “why don’t you just crank the boost up more?” as a result of significant testing and development, it was confirmed that closer to 13.0 PSI was a better suited boost level. At around 14.5 PSI the turbo was already well and truly above its max efficiency level and not generating any more power. More boost is not always a good thing, in this case simply stressing the turbo and superheating air, meaning no additional power gains, greater risk of detonation and reduced turbo longevity!

With the car in its current form, peak torque was available at just under 3000rpm and peak power held from 4400-5500rpm. Massive gains are seen in nearly all areas across the rev range in both torque and power, and this is replicated on the road with the XT now noticeably faster in all gears. Feedback from owners of test vehicles has also been as positive as the results above suggest!

Interestingly some feedback received indicated that with the XB kit modifications in place, the XT was actually slightly down from standard torque near idle (around 1200rpm, as seen on the graphs). On the road this is unnoticeable unless heavily laden (towing etc), where a few more rpm are needed off the line with the manual version. Having said that at 1900rpm it has passed standard torque levels and from there up it is all good! In the auto versions this is all irrelevant as the torque converter does its thing down low – in some cars in the wet full throttle off the line will spin the front wheels briefly (until the centre LSD catches up), pinning you back in the seat until well over 100kp/h!!!

The other thing that on road testing was now showing up was the fact that the suspension and brakes of the standard Forester XT were never designed for massive power increases. For people planning on taking full advantage of the new found power/torque on a regular basis, suspension, brake and tyre upgrades come HIGHLY recommended...!! Even more scarily, this is only one step up from the entry level kit – in this round of testing there is still one more set of modifications to go...commonly referred to as the XC Kit...

FORESTER XT – **MRT** POWER XC Kit

With the testing in the previous kit, the main weakness was shown to be the small factory turbo. This was the most obvious thing that needed to change in the quest for more power. The XT Forester runs larger injectors than the later model WRX's as standard fitment, so injector duty cycles were still well within safe margins. Testing showed there was no need to make any other modifications to the fuel setup other than replacement of the factory fuel pump to a higher flowing unit.



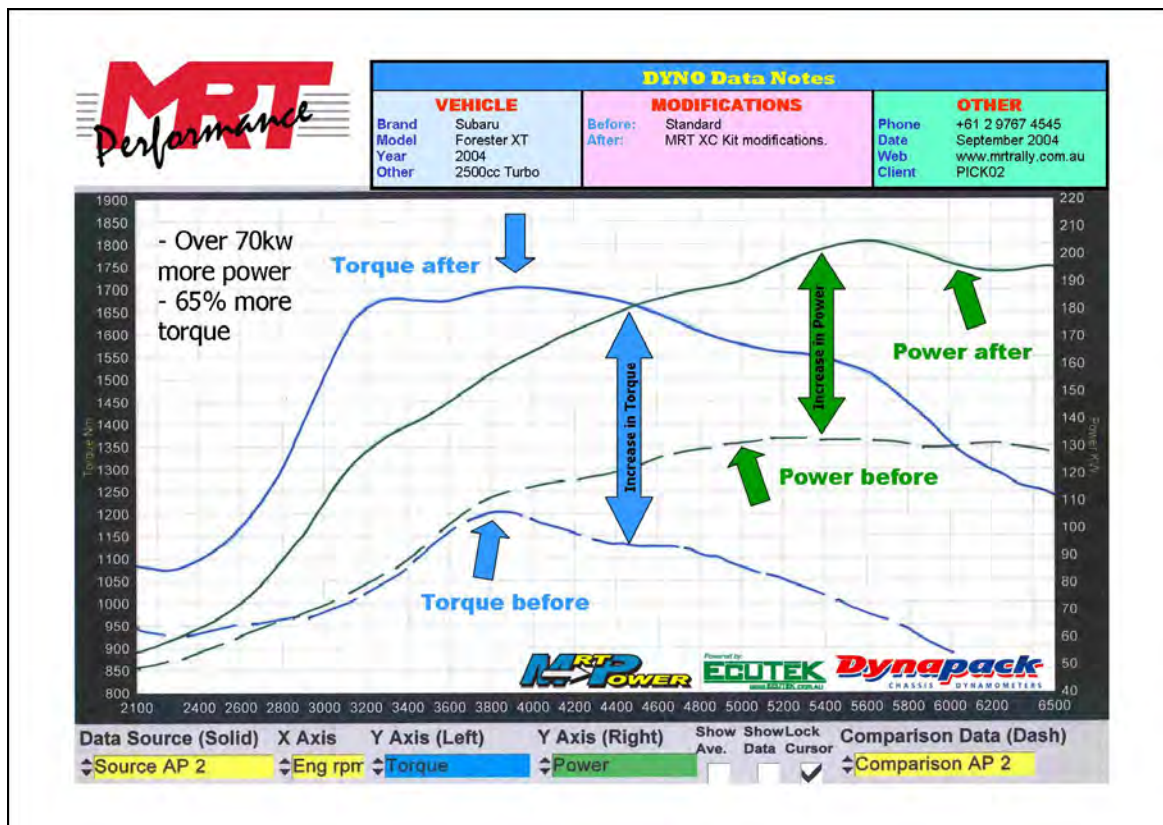
The modifications in this kit include the items from the XB kit listed previously plus the following:

- ~ Replacement of factory TD04 with new IHI VF30 (VF34 is optional). The aim with this size turbo is to minimize any increases in lag, whilst maximize flow at higher rpm levels. Costs of the VF30 have also come down over recent times, making them a more cost effective option than what they used to be with earlier **MRT** POWER XC kits on the WRX.

- ~ Replacement in tank 500hp fuel pump was also fitted to ensure adequate fuel flow/pressure.

- ~ A catless uppipe was used in place of the factory setup to improve flow and reliability (some standard cars have been known to have the pre turbo cat fail and end up destroying the turbo).

- ~ ECU is remapped again to suit the vastly different flow characteristics of the larger VF30 turbo, with peak target boost now also rising to 15.5 PSI. Fuel and ignition timing are altered further, and adjustments made to the variable cam timing to assist responsiveness with the larger turbo, etc.



The larger turbo and further revised mapping has simply transformed the XT! Power is now up by over 70kw at the wheels at 5600rpm when compared to the standard car (205kw compared to 132kw standard at around 5600rpm). This is 35kw higher again than even the XB kit modifications!

The larger turbo truly takes advantage of what the 2500cc motor has to offer in terms of mid range grunt. Lag has increased marginally over the XB kit above (as you would expect it to with the increase in turbo size) with good usable torque now coming with a rush around 2500rpm on the street. Funnily enough the car feels laggier at low rpm compared to the XB Kit, BUT it actually still has more torque at lower rpm than the standard car!! The monster mid range just makes it feel lower than it really is!

Although a higher figure, peak torque is now achieved further back in the rev range at 3300rpm (compared to 3000rpm with the XB kit). However the XT now carries a virtually flat torque curve from 3200rpm to 4600rpm before tapering off towards redline. On the road in a straight line the car has so much mid range grunt you will wonder if the front seats will hold you. Under full acceleration the rear squats heavily and the front of the car lifts noticeably from the massive mid range torque!



If we were concerned with the brakes/suspension of the car with the performance gain shown on the XB kit, the performance potential of the car in its XC state of tune is leaves them wanting. An upgrade to 4 pot calipers and larger rotors on the front (as a minimum) is now almost considered mandatory, and replacement struts (to give stiffer spring/shock rates and adjustable ride height) should be considered. At this level though, the car is definitely starting to get that little bit closer towards performance car and away from family wagon! Not that it is necessarily a bad thing mind you!! ☺

In conjunction with Whiteline Automotive we have also recently developed a full handling upgrade package which is now also available. This is either for owners of standard cars looking for a little better handling, or for owners with an extra 70kw that simply MUST have better handling!

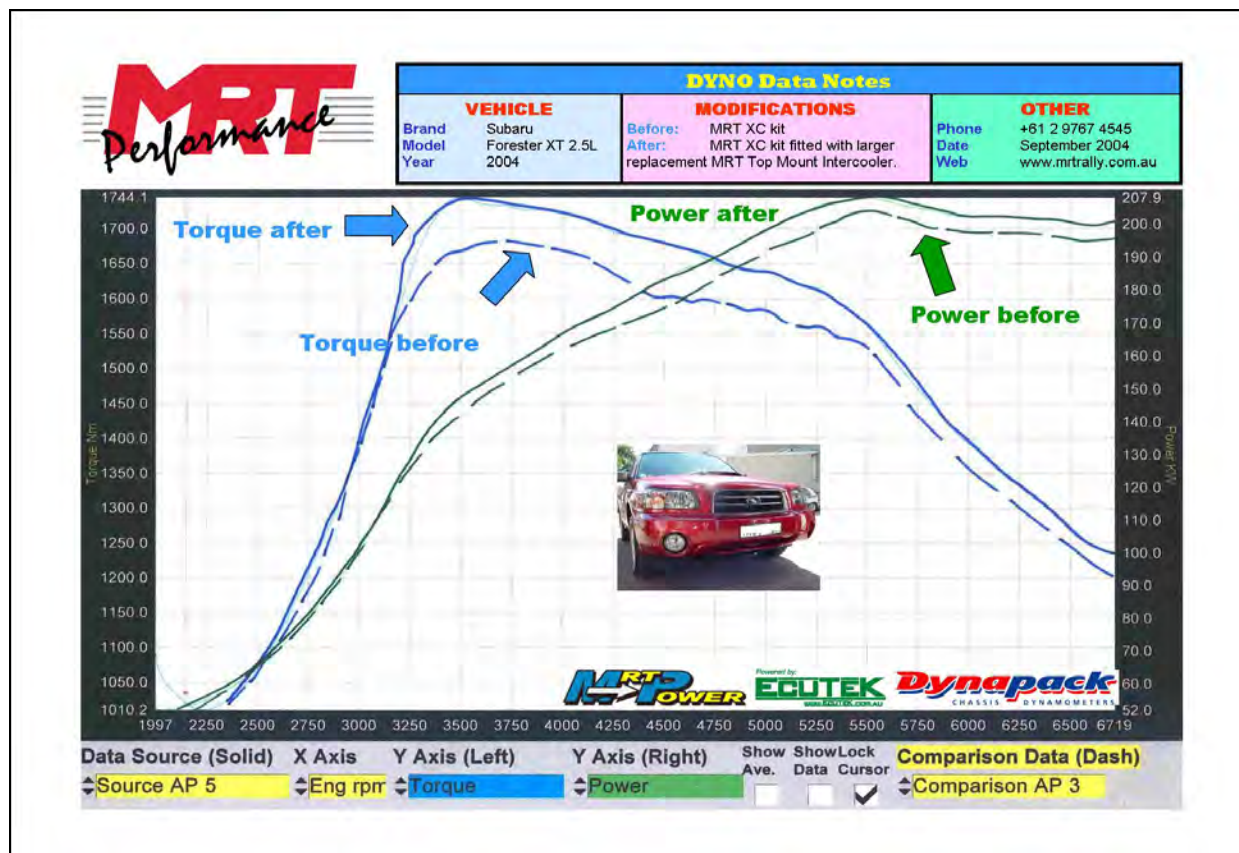
Full details on the Whiteline kit can be found on their website at http://www.whiteline.com.au/docs/fact_sheets/CK_Forester_SG_XT.pdf.

FORESTER XT - INTERCOOLER TESTING

It just wouldn't be another round of  research and development without testing out a new top mounted intercooler. In conjunction with Hyperflow, we already have a larger TMIC developed (and in stock!) to suit the latest Forester XT setup.

With the replacement TMIC bolted in place and mild retuning completed, the following gains were seen (with XC level of modifications still in place):





Mid range torque is up yet again whilst power gains of 3-6kw are seen from 3250rpm to redline. With the dramatic gains seen with the other modifications, we were surprised not to have seen more power at upper rpm with the larger TMIC, given the increase in dimensions and superior specification.

So far with all previous testing in the XA/XB/XC kits above, post intercooler inlet temps had been quite good (better than expected actually) rarely seeing above 40 deg C under peak load. Given that the performance of the car had increased so substantially, the standard intercooler was coping quite well. This was no doubt helped by the dyno room setup, with dedicated fan and ducting shroud ensuring a constant supply of cool air to the intercooler. On the road in traffic during summer could well be a different story.

Ambient temps on the day of around 26 deg C had definitely been in our favour, and we would expect that as ambient temps rise through the summer months, the need for the replacement intercooler would also rise. Any cars looking to take on track work (once suspension and brake upgrades were in place obviously!), or who will be heavily loading the engine up (eg towing) would also benefit highly from the larger intercooler. Heat soak would become a fairly large issue when under consistent load (rather than just power runs or street use as we were completing during testing) and in these situations the larger TMIC would be considered a worthy addition to the other modifications listed earlier.

FREQUENTLY ASKED QUESTIONS

Do the modifications void my new car warranty?

One of the most common queries we get in relation to performance upgrades on new models is the potential effects on factory warranty. To that extent, Subaru retains the right to refuse claims on warranty where the item being claimed on has been modified or changed from factory specification.

However, to date we are yet to have any vehicle fitted with one of the MRT Power Kit upgrades fail as a direct result of the improvements made, with hundreds of kits supplied and fitted to date Australia wide. We also offer a full 12 mth warranty against manufacturer defect on all parts we supply. We also spend countless hours on research and development of parts, tuning, and the associated effects of these changes on the rest of the vehicle.

If I have one type of kit, can I upgrade at a later stage if I want more?

Easily! All of our parts are designed to be compatible with other items. For example if you have the XA kit, upgrading to the XB kit consists of adding a new engine and centre pipe to the muffler you already have on the car, adding the cold air intake and retuning the ECU accordingly.

The cost to upgrade depends on what parts you already have fitted. As a guide it's generally around the difference in price between your kit and the next + any additional labour associated with the changeover that isn't covered in the kit.

How long does the work take?

Both the XA and XB kits can be completed within 1 day. The XC kit requires 1½ days due to the considerable amount of parts requiring fitment. When booking your car with us (or your local authorised outlet) the total time your vehicle is required will be reconfirmed for you as well.

I have already made some modifications, can I get the same results as seen above?

A lot of customers perform modifications in stages, partly due to budget constraints and partly because it starts in stages and then the bug bites and performance becomes an obsession. All of the modifications listed above can be performed around what you already have. Depending on the quality and type of items fitted, we will get performance gains as close as feasible to the above. Of course to make sure you get the gains the vehicle is capable of, just make sure you use MRT parts from the beginning! ☺

Where can I get the work done?

Any authorised MRT/EcuTek reseller can easily complete the above work for you, or assist in designing a series of modifications around your requirements. For further information and contact details please check out our website at <http://www.mrtrally.com.au/performance/dealers.htm>.

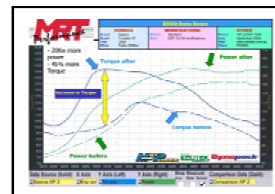
Of course if you have any other queries that we have missed, or need further information either give us a call directly at our new premises on (02) 9767 4545 or get in touch with your local reseller.

XA kit

***Guaranteed minimum 15kW ATW gain
(up to 45% more torque)**

Includes:

- 1 x MRT 3" Rear muffler
- 1 x Adaptor Flange for fitting to standard exhaust flange at rear diff
- 1 x Flat Panel Foam filter
- 1 x Intake resonatorectomy
- 1 x EcuTeK MRT ECU software upgrade
- 1 x Recalibration of factory ECU using mapping extensively developed on road and dyno
- All labour to fit/tune/test vehicle



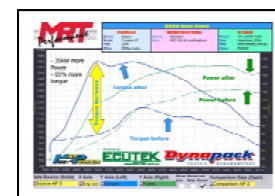
AU\$2390 incl GST fully fitted

XB kit

***Guaranteed minimum 35kW ATW gain
(up to 60% more torque)**

Includes:

- 1 x MRT 3" Rear muffler
- 1 x MRT Centre pipe with high flow cat and centre resonator
- 1 x MRT Engine pipe with splitter on turbo outlet for improved response
- 1 x MRT Cold Air Intake pipe with filter
- 1 x Intake resonatorectomy
- 1 x EcuTeK MRT ECU software upgrade
- 1 x Recalibration of factory ECU using mapping extensively developed on road and dyno
- All labour to fit/tune/test/vehicle



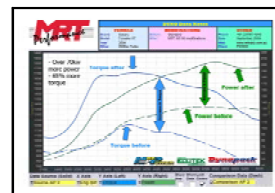
AU\$4190 incl GST fully fitted

XC kit

***Guaranteed minimum 65kW ATW gain
(up to 65% more torque)**

Includes:

- 1 x MRT 3" Rear muffler
- 1 x MRT Center pipe with high flow cat and resonator
- 1 x MRT Engine pipe with splitter on turbo outlet for improved response
- 1 x MRT Cold Air Intake pipe with filter
- 1 x Intake resonatorectomy
- 1 x 500hp in tank fuel pump replacement
- 1 x VF30 Turbocharger (interchangeable with VF34 which is similar)
- 1 x cat less uppipe with flex joint
- 1 x EcuTeK MRT ECU software upgrade
- 1 x Recalibration of factory ECU using mapping extensively developed on road and dyno
- All labour to fit/tune/test/vehicle



AU\$6690 incl GST fully fitted

* Whilst realistic and achievable on all XT models, power gains quoted are subject to 10% variation as a result of fuel quality and temperature variations in various areas of Australia. If you have concerns about any aspect of the work to be completed, please just ask us (or your local Authorised MRT Distributor).