ESCORT RS COSWORTH SPECIAL

THE EXPERT STEWART SANDERSON

Having worked as a tuner for 17 years, Stewart 'Stu' Sanderson is one of the most-respected names in the business. A Level 5-trained fuel-injection technician, Stu has worked for a Ford Rallye Sport dealer, a well-known fuel-injection specialist and various tuning companies.

Eight years ago he joined forces with Kenny Walker and opened up Motorsport Developments near Blackpool (01253 508400, www.remapping.co.uk), specialising in engine management live remapping, as well as developing a range of Evolution chips which are now sold all over the world.

He is the creator and administrator of www.passionford.com, which he started in 2003. It has grown rapidly from a few friends contributing, to one of the biggest Ford communities on the web.

Stu's enviable knowledge of the workings of modern-day Ford performance engines means that every month he's just the man to explain how and why things work, and importantly how they can be improved.

SIZE MATTE RS

DIFFERENCES BETWEEN THE T25 SMALL TURBO AND T3/T04 LARGE TURBO ESCORT COSWORTH.

Words: Stewart Sanderson

In early 1992, around the same time as the Sierra Sapphire 4x4 Cosworth production came to an end, the T3/T04-powered 'large turbo' Escort RS Cosworth was released to the delight of Cosworth enthusiasts.

The Escort came with pretty radical styling of flared front and rear arches and an unmissable whale tail rear spoiler. The outrageous external looks were only a hint at the tuning potential under the bonnet.

This original model eventually became known as the large turbo Escort Cosworth as it was fitted with the Garrett T3/T04, which was significantly larger than the T3 fitted to the earlier Sierra 4x4 Cosworths. This particular T3/T04 turbo is sized between the responsive T3 turbocharger found on the normal Sierra RS Cosworths and the big-power-capable T4 turbocharger found on the three-door Sierra RS500 Cosworth.

From a motorsport and tuning perspective, the T3/T04 turbocharger was an excellent unit. However, the .63AR exhaust housing led a lot of people to complain that they found the vehicle 'laggy' as a production car.

Summer 1994 saw the release of the 'small turbo' Escort RS Cosworth. It seems that Ford's designers considered most of the customer feedback it received as this vehicle saw the majority of the earlier vehicles' technical issues addressed and some excellent improvements brought into play too.

The T25 turbocharger was an excellent solution to the 'lag' issue of its T3/T04-powered big brother. However, the turbocharger change was the tip of the iceberg. The small turbo model was no longer a motorsport car for the road; it was simply a Fast Road car and had obviously been designed as such, making it a far better road car than the earlier model in most driver's opinions. Here's a look at the differences between the two models.

Small turbo Escorts came with a much prettier cam cover

BODYWORK

Externally there's very little to tell the two models apart, other than a pair of smaller and more aerodynamic side mirrors and a new fuel filler cap covered by a body colour flap on the small turbo model.

ENGINE

BLOCK

Large turbo: This 200 block was the same as the Sierra 4x4 units with oil spray jets fed from a pipe out of the oil pump.

Small turbo: This block had improved individual pressure operated oil spray jets machined directly into the main oil gallery. (see oil system). It also had revised core plug locations.

SUMP

Large turbo: This sump and oil control system was the same as the Sierra 4x4.

Small turbo: This unit had a far better oil control system in the sump that included a windage tray. Often retro-fitted to earlier models as an excellent upgrade.

OIL SUPPLY SYSTEM

Large turbo: This engine had an identical oil supply system as the earlier Sierra 4wd engines, with an oil supply pipe coming out of the side of the oil pump and directing oil out of four jets pointing up the bore.

Small turbo: This block had a much-improved piston under spray system utilising individual pressure operated oil spray jets that were machined directly into the main oil gallery. These jets are controlled by pressure valves and therefore don't operate until oil pressure has built up in the oil system. They have a better spray pattern and more fixed direction than the old pipe system.

CYLINDER HEAD

Large turbo: Essentially the same head as found on previous 4wd Cosworth models.

Small turbo: A totally new style head with noticeably larger head ports and a slightly different cam cover bolt pattern allowing a much more aesthetically pleasing design of cam cover and front engine cover.

CAM COVER

Large turbo: Same 'DOHC 16V TURBO – COSWORTH' item found on previous Cosworth models, now painted blue.

Small turbo: A new style, smoother, modern looking item with a plastic insert that completely conceals the HT leads and coils.

INLET MANIFOLD

Large turbo: Same item as found previously on the 4wd Sierra Sapphire Cosworth.

Small turbo: A new item with less flow restriction, a relocated idle valve and vacuum reference ports at either side and rear as opposed to on the main face. Presumably as a bid to tidy up the historically untidy Cosworth engine bay.

IDLE SPEED CONTROL VALVE (ISCV)

Large turbo: Same ISCV as on previous RS Cosworth vehicles.

Small turbo: Utilises a new style idle valve mounted directly to the inlet manifold.

THROTTLE BODY

Large turbo: Same as used on the 4wd Sierra Sapphire Cosworth.

Small turbo: Has a revised throttle body that is larger, and has the ability to flow significantly more air than its large turbo counterpart.

FUEL INJECTORS

Large turbo: Coloured blue and are the same units found in the 4wd Sierra Sapphire Cosworth.

Small turbo: Totally different to all other Ford Sierra and Escort Cosworths as they are high impedance saturated coil units that are, as we'll discuss later, one of the limiting factors for tuning.

EXHAUST MANIFOLD

Large turbo: A one-piece item with a flange suitable for T3, T34 and T4 turbocharger as found on the 4wd Sierra Sapphire Cosworth.

Small turbo: A specific item for the small

Big turbo models had the same manifold as found on the 4x4 Sapphires, which doesn't need changing until you reach over 400bhp

ECU

Large turbo: This vehicle is fitted with the Weber Marelli P8 ECU. The latest in the Weber series of management systems and is a step on from the 4wd Sierra's Level 8 ECU as it has adaptive fuel and spark control, is capable of running closed loop fuelling and can be adapted to run wasted spark ignition with just a software change.

The P8 means tuning the vehicle is easy, and it can handle engines in excess of 600bhp very easily. However, many tuners cannot unlock its potential and choose to remove it and fit the Sierra's Level 8 ECU. Sadly, this is a downgrade but not one that will bother most drivers.

Small turbo: For the first time ever Ford moved away from the Weber Marelli ECU on a Cosworth and fitted its own Ford EEC IV ECU. This ECU is actually capable of far greater engine control than the old Weber system, and sports wasted spark, closed loop and fully adaptive fuel and spark control as standard, so is an excellent upgrade.

However, it became known as a major hurdle to overcome when tuning the car as virtually nobody could tune it, and those who could were limited to high impedance injectors. A few Stage 1s were developed with claims ranging from 270–305bhp, but that's it. Most tuners offered a 'large turbo conversion' and proceeded to rip off all this new technology and retrofit old parts from the earlier car, including distributor caps and rotor arms!

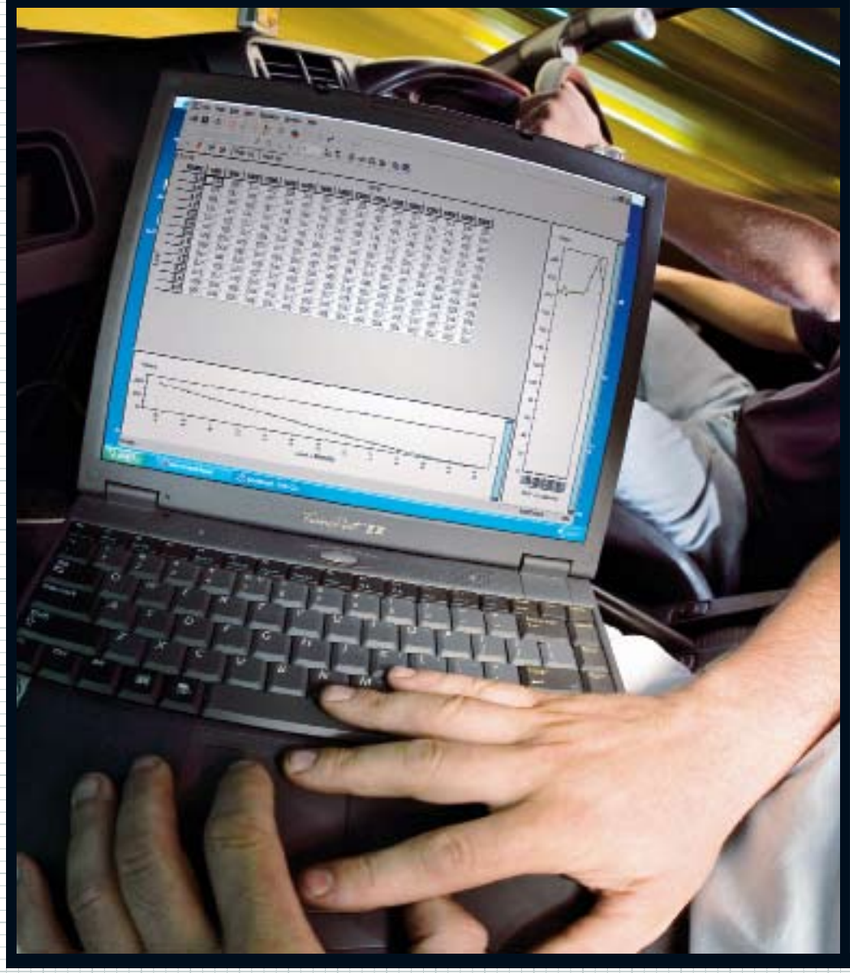
While it's considerably harder to tune than the Weber system, watch this space as there are some interesting tunes in the pipeline.

"A FEW STAGE 1S WERE DEVELOPED WITH CLAIMS RANGING FROM 270-305BHP."

ENGINE MANAGEMENT LOOM

Large Turbo: Specific to the large turbo Escort, the loom goes through two large multi-plugs in front of the coolant header tank.

Small Turbo: Specific to the small turbo Escort, the loom is unique to the EEC IV ECU and sensors.



The turbo Escort Cosworth, a very similar one-piece construction, but differs slightly to the large turbo unit.

TURBOCHARGER

Large turbo: A Garrett T3/T04.63 turbocharger, unique to the large turbo Escort Cosworth. Capable of flowing 400-plus bhp when tuned.
Small turbo: A Garrett T25 turbocharger, complete with its own internal dump valve. Unique to the small turbo Escort Cosworth and is capable of just about 300bhp when tuned.

SENSORS

AIR TEMP SENSOR

Large turbo: As found on previous Cosworths.
Small turbo: Specific to the small turbo Escort and EEC IV ECU. Mounted in the intercooler outlet.

WATER TEMP SENSOR

Large turbo: As found on previous Cosworth models at the rear of the engine, under the inlet manifold.
Small turbo: Specific to the small turbo Escort and EEC IV ECU found at the front of the engine under the inlet manifold.

CRANK SENSOR

Large turbo: As found on previous Cosworth models. Uses a four-tooth trigger wheel on the crank pulley.
Small turbo: Using a 36-1 trigger wheel pattern, the crank sensor is unique to the small turbo model.

PHASE SENSOR

Large turbo: As found on previous Cosworth models, mounted under the rotor arm inside the distributor.
Small turbo: This vehicle has no distributor and has a gear driven phase sensor in its place. Mounted in the same place as the large turbo item but with a different trigger pattern. The timing is checked through a small viewing window in the top.

THROTTLE SENSOR

Large turbo: As found on previous Cosworth models mounted on the side of the throttle body. A Weber PF09 unit.
Small turbo: Mounted in a similar position but this unit is a Ford item that is specific to the EEC management system.

MAP SENSOR

Large turbo: Fitted with a 2.5bar MAP sensor unique to the Escort Cosworth.
Small turbo: As per its big brother, the small turbo was also fitted with a 2.5bar MAP sensor, although this is a Ford unit not a Weber one.

MAF SENSOR

Large turbo: Wasn't fitted with a MAF sensor as its management is a speed density system.
Small turbo: Fitted with a Mass Air Flow sensor mounted after the airbox and before the turbo intake.

IGNITION SYSTEM

Large turbo: Ran a single coil with a conventional distributor based ignition system with a distributor cap, rotor arm and a HT lead per cylinder.
Small turbo: The small turbo version took a leap forward and ran wasted spark ignition, with a coilpack mounted directly on the top of spark plugs number 2 and 4 that each fired two plugs (1+4 and 2+3).

As you would expect it is rare to encounter misfires on this high voltage system and when you do it's often due to coil wiring as opposed to the coils themselves, although running the wrong type of spark plus can damage them.

SPARK PLUGS

Large turbo: A GPR 12PP8. Platinum tipped and unique to the Escort Cosworth. These plugs are good for up to 300bhp. They are a little too hot to use in anger with any more power than this. We move to Iridium from 300bhp upwards.
Small turbo: Uses a virtually identical plug except this one comes with a gap of 1.2mm instead of 0.8mm. This is a benefit of its wasted spark ignition as standard.

Big turbo models have endless scope for tuning. How does 700-plus bhp sound?

TUNING

Whichever Escort Cosworth model you are considering tuning, a fuel pump upgrade is essential. For power levels up to 350bhp an uprated in-tank 255lph unit is acceptable. For power of over 350bhp, an upgrade to a Bosch 023 unit is strongly advised.

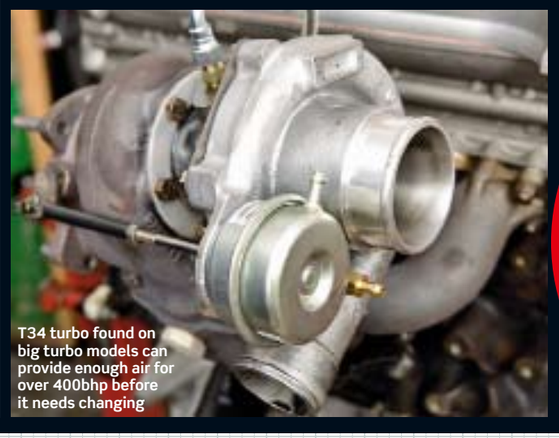
Large turbo: Can be tuned to 340-plus bhp with the fitment of a set of Bosch 803 dark green fuel injectors, a 3bar MAP sensor, uprated actuator and a suitable chip, ideally retaining its standard closed loop and adaptive fuel and spark features. (Many chips do not.)

To go further, 380bhp can be achieved with a set of Siemens 55lb fuel injectors, a 3bar MAP sensor, uprated actuator and a suitable chip. (Still ideally retaining its standard closed loop and adaptive fuel and spark features.) However, head gasket and oil breather upgrades are also strongly advised prior to this upgrade being performed.

From here onwards your wallet is the limit. Power outputs in excess of 700bhp are now becoming more common and you should speak to your tuner about your plans to tune further.

Small turbo: Can be very easily tuned to 300bhp running 20psi held boost pressure. The fitment of an uprated actuator and a suitable module to plug in to the side of the EEC IV ECU is required. Good software for this ECU will retain all factory safety features as well as closed loop and adaptivity. Not all do, so take care when choosing.

There is some ongoing development work being performed at Motorsport Developments that we hope to complete in the early part of 2010, which will allow the fitment of a T3/T04 turbocharger and larger fuel injectors while still retaining all of the original EEC IV engine management! Watch this space...



T34 turbo found on big turbo models can provide enough air for over 400bhp before it needs changing

NEXT MONTH
SIZE AND CHOOSE YOUR FUEL SYSTEM COMPONENTS