

Y IS FOR YB COSWORTH

Words: Stewart Sanderson

Make even more from the legendary lump.

Good points: The cylinder head flows well and the pistons are high-grade Mahle forged items. The crankshaft, con-rods and block, are over-engineered and capable of in excess of 500 bhp. As standard even the turbocharger is strong and robust if treated correctly.

Bad points: It doesn't really have any truly bad points as standard or even when tuned to 300-plus bhp. The head gasket could be a weak point as without a good uprated item they're prone to failure. It also has an appetite for engine oil, so keep your eye on the water and oil levels. The Weber-Marelli wiring harnesses are quite poor, so beware of wiring glitches causing running problems.

Tuning: There isn't enough space to fully cover tuning the YB, so we'll look at the most common stages. Those mentioned assume you have a decent exhaust and free-flow air filter and have dealt with the head gasket too, or accept it will be sent to an early

grave as soon as you pay your bill and drive away at full boost.

WEBER MANAGEMENT-EQUIPPED ENGINES (SIERRAS AND THE T34 ESCORT)

Stage 1: A new chip to remap the fuel, spark timing and boost curves plus an uprated wastegate actuator takes you to 16 psi of boost pressure and around 270-290 bhp at the flywheel, depending on the turbocharger. **Cost: £450**

Stage 2: As above but with a set of higher-flow Bosch 803 fuel injectors and Weber 3 bar MAP sensor that will allow the ECU to see more boost. 23 psi held will see the Sierras at around 315 bhp. This is the limit of the standard turbocharger on the Sierras. The large turbo Escort gets the same treatment. However, the T34 fitted to that model as standard will give around 350-plus bhp at this stage of tune (requires an uprated in-tank fuel pump). **Cost: £470**

Stage 3: Same kit as Stage 2, but with a larger intercooler to cool the bigger boost pressures, and a T34 turbocharger to supply the boost for the Sierras, bringing them up to the spec of the large turbo Escort Cossies. Once equipped, add a set of Siemens injectors and a suitably mapped chip to allow the safe running of 28 psi to release around 375 bhp from the otherwise standard engine. **Cost: £1000-1400**

Stage 4: From here on we are into modifying engine internals. The addition of a ported head and sensible inlet cam will see the engine at 400-plus bhp if you previously chose the kit in Stage 3 and already have a decent head gasket, filter, exhaust and cooler fitted. **Cost: £1200-upwards**



Stage 5 and above: After Stage 4, we can lower the compression slightly, beef up the head to block clamping studs and gasket and then add bigger turbos, injectors, fuel pumps, inlet manifolds and cylinder heads to release as much power as most people can afford. With the YB, power available is only a question of, 'How fast can you afford to go?'. **Cost: £4000-upwards**

FORD EEC MANAGEMENT EQUIPPED ENGINES (1995-ON ESCORT COSWORTHS)

Stage 1: A new EEC IV chip to remap the fuel, timing and boost curves plus an uprated Garrett -31 wastegate actuator takes you to 18 psi of boost pressure held on your T28 turbo and gives around 285 bhp. An uprated fuel pump is highly recommended at this level of tune. **Cost: £600**

Stage 2: Exclusive to Motorsport Developments. With a set of higher-flowing Siemens fuel injectors and an Evolution chip, you can now fit a good Bosch fuel pump, a T34 turbocharger and develop around 350 bhp and lots of torque thanks to the 28 psi peak in the mid-range and 23 psi held. Further details aren't available yet as at the time of writing the work isn't totally finished, but it should be by the time you read this. **Cost: £POA**

The future: We don't think the YB will ever die. It was a milestone in petrol turbo engines and is one of the most highly-tuned and used engines on the road, and found in everything from kit cars to rally cars.

New developments are coming through with closed loop fuel control on Level 8 and P8 ECUs giving 30-plus mpg on 1000cc injectors and wasted spark driver systems getting rid of the old distributor cap and its associated misfires. Engine monitoring is making new progress with the IAW serial data stream monitors and dataloggers available.

Big headlines are still to come with this engine as Mark Shead (MA Developments) and Rod Tarry pushed their monster YB-powered Saph Cosworth to a proven 206 mph with their 850 bhp engine last year, with promises of much more power and speed to come soon. There's life in the old YB yet, that's for sure.

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COMPRESSION RATIO P61
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Z IS FOR ZETEC & SE

Release these engines' tuning potential. Here's how.

Words: Jon Hill, Stewart Sanderson

ZETEC Good Points: There are millions around so they're cheap to buy from a salvage yard. The later black-top brought many small improvements over the earlier silver-top models. The head flows well and gives great mid-range torque. The bottom end is good for 7000 rpm as standard and is pretty hard to break. The bottom end is good for big miles.

Bad points: These have been known to shear a con-rod bolt or two. Well worth whipping the sump off and fitting ARP units. As a standard unit it also has a restrictive intake manifold system that is worth getting rid of for something more free-flowing if you want more power.

Tuning Stage 1: The first thing to do, as with most production engines, is to get yourself a good free-flowing air filter, a decent exhaust and a good chip. These should see you with around a

genuine 15 bhp improvement. **Cost: £450**

Stage 2: Cams and some light headwork can see you enjoying an additional 10 bhp on top of Stage 1, but beware, cams on these engines tend to spoil the mid-range quite a lot. **Cost: £600**

Stage 3: The inlet system has to go if you want more power, so whip it all off and fit some nice throaty-sounding throttle bodies and a decent management system. Once you have throttle bodies and the ability to rev the engine hard, it's possible to extract over 200 bhp from this Zetec E Power unit. **Cost: £2000**

Stage 4: Turbocharge it. Once you get involved in forced induction, you're only limited by funds. Beware, tuning a normally-aspirated engine with a turbo and associated items is never cheap if done properly due to the required manifold, cooling and management changes. **Cost: £4000 upwards**

The future: We probably won't see any amazing things from this engine power-wise in normally-aspirated form, simply because as with all normally-aspirated engines, they can't be improved to give massive power outputs without finding some way to increase airflow substantially, and that requires forced induction. It will still be a popular engine for many more years to come though.

ZETEC SE Good Points: Lovely light engine of all-alloy construction, which can be tuned to surprisingly high levels and produces plenty of torque too, especially for its size.

A thoroughly modern engine, which has a lot in common with its big brother, the Duratec HE. It has some cred too being tuned to over 220 bhp in the Junior WRC cars plus powering

the mighty Racing Puma to 150 bhp. In the right car it's a stormer.

Bad points: Like the Duratec HE it's tuneable to a point, thanks to its powdered metal rods — it'll buzz to 8000 rpm, but sustaining over 7400 rpm and it's fragile. Real top power needs a rod and piston change. It is tricky to tune at low levels — you can easily go backwards but it wakes up with cams. True to modern Ford engines though, these have friction-fit cam wheels, which need proper keyways for performance.

Tuning Stage 1: This is the foundation stage as you won't get much improvement from the usual air filter and exhaust — a couple of bhp, if that! **Cost: £300**

Stage 2: Chipping works via Superchips, or ECU re-programming with DreamScience gives around 8-10 bhp. **Cost: £300**

Stage 3: Later engines have limits in the inlet, which needs converting back to cable rather than fly-by-wire using the earlier plenum and 54 mm throttle body — a kit including pedals is available from BPJ. This benefits best from an ECU swap to Omex and loom giving 123 bhp (1600cc). Add cams too (BPJ-2330) and you're looking at 140 bhp. Ric Wood recommends the Puma Racing inlet, Ford Racing cams along with a Superchip totalling an extra 25 bhp. **Cost: £1500**

Stage 4: Junk the lot and fit throttle bodies for better torque. A good 4-2-1 manifold is important. Add BPJ 2168/7 cams, with headwork and you're looking at 175-180 bhp. Ric Wood agrees recommending his CNC-ported head and cams to match. Rods and pistons would give close on 195 bhp. **Cost: £2000-4000**



ZETEC

WHEN PRODUCED

1998-2005

FOUND IN

Focus, Mondeo, RS1800, Escort

CAPACITY

1998cc

LAYOUT

Four-cylinder, double overhead camshafts, 16 valves with hydraulic actuation up to 1998

POWER OUTPUT

130 bhp (2-litre)

The future: There's scope for more but the revs will be creeping up too — a Super 1600 will produce 220 bhp but then revs will be up to 14,000 with the narrow powerband to match. The engine has been turbocharged but it's really only suited to low boost — the crank and rod bearing size isn't ideal for this type of application. Turn it round though and this can be an excellent rwd kit car engine too.

THANKS

BPJ SERVICES
01432 3510006
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