

Cosworth 'YD' Duratec Engine

205bhp to 280bhp



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Every effort is made to ensure the accuracy and correctness of the information contained within this document. The contents are subject to change and Cosworth Ltd can accept no liability for the accuracy of all the information presented at any given time.

Section A - Overview

Introduction

Cosworth benefits from over 50 years of engine design and development expertise. Such unparalleled knowledge and experience has allowed Cosworth to develop Fords 'i4' Duratec global product into a suite of reliable and robust high performance 2.0L and 2.3L engines, designated the 'YD'. Cosworth engines feature an extensive range of bespoke components and are comprehensively road and race proven. Cosworth-engined applications range from individual customer road car builds, to original fitment in Caterham's CSR road and track day model range, right through to the formidable 'YDX' 300bhp Formula Atlantic single seater racing car.

A selection of Cosworth engines (designated 'YDE') from 205bhp to 280bhp are available for purchase direct from Cosworth. Each engine is individually hand built at Cosworth Limited in Northampton, England and includes a bespoke port bored barrel throttle inlet system, performance cams, custom valve springs, race proven dry sump and a mappable racing engine management system. Higher output engines also feature forged pistons and con rods, ported cylinder heads and bespoke valvetrain components.

All engines are externally similar (the difference in block height between the 2.0L and 2.3L being the only major external difference) which enables a clear and easy route to potential future power upgrades.

Product Specifications


































































Overview Specification

Cosworth Engine Code:	YD
Bore:	87.5mm
Stroke:	94.0mm (2.3L) / 83.0mm (2.0L)
Capacity:	2261cc (2.3L) / 1996cc (2.0L)
*Pistons:	Forged
*Piston Rings:	Tungsten Carbide Carbon Coated Top Ring
*Rods:	Forged I-Section
Inlet System:	Barrel Port Throttles with Carbon Airbox and Low Loss Air Filter
Cam Cover:	Light Weight Cam Cover
Spark Plugs:	NGK BR7EFS
*Cylinder Head:	Extrude Honed
Camshafts:	Cosworth Developed Profiles
*Valve Springs:	High Lift
Lubrication System:	Dry Sump with Integral 2 Stage Scavenge Pump
Engine Management:	MBE Programmable Race Engine Management

** Not on all specification engines*

Engine Component Matrix

●	Standard	○	Option		n/a
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		2,0 Litre			2,3 Litre		
		205 bhp	225 bhp	255 bhp	220 bhp	250 bhp	280 bhp
Description	Part No:	20001721	20001722	20001723	20001725	20001726	20001727
BASE ENGINE							
Ford 2,0 Duratec Short-block Engine - New		●	●	●			
Ford 2,3 Duratec Short-block Engine - New					●	●	●
CRANKSHAFT/PISTONS/RODS							
2,0 Std Cast Pistons (CR 11:1)		●					
2,0 Forged Pistons (CR 12:1)			●				
2,0 Forged Pistons (CR 13:1)				●			
2,3 Std Cast Pistons (CR 9:1)					●		
2,3 Forged Pistons (CR 12:1)						●	
2,3 Forged Pistons (CR 13:1)							●
Cosworth Piston Ring Pack			●	●		●	●
2,0 Std Cast Connecting Rod Kit (up rated bolts)		●					
2,0 Forged Connecting Rod Kit			●	●			
2,3 Std Cast Connecting Rod Kit (up rated bolts)					●		
2,3 Forged Connecting Rod Kit						●	●
2,0 Big End bearings (VP2)		○	○	○			
2,3 Big End bearings (VP2)					○	○	○
2,3 Billet Crankshaft					○	○	○

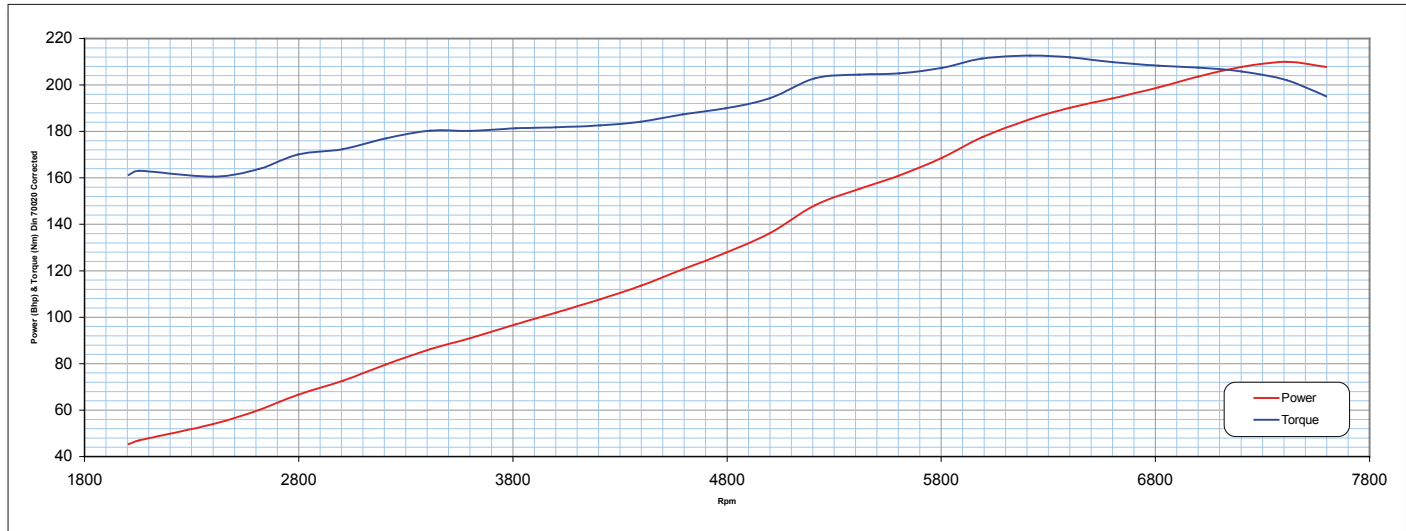
		2,0 Litre			2,3 Litre		
		205 bhp	225 bhp	255 bhp	220 bhp	250 bhp	280 bhp
Description	Part No:	20001721	20001722	20001723	20001725	20001726	20001727
FUEL SYSTEM							
High Flow Fuel injectors				•		•	•
Large Capacity Fuel Rail		•	•	•	•	•	•
CYLINDER HEAD/VALVETRAIN							
Cosworth Level 1 Fast Road Camshafts		•			•		
Cosworth Level 2 Race Camshafts			•			•	
Cosworth Ultra Race Camshafts				•			•
Cam Friction Washer		•	•	•	•	•	•
Race Valve spring		•	•			•	
Ultra Race Valve spring				•			•
Cosworth Cylinder Head Assembly		•	•		•	•	
Cosworth Extrude Honed Cylinder Head				•			•
Heavy Duty Head Bolts		○	○	○	○	○	○
LUBRICATION SYSTEM							
Modine Oil Cooler		•	•	•	•	•	•
High Flow Oil Pump		•	•	•	•	•	•
Cosworth 2 Stage Dry Sump		•	•	•	•	•	•
COOLANT SYSTEM							
Cosworth Large Pulley Water Pump		•	•	•	•	•	•
Thermostat (82° C) & Housing		•	•	•	•	•	•

		2,0 Litre			2,3 Litre		
		205 bhp	225 bhp	255 bhp	220 bhp	250 bhp	280 bhp
Description	Part No:	20001721	20001722	20001723	20001725	20001726	20001727
INDUCTION SYSTEM							
Cosworth Roller Barrel Throttle Assembly		●	●	●	●	●	●
Carbon Fibre Airbox, and Foam Air Filter		●	●	●	●	●	●
Throttle Position Sensor		●	●	●	●	●	●
EXHAUST SYSTEM							
Exhaust Gasket		●	●	●	●	●	●
ELECTRICAL SYSTEM							
Starter Motor		●	●	●	●	●	●
Ignition Coil		●	●	●	●	●	●
Spark Plug (Temp 7)		●	●	●	●	●	●
Loom Kit		○	○	○	○	○	○
ECU (flashed with base calibration)		○	○	○	○	○	○
Calibration Interface Kit		○ ¹	○ ¹	○ ¹	○ ¹	○ ¹	○ ¹
AUXILIARY DRIVE							
Lightweight Alternator (40 Amp)		●	●	●	●	●	●
Lightweight Alternator Brackets		●	●	●	●	●	●
Alternator Pulley (64mm)		●	●	●	●	●	●
Accessory Drive Belt (1,295mm)		●	●	●			
Accessory Drive Belt(1,310mm)							

¹ Includes interface cable and software to alter calibration from a personal computer

		2,0 Litre			2,3 Litre		
		205 bhp	225 bhp	255 bhp	220 bhp	250 bhp	280 bhp
Description	Part No:	20001721	20001722	20001723	20001725	20001726	20001727
MISCELLANEOUS							
Lightweight Flywheel		○	○	○	○	○	○
Clutch		○	○	○	○	○	○
Spigot Bearing		●	●	●	●	●	●
Heavy Duty Flywheel Bolt Set		○	○	○	○	○	○
Engine Lifting Eyes (Pair)		●	●	●	●	●	●
Cosworth Carbon Coil Cover including Fitting Kit		●	●	●	●	●	●
ENGINE ASSEMBLY AND TEST							
Cosworth Assembled		●	●	●	●	●	●
Engine Hot Test		○	○	○	○	○	○
Full Engine Break-in & Performance Test		○	○	○	○	○	○
Dispatch Kit		●	●	●	●	●	●

2,0L 205bhp Performance Status



Test Parameters

Air Inlet Temperature: 20°C

Coolant Inlet Temperature: 70°C

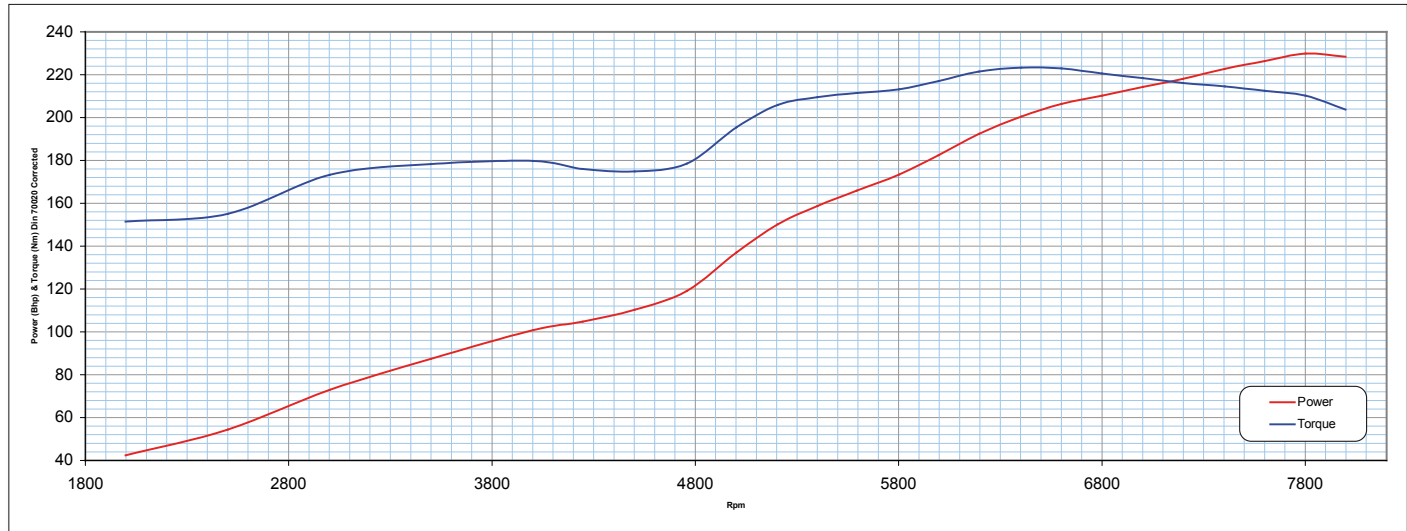
Oil Inlet Temperature: 95°C

Max Exhaust Back Pressure: 7.0kPa at 7,700rpm

Exhaust Manifold: Caterham CSR260

Engine Assembly No: 20001721

2,0L 225bhp Performance Status



Test Parameters

Air Inlet Temperature: 20°C

Coolant Inlet Temperature: 70°C

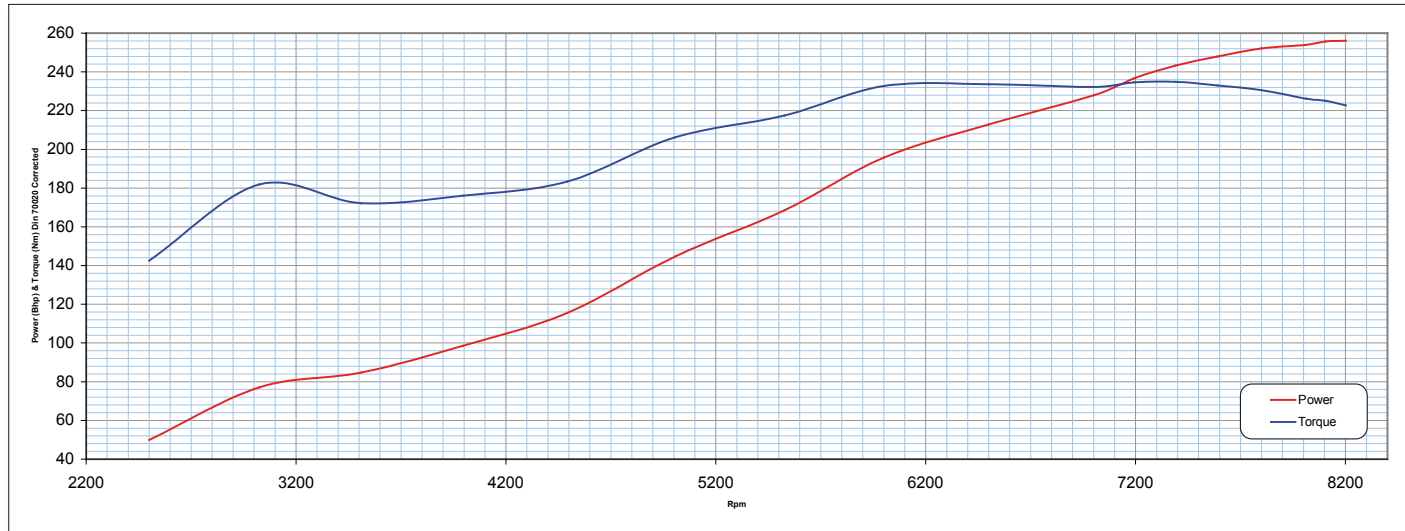
Oil Inlet Temperature: 95°C

Max Exhaust Back Pressure: 6.0kPa at 8,000rpm

Exhaust Manifold: Caterham CSR260

Engine Assembly No: 20001722

2,0L 255bhp Performance Status



Test Parameters

Air Inlet Temperature: 20°C

Coolant Inlet Temperature: 70°C

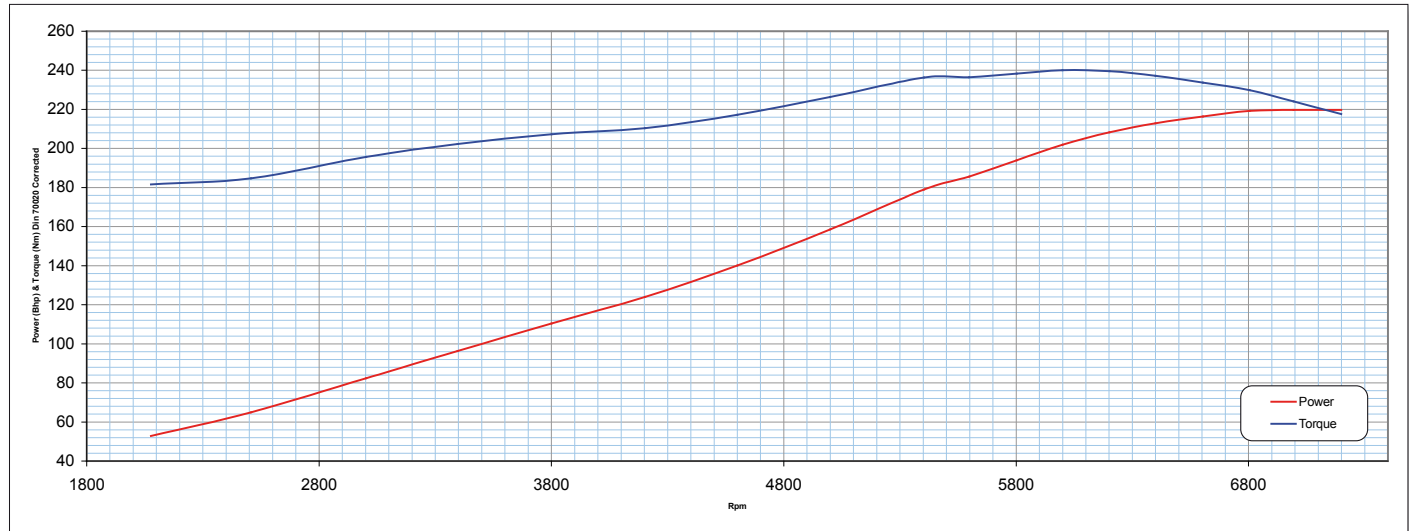
Oil Inlet Temperature: 95°C

Max Exhaust Back Pressure: 8.0kPa at 8,200rpm

Exhaust Manifold: Caterham CSR260

Engine Assembly No: 20001723

2,3L 220bhp Performance Status



Test Parameters

Air Inlet Temperature: 20°C

Coolant Inlet Temperature: 70°C

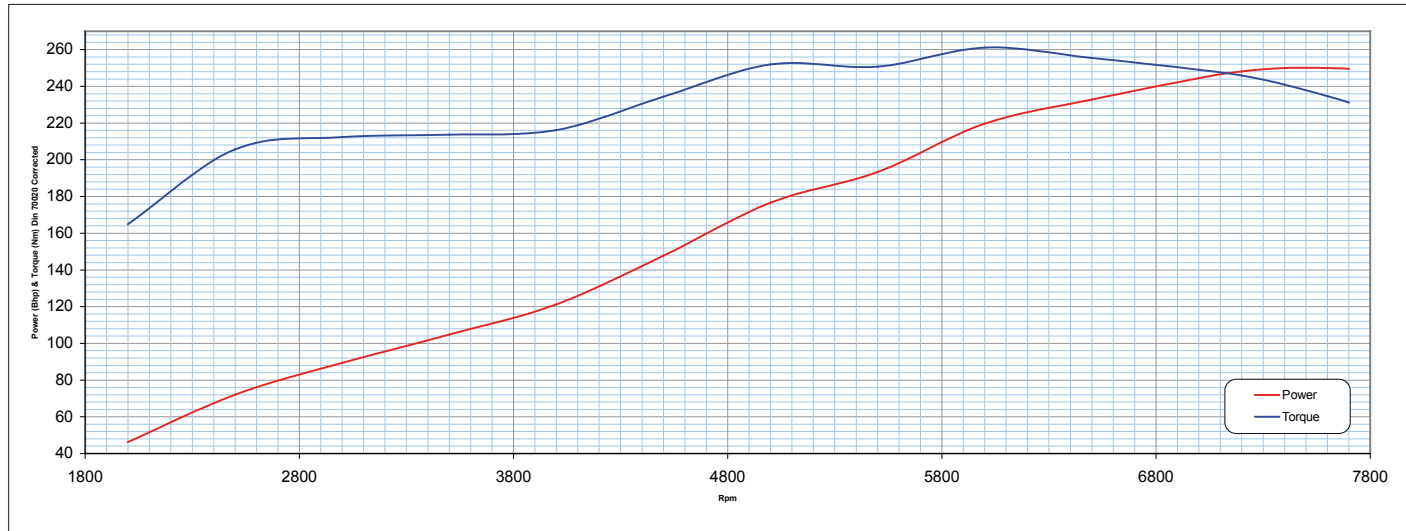
Oil Inlet Temperature: 95°C

Max Exhaust Back Pressure: 7.0kPa at 7,700rpm

Exhaust Manifold: Caterham CSR260

Engine Assembly No: 20001725

2,3L 250bhp Performance Status



Test Parameters

Air Inlet Temperature: 20°C

Coolant Inlet Temperature: 70°C

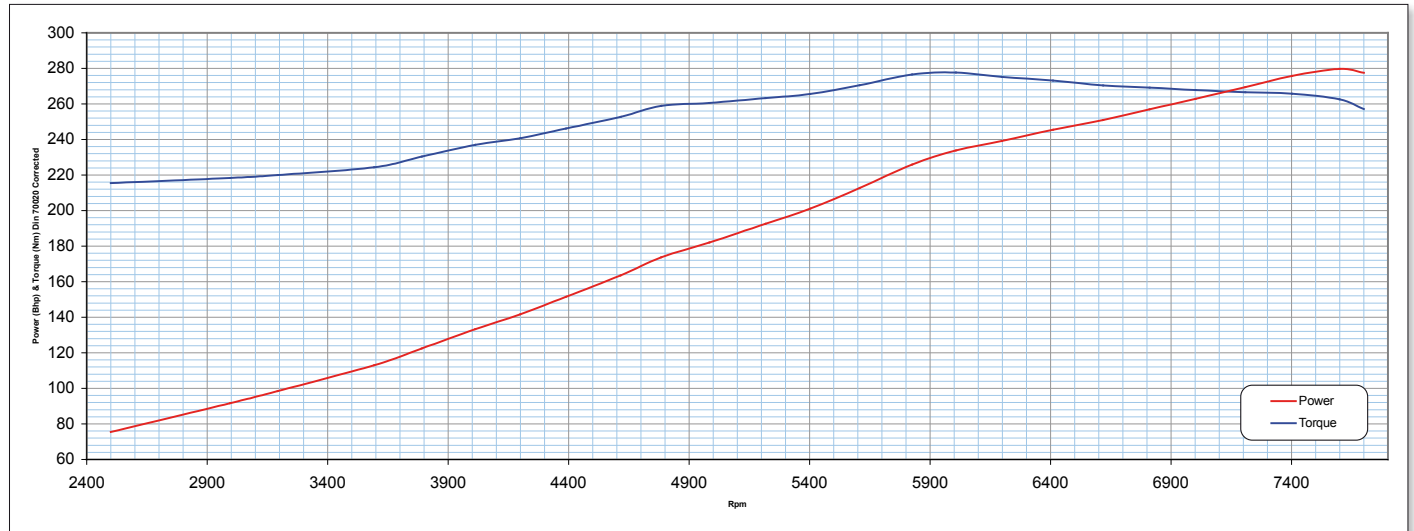
Oil Inlet Temperature: 95°C

Max Exhaust Back Pressure: 9.0kPa at 8,000rpm

Exhaust Manifold: Caterham CSR260

Engine Assembly No: 20001726

2,3L 280bhp Performance Status



Test Parameters

Air Inlet Temperature: 20°C

Coolant Inlet Temperature: 70°C

Oil Inlet Temperature: 95°C

Max Exhaust Back Pressure: 6.0kPa at 8,000rpm

Exhaust Manifold: Caterham CSR260

Engine Assembly No: 20001727

Running & Servicing

Recommended Fluids

Fuel: Unleaded Gasoline - Cosworth recommend 97RON
(Minimum 95RON Unleaded Gasoline)

Oil: Comma Fully Synthetic SAE 5w50 or similar

Coolant: Comma XSTREAM RED or similar

Engine Servicing Overview

Servicing requirements will be dependent on how the vehicle is used, if it is used for both track and road use the track service intervals should be applied. As an example, from the second service onwards the oil and oil filter should be changed every 6000 road miles or 1000 race miles.

See section C for detailed service procedure

Contact Information

Further information please contact clsales@cosworth.com.



Section B - Installation

Overview

The engine is fitted with a dry sump and therefore must be fitted with an approved external oil tank before it is run. All vehicle systems (fuel, coolant and oil) must be clean and free from debris. The engine should be installed and all systems filled and bled correctly.

On first start up the engine should be cranked with the ignition coil loom disconnected until oil pressure is seen. The coil loom should then be re-connected and the engine fired and fully warmed up (while checking for leaks).

Note: The coil loom is the small loom that connects the four individual coils into a single, convenient, connector to the rest of the engine harness. It is this single connector that should be disconnected when cranking.



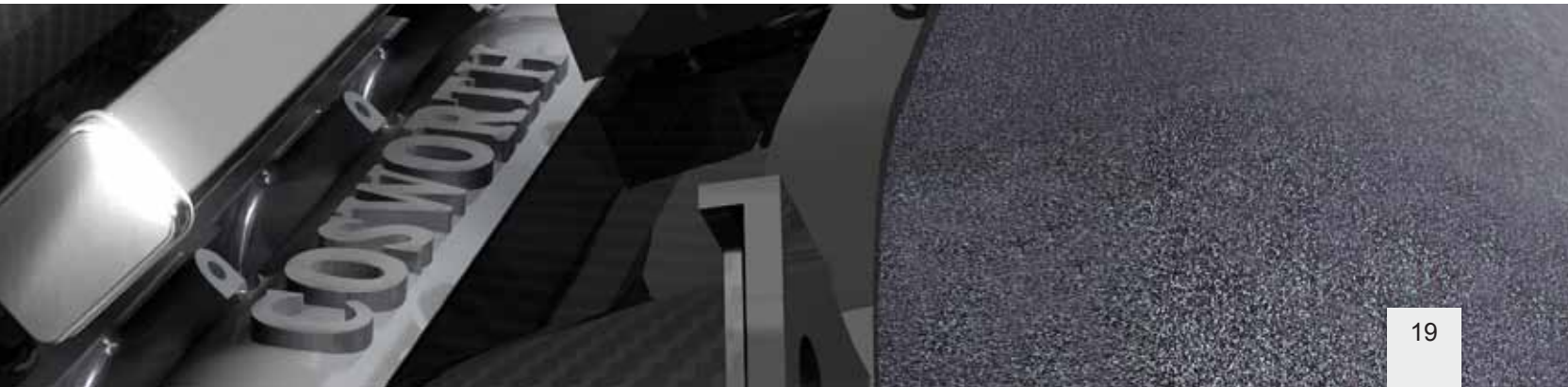
Engine Running

The engine must not be run on a lower grade fuel than that specified. The engine coolant and oil must always be fully warm before the engine is used at high speed and full load. The best way to warm up the engine is by gentle driving. Avoid leaving the engine to idle for long periods. Avoid using the engine at ambient temperatures of less than -5°C or greater than 35°C.

Each engine is dispatched with a unique, serial numbered ECU which has an engine data logging function used to assist with engine diagnostics in the event of any concerns. Other than bespoke mapping for fuel and ignition the ECU should not be tampered with in any way.

Installation Drawings

PDF installation drawings giving an overall dimensions and critical connections are available for download from the website or contact Cosworth for more information.



Electrical Information (Cosworth loom/ECU option only)

All YD engines are available with a bespoke Cosworth loom and MBE ECU. In the vast majority of cases this loom is the easiest way of installing and running the engine. The loom has been fitted in accordance with Cosworth procedures to minimise any issues regarding chafing or vibration that could otherwise cause long term issues.

Customer installations can result in variances to the induction and exhaust characteristics and this changes the calibration required for fuel and spark. Therefore all engines must have the ECU calibrated by an experienced MBE agent once fitted into a car prior to road or track use. The engine is supplied with an ECU calibration that will allow safe fireup and idling, and a baseline calibration across the rest of the map to minimise mapping time and expense.

The following are the connections to be made to chassis based hardware.

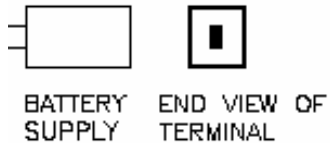
- Battery Supply
- Battery Ground
- Chassis Ground
- Fan Control 1
- Fan Control 2
- Vehicle Split (including ignition control, rev counter output fuel pump control)

All connector part numbers are of the engine harness half of the connector. The installer is required to provide suitable mating connectors/hardware on the chassis side. All diagrams show the connectors and pin positions as viewed when looking at the back of the engine loom connectors, i.e. from the wire side of engine loom.

Battery Supply

The Battery Supply is responsible for supplying fuel pump, ECU (including injectors and ignition system) and many other engine systems.

Part: Terminal: AMP 42098-1, Cover: AMP 180916-0

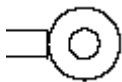


<i>Pin No.</i>	<i>Gauge</i>	<i>Title</i>
1	4 (BN)	Battery Supply

Battery Ground Eyelet

The Battery Ground Eyelet is the main return path for the engine electrical system and **must** be connected directly to the negative post of the battery.

Part: M6 Eyelet

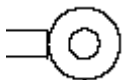


Pin No.	Gauge	Title
1	4 (GY)	Battery Ground

Chassis Ground Eyelet

The Chassis Ground Eyelet is a separate return for critical cam and crank sensors and can **either** be connected to a chassis grounding stud **or** directly to the battery negative post, depending upon what is most convenient.

Parts: Terminal: AMP 42098-1, Cover: AMP 180916-0

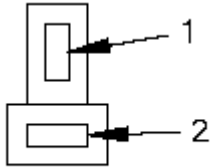


Pin No.	Gauge	Title
1	0.5 (GY)	Cam Crank Ground

Fan Control 1

The output is direct from the relay unit and therefore suitable for direct connection to the fan motor.

Part: AMP 180907-0



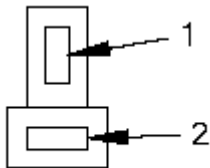
WIRING SIDE VIEW

<i>Pin No.</i>	<i>Gauge</i>	<i>Title</i>	<i>Description</i>
1	2 (GY)	Cooling Fan 1 Gnd	Fan ground
2	2 (WH)	Cooling Fan 1 Output	12V supply to fan

Fan Control 2

The output is direct from the relay unit and therefore suitable for direct connection to the fan motor.

Part: AMP 180907-0



WIRING SIDE VIEW

Pin No.	Gauge	Title
1	2 (GY)	Cooling Fan 1 Gnd - Fan ground
2	2 (WH)	Cooling Fan 1 Output - 12V supply to fan

NB Both fan outputs are triggered off the same source and therefore activate at the same time.

Vehicle Split

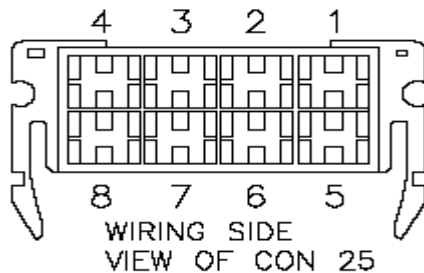
The mating half (Chassis loom side) of the Vehicle Split connector is included in the engine purchase.

An 'OBD' connector with a pair of wires is also included in the purchase. In order to allow communication with the ECU (for engine calibration and fault diagnosis) the wires should be wired into the chassis loom and connected to pins 1 & 2 of the Vehicle Split connector (CAN_Hi and CAN_Lo).

When installed all electrical looms should be suitably restrained to prevent undue vibration. Looms should also be protected from chaffing on rough surfaces or sharp edges.

Having completed the installation, a final check should be made that the engine earth, chassis earth and battery negative connection are all connected linked together correctly.

Part: AMP 163008-0



Pin No.	Gauge	Title	Description
1	0.5 (GN)	CAN_Hi	Diagnostic and programming communication from chassis loom to ECU
2	0.5 (GN)	CAN_Lo	Diagnostic and programming communication from chassis loom to ECU
3	0.5 (GN)	Vehicle Speed Signal	Wheelspeed signal from chassis to engine (if available)
4	2 (WH)	Fuel Pump Relay Output	12V supply from ECU/engine to chassis fuel pump
5	0.5 (GN)	Alternator Charge Signal	Switch to ground in order activate chassis based warning light
6	0.5 (GN)	Clean Tach Output Signal	Tachometer output signal from engine to chassis dash / logger etc
7	1 (WH)	Ignition Sense	12V supply from chassis ignition switch to engine
8	0.5 (GN)	Starter Solenoid Relay Control Signal	12V supply from chassis ignition/cranking switch to engine

Exhaust Information

All exhaust systems require adaptation to the installation constraints of the vehicle. As a track day installation, Cosworth has found a four into one manifold with 1 5/8" primaries (760mm long) and a 2 1/2" tail pipe (1500mm long including straight through silencer) to be a good starting point across the range of crate engines.

Oil System

The race proven dry sump system uses internal scavenge and pressure pumps. The only connections to be made to the engine are an oil supply from the chassis oil tank and an oil return back to the chassis oil tank. A proven oil tank, such as a 'Pace EasyClean' oil tank, is required on the chassis which ensures sufficient oil supply under all vehicle usage. The oil tank should also incorporate a swirl pot feature in the oil return to minimise oil aeration.

The engine comes complete with integral oil cooler (cooled by engine coolant) which has proven very effective in European road and race applications. Customers using engines in applications with extreme periods of full throttle and/or in extreme climates (e.g. Bahrain) should contact Cosworth for further information.

Fuel System

'YDE' engines run a 'dead head' fuel system whereby the engine requires a pressure controlled fuel supply from the chassis. Therefore the engine only has a single 'Fuel In' supply and no return.

The chassis should have a fuel regulator and fuel pump system capable of supplying in excess of 1.4l/min regulated to 4.3 bar.

Coolant System

There are 4 coolant connections on the engine; a main coolant inlet (via the thermostat on the side of the block), a main outlet on the rear of the head, and a feed/return pair of connections to the [coolant-oil] oil cooler.

The engine comes fitted with integral thermostat and bypass hose. The thermostat is a conventional manual device with an 82deg set point. It is entirely normal for the thermostat to open at lower temperatures whilst at high engine speed in order to maintain sufficient coolant flow through the engine.

The header tank should be fitted with a 21-25psi cap. Provision for coolant feeds and air bleeds to the header tank should be made at suitable locations in the chassis coolant system.

Breather System

The engine has a spigot ('breather') on the cam cover which requires plumbing into a suitable breather/catch tank system on the chassis.

Throttle Linkage

The throttle linkage is designed with a 2mm cable slot and 6.4mm hole feature to accept a barrel ended cable. The engine comes complete with cable bracket to ensure correct cable alignment.

CAD models

Surface models in .STP and .IGS format of critical external features are available. Contact Cosworth at clsales@cosworth.com for more information.

Additional engineering support

All engines are tested prior to despatch from Cosworth and the technical information contained within this document aims to supply all the information required to enable you to enjoy the engine at the earliest opportunity. In the event of a problem, please re-read and re-check all of the installation procedures thoroughly prior to contacting Cosworth. Cosworth will seek to assist wherever possible but support is primarily limited to email support. Full on-site support is available at additional cost and can be used

to assist in start-up diagnosis, installation checking and/or bespoke performance optimisation. See Section C for further details.



Section C - Servicing and Storage

Engine Servicing

Servicing requirements will be dependent on how the vehicle is used, if it is used for both high speed track use ('high duty cycle use') and low speed tuition use ('low duty cycle use') the high speed track use service intervals should be applied.

Service Requirements	Low Duty Cycle Use (Miles)	High Duty Cycle Use (Miles)
First Oil Change	500	100
Change Engine Oil & Oil Filter (PR6719)	6,000	1,000
Change Spark Plugs (PR6084)	3,000	1,000
Replace Alternator Belt (PR6894)	12,000	3,000

Fluid levels must be regularly checked

Air filters

The foam air filter element should be cleaned and impregnated with the correct filter oil at regular intervals. This should be at least once a year or more frequently if the car is used in very wet or dusty conditions.

The element should be replaced if there is any sign of damage to the foam element or seal. Cleaning instructions are supplied with every new air filter element and these are pre treated, ready for use.

Engine Servicing Notes

Crank and throttle position sensors are factory set. The crank sensor must remain in its set position.

Engines used for racing should be stripped and inspected by Cosworth or an approved engine builder after 3,000 track miles. This will ensure that the engine continues to give peak performance and exceptional reliability. In situations where peak power and absolutely parity are not so important, the service interval can be relaxed significantly.

Engines used solely for demonstration and school tuition should not need any special attention other than routine servicing. A good service agent can monitor the engine condition throughout its life and recommend remedial work as it becomes necessary.

Engine Abuse

An engine that has lost oil pressure, overheated, or has been over-revved should be returned for inspection by Cosworth (note this is a chargeable service). The table below shows the maximum engine speed:

<i>Engine</i>	<i>Maximum Engine Speed</i>
20001721 – 2.0L - 205bhp	7700rpm
20001722 – 2.0L - 225bhp	8200rpm
20001723 – 2.0L - 255bhp	8200rpm
20001725 – 2.3L - 220bhp	7200rpm
20001726 – 2.3L - 250bhp	7700rpm
20001727 – 2.3L - 280bhp	7700rpm

The engine should always be warmed to normal operating temperatures before running under full throttle and/or full rev range.

Engine Storage

The engine is dispatched from Cosworth with all external holes plugged and sealed. If the engine is to be stored prior to vehicle installation it is essential that this protection remains in place and that the engine is kept covered and stored in a clean and dry environment. The engine should be fitted and run within 6 months of purchase. Engines stored for prolonged periods should be regularly turned by hand to ensure it remains free and that its components do not sit in the same position for extended periods.

Rebuild, Calibration and Fault Diagnosis Services

Cosworth offer a full rebuild service for all crate engines in order to ensure that customers continue to enjoy the performance and durability expected from their engine. On receipt of an engine from a customer, Cosworth will perform a pre-strip inspection. This will be collated into a brief report and sent to the customer with a fixed quotation to perform the rebuild. The report and quotation is chargeable, but is refundable if/when the customer goes ahead with the rebuild.

- Pre-strip inspection report and rebuild quotation
- Full run-in and power test

Cosworth also offer complete calibration and fault diagnosis support. The rates for this are dependent upon the type and complexity of work required. Please contact Cosworth for more information.

Upgrades

The range of Cosworth engines listed in this document represents the optimal selection of components required to achieve the specification published. However, for customers requiring a bespoke build or who desire performance upgrades to their current unit, Cosworth offer a large variety of component upgrades including:

- Steel crank for improved durability and engine speed range
- Higher compression pistons
- Alternative cams and valve springs
- Port bored cylinder heads for maximum power output
- Larger bore throttles
- Longer air box trumpets to optimise the torque characteristic in an application
- Higher scavenge dry sump system for race engine performance improvement

Components can be bought individually or purchased and fitted as part of an engine rebuild service. Please contact Cosworth for further information.

Terms and conditions

A copy of our standard terms and conditions of sale can be found on www.cosworth.com or available as a hard copy upon request.



Section D - Document Revision

Version History

<i>Version Number</i>	<i>Reason for Change</i>	<i>Revision Date</i>	<i>Author</i>
1.0	New Issue	7th May 2009	Chris Horton



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