

1.5 and 1.6 Ti-VCT / SCTi 'Ecoboost' (Sigma) petrol engines in:

FORD:

Fiesta
Focus
B-Max
C-Max
Grand C-Max
Ecosport

Kuga
S-Max
Galaxy
Mondeo
Transit Connect
Torneo Connect

VOLVO:

S60
S80
V70

V40
V60
V70

Engine codes:

1.5 SCTi

M8DA
M8DB
M8MA
M9DA
M9DB
M9MA
UNCA
UNCB
UNCC
UNCD
UNCE
UNCF
UNCJ
UNCK

1.6 SCTi

JQMA
JQMB
JTMA
JQDA
JQDB
JQGA
JTBA
JTBB
JTDA
JTDB
JTWA
JTWB
JTJA
JTJB

1.6 Ti-VCT

HXDA
HXDB
HXJA
HXJB
IQDA
IQDB
IQJA
KGBA
PNBA
PNDA
PNDD
RHBA
RVJA
SIDA
XTDA
XTDB
MUDD
MUDA
U5JA

1.5 Ti-VCT

UEJB

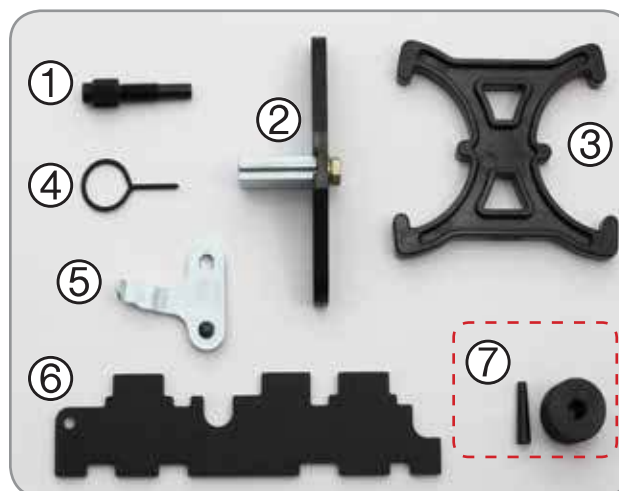
1.6 GTDi

B4164T
B4164T2
B4164T3
B4164T4



AST5155

Kit Contents / Spares:



Item	Part No.	Description	OE Ref.
1	AST3032-21	Crankshaft Locking Pin	303-748
2	AST4832	Flywheel Locking Tool	303-393A + 303-393-02
3	AST4931	VVT Setting Plate	303-1097
4	AST4640T7	Belt Tensioner Locking Pin	303-1054
5	AST5156	Crankshaft Pulley Setting Tool	303-1550
6	AST5157	Camshaft Setting Plate	303-1552
7	AST5158	Injector Seal Installer	310-128
8	AST5155-84	Case + Insert	-

IMPORTANT: Always refer to the vehicle manufacturer's service instructions, or proprietary manual, to establish the current procedures and data. Product Information Sets detail applications and use of the tools with any general instructions provided as a guide only.

AST has a policy of continuous development & reserve the right to change product specification or appearance without prior notice.

Introduction

1.5 & 1.6 Ti-VCT and SCTi (Ecoboost) 4 cylinder petrol engines are fitted in various cars and light commercial vehicles across the Ford range, the 1.6 SCTi Ecoboost engine also features in a number of popular Volvo models (known as GTDi).

The SCTi (Ecoboost) turbocharged engine is an evolution of the earlier Ti-VCT naturally aspirated 'Sigma' unit. Downsized 1.5 litre capacity variants of both engine types have been developed to meet the requirements of different markets. A number of tools are shared across Ti-VCT and Ecoboost engines with engine timing procedures for 1.5 variants of each engine type closely following the procedure for the 1.6 engines.

NOTE: The following information is based on a 1.6 SCTi (Ecoboost) engine. Always refer to vehicle manufacturer's latest information before carrying out engine timing procedures to ensure that correct procedures and specifications are maintained.

Toothed Belt Removal

Disconnect the vehicle battery.

Remove the engine top covers and detach the cooling system header tank.

Disconnect air mass sensor and remove the air intake pipe from the top of the engine.

Loosen the 4 retaining bolts of the water pump pulley by 2 turns. Raise the vehicle.



Remove the starter motor from the engine.
Remove the right hand drive shaft bearing strap and the drive shaft support bracket to give access to the entry point for **AST3032-21 Crankshaft locking pin**.
Remove the engine undershield and the right hand inner wing shield to give access to the auxiliary belt.



Remove the crankshaft position sensor.
Rotate the auxiliary belt tensioner pulley in an anticlockwise direction to release tension from the belt, remove the auxiliary belt from the pulleys.

NOTE: If the auxiliary belt is to be refitted, mark the direction of rotation on the belt before removing it from the engine.



Remove the auxiliary belt tensioner and belt from the engine.
Remove the pulley from the water pump.
Remove the three bolts retaining the alternator, remove the alternator from the engine.

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Petrol Engine Setting/Locking Tool Kit



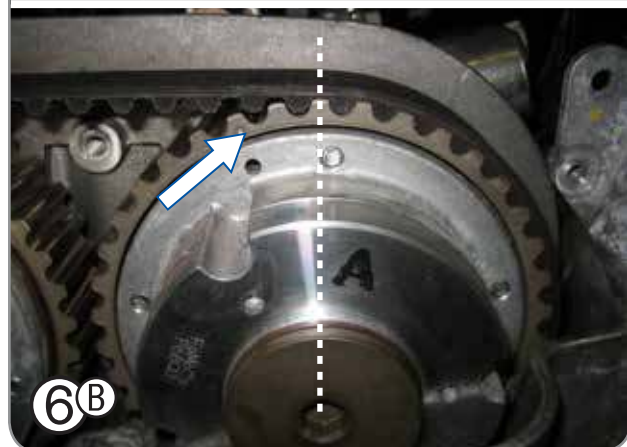
Support the engine using a suitable method.
Remove the Engine mount and the stud from the mount block.
Remove the 7 bolts and stud that retain the toothed belt cover, remove the cover from the engine.



Release the 4 bolts of the right hand engine mount block and remove it from the engine.

NOTE: The retaining bolts for the engine mount block are different lengths.

Make a note of the length and position of the 4 bolts to ensure that the correct length of bolt is fitted in the correct position at reassembly.



Rotate the crankshaft pulley central bolt in the normal direction of engine rotation until the marks of the camshaft sprockets are positioned at approximately 11 o'clock relative to the central bolts of the sprockets.



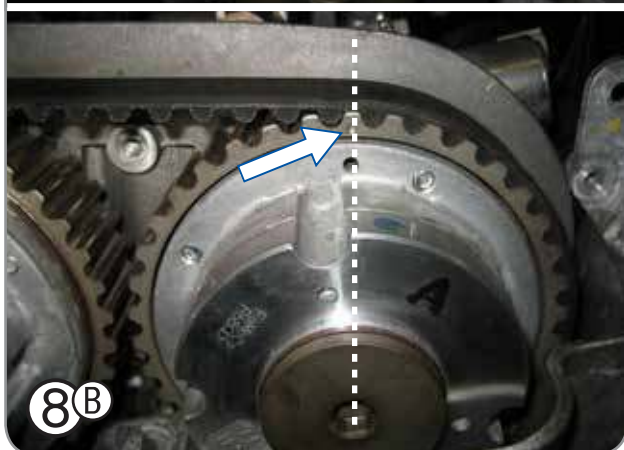
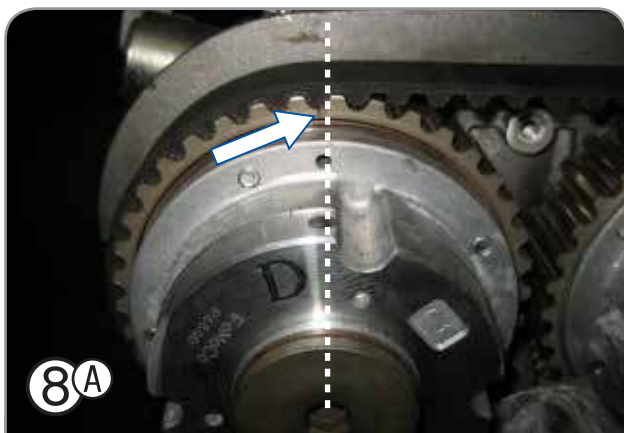
Remove the blanking plug for the crankshaft setting position.
Note: When locating the blanking plug be aware that it may be partially obscured by the driveshaft.

Fit **AST3032-21 Crankshaft locking pin** to the engine, ensuring that it is fully located in the engine block.

Slowly rotate the crankshaft pulley in the normal direction of engine rotation until the crankshaft contacts **AST3032-21 Crankshaft locking pin**.

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Fit **AST4832 Flywheel locking tool** into the aperture for the starter motor, using the adjustable tooth to lock the flywheel. Ensure that the crankshaft remains in the correct timing position, contacting **AST3032-21 locking pin**, when locking the flywheel.

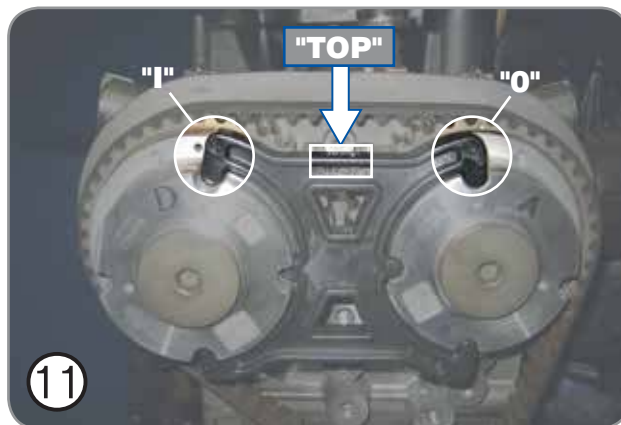


Remove and discard the crankshaft pulley central bolt.

WARNING: The crankshaft sprocket is 'floating', it is not locked on to the crankshaft using a drive key.

The toothed belt is free to turn independently of the crankshaft once the crankshaft pulley bolt has been released. Do not remove the crankshaft locking pin and flywheel locking tool until a new crankshaft pulley bolt has been installed.

Check that the camshaft sprockets are positioned with the '0' and 'I' markings at approximately 12 o'clock relative to the camshaft sprocket central bolts.



Fit **AST4931 Camshaft sprocket locking tool** into the recesses of the camshaft sprockets.

AST4931 is marked with the word "TOP" and timing marks 'I' and 'O' to aid correct installation of the tool.

The word TOP should be visible on the top of the tool and marks 'I' and 'O' should match the 'line' and 'dot' markings at the 12 o'clock position of the camshaft sprockets.

If it not possible to fit **AST4931** to the camshaft VVT sprockets, camshaft timing may require adjustment.

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Apply pressure to the toothed belt at the belt tensioner to release tension from the belt.

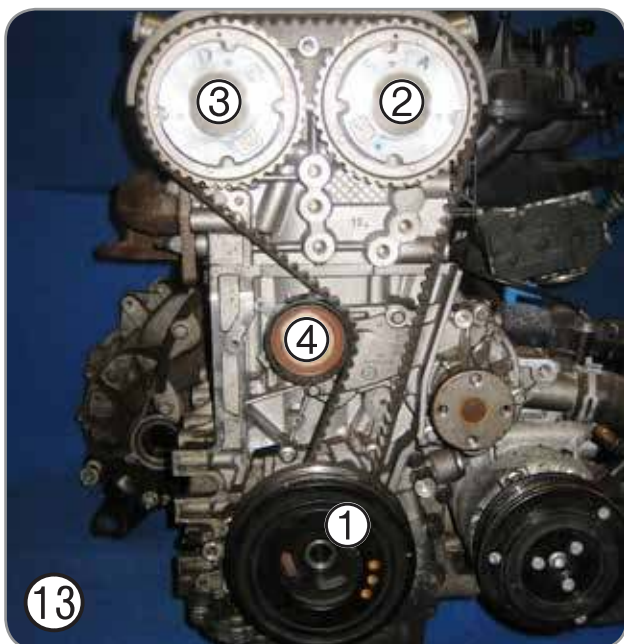
Retain the toothed belt tensioner in position using **AST4640T7 Tensioner locking pin**.

Remove the toothed belt from the engine.

Toothed Belt Installation

Ensure that the camshafts and crankshaft are set in the correct timing position using **AST3032-21 Crankshaft locking pin** and **AST4931 Camshaft sprocket locking tool**.

Ensure that the flywheel is securely locked using **AST4832 Flywheel locking tool**.



Fit the timing belt in an anti-clockwise direction starting at the crankshaft sprocket, then the inlet camshaft sprocket, exhaust camshaft sprocket and finally onto the tensioner pulley.
Remove **AST4640T7** from the tensioner to apply tension to the belt.



Install **AST5156 Crankshaft pulley setting tool**.

Slide the crankshaft pulley onto the crankshaft, locating the slot in the sensor ring at the rear of the pulley onto the tooth of **AST5156 Crankshaft pulley setting tool**.

Tighten the crankshaft pulley central bolt finger tight only to retain crankshaft pulley position.

Remove **AST5156 Crankshaft pulley setting tool**.

Tighten crankshaft pulley central bolt to 100Nm, then 90°, then wait for 10 seconds and tighten a further 15°.

Remove all tools.

Rotate the crankshaft 1 and 3/4 turns in the normal direction of engine rotation.

Refit **AST3032-21 Crankshaft locking pin**.

Rotate the crankshaft until it contacts **AST3032-21 pin**, refit **AST4931 Camshaft sprocket locking tool**.

If it is not possible to fit **AST4931 Camshaft sprocket locking tool**, the camshafts may require adjustment.

Reassemble engine in reverse order of removal.

Camshaft Timing Adjustment (VVT / Camshaft / Cylinder head overhaul applications)

The camshaft timing adjustment procedure assumes that **AST3032-21** and **AST4832** are fitted to the engine, that the crankshaft is in the correct timing position and that the toothed belt has been removed.

Engine timing adjustment and overhaul procedures require access to the rear of the camshafts.

To access the camshafts a number of cylinder head components must be removed.



Disconnect and remove the VVT solenoid valves, breather pipes, ignition coil packs and the fuel rail cover plate from the top of the cylinder head.

Remove and discard the H.P. fuel rail feed pipe, remove the fuel rail and injector assembly.

WARNING: The fuel system is under very high pressure and is extremely hazardous.

Relieve pressure from the fuel system before disconnecting any fuel system components.

This can be carried out by disconnecting the electrical feed for the fuel feed pump and running the engine until it is starved of fuel. Crank the engine for a further 5 seconds to ensure that sufficient pressure has been released from the system.



Remove the engine lifting eye and the H.P. fuel pump from the exhaust camshaft.

Remove the vacuum pump from the rear of the inlet camshaft.

Remove the inlet camshaft position sensor and then the camshaft cover.

Remove the vacuum pump/camshaft position sensor mounting bracket.



Using a wrench to counterhold the camshafts, remove the blanking caps from the camshaft sprockets/VVT units.

Remove and discard the central bolts of the camshaft sprockets, then loosely fit new bolts to the camshaft sprockets so that the sprockets are free to rotate but not tilt on the camshafts.



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Using a wrench on the hexagon of the camshafts, adjust the position of each camshaft in turn.

Locate **AST5157 Camshaft setting plate** to the rear of the camshafts to maintain correct camshaft position.

Fit **AST4931 Camshaft sprocket locking tool** into the recesses of the camshaft sprockets.

AST4931 is marked with the word "TOP" and timing marks 'I' and 'O' to aid correct installation of the tool.

The word TOP must be visible on the top of **AST4931** and marks 'I' and 'O' must match the 'line' and 'dot' markings at the 12 o'clock position of the camshaft sprockets.



Using a wrench to counterhold the camshafts, tighten the central bolts of the camshaft sprockets to 25Nm.

Remove **AST4931 Camshaft sprocket locking tool** and **AST5157 Camshaft setting plate**.

Using a wrench to counterhold the camshafts, tighten the central bolts of the camshaft sprockets by a further 75°.

Refit **AST4931 Camshaft sprocket locking tool** and **AST5157 Camshaft setting plate**.

If it is not possible to fit **AST4931** and **AST5157**, repeat the camshaft timing adjustment procedure.



Remove **AST4931 Camshaft sprocket locking tool** and **AST5157 Camshaft setting plate**.

Refit the camshaft sprocket blanking caps.

Using a wrench to counterhold the camshafts, tighten the blanking caps to 16Nm.

Continue with "Toothed belt installation" procedure.

Injector Seal Replacement

Engine timing adjustment and overhaul procedures require access to the rear of the camshafts.

To access the camshafts the fuel injectors and the fuel rail must be removed.

Ford specifications require replacement of the injector seals when they are removed from the engine.

AST5158 Injector seal installer is provided to aid the installation of new seals to each injector.



Carefully cut the used seal from the injector.

Ensure that the injector seal location groove is clean and free from foreign objects.



Locate the new seal on the taper shaft of **AST5158 Injector seal installer** and position the taper shaft of **AST5158** at the nozzle of the injector.



Using the taper ring of **AST5158 Injector seal installer**, slide the seal over the injector nozzle and into the seal location groove. Rotate the taper ring back and forth to aid movement of the seal over the nozzle.