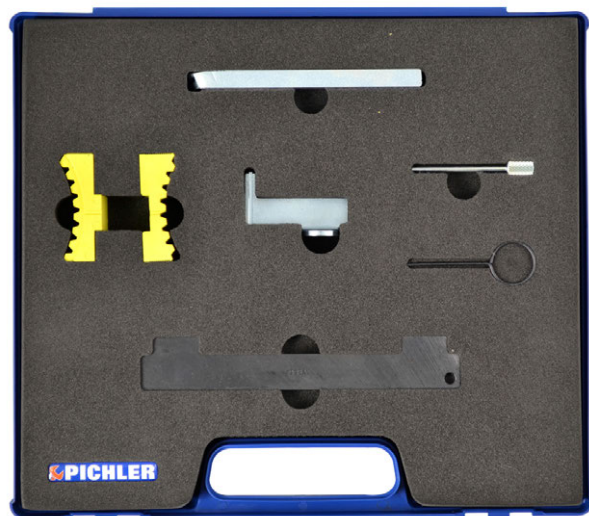


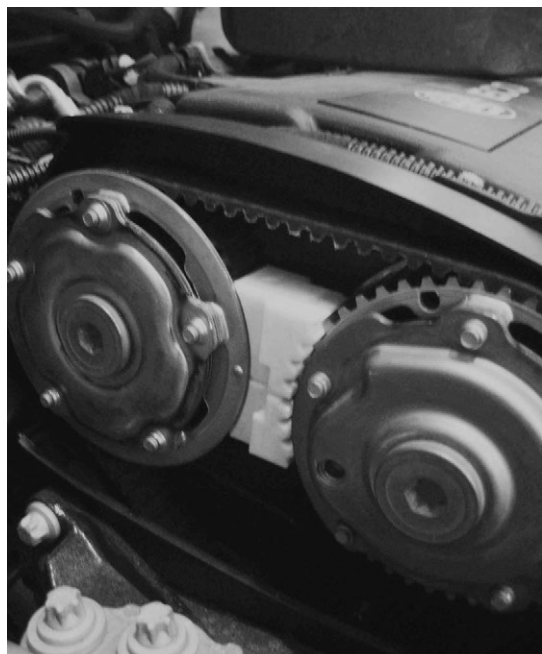
Product Information

60398135

Petrol Engine Twin Camshaft Setting/Locking Tool Kit



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.



Applications:

VAUXHALL-OPEL 1.6 and 1.8 "Twinport" 16v.
Petrol engines in

VAUXHALL-OPEL

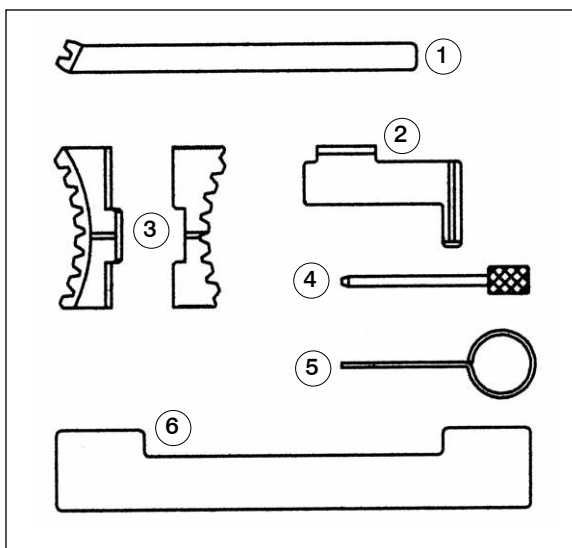
Corsa-D	Astra G + H	Meriva
Zafira-B	Vectra-C	Signum
Insignia		

Z16LEL, Z16LER, Z16LET, Z16XE1, Z16XEP, Z16XER, Z18XER, LDE & 2HO engines

XER engines have VVT (variable valve timing) on both inlet and exhaust camshafts.

Additional Tools required:

4742 Ignition Module Removal Tool Set – required for Timing Adjustment applications (XER).



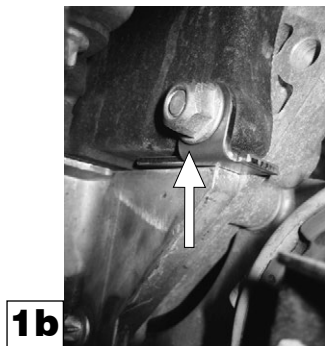
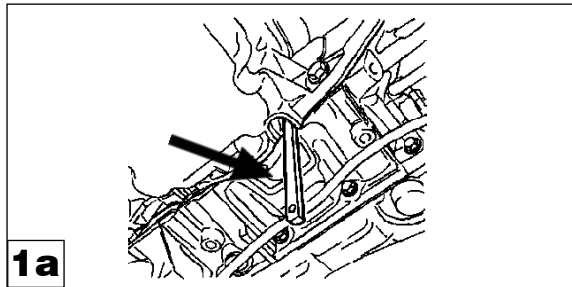
Kit contents/spares

Item	Part Number	Description
1	4353	Flywheel Holding Tool
2	4996	Flywheel Holding Tool
3	4997	Camshaft Sprocket Locking Tool
4	3032-20	Auxiliary Belt Tensioner Locking Pin
5	4593-1F	Timing Belt Tensioner Locking Pin
6	4998	Camshaft Setting Plate
--		Case + Insert

Vauxhall-Opel 1.6 "Twinport" engines were introduced in 2003 in the Astra-G (Z16XEP), with a number of 1.6 variants following in the Astra H, Zafira, Meriva and Corsa-D models. These 1.6 engines did not have VVT (variable valve timing) which was first introduced in the 1.6 engine in the Astra-H in 2007 (Z16XER), followed by the Zafira-B. The 1.8 "Twinport" engine (Z18XER) launched in 2005 has VVT and is fitted in Astra-H, Vectra-C/Signum and Zafira-B models.

60398135 Petrol Engine Twin Camshaft Setting/Locking Tool Kit

Comprises: 4997 Camshaft Sprocket Locking Tool
4998 Camshaft Setting Plate
4593-1F Timing Belt Tensioner Locking Pin
3032-20 Auxiliary Belt Tensioner Locking Pin
4353 Flywheel Holding Tool
4996 Flywheel Holding Tool



NOTE: Flywheel Holding Tool Applications:- 4995 Kit contains two Flywheel Holding Tools, each used to 'lock' the flywheel for removal and installation of the crankshaft pulley which must be removed in order to remove the timing belt. 4353 Holding Tool is used on Astra-G applications. On Astra-H either the 4353 or 4996 Holding Tools can be required depending on access, whilst 4996 will be needed for all 1.8XER engines and later 1.6 engines in Zafira, Meriva and Vectra models.

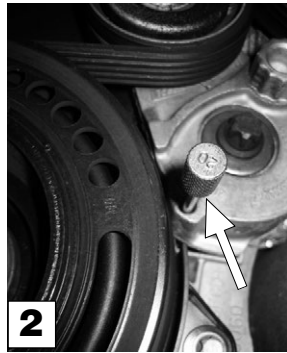
NOTE: For "Timing Check" and "Timing Adjustment" applications on engines with VVT, both the 4997 Camshaft Sprocket Locking Tool and the 4998 Camshaft Setting Plate are required.

"Timing belt replacement", "Timing Check" and "Timing Adjustment" applications will require the vehicle to be raised and lowered on numerous occasions during the procedure in order to gain access to the camshafts or crankshaft pulley area and auxiliary belt/tensioner.

Timing belt replacement

The timing belt replacement procedures for 1.6 and 1.8 "Twinport" engines are basically the same.

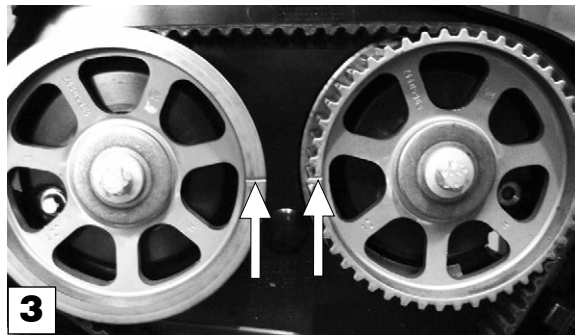
Remove the air cleaner housing and upper timing belt cover. Raise the vehicle in order to remove the lower belt cover, engine splash guard and auxiliary belt.



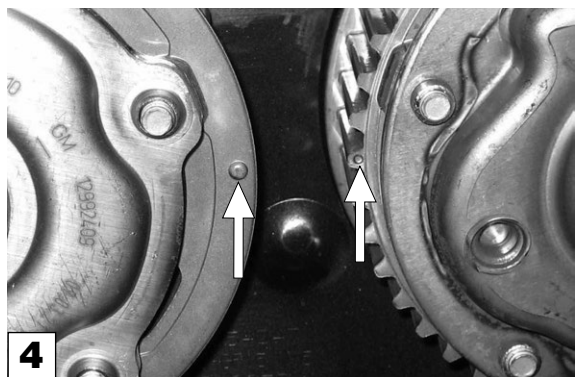
To remove the auxiliary belt, apply tension to the belt to activate the tensioner and use 3032-20 Locking Pin to "lock back" the tensioner unit off the belt. Remove the belt and remove the tensioner unit with the 3032-20 Pin in place.

Turn the engine to TDC No.1 cylinder and check timing mark alignment on the crankshaft pulley.

IMPORTANT: Check that the timing marks on camshaft sprockets align correctly –



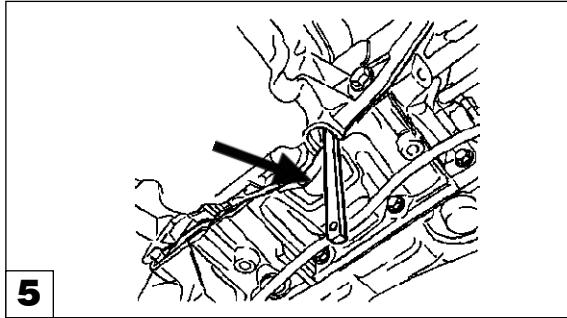
On 1.6 non-VVT engines - sprockets have "timing lines" which should be horizontally level and face each other.



On VVT engines (XER) - sprockets have "timing spots" – the inlet (left-hand) sprocket "timing spot" will be slightly above horizontal level, whereas the exhaust (right-hand) sprocket "timing spot" (located on the sprocket tooth), will be at a horizontal level position.

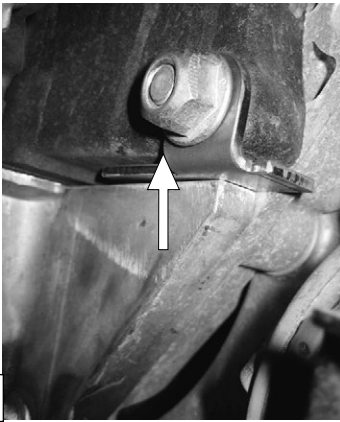
4353 and 4996 Flywheel Holding Tools

Insert 4353 or 4996 Flywheel Holding Tool, dependant upon the engine/model being worked on (visual check of flywheel area required – refer to “Flywheel Holding Tool Applications”).



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4353



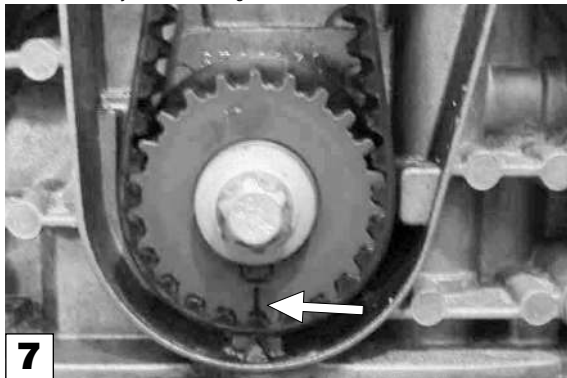
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4996

NOTE: The protective cap cover will need to be removed in order to insert 4353, whereas 4996 must be bolted in place to retain its position in the flywheel.

Release the crankshaft pulley bolt and remove crankshaft pulley and belt cover. Screw the old pulley bolt back in to aid in turning the crankshaft.

Remove the Flywheel Holding Tool.



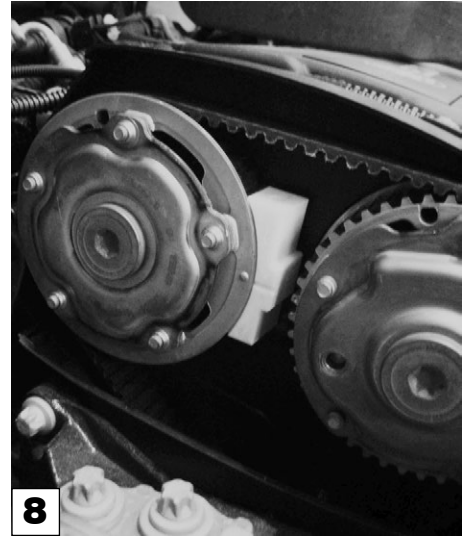
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Check that the engine is at TDC No.1 cylinder via the timing mark on the crankshaft gear.

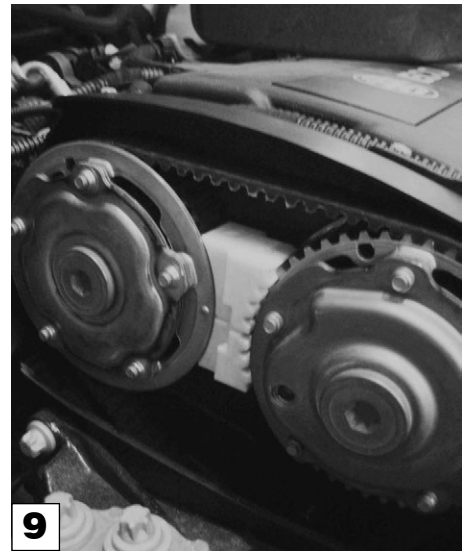
4997 Camshaft Sprocket Locking Tool

The 4997 Camshaft Sprocket Locking Tool comprises two parts (marked “1” and “2”), which ‘lock’ the camshaft sprockets in timed position by locating in to the sprocket teeth.

IMPORTANT: Always insert 4997 Sprocket Locking Tool with the identifying numbers “1” and “2” on top (uppermost) and with its central timing mark lines visible.



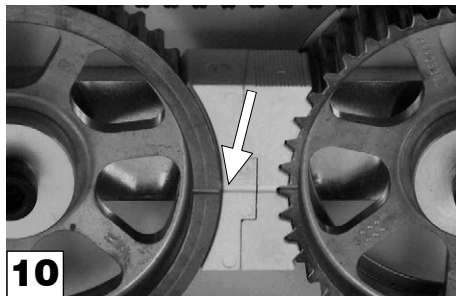
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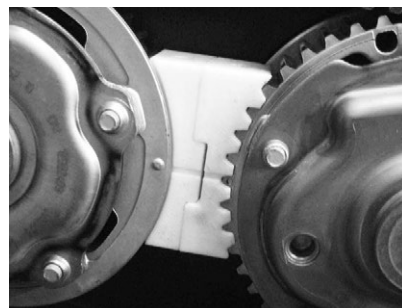
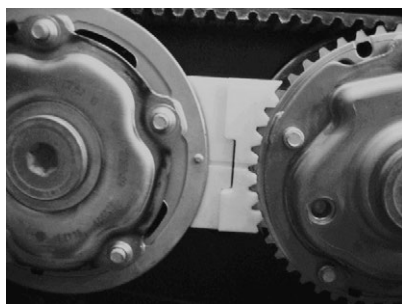
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The inlet sprocket of these “Twinport” engines has a flanged front face and therefore it is necessary to insert Part 1 of the 4997 Tool first, fitting it into the teeth of the inlet (left-hand) sprocket, followed by Part “2” of the Tool in to the teeth of the exhaust (right-hand) sprocket. Parts “1” and “2” slide together and align via a central tongue, and have an angled face, which increases the pressure of the Tool in to the sprocket teeth as Part “2” is inserted. The “timing lines” on 4997 Locking Tool should be in a horizontal plane and align to the timing marks on the sprockets.

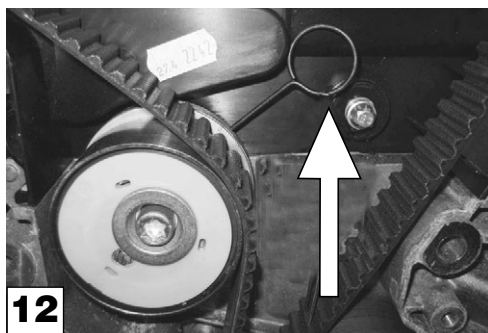
IMPORTANT: Sprocket Timing marks – 4997 Sprocket Locking Tool has horizontal timing mark lines on both Parts “1” and “2”. The Tool is inserted so that the timing marks are horizontally level to each other.



The camshaft sprocket timing lines on non-VVT sprockets must be horizontal and level and aligned to the timing lines on the 4997 Tool for camshaft timing to be correct.



VVT sprockets have “timing spots” – the inlet (left-hand) sprocket “spot” should be very slightly higher (on the upper edge of the Tool’s timing line), whereas the exhaust (right-hand) sprocket “spot” (located on the sprocket tooth), should be level with the 4997 timing line, for camshaft timing to be correct.



4593-1F Timing Belt Tensioner Locking Pin

Using an allen key, turn the belt tensioner **clockwise** to expose the locking pin hole and insert 4593-1F Locking Pin.

NOTE: When turning the tensioner there is an initial 1st stage of resistance and then a further amount of turning necessary to align the small hole in the rear plate with the corresponding hole in the tensioner assembly (at approx the 2-0-clock position), so Locking Pin can be inserted.

Remove the old timing belt.

Installing new timing belt

WARNING: Fitting the new belt must be carried out using the installing tool (sleeve) supplied with the belt in order to protect it when threading through the engine mounting support to avoid damage to the belt caused by kinking.

Fit new belt over inlet camshaft sprocket, exhaust camshaft sprocket, belt tensioner/guide roller and crankshaft gear.

Apply tensioner to belt and pull out 4593-1F Locking Pin to activate.

Install lower belt cover, and fit 4353 or 4996 Flywheel Locking Tool and install crankshaft pulley using new bolt to specified torque – 95Nm. + 45 degrees + 15 degrees.

Remove Flywheel Holding Tool and Camshaft Sprocket Locking Tool

Turn the engine over twice, in direction of normal engine rotation, and return to TDC No.1 cylinder and check crankshaft timing marks align.



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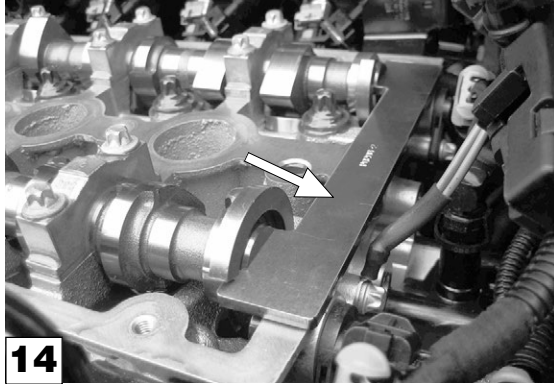
Check that the camshaft sprocket timing marks are in line with positions advised earlier (VVT or non-VVT engines), and fit 4997 Camshaft Sprocket Locking Tool, to confirm correct timing position of camshafts/sprockets.

Install auxiliary belt tensioner unit. Install auxiliary belt and apply tension by removing the 3032-20 Locking Pin from the tensioner unit.

Checking timing

On non-VVT engines, checking the valve timing involves positioning the crankshaft at TDC No.1 cylinder and fitting the 4997 Camshaft Sprocket Locking Tool in to the camshaft sprockets.

Check that the timing marks on the sprockets and the marks on 4997 Tool align correctly. If the marks do not align, then "Timing Adjustment" will be necessary.



4998 Camshaft Setting Plate

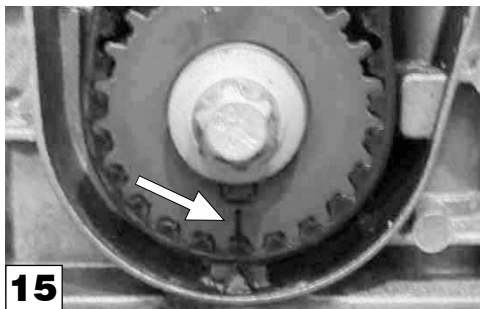
For checking timing **on VVT engines**, follow the same checking procedure as non-VVT, but note that the camshaft sprockets have "timing spots" the timing position of which, relevant to the timing mark lines on Tool 4997, has been described earlier. It is necessary to additionally remove the cylinder head cover and insert 4998 Setting Plate in to the "slots" in the rear of the camshafts to check they are aligned correctly. Check that the crankshaft timing marks are aligned. If the camshaft sprocket marks do not position correctly to Tool 4997, or the 4998 Setting Plate cannot be inserted, then "Timing Adjustment" will be necessary.

Timing Adjustment

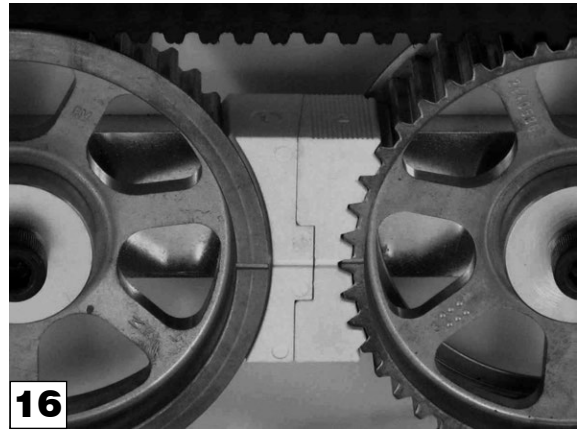
On non-VVT engines, timing adjustment is achieved by removing the timing belt, establishing correct crankshaft and camshaft timing positions and re-fitting the belt.

Remove timing belt covers and auxiliary belt/tensioner as described in "Timing belt replacement".

Fit the appropriate Flywheel Holding Tool and remove the crankshaft pulley.



Remove the Flywheel Holding Tool and turn engine to TDC No.1 cylinder, aligning crankshaft timing marks.



Lock the camshaft sprockets with 4997 Locking Tool and ensure timing marks align.

Release tension from timing belt and 'lock the tensioner with 4593-1F Locking Pin.

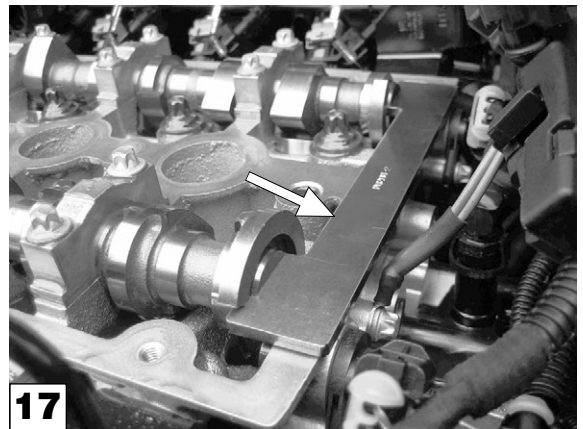
Remove the timing belt

Check crankshaft is in TDC position by checking timing marks align. Check camshaft sprocket timing marks are horizontal and facing each other, in line with the timing marks on Tool 4997.

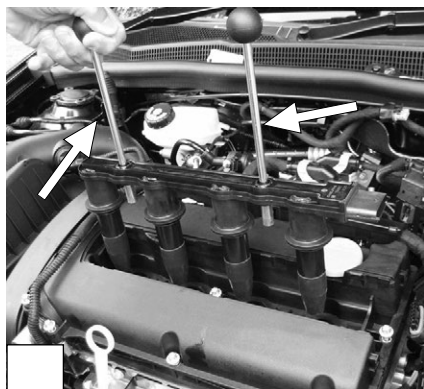
Re-fit the timing belt and apply tension by removing Pin 4593-1F.

Remove 4997 Sprocket Locking Tool and turn the engine over twice, returning to TDC No.1 cylinder position.

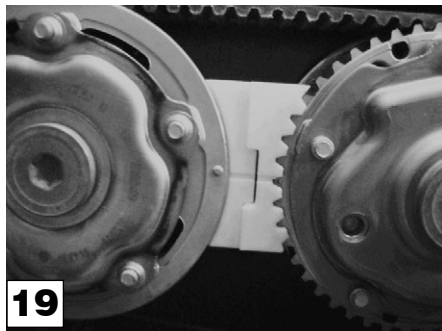
Check crankshaft timing marks align and that Locking Tool 4997 can be inserted in to the camshaft sprockets and that the timing marks align correctly.



On VVT engines, timing adjustment is achieved by fixing the camshafts in position at the rear using 4998 Setting Plate and releasing the camshaft sprockets from the camshafts in order to make the required adjustment.



Remove the timing belt covers, remove the ignition module, using Tool 4742, and remove the cylinder head cover.



Insert 4997 Camshaft Sprocket Locking Tool in to the sprockets ensuring the "timing spots" are in timing position detailed in "Timing Belt Replacement".

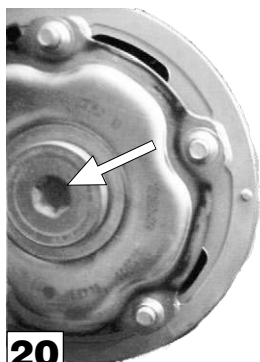
Using an allen key, turn the belt tensioner and 'lock' with 4593-1F Locking Pin.

Install the appropriate Flywheel Holding Tool – 4353 or 4996 and remove the crankshaft pulley. Remove lower belt cover and belt guide roller.

Remove the timing belt.

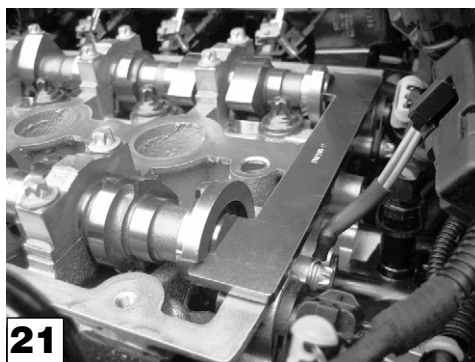
Remove the Flywheel Holding Tool.

Turn the crankshaft 60 degrees against the direction of engine rotation.



Unscrew the camshaft bolt covers of the exhaust and inlet camshaft sprockets –

NOTE: be prepared for oil to leak out.



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Turn the camshafts, using hexagon, in order to insert 4998 Camshaft Setting Plate in to the rear of the camshafts.

NOTE: 4988 Plate must be fully inserted in to both camshafts.

Fit new camshaft bolts.

Turn the camshafts, using hexagon, in order to insert 4998 Camshaft Setting Plate in to the rear of the camshafts.

NOTE: 4988 Plate must be fully inserted in to both camshafts.

Fit new camshaft bolts.

Counter-hold the exhaust camshaft with a spanner at the hexagon provided on the camshaft and tighten the exhaust camshaft sprocket bolt – 65Nm. +125 degrees + 15 degrees.

Counter-hold the inlet camshaft with a spanner at the hexagon provided on the camshaft and tighten the inlet camshaft sprocket bolt – 65Nm. +125 degrees + 15 degrees.

Replace the seals in the camshaft bolt covers and tighten them to 30Nm.

Remove the 4998 Camshaft Setting Plate and turn the crankshaft to TDC No.1 cylinder position. Check timing marks align on crankshaft gear and oil pump housing (6-o-clock position).

Fit appropriate Flywheel Locking Tool.

Fit timing belt using assembly tool to avoid damage whilst passing through engine mounting.

Fit belt guide roller and activate belt tensioner by removing 4593-1F Locking Pin.

Install lower belt cover and crankshaft pulley. Use a new crankshaft pulley bolt and tighten to 95Nm. +45 degrees + 15 degrees

Remove Flywheel Holding Tool and Camshaft Sprocket Locking Tool.

Turn the engine over twice in normal direction of engine rotation and return to TDC No.1 cylinder.

Check the crankshaft timing marks align and insert 4997 in to the slots in the rear of the camshaft sprockets, checking timing marks are in correct position (as described earlier), and ensure that 4998 Setting Plate can be fitted in to the rear of the camshafts.