

INSTRUCTIONS FOR:

PETROL ENGINE SETTING/LOCKING KIT - JAGUAR/LAND ROVER/DAIMLER - CHAIN DRIVE

MODEL No: VS4980

Thank you for purchasing a Sealey product. Manufactured to a high standard, this product will, if used according to these instructions and maintained properly, give you years of trouble free performance.

IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY. NOTE THE SAFE OPERATIONAL REQUIREMENTS, WARNINGS & CAUTIONS. USE THE PRODUCT CORRECTLY AND WITH CARE FOR THE PURPOSE FOR WHICH IT IS INTENDED. FAILURE TO DO SO MAY CAUSE DAMAGE AND/OR PERSONAL INJURY AND WILL INVALIDATE THE WARRANTY. KEEP THESE INSTRUCTIONS SAFE FOR FUTURE USE.





Refer to Instruction Manual

Wear Eye Protection

1. SAFETY

- WARNING! Ensure Health and Safety, local authority and general workshop practice regulations are adhered to when using tools.
- X DO NOT use tools if damaged.
- Maintain tools in good and clean condition for best and safest performance.
- Ensure that a vehicle which has been jacked up is adequately supported with axle stands.
- Wear approved eye protection. A full range of personal safety equipment is available from your Sealey dealer.
- √ Wear suitable clothing to avoid snagging. DO NOT wear jewellery and tie back long hair.
- X DO NOT attempt to start engine or move vehicle whilst in gear with locking devices fitted.
- ✓ Always display warning notification on steering wheel when locking engine components.
- ✓ Account for all tools, locking bolts, pins and parts being used and do not leave them in or near the engine.
- WARNING! Incorrect or out of phase camshaft timing can result in contact between valve head and piston crown causing damage to the engine.
- ☐ IMPORTANT: These instructions are provided as a guide only Always refer to the vehicle manufacturer's service instructions, or a proprietary manual, to establish the current procedure and data

2. CONTENTS

Kit contains specialised tools required for timing chain setting and locking on Jaguar, Land Rover and Daimler 3.2, 3.5, 4.0, 4.2, 4.4 V8 AJ26/AJ27/AJ28/AJ34 series petrol engines. Supplied with comprehensive instructions and carry-case.

3. APPLICATIONS

Jaguar: S-Type (99-08), XF (08-09), XJR (97-10), XJ8 (97-10),

XKR (98-09), XK8 (96-09), Sovereign (97-03)

Land Rover: Discovery III (04-09), Range Rover (05-09),

Range Rover Sport (05-09)

Daimler: V8 (97-03), Super V8 (97-03)

Engine Codes:

3.2: AC, KB, KC

3.5: RB

4.0: BC, CC, CE, DC, EC, GB, GC, LB,LC, MA, MB, NB, NC, PA, PB

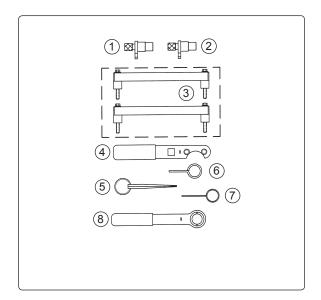
4.2: 1B, 2B, 3B, 1G, 5G, 9G, HB, HG, SB,TB, PC, 428PS

4.4: 448PN





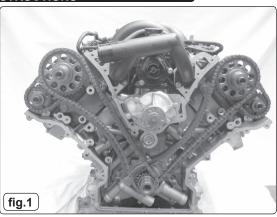
| Item: | Part No: | Description: | OEM No: |
|-------|-----------|--|---------|
| 1 | VS4981 | Flywheel Locking Pin (Silver) | 303-531 |
| 2 | VS4982 | Flywheel Locking Pin (Gold) | 303-645 |
| 3 | VS4983 | Camshaft Setting Plate Set (2 per kit) | 303-530 |
| 4 | VS4984 | Camshaft Gear Holding Tool | 303-532 |
| 5 | VS4986 | Tensioner Wedge Set (2 per kit) | 303-533 |
| 6 | VS4975TB | Primary Tensioner Locking Pin | - |
| 7 | VS4593-1A | Tensioner Depress Pin | - |
| 8 | VS4987 | VVT Unit Setting Tool | 303-654 |



Associated Tools:

VS4985 Petrol Engine Crankshaft Pulley Removal/Installation Kit - Daimler V8, Jaguar, Land Rover.

4. INSTRUCTIONS



This V8 petrol engine was first introduced by Jaguar in 1997 and is still in use today. Land Rover also started to use the later versions of the engine in 2005. There have been many changes, both in engine capacity and components over the years, but most of the basic procedures for checking and adjusting engine timing, dis-mantling and assembly of the front-end gears, timing chain, camshafts etc., applies across the engine range.

The timing applications on early and later engines are covered by the VS4980 Engine Setting/Locking Tool Kit.

Timing adjustment and overhaul applications involving the front end, gears, timing chains etc., require removal of the front timing chain cover, and to remove this, the crankshaft pulley must be removed.

On most variants the pulley bolt has a very high torque specification and removal and installation of this pulley requires the Special Remover and Holding Tool in Set VS4985 – Associated Tool.

IMPORTANT: References made to "left-hand bank" and "right-hand bank" within this Product Information, refers to the left or right cylinder heads as viewed from the front of the engine - ie. from the camshaft gears.

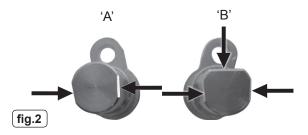
VS4980 Engine Setting/Locking Tool Kit

Comprises: VS4981 Flywheel Locking Pin (Silver)
VS4982 Flywheel Locking Pin (Gold)
VS4983 Camshaft Setting Plate Set (pair)
VS4984 Camshaft Gear Holding Tool
VS4986 Tensioner Wedge Set (Pair)
VS4975T8 Primary Tensioner Locking Pin
VS4593-1A Tensioner Depress Pin
VS4987 VVT Unit Setting Tool

VS4985 Crankshaft Pulley Remover/Installer Tool Set Comprises: VS4921 Crankshaft Pulley Holding Tool VS4922 Crankshaft Pulley Remover Set

4.1 Checking valve timing

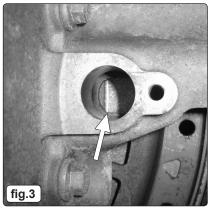
To check that the valve timing is correct, a Flywheel Locking Tool must be inserted to 'lock' the flywheel (and therefore the crankshaft), in timed position, and a Camshaft Setting Plate must be able to be fixed in place across the 'timing flats' on **each bank** of camshafts and **rest fully** on the surface of the cylinder head.



"A" - VS4981 (early) / "B" - VS4982 (Late)

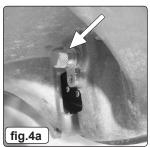
VS4981 Flywheel Locking Pin - Silver (early engines) VS4982 Flywheel Locking Pin - Gold (later engines) These two Flywheel Locking Pins cover the complete range of engines.

They are colour coded and for additional identification it can also be seen in fig.2, that VS4981 (Silver) has two parallel flat faces, whereas VS4982 (Gold) has three flat faces.

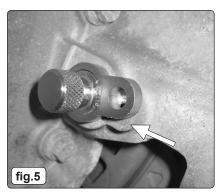


4.1.1 The shapes of these Flywheel Locking Pins match the appropriate 'timing hole' profiles in the flywheel (fig.3).





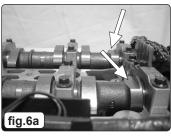
4.1.2 The Flywheel Locking Pin enters in to the flywheel 'timing hole' through the crankshaft position sensor hole (fig.4). The position sensor is removed, and the Flywheel Locking Pin is inserted through the engine, in to the flywheel (fig.4a) and bolted in position.



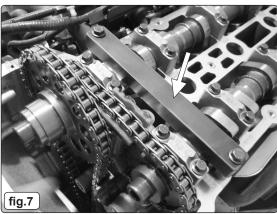
WARNING: Under certain circumstances it may be possible to insert the VS4982 Locking Pin for later engines into the flywheel of early engines. However it will not feel a good, positive fit and it will not be possible to fit the securing screw for the Pin as the securing hole will be off-set (fig.5). If this occurs, remove and fit VS4981 Pin.

4.2 VS4983 Camshaft Setting Plate Set (Pair)



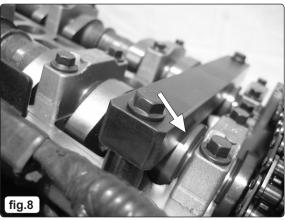


- 4.2.1 In order to check the camshaft timing the camshaft covers must be removed.
- 4.2.2 With the crankshaft locked in 'timed' position the 'timing flats' (fig.6a) on the camshaft should be uppermost.



4.2.3 One of the VS4983 Camshaft Setting Plates is placed across the 'timing flats' on the left-hand bank of camshafts and the other Plate is located across the 'timing flats' on the right-hand hank

IMPORTANT: References made to left-hand bank and right-hand bank are as viewed from the direction of the camshaft gears.



4.2.4 In order for the camshaft timing to be correct, **both** Setting Plates **MUST** fit flush on to the camshaft 'timing flats' and rest fully on the surface of the cylinder head (fig.8).

If this cannot be achieved, then timing adjustment will be necessary.

Timing adjustment and applications involving cylinder head/ camshaft removal will involve removal/installation of gears and timing chains.

These applications require the front timing chain cover to be removed, for access to gears, chains and tensioners, and to remove the cover, the crankshaft pulley must be removed.



4.3 VS4985 Crankshaft Pulley Remover/Installer Tool Kit –
Associated Tool Set – not included in VS4980 Kit

The VS4985 Set comprises VS4921 Crankshaft Pulley Holding Tool and VS4922 Crankshaft Pulley Remover Set (fig.9).

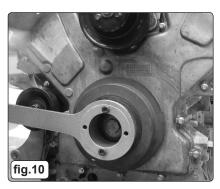
These tools must be used together when removing the crankshaft pulley.

The VS4922 Holding Tool is also used to counter-hold the crankshaft pulley during installation.

WARNING: Some crankshaft pulley bolts require a torque as high as 375Nm. making the tools in VS4895 Set an essential part of the procedures requiring removal/installation of the crankshaft pulley.

Crankshaft pulley removal

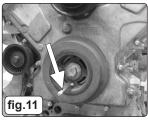
WARNING: The Flywheel Locking Pin MUST NOT be used to counter-hold flywheel/crankshaft for releasing or tightening the crankshaft pulley bolt as engine damage will result.



4.3.1 VS4921 Crankshaft Pulley Holding Tool – releasing and tightening pulley bolt.

The VS4921 Holding Tool is attached to the pulley using the shorter securing bolts supplied in the Set. The bolts pass through the Holding Tool and are screwed in to the threaded holes in the pulley.

IMPORTANT: The threaded holes in the crankshaft pulley, which accept the securing bolts, can be corroded or blocked. Always check these threads and ensure they are clean and clear to accept the securing bolts.





NOTE: It can be difficult to align the threaded holes in the pulley when attaching the Holding Tool, therefore utilise the Special Guide Pin from the VS4922 Remover Set (fig.11).

4.3.2 First, screw the Guide Pin into one of the threaded holes in the pulley and then locate one of the holes in VS4921 Holding Tool on to the Guide Pin and slide the Holding Tool in place in to the recess of the pulley (fig.11a).





- 4.3.3 Insert a bolt in to the opposite hole in the Holding Tool and screw it into the pulley (fig.12). Remove the Guide Pin and replace it with the second bolt, screwing in to the pulley (fig.12a).
- 4.3.4 Tighten both bolts, firmly, to secure the Holding Tool to the crankshaft pulley.



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- 4.3.5 Using a breaker bar and socket, release the bolt of the crankshaft pulley whilst counter-holding with the VS4921 Holding Tool (fig.13)
- 4.3.6 Undo the bolts attaching the VS4921 and remove the Holding Tool (fig.13a).



4.4 VS4922 Pulley Remover Set – Removal of crankshaft pulley

NOTE: To remove the crankshaft pulley, the Holding Tool and the Pulley Remover are assembled together onto the pulley.

The VS4921 Holding Tool is used to prevent the crankshaft pulley from rotating whilst the force screw of the Pulley Remover is screwed in to remove the crankshaft pulley (fig.14).

4.4.1 Pre-assemble the Bridge Piece, Force Screw and Securing Bolts (the longer bolts in VS4895 Set) to make up the VS4922 Pulley Remover.





IMPORTANT: Insert the Thrust Plate into the centre hole of the pulley (fig.15).

4.4.2 Screw the Guide Pin in to one of the threaded holes in the pulley (fig.15a).





- 4.4.3 Slide the VS4921 Holding Tool over the Guide Pin and into the recess to the pulley (fig.16).
- 4.4.4 Attach the VS4922 Remover on to the Holding Tool, and to the crankshaft pulley, by inserting one of the securing bolt through the opposite hole to the Guide Pin (in the VS4921 Holding Tool), and into the crankshaft pulley threaded hole (fig.16a).



- 4.4.5 Remove the Guide Pin and replace it with the second securing bolt, passing it through Pulley Remover and the Holding Tool and into the threaded hole of the pulley (fig.17).
- 4.4.6 Tighten both bolts, **firmly**, to secure the Pulley Remover and Holding Tool assembly to the crankshaft pulley.



4.4.7 Prevent the crankshaft pulley from rotating by counter-holding with the VS4921 Tool. Screw in the Force Screw of the VS4922 Remover to extract the pulley off the crankshaft (fig.18).





4.4.8 Remove the Thrust Plate (fig.19), the crankshaft pulley and the split ring (if fitted) (fig.19a).

4.5 Installing crankshaft pulley

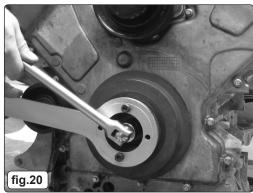
IMPORTANT: The thread in the end of the crankshaft must be cleaned out before installing a new pulley securing bolt. All mating surfaces should be cleaned.

All except very early pulleys utilise a split locking ring.

4.5.1 If the pulley is a type without a locking ring - apply Loctite 648 to the bore of the crankshaft pulley. DO NOT apply to the faces or to the crankshaft.

WARNING: The pulley must be fitted and the securing bolt fully tightened, within 7 minutes of the Loctite being applied.

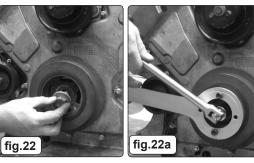
4.5.2 Fit the pulley to the crankshaft and wipe off any excess Loctite.



- 4.5.3 Screw in a new pulley securing bolt to finger-tight only.
- 4.5.4 Fit VS4921 Holding Tool to the crankshaft pulley and use it to counter-hold whilst tightening the securing bolt to the specified torque for the engine variant being worked on (fig.20).
- 4.5.5 **If the pulley utilises a split locking ring** fit a new o-ring seal to the pulley and apply petroleum jelly to the bore and O-ring.



4.5.6 Fit the pulley on to the crankshaft and fit the split locking ring inside the bore of the pulley (fig.21).



- 4.5.7 Screw in a new pulley securing bolt to finger-tight only (fig.22).
- 4.5.8 Fit VS4921 Holding Tool to the crankshaft pulley and use it to counter-hold whilst tightening the securing bolt to the specified torque for the engine variant being worked on (fig.22a).

4.6 Adjusting valve timing

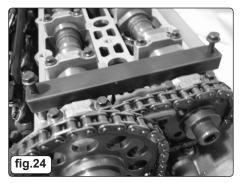
The following procedure covers valve timing adjustment and also applies to setting up the valve timing when installing camshafts, gears after cylinder head overhaul etc.

- 4.6.1 Check that the crankshaft is in its 'timed' position and that the appropriate Flywheel Locking Pin has been inserted, as described in "Checking valve timing"
- 4.6.2 Remove the water pump pulley.
- 4.6.3 Remove the front timing chain cover.
- 4.6.4 Remove the VVT solenoid housing from the inlet camshafts (if fitted).



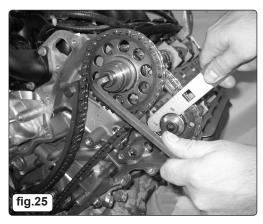
NOTE: In order for the camshaft timing to be correct, both VS4983 Setting Plates MUST fit flush on to the 'timing flats' and rest fully on the surface of the cylinder head.

4.6.5 To adjust the position of the camshafts to achieve this position the inlet and exhaust camshaft gear bolts must be slackened.



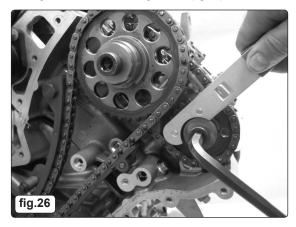
Work on one bank of camshafts at a time.

4.6.6 Install an VS4983 Camshaft Setting Plate loosely across the 'timing flats' on the camshafts. **DO NOT** tighten the securing bolts of the Setting Plate at this stage (fig.24).



VS4984 Camshaft Gear Holding Tool

4.6.7 Fit VS4984 Camshaft Gear Holding Tool in to the holes in the EXHAUST camshaft gear and use it to counter-hold whist slackening the INLET camshaft gear bolt (fig.25).



4.6.8 Maintain VS4984 Holding Tool in this counter-holding position and slacken the EXHAUST camshaft gear bolt (fig.26).

NOTE: It may be necessary to fit a breaker bar into the square drive provided in VS4984 Tool, to increase its counter-holding leverage.



4.6.9 Remove VS4984 Holding Tool from the camshaft gear and slowly turn the camshafts to position the 'timing flats' to achieve the correct alignment to the Setting Plate. This will allow the Camshaft Setting Plate to be bolted down, using the securing bolts provided, in order that the Plate rests fully on the surface of the cylinder head (fig.27).

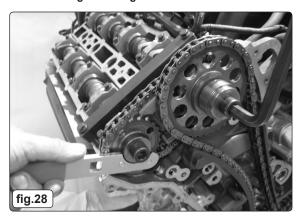
WARNING: The camshaft 'timing flats' MUST BE in correct alignment to the Setting Plates BEFORE the securing screws of the Setting Plates are tightened down. The action of tightening the securing screws of the Setting Plates MUST NOT be used to turn the camshaft to position the 'timing flats' alignment, as damage to the cylinder head will result.

4.6.10 Repeat this procedure on the other bank of camshafts.

NOTE: Discard the old camshaft gear bolts – always fit new camshaft gear bolts.

WARNING: Tightening procedure for camshaft gear bolts:-For early engines, Jaguar instructs that the EXHAUST camshaft gear bolt is tightened first, followed by the INLET gear bolt.

However, for later engines Jaguar and Land Rover instruct that the INLET camshaft gear bolts MUST BE tightened before the EXHAUST gear bolts, and a WARNING is given that failure to tighten the INLET camshaft gear bolts first, will result in engine damage.

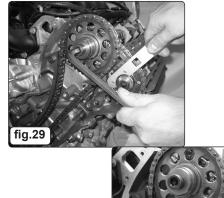


4.6.11 Fit new bolts and use VS4984 Holding Tool to counter-hold the exhaust camshaft gear. Tighten the new camshaft gear bolts to specified torque (fig.28).

4.7 Removal of timing chains and gears. Primary chains

- 4.7.1 Follow the procedure for "Checking valve timing", and fit the appropriate Flywheel Locking Pin and the Camshaft Setting Plates on both banks of camshafts.
- 4.7.2 Remove the crankshaft pulley following the procedure detailed earlier.
- 4.7.3 Remove the front timing chain cover and the VVT control solenoid housing, if fitted.
- 4.7.4 Commence work on the left-hand bank first as the primary chain from this bank is at the front of the crankshaft gear and therefore must be removed first to allow access to remove the other primary chain.

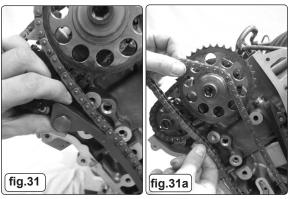
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4.7.5 Fit VS4984 Holding Tool to the EXHAUST camshaft gear and use to counter-hold whilst slackening the INLET camshaft gear bolt (fig.29). Continue to counter-hold and slacken the EXHAUST camshaft gear bolt (fig.29a).

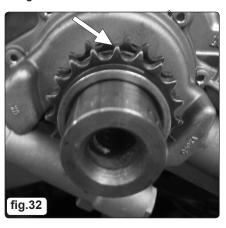


4.7.6 Remove the primary chain tensioner unit and back plate (fig.30).



- 4.7.7 Remove the chain guide rails (fig.31) and the primary chain (fig.31a).
- 4.7.8 Carry out the same procedure on the right-hand bank.

Crankshaft gears



4.7.9 **IMPORTANT:** The crankshaft gear is a two piece gear - make a note of the orientation of the gear teeth. The teeth of the left hand bank crankshaft gear (front) must be out of phase to the teeth of the right hand bank gear (rear) (fig.32).

Camshaft gears / Secondary chains



4.7.10 Remove the bolts of the inlet and exhaust camshaft gears and discard old bolts (fig.33).

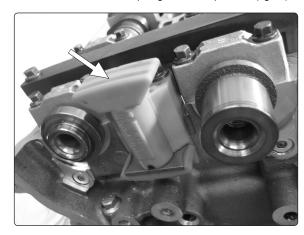


- 4.7.11 Remove the gears, secondary chains and chain tensioners (fig.34).
- 4.8 Installation chains and gears

NOTE: Early secondary chain tensioners must be de-pressurised before re-fitting.



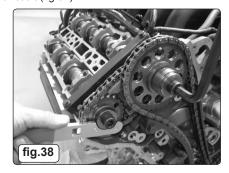
4.8.1 Insert VS4593-1A Depress Pin, from Kit VS4980, in to the hole in the tensioner to allow the plunger to be depressed (fig.35).



4.8.2 Working on the left-hand bank, re-fit the secondary chain tensioner to the engine and tighten bolts (fig.36).



4.8.3 Re-fit the camshaft gears together with the secondary chain. Screw in new gear bolts, finger-tight only, allowing the gears to turn, but not tilt (fig.37).



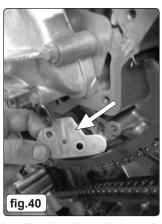
- 4.8.4 Fit VS4984 Holding Tool and rotate and position the gears to the most advantageous position in readiness for using the Holding Tool when tightening the gear bolts (NOTE: once the primary chain is fitted, the camshaft gears cannot be positioned to assist Tool positioning (fig.38).
- 4.8.5 Repeat this procedure on the right-hand bank camshaft gears.



- 4.8.6 Install the primary chain on the right-hand bank (right-hand bank primary chain is the rear chain on the crankshaft gear.
- 4.8.7 Fit the chain over the **INLET** camshaft gear and the crankshaft gear (fig.39).

IMPORTANT: Ensure that there is **NO SLACK** on the drive side of the chain and that the VVT Unit (if fitted), is **NOT** rotated on the camshaft.

- 4.8.8 Check that slack is on the tensioner side of the chain.Re-fit the chain guide rails and tighten the rail bolts.Repeat this procedure on the left-hand bank camshaft gears.
- 4.9 EARLY ENGINES
 Primary chain tensioners



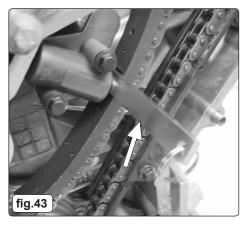
NOTE: When installing the primary chain tensioners, ensure that both the back plate and tensioner unit are re-fitted (fig.40), (the back plate creates the seal for the tensioner unit).



4.9.1 Insert VS4593-1A Depress Pin in to the centre of the tensioner plunger and press the Pin to de-press the plunger in to its retracted position (fig.41).



4.9.2 Fit the back plate and tensioner unit to the engine (fig.42).



VS4986 Tensioner Wedge Set

4.9.3 Fit the VS4986 Wedge between the tensioner plunger and the chain rail to fill any gap, removing slack from the chain (fig.43).

NOTE: VS4986 is a pair of Tensioner Wedges and can be used as a single Wedge or in a combination of two Wedges, dependant upon the gap between plunger and rail.





Tightening camshaft gear bolts:-

IMPORTANT: On early engines, Jaguar instruct that the EXHAUST camshaft gear bolt is tightened first, followed by the INLET gear bolt.

- 4.9.4 Tighten the EXHAUST camshaft gear bolt (fig.44).
- 4.9.5 Fit VS4984 Holding Tool to the EXHAUST gear and apply force to the Tool, in an anti-clockwise direction, in order to ensure slack on the secondary chain on the tensioner plunger side.
- 4.9.6 Whilst applying this force, tighten the EXHAUST camshaft gear
- 4.9.7 If engine does not have VVT, continue to apply force with VS4984 and tighten the INLET camshaft gear bolt (fig.45).

VS4987 VVT Setting Tool

Some early engines, are fitted with VTT, and it is necessary to use VS4987 Setting Tool before tightening the INLET camshaft gear bolt.

- 4.9.8 Fit VS4987 to the VVT Unit and rotate the Unit anti-clockwise to the fully retarded position. Then fit VS4984 Holding Tool to the EXHAUST camshaft gear and apply force in an anti-clockwise direction in order to ensure slack on the secondary chain on the tensioner plunger side.
- 4.9.9 Whilst continuing to apply this force, tighten the INLET camshaft gear bolt.
- 4.9.10 Repeat this procedure on the left-hand bank.

IMPORTANT: Remove all tools.

4.10 LATER ENGINES

Primary chain tensioners

These primary chain tensioners have a ratchet system on the tensioner plunger.

WARNING: When compressing the plunger DO NOT release the ratchet until the plunger has fully retracted into its bore or damage to the ratchet system will result.

The plunger is compressed using a vice, and retained in this position using VS4975T8 Locking Pin, from Kit VS4980.

- 4.10.1 Slowly compress the tensioner plunger using minimal force, and insert VS4975T8 Locking Pin to retain the retracted plunger position.
- 4.10.2 Fit the tensioner to the engine.
- 4.10.3 Pull out VS4975T8 Pin to actuate the plunger onto the chain rail.

Tightening camshaft gear bolts:-

4.10.4 Work on the right-hand bank.

IMPORTANT: On later engines, Jaguar and Land Rover instruct that the INLET camshaft gear bolt is tightened first, followed by the EXHAUST gear bolt.

WARNING: On these engines the INLET camshaft gear bolt MUST BE tightened before the EXHAUST camshaft gear bolt. Failure to tighten the INLET camshaft gear bolts first, will result in engine damage.

- 4.10.5 Fit VS4984 to the EXHAUST camshaft gear and apply force, in an anti-clockwise direction, to tension the primary chain on its drive side, allowing the tensioner plunger to fully extend outwards.
- 4.10.6 Whilst applying force with VS4984 Holding Tool, tighten the INLET gear bolt first, and then tighten EXHAUST gear bolt
- 4.10.7 Repeat procedure on the left-hand bank.

Environmental Protection



Recycle unwanted materials instead of disposing of them as waste. All tools, accessories and packaging should be sorted, taken to a recycling centre and disposed of in a manner which is compatible with the environment. When the product becomes completely unserviceable dispose of it according to local regulations.

NOTE: It is our policy to continually improve products and as such we reserve the right to alter data, specifications and component parts without prior notice. **IMPORTANT:** No liability is accepted for incorrect use of this equipment.

WARRANTY: Guarantee is 12 months from purchase date, proof of which will be required for any claim.



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