

AST5130

Diesel Engine Setting / Locking & Injection Pump Removal / Installation Kit



Auto Service Tools Ltd

AST5130 Diesel Engine Setting / Locking & Injection Pump R+I Kit

Kit Option:

AST5135 Updates AST4730 to include H.P. pump removal on 2.4L engines in Transit and Defender, (2006 onwards) with Denso common rail fuel systems.



| Item | Part Number | Description |
|--|-------------|--|
| AST5130 - Timing Setting / Locking Tool Set - items 1-8 | | |
| 1 | AST5131 | Engine Cover Aligner |
| 2 | AST5132 | Engine Cover / Crankshaft Seal Removal / Installation Tool |
| AST5135 - AST4730 Update (2.4L 06-) items 3 & 4 | | |
| 3 | AST5133 | High Pressure Pump Sprocket Retaining Tool |
| 4 | AST5134 | H.P. Pump Removal Tool |
| 5 | AST4727 | Flywheel Locking Pin (Gold) |
| 6 | AST4728 | Flywheel Locking Pin (Silver) |
| 7 | AST4730F1 | Locking Pin Set (3 x Pins) |
| 8 | AST4593-1F | Tensioner Locking Pin |
| - | AST5130-84 | Case + Insert |

Associated Tool:

AST4833 Auxiliary belt tensioner wrench
(Ford & Jaguar)

Applications:

FORD DURATORQ (PUMA)

2.0, 2.2, 2.4 & 3.2L Diesel engines in:

CITROËN

Relay Jumper III

FIAT

Ducato

FORD

Mondeo Transit

JAGUAR

X-Type

LAND ROVER

Defender

LDV

Convoy

PEUGEOT

Boxer III

2.0 Engines

ABFA, D3FA, D5BA, D6BA, F3FA, FIFA, FMBA, HJBA, HJBB, HJBC, HJBE, N7BA, N7BB

2.2 Engines (Chain driven H.P. pump)

QJBA(BG), QJBB, QJBC, QJBD

2.2 Engines (Camshaft driven H.P. pump)

4HM, 4HU, 4HV, P8FA, P22DTE, QVFA, QWFA

2.4 Engines

244DT, D0FA, D2FA, D2FB, D4FA, F4FA, FXFA, H9FA, H9FB, HEFA, HFFA, JXFA, PHFA, ZSD 424

3.2 Engines

SAFA (Engine timing only)

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

The Ford Duratorq (PUMA) 2.0, 2.2, 2.4 and 3.2 engines are twin camshaft, chain drive, direct injection diesel units.

There have been several changes to the fuel system of these engines since their introduction in 2000.

Early variants feature a standard 'distribution type' injection pump. This was replaced with a 'common rail' fuel injection system in 2002. Both systems use the camshaft/crankshaft timing chain to drive the diesel pump.

In 2006 a new Ford Transit was launched and the fuel system on the van based (2.4) engines was changed to a Denso common rail system. At the same time the 2.0 engine was replaced with a new 2.2 engine – this engine uses the inlet camshaft to directly drive the H.P. pump. The H.P. pump configuration on the 2.4 engine remained unchanged.

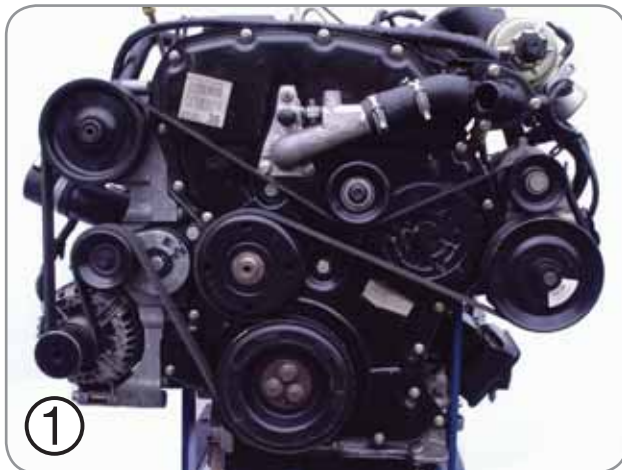
Section 1 - Engine Timing (Setting & Locking engine)... page 2

Section 2 - Fuel Injection Pump Removal / Installation... page 5

Section 1 - Engine Timing (Setting & Locking engine)

When carrying out service work on the timing chains, cylinder head, chain tensioner, etc, the crankshaft, camshaft and injection pump timing positions are retained with locking pins. The 3 pins of AST4730F1 set are required for the camshafts (x2) and injection pump (x1).

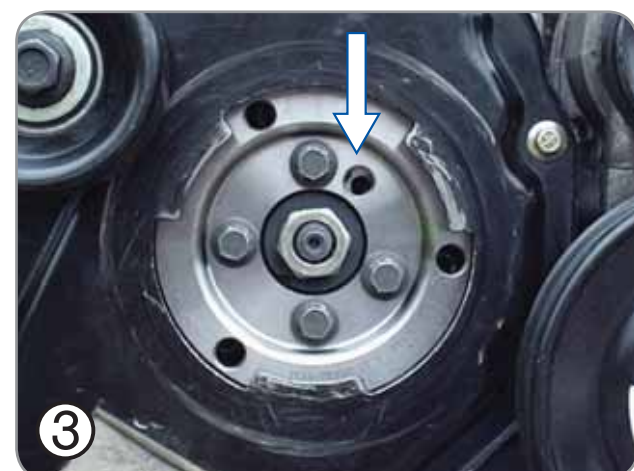
A larger locking pin is required for the flywheel (crankshaft). There are two types of locking pin, **Silver** for common rail engines, and **Gold** for non-common rail engines.



The timing chain cover must be removed to gain access to the camshaft sprockets, injection pump, timing chains etc. Removal of the timing cover requires disassembly/removal of a number of components including EVR valves, air intake ducting, radiator, viscous fan and auxiliary drive belt.

NOTE: When removing the timing chain cover, great care must be taken not to distort the cover. If the cover is damaged or distorted during removal, then a new cover should be used.

AST4727 / AST4728 Flywheel Locking Pins



Use the injection pump timing hole to help find the flywheel position for inserting the Locking Pin

To insert **AST4727** or **AST4728 Flywheel Locking Pin** in the correct datum hole, first remove the crankshaft position sensor and then position the flywheel by turning the crankshaft **clockwise** until the timing hole in the injection pump sprocket is positioned at a point **just before** it is fully aligned.

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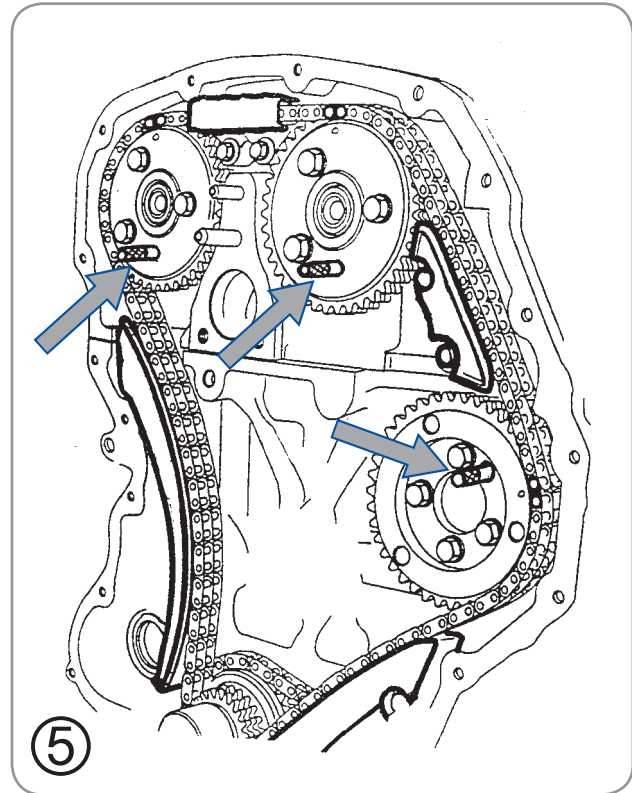


Engine shown with gearbox removed

Insert the Flywheel Pin through the sensor holder so it rests on the flywheel ring. Apply slight pressure to the end of the pin and turn the crankshaft slowly and carefully until the Pin engages the slot in the flywheel ring.

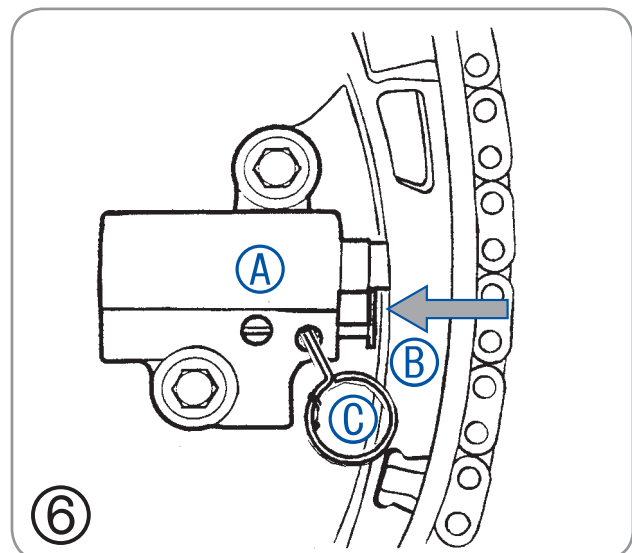
The crankshaft is now at 50° BTDC

WARNING: DO NOT use the Flywheel Locking Pin to counter-hold the crankshaft when releasing or tightening the crankshaft pulley bolts. The Flywheel Pin is located through the sensor holder which will be damaged if used to restrain the crankshaft. DO NOT turn the engine with the Flywheel Pin fitted



AST4730F1 Pin Set comprises 3 locking pins, 1 for each of the camshafts and 1 for injection pump timing.

Fit the 3 pins in position and release the camshaft sprocket bolts and the 4 injection pump sprocket bolts.



AST4593-1F Chain Tensioner Locking Pin

To remove the timing chain, the chain tensioner must be 'locked back' and removed.

Release (A) and simultaneously push back (B) and insert AST4593-1F Pin through the hole (C) to lock back tensioner.

Remove the tensioner, rail and chain guides. Mark the camshaft sprockets as "inlet" and "exhaust" before removing them, along with the injection pump sprocket and timing chain.

IMPORTANT: AST4730F1 Locking Pins are designed to allow removal of the sprockets without removing the timing pins. **DO NOT** remove the pins from their timing holes when sprockets have been removed.

When re-assembling the sprockets, chain and front end, ensure that the 3 copper coloured links on the timing chain align with the timing marks on all three sprockets, and the chain is taut on the non-tensioned side. Loosely fit the camshaft and injection pump sprocket bolts (finger tight only). Re-fit the chain guides and tensioner, then withdraw AST4593-1F Pin from the tensioner to activate it. Tighten all sprocket bolts to the specified torque and then remove the locking pins.

Timing check

To ensure engine timing is correct, turn the engine over, by hand, two revolutions, returning to 50° BTDC and insert the correct flywheel locking pin. Check that the 3 x AST4730F1 locking pins can be inserted into the timing holes of the camshafts and injection pump timing holes. If the 3 x AST4730F1 locking pins cannot be fitted then remove the chain and repeat the procedure, engine timing adjustment.

IMPORTANT: Do not slacken the sprocket bolts unless the locking pins are fitted. If only the injection pump locking pin will not enter – slacken the 4 sprocket bolts, turn pump shaft nut slightly until the pin enters, then tighten sprocket bolts.

Front cover Installation

NOTE: If the front cover is damaged or distorted from removal, then a new cover should be used.

When installing the engine front cover it must be correctly positioned relative to the crankshaft using AST5131 Engine Cover Aligner. This ensures that the crankshaft seal located in the engine front cover is correctly aligned and will not wear prematurely.

Ensure that the engine and front cover mating surfaces are clean and that any old sealant has been removed.



Locate AST5132 Engine Cover/Crankshaft Seal Tool onto the three holes of the crankshaft front oil seal. Then locate AST5131 Engine Cover Aligner onto AST5132 and remove the seal by rotating in an anti-clockwise direction.



Apply a 3mm bead of a suitable sealant around the contact face of the front cover. Fit the front cover to the engine and retain in place with a few bolts, loosely fitted.

NOTE: To ensure correct alignment, the cover must be free to move on the retaining bolts.



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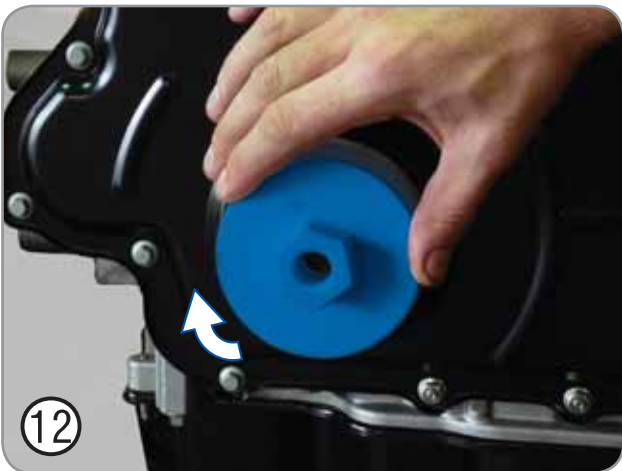
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Fit **AST5131 Engine Cover Aligner** on to the crankshaft and into the engine cover, ensuring that it is locating fully in the recess of the engine cover.

Whilst maintaining the position of the cover, fit and fully tighten all nuts and bolts that attach the front cover to the engine. Remove **AST5131 Engine cover aligner**.



NOTE: A new oil seal comes with a sleeve to aid fitment over the crankshaft.



Install the oil seal on to the crankshaft, ensuring that the seal retaining tabs are positioned behind the timing cover. Assemble **AST5132 Crankshaft Seal Tool** with **AST5131 Engine cover aligner** and fit into the three holes of the oil seal. Rotate the seal clockwise until it is locked in position.

Section 2 - Fuel Injection Pump Removal & Installation

WARNING: WAIT A MINIMUM OF 15 MINUTES AFTER STOPPING THE ENGINE BEFORE BEGINNING WORK ON THE HIGH PRESSURE FUEL SYSTEM.

NOTE: If a new injection pump is to be fitted, it must be configured to the PCM (Powertrain Control Module) using Dealer special equipment.

IMPORTANT: Fuel line connections and their surrounding areas must be thoroughly cleaned prior to dismantling. All fuel circuit openings should be blanked off immediately to prevent foreign matter from entering the fuel system. The components of the high pressure fuel system may fail prematurely if this is not observed. Once disconnected, the high pressure fuel lines that run from the pump to the injectors/fuel rail should be discarded and replaced.

The engine design allows the injection pump to be removed and installed without disturbing the engine timing.

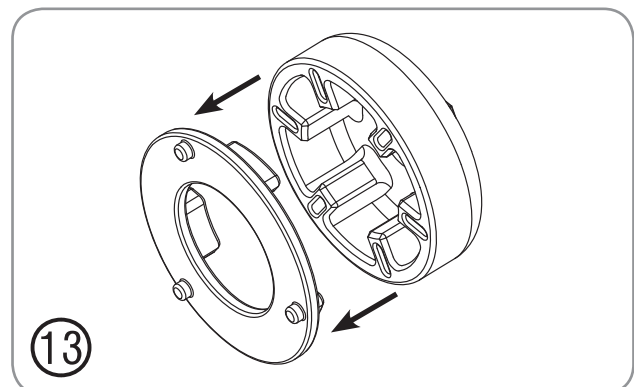
An aperture allowing access to the injection pump sprocket is provided in the front timing chain cover. Using **AST5133 Sprocket Retaining Tool** the sprocket can be held securely in place whilst the pump is removed.

The following instruction does not apply to the 2.2 engines with the H.P. pump driven from the rear of the inlet camshaft. Removal of the H.P. pump on these engines does not affect the timing system (no special tools are required).

For 2.4 TDCi Engines from 2006 with Denso common rail systems see instruction on page 8

TDDi & TDCi Fuel systems (NOT Denso)

NOTE: Highlighted text applies to **TDDi** fuel systems **only**



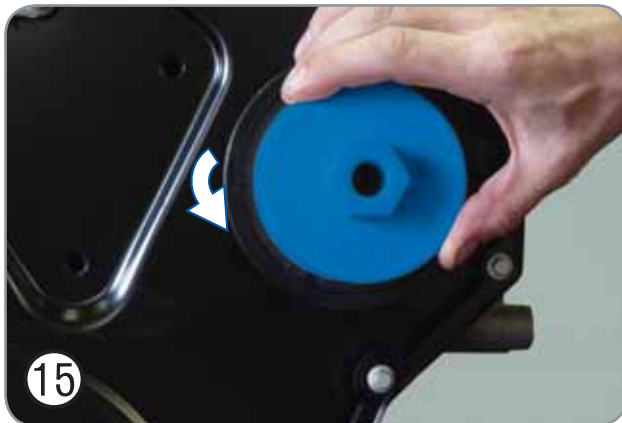
Assemble **AST5132 Engine Cover/Crankshaft Seal Tool** with **AST5131 Engine Cover Aligner**.

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With AST5132 located into the three holes of the access cover, rotate the tools in an anti-clockwise direction to remove the pump sprocket cover from the engine timing cover.

On engines with TDDi fuel systems it is necessary to lock the flywheel in its 'timed' position before removing the fuel pump.

On engines with TDCi fuel systems (NOT Denso) it is only necessary to visually position the timing hole in the pump sprocket before removing the fuel pump.

Removal

Rotate the engine in the normal direction of rotation whilst observing the fuel pump sprocket.



Position the timing hole in the pump sprocket to:

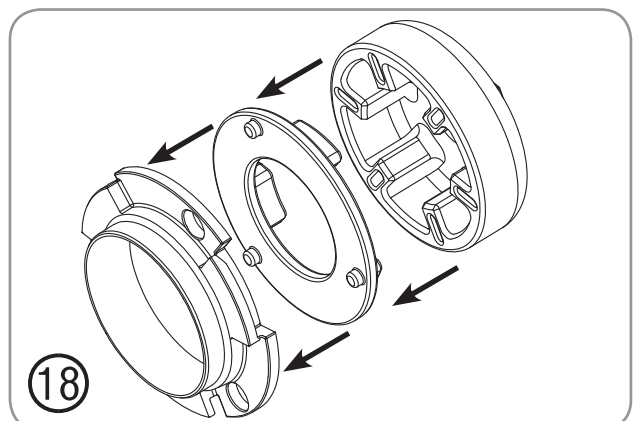
TDDi engines - 12 o'clock

TDCi engines - 1 o'clock

WARNING: DO NOT use the Flywheel Locking Pin to counter-hold the crankshaft when releasing or tightening the crank pulley bolt. The Flywheel Pin is located through the sensor holder which will be damaged if used to restrain the crankshaft. DO NOT turn the engine with the Flywheel Pin fitted.



Remove the crankshaft position sensor. Insert AST4727 Flywheel Locking Pin through the sensor holder so it rests on the flywheel ring. Apply slight pressure to the end of the pin and turn the crankshaft slowly and carefully until the Pin engages the slot in the flywheel ring. **The crankshaft is now at 50° BTDC.**



Assemble AST5133 Sprocket Retaining Tool, AST5132 Engine Cover/Crankshaft Seal Tool with AST5131 Engine Cover Aligner.

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Position the assembled tools through the access cover aperture and the recess of the pump sprocket, ensuring that the 3 tabs of **AST5133 Sprocket Retaining Tool** are positioned behind the engine front cover.

Rotate the assembled tools clockwise until they reach the stop position and then remove **AST5131 Engine Cover Aligner** and **AST5132 Engine Cover/Crankshaft Seal Tool**. The fuel pump sprocket is now secured in position.

WARNING: AST5133 Sprocket Retaining Tool **MUST NOT** be removed once the fuel pump bolts are released. If the pump sprocket is not secured correctly and moves, the timing cover will need to be removed to enable the engine timing and chain tensioner to be re-set.

Remove electrical connections to the fuel pump.
Remove all fuel line connections to the pump, fitting suitable blanking caps that will prevent foreign matter from entering the fuel system.



Using a Tx45 Drive Bit, locate and release the 3 bolts that secure the injection pump body. These bolts are accessed through the 3 holes in AST5133 Sprocket Retaining Tool.

NOTE: These securing bolts cannot be fully removed and remain in the sprocket throughout this procedure.



Remove the 4 injection pump sprocket retaining bolts, releasing the pump from the sprocket.

At the rear of the pump – slacken the bolts fixing the pump to its mounting bracket and remove the bolts fixing the bracket to the cylinder block.

Remove the pump, taking care to ensure that the spacer remains on the front flange.

Installation

Fit the H.P. pipes to the pump using new washers and fit the spacer and new gasket.



TDDi fuel systems only

Fit one of the AST4730F1 Locking Pins through the slot in the pump flange **prior to re-locating the pump**.

Clean and apply Loctite (270) to the three pump securing bolts and re-locate the pump on to the engine, screw the three bolts finger tight at this stage.

Loosely secure the mounting bracket at the rear of the pump to the cylinder block.

Fully screw in the four pump sprocket retaining bolts, then release them back ¼ turn.

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Tighten the three injection pump securing bolts using a suitable Tx45 Drive Bit to 22Nm and then fully tighten the sprocket retaining bolts to 32Nm.

Remove **AST5133 Sprocket Retaining Tool** securing the pump sprocket.

Tighten the four pump mounting bracket bolts to secure the bracket to pump and cylinder block.

TDDi fuel systems only

Remove **AST4730F1 Injection Pump Locking Pin**.

TDDi fuel systems only - Checking pump timing

Paint mark the crankshaft position on crank pulley and timing cover. Remove the Flywheel Locking Pin and turn the engine over twice, by hand, returning to the paint timing marks.

Fit **AST4727 Flywheel Locking Pin** into the flywheel sensor ring.

Check that pump timing is correct by ensuring that **AST4730F1 Pump Locking Pin** can be fully inserted.

WARNING: DO NOT remove the fuel pump bolts. If the pump sprocket is not secured correctly and moves, the timing cover will need to be removed to enable the engine timing and chain tensioner to be re-set.

Slacken the four sprocket retaining bolts.

WARNING: DO NOT use the fuel pump nut or bolts to adjust the timing chain tension.

Tension the timing chain by applying a force in an anti-clockwise direction to the pump sprocket using a screwdriver.

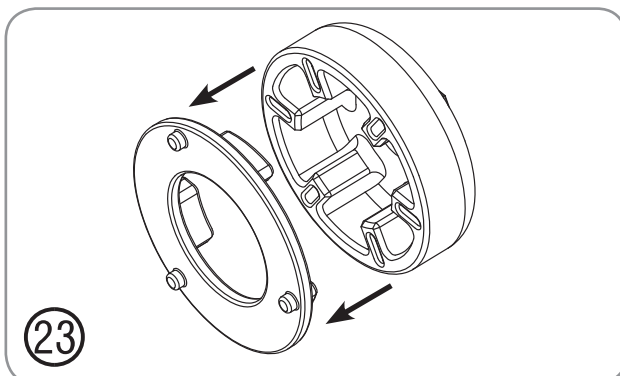
Tighten the sprocket retaining bolts to 32Nm and remove the **AST4730F1 Injection Pump Locking Pin**.

Remove **AST4727 Flywheel Locking Pin**.

Using **AST5132 Engine Cover/Crankshaft Seal Tool** with **AST5131 Engine Cover Aligner**, re-fit the pump sprocket access cover.

2.4 Engines from 2006 - Denso common rail system

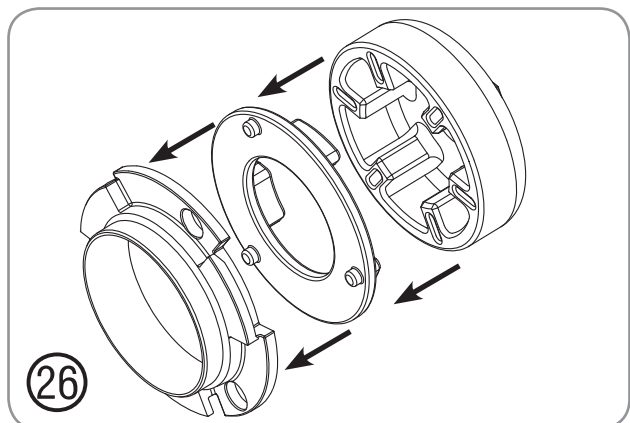
Removal



Assemble **AST5132 Engine Cover/Crankshaft Seal Tool** with **AST5131 Engine Cover Aligner**.



With **AST5132 Engine Cover/Crankshaft Seal Tool** located into the three holes of the pump sprocket access cover, rotate the tools anti-clockwise to remove the access cover from the timing chain cover.



Assemble **AST5133 Sprocket Retaining Tool**, **AST5132 Engine Cover/Crankshaft Seal Tool** with **AST5131 Engine Cover Aligner**.

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Fit the assembled tools into the access cover aperture and the pump sprocket, and then rotate the tools clockwise until they reach the stop position. The fuel pump sprocket is now secured in position.

WARNING: AST5133 MUST NOT be removed once the fuel pump bolts are released. If the pump sprocket is not secured correctly and moves, the timing cover will need to be removed to enable the engine timing and chain tensioner to be re-set.



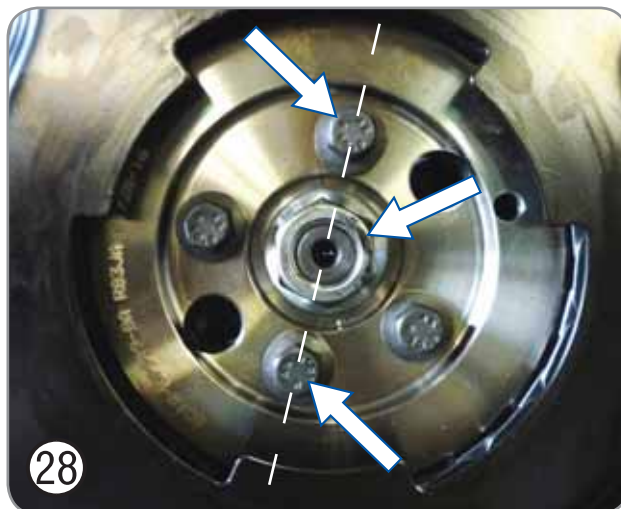
Fit **AST5134 H.P. Pump Removal Tool** and rotate the force screw in a clockwise direction, pushing the pump out of the sprocket. Support the fuel pump during this procedure to prevent it from falling. Remove the fuel pump.

Remove **AST5134 H.P. Pump Removal Tool** from the pump sprocket.

Installation

Clean the mating surfaces of the fuel pump and the engine. Replace the o-ring oil seal on the fuel pump.

Fit the fuel pump and two securing bolts at rear of the pump, tightening to 23Nm.



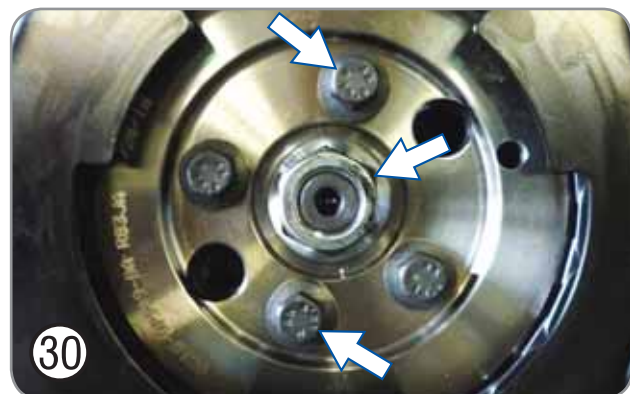
Shown without AST5133 fitted for clarity.

IMPORTANT: If the incorrect bolts are removed it will not be possible to install **AST5134 H.P. Pump Removal Tool** correctly. Ensure that AST5133 Pump Sprocket Retaining Tool is fitted before releasing sprocket bolts.

Remove the two sprocket bolts as shown and the central nut from the pump spindle.

Remove the electrical connections to the fuel pump. Remove all fuel line connections to the pump, fitting suitable blanking caps that will prevent foreign matter from entering the fuel system.

Remove the two securing bolts from the rear of the pump.



Refit the central nut to the pump spindle, tightening to 64Nm. Refit the two sprocket bolts and tighten to 33Nm.

Remove **AST5133 Pump Sprocket Retaining Tool** and refit the access cover to the timing chain.

Reconnect the low pressure fuel lines and electrical connections to the fuel pump.

Fit a **new** H.P. fuel line from the pump to the fuel rail. Fit both end nuts finger tight, then tighten to a final torque to 35Nm.

Using main dealer level special equipment, carry out the fuel injection pump learning procedure.