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IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY. NOTE THE SAFE OPERATIONAL REQUIREMENTS, WARNINGS AND 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. PLEASE KEEP INSTRUCTIONS SAFE FOR FUTURE USE.

1. SAFETY INSTRUCTIONS

- WARNING!** Ensure Health and Safety, local authority and general workshop practice regulations are adhered to when using tools.
 - 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.
 - 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. INTRODUCTION & APPLICATIONS

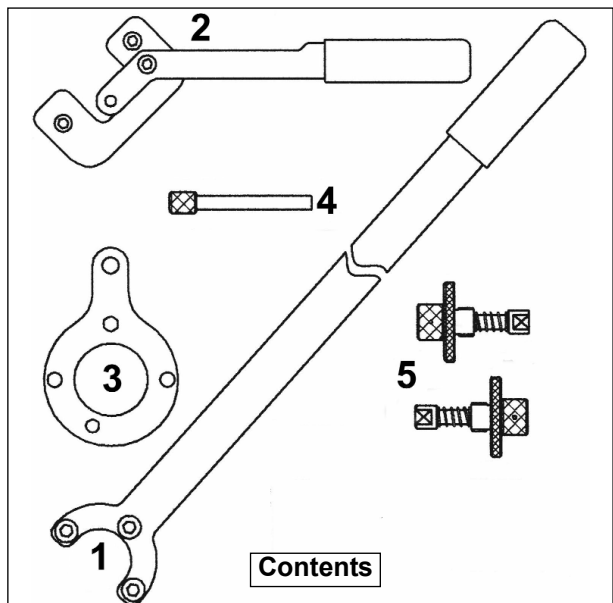
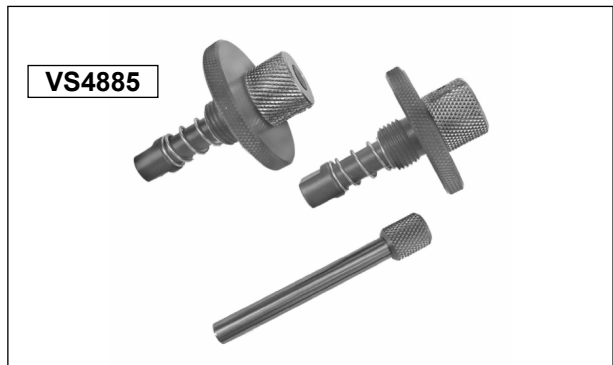
2.1 Introduction
 The Fiat 1.3JTD Multijet 16v range of engines are all twin camshaft, common rail diesels. The chain drive connects crankshaft to exhaust camshaft, which is in turn connected by rear gears to the inlet camshaft.

There are two kits of timing tools covering these engines. The kit required depends upon the level of repair work being undertaken on the engine.
VS4885: For straightforward checking and setting of camshaft/crankshaft timing.
VS4880: For locking and setting engine timing during engine / cylinder head overhaul - engine in-situ or removed from the vehicle.
NOTE: VS4880 Kit includes the timing tools included in **VS4885 Kit**.

2.2 Applications
 FIAT 1.3JTD MULTIJET 16v Diesel engine fitted to:
FIAT: Doblo, Doblo Cargo, Idea, Panda, Punto
Engine Codes: 188A8.000 and 188A9.000

3. CONTENTS

| ITEM | PART NO. | DESCRIPTION |
|------|-----------|--|
| 1 | VS4882 | Crankshaft Pulley Flange Holding Tool |
| 2 | VS4883 | Timing Chain Tensioner Tool |
| 3 | VS4884 | Crankshaft Timing Position Tool |
| 4 | VS4881 | Flywheel Locking Pin |
| 5 | VS4771 | Camshaft Setting Tools (Pair) |
| -- | VS4880-84 | Case and Insert (not shown) |
| | | (VS4880 Overhaul Timing Tool Kit - items 1-5) |
| | | (VS4885 Locking Tool Kit - items 4-5) |



4. INSTRUCTIONS

Built into the design and construction of these engines are a number of features to minimise the level of dis-assembly required during repair work. These features are particularly relevant to maintaining engine timing during removal of the cylinder head/camshafts. With the use of the special tools in the Overhaul Timing Tool Kit (**VS4880**), the camshafts can be removed without disturbing front-end timing, sprockets, and timing chain, or removing the front timing chain covers.

4.1. LEVEL 1: Engine Timing (Setting/Locking) using VS4885 Set

Checking timing

Engine timing position is established at both camshafts using **VS4771** Setting Tools, and at the flywheel (for crankshaft position), using **VS4881** Locking Pin.

Both of the camshafts have a 'timing position slot' and are locked in timed position by **VS4771** Setting Tools, which screw into the camshaft housing and locate into the 'timing position slots' (**Fig.1**).

NOTE: To access the blanking plugs in the camshaft housing, which are removed in order to insert **VS4771** Setting Tools, it is necessary to detach the fuel rail and engine management wiring harness and disconnect glow plug, injector and sensor plugs.

4.1.1. VS4771 Camshaft Setting Tool Set (Pair)

VS4771 Setting Tools have spring loaded spindles on the end of which are 'flats' which engage the 'timing position slots' in the camshafts.

IMPORTANT: When fitting the **VS4771** Tools, the 'flats' must be maintained in a horizontal position. Their horizontal plane is confirmed by the roll pin in the spindle knob being on 'top' position (uppermost) (**Fig.2**).

Remove the blanking plugs and screw in **VS4771** Setting Tools (**Fig.3**). Using the roll pin in the spindle knob as a guide, ensure the flats on the ends of the spindles are horizontal.

Slowly turn the engine in its normal direction of rotation.

IMPORTANT: Ensure the spindles are held horizontal as they may rotate as the camshafts turn.

As the ends of the spindles engage the slots in the camshaft an audible 'click' will be heard as the springs activate the spindles.

4.1.2. VS4881 Flywheel Locking Pin

The crankshaft timing position is established by **VS4881** Locking Pin locating into the flywheel via a datum hole in the gearbox bell housing (**Fig.4**).

4.2. LEVEL 2: Engine Overhaul Timing using VS4880 Kit

By using the specialised timing tools in **VS4880** kit, the design of the 1.3JTD engines provides for removal and service work on the cylinder head, camshafts, gaskets etc., in-situ, without disturbing engine timing and without removal of the timing chain, tensioner and front cover assembly.

When undertaking removal/dis-assembly of cylinder head/camshafts, AC and coolant systems will need to be drained and disconnected, and the fuel system, including common rail components and injectors etc., will have to be removed.

4.2.1. 'Service hatches'

To provide for cylinder head/camshaft removal without disturbing the front chain cover, access to the exhaust camshaft sprocket retaining bolt and the timing chain tensioner is provided via 'service hatches' in the front timing cover (**Fig.5**).

With the camshafts and crankshaft 'locked' in timed position with **VS4771** and **VS4881** (refer to "Checking timing"), the crankshaft gear centre bolt is released using **VS4882** Holding Tool. The exhaust camshaft sprocket is separated from the camshaft with the chain still fitted, and is retained by the internal contours of the front cover, thus maintaining the timing chain position. When required, the chain tensioner is retracted or applied using **VS4883** Tensioner Tool via the 'service hatch' provided.

Fit both **VS4771** Camshaft Setting Tools to 'lock' the camshafts in timed position
IMPORTANT: Both tools must be fitted to ensure both camshafts are correctly positioned.

Fit **VS4881** Flywheel Locking Pin to position the crankshaft in timed position.

4.2.2. Crankshaft Gear

The crankshaft gear must be 'free to turn' on the crankshaft. It is fixed to the crankshaft via the crankshaft pulley flange and centre bolt

WARNING: This centre bolt has a **LEFT-HAND THREAD** and a **high torque loading**.

Remove the crankshaft pulley (4 bolts) to access the pulley flange.

4.2.3. VS4882 Crankshaft Pulley Flange Holding Tool

Attach **VS4882** Holding Tool to the pulley flange at **all 3 securing points**, using the 3 bolts provided, and use it to retain and counter-hold the flange whilst releasing the centre bolt (left-hand thread) (**Fig.6**).

IMPORTANT: The engine **MUST BE** correctly supported, as it is necessary to remove the timing side engine mounting to give access to the 'service hatches' in the front cover.

Fig.1

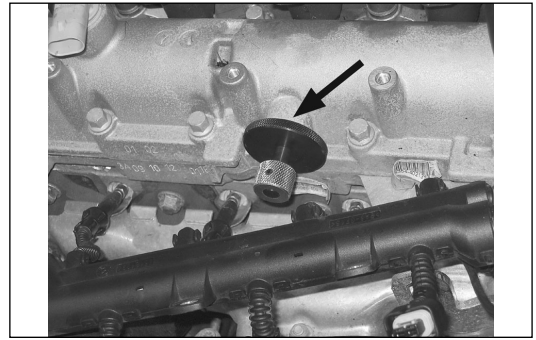


Fig.2

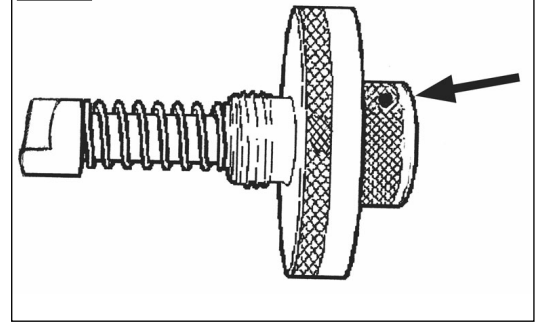


Fig.3

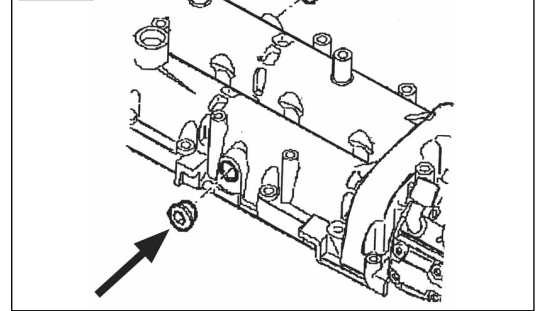


Fig.4

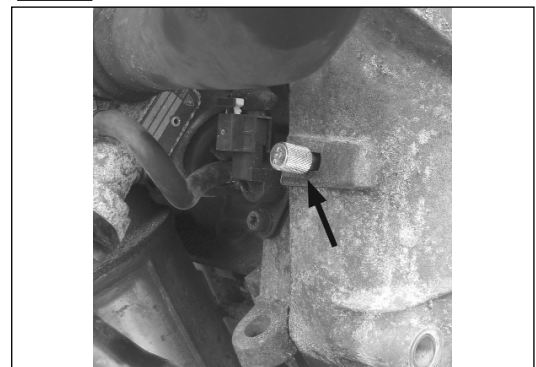
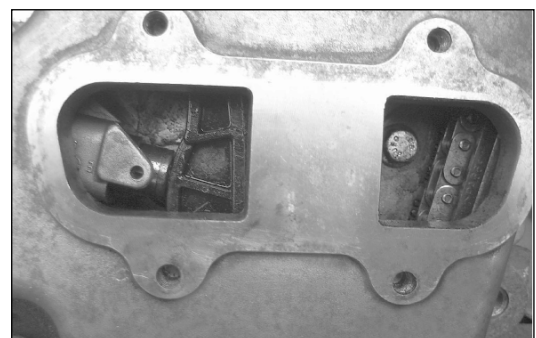
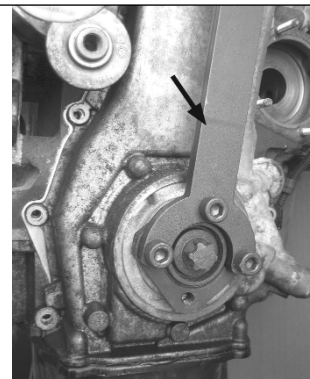


Fig.5



Unscrew and remove the sprocket service plug 'A' and the sprocket securing bolt 'B'. Unscrew the bolts retaining service hatch cover 'C' and remove the service hatch cover complete with gasket (Fig.7).

Fig.6



4.2.4. Understanding the operation of the chain tensioner.

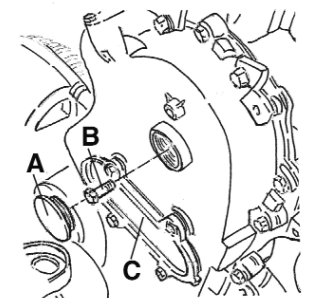
WARNING: Prior to extracting the camshaft sprocket from the end of the camshaft it is important to understand the working of the chain tensioner:-

The chain tensioner has an internal ratchet 'notch' system, which will not allow the plunger to be retracted away from the timing chain unless the plunger has first been allowed to **extend fully outwards**.

There are 5 'notch positions' to fully retract the plunger. However if the tensioner plunger has not been allowed to extend fully out to its maximum extended position it will not retract back further than the next notch position.

NOTE: If the plunger is not in its fully extended position it will lock as Tensioner Tool VS4883 is used to lever back the plunger to retract it, and tool damage will result if force is applied. The plunger must first be allowed to extend fully outwards before it can be levered back to take tension off the chain (Fig.8).

Fig.7



The exhaust camshaft sprocket can now be extracted from the end of the camshaft, with the assistance of a magnet and a **very slight** retraction of the tensioner plunger via pressure on the chain guide rail - see chain tensioner note above. The contoured shape of the front cover will retain the sprocket in a location approximate to the end of the camshaft. The chain tensioner plunger should extend fully outwards, taking up any slack in the chain and avoiding the links kinking at the crankshaft gear. The camshafts, cylinder head etc. can now be removed for service work.

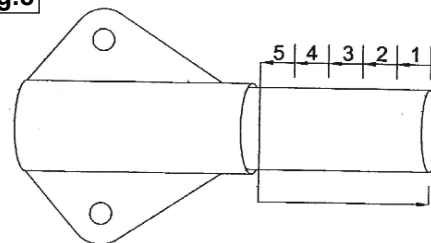
4.2.5. VS4883 Timing Chain Tensioner Tool

The VS4883 Tensioner Tool is used to first retract and then release the timing chain tensioner plunger (via action on the chain guide rail), when fitting the exhaust camshaft sprocket back onto the camshaft.

Fit the VS4883 Tensioner Tool on to the RIGHT-HAND SIDE of the LEFT-HAND window of the 'service hatch', securing in place, with the two bolts provided, into the holes for the hatch cover. Ensure that the pin on the end of the lever reacts on the chain guide rail close to the tensioner plunger (Fig.9).

WARNING: Prior to applying leverage to retract the tensioner plunger, ensure that the plunger has fully extended outwards - refer to "Understanding the operation of the chain tensioner".

Fig.8



Pull the lever to the right to retract the tensioner plunger (4 notches) and hold back in this position, to remove tension off the chain.

NOTE: During initial removal of the camshaft sprocket, the chain links may have kinked at the crankshaft gear now preventing the camshaft sprocket from lifting on to the end of the camshaft. As the crankshaft gear is free to turn - simply rotate to straighten out the chain links as the sprocket is fitted onto the camshaft.

Screw in the camshaft sprocket securing bolt to finger-tight.

Pull the Tensioner Tool lever to the right to its final (5th) notch and release the lever allowing the plunger to **extend outwards** and apply tension to the chain.

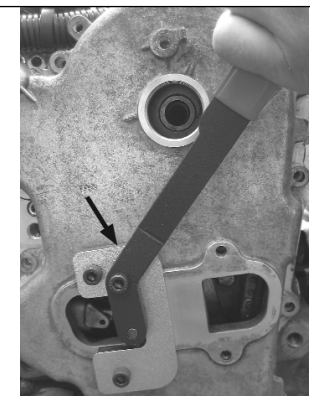
Check the plunger is in contact with the chain guide rail.

Tighten the camshaft sprocket retaining bolt to specified torque.

Replace 'service hatch' plug and cover/gasket. Replace timing side engine mounting bracket.

Tighten the crankshaft pulley flange centre bolt to specified torque (**Left-Hand threaded bolt**).

Fig.9



VS4884 Crankshaft Timing Position Tool (engine out of vehicle)

Should it be necessary to remove the engine out of the vehicle, and disconnect it from the gearbox, to carry out repair work, then the VS4881 Flywheel Locking Pin cannot be used to position the crankshaft in its timed position.

VS4884 Positioning Tool is used in place of the VS4881 to establish and lock the crankshaft with the flywheel removed (Fig.10).

VS4884 should be secured in place with at least 3 bolts.

When ready to re-install the engine and setting the engine in timed position, the crankshaft is 'locked' with VS4884, and the camshafts 'set' with VS4771 Setting Tools. The crankshaft gear and camshaft sprocket should be 'free to turn' and tension off the chain. Tighten the crankshaft pulley flange centre bolt first (counter-hold with VS4882), followed by the camshaft sprocket bolt. Ensure that the chain tensioner plunger is applying tension to the chain rail, as detailed earlier.

Once the engine is installed, the engine timing should be re-checked - refer to "Checking timing".

Fig.10



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.

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

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