7 Timing chains - removal, inspection and installation

Note:
A new timing chain tensioner cover plug seal will be required on installation.

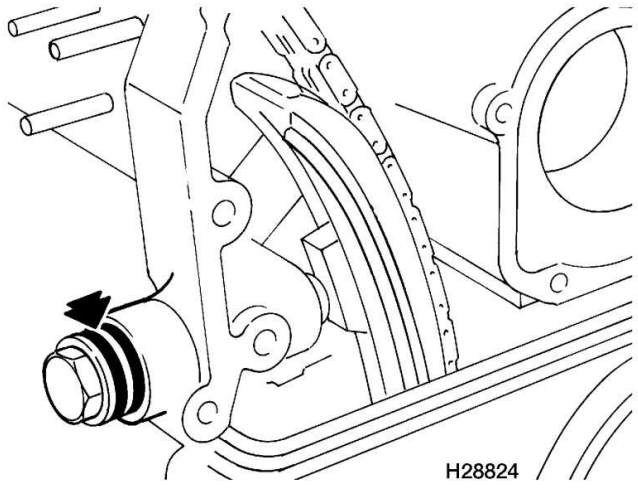
Removal

1 Position No. 1 piston at TDC, and lock the flywheel in position (see Section 3).

2 Remove the upper and lower timing chain covers (see Section 6).

3 Unscrew the chain tensioner plug from the right-hand side of the engine. Recover the sealing ring **(see illustration)** .

7.3 Unscrew the chain tensioner plug (arrow)



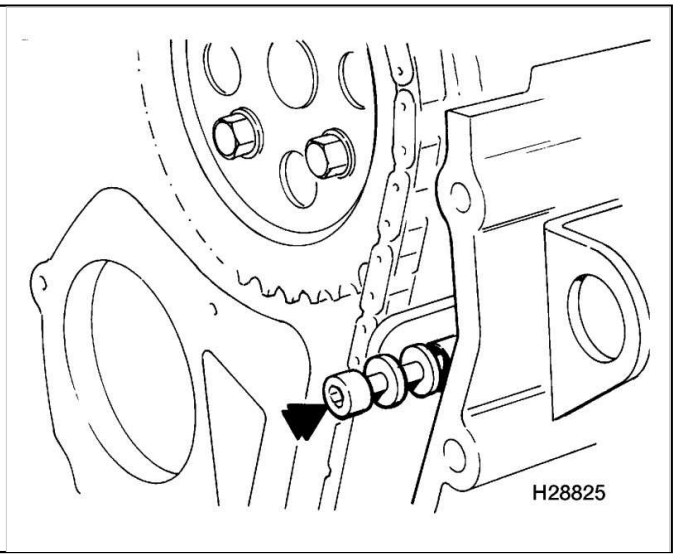
4 Withdraw the timing chain tensioner assembly from its housing.

5 Unscrew the securing bolts, and withdraw the upper chain guide from the cylinder head **(see illustration)** .

7.5 Upper chain guide securing bolts (arrows)

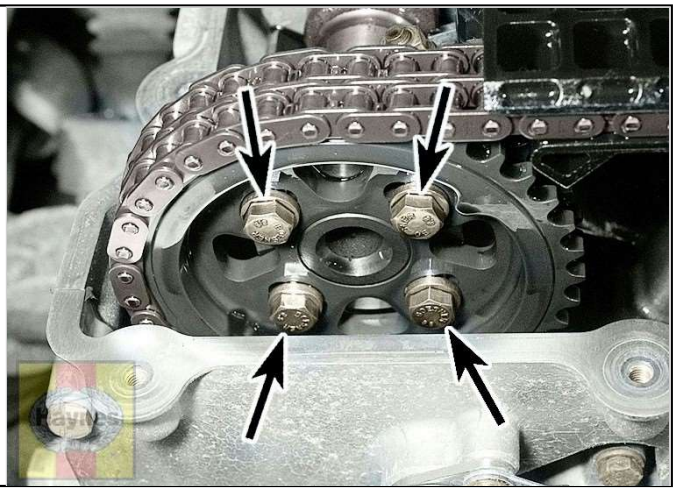
6 Unscrew the upper securing bolt from the left-hand chain guide **(see illustration)** .

7.6 Unscrew the upper securing bolt (arrow) from the left-hand chain guide

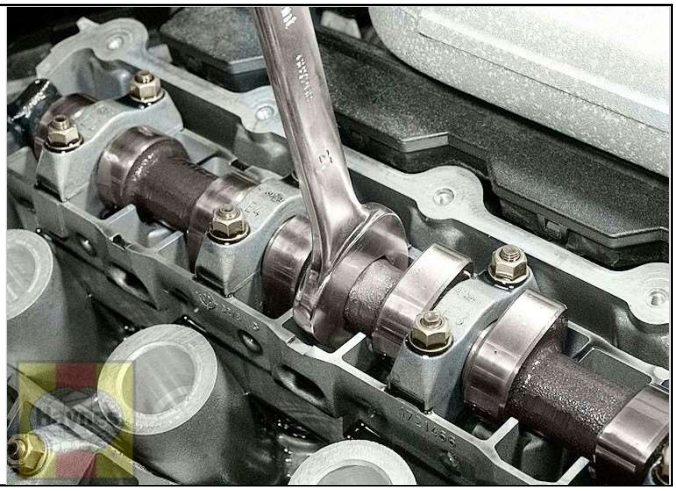


7 On M44 engines, note the position of the sensor wheel on the intake camshaft. Unscrew the bolts securing the chain sprockets to the camshafts. Take care not to move the camshafts - if necessary, the camshafts can be counterheld using a 27 mm wrench on the flats provided between No. 5 and 6 cam lobes **(see illustrations)** .

7.7a Unscrew the camshaft sprocket securing bolts (arrows)



7.7b If necessary counterhold the camshafts using a wrench on the flats provided

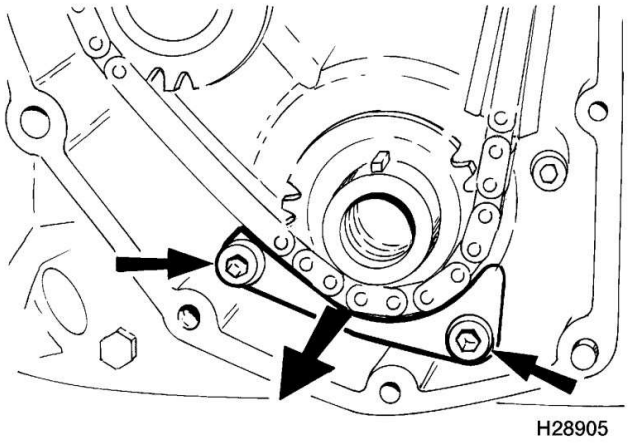


8 Withdraw the sprockets from the camshafts, and disengage them from the chain. Note which way the sprockets are fitted to ensure correct installation.

9 Note the routing of the chain in relation to the sprockets, tensioner rail and the chain guides.

10 Unscrew the securing bolts, and remove the lower chain guide **(see illustration)** .

7.10 Unscrew the securing bolts (arrows) and remove the lower chain guide



11 Manipulate the tensioner rail as necessary to enable the chain to be unhooked from the idler sprocket and crankshaft sprocket and lifted from the engine. **Caution:** *Once the timing chain has been removed, do not turn the crankshaft or the camshafts, as there is a danger of the valves hitting the pistons.*

12 If desired, the tensioner rail can now be removed after removing the clip from the lower pivot.

13 Similarly, the left-hand chain guide can be removed after unscrewing the remaining bolts.

Inspection

14 The chain should be renewed if the sprockets are worn or if the chain is worn (indicated by excessive lateral play between the links, and excessive noise in operation). It is wise to replace the chain in any case if the engine is disassembled for overhaul. Note that the rollers on a very badly worn chain may be slightly grooved. To avoid future problems, if there is any doubt at all about the condition of the chain, replace it.

15 Examine the teeth on the sprockets for wear. Each tooth forms an inverted “V”. If worn, the side of each tooth under tension will be slightly concave in shape when compared with the other side of the tooth (i.e., the teeth will have a hooked appearance). If the teeth appear worn, the sprockets must be renewed. Also check the chain guide and tensioner rail contact surfaces for wear, and replace any worn components as necessary.

Installation

16 Ensure that No. 1 piston is still positioned at TDC, with the crankshaft locked in position. Check the position of the camshafts using the template.

17 Where applicable, install the tensioner rail and the left-hand chain guide. Install the two lower chain guide securing bolts, but do not tighten them at this stage. Do not fit the upper securing bolt at this stage.

18 Engage the chain with the crankshaft sprocket, then install the lower chain guide and tighten the securing bolts.

19 Lay the chain in position around the left-hand chain guide and the tensioner rail, ensuring that the chain is routed as noted before removal.

20 Manipulate the camshaft sprockets until the timing arrows on the sprockets are pointing vertically upwards, then engage the chain with the sprockets.

21 Fit the sprockets to the camshafts, ensuring that the sprockets are installed the correct way as noted before removal. On M44 engines, install the sensor wheel on the intake cam sprocket with the arrow on the sensor wheel pointing up, and then install the sprocket securing bolts.

22 Tighten the sprocket securing bolts to the specified torque - if necessary, the camshafts can be counterheld using a 27 mm wrench on the flats provided between No. 5 and 6 cam lobes.

23 Install the upper securing bolt to the left-hand chain guide, but do not tighten it at this stage.

24 Install the upper chain guide and tighten the securing bolts.

25 The timing chain tensioner must now be fitted. **Note:** *The M44-style tensioner can be retrofitted to an M42 engine.* Before fitting, check that the tensioner plunger is retracted. If a new tensioner is being fitted, it should be supplied with the plunger already in the retracted position.

26 On M42 engines, retract the tensioner as follows. **Caution:** *It is essential that the following procedure is carried out to ensure that the tensioner plunger is retracted. If the plunger is not fully retracted, it can lock in the extended position, causing the tensioner or timing chain to break, resulting in expensive engine damage.*

A. Hold the tensioner upright, then knock the bottom end of the tensioner sleeve sharply on a solid surface such as a vise. This should cause the plunger to jump out of the end of the tensioner sleeve. Lift out the plunger and the spring.

B. Note the locations of the two circlips on the plunger (see illustration).

C. Thoroughly clean the components.

D. Ensure that the circlips are correctly located in their respective grooves on the plunger.

E. Slide the spring into the sleeve, and engage the plunger with the end of the spring.

F. Clamp the assembly in a vise, with the plunger resting in the sleeve so that both circlips are still visible.

G. Tighten the vise to compress the plunger into the sleeve, until the first snap-ring engages with the groove in the sleeve (see illustration).

H. Tighten the vise further to compress the plunger into the sleeve until the second snap-ring is heard to engage positively (see illustration). Do not push the plun-ger too far into the sleeve, or the snap-ring will be released, unlocking the plunger.

I. Loosen the vise - the plunger should stay retracted in the sleeve.

J. If the plunger comes out of the sleeve as the vise is loosened, or if the overall length of the tensioner assembly is greater than specified, then the procedure in paragraphs a) to i) must be repeated (see illustration).

7.26a Timing chain tensioner components (M42 engine)

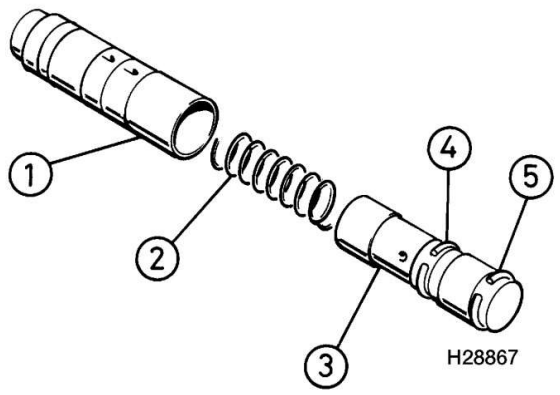
1 Sleeve

2 Spring

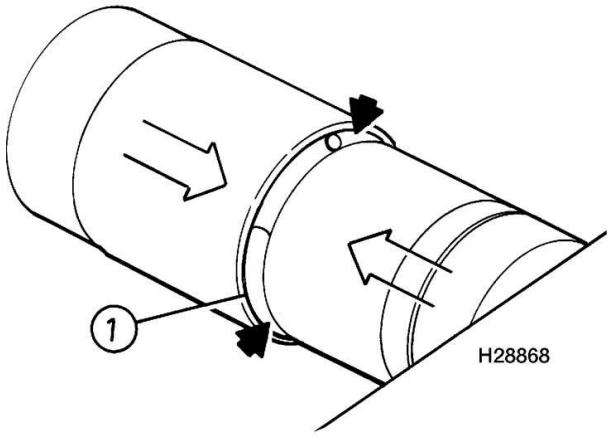
3 Plunger

4 Snap-ring

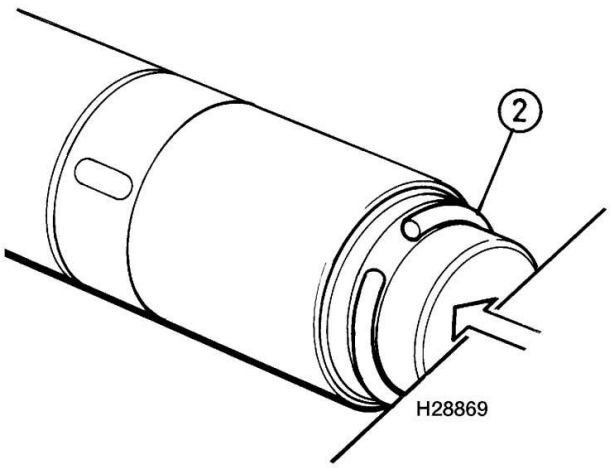
5 Snap-ring



7.26b Compress the tensioner until the first snap-ring (1) engages with the groove in the sleeve . . .

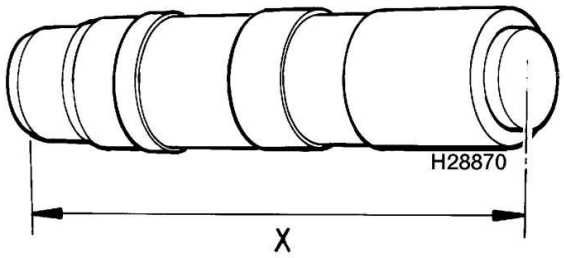


7.26c . . . then compress the tensioner further until the second snap-ring (2) is engaged positively (M42 engine)



7.26d Measure the overall length of the tensioner (M42 engine)

Dimension X = 2.70 inches (68.5 mm)

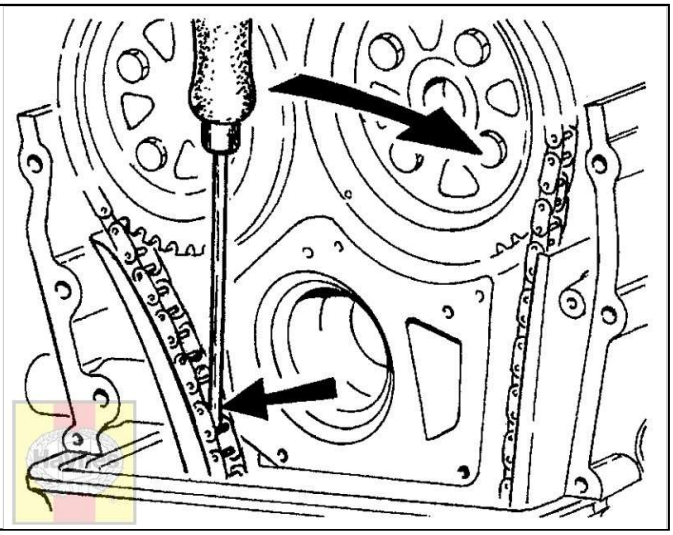


27 On M44 engines, place the tensioner between the jaws of a bench vise. Make sure the bench vise jaws are lined with soft jaw pads to protect the tensioner. Carefully squeeze the tensioner piston to expel the oil from the tensioner. Compress the piston to the second circlip (the one near the end). Repeat this procedure twice to ensure that all old oil has been removed from the tensioner.

28 Install the tensioner assembly, ensuring that it is fitted with the plunger against the tensioner rail, then install the tensioner plug using a new sealing ring. Tighten the plug to the specified torque.

29 On M42 engines, using a screwdriver, lever the timing chain and tensioner rail against the tensioner until the tensioner plunger is released from the sleeve to tension the chain **(see illustration)** . (This step is unnecessary on M44 engines, or if you're retrofitting an M44-style tensioner to an M42 engine.)

7.29 Lever the timing chain and tensioner rail until the tensioner plunger is released (M42 engine)



30 Once the chain is under tension, the left-hand chain guide securing bolts can be tightened. Using feeler gauges, position the guide to give an equal clearance between each side of the guide and the chain, then tighten the securing bolts.

31 Install the timing chain covers (see Section 6).

32 Remove the flywheel locking tool and the camshaft positioning template, and install the valve cover as described in Section 4 . **Caution:** *When the engine is first started, it must be run at a speed of 3500 rpm for 20 seconds as soon as it starts - this is to ensure that the tensioner is primed with oil. A loud rattling sound will be heard until the tensioner is primed - do not be alarmed by the noise!*