



**Haynes**  
shows you how

BMW 3-Series (92-98) & Z3 (96-98) Haynes Online Manual

## 7 Timing chains - removal, inspection and installation

### Secondary (exhaust-to-intake camshaft) chain

#### 1992 models

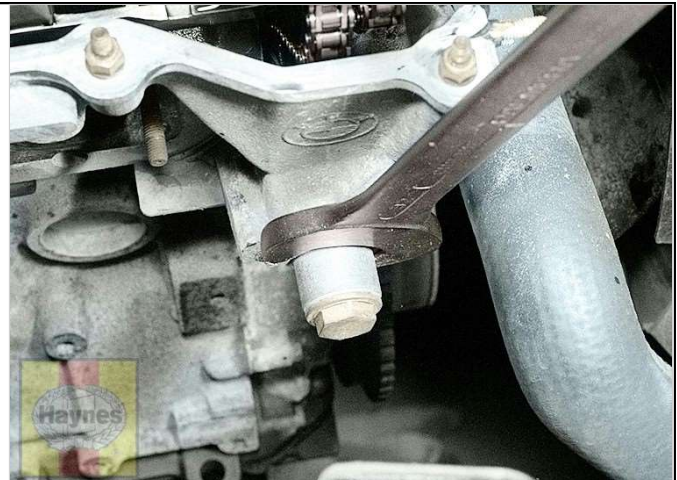
##### Removal

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

2 Remove the upper timing chain cover, (see [Section 6](#)).

3 Unscrew the primary timing chain tensioner plunger cover plug from the right-hand side of the engine. Recover the sealing ring (see illustrations) . **Warning:** *The chain tensioner plunger has a strong spring. Take care when unscrewing the cover plug.*

#### 7.3a Using a wrench . . .



**7.3b . . . unscrew the primary timing chain tensioner assembly**



4 Recover the spring and withdraw the tensioner plunger.

5 Press the secondary timing chain tensioner pad down, and lock it in position using a tool made up from a length of welding rod or similar material. Insert the tool through the holes in the top of the tensioner to hold the tensioner plunger down (see illustration) .

**7.5 Lock the secondary chain tensioner pad down using a length of rod (arrow)**



6 Unscrew the bolts securing the chain sprockets to the camshafts (see illustration) . Take care not to move the camshafts - if necessary, the camshafts can be counterheld using a 24 mm wrench on the flats provided between No. 10 and 11 cam lobes.

**7.6 Unscrew the bolts securing the secondary chain sprockets to the camshafts**



**7 Withdraw the sprockets, complete with the secondary chain, from the front of the camshafts (see illustration)**

**7.7 Withdraw the sprockets complete with the secondary timing chain**



**8 Recover the camshaft position sensor plate from the front of the intake camshaft (see illustration) .**

**7.8 Recover the camshaft position sensor plate from the inlet camshaft**



## Inspection



9 The chain should be replaced 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.

10 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 replaced. Also check the chain guide and tensioner contact surfaces for wear, and replace any worn components as necessary.

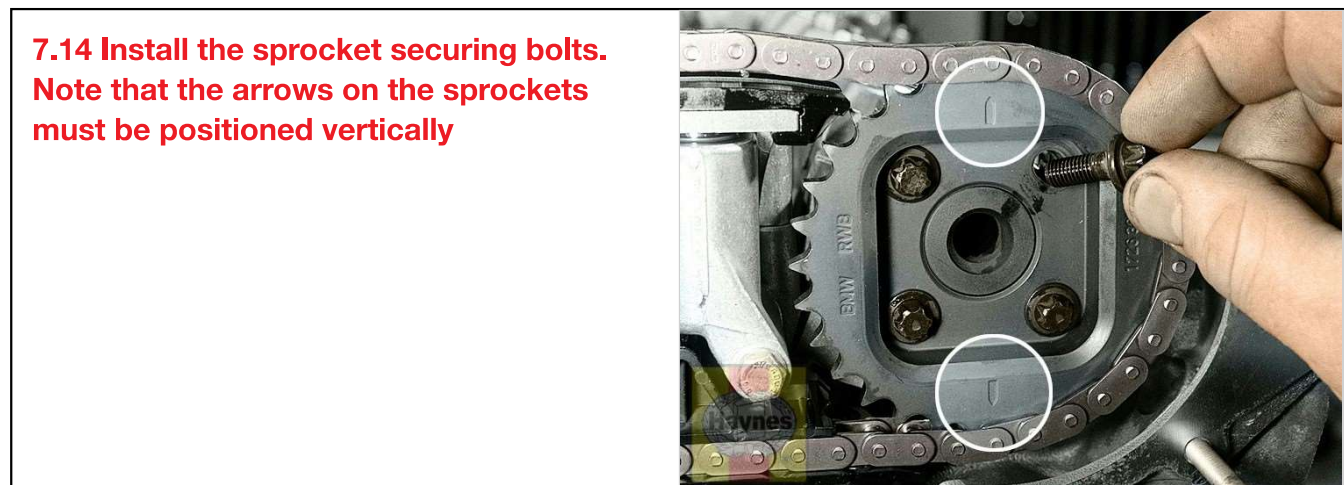
## Installation

11 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 described in [Section 3](#).

12 Where applicable, fit the camshaft position sensor plate to the intake camshaft.

13 Lay the chain over the sprockets, ensuring that the arrows on the front faces of the sprockets are pointing upwards (note that some sprockets have two arrows, which must point vertically up and down), then position the sprockets on the camshafts.

14 Install the sprocket securing bolts and tighten them finger-tight only at this stage (see illustration).



15 Install the primary timing chain tensioner plunger, ensuring that the guide lugs engage with the tensioner rail.

16 Fit the tensioner spring, then fit the cover plug, using a new seal, and tighten the plug to the specified torque.

17 Remove the tool locking the secondary timing chain tensioner in position.

18 Again, check the position of the camshafts using the template, then tighten the intake camshaft sprocket securing bolts to the specified torque in the two stages given in the Specifications.

19 Similarly, tighten the exhaust camshaft sprocket bolts to the specified torque.

20 Withdraw the flywheel locking rod from the timing hole in the cylinder block, and where applicable remove the template from the camshafts.

21 Rotate the engine through two complete revolutions clockwise (note that the engine is easier to turn with the spark plugs removed), then install the locking rod to the timing hole in the cylinder block, ensuring that the tool engages with the flywheel, and check that the template can be refitted to the camshafts without turning the camshafts (the timing arrows on the camshaft sprockets should be pointing vertically upwards). If not, the secondary timing chain and/or sprockets have been incorrectly installed.

22 Remove the camshaft template from the cylinder head, and remove the locking rod from the flywheel (install the blanking plug to the timing hole).

23 Install the upper timing chain cover (see [Section 6](#) ).

## 1993 and later models

### Removal

24 Remove the VANOS adjustment unit (see [Section 9](#) ).

25 Remove the exhaust camshaft sprocket securing bolts (the bolts should already have been loosened), and withdraw the thrust plate from the sprocket.

26 Unscrew the intake camshaft sprocket securing nuts, and withdraw the thrust plate from the front of the sprocket.

27 Withdraw the sprockets, complete with the secondary chain, from the front of the camshafts.

28 If desired, the camshaft position sensor plate can be removed from the front of the intake camshaft as follows.

A. Unscrew the three securing studs from the camshaft flange.

B. Withdraw the thrust plate.

C. Withdraw the sensor plate.

### Inspection

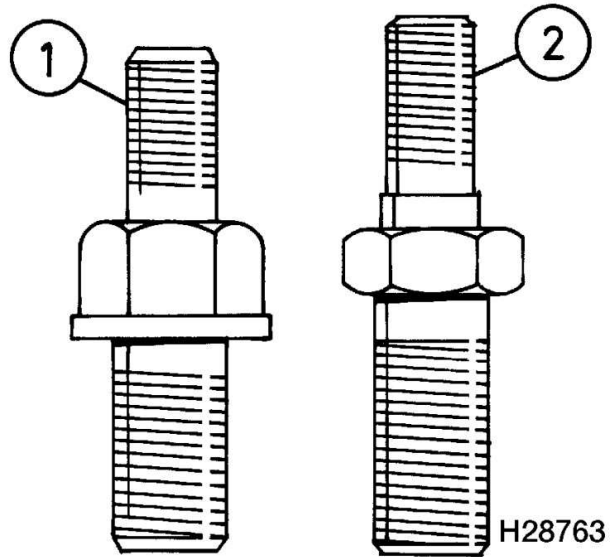
29 Refer to paragraphs 9 and 10.

### Installation

30 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.

31 Where applicable, install the camshaft position sensor plate to the intake camshaft. Ensure that the thrust plate is refitted, and make sure that the correct studs are used to secure the sensor plate and thrust plate. Tighten the studs to the specified torque. **Caution:** *It is possible to mix up the valve cover studs and the camshaft position sensor plate securing studs. The camshaft position sensor plate studs are longer, and have a narrower "hexagon" section (see illustration) .*

**7.31 Do not mix up the valve cover studs (1) with the camshaft position sensor plate securing studs (2)**



32 Lay the chain over the sprockets, noting that when the sprockets are refitted, the securing bolt holes/studs on the camshafts must be centered in the elongated holes in the sprockets. Note that the intake camshaft sprocket fits with the flat side facing the VANOS adjustment unit, and the raised collar facing the camshaft.

33 Fit the sprockets to the camshafts, ensuring that the securing bolts holes/studs are aligned in the center of the elongated sprocket holes.

34 Fit the thrust plate to the intake camshaft sprocket, then fit the sprocket securing nuts, and tighten the nuts to the specified torque.

35 Fit the thrust plate to the exhaust camshaft sprocket, then fit the sprocket securing bolts. Tighten the bolts finger-tight only at this stage.

36 Install the VANOS adjustment unit (see [Section 9](#)).

## Primary (crankshaft-to-exhaust camshaft) chain

### 1992 models

#### Removal

37 Remove the secondary timing chain as described previously in this Section.

38 Remove the tool locking the secondary timing chain tensioner in position.

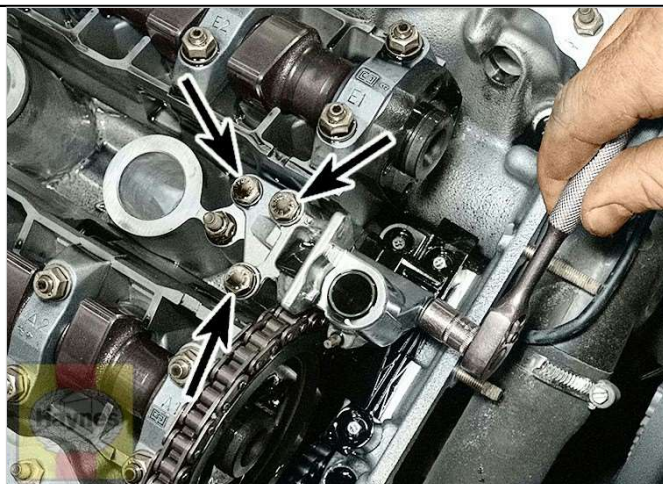
39 Remove the lower timing chain cover (see [Section 6](#)).

40 Remove the tool locking the secondary chain tensioner plunger in position, then lift out the plunger and spring, unscrew the securing bolts, and withdraw the secondary chain tensioner from the cylinder head (see [illustrations](#)) .

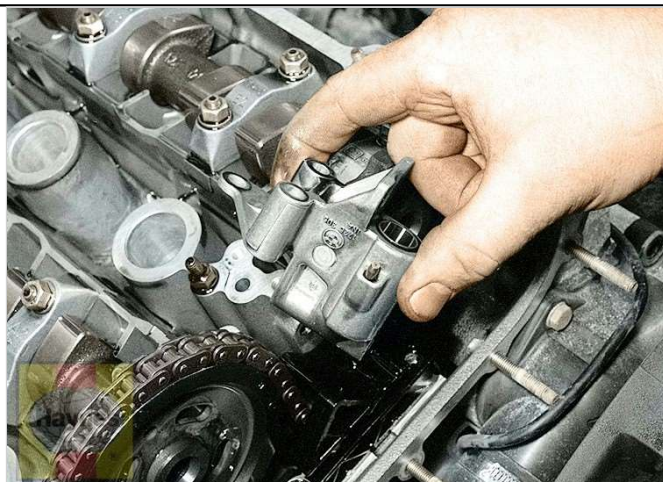
**7.40a Lift out the plunger and spring . . .**



**7.40b . . . then unscrew the securing bolts . . .**



**7.40c . . . and withdraw the secondary chain tensioner**



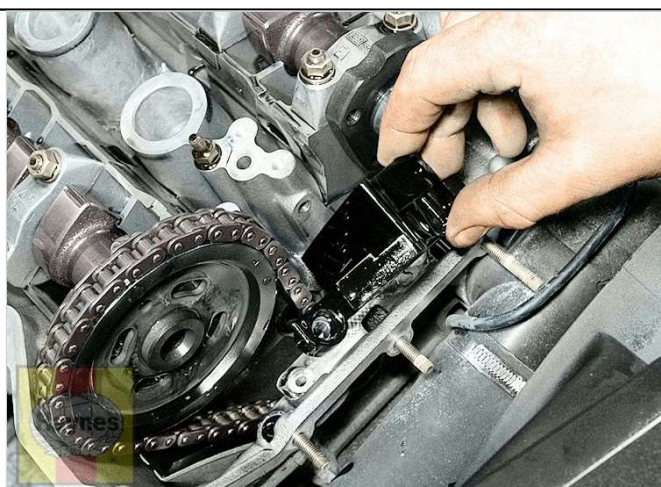


41 Unscrew the securing bolts and withdraw the secondary chain guide (see illustrations) .

**7.41a Unscrew the securing bolts . . .**



**7.41b . . . and withdraw the secondary chain guide**



42 Withdraw the primary timing chain sprocket from the exhaust camshaft, complete with the chain (see illustration) . Remove the sprocket. Note which way the sprocket faces to ensure correct installation.

**7.42 Withdraw the primary timing chain sprocket complete with the chain**

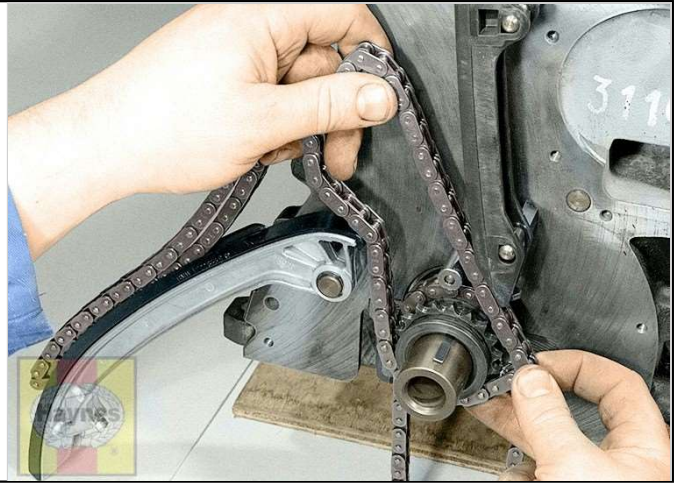


43 Note the routing of the chain in relation to the tensioner rail and the chain guide.



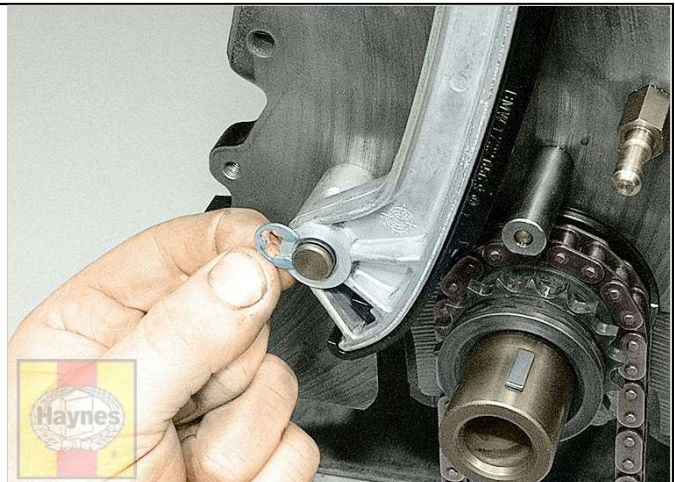
44 Manipulate the tensioner rail as necessary to enable the chain to be unhooked from the crankshaft sprocket and lifted from the engine (see illustration) . **Warning:** *Once the primary timing chain has been removed, do not turn the crankshaft or the camshafts, as there is a danger of the valves hitting the pistons.*

**7.44 Manipulate the tensioner rail and unhook the chain from the crankshaft sprocket - viewed with engine removed**



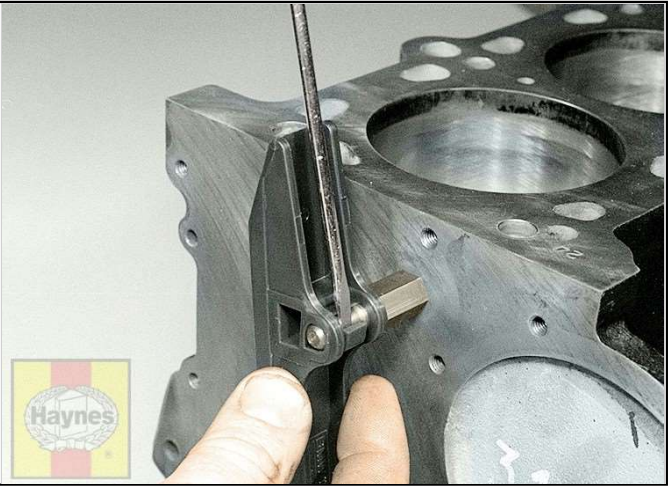
45 If desired, the tensioner rail can now be removed after removing the clip from the lower pivot (see illustration) .

**7.45 Remove the clip from the lower pivot to remove the tensioner rail - viewed with engine removed**



46 Similarly, the chain guide can be removed after releasing the upper and lower retaining clips. Take care when releasing the retaining clips, as the clips are easily broken (see illustration) .

### 7.46 Release the retaining clips to remove the chain guide



## Inspection

47 Refer to paragraphs 9 and 10.

## Installation

48 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.

49 Commence installation by engaging the chain with the crankshaft sprocket.

50 Where applicable, install the chain guide and the tensioner rail, ensuring that the chain is correctly routed in relation to the guide and tensioner rail, as noted before removal. Take care when installing the chain guide, as the clips are easily broken.

51 Manipulate the exhaust camshaft primary chain sprocket until the timing arrow on the sprocket is pointing vertically upwards, then engage the chain with the sprocket. Fit the sprocket to the exhaust camshaft, aligning the sprocket so that the tapped holes in the camshaft flange are positioned at the left-hand ends of the elongated slots in the sprocket (see illustration) . Ensure that the sprocket is facing the correct way as noted before removal.

### 7.51 The tapped holes in the camshaft flange should be positioned at the left-hand ends of the elongated slots in the sprocket



52 Install the secondary chain guide and the secondary chain tensioner. Note that the tensioner plunger fits with the cut-out in the plunger positioned on the right-hand side of the engine.

53 Install the secondary timing chain as described previously in this Section, but do not install the valve cover until the lower timing chain cover has been installed.

54 Install the lower timing chain cover (see [Section 6](#) ).

## 1993 and later models

### Note:

BMW special tool No. 11 3 390 or a suitable equivalent will be required to carry out this operation.

## Removal

55 Remove the secondary timing chain as described previously in this Section.

56 Unscrew the timing chain tensioner plunger cover plug from the right-hand side of the engine. Recover the sealing ring. **Warning:** *The chain tensioner plunger has a strong spring. Take care when unscrewing the cover plug.*

57 Recover the spring and withdraw the tensioner plunger.

58 Follow the procedure outlined in steps 38 through 46 of this Section.

## Inspection

59 Refer to paragraphs 9 and 10.

## Installation

60 Follow the procedure outlined in steps 48 through 52 of this Section.

61 Fit special tool No. 11 3 390 into the tensioner aperture (see [Section 9](#) ), then turn the adjuster screw on the tool until the end of the screw just touches the tensioning rail. Note that the exhaust camshaft sprocket should now have moved counterclockwise so that the tapped holes in the camshaft flange are centered in the elongated holes in the sprocket.

62 Install the secondary timing chain as described previously in this Section.