9 Variable valve timing system (VANOS) components - removal, inspection and installation

VANOS adjustment unit

Note:
Before the installation procedure can be completed, the operation of the VANOS system and the intake camshaft position adjustment must be checked by a BMW dealer or other qualified repair shop. BMW special tool No. 11 3 390 or a suitable equivalent will be required to carry out this operation. A new VANOS unit gasket will be required on installation.

Removal

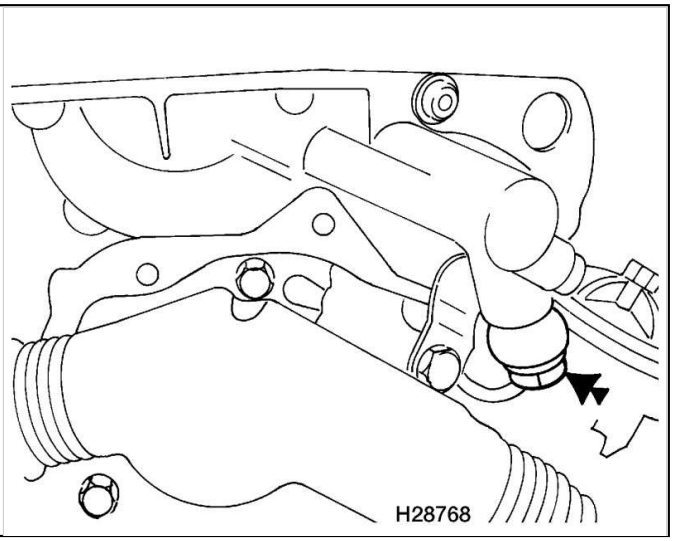
1 Unscrew the securing bolts and/or nuts, and remove the alternator air ducting from the front of the vehicle.

2 Remove the viscous cooling fan and fan cowl assembly (see Chapter 3).

3 Remove the valve cover (see Section 4).

4 Unscrew the union bolt, and disconnect the oil feed pipe from the front of the VANOS adjustment unit **(see illustration)** . Recover the sealing rings.

9.4 VANOS adjustment unit oil feed pipe union bolt (arrow)



5 Disconnect the solenoid valve wiring connector. The connector is clipped to the wiring harness located behind the oil filter housing.

6 Unscrew the securing nut and bolt, and remove the engine lifting bracket from the front of the engine.

7 Release the securing clips, and remove the wiring ducting from the front of the VANOS adjustment unit.

8 Unclip the plastic cover from the intake camshaft.

9 Position No. 1 piston at TDC, and lock the flywheel in position, and check the position of the camshafts using the template, (see Section 3).

10 Unscrew the two cover plugs from the front of the VANOS adjustment unit to expose the lower exhaust camshaft sprocket securing bolts **(see illustration)** . Recover the sealing rings.

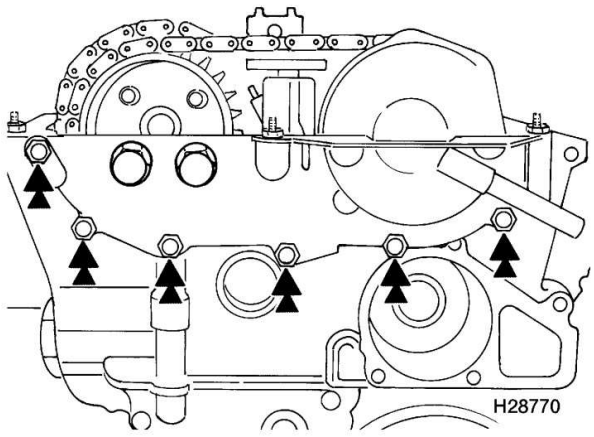
9.10 Unscrew the two cover plugs (arrows) to expose the camshaft sprocket securing bolts

11 Fully loosen the four exhaust camshaft sprocket securing bolts. The two lower bolts are reached through the holes in the front of the VANOS adjustment unit.

12 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)** .

13 Unscrew the securing nuts and remove the VANOS adjustment unit from the front of the engine **(see illustration)** . Recover the gasket.

9.13 Unscrew the securing nuts (arrows) and remove the VANOS adjustment unit



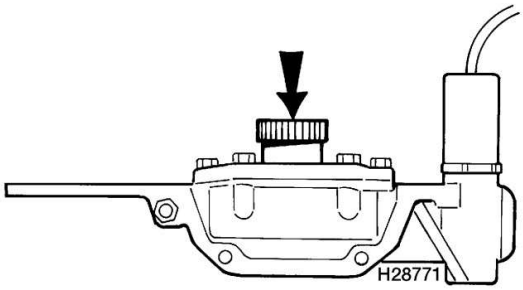
Inspection

14 To test the operation of the VANOS adjustment unit, special equipment is required. Testing must therefore be entrusted to a BMW dealer or other qualified repair shop.

Installation

15 Commence installation by pressing the splined shaft into the VANOS adjustment unit until the shaft reaches the stop in the housing **(see illustration)** .

9.15 Press the splined shaft into the VANOS adjustment unit as far as the stop



16 Make sure that the dowel sleeves are in position on the top VANOS adjustment unit securing studs in the cylinder head.

17 Fit a new gasket over the studs on the cylinder head, and apply a little sealant to the corners of the joint surfaces between the cylinder head and the VANOS adjustment unit.

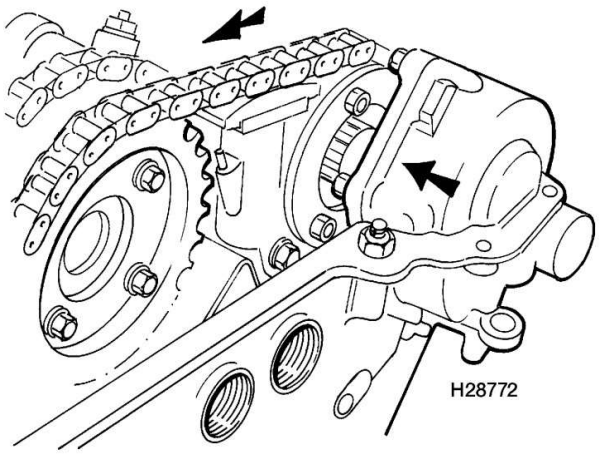
18 Turn the intake camshaft sprocket clockwise as far as possible by hand (the camshafts should be locked in position by fitting the template described in Section 3 , so turn the sprocket until it reaches the clockwise stop).

19 Offer the VANOS adjustment unit into position and, if necessary, rotate the splined shaft on the VANOS adjustment unit slightly until the internal splines on the VANOS adjustment unit shaft engage with the splines on the camshaft. Do not turn the camshaft or the camshaft sprocket.

20 It is now necessary to engage the VANOS adjustment unit shaft outer splines with the internal splines on the camshaft sprocket. Turn the camshaft sprocket slowly by hand counterclockwise until the VANOS adjustment unit shaft splines mesh with the sprocket. **Warning:** *It is essential to ensure that that the FIRST suitable spline meshes when the sprocket is turned back counterclockwise from its clockwise stop.*

21 Push the VANOS adjustment unit fully onto the cylinder head studs, noting that the camshaft sprockets and chain will turn counterclockwise slightly as the VANOS adjustment unit is pushed into position (this is due to the helical sprocket splines). As the unit is pushed into position, guide the sprockets and chain counterclockwise as necessary by hand **(see illustration)** .

9.21 The sprockets and chain will turn counterclockwise as the VANOS adjustment unit is fitted



22 Install and tighten the VANOS adjustment unit securing nuts.

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

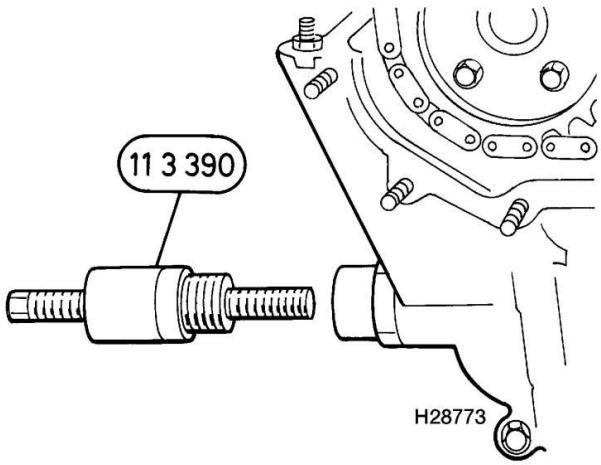
24 Unscrew the primary timing chain tensioner plunger cover plug from the right-hand side of the engine **(see illustrations 7.3a and 7.3b)** . Recover the sealing ring. **Warning:** *The chain tensioner plunger has a strong spring. Take care when unscrewing the cover plug.*

25 Recover the spring and withdraw the tensioner plunger.

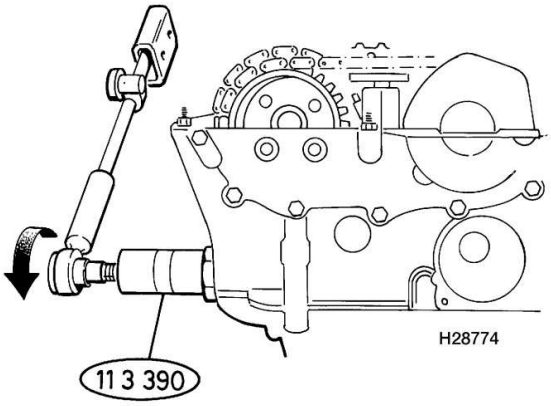
26 Fit special tool No. 11 3 390 into the tensioner aperture, then turn the adjuster screw on the tool until the end of the screw just touches the tensioner rail.

27 Using a torque wrench, apply a torque of 12 in-lbs to the adjusting screw on the special tool **(see illustrations)** .

9.27a Fit BMW special tool No. 11 3 390 to the timing chain tensioner aperture . . .



9.27b . . . then apply the specified torque (see text) to the tool



28 Tighten the exhaust camshaft sprocket securing bolts to the specified torque.

29 Remove the template from the camshafts, then withdraw the locking rod from the timing hole in the cylinder block.

30 Rotate the engine through two complete revolutions clockwise, then install the locking rod to the timing hole in the cylinder block, ensuring that the tool engages with the flywheel.

31 Install the template to check the position of the camshafts. If the template cannot be fitted with the flywheel locked in position, the VANOS adjustment unit has been incorrectly installed.

32 Unscrew the special tool (No. 11 3 390) from the tensioner aperture.

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

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

35 Install the camshaft sprocket securing bolt cover plugs to the front of the VANOS adjustment unit, using new sealing rings. Tighten the plugs to the specified torque.

36 It is now necessary to check the operation of the VANOS system and to adjust the intake camshaft position. Special tools are required to do this, and the operation must be entrusted to a BMW dealer or other qualified repair shop.

37 Once the VANOS system has been checked and adjusted, remove the camshaft template and flywheel locking tool. The remainder of the installation procedure is a reversal of removal, bearing in mind the following points.

A. Use new sealing rings when reconnecting the oil feed pipe to the VANOS adjustment unit.

B. Install the valve cover with reference to Section 4 .

C. Install the viscous cooling fan and cowl assembly (see Chapter 3).

VANOS solenoid valve

Note:
A new sealing ring will be required on installation.

Removal

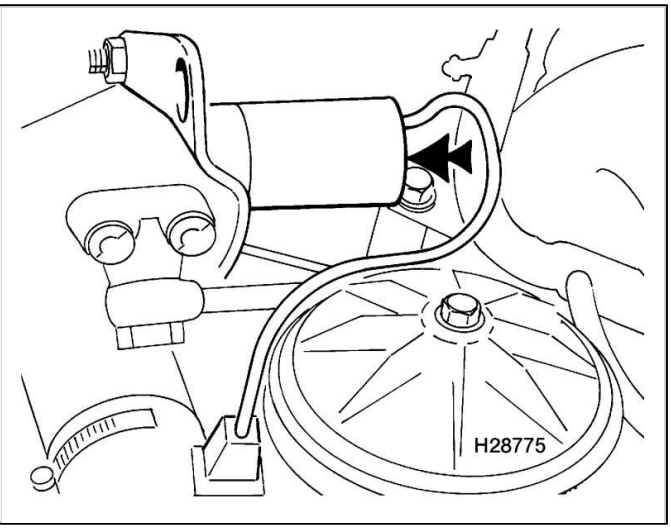
38 Ensure that the ignition is switched off.

39 Unscrew the securing bolts and/or nuts, and remove the alternator air ducting from the front of the vehicle.

40 Disconnect the solenoid valve wiring connector, which is clipped to the engine wiring harness behind the oil filter assembly.

41 Using an open-ended wrench, unscrew the solenoid valve and recover the seal **(see illustration)** .

9.41 VANOS solenoid valve location (arrow)



Inspection

42 Check that the solenoid plunger can be pulled freely back and forth by hand. If not, the solenoid must be renewed.

43 Similarly, check that the hydraulic piston in the VANOS adjustment unit can be moved easily. If it is difficult to move the hydraulic piston, the complete VANOS adjustment unit must be renewed.

Installation

44 Installation is a reversal of removal, but use a new sealing ring.