3 Top Dead Center (TDC) for No. 1 piston - locating

Note:
To lock the engine in the TDC position, and to check the position of the camshafts, special tools will be required. These tools can easily be improvised - see text.

1 Top Dead Center (TDC) is the highest point in the cylinder that each piston reaches as it travels up and down when the crankshaft turns. Each piston reaches TDC at the end of the compression stroke and again at the end of the exhaust stroke, but TDC generally refers to piston position on the compression stroke. No. 1 piston is at the timing chain end of the engine.

2 Positioning No. 1 piston at TDC is an essential part of many procedures, such as timing chain removal and camshaft removal.

3 Remove the valve cover (see Section 4).

4 Unclip the plastic cover from the intake camshaft **(see illustrations)** .

3.4a Release the securing clips . . .

3.4b . . . and remove the cover from the intake camshaft

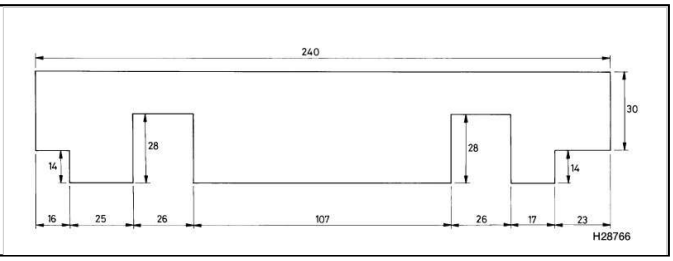
5 Using a socket or wrench on the crankshaft pulley bolt, turn the engine clockwise until the tips of the front cam lobes on the exhaust and intake camshafts face one another. When the camshafts are correctly positioned, the arrows on the camshaft sprockets will point vertically upwards (note that there may be arrows at the top and bottom of the sprockets) **(see illustrations)** . Note also that the square flanges on the rear of the camshafts should be positioned with the sides of the flanges exactly at right-angles to the top surface of the cylinder head (this can be checked using a set-square), and the side of the flange with holes drilled into it uppermost.

3.5a With No. 1 piston at TDC the tips of the front cam lobes should face one another . .

3.5b . . . and the arrows on the camshaft sprockets should point vertically upwards

6 A more accurate check on the camshaft positions can be made by making up a template from metal sheet to the dimensions shown - when the camshafts are correctly positioned, the template will fit exactly over the camshaft flanges, and rest on the upper surface of the cylinder head **(see illustrations)** . Note that it will be necessary to unbolt the rear camshaft cover studs from the cylinder head to enable the template to be fitted.

3.6a Make up a template from metal sheet to the dimensions shown



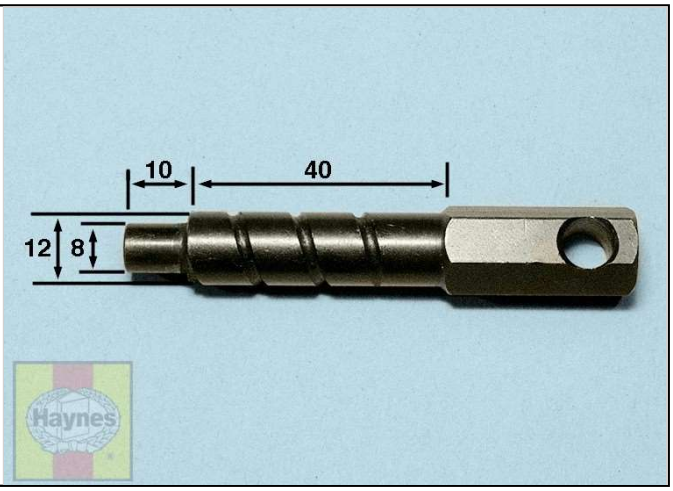
3.6b Template in place on upper surface of cylinder head with No. 1 piston at TDC

7 Pull the blanking plug from the timing hole in the left-hand rear corner flange of the cylinder block (access is greatly improved if the starter motor is removed - see Chapter 5).

8 To “lock” the crankshaft in position, a special tool will now be required. BMW tool No. 11 2 300 can be used, but an alternative can be made up by machining a length of steel rod to the dimensions shown **(see illustration)** .

3.8 Dimensions of the flywheel “locking” tool

All dimensions in mm



9 Insert the rod through the timing hole. If necessary, turn the crankshaft slightly until the rod enters the TDC hole in the flywheel **(see illustrations)** .

3.9a Insert the rod through the timing hole . . .

3.9b . . . until it enters the TDC hole in the flywheel - viewed with engine removed for clarity

10 The crankshaft is now "locked" in position with No. 1 piston at TDC. **Warning:** *If, for any reason, it is necessary to turn either or both of the camshafts with No. 1 piston positioned at TDC, and either of the timing chain tensioners slackened or removed (or the timing chains removed), the following precaution must be observed. Before turning the camshaft(s), the crankshaft must be turned approximately 30-degrees clockwise away from the TDC position (remove the locking rod from the TDC hole in the flywheel to do this) to prevent the possibility of piston-to-valve contact.*

11 **Do not** attempt to turn the engine with the flywheel or camshaft(s) locked in position, as engine damage may result. If the engine is to be left in the "locked" state for a long period of time, it is a good idea to place suitable warning notices inside the vehicle, and in the engine compartment. This will reduce the possibility of the engine being cranked on the starter motor.