Chapter 5 Part A:
Ignition system - contact breaker type

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Degrees of difficulty

Easy, suitable for novice with little experience

Fairly easy, suitable for beginner with some experience

Fairly difficult, suitable for competent DIY mechanic

Difficult, suitable for experienced DIY mechanic

Very difficult, suitable for expert DIY or professional

Specifications

General

System type	12 volt battery and coil with contact breaker points
Firing order	1-3-4-2 (No. 1 cylinder at crankshaft pulley end)

Spark plugs

Type	Refer to Chapter 1 Specifications

HT leads

Type:	
1.05 litre.	Champion LS-05 boxed set
1.3, 1.6 and 1.8 litre.	Champion LS-07 boxed set

Coil

Pre August 1987:	
Primary winding resistance	1.7 to 2.1 ohm
Secondary winding resistance	7000 to 12 000 ohm
From August 1987:	
Primary winding resistance	0.6 to 0.8 ohm
Secondary winding resistance	6900 to 8500 ohm

Distributor

Rotor rotation:	
1.05 and 1.3 litre	Anti-clockwise
1.6 and 1.8 litre	Clockwise
Contact breaker gap (initial setting only)	0.4 mm
Dwell angle (1.05, 1.3 and 1.6 litre):	
Setting	44 to 50° (50 to 56%)
Wear limit	42 to 58° (47 to 64%)
Rotor cut-out speed:	
1.05 and 1 3 litre (if applicable)	6300 to 6700 rpm
1.6 and 1.8 litre (carburettor engine)	No figures available
1.8 litre (injection engine)	6500 to 6900 rpm
Centrifugal advance:	
1.05 litre	Begins at 1100 to 1500 rpm
1.3 litre	Begins at 1500 to 1900 rpm
1.6 litre	Begins at 1100 to 1300 rpm
1.8 litre (carburettor engine)	Begins at 900 to 1100 rpm
1.8 litre (fuel injection engine)	Begins at 1150 to 1450 rpm
Ignition timing (at idle)	Refer to Chapter 1 Specifications

Torque wrench settings	Nm	lbf ft
Spark plugs	20	15
Distributor clamp bolt:		
1.05 and 1.3 litre	10	7
1.6 and 1.8 litre	25	18

1 General information and precautions

General information

The ignition system covered in this Chapter is of the conventional contact breaker type. On 1.05 and 1.3 litre engines, the distributor is mounted on the left-hand (gearbox) end of the cylinder head and is driven direct from the camshaft **(see illustrations)**. On 1.6 and 1.8 litre engines, the distributor is mounted at the front (radiator) end of the engine and it is driven by a skew gear in mesh with the intermediate shaft of the engine **(see illustration)**.

To enable the engine to run correctly, it is necessary for an electrical spark to ignite the fuel/air mixture in the combustion chamber at exactly the right moment in relation to engine speed and load. The ignition system is based on feeding low tension voltage from the battery to the coil, where it is converted to high tension voltage. The high tension voltage is powerful enough to jump the spark plug gap in the cylinders many times a second under high compression, providing that the system is in good condition.

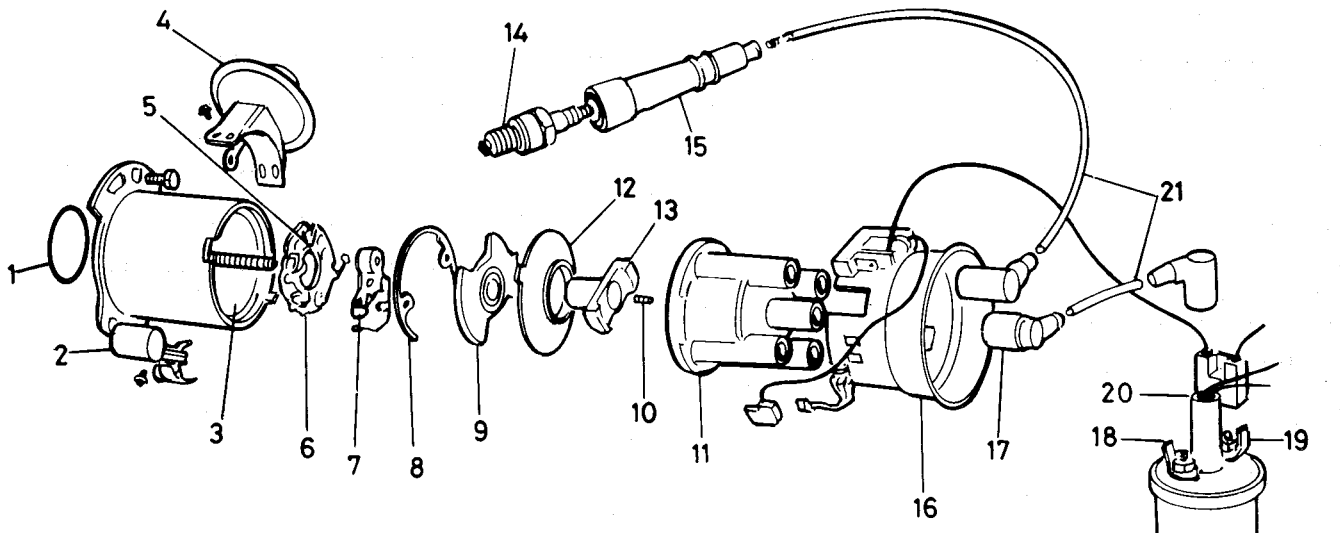
The ignition system is divided into two circuits, the low tension (LT) circuit and the high tension (HT) circuit.

The LT (primary) circuit comprises the battery, a lead to the ignition switch, a lead from the ignition switch to the LT coil windings (terminal +) and a lead from the LT coil windings (terminal -) to the contact breaker points and condenser in the distributor. The condenser is fitted in parallel with the contact points and its purpose is to reduce arcing between the points and also to accelerate the collapse of the coil low tension magnetic field.

The HT circuit comprises the HT (secondary) coil windings, the heavy ignition lead from the coil to the distributor cap, the rotor arm and the spark plug leads and spark plugs.

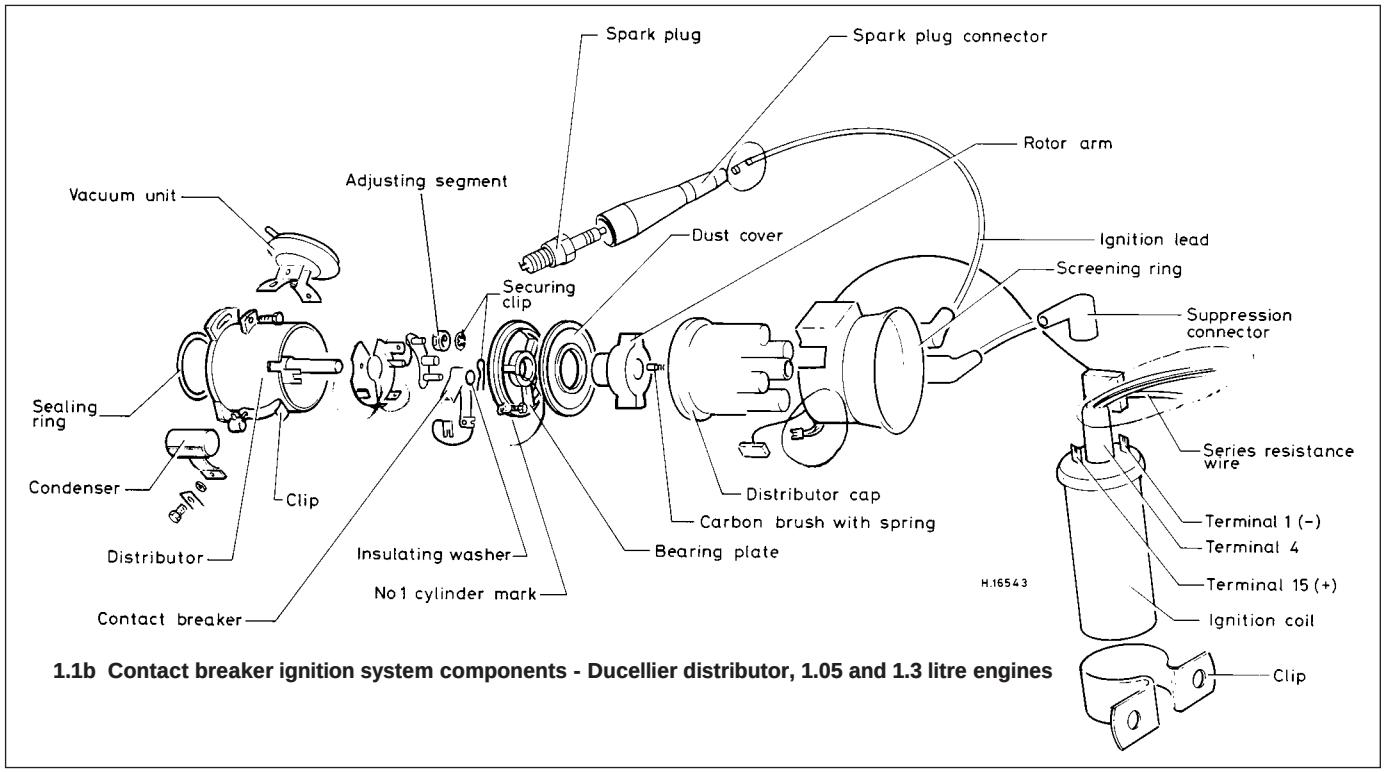
The system functions in the following manner. LT voltage is changed in the coil into HT voltage by the opening and closing of the contact breaker points. HT voltage is then fed via the carbon brush in the centre of the distributor cap to the rotor arm of the distributor and each time it comes in line with one of the four metal segments in the cap, which are connected to the spark plug leads, the opening and closing of the contact breaker points causes the HT voltage to build up, jump the gap from the rotor arm to the appropriate metal segment, and so via the spark plug lead to the spark plug, where it finally jumps the spark plug gap before going to earth.

Ignition timing is advanced and retarded automatically, to ensure that the spark occurs at just the right instant for the particular load at the prevailing engine speed.

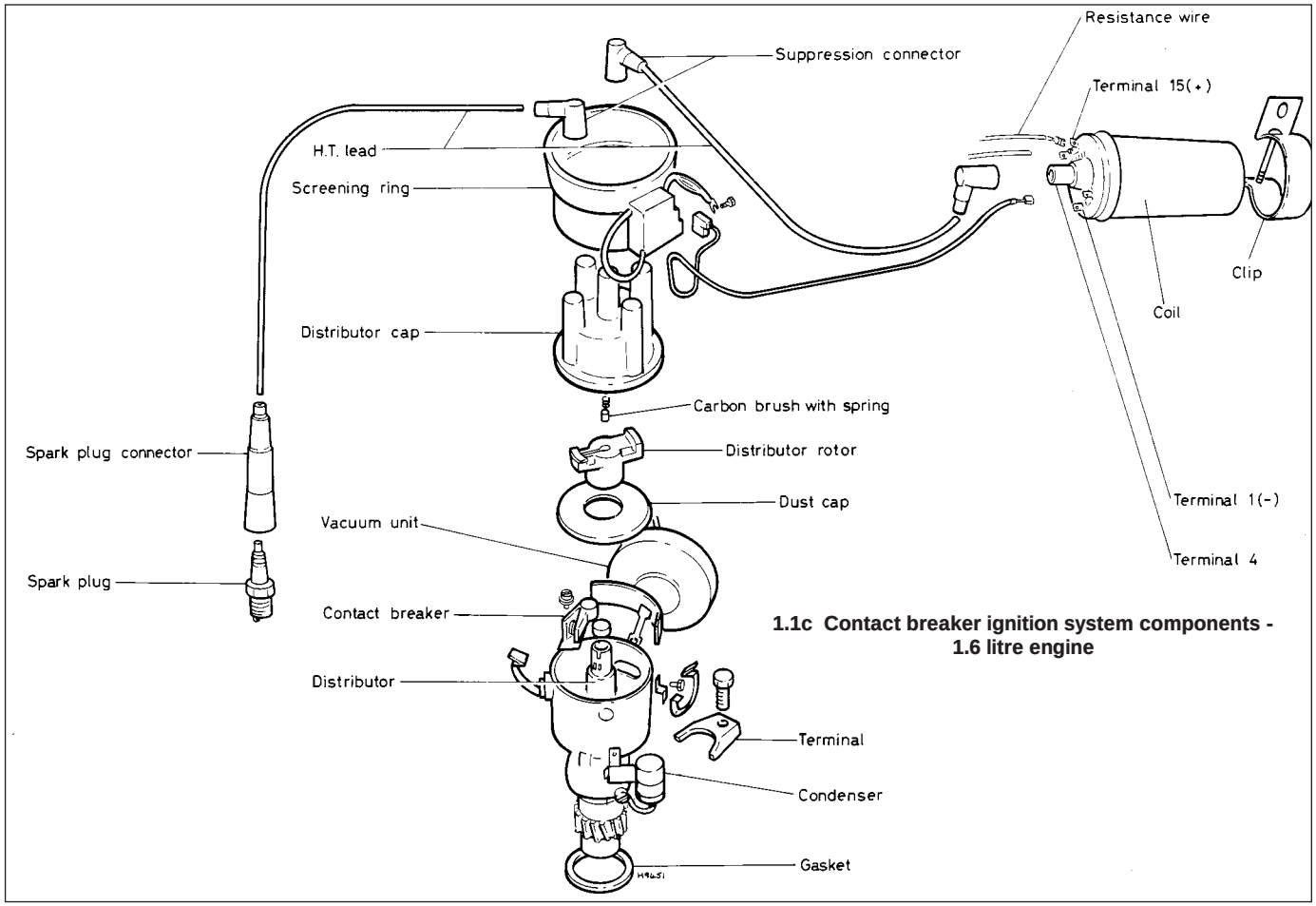


1.1a Contact breaker ignition system components - Bosch distributor, 1.05 and 1.3 litre engines

1 Sealing ring
2 Condenser
3 Distributor
4 Vacuum unit
5 Lockwasher
6 Contact breaker plate
7 Contact set
8 Retaining ring
9 Bearing plate
10 Carbon brush with spring
11 Distributor cap
12 Dust cover
13 Rotor arm
14 Spark plug
15 Spark plug connector
16 Screening ring
17 Suppression connector
18 Terminal 15 (+)
19 Terminal 1 (–)
20 Terminal 4
21 HT ignition lead
22 Clip



1.1b Contact breaker ignition system components - Ducellier distributor, 1.05 and 1.3 litre engines



1.1c Contact breaker ignition system components - 1.6 litre engine

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Ignition advance is controlled both mechanically and by a vacuum-operated system. The mechanical governor mechanism comprises two weights, which move out from the distributor shaft as the engine speed rises due to centrifugal force. As they move outwards, they rotate the cam relative to the distributor shaft and so advance the spark. The weights are held in position by two light springs and it is the tension of these springs which is largely responsible for correct spark advancement.

The vacuum control comprises a diaphragm, one side of which is connected via a small bore pipe to the inlet manifold and the other side to the contact breaker plate. Depression in the inlet manifold, which varies with engine speed and throttle opening, causes the diaphragm to move, so moving the contact breaker plate and advancing or retarding the spark. A fine degree of control is achieved by a spring in the vacuum assembly.

The system incorporates a ballast resistor or resistive wire in the low tension circuit, which is in circuit all the time that the engine is running. When the starter is operated, the resistance is bypassed to provide increased voltage at the spark plugs for easier starting.

Precautions

It is necessary to take extra care when working on the electrical system to avoid damage to semi-conductor devices (diodes and transistors) and to avoid the risk of personal injury. Take note of the following points:

a) Before disconnecting any wiring, or removing components, always ensure that the ignition is switched off.

b) Always remove rings, watches, etc. before working on the ignition system. Even with the battery disconnected, capacitive discharge could occur if a component live terminal is earthed through a metal object. This could cause a shock or nasty burn.

c) Do not reverse the battery connections. Components such as the alternator or any other having semi-conductor circuitry could be irreparably damaged.

d) If the engine is being started using jump leads and a slave battery, connect the batteries positive to positive and negative to negative. This also applies when connecting a battery charger.

e) Never disconnect the battery terminals, or alternator multi-plug connector, when the engine is running.

f) The battery leads and alternator multi-plug must be disconnected before carrying out any electric welding on the vehicle.

g) Never use an ohmmeter of the type incorporating a hand cranked generator for circuit or continuity testing.

h) The HT voltage generated by an electronic ignition system is extremely high and in certain circumstances, could prove fatal. Persons with surgically-implanted cardiac pacemaker devices should keep well clear of the ignition circuits, components and test equipment.

i) Do not handle HT leads, or touch the distributor or coil when the engine is running. If tracing faults in the HT circuit, use well insulated tools to manipulate live leads.

2 Spark plugs - renewal

Caution: When pulling the HT lead from a spark plug, grip the rubber end fitting not the lead, otherwise the lead connection may be fractured

Note: *To prevent dirt from dropping into the cylinders, remove dirt from the spark plug recesses before removing the plugs*

Refer to Chapter 1, Section 15

3 HT leads, distributor cap and rotor arm - inspection and renewal

1 Clean all HT and LT leads by wiping along their length with a fuel-moistened cloth. Inspect each lead for damage and renew if defective in any way.

2 Note the fitted position of each HT lead before disconnection. When removing a lead from a spark plug or the HT coil, pull the lead off by its rubber connector, not the lead itself.

3 The socket contacts on the distributor cap and HT coil should be cleaned if corroded. A smear of petroleum jelly (not grease) applied to the ferrule on the end of the HT lead will help to prevent corrosion.

4 Remove the distributor cap and rotor arm.

5 Examine the rotor arm and inside of the distributor cap . If the contacts are corroded or are excessively burnt, or if the carbon centre contact in the cap is worn away, renew the cap or rotor, as necessary. Check carefully for hairline cracks and signs of arcing.

6 Ensure that all HT leads are reinstalled in their correct firing order. Check that all leads are correctly routed and clear of moving or hot engine components. Ensure that all lead connections are secure and where applicable, protected.

6.5 Condenser location

4 Contact breaker points - inspection and adjustment

Inspection

Refer to Chapter 1, Section 11

Adjustment

Refer to Chapter 1, Section 16

5 Contact breaker points - renewal

Refer to Chapter 1, Section 16

6 Condenser - testing, removal and refitting

Testing

1 A faulty condenser can cause complete failure of the ignition system, as the points will be prevented from interrupting the low tension circuit.

2 To test the condenser, remove the distributor cap, rotor arm and dust cover and rotate the engine until the contact points are closed. Switch on the ignition and separate the points. If this is accompanied by a strong blue flash, the condenser is faulty. Note that a weak white spark is normal.

3 A further test can be made for short circuiting by removing the condenser and connecting a test lamp and leads to the supply lead and body (ie. connecting the condenser in series with a 12 volt supply). If the test lamp lights, the condenser is faulty.

4 If correct operation of the condenser is in doubt, substitute a new unit and check whether the fault persists.

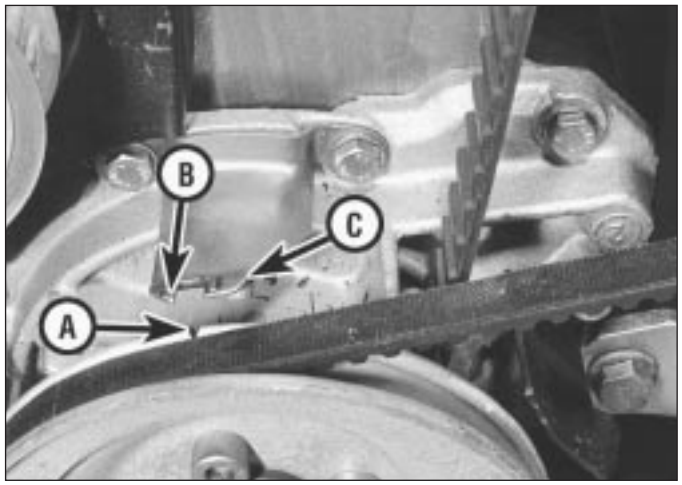
Removal

5 To remove the condenser, unscrew its retaining screw and disconnect the LT supply lead (at the coil on some models) **(see illustration)**.

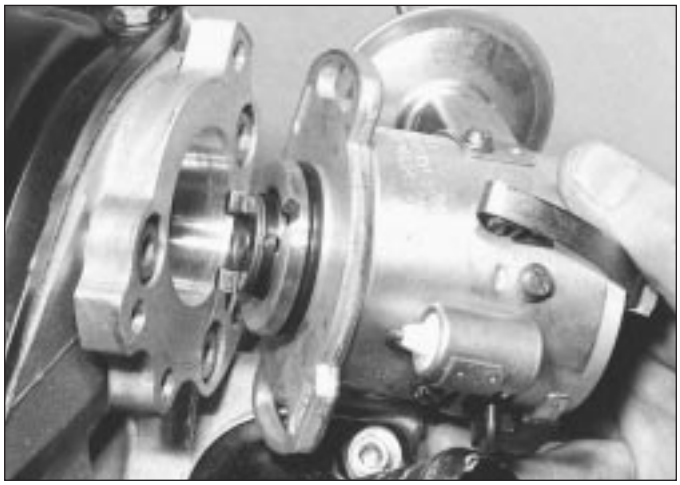
6 Withdraw the condenser far enough to disconnect the moving contact supply lead then withdraw the condenser. If the moving contact supply lead has insufficient length, it will be necessary to remove the distributor cap, rotor arm, dust cover and bearing plate (if applicable) first.

Refitting

7 Refitting is a reversal of removal.



7.4 Crankshaft pulley mark (A) timing mark (B) and TDC mark (C) with timing cover removed - 1.3 litre engine

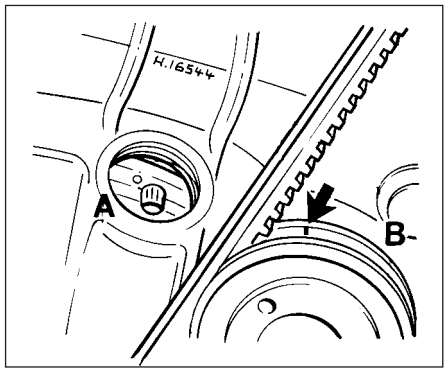


7.5 Removing the distributor

7 Distributor - removal, overhaul and refitting

Removal

1 Disconnect the battery earth lead, then remove the distributor cap and screening ring.
2 Disconnect the vacuum hose.



7.6a TDC timing marks - 1.6 and 1.8 litre engines

A Flywheel/driveplate
B Crankshaft pulley

1.05 and 1.3 litre engines

3 The distributor driveshaft is located in the end of the camshaft by an offset centre key and therefore the procedures described in paragraphs 4 and 5 are only necessary for checking purposes, such as when fitting a new distributor.
4 Turn the engine with a spanner on the crankshaft pulley bolt until the rotor arm points to the No. 1 spark plug lead position. On some models, a TDC groove is provided on the distributor body rim and the rotor arm must align with this. The mark on the crankshaft pulley should be aligned with the TDC pointer with No. 1 piston (timing belt end) at TDC compression **(see illustration)**.
5 Mark the distributor flange and cylinder head in relation to each other, then unscrew the bolts and withdraw the distributor **(see illustration)**.

1.6 and 1.8 litre engines

6 Unscrew and remove the TDC sensor or blanking plug from the top of the gearbox then turn the engine over so that the TDC "O" mark on the flywheel or driveplate is visible and aligned with the timing pointer. The crankshaft pulley timing notch should be aligned with the TDC arrow mark on the timing case **(see illustration)**. The rotor arm should be pointing to the timing mark on the top rim of the distributor body **(see illustration)**.
7 Mark the distributor body in line with the tip of the rotor arm and also mark the distributor body and cylinder block in relation to each other, then unscrew the clamp bolt and withdraw the clamp, followed by the distributor, from the cylinder block. Note by how much the rotor turns clockwise. Remove the distributor body sealing washer which must be renewed.

Overhaul

8 Overhauling of the distributor is similar for all models. The accompanying illustrations show the distributor fitted to 1.05 and 1.3 litre engines.
9 Remove the contact breaker points.
10 On the Bosch distributor, mark the position of the guide pin then remove the bearing plate retaining ring **(see illustrations)**.
11 Before removing the vacuum unit on the Ducellier distributor, mark the adjustment segment position so that it can be correctly repositioned when reassembling.
12 Extract the circlip securing the vacuum unit arm to the contact breaker plate.
13 Remove the retaining screws, then unhook the arm and withdraw the vacuum

5A

7.6b Rotor arm aligned with TDC mark on distributor body

7.10a Correct fitted position of bearing plate retaining ring

7.10b Removing bearing plate retaining ring

7.22 Oil pump drive spigot position prior to refitting distributor

unit. Note that the screws may also secure a suppression choke unit to the distributor body.

14 Remove the side screws, noting the location of the earth lead terminal, then remove the contact breaker plate by turning it anti-clockwise to align the lugs with the cut-outs (if applicable).

15 Wipe clean all electrical components. Clean the distributor body assembly with paraffin then wipe dry.

16 Check all components for wear and damage.

17 Reassembly is a reversal of the dismantling procedure.

18 On the Ducellier distributor, realign the vacuum unit adjuster segment with the mark made when removing it.

19 On the Bosch distributor, locate the retaining ring guide pin as previously marked.

20 Lubricate the centrifugal mechanism and the contact breaker plate with a little multi-purpose grease then adjust the contact breaker points.

Refitting

1.05 and 1.3 litre engines

21 To refit the distributor, reverse the removal procedure and align the timing marks made during removal before tightening the clamp bolts.

1.6 and 1.8 litre engines

22 To refit the distributor, first check that the oil pump drive spigot is correctly positioned with the spigot parallel to the crankshaft. This is visible through the distributor aperture **(see illustration)**. Check that the TDC "O" mark is still aligned. Set the rotor arm to the position noted, align the distributor body and cylinder block marks and insert the distributor. As the gears mesh, the rotor will turn anti-clockwise and point to the previously made mark. Refit the clamp and tighten the bolt. Reconnect the vacuum hose, and low tension lead or multi-plug (as applicable). Refit the TDC sensor or blanking plug.

All models

23 Refit the distributor cap, then reconnect the battery negative terminal .

24 Check and if necessary, adjust the ignition timing.

8 Ignition timing - checking and adjustment

Refer to Chapter 1, Section 17

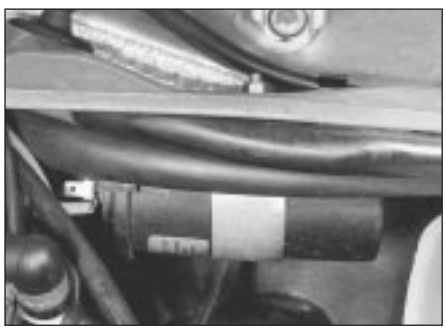
9 Coil - testing

1 The coil is located on the bulkhead under the plenum chamber **(see illustration)**. It should be periodically wiped clean to prevent HT voltage loss through possible arcing.

2 To ensure that the correct HT polarity at the spark plugs, the coil LT leads must always be connected correctly. The ignition lead from the fusebox must be connected to the positive (+) terminal 15, and the distributor lead (usually green) must be connected to the negative (-) terminal 1. Incorrect connections can cause bad starting, misfiring, and short spark plug life.

3 Complete testing of the coil requires special equipment. However, if an ohmmeter is available, the primary and secondary winding resistances can be checked and compared with those specified. During testing, the LT and HT wires must be disconnected from the coil.

4 To test the primary winding, connect the ohmmeter between the two LT terminals. To test the secondary winding, connect the ohmmeter between the negative (-) terminal 1 and the HT terminal.



9.1 Ignition coil location