Chapter 5 Part B:
Ignition system

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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

System type

Carburettor, L3.1-Jetronic and LU2-Jetronic models	Breakerless electronic ignition system
Other models except XU10J4 (16-valve)	Integral ignition system controlled by engine management ECU
XU10J4 (16-valve) models	Direct ignition system controlled by engine management ECU
Firing order	1-3-4-2 (number 1 cylinder at transmission end)

Ignition timing

Carburettor models*:	
TU3 engine	8° BTDC at 750 rpm
XU5 (B2A) and XU9 (D2H) engines	10° BTDC at 750 rpm
Fuel injection models*:	
L3.1-Jetronic fuel injection models	5° BTDC at 900 rpm
LU2-Jetronic fuel injection models	10° BTDC at 850 rpm
All other fuel injection models	ECU controlled (non-adjustable)

***Note:** *If unleaded fuel is used in the following engines, the ignition timing must be retarded by 3° - check with your Peugeot dealer.*

a) TU3 (K1A)
b) TU3A (K1G)
c) XU92C (D2D)
d) XU9J2 (D6A)
e) XU9J4 (D6C)
f) XU52C (B2A)

Ignition HT coil resistances*:

Primary windings	0.7 ohms
Secondary windings	6.6 K ohms
Impulse generator resistance	300 ohms

**The above specifications are approximate values and are accurate only when the coil is at 20°C. See text for further information*

Torque wrench settings	Nm	lbf ft
Distributor mounting nuts	8	5

5B

1 Ignition system - general information

Breakerless Electronic ignition system

All carburettor models, and models fitted with the Bosch L3.1-Jetronic and Bosch LU2-Jetronic fuel injection systems are equipped with a breakerless electronic ignition system is used. The system comprises solely of the HT ignition coil and a distributor mounted on the left-hand end of the cylinder head and driven by the camshaft. On carburettor models the coil is mounted on a bracket attached to the cylinder block, and on models fitted with L3.1 and LU2 systems it is mounted on the inlet manifold.

The distributor contains a reluctor mounted onto its shaft and a magnet and stator fixed to its body. The ignition amplifier unit is also mounted onto the side of the distributor body. The system operates as follows.

When the ignition is switched on but the engine is stationary the transistors in the amplifier unit prevent current flowing through the ignition system primary (LT) circuit.

As the crankshaft rotates, the reluctor moves through the magnetic field created by the stator. When the reluctor teeth are in alignment with the stator projections a small

AC voltage is created. The amplifier unit uses this voltage to switch the transistors in the unit and complete the ignition system primary (LT) circuit.

As the reluctor teeth move out of alignment with the stator projections the AC voltage changes and the transistors in the amplifier unit are switched again to interrupt the primary (LT) circuit. This causes a high voltage to be induced in the coil secondary (HT) windings which then travels down the HT lead to the distributor and onto the relevant spark plug.

A TDC sensor is fitted to the rear of the flywheel but the sensor is not part of the ignition system. It is there to be used for diagnostic purposes only.

Integral ignition/ fuel injection system

On fuel-injected models except the L3.1 and LU2 systems, the ignition system is integrated with the fuel injection system to form a combined engine management system under the control of one ECU (See the relevant Part of Chapter 4 for further information).

The Bosch Motronic ML4.1 and Fenix 1B systems retain the distributor cap and rotor arm assembly in order to distribute the spark to the cylinders, together with a conventional ignition coil.

All other models use a static (distributorless) ignition system, consisting only of a four output ignition coil. The ignition coil actually consists of two separate HT coils which supply two cylinders each (one coil supplies cylinders 1 and 4, and the other cylinders 2 and 3). Under the control of the ECU, the ignition coil operates on the "wasted spark" principle, ie. each spark plug sparks twice for every cycle of the engine, once on the compression stroke and once on the exhaust stroke - the spark on the exhaust stroke has no effect on the running of the engine, and is therefore "wasted". The ECU uses its inputs from the various sensors to calculate the required ignition advance setting and coil charging time.

On some models a knock sensor is incorporated into the ignition system. The sensor is mounted onto the cylinder head and prevents the engine "pinking" under load. The sensor is sensitive to vibration and detects the knocking which occurs when the engine starts to "pink" (pre-ignite). The knock sensor sends an electrical signal to the ECU which in turn retards the ignition advance setting until the "pinking" ceases.

Direct ignition system

The ignition system on 1998 cc XU10J4 (16-valve) models is of the "direct" type. The system components consist of two amplifier modules, four ignition HT coils, and a knock sensor. The ignition system is integrated with the fuel injection system, to form a combined engine management system under the control of one ECU via the ignition amplifier modules.

Each ignition amplifier module operates two HT coils; the ignition HT coils are integral with the plug caps, and are pushed directly onto the spark plugs, one for each plug. This removes the need for any HT leads connecting the coils to the plugs. The ECU uses the inputs from the various sensors to calculate the required ignition advance setting and coil charging time.

The knock sensor is mounted onto the cylinder head, and prevents the engine "pinking" under load. The sensor detects abnormal vibration, and is thus able to detect the knocking which occurs when the engine starts to "pink" (pre-ignite). The knock sensor sends an electrical signal to the ECU, which in turn retards the ignition advance setting until the "pinking" ceases.

2 Ignition system - testing

Warning: Voltages produced by an electronic ignition system are considerably higher than those produced by conventional ignition systems. Extreme care must be taken when working on the system with the ignition switched on. Persons with surgically-implanted cardiac pacemaker devices should keep well clear of the ignition circuits, components and test equipment.

Breakerless Electronic ignition system

Note: *Refer to the precautions given in Section 1 of Part A of this Chapter before starting work. Always switch off the ignition before disconnecting or connecting any component and when using a multi-meter to check resistances.*

General

1 The components of electronic ignition systems are normally very reliable; most faults are far more likely to be due to loose or dirty connections or to "tracking" of HT voltage due to dirt, dampness or damaged insulation than to the failure of any of the system's components. **Always** check all wiring thoroughly before condemning an electrical component and work methodically to eliminate all other possibilities before deciding that a particular component is faulty.

2 The old practice of checking for a spark by holding the live end of an HT lead a short distance away from the engine is not recommended; not only is there a high risk of a powerful electric shock, but the HT coil or amplifier unit will be damaged. Similarly, **never** try to "diagnose" misfires by pulling off one HT lead at a time.

Engine will not start

3 If the engine either will not turn over at all, or only turns very slowly, check the battery and starter motor. Connect a voltmeter across the battery terminals (meter positive probe to battery positive terminal), disconnect the ignition coil HT lead from the distributor cap and earth it, then note the voltage reading obtained while turning over the engine on the starter for (no more than) ten seconds. If the reading obtained is less than approximately 9.5 volts, first check the battery, starter motor and charging system as described in the relevant Sections of this Chapter.

4 If the engine turns over at normal speed but will not start, check the HT circuit by connecting a timing light (following the manufacturer's instructions) and turning the engine over on the starter motor; if the light flashes, voltage is reaching the spark plugs, so these should be checked first. If the light does not flash, check the HT leads themselves followed by the distributor cap, carbon brush and rotor arm using the information given in Chapter 1.

5 If there is a spark, check the fuel system for faults referring to the relevant part of Chapter 4 for further information.

6 If there is still no spark, check the voltage at the ignition HT coil "+" terminal; it should be the same as the battery voltage (ie, at least 11.7 volts). If the voltage at the coil is more than 1 volt less than that at the battery, check the feed back through the fusebox and ignition switch to the battery and its earth until the fault is found.

7 If the feed to the HT coil is sound, check the coil's primary and secondary winding resistance as described later in this Section; renew the coil if faulty, but be careful to check carefully the condition of the LT connections themselves before doing so, to ensure that the fault is not due to dirty or poorly-fastened connectors.

8 If the HT coil is in good condition, the fault is probably within the amplifier unit or distributor stator assembly. Testing of these components should be entrusted to a Peugeot dealer.

Engine misfires

9 An irregular misfire suggests either a loose connection or intermittent fault on the primary circuit, or an HT fault on the coil side of the rotor arm.

10 With the ignition switched off, check carefully through the system ensuring that all connections are clean and securely fastened. If the equipment is available, check the LT circuit as described above.

11 Check that the HT coil, the distributor cap and the HT leads are clean and dry. Check the leads themselves and the spark plugs (by substitution, if necessary), then check the distributor cap, carbon brush and rotor arm as described in Chapter 1.

12 Regular misfiring is almost certainly due to a fault in the distributor cap, HT leads or spark

plugs. Use a timing light (paragraph 4 above) to check whether HT voltage is present at all leads.

13 If HT voltage is not present on any particular lead, the fault will be in that lead or in the distributor cap. If HT voltage is present on all leads, the fault will be in the spark plugs; check and renew them if there is any doubt about their condition.

14 If no HT voltage is present, check the HT coil; its secondary windings may be breaking down under load.

Integral and Direct ignition systems

15 If a fault appears in the engine management (fuel injection/ignition) system first ensure that the fault is not due to a poor electrical connection or poor maintenance; ie, check that the air cleaner filter element is clean, the spark plugs are in good condition and correctly gapped, that the engine breather hoses are clear and undamaged, referring to Chapter 1 for further information. Also check that the accelerator cable is correctly adjusted as described in the relevant part of Chapter 4. If the engine is running very roughly, check the compression pressures and the valve clearances as described in Chapter 2A.

16 On systems with a distributor cap and rotor arm, check these items as described in the previous sub-section.

17 If these checks fail to reveal the cause of the problem the vehicle should be taken to a suitably equipped Peugeot dealer for testing. A wiring block connector is incorporated in the engine management circuit into which a special electronic diagnostic tester can be plugged. The tester will locate the fault quickly and simply alleviating the need to test all the system components individually which is a time consuming operation that carries a high risk of damaging the ECU.

18 The only other ignition system checks which can be carried out by the home mechanic are those described in Chapter 1, relating to the spark plugs, and the ignition coil test described in this Chapter. If necessary, the system wiring and wiring connectors can be checked as described in Chapter 12 ensuring that the ECU wiring connector(s) have first been disconnected.

3 Ignition HT coil(s) - removal, testing and refitting

Removal

Breakerless Electronic ignition system

1 On early models the coil is mounted either on the cylinder block above the starter motor or on the inlet manifold. On later models it is mounted on the left-hand end of the cylinder head. First disconnect the battery negative terminal.

2 Where necessary, disconnect the hot air inlet hose from the exhaust manifold shroud and air temperature control valve and remove it from the engine. Release the inlet duct fastener and position the duct clear of the coil.

3 Disconnect the wiring connector from the capacitor mounted on the coil mounting bracket and where necessary release the TDC sensor wiring connector from the front of the bracket **(see illustration)**.

4 Disconnect the HT lead from the coil then depress the retaining clip and disconnect the coil wiring connector **(see illustrations)**.

5 Slacken and remove the two retaining bolts and remove the coil and mounting bracket. Where necessary, slacken and remove the four screws and nuts and separate the HT coil and mounting bracket **(see illustrations)**.

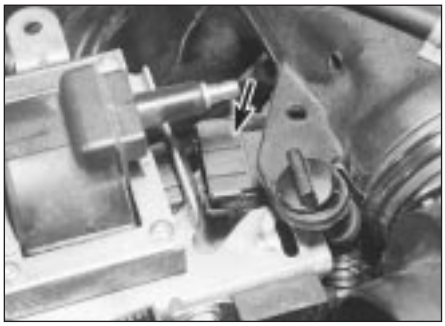
Integral ignition models

6 Disconnect the battery negative terminal. The ignition HT coil is mounted on the left-hand end of the cylinder head.

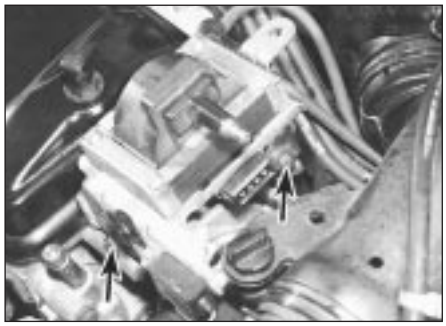
7 Depress the retaining clip and disconnect the wiring connector from the HT coil.

3.3 On breakerless ignition models, disconnect the capacitor wiring connector, and release the TDC sensor connector . . .

3.4a . . . then disconnect the HT lead . . .

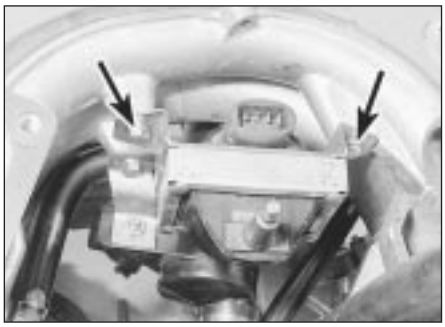


3.4b . . . and wiring connector (arrowed) from the ignition HT coil



3.5a Undo the two retaining bolts (arrowed) . . .

3.5b . . . and remove the coil and mounting bracket from the cylinder head



3.5c Coil mounting bolts (arrowed) on Bosch L3.1 system

3.5d Removing the ignition coil and bracket on the Motronic ignition system

8 Make a note of the correct fitted positions of the HT leads then disconnect them from the coil terminals.
9 Undo the four retaining screws securing the coil to its mounting bracket and remove it from the engine compartment.

Direct ignition models

10 Disconnect the battery negative terminal. There are four separate ignition HT coils, one on the top of each spark plug.
11 To gain access to the coils, undo the eight bolts, noting the correct fitted position of the wiring clip, and remove the access cover from the centre of the cylinder head cover.
12 To remove an HT coil, depress the retaining clip and disconnect the wiring connector, then pull the coil off the spark plug and remove it along with its rubber seal.

Testing

13 Testing of the coil consists of using a multimeter set to its resistance function, to check the primary (LT "+'"to "-" terminals) and secondary (LT "+" to HT lead terminal) windings for continuity, bearing in mind that on the four output, static type HT coil there are two sets of each windings. Compare the results obtained to those given in the Specifications at the start of this Chapter. Note the resistance of the coil windings will vary slightly according to the coil temperature, the results in the Specifications are approximate values for when the coil is at 20°C.
14 Check that there is no continuity between the HT lead terminal and the coil body/ mounting bracket.
15 If the coil is thought to be faulty, have your findings confirmed by a Peugeot dealer before renewing the coil.

Refitting

16 Refitting is a reversal of the relevant removal procedure, ensuring the wiring connectors are securely reconnected and, where necessary, the HT leads are correctly connected.

4 Distributor - removal and refitting

Removal

Breakerless ignition system

1 Disconnect the battery negative terminal. Where necessary, to improve access to the distributor, remove the ignition HT coil as described in Section 3 and the inlet duct as described in the relevant Part of Chapter 4.
2 Peel back the waterproof cover then slacken and remove the distributor cap retaining screws. Remove the cap and position it clear of the distributor body **(see illustrations)**. Recover the seal from the cap. If necessary disconnect the HT leads from the spark plugs after noting their positions.
3 Depress the retaining clip and disconnect the wiring connector from the distributor. Disconnect the hose from the vacuum diaphragm unit **(see illustrations)**.
4 Check the cylinder head and distributor flange for signs of alignment marks. If no marks are visible, using a scriber or suitable marker pen, mark the relationship of the distributor body to the cylinder head. Slacken and remove the two mounting nuts and withdraw the distributor from the cylinder head **(see illustrations)**. Remove the O-ring

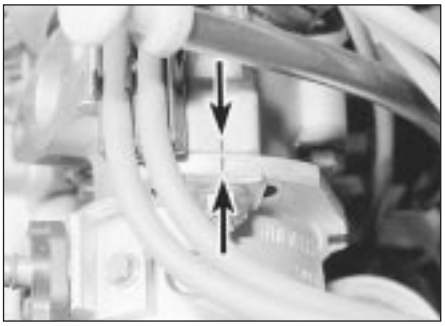
4.2a Peel back the waterproof cover . . .

4.2b . . . then undo the retaining screws . . .

4.2c . . . and remove the cap from the end of the distributor

4.3a Disconnect the distributor wiring connector . . .

4.3b . . . and the vacuum diaphragm hose



4.4a Alignment marks across the distributor and cylinder head housing

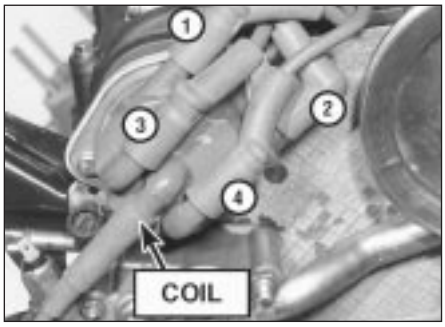
4.4b Unscrew the retaining nuts . . .

4.4c . . . and withdraw the distributor from the cylinder head

4.8a On XU9J4 16-valve engines undo the rotor screws and remove the rotor

4.8b Rotor drive flange

4.10 Off-set drive slots on the camshaft



4.17 Distributor cap and HT leads on the XU9J4 16-valve model

from the end of the distributor body and discard it; a new one must be used on refitting.

Integral ignition system with distributor

5 Disconnect the battery negative terminal. If necessary, to improve access to the distributor, remove the airflow meter as described in Chapter 4.

6 Peel back the waterproof cover, slacken and remove the distributor cap retaining screws, then remove the cap and position it clear of the distributor body. Recover the seal from the cap. If necessary, disconnect the HT leads from the spark plugs after noting their positions - on 16-valve engines it will be necessary to remove the cover plate over the spark plugs.

7 On 8-valve engines slacken and remove the two mounting bolts and washers, and withdraw the distributor from the cylinder head. Remove the O-ring from the end of the distributor body, and discard it; a new one must be used on refitting.

8 On XU9J4 16-valve engines undo the three Torx-headed screws securing the rotor to the rotor drive flange and lift off the rotor, then unscrew the screw from the centre of the drive flange and withdraw the flange. Remove the plastic base plate from the end of the cylinder head **(see illustrations)**.

Refitting

Breakerless ignition system

9 Lubricate the new O-ring with a smear of engine oil and fit it to the groove in the distributor body. Examine the distributor cap seal for wear or damage and renew if necessary.

10 Align the distributor rotor shaft drive coupling key with the slots in the camshaft end noting that the slots are offset to ensure that the distributor can only be fitted in one position **(see illustration)**. Carefully insert the distributor into the cylinder head whilst rotating the rotor arm slightly to ensure that the coupling is correctly engaged. Refit the distributor retaining nuts, tightening them lightly only.

11 Ensure that the seal is correctly located in its groove then refit the cap assembly to the distributor and tighten its retaining screws securely. Fold the waterproof cover back over the distributor cap ensuring it is correctly located. Where necessary reconnect the HT leads to the spark plugs.

12 Reconnect the vacuum hose to the diaphragm unit and the distributor wiring connector. Where necessary, refit the ignition HT coil as described in Section 3, and the inlet duct as described in Chapter 4.

13 Reconnect the battery negative terminal, then check and if necessary adjust the ignition timing as described in Section 6. Tighten the distributor mounting nuts to the specified torque.

Integral ignition system with distributor

14 On XU9J4 16-valve engines refit the plastic base plate to the end of the cylinder head, then refit the drive flange using locking fluid on the threads of the drive flange screw. Tighten the centre screw. Refit the rotor and tighten the Torx-headed screws.

15 On 8-valve engines lubricate the new O-ring with a smear of engine oil and fit it to the groove in the distributor body. Examine the distributor cap seal for wear or damage and renew if necessary. Align the distributor rotor shaft drive coupling key with the slots in the camshaft end noting that the slots are offset to ensure that the distributor can only be fitted in one position. Carefully insert the distributor into the cylinder head whilst rotating the rotor arm slightly to ensure that the coupling is correctly engaged. Refit the distributor retaining nuts, tightening them securely.

16 Ensure that the seal is correctly located in its groove then refit the cap assembly to the distributor and tighten its retaining screws securely. Fold the waterproof cover back over the distributor cap ensuring it is correctly located.

17 Where necessary reconnect the HT leads to the spark plugs **(see illustration)** and on 16-valve engines refit the cover plate.

5 Ignition system amplifier unit(s) - removal and refitting

Removal

1 Disconnect the battery negative terminal.

Breakerless ignition system

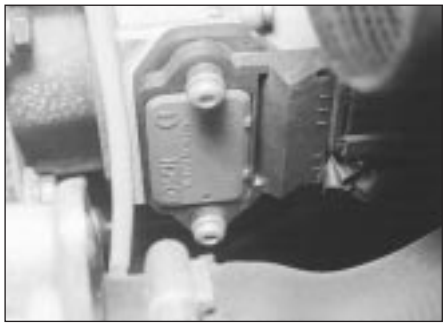
2 The amplifier unit is mounted onto the side of the distributor body **(see illustration)**. To improve access to the unit, disengage the hot air inlet hose from the control valve and manifold shroud and remove it from the vehicle.

3 Disconnect the wiring connector then undo the two retaining screws and remove the amplifier unit.

Integral ignition system

4 The amplifier unit is located in the right-hand rear corner of the engine compartment.

5 To remove the unit, disconnect the wiring connector, undo the two retaining screws and remove the amplifier from its mounting bracket.



5.2 On breakerless ignition systems the amplifier unit is mounted on the side of the distributor body

Direct ignition system

6 Both amplifier units are located on a bracket situated in the left-hand rear corner of the engine compartment, to the rear of the battery.

7 To remove either unit, disconnect the wiring connector, undo the two retaining screws and remove the amplifier unit from its mounting bracket.

Refitting

8 Refitting is a reversal of the removal procedure.

6 Ignition timing - checking and adjustment

Breakerless Electronic ignition system

1 To check the ignition timing, a stroboscopic timing light will be required. It is also recommended that the flywheel timing mark is highlighted as follows.

2 Remove the plastic cover from the aperture on the front of the transmission clutch housing. Using a socket and suitable extension bar on the crankshaft pulley bolt, slowly turn the engine over until the timing mark (a straight line) scribed on the edge of the flywheel appears in the aperture. Highlight the line with quick-drying white paint - typist's correction fluid is ideal **(see illustrations)**.

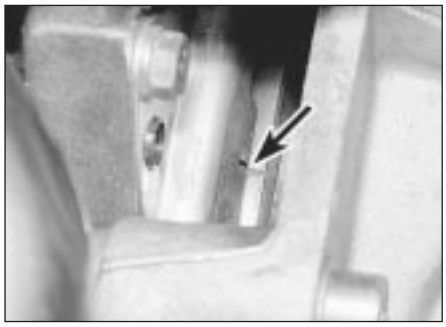
3 Start the engine, allow it to warm up to operating temperature, and then stop it.

4 Disconnect the vacuum hose from the distributor diaphragm, and plug the hose end.

5 Connect the timing light to No 1 cylinder spark plug lead (No 1 cylinder is at the transmission end of the engine) as described in the timing light manufacturer's instructions.

6 Start the engine, allowing it to idle at the specified speed, and point the timing light at

6.2a Removing the plastic cover from the timing aperture



6.2b Timing marks on the flywheel and timing plate

the transmission housing aperture. The flywheel timing mark should be aligned with the appropriate notch on the timing plate (refer to the Specifications for the correct setting). The numbers on the plate indicate degrees Before Top Dead Centre (BTDC).

7 If adjustment is necessary, slacken the two distributor mounting nuts, then slowly rotate the distributor body as required until the flywheel mark and the timing plate notch are brought into alignment. Once the marks are correctly aligned, hold the distributor stationary and tighten its mounting nuts. Recheck that the timing marks are still correctly aligned and, if necessary, repeat the adjustment procedure.

8 When the timing is correctly set, increase the engine speed, and check that the pulley mark advances to beyond the beginning of the timing plate reference marks, returning to the specified mark when the engine is allowed to idle. This shows that the centrifugal advance mechanism is functioning; if a detailed check is thought necessary, this must be left to a Peugeot dealer having the necessary equipment. Reconnect the vacuum hose to the distributor, and repeat the check. The rate of advance should significantly increase if the vacuum diaphragm is functioning correctly, but again a detailed check must be left to a Peugeot dealer.

9 When the ignition timing is correct, stop the engine and disconnect the timing light.

Integral and Direct ignition systems

10 On these systems, there are no timing marks on the flywheel or crankshaft pulley. The timing is constantly being monitored and adjusted by the engine management ECU, and nominal values cannot be given. Therefore, it is not possible for the home mechanic to check the ignition timing.

11 The only way in which the ignition timing can be checked is using special electronic test equipment, connected to the engine management system diagnostic connector (refer to the relevant Part of Chapter 4 for further information).

12 On models with Magneti Marelli engine management systems, adjustment of the ignition timing is possible. However, adjustments can be made only by re-programming the ECU using the special test equipment (see relevant Part of Chapter 4).

13 On all other models, with Bosch engine management systems, no adjustment of the ignition timing is possible. Should the ignition timing be incorrect, then a fault must be present in the engine management system.