








Chapter 5 Part B: Ignition system (petrol models)

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Degrees of difficulty

<p>Easy, suitable for novice with little experience</p> 	<p>Fairly easy, suitable for beginner with some experience</p> 	<p>Fairly difficult, suitable for competent DIY mechanic</p> 	<p>Difficult, suitable for experienced DIY mechanic</p> 	<p>Very difficult, suitable for expert DIY or professional</p> 
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Specifications

System type

Engine code:	
R6A	Breakerless distributor with transistor ignition amplifier
RFZ	Static, Bosch Motronic 5.1.
RGY, RGX	Static, Bosch Motronic 3.2.

Firing order

1-3-4-2 (No 1 cylinder at transmission end)

Ignition timing

Engine code:	
R6A	5° BTDC at 850 rpm at normal operating temperature, with vacuum advance hose disconnected and plugged.
RFZ, RGY, RGX	Ignition timing controlled by engine management ECU (see text).

Ignition HT coil resistances

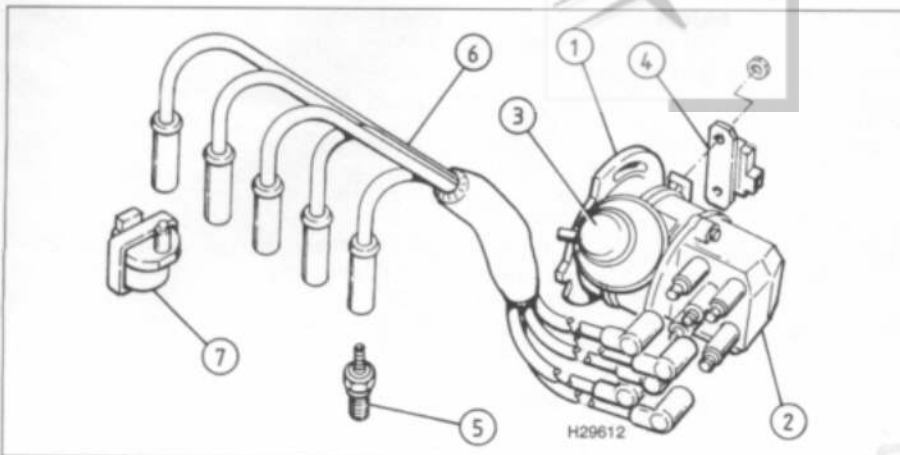
Engine code:	
R6A:	
Primary windings	0.8 Ω
Secondary windings	6.5 kΩ
RFZ, RGY, RGX	not available at time of writing

Miscellaneous

Distributor electromagnetic sensor, coil resistance (R6A engine)	300 Ω
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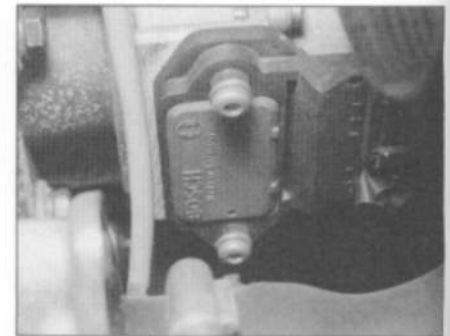
Torque wrench settings

At the time of writing, no torque figures were available for the ignition systems components.



1.1a Ignition system HT components - models with a breakerless distributor ignition system

- | | | |
|--------------------|------------------------------------|-----------------|
| 1 Distributor body | 3 Vacuum advance diaphragm housing | 5 Spark plug |
| 2 Distributor cap | 4 Ignition amplifier module | 6 HT leads |
| | | 7 Ignition coil |



1.1b The ignition amplifier module is mounted on the side of the distributor body

advance correction is carried out by a vacuum diaphragm module, mounted on the side of the distributor.

Models with Bosch Motronic engine management

5 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).

6 The ignition side of the system is of the static (distributorless) type, consisting only of a four output ignition coil (see illustration). The ignition coil actually consists of two separate, double-ended HT coils, which supply two cylinders each. 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 (hence the 'wasted spark'). The ECU uses its inputs from the various sensors to calculate the required ignition advance setting and coil charging time. The ignition timing is under the control of the engine management system ECU and is not manually adjustable without access to dedicated electronic test equipment. Static ignition timing is derived from a signal received from the crankshaft sensor. A basic ignition setting at idle speed is not quoted, because the ignition timing is constantly being altered to control engine idle speed (in conjunction with the idle actuator valve). The vehicle must be taken to a Citroën dealer or Bosch engine management system specialist if the ignition timing requires checking or adjustment.

7 A knock sensor is incorporated into the ignition system. The sensor is mounted onto the cylinder block and is sensitive to the high frequency vibrations which occur when the engine starts to 'pink' (pre-ignite), usually under load. Under these conditions, the knock sensor sends an electrical signal to the ECU, which in turn retards the ignition advance setting until the 'pinking' ceases. The ECU then advances the ignition again in small steps, to maintain optimum engine performance and economy. This process is

1 Ignition system - general information

Models with breakerless distributor ignition system

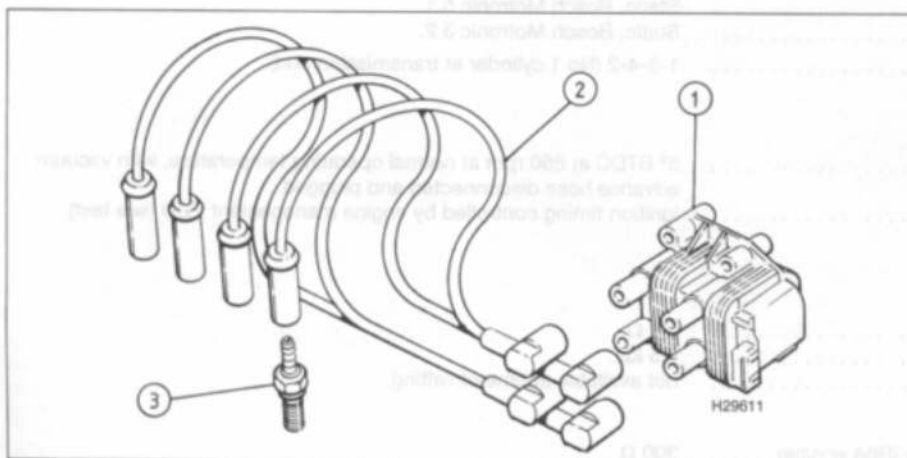
1 The ignition system consists of a breakerless distributor, mounted at the left hand end of the cylinder head and driven by the camshaft, a single ended HT coil, a transistorised ignition amplifier module, mounted on the side of the distributor body, and five HT leads (see illustrations).

2 The distributor contains an electronic trigger mechanism which is made up of a four pole trigger wheel mounted on the distributor shaft and an electromagnetic sensor. When the distributor shaft rotates, the trigger wheel poles pass under the sensor and alter the current flowing through it. This causes the

sensor to send a trigger signal to the amplifier module, which then interrupts the LT supply to the coil primary windings. The electromagnetic field surrounding the primary windings collapses and this induces a large HT voltage in the secondary windings. The HT voltage is then directed to the appropriate spark plug, via the HT leads, by the distributor rotor arm passing under the distributor cap terminals.

3 The static ignition timing is set by altering the position of the distributor on its mountings, using a strobe timing lamp to illuminate timing marks on the flywheel and transmission bellhousing (refer to the relevant Section for greater detail). Dwell angle is set by the amplifier module and as such is not adjustable.

4 Dynamic ignition timing is controlled by mechanisms within the distributor. Engine speed advance correction is handled by a centrifugal advance mechanism. Engine load



1.6 Ignition system HT components - models with Bosch Motronic engine management

- | | | |
|-----------------|------------|---------------|
| 1 Ignition coil | 2 HT leads | 3 Spark plugs |
|-----------------|------------|---------------|

repeated whenever engine knock is detected. It should be noted that comprehensive fault diagnosis of all the engine management systems described in this Chapter is only possible with dedicated electronic test equipment. Problems with the systems operation that cannot be pinpointed by following the basic guidelines in Section 2 should therefore be referred to a Citroën dealer for assessment. Once the fault has been identified, the removal/refitting sequences detailed in the following Sections will then allow the appropriate component(s) to be renewed as required.

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.

Models with breakerless distributor ignition systems

General

1 Most ignition system faults are likely to be due to loose or dirty connections or to 'tracking' (unintentional earthing) of HT voltage due to dirt, dampness or damaged insulation, rather than by 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 an electric shock, but the HT coil could be damaged. Similarly, **never** try to 'diagnose' misfires by pulling off one HT lead at a time, as well as the risk of electric shock, the test may be invalid as the ignition system fitted to later models has the capability to detect and temporarily disable HT lines that are open circuit.

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 systems (see Chapter 5, Part A).

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 1A.

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, then the problem may lie within the ignition control/engine management system. In these cases, the vehicle should be referred to a Citroën dealer or automotive electrical specialist for assessment.

Engine misfires

7 An irregular misfire suggests either a loose connection or intermittent fault in the control system or primary circuit, or an HT fault on the coil side of the rotor arm (where applicable).

8 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.

9 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 1A.

10 Regular misfiring is almost certainly due to a fault in the distributor cap (where applicable), coil, HT leads or spark plugs. Use a timing light (paragraph 4 above) to check whether HT voltage is present at all leads.

11 If HT voltage is not present on one particular lead, the fault will be in that lead or in the distributor cap. If HT 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.

12 If no HT voltage is present, check the HT coil(s); the secondary windings may be breaking down under load.

Models with Bosch Motronic engine management systems

13 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. 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.

14 If these checks fail to reveal the cause of the problem the vehicle should be taken to a suitably equipped Citroën 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.

15 The only ignition system checks which can be carried out by the home mechanic are those described in Chapter 1A, 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 13 ensuring that the ECU wiring connector(s) have first been disconnected.

3 Ignition HT coil - removal, testing and refitting

Models with breakerless distributor ignition systems

Removal

1 The ignition HT coil is mounted on a bracket at the front of the engine, underneath the intake air ducting.

2 Disconnect the negative cable from the battery terminal.

3 Slacken the hose clips at either end and remove the section of air ducting that runs between the air flow meter and the throttle body.

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

5 Pull the HT king lead from the coil terminal. Pull on the cable end fitting, not the cable itself. Remove the securing screws and lift the coil away from its mounting bracket.

Testing

6 Testing of the coil consists of using a multimeter set to its resistance function, to check the resistance of the primary (LT '+' to '-' terminals) and secondary (LT '+' to HT lead terminal) 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. A short circuit (zero ohms) or open circuit (no continuity) in either of the windings means that the coil is faulty.

7 Check that there is no continuity between the HT lead terminal and the coil body/mounting bracket. If the coil is thought to be

faulty, have your findings confirmed by a Citroën dealer before renewing the coil.

Refitting

8 Refitting is a reversal of the removal procedure, ensuring that the wiring connectors are securely reconnected.

Models with Bosch engine management systems

Removal

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

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

11 Make a note of the correct fitted positions of the HT leads then disconnect them from the coil terminals.

12 Undo the four retaining screws securing the coil to its mounting bracket and remove it from the engine compartment.

Testing

13 Testing of the coil is limited to checking the continuity of the primary (LT '+' to '-' terminals) and secondary (LT '+' to HT lead terminal) windings, using a multimeter. An open circuit (no continuity) in either of the windings means that the coil is faulty.

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 Citroën dealer before renewing the coil.

Refitting

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

4 Ignition timing - checking and adjustment

Models with Bosch engine management systems

1 On all fuel-injected models, 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.

2 The only way in which the ignition timing can be checked is using dedicated electronic test equipment, connected to the engine management system diagnostic connector. Refer to your Citroën dealer, or a Bosch engine management system specialist for advice.

Models with breakerless distributor ignition systems

Checking

Note: The engine should be at normal operating temperature to ensure correct results. Ideally the test should be completed before the coolant temperature exceeds 95°C, or before the auxiliary cooling fan cuts in.

3 Connect the stroboscopic timing light to the engine in accordance with the manufacturer's instructions, so that it is triggering from the No 1 cylinder HT lead.

4 Disconnect the vacuum advance hose from the diaphragm unit on the side of the distributor. Prevent air entering the manifold via the hose by plugging the open end of the hose.

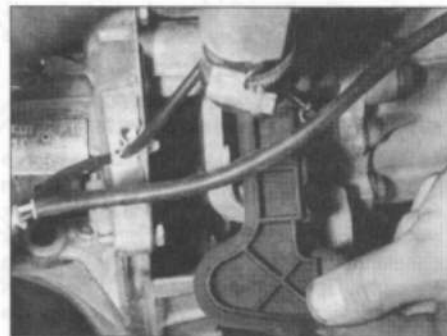
5 Remove the cover from the timing mark access hole, located at the top of the transmission bellhousing, below the distributor (see illustration). It may be necessary to push the adjacent coolant hoses to one side, to gain access to the cover.

6 Start the engine and run it at idling speed. Direct the beam from timing light at the timing mark access hole. The stroboscopic effect should 'freeze' the motion of the rotating flywheel and the timing mark stamped upon it. If the mark appears to be moving back and forth, this may be due erratic idling - check that all of the cars electrical accessories are switched off and that the auxiliary cooling fan is not running. The engine should be at normal operating temperature, but the idle speed may become unstable if it is particularly hot day and the engine has been idling for some time.

7 Read off the ignition timing by observing the position of the mark on the flywheel in relation to the markings on the graduated plate. Compare your readings with the Specifications.

Ignition timing - adjusting

8 To adjust the basic ignition timing setting, first switch off the engine, to avoid the risk of a getting a shock from the HT voltage. Refer to Section 5 and slacken the distributor clamp bolt(s). **Note:** It is good idea to mark the relationship between the distributor body and



4.5 Remove the cover from the timing mark access hole, located at the top of the transmission bellhousing

the cylinder head with a dab of paint, before adjustment is attempted. This gives a reference point that can be reverted to if the timing setting is lost.

9 Turn the distributor by a small amount clockwise to advance (or anti-clockwise to retard) the ignition timing. Tighten the bolts lightly and re-check the timing using the stroboscopic light, as described in the previous sub-section. Repeat this process, until the timing setting is correct, then tighten the distributor clamp bolt securely and disconnect the stroboscopic light.

5 Distributor - removal and refitting

Removal

1 The distributor is mounted horizontally on the left hand end of the cylinder head and is driven directly by the camshaft.

2 Disconnect the battery negative cable and position it away from the terminal.

3 Set the engine to TDC on cylinder No 1, as follows. Remove the screws, lift off the distributor cap and move it to one side, with the HT leads still attached.

4 On the distributor body, find the alignment marking, which is a small recess cut into the upper edge of the distributor cap mating surface. Highlight it if required, using typists correction fluid or similar.

5 To bring any piston up to TDC, it will be necessary to rotate the crankshaft manually. This can be done by using a ratchet wrench and socket on the crankshaft bolt at the front of the engine.

6 Turn the crankshaft in its normal direction of rotation, until the distributor rotor arm electrode approaches the mark that was made on the distributor body.

7 With the cover removed from the timing mark access hatch (see Section 4), observe the timing mark on the flywheel. Continue rotating the crankshaft until the flywheel timing mark is aligned exactly with the '0' TDC notch on the graduated timing plate. **Note:** Observe from directly above the pointer to ensure correct alignment.

8 Check that the distributor rotor arm is now pointing to the marking on the distributor body. If it is offset by 180°, then No 1 cylinder is on its exhaust stroke; rotate the crankshaft through one complete revolution and repeat the steps in paragraphs 6 to 7 inclusive.

9 Cylinder No 1 will then be set at TDC. The distributor can now be removed and refitted without losing its alignment, provided that the engine is not rotated after the distributor body has been withdrawn from the crankcase.

10 Unplug the hose from the vacuum unit on the side of the distributor body.

11 Unplug the sensor wiring from the distributor, at the connector on the side of the distributor body.

