Chapter 3 Ignition system

For modifications, and information applicable to later models, see Supplement at end of manual

Specifications

System type	Contact breaker and coil. No distributor, cam driven directly from camshaft, centrifugal advance only
Spark plugs	
Make and type	Champion L82C
Electrode gap	0.6 mm (0.024 in)
HT leads	Champion CL5H and CL7H (1974-on)
Coil	
Make and type:	
6 volt	Ducellier 2768
12 volt	Ducellier 2769
Adjustment **data**	
Contact breaker gap	0.35 to 0.45 mm (0.014 to 0.018 in)
Dwell angle (percentage):	
Up to February 1970	142° to 146° (78% to 81%)
February 1970 on	106° to 112° (58% to 62%)
Static ignition timing:	
M28 and M28/1 engines	8° BTDC
All other models	12° BTDC
Dynamic ignition timing:	
All models	12 to 17° BTDC at 1000 rpm 18 to 25° BTDC at 2000 rpm 32 to 42° BTDC at 3000 rpm

1 General description

In order that the engine can 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 and that all adjustments are correct.

The ignition system is divided into two circuits, low tension and high tension.

The low tension circuit (sometimes known as the primary) consists of the battery, lead to the control box. lead to the ignition system, lead from the ignition switch to the low tension or primary coil windings (+ terminal), and the lead from the low tension coil windings (— terminal) to the contact breaker points and condenser attached to the points box.

The high tension (HT or secondary) circuit consists of the coil secondary windings and the HT leads, one from each end of the secondary winding, to the plugs. There is no distributor as found on conventional multi-cylinder engines; instead each plug sparks both on the compression and on the exhaust stroke, and additionally one plug operates in reverse polarity, wear occurring at the side instead of at the centre electrode. For these reasons it is important to renew the plugs at the specified intervals.

The points box (sometimes erroneously referred to as the distributor) is mounted on the front of the crankcase, the points cam being retained on the end of the camshaft by a circlip. Access to the points is only possible after removing the front grille panel and fan. This is not such a problem as may at first appear because the points operate in a more favourable environment than that found in a conventional distributor. They should only be disturbed if the ignition timing or dwell angle need adjusting.

There is no vacuum-operated advance/retard mechanism used on these engines, ignition advance being undertaken entirely by centrifugal weights and springs.

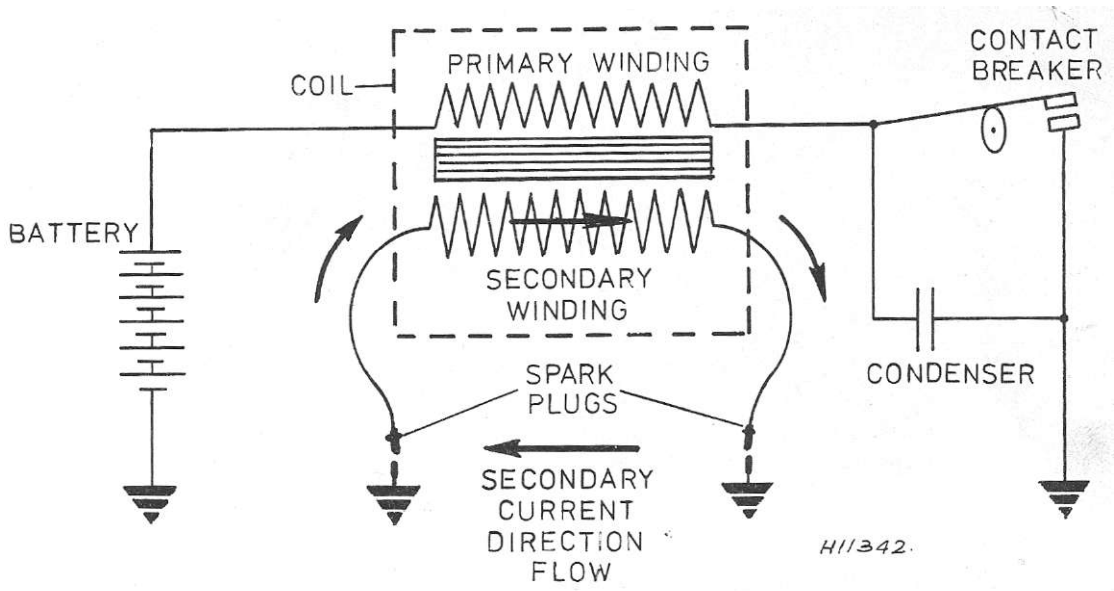


Fig. 3.1 Circuit diagram of ignition system (Sec 1)

2 Spark piugs and high tension (HT) leads

1 The correct functioning of the spark plugs is vital for the correct running and efficiency of the engine. It is essential that the plugs fitted are appropriate for the engine, and the suitable type is specified at the beginning of this Chapter. If this type is used and the engine is in good condition, the spark plugs should not need attention between scheduled replacement intervals. Spark plug cleaning is rarely necessary and should not be attempted unless specialised equipment is available as damage can easily be caused to the firing ends.

2 The condition of the spark plug will tell much about the overall condition of the engine.

3 If the insulator nose of the spark plug is clean and white, with no deposits, this is indicative of a weak mixture, or too hot a plug. (A hot plug transfers heat away from the electrode slowly - a cold plug transfers it away quickly).

4 If the top and insulator nose is covered with hard black-looking deposits, then this is indicative that the mixture is too rich. Should the plug be black and oily, then it is likely that the engine is fairly worn, as well as the mixture being too rich.

5 If the insulator nose is covered with light tan to greyish brown deposits, then the mixture is correct and it is likely that the engine is in good condition.

6 The spark plug gap is of considerable importance, as, if it is too large or too small the size of the spark and its efficiency will be seriously impaired. The spark plug gap should be set to the specified gap for the best results.

7 To set it, measure the gap with a feeler gauge, and then bend the outer plug electrode until the correct gap is achieved. The centre electrode should never be bent as this may crack the insulation and cause plug failure, if nothing worse.

8 The HT leads require no attention other than being kept clean and dry. Renew them if they are cracked.

3 Dwell angle - checking and adjustment

1 Dwell angle is the angle through which the contact breaker cam rotates whilst the points are closed. It is directly proportional to the contact breaker points gap. Since access to the points is relatively difficult, the dwell angle is measured to ascertain that the gap is correct.

2 Dwell angle is measured by connecting a dwell meter in accordance with its maker's instructions - usually between the coil LT lead and earth - and taking a reading with the engine idling, then at higher rpm. If the angle is within the specified limits, no further action is necessary. If the angle is not within the specified limits, or varies by more than 6° when the engine speed is altered, the contact breaker points require attention (Section 4).

3 Reducing the points gap increases the dwell angle, and vice versa.

4 If a dwell meter is not available, a Citroen dealer may measure the angle for a small charge. Alternatively some system may be devised for accurately measuring angular rotation of the engine and a test lamp connected as for the static timing check (Section 8). It is possible to count the number of flywheel gear teeth which pass in the periods when the test lamp is lit and when it is not, and thus compute the dwell angle. For anybody with sufficient patience, the number of teeth which should pass whilst the lamp is not illuminated is 84 to 87 for early models (up to Feb 1 970) and 63 to 67 for later models. Obviously this method cannot measure changes in the dwell angle occurring with variations in engine speed.

4 Contact breaker points - adjustment

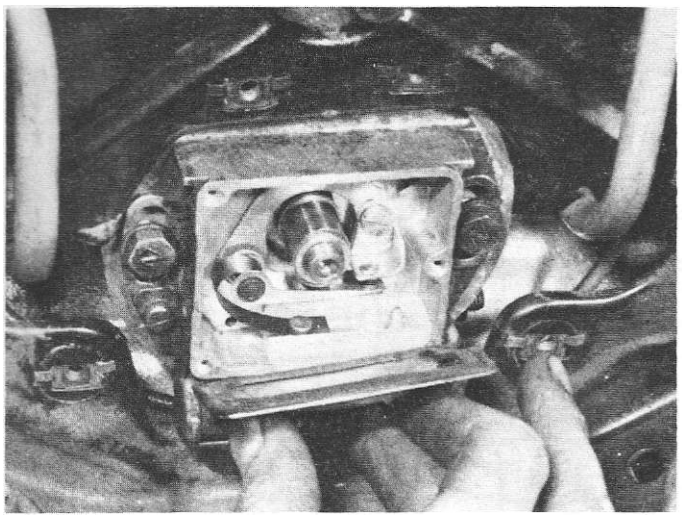
1 Remove the front grille panel as described in Chapter 11.

2 Loosen the generator mounting bolts and pivot it towards the engine to slacken the tension on the drivebelt.

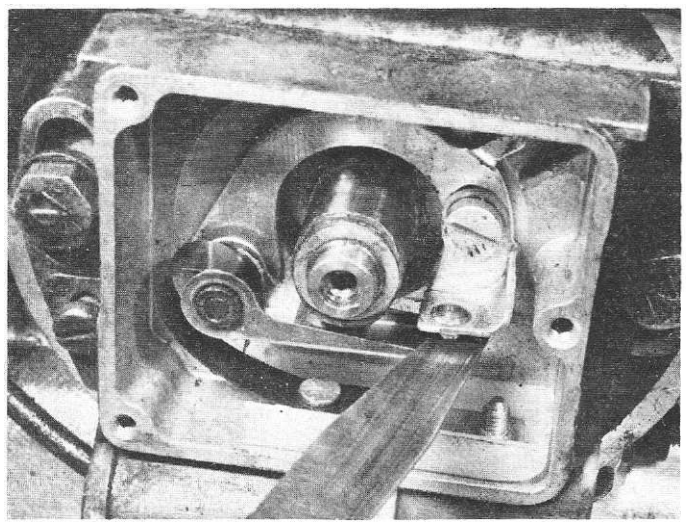
3 The fan must now be removed. To unscrew the retaining bolt of the starter dog and fan you will need a long 14 mm box spanner. To prevent the engine turning over when loosening the bolt, jam a screwdriver blade between the flywheel starter ring teeth and the starter mounting.

4 On removal of the retaining bolt it may be found that the fan/starter dog unit is reluctant to be withdrawn due to being jammed on the taper of the crankshaft. This being the case refer to Section 8 of Chapter 1, where further special instructions on the fan removal are given. As the fan is withdrawn disengage the alternator drivebelt.

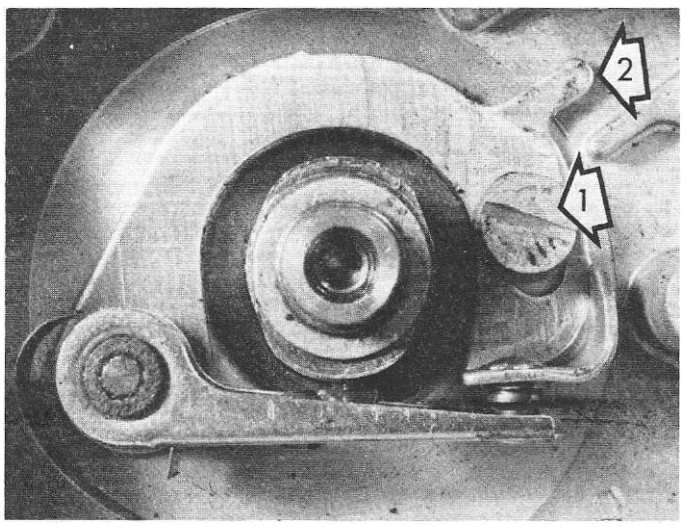
5 Unscrew and remove the seven bolts and washers securing the



4.6 Remove the cover and seal



4.8 Check the points gap with feeler gauges



4.11 Points adjustment/retaining screw (1) and adjustment lug (2)

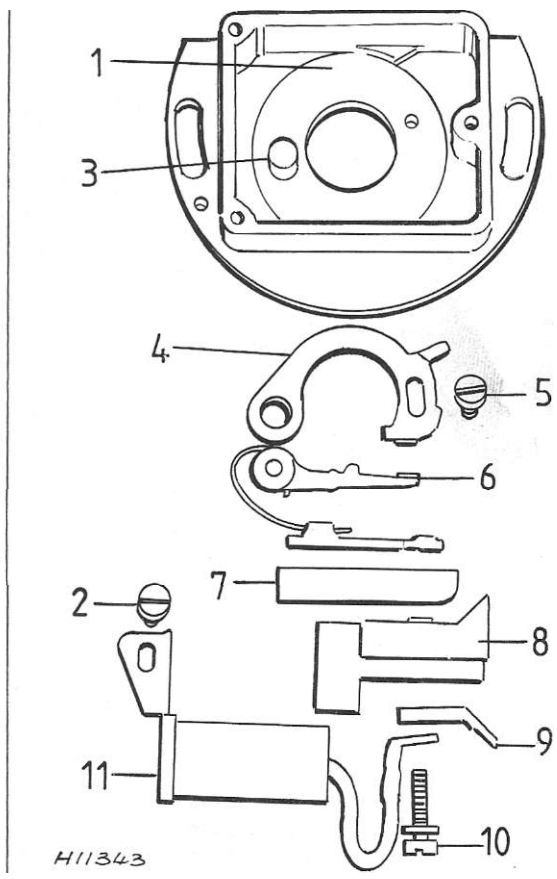


Fig. 3.2 The contact breaker points box assembly (Sec 4)

1 Contact box
2 Condenser retaining screw
3 Contact pivot post
4 Fixed contact
5 Retaining screw
6 Moving contact
7 Insulator
8 Support
9 Terminal
10 Screw and shakeproof washer
11 Condenser

rubber shield (if fitted) in position over the front of the points box. Earlier models did not have this fitting.

6 Clean the area around the points box and then unscrew and remove the three box cover retaining screws, the cover and the rubber seal (photo).

7 The points are now fully accessible for inspection, adjustment and if necessary replacement.

8 To check the points gap they should be fully open on the heel on the cam. Insert a clean feeler blade of the specified thickness between the point faces (photo). Take care not to contaminate the point faces with oil. The blade of the feeler gauge should be a firm sliding fit at this gap, not a loose or tight fit. Check the gap with the points open on both cam lobes. If the gap measurement differs on each lobe by 0.05 mm (0.002 in) or more, then this is indicative of a worn cam which should be renewed.

9 If on inspection the contact points are badly worn or pitted they should be renewed.

10 If adjustment to the points gap is necessary then the ignition timing must be reset (Sections 8 and 9).

1 1 To adjust the points gap, loosen the contact retaining screw and move the fixed point as necessary (photo). Retighten the retaining screw and recheck the clearance.

12 Set the timing as described in Section 8 or 9.

13 Refit the points cover and (if fitted) the rubber shield. Refit the fan and generator drivebelt and tighten the retaining bolt to the specified torque. Refit the grille panel to complete.

Contact breaker points - removal and refitting

Referring to the previous Section, follow the instruction given in paragraphs 1 to 6 inclusive.

Unscrew and remove the two bolts retaining the contact box to tie crankcase. Withdraw the box and detach the wire spade connector photo).

3 The points can now be removed. Unscrew the fixed contact retaining screw.

£ Unscrew and remove the capacitor/insulator retaining screw and tnen extract the contact arm and spring, followed by the fixed contact.

5 Clean out the points box before commencing reassembly. Lightly smear the points pivot post with grease. In view of its low cost, it is rot a bad idea to renew the condenser at the same time as the points.

6 Refitting of the points and condenser is a direct reversal of the removal procedure. Lightly lubricate the cam lobes and check that the spring and moving contact arm are securely fitted to each other.

7 Adjust the points gap (Section 4) and check the dwell angle (Section 3) and the timing (Section 8 or 9) before refitting the fan and front grille.

6 Condenser (capacitor) - description, removal and refitting

1 The condenser is fitted in parallel with the contact breaker points. !Its main function is to prevent excessive sparking between the point faces which would otherwise occur every time the LT circuit was interrupted.

2 If the condenser fails in the short-circuit mode, the points will no longer be able to interrupt the ignition circuit and total failure of the ignition system will occur. If the condenser fails in the open-circuit mode, or becomes disconnected, there will be excessive arcing across the points and difficult starting and rough running will result.

3 It is not possible to test the condenser without special equipment and the surest test is by substitution of a new unit. In view of its low cost and inaccessibility, it is well worth renewing the condenser every time new contact breaker points are fitted.

4 To remove the condenser, proceed as described in Section 4, paragraphs 1 to 6, then undo the securing screws and remove the points box and condenser.

5 Refitting is the reverse of the removal procedure.

7 Ignition cam and centrifugal weights - removal and refitting

1 Refer to Section 5 and remove the ignition points box from the front of the crankcase.

2 Extract and remove the protector plate (photo).

3 Remove the circlip from the groove in the end of the camshaft and then withdraw the thrust washer, the cam and the advance/retard control weights, noting their locations.

4 Refitting is a reversal of the removal procedure. Ensure that all components are clean and serviceable prior to assembly. Lightly Rubricate the cam and advance/retard spindles with engine oil before assembling. Check that the circlip is fully located in its groove. Refit the protector plate, contact box and points.

5 Adjust the points gap (Section 4) and check the cam play. If the points gap is checked on the two lobes and a difference in measurement is shown then either the cam or camshaft is defective and should be renewed.

6 Check and adjust the timing (Section 8 or 9) before refitting the fan and front grille.

8 Static ignition timing - checking and adjustment

1 To check the static ignition timing it will be necessary to obtain or make a tool similar to that shown in Fig. 3.4. If access is good it may be possible to use a straight rod (6 mm diameter approx) as shown (photo). The Dyane will need a longer rod than that shown.

2 Insert the rod through the hole in the left-hand top half of the crankcase so that it bears on the front of the flywheel. Slowly rotate the flywheel whilst applying pressure to the rod; when the rod enters the hole in the flywheel face, the engine is at the correct static firing point.

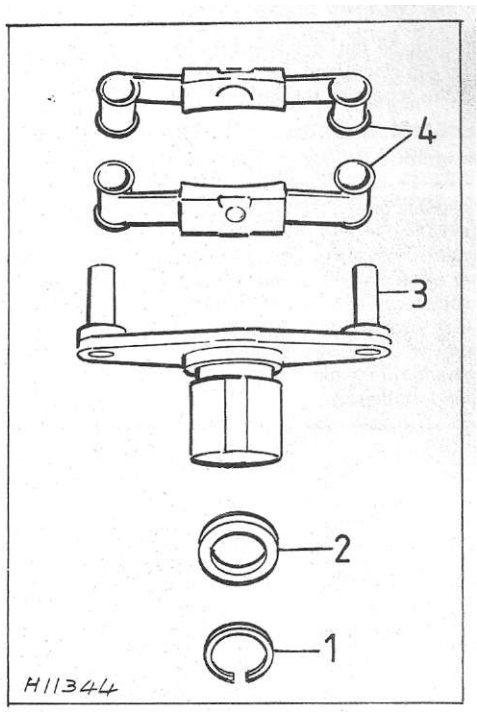
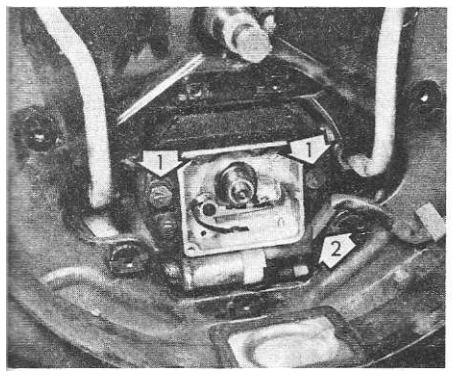
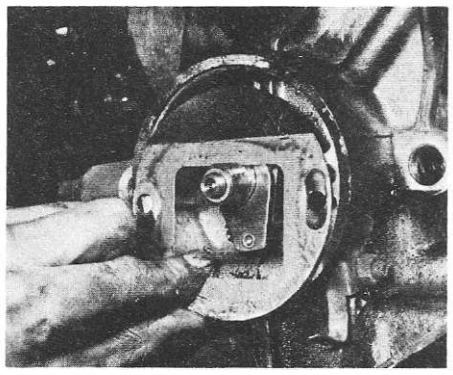


Fig. 3.3 The points cam and centrifugal weights (Sec 7)

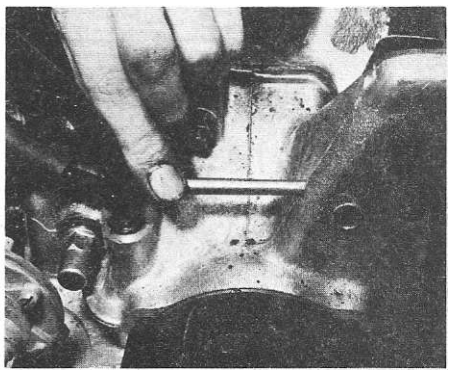
1 Circlip
2 Thrust washer
3 Centrifugal weight pivots and cam
4 Advance weights



5.2 Remove box retaining/timing adjustment bolts (1) and detach the spade connector (2)



7.2 Remove the protector plate



8.1 Insert rod through access hole to check timing

3 Paint alignment marks on one flywheel tooth and the starter motor housing for future reference, then remove the rod.
4 Connect a 12V test lamp between the coil terminal which feeds the contact breaker (slide back the blue sleeve) and earth. Turn on the ignition. Remove the plug caps so that the engine cannot fire. If the test lamp is correctly connected, it will light when the points are open and extinguish when they are closed.
5 *Check that the timing rod is removed,* then rotate the flywheel. As the timing marks made in paragraph 3 come into alignment, the lamp should just come on - ie the points must just be separating. If not, remove the fan and grille (if not already done), slacken the points box retaining bolts and move the box in the required direction. Tighten the bolts and recheck the timing.
6 Due to backlash, a variation in the specified timing may be evident when adjusting the ignition timing. If timing is being done statically, then, if the crankshaft is rotated one revolution after setting, the timing marks could appear to be one tooth different between the piston firing points.
7 When checking dynamically, the tolerance given for the BTDC figures in the Specifications allows for this. If the difference between the two cylinder firing points is greater than one tooth (3°) suspect a worn cam.
8 When refitting the fan, position the timing mark on the flywheel vertically (12 or 6 o'clock) and the slots in the starter dog horizontally. Lightly grease the tapers of the fan and crankshaft.

9 Dynamic ignition timing - checking and adjustment

1 If a stroboscopic timing light is available, the ignition timing can be checked dynamically, ie with the engine running.
2 If not already done, make timing marks on the flywheel and starter motor housing as described in Section 8, paragraphs 1 to 3.
3 Connect the timing light to one of the HT leads in accordance with the maker's instructions.
4 Check that the timing rod is removed, then start the engine and shine the timing lamp on the timing marks. The marks should appear in alignment and stationary.
5 If the marks are not in alignment, remove the fan and grille (if not already done), slacken the points box adjustment bolts and rotate the box as necessary to bring the marks into alignment. The engine will idle for 10 minutes or so without the fan or alternator, so it is possible to make the adjustment without refitting the fan every time to check.
6 When the marks appear to be satisfactorily aligned, increase the engine speed and check that the marks appear to drift away from each other as the centrifugal advance mechanism comes into operation. It may be that the cam, camshaft or centrifugal weights are worn, in which case there will be some flutter or spread.
7 Disconnect the timing light and (if removed) refit the fan and grille.

10 Fault diagnosis - ignition system

1 Ignition faults can usually be divided into two groups: faults causing total ignition failure, resulting in refusal to start or failure to restart, and faults causing misfiring. The latter may be intermittent or regular, and this may give a clue as to the origin of the fault.
2 A fault which may give rise to no more than a misfire on a four-cylinder car will have a much more noticeable effect on a two-cylinder engine. It is seldom, therefore than an ignition fault will remain undetected for long.
3 In cases of poor starting or indifferent running, always check the spark plugs first. If in doubt as to their condition, substitute new ones if possible.

Engine fails to start

4 If the engine fails to start due to either damp HT leads or distributor cap, a moisture dispersant, such as Holts Wet Start, can be very effective. To prevent the problem recurring. Holts Damp Start can be used to provide a sealing coat, so excluding any further moisture from the ignition system. In extreme difficulty, Holts Cold Start will help to start a car when only a very poor spark occurs.
5 If the engine fails to start and the car was running normally when it was last used, first check there is fuel in the fuel tank. If the engine turns over normally on the starter motor and the battery is.evidently well charged, then the fault may be in either the high or low tension

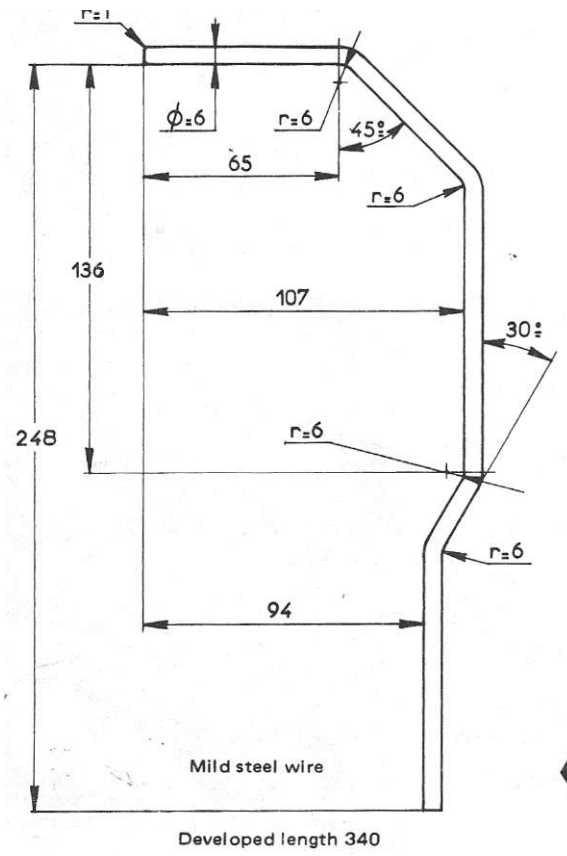


Fig. 3.4 Special timing adjustment tool (Citroen number MR 630-51/15) (Sec 8)

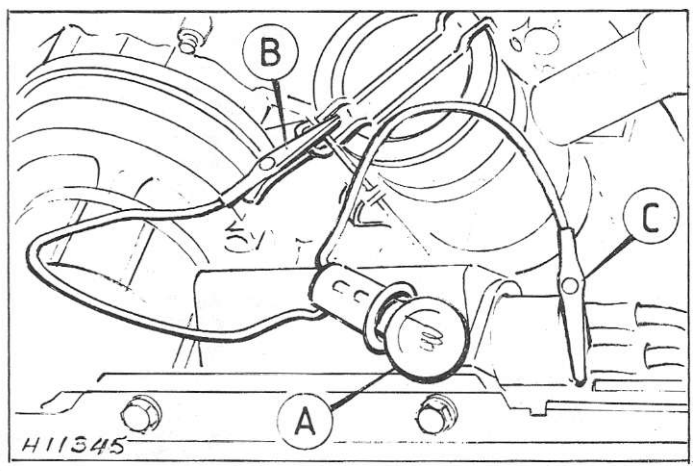


Fig. 3.5 Typical timing test light connections, bulb (A) inter-connected between earth (B) and coil feed wire connection (C) (Sec 8)

circuits. First check the HT circuit. Note: if the battery is known to be fully charged, the ignition light comes on, and the starter motor fails to turn the engine, check the tightness of the leads on the battery Terminals and also the security of the earth lead to its connection to :he body. It is quite common for the leads to have worked loose, even if they look and feel secure. If one of the battery terminal posts gets very hot when trying to work the starter motor this is a sure indication of a faulty connection to that terminal.

6 Check that HT current is reaching the plugs. Remove a plug cap and unscrew it to expose the end of the HT lead, or insert a nail or piece of wire so that the live metal can be held about ^ in (5 mm) away from the block. Hold the lead with rubber or an insulated tool to avoid electric shocks. Spin the engine on the starter (ignition on). Sparking from the lead to the block should be fairly strong with a regular blue spark. If it is, check the plugs; if they are in order, the fault must lie elsewhere.

7 If there is only a weak spark, this may be due to a discharged battery. In that case it should be possible to start the engine by using the starting handle. Keep your hand open when pressing down on the starting handle to avoid dislocating the wrist or thumb if the engine kicks back.

8 If there is no spark at either plug lead, check with a 12V test lamp that current is reaching the coil LT connections. With the ignition on, there should be a continuous reading at the wire from the battery and (as the engine is rotated) an intermittent reading at the contact breaker terminal as the points open and close.

9 No reading at the coil battery terminal suggests a break in the wire from the ignition switch or a defective switch; it may be possible to run a wire from the battery + terminal directly to the coil as a 'get-you-home measure.

10 A reading at the coil battery terminal but none at the contact breaker terminal may be due to a defect in the coil (open circuit primary), short circuit condenser or defective points. It could also be due to the wire from the coil to the points box being earthed somewhere along its length. Disconnect the wire and check again; if the lamp now lights the fault is probably not in the coil.

11 A reading at the coil battery terminal combined with a continuous reading at the contact breaker terminal when the engine is turned over may be due to a broken wire from the coil to the points box or contamination or physical damage at the point faces. In any event it suggests that the next move should be to examine the points.

12 Even if the LT system appears to be in order, it is possible for coil or condenser faults to exist which will prevent the engine running. Test by substitution if possible, but do not substitute more than one thing at a time or you will not know what was causing the fault.

Engine misfires

13 As mentioned above, 'misfiring' on a two-cylinder engine will probably involve the loss of half the available power and so will not go unnoticed for long.

14 If the misfire is regular, it is almost certainly in the HT circuit. Removing the plug cap from the surviving 'good' cylinder will cause the engine to stop; removing the cap from the defective side will make no difference. The plug and the HT lead are the only items to investigate," since there is no distributor to consider.

15 An irregular misfire is usually caused by a loose connection, although it can be due to a faulty condenser or coil. Check that all connections are clean and tight and that the points are in good condition and correctly gapped; renew the condenser as a matter of course if your investigations proceed so far as to make it accessible.