Spare Parts for Classic British Cars

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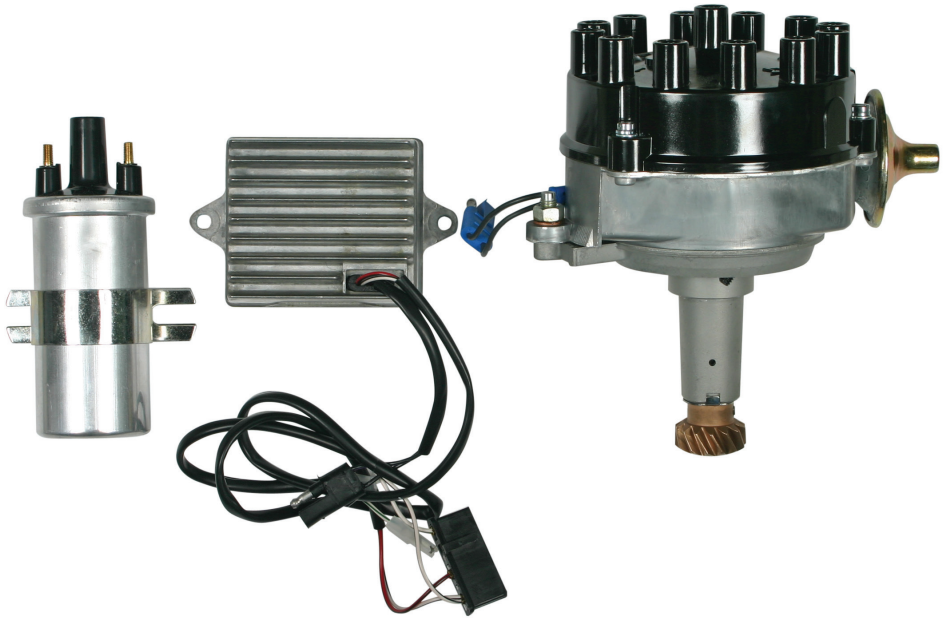

Opus ignition conversion kit

Opus ignition conversion kit
Converts the OPUS ignition system
to the later constant energy type whilst
retaining the original appearance.

Suitable for the Jaguar E-Type Series 3 V12,
Jaguar XJS Pre H.E. & Jaguar XJ12 Pre H.E.

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Replacement ignition kits- DAB113HE & DAB113HEF

Replacing the OPUS ignition system on the Jaguar V12 E-Type

The following text relates to the general method of replacing the Lucas OPUS ignition system on the Jaguar V12 E-Type with the kit DAB113HE/suffix due to the possibility of variations between cars it may not be suitable as a means of reference for every example of the model.

It is the responsibility of the person carrying out work on a motor vehicle to ensure that the procedure adopted is suitable for the operation, complete in every respect, compliant with all safety recommendations and in accordance with applicable legislation.

Please note that in the case of conversion kit DAB113HEF for fuel injected models it will be necessary to retain the existing trigger board.

Notes

A. The vehicle will usually have to be placed in a position that affords access to the front crankshaft pulley so that 1/18 engine can be rotated with a spanner.
B. If you decide to raise the vehicle please: Take all necessary safety precautions. Ensure that all equipment is suitable for the purpose for which it will be used and that it is operated in the correct manner. Place the vehicle on a firm level surface if using a jack or drive on wheel ramps. Never rely on a jack alone for support. Always place suitable safety blocks or stands underneath a raised vehicle. Chock front and rear of wheels remaining on the ground if others are raised. If using a vehicle lift: ensure that safety locks are fitted and functional.
C. When disconnecting fuel pipes: Carry out this operation in a well ventilated area - preferably in the open air. Take adequate precautions to ensure that spilt petrol is collected and disposed of safely. Ensure that suitable fire extinguishers are to hand, that they are in good working order, have valid certification if required by local legislation and that you know how to use them.
D. Check that the vacuum capsule on the original distributor (identified in fig 3) has the same number and position of pipes as on the replacement. If the vacuum capsule on the replacement distributor is different in construction to the one that was originally fitted contact Limora for advice before proceeding.
E. Tile operations described relate to the electrical wiring that is usually fitted to the OPUS and the replacement ignition systems.
F. Incorrect fitment of the ignition system and/or the attachment of additional cables and/or components may cause the ignition system to malfunction and invalidate the warranty.
G. Please read each section completely before commencing the operation.

A few suggestions for replacing the OPUS ignition system

1. Place the vehicle in position for the work to be undertaken.
2. Place a manual gearbox in neutral, an automatic in park.
3. Apply the hand brake and check that it is effective.
4. Switch off the engine and remove the keys from the car.
5. Open the bonnet.
6. Check that the support struts wil hold the bonnet securely - particularly if the front of the car is to be lifted. Should there be any possibility that the bonnet may fall, support it with a suitable prop.
7. Disconnect the battery earth terminal (- negative).
8. Position the disconnected battery earth cable so that the terminal cannot accidentally come into contact with the battery post.
9. For additional safety place an insulating medium (such as a piece of rag) between the battery post and the detached terminal.
10. Identify the following OPUS components that will be replaced after referring to figure 1 which shows a typical installation on the V12 E-Type after removal of several pipes and high tension leads for clarity.

Distributor
Amplifier
Ballast resistor
Ignition coil

The distributor will always be in the same location although the other components may be mounted in different positions.

11. Disconnect the cable socket that joins the amplifier to the distributor.
12. Detach the socket from the amplifier side of the ballast resistor which is usually marked (AMPLIFIER) and identified in figure 2.
13. Detach the socket from the voltage supply side of the ballast resistor which is usually marked with some or all of the words (TACHO +SW START) and identified in figure 2.
14. Detach all cables from the ignition coil.
15. Check whether or not there are spacers fitted to the bolts that secure the ignition coil and ballast resistor.
16. Whist supporting the ignition coil and ballast resistor, remove the securing bolts and spacers if they are fitted. Tile text assumes that the coil and ballast resistor share the same bolts and mounting location. If this is not the case please modify the procedure accordingly.
17. Remove the ignition coil with (if fitted) radio interference suppressor which is not required with the new coil as it is contained in the replacement amplifier casing.
18. Remove the ballast resistor.
19. Remove the ignition amplifier.
20. Note the position of high tension lead 1A on the distributor cap which is usually marked 1. cylinder 1A is at the front right hand side of the engine when viewed from the driver‘s seat. It is possible that the engine may have been timed with the high tension leads in a different position on the distributor cap so please check carefully before proceeding further. If 1A high tension lead is in a different position mark the cap accordingly.
21. Detach the high tension leads from the distributor cap. They do not have to be lifted off the spark plugs - they were removed for figure 1 to show the installation more clearly.
22. Remove the cap from the distributor.
23. Note the number and orientation of pipes (if attached) to the vacuum capsule on the distributor.
24. Disconnect the pipe(s) (if attached) from the vacuum capsule on the distributor.
25. Check between the cylinder heads for debris that could fall into the engine when the distributor is removed. Clean the area as necessary.
26. Rotate the engine by hand (usually with a 7/8“ A.F. spanner on the crankshaft front pulley extension hexagon) in a clockwise direction when looking on the front of the engine until piston 1A is almost at top dead centre on compression stroke at the point where ignition should occur. when the crankshaft is in this position the following conditions (a to c) will be satisfied.

A. The thin end of the rotor arm is pointing to the number 1A high tension pick up post in the distributor cap - as in figures 1 and 3 or as determined in operation 20 if your 1A high tension lead is in a different position.
B. The number 1 mark on the distributor timing rotor is approximately opposite the centre of the pick up unit as in figures 1 and 3 if the engine has been timed with the 1A high tension lead in the location marked 1 in the distributor cap. If timed differently as determined in operation 20 another of the 12 ferrite rods (identified in fig 3) will occupy this position.
C. The crankshaft front pulley line marked 1A is aligned with the position on the degree plate that corresponds to the required ignition timing for the engine. This information is usually located in the vehicle's documents or the relative workshop manual. As a general guide - the majority of cars manufactured for use in the United Kingdom have the ignition timing set at 12 degrees before top dead centre (BTDC) when using 97 octane petrol or 8 degrees BTOC if 95 octane petrol is to be used. Fig 4 illustrates the crankshaft pulley 1A timing mark and the degree plate removed from the engine for clarity.

Notes

i. If the crankshaft is rotated too far so that the 1A mark has passed the required degree position, turn the engine forwards (clockwise when looking on the front) for another two revolutions and reset the timing position.
ii. The crankshaft rotates twice for one revolution of the distributor.
iii. Do not rotate the engine backwards. i.e. anticlockwise when looking on the engine from the front.
iv. Once positioned correctly for static ignition timing the crankshaft must not be rotated until the replacement distributor has been fitted and timed.
v. In this operation the engine has being set in the position for static ignition timing therefore considerations of idle speed and distributor vacuum connection are not applicable.

27. Remove the spanner (if applicable) from the crankshaft pulley.
28. Lift the rotor arm off the distributor spindle. If the rotor arm is sized and breaks whilst being removed it is not important as a new one is supplied with the kit.
29. Insert a 3/16" A.F. (across flats) hexagon key through one of the slots in the distributor timing rotor (as in figures 1 and 3) and engage it in one of the three screws that attach the distributor to the engine.
30. Undo the screw by one turn only. Unfortunately the screw cannot be completely disengaged from its thread in one operation because after a short distance the head will come into contact with a flange inside the distributor further removal will thus be prevented until the distributor body is lifted off the engine.
31. Repeat operations 29 and 30 for the other two screws.
32. Lift the distributor as far out of the engine as permitted by the loosened screws.
33. Carefully undo the three screws one turn at a time in sequence until the distributor can be lifted out of its housing.
34. If sufficient space is available, lift the distributor out of its housing and away from the engine.

Notes

On many engines the distributor can be lifted clear of the engine without further work being necessary and if it has please proceed with operation 38. On some variants of the model this operation may be prevented by pipes which, need to be moved, disconnected or removed (according to the installation) from on top of the engine. Operations 35 to 37 offer suggestions for this procedure.

35. Make written notes of the position, route and connections of pipes and brackets that will have to be moved, disconnected or removed.
36. Move, disconnect and remove pipes as necessary so that the distributor can be lifted out of the engine. Please refer to NOTE (C) above before disconnecting fuel lines.
37. Blank open pipes and orifices.
38. Blank the housing from which, the distributor was removed.

All operations from this point onwards relate to the fitting and timing of the replacement distributor.

39. Check that the o ring is fitted to the base of the distributor.
40. Remove the cap from the distributor.
41. Slacken the timing adjuster lock nut, identified in fig 5. which shows the replacement distributor with the spark shield (the clear cover underneath the rotor arm) removed for clarity.

42. Rotate the timing adjuster screw clockwise and then anticlockwise to determine the limits of its travel.
43. Set the timing adjuster in the middle of its travel so that the line on the distributor base is opposite the centre of the scale cast on the upper section of the distributor body.
44. Hold the adjuster screw to prevent it rotating and lightly tighten the lock nut.
45. Rotate the centre spindle of the distributor so that:

A. The reluctor peak marked with the figure (1) is approximately opposite the centre of the pick up unit as in fig 5. The reluctor. normally grey. was painted white for ease of identification in the photograph.
B. The thin end of the rotor arm points to the rib on the spark shield that corresponds with number 1A high tension pick up post in tlle distributor cap. There are two possible orientations for the shield at 180 degree spacing so it is important that it is fitted correctly.
C. Rotate the distributor spindle one twelvth of a revolution clockwise so that the next reluctor peak is approximately opposite the centre of the pick up unit.

46. Without rotating the centre spindle remove the rotor arm from the distributor.
47. Apply a light coat of engine oil to the o ring and base of the distributor where it sits on the engine.
48. Remove the blanking material from the distributor orifice in the engine.
49. Lower the distributor into the engine and establish the condition where:

A. The vacuum capsule points to the rear of the engine in approximately the same alignment as the original distributor fitment in figures 1 and 3. The final position of the distributor body will be determined when the ignition timing is adjusted.
B. The three securing screws align with their locations in the engine.
C. The distributor and engine drive gears engage. At this juncture the locating screws contacting the base of the distributor will prevent it being lowered into its housing.

50. Insert the hexagon wrench into one of the three screws that attach the distributor to the engine.
51. Engage the screw with its thread and tighten for 1 turn only.
52. Repeat operations 50 and 51 for the other two screws.
53. Gently lower the distributor into its housing as far as the screws will permit.
54. Very carefully tighten each screw in turn for approximately one revolution until the distributor is fully seated in its housing. Take care to ensure that:

A. The distributor remains correctly aligned with the engine.
B. The distributor does not jam whilst being lowered into its housing.
C. Undue force is not used when fitting the base screws which should require minimal torque for rotation.

Do not fully tighten the screws, leave them just sufficiently loose so that the distributor body can be rotated by hand.

55. Refit the rotor arm to the distributor spindle.
56. Check that whilst fitting the distributor the spindle has rotated anticlockwise due to the action of engaging the skew gears so that:

A. The reluctor peak marked with the figure (1) is approximately opposite the centre of the pickup unit.
B. The thin end of the rotor arm is aligned with the moulded line on the spark shield that corresponds to 1A high tension lead pick up point in the distributor cap. There are two possible orientations for the shield at 180 degree spacing so it is important that it is fitted correctly

57. Rotate the body of the distributor until the reluctor peak marked (1) when rotating in an anticlockwise direction (viewed looking down onto tile distributor) would have just passed the centre of the pick up unit as in fig 6. This is the approximate relationship of the reluctor peak to the pick up unit when the high tension spark is triggered.
58. Remove the rotor arm.

59. Tighten the screws that attach the distributor to the engine.
60. Fit the rotor arm.
61. Fit the rubber gasket that seals the cap to the distributor body

62. Fit the cap to the distributor, seat it squarely and tighten the three screws evenly.
63. Attach the pipe(s) (if applicable) to the vacuum capsule.
64. Fasten the replacement amplifier to the mounting location in front of the distributor as in figures 1 and 3. On some cars the amplifier may be attached to a bracket that positions it at ninety degrees to the orientation shown in the photographs.
65. Fasten the replacement resistor pack in a suitable position - usually tile location from which the original was removed. If spacers were fitted to the bolts that secured the original ballast resistor they should normally be used with the replacement.
66. Fasten the replacement ignition coil in a suitable position - usually the location from which the original was removed. If spacers were fitted to the bolts that secured the original coil they should normally be used with the replacement.
67. Connect the cable sockets that join the distributor to the amplifier.
68. Route the harness from the amplifier to the resistor pack in such a manner that it is clear of rotating components and sharp edges upon which it could abrade.
69. Plug the amplifier harness connector socket into the AMPLIFER side of the resistor pack as in fig 7.
70. Attach the white and green cable from the resistor pack amplifier socket to the positive (+) terminal of the ignition coil as in fig 7.
71. Attach the white and black cable from the resistor pack amplifier socket to the negative (-) terminal of the ignition coil as in fig 7.
72. Plug the original ballast resistor supply connector socket into the supply side of the new resistor pack as in fig 7.

Notes

i. On some installations the tachometer sensing cable (usually white with a blue tracer) will have been detached from the TACHO terminal on the resistor supply socket and connected via an in-line resistor directly or indirectly to the negative side of the ignition coil. If this is the case, the cable must be reconnected to the TACHO terminal on the resistor supply socket without the in-line resistor in circuit. The TACHO terminal on the resistor pack is the uppermost location on the left hand connector as identified in figure 7.
ii. If the vehicle‘s wiring to the supply side of the resistor pack does not have a connector block fitted:

Attach the cables to the resistor pack as identified in figure 7 using the terminals supplied with the kit.

73. Secure all cables so that they cannot abrade on sharp edges or rotating components.
74. Fit the high tension leads to the distributor in the correct firing order starting with number 1A and proceeding in an anticlockwise direction looking on top of the distributor. The firing order of the Jaguar V12 E-Type engine is:
    1A, 6B, 5A, 2B, 3A, 4B, 6A, 1B, 2A, 5B, 4A, 3B.

75. Fit the high tension lead between the distributor and the ignition coil.
76. Remove orifice and pipe blanking plugs that were fitted in operation 37 (if applicable).
77. Reposition, connect or refit all pipes that were moved, disconnected or removed in operation 36 (if applicable).
78. Think through the job and check that all operations have been completed, whether listed here or not. There may be vehicles which require additional work to that detailed.
79. Check that the hand brake is applied and check that it is effective.
80. Check that a manual gearbox is in neutral, an automatic in park.
81. Disconnect the white and black cable from the ignition coil negative (-) terminal.
82. Remove insulating material from the battery post (if applicable).
83 Connect the battery.
84. Switch on ignition but do not engage the starter motor.
85. Check the petrol system for leaks and rectify if required.
86. Remove all tools, rags, etc. from the engine compartment.
87. Check that there is nothing that can catch on rotating components when the engine is turned on the starter motor.
88. Rotate the engine with the starter motor and check that there are no unusual sounds. If everything appears to be in order continue with operation 90. If there are any unusual noises, stop turning the engine immediately, switch off ignition if necessary and rectify the problem before proceeding further.

89. Carry out operations 84 to 88 if work has been done on the engine as determined when the engine was rotated on the starter motor.
90. Switch off ignition.
91.. Reconnect the white and black cable to the negative (-) terminal of the ignition oil.
92. Switch on ignition, keep hold of the key (so that you can switch off immediately if necessary) and start the engine.
93. Allow the engine to warm up slightly so that it will run at a stable idle speed.

Notes

The ignition timing should have been set approximately by using the static methoddescribed for the purpose of starting the engine only. It is essential that the ignition timing be set accurately with the use of a stroboscopic light (often referred to as a „strobe light“ or „timing light“) as outlined in operations 95 to 104. Driving the ear with incorrect ignition timing can cause damage to or total destruction of the engine. If the ear has to be taken elsewhere to have the timing set by stroboscopic means, proceed to operation 106 and remember:

A. Use minimal throttle when driving the car.
B. Keep engine rpm to the minimum possible.
C. Drive the car at low speeds only.
D. If the engine exhibits any problems such as misfiring, knocking, pinking, unusual noises, loss of power etc. switch off ignition as soon as possible having regard to all relevant factors and rectify the fault(s) before proceeding. If necessary seek professional advice.

Stroboscobic timing

The principle of using a stroboscopic light to determine the ignition timing is that a flashing light (activated every time the spark is produced on the high tension lead to which it is connected) is directed onto a rotating component (such as a crankshaft pulley) which appears to the eye to be stationary so that the relationship between the TDC mark and the timing plate can be seen. On the Jaguar V12 engine the TDC mark is usually on the pulley and the degree plate attached to the engine as in fig 4.

The principle of stroboscopic timing also applies if the markings are the other way round. i.e. a stationary plate with a TDC mark and a rotating degree indicator.
When checking stroboscopic ignition timing it is essential that the engine runs below the speed at which the centrifugal ignition advance mechanism in the distributor begins to operate. An engine speed of 750 rpm or less is usually suitable for this purpose although other criteria may be specified in the relative data. If the engine is allowed to run at a speed where the centrifugal advance mechanism is in operation the stroboscopic timing will be the static figure plus the amount by which the distributor has advanced.

An example

Static timing - 12 degrees BTDC
Centrifugal advance - 8 degrees BTDC
Total advance - 20 degrees BTDC

The difficulty in the initial stages of setting the timing is that a large error (either advance or retard) can have considerable effect on the engine's idle speed. Ignition timing that is too far advanced will, provided that it is within reasonable limits, usually cause an increase in engine idle speed and vice versa if the timing is retarded. What this means in practice is that adjusting the ignition timing may alter the engine idle speed which in turn can affect the operation of the distributor centrifugal advance mechanism and hence the ignition timing.

94. Switch off ignition.
95. Obtain stroboscopic timing data for the engine which for U.K. specification Jaguar V12 E-Types is usually:

When using 97 octane petrol
12 degrees before top dead centre (BTDC) at an idle speed of no more than 750 rpm with the vacuum capsule disconnected.

When using 95 octane petrol
8 degrees before top dead centre (BTDC) at an idle speed of no more than 750 rpm with the vacuum capsule disconnected.

96. Connect a stroboscopic light in accordance with the relevant instructions. A timing light can by purchased from Limora.
97. Disconnect the pipe(s) from the distributor vacuum capsule if specified in the timing data.
98. Slacken the distributor timing adjuster lock nut just sufficiently to allow the adjuster to be rotated with a screwdriver.
99. Remove all tools, rags, etc. from the engine compartment.
100. Check that there is nothing that can catch on rotating components when the engine is started.
101. Start the engine and allow it to idle.
102. Check the ignition timing with the strobe light and note the reading.
103. If the ignition timing is within approximately 4 degrees of the required setting proceed to operation 102. If the error is greater than 4 degrees continue with operation 96.
104. Switch off the engine.
105. Adjust the ignition timing if required by rotating the distributor body with the timing adjuster. Turning the adjusting screw clockwise advances the ignition timing and vice versa.
106. Remove all tools, rags. etc. from the engine compartment.
107. Check that there is nothing that can catch on rotating components when the engine is started.
108. Start the engine.
109. Check the stroboscopic ignition timing and note the reading.

If the ignition timing is within approximately 4 degrees of the required setting proceed to operation 110. If the timing is not within these limits, repeat operations 104 - 109 until the desired result is achieved.

110. Check and if necessary adjust the engine speed to bring it within the requirements of the stroboscopic timing data. On the majority of installations this will be when the engine is idling but it is possible for other criteria to be stated.
111. Check the ignition timing with the strobe light and note the reading.

If the ignition timing is correct proceed to operation 112. If the timing is not within these limits, repeat operations 104 -109 until the desired result is achieved.

112. Switch off the engine.
113. Remove the timing light and all of its cables.
114. Restore the engine to running condition as applicable.
115. Connect the pipe(s) to the distributor vacuum capsule if applicable.
116. Remove all tools, rags, etc. from the engine compartment.
117. Check that there is nothing that can catch on rotating components when the engine is started.
118. Start the engine and allow to idle.
119. Adjust the engine idle speed (if applicable) to the figure stated in the relevant technical data. It is possible that on some engine variants the recommended idle speed will be different to that specified for setting stroboscopic ignition timing.
120. Switch off the engine.
121. Remove all rags, tools, etc. from the engine compartment.
122. Think through the job to check that all operations have been completed, whether listed here or not.
123. Remove the support prop if applicable and close the bonnet.
124. Whilst taking all necessary safety precautions carry out operations as necessary to place the car in position for a test drive.
125. Carefully take the car for a test drive. If the engine exhibits any problems such as misfiring, knocking, pinking, unusual noises, loss of power etc. switch off ignition as soon as possible having regard to all relevant factors and rectify the fault(s) before proceeding. If necessary seek professional advice.

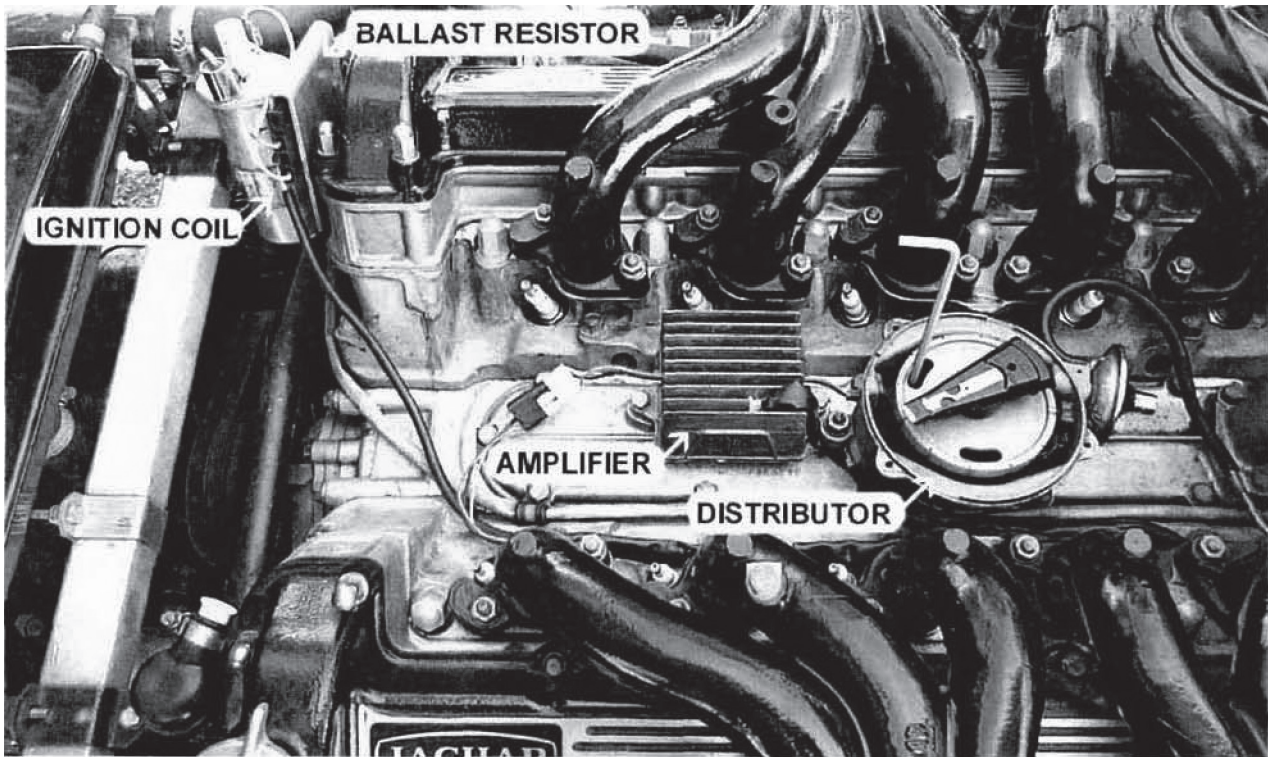

Figure 1

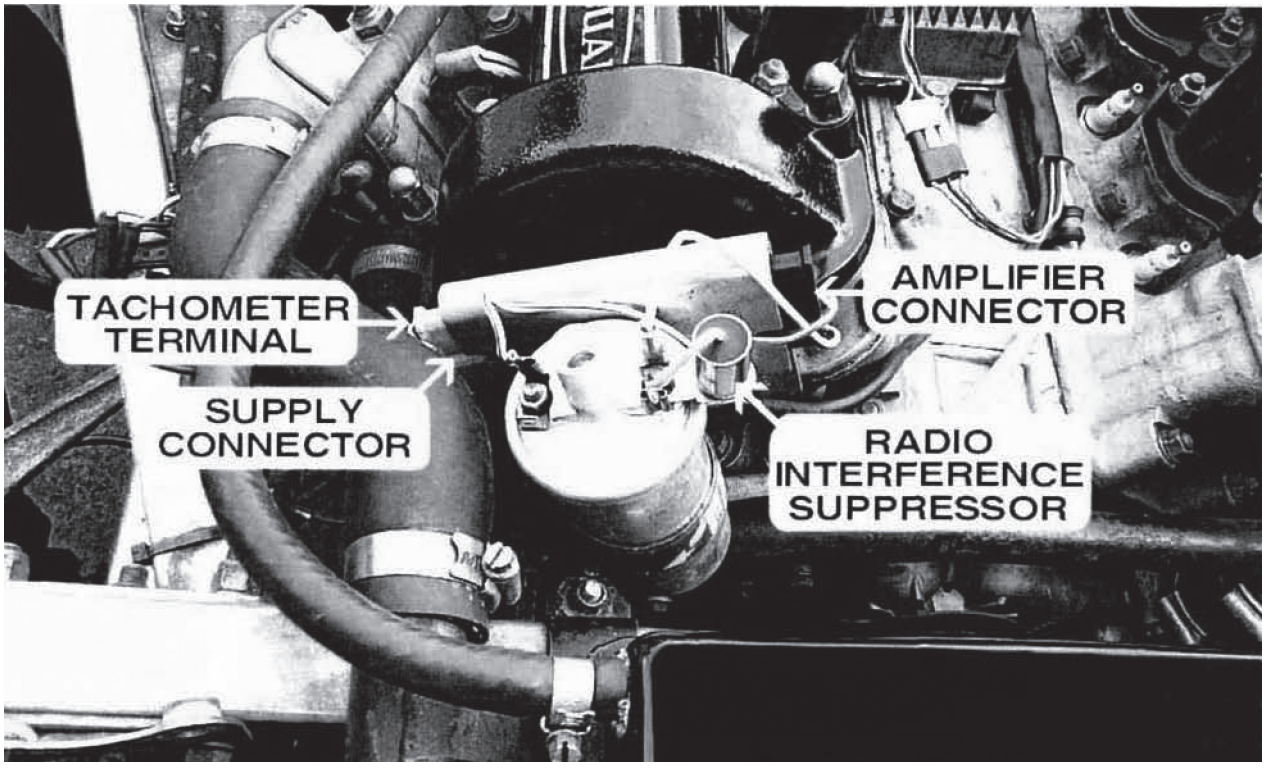

Figure 2

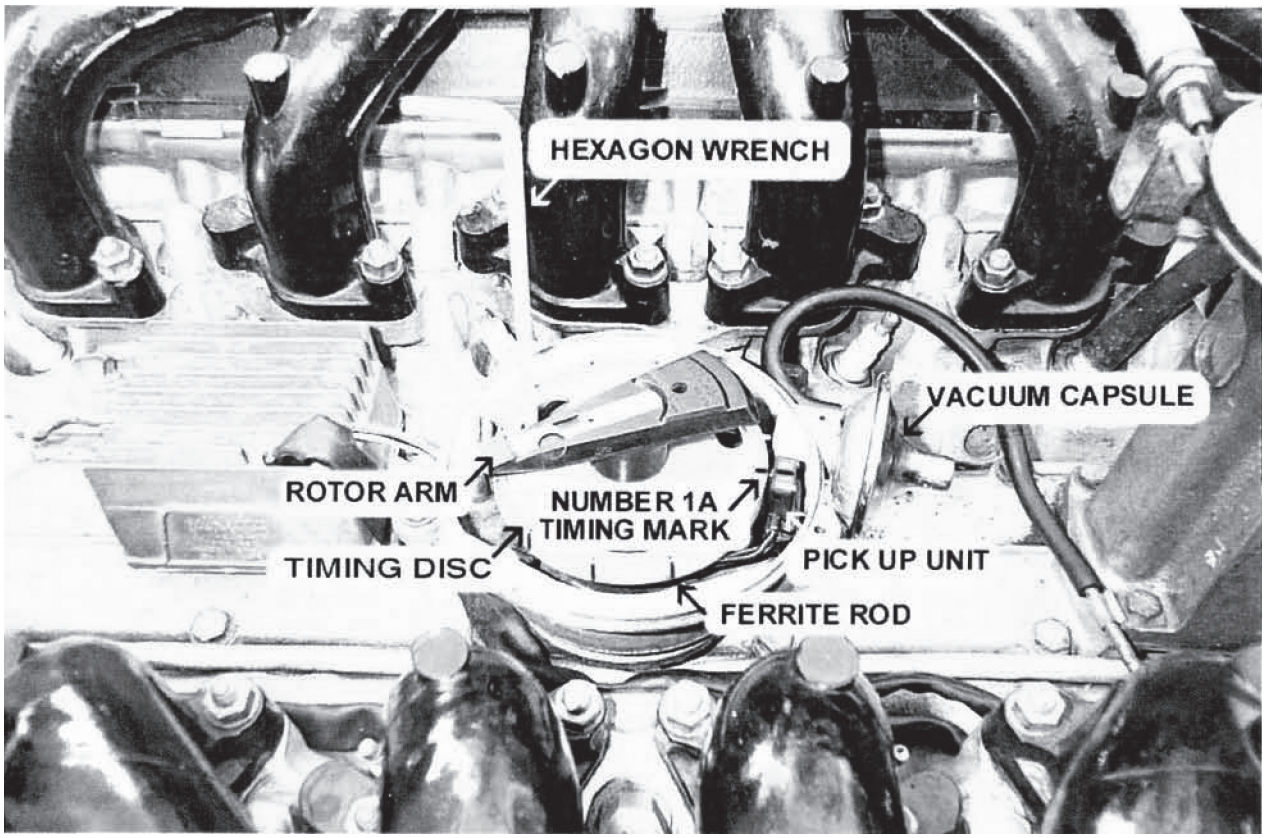

Figure 3

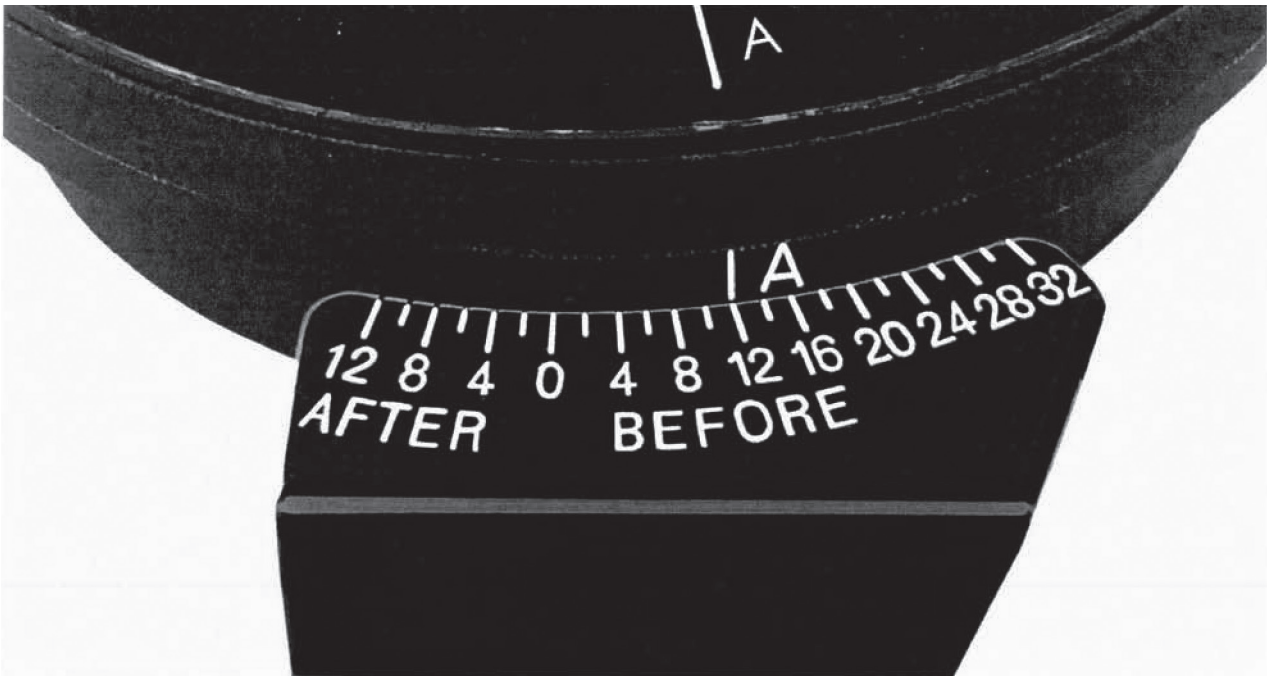

Figure 4

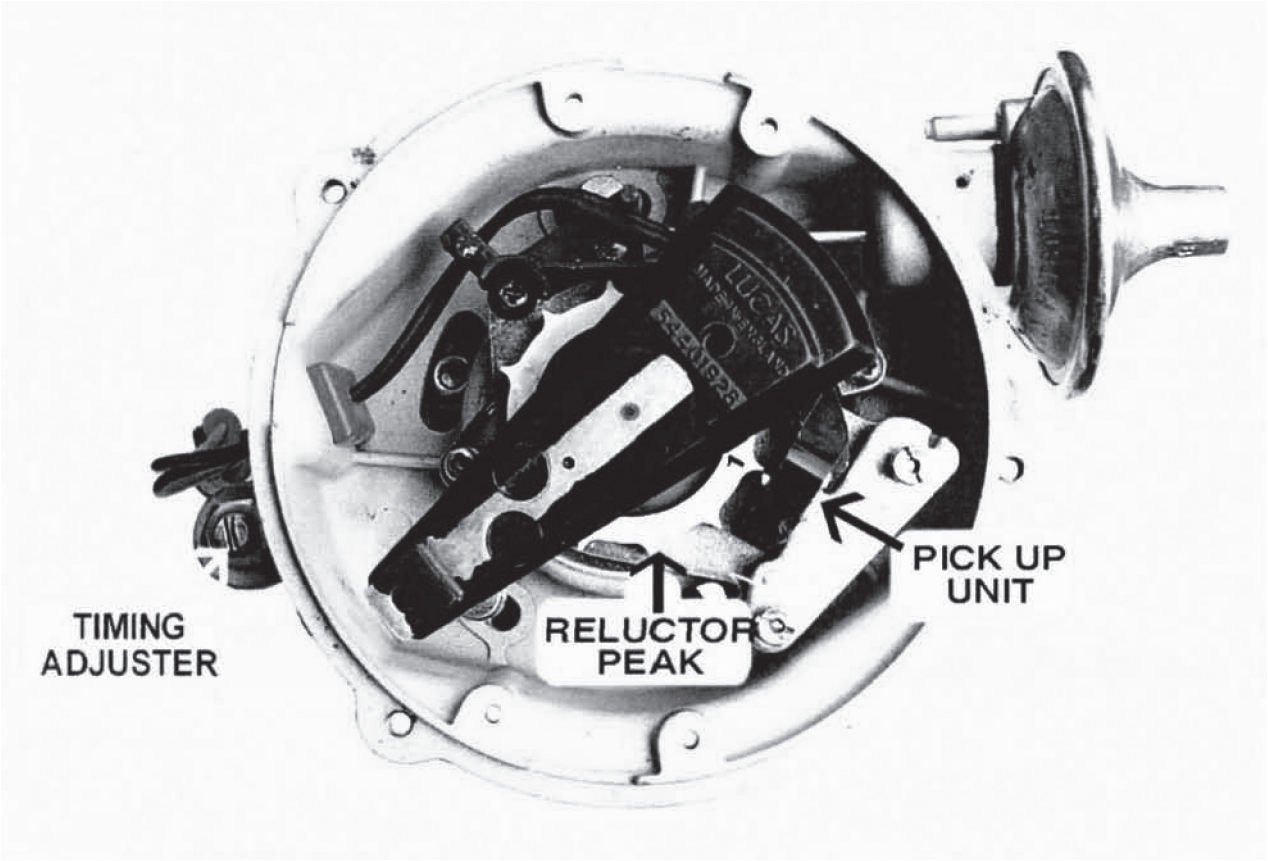

Figure 5

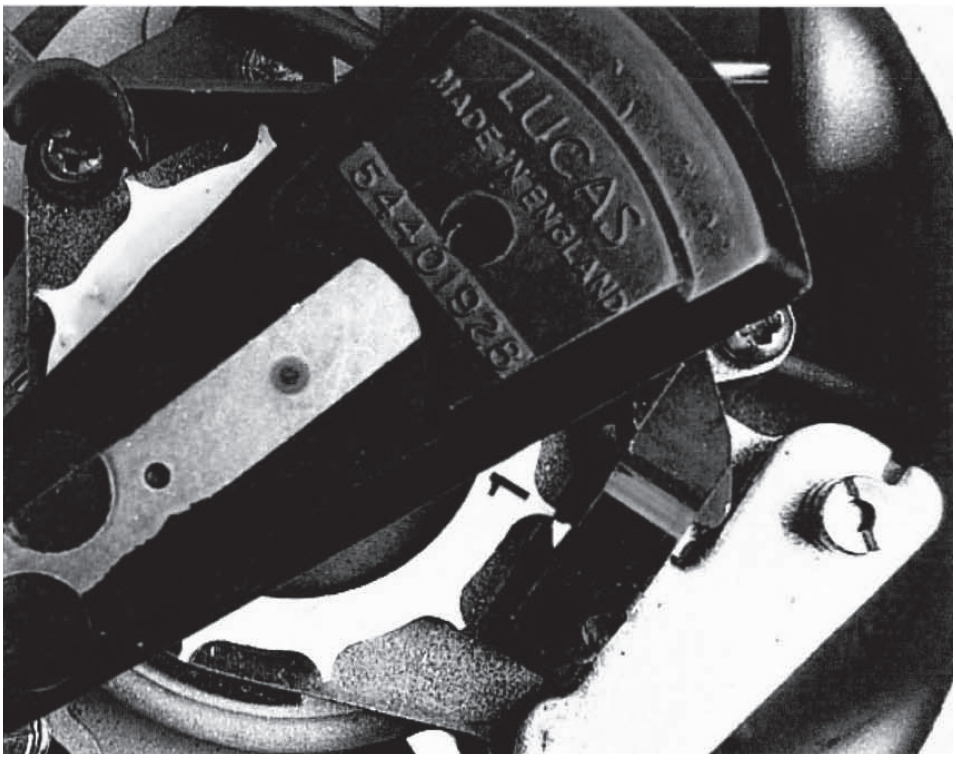

Figure 6

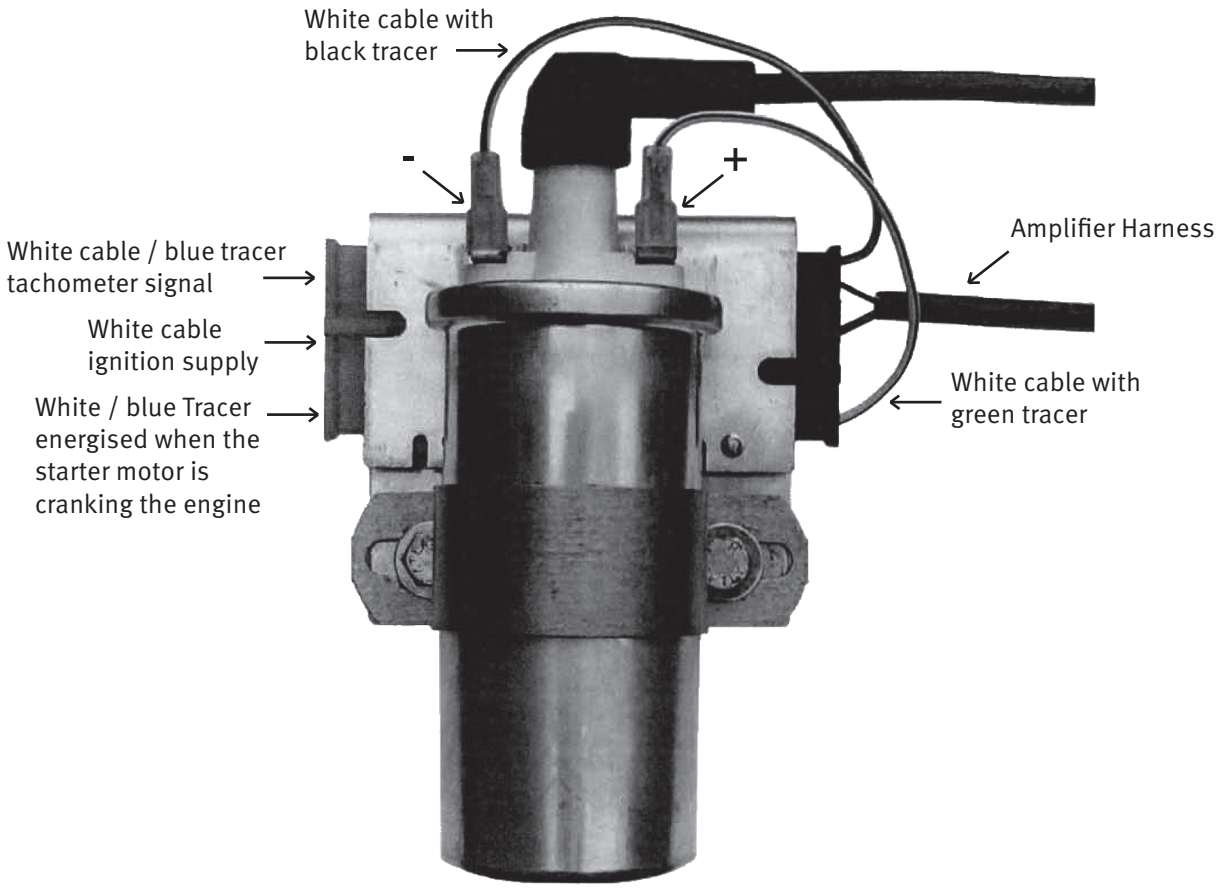
White cable with
black tracer
-
+
Amplifier Harness
White cable / blue tracer
tachometer signal
White cable
ignition supply
White / blue Tracer
energised when the
starter motor is
cranking the engine
White cable with
green tracer

Figure 7