T. A. C. IGNITION

INCORPORATING TRANSISTOR IGNITION UNIT MODEL TAC3

Important: Model TAC3 is intended for 12-VOLT POSITIVE EARTH vehicles only.

When a TAC3 ignition unit is used to replace a TAC2 unit, the external suppression capacitor, when fitted, must be removed.

1. DESCRIPTION

(a) Construction

The Lucas TAC3 ignition system comprises: Transistor Ignition Unit; Ballast Resistor Model 3BR; Ignition Coil Model BA12; and a conventional distributor, except that the contact breaker capacitor is not required.

The physical layout of these units is shown in Fig. 1.

Transistor Ignition Unit. The unit (see Figs. 2 and 3) is built-up on an aluminium extruded heat sink and incorporates a high voltage transistor, two capacitors and two printed circuit resistors. Although the transistor is capable of functioning at ambient temperatures up to 100°C, adequate for normal under-bonnet operation, both the transistor and printed circuit resistors are cooled by convection currents, the back compartment of the heat sink where they are sited being left open at both top and bottom. On the other hand, the front compartment of the heat sink which houses the two capacitors is enclosed by a pressed aluminium cover making the front compartment splash-proof.

The cover is attached to the heat sink base by four self-tapping screws, and the whole unit is secured to the vehicle through four $\frac{9}{32}$ in (7.14 mm) diameter flange fixing holes.

Electrical connexions to the ignition unit are made by a single shrouded plug comprising three 'Lucar' connectors to British Standard AU17.

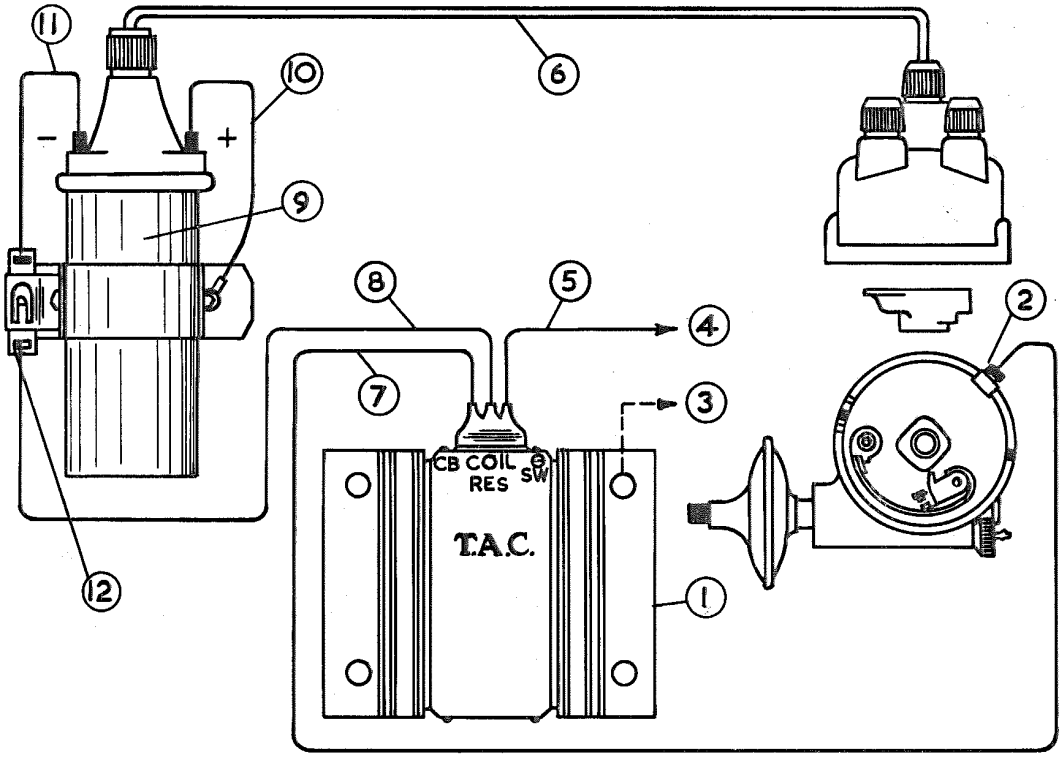

Fig. 1 Wiring Diagram

1. Transistor ignition unit
2. Distributor low tension terminal
3. To earth via fixing bolts
4. To ignition switch
5. Cable colour, white
6. High tension cable
7. Cable colours, white-with-black
8. Cable colours, white-with-blue
9. Ignition coil, model BA12
10. Earthing Cable, black
11. Cable colours, white-with-blue
12. Ballast resistor

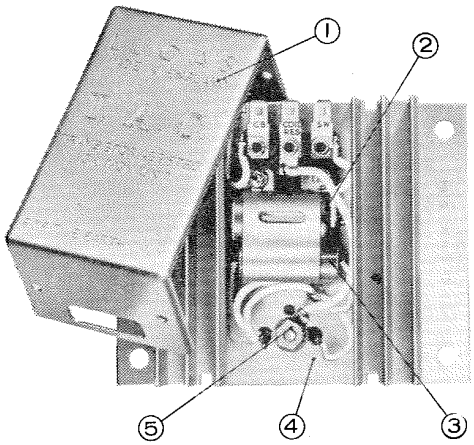

Fig. 2 Ignition Unit with cover withdrawn

1. Cover
2. Capacitor C2
3. Capacitor C
4. Heat sink
5. Transistor fixing stud

Ignition Coil Model BA12. This is a fluid-cooled coil with a high turns ratio and a lower primary inductance than that of the ignition coil used in a conventional system.

L.T. terminals are marked '+' and '—'.

It is important that the coil can is always earthed when in use.

Ballast Resistor Model 3BR. This is wired in series with the ignition coil primary winding and limits the voltage applied to the primary winding. Electrical connexions are made by two 'Lucar' connectors to British Standard AU17. The ballast resistor is secured by one of the ignition coil fixing bolts, usually on the coil negative side.

(b) Operation

The electrical circuit of TAC3 is shown in Fig. 4. It operates as follows:—

When the distributor contact breaker is closed, a current of about 1A flows from the battery positive, via the contacts, resistor R1, the base-emitter junction of the transistor and back to the battery via the ignition switch. With current flowing in the base circuit transistor T assumes a conductive state and, due to its current gain, a much larger current of about 5A flows in the collector-emitter circuit and the primary of the ignition coil. Energy is thus stored magnetically in the coil.

When the contacts open due to the rotation of the distributor cam, current ceases to flow in the base circuit and the transistor reverts to a non-conductive state. With no current in the primary of the ignition coil to sustain it, the magnetic flux in the coil core quickly collapses, inducing a high voltage across the coil secondary winding which in turn produces a spark at the plug in the normal manner. The self-induced voltage in the primary winding of the coil now appears across the collector to base and emitter of the transistor, the latter being designed to withstand this high voltage.

When the spark occurs, high frequency reverse voltage transients are produced at the collector of the transistor. Capacitor C absorbs these impulses and prevents transistor breakdown.

Capacitor C2 connected across the supply prevents radio interference currents being transmitted into vehicle low tension wiring.

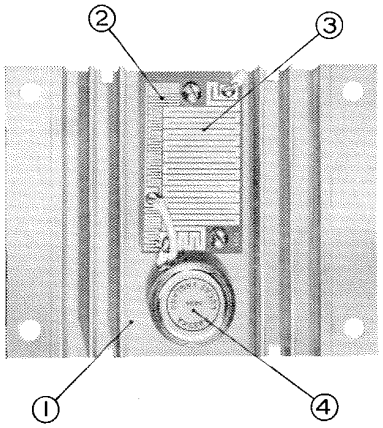

Fig. 3 Rear view of Ignition Unit

1. Heat sink
2. Printed circuit resistor R2
3. Printed circuit resistor R1
4. Transistor

2. ROUTINE MAINTENANCE

(a) After the first 500 miles

Distributor. To compensate for initial bedding-in of the fibre heel, adjust the contact breaker gap to measure 0.014–0.016 in (0.35–0.4 mm) when fully opened.

(b) Every 6,000 miles

Distributor. Carry out the usual lubrication and cleaning procedure for a conventional ignition distributor.

Transistor Ignition Unit. Wipe away any dirt, oil or grease which may have collected on the heat sink - otherwise its cooling efficiency will be impaired.

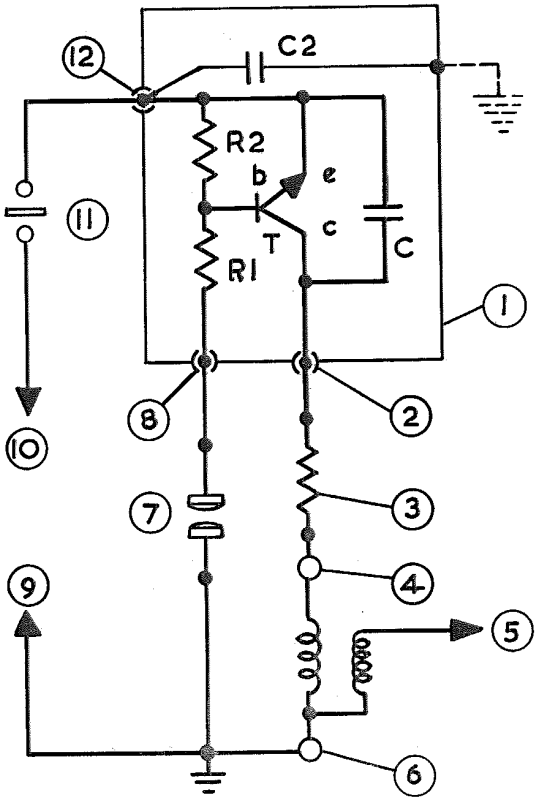

Fig. 4 Circuit Diagram

1. Transistor ignition unit
2. Terminal marked 'Coil Res'
3. Ballast resistor
4. Ignition coil terminal marked '—'
5. Ignition coil high tension
6. Ignition coil terminal marked '+'
7. Contact breaker
8. Terminal marked 'CB'
9. To battery positive
10. To battery negative
11. Ignition switch
12. Terminal marked 'SW'

Terminal Connexions. Make sure that all terminal connexions are secure.

(c) Every 25,000 miles

Distributor. Check the contact breaker gap and adjust if necessary.

3. TECHNICAL DATA

(a) Nominal voltage:	12V (Positive Earth)
(b) Stall current (battery voltage 12.0–12.5V):	4.8–6.5A
(c) Primary resistance of ignition coil:	1.3–1.5 ohm
(d) Resistance of ballast resistor:	1.0 ohm (0.5 ohm on earlier models)
(e) Contact breaker gap setting:	0.014–0.016 in (0.35–0.4 mm)

4. SERVICING

Should it be necessary during the following tests to disconnect and reconnect the transistor, it is extremely important to grip the transistor pins below the soldered joint with a pair of pointed-nose pliers. These act as a heat shunt and prevent damage to the transistor.

Testing the System in Position

In the event of a fault being suspected in the ignition circuit, confirm this by checking the high tension in the normal way, adopting the following procedure to locate the cause of trouble.

(i) Remove the transistor ignition unit cover and switch on the ignition.

Connect the negative lead of a d.c. voltmeter to the 'SW' terminal of the transistor ignition unit and the positive lead to the '+' terminal of the ignition coil. The voltmeter should read battery voltage.

Should a zero reading result, then there is an open circuit lead from the ignition switch to the 'SW' terminal or from the ignition coil to earth. This must be traced and remedied.

(ii) Transfer the voltmeter negative lead to the 'CB' terminal of the ignition unit. Having removed the distributor cover and ensured that the contacts are open, observe the voltmeter reading. It should be within 2 or 3 volts of that indicated in test (i).

If no reading is obtained, resistor R1 is open circuit and the printed circuit board will have to be replaced. This, however, is unlikely to occur.

(iii) With the voltmeter connected as in (ii) above, close the contacts. If the voltmeter reading does not fall to zero, remove and clean the contacts. Refit them after cleaning and set the contact breaker gap to 0.014–0.016 in (0.35-0.4 mm). If the voltmeter reading still does not fall back to zero with the contacts closed, then either the 'CB' lead from the ignition unit to the distributor (white-with-black lead), or the contact breaker earth lead in the distributor, is open circuit. This must be traced and remedied.

(iv) Transfer the voltmeter negative lead to the ignition unit 'Coil Res.' terminal. Close the contacts and observe the voltmeter reading which should be

approximately battery voltage. If such a reading is obtained proceed to test (v).

If no reading is obtained then the transistor is faulty and will have to be replaced. To remove the transistor from the ignition unit proceed as follows.

Disconnect the voltmeter leads, switch off the ignition and remove the shrouded plug from the ignition unit. Unscrew the four fixing bolts and remove the ignition unit from the vehicle.

Having taken note of the appropriate connexions, unsolder the leads from the two transistor pins.

Unscrew the transistor securing nut and lift off the spring washer (when fitted), solder tag, metal washer and mica insulating washer. The transistor and second mica washer may now be removed from the heat sink.

To replace a transistor the above procedure should be reversed.

Note: When reassembling a transistor to the heat sink smear both sides of the mica washers with 484 silicone grease.

The transistor pins must be insulated with $\frac{3}{16}$ in (4.75 mm) lengths of pvc 2 mm bore tubing, and the fixing stud with an insulating bush.

Maximum torque to be applied to the transistor fixing nut is 12 lbf in (0.14 kgf m).

Secure the ignition unit to the vehicle and insert the shrouded plug.

(v) With the same voltmeter connexions as in test (iv) and the ignition switched on, open the contacts. If the voltmeter reading does not fall to zero either the transistor or capacitor C is faulty. To determine which should be replaced, proceed as follows.

Disconnect the voltmeter leads, switch off the ignition and remove the shrouded plug from the ignition unit. Unscrew the transistor securing nut and lift off the tag located under the nut. Replace the nut.

Important: Do not allow the tag to reconnect with the transistor stud or the heat sink during the subsequent test.

Connect a 500V megger between the ignition unit 'Coil Res.' and 'SW' terminals and check for a short circuit. If a short circuit is indicated the capacitor should be replaced.

If a short circuit is not indicated the transistor is faulty and should be replaced (see test iv).

(vi) While the solder tag is still removed check the two insulating mica washers. To do this transfer the megger leads to the transistor stud and the heat sink. A minimum reading of 50 megohms should be obtained. If such is the case, reconnect the solder tag to the transistor stud, the shrouded plug to the ignition unit and proceed to test (vii).

If less than 50 megohms is indicated remove the transistor securing nut, metal washer and transistor (see test iv), and examine the two insulating mica washers. If either of the mica washers is cracked or broken it should be replaced by another mica washer smeared on both sides with 484 silicone grease.

Reassemble the transistor to the heat sink, ensuring that both the mica washers and the metal washer are in their correct position. Repeat the test.

When a satisfactory reading has been obtained, reconnect the solder tag to the transistor stud and the shrouded plug to the ignition unit.

(vii) Switch on the ignition and connect the negative lead of the voltmeter to the ignition unit side of the ballast resistor, and the positive lead to earth. Close the contacts. The voltmeter should indicate the same as for test (iv).

If previously in test (iv) a reading approximately equal to the battery voltage was obtained, but now the voltmeter reads zero, this indicates an open circuit lead from the ballast resistor to the ignition unit. It should be traced and remedied.

(viii) Keeping the contacts closed, transfer the negative voltmeter lead to the coil side of the ballast resistor. The voltmeter should read about half that obtained in test (iv).

If no reading is obtained the ballast resistor is open circuit and should be replaced.

(ix) Transfer the voltmeter negative lead to the '—' terminal of the ignition coil. With the contacts closed the voltmeter should give the same reading as obtained in test (viii).

If previously a satisfactory reading was obtained for test (viii) but now the voltmeter reads zero, this indicates an open circuit lead from ballast resistor to ignition coil which should be replaced.

(x) Connect the voltmeter negative lead to the ignition unit side of the ballast resistor, and the positive lead to the other terminal of the ballast resistor. If the primary winding of the ignition coil is satisfactory approximately 5 volts will be indicated on the voltmeter.

If no reading is obtained, fit a replacement coil.