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LUCAS IGNITION SYSTEM
MODELS T.A.C.
3 & 4

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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 -:& 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.

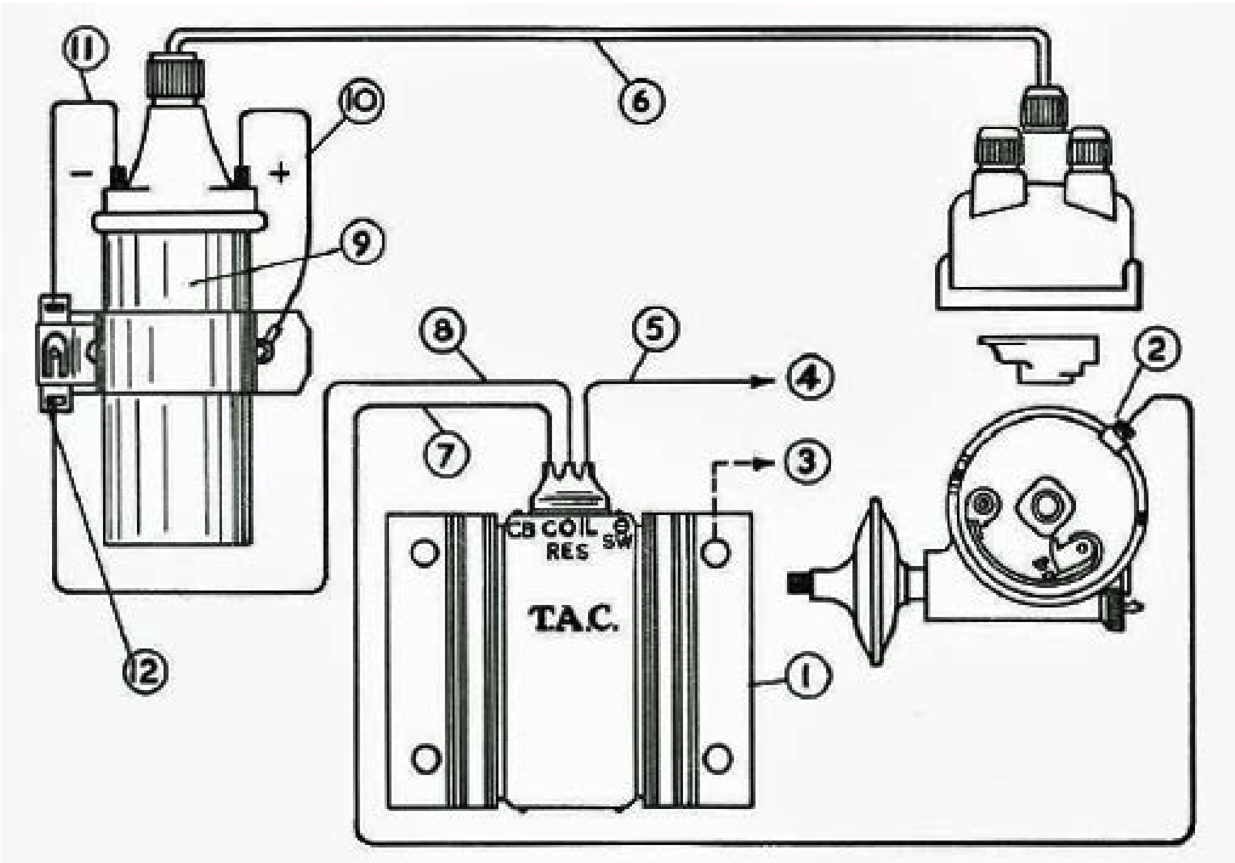

Fig. 1 Wiring Diagram

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

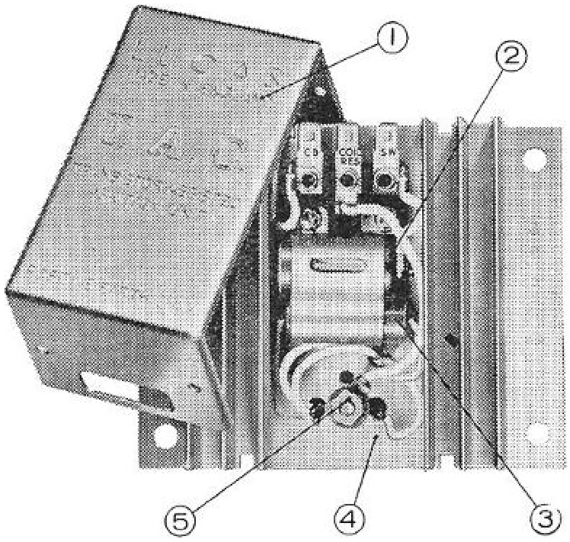

Fig. 2 Ignition Unit with cover withdrawn

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 with-stand 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.

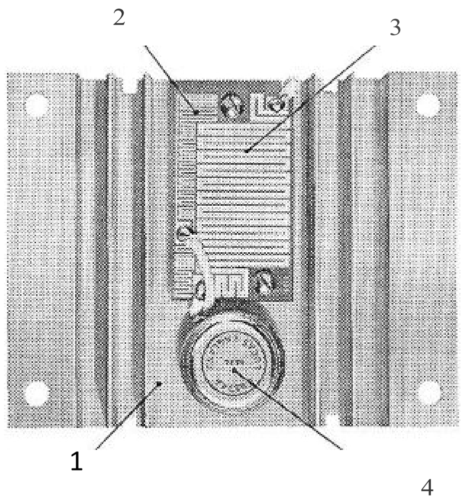

Fig. 3 Rear view of Ignition Unit

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.

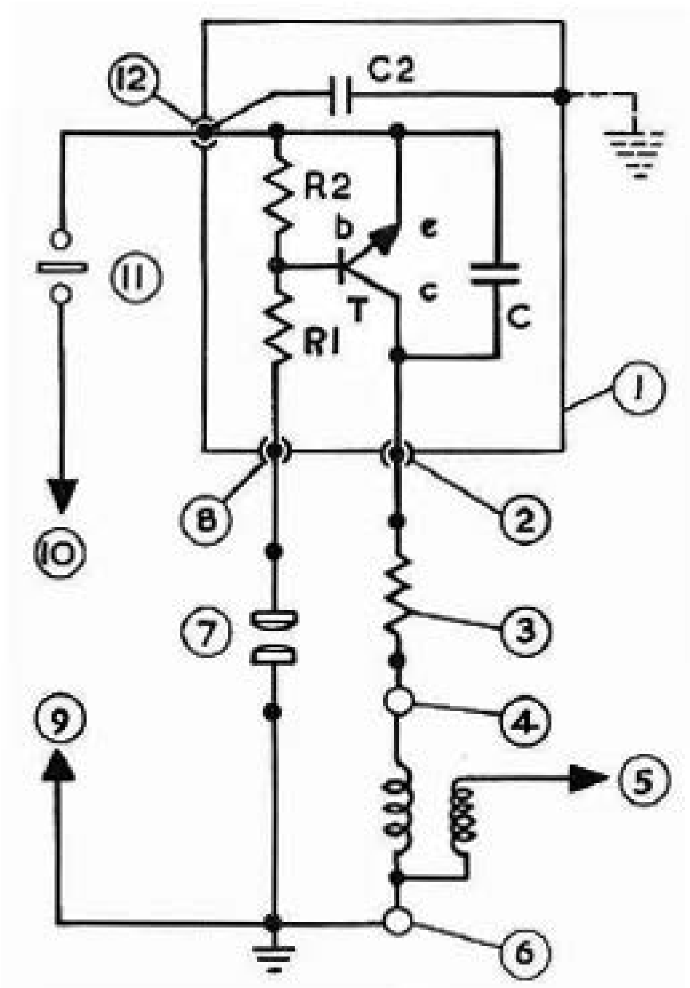

Fig. 4 Circuit Diagram

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 ail terminal connexions are secure.

(c) Every 25,000miles

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

3. TECHNICAL DATA

(a) Nominal voltage:	12V (Positive Earth)
(b) Stall current (battery voltage 12.0-12.5Y):	4.8-6.5A
(c) Primary resistance of ignition coil:	I. 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 nun)

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 Rl 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 fcr 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 S00Y 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.

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INCORPORATING EITHER NEGATIVE OR POSITIVE EARTH

TRANSISTOR IGNITION UNIT MODEL TAC4

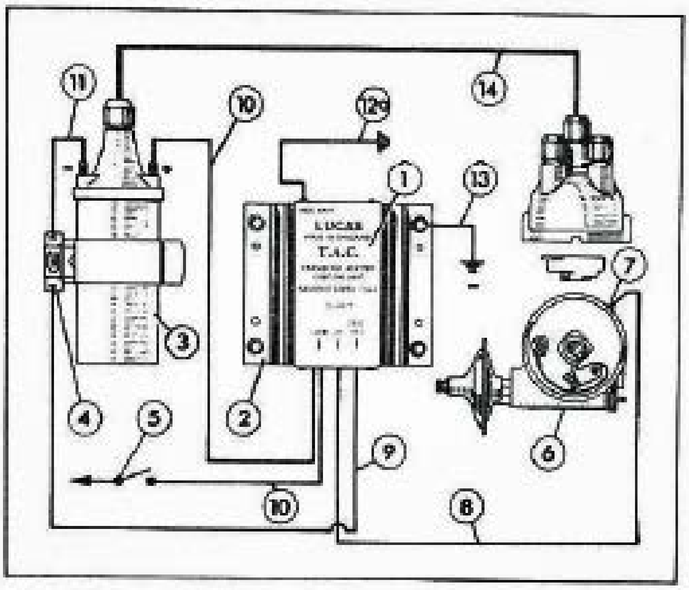

Fig. 1 (a) Negative earth wiring diagram

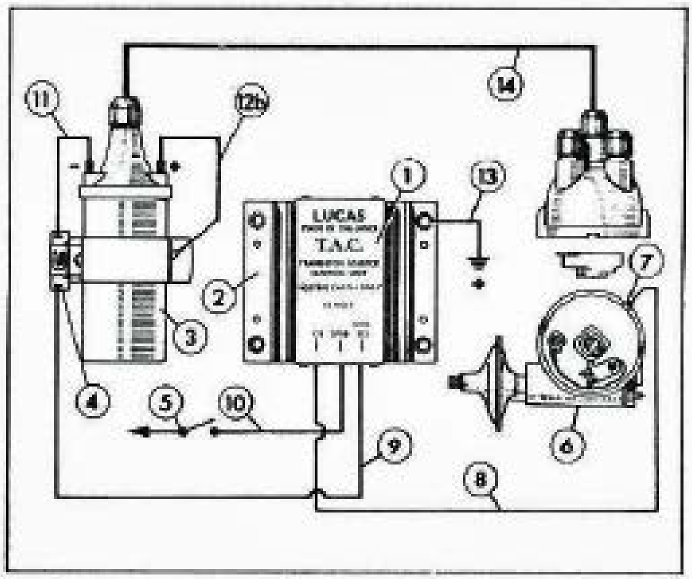

Fig. 1 (b) Positive earth wiring diagram

1 Transistor ignition unit (Front compartment cover)
2 Transistor ignition unit (heat sink)
3 Ignition coil (ballast ignition type)
4 Ballast resistor (3BR)
5 Ignition switch (battery supply)
6 Distributor
7 Distributor L.T. terminal
8 Cable (white with black)
9 Cable (white with blue)
10 Cable (white)
11 Cable (white with black)
12a Cable (black) earthed direct to distributor fixing bracket
12b Cable (black) earthed to ignition coil fixing bolt
13 Cable (black) earth
14 High tension (H.T.) cable

1. DESCRIPTION

(a) Construction

The Lucas TAC4 ignition system comprises: Transistor Ignition Unit (of suitable polarity); Ballast Resistor Model 3BR; Ignition Coil Model BA12; and a conventional distributor, except that the contact breaker capacitor is not required. Except for the transistor ignition unit, these components are the same as used in the TAC3 system, which is confined to positive earth applications.

TAC4 negative earth and positive earth wiring diagrams are illustrated in Fig. 1 (a) and 1 (b),

Transistor Ignition Unit. The unit comprises a black anodised aluminium heat sink assembly, with a natural finish aluminium cover. Incorporated in the heat sink are two compartments, known as the front and rear compartments (see Fig. 2 (a), 2 (b), and 2 (c)). The front compartment, normally enclosed by the cover, contains a power transistor and two capacitors. The rear compartment, which has no cover and is exposed for convection cooling, contains a printed circuit wiring board assembly, which incorporates resistors (plus a driver transistor and an additional resistor in the case of negative earth systems) and 'Lucar' terminal blades for connecting the external circuits. The 'CB' and 'SW' terminals have double-bladed connectors, so enabling additional wiring to be fitted. This would normally be connected to the ignition coil terminals in conventional ignition systems.

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Incorporating Either Negative or Positive Earth Transistor Ignition Unit Model TAC4

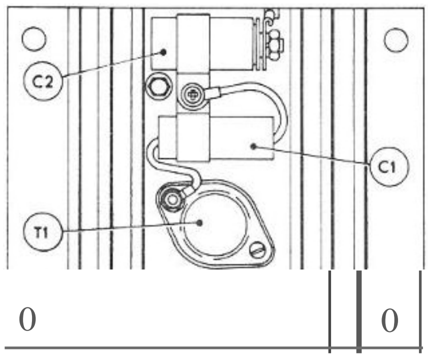

Fig. 2 (a) Front compartment of transistor ignition unit
(negative and positive earth systems)

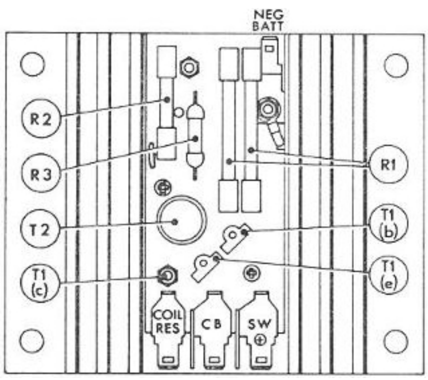

Fig. 2 (b) Rear compartment of transistor ignition unit
(negative earth system)

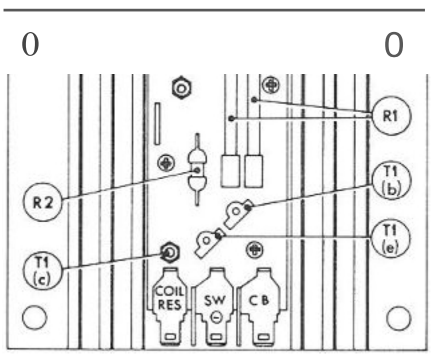

Fig. 2 (c) Rear compartment of transistor ignition unit
(positive earth system)

T1	Power transistor
T1 (e)	Emitter connection of power transistor
T1 (c)	Collector connection of power transistor
T1 (b)	Base connection of power transistor
T2	Driver transistor
C1	Capacitor (transient H.T. suppression)
C2	Capacitor (radio interference suppression)
R1	Resistor(s) 10 ohms (Fig. 2 b and 2 c)
R2	Resistor(s) 33 ohms (Fig. 2 b) 15 ohms (Fig. 2 c)
R3	Resistor 68 ohms

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. The coil low tension terminals are marked '+' and '–' and the primary winding resistance is 1.3–1.5 ohms. It is important to provide a good earth connection at the coil fixing bracket.

Ballast Resistor Model 3BR. This has a resistance value of 0.9–1.1 ohms and it is wired in series with the ignition coil primary winding to limit the voltage applied to the primary winding. Electrical connections are by means of two 'Lucar' connectors and the resistor is secured by one of the coil fixing bolts, or screws.

(b) Operation

Note: The contact breaker is called upon to handle only a relatively small current and since the contact breaker circuit is resistive only, instead of the highly inductive circuit with conventional ignition, the life of the contacts is greatly increased. Moreover, the transistor can handle a greater current and is a most efficient switch, which ensures more consistent firing at low engine speeds.

Negative Earth Systems

Refer Fig. 3 (a): The negative earth system employs two transistors, 'Tl' and 'T2'. Transistor Tl is known as the power transistor and controls the current in the primary winding of the ignition coil. Transistor T2 is known as the driver transistor and controls the switching operation of transistor Tl. When the distributor contacts close, the base of T2 is short-circuited to earth and a small current flows in the base of Tl by way of resistor Rl. This allows a larger current to flow in the collector/emitter of Tl and the ballast resistor and coil. When the contacts open, the base of T2 is no longer short-circuited to earth and a current flows in the base by way of resistors R2 and R3. This permits a greater current to flow in the collector/emitter of T2 and effectively short-circuits the base of Tl, which now switches off. Current in the coil now collapses and a high voltage is developed across the secondary winding to produce a spark at the plug in the normal manner. When the contact breaker closes, T2 is once again short-circuited and the cycle is repeated.

Positive Earth Systems

Refer Fig. 3 (b): The positive earth system employs a power transistor only, 'Tl'. This controls the current in the primary winding of the ignition coil. The distributor contact breaker controls the base circuit, which influences the switching of the transistor. When the distributor contacts close, a small current flows in the base circuit, so switching on the transistor and allowing a much larger current to flow through the ignition coil primary winding,

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Incorporating Either Negative or Positive Earth Transistor Ignition Unit Model TAC4

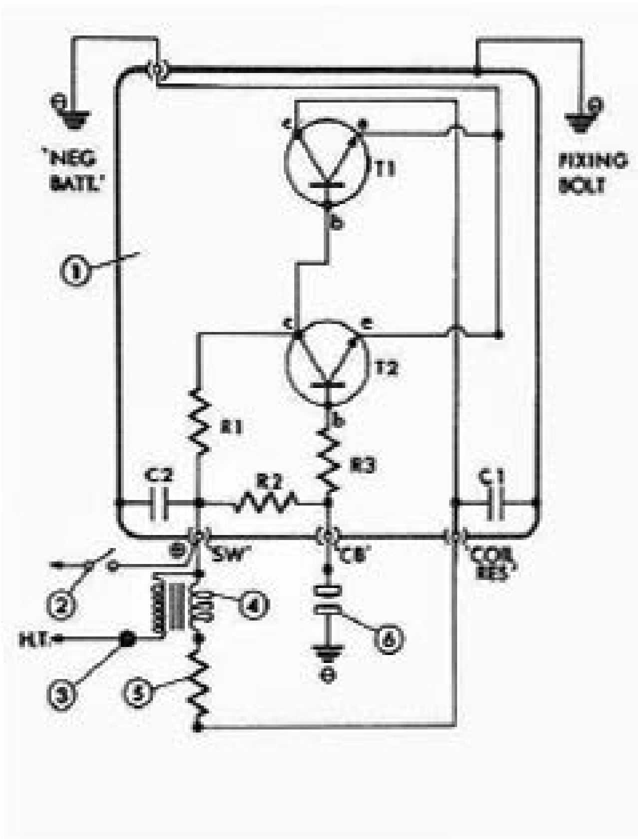

Fig. 3(a) Negative earth circuit diagram

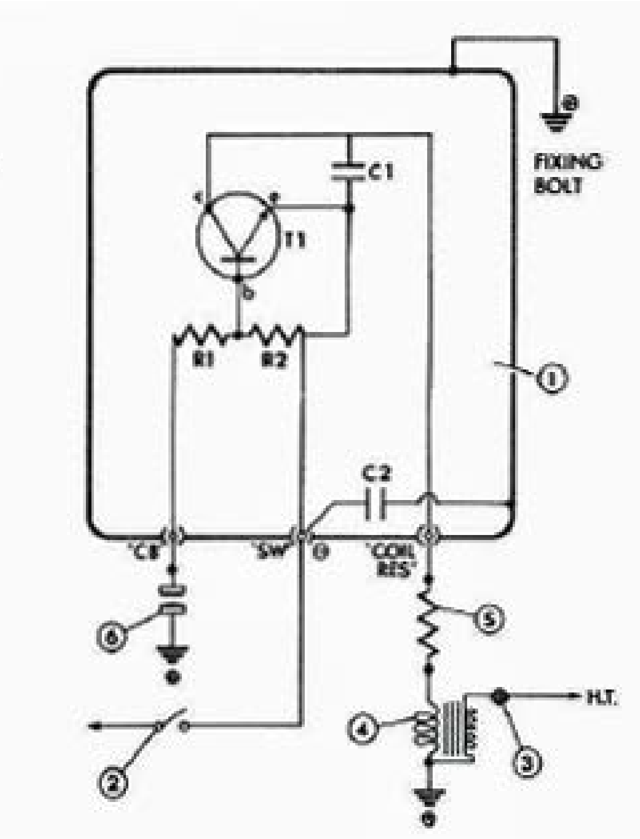

Fig. 3(b) Positive earth circuit diagram

Transistor ignition (T.A.C.) unit
2 Ignition switch (battery supply)
3 Ignition coil secondary winding (H.T. terminal connection)
4 Ignition coil primary winding
5 Balast resistor
6 Distributor contact breaker
T1 Power transistor
T2 Driver transistor
(b) Base
(c) Collector
(e) Emitter

C1 Capacitor (transient H.T. suppression)
C2 Capacitor (radio interference suppression)
R1 Resistor(s) 10 ohms (Fig. 3 a and 3 b)
R2 Resistor(s) 33 ohms (Fig. 3 a) 15 ohms (Fig. 3 b)
R3 Resistor 68 ohms

via the collector and emitter electrodes of the transistor. When the contacts open, the base current is switched off and the transistor immediately becomes non-conductive. Current in the coil now coJlapses and a high voltage is developed across the secondary winding to produce a spark at the plug in the normal manner.

Note: Negative and positive earth systems. When the H.T. spark occurs, high-frequency reverse transients are produced at the collector of the power transistor. Capacitor 'Cl' absorbs these impulses and prevents transistor breakdown. Capacitor 'C2', connected across the supply, prevents radio interference currents being transmitted into the vehicle low-tension wiring.

2. ROUTINE MAINTENANCE

No routine maintenance is necessary other than the usual periodic attention to the distributor.

3. SERVICING

Checking the Ignition System

Note: If a short-circuit is inunediately obvious when the ignition is switched on, first check the wiring attached to the 'SW' terminal of the T.A.C. unit and ensure that a short-circuit does not exist between the wiring and frame. If the wiring is satisfactory, suspect a faulty capacitor 'C2' inside the T.A.C. unit (see Fig. 2 a).

(a) Check Whether a High Tension (H.T.) Spark is Available at the Centre Terminal of the Distributor

(i) Remove the distributor moulded cover and check the contact breaker.

If the contacts are dirty or contaminated with oil, clean them with a petrol-moistened cloth.

Crank the engine by hand and check that the contact breaker is functioning, then with the moving

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Incorporating Either Negative or Positive Earth Transistor Ignition Unit Model TAC4

contact on the highest part of the cam, check the contact gap. This should be 0.014"-0.016" (0.35-0.40 mm).

(ii) Crank the engine so that the distributor contact breaker is in the fully closed position.

Remove the H.T. cable from the centre terminal of the distributor moulded cover and position the cable-end about -fs" (0.187") or (4.76 mm) from a clean and unpainted part of the engine. Switch on the ignition and open the contact breaker a few times. A spark should regularly occur at the cable-end.

If the test is satisfactory, proceed direct to 3 (c).

If the test is unsatisfactory, again carry out the same test but this time *with* the H.T. cable-end positioned near a good earth point on the vehicle frame, instead of the engine. If a spark now occurs (but a spark did not previously occur between H.T. cable and engine) the engine earth cable (or flexible strap) must be faulty. If a spark still does not occur, proceed to 3 (b).

(b) No H.T. Spark, or Weak H.T. Spark, at the Centre Terminal of the Distributor

Note: The H.T. spark is too weak if the test gap is less than that specified in the previous test (see 3 (a), para. ii). It is also assumed that the distributor contact breaker has already been checked, as detailed in 3 (a), para. I.

A d.c. moving-coil low-range voltmeter (e.g. 0-20 V) is required in the following tests. The plastic protective sleeves usually fitted over the 'Lucar' female connectors at the cable-ends, must be pulled back along the cables to enable the voltmeter to be connected to the terminals of the T.A.C. unit.

(i) Check the Supply Voltage to the T.A.C. Unit:

Positive Earth Systems: Connect the negative lead of the voltmeter to the 'SW' terminal of the T.A.C. unit and the positive lead to the L.T. '+' terminal of the ignition coil.

Negative Earth Systems: Connect the positive lead of the voltmeter to the 'SW' terminal of the T.A.C. unit and the negative lead to a good earth point.

With the ignition switch ON: The voltmeter should indicate battery terminal voltage.

If the test is satisfactory, proceed to the next test (para. ii).

If the test is unsatisfactory, check the ignition switch and associated wiring, and, in the case of positive earth systems, check the cable and connections between the ignition coil L.T. '+' terminal and frame (earth).

(ii) Check for Satisfactory Operation of the T.A.C. Unit

Check the Switching Action of the T.A.C. Unit

Positive Earth Systems: Connect the negative lead of the volt.meter to the 'COIL RES' terminal of the T.A.C. unit and connect the positive lead of the voltmeter to a good earth point.

Negative Earth Systems: Connect the positive lead of the voltmeter to the 'SW' terminal of the T.A.C. unit and connect the negative lead of the voltmeter to the 'COIL RES' terminal of the T.A.C. unit.

With the distributor contact breaker closed and the ignition switched on, open the contact breaker points a few times and observe the voltmeter reading. The opening and closing of the contact breaker points should cause the voltmeter needle to fluctuate between zero and battery voltage.

If the test is satisfactory, the T.A.C. unit is working normally and this and the distributor contact breaker can be eliminated from further testing. Check the ballast resistor and ignition coil (para. vi).

If the test is unsatisfactory, proceed to the next test (para. iii).

(iii) Check for Satisfactory Opening and Closing of the Distributor Contact Breaker

Positive Earth Systems: Connect the negative lead of the voltmeter to the 'CB' terminal of the T.A.C. unit and connect the positive lead of the voltmeter to a good earth point.

Negative Earth Systems: Connect the positive lead of the voltmeter to the 'CB' terminal of the T.A.C. unit and connect the negative lead of the voltmeter to a good earth point.

With the distributor contact breaker closed and the ignition switched on: The voltmeter should indicate zero voltage.

If the test is unsatisfactory, the distributor contact breaker points are probably not making good electrical contact. If the fault is not due to the contact breaker, check the miniature wiring connections associated with the contact breaker. Finally, check the wiring between the 'CB' terminal of the T.A.C. unit and the L.T. terminal of the distributor.

If the test is satisfactory, carry out an extension to the original test by opening the distributor contact breaker points. The voltmeter should now indicate 9-12 V (positive earth systems) or approximately 8 V (negative earth systems).

If this second part of the test is unsatisfactory, a faulty base circuit resistor is indicated and the printed circuit wiring board assembly must be renewed (see para. v).

If this second part of the test is satisfactory and an earlier test (para. ii) was unsatisfactory (no switching action at the 'COIL RES' terminal of the T.A.C. unit), a faulty transistor action is indicated.

Positive Earth Systems: When the power transistor 'Tl' is renewed (see para. v) it is advisable to check that the base circuit resistor 'R2' (see Fig. 2c) is not open-circuit. If this resistor is faulty the printed circuit wiring board assembly must be renewed, at the same time as the transistor, otherwise premature failure of the transistor will occur. Premature failure of the transistor could also occur due to partial failure of capacitor 'Cl'. Therefore, if resistor 'R2' is found to be satisfactory, it is advisable when renewing the transistor to renew the capacitor 'Cl' also (see Fig. 2a).

Negative Earth Systems: A faulty transistor action having been established, further testing is now necessary to determine whether it is the power transistor or the driver transistor which is associated with the fault. (Proceed to next test, para. iv).

(iv) Negative Earth Systems:

Proving the Transistor Circuits (T.A.C. unit in-situ and normally connected)

The positive lead of the voltmeter is a common connection throughout the following tests.

Connect the positive lead of the voltmeter, either direct to the positive (insulated) terminal of the battery or a convenient battery supply terminal not controlled by the ignition switch.

Connect the negative lead of the voltmeter, as detailed in the following separate tests.

Check the Driver Transistor 'T2' for Short-circuit Fault between Collector and Emitter

First disconnect the cables from the 'NEG BATT' and 'COIL RES' terminals of the T.A.C. unit, then connect the negative lead of the voltmeter to the 'NEG BATT' terminal of the T.A.C. unit. With the distributor contact breaker closed, and the ignition switch OFF: The voltmeter should indicate zero or a negligible voltage.

If the test is unsatisfactory, the driver transistor is not serviced separately and the printed circuit wiring board assembly comprising resistors and transistor must be renewed (see appropriate heading, para. v).

If the test is satisfactory, disconnect the negative lead of the voltmeter and refit the cable to the 'NEG BATT' terminal of the T.A.C. unit, then proceed to the next test.

Prove the Power Transistor 'T1'
Check for a Short-circuit Fault between Collector and Emitter:

With the cable disconnected from the 'COIL RES' terminal of the T.A.C. unit (reference previous test), connect the negative lead of the voltmeter to the disconnected terminal of the T.A.C. unit. With the ignition switch OFF: The voltmeter should indicate either zero or a negligible voltage.

If the test is unsatisfactory, either the transistor or the capacitor 'Cl' has an internal short-circuit. Determine the fault by disconnecting one side of the capacitor (preferably the earth side by removing the screw from between capacitors 'Cl' and 'C2', see Fig. 2a) and then carry out the test again. If this results in the test being satisfactory, renew the capacitor 'Cl'. If the test is still unsatisfactory with the capacitor disconnected, renew the power transistor 'Tl' (see para. v).

If the test is satisfactory, leave the voltmeter connected and proceed to the next test.

Check the Base Circuit and the Switching Action between Collector and Emitter:

With the cable disconnected from the 'COIL RES' terminal of the T.A.C. unit, and the negative lead of the voltmeter still connected to the disconnected terminal of the T.A.C. unit, with the distributor contact breaker closed and the ignition switch ON: The voltmeter should indicate battery terminal voltage.

If the test is unsatisfactory, either the power transistor 'Tl' or its base circuit resistor is faulty. Determine the fault by checking resistor 'Rl' (see Fig. 2b). If the resistor is faulty, the printed circuit wiring board assembly should be renewed (see para. v). If the resistor is found to be satisfactory, the power transistor 'T1' must be faulty and should be renewed (see para. v).

If the test is satisfactory, the power transistor 'Tl' has now been eliminated as the cause of the fault (no transistor switching action at the 'COIL RES' terminal of the T.A.C. unit, reference previous testing 3 b ii). This means that the fault is now confined either to the driver transistor or its base circuit resistor 'R3' (base circuit resistor 'R2' having been previously proved satisfactory during the distributor contact breaker test 3 (b) iii).

In view of the fact that the driver transistor and resistor 'R3' are combined in one assembly, the printed circuit wiring board assembly must now be renewed (see para. v).

(v) Servicing the T.A.C. Unit
Renewing the Power Transistor

The power transistor ('Tl') is fitted in the front compartment of the heat sink, normally enclosed by the aluminium cover (see Fig. 2a). The base and emitter connecting pins of the transistor are soldered to connectors Tl (b) and Tl (e) on the printed circuit wiring board (see Fig. 2b, or 2c).

Note: The soldering iron required for unsoldering and re-soldering the transistor connections should be a type not exceeding 25-watt.

Remove the transistor fixing clip (an additional securing nut, sandwiched between the heat sink and the printed circuit wiring board, should be left in position).

Hold the T.A.C. unit in one hand, so that the printed circuit wiring board is facing the body with the main terminal arrangement at 6 o'clock, and then with the other hand apply the hot soldering iron alternately to each of tbe soldered connections. When the solder is fully-melted, shake from the connections by giving the T.A.C. unit a sharp tap on the top of the bench. Now lightly clamp the T.A.C. unit in a vice, with the main terminal arrangement at the top and leaving sufficient access to the transistor and its connections. Finally, melt the solder of both connections simultaneously, by applying the soldering iron across the gap between the two connections, and pull on the body of the transistor until it is freed from the T.A.C. unit.

After removing the faulty transistor, transfer the insulating sleeves of the connecting pins and also the mica insulating washer from the original transistor. Keep the mica washer clean and do not wipe the greasy film from the washer. This is silicone grease to ensure efficient heat transfer between the transistor, mica washer, and heat sink. If the original mica washer requires a fresh application of silicone grease, or if the mica washer is renewed, smear both sides of the washer with No. 484 silicone grease.

Before commencing to fit the new transistor, ensure that the transistor connecting pins are adjusted to the correct width and that they engage easily in the connector holes of the printed circuit wiring board. If necessary wipe the holes clear of solder with the hot soldering iron, or clear the solder from the holes with a small drill.

Note: The transistor base-and-emitter connecting pins do not have any identification marks. However, if the transistor connecting pins are accidentally engaged in the wrong connectors of the printed circuit wiring board, the transistor fixing clip will be prevented from being fitted until the transistor has been correctly repositioned. Incorrect assembly of the transistor can be avoided by ensuring that an imaginary line, drawn through the centre of the top of the transistor, coincides with the position in the heat sink of the two screw holes which fix the transistor fixing clip.

Engage the transistor connecting pins in the connector holes of the printed circuit wiring board and then secure the transistor with the fixing clip before soldering the connections. (Connect the capacitor to the clip, and assemble the non-captive clip fixing screw the correct way round, as illustrated in Fig. 2a).

Finally, place the T.A.C. unit flat on the bench with the printed circuit wiring board uppermost and (using only resin-cored solder) solder the transistor connections as quickly as possible. Avoid making dry-soldered joints, by ensuring that the soldering iron is clean and sufficiently heated and do not allow excess solder to bridge the gap between the two connections.

Renewing the Printed Circuit Wiring Board Assembly

Disconnect capacitor 'C2' from the lead connecting it to the printed circuit wiring board. (To achieve this it will be necessary to remove the capacitor clip securing screw from between the two capacitors 'Cl' and 'C2').

Remove nut(s) and screws which secure the printed circuit wiring board to the T.A.C. unit. (It is not necessary to remove one particular nut, shown unmarked in Fig. 2 (b) and 2 (c), but excluding the 'NEG BATT' terminal nut in Fig. 2 (c), which needs to be removed).

In the case only of negative earth systems, remove also a shakeproof washer, connecting lead and 'Lucar' terminal blade ('NEG BATT' terminal) from one of the screws which fix the printed circuit wiring board assembly.

Hold the T.A.C. unit in one hand, so that the printed circuit wiring board is facing the body with the main terminal arrangement at 6 o'clock, and then with the other hand apply a hot soldering iron (25-watt max) alternately to each of the soldered connections. When the solder is fully-melted, shake most of the solder from the connections by quickly giving the T.A.C. unit a sharp tap on the top of the bench. Now lightly clamp the T.A.C. unit in a vice, with the printed circuit wiring board uppermost and the main terminal arrangement facing the body. Finally melt the solder of both connections simultaneously, by applying the soldering iron across the gap between the two connections, and pull the printed circuit wiring board upwards until it is freed from the T.A.C. unit.

After removing the printed circuit wiring board assembly, remove excess solder from the connecting pins of the power transistor so that the connecting pins will engage easily in the connectors of the new printed circuit wiring board assembly. Also, check that the insulating sleeves are still fitted to the transistor connecting pins.

Fitting a new printed circuit wiring board assembly, is simply a reversal of the procedure detailed for removing the original part. Solder the transistor connections as quickly as possible and use only resin-cored solder. Avoid making dry-soldered joints, by ensuring that the soldering iron is clean and sufficiently heated and do not allow excess solder to bridge the gap between the two connections.

(vi) Checking Ballast Resistor and Ignition Coil

Measure the Volt-Drop Across the Ballast Resistor

Connect the negative lead of the voltmeter to the 'COIL RES' terminal of the T.A.C. unit (cable connected) and connect the positive lead of the voltmeter to the ignition coil L.T. terminal marked '-'. With the distributor contact breaker closed, switch on the ignition. The voltmeter should indicate approximately 5 V.

If the test is satisfactory, the correct amount of current must be flowing in the ballast resistor and ignition coil primary winding circuit and the ballast resistor and ignition coil primary winding must therefore be satisfactory. Finally, check the ignition coil secondary winding by carrying out the H.T. spark test detailed in the second para 3 (a) ii. If this test is unsatisfactory, renew the ignition coil.

If the test is unsatisfactory, one of the following conditions will apply:-

(1) The voltmeter indicates a voltage appreciably different to that stated: Check the resistance of the ignition coil primary winding (1.3–1.5 ohms) and the ballast resistor (0.9-1.1 ohms), using a good quality ohmmeter. If the resistance check confirms the fault, renew the ballast resistor or ignition coil.

(2) The voltmeter indicates zero voltage: Check the continuity of the ignition coil primary winding, using a battery-operated test lamp, or an ohmmeter, connected between the coil L.T. terminals marked'+' and '—'. The lamp should light, or the ohmmeter should indicate a reading. If the continuity check confirms the fault, renew the ignition coil.

(3) The voltmeter indicates battery terminal voltage: An open-circuit ballast resistor is indicated and this must be renewed.

(c) Check for Satisfactory Distribution of the High Tension Voltage from Ignition Coil to Sparking Plugs

(i) Check the Distributor Rotor

Providing a satisfactory spark is available at the centre terminal of the distributor (previous testing 3 (a), para. ii refers), the ignition coil high-tension voltage can be utilised for testing the insulation of the rotor arm electrode.

With the contact breaker closed and the rotor fitted to the distributor shaft, position the cable-end of the H.T. cable (taken from the centre terminal of the distributor) close to the rotor arm electrode. Switch on the ignition and open the contact breaker a few times. Ha spark occurs (except a very faint trace of a spark), the rotor must be renewed.

(ii) Check the Distributor Moulded Cover

The inside and outside of the distributor moulded cover should be reasonably clean, dry, and free from contamination by oil. Closely inspect the inside of the cover. 'Tracking' of the H.T. spark will be indicated by a thin greyish-white line or, sometimes more obviously, by signs of charring of the moulding. In such cases the fault can normally only be rectified by renewing the moulded cover. Check the carbon brush and spring for freedom of movement in the moulding. Check whether the spring is making electrical contact with the bottom of the brush-and-spring housing. Check whether the brush needs renewing. Inspect the contact tip of the brush, which should be bevelled. If the bevelled (hardened) tip of the brush has worn away, the brush-and-spring should be renewed. If the centre of the moulding around the brush-and-spring housing shows signs of damage, check that the rotor is fully-located on the distributor shaft.

(iii) Check the High Tension Cables

The general condition of the H.T. cables can be considered satisfactory, if the cables are clean and dry, free from contamination by oil and the insulation shows no sign of cracks.

If the engine fails to start, or misfires, the H.T. cables may previously have been removed and then accidentally refitted to the sparking plugs in the incorrect firing order. If this is not the cause of the fault, check whether a satisfactory spark occurs at the sparking plug end of each of the H.T. cables. First prevent the engine from starting by disconnecting the H.T. cables from the sparking plugs . (Ensure that the H.T. cable connectors are not adjacent to the carburetter or petrol pipes during the following test). Remove each of the H.T. cable connector/suppressors in tum, then position the cable-end about "lt-" (0.187") or (4.76 mm) from a clean and unpainted part of the engine. Switch on the ignition and crank the engine. A spark should regularly occur.

If the test is satisfactory, the fault must be due to one of the following causes:- H.T. cable connectors/suppressors, sparking plugs, carburation (or fuel supply), or an engine fault.

If the test is unsatisfactory,

(1) A spark is absent from the cable-end of all the H.T. cables. Check the centre terminal connection in the distributor cover.

(2) A weak spark occurs. Check the connections in the distributor cover.

(3) A satisfactory spark occurs, but is absent from one or more H.T. cable(s). Check the connection of the faulty cable(s) in the distributor cover.