TEST PROCEDURES - ELECTRONIC IGNITION

INTRODUCTION

Diagnosis and location of faults in the electronic ignition system must be done by a systematic test procedure for conclusive results.

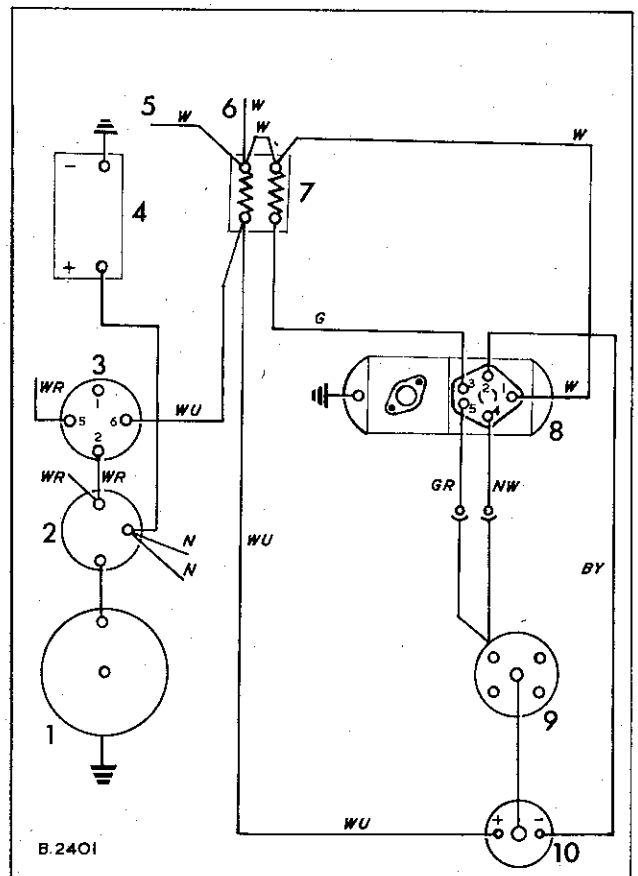
It is usual for the electronic ignition system to either work satisfactorily or not at all, since the components are not subject to the deterioration of those in the orthodox ignition. Most diagnosis will therefore be concerned with total failure.

Do not substitute the control unit or distributor/pick-up without first establishing that all the connections and wiring are in order. If a control unit or distributor/pick-up has been damaged by external short circuit the new unit will very likely be similarly damaged.

REMEMBER THAT FAULTS IN THE FUEL SYSTEM AND MECHANICAL FAULTS IN THE ENGINE CAN GIVE SYMPTOMS SIMILAR TO FAULTY IGNITION.

The H.T. output can be established in the same way as with orthodox ignition:—

Remove the H.T. cable from the centre tower of the distributor cap and hold it 6 mm (¼ in) away from a good earth point while the engine is cranked by operating the key start. If a vivid blue spark does not occur regularly there is a fault in the ignition.



B BLACK R RED
N BROWN U BLUE
O ORANGE W WHITE

1. STARTER MOTOR
2. STARTER MOTOR SOLENOID
3. STARTER MOTOR RELAY
4. BATTERY
5. 2 LITRE ENGINE
6. RG 225 ENGINE
7. BALLAST RESISTOR
8. CONTROL UNIT
9. DISTRIBUTOR
10. IGNITION COIL

Fig. 1 *Circuit diagram — electronic ignition*

PRELIMINARY CHECKS

In all cases of a suspected ignition fault, first check, and if necessary rectify:–

1. Battery voltage, and that the connections on the battery, earth cable and starter solenoid are clean and tight.
2. That the control unit has a good earth connection to the wing valance and that the securing bolts are tight.
3. That the coil L.T. connections are clean and tight.
4. That the coil H.T. tower is free from tracking, the H.T. lead is fully entered into the coil chimney and the rubber cover is in good condition.

When refitting H.T. wires into the coil or distributor cap towers ensure the terminals are fully seated. Enter the terminal into the tower, pinch the large diameter of the boot to release air trapped between the boot and tower, then continue pushing on the cable until the terminal is fully seated in the tower.

The rise of H.T. voltage is faster than with orthodox ignition, so that cracking and burning are more likely to occur with surrounding dirt and damp, or poor insulation.

5. That the spark plugs are clean and correctly gapped, and the H.T. leads are in good condition.
6. That the distributor cap and rotor are free of cracks and are not tracking.
7. That the pick-up leads between the distributor and control unit are not touching any metal parts of the engine.

TEST PROCEDURES

Equipment required

'Scopeless' Engine Analyser, Model BD 123/C Part No. 75243573

or

Voltmeter, 0 – 12 volt
Ohmmeter, multi-range
Test probes

The large scale 250 mm (10 in) meters of the 'Scopeless' Engine Analyser have scales for volts and three ranges of ohms. The equipment also includes an ignition timing light with spark advance control so that centrifugal advance can be checked on the engine.

If a suspected fault persists after the preliminary checks have been carried out, use a voltmeter and ohmmeter with the following test procedure to establish the faulty component or fault area.

Notes

A. If a fault is found it must be corrected before carrying out further tests.

B. Always switch off the ignition before disconnecting the control unit.

C. Move the harness and leads about when making continuity or resistance checks so as to reveal intermittent connections or fractured conductors.

D. **DO NOT USE THE CONTROL UNIT AS AN EARTH.**

Summary

Briefly, the testing procedure is to establish that:

1. There is adequate battery voltage at the resistor inputs.

2. The resistors have continuity and are in their correct circuit.

3. There is continuity through the harness wires and coil L.T. to the control unit.

4. There is continuity and correct resistance between control unit and pick-up coil.

5. The ballast resistor is by-passed when starting.

6. If all the checks prove positive the fault must be in the ignition coil or control unit. It is unlikely that both units would fail at the same time, and substitution will establish which component restores secondary voltage.

To check the electrical supply through the vehicle wiring to the ballast and auxiliary resistors

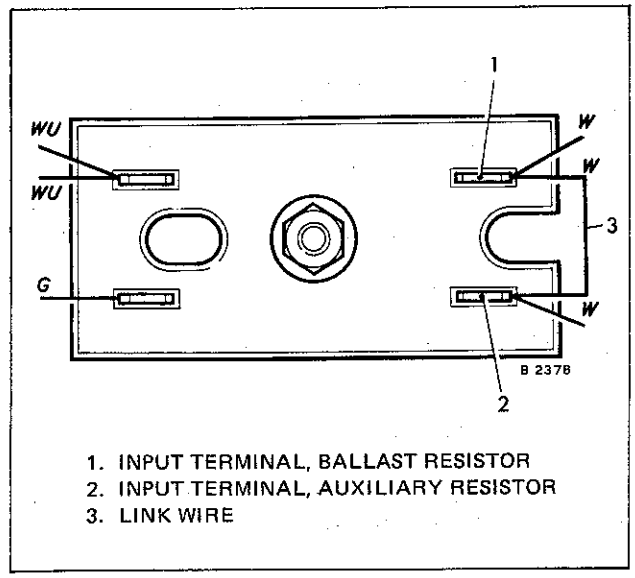
1. Connect the voltmeter negative lead to a good earth point, switch on the ignition and switch off all accessories.

2. Connect the voltmeter positive lead to each input terminal of the resistors—the terminals with the two white wires. The voltmeter readings should be within 1 volt of battery voltage.

   If the readings are low the vehicle wiring between the battery and ballast resistor (Fig.1) must be checked for loose, corroded or dirty connections.

   Zero reading on the voltmeter indicates an open circuit—break—in the wiring mentioned above.

3. If the voltmeter shows a reading at one terminal and zero or a much lower reading at the other the fault is in the white wire (3, Fig.2) linking the two terminals.

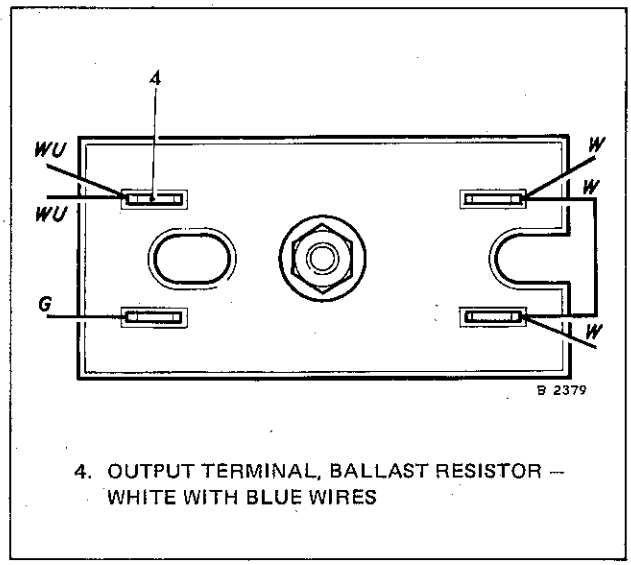


1. INPUT TERMINAL, BALLAST RESISTOR
2. INPUT TERMINAL, AUXILIARY RESISTOR
3. LINK WIRE

Fig. 2 *Checking the current supply to the resistor input terminals*

To check the ballast and auxiliary resistors

1. With correct supply voltage established at the inputs of the resistors, connect the voltmeter positive lead to the output terminal of the ballast resistor—the terminal with white and blue wires (4, Fig.3).



4. OUTPUT TERMINAL, BALLAST RESISTOR — WHITE WITH BLUE WIRES

Fig. 3 *Checking continuity of the ballast resistor*

The voltmeter reading should be 5 to 8 volts.

If the voltmeter reading is zero the ballast resistor is broken and the resistor block must be replaced.

If the voltmeter reading is 11 to 12 volts there is:

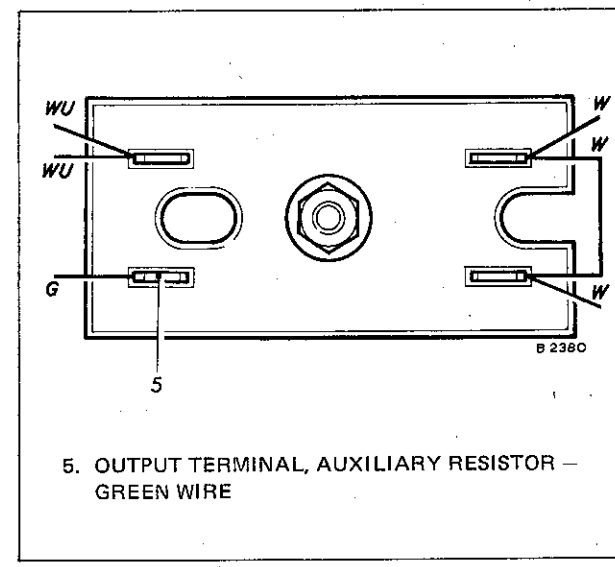
a. An open circuit between the ballast resistor and control unit.

b. The control unit earth connection is faulty, or

c. The control unit is faulty.

Later tests will establish the exact fault.

2. Connect the voltmeter positive lead to the output terminal of the auxiliary resistor—the terminal with a green wire (5, Fig.4).



5. OUTPUT TERMINAL, AUXILIARY RESISTOR — GREEN WIRE

Fig. 4 *Checking continuity of the auxiliary resistor*

The voltmeter reading should be 1.5 to 3.5 volts. If the reading is zero the resistor is broken and the resistor block must be replaced.

If the reading is 11 to 12 volts there is:

a. An open circuit between the auxiliary resistor and control unit, or

b. The control unit earth is faulty.

c. The control unit is faulty.

Later tests will establish the fault.

To check the electronic ignition harness between the ballast resistor, ignition coil and control unit.

Switch off the ignition, disconnect the battery main supply, release the screw securing the multi-wire connector to the control unit, withdraw the connector, reconnect the battery and switch on the ignition.

Note: The following three tests, on cavities 1, 2 and 3, are continuity tests only, the voltmeter being used for convenience. A low wattage test lamp can be used as an alternative. In these and all continuity checks, move the wire to reveal intermittent connections and fractured conductors.

Cavity 1. With the voltmeter negative lead still connected to a good earth point, connect the voltmeter positive lead to No. 1 cavity of the connector (Fig. 5) DO NOT USE ANY PART OF THE CONTROL UNIT FOR EARTH CONNECTIONS.

The voltmeter should show a reading. If it does not, check the white wire between the auxiliary resistor input terminal and No. 1 cavity for continuity and poor connection at each terminal. Renew the wire as necessary.

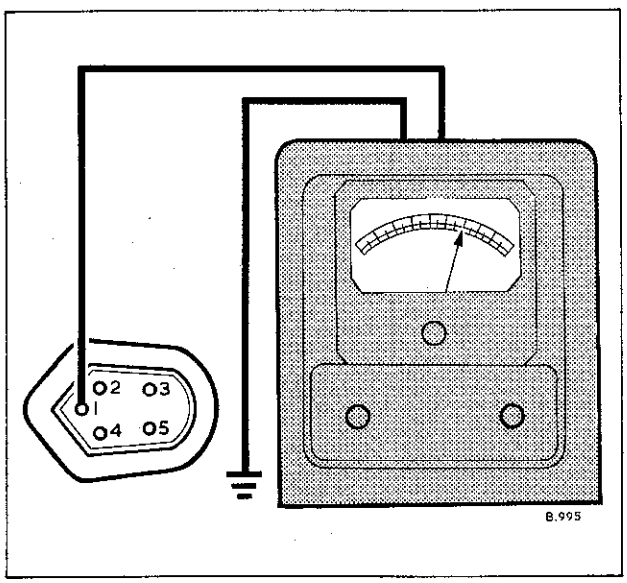


Fig. 5 *Continuity check at cavity No. 1*

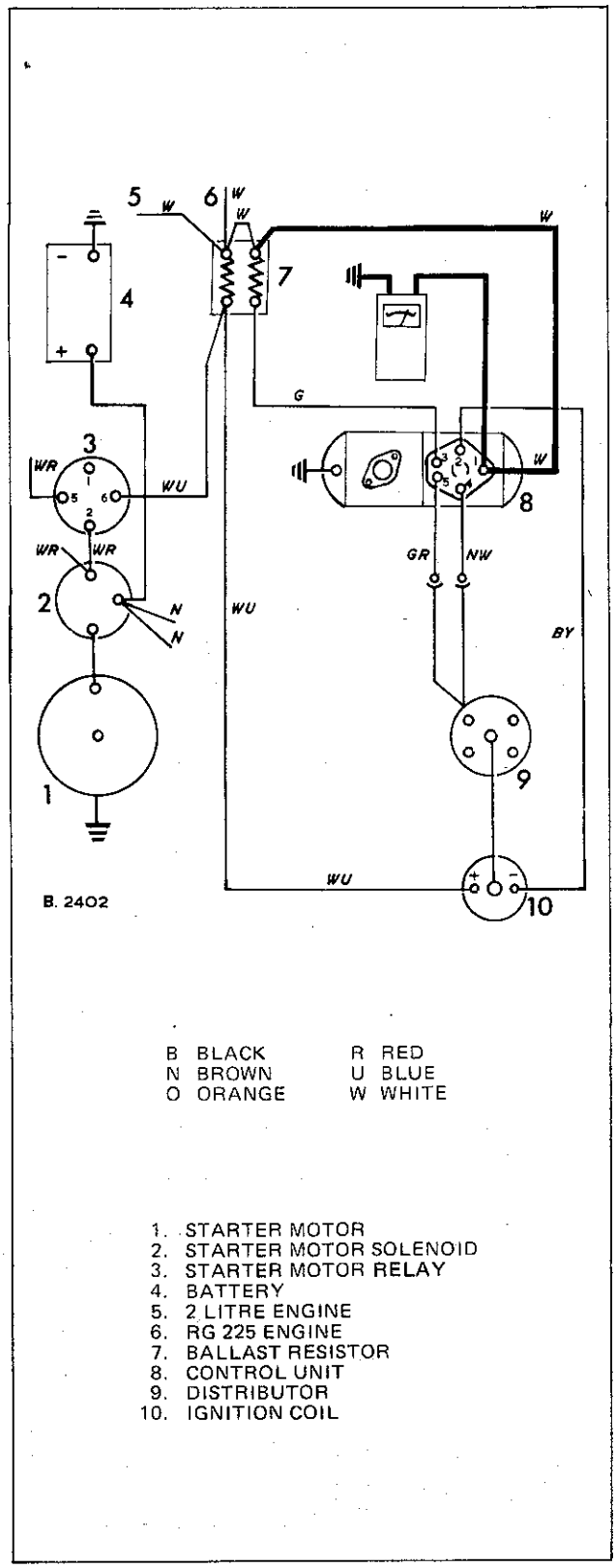


Fig. 6 *Circuit being checked at cavity No. 1*

Cavity 2. Connect the voltmeter positive lead to the connector cavity No. 2 (Fig.7).

The voltmeter should show a reading. If it does not, there is a fault between the ballast resistor output, ignition coil and cavity No. 2.

If a fault is shown, transfer the voltmeter positive lead to the coil positive terminal (+, white with blue wire). If there is still no reading on the voltmeter the fault is in the white with blue wire connecting the ballast resistor and coil positive terminal.

If the voltmeter does show a reading in the above test, transfer the voltmeter positive lead to the coil negative (−, black with yellow wire). If the voltmeter shows zero volts at the coil negative terminal and a reading at the coil positive terminal the primary winding of the ignition coil is faulty and the coil must be replaced.

If the voltmeter shows a reading at the coil negative terminal and zero volts at No. 2 cavity, the fault is in the black with yellow wire connecting the ignition coil and cavity.

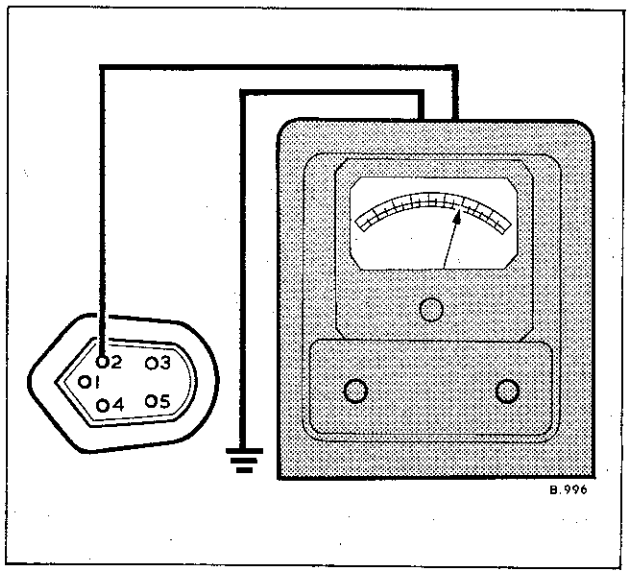


Fig. 7 *Continuity check at cavity No. 2*

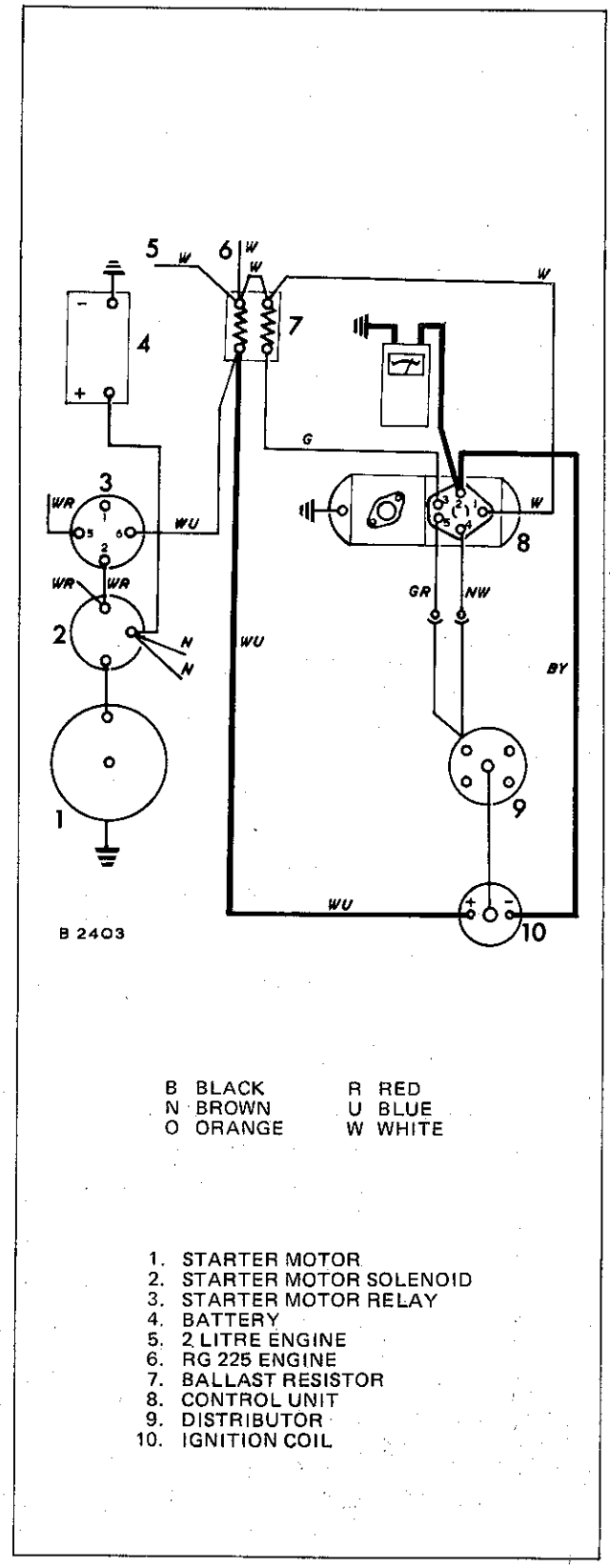


Fig. 8 *Circuit being checked at cavity No. 2*

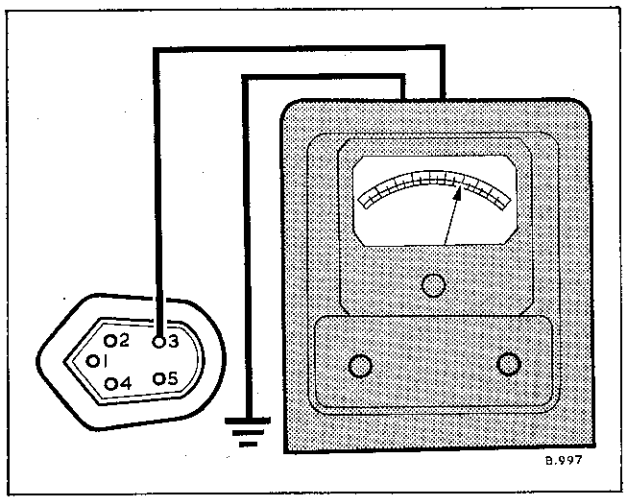


Fig. 9 *Continuity check at cavity No. 3*

Cavity 3. Connect the voltmeter positive lead to the connector cavity No. 3.

The voltmeter should show a reading. If it does not the fault is in the green wire connecting the auxiliary resistor output terminal and No. 3 cavity.

Switch off the ignition.

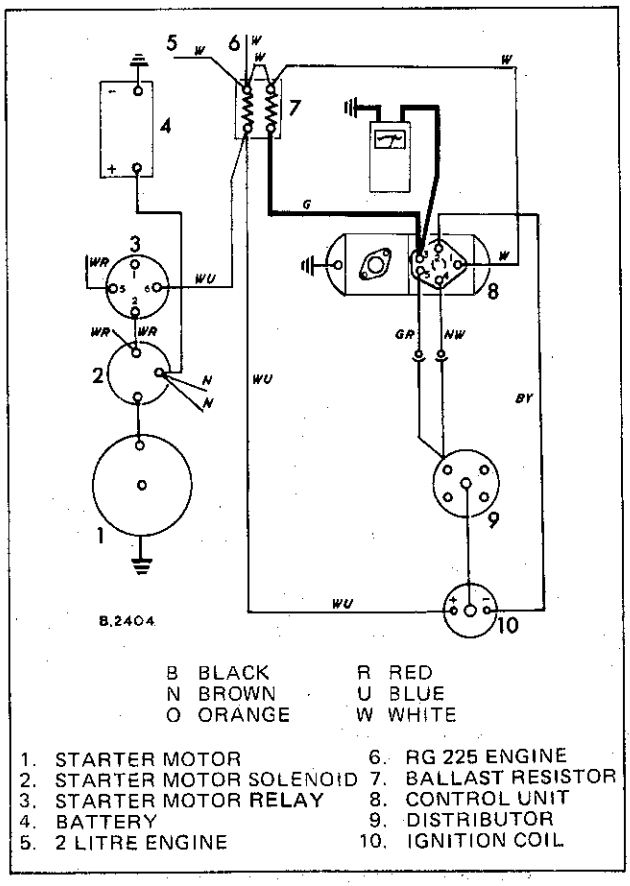


Fig. 10 *Circuit being checked at cavity No. 3*

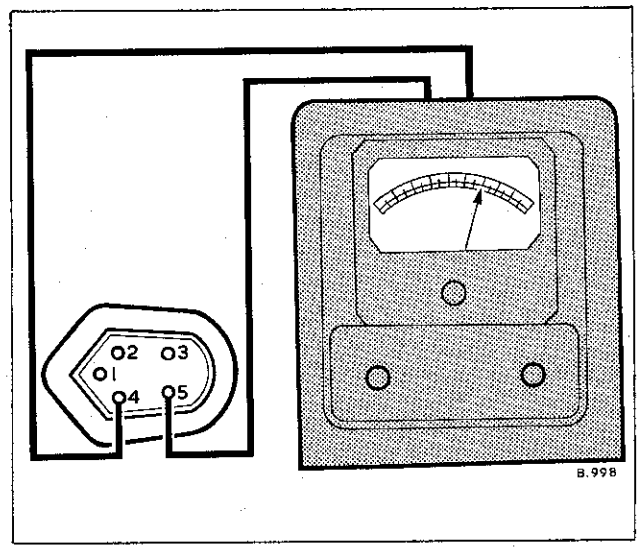


Fig. 11 *Ohmmeter check at cavities No. 4 and 5*

To check the pick-up coil, and harness between pick-up coil and control unit.

1. Disconnect the voltmeter. Connect an ohmmeter to cavities No. 4 and 5 in the connector. The ohmmeter reading should be as given in Data (sub-section D300) under 'pick-up coil resistance'.

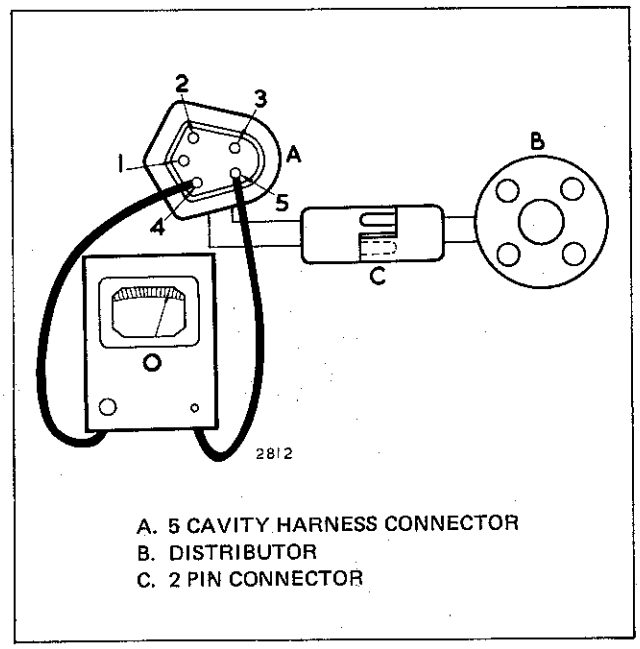


Fig. 12 *Circuit and resistance check at cavities No. 4 and 5*

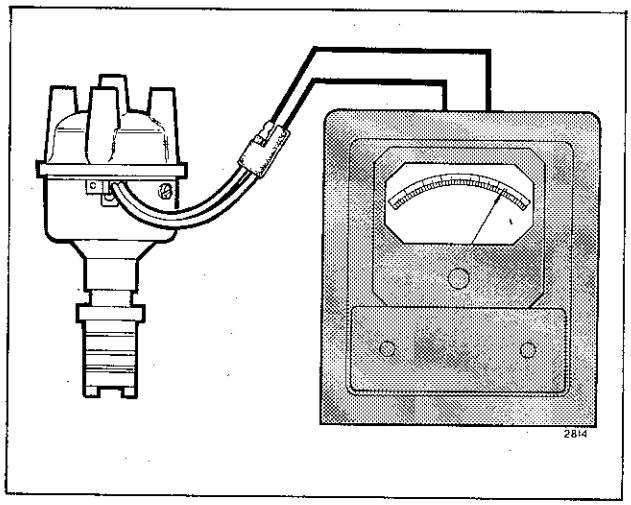


Fig. 13 *Ohmmeter check on pick-up coil and leads*

If the reading is higher or lower than specified disconnect the dual lead connector between the distributor and multi-connector. Connect the ohmmeter leads to the distributor connections. If the reading is not to the figure given in the Data replace the distributor or pick-up.

If the ohmmeter reading is satisfactory at the dual connector but not at the multi-connector cavity, the fault is in the wires between the two connectors—brown and white wire at No. 4 cavity, green and red wire at No. 5 cavity.

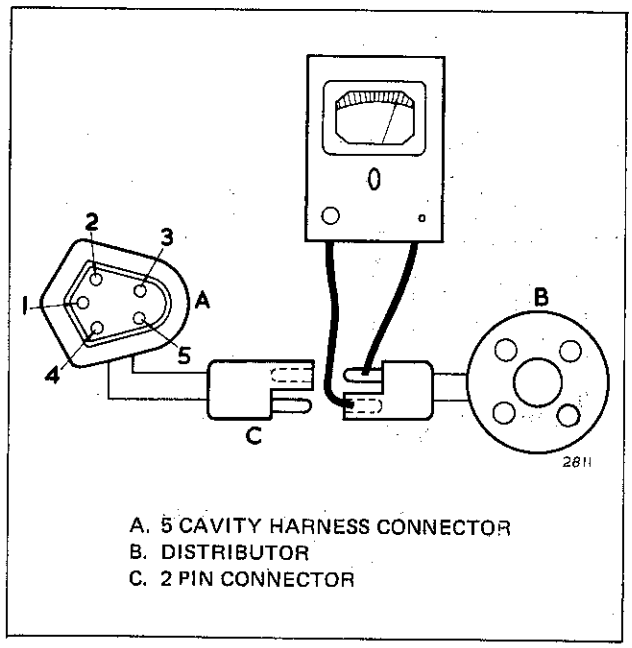


Fig. 14 *Circuit and resistance check on pick-up coil and leads*

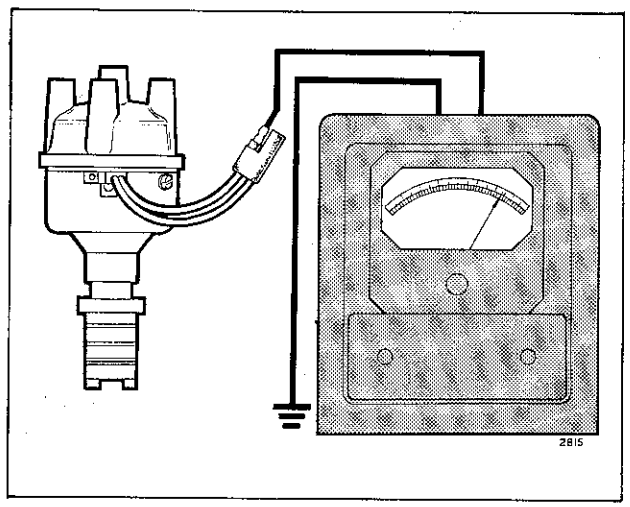


Fig. 15 *Short circuit check on pick-up coil and leads*

2. Connect one lead of the ohmmeter to a good earth point and the other lead to either pin of the dual connector on the distributor. The ohmmeter should show an open circuit.

If the ohmmeter shows continuity replace the distributor or pick-up.

3. Reconnect the dual connector between control unit and distributor.

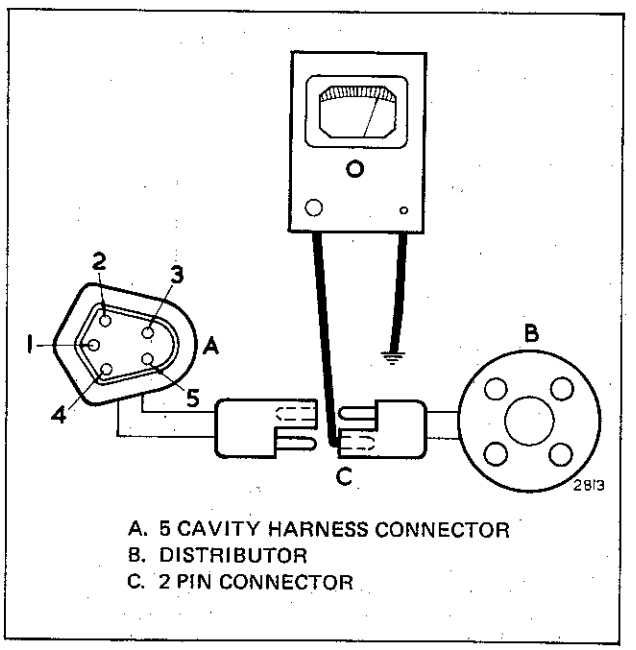


Fig. 16 *Short circuit check on pick-up coil and leads*

To check the earth connection of the control unit circuit.

1. Connect one lead of the ohmmeter to a good earth point and the other lead to No. 5 pin on the control unit.

The ohmmeter should show continuity between the pin and earth. If it does not, remove the control unit, clean the contact points of control unit and wing valance, refit the control unit and retest. If continuity is still not shown, replace the control unit.

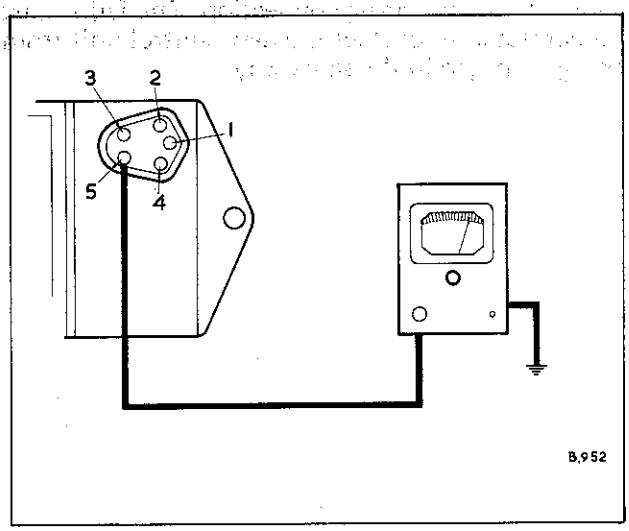
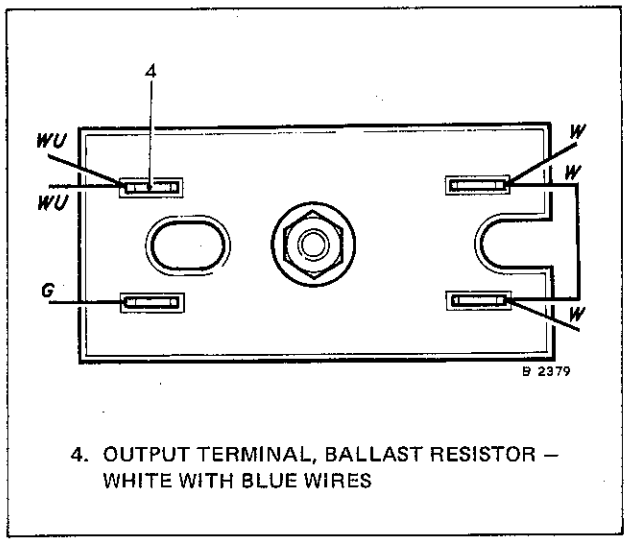


Fig. 17 *Checking earth continuity through the control unit*



4. OUTPUT TERMINAL, BALLAST RESISTOR – WHITE WITH BLUE WIRES

Fig. 18 *Checking the ballast resistor by-pass*

To check the ballast resistor by-pass under start conditions

Note: This test is important if difficult starting is experienced.

1. Disconnect the battery and refit the multi-wire connector to the control unit. Disconnect the coil H.T. lead at the distributor cap and connect it to earth.

2. Connect the negative lead of a voltmeter to a good earth point, and the positive lead to the output terminal of the ballast resistor—the terminal with white and blue wires, (Fig.18).

3. Switch on the ignition. The voltmeter reading should be 5 to 8 volts, as previously established.

4. Have an assistant to turn and hold the ignition key in the "start" position. The engine will not start because the H.T. lead is earthed.

The voltmeter reading should increase to a minimum of 9 volts whilst the key is in the start position.

If the voltmeter reading does not increase, or increases only slightly, the contact in the starter solenoid or the wire connecting the solenoid to the resistor is faulty.

If a fault is shown, transfer the positive lead of the voltmeter to the ballast resistor by-pass terminal—the terminal with the white and blue wires—on the solenoid. With the key in the start position the voltmeter reading should be a minimum of 9 volts. If it is not the contacts are faulty and the solenoid must be renewed.

If a satisfactory reading is obtained at the solenoid, but not at the ballast resistor, the connecting wire—white with blue—from solenoid to ballast resistor is faulty and must be renewed.

To check the secondary output and control unit by substitution

1. Remove the H.T. cable from the centre tower of the distributor cap and hold it 6 mm (¼ in) away from a good earth point.

Crank the engine by operating the key start. A vivid blue spark should be obtained at the H.T. lead.

If a spark is not obtained, or it is weak and red, remove and test the ignition coil on a coil tester, or replace it and retest.

If there is still no spark, replace the control unit and retest.

2. With secondary voltage established, move the H.T. lead from the earth point until the spark no longer bridges the gap and observe the coil H.T. tower for arcing. If no arcing occurs the ignition system is in order and the testing is complete.

It is re-emphasised that while the H.T. spark test can be applied when an ignition fault is first suspected, the control unit must not be 'tested' by substitution until all the circuits have been tested as previously detailed and all faults eliminated.

A faulty control unit is most likely the result of a short circuit or wrong connection. The fault must be corrected to protect the new control unit from being damaged in the same way.