

Chapter 3

BONDING TESTERS

See drawing.

MISC. FILE.

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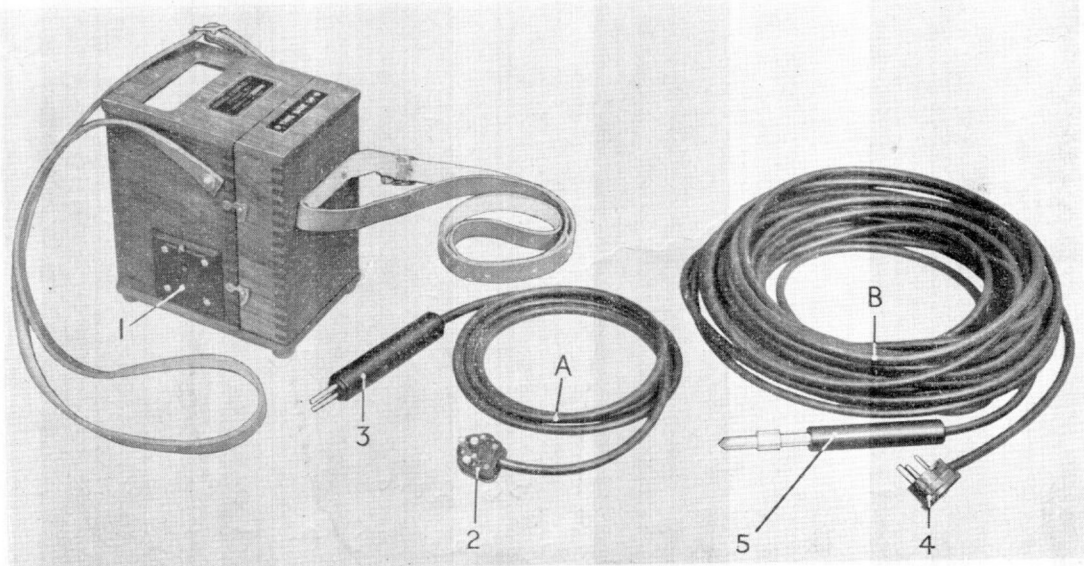
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Introduction

1. Bonding testers are used for testing the bonding and screening connections on aircraft. They consist essentially of an ohmmeter, with a battery incorporated in the instrument to supply the test current. Two

test prods are connected to the ohmmeter by flexible leads, to make contact to the two components of the aircraft between which the bonding is to be tested. The resistance between these two points is indicated on the scale of the instrument.



1 LOCKING SOCKET
2 3-POLE PLUG

3 HANDLE FOR DOUBLE-CONTACT PROD
4 3-POLE PLUG
5 HANDLE FOR SINGLE-CONTACT PROD

Fig. 1. Typical bonding tester

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DESCRIPTION

2. The instrument movement is that employed for the usual true ohmmeter. It consists of two coils mounted at an angle to one another on a common spindle and placed between the poles of a permanent magnet. One of these coils carries a fixed proportion of the current passed through the bond which is under test. The second coil is shunted across the bond under test, and is of high resistance compared with it; it thus carries a current proportional to the voltage drop across the bond. There is no spring or other mechanical control of the movement, and the pointer may take up any position when no current is passing. The torque produced by the current in the first coil is in opposition to that of the second, so that a position of equilibrium will be taken up by the movement dependent on the ratio between the two currents. This ratio is directly proportional to the value of the bond under test, and will therefore be indicated by the position of the pointer.

3. By using the current of the coil to provide the controlling torque, instead of the usual spring control as for a voltmeter, the effect of variations of the battery voltage is eliminated, for since the currents in the coils are both directly proportional to this voltage, their ratio will be independent of it. A diagram showing the electrical circuit is given in fig. 2.

4. The instrument is required to measure the resistance of the bond under test between the points of contact with the prods only, and, to avoid including the resistance of the leads in the measured value, the prods are connected to the voltage coil through separate conductors. One conductor in each lead is used to carry the main current, and the other to connect the voltage coil, through separate conductors, to the points between which the voltage is being measured.

5. In the Type B lead, the voltage circuit is permanently connected to the current circuit, since both conductors are connected to the one prod. In the Type A lead, the conductors are connected to separate prods, and the voltage circuit is not completed until the two spikes of the prod are connected by contact with the metal of the bond under test. If these two spikes are connected together, and the Type A lead left unconnected, the full voltage of the battery will be applied to the voltage coil and the indicator will show infinite resistance.

OPERATION

6. The tester is carried slung by its straps so that the dial can be read easily. Where two straps are provided, one is used to steady the tester by passing the strap round the body of the person making the test.

7. The instrument is used for testing the electrical continuity or efficiency of the electrical bonding of metal parts of an aircraft.

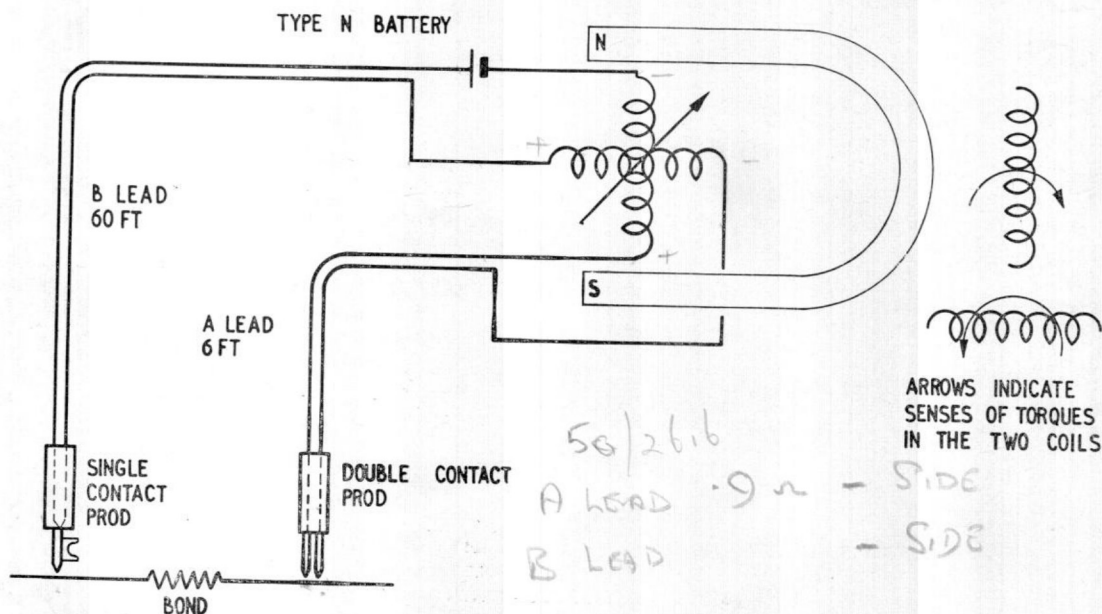


Fig. 2. Diagram showing electrical circuit

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This is done by measuring the resistance between a specified reference point and all other specified points, either of a complete aircraft or of a component such as a wing or fuselage. The reference point in the case of a complete aircraft will usually be an earth terminal, and in the case of a component the terminal used to connect its bonding to that of the adjacent component.

8. In metal aircraft, the resistance of the complete aircraft should not exceed 0.05 ohm, measured between the main earth terminal and any extremity of the aircraft. In non-metal aircraft, the electrical resistance of the main earth system should be approximately equal to the calculated value of all earth strips in parallel. The resistance between any bonded component and the main earth should not exceed 0.05 ohm.

9. To measure the resistance between any two points, the leads should be connected to the ohmmeter by inserting the plugs into the sockets in the side of the instrument. The circuit is such that either lead may be connected to either socket. The operation of the tester may then be checked by pressing the two prods on the Type A lead against the single prod of the Type B lead. A reading of zero should be obtained.

10. The single prod should be connected to the reference point, either by pressing the prod into the surface of the metal by hand, or by using the lug to make semi-permanent connection. This connection should always be made first. The instrument may then be carried to the second point, and contact made there with both points of the double prod. The ohmmeter will then indicate the value of the resistance between the two points.

11. The contact points of the prods are pointed to enable the protective covering on the metal to be pierced, so that good contact can be obtained with the least possible damage to the finish. Care must be exercised

in making contact with metal of a light gauge to avoid damaging the structure itself in any way. If a high resistance value is obtained, the contact itself should first be suspected and the measurements repeated with the contact points pressed on a different part of the component. As parts of the electrical testing system, the leads should be carefully handled to avoid kinking, crushing, or other damage with resultant injury to the electrical conductors.

SERVICING

12. The battery must be kept in good condition and be periodically removed from the case and re-charged. When re-connecting the battery, ensure that the polarity is correct. Further information on the servicing of alkaline batteries is given in A.P.4343, Vol. 1, Sect. 3.

13. The ohmmeter itself is sealed in the case, and no attempt must be made to open it. If a fault should develop, the tester must be returned for repair.

14. Ensure that the leads are in good condition and that the connections to the plugs and prods are sound. The reading of the instrument is affected by the resistance of the leads, which must not, therefore, be shortened or repaired. The plugs and sockets must be kept clean and the plugs should be a good push fit in the sockets. The contact points of the prods should be sharpened if they have become blunt, care being taken to remove as little metal from the points as possible.

15. Check the accuracy of the instrument from time to time by measuring resistors of known value, using the leads and prods. Resistors of 0.02, 0.06, and 0.1 ohm should be measured, and the reading for these should be within 10 per cent of the true value. The zero should also be checked by pressing the two prods of the Type A lead against the single prod of the Type B lead.

250A

50 V x 250
1000

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