

## Chapter 1

# INSULATION RESISTANCE TESTERS

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#### Introduction

1. The reliability of electrical equipment demands a high standard of insulation in both the components and the associated wiring and wherever practicable periodic tests are prescribed in Servicing Schedules to ensure that the standard is maintained. Tests may be made on installed equipment, wiring systems or on components in servicing bays, by means of insulation resistance testers of appropriate voltage or by the use of circuit testing or safety ohmmeters dependent on the voltage limitations of the system or component to be tested.

2. The complexity of modern aircraft electrical installations and the increasing use of semiconductors and other components, having a low working voltage, have however necessitated the discontinuance of routine insulation resistance tests on aircraft systems except where they are prescribed in Servicing Schedules to meet specified requirements. Insulation resistance testers and circuit testing ohmmeters are described in A.P.4343J, Vol. 1, Sect. 3 whilst safety ohmmeters are covered in Sect. 4 of the same publication.

#### DESCRIPTION

##### Insulation resistance testers

3. The insulation resistance testers, types A, C, D, and E are portable, self-contained instruments comprising a hand-driven generator and an ohmmeter housed in a case to form a single unit. The permanent magnet generator is driven through gearing by a hand-crank which can be folded into the case when not in use. The ohmmeter consists of two coils mounted at an angle to each other on a common spindle and free to move in the field of a permanent magnet.

4. One of the coils is connected through a resistance across the generator whilst the other is in series with another resistance and the insulation under test. The coils produce opposing torques and the movement comes to rest in a position where the two forces are in equilibrium and a pointer attached to the movement indicates the resistance value on a scale calibrated in thousands of ohms and megohms.

##### Bridge-Megger Testers

5. Bridge-Megger testers combine the functions of insulation resistance testers and those of a Wheatstone bridge. Descriptive information and operating instructions are contained in A.P.4343J, Vol. 1, Sect. 3.

##### Circuit testing and Safety ohmmeters

6. These instruments are designed for the measurement of resistance of circuits where the maximum test voltage and current must not exceed specified maximum values. The earlier types of ohmmeter are of similar construction to the Type A insulation resistance tester but later designs are powered by batteries and in one type by a photo-electric cell. Reference should be made to A.P.4343J, Vol. 1, Sect. 3 and 4 for further information on these instruments.

#### OPERATION

##### General

7. Insulation resistance measurements should always be made under 'power off' conditions and in general, the testing voltage should not be more than twice the operating voltage of the circuit under test. Reference should be made to the relevant Vol. 1 or Servicing Schedule for testing data before any tests are made.

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8. Tests should whenever possible be made under cover in dry atmospheric conditions since low insulation values due to dampness may be misinterpreted as being caused by faults. Testers should not be operated in the proximity of magnetic fields or whilst rested on the metalwork of any electrical machines. It is not necessary to remove testers from carrying cases before use but they must be held firmly whilst being operated. Care should be taken to avoid knocking the tester whilst slung from the shoulder or subjecting it to jarring which might cause the delicate mechanism to become deranged.

9. When testing circuits having a high capacitance, the generator should be turned at a speed that allows the voltage limiter to operate, or where no controlling device is fitted, at the rated speed for the tester being used. Excessive speed should be avoided since where there is no voltage limitation, components may be damaged by the high testing voltage.

10. Before use the instrument should be tested by turning the generator with the test leads on open circuit when the pointer should

move to the Infinity marking on the scale. The leads should then be connected together and the handle turned slowly so that the pointer moves towards the Zero position. These tests should be repeated whenever doubt exists about the accuracy of successive indications.

11. Records of insulation resistance measurements can be of value where systems are subjected to regular tests since a reduced indication, which is not attributable to increased humidity, may enable a fault to be traced and rectified before unserviceability occurs.

### SERVICING

12. Insulation resistance testers are reliable instruments and require very little routine servicing. They should be examined before use for signs of physical damage and to ensure that the test leads are serviceable. Periodic calibration checks should be made connecting resistors of known values across the terminals of the tester and turning the generator at its rated speed. The indications on the scale of the tester should be within 10% of the actual resistance values.

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