



ANSI/EIA-364-21C-2000
Approved: March 10, 2000

EIA-364-21C

EIA STANDARD

TP-21C

Insulation Resistance Test Procedure for Electrical Connectors, Sockets, and Coaxial Contacts

EIA-364-21C

(Revision of EIA-364-21B)

MAY 2000



Electronic Components, Assemblies & Materials Association

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(From Standards Proposal Number 4213-A, formulated under the cognizance of the CE-2.0 National Connector Standards Committee.)

Published by

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Technology Strategy & Standards Department
2500 Wilson Boulevard
Arlington, VA 22201

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TEST PROCEDURE No. 21C
INSULATION RESISTANCE TEST PROCEDURE
FOR
ELECTRICAL CONNECTORS, SOCKETS, AND COAXIAL CONTACTS

(From EIA Standards Proposal No. 4213-A, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards, and previously published in EIA-364-21B.)

1 Introduction

1.1 Scope

This standard applies to electrical connectors, sockets and coaxial contacts.

1.2 Object

The object of this test procedure is to detail a standard method to assess insulation resistance.

2 Test resources

2.1 Test equipment

Insulation resistance measurements shall be made on an apparatus suitable for the characteristics of the component to be measured, such as a megohm bridge, megohm-meter, insulation resistance test set, or other suitable apparatus. The voltage source should be capable of supplying a constant 500 Vdc \pm 10%. The equipment shall have an accuracy of \pm 5% of the finite value of the full-scale readings for the range being used. The lowest range of the test equipment read-out device that is compatible with the results being obtained shall be used so that the minimum equipment tolerance error will be introduced into the test results.

3 Test specimen

3.1 Description

A test specimen shall consist of a plug, a receptacle, a mated plug and receptacle, a coaxial pin contact, a coaxial socket contact, or a mated coaxial pin and socket contact.

3.2 Preparation

3.2.1 Specimens shall be prepared as they would be for normal applications. Specimens to be tested shall be free from foreign matter that can affect their operation. When special preparation or conditions such as special test fixtures, reconnections, grounding, isolation, low atmospheric pressure, humidity, or immersion in water are required, they shall be specified in the referencing document.

3.2.2 Unless otherwise specified, test specimens shall be tested in the as-received state. If test leads are soldered to the terminations, the solder joints and surrounding areas may be cleaned. If cleaning is specified, the assembly shall be cleaned with a suitable solvent, dipping in distilled water while still moist with solvent, and conditioned in an air circulating oven at $35\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ for 2 hours. When removed from the oven, parts shall be cooled in ambient conditions for a minimum of 30 minutes prior to the test.

4 Test procedure

4.1 Measurement

Insulation resistance shall be measured separately between the closest adjacent contacts; and between connector shell or mounting plate and the closest adjacent contact, or both. Unless otherwise specified in a detail specification, a minimum of six measurements (3 adjacent contacts and/or 3 contacts-to-shell and/or 3 contacts-to-base plate) or 10% of the total number of contacts (whichever is greater) shall be made for each case. The same contact locations for a given connector shall be used each time the insulation resistance test is performed. Unless otherwise specified, test voltage applied shall be $500\text{ Vdc} \pm 10\%$. Insulation resistance measurements for coaxial contacts shall be made between the inner and outer contacts, as specified in the referencing document.

4.2 Electrification time

When electrification time is a factor, or when variable data are required, the insulation measurements shall be made immediately after a two-minute period of uninterrupted test voltage application, unless otherwise specified. However, if the instrument reading indicates that an insulation resistance meets the specified limit, and is steady or increasing, the test may be terminated before the end of the specified period. When more than one measurement is specified, subsequent measurements of insulation resistance shall be made using the same polarity as the initial measurements. The minimum value of insulation resistance obtained shall be greater than the minimum value specified in the requirements for the specimens being tested.

4.3 Precautions

Suitable precautions must be taken to protect personnel and apparatus from the relatively high potentials used in performing the test. Care shall be taken to prevent a direct short circuit of the testing apparatus since damage to the indication device may result.

4.4 Final measurements

When insulation resistance is performed in conjunction with environmental tests, the specimens shall be measured within one hour, unless otherwise specified in the referencing document.

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Test specimen preparations or conditioning, if required; see 3.2.1

5.2 Magnitude of test voltage, if other than 500 Vdc; see 4.1. (Typical dc test voltages are 100 V, 500 V, 1000 V and 1500 V)

5.3 Electrification time, if other than two minutes; see 4.2

5.4 Points of application of test voltage, if other than specified in 4.1

5.5 The minimum value of insulation resistance; see annex A

5.6 Environmental conditions for test if other than standard conditions. (Barometric pressure, temperature and relative humidity)

5.7 Define test specimen (mated or unmated)

5.8 Number of specimens to be tested

5.9 Number of readings per specimen

5.10 Specimen description including fixture, if applicable

6 Test documentation

Documentation shall contain the details specified in clause 5, with any exceptions, and the following:

6.1 Title of test

6.2 Specimen description including fixturing, if applicable

6.3 Test equipment used, and date of last and next calibration

6.4 Test procedure

6.5 Values and observations

6.6 Name of operator and date of test

Annex A

A Informative

A.1 This test procedure is used for determining the resistance offered by the insulation materials and the various seals of a connector to a dc potential tending to produce a leakage of current through or on the surface of these members. This test is especially useful in determining the extent to which insulating properties are affected by deteriorating influences, such as heat, moisture, contamination, or loss of volatile materials.

A.2 The purpose of the insulation resistance test is to measure the resistance offered by the insulating members of a component part to an impressed direct voltage tending to produce a leakage current through or on the surface of these members. The value of insulation resistance may be the limiting factor in the design of high-impedance circuits, and can disturb the operation of circuits intended to be isolated, for example, by forming feedback loops. Excessive leakage currents can lead to deterioration of insulation by heating or by direct current effects. Insulation resistance measurements are not equivalent to dielectric withstanding voltage or dielectric breakdown test.

A.3 Since members composed of different materials or combinations of materials may have inherently different insulation resistance values, the numerical value of measured insulation resistance cannot be taken as a direct measure of the degree of cleanliness or absence of deterioration. The test is especially helpful in determining the extent to which insulation is affected by deteriorating influences.

A.4 The following situations should be considered while formulating the testing requirements of an item where insulation resistance is tested:

A.4.1 Test potential applied (voltage range) should be of the same range as that of the connector use and expected voltage spike that the connector is expected to see in its use.

A.4.2 Connector insulation resistance values will vary depending on contact size, composition of contact and insulator, and distance between test points. However, designers specifying test values should realize that connectors of identical properties should have identical resistance values specified.

EIA Document Improvement Proposal

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