SCTE · ISBE

STANDARDS

Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 103 2018

Test Method for DC Contact Resistance, Drop cable to "F" connectors and F 81 Barrels

NOTICE

The Society of Cable Telecommunications Engineers (SCTE) / International Society of Broadband Experts (ISBE) Standards and Operational Practices (hereafter called "documents") are intended to serve the public interest by providing specifications, test methods and procedures that promote uniformity of product, interchangeability, best practices and ultimately the long-term reliability of broadband communications facilities. These documents shall not in any way preclude any member or non-member of SCTE•ISBE from manufacturing or selling products not conforming to such documents, nor shall the existence of such standards preclude their voluntary use by those other than SCTE•ISBE members.

SCTE•ISBE assumes no obligations or liability whatsoever to any party who may adopt the documents. Such adopting party assumes all risks associated with adoption of these documents, and accepts full responsibility for any damage and/or claims arising from the adoption of such documents.

Attention is called to the possibility that implementation of this document may require the use of subject matter covered by patent rights. By publication of this document, no position is taken with respect to the existence or validity of any patent rights in connection therewith. SCTE•ISBE shall not be responsible for identifying patents for which a license may be required or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Patent holders who believe that they hold patents which are essential to the implementation of this document have been requested to provide information about those patents and any related licensing terms and conditions. Any such declarations made before or after publication of this document are available on the SCTE•ISBE web site at http://www.scte.org.

140 Philips Road
Exton, PA 19341

TABLE OF CONTENTS

1.0 SCOPE

This document is identical to SCTE 103 2012 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

The purpose of this test procedure is to measure the contact resistance or intimacy of contact between an F connector and the drop cable shield (outer conductor contact resistance) or the cable center conductor and the F81 barrel (inner conductor contact resistance.). This method is used to evaluate the tendency for unwanted high-resistance contacts. Depending on the application, high resistance contacts may cause excessive energy losses, overheating and possibly, in Cable Telecommunications systems, common path distortions. In any case however, it is most desirable to have contact resistance as close to zero as possible.

2.0 NORMATIVE REFERENCES

The following documents contain provisions, which, through reference in this text, constitute provisions of this standard. At the time of subcommittee approval, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

2.1 ANSI/SCTE 74 2011: Specification for Braided 75 Ohm Flexible RF Coaxial Drop Cable.

2.2 ANSI/SCTE 123 2011: Specification for "F" Connector, Male, Feed-Through.

2.3 ANSI/SCTE 124 2011: Specification for "F" Connector, Male, Pin Type.

2.4 ANSI/SCTE 155 2008: Indoor "F" Female to "F" Female Inline Splice.

3.0 INFORMATIVE REFERENCES

The following documents may provide valuable information to the reader but are not required when complying with this standard.

3.1 ANSI/SCTE 44 2010: Test Method for DC Loop Resistance.

4.0 COMPLIANCE NOTATION

"SHALL"	This word or the adjective "REQUIRED" means that the item is an absolute requirement of this specification.
"SHALL NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word or the adjective "RECOMMENDED" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
"SHOULD NOT"	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
"MAY"	This word or the adjective "OPTIONAL" means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

5.0 TEST SAMPLES GENERAL

5.1 Cable used for testing should meet the requirements of ANSI/SCTE 74.

5.2 "F" Male Connectors used for test should meet the requirements of ANSI/SCTE 123 or ANSI/SCTE 124.

5.3 "F" Female inline splices should meet the requirements of ANSI/SCTE 155.

6.0 TEST SAMPLES

6.1 CONNECTOR TO SHIELD CONTACT

Cable for the test sample should be cut to 12" ± 0.125" long. The male "F" connector should be installed onto one end of the cable using the manufacturer's recommended instructions and tools. The inline "F" female splice should be installed on the "F" Male Connector and tightened to manufacturer recommendations.

2" ± 0.125" of the jacket on the non-connectorized end shall be removed.

The test sample may be pre-conditioned prior to testing, i.e., temperature cycled, humidity cycled, etc.

6.2 CONNECTOR TO CENTER CONDUCTOR CONTACT

Cable for the test sample should be two samples 12” ± 0.125” long each. The ”F Male connectors should be installed onto one end of each cable using the manufacturer’s recommended instruction and tools. Install the connectorized samples on the inline “F” female splice and tighten to manufacturers recommendations.

2” ± 0.125” of the jacket, outer shield(s) and dielectric shall be removed to cleanly expose the center conductor on each non-connectorized end.

The test sample may be pre-conditioned prior to testing, i.e., temperature cycled, humidity cycled, etc.

6.3 SHIELD, CONNECTOR AND CENTER CONDUCTOR CONTACT (LOOP)

Cable for the test sample should be cut to 12” ± 0.125” long. A “F” Male connector should be installed onto one end of the cable using manufacturer recommended instruction and tools. The “F” female splice should be installed into the F-Connector and tightened to manufacturer recommendations. A jumper should be constructed to connect between the outer surface of the F Female splice and the center contact of the splice. It may be useful to use a length of 18 AWG, solid copper wire with an appropriately sized lug soldered onto one end, attached to the threaded portion of the splice and the other end inserted into the center contact..

2” ± 0.125”of the jacket on the non-connectorized end shall be removed

The exposed braid should be folded back over the jacket.

1.5 “ +/- 0.125” of the dielectric should be removed to cleanly expose the center conductor.

The test sample may be pre-conditioned prior to testing, i.e., temperature cycled, humidity cycled, etc.

7.0 EQUIPMENT

7.1 Ammeter – Capable of measuring 0 – 10 Amperes with a full-scale accuracy of 2% maximum, CEN-TECH Model number P37772 or equivalent.

7.2 Digital Multimeter – Capable of measuring the voltage range with an accuracy of 1% maximum, Fluke DMM Model number 5050A or equivalent.

7.3 DC Power supply capable of delivering current up to 10 Amperes, with a full-scale accuracy of 2% maximum, EPSCO DC power supply Model Number EFB 15 or equivalent.

7.4 Load tester, 500 Ampere Chicago Electric Model 91129 or equivalent

8.0 PROCEDURE

Turn on the test equipment and allow an adequate warm up period in accordance with the equipment manufacturers instructions. Ensure surface oxides and films that are in the paths of contact be kept to a minimum for stability of test results.

8.1 CONNECTOR TO SHIELD CONTACT

The intent of the setup is to pass steps of 2, 4 and 6 amperes through the cable shield, the cable-to-connector interface and the connector and measure the voltage drop across the interface.

One alligator clip from the DC Power supply shall be placed on the threaded portion of the inline splice, the other alligator clip shall be placed on the cable outer conductor. It may be desirable to twist the braid wires together in order to provide better contact.

One alligator clip from the Voltmeter shall be placed on the threaded portion of the inline splice, the other alligator clip shall be placed on the cable outer conductor.

Currents of 2, 4 and 6 amperes shall be delivered for a period of one minute each or until the current stabilizes, whichever is shorter. Voltage drop measurements shall be taken and the resulting resistance calculated and recorded. The contact resistance shall be calculated from the following equation:

$$R_{contact} = \frac{MeasuredVoltageDrop}{Current}$$

8.2 CONNECTOR TO CENTER CONDUCTOR CONTACT

The intent of the setup is to pass steps of 2, 4 and 6 amperes through the cable center conductor, the connector and the cable-to-connector interface and measure the voltage drop across the interface.

The alligator clips from the DC Power supply shall be placed on each of the two-unconnectorized cable center conductor ends of the test sample.

Similarly, the alligator clips from the Voltmeter shall be placed on each of the two-unconnectorized cable center conductor ends of the test sample.

Currents of 2, 4 and 6 amperes shall be delivered for a period of one minute each or until the current stabilizes, whichever is shorter. Voltage drop measurements shall be taken and the resulting resistance calculated and recorded. The Contact resistance shall be calculated from the following equation:

$$R_{contact} = \frac{MeasuredVoltageDrop}{Current}$$

8.3 SHIELD, CONNECTOR AND CENTER CONDUCTOR CONTACT (LOOP)

Depending on the particular test equipment (voltmeter, ohmmeter and DC power supply.) The ammeter shall be place in series in the circuit and the voltmeter shall be placed in parallel. The intent of the setup is to pass steps of 2, 4 and 6 amperes through the cable shield, the cable-to-connector interface, the connector and the cable center conductor and measure the voltage drop across the interface of interest.

One alligator clip from the DC Power supply shall be placed on the exposed cable center conductor and the other alligator clip shall be placed on the cable outer conductor. It may be desirable to twist the braid wires together in order to provide better contact.

One alligator clip from the Voltmeter shall be placed on the exposed cable center conductor and the other alligator clip shall be placed on the cable outer conductor.

Currents of 2, 4 and 6 amperes shall be delivered for a period of one minute each or until the current stabilizes, whichever is shorter. Voltage drop measurements shall be taken and the resulting resistance calculated and recorded. The Calculated contact resistance shall be calculated from the following equation:

$$R_{contact} = \frac{MeasuredVoltageDrop}{Current}$$

9.0 TEST RESULTS

CURRENT (Amperes)	Calculated Resistance (before aging, milliohms) $R_{contact} = \frac{MeasuredVoltage}{Current}$	Calculated Resistance (after aging, if applicable, milliohms) $R_{contact} = \frac{MeasuredVoltage}{Current}$
2		
4		
6		

10.0 DISCUSSION

The definition of maximum contact resistance for every combination of cable size, center conductor and shield configuration is beyond the scope of this Test Procedure. The test engineer should keep in mind that it is most desirable to have contact resistances as close to zero as possible.

A control jumper should be made using the cable that is to be tested to verify circuit stability and accuracy.

Another approximate verification method is to use the approximate meter reading values as determined by the use of center conductor and loop resistance values contained in ANSI/SCTE 74. For example, a 6 Series, single tape and braid construction has a maximum center conductor resistance of 31.10 Ω / 1000ft (31.10 X 10^{-3} Ω /ft) and a maximum DC loop resistance of 41.16 Ω / 1000ft (41.16 X 10^{-3} Ω /ft). This results in an outer conductor resistance of 10.06 Ω / 1000ft (10.06 X 10^{-3} Ω /ft).

Notice that the approximate sample length of the test sample in Section 2.1 is 12". Therefore, the resistance calculated in Section 5.0 should be approximately 10 X 10^{-3} Ω or 10 milliohms. If the calculated resistance is in the area of 10 milliohms for the 2, 4 and 6 ampere tests; the resistance may be considered acceptable. If, for example, the calculated resistance values are 25, 65 and 90 milliohms; the interface might be suspect.