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**John C. Stennis Space Center**  
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**SSTD-8070-0096-TEST**

**Rev. B-1**

**AUGUST 2020**

# **COMPLIANCE IS MANDATORY**

## **John C. Stennis Space Center CONTROLS AND INSTRUMENTATION CABLE TESTING**

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8-5-2020

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## Document History Log

Change/ Revision	Change Date	Originator / Phone	Description
Basic	09.22.10	J. Lacher /8-1066	Initial release, supersedes SSC 61-003.
A	09.17.15	J. Lacher /8-1066	Five-year review. Revised cover sheet to require approval from NASA SSC Center Operations Directorate Operations & Maintenance Division, and concurrence by NASA SSC Engineering and Test Directorate. Updated references and acronyms. Administrative changes throughout. Removed 7.1-c, 7.1-d and Table 2; changed 7.1-e to 7.1-c.
B	07.27.2020	J. Lacher /8-1066	Five year review. Updated directorates on cover and header. Updated acronyms and headers. Section 2.0-a: Replaced "cables which are either installed, in storage, or in shop-made assemblies" with "all serialized and test critical cables or harnesses." Section 5.0-c: Deleted "general radio" and "type 1862-C or equivalent." Section 5.0-d: Added details for testing multiple cables. Section 6.7-c: Deleted "(See Chart A)" and Chart A. Section 7.1: Replaced "Continuity Test" subhead with "Short/Continuity Test". Section 7.2-a: Replaced "Megger" with "Megger type"; and, in the accompanying table, added "(based on cable rating)" to "Test Voltage" and replaced "500 VDC +/- 25": with "50-500 VDC +/- 5%". Section 7.2-b: Deleted "at 500 VDC". Section 7.2-c: Deleted "At 500VDC +/- 25 V, measure and record resistance pin-to-pin. Minimum acceptable values are shown in Table 2." Also, deleted Table 2. Section 7.2-d: Deleted "Minimum acceptable resistance for different types of cables are shown in Table III." Section 7.2-e (with above change, now 7.2-d): Replaced "jumpered" with "jumped."
B-1	08.05.2020	C. Wolfram / 8/1620	Administrative change for format purposes and to make current the effective/review dates.

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## 1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) defines acceptance requirements and procedures for testing low voltage instrumentation transmission, distribution and control cable for continuity, short circuit and insulation resistance.

## 2.0 APPLICABILITY

- a. This SSTD applies to all serialized and test critical cables or harnesses.
- b. Work specifications shall specifically state the need for cable testing when it is required.
- c. This SSTD shall be used for cable testing unless specified otherwise.
- d. Testing of coaxial cable or power cable is not within the scope of this SSTD.

## 3.0 REFERENCES

All references are assumed to be the latest version unless otherwise indicated.

ANSI/NEMA WC 70/ICEA 5-95-658, *Power Cables Rated 2000V Or Less For The Distribution Of Electrical Energy*

ANSI/NEMA WC 71/ICEA 5-96-659, *Non-Shielded Cables Rated 2001-5000V For Use In The Distribution Of Electrical Energy*

NEMA WC 74/ICEA 5-93-639, *5-46 KV Shielded Power Cable For Use In The Transmission And Distribution Of Electrical Energy*

SPR 1440.1, *SSC Records Management Program Requirements*

SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval, and Release of SSC Standards*

## 4.0 RESPONSIBILITIES

- a. Users of this SSTD shall comply with its requirements, ensure use of the correct version of this SSTD and the documents it references, and inform the appropriate organization of needed changes in accordance with SSTD-8070-0005-CONFIG.
- b. Responsibilities for the use and control of this SSTD and for the review and approval of revisions or cancellation of this SSTD shall be as specified in SSTD-8070-0005-CONFIG and the applicable documents referenced therein.

## 5.0 TEST EQUIPMENT

- a. For continuity and short tests, use an ohmmeter.

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- b. Buzzer may be used for continuity check only.
- c. For insulation resistance tests, use a megohmmeter, with calibration traceable to the National Institute of Standards and Technology (NIST) and capable of ranging to four (4) times the required operating voltage of the cable tested.
- d. If multiple cables are to be tested, use of an automated cable testing device such as the CAMI Research HVX High Voltage Test System, or equivalent, is acceptable.

## **6.0 GENERAL REQUIREMENTS**

### **6.1 Patch Panel Testing**

Cables terminating into patch panels can remain connected provided the cable being tested is isolated from other cable or equipment.

### **6.2 Taper Pin Terminal Block Testing**

Cables terminating into taper pin terminal blocks can be tested without removing the cables provided the cable being tested is isolated from other cable or equipment.

### **6.3 Military Specification (MS) Connector Testing**

Cables terminating into connectors such as CANNON or Military Standard (MS) shall be left terminated to connector provided the connector is disconnected from the equipment and the cable is isolated.

### **6.4 Test Conditions**

- a. Special care shall be taken for all testing to prevent damage to the connectors, wire harness, and related equipment.
- b. Items being tested shall not be connected to electrical or electronic components or assemblies during tests, except as outlined in this SSTD.

### **6.5 Test Connections**

- a. Test connections shall be made at wire or cable terminations.
- b. Connection shall not be made by piercing insulation.

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- c. For connection to the connector end of cable being tested, a mating plug/receptacle or mating pins/sockets, shall be used.
- d. In no case shall test probes be used on cable connection contacts.

## 6.6 Mating

- a. Test cable connectors shall be thoroughly examined for cleanliness, compatibility, and damage prior to mating with connector of cable being tested.
- b. Extreme care shall be used to prevent damage to cable connectors.

## 6.7 Test Sequence

Tests shall be performed on completed cables in the following sequence:

- a. Short test
- b. Conductor continuity or resistance test
- c. Insulation resistance test

## 7.0 DETAILED REQUIREMENTS

### 7.1 Short/Continuity Test

- a. All wires and cables shall be resistance tested for continuity of conductors and shields in accordance with the applicable engineering drawing or wire list.
- b. Excluding the resistance of test equipment, the maximum acceptable resistance of tested cable shall be in accordance with Table 1.

**TABLE 1**

CONTINUITY RESISTANCE	
Wire Size (AWG)	Maximum Resistance/100 ft. (OHMS)
26 through 24	5
22 through 20	2
18 through 10	1
Cable Shield	3

- c. Each conductor in a cable is checked for a short to the shield, connector shell, and to each other conductor.

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## 7.2 Insulation Resistance Test

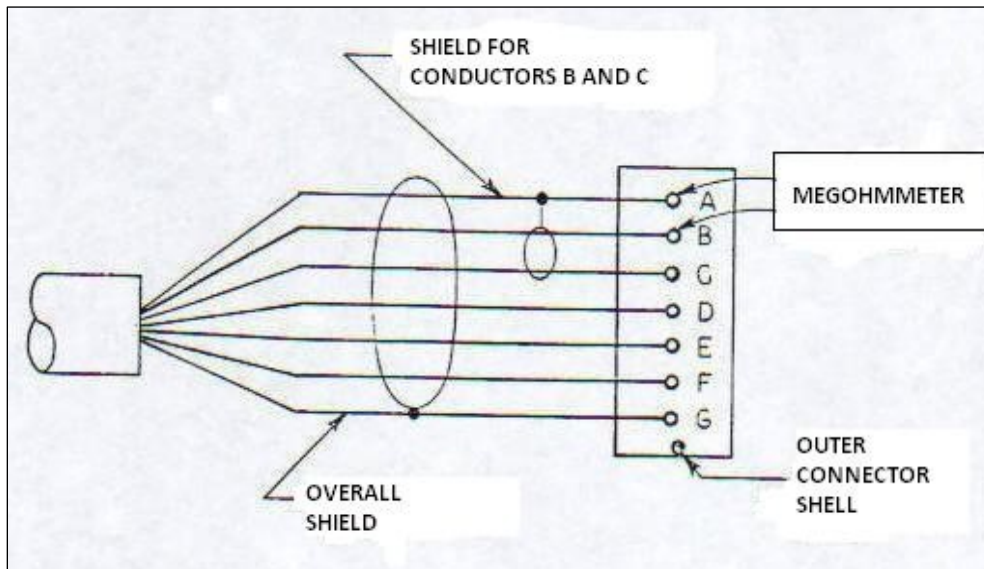
- a. Use Megger type listed in Section 5.0 "Test Equipment" as follows:

Test Voltage (based on cable rating)	50-500 VDC +/- 5%
Maximum Dwell Time	Two (2) minutes
Minimum Insulation Resistance	100 Megohms

- b. Wires and cable shall be subjected to the following insulation resistance tests for a dwell time adequate for stabilization but not to exceed two (2) minutes.

The minimum insulation resistance shall be 100 megohms between the following points referred to in Sketch A below:

**SKETCH A**



**NOTE:** Use the connector end of cable that terminates all conductors and shields.

1. Between each conductor and all other conductors.
  2. Between each conductor and connector shell.
  3. Between each conductor and each shield (except ground wires) in the same assembly.
  4. Between each shield terminating inside a connector and the outer connector shell. (This does not apply to shields which terminate **on** the connector shell.)
  5. Between each shield and all other shields.
- c. Shields may be jumped together to expedite a test only when specified in the engineering drawing or test instruction.

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## 8.0 QUALITY ASSURANCE

### 8.1 Inspection

- a. An authorized Quality Control Representative shall monitor the performance of all tests specified.
- b. An authorized Quality Control Representative shall verify compliance to this specification by signing or stamping the applicable documents.

### 8.2 Failures

Any partial failure shall mean complete failure and cause for rejection of the tested assembly.

## 9.0 RECORDS AND FORMS

Records and forms required by the procedures of this SSTD shall be maintained in accordance with SPR 1440.1. All records and forms are assumed to be the latest edition unless otherwise indicated. Forms may be obtained from the SSC Electronic Forms repository or from the National Aeronautics and Space Administration (NASA) SSC Forms Management Officer. Quality Records are identified in the SSC Master Records Index.

## 10.0 ACRONYMS AND ABBREVIATIONS

°	Degrees
ANSI	American National Standards Institute
AWG	American Wire Gage
DC	Direct Current
F	Fahrenheit
FT	Foot/Feet
ICEA	Insulated Cable Engineers Association
MS	Military Specification
NASA	National Aeronautics and Space Administration
NEMA	National Electrical Manufacturers Association
NIST	National Institute of Standards and Technology
SSC	John C. Stennis Space Center
SSTD	John C. Stennis Space Center Standard
SPR	Stennis Procedural Requirements