SCTE · ISBE

STANDARDS

Interface Practices Subcommittee

SCTE STANDARD

SCTE 156 2019

Specification for Mainline Plug (Male) to Cable Interface

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1. Introduction

1.1. Scope

The primary purpose of this specification is to assure acceptable electrical, mechanical and environmental performance of the cable and connector interface. The scope of this standard will be directed to acceptable performance of impedance, galvanic action, loop resistance, cable retention, intermodulation distortion, signal response, RF shielding, and watertight seals. This specification in no way *should* limit or restrict any manufacturers from innovative designs and product improvements.

1. This specification applies to the interface between ANSI/SCTE 92, Specification for 5/8 – 24 Plug (Male), Trunk and Distribution Connectors and 75-ohm coaxial aluminum hardline cable manufactured to ANSI/SCTE 15 and ANSI/SCTE 100.
2. 75-ohm coaxial cables and connectors are used to transport radio frequency (RF) signals and AC power between active and passive equipment.
3. Unless otherwise specified, all requirements in this document ***shall*** meet the performance requirements stated herein after thermal conditioning from -40 °C to 60 °C.
4. This document includes requirements for DOCSIS 3.1 operation.

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of the standard. At the time of Subcommittee approval, the editions indicated were valid. All standards are subject to revision; and while parties to any agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents may not be compatible with the referenced version.

2.1. SCTE References

- ANSI/SCTE 15 2006, Specification for Trunk, Feeder and Distribution Coaxial Cable
- ANSI/SCTE 48-1 2015, Test Method for Measuring Shielding Effectiveness of Passive and Actives Devices Using a GTEM Cell
- ANSI/SCTE 60 2010, Test Method for Interface Moisture Migration Double Ended
- ANSI/SCTE 92 2012, Specification for 5/8-24 Plug (Male), Trunk and Distribution Connectors
- ANSI/SCTE 93 2013, Test Method for Connector/Cable Twist
- ANSI/SCTE 100 2010, Specification for 75 Ohm Smooth Aluminum Subscriber Access Cable
- ANSI/SCTE 101 2011, “Mainline” Splice Connector Return Loss
- ANSI/SCTE 102 2010, Cable Retention Force Testing of Trunk and Distribution Connectors
- ANSI/SCTE 109 2010, Test Procedure for Common Path Distortion (CPD)
- ANSI/SCTE 125 2011, “Mainline” Pin (Plug) Connector Return Loss
- ANSI/SCTE 144 2012, Test Procedure for Measuring Transmission and Reflection
- ANSI/SCTE 152 2014, Test Procedure for Contact Resistance Measurement of Mainline Plug Interface

2.2. Standards from other Organizations

- ASTM D 1171, Test Method for Rubber Deterioration
- ASTM G 154 - Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

3. Informative References

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

- No references are applicable

4. 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.
forbidden	This word means the value specified shall never be used.
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.
deprecated	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of the standard. Implementations should avoid use of deprecated features.

5. Center Conductor Interface

5.1. Mechanical

The center conductor seizure device ***shall*** hold the following cable center conductor sizes to no less than the following retention forces when measured per ANSI/SCTE 102 Cable Retention Force Testing of Trunk and Distribution Connectors, and prepared to the lengths as shown in Figure 2.

Table 1 – Center Conductor Minimum Retention Force

Cable Size	Pound Force (lbf)	Cable Size	Pound Force (lbf)
320 F	45	750 F (D)	250
412 F	100	840 F	275
500 F (D) / 540 F	150	860 F	315
565 F	175	875 F	300
625 F / 650D	200	1.000 F (D) / 1.125 F	350
700 F / 715 F	225	1.160 F	375

5.2. Electrical

The initial contact resistance reading ***shall not*** exceed 3 milliohms and *may* not exceed an additional 2 milliohms after being cycled from -40 °C to 60 °C, with 2 hour dwell times at each temperature extreme and 1 hour ramp times between temperature transitions, for a period of 7 days, as shown in Figure 1 and tested in accordance to ANSI/SCTE 152 Test Procedure for Contact Resistance Measurement of Mainline Plug Interface.

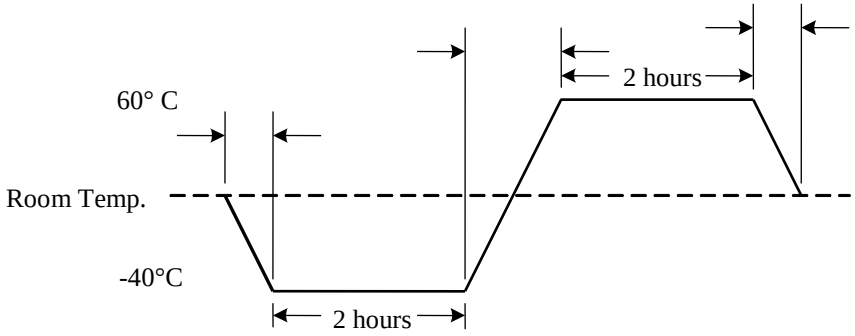

Figure 1 – Temperature Transitions

6. Outer Conductor Interface

6.1. Mechanical

The cable sheath gripping mechanism ***shall*** be designed to hold the following cable outer conductor sizes to no less than the following retention forces when used with a support sleeve as described in Section 8 and when measured per ANSI/SCTE 102, Cable Retention Force Testing of Trunk and Distribution Connectors.

Table 2 – Outer Conductor Minimum Retention Force

Cable Size	Pound Force (lbf)	Cable Size	Pound Force (lbf)
320 F*	180	840 F	475
412 F	250	860* F	480
500F (D) / 540* F	350	875 F	500
565F / 625F / 650 D	400	1.000 F (D) / 1.125* F	600
700F / 715* F	425	1.160 F	650
750 F (D)	450		

*__Note__: Measured force includes combination of outer conductor and jacket

The cable to connector interface ***shall not*** allow cable rotation more than 10 degrees during installation when tested per ANSI/SCTE 93, Test Method for Connector/Cable Twist.

6.2. Electrical

The initial contact resistance reading ***shall not*** exceed 1 milliohm and *may* not exceed an additional 2 milliohms after being cycled from -40 °C to 60 °C, with 2 hour dwell times at each temperature extreme and 1 hour ramp times between temperature transitions, for a period of 7 days, as shown in Figure 1. And tested in accordance to ANSI/SCTE 152, Test Procedure for Contact Resistance Measurement of Mainline Plug Interface.

7. “O” Ring Seal(s)

7.1. Material

The design and materials ***shall*** show no signs of cracking, brittleness or degradation when tested for 500 hours per ASTM G 154, table X2.1, cycle 2.

The design and materials ***shall*** show no signs of cracking, brittleness or degradation when tested in accordance to ASTM D 1171, Method A.

7.2. Environmental

Design performance ***shall not*** allow moisture migration applying ANSI/SCTE 60 Test Method for Interface Moisture Migration Double Ended.

8. Support Sleeve

All connector designs ***shall*** incorporate a cable outer conductor support sleeve to ensure meeting all sections of this document. Removing the dielectric of the cable using industry standard tools, as shown in Figure 2, provides the outer conductor support lengths and inside cable diameters.

9. Electrical Requirements

The connector to cable interface ***shall*** maintain minimum of 25 dB return loss from 5 MHz to 1794 MHz, when tested per ANSI/SCTE 125, “Mainline” Pin (Plug) Connector Return Loss and ANSI/SCTE 101, “Mainline” Splice Connector Return Loss.

The connector to cable interface ***shall*** provide low signal loss of no more than 0.25 dB from 5 MHz to 1794 MHz when tested in accordance to ANSI/SCTE 144, Test Procedure for Measuring Transmission and Reflection.

The connector to cable interface RFI shielding integrity ***shall*** be no less than 120 dB from 5 MHz to 1794 MHz when tested per ANSI/SCTE 48-1, Test Method for Measuring Shielding Effectiveness of Passive and Active Devices Using a GTEM Cell.

The connector to cable interfaces ***shall not*** exhibit any common path signals greater than -90 dBc when tested in accordance to ANSI/SCTE 109, Test Procedure for Common Path Distortion (CPD).

10. Cable Preparations Dimensions

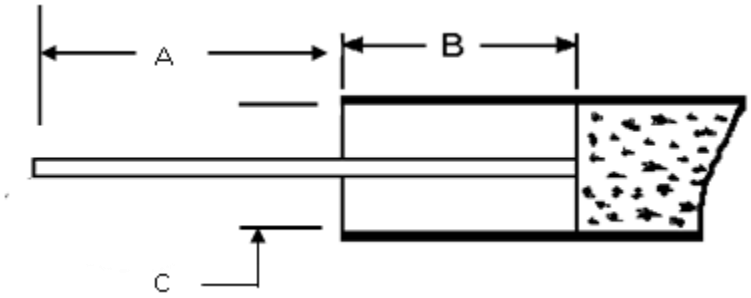

Figure 2 – Cable Core

Table 3 – Cable Core Dimensions

Cable Size	Core Depth "B"	Inside Dia. "C"	Cable Size	Core Depth "B"	Inside Dia. "C"
320 F	1.25 (31.73 mm)	0.293 (7.44 mm)	750 F	0.875 (22.21 mm)	0.678 (17.21 mm)
412 F	0.875 (22.21 mm)	0.362 (9.19 mm)	750D	0.875 (22.21 mm)	0.709 (18.00 mm)
500 F	0.875 (22.21 mm)	0.45 (11.42 mm)	840 F	0.875 (22.21 mm)	0.78 (19.80 mm)
500 D	0.875 (22.21 mm)	0.473 (12.00 mm)	860 F	1.25 (31.73 mm)	0.828 (21.02 mm)
540 F	1.25 (31.73 mm)	0.513 (13.02 mm)	875 F	0.875 (22.21 mm)	0.797 (20.23 mm)
565 F	0.875 (22.21 mm)	0.519 (13.17 mm)	1000 F	1.25 (31.73 mm)	0.89 (22.59 mm)
625 F	0.875 (22.21 mm)	0.563 (14.29 mm)	1000D	1.25 (31.73 mm)	0.925 (23.50 mm)
650 D	0.875 (22.21 mm)	0.601 (15.25 mm)	1125 F	1.25 (31.73 mm)	1.081 (27.44 mm)
700F	0.875 (22.21 mm)	0.653 (16.57 mm)	1160 F	1.25 (31.73 mm)	1.062 (26.95 mm)
715 F	1.25 (31.73 mm)	0.686 (17.41 mm)			

Note: The first numbers listed in core depth and inside diameter appear in inches.

Table 4 – Center Conductor Dimensional Range

Cable Size	Length "A"	Cable Size	Length "A"
320 F	0.50 – 1.00 (12.70 – 25.38 mm)	750 F (D)	0.90 – 1.30 (22.84 – 33.00 mm)
412 F	0.90 – 1.20 (22.84 – 30.46 mm)	840 F	0.90 – 1.50 (22.84 – 38.07 mm)
500 F (D)	0.90 – 1.20 (22.84 – 30.46 mm)	860 F	0.90 – 1.30 (22.84 – 33.00 mm)
540 F	0.90 – 1.20 (22.84 – 30.46 mm)	875 F	0.90 – 1.50 (22.84 – 38.07 mm)
565 F	0.90 – 1.20 (22.84 – 30.46 mm)	1000 F	0.90 – 1.70 (22.84 – 43.15 mm)
625 F	0.90 – 1.30 (22.84 – 33.00 mm)	1125 F	0.90 – 1.30 (22.84 – 33.00 mm)
650 D	0.90 – 1.30 (22.84 – 33.00 mm)	1160 F	0.90 – 1.50 (22.84 – 38.07 mm)
715 F	0.90 – 1.30 (22.84 – 33.00 mm)		

Note: The first numbers listed in core depth and inside diameter appear in inches.

Table 5 – Coring Bit Dimensions

Cable Size	Coring bit O.D.*	Cable Size	Coring bit O.D.*
320 F	0.284 (7.21 mm)	750 (D)	0.693 (17.59 mm)
412 F	0.351 (8.91 mm)	750 F	0.653 (16.57 mm)
500 (D)	0.452 (11.47 mm)	840 F	0.767 (19.47 mm)
500 F	0.439 (11.14 mm)	860 F	0.813 (20.64 mm)
540 F	0.502 (12.74 mm)	875 F	0.767 (19.47 mm)
565 F	0.496 (12.59 mm)	1.000 F	0.872 (22.13 mm)
625 F	0.552 (14.01 mm)	1.000 (D)	0.937 (23.78 mm)
650 (D)	0.580 (14.72 mm)	1125 F	1.064 (27.00 mm)
700 F	0.641 (16.27 mm)	1160 F	1.042 (26.45 mm)
715 F	0.673 (17.08 mm)		

*Note: Minimum outside diameter (O.D.)

Note: The first numbers listed in core depth and inside diameter appear in inches.