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Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

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Specification for Mainline Plug (Male) to Cable Interface

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Document Types and Tags

☒ Specification	☐ Checklist	☐ Facility
☐ Test or Measurement	☐ Metric	☒ Access Network
☐ Architecture or Framework	☐ Cloud	☐ Customer Premises
☐ Procedure, Process or Method		

Document Release History

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SCTE 156 2008	*9/5/2008*
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Note: Standards that are released multiple times in the same year use: a, b, c, etc. to indicate normative balloted updates and/or r1, r2, r3, etc. to indicate editorial changes to a released document after the year.

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1. Introduction

1.1. Executive Summary

This specification applies to the Mainline Plug (Male) Connector to Cable Interface used for distribution of RF and AC power used for broadband devices, such as mainline taps / passives, power inserters and active that are used in the 75 ohm RF broadband communications industry.

1.2. 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 [SCTE 92], Specification for 5/8 – 24 Plug (Male), Trunk and Distribution Connectors and 75-ohm coaxial aluminum hardline cable manufactured to [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 4.0 operation.

1.3. Benefits

This specification is to provide manufacturers and users of this product a basic set of standard mechanical, electrical, and environmental performance requirements.

1.4. Intended Audience

The intended audience for this specification is manufacturers, test laboratories, and end-users.

1.5. Areas for Further Investigation or to be Added in Future Versions

None

2. Normative References

The following documents contain provisions which, through reference in this text, constitute provisions of this document. The editions indicated were valid at the time of subcommittee approval. All documents are subject to revision and, while parties to any agreement based on this document 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 might not be compatible with the referenced version.

2.1. SCTE References

[SCTE 15] ANSI/SCTE 15 2022, Specification for Trunk, Feeder and Distribution Coaxial Cable

[SCTE 48-1] ANSI/SCTE 48-1 2021, Test Method for Measuring Shielding Effectiveness of Passive and Actives Devices Using a GTEM Cell

[SCTE 60] ANSI/SCTE 60 2015(2021), Test Method for Interface Moisture Migration Double Ended

[SCTE 92] ANSI/SCTE 92 2022, Specification for 5/8-24 Plug (Male), Trunk and Distribution Connectors

[SCTE 93] ANSI/SCTE 93 2020, Test Method for Connector/Cable Twist

[SCTE 101] ANSI/SCTE 101 2019, "Mainline" Splice Connector Return Loss

[SCTE 102] ANSI/SCTE 102 2016, Cable Retention Force Testing of Trunk and Distribution Connectors

[SCTE 109] ANSI/SCTE 109 2019, Test Procedure for Common Path Distortion (CPD)

[SCTE 125] ANSI/SCTE 125 2020, "Mainline" Pin (Plug) Connector Return Loss

[SCTE 144] ANSI/SCTE 144 2017, Test Procedure for Measuring Transmission and Reflection

[SCTE 152] ANSI/SCTE 152 2019, Test Procedure for Contact Resistance Measurement of Mainline Plug Interface

2.2. Standards from Other Organizations

[ASTM D 1171] ASTM D 1171, Test Method for Rubber Deterioration

[ASTM G 154] ASTM G 154 - Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

2.3. Other Published Materials

No normative references are applicable.

3. Informative References

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

3.1. SCTE References

No informative references are applicable.

3.2. Standards from Other Organizations

No informative references are applicable.

3.3. Other Published Materials

No informative references are applicable.

4. Compliance Notation

shall	This word or the adjective "***required***" means that the item is an absolute requirement of this document.
shall not	This phrase means that the item is an absolute prohibition of this document.
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 weighed 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*" indicate a course of action permissible within the limits of the document.
deprecated	Use is permissible for legacy purposes only. Deprecated features *may* be removed from future versions of this document. 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 [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 (kgf)	Cable Size	Pound Force lbf (kgf)
320 F	45 (20.4)	750 F (D)	250 (113.4)
412 F	100 (45.4)	840 F	275 (124.7)
500 F (D) / 540 F	150 (68.0)	860 F	315 (142.9)
565 F	175 (79.4)	875 F	300 (136.1)
625 F / 650D	200 (90.8)	1.000 F (D) / 1.125 F	350 (158.8)
700 F / 715 F	225 (102.1)	1.160 F	375 (170.1)

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 °F/C to 140 °F (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 [SCTE 152] Test Procedure for Contact Resistance Measurement of Mainline Plug Interface.

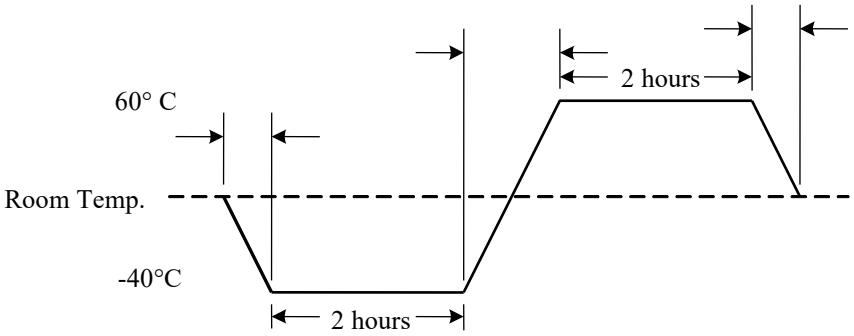

Figure 1 – Temperature Transitions

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 [SCTE 102], Cable Retention Force Testing of Trunk and Distribution Connectors.

Table 2 – Outer Conductor Minimum Retention Force

Cable Size	Pound Force lbf (kgf)	Cable Size	Pound Force lbf (kgf)
320F*	180 (81.6)	840F	475 (215.5)
412F	250 (113.4)	860F*	480 (217.7)
500F (D) / 540F*	350 (158.8)	875 F	500 (226.8)
565F / 625F / 650D	400 (181.4)	1.000 F (D) / 1.125F*	600 (272.2)
700F / 715F*	425 (192.8)	1.160 F	650 (294.8)
750 F (D)	450 (204.1)		

***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 [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 °F/C to 140°F (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 with [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 with ASTM D 1171, Method A.

7.2. Environmental

Design performance ***shall not*** allow moisture migration applying [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 3000 MHz, when tested per [SCTE 125], “Mainline” Pin (Plug) Connector Return Loss and [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 3000 MHz when tested in accordance to [SCTE 144], Test Procedure for Measuring Transmission and Reflection.

The connector to cable interface RFI shielding integrity ***shall*** be no less than 125 dB from 5 MHz to 1000

MHz, 115 dB from 1000 MHz to 2000 MHz, and 105 dB from 2000 MHz to 3000 MHz when tested per

[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 [SCTE 109], Test Procedure for Common Path Distortion (CPD).

10. Cable Preparations Dimensions

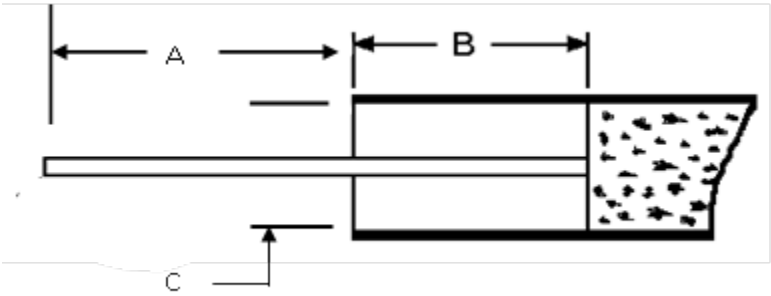

Figure 2 – Cable Core

Table 3 – Cable Core Dimensions

Cable Size	Core Depth "B" Inches (mm)	Inside Dia. "C" Inches (mm)	Cable Size	Core Depth "B" Inches (mm)	Inside Dia. "C" Inches (mm)
320F	1.25 (31.73 mm)	0.293 (7.44 mm)	750F	0.875 (22.21 mm)	0.678 (17.21 mm)
412F	0.875 (22.21 mm)	0.362 (9.19 mm)	750D	0.875 (22.21 mm)	0.709 (18.00 mm)
500F	0.875 (22.21 mm)	0.45 (11.42 mm)	840F	0.875 (22.21 mm)	0.78 (19.80 mm)
500D	0.875 (22.21 mm)	0.473 (12.00 mm)	860F	1.25 (31.73 mm)	0.828 (21.02 mm)
540F	1.25 (31.73 mm)	0.513 (13.02 mm)	875F	0.875 (22.21 mm)	0.797 (20.23 mm)
565F	0.875 (22.21 mm)	0.519 (13.17 mm)	1000F	1.25 (31.73 mm)	0.89 (22.59 mm)
625F	0.875 (22.21 mm)	0.563 (14.29 mm)	1000D	1.25 (31.73 mm)	0.925 (23.50 mm)
65D	0.875 (22.21 mm)	0.601 (15.25 mm)	1125F	1.25 (31.73 mm)	1.081 (27.44 mm)
700F	0.875 (22.21 mm)	0.653 (16.57 mm)	1160F	1.25 (31.73 mm)	1.062 (26.95 mm)
715F	1.25 (31.73 mm)	0.686 (17.41 mm)			

Table 4 – Center Conductor Dimensional Range

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

Table 5 – Coring Bit Dimensions

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

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