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STANDARDS

Interface Practices Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 129 2017

Drop Passives: Bonding Blocks (Without Surge Protection)

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140 Philips Road
Exton, PA 19341

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1. Introduction

1.1. Scope

The purpose of this document is to recommend mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to provide a transition point between the network operator's service cable (the "drop") and the distribution wiring within premises. An important function of the device is to provide a connection point for a bonding conductor in accordance with requirements of the National Electrical Code or local building requirements. The scope of this specification is limited to 75 ohm devices whose ports are provided with female type F ports.

The specification is not intended to restrict any manufacturer's innovation and improvement.

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. At the time of Subcommittee approval, the editions indicated were valid. 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

- ANSI/SCTE 01 2015, "F" Port (Female Outdoor) Physical Dimensions
- ANSI/SCTE 02 2015, "F" Port (Female Indoor) Physical Dimensions
- ANSI/SCTE 29 2012, Torque Requirements for Bond Wire Penetration of Bonding Set Screw
- ANSI/SCTE 48-1 2015, Test Method for Shielding Effectiveness of Actives and Passives Using GTEM Cell
- ANSI/SCTE 74 2011, Specification for Braided 75 Ohm Flexible RF Coaxial Drop Cable
- ANSI/SCTE 81 2012, Test Method for Surge Withstand
- ANSI/SCTE 123 2011, Specification for "F" Connector, Male, Feed-Through
- ANSI/SCTE 143 2013, Test Method for Salt Spray
- ANSI/SCTE 144 2012, Test Procedure for Measuring Transmission and Reflection
- ANSI/SCTE 149 2013, Test Method for Withstand Tightening Torque – "F" Female
- ANSI/SCTE 153 2008, Drop Passives: Splitters, Couplers and Power Inserters
- SCTE 158 2016, Recommended Environmental Condition Ranges for Broadband Communications Equipment
- ANSI/SCTE 191 2013, Test Method for Axial Pull Force, Female "F" Port

2.2. Standards from Other Organizations

- 12.14. Military Standard MIL-STD-889 (Dissimilar Metals)
- NFPA 70 National Electric Code 2017
- C62.41-1991: IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

2.3. Published Materials

- No normative references are applicable.

3. 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 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 this document. Implementations should avoid use of deprecated features.

4. Mechanical

4.1. RF Ports

All RF ports shall be type "F" female and shall conform to the requirements of ANSI/SCTE 01 for outdoor use.

Where more than one "F" female connector exits from a common surface of the device, refer to ANSI/SCTE 153 for minimum spacing.

Axial Force. Per ANSI/SCTE 191, any F81 movement with 60 pounds of force (27.2kg) applied to either end constitutes failure. Any bracket bending or breakage with ≤160 pounds of force (≤72.6kg) applied to either end will constitute a failure.

RF Port Mount rotational torque. Test per ANSI/SCTE 149 (Test Method for Withstand Tightening Torque – "F" Female) for applying clockwise (CW) and counter-clockwise (CCW) rotational torque. Each "F" Port to Bracket Mount shall withstand 100 inch pounds torque (115cm-kgs), both CW and CCW directions.

4.2. Mounting

Mounting holes or slots may be located at the manufacturers preferred location if they meet the requirements of mounting specifications in SCTE 153 (Drop Passives: Splitters, Couplers and Power Inserters). Refer to Figure 1.

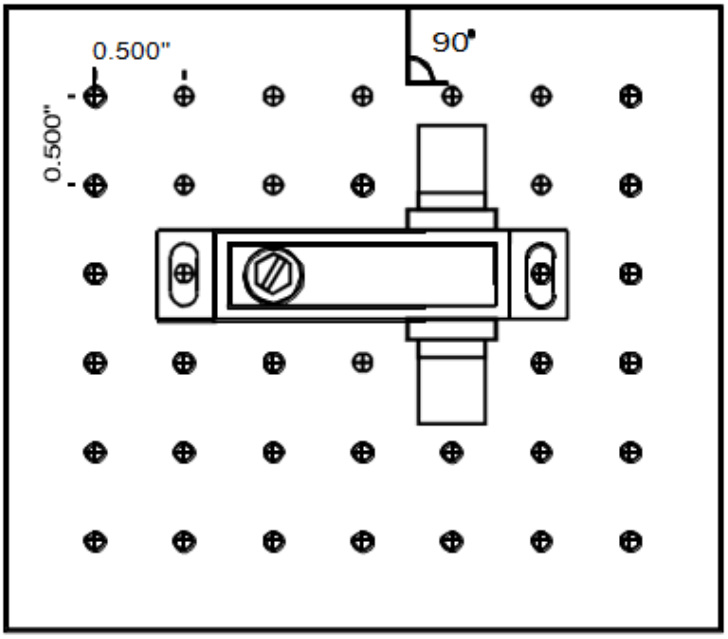

Figure 1 - Orthogonal Mounting of Device on Centerline Pattern

4.3. Bonding

Bonding wire attachment points must use, multi-drive head, flat point (or mechanically equivalent non-piercing) bonding device to maximize surface area contact.

Bonding fastener dual-drive screw must provide a 1/4 inch SAE or 7/16 inch SAE head size. The head size should be a Hexagon drive head and may include a Slotted and/or Phillips drive (see Figure 2).

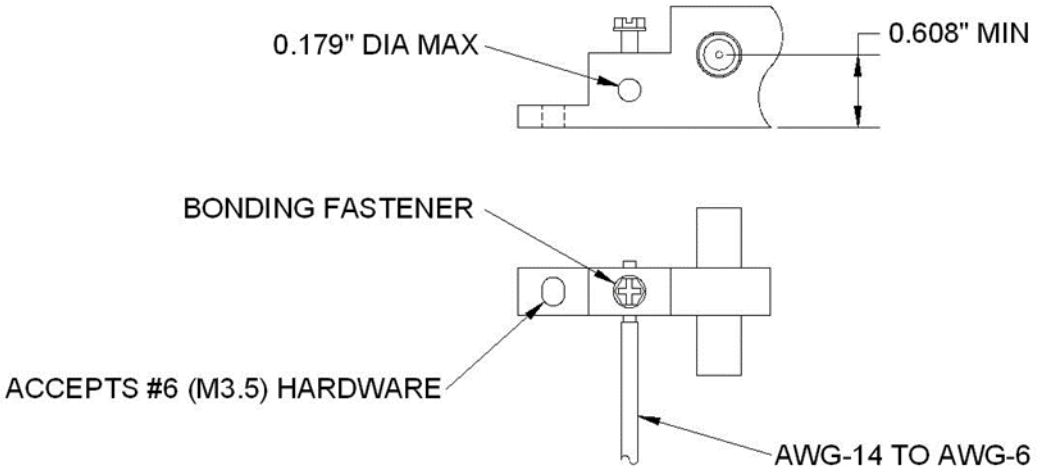

Figure 2 - Bonding Wire Seizure Arrangement

The bonding wire attachment point must accommodate wire sizes from AWG #6 to AWG #14, with maximum wire access 0.179" (4.55 mm) diameter.

Table 1 - AWG Size, Hole Size, Terminal Screw Size and Torque

AWG Size	AWG Dia. inch/(mm)	Minimum Terminal Screw Size UL 467 (CSA C22.2 41-07)	Torque in-lb/(cm-kgs) +/-2 NEC 110.14
14	0.0641/(1.63)	#10	20/(23.0)
12	0.0808/(2.05)	#10	20/(23.0)
10	0.1019/(2.59)	#10	20/(23.0)
8	0.1285/(3.26)	#10	25/(28.8)
6	0.1620/(4.11)	1/4"	35/(40.3)

For AWG #14 through AWG #8, neither the seizure screw, nor the mating part shall break nor shall the threads strip when 30 inch pounds of torque (34.5cm-kgs) is applied to the screw head. For AWG #6, neither the seizure screw, nor the mating part shall break nor shall the threads strip when 45 inch pounds of torque (51.8cm-kgs) is applied to the screw head.

Penetration of the seizure screw or clamp device into AWG #6 through AWG #10 annealed copper wire shall not exceed 25% of the wire outside diameter, when 30 inch-pounds of torque (34.5cm-kgs) is applied to the screw head. Penetration into AWG #12 or AWG #14 annealed copper wire shall not exceed 25% at 20 inch pounds of torque (23cm-kgs) applied to the screw head. Compliance shall be tested using ANSI/SCTE 29.

4.4. Galvanic Compatibility

The Bonding Block wire attachment point shall be Galvanically Compatible with bond wire employed.

Cable Communications industry standard practice has established this wire type to be Bare Annealed Copper, which has an Anodic Index of 0.35 V.

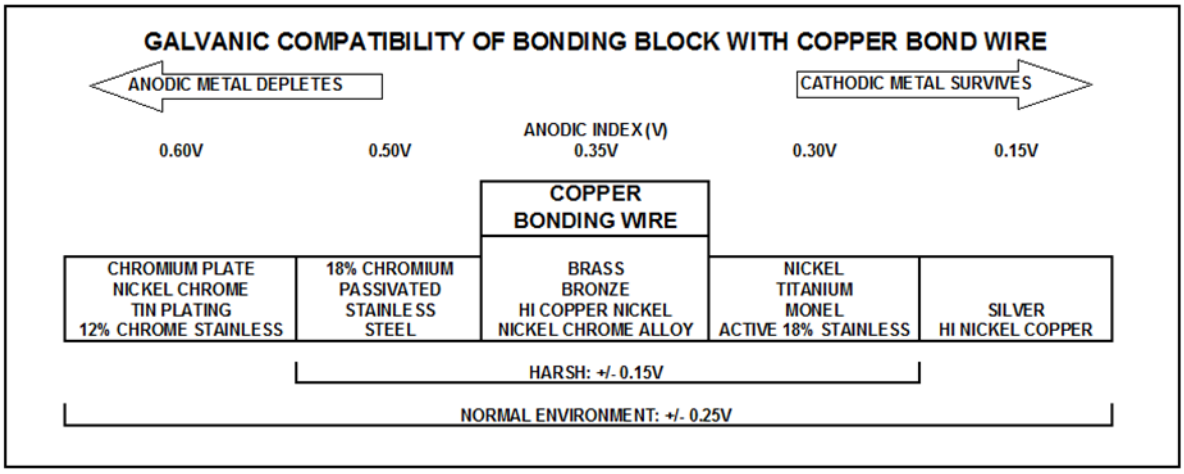

Figure 3 - Galvanic Compatibility as per MIL-STD-889

Galvanic Compatibility is defined as the differential in Anodic Index Voltage between the various metals at the junction. MIL-STD-889 (Dissimilar Metals) shows the Anodic Index (V) of various common Metals and Platings (see Figure 3).

Table 2 - Allowable Military/Aviation/Marine Limits

Environment	Anodic Index
Salt Spray, Outdoor, High Humidity	+/-0.15 V
Normal Environment: Indoor non-temperature and non-humidity controlled	+/-0.25 V
Controlled Environments	+/-0.50V

4.5. Listing Requirements

All bonding blocks shall be listed per NEC requirements for use with AWG bonding conductors that the product accepts.

Note: Bond point hole sizes are for AWG (solid conductors) only.

Table 3 - Wire Size vs. Hole Size

AWG Size	AWG Dia. (inch)	Bond Point Hole		Bond Block Label "Accepts AWG…"	Minimum Terminal Screw Size
		(Inch Dia.)	(mm Dia.)		
14	0.0641	0.074	1.88	#14	#10
12	0.0808	0.091	2.31	#14 - #12	#10
10	0.1019	0.112	2.84	#14 - #10	#10
8	0.1285	0.139	3.52	#14 - #8	#10
6	0.1620	0.172	4.37	#14 - #6	1/4"

4.6. Listing Stamp Requirements

All bonding blocks shall be listed. Bonding blocks accepting a given conductor size shall not be stamped as “listed” unless it applies to that wire conductor size or conductor size range. Refer to Table 3.

5. Electrical

5.1. Bandwidth

All devices shall be designed to operate over a bandwidth of DC to 1,225 MHz

5.2. Insertion Loss

The insertion loss of the device, measured from the input port to the output port shall not exceed 0.1 dB for frequencies between 5 MHz and 600 MHz, 0.2 dB, for frequencies above 600 MHz and up to 1,002 MHz, and 0.25 dB for frequencies above 1002 MHz and up to 1,218 MHz when tested in accordance to ANSI/SCTE 144 2012, Test Procedure for Measuring Transmission and Reflection.

All electrical specifications shall apply to both ports and either signal flow direction.

5.3. Return Loss

The return loss, as measured at either RF port, with the other port terminated into 75 ohms, shall be a minimum of 30 dB from 5MHz to 1,225 MHz, when mated with cables of size series 6 through series 11 which meet the requirement of ANSI/SCTE 74 and which have male F connectors meeting and installed in accordance with ANSI/SCTE 123. All measurements should be made in accordance with the procedures outlined in ANSI/SCTE 144. ANSI/SCTE 04 and/or ANSI/SCTE 05 can be used as an optional method.

All electrical specifications shall apply to both ports and either signal flow direction.

5.4. Shielding Effectiveness

The shielding of components when measured in accordance with ANSI/SCTE 48-1 shall be at least 100 dB.

5.5. Surge Withstand

The surge withstand of components when measured in accordance with ANSI/SCTE 81 shall be a minimum of IEEE C62.41-1991, Category B3 Combo Wave, 6 kV, 3 kA at the F Port, with the second port terminated into a short circuit.

Post surge shall maintain center conductor DC Resistance and electrical requirements of ANSI/SCTE 01 (“F” Port (Female Outdoor) Physical Dimensions).

5.6. Bonding effectiveness

The bonding wire attachment method employed shall exhibit a contact resistance between the device and bonding wire of less than 50 milliohms as measured with a standard low resistance milliohm meter.

DC resistance to connector shall be <0.010 ohms when torqued at 35 in lbs (40.3cm-kgs) as measured with a standard low resistance milliohm meter.

6. Environmental

6.1. Salt Spray

Devices must meet all performance requirements after conditioning as specified in ANSI/SCTE 143 for a minimum of 1,000 hours. The device must exhibit less than 0.050 Inch (1.25mm) material depth corrosion, and maintain <50 milliohm contact resistance as specified in Section 5.6.

6.2. Temperature

The devices must meet all performance requirements during and after exposure to temperatures ranging from -40°F (-40°C) to +140°F (+60°C) as per ANSI/SCTE 158, Class 1, Condition A.

Temperature cycle shall be:

1. 2 hours at low limit
2. 1 hour transition to high limit
3. 2 hours at high limit
4. 1 hour transition to low limit
5. Repeat for 15 cycles