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Telecommunications
Engineers***

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**Recommended Environmental Condition Ranges for
Broadband Communications Equipment**

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1. Scope

This document specifies the recommended environmental conditions (temperature, humidity, altitude and vibration) for the operation, storage and shipment of broadband communications equipment.

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.

- No references are applicable

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

<i>shall</i>	This word or the adjective “ <i>required</i> ” means that the item is an absolute requirement of this specification.
<i>shall not</i>	This phrase means that the item is an absolute prohibition of this specification.
<i>forbidden</i>	This word means the value specified shall never be used.
<i>should</i>	This word or the adjective “ <i>recommended</i> ” 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.
<i>should not</i>	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.
<i>may</i>	This word or the adjective “ <i>optional</i> ” 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.
<i>deprecated</i>	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. Equipment Classes

5.1. Class 1

Represents outdoor aerial (strand) and pedestal enclosure (street cabinet) located equipment. Examples of these types of equipment are RF amplifiers, fiber optic nodes, taps, etc.

5.2. Class 2

Represents indoor headend facility located equipment. Typically these facilities are environmentally controlled with HVAC systems. Examples of this type of equipment are receivers, modulators, demodulators, etc.

5.3. Class 3A

Represents an indoor premises (subscriber) located equipment. Examples of this type of equipment are set top converters, cable modems etc.

5.4. Class 3B

Represents indoor premises (subscriber) located equipment where extended temperature extremes *may* exist (such as in an attic or a garage). Examples of this type of equipment are hardened cable modems and eMTA's.

6. Equipment Conditions

6.1. Condition A

Represents the operating (functional) condition of the equipment.

6.2. Condition B

Represents the non-operating (storage) condition of the equipment.

6.3. Condition C

Represents the shipment (packaged and including transport) condition of the equipment.

7. Temperature Conditions

Table 1 – Temperature Conditions

	Condition A	Condition B	Condition C
Class 1	-40 to +60 °C -40 to +140 °F	-40 to +85 °C -40 to +185 °F	-40 to +85 °C -40 to +185 °F
Class 2	0 to +50 °C +32 to +122 °F	-40 to +70 °C -40 to +158 °F	-40 to +70 °C -40 to +158 °F

Class 3A	+15 to +40 °C +59 to +104 °F	-40 to +70 °C -40 to +158 °F	-40 to +70 °C -40 to +158 °F
Class 3B	0 to +50 °C +32 to +122 °F	-40 to +70 °C -40 to +158 °F	-40 to +70 °C -40 to +158 °F

8. Humidity Conditions

Table 2 – Humidity Conditions (percent relative humidity)

	Condition A	Condition B	Condition C
Class 1	5 to 95%RH non-condensing	5 to 95%RH non-condensing	5 to 95%RH non-condensing
Class 2	5 to 85% RH	5 to 85% RH	5 to 85% RH
Class 3A	5 to 85% RH	5 to 85% RH	5 to 85% RH
Class 3B	5 to 85% RH	5 to 85% RH	5 to 85% RH

9. Altitude Conditions

Table 3 – Altitude Conditions

	Condition A	Condition B	Condition C
Class 1	-200 to 6,000 feet above sea level -61 to 1,829 meters above sea level	-200 to 6,000 feet above sea level -61 to 1,829 meters above sea level	-200 to 9,000 feet above sea level -61 to 2,744 meters above sea level
Class 2	-200 to 10,000 feet above sea level -61 to 3,049 meters above sea level	-200 to 9,000 feet above sea level -61 to 2,744 meters above sea level	-200 to 9,000 feet above sea level -61 to 2,744 meters above sea level
Class 3A	-200 to 10,000 feet above sea level -61 to 3,049 meters above sea level	-200 to 15,000 feet above sea level -61 to 4,573 meters above sea level	-200 to 15,000 feet above sea level -61 to 4,573 meters above sea level
Class 3B	-200 to 10,000 feet above sea level -61 to 3,049 meters above sea level	-200 to 15,000 feet above sea level -61 to 4,573 meters above sea level	-200 to 15,000 feet above sea level -61 to 4,573 meters above sea level

10. Vibration Conditions

Table 4 – Vibration Conditions

	Condition A	Condition B	Condition C
Class 1	5 – 100 Hz Frequency @ 0.10 G's Amplitude Force w/ 0.10 Octave/Min. Sweep Rate for 90 min.	5 – 100 Hz Frequency @ 0.10 G's Amplitude Force w/ 0.10 Octave/Min. Sweep Rate for 90 min.	5 – 50 Hz Frequency @ 0.50 G's Amplitude Force w/ 0.10 Octave/Min. Sweep Rate 50 – 500 Hz Frequency @ 3.00 G's Amplitude Force w/ 0.25 Octave/Min. Sweep Rate
Class 2	5 – 100 Hz Frequency @ 0.10 G's Amplitude Force w/ 0.10 Octave/Min. Sweep Rate for 90 min.	10 – 50 Hz Frequency @ 0.50 G's Amplitude Force w/ 0.10 Octave/Min. Sweep Rate 50 – 500 Hz Frequency @ 1.50 G's Amplitude Force w/ 0.25 Octave/Min. Sweep Rate	5 – 50 Hz Frequency @ 0.50 G's Amplitude Force w/ 0.10 Octave/Min. Sweep Rate 50 – 500 Hz Frequency @ 3.00 G's Amplitude Force w/ 0.25 Octave/Min. Sweep Rate
Class 3A	5 – 20 Hz @ .25in (6.4mm) Displacement 20 – 350 Hz @ 0.05G's Peak	10 – 30 – 10 Hz 6 Sweeps (Min) 0.039in (1.0 mm) Displacement	ISTA 1A 1 in (25.4mm) Displacement @ Freq Between 2.5 Hz and 5 Hz
Class 3B	5 – 20 Hz @ .25in (6.4mm) Displacement 20 – 350 Hz @ 0.05G's Peak	10 – 30 – 10 Hz 6 Sweeps (Min) 0.039in (1.0 mm) Displacement	ISTA 1A 1 in (25.4mm) Displacement @ Freq Between 2.5 Hz and 5 Hz