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UL 1488

Outline of Investigation for Seasonal Use Modular Trees

Issue Number: 2

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Summary of Topics

This second issue of the Outline of Investigation for Seasonal Use Modular Trees, UL 1488, revises Table 8.1 and includes additional marking requirements.

The effective date for UL LLC will be announced through Industry File Review – Announcement Letter.

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INTRODUCTION

1 Scope

1.1 This outline covers temporary Indoor Use Seasonal Use Modular trees (“Modular Tree”) and Tree Poles optionally provided with factory-assembled lighting strings or segments (incandescent or LED) and/or other decorative features, with a maximum input voltage rating of 120 V to be used in accordance with the National Electrical Code, ANSI/NFPA 70. Temporary-use is considered to be a period of installation and use not exceeding 90 days.

1.2 These requirements do not cover decorative lighting strings or other seasonal products that are covered under the Standard for Seasonal and Holiday Decorative Products, UL 588.

1.3 The complete modular tree shall additionally comply with the Outline of Investigation for Fire Tests of Pre-Lit Artificial Seasonal Use Trees and Other Seasonal Decorative Items, UL 2358.

2 Glossary

2.1 CLASS 2 CIRCUIT – A circuit powered from the output of a Class 2 transformer or a Class 2 power unit. Refer to Section 16 for detailed information.

2.2 CONNECTORS, TREE POLE SEGMENT – Connecting couplers installed within tree pole providing electrical and physical connection between tree pole segments.

2.3 INTERCONNECTING CORDS – Length of cord with a minimum of one nonstandard fitting intended for connecting multiple modules.

2.4 LIGHTING STRING SEGMENT – Lighting strings that are provided with nonstandard fittings or intended for direct wiring to a tree pole or modular tree.

2.5 MODULAR TREE – A complete artificial pre-lit tree that may or may not be provided with modules.

2.6 MODULES – Units or sections that can be added or removed. Examples include flasher controllers, music boxes and the like, and means for connection to source of supply.

2.7 SHUNT, LAMP – A device used in series-connected lamps to provide a current path when the filament of a lamp opens so that the remaining lamps in the series-connected string or decorative outfit remain illuminated. A shunt typically consists of several turns of aluminum wire wound around the pair of filament support posts. The aluminum oxide coating on the wire acts as an insulator, allowing current to normally flow through the filament. When the filament of the lamp opens, a high voltage (approximately 120 V) is present across the support posts causing the oxide coating of the shunt to break down. The shunt then becomes electrically connected to the support posts and allows current to continue to flow through the shunt despite the open filament.

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this outline shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this outline.

3.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this outline, or
- b) Is superseded by a requirement in this outline.

3.3 A component shall be used in accordance with its rating established for the intended conditions of use.

3.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

4 Units of Measurement

4.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

5 References

5.1 Any undated reference to a code or standard appearing in the requirements of this outline shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

6 General

6.1 If a product employs a component or another product as part of its construction, each part of the product shall comply with its applicable construction requirements. For example, if a modular tree employs a lighting string and controller, then construction requirements for a lighting string and controller shall all be applicable.

7 Supply Connections

7.1 A product shall be provided with a means for connection to the supply circuit. This means shall consist of one of the following:

- a) An integral power-supply cord consisting of a length of flexible cord and a NEMA 1-15 polarized attachment plug or current tap,
- b) A power inlet intended for use with a cord set or detachable power-supply cord with a NEMA 1-15 polarized plug if the manufacturer provides a detachable cord set with the product which complies with the Standard for Cord Sets and Power-Supply Cords, UL 817. The user instruction manual shall provide information on the connection and use of the cord set.

7.2 The length of a detachable power supply cord provided with a modular tree shall be suitable for the application.

7.3 The conductors of the flexible cord or wire shall be fastened securely and in a workmanlike manner to the terminals of an attachment plug, current tap, load fitting or connectors as determined by the Reliability of Conductor Connections Test, Section 41.

7.4 Wire positioning devices are permitted to be used on tree poles or branches provided that there is no deformation of the insulation of the flexible cord, wires, or other conductors.

8 Cords

8.1 Cords employed shall comply with the Standard for Flexible Cords and Cables, UL 62, or the Standard for Appliance Wiring Material, UL 758. All wire shall be rated VW-1.

8.2 The wire size and type and overcurrent protection requirement for a modular tree shall be in accordance with Table 8.1.

Table 8.1
Wire types, size and overcurrent protection rating

	Supply Connection ^b					All other external wiring ^a
Cord Type	SPT-2			CXTW		
Wire Size, AWG	14	16	18	20	22	22
Max. Current, A	12	10	8 ^d	4	2.4 ^c	2.4 ^c
Overcurrent Protection, A	N/A	N/A	8 ^d	5	3	3
^a When the wiring is in the secondary of a Class 2 power supply, the wire shall be suitable for the current and rated VW-1. The insulation shall be suitable for the voltage and temperature, and temperatures on the insulation shall not exceed 90°C (194°F). The wire is required to meet the requirements described in the Standard for Appliance Wiring Material, UL 758. ^b CXTW is only permitted as a supply connection when the product only employs lighting strings and where the first lighting string is used for connection to the wall receptacle. ^c When a load fitting is provided, the maximum current is limited to 1.8 amps. ^d When an 8 A fuse is employed, the maximum current shall not exceed 8 A. When a 5 A fuse is employed, the maximum current shall not exceed 4 A.						

9 Internal Wiring

9.1 All internal wiring shall comply with the Standard for Flexible Cords and Cables, UL 62, or the Standard for Appliance Wiring Material, UL 758, with a minimum 30 mil (0.76 mm) insulation thickness and shall be suitable for the voltage, temperature and current.

10 Lighting String Segment

10.1 General

10.1.1 The Lighting string segment shall comply with the applicable requirements described in the Standard for Seasonal and Holiday Decorative Products, UL 588, unless otherwise referenced within this document. In addition, the segments are permitted to be terminated in non-standard connectors.

10.1.2 Single conductor CXTW, CXTW-X, LXT or LXT-X wire is permitted provided it is secured to and supported by the branch of the tree and space between the suspended wire and the branch shall not exceed 1/2 in (12.7 mm).

Exception: In areas where the branches need to fold such as for storage, the space between the branch and the wire is permitted to exceed ½ in (12.7 mm). The length of the wire shall be sufficient so that there is no pinching, cutting or abrasion of the wire or stress on the internal conductors.

10.1.3 A non-standard connector used to terminate the lighting string segment shall be capable of preventing a pull exerted on the leads to be transmitted to the connector contacts. This connector shall comply with the Strain Relief requirements in 79.1 and 79.2 of the Standard for Seasonal and Holiday Decorative Products, UL 588.

10.1.4 Lighting segments are permitted to employ wire types shown in Table 10.1.

Table 10.1
Lighting Segment Wire Types

Lamp Type	Wire in the Lighting Segment ^a			Wire Between Series-connected Lampholders ^b		
	Wire Size AWG	Wire Type	Temperature °C (°F)	Wire Size AWG	Wire Type	Temperature °C (°F)
LED	22	LXT	60 (140)	25	LXT-X	60 (140)
Incandescent	22	CXTW	105 (221)	25	CXTW-X	105 (221)

^a Is also permitted to be employed between series-connected lampholders.

^b The maximum length shall not exceed 20 in (508 mm) and shall be used in a circuit where the maximum current does not exceed 300 mA. In cases where the lampholders are in different branches, the length of wire shall be sufficient so that there is no stress on the electrical connections.

10.2 Lamps

10.2.1 Lamps shall comply with the applicable requirements in the Standard for Seasonal and Holiday Decorative Products, UL 588.

10.3 Lamping

10.3.1 Each segment shall be provided with a number of lamps equal to or greater than the number of lampholders in the segment.

10.3.2 Each product employing push-in with user-replaceable lamps in accordance with 10.3.1 shall be provided with at least two spare lamps for each type of lamp installed in the product.

10.4 Polarization

10.4.1 The attachment plug, current tap, or power inlet of a product shall be polarized.

11 Fuseholders and Fused Attachment Plugs

11.1 A fuseholder shall comply with the Standard for Fuseholders – Part 1: General Requirements, UL 4248-1.

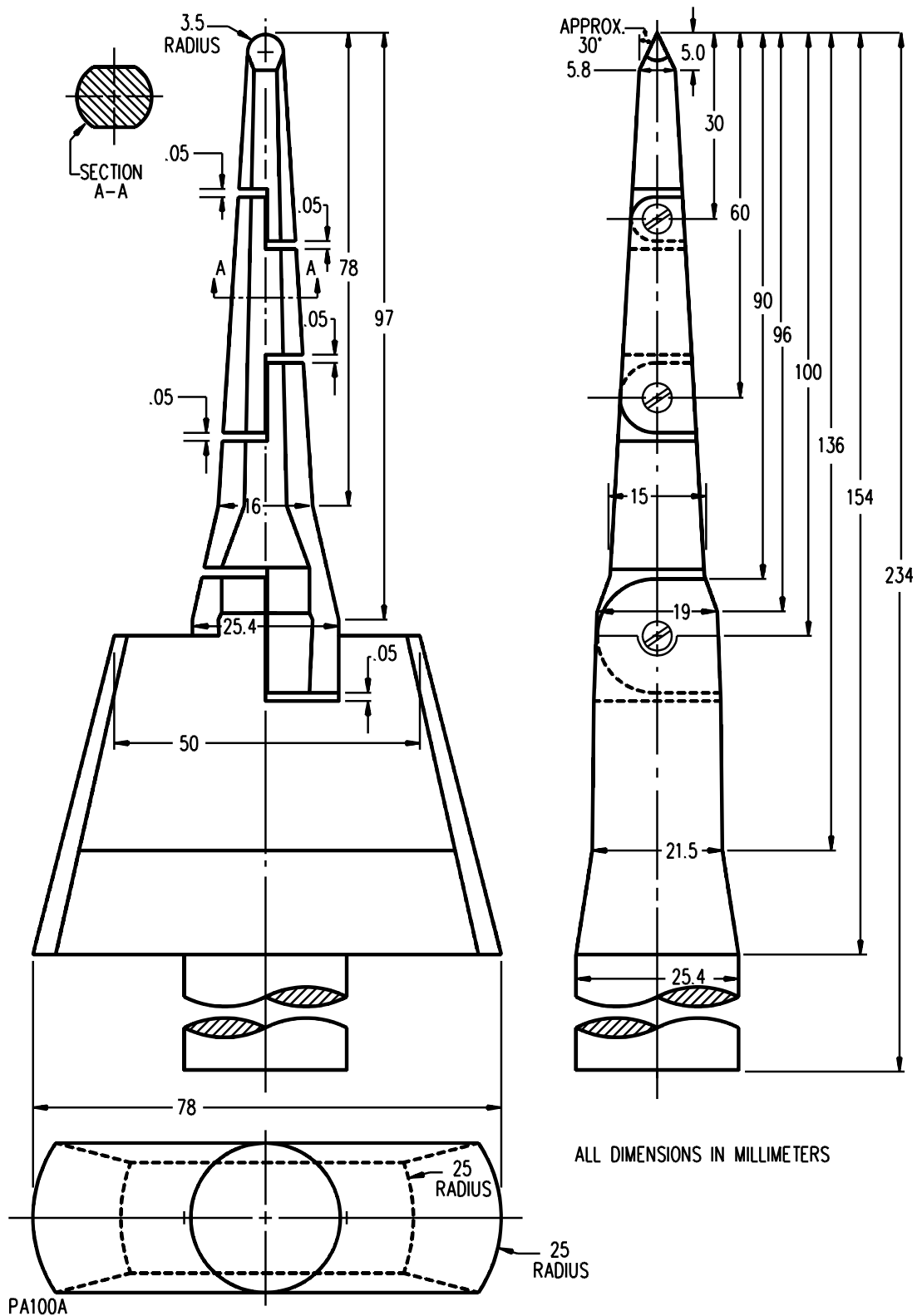
11.2 A fused attachment plug or current tap shall comply with the Standard for Attachment Plugs and Receptacles, UL 498, or the Standard for Cord Sets and Power-Supply Cords, UL 817.

11.3 Insulation piercing terminals shall not be permitted.

11.4 The fused attachment plug, current tap, fuseholder, or in-line fuseholder shall be constructed such that there shall not be exposure of live parts during removal or replacement of the fuse(s). In addition, for a fused attachment plug or current tap, there shall not be exposure of live parts with the fuse cover partially open during 0.08 in (2.03 mm) insertion into a receptacle. Exposure of live parts shall be determined by contact with the accessibility probe illustrated in Figure 11.1.

Exception: If the design of the fused attachment plug, current tap, fuseholder, or in-line fuseholder prevents the parts from being energized during the removal or replacement of fuse(s), exposure of live parts is permitted.

Figure 11.1
Accessibility probe



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12 Wiring Devices

12.1 Power inlet box or similar construction

12.1.1 If the product employs a power inlet intended for use with a cord set or detachable power-supply cord, the connecting means to the power supply of the product shall be constructed such that, when the cord connector of a cord set or detachable power-supply cord is inserted, the blades will not be energized until they are inaccessible to contact by persons. Compliance shall be determined by the Accessibility Test, Section 45.

12.1.2 The face of a cord connector, current tap, or dedicated receptacle employed in a product shall be:

- a) Circular with a minimum area equal to the area of a 9/16-in (14.2-mm) radius circle, the center point of which is coincident with the intersection of a center line drawn through the center of the slots. See Figure 12.1 for details; or
- b) Rectangular with a minimum area equal to the area of a 1- by 3/4-in (25.4- by 19.0-mm) rectangle with a 7/32-in (5.6-mm) radius at the corners and provided with a 3/16-in (4.8-mm) radius half-circle projection from the center of each of the 1-in (25.4-mm) sides. See Figure 12.2 for minimum dimensions.

Exception No. 1: The projections need not be in the shape of a half-circle if they are located as shown in Figure 12.2, provide a minimum overall dimension of 1-1/4 inches along the center line between the contact slots, and occupy an area equal to or greater than that indicated by the shading in the figure.

Exception No. 2: The half-circle projections need not be provided if the face is sized such that the dimension along the center line between the contact slots is a minimum of 1-1/4 inches so that the face provides the obstruction that would have been provided by the half-circle projections. See Figure 12.2.

Figure 12.1
Slot location and face size

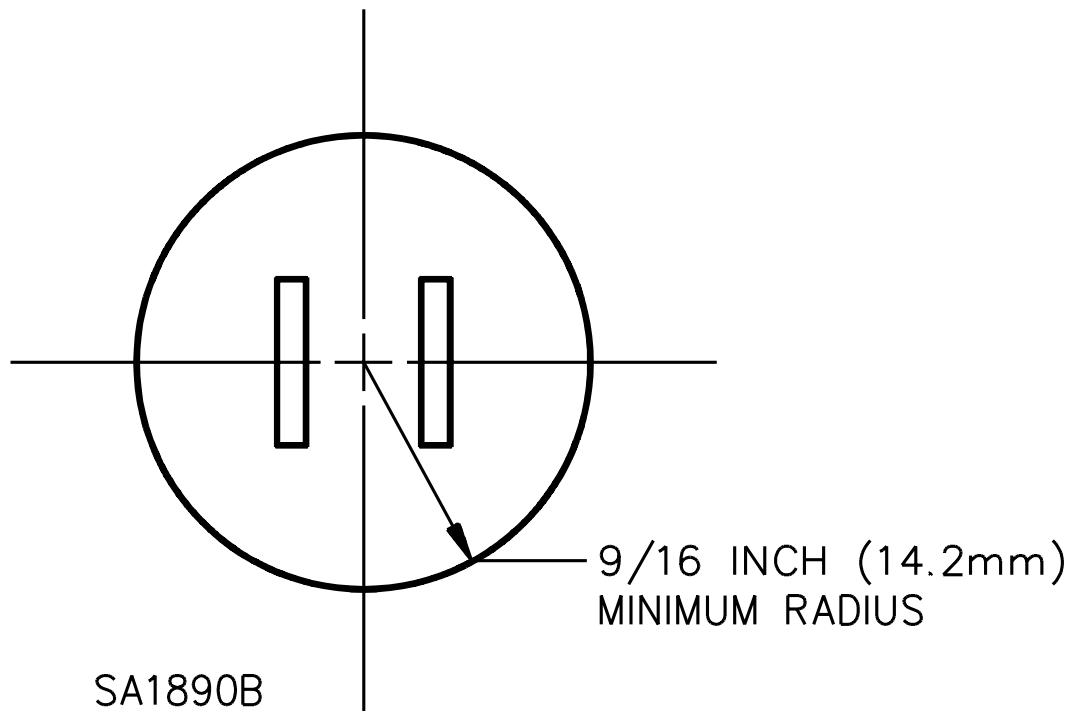
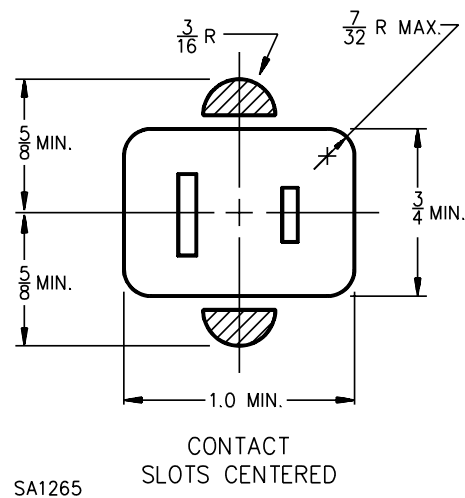


Figure 12.2
Face dimensions



All dimensions are in inches

Inch	3/16	7/32	5/8	3/4	1
mm	4.8	5.6	15.9	19.0	25.4

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12.1.3 A USB connector shall comply with the applicable requirements in the Standard for Component Connectors for Use in Data, Signal, Control and Power Applications, UL 1977.

12.1.4 Terminal blocks shall comply with the applicable requirements in the Standard for Terminal Blocks, UL 1059.

12.2 Tree pole segment connectors

12.2.1 Tree Pole Segment Connectors shall be subjected to the Overload, Temperature and Resistance to Arcing Tests as described in the Standard for Attachment Plugs and Receptacles, UL 498, except that the Resistance to Arcing Test shall be conducted for 25 cycles.

13 Terminals and Conductive Parts

13.1 Current-carrying parts shall be of silver, copper, copper alloy or other material acceptable for the particular application and shall be mounted on polymeric, phenolic or urea composition or on another insulating material acceptable for the purpose. LED lamp leads shall not be plated steel.

14 Overcurrent Protection

14.1 A product covered by this outline shall provide with suitable overcurrent protection in accordance with Table 8.1. The overcurrent protection shall comply with the Standard for Low-Voltage Fuses – Part 1: General Requirements, UL 248-1, and the Standard for Low-Voltage Fuses – Part 14: Supplemental Fuses, UL 248-14.

Exception: A product employing a power unit that complies with the requirements in Section 16, Class 2 Circuits, need not be provided with integral overcurrent protection.

14.2 A fuse shall be connected to all the ungrounded supply conductors.

14.3 The overcurrent protection required for power supply cord shall be either an integral part of the attachment plug or current tap, or of a through-cord design (in-line fuseholder) located so that there is not more than 6 in (152 mm) between the face of the attachment plug or current tap and the side of the fuseholder furthest from the attachment plug or current tap.

14.4 A product employing a replaceable fuse or fuses shall be provided with at least one spare fuse.

15 Switches

15.1 In addition to the applicable requirements in this standard, a switch employed in a modular tree product shall comply with the applicable requirements in the Standard for Special-Use Switches, UL 1054, or the Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1. A photoelectric switch shall comply with the requirements in the Standard for Nonindustrial Photoelectric Switches for Lighting Control, UL 773A.

Exception: A switch employed in a Class 2 circuit need not comply with the requirements in UL 1054, UL 61058-1, or UL 773A.

15.2 In determining the required switch rating for a product without a load fitting, the sum of the marked ratings of any fixed loads shall be used. For a product without a load fitting and with lampholders, the switch shall be sized based on the Input Test, Section 28, with all loads set to draw the maximum current.

15.3 If provided, a switch shall have a voltage and current rating suitable for the maximum load it controls. It shall be tungsten-rated if a switch controls the load fitting or tungsten-filament lamps. An on/off switch which controls all functions of a product employing a polarized attachment plug or current tap shall be a single-pole switch connected to the ungrounded (hot) supply conductor.

Exception: An on/off switch located in a Class 2 Circuit need not comply with this requirement.

16 Class 2 Circuits

16.1 A Class 2 circuit shall be derived from the output of:

- a) A Class 2 transformer that complies with the applicable requirements in the Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3; or
- b) A Class 2 power unit which complies with the applicable requirements in the Standard for Class 2 Power Units, UL 1310; or
- c) A power unit which complies with the applicable requirements for a limited power source in the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1.
- d) A LED Driver that complies with the requirements described in the Outline of Investigation for Seasonal Use LED Drivers and Non-Integral LED Lighting Strings, UL 2749.