



UL 150

Underwriters Laboratories Inc. Standard for Safety

Antenna Rotators



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UL Standard for Safety for Antenna Rotators, UL 150

Fourth Edition, Dated November 9, 2004

Summary of Topics

These revisions include a revised title page to reflect the ANSI approval of the current edition of UL 150. No changes in requirements are involved.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 20, 2011.

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The most recent designation of ANSI/UL 150 as an American National Standard (ANSI) occurred on July 28, 2011. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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APPENDIX A

Standards for Components.....	A1
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INTRODUCTION

1 Scope

1.1 These requirements cover antenna rotators intended for household and commercial use on supply circuits in accordance with the National Electrical Code, NFPA 70.

1.2 An antenna rotator generally consists of:

- a) A mast-mounted (generally outdoors), motorized drive unit that rotates the antenna to the desired receiving azimuth,
- b) An indoor-located (usually near television- or radio-receiving equipment) user-operated control unit that delivers operating power and direction signals to the drive unit, and,
- c) A length of multiple-conductor Class-2 circuit cable to electrically interconnect the drive unit and the control unit.

Some antenna rotating units may control antenna elevation separately or in addition to azimuth. In some cases, the drive unit may be located indoors.

1.3 The power used to drive the motor of an antenna rotator is derived from a circuit complying with Class 2 limitations in accordance with Article 725 of the National Electrical Code, ANSI/NFPA 70.

1.4 These requirements do not cover systems that use a stationary antenna and change or rotate the receiving pattern by electronic or switching means. Such systems are covered by the Standard for Audio-Video Products and Accessories, UL 1492.

2 General

2.1 Components

2.1.1 A component shall be used in accordance with its rating established for the intended conditions of use. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

2.1.2 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 standard, or
- b) Is superseded by a requirement in this standard.

2.1.3 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.

2.2 Units of measurement

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

2.2.2 Alternating-current electrical measurements are in rms units unless otherwise stated.

2.3 Undated references

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

3 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 ACCESSIBLE PART – A part located so that it can be contacted by means of a probe. See Accessibility of Parts, Section 10.

3.3 ADJUSTABLE CONTROL – A control provided for making adjustments necessary to render the product capable of performing its intended functions.

3.4 CONTROL UNIT – A user-operated, indoor-mounted unit with total output limited to Class 2 levels (see 1.3), the primary function of which is to deliver power to and control a drive unit.

3.5 DRIVE UNIT – A mast-mounted (generally outdoors), motorized unit that may be user-installed and is intended to position an antenna and that requires an energy source limited to Class 2 levels. See 1.3.

3.6 FIBER – Vulcanized fiber.

3.7 INSULATION, BASIC – The insulation necessary for the intended functioning of the product and for basic protection to reduce the risk of electric shock.

3.8 INSULATION, REINFORCED – An improved basic insulation with mechanical and electrical qualities such that it, in itself, provides the same degree of protection to reduce the risk of electric shock as an insulation system comprised of both basic insulation and supplementary insulation.

3.9 INSULATION, SUPPLEMENTARY – An independent insulation provided in addition to the basic insulation to provide protection to reduce the risk of electric shock in case of electrical breakdown of the basic insulation.

3.10 MAJOR ENCLOSURE PART – A part of the enclosure that:

- a) Forms more than 50% of any one surface, and
- b) Is needed to comply with the requirements to
 - 1) Reduce the risk of fire, electric shock, or injury to persons, or
 - 2) Reduce the risk of mechanical damage to internal parts.

3.11 MINOR DIMENSION OF OPENING – The diameter of the largest sphere that can pass through the opening.

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3.12 OPERATING CONTROL – A control, usually a knob, pushbutton, or lever, provided to enable the user to cause the product to perform its intended function, without the use of tools, when the product is in normal operating condition.

3.13 ORDINARY TOOLS – Flat-bladed and cross-head screwdrivers, nut-drivers, pliers, and the like.

3.14 POWER-SUPPLY CORD – The cord provided to connect the control unit to the supply circuit.

3.15 SUPPLY CIRCUIT – The branch circuit supplying electrical energy to the product.

3.16 UNINSULATED PART – A part that is bare (without insulation) or has insulation that is not suitable for the operating conditions (such as potential and temperature) involved.

3.17 USER SERVICING – User servicing includes:

a) Fuse – Replacement of a fuse other than:

- 1) A fuse intended to be soldered in place.
- 2) A fuse not readily perceptible to the user. A fuse is not readily perceptible if it is located within a chassis, compartment, or enclosure within the overall product that makes the fuse invisible to the user. If the enclosure has a cover, it is to be one that:
 - i) Does not need to be opened or removed in normal operation or user servicing,
 - ii) Can be opened or removed only with a tool, and
 - iii) Is prevented from being discarded.

A fuse is readily perceptible if it is recognizable during normal operation or user servicing, either visually or by touch; or if the fuse is indicated, either on the product or on literature packed with it.

3) A clipped-in-type fuse that is within a compartment provided with the marking described in 53.4.1.

b) User Adjustment – Adjustment of a marked adjustable control or an adjustable component if the adjustment can be accomplished:

- 1) By using an ordinary tool,
- 2) With the product in operation, and
- 3) Without defeating an interlock.

c) Unmarked Adjustment – Adjustment of an unmarked adjustable control if the adjustment can be accomplished:

- 1) Without a tool,
- 2) With the product in operation, and

3) Without defeating an interlock.

d) Lamp – Replacement of lamp, whether a single lamp or one of a series or parallel string, intended for connection directly across the supply circuit of a nominal 120 or 220 V.

Exception: This requirement does not apply to a lamp that is intended to be soldered in place and is soldered in place in the product, or a neon lamp, such as an electric-discharge lamp with neon as the filling gas.

3.18 WET LOCATION – In direct contact with earth and locations subject to saturation with water, or unprotected and exposed to weather.

CONSTRUCTION

4 General

4.1 The construction of a product shall be such that:

- a) Intended use and user servicing does not result in a risk of fire, electric shock, or injury to persons;
- b) The materials and components are used within their electrical, mechanical, and temperature limits; and
- c) The assembly protects the components and wiring from being displaced or damaged.

4.2 The materials and components referred to in 4.1 and elsewhere in these requirements are those involving a risk of fire, electric shock, or injury to persons and are so considered unless specifically indicated otherwise.

4.3 A product shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it might be subjected, without causing a risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacing, loosening, or displacement of parts, or other serious defects.

5 Enclosure

5.1 Control unit

5.1.1 A control unit shall be provided with an enclosure that houses all live parts, other than cords and cables, that involves a risk of fire, electric shock, or injury to persons. The enclosure shall be constructed to reduce the risk of mechanical damage to the various parts of the product.

5.1.2 Major enclosure parts (see 3.10) that are molded of polymeric material shall be identified in accordance with the Standard for Polymeric Materials – Fabricated Parts, UL 746D.

5.2 Drive unit

5.2.1 A drive unit shall be provided with a metallic enclosure that renders all live parts that involve a risk of electric shock or injury to persons inaccessible as specified in Accessibility of Parts, Section 10.

Exception: A polymeric enclosure may be employed if found to comply when investigated in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

6 Mechanical Assembly

6.1 A switch, lampholder, attachment plug, or similar component shall be mounted securely and prevented from turning.

Exception No. 1: A switch need not be prevented from turning if any one of the following conditions are met:

- a) The switch is a plunger or other type that does not tend to rotate when operated. A toggle switch is considered to be subject to forces that tend to turn the switch during the normal operation of the switch,*
- b) The means of mounting the switch make it unlikely that operation of the switch will loosen it,*
- c) The spacings are not reduced below the minimum acceptable values, as determined using Section 23, if the switch rotates, and*
- d) The normal operation of the switch is by mechanical means rather than by direct contact by persons.*

Exception No. 2: A lampholder of a type in which the lamp cannot be replaced, such as a neon pilot or indicator light where the lamp is sealed in by a nonremovable jewel, need not be prevented from turning if rotation cannot reduce spacings below the minimum acceptable values, as determined using Section 23.

Exception No. 3: A user-accessible lampholder intended to be readily removable without the use of a tool need not be prevented from turning.

6.2 An uninsulated live part shall be secured to the base or mounting surface so that it will be prevented from turning or shifting in position if such displacement can result in a reduction of spacings below the minimum acceptable values, as determined using Section 23.

6.3 The means for preventing the turning or shifting mentioned in 6.1 and 6.2 is to consist of more than friction between surfaces; for example, a lock washer is suitable for use as the means for preventing a small stem-mounted switch or other device that has a single-hole mounting means from turning.

7 Materials

7.1 General

7.1.1 Cellulose nitrate or any comparably flammable material shall not be used.

7.1.2 A material shall comply with the applicable requirements in Table 7.1.

Exception: This requirement does not apply to a drive unit.

Table 7.1
Material flammability requirements

Material and application	Minimum flammability classification ^a
1. Fiber and similar material regardless of use or location	V-1
2. Polymeric material in contact with an uninsulated part that involves a power greater than 15 W ^{b, c}	V-2 or HF-2
3. Polymeric material used as a required part of the enclosure	V-2
4. Material in contact with an uninsulated part that involves a power equal to or less than 15 W ^{b, c}	HB or HBF
5. Material used in applications other than those specified in (1 – 4)	HB or HBF

NOTE – The requirements in Table 7.1 do not apply to a small part. For the purpose of Table 7.1, a small part is defined as one that complies with all of the following items:

- 1) Its volume does not exceed 0.122 in³ (2 cm³).
- 2) Its maximum dimension does not exceed 1.18 in (3 cm).
- 3) Its location is such that it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

^a The flammability classifications (V-0, V-1, V-2, and HB if the specific gravity is equal to or greater than 0.6; or, HF-1, HF-2, and HBF if the specific gravity is less than 0.6) are to be determined by the tests described in the Standard for Tests for Flammability of Plastic Materials in Devices and Appliances, UL 94. Test samples are to be flat stock approximately 5-in (127-mm) long, 1/2-in (12.7-mm) wide, and of the smallest thickness used; or, for an assembly, the samples may consist of the assembly. Printed-wiring boards, terminal strips, and the like can be tested as finished parts, or test samples can be cut from finished parts. In the case of small parts that might be consumed before the test is completed, larger samples of the same material can be tested, provided they represent thicknesses that are the same or less than the part in question. None of the larger samples is to be entirely consumed by flame. Samples that consist of an assembly or a section thereof, and that are not flat stock samples are to be positioned in what is considered to be the position most conducive to burning. A material for a part, other than the enclosure, rated using 1/16-in (1.6-mm) thick bar specimens may be accepted in lesser thicknesses in the end product. For polymeric enclosures, a material rated using 1/8-in (3.2-mm) thick bar specimens may be accepted in lesser thicknesses in the end product.

^b Does not apply to the internal insulation system of a component or where component requirements exist (see 2.1.1).

^c Power measured in accordance with 43.1.1.

7.1.3 A material in contact with an uninsulated live part shall comply with the requirements in 7.1.4 and 7.1.5.

7.1.4 A material in contact with an uninsulated live part shall have a dielectric strength of at least 175 V per mil (7000 V/mm) after conditioning for 96 h at $35.0 \pm 1.0^\circ\text{C}$ ($95.0 \pm 1.8^\circ\text{F}$) and $90 \pm 5\%$ relative humidity, conducted in accordance with the Standard Test Methods for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies, ASTM D149.

7.1.5 A material in contact with an uninsulated live part shall have a volume resistivity of:

a) At least $50 \text{ M}\Omega\text{-cm}$ as measured after conditioning for 40 h at $23.0 \pm 1.0^\circ\text{C}$ ($73.4 \pm 1.8^\circ\text{F}$) and $50 \pm 5\%$ relative humidity as indicated in Procedure A of the Standard Practice for Conditioning Plastics for Testing, ASTM D618, and

b) $10 \text{ M}\Omega\text{-cm}$ after being conditioned for 96 h at $35.0 \pm 1.0^\circ\text{C}$ ($96.8 \pm 1.8^\circ\text{F}$) and $95 \pm 5\%$ relative humidity as indicated in Procedure C conducted in accordance with the Standard Test Methods for D-C Resistance or Conductance of Insulating Materials, ASTM D257.

7.2 Guard and barrier insulating material for rendering live parts inaccessible

7.2.1 A guard or barrier of insulating material employed to parts involving a risk of electric shock or injury to persons in order to render the part inaccessible shall:

a) Not be less than 0.028-in (0.71-mm) thick.

Exception No. 1: Fiber or the equivalent that is not less than 0.013-in (0.33-mm) thick may be used to cover a splice within the overall enclosure.

Exception No. 2: A covering of paper that is not less than 0.028-in thick may be used on an electrolytic capacitor or similar part.

Exception No. 3: A fiber shell of a metal-jacketed pilot lampholder covering all live parts may not be less than 0.020-in (0.51-mm) thick.

b) Comply with the requirement specified in 7.1.2.

8 Protection Against Corrosion

8.1 A metal part, unless inherently corrosion resistant, shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means, if corrosion of the unprotected part would result in a risk of fire, electric shock, or injury to persons.

9 Current-Carrying Parts

9.1 A current-carrying part shall be of silver, copper, a copper-base alloy, stainless steel, aluminum, or other material acceptable for the intended use.

Exception No. 1: Plated steel may be used for secondary-circuit parts and for some primary-circuit parts, such as for capacitor terminals where a glass-to-metal seal is necessary and for leads or threaded studs of semiconductor devices.

Exception No. 2: Blued steel or steel that is equivalently resistant to corrosion is acceptable for the current-carrying arms of a mechanically or magnetically operated leaf switch, but not elsewhere.

9.2 A contact of a socket, separable connector, and similar parts, connected in a circuit involving a risk of fire shall be made of nonferrous spring metal acceptable for the intended use.

10 Accessibility of Parts

10.1 General

10.1.1 A part that involves a risk of electric shock or injury to persons shall not be accessible to the extent that it can be touched during normal operation or user servicing. See Electric Shock, Section 11.

10.1.2 An opening in an enclosure is acceptable if the opening will not permit the entrance of a 1-in (25.4-mm) diameter sphere and the probe illustrated in Figure 10.1 cannot be made to touch any uninsulated live part, film-coated wire, or moving part when inserted into the opening. The probe may be articulated into any configuration and may be rotated or angled to any position before, during, or after insertion into the opening, and the penetration may be to any depth allowed by the opening size, including minimal depth combined with maximum articulation. No force is to be applied to the probe.

10.2 Control unit

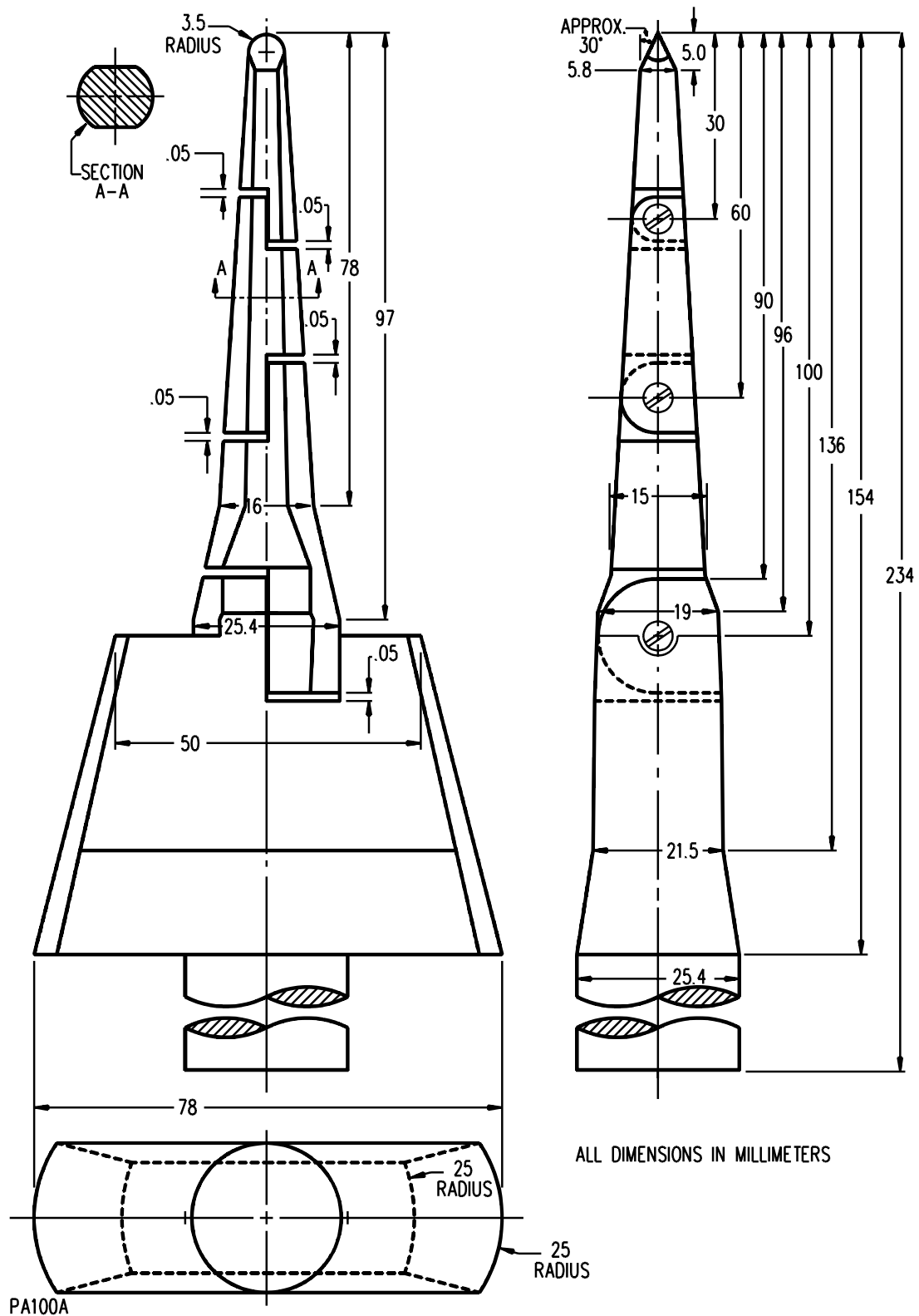
10.2.1 When determining the accessibility of parts of a control unit, any of the following operations may be performed.

- a) Removal or opening of friction-fit knobs, snap covers, and similar loose parts;
- b) Removal, opening, or loosening of parts as described in the installation and operating instructions; and
- c) Removal of knobs not captive in accordance with Captive Parts, Section 21.

10.3 Drive unit

10.3.1 The accessibility of parts of a drive unit is to be determined only after the installation of the unit has been completed in accordance with the manufacturer's installation instructions.

Figure 10.1
Probe for determining accessibility of live parts



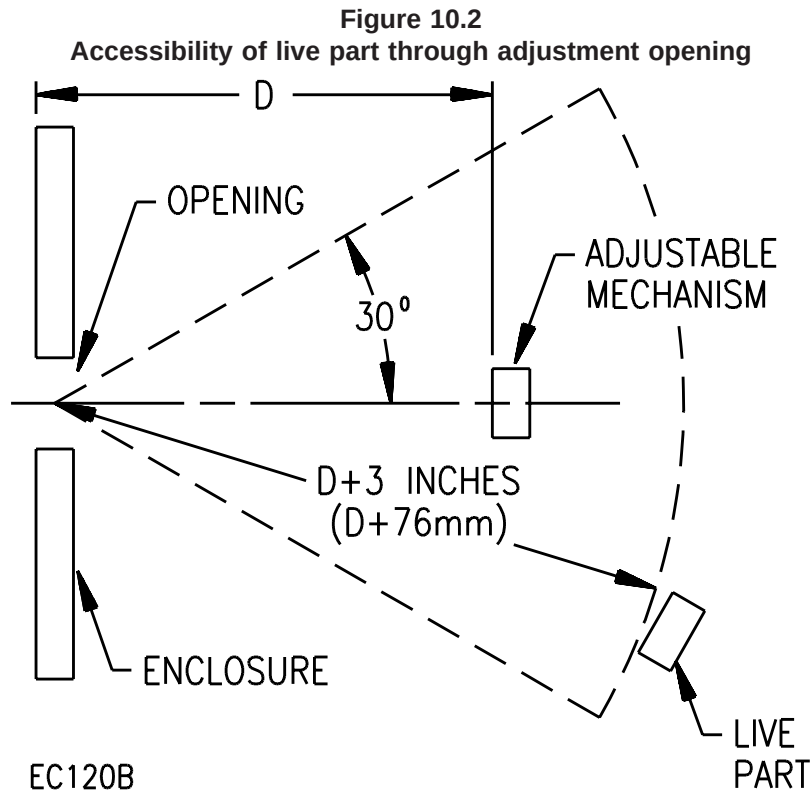
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10.4 Adjustment openings and control shafts – control unit

10.4.1 A part beyond an opening in a control unit that may be used in making an adjustment considered to be a function of user servicing, is considered not to be accessible if a 1/8-in (3.2-mm) diameter straight rod is unable to touch the part when the rod is inserted through the opening and moved to all positions possible without producing an angle of more than 30° between the rod and a line drawn between the center of the opening and the center of the face of the adjusting mechanism. The length of the rod inside the opening is not to exceed the distance between the opening and the face of the adjusting mechanism by more than 3 in (76.2 mm). See Figure 10.2.



10.4.2 A control shaft formed of polymeric material is not considered to be part of the enclosure, but may be considered to be a barrier.

10.5 Top opening – control unit

10.5.1 An opening in the top of the overall enclosure of a control unit shall not permit passage of a sphere having a diameter of $3/32$ in (2.4 mm), if passage of a conductive object through the opening results in a risk of electric shock.

Exception No. 1: An opening such as D in Figure 10.3, in a top surface that makes an angle of 30° or more with the horizontal is acceptable if the opening projection onto a horizontal plane does not exceed $3/32$ in when measured in the direction of the maximum slope of the surface in which the opening is located. The upper edge of the opening is the point of tangency between a vertical line and the enclosure above the opening. The lower edge of the opening is the point of tangency between the enclosure below the opening and a line that slopes downward away from the enclosure at an angle of 5° to the horizontal.

Exception No. 2: An opening in the top of an overall enclosure having a dimension larger than $3/32$ in and protected by a knob, handle, louver, or similar part is acceptable if:

- a) A falling object cannot pass directly through the opening in a vertical direction; and*
- b) The construction is such that an object placed at any point on the enclosure top does not slide or roll into a top opening. See 10.5.3.*

This generally requires a $1/16$ -in (1.6-mm) high lip on the surface surrounding the opening. A knob protecting an opening is to be on its shaft as far as possible without actually contacting the enclosure.

