

UL 69

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Electric-Fence Controllers

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UL Standard for Safety for Electric-Fence Controllers, UL 69

Ninth Edition, Dated June 30, 2003

Revisions: This Standard contains revisions through and including May 3, 2006.

Summary of Topics

These editorial revisions to ANSI/UL 69 replace all references to UL 1020, the Standard for Thermal Cutoffs for Use in Electrical Appliances and Components, with reference to UL 60691, the Standard for Thermal-Links – Requirements and Application Guide. UL 1020 was withdrawn and superseded by UL 60691.

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Text that has been changed in any manner 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 revisions dated May 3, 2006 include a reprinted title page (page1) for this Standard.

The revisions dated May 3, 2006 editorially replace all references to UL 1020 with the reference to UL 60691.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

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This Standard consists of pages dated as shown in the following checklist:

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1.....	May 3, 2006
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A1-A2.....	May 3, 2006

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UL 69

Standard for Electric-Fence Controllers

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This ANSI/UL Standard for Safety, which consists of the Ninth Edition with revisions through May 3, 2006, is under continuous maintenance, whereby each revision is ANSI approved upon publication. 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>.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

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INTRODUCTION

1 Scope

1.1 These requirements cover electric-fence controllers to be employed on lighting or line circuits in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements cover electric-fence controllers used only for the control of animals.

1.3 These requirements cover portable and permanently mounted electric-fence controllers with peak-discharge or sinusoidal-discharge output for indoor or outdoor use, including battery-operated controllers intended to operate from battery circuits of 42.4 V or less, line-operated controllers intended to operate from circuits of 125 V or less, combination controllers intended to operate from either a battery or a line circuit, and photovoltaic module battery operated controllers.

1.4 These requirements do not cover electric-fence controllers for the continuous (uninterrupted) current type or intermediate equipment, such as a converter, a rectifier, or the like, that is sometimes used between the primary source of supply and an electric-fence controller and that is investigated only as part of a complete controller.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard 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 standard.

2.2 A component need not comply with a specific requirement that:

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

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

2.4 Specific components are recognized as being 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 for which they have been recognized.

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3 General

3.1 Units of measurement

3.1.1 If a value for measurement is followed by another value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

3.2 Undated references

3.2.1 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.

4 Glossary

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

4.2 CONTINUOUS CURRENT OUTPUT – Output current which has a steady-state peak of 7.0 mA or more.

4.3 CURRENT PULSE – The current which flows during the time period in which 95 percent of the output energy of a single fence controller output waveform has been transferred to the load resistor.

4.4 ELECTRICAL BREAKDOWN – Occurs when a discharge bridges the insulation under test, reducing the voltage between the electrodes to zero or nearly zero.

4.5 EQUIPMENT GROUNDING MEANS – A lead or terminal, provided in the splice compartment of a permanently mounted fence controller, that is intended for connection to the branch circuit (supply) grounding conductor; or the grounding pin of an attachment plug of a 3-wire power supply cord, provided on a portable fence controller, that is intended for connection to the branch circuit (supply) grounding conductor.

4.6 FENCE TERMINAL – The output terminal that is not intended to be connected to earth ground.

4.7 LEAKAGE CURRENT – Any current that may be conveyed from accessible parts, other than the fence output terminals, to ground or to other accessible parts.

4.8 OUTPUT GROUND TERMINAL – The output terminal that is intended to be connected to the fence ground rod.

4.9 PEAK-DISCHARGE OUTPUT – Output current pulses that are unidirectional single impulses.

4.10 PERMANENTLY CONNECTED CONTROLLERS – Connected to branch circuit wiring by a means other than a cord and plug, such as by using conduit.

4.11 PERMANENTLY MOUNTED CONTROLLERS – Secured to a mounting surface by a means that requires the use of a tool for removal.

4.12 PORTABLE CONTROLLER – A cord connected controller that is mounted by means not requiring a tool for removal and not intended for permanent mounting.

4.13 PULSE SEGMENT – A part of a current pulse that is between any two points in time within the duration of the current pulse.

4.14 SECONDARY CIRCUITS – Those circuits supplied from transformer output windings that are electrically separated from the input windings.

4.15 SINUSOIDAL-DISCHARGE OUTPUT – Output current pulses that are oscillatory current waveforms.

4.16 SUPPLEMENTARY (PROTECTING) INSULATION – An independent insulation provided in addition to basic insulation to protect against electric shock in case of mechanical rupture or electrical breakdown of the basic insulation. An enclosure of insulating material may form a part or the whole of the supplementary insulation.

4.17 SUPPLY CIRCUIT – The branch circuit supplying electrical energy to the fence controller.

CONSTRUCTION

5 General

5.1 A fence controller shall employ materials that are acceptable for the use.

5.2 An enclosure, an opening, a frame, a guard, a knob, a handle, or the like shall not be sufficiently sharp to constitute a risk of injury in normal maintenance or use.

6 Enclosure

6.1 General

6.1.1 A fence controller shall be provided with an enclosure that, except for the fence terminals, will enclose all uninsulated live parts. The enclosure shall be constructed of metal or polymeric material that complies with the requirements for Polymeric Materials, Section 20.

6.1.2 The enclosure housing the timing and output mechanism shall be dust and water-resistant as determined by the Humidity and Water-Spray Test, Section 28, and the Hosedown Test, Section 29.

6.1.3 The enclosure shall be formed so that it will have the strength and rigidity necessary to resist the abuses to which it may be subjected, without resulting in a risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other defects. See 6.1.4 and 20.5.

6.1.4 To determine compliance with 6.1.3, a fence controller shall be subjected to the applicable tests specified in Section 30, Impact Test.

6.1.5 The enclosure of a fence controller shall be tamper-resistant to the extent that the use of a tool, other than an ordinary tool such as a screwdriver, pliers, or a wrench, or partial destruction of the enclosure is necessary to gain access to the timing mechanism or circuit or to any other part that tampering with may result in a risk of fire, electric shock, or injury to persons.

6.1.6 The degree to which the enclosure is required to be tamper-resistant is determined in part by the type of current-limiting means employed, the type of timing mechanism or circuit employed, and any auxiliary device that would function to make the controller inoperable in the event of tampering. Sealing wax applied over a screwhead or in a recess to conceal a bolt head or nut is not considered to be an acceptable means for making an enclosure tamper-resistant.

6.1.7 The tamper-resistant enclosure shall completely house all live parts if tampering with such parts may result in a risk of fire, electric shock, or injury to persons.

Exception: The screw shell of a lampholder or fuseholder that is not completely within the enclosure, the supply cord or wiring terminals, and the terminals for connecting the fence and grounding conductors need not be enclosed.

6.1.8 Leads or terminals for primary connections of a fence controller, that are located outside the tamper-resistant enclosure shall be housed within a supplementary enclosure.

Exception: This requirement does not apply to a portable, indoor, battery-operated fence controller if it complies with the requirements in 10.3.1.8.

6.1.9 A battery-operated fence controller marked "Outdoor Use" as specified in 38.2 shall have provision for completely enclosing the battery leads.

Exception: This requirement does not apply to a battery-operated fence controller provided with leads that are marked for outdoor use with "Water Resistant," "W," and "W-A" or the word "Outdoor," or other equivalent marking. See 10.2.3.

6.2 Doors and covers

6.2.1 A door, cover, or the like employed as a supplementary enclosure shall be provided with means, such as locks, interlocks, screws, and seals, for securing it firmly in place.

6.2.2 A door or cover that provides access to a fuse, thermal cutout, or other overload-protective device or control switch that requires access by the user shall be hinged, sliding, or similarly attached, so that it cannot be removed without the use of tools.

6.2.3 A hinged cover shall be so attached to the enclosure that it will close by gravity when the fence controller is installed and mounted in its intended manner.

Exception: A cover need not close by gravity if it is investigated and found to be acceptable for the application, or if it will not create a risk of fire, electric shock, or injury to persons if left open.

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6.3 Thickness

6.3.1 Cast metal for an enclosure shall not be less than 1/8 in (3.2 mm) thick at every point, and shall have a greater thickness at reinforcing ribs and door edges, except that die-cast metal may not be less than 1/16 in (1.6 mm) for an area of 24 in² (155 cm²) or less and having no dimension greater than 6 in (152 mm), and may be not less than 3/32 in (2.4 mm) for an area greater than 24 in² or having any dimension greater than 6 in. See 6.3.2.

6.3.2 Cast metal shall be not less than 1/4 in (6.4 mm) thick at threaded holes for conduit.

6.3.3 A sheet steel enclosure shall have a thickness not less than that specified in Table 6.1. See 6.3.4.

Table 6.1
Thickness of enclosure

Maximum dimension of largest surface, in (mm)		Minimum thickness					
		Sheet steel			Aluminum		
		Unreinforced flat surface, in (mm)	Reinforced, in (mm)		Unreinforced flat surface, in (mm)	Reinforced, in (mm)	
8	(203)	0.032 (0.81)	0.020 (0.51)		0.045 (1.14)	0.036 (0.91)	
12	(305)	0.042 (1.07)	0.032 (0.81)		0.058 (1.47)	0.045 (1.14)	
18	(457)	0.053 (1.35)	0.042 (1.07)		0.075 (1.91)	0.058 (1.47)	
24	(610)	0.067 (1.70)	0.053 (1.35)		0.095 (2.41)	0.075 (1.91)	

6.3.4 Sheet metal to which conduit is intended to be connected shall be of such thickness, or shall be formed or reinforced so that it will have a stiffness at least equivalent to that of a 0.060 in (1.52 mm) thick sheet steel.

6.3.5 An enclosure material other than cast metal or sheet steel shall be investigated to determine if it is acceptable for the purpose.

6.4 Openings

6.4.1 Ventilating openings shall be of such size or shape that no opening will permit entrance of a rod having a diameter greater than 1/4 in (6.4 mm) to contact any internal component if the current and voltage available from the component may present a risk of electric shock.

Exception: If the distance between a live part and the enclosure is more than 4 in (102 mm), an opening may be larger provided that:

- a) No opening will permit entrance of a rod having a diameter greater than 1/2 in (12.7 mm), and*
- b) The insertion of a rod for a distance of 4 in through the opening cannot be made to affect the operation of the controller.*

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6.4.2 A lens that forms a part of an enclosure housing a timing mechanism shall be acceptable for the purpose. See 6.1.1 – 6.1.3, and 20.3.

Exception: A lens that has a total area of 0.25 in² (1.6 cm²) or less is acceptable without additional tests.

7 Mounting

7.1 Means shall be provided for securely mounting or otherwise supporting the fence controller in its intended operating position.

7.2 A line- or battery-operated fence controller shall not be provided with a means for permanent mounting unless the supply connections comply with the requirements in 10.2.1 or 10.2.2, respectively. Keyhole slots that may be provided on a portable unit are not considered a means for permanent mounting.

7.3 Bolts, screws, or other parts used for mounting a fence controller shall be independent of those used for securing parts of the fence controller to the frame, base, or panel.

8 Mechanical Assembly

8.1 The assembly of a fence controller shall be such that it will not be adversely affected by the vibration of normal operation.

8.2 An attachment-plug receptacle, a fuseholder, a lampholder, a switch, a plug connector, or the like provided as part of a fence controller shall be mounted securely and shall be provided with means other than friction between surfaces that will reduce the likelihood of turning or shifting.

8.3 A lock washer properly applied is considered to be acceptable as a means to reduce the likelihood of a wiring device turning as mentioned in 8.2.

8.4 Each screw and nut accessible from the outside of the enclosure shall be riveted, staked, filed, or otherwise treated in such a manner as to discourage the user of the fence controller from trying to loosen it in an attempt to gain admittance to the enclosure.

Exception: A screw and nut that can be removed with an ordinary tool may be employed if its removal does not create a risk of fire, electric shock, or injury to persons. See 6.1.6.

8.5 Uninsulated live parts shall be secured to the base or mounting surface so that the likelihood of turning or shifting in position is reduced, if such motion may result in reduction of spacings below the minimum specified in Section 19, Spacings, or may otherwise adversely affect the operation of the fence controller.

9 Protection Against Corrosion

9.1 An enclosure constructed of iron or steel shall be enameled, galvanized, plated, or provided with equivalent corrosion protection, if corrosion of such parts would be likely to result in a risk of fire, electric shock, or injury to persons. Both inside and outside surfaces of an enclosure shall be protected against corrosion.

9.2 If the corrosion of iron or steel parts might result in a risk of fire, electric shock, or injury to persons, and if the adequacy of the corrosion protection provided is in doubt, appropriate exposure tests are to be conducted.

9.3 A ferrous metal enclosure of a fence controller marked "Outdoor Use" shall be protected against corrosion in accordance with Table 9.1.

Exception: A steel enclosure provided with an organic coating may be acceptable if comparative tests with galvanized sheet steel (without annealing, wiping, or other surface treatment) conforming with ASTM Coating Designation G90 indicate the coating provides equivalent protection. Among the factors that are to be taken into consideration when investigating the acceptability of such a coating system are exposure to salt spray and moist carbon-dioxide/sulfur-dioxide air mixtures.

Table 9.1
Sheet-metal coatings

Table 9.1 revised February 14, 2005

Type of coating	Coating designation or thickness in in (mm)
Hot-dipped, mill-galvanized steel	G90 ^a
Other coating	0.00041 (0.0104) ^b
^a Conforming with the coating designation G90 in the Weight (Mass) of Coating Requirements Table of the Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, ASTM A653, with not less than 40 percent of the zinc on any side, based on the minimum single-spot-test requirement in this ASTM specification.	
^b Average thickness with a spot minus tolerance of 0.00007 in (0.0018 mm).	

10 Supply Connections

10.1 General

10.1.1 Supply connections are considered to be those that are made in the field when a fence controller is installed.

10.1.2 The primary circuit is considered to include primary-supply wiring terminals or leads, supply cords and plugs, and all wiring and circuit components conductively connected to them.

10.2 Permanently mounted controllers

10.2.1 A line-operated fence controller intended for permanent mounting, and marked "Outdoor Use" shall have provision for the connection of conduit.

10.2.2 A battery-operated fence controller intended for permanent mounting and provided with an interconnecting cord shall be provided with Type SJT, SJO, SJTO, or SJE flexible cord, or other jacketed cord acceptable for at least hard usage. The flexible cord shall be provided with a bushing as specified in 10.3.3 and shall be subjected to the Strain Relief Test, Section 34.

10.2.3 A battery-operated fence controller intended for permanent mounting and marked "Outdoor Use" shall be provided with a power supply cord that is in accordance with 10.2.2, and additionally marked with the suffix "W-A," "W," or with the word "Outdoor."

10.2.4 A battery- or line-operated fence controller shall be provided with wiring terminals or leads for the connection of supply conductors. A fixed wiring terminal shall be prevented from turning.

10.2.5 The binding screw of a screw-and-washer construction employed at a wiring terminal shall not be smaller than No. 6 (3.5 mm diameter).

10.2.6 A terminal plate for a wire-binding screw shall be of metal not less than 0.050 in (1.27 mm) thick.

10.2.7 A tapped hole in a terminal plate for a wire-binding screw shall be provided with not fewer than two full threads in the metal. The metal may be extruded at the tapped hole for the binding screw to provide two full threads.

10.2.8 An upturned lug or cupped washer shall be capable of retaining at least a No. 14 AWG (2.1 mm²) conductor under the head of a screw or washer, even though the screw becomes slightly loosened.

10.2.9 A wire-binding screw shall not thread into material other than metal.

10.2.10 A permanently mounted fence controller rated at 125 V or less and employing, in the primary circuit, a lampholder of the Edison-screw-shell type or a single-pole switch or overcurrent-protective device shall have one terminal or lead identified for the connection of the grounded conductor of the supply circuit. The identified terminal or lead shall be the one that is conductively connected to the screw shells of lampholders and to which no switches or overcurrent-protective devices of the single-pole type are connected.

10.2.11 A terminal intended for the connection of a grounded power-supply conductor shall be readily distinguishable from the other terminals, and:

- a) Identified by a plating that is substantially white in color (such as nickel),
- b) Of a metal that is substantially white in color,
- c) Otherwise colored white,
- d) Marked WH, or
- e) Properly identified in some other manner, such as on an attached wiring diagram.

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