

# Lumacurve's Equipment Manual

## LED - Sign Management Program

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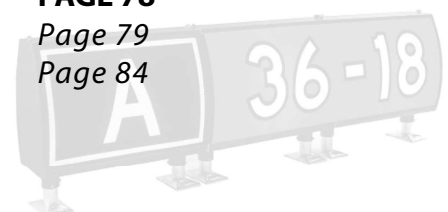
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PROGRAM ADMINISTRATOR  
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STANDARD SIGNS INC  
9115 Freeway Drive  
MACEDONIA, OH 44056

REVISION DATE: October 24, 2022

ORIGINAL ISSUE DATE: April 22, 2020

Recertification due: June 2024

An Activity Sponsored and Administered by  
Intertek

**AIRPORT LIGHTING  
EQUIPMENT  
CERTIFICATION PROGRAM**

**CERTIFICATE OF  
CONFORMANCE**

The product described below is hereby approved for listing in the next issue of the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5345-53, Appendix 3 Addendum "Airport Lighting Equipment Certification Program. The approval is based on successful completion of tests in accordance with the specifications listed in, and the requirements for approval described in the Advisory Circular, and the reporting to the Program Administrator the results of such tests, accompanied by related documents by an Intertek recognized testing laboratory. This Certificate is only confirmable in conjunction with equipment being listed in AC 150/5345-53, Appendix 3, Addendum, as currently published by the FAA. The certification is not valid for a product modified with non-OEM replacement parts or non-production components.

L-858(L) – Signs, Runway and Taxiway (AC 150/5345-44K)						
Manufacturer	Type	Size	Style	Class	Mode	Manufacturer's Catalog Number
Standard Signs	Y, R, L	1	2, 3, 5	1,2	2	SXL (442)
	Y, R, L	2	2, 3, 5	1,2	2, 3	MXL (442)
	Y, R, L	3	2, 3, 5	1,2	2, 3	LXL (442)
	B	4	2, 3, 5	1,2	2, 3	D1L (442)
	B	5	2, 3, 5	1,2	2, 3	DL1L (442)
Equipment meets the requirements of FAA Engineering Brief No. 67D additional requirements for "Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures" dated 3/6/2012.						

1. This Equipment requires continuing validation in accordance with the requirements of AC 150/5345-53, and the Intertek Airport Lighting Equipment Certification Program.
2. Product tested and Report issued by: Standard Signs; Intertek

(A) Report No: 102612461CRT-001; TP006;  
G103125055W; 103835030CRT-002;  
103835030BOX-007; 103835030CRT-001;  
G103838414W

(B) Date of Report: 08/2016; 08/2016; 07/2017;  
03/2020; 03/2019; 10/2019; 03/2019

NOTE: PLEASE REVIEW, AND ADVISE  
ADMINISTRATOR AT INTERTEK IMMEDIATELY  
IF DATA, AS SHOWN, NEED TO BE  
CORRECTED.

Approved for Certification by:

Jeremy N. Downs, P.E., Program Administrator  
Date: October 24, 2022



## LUMACURVE AIRFIELD GUIDANCE SIGNS

*Technical Information*

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All Lumacurve Airfield Signs are manufactured in accordance with FAA Advisory Circular 150/5345-44, and are available in all listed sizes and lighting styles. This sheet covers FAA sizes 1, 2, and 3 Taxiway and Runway Signs, size 5 Distance Remaining Signs, and FAA lighting styles 1, 2, 3, and 5.

LUMACURVE is a registered trademark of Standard Signs Inc.

**Design:** Lumacurve's simple construction provides reliable performance and easy maintenance. Its sturdy modular design, consisting of extruded aluminum covers & bases and casted aluminum end panels & inter-modular connectors, holds up in the airfield environment and facilitates modification. Sign covers are secured with turn fasteners and are removable without tools for easy re-lamping. Factory assembled and wired in up to 4 module lengths (*single or double faced*) LUMACURVE signs accommodate numerous legend displays. Curved face panels are translucent and retro-reflective, ensuring uniform lighting and maximum readability. Signs are supplied with frangible couplings and floor flanges and can be mounted on a concrete pad or with stakes.

**Lighting:** Various dependable lighting systems are available for all airport circuit applications and regulator capacity needs, and can be supplied in new signs and kit form for retrofitting existing signs. Supplemental information sheets on most systems that follow are available upon request.

**Energy efficient LED Systems:** LED signs are wired in parallel with "LED" 4W screw base type lamps and designed for high efficiency and long life; this system operates per Style 2, 3, or Style 5 requirements without internal modification.



# LUMACURVE AIRFIELD GUIDANCE SIGNS

Technical Information

## Taxiway & Runway Guidance Sign Dimensions:

FAA Sign Size	Size 1 (small)		Size 2 (medium)		Size 3, 5 (large)	
	in/lb	mm/kg	in/lb	mm/kg	in/lb	mm/kg
Letter Height	12.00	305.00	15.00	381.00	18.00	457.00
Face Height	18.00	457.00	24.00	610.00	30.00	762.00
Sign Height	25.30	643.00	31.30	795.00	37.30	947.00
Maximum Sign Depth	13.20	335.00	14.40	366.00	15.80	401.00
Leg Mounting Centers	14.60	371.00	18.20	462.00	20.90	531.00
Module Weight	41.00	18.500	52.00	3.60	70.00	31.80

FAA Sign Length	Size 1 (small)		Size 2 (medium)		Size 3, 5 (large)	
	inches	meters	inches	meters	inches	meters
1-Module (Size 3, 1-mod = Size 5 Distance Marker)	29.40	747.00	36.60	930.00	42.00	1067.00
2-Module	58.50	1486.00	73.00	1854.00	83.80	2129.00
3-Module	87.60	2225.00	109.40	2779.00	125.50	3188.00
4-Module:	116.80	2967.00	145.80	3703.00	167.30	4249.00
Module Weight	41.00	18.50	52.00	23.60	70.00	31.80

Ground Clearance (all sizes): 6.00 inch 152.00 mm

**Wind Load Resistance & Frangibility:** Per FAA specifications, Mode 2 signs are supported on frangible couplings that withstand wind loads from jet blast up to 200 mph and break before reaching an applied static load of 1.3 PSI. Mode 3 signs are supported on frangible couplings that withstand wind loads up to 300 mph and break before reaching an applied static load of 2.8 PSI.

(\*PSI = pounds per square inch distributed over the sign face.)

**Installation:** For guidance on the installation of signs see FAA Advisory Circular 150-5340-18 on sign systems. For recommended concrete pad dimensions, refer to the 'Installation' section of this manual. FAA suggests that signs be mounted at the following distances from the pavement edge:

	Size 1 (small)	Size 2 (medium)	Size 3, 5 (large)
Feet	10 to 20	25 to 35	35 to 60
Meters	3 to 6	6 to 10.5	10.5 to 18

We recommend that signs be mounted at or beyond these maximum distances at airports with jet operations. Airports with wide-body jet operations should use Size 3 (large) signs mounted 60 feet or more from the pavement edge. All sign locations should be carefully selected to prevent frangible coupling failure from jet blasts.





## LUMACURVE AIRFIELD GUIDANCE SIGNS

*Technical Information*

**Packing & Shipping:** Signs are packed in heavy double-wall corrugated cartons suitable for export shipment. Lamps are included. Approximate packed volumes and weights per module are:

	Size 1 ( <i>small</i> )	Size 2 ( <i>medium</i> )	Size 3, 5 ( <i>large</i> )
Cubic Feet	6	10	15
Cubic Meters	0.17	0.28	0.44
Pounds	50	70	85
Kilograms	22.7	31.8	38.5

**Warranty:** Standard Signs Inc warrants that all Lumacurve signs are manufactured and will perform in accordance with FAA Specification L-858, and that any defects in design, materials (excluding lamps), or workmanship which may appear with proper and normal use during a period of three (3) years (four (4) years for LED lamps and associated electronics) from the date of installation will be corrected by repair or replacement by Lumacurve, FOB our factory, Macedonia, Ohio.



## LUMACURVE AIRFIELD GUIDANCE SIGNS

*Lumacurve LED Specifications*

### Sample Specifications for Engineers and Planners

ALD (*Alternative Lighting Device*) L-858 SIGN – SAMPLE SPECIFICATION  
LUMACURVE LED L-858 SIGN–SAMPLE SPECIFICATION

#### DESCRIPTION

858-1.1: This item shall consist of furnishing and installing the L-858 guidance signs in accordance with these specifications and the details shown on the plans. This item shall include all wire and cable connections, furnishing, and installing all necessary conduits, fittings, and mounting structures. It shall also have the testing of the installation, and all required incidentals to place the signs in operation as completed units to the satisfaction of the Engineer.

#### EQUIPMENT AND MATERIALS

858-2.1 GENERAL.

858-2.1: The signs shall use LED (light emitting diode) technology and shall be ETL certified and conform to the requirements of FAA Advisory Circular 150/5345-44 "Specification for Runway and Taxiway Signs." The LED L-858 signs shall be Lumacurve, manufactured by Standard Signs Inc., or approved equal.

*Include section 858-2.1a (below) if the desire is to match existing Lumacurve signs on the field.*

*{858-2.1a: Match Existing Signage Airport signs shall be Lumacurve, manufactured by Standard Signs Inc, to match existing airfield signage. The airport/owner desires to maintain standardized airfield lighting equipment to reduce costs by minimizing replacement parts inventory and maintenance training. All required changes in existing signs must be accomplished by retrofitting with OEM LUMACURVE add-on modules and replacement face panels. If other than LUMACURVE signs are supplied, the installing contractor must bid all retrofit situations as new signs and replace all existing signs so that airport signage will remain consistent.}*

#### CONSTRUCTION

858-3.1 MODULARITY.

To provide maximum flexibility to the airport, signs shall have a modular construction. Modules shall be of a standard length and combined to make 1, 2, 3 and 4 module signs. Signs must allow for future legend changes of various lengths by simply adding additional modules or removing existing modules. Sign shortening of multiple module signs shall be accomplished without the use of additional sign frame components. Sign lengthening shall be accomplished by using all existing sign frame components in addition to the required add-on modules.

Sign tops shall be secured with a maximum of two turn fasteners per module and be removable without tools for easy maintenance. Sign faces shall be curved to provide uniform, balanced lighting. Sign faces must not exceed 42" in length to ensure easy removal and replacement by one individual.



## LUMACURVE AIRFIELD GUIDANCE SIGNS

*Lumacurve LED Specifications*

### PERFORMANCE

#### 858-3.2 LIGHTING SYSTEM.

Signs shall use an energy efficient, long life LED type lamp or engineer approved equal. Lamps shall be 4W with an estimated life of 25,000 hours. To facilitate quick lamp changes without the use of tools, lamps shall utilize a screw base socket. All sign configurations shall have a power factor of .88 or higher as measured on the primary of the L-830 or L-831 isolation transformer. Sign systems must operate on both medium intensity (4.8A – 6.6A) and high intensity (2.8A – 6.6A) circuits without internal modification to give the airport maximum flexibility in sign usage and minimize parts to be stocked. To maximize maintenance personnel safety, there shall be no more than 170V DC at any point inside the sign. In addition, the power supply circuit shall output a regulated DC current of 0.29 amps maximum. The VA loading requirements shall not exceed those listed in the table below:

	1 Module	2 Module	3 Module	4 Module
Size 1	49	64	67	73
Size 2	62	67	74	78
Size 3	62	67	74	78
Size 4	67			
Size 5	62			

#### 858-3.3 REPLACEMENT PARTS POLICY.

In order to maximize safe operations on the airfield, reduce risk of runway incursions & minimize inventory requirements, sign manufacturer shall provide the owner an emergency replacement signs and parts service for the life of the signs. Orders for replacement parts & complete signs shall ship within 24 hours of order receipt. Manufacturer shall provide a history of providing such a service for a minimum of 5 years. The cost for this policy shall be considered incidental to each pay item for the signs.

*[Include section 858-3.4 if it is required to modify existing Lumacurve signs on field]*

#### 858-3.4 SIGN MODIFICATION AND PANEL REPLACEMENT.

*The existing airfield signs are LUMACURVE manufactured by Standard Signs, Inc. of Macedonia, OH. Only OEM replacement panels and parts shall be allowed for use in the modification or upgrades to existing signage. Per the equipments' FAA/ETL Certificate of Conformance: "The certification is not valid for a product modified with non-OEM replacement parts or non-production components". The original manufacturer shall continue to be held accountable for their signs and maintain the liability associated with the products performance. This shall provide to the owner the following assurances: uncompromised FAA certification of the product, the continuation of all applicable manufacturer warranties, and continued product support from the manufacturer.*

#### 858-3.5 SPARES.

In case of knock-downs or maintenance vehicle damage, new installations shall include 15 percent spare lamps/light sources for every sign supplied and 2 spare power supplies for every 10 signs supplied (*minimum qty of one.*) This will further protect the airport from premature component failure that occurs after the manufacturer's warranty expiration but prior to reaching the projected light sources full rated life.



## Example Lumacurve LED Specifications

### Sample Specifications for Engineers and Planners

ALD (*Alternative Lighting Device*) L-858 SIGN – SAMPLE SPECIFICATION  
LUMACURVE LED L-858 SIGN–SAMPLE SPECIFICATION

#### DESCRIPTION

858-1.1 This item shall consist of furnishing and installing the L-858 guidance signs in accordance with these specifications and the details shown on the plans. This item shall also include all wire and cable connections, the furnishing and installing of all necessary conduits and fittings and all necessary mounting structures. It shall also include the testing of the installation and all incidentals necessary to place the signs in operation as completed units to the satisfaction of the Engineer.

#### EQUIPMENT AND MATERIALS

858-2.1 GENERAL.

858-2.1 The signs shall use a LED (light emitting diode) technology and shall be ETL certified and conform to the requirements of FAA Advisory Circular 150/5345-44 (latest version) "Specification for Runway and Taxiway Signs. The LED L-858 signs shall be Lumacurve, manufactured by Standard Signs Inc. ([www.lumacurve.com](http://www.lumacurve.com)), or approved equal.

*[include section 858-2.1a if desire is to match existing Lumacurve signs on field]*

*{858-2.1a Match Existing Signage*

*Airport signs shall be LUMACURVE as manufactured by Standard Signs Inc to match existing airfield signage. The airport/owner desires to maintain standardized airfield lighting equipment in order to reduce costs by minimizing replacement parts inventory and maintenance training. All required changes in existing signs must be accomplished by retrofit with OEM LUMACURVE add-on modules and replacement face panels. If other than LUMACURVE signs are supplied, the installing contractor must bid all retrofit situations as new signs and replace all existing signs so that airport signage will remain consistent.}*

#### CONSTRUCTION

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## PERFORMANCE

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	1	2	3	4
	Module	Module	Module	Module
Size 1	49	64	67	73
Size 2	62	67	74	78
Size 3	62	67	74	78
Size 4	67			
Size 5	62			

### 858-3.3 REPLACEMENT PARTS POLICY

In order to maximize safe operations on the airfield, reduce risk of runway incursions & minimize inventory requirements, sign manufacturer shall provide the owner an emergency replacement signs and parts service for the life of the signs. Orders for replacement parts & complete signs shall ship within 24 hours of order receipt. Manufacturer shall provide a history of providing such a service for a minimum of 5 years. The cost for this policy shall be considered incidental to each pay item for the signs.

*[include section 858-3.4 if it is required to modify existing Lumacurve signs on field]*

### 858-3.4 SIGN MODIFICATION AND PANEL REPLACEMENT.

*The existing airfield signs are LUMACURVE manufactured by Standard Signs, Inc. of Macedonia, OH. Only OEM replacement panels and parts shall be allowed for use in the modification or upgrades to existing signage. Per the equipments' FAA/ETL Certificate of Conformance: "The certification is not valid for a product modified with non-OEM replacement parts or non-production components". The original manufacturer shall continue to be held accountable for their signs and maintain the liability associated with the products performance. This shall provide to the owner the following assurances: uncompromised FAA certification of the product, the continuation of all applicable manufacturer warranties, and continued product support from the manufacturer.*

### 858-3.5 SPARES.

In case of knock-downs or maintenance vehicle damage, new installations shall include 15 percent spare lamps/light sources for every sign supplied and 2 spare power supplies for every 10 signs supplied (minimum qty of 1). This will further protect the airport from premature component failure that occurs after the manufacturer's warranty expiration but prior to reaching the projected light sources full rated life.

## CONSTRUCTION METHOD

### 858-4.1 PLACING THE LED L-858 SIGNS.

The contractor shall furnish and install each L-858 sign as specified in the proposal and shown in the plans. The LED L-858 shall be mounted on concrete pads at the location shown on the plans.

### 858-4.2 TESTS.

The sign system shall be fully tested by continuous operation for not less than 72 hours as a completed system prior to acceptance.

## METHOD OF MEASUREMENT

### 858-5.1 MEASUREMENT.

The quantity of lights to be paid for under this item shall be for the quantity of LED L-858 signs (with tethers) as shown on the plans and one Instruction Manual (per lot) installed and accepted as completed units, in place, ready for operation.

## BASIS FOR PAYMENT

### 858-6.1 PAYMENT.

Payment will be made at the contract unit price for the completed total quantity of LED L-858 signs installed, in place by the contractor, and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item L-858-5.1 LED L-858 Sign, in Place-per each

## RECOMMENDATION

*To accurately assess the true lifecycle costs and minimize the risk associated with a newer lighting technology of a given airfield signage lighting system, it is advised that there be a separate bid item for spare parts to include:*

*Lamps, light sources or LED light engines, complete (as required to light the signs provided)*

*Power supplies, complete (as required to power the light source/s of the signs provided)*

*The pricing should be held for a given number of years, determined by the airport and should typically match the manufacturers published rated useful life of the light source utilized in the sign/s provided. The quantity of the bid items should reflect an appropriate number that will hedge the owners risk against premature failure of long life technologies that have yet to be proven.*

# STANDARD SIGNS, INC. TERMS & CONDITIONS FOR THE SALE OF GOODS

## I. GENERAL PROVISIONS AND CONDITIONS

**A. NATURE OF CONTRACT AND NAMES OF PARTIES.** This agreement between Standard Signs, Inc. ("Seller") of 9115 Freeway Drive, Macedonia, Ohio 44056 and Buyer is for the sale of goods ("Goods") identified on the face of this Agreement and/or Seller's Order Acknowledgement (collectively "Agreement"). Seller recognizes that Buyer may desire to use its own acknowledgement form to reflect this agreement; however, any provisions in Buyer's acknowledgement form which modify, conflict with or contradict any provisions of this Agreement, shall not be binding between the parties. An acceptance of any of the Goods covered by this Agreement or Seller's Order Acknowledgement shall constitute an acceptance of these terms and conditions and shall constitute the entire understanding between Seller and Buyer.

**B. INTEGRATED AGREEMENT.** All orders are subject to approval by Seller at its offices in Macedonia, Ohio. The parties agree and understand that no waiver or alteration of terms contained in this Agreement, including but not limited to any verbal alteration or agreement between Buyer and any agent of Seller, shall bind Seller unless in writing, signed by an executive officer of the Seller. No course of prior dealings between the parties and no usage of the trade shall supplement or explain any term used in this Agreement. Buyer acknowledges that it has not relied upon any sample, model, description or exact technical specifications in placing its order. The parties intend the terms of this Agreement to be the final, complete and exclusive expression of their agreement.

**C. TERMINATION, CANCELLATION CHARGES.** Seller reserves the right to begin production of orders and/or to ship Goods in stock immediately unless specifically requested otherwise. Buyer may not terminate, modify, cancel, or defer shipment of the Goods under this Agreement, except with Seller's prior written consent and subject to conditions then agreed upon. Cancellation will involve cancellation charges for all work performed, including but not limited to engineering and production work performed, up to receipt of written cancellation provided by Buyer to Seller. Buyer agrees to pay these charges as a condition of sale.

**D. GOVERNING LAW, VENUE, JURISDICTION.** The laws of the state of Ohio shall govern this Agreement, the construction of its terms, and the interpretation of all rights and duties of Buyer and Seller. Buyer agrees that venue shall lie in Summit County, Ohio. Buyer and Seller agree that they are amenable to suit in Ohio, and therefore, subject themselves to the jurisdiction of the state courts in Ohio by entering into this Agreement.

**E. MANDATORY ARBITRATION.** Except for a breach of the Intellectual Property Rights and Confidentiality provisions contained in this Agreement, for which Seller may seek equitable relief, including temporary and permanent injunction, against Buyer, the parties shall arbitrate any dispute, claim or controversy arising out of or relating to this Agreement in Ohio in accordance with the commercial rules of the American Arbitration Association then in effect. The party requesting arbitration of a dispute shall give written notice to the other party as soon as possible within the applicable time frames set forth in this Agreement for pursuing a dispute, claim or controversy. The parties agree that the results of the arbitration will bind the parties and that the prevailing party may enter judgment upon the award rendered in the highest court in Ohio, state or federal.

**F. STATUTE OF LIMITATIONS.** Pursuant to Ohio Revised Code Section 1302.98 the parties agree that an action for breach of this agreement, or any other cause of action arising from this agreement, must be commenced if at all within one year from when the cause of action accrued.

**G. WAIVER.** Neither the parties nor any interpreting legal authority shall construe any failure of Seller to demand rigid adherence to one or more of this Agreement's provisions, on one or more occasions, as a waiver or deprive Seller of the right to insist upon strict compliance in the future.

**H. BINDING EFFECT, ASSIGNMENT.** This Agreement shall bind and inure to the benefit of the parties and their successors and assigns; provided, however, that Buyer may not assign or transfer this Agreement, in whole or in part, except with prior written consent of Seller.

**I. LEGAL CONSTRUCTION.** In case any one or more of the provisions contained in this Agreement are held to be invalid, illegal, or unenforceable in any respect, the invalidity, illegality, or unenforceability shall not affect any other provision and this Agreement shall be construed as if the invalid, illegal, or unenforceable provision had never been contained in it.

**J. EQUAL EMPLOYMENT OPPORTUNITY.** The parties incorporate herein by reference the Equal Opportunity clause, Section 202 of Executive Order 11246, as amended, relative to equal employment opportunities and implementing rules and regulations of the Secretary of Labor.

## II. PACKAGING, SHIPMENT, RISK OF LOSS, DELIVERY

**A. PACKAGING.** Seller shall package the Goods in standard commercial package that is acceptable to commercial carrier. Seller shall furnish special customer packaging only upon Buyer's written request and Buyer shall bear the cost for any special packing requirements. Buyer agrees to hold Seller harmless for any damage to the Goods caused by Buyer's special packaging requirements.

**B. SHIPMENT, RISK OF LOSS.** Seller ships all Goods F.O.B. Seller's plant. Seller ships LUMACURVE Goods with freight allowed within the contiguous 48 US states via the lowest overland rate, on orders exceeding a net value of \$3500. If qualified, Seller will ship LUMACURVE Goods consigned to Alaska or Hawaii freight allowed to the contiguous U.S. port of exit. Buyer shall bear the expense of the shipping costs to Alaska or Hawaii. If Buyer requests premium routing, Buyer shall pay the shipping cost differential. Buyer may combine any LUMACURVE Goods manufactured by Standard Signs, Inc. consigned to a single destination within the 48 contiguous U.S. states when calculating invoice value for freight allowance. Seller ships Porcelain Enamel Goods to Buyer in a reasonably commercial manner. Seller invoices Buyer for all shipping charges incurred and Buyer is responsible for payment of all shipping charges. The risk of loss passes to Buyer upon Seller's delivery to a common carrier for shipment to Buyer. Seller may treat each shipment made as a separate transaction.

**C. DELIVERY.** Unless expressly specified to the contrary, Seller shall ship Goods as soon as practicable. Shipping dates represent Seller's best estimate and are approximate based upon current availability of materials, present productions schedules, and prompt receipt of all necessary information. Failure to meet these dates shall not constitute default by Seller nor shall Seller be liable for any failure to perform by reason of

causes beyond its control. These causes include, but are not limited to, storms, floods, fires, accidents, wars, shortages of fuel, materials, transportation facilities, labor disputes and shortages, legislative action, judicial action and acts of God. In the event of any delay or nonperformance, Seller may at its option and without liability, upon written notice to Buyer, cancel all or any portion of this Agreement and/or extend any date upon which any performance under this Agreement is due.

## III. PRICE, PAYMENT TERMS, INTEREST, COLLECTION FEES & COSTS, TITLE, SECURITY INTEREST, RETURNS

**A. PRICE.** The price for the Goods that are the subject matter of this Agreement are set forth on the face side of this Agreement. Prices stated are subject to change without notice in the event of: (i) alterations in specifications, quantities, designs, or delivery schedules; (ii) increases in the cost of fuel, power, material, supplies, or labor; and/or (iii) foreign or domestic legislation enacted by any level of government, including tax legislation, which increases the cost of producing, warehousing, or selling the Goods purchased by Buyer. Seller shall not provide Buyer with any discount unless a discount is set forth on the face side of this Agreement. Prices do not include federal, state or local taxes as applicable and Seller will add these taxes to the sales price when Seller is legally obligated to collect the taxes unless Buyer provides Seller with a proper tax exemption certificate. If Seller pays any taxes on the Goods, Buyer shall immediately reimburse Seller for any tax payment upon demand. All prices are subject to correction for stenographic, typographic and clerical errors.

**B. PAYMENT TERMS, CREDIT.** The terms of payment for Goods are net thirty (30) days from the date of invoice, unless otherwise agreed between the parties. Seller may require advanced payment of 50% of the total order amount for all Porcelain Enamel Goods at the time Buyer orders Porcelain Enamel Goods. Seller extends credit purely at its discretion. If in Seller's judgment, Buyer's financial condition does not justify the terms of payment specified, Seller may at its option (1) cancel this Agreement; or (2) refuse to perform further under this Agreement unless Buyer shall immediately pay for all Goods which Seller has delivered to Buyer.

**C. INTEREST, COLLECTION FEES & COSTS, TITLE, SECURITY INTEREST.** Buyer agrees to pay a delinquency charge of 1½% per month (18% per annum) on any outstanding balances owed by Buyer and not paid after sixty (60) days from invoice date until Buyer renders payment in full. If Seller must pursue legal action against Buyer to collect any amounts owed by Buyer to Seller, Buyer agrees to pay Seller's expenses, including reasonable attorneys' fees, incurred as a result of the legal action. Until Buyer pays Seller the purchase price and all other sums due in full, Seller retains title to all goods shipped by Seller to Buyer. Seller may, at its discretion, seek additional security from Buyer on any amount due to Seller for goods shipped from Seller to Buyer and thus Seller may retain a security interest in the Goods and in all proceeds of the Goods. Buyer shall execute a financing statement(s) on request and irrevocably authorize Seller to execute and file same.

**D. RETURNS.** This return policy applies only to LUMACURVE Goods (with the exception of LUMACURVE legend panels which are custom made and not returnable). Seller only accepts returned Goods within 90 days from shipment date. Seller will not accept Goods returned for credit without Seller's permission. Buyer must contact Seller and obtain verbal permission to return any Goods and at that time Seller will issue a return confirmation number to Buyer. All returned Goods require a return confirmation number, and Seller reserves the right to reject any returned Goods without a return confirmation number. Seller will not issue any refunds prior to Seller's receipt of the returned Goods. Buyer must return any Goods for which it seeks a refund in good, usable condition. If Seller, at its sole discretion, determines that the Goods that Buyer seeks to return are not in good, usable condition, Seller reserves the right to reject the return of the Goods and deny Buyer a refund for the Goods. All accepted returned Goods are subject to a 25% restocking charge. Seller will not refund original freight charges. Buyer, at its sole expense, shall bear all freight charges incurred to return any Goods to Seller. **All Seller's Porcelain Enamel Goods are custom made and not returnable.**

The original manufacturer's return policy shall apply to any non-Seller manufactured Goods sold through Seller that Buyer seeks to return. Buyer must notify Seller and obtain a return confirmation number as stated above in Seller's return policy.

## IV. WARRANTY, LIMITATION OF LIABILITY, INDEMNIFICATION

**A. LIMITED WARRANTY.** THE FOLLOWING WARRANTY FROM SELLER IS EXPRESSED IN LIEU OF ANY OTHER WARRANTY, EXPRESS OR IMPLIED, OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF SELLER. SELLER NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF SELLER'S GOODS.

THE FOLLOWING WARRANTY APPLIES TO LUMACURVE GOODS ONLY. SELLER WARRANTS THAT LUMACURVE GOODS ARE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF THREE (3) YEARS FROM DATE OF INSTALLATION. SELLER WARRANTS THAT LUMACURVE "LED" LAMPS AND LUMACURVE "LED" SYSTEM ELECTRONIC PARTS ONLY ARE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF FOUR (4) YEARS FROM DATE OF INSTALLATION. If Buyer finds Goods defective, Buyer's sole and exclusive remedy and Seller's sole and exclusive obligation shall be, at Seller's option, replacement or repair of Goods. This exclusive remedy shall not fail for its essential purpose so long as Seller is willing and able to repair or replace defective Goods in the prescribed manner. Buyer's remedy is subject to an inspection and determination by Seller at Seller's Plant, that any alleged defect, malfunction or other failure of Goods is not the result of misuse, mishandling, misapplication, neglect (including but not limited to improper maintenance), accident, improper installation, modification (including but not limited to use of unauthorized parts or attachments), or adjustment or repair performed by anyone other than Seller or one of Seller's authorized agents.

IF SELLER MANUFACTURES THE GOODS ACCORDING TO BUYER'S SPECIFICATIONS, SELLER DOES NOT WARRANT THE ADEQUACY OF BUYER'S SPECIFICATIONS OR THAT THE GOODS WILL PERFORM IN ACCORDANCE WITH BUYER'S SPECIFICATIONS. SELLER DOES NOT WARRANT ANY GOODS SOLD BY SELLER BUT NOT MANUFACTURED BY SELLER. THIS WARRANTY DOES NOT COVER LABOR OR OTHER COSTS OR EXPENSES TO REMOVE OR INSTALL ANY DEFECTIVE, REPAIRED OR REPLACED GOODS.

The parties expressly acknowledge that any technical advice that Seller furnishes to Buyer with respect to the use of the Goods, Seller provides

without charge, and Seller assumes no obligation or liability for the advice given or the results obtained, and Buyer accepts any advice that Seller provides at Buyer's risk. This warranty is void in the event that anyone other than Seller makes repairs to the Goods without prior written authorization from Seller.

IF BUYER SEEKS REJECTION OF GOODS DELIVERED FOR NONCONFORMITY WITH THIS AGREEMENT, SELLER'S ORDER ACKNOWLEDGEMENT, OR PACKING LIST DISCREPANCIES, BUYER MUST SEND WRITTEN NOTIFICATION TO SELLER OF THE REJECTION OF THE GOODS WITHIN FORTY- EIGHT (48) HOURS AFTER DELIVERY OF THE GOODS TO BUYER. This notification shall state the basis of the alleged nonconformity and a description of the portion of the shipment rejected. Buyer's failure to send written notification to the Seller within forty-eight (48) hours after delivery shall result in Seller deeming that no nonconformities or packing list discrepancies existed at the time of delivery to Buyer.

## **SELLER OFFERS NO WARRANTY ON AND NO WARRANTY APPLIES TO PORCELAIN ENAMEL GOODS.**

**B. LIMITATION OF LIABILITY.** Pursuant to Ohio Revised Code Sections 1302.29 and 1302.93 Seller's liability for Buyer's damages is limited in the event of a breach or repudiation of this contract or of any of the provisions by Seller. SELLER'S LIABILITY (WHETHER UNDER THE THEORIES OF BREACH OF CONTRACT OR WARRANTY, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE) FOR ITS GOODS IS LIMITED TO REPAIRING OR REPLACING GOODS FOUND BY SELLER AS DEFECTIVE, OR AT SELLER'S OPTION, TO REFUNDING THE PURCHASE PRICE OF THE GOODS OR PARTS. AT SELLER'S REQUEST, BUYER WILL SEND AT BUYER'S SOLE EXPENSE, ANY ALLEGEDLY DEFECTIVE GOODS TO THE PLANT OF SELLER. BUYER SHALL NOT BE ENTITLED TO RECOVER INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING THOSE ARISING OUT OF OR UPON THE RIGHTS RAISED OUT OF A CLAIMED BREACH OF WARRANTY, BREACH OF IMPLIED WARRANTY OF MERCHANTABILITY, WARRANTY FOR A PARTICULAR PURPOSE OR USE, OR ANY LOSSES, COSTS, EXPENSES, LIABILITIES AND DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS, DAMAGES TO PROPERTY, ALL LIABILITIES OF BUYER TO ITS CUSTOMERS OR THIRD PERSONS, AND ALL OTHER SPECIAL OR CONSEQUENTIAL DAMAGES) WHETHER DIRECT OR INDIRECT, AND WHETHER RESULTING FROM, OR CONTRIBUTED TO BY THE DEFAULT OR NEGLIGENCE OF SELLER, ITS AGENTS, EMPLOYEES, OR SUBCONTRACTORS, WHICH MIGHT BE CLAIMED AS THE RESULT OF THE USE, MISUSE OR FAILURE OF THE GOODS DELIVERED. Additionally, Buyer shall not be entitled to recover any costs for materials expended or used, initiated at the request of Buyer.

**C. INDEMNIFICATION.** Buyer agrees to indemnify and hold harmless Seller from and against all claims for bodily injury, illness, death or property damage, liabilities, damages, losses and expenses, including attorneys' fees, arising: (1) from the use or misuse of the Goods by Buyer, Buyer's customers or any other party; (2) the infringement of any United States patent, copyright, trade secret, trademark or similar intellectual property rights, arising from the manufacture or purchase of the Goods; or (3) out of the performance of this Agreement.

## V. INTELLECTUAL PROPERTY RIGHTS, CONFIDENTIALITY

**A. INTELLECTUAL PROPERTY RIGHTS.** Seller shall retain all intellectual property rights to the Goods that are the subject matter of this Agreement. Seller's intellectual property rights include, but are not limited to patent, trademark, trade name and copyright rights. Specifically, Seller retains the right to file for patent protection under 35 U.S.C. §1 et seq. for the Goods which are the subject matter of this Agreement.

**B. CONFIDENTIALITY.** Buyer shall consider confidential the Goods and all specifications, drawings, prototype articles and information furnished by Seller or prepared by Seller for Buyer in connection with this Agreement. Buyer shall not disclose this information to any other person or use this information itself for any purpose other than performing under this Agreement without Seller's prior written permission. Buyer shall not disclose any information relating to this Agreement without Seller's prior written permission.

Standard Signs, Inc.  
9115 Freeway Drive Macedonia, OH 44056  
P: 800.258.1997 / 330.467.2030  
www.lumacurve.com  
www.signsporcelain.com

*Lumacurve is a brand of Standard Signs.*

Updated 2/15/23



# **ORDERING LUMACURVE SIGNS**



## DETERMINING THE SIGN YOU NEED

**Use this guide to assist in filling out sign submittal forms.**

*Master submittal forms are included in this section (always make a copy of the original, retain the master)*

### Step 1: Select the appropriate submittal form

#### Lighted signs:

1 module submittal	1 module submittal(*)
2 module submittal	2 module submittal(*)
3 module submittal	3 module submittal(*)
4 module submittal	4 module submittal(*)

#### Unlighted signs:

4' single faced submittal
4' double faced submittal
6' single faced submittal
6' double faced submittal

*Lighted signs: 1, 2, 3 or 4 Module length is determined by the sign message.*

*Rule of thumb: 2 characters per module (dots, dashes & narrow characters count as ½ characters)*

*\*Designates Outer Mount foot print is for mode 3 signs (size 2 & 3 only)*

### Step 2: Complete the “Product” portion of the submittal form

#### • Select the product

- ☐ New sign
- ☐ Replacement legend panels only for existing sign
- ☐ Add-On conversion modules to extend an existing signs length

#### • Select the FAA Sign Size

**Size 1** - small (12” character, 18” face)

**Size 2** - medium (15” characters, 24” face)

**Size 3** - large (18” characters, 30” face)

**Size 4** - Distance Remaining (40” numbers, 48” face)

**Size 4** - Barrier engagement marker (39” dot, 48” face)

**Size 5** - Distance Remaining (25” numbers, 30” face)

#### • Select your Lighting Circuit “Style”

**FAA style “2”**

3 Step regulator(4.8A-6.6A)

**FAA style “3”**

5 step regulator (2.8A-6.6A)

**FAA style “5”**

5.5A constant current (sign circuit)

#### • Select your sign Class (temperature rating) and Mode (wind resistance rating)

**Class 1:** -4 degrees to +131 degrees F

**Mode 2:** withstands 200 mph wind loads  
(typical)

**Class 2:** -40 degrees to +131 degrees F  
(all Lumacurve systems are Class 2 rated)

**Mode 3:** withstands 300 mph wind loads  
(special high jet blast applications)



## DETERMINING THE SIGN YOU NEED

### Step 3: Select the “Lighting System” available for your Circuit

Circuit Type:	Lamp Options	
Style 2: 4.8A-6.6A (3 step regulator)	“LED” 4W	XTL 20W Quartz
Style 3: 2.8A-6.6A (5 step regulator)	“LED” 4W	XTL 20W Quartz
Style 5: 5.5A fixed (dedicated sign circuit)	“LED” 4W	XTL 20W Quartz

### Step 4: Record sign message and indicate legend panel colors

Record your sign legend. Above each module designate the panel color with one of the following:

#### Panel Color Key

<b>RO</b> ( <i>Mandatory message</i> )	White characters with a Black Outline on Red background
<b>Y</b> ( <i>Directional message</i> )	Black characters on Yellow background
<b>L</b> ( <i>Location message</i> )	Yellow characters on a Black background
<b>D</b> ( <i>Distance Remaining message</i> )	White number on Black background
<b>B</b> ( <i>Blank panel</i> )	

*If you are requesting **Panels Only**, the above designations should be followed by a “\*”*

### Step 5: Select any “Options” available for your sign

*Signs come complete with frangible couplings & floor flanges for mounting as well as 3/16” stainless tethers (one per sign module).*

- ☐ On/Off Switch (*weatherproof cover available*)
- ☐ 2” Field reference numbers
- ☐ Performance Tops

### Step 6: Place your order

*If you are uncertain as to how many modules are required, or where specific characters fall over the sign modules, contact Customer Service at 1-800-258-1997.*

#### LUMACURVE AIRFIELD SIGNS

9115 Freeway Dr., Macedonia, OH 44056  
800-258-1997    [www.lumacurve.com](http://www.lumacurve.com)



## PART NUMBERING KEY

*Lumacurve Catalog Number for Complete Signs*

### FAA Certified Lighting Systems

Lumacurve lighted signs can be ordered using the multi-element part number below, which indicates sign size, module length, and lamp type.

FAA SIGN SIZE	MOD LENGTH	LAMP TYPE
S = Size 1 (small)	1	L = "LED"; 4W (Style 2: 4.8A-6.6A, Style 3: 2.8A-6.6A & St 5: 5.5A)
M = Size 2 (medium)	2	X = "XTL"; 10V/20W Quartz (Style 2: 4.8A-6.6A and Style 3: 2.8A-6.6A)
L = Size 3 (large)	3	
D = Size 4 (distance remaining)	4	
DL = Size 5 (distance remaining)		
B = Size 4 (barrier engagement marking)		

(Example: "M3L" = Size 2, 3 Modules, "LED" 4W Lamp)

**Lighting Style:** Style 2 and style 3 systems are available with "XTL" 20W Quartz & "LED" 4W lamps in all sizes.  
Style 5 systems are available with "LED" 4W lamps in all sizes.

**Class:** All lighting systems are Class 2 (operation from -40°F [-40°C] to 131°F [55°C] environment).

**Mode:** All lighted signs are available in Mode 2 or 3 in accordance with FAA AC 150/5345-44.  
Mode 2 must withstand wind loads of 200 mph (322kph).  
Mode 3 must withstand wind loads of 300 mph (483 kph).

### FAA Certified UL Series - Unlighted Sign

UL SIGN SIZE	HEIGHT	LENGTH
SUL- 4 = Size 1 (small)	18"	4 = 4"
SUL- 6 = Size 1 (small)	18"	6 = 6"
MUL- 4 = Size 2 (medium)	24"	4 = 4"
MUL- 6 = Size 2 (medium)	24"	6 = 6"
LUL- 4 = Size 3 (large)	30"	4 = 4"
LUL- 6 = Size 3 (large)	30"	6 = 6"

(Example: "MUL-4" = Size 2, 4 foot)

**Mode:** All unlit signs are available in mode 2 in accordance with FAA AC 150/5345-44. Mode 2 must withstand wind loads of 200 mph (322kph).

#### LUMACURVE AIRFIELD SIGNS

9115 Freeway Dr., Macedonia, OH 44056  
800-258-1997 www.lumacurve.com

# FAA L-858 AIRFIELD GUIDANCE SIGN



# LUMACURVE®

## AIRFIELD SIGNS

800.258.1997    www.lumacurve.com

AIRPORT CODE:

CREATION DATE:

AIRPORT, STATE:

REVISION DATE:

PROJECT TITLE:

PROJECT NUMBER:

SSI ORDER NUMBER:

SIGN NUMBER: \_\_\_\_\_ PART # \_\_\_\_\_

ITEM: \_\_\_\_\_ LIGHTING: \_\_\_\_\_

SIZE: \_\_\_\_\_ STYLE: \_\_\_\_\_

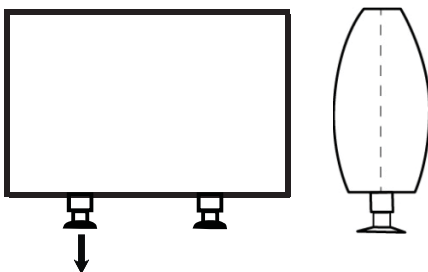
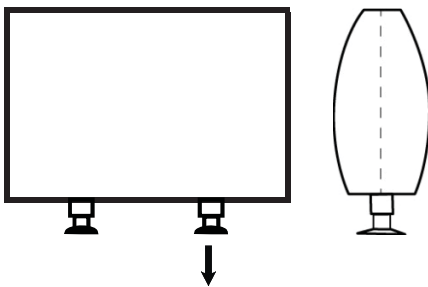
LENGTH: 1-mod ISO XFMR: \_\_\_\_\_

CLASS: 2 VA: \_\_\_\_\_

MODE: 2 PF: \_\_\_\_\_

### OPTIONS

Switch - With Cover
Switch - Without Cover
2" I.D. #, One End
2" I.D. #, Two Ends
1 Tether per Leg
Performance Top
Sign Ground Lug
Other:



### SPECIAL INSTRUCTIONS:

### LEGEND KEY

R = White w/Black Outline on Red

Y = Black on Yellow

L = Yellow on Black

↓ = Power Cord

### NOTES

Sign and Legend are not to scale. Submittal is for approval of sign information and legend only.

If face panel arrow angle orientations are not specified, we default to 45 degree increments from vertical zero.

Signs include: Frangible couplings, floor flanges, & one tether per module.

# FAA L-858 AIRFIELD GUIDANCE SIGN



# LUMACURVE®

## AIRFIELD SIGNS

800.258.1997    www.lumacurve.com

AIRPORT CODE:

CREATION DATE:

AIRPORT, STATE:

REVISION DATE:

PROJECT TITLE:

PROJECT NUMBER:

SSI ORDER NUMBER:

SIGN NUMBER: \_\_\_\_\_ PART # \_\_\_\_\_

ITEM: \_\_\_\_\_

LIGHTING: \_\_\_\_\_

SIZE: \_\_\_\_\_

STYLE: \_\_\_\_\_

LENGTH: 2-mod

ISO XFMR: \_\_\_\_\_

CLASS: 2

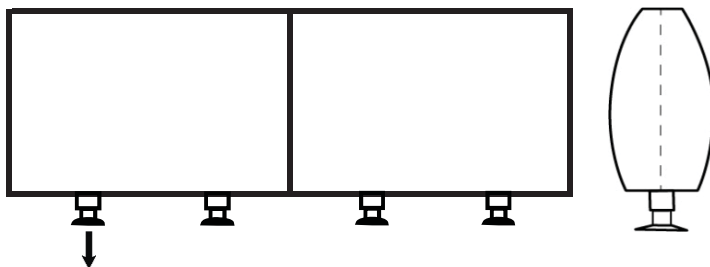
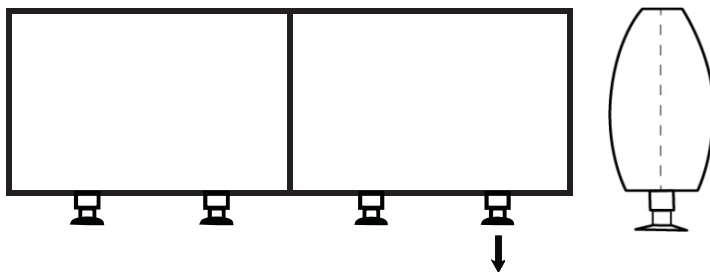
VA: \_\_\_\_\_

MODE: 2

PF: \_\_\_\_\_

### OPTIONS

Switch - With Cover
Switch - Without Cover
2" I.D. #, One End
2" I.D. #, Two Ends
1 Tether per Leg
Performance Top
Sign Ground Lug
Other:



### SPECIAL INSTRUCTIONS:

### LEGEND KEY

R = White w/Black Outline on Red

Y = Black on Yellow

L = Yellow on Black

↓ = Power Cord

### NOTES

Sign and Legend are not to scale. Submittal is for approval of sign information and legend only.

If face panel arrow angle orientations are not specified, we default to 45 degree increments from vertical zero.

Signs include: Frangible couplings, floor flanges, & one tether per module.

# FAA L-858 AIRFIELD GUIDANCE SIGN



# LUMACURVE®

## AIRFIELD SIGNS

800.258.1997 www.lumacurve.com

AIRPORT CODE:

CREATION DATE:

AIRPORT, STATE:

REVISION DATE:

PROJECT TITLE:

PROJECT NUMBER:

SSI ORDER NUMBER:

SIGN NUMBER: \_\_\_\_\_ PART # \_\_\_\_\_

ITEM: \_\_\_\_\_

LIGHTING: \_\_\_\_\_

SIZE: \_\_\_\_\_

STYLE: \_\_\_\_\_

LENGTH: 3-mod

ISO XFMR: \_\_\_\_\_

CLASS: 2

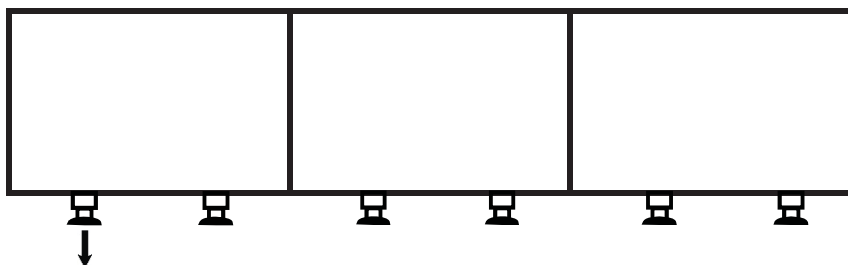
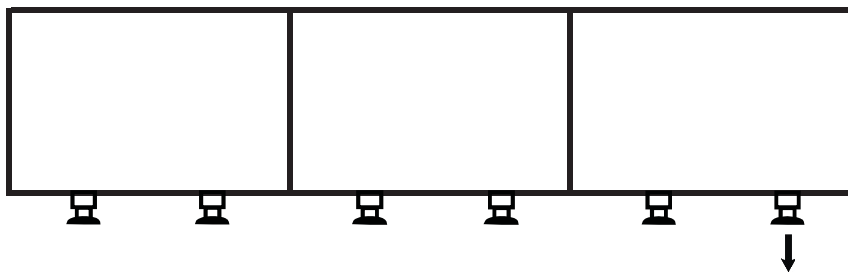
VA: \_\_\_\_\_

MODE: 2

PF: \_\_\_\_\_

### OPTIONS

<input type="checkbox"/>	Switch - With Cover
<input type="checkbox"/>	Switch - Without Cover
<input type="checkbox"/>	2" I.D. #, One End
<input type="checkbox"/>	2" I.D. #, Two Ends
<input type="checkbox"/>	1 Tether per Leg
<input type="checkbox"/>	Performance Top
<input type="checkbox"/>	Sign Ground Lug
<input type="checkbox"/>	Other:



### SPECIAL INSTRUCTIONS:

### LEGEND KEY

R = White w/Black Outline on Red

Y = Black on Yellow

L = Yellow on Black

↓ = Power Cord

### NOTES

Sign and Legend are not to scale. Submittal is for approval of sign information and legend only.

If face panel arrow angle orientations are not specified, we default to 45 degree increments from vertical zero.

Signs include: Frangible couplings, floor flanges, & one tether per module.



# FAA L-858 AIRFIELD GUIDANCE SIGN



# LUMACURVE®

## AIRFIELD SIGNS

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AIRPORT CODE:

CREATION DATE:

AIRPORT, STATE:

REVISION DATE:

PROJECT TITLE:

PROJECT NUMBER:

SSI ORDER NUMBER:

SIGN NUMBER: \_\_\_\_\_ PART # \_\_\_\_\_

ITEM: \_\_\_\_\_ LIGHTING: \_\_\_\_\_

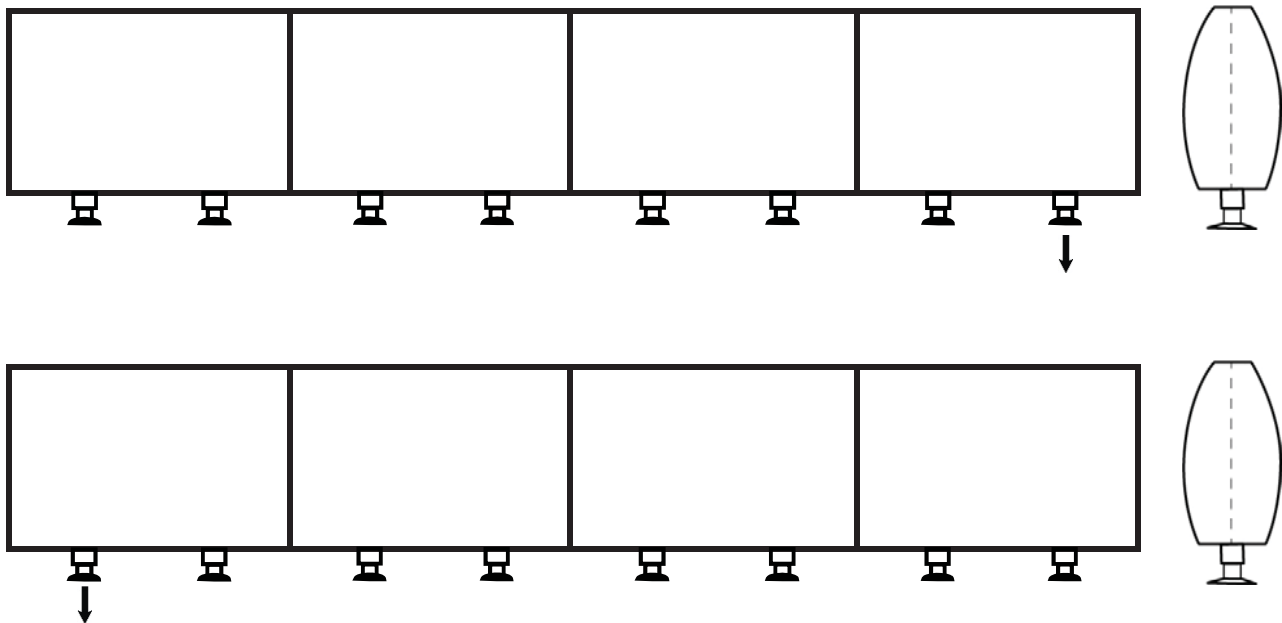
SIZE: \_\_\_\_\_ STYLE: \_\_\_\_\_

LENGTH: 4-mod ISO XFMR: \_\_\_\_\_

CLASS: 2 VA: \_\_\_\_\_

MODE: 2 PF: \_\_\_\_\_

OPTIONS	
<input type="checkbox"/>	Switch - With Cover
<input type="checkbox"/>	Switch - Without Cover
<input type="checkbox"/>	2" I.D. #, One End
<input type="checkbox"/>	2" I.D. #, Two Ends
<input type="checkbox"/>	1 Tether per Leg
<input type="checkbox"/>	Performance Top
<input type="checkbox"/>	Sign Ground Lug
<input type="checkbox"/>	Other:



## SPECIAL INSTRUCTIONS:

## LEGEND KEY

R = White w/Black Outline on Red    Y = Black on Yellow    L = Yellow on Black    ↓ = Power Cord

## NOTES

Sign and Legend are not to scale. Submittal is for approval of sign information and legend only.

If face panel arrow angle orientations are not specified, we default to 45 degree increments from vertical zero.

Signs include: Frangible couplings, floor flanges, & one tether per module.

# FAA L-858 AIRFIELD GUIDANCE SIGN



# LUMACURVE®

## AIRFIELD SIGNS

800.258.1997    www.lumacurve.com

AIRPORT CODE:

CREATION DATE:

AIRPORT, STATE:

REVISION DATE:

PROJECT TITLE:

PROJECT NUMBER:

SSI ORDER NUMBER:

SIGN NUMBER: \_\_\_\_\_ PART # \_\_\_\_\_

ITEM: \_\_\_\_\_

LIGHTING: \_\_\_\_\_

SIZE: 4 (D)

STYLE: \_\_\_\_\_

CLASS: 2

ISO XFMR: \_\_\_\_\_

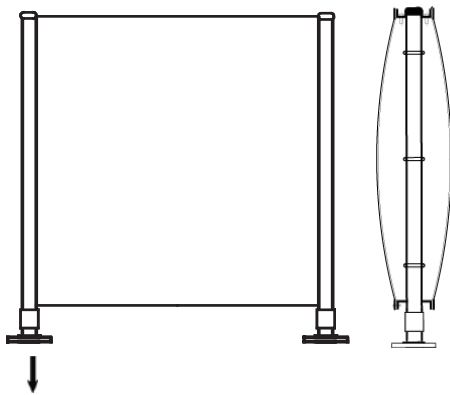
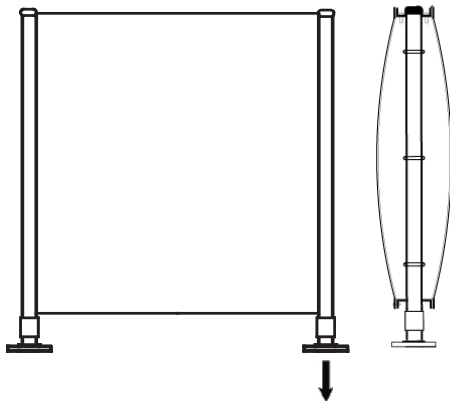
MODE: 2

VA: \_\_\_\_\_

PF: \_\_\_\_\_

### OPTIONS

Switch - With Cover
Switch - Without Cover
2" I.D. #, One End
2" I.D. #, Two Ends
Sign Ground Lug
Other:



### SPECIAL INSTRUCTIONS:

### LEGEND KEY

D = White on Black

B = Blank (Black)

↓ = Power Cord

### NOTES

Sign and Legend are not to scale. Submittal is for approval of sign information and legend only.

Signs include: Frangible couplings, floor flanges, & one tether per leg.

# FAA L-858 AIRFIELD GUIDANCE SIGN



# LUMACURVE®

## AIRFIELD SIGNS

800.258.1997    www.lumacurve.com

AIRPORT CODE:

CREATION DATE:

AIRPORT, STATE:

REVISION DATE:

PROJECT TITLE:

PROJECT NUMBER:

SSI ORDER NUMBER:

SIGN NUMBER: \_\_\_\_\_ PART # \_\_\_\_\_

ITEM: \_\_\_\_\_

LIGHTING: \_\_\_\_\_

SIZE: 4 (D)

STYLE: \_\_\_\_\_

CLASS: 2

ISO XFMR: \_\_\_\_\_

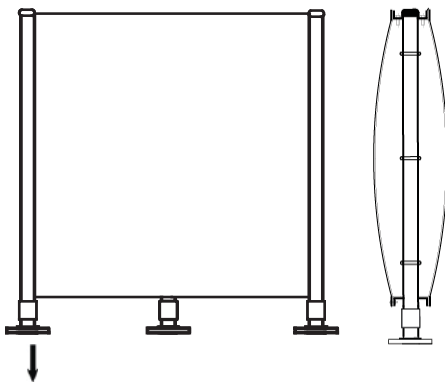
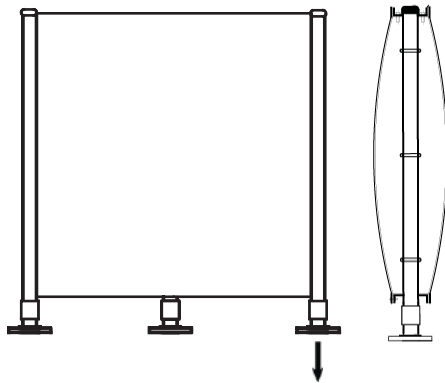
MODE: 3

VA: \_\_\_\_\_

PF: \_\_\_\_\_

### OPTIONS

<input type="checkbox"/>	Switch - With Cover
<input type="checkbox"/>	Switch - Without Cover
<input type="checkbox"/>	2" I.D. #, One End
<input type="checkbox"/>	2" I.D. #, Two Ends
<input type="checkbox"/>	Sign Ground Lug
<input type="checkbox"/>	Other:



### SPECIAL INSTRUCTIONS:

### LEGEND KEY

D = White on Black

B = Blank (Black)

↓ = Power Cord

### NOTES

Sign and Legend are not to scale. Submittal is for approval of sign information and legend only.

Signs include: Frangible couplings, floor flanges, & one tether per leg.

# **LUMACURVE SIGN ELECTRICAL SYSTEMS**



## LED LIGHTING SYSTEM

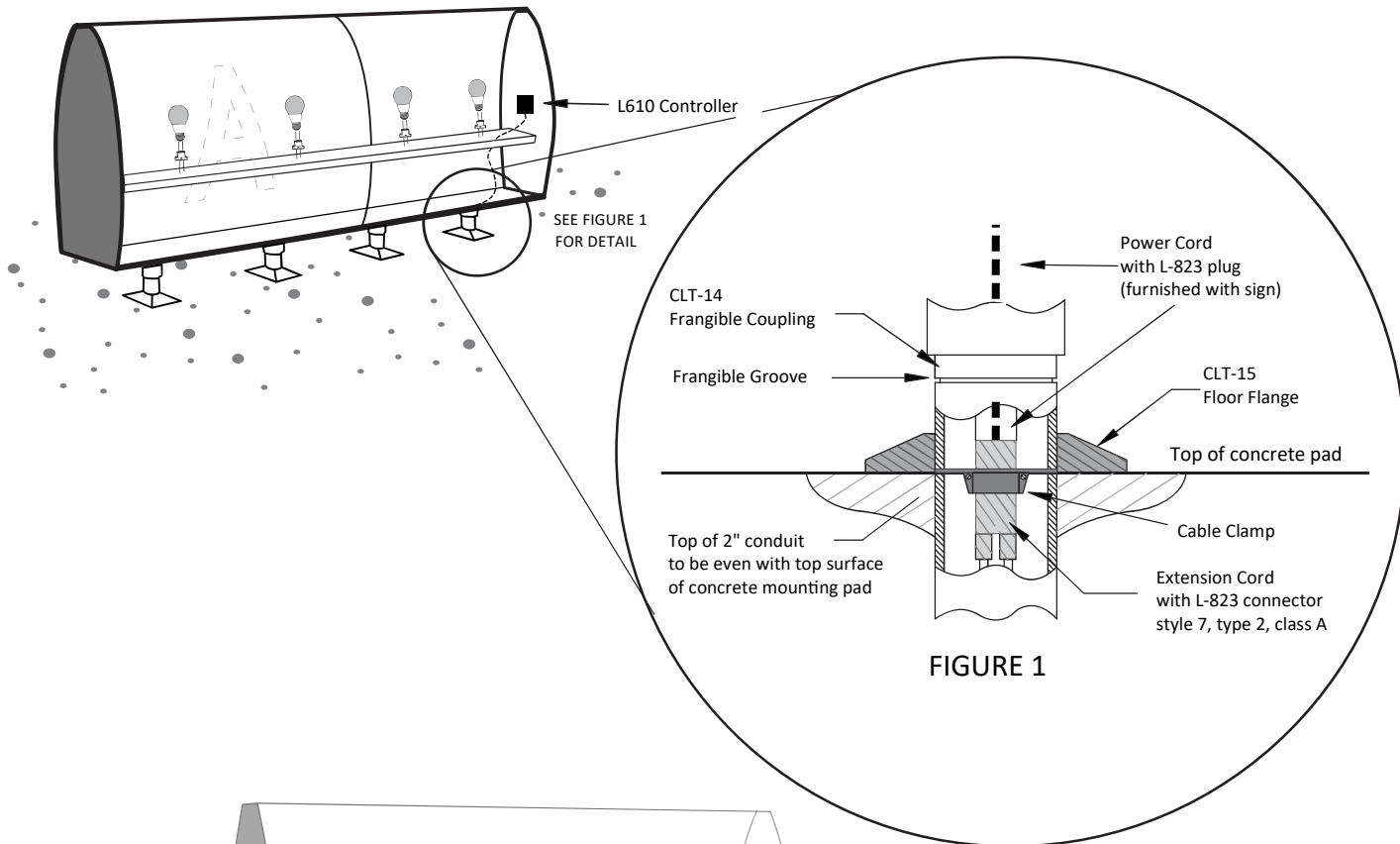
### VA Loading & Power Factors

#### Certified to current FAA Advisory Circular 150/5345-44

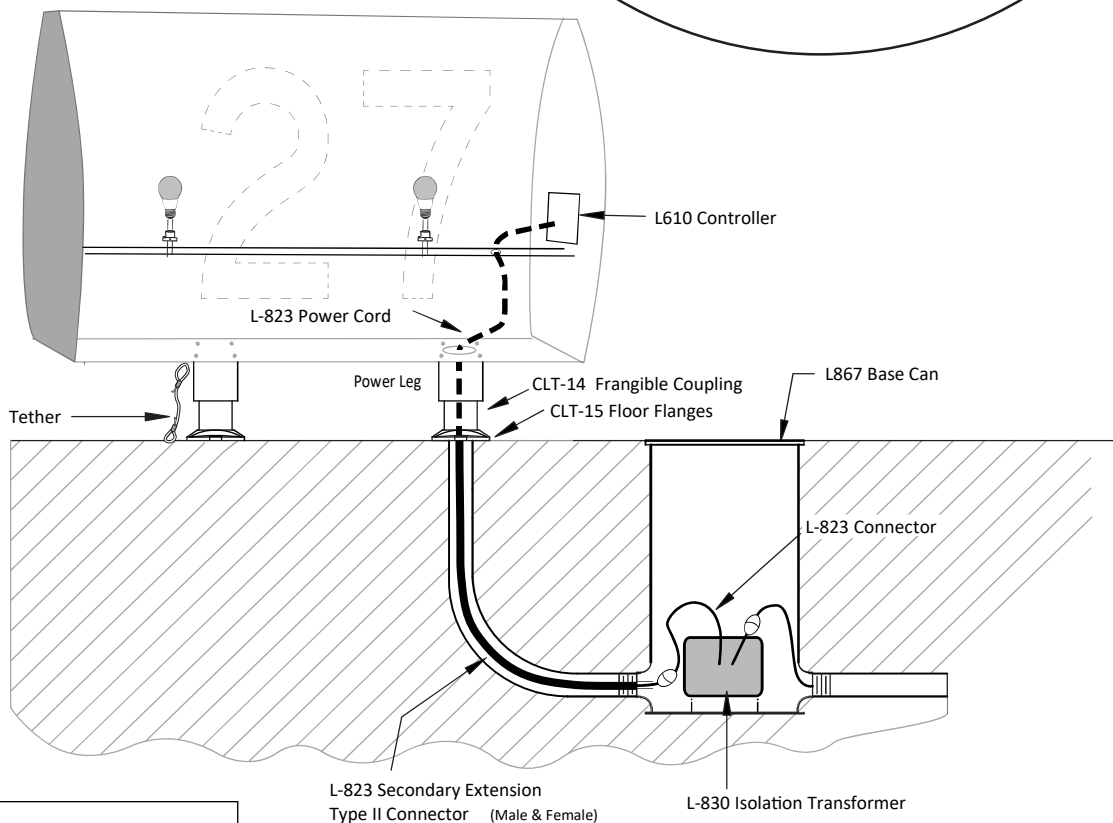
Specification for Runway and Taxiway Signs

*View our Certificate of Conformance*

		FAA Style 2 (4.8A-6.6A) FAA Style 3 (2.8A-6.6A)			FAA Style 5 (5.5A)		
SIGN SIZE & MODULE LENGTH	LAMPS	4W LED			4W LED		
		ISO XFMR	MAX VA	POWER FACTOR	ISO XFMR	MAX VA	POWER FACTOR
Size 1, 1-mod	2	100W	49	.94	100W	37	.94
2-mod	4	100W	64	.88	100W	48	.89
3-mod	6	100W	67	.89	100W	50	.90
4-mod	8	100W	73	.90	100W	56	.91
Size 2, 1-mod	3	100W	62	.87	100W	46	.88
2-mod	6	100W	67	.89	100W	50	.90
3-mod	9	100W	74	.90	100W	58	.92
4-mod	12	100W	78	.91	100W	62	.93
Size 3, 1-mod	3	100W	62	.87	100W	46	.88
2-mod	6	100W	67	.89	100W	50	.90
3-mod	9	100W	74	.90	100W	58	.92
4-mod	12	100W	78	.91	100W	62	.93
Size 5, 1-mod	3	100W	62	.87	100W	46	.88
Size 4, 1-mod	6	100W	67	.89	100W	50	.90



**FIGURE 1**





## LED LIGHTING SYSTEM

### Technical Information

### LUMACURVE LED System

The LUMACURVE LED system maintains constant sign brightness in accordance with FAA A/C 150-5345-44 with appreciably higher efficiency relative to traditional lighting systems, and is available in new signs or in kit form for retrofit. This system delivers a constant voltage to the 4W LED lamps at all CCR current steps. This system works equally well for high intensity (Style 3, 2.8A-6.6A), medium intensity (Style 2, 4.8A-6.6A) and Style 5 (5.5A fixed) dedicated sign circuits without internal modification\*. The lamps authorized for use in this system are Standard Signs, Inc. 4W LED lamps with medium screw base. They are available directly from Standard Signs, Inc.

#### **IMPORTANT!**

*The LUMACURVE LED lighting system is designed exclusively for FAA styles 2, 3 & 5 operation on a series circuit together with and without non-sign fixtures, such as edge lights, where the sign brightness control components are necessary to maintain constant sign brightness regardless of CCR step.*

### INSTALLATION:

System lamp voltage is factory set but we recommend that one sign per CCR be spot checked with a DC voltmeter after installation. Lamp voltage is read across the lamp socket leads. If voltage varies from recommended settings (170V DC for Sizes 1, 2, 3, and 5), call and ask for technical support: 800-258-1997.

### LAMP REPLACEMENT:

When a lamp fails, the controller will sense that there is a lamp out and will turn off the remaining lamps. This feature is required per current FAA specifications. With the sign energized, press and hold the lamp reset button located on the side of the controller. Release reset button immediately when lamps are energized. The sign will relight except for the failed lamp. Replace the failed lamp(s). This completes the lamp replacement process. The controller does not need to be reset again.

#### **WARNING:**

*The use of non-OEM replacement lamps may damage electrical components as well as cause premature lamp failure. Only OEM Lumacurve 4W LED lamps will maintain FAA certifications and factory warranties.*

### DIELECTRIC GREASE:

These LED lamps are powered by a DC source and are susceptible to corrosion from moisture. We recommend the use of dielectric grease on the lamp base to prevent corrosion.

\*Isolation transformer wattage requirements may vary for each application.

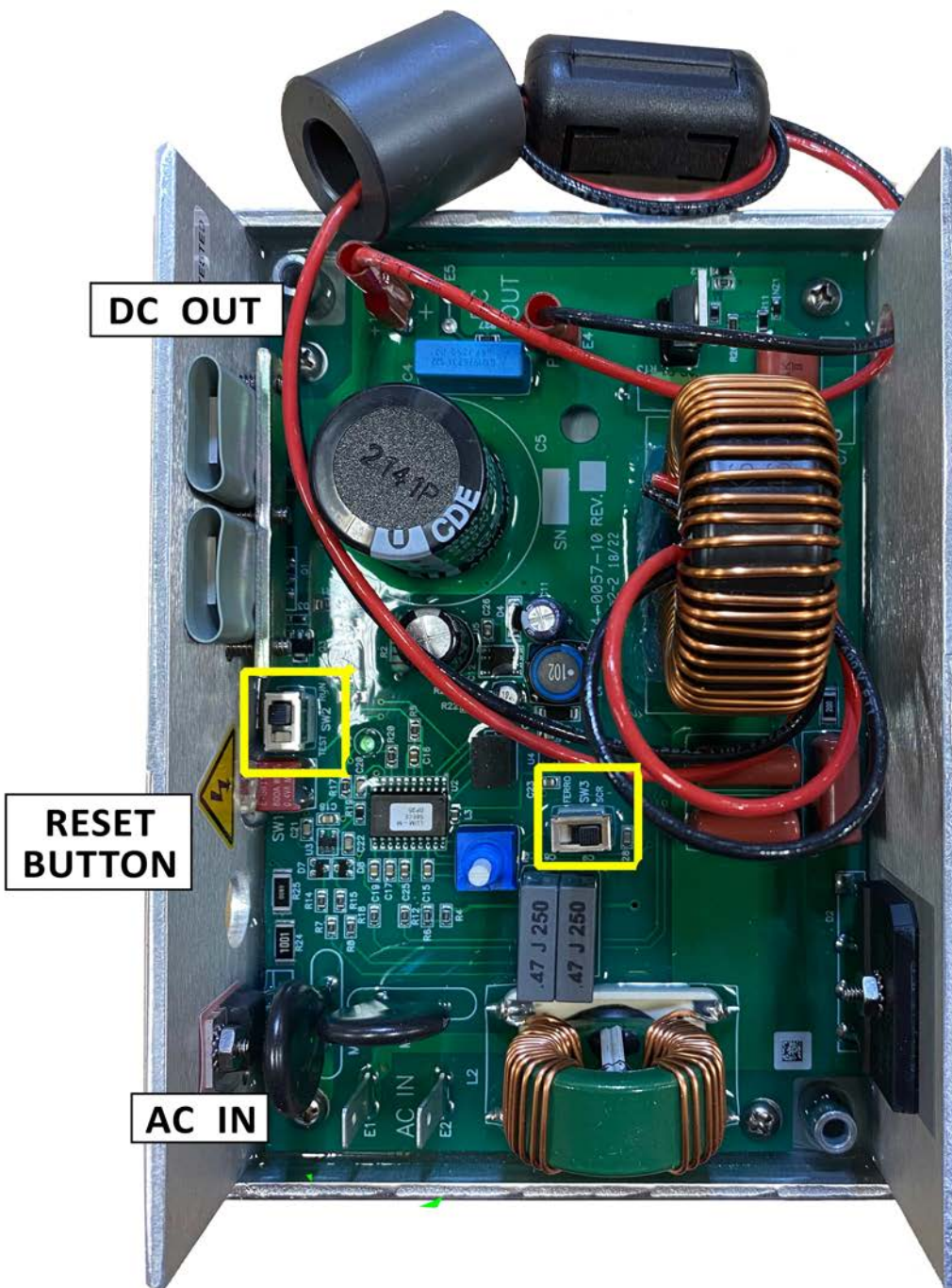


## LED LIGHTING SYSTEM

*L-610 Controller*

### L610 CONTROLLER

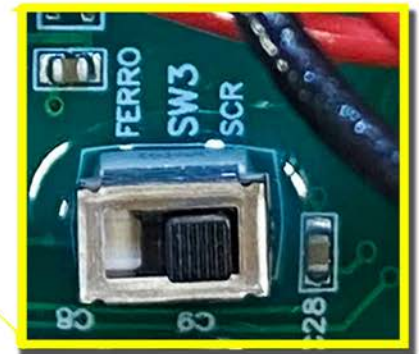
- Switch SW2 (Run & Test) is used to isolate controller programming functions when troubleshooting (1 out all out).
- Switch SW3 (Ferro & SCR) is used to set controller functions with constant current regulators (CCR's)



**SW2**



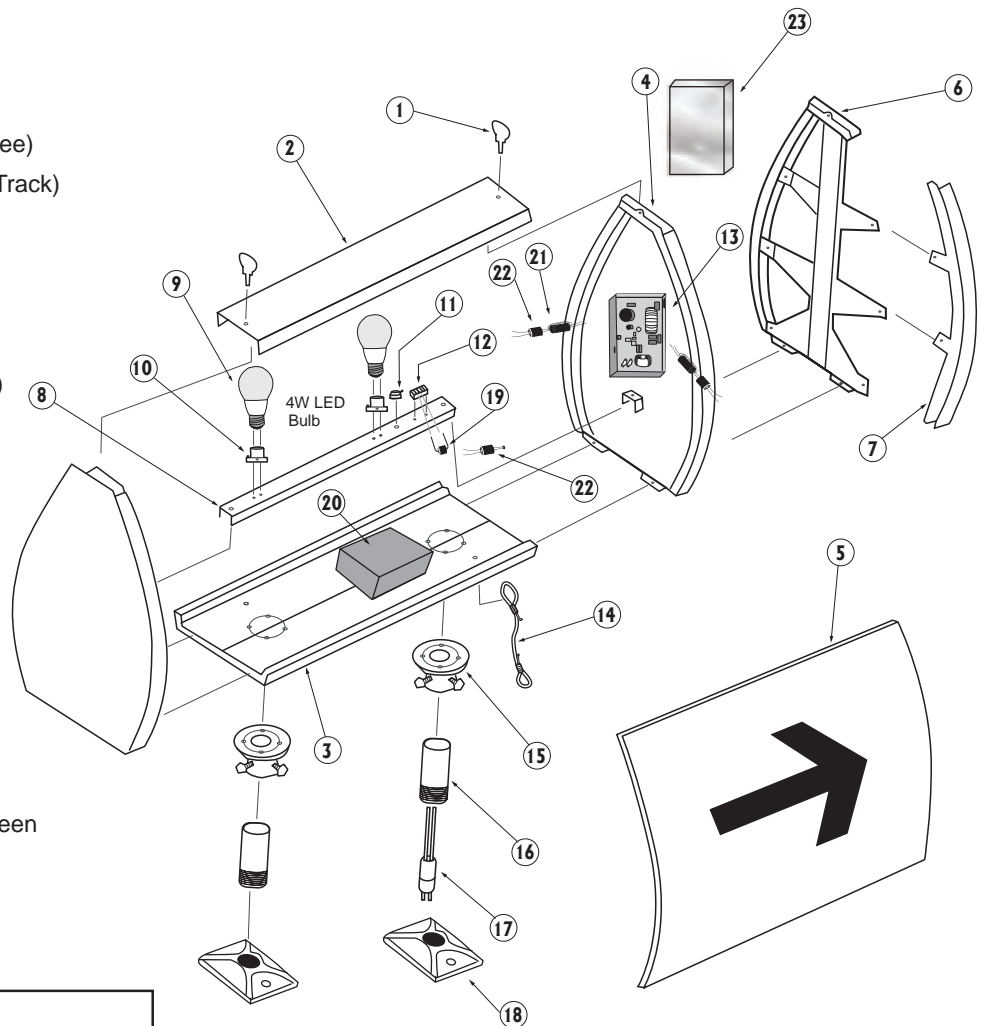
**SW3**



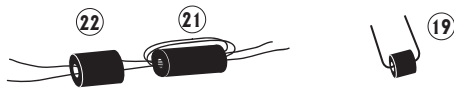
## LED LIGHTING SYSTEM

### Parts

Item	Description
1. 340/345	Turn Fasteners
2. *CLT-2	Cover
3. *CLT-3	Base
4. *CLT-4	End Panel
5. *CLT-5	Legend Panel <sup>1</sup>
6. *CLT-6	Multi-Module Insert (Tree)
7. *7-B	Face Insert Channel <sup>2</sup> (Track)
8. *8-A	Light Bar
9. LED Lamp	4W LED Lamp
10. 500Medium	Screw Socket
11. 480 Cable	Clamp
12. 420	Terminal Strip (section)
13. L610	LED PCB Controller
14. 190-3/16"	Tether
15. 130	Slipfitter
16. *140	6" Frangible Coupling
17. 430	Cord & Plug
18. 15	Floor Flange
19. E416	Surge Protector
20. Filter	ALD Low Pass Filter
21. Ferrite A	Ferrite Core Split
22. Ferrite B	Ferrite Core Not Split
23. G EMI Shield Screen	Controller Screen



#### Enlarged Views



#### To help in placing your order:

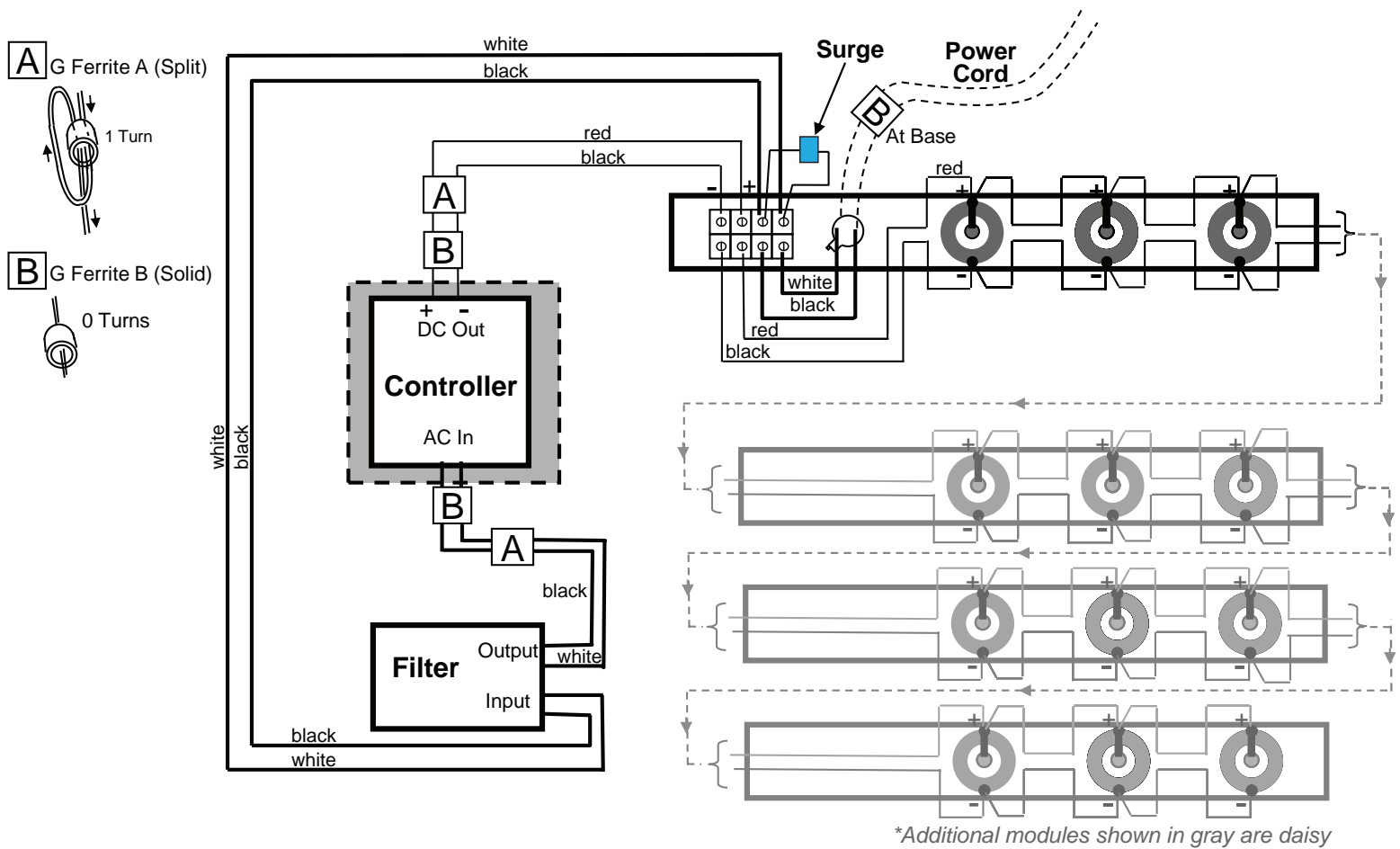
\*Prefix part number with one of the following sign sizes: "S" (small/ size 1), "M" (medium/ size 2), "L" (large/ size 3 & 5)

<sup>1</sup> Specify one of the following sign types: L-858Y ("Y"ellow), L-858R ("R"ed), L-858L ("L"ocation), or Blank/ Black

<sup>2</sup> Specify one of the following track colors: (B) Black, (Y) Yellow or (R) Red

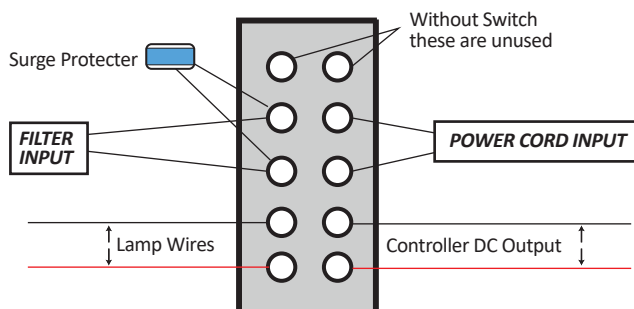
## LED LIGHTING SYSTEM

### Electrical Wiring Diagram

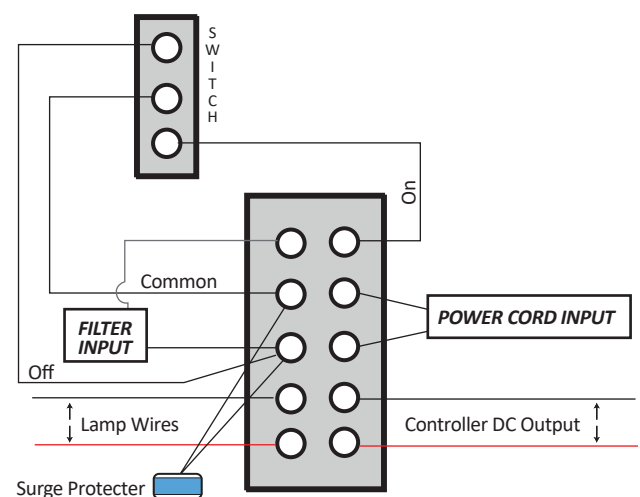


## On/Off Switch Wiring

### LED Sign - NO SWITCH



### LED Sign - SWITCH



# **LUMACURVE SIGN INSTALLATION & MODIFICATIONS**

**—— DO NOT DISCARD ——**  
Important information for AIRPORT MAINTENANCE DEPT

**To install:**

1. Locate the frangible couplings (item #1 see Electrical Connection Detail on page 2) and floor flanges (#2) that are provided with the sign. (Small sign orders may be packaged in the box with the sign. Larger order will have a separate carton containing this hardware). Coat the threads of the frangible coupling with anti-seize compound or petroleum jelly. Then screw them hand tight into the floor flanges.

***Note: It is also crucial that the correct couplings be used with the sign. The coupling size and mode are etched on the outside of the coupling. Incorrectly sized couplings will not meet FAA frangibility requirements.***

2. Locate the power cord (#4). It will be visible protruding from the power leg slip fitter.

***Note: the power cord and electrical components are located in the module nearest the nameplate on the end of the sign.***

3. Slip the coupling/floor flange assemblies into each slip fitter (#3) on the bottom of the sign. Tighten the set screws (#5) just enough to hold them in place. Floor flanges must be oriented with mounting holes perpendicular to sign base. For the power cord leg, pull enough power cord slack from the sign to connect with the isolation transformer secondary extension cord (#6).

***Note: The provided power cord is extra-long to allow exiting the sign through any leg desired.***

***Note: in a typical remote L867 base can installation, the sign leg is connected to the remote can with 2" rigid galvanized steel (RGS) conduit. An isolation transformer secondary extension cord (#6) is fed through the conduit and connects the sign power cord plug to the isolation transformer secondary plug.***

4. Locate the cable clamp (#7, provided with the sign for most new sign installations). Tighten the cable clamp (#7) onto the isolation transformer secondary extension cord female plug at grade level. Ensure the cable clamp side labeled "TOP" is facing up. The cable clamp should nest on the underside of the floor flange (#2) and on top of the conduit (#8) that is flush with the surface of the concrete mounting pad. Insert the power cord plug (male) into the isolating transformer secondary extension cord (female).

***Note: As required by the FAA, this step, in conjunction with step 6, ensures that the power cord will be disconnected/unplugged if the sign is knocked over.***



## To install (continued):

**5.** Lift the sign upright into place on the cement pad. Use the sign as a template to locate and mark mounting holes. Place sign off to one side and install anchor bolts. *Recommended anchor bolts: 3/8" x 5" for mode 2 signs, 1/2" x 5" for mode 3 signs.* Position sign over the anchor bolts and fasten the floor flanges to the cement pad with lock washers and nuts. Temporarily loosen the slip fitter set screws (#5). With a pipe wrench, tighten the frangible couplings 1/4 - 1/2 turn into the Floor Flanges. (*Warning: Do not use the wrench above the shear groove.*) Ensure that the sign is level and the modules are aligned by sighting down the length of the tops. Tighten the slip fitter set screws using a socket wrench.

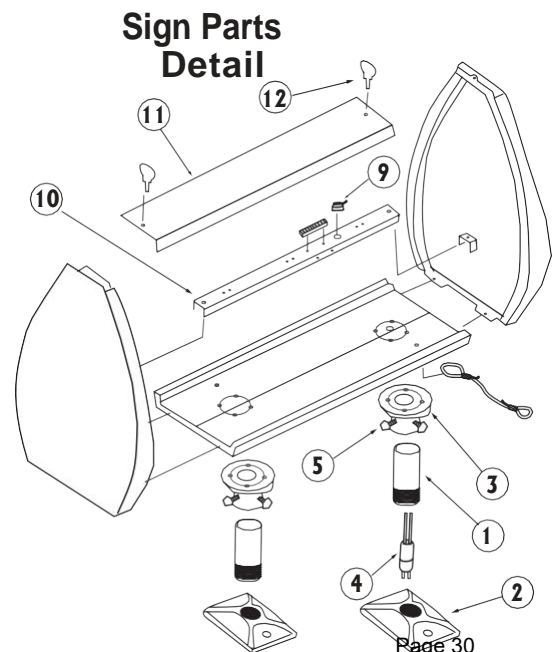
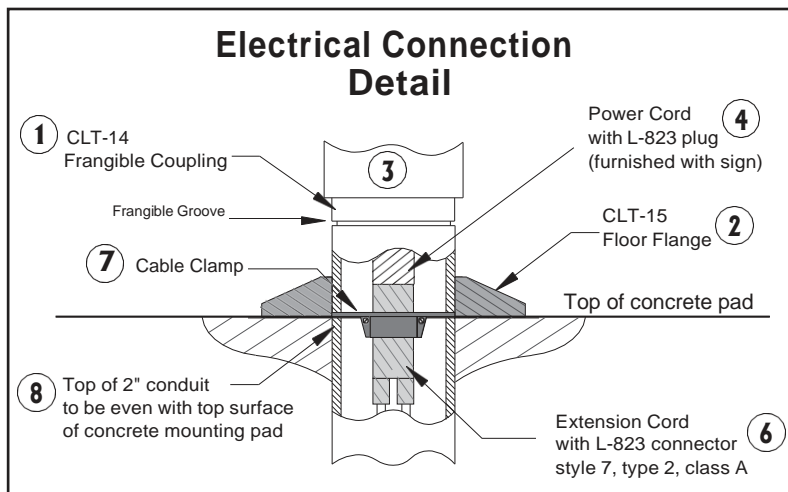
**6.** Locate the strain relief clamp (#9) inside of the sign on the light bar (#10). Remove the sign cover (#11) nearest to the nameplate on the end of the sign by unscrewing the two turn fasteners (#12) and slide out the legend panels. Remove all slack in the power cord between the plug and the strain relief clamp, then tighten the set screw on the strain relief clamp. The extra cord can be coiled & put in the bottom of the sign. (*As required by the FAA, this step in conjunction with Step 4 ensures that the power cord will be disconnected/ unplugged in the event that the sign is knocked over.*)

**7.** Electrical adjustments are now required. Power supply settings have been factory set but must be rechecked with an RMS meter once installed in the airfield environment. Please refer to the "Parts & Electrical Information" sheet for the lighting system being installed. Follow the "Installation" portion of those directions to ensure that the electrical settings are correct.

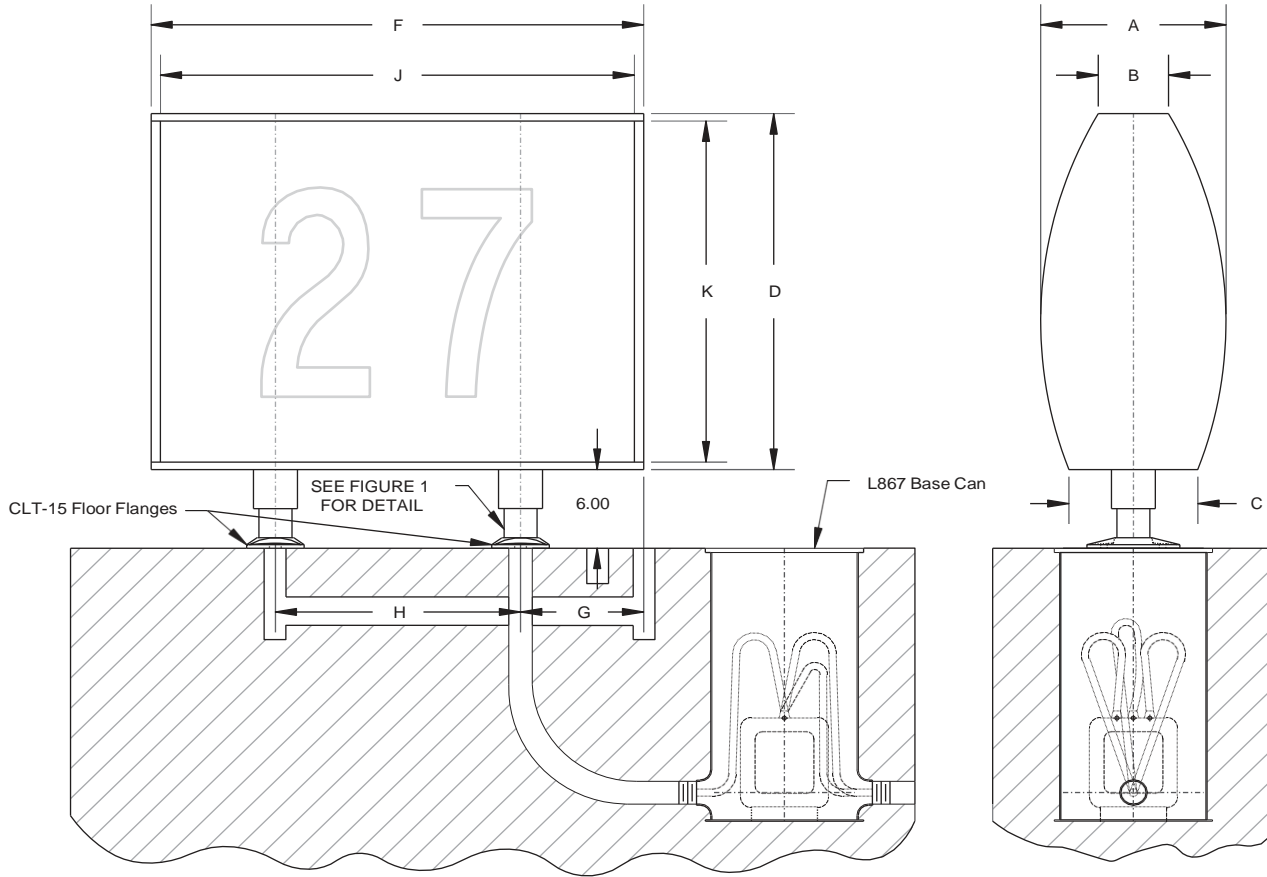
**8.** Replace any covers removed.

**Note: sometimes legend panels seem to obstruct the re-installation of the top covers.**

*If panels are not engaging on the underside of the top cover into the gasketed channel, please try the following: Engage the turn fasteners loosely. With the palms of your hands, slap or "pop" the centers of the opposing panels inward simultaneously. The internal pressure should apply a force that allows the top to drop into place. Apply pressure downward on the top. The technique worked and if panels are correctly installed. The resistance to tightening the turn fasteners will be eliminated.*

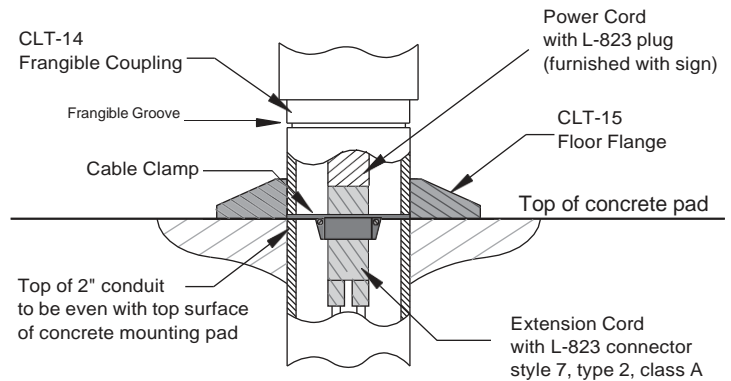


## Installation Drawings



Size	1	2	3
Letter Ht.	12.0 (305)	15.0 (381)	18.0 (457)
Lamps	1	2	2*
A	13.2 (335)	14.4 (366)	15.8 (401)
B	6.0 (152)	6.0 (152)	6.0 (152)
C	11.0 (280)	11.0 (280)	11.0 (280)
D	19.3 (490)	25.3 (643)	31.3 (795)
F	29.4 (747)	36.6 (930)	42.0 (1067)
G	7.4 (188)	9.2 (234)	10.6 (269)
H	14.6 (371)	18.2 (462)	20.9 (531)
J	27.8 (706)	35.0 (889)	40.4 (1026)
K	18.0 (457)	24.0 (610)	30.0 (762)

Note: Dimensions are in english with metric equivalents in parenthesis



**FIGURE 1**



**Certified to current FAA Advisory Circular 150/5345-44**

Specification for Runway and Taxiway Signs  
*View our Certificate of Conformance*

**LUMACURVE LED System**

The LUMACURVE LED system maintains constant sign brightness per FAA A/C 150-5345-44, with appreciably higher efficiency than traditional lighting systems, and is available in new signs or kit form for retrofit. This system delivers a constant voltage to the 4W LED lamps at all CCR current steps. This system works equally well for high intensity (Style 3, 2.8A-6.6A), medium intensity (Style 2, 4.8A-6.6A), and Style 5 (5.5A fixed) dedicated sign circuits without internal modification\*. The lamps authorized for use in this system are Standard Signs, Inc. 4W LED lamps with a medium screw base. They are available directly from Standard Signs, Inc.

**IMPORTANT!**

The LUMACURVE LED lighting system is designed exclusively for FAA styles 2, 3 & 5 operation on a series circuit together with and without non-sign fixtures, such as edge lights, where the sign brightness control components are necessary to maintain constant sign brightness regardless of CCR step.

**INSTALLATION:**

System lamp voltage is factory set, but we recommend that one sign per CCR be spot-checked with a DC voltmeter after installation. Lamp voltage is read across the lamp socket leads. If voltage varies from recommended settings (170V DC for Sizes 1, 2, 3, and 5), call and ask for technical support: 800-258-1997.

**LAMP REPLACEMENT:**

When a lamp fails, the controller will sense that there is a lamp out and will turn off the remaining lamps. This feature is required per current FAA specifications. With the sign energized, press and hold the lamp reset button located on the side of the controller. Release reset button immediately when lamps are energized. The sign will relight except for the failed lamp. Replace the failed lamp(s). This completes the lamp replacement process. The controller does not need to be reset again.

**WARNING:**

The use of non-OEM replacement lamps may damage electrical components as well as cause premature lamp failure. Only OEM Lumacurve 4W LED lamps will maintain FAA certifications and factory warranties.

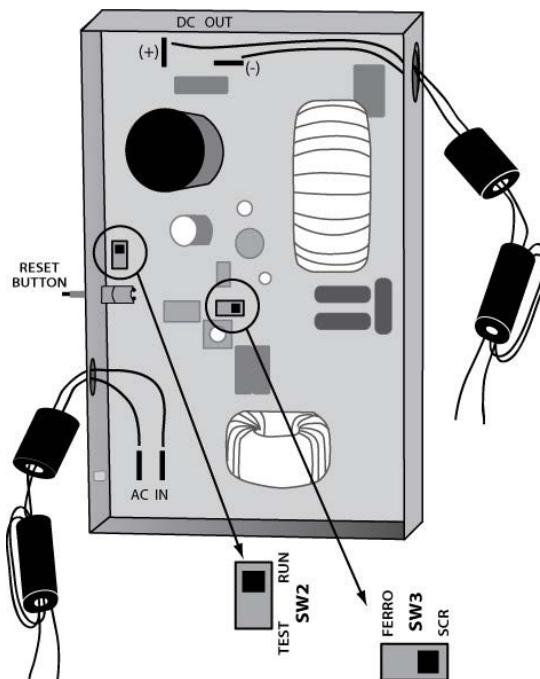
**DIELECTRIC GREASE:**

These LED lamps are powered by a DC source and are susceptible to corrosion from moisture. We recommend the use of dielectric grease on the lamp base to prevent corrosion.

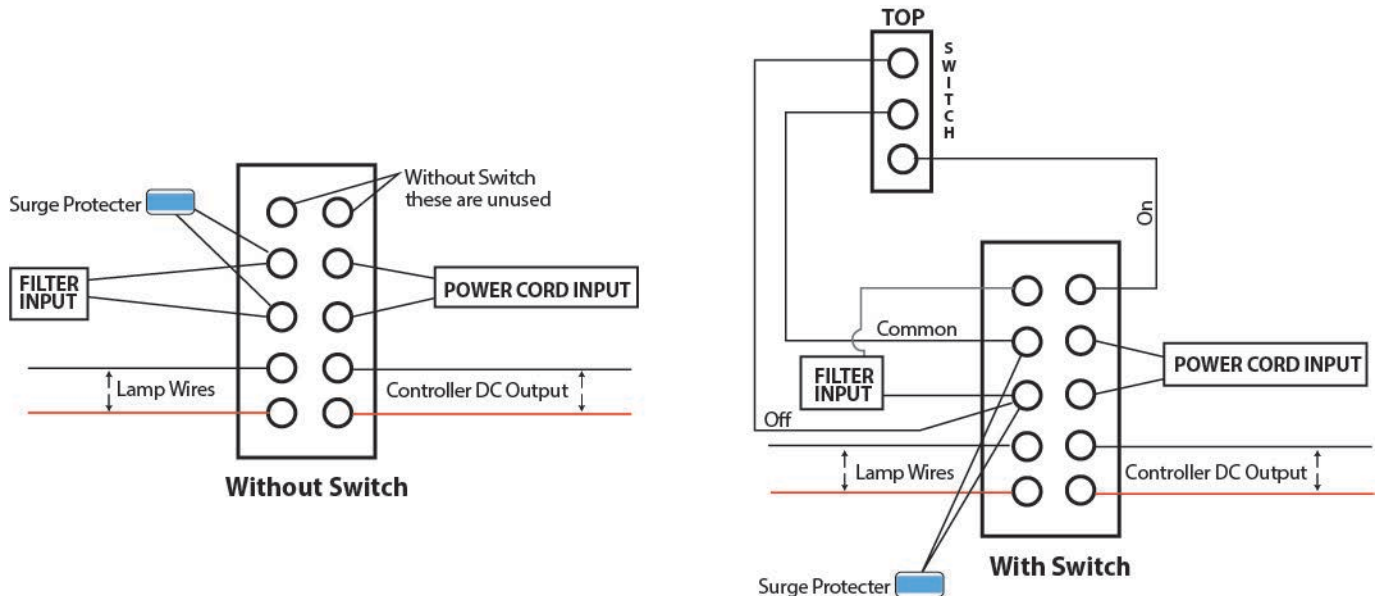
\*Isolation transformer wattage requirements may vary for each application.

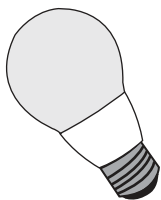
## L610 CONTROLLER

- Switch SW2 (Run & Test) isolates controller programming functions when troubleshooting (One out allout).
- Switch SW3 (Ferro & SCR) is used to set controller functions with constant current regulators (CCR's)



## ON/OFF SWITCH WIRING





# LUMACURVE PARTS LIST

## LED Lighting Systems

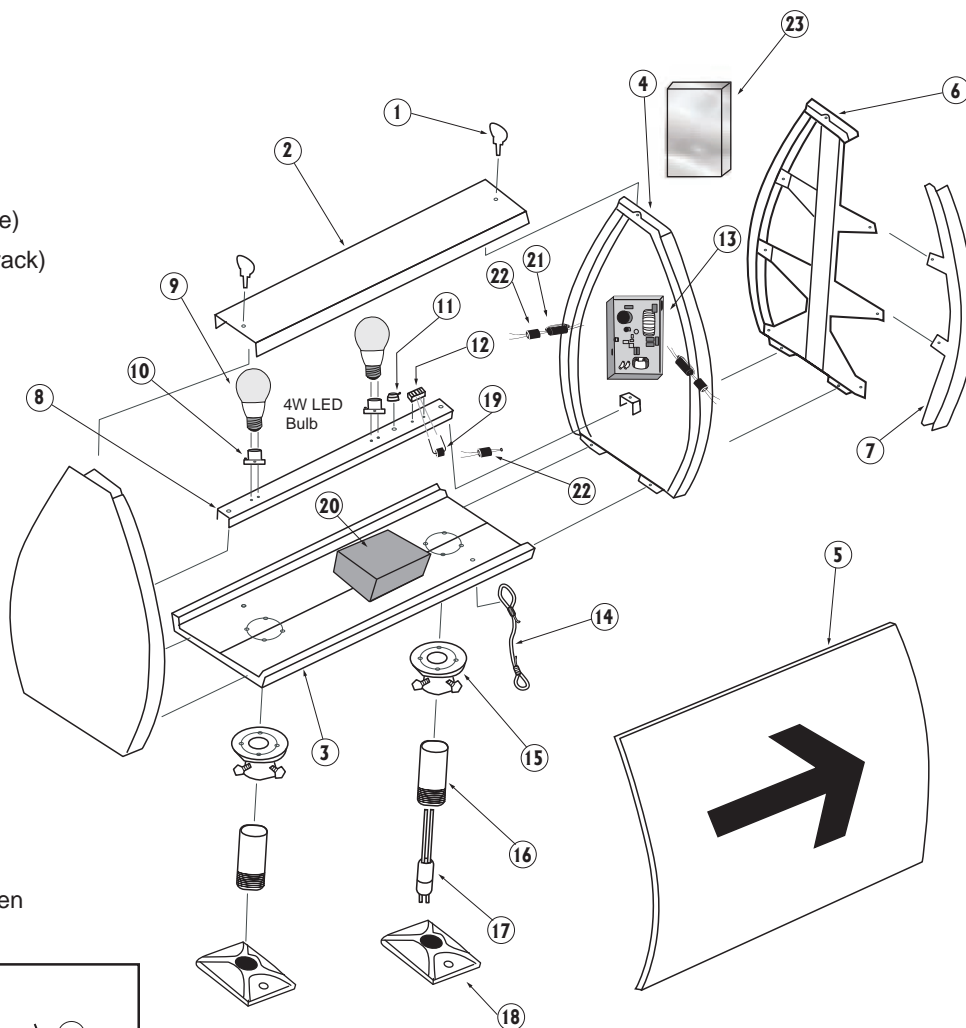
(4W LED screw base type lamp)

**Certified to current FAA Advisory Circular 150/5345-44**

Specification for Runway and Taxiway Signs

*View our Certificate of Conformance*

Item	Description
1. 340/345	Turn Fasteners
2. *CLT-2	Cover
3. *CLT-3	Base
4. *CLT-4	End Panel
5. *CLT-5	Legend Panel <sup>1</sup>
6. *CLT-6	Multi-Module Insert (Tree)
7. *7-B	Face Insert Channel <sup>2</sup> (Track)
8. *8-A	Light Bar
9. LED Lamp	4W LED Lamp
10. 500Medium	Screw Socket
11. 480 Cable	Clamp
12. 420	Terminal Strip (section)
13. L610	LED PCB Controller
14. 190-3/16"	Tether
15. 130	Slipfitter
16. *140	6" Frangible Coupling
17. 430	Cord & Plug
18. 15	Floor Flange
19. E416	Surge Protector
20. Filter	ALD Low Pass Filter
21. Ferrite A	Ferrite Core Split
22. Ferrite B	Ferrite Core Not Split
23. G EMI Shield Screen	Controller Screen



Enlarged Views



### To help in placing your order:

\*Prefix part number with one of the following sign sizes: "S" (small/ size 1), "M" (medium/ size 2), "L" (large/ size 3 & 5)

<sup>1</sup> Specify one of the following sign types: L-858Y ("Y"ellow), L-858R ("R"ed), L-858L ("L"ocation), or Blank/ Black

<sup>2</sup> Specify one of the following track colors: (B) Black, (Y) Yellow or (R) Red

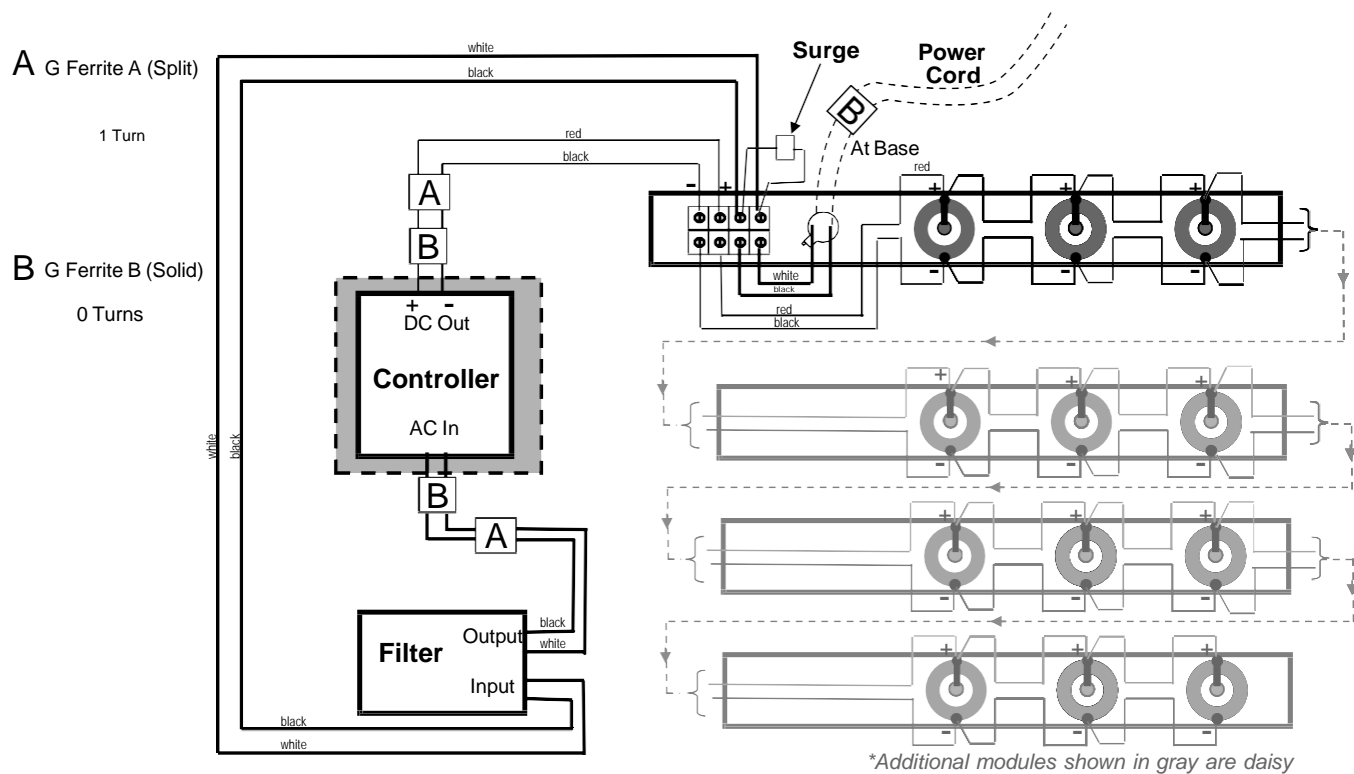
### LUMACURVE AIRFIELD SIGNS

9115 Freeway Drive, Macedonia, OH 44056

330.467.2030 [www.lumacurve.com](http://www.lumacurve.com)



# LED Electrical Wiring Diagram



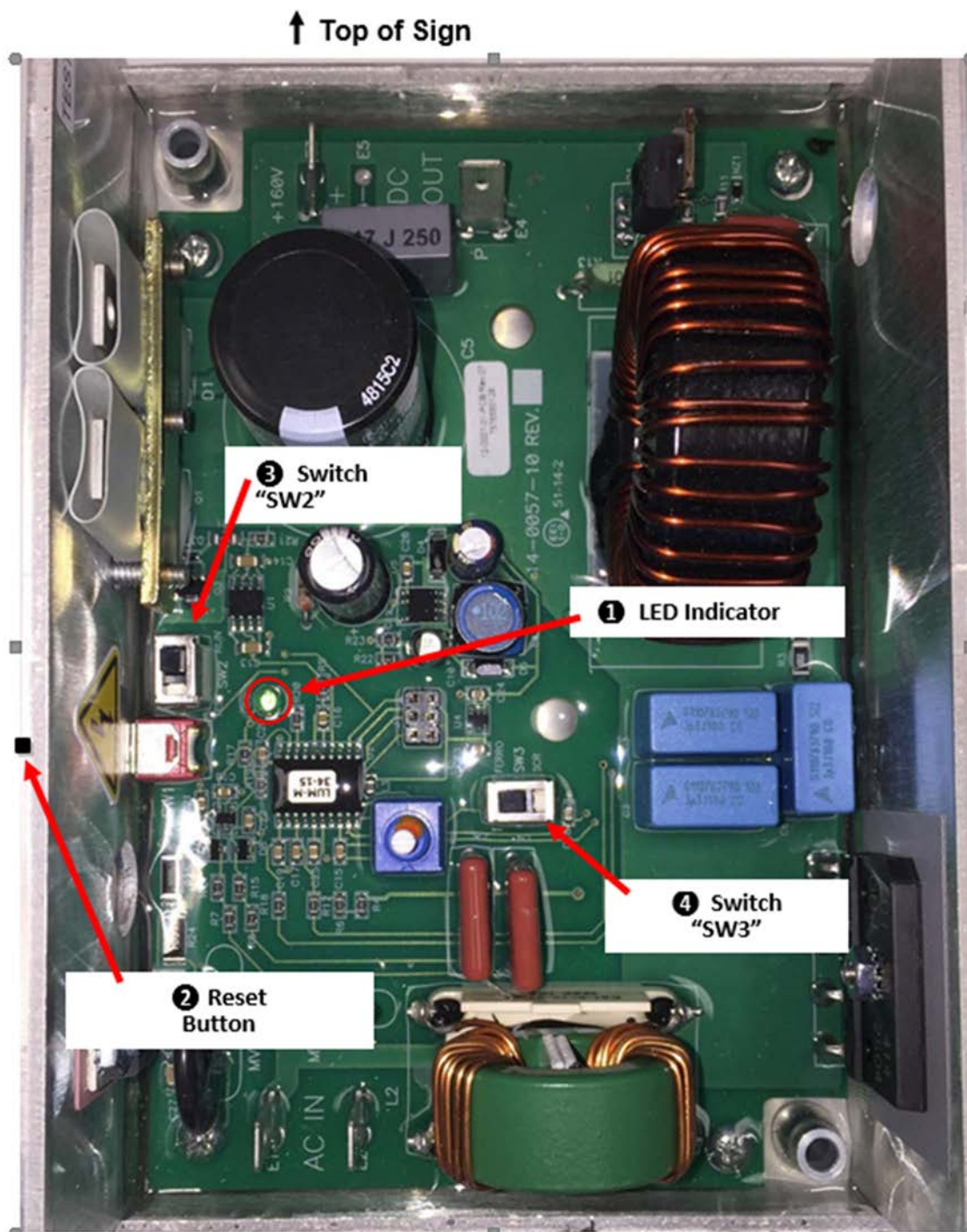
## LED VA Loads, Power Factors and Isolation Transformers

		FAA Style 2 <small>(4.8A-6.6A)</small> FAA Style 3 <small>(2.8A-6.6A)</small>				FAA Style 5 <small>(5.5A)</small>		
SIGN SIZE & MODULE LENGTH	LAMPS	4W LED				4W LED		
		ISO XFMR	MAX VA	POWER FACTOR		ISO XFMR	MAX VA	POWER FACTOR
Size 1, 1-mod	2	100W	49	.94		100W	37	.94
2-mod	4	100W	64	.88		100W	48	.89
3-mod	6	100W	67	.89		100W	50	.90
4-mod	8	100W	73	.90		100W	56	.91
Size 2, 1-mod	3	100W	62	.87		100W	46	.88
2-mod	6	100W	67	.89		100W	50	.90
3-mod	9	100W	74	.90		100W	58	.92
4-mod	12	100W	78	.91		100W	62	.93
Size 3, 1-mod	3	100W	62	.87		100W	46	.88
2-mod	6	100W	67	.89		100W	50	.90
3-mod	9	100W	74	.90		100W	58	.92
4-mod	12	100W	78	.91		100W	62	.93
Size 5, 1-mod	3	100W	62	.87		100W	46	.88
Size 4, 1-mod	6	100W	67	.89		100W	50	.90



## Key Components of the L610 LED Controller

Identify the locations of the key components of the LED Controller in the photo below. Having a familiarity of these components will help you maintain and troubleshoot your Lumacurve LED airfield signs.





## LED Controller Components and their Functions

### 1.) LED Indicator Light

The green LED light indicates the basic status of the LED Controller.

**Solid green light** (with the power on) indicates the LED Controller is functioning properly, and the output voltage to the lamps is within range.

**Flashing green light** (with the power on) indicates a lamp is out. The failed lamp will need to be identified and replaced. The Controller must then be reset.

*False trips are possible. See troubleshooting scenarios.*

**No green light** (with the power on) indicates the Controller is receiving no power or has failed. Contact Lumacurve technical support.

### 2.) Reset Button

The reset button is used to reset the sign when the sign is dark and the LED indicator light is flashing. It is located on the side of the Controller, protruding through the aluminum case. A failed lamp that needs replacement is typically the source of the problem.

**Reset Procedure:** with the sign energized, press and hold the reset button until the lamps are illuminated. Release button immediately once the lamps are illuminated. This will reveal the failed lamp.

### 3.) Test/Run Switch ("SW2") *see "Switch Positions" diagrams below*

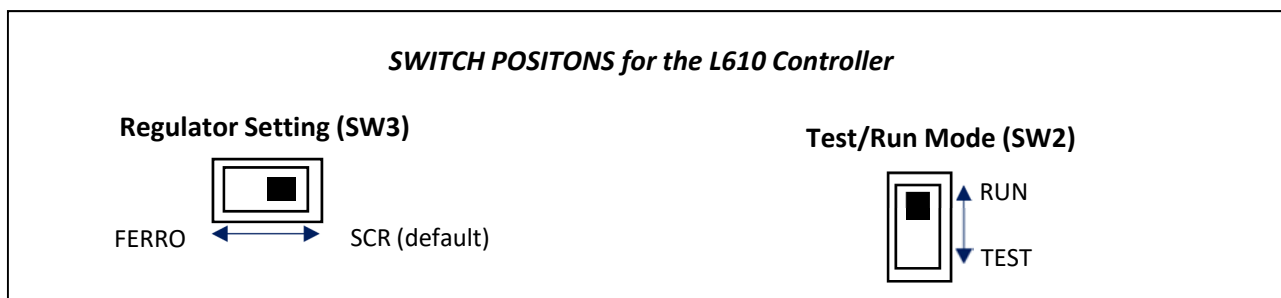
The test switch position is used to disable the "one-out-all-out" lamp feature as required by the FAA.

**"TEST" position-** select this setting to troubleshoot a sign that is exhibiting inexplicable problems. This will eliminate "failing" sign lamps as a source of false "one-out-all-out" trips.

**"RUN" position-** the default setting for the Controller to perform per FAA specifications.

### 4.) Regulator Type Switch ("SW3") *see "Switch Positions" diagrams below*

The regulator switch is factory set to the "SCR" position. This setting is more accommodating when the power supplied by the airfield circuit is irregular or inadequate. In most cases, the Controller will function more effectively in the "SCR" position. However, we may need to switch the regulator setting once the sign is installed. During troubleshooting, our technical department will advise if a switch setting change is recommended.



## Scenario 1: LED sign is not lighting

*Sign function relies on a proper installation.*

*Please verify this by referencing the Lumacurve Electrical Installation Records for your signs.*

### Step One: Check Controller

Does the Controller have an illuminated green LED indicator light, either steady or blinking with the power on?

If **Yes**, the Controller is good.

If **No**, the Controller is not receiving power or has failed & needs to be replaced.

### Step Two: Check for Failed Lamp

Is the green LED indicator light on the controller blinking?

If **yes**, the one-out-all-out feature has tripped. Press and hold the reset button (located on the side of the Controller) until the lamps illuminate. Release immediately.

Is there a lamp that has not been illuminated?

If **Yes**, replace the lamp (problem solved).

*(Keep failed lamps within the 4 year warranty period and contact Lumacurve for replacements.)*

## Scenario 2: LED sign needs to be reset regularly

### Step One: Investigate for "suspect" or failing lamps

Although sometimes challenging to identify, an "intermittent" or failing lamp is often why a sign needs to be reset regularly.

Set the Test/Run switch ("SW2") to the "TEST" position, then reset the Controller. Monitor the sign for 3 weeks. With the power continuously on (and the "one-out-all-out" feature temporarily disabled), a failing lamp should burn itself out completely. When the failed lamp is identified, replace the lamp, return the Test/Run switch to the "RUN" position and reset the sign.

If a lamp fails after years of service (outside the warranty period), we recommend replacing all the lamps in the sign and record in your maintenance log.

*Keep failed lamps under the 4 year warranty and contact Lumacurve for replacements.*



**Step Two:** Verify the regulator switch position on the Controller is set to "SCR" (*original factory setting*)

Regardless of the type of constant current regulator (CCR) powering your airfield sign, locate the regulator setting switch (SW3) on the Controller and select the "SCR" switch position. The "SCR" setting is more accommodating when the power supplied by the airfield circuit is irregular or inadequate. This may reduce the need to reset the Controller.

**Step Three:** Check for loose connections

Verify all wire connections are secure by tugging on wires at their connection points. (terminal strip, lamps, and electrical components)

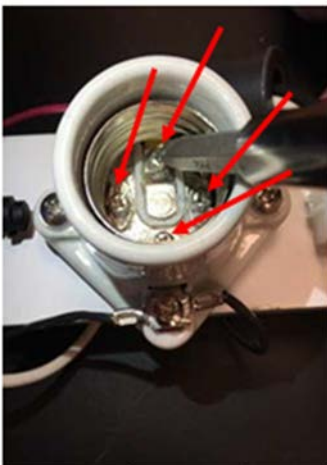
**Step Four:** Check lamp sockets for loose screws and signs of corrosion

With the power off, remove all lamps from their sockets. Check that all 4 internal screws in the base of the lamp sockets are tight. (*see figure 1*)

Inspect lamp sockets for corrosion. Remove the corrosion or replace the socket if present. A light coating of dielectric grease should be present. If not, put an appropriate amount of dielectric grease on your finger and lightly coat the inside of the socket on the threaded perimeter and the contact tab centered in the base. (*see figure 2*)

**WARNING:** Applying too much dielectric grease to the socket will prevent the lamp from making a proper connection or block the drain holes.

Replace the lamps and ensure they are firmly tightened into their sockets.



**Figure 1,** tightening the 4 socket screws



**Figure 2,** adding dielectric grease to sockets

**Scenario 3: (1) Sign lights after resetting Controller then goes dark, or  
(2) Controller indicator light is flashing, but no lamps will illuminate.**

**Step One: Check the Controller (DC Voltage output with lamps disconnected)**

With power on, unscrew a lamp to shut off the controller output. Disconnect the output wires to the lamps at the terminal strip (Red, Black). Reset the Controller by holding the reset button for approx. 4 seconds. Place the meter leads (probes) on the Controller's DC output at the terminal strip with your multimeter set on DC volts. You should get a reading near 170V.

**Step Two: Check lamp sockets & wiring**

Remove all lamps from their sockets. Reconnect the wires from the lamps to the terminal strip (from the above step). Reset Controller if necessary (press and hold the reset button for approx. 4 seconds). Sockets should become energized with a solid green LED indicator light on the Controller.

With power on, touch the screws on either side of the lamp furthest from the Controller with your multimeter probes set at DC volts (*red probe on red wire & black probe on the black wire*). A reading near 170 DC volts should indicate there is not a problem with the wiring or sockets.

**Step Three: Check individual lamps**

*Continued from Step Six*

All lamps should be removed with the power on, and a solid green LED indicator light on the Controller. Start with the lamp furthest from the Controller and screw it into the socket. Wait 20 seconds, then screw in the next lamp. Repeat this process with all sign lamps. If the controller trips and the lamps go dark during this process, the last lamp inserted is likely bad. Remove this lamp, reset the Controller and insert a new lamp. Repeat the process until all lamps are illuminated.

## Scenario 4: LED Sign is Flashing

*Flashing sign lamps indicate inadequate or irregular power to the sign. When proper power is restored to the sign, the flashing will stop, and the sign will resume regular operation.*

### Questions to be Asked

1. Is the sign at the end of the circuit? *(Possibly receiving less amperage than other fixtures?)*
2. What is the regulator type? *(Is the regulator type switch in the correct position?)*
3. Is the input amperage within the FAA specifications? (You should verify this at the sign as well as the vault) At the sign with your multimeter set to AC Amps, place the probes on the power cord leads at the terminal strip. The meter will display primary circuit amps. *(2.8 amps minimum is required)*
4. What is the health of your circuits? *(When did you last megger your circuit?)*
5. Are there significant losses to the ground? *(Circuits are in a state of constant erosion, compromising the power to lighting fixture)*
6. What is the current size and condition of the isolation transformer? *(undersized or transformers with compromised performance may be the culprit)*

### Other Possible Solutions to Trouble Locations

1. Upsize the isolation transformer.  
(Larger isolation transformers will not compromise electrical components.)
2. Move the Regulator Type Switch (SW3) to the "SCR" position regardless of the regulator type. This setting is typically more accommodating of irregular or inadequate power.
3. Increase the amperage of the constant current regulator to a minimum of 2.8 amps at the lowest regulator step.

*If the above steps do not address the problem,  
call Lumacurve technical support for additional assistance at **800-258-1997***

## Installing: Lumacurve LED Upgrade kits

Updated 2/15/22

### Installing Lumacurve LED Upgrade kits

*Replacing Existing Lighting Systems - Sizes 1, 2, 3, 5*

The purpose of this guide is to help contractors and airfield personnel install Lumacurve LED Upgrade Lighting Kits into existing Lumacurve airfield guidance signs. Work through the steps below, and if you have any problems, don't hesitate to call us for technical support at 800-258-1997.

We recommend reading through the entire instructions first and familiarizing yourself with the procedures before beginning the installation.

**NOTE: Using Non-OEM after-market parts will void FAA Certification and void manufacturer warranties.**

**WARNING:** The sign must be de-energized before working on Lumacurve airfield guidance signs unless otherwise instructed. Failure to do so may result in personal injury or damage to internal sign components.

#### **Recommended tools:**

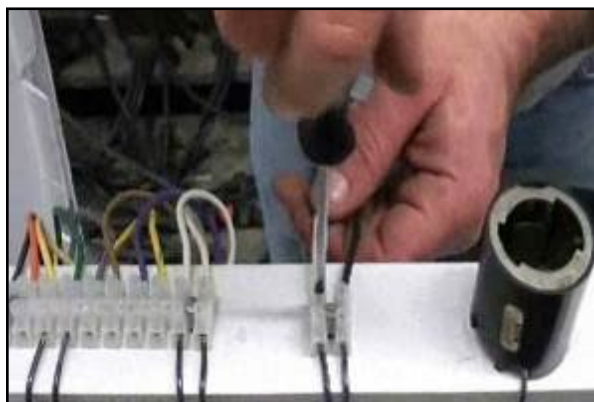
Small Standard Screwdriver  
#2 Phillips Screwdriver  
7/16" Combination wrench

Power Drill  
Drill Bits: 13/64", 1/4", 5/32", 1/8"  
3/8" Socket Wrench or Nut Driver

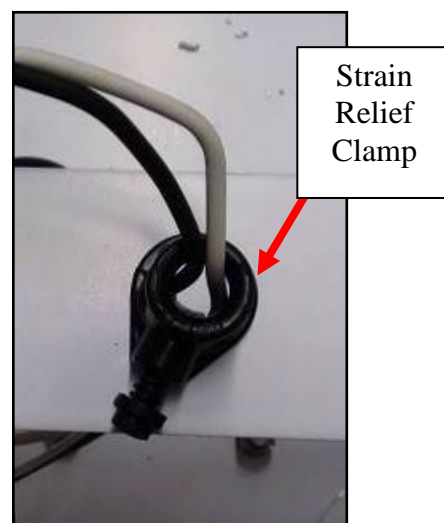
Rubber Mallet  
Pop Rivet Tool 1/8"

### 1. Removal of existing lighting system

- Remove sign tops and all panels.
- Unscrew power cord leads and remove from terminal strip. (*Photo #1*)
- Loosen the set screw on the strain relief clamp (*Photo #2*) and pull the length of the cord out of the clamp. Lay cord on the bottom of sign for reconnection once LED light bars are installed.
- Remove all the screws that attach the light bars to the vertical sign frame components (Tools: 3/8" socket or nut driver and #2 Phillips screwdriver).
- Remove the light bars from the sign.



*Photo #1*



*Photo #2*

## 2. Installing the LED Light Bars

- a) Reinstall the tops and tighten all the turn fasteners.
- b) After tightening turn fasteners, take a rubber mallet and give a firm tap to the top of the end panel on both sides of the sign. *(Photo #5) **Note:** Reinstalling the tops correctly and eliminating any gaps before mounting the light bars ensures that the sign frame is aligned and the legend panels will fit squarely (and smoothly) into the frame.*
- c) Place the light bar with terminal strip and strain relief clamp into position first. The terminal strip end must be installed closest to the power cord. *(Photo #3)*  
For multiple module sign, the light bars are connected with continuous wiring. Additional modules must be fed through the tree branches to place into position. For size 2 (medium) and size 3 (large) signs, the light bars of the additional modules must pass below the center branch of the trees *(Photo #4)* and installed in order. For size 1 (small) signs, pass the light bars below the bottom branch.
- d) With the light bars in place, drill through the pilot holes of the new light bars with a 13/64" drill bit. After every drilled hole, replace the screws before drilling the next hole. *(Note: If screws are not replaced as holes are drilled, the lightbar may move between holes. Misaligned holes cause difficulties when replacing screws.* Place lock washers and nuts (or nyloc nuts) on the screws on the underside of the light bars. Tighten them with a 3/8" socket or nut driver and #2 Phillips screwdriver. ***Note:** Tops can be removed again to allow more light and headroom while completing the installation.*

Terminal Strip

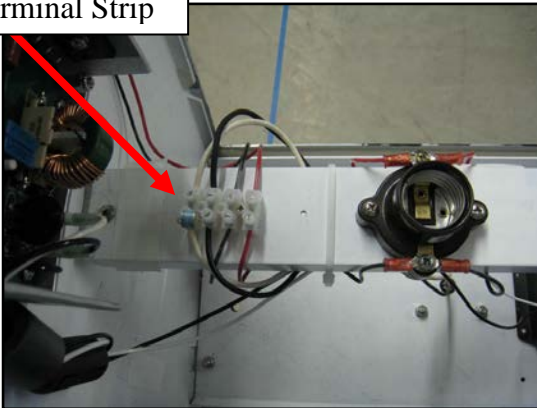


Photo #3

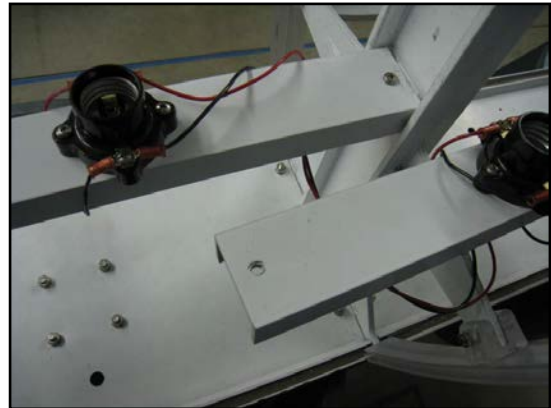


Photo #4



Photo #5

### 3. Installing the Controller

The Controller is to be mounted on the end panel closest to the power cord.

- a) Position the “LED Controller Mounting Hole Template” (Figure #19) on the end panel, closest to the power cord (above the lightbar). Using a 1/8” drill bit, drill lightly to mark the hole location (this will ensure the template will not wear out). Now using a 13/64” drill bit to enlarge the two (2) mounting holes (upper left and lower right).

**Warning:** Do not drill through the actual mounting holes of the Controller with the Controller in place! There is a very high risk of doing damage to the Controller. **Note:** The Controller needs to be a least 2” above the lightbar to keep the controller and filter screen from interfering with the surge protector (Photo #6).

- b) Remove the template. The template is to be used for multiple LED Controller installations.
- c) Insert the two 8-32 x 1-1/4 bolts from the outside of the end panel.
- d) While holding the bolts in place, slide the Controller over the bolts. **Note:** Controller DC outputs must be oriented toward the top of the sign, AC inputs to the bottom.
- e) Tighten and secure Controller in place using the enclosed nyloc nuts.

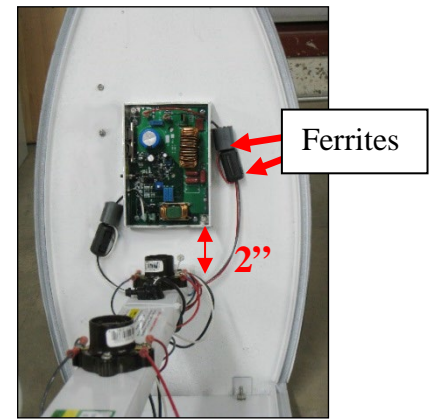


Photo #6

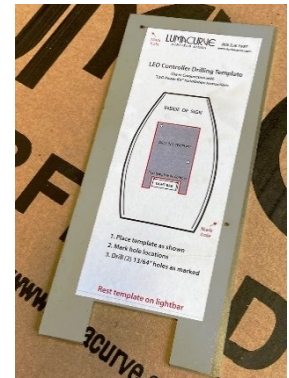


Figure #19

### 4. Installing the Filter

- a) Place the filter on the sign base (underneath the light bar) of the power leg module.
  - b) Orient the wire side of the filter to face the Controller. Adjust the position of the filter to be approximately 13” from the end panel. (Photo #7).
  - c) Adjust the position of the filter to be approximately 2.5” from the inside edge of the sign base on one side and approximately 3” from the inside edge of the sign base on the other side (Figure #8).
- Warning:** Do not center the filter between the two edges of the sign base! There are two reinforcement ribs running the length of the sign base inside its double wall. Centering the filter runs the risk of drilling into the ribs.
- d) Even though the filter has four holes for mounting, only two are required to hold the filter in place and mark two hole locations diagonally across from each other. Remove the filter, locate the marked hole locations, then drill using a 5/32” drill bit. **Note:** the sign frame base is double-walled. Only drill through the top (interior/white) wall.
  - e) Place the filter back in to place and secure using the enclosed #8-5/8” hex head self-tapping screws.

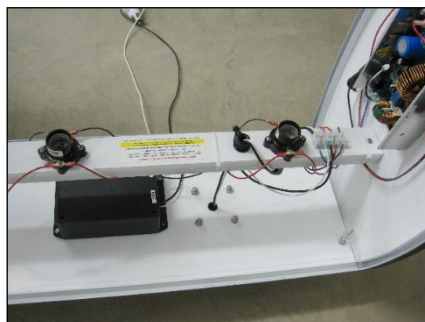


Photo #7

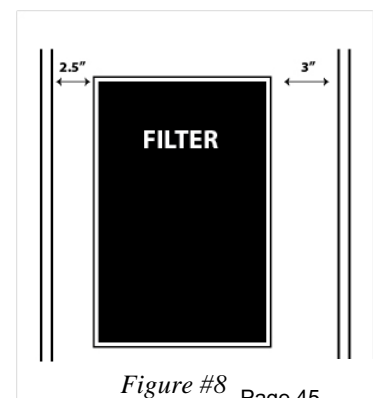
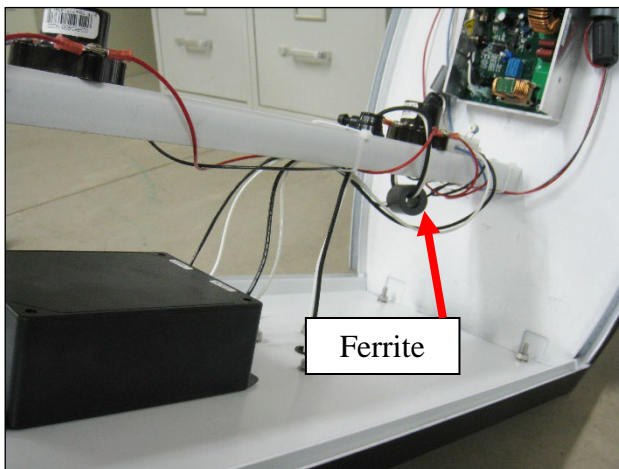


Figure #8



## 5. Reinstalling the Power Cord

- Feed the power cord through the ferrite provided and then through the strain relief clamp (*Photo #9*) from the underside of the lightbar. Pull the power cord taught, removing any slack between the bottom of sign and the cable clamp. As required by the FAA, this ensures the power cord will disconnect at the plug in the frangible sign leg if the sign is knocked over.
- Tighten the set screw on the strain relief cable clamp (*Photo #10*). Do not overtighten.
- Reinstall the power cord leads on the two terminals on the power strip opposite the surge protector (*Figure #11*). Excess slack in power cord can be trimmed to fit or coiled and zip-tied to the underside of the lightbar. This will eliminate any potential shadowing from excess wire onto the panel faces.

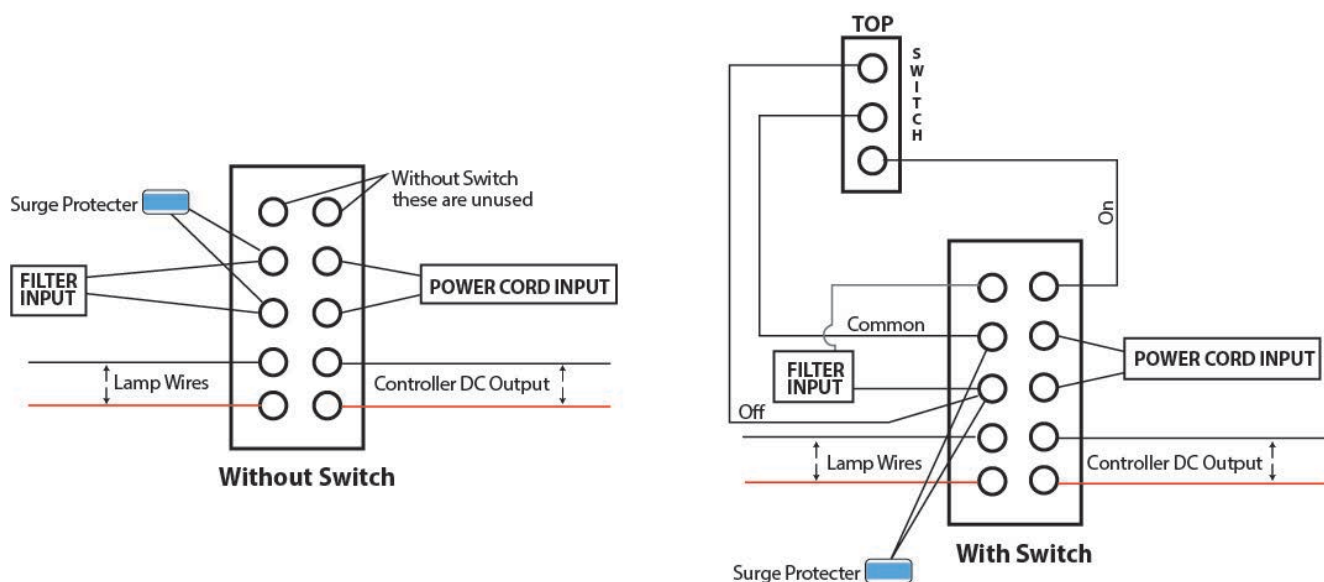


*Photo #9*



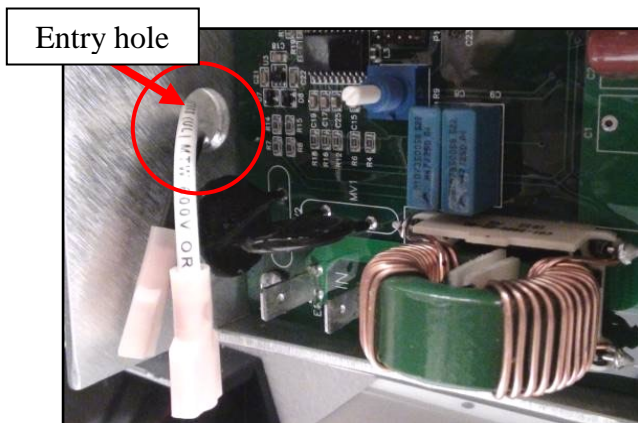
*Photo #10*

*Figure #11*

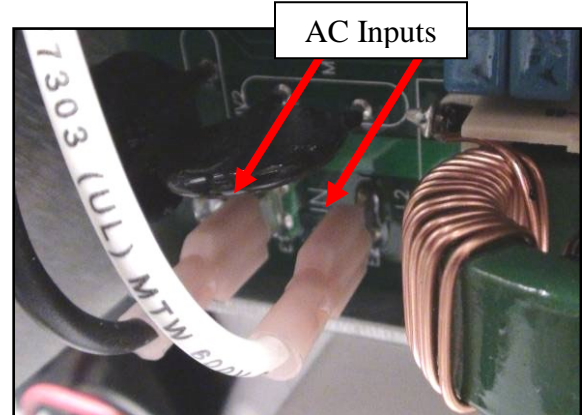


## 6. Connecting the Filter and Controller

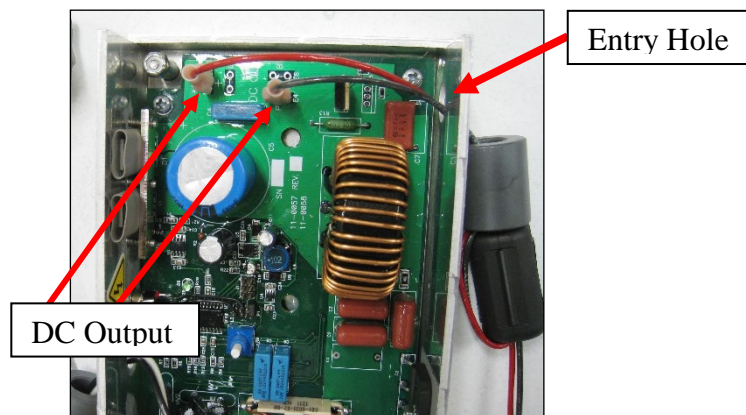
- a) Identify the filter input leads. Install these leads into the terminal strip opposite of the power cord leads. These leads must be installed in parallel with the surge protector (*Figure #11*). These connections are not polarity sensitive.
- b) Identify the filter output leads. These will have two factory-installed black ferrites. Route these leads through the hole on the lower left side of the Controller (*Photo #12*) and connect to the AC input of the Controller (*Photo #13*). These connections are not polarity sensitive.
- c) Identify the DC controller output leads, factory installed on the Controller (*Photo #14*) with two black ferrites. Connect these two leads to the terminal strip (*Figure#11*). These leads are polarity sensitive. The Red lead is (+). Black lead is (-).



*Photo #12*



*Photo #13*

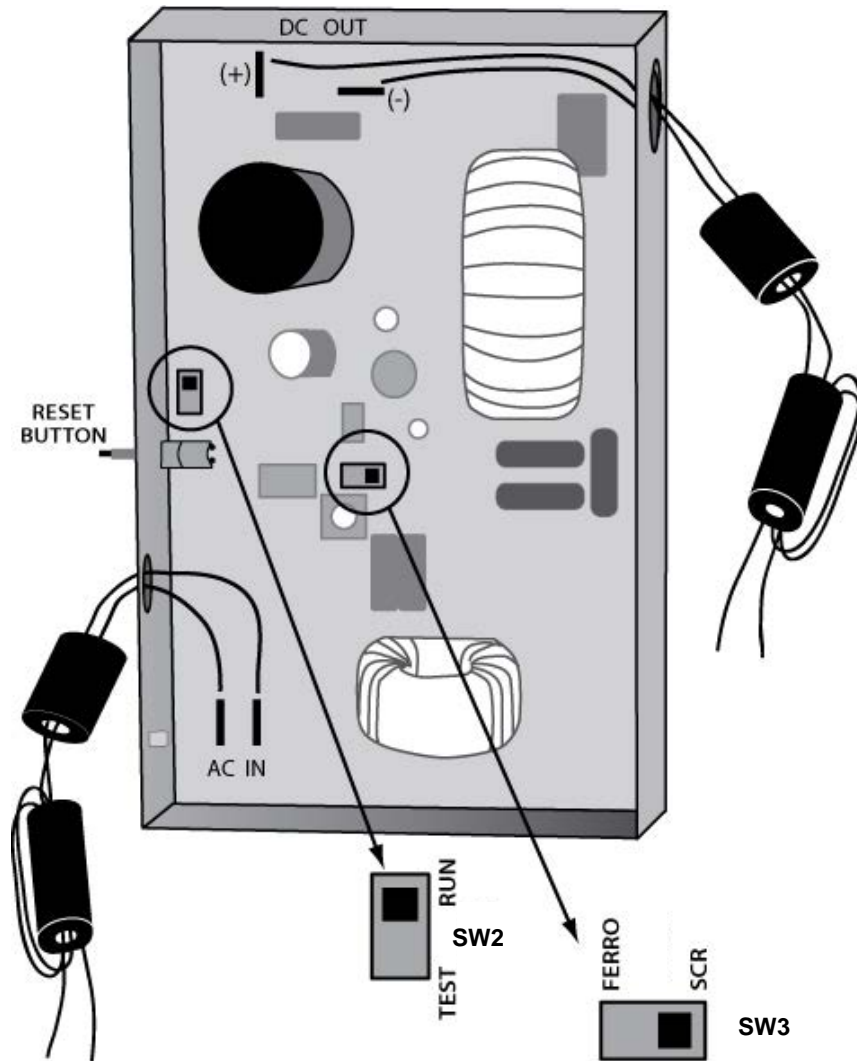


*Photo #14*



## 7. Using the switches on the L610 Controller

- Switch **SW2** (Run & Test) is used to isolate controller programming functions when troubleshooting (One out, all out).
- Switch **SW3** (Ferro & SCR) is used to set controller functions with constant current regulators (CCR's)



## 8. Installing the Shielding Screen

On each side of the Controller are screws and fender washers (*Photo #15*). These hold the shielding screen in place. If the fender washers are tight to the side of the Controller, loosen them slightly to slip the edge of the screen between the fender washer and the controller case (*Photo #16*). The shielding screen is shaped to fit the Controller precisely. Once the screen is in place, tighten the screw & fender washers to secure the screen. The screen is installed to shield out radiated emissions (*Photo #17*).

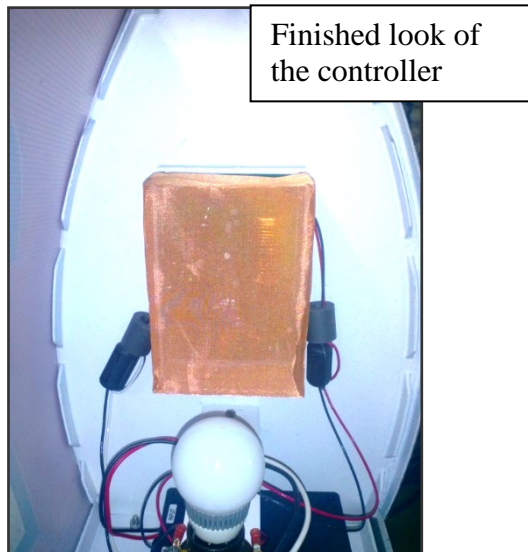


*Photo #15*



*Photo #16*

Fender washer and screw serves as a clamp to hold the shielding screen in place



*Photo #17*

## 9. Installing the OEM Electrical Upgrade Nameplate

Each Lumacurve LED Upgrade Kit contains an OEM Electrical Upgrade Label (*Photo #18*) and (2) 1/8" pop-rivets. Information on this label is critical for future sign maintenance. This label should be mounted to the sign end panel (power side of sign) just below the original factory nameplate.

- Be careful not to come into contact with any components mounted on the inside of the end panel. Carefully position the OEM Electrical Upgrade Label just below the original factory nameplate. While holding the label in place, use a 1/8" or 9/64" drill bit to drill through the two holes in the label.
- Install two 1/8" pop-rivets to secure the label in place.



## 10. Checking system & restoring the sign to service

The electrical components should now be mounted and wired properly.

- a) Insert all lamps into the sockets.

**Warning:** the use of non-OEM replacement lamps may damage electrical components and cause premature lamp failure. Only OEM Lumacurve lamps will maintain FAA photometric requirements and factory warranties.

- b) Check that the adequately sized isolation transformer is being used. *See chart.*

- c) Power up sign and check that all lamps are functioning properly.

**Note:** If sign is not functioning, revisit the above steps once again to ensure the sign is wired correctly. If there are still problems, contact us for technical support at 800-258-1997 or visit our [Help Yourself Center](http://www.lumacurve.com/helpyourself) and for videos and troubleshooting documents at [www.lumacurve.com/helpyourself](http://www.lumacurve.com/helpyourself)

- d) Reinstall all the legend panels. Replace and secure all sign tops.

Use the chart below to identify the proper size isolation Transformer:

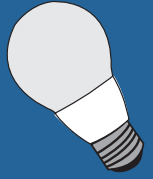
		FAA Style 2 (4.8A-6.6A) FAA Style 3 (2.8A-6.6A)			FAA Style 5 (5.5A)		
SIGN SIZE & MODULE LENGTH	LAMPS	4W LED			4W LED		
		ISO XFMR	MAX VA	POWER FACTOR	ISO XFMR	MAX VA	POWER FACTOR
Size 1, 1-mod	2	100W	49	.94	100W	37	.94
2-mod	4	100W	64	.88	100W	48	.89
3-mod	6	100W	67	.89	100W	50	.90
4-mod	8	100W	73	.90	100W	56	.91
Size 2, 1-mod	3	100W	62	.87	100W	46	.88
2-mod	6	100W	67	.89	100W	50	.90
3-mod	9	100W	74	.90	100W	58	.92
4-mod	12	100W	78	.91	100W	62	.93
Size 3, 1-mod	3	100W	62	.87	100W	46	.88
2-mod	6	100W	67	.89	100W	50	.90
3-mod	9	100W	74	.90	100W	58	.92
4-mod	12	100W	78	.91	100W	62	.93
Size 5, 1-mod	3	100W	62	.87	100W	46	.88
Size 4, 1-mod	6	100W	67	.89	100W	50	.90

# LUMACURVE LED UPGRADE KIT PARTS LIST



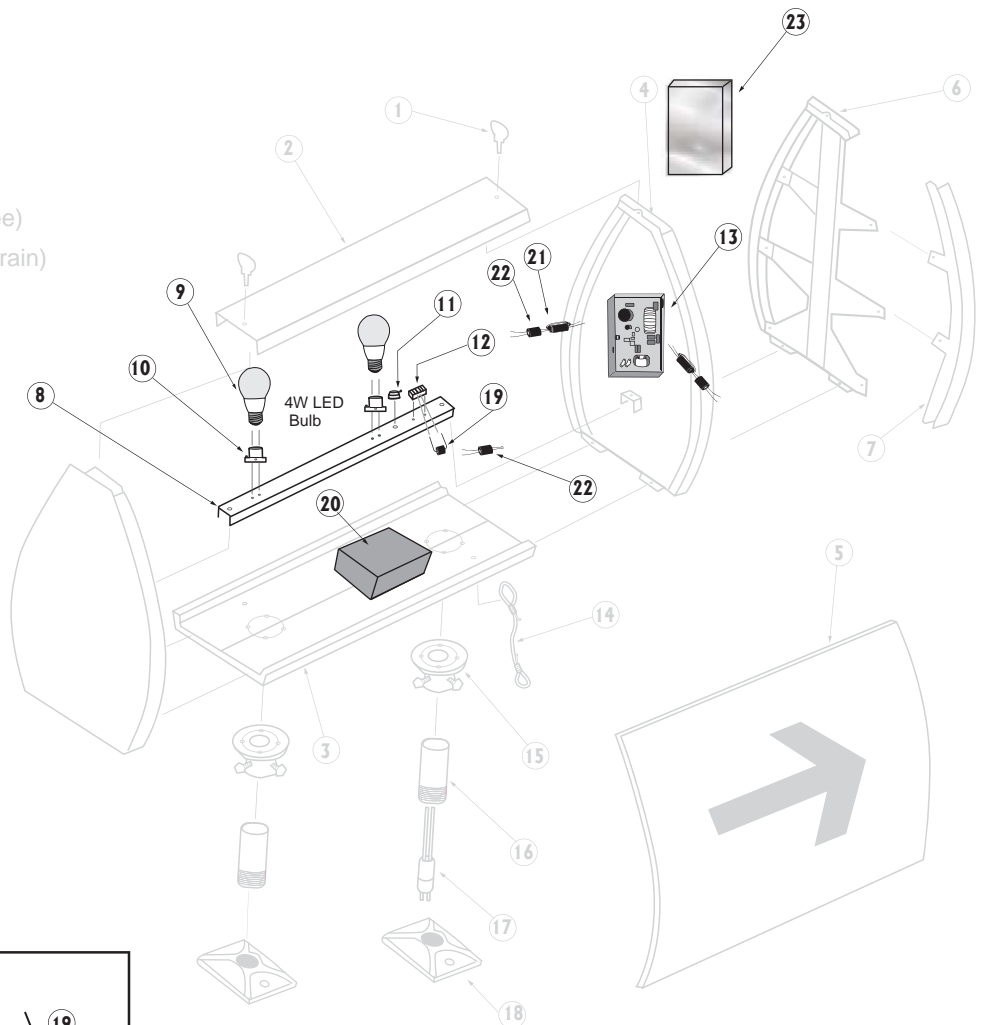
## LED Upgrade Kit Parts List

All other components grayed out.



LED Upgrade Kit comes all-inclusive for changing out your old lighting system (with a handy handle!)

Item	Description
1. 340/345	Turn Fasteners
2. *CLT-2	Cover
3. *CLT-3	Base
4. *CLT-4	End Panel
5. *CLT-5	Legend Panel <sup>1</sup>
6. *CLT-6	Multi-Module Insert (Tree)
7. *7-A	Face Insert Channel <sup>1</sup> (Train)
8. *8-A	Light Bar
9. LED Lamp	4W LED Lamp
10. 500	Medium Screw Socket
11. 480	Cable Clamp
12. 420	Terminal Strip (section)
13. L610	LED PCB Controller
14. CLT-19	Tether
15. 130	Slipfitter
16. *140	6" Frangible Coupling
17. 430	Cord & Plug
18. 15	Floor Flange
19. E416	Surge Protector
20. Filter	ALD Low Pass Filter
21. Ferrite A	Ferrite Core Split
22. Ferrite B	Ferrite Core Not Split
23. G EMI Shield	Controller Screen Screen



### Enlarged Views

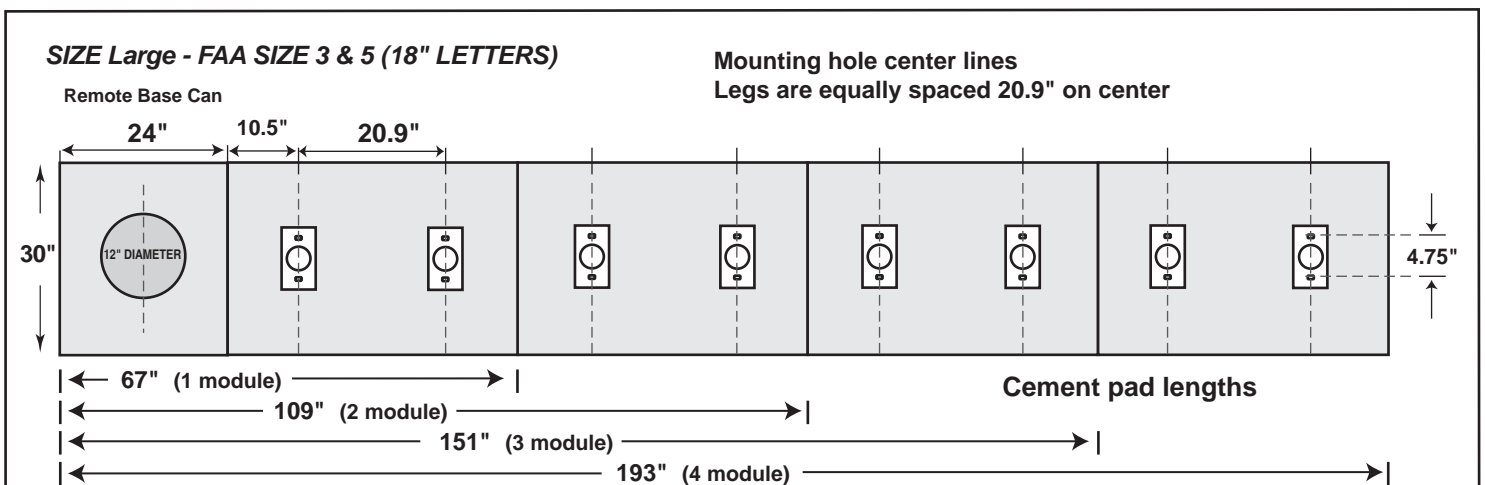
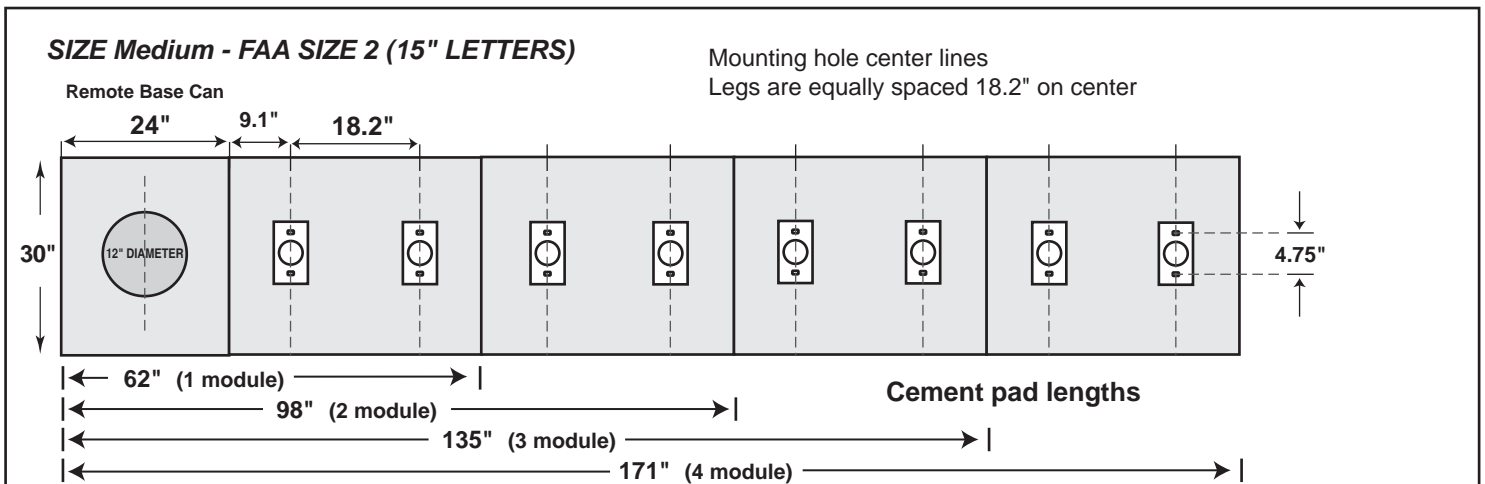
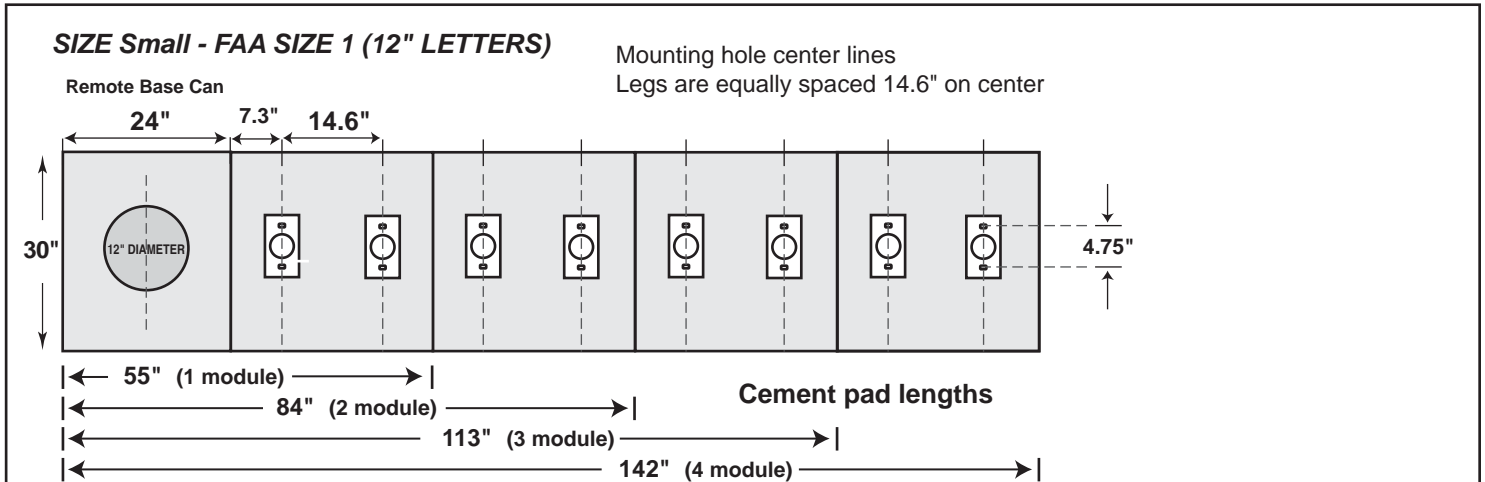




# Installation Instructions

Pad dimensions & mounting locations  
Sign Sizes: 1, 2, 3 & 5

## Standard Mode 2 Installation (Inner Mount)

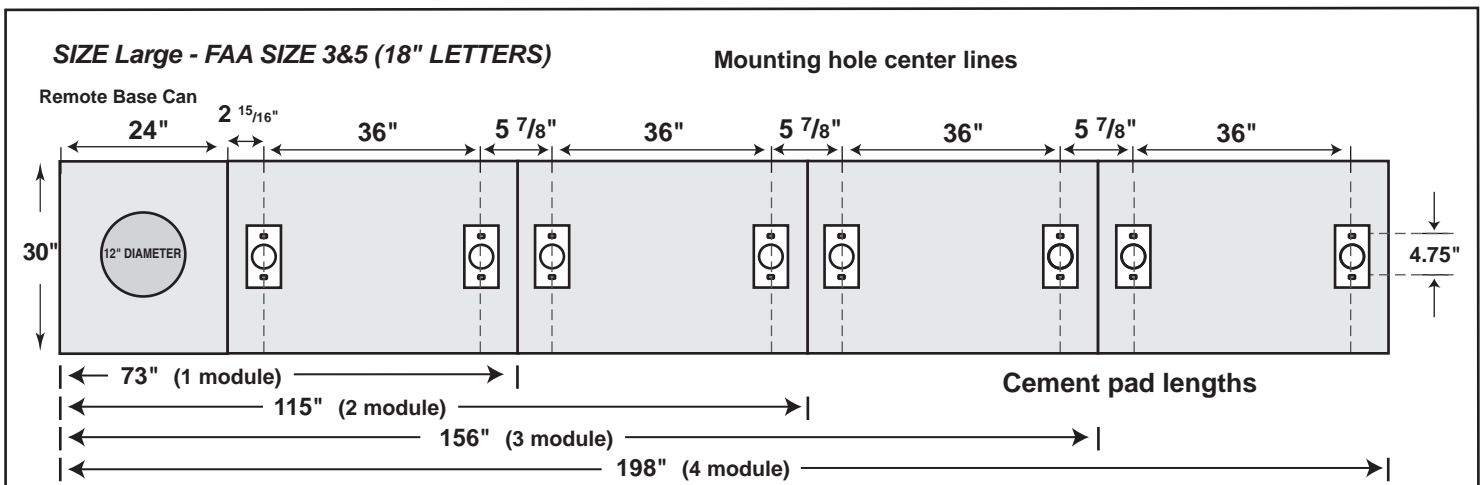
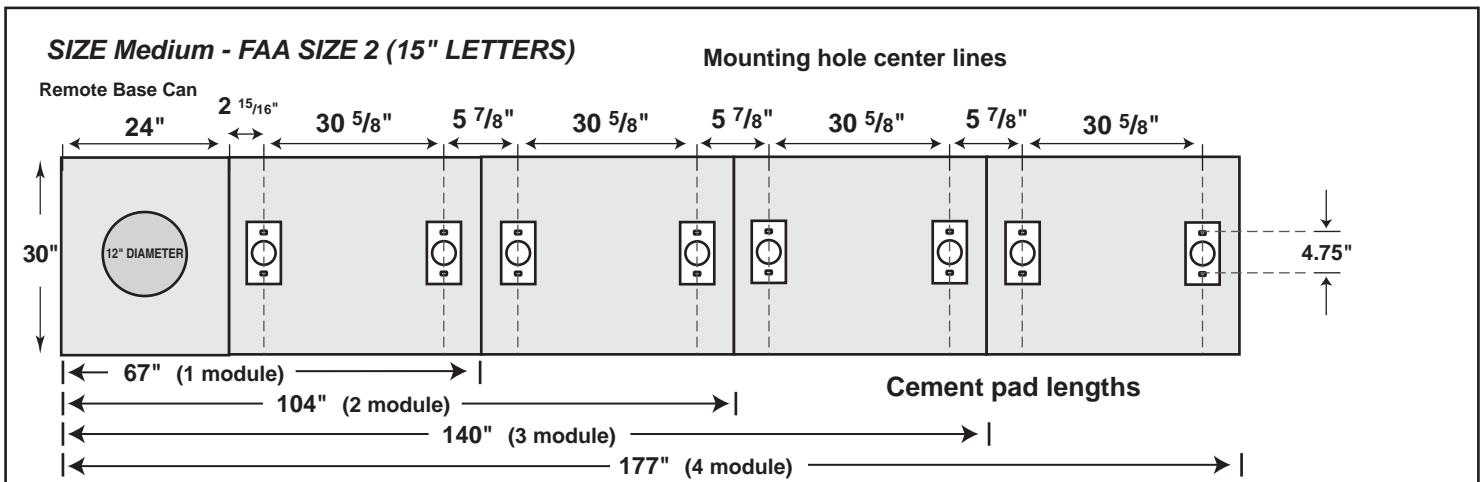
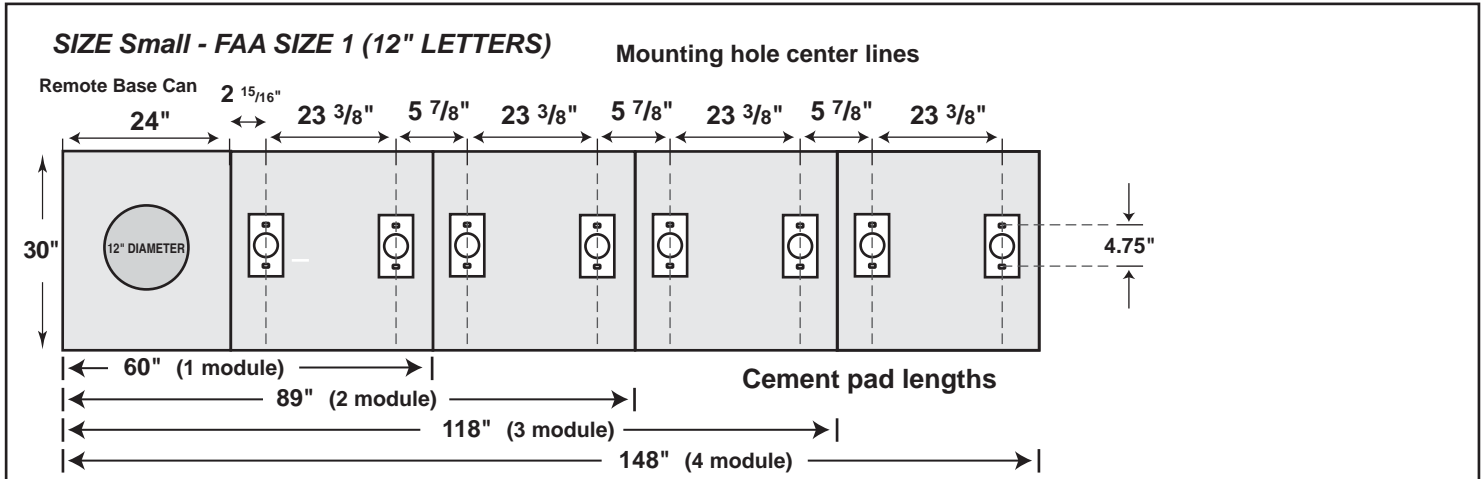


Above references recommended cement pad dimensions and mounting bolt locations for Lumacurve signs

\*Recommended concrete thickness : 6"-8"

\*Recommended anchor bolts: 3/8" x 5" with LOCK washers

## Alternate Mode 2 Installation (Outer Mount)

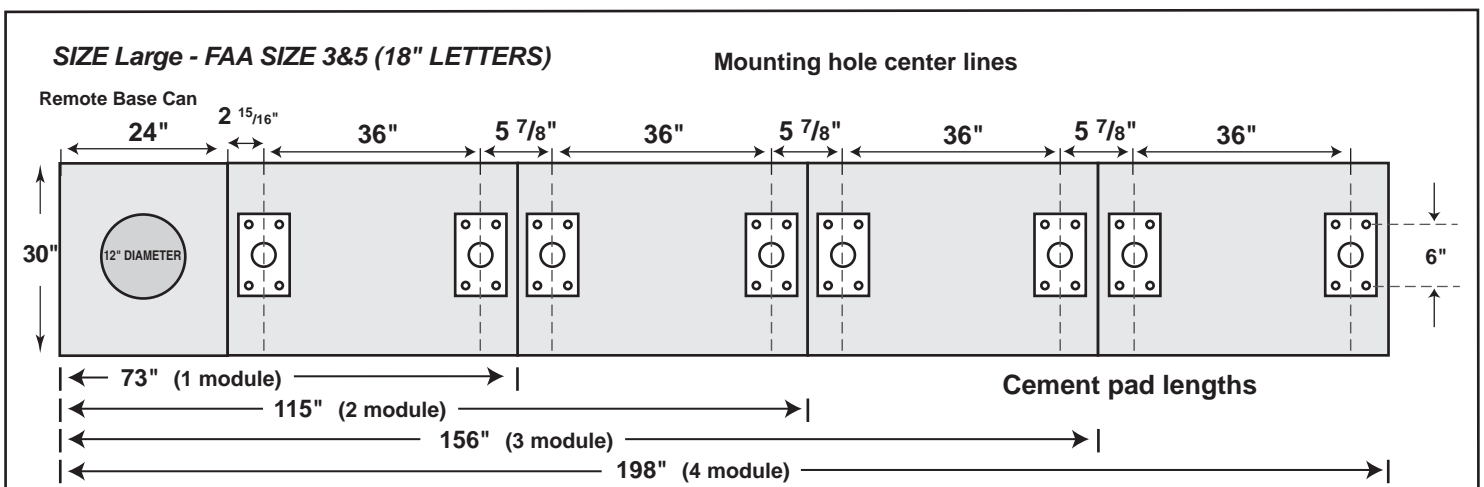
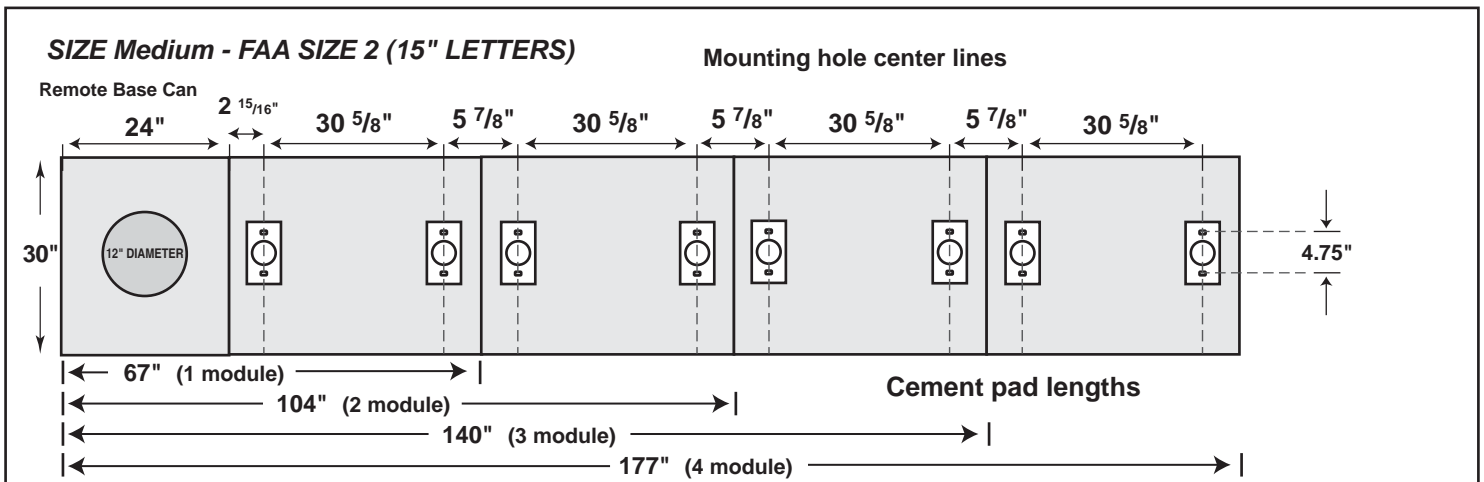
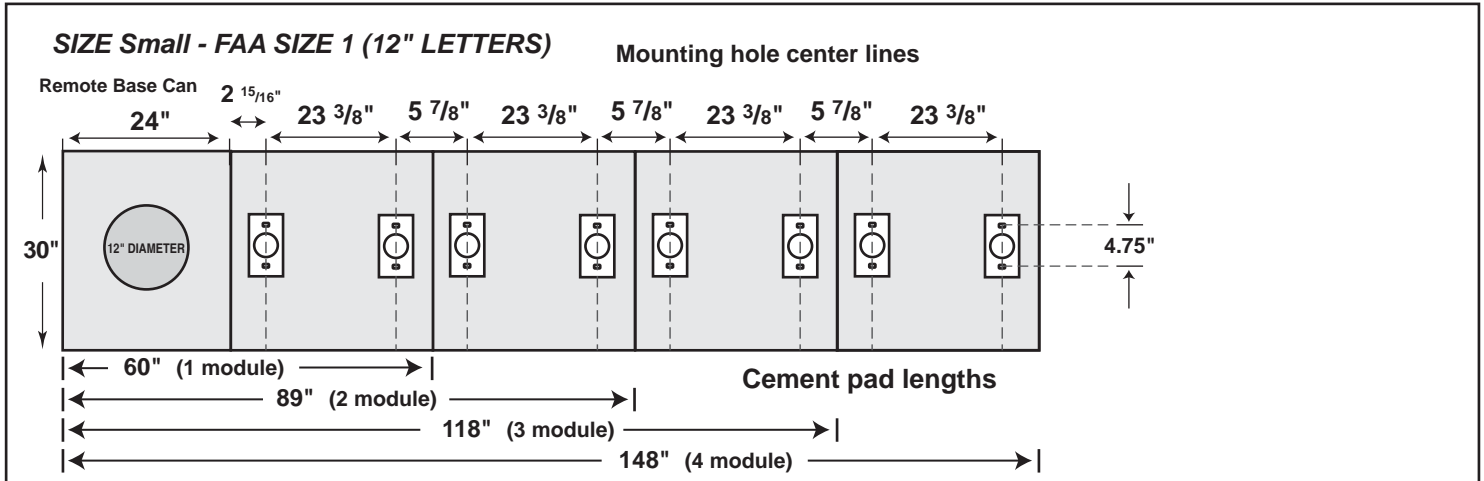


Above references recommended cement pad dimensions and mounting bolt locations for Lumacurve signs

Recommended concrete thickness : 6"-8"

Recommended anchor bolts: 3/8" x 5" with LOCK washers

## Mode 3 Installation (Outer Mount Only)



Above references recommended cement pad dimensions and mounting bolt locations for Lumacurve signs

Recommended concrete thickness : 6"-8"

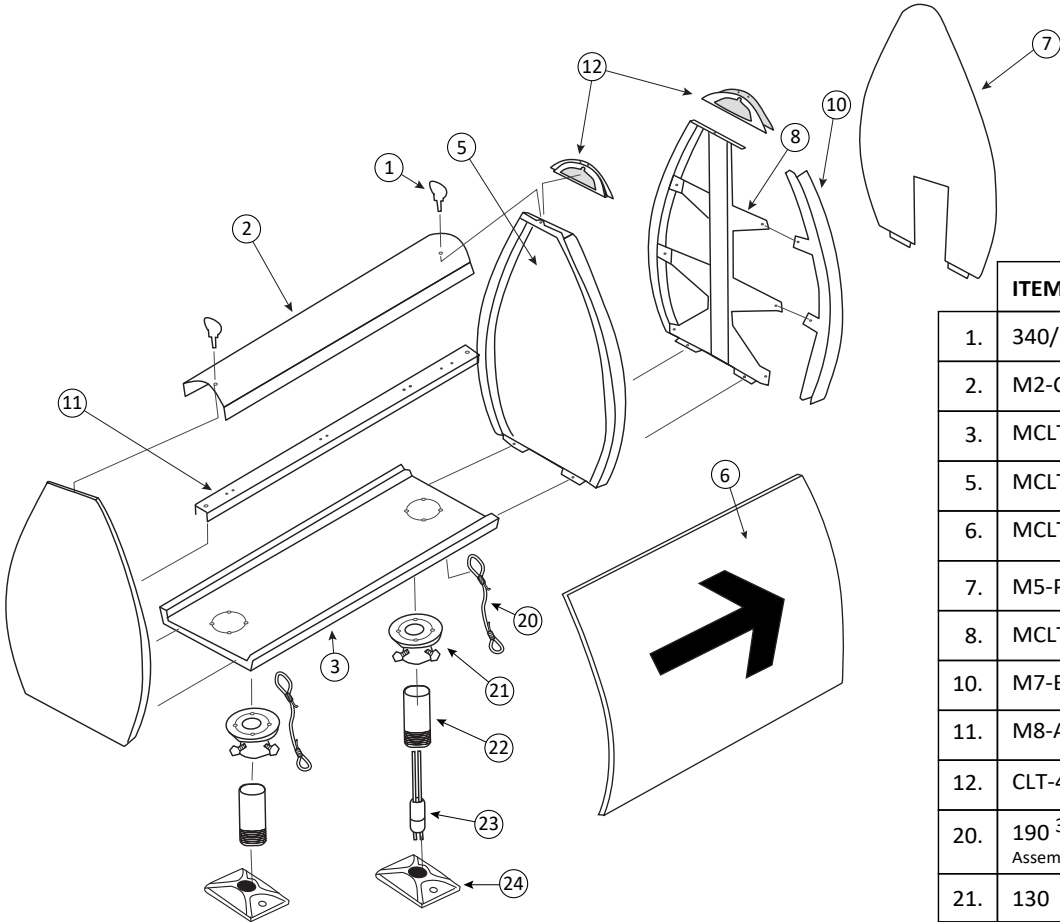
Recommended anchor bolts: Size 1 & 2: 1/2" x 5"

Size 3 & 5: 5/8" x 5"





SIZE 2 SIGN, MODE 3  
Parts List



	ITEM	DESCRIPTION
1.	340/345	Turn Fastener/Retainer
2.	M2-C	Performance Top
3.	MCLT-3*	Base
5.	MCLT-4	End Panel
6.	MCLT-5*	Legend Panel
7.	M5-PS	Full Length Panel Spacer Inserts
8.	MCLT-6	Multi-Module Insert (Tree)
10.	M7-B-**	Face Insert Channel
11.	M8-A	Light Bar
12.	CLT-4AC	Adapter Casting^
20.	190 3/16" Assembly	Tether (2 per module)
21.	130	Slip-Fitter
22.	140-S2M3	6 inch Frangible Coupling
23.	430	Cord & Plug
24.	15	5 inch x 8 inch Aluminum Floor Flange

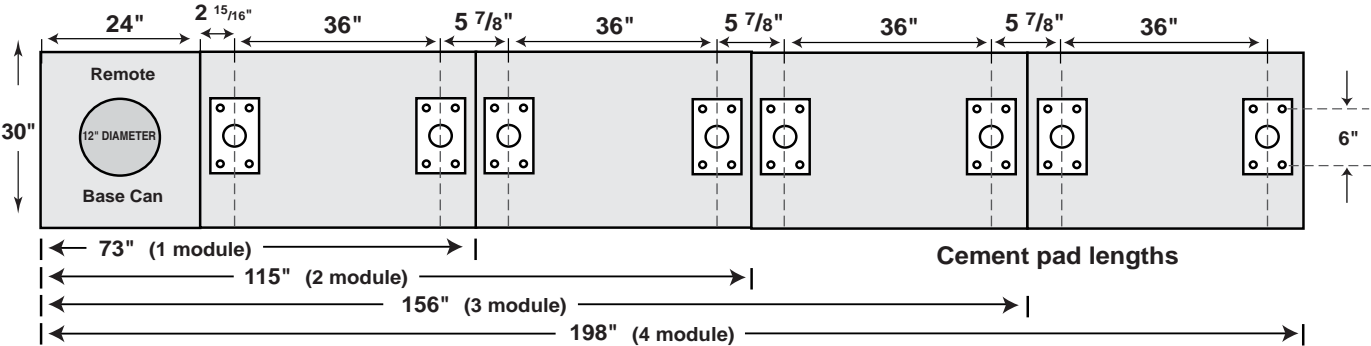
MODE 3 INSTALLATION

SIZE Medium - FAA SIZE 2 (15" LETTERS)

Mounting hole center lines

(Outer Mount Only)

\* Must indicate Mode 3 when ordering  
\*\* Replace with color track needed  
^ Must indicate number of modules when ordering

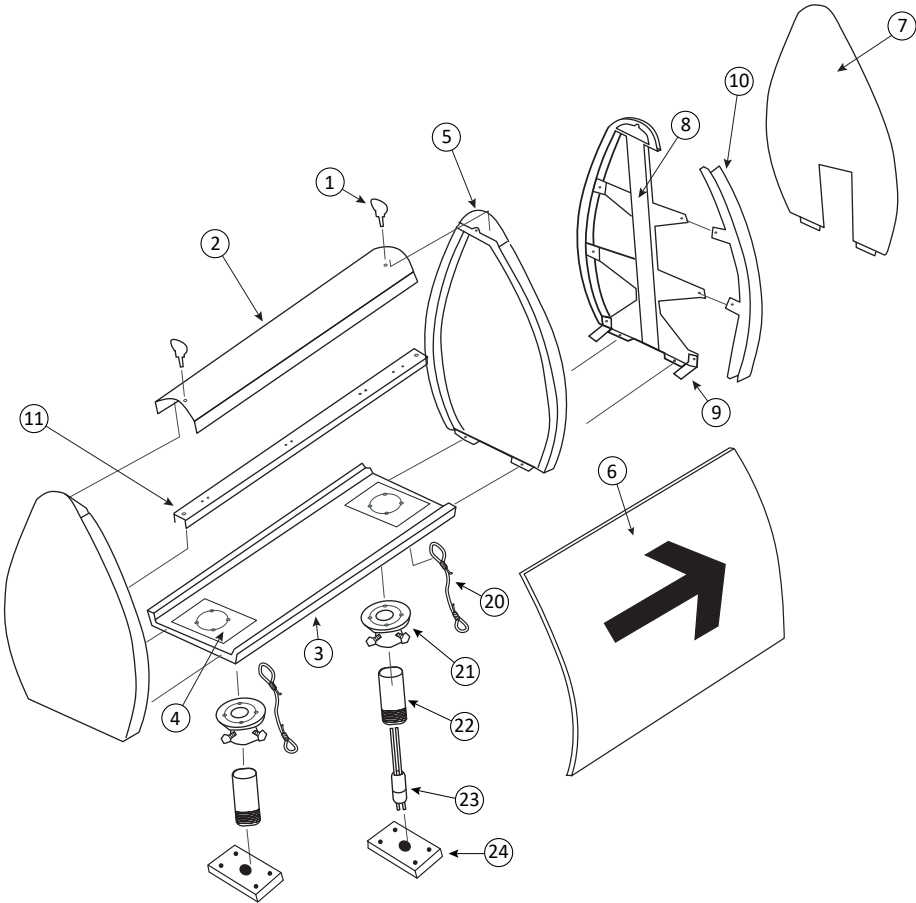


Above references recommended cement pad dimensions and mounting bolt locations for Lumacurve signs.  
Recommended concrete thickness : 6"- 8"  
Recommended anchor bolts: Size 1 & 2: 1/2" x 5" / Size 3 & 5: 5/8" x 5"





SIZE 3 SIGN, MODE 3  
Parts List



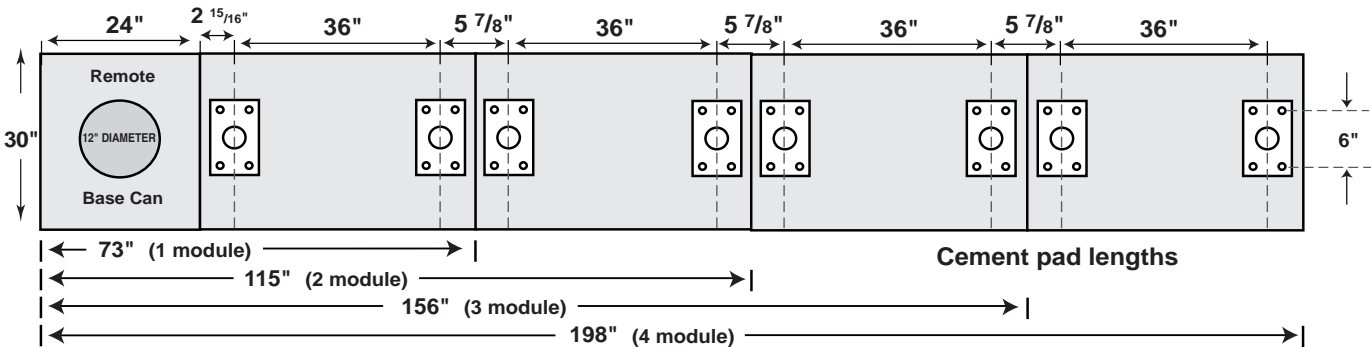
	ITEM	DESCRIPTION
1.	340/345	Turn Fastener/Retainer
2.	L2-C	Performance Top
3.	LCLT-3*	Base
4.	L3-AP	Aluminum Plate (2 per base)
5.	LCLT-4C	Curved Top End Panel
6.	LCLT-5*	Legend Panel
7.	L5-PS	Full Length Panel Spacer Inserts
8.	LCLT-6C	Multi-Module Insert (Tree)
9.	L6-AB	Aluminum Bracket (4 per tree)
10.	L7-B-**	Face Insert Channel
11.	L8-A	Light Bar
20.	190 3/16" Assembly	Tether (2 per module)
21.	130-HD	Slip-Fitter
22.	140-S3M3	6" Frangible Coupling
23.	430	Cord & Plug
24.	15-XHDT	5"x 8" Aluminum Floor Flange

MODE 3 INSTALLATION

SIZE Large- FAA SIZE 3 & 5 (18" LETTERS)

Mounting hole center lines  
(Outer Mount Only)

\* Must indicate Mode 3 when ordering  
\*\* Replace with color track needed



Above references recommended cement pad dimensions and mounting bolt locations for Lumacurve signs.  
Recommended concrete thickness : 6" - 8"  
Recommended anchor bolts: Size 1 & 2: 1/2" x 5" / Size 3 & 5: 5/8" x 5"

# **LUMACURVE DISTANCE REMAINING (DISTANCE MARKER SIGNS)**



## DISTANCE REMAINING SIGN

*Technical Information*

LUMACURVE Size 4 Distance Remaining Signs are certified by ETL/Intertek as compliant with specifications listed in FAA Advisory Circular 150/5345-44.

### **CONSTRUCTION & DESIGN:**

Sign sides, top & bottom are fiberglass panels bolted together. Legs of 2" schedule 80 aluminum tube run up each side of the sign and are fastened with three U-bolts. Lamps are mounted on an aluminum channel across the center of the sign. Access doors located on each side of the sign allow re-lamping. A standard L-823 cord & plug exits through a mounting leg. Overall dimensions are 53" wide x 12" deep (at deepest part of curve) x 54" high (including 6" ground clearance). All parts have a durable low luster finish, inside white and outside flat black. Face panels are curved and 48" square; they consist of clear polycarbonate plastic painted black on the inside. A translucent retro-reflective material is applied to the inside of the panel. Face panels display white 40" numbers on a black background. For Barrier Engagement signs, face panels display a 39" diameter non-reflective yellow dot on a black background. A drawing of the sign structure is available upon request. Refer to Taxiway & Runway Signs Technical Information sheet for detail on Size 5 Distance Remaining signs.

### **LIGHTING SYSTEMS:**

Lighting systems are available for FAA styles 1 (120V), 2 (4.8A – 6.6A), 3 (2.8A – 6.6A) and 5 (constant 5.5A input) applications. Style 5 systems are available with 45W/6.6A/T10P incandescent lamps, 45W EXM quartz lamps, 20W quartz lamps & 4W LED lamps. Style 2 systems are available with 45W/6.6A/T10P\*\* incandescent lamps, 45W EXM\*\* quartz lamps, 20W quartz lamps & 4W LED lamps. Style 3 systems are available with 30V/50W\*\* Train incandescent, 20W quartz lamps & 4W LED lamps. All incandescent, quartz & LED systems use qty 6 lamps except for style 1. The style 1 system uses (qty 2) 100W frosted rough service lamps. Request separate literature sheets on each system for further details. (\*\*approved under FAA AC 150/5345-44G only)

### **FRANGIBILITY & MOUNTING:**

Sign legs consist of standard 2" aluminum pipe couplings connected to frangible couplings made of schedule 160 aluminum tubing. Frangible couplings screw into floor flanges (feet) or a base plate. The frangible couplings are designed to break at a total force on the sign of approx. 5200 ft/lbs, or the equivalent of approx. 1.0 psi.

### **INSTALLATION:**

See FAA Advisory Circular 150/5340-18 for guidance. FAA recommends that signs be installed 60 – 75 feet from the runway pavement edge (The 75 ft distance is best for airports with wide body jet traffic). See Runway Distance Marker Installation Instructions for mounting guidance and recommended pad dimensions.

### **PACKING & SHIPPING:**

Signs are packed in heavy double walled corrugated cartons suitable for export shipment. Carton dimensions are 55" by 56" by 12". Each sign has a packed weight of approximately 157 lbs and a volume of 22 cu/ft.



## LED LIGHTING SYSTEM

### Technical Information

#### LUMACURVE LED System

The LUMACURVE LED system maintains constant sign brightness in accordance with FAA A/C 150-5345-44 with appreciably higher efficiency relative to traditional lighting systems, and is available in new signs or in kit form for retrofit. This system delivers a constant voltage to the 4W LED lamps at all CCR current steps. This system works equally well for high intensity (Style 3, 2.8A-6.6A), medium intensity (Style 2, 4.8A-6.6A) and Style 5 (5.5A fixed) dedicated sign circuits without internal modification\*. The lamps authorized for use in this system are Standard Signs, Inc. 4W LED lamps with medium screw base. They are available directly from Standard Signs, Inc.

#### **IMPORTANT!**

*The LUMACURVE LED lighting system is designed exclusively for FAA styles 2, 3 & 5 operation on a series circuit together with and without non-sign fixtures, such as edge lights, where the sign brightness control components are necessary to maintain constant sign brightness regardless of CCR step.*

#### **INSTALLATION:**

System lamp voltage is factory set but we recommend that one sign per CCR be spot checked with a DC voltmeter after installation. Lamp voltage is read across the lamp socket leads. If voltage varies from recommended settings (170V DC for Sizes 1, 2, 3, and 5), call and ask for technical support: 800-258-1997.

#### **LAMP REPLACEMENT:**

When a lamp fails, the controller will sense that there is a lamp out and will turn off the remaining lamps. This feature is required per current FAA specifications. With the sign energized, press and hold the lamp reset button located on the side of the controller. Release reset button immediately when lamps are energized. The sign will relight except for the failed lamp. Replace the failed lamp(s). This completes the lamp replacement process. The controller does not need to be reset again.

#### **WARNING:**

*The use of non-OEM replacement lamps may damage electrical components as well as cause premature lamp failure. Only OEM Lumacurve 4W LED lamps will maintain FAA certifications and factory warranties.*

#### **DIELECTRIC GREASE:**

These LED lamps are powered by a DC source and are susceptible to corrosion from moisture. We recommend the use of dielectric grease on the lamp base to prevent corrosion.

\*Isolation transformer wattage requirements may vary for each application.

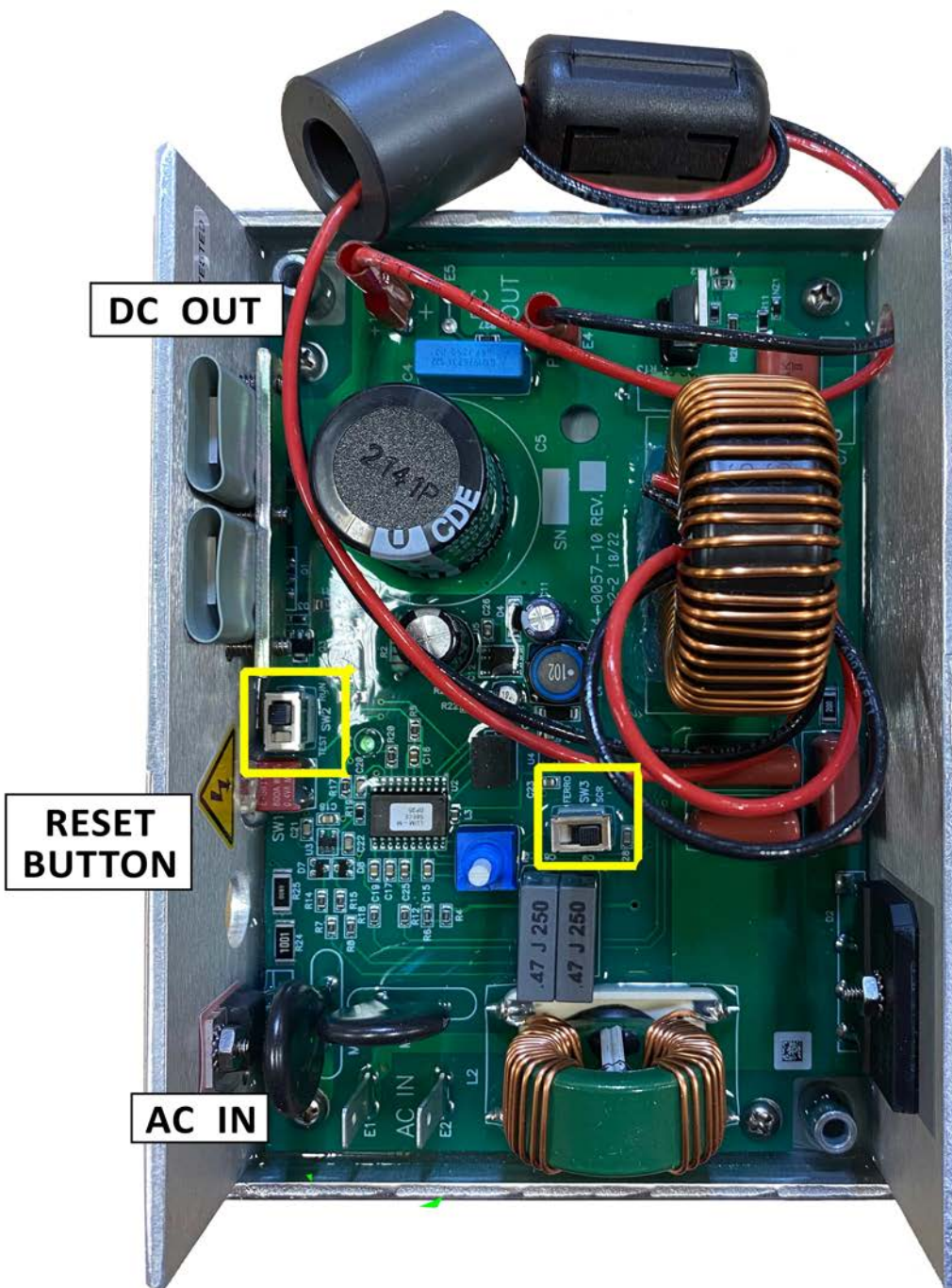


## LED LIGHTING SYSTEM

*L-610 Controller*

### L610 CONTROLLER

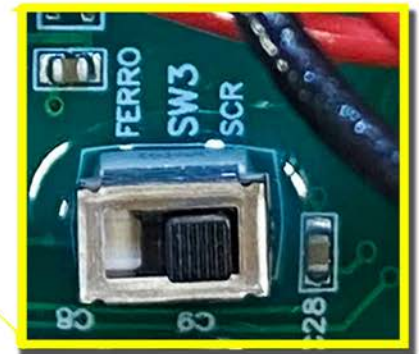
- Switch SW2 (Run & Test) is used to isolate controller programming functions when troubleshooting (1 out all out).
- Switch SW3 (Ferro & SCR) is used to set controller functions with constant current regulators (CCR's)



**SW2**



**SW3**



—— **DO NOT DISCARD** ——

Important information for AIRPORT MAINTENANCE DEPT

**To install:**

1. Locate the frangible couplings (item #1 see Electrical Connection Detail on page 2) and floor flanges (#2) that are provided with the sign. (Small sign orders may be packaged in the box with the sign. Larger order will have a separate carton containing this hardware). Coat the threads of the frangible coupling with anti-seize compound or petroleum jelly. Then screw them hand tight into the floor flanges.

***Note: It is also crucial that the correct couplings be used with the sign. The coupling size and mode are etched on the outside of the coupling. Incorrectly sized couplings will not meet FAA frangibility requirements.***

2. Locate the power cord (#4). It will be visible protruding from the power leg slip fitter.

***Note: the power cord and electrical components are located in the module nearest the nameplate on the end of the sign.***

3. Slip the coupling/floor flange assemblies into each slip fitter (#3) on the bottom of the sign. Tighten the set screws (#5) just enough to hold them in place. Floor flanges must be oriented with mounting holes perpendicular to sign base. For the power cord leg, pull enough power cord slack from the sign to connect with the isolation transformer secondary extension cord (#6).

***Note: The provided power cord is extra-long to allow exiting the sign through any leg desired.***

***Note: in a typical remote L867 base can installation, the sign leg is connected to the remote can with 2" rigid galvanized steel (RGS) conduit. An isolation transformer secondary extension cord (#6) is fed through the conduit and connects the sign power cord plug to the isolation transformer secondary plug.***

4. Locate the cable clamp (#7, provided with the sign for most new sign installations). Tighten the cable clamp (#7) onto the isolation transformer secondary extension cord female plug at grade level. Ensure the cable clamp side labeled "TOP" is facing up. The cable clamp should nest on the underside of the floor flange (#2) and on top of the conduit (#8) that is flush with the surface of the concrete mounting pad. Insert the power cord plug (male) into the isolating transformer secondary extension cord (female).

***Note: As required by the FAA, this step, in conjunction with step 6, ensures that the power cord will be disconnected/unplugged if the sign is knocked over.***

## To install (continued):

**5.** Lift the sign upright into place on the cement pad. Use the sign as a template to locate and mark mounting holes. Place sign off to one side and install anchor bolts. *Recommended anchor bolts: 3/8" x 5" for mode 2 signs, 5/8" for mode 3 signs.* Position sign over the anchor bolts and fasten the floor flanges to the cement pad with lock washers and nuts. Temporarily loosen the slip fitter set screws (#5). With a pipe wrench, tighten the frangible couplings 1/4 - 1/2 turn into the Floor Flanges. (*Warning: Do not use the wrench above the shear groove.*) Ensure that the sign is level and the modules are aligned by sighting down the length of the tops. Tighten the slip fitter set screws using a socket wrench.

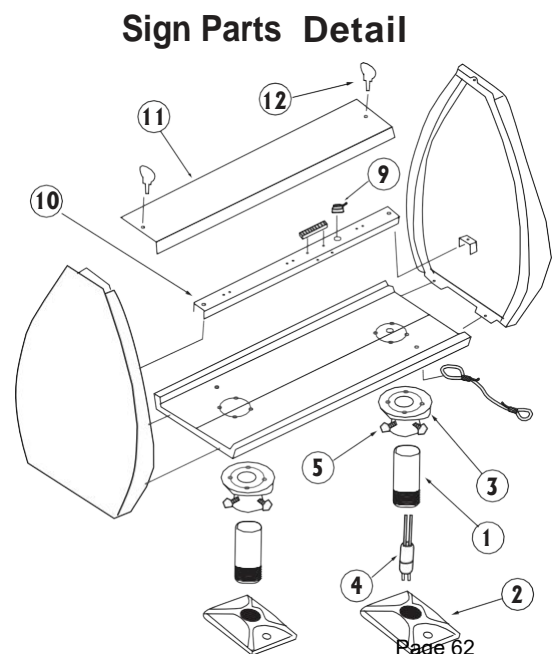
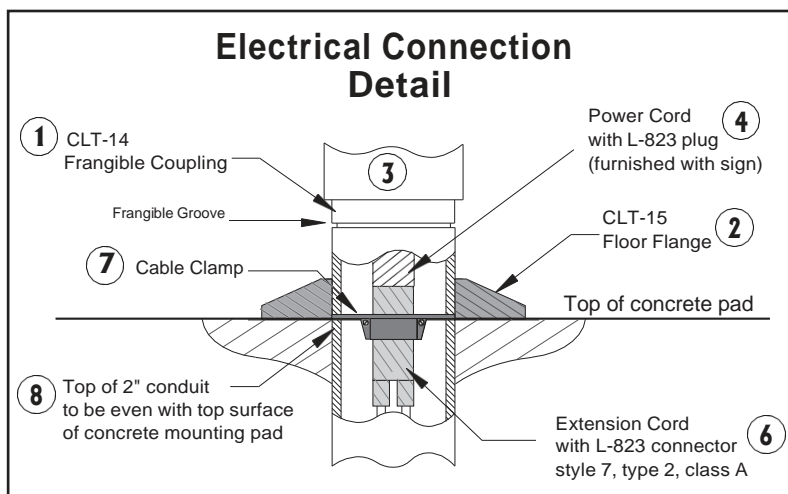
**6.** Locate the strain relief clamp (#9) inside of the sign on the light bar (#10). Remove the sign cover (#11) nearest to the nameplate on the end of the sign by unscrewing the two turn fasteners (#12) and slide out the legend panels. Remove all slack in the power cord between the plug and the strain relief clamp, then tighten the set screw on the strain relief clamp. The extra cord can be coiled & put in the bottom of the sign. (*As required by the FAA, this step in conjunction with Step 4 ensures that the power cord will be disconnected/ unplugged in the event that the sign is knocked over.*)

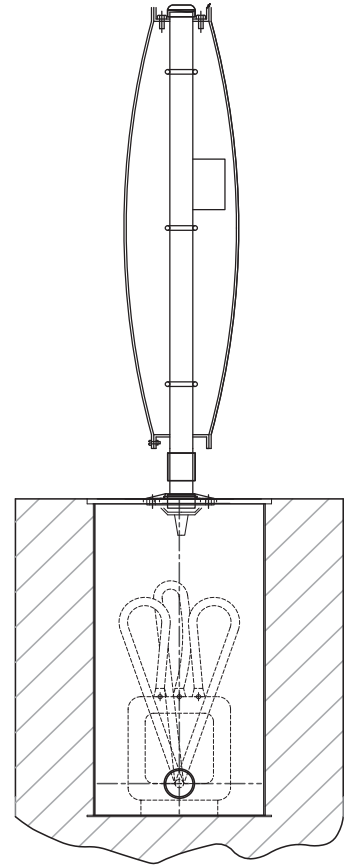
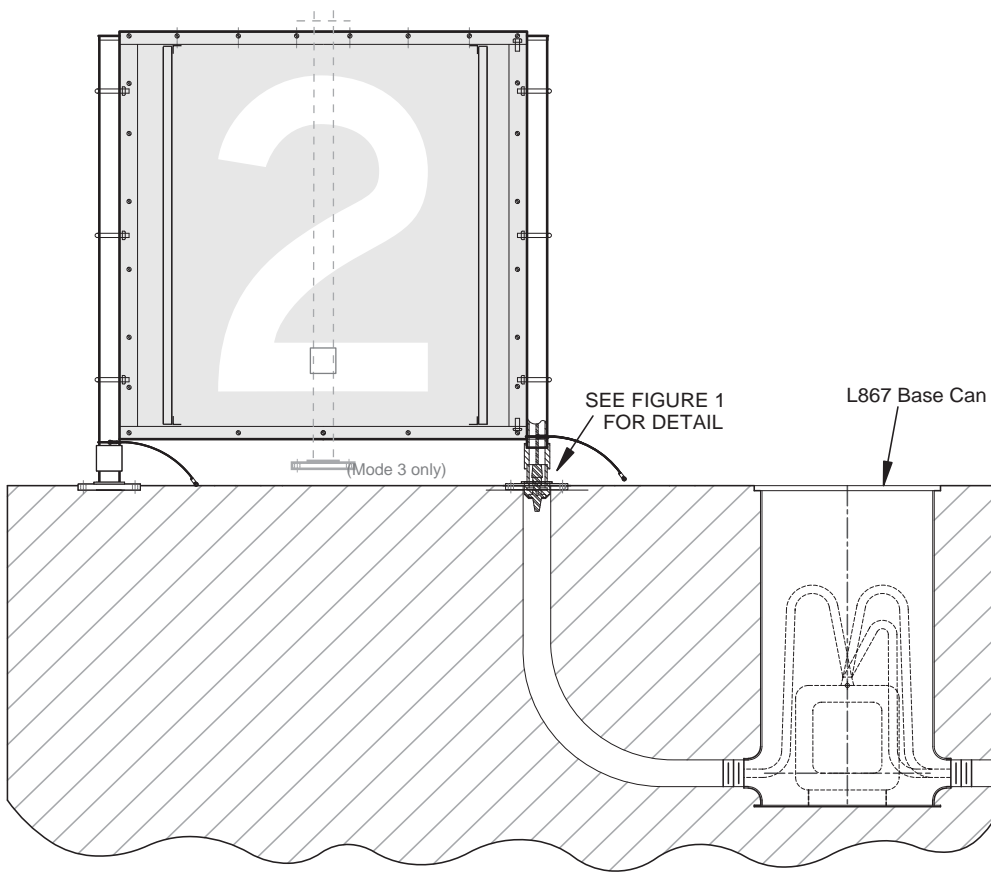
**7.** Electrical adjustments are now required. Power supply settings have been factory set but must be rechecked with an RMS meter once installed in the airfield environment. Please refer to the "Parts & Electrical Information" sheet for the lighting system being installed. Follow the "Installation" portion of those directions to ensure that the electrical settings are correct.

**8.** Replace any covers removed.

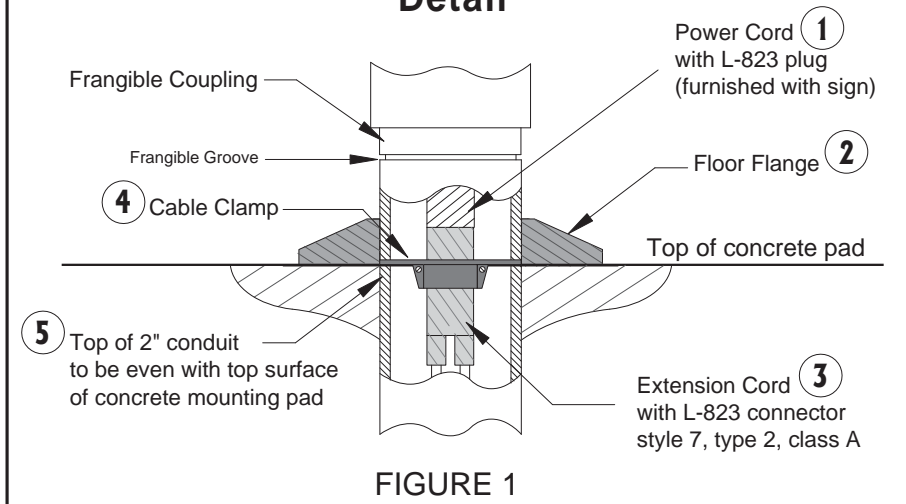
**Note: sometimes legend panels seem to obstruct the re-installation of the top covers.**

*If panels are not engaging on the underside of the top cover into the gasketed channel, please try the following: Engage the turn fasteners loosely. With the palms of your hands, slap or "pop" the centers of the opposing panels inward simultaneously. The internal pressure should apply a force that allows the top to drop into place. Apply pressure downward on the top. The technique worked and if panels are correctly installed. The resistance to tightening the turn fasteners will be eliminated.*





### Electrical Connection Detail



### LUMACURVE AIRFIELD SIGNS

9115 Freeway Drive, Macedonia, OH 44056

800.258.1997 / [www.lumacurve.com](http://www.lumacurve.com)



**Certified to current FAA Advisory Circular 150/5345-44**

Specification for Runway and Taxiway Signs  
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## **LUMACURVE LED System**

The LUMACURVE LED system maintains constant sign brightness in accordance with FAA A/C 150-5345-44 with appreciably higher efficiency relative to traditional lighting systems, and is available in new signs or in kit form for retrofit. This system delivers a constant voltage to the 4W LED lamps at all CCR current steps. This system works equally well for high intensity (Style 3, 2.8A-6.6A), medium intensity (Style 2, 4.8A-6.6A) and Style 5 (5.5A fixed) dedicated sign circuits without internal modification\*. The lamps authorized for use in this system are Standard Signs, Inc. 4W LED lamps with medium screw base. They are available directly from Standard Signs, Inc.

## **IMPORTANT!**

The LUMACURVE LED lighting system is designed exclusively for FAA styles 2, 3 & 5 operation on a series circuit together with and without non-sign fixtures, such as edge lights, where the sign brightness control components are necessary to maintain constant sign brightness regardless of CCR step.

## **INSTALLATION:**

System lamp voltage is factory set but we recommend that one sign per CCR be spot checked with a DC voltmeter after installation. Lamp voltage is read across the lamp socket leads. If voltage varies from recommended settings (170V DC for Sizes 1, 2, 3, and 5), call and ask for technical support: 800-258-1997.

## **LAMP REPLACEMENT:**

When a lamp fails, the controller will sense that there is a lamp out and will turn off the remaining lamps. This feature is required per current FAA specifications. With the sign energized, press and hold the lamp reset button located on the side of the controller. Release reset button immediately when lamps are energized. The sign will relight except for the failed lamp. Replace the failed lamp(s). This completes the lamp replacement process. The controller does not need to be reset again.

## **WARNING:**

The use of non-OEM replacement lamps may damage electrical components as well as cause premature lamp failure. Only OEM Lumacurve 4W LED lamps will maintain FAA certifications and factory warranties.

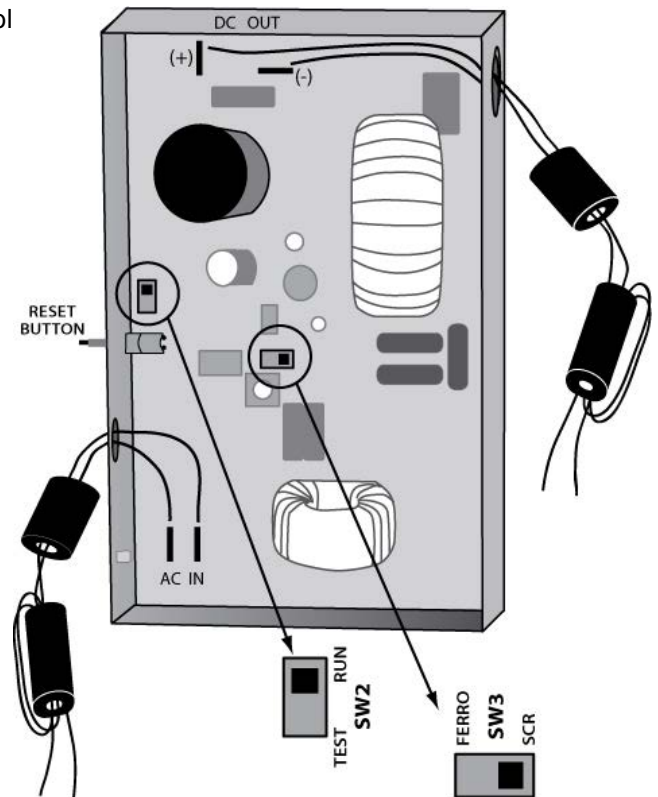
## **DIELECTRIC GREASE:**

These LED lamps are powered by a DC source and are susceptible to corrosion from moisture. We recommend the use of dielectric grease on the lamp base to prevent corrosion.

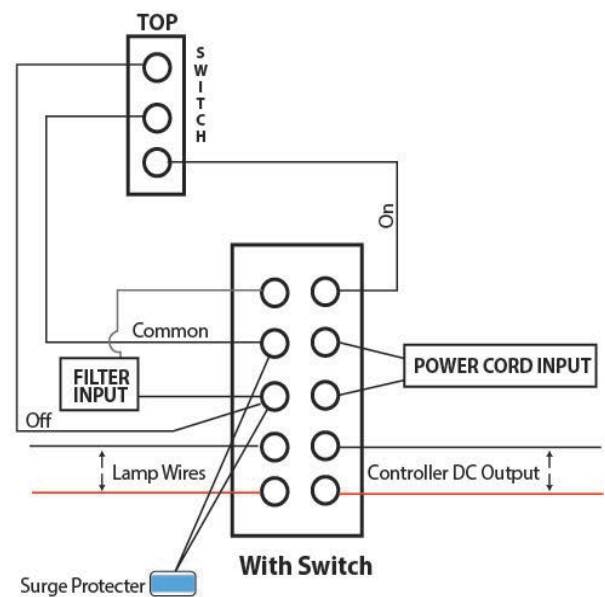
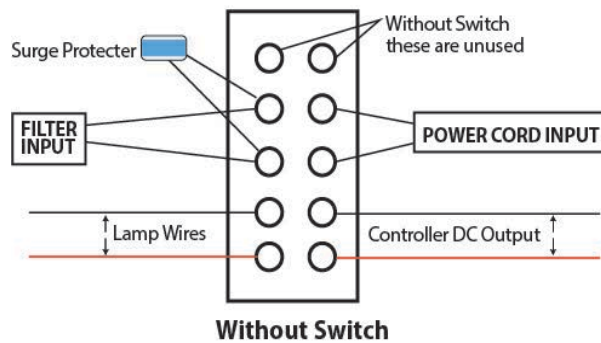
\*Isolation transformer wattage requirements may vary for each application.

## L610 Controller

- Switch **SW2** (Run & Test) is used to isolate control programming functions when troubleshooting (1 out all out).
- Switch **SW3** (Ferro & SCR) is used to set controller functions with constant current regulators (CCR's)



## On/Off Switch Wiring

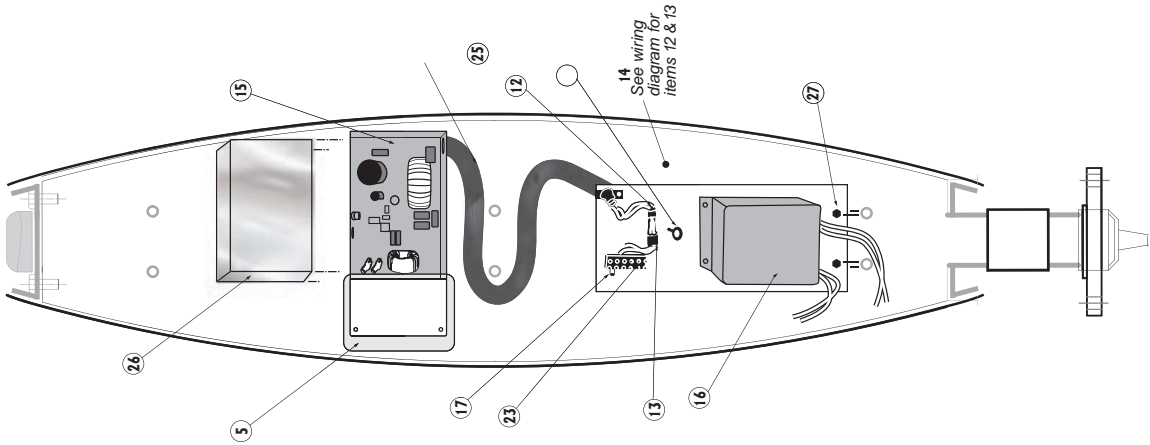


# LED LIGHTING SYSTEM

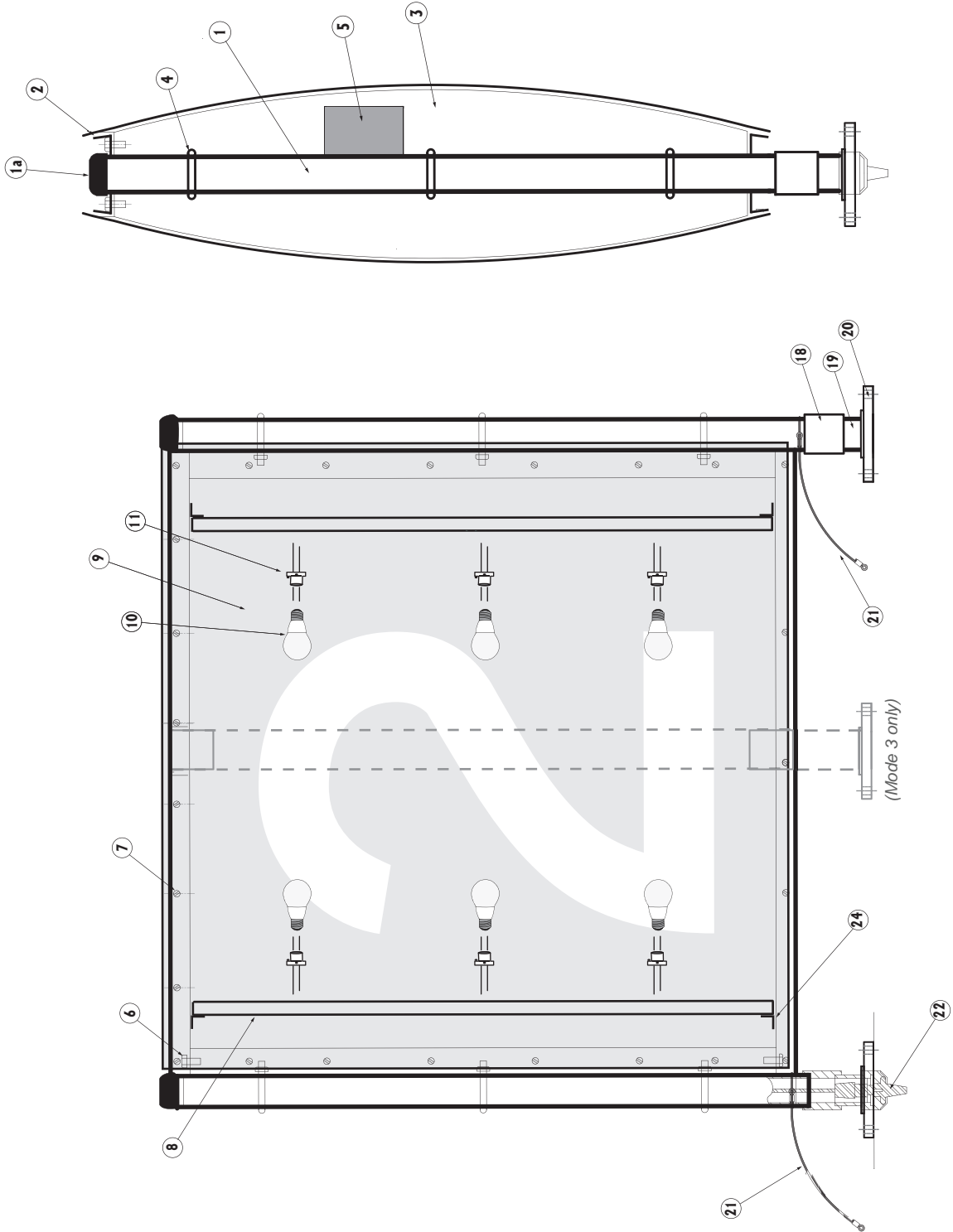
## Lumacurve Parts List

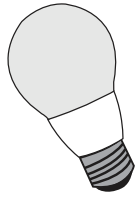
### Size 4 Distance Remaining Sign

Inside Electrical View



Outside View





# LUMACURVE PARTS LIST

## Size 4 Distance Remaining Sign

### LED Lighting System

**Certified to current FAA Advisory Circular 150/5345-44**

Specification for Runway and Taxiway Signs

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## LED Lighting System

<i>Item</i>	<i>Description</i>
1a. DCLT-1A	Leg Cap
*1. D-1	Leg
2. D-2XHD	Top/Bottom Channel
3. DTG-2	End Panel
*4. D-4/D-4AA/370/360	U-Bolts w/ nuts & washers
5. D-3A/D-3B DM Door Handle	Access Door (handle on power side)
6. 215/220/230/232	1/4" Hardware
7. 394 Face Hardware	1/4" x 3/4" Hex Head
8. D-8P	Light Bar
9. D-15	48" x 48" legend panel
10. LED Lamp	4W LED Lamp
11. 500	Lampholder
12. G Ferrite A	Ferrite Core Split
13. G Ferrite B	Ferrite Core Not Split
14. 480	Cable Clamp
15. L610	LED PCB Controller, DC (1-12 lamps)
16. G Low Pass Filter	ALD Low Pass Filter
17. E416	Surge Protector
*18. 2" Al Coupling	2" Pipe Coupling
*19. 140A	Frangible Coupling-2600 ft/lbs
20. 15-XHDT	5" x 8" Aluminum Floor Flange
21. 190-3/16"	Tether
22. 430	Cord & Plug
23. 420	Terminal Strip (6 block)
24. PS Bracket	Angle Brackets
25. 3/8" Conduit	Flexible Conduit
26. G EMI Shield Screen	Controller Screen
27. 360	3/8" Hardware

Enlarged Views



*\*Mode 3 parts may be different or not listed.  
Please call for more information.*

## LUMACURVE AIRFIELD SIGNS

9115 Freeway Drive, Macedonia, OH 44056

Phone: 800.258.1997 / 330.467.2030

[www.lumacurve.com](http://www.lumacurve.com)



## Installing: Lumacurve LED Upgrade kits Size 4 Distance Remaining Signs

### Installing Lumacurve Distance Remaining Size 4 LED Upgrade kits

The purpose of this guide is to help contractors and airfield personnel install Lumacurve LED Upgrade Lighting Kits into existing Lumacurve Size 4 Distance Remaining signs. Work through the steps below, and if you have any problems, don't hesitate to call us for technical support, 800-258-1997.

We recommend reading through the entire instructions first and familiarizing yourself with the procedures before beginning the installation.

**NOTE: Using Non-OEM after-market parts will void FAA Certification and void manufacturer warranties.**  
**WARNING:** The sign must be de-energized before working on Lumacurve airfield guidance signs unless otherwise instructed. Failure to do so may result in personal injury or damage to internal sign components.

**Recommended tools:** (Additional tools may be needed to remove the existing lighting system.)

Small Standard Screwdriver	Power Drill	Pop Rivet Tool 1/8"
#2 Phillips Screwdriver	Drill Bits: 13/64", 1/4", 5/32", 1/8"	5/16" Nut drivers
3/8" Socket Wrench or Nut Driver	9/16" Socket or Wrench	Round file

#### 1. Removing the existing lighting system

- Remove one face panel, exposing the "power" leg to your left. Be careful not to strip fiberglass frame components.
- Completely remove the existing lighting system.

#### 2. Installing the Line Filter (image)

- Position filter mounting plate on the lower 2 U-bolt threaded ends as shown in Figure #1
- Secure using two 3/8" hex nuts
- Install power cord leads through cable clamp, connect to the terminal strip, shown in Figure #2

#### 3. Installing the Distance Marker LED Light Bars

- Lightbars need to be 3" from the flat edge of the end panel.
- Install the light bars with lead wires into position first on the power side of the sign.
- Install the non-power side light bar.
- <https://lumacurve.com/wp-content/uploads/2020/10/G.DM-LED-InstallInstructions.pdf> Install the terminal strip as shown in Figure #2

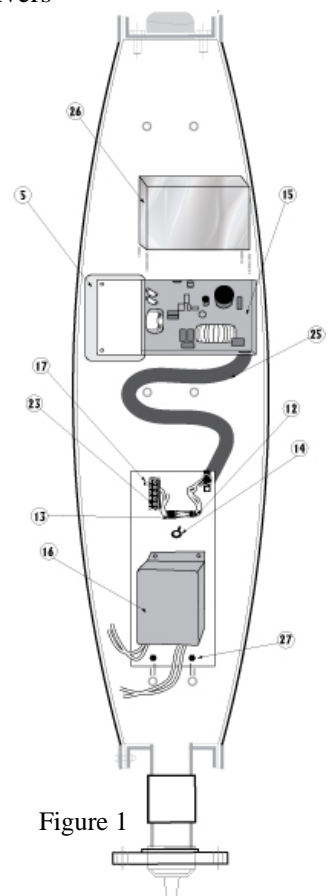


Figure 1

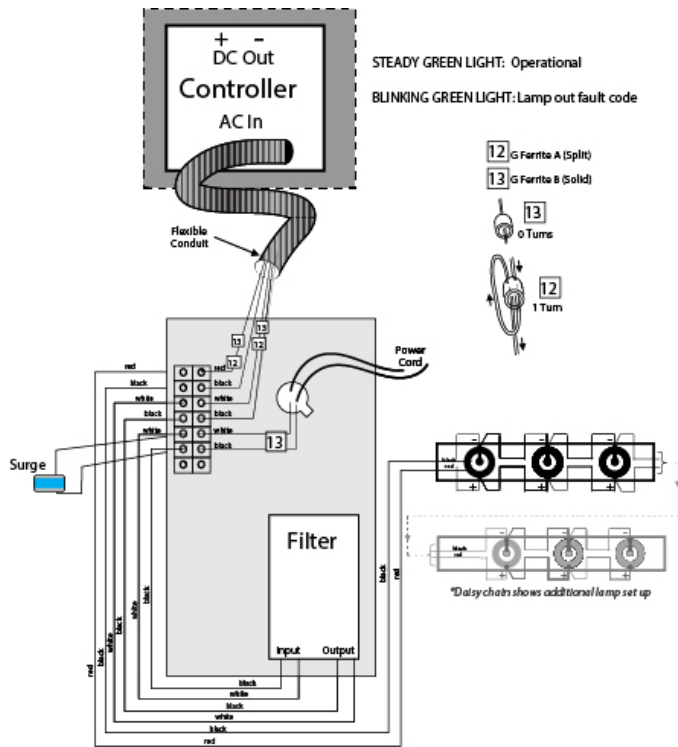


Figure 2:  
General Wiring

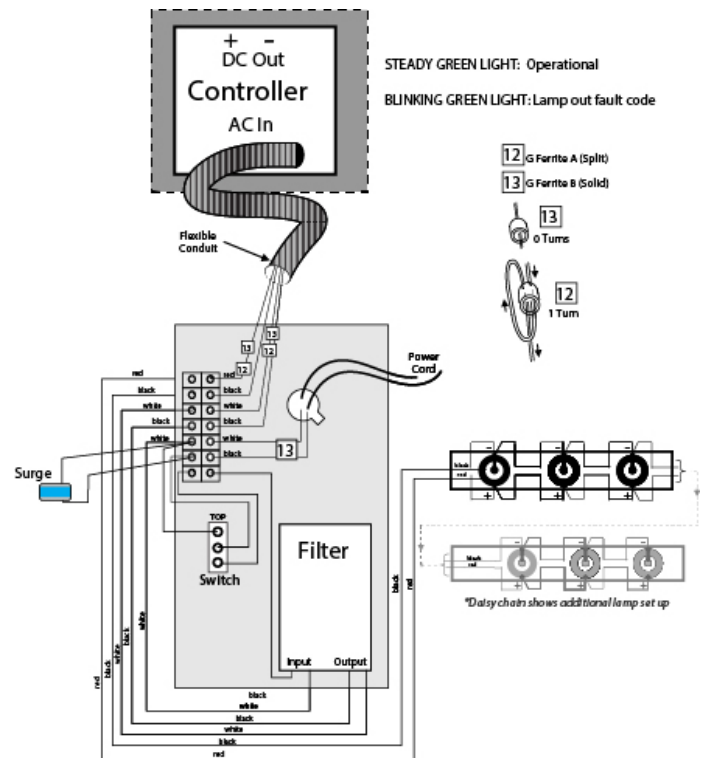


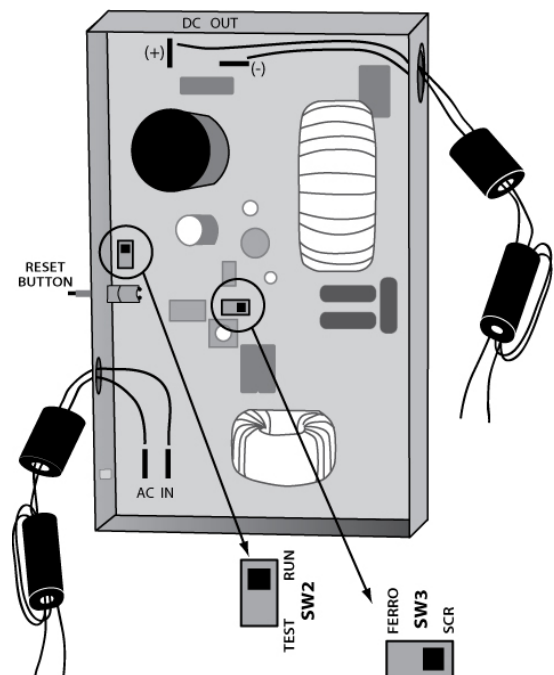
Figure 2A:  
On/Off Switch Wiring

#### 4. Installing the Controller

- Remove the power side access door.
- Carefully install new access door (with controller and controller plate.)
- Secure wire harness end furthest from the controller to filter mounting plate at top right with #8 x 5/8" screw.

#### 5. Making Electrical Connections

- Identify the Controllers input leads. Install these black and white leads into the terminal strip opposite of the Filter Output wires, as shown in Figure #2.
- Identify the DC output leads. Connect these red and black wires opposite the lamp socket red and black wires on the filter plate terminal strip, as shown in Figure #2.
- The wiring diagram for our signs' On/Off switch is shown in Figure #2A.





## 6. Using the switches on the L610 Controller

- Switch **SW2** (Run & Test) is used to isolate controller programming functions when troubleshooting (1 out all out).
- Switch **SW3** (Ferro & SCR) is used to set controller functions with constant current regulators (CCR's)

## 7. Installing the Shielding Screen

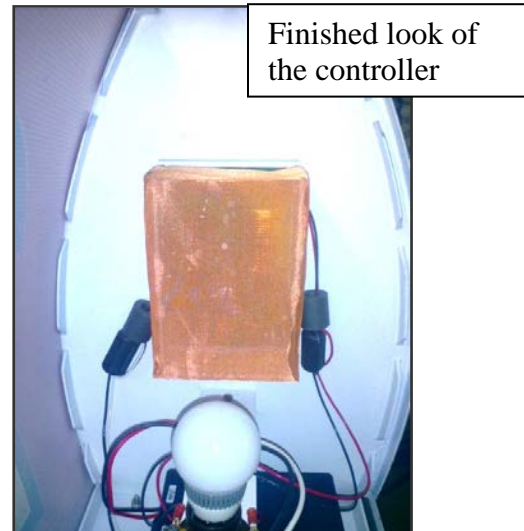
On each side of the controller are screws and fender washers Figure #3. These hold the shielding screen in place. If the fender washers are tight to the side of the controller, loosen them slightly to slip the edge of the screen between the fender washer and the controller case. The shielding screen is shaped to precisely fit the controller. Once the screen is in place, tighten the screw & fender washers to secure screen.



(Figure #3)



Fender washer and screw serves as a clamp to hold the shielding screen in place



## 8. Installing the OEM Electrical Upgrade Nameplate

Each Lumacurve LED Upgrade Kit contains an OEM Electrical Upgrade Label Figure #4 and (2) 1/8" pop-rivets. Information on this label is critical for future sign maintenance. This label should be mounted to the sign end panel (power side of sign) just below the original factory nameplate.

- a) Be careful not to come into contact with any components mounted on the inside of the end panel. Carefully position the OEM Electrical Upgrade Label just below the original factory nameplate. While holding the label in place, use a 1/8" or 9/64" drill bit to drill through the two holes in the label.
- b) Install two 1/8" pop-rivets to secure the label in place.



Figure #4

## 9. Checking system & restoring the sign to service

The electrical components should now be mounted and wired correctly.

- a) Insert all lamps into the sockets.  
Warning: the use of non-OEM replacement lamps may damage electrical components and cause premature lamp failure. Only OEM Lumacurve lamps will maintain FAA photometric requirements and factory warranties.
- b) Check that the properly sized isolation transformer is being used. See chart.
- c) Power up the sign and check that all lamps are functioning adequately.
- d) Reinstall all the legend panels.

**Note: If the sign is not functioning, revisit the above steps once again to ensure the sign is wired properly. If there are still problems, contact us for technical support at 800-258-1997 or visit our Help Yourself Center for videos and troubleshooting documents at [www.lumacurve.com/helpyourself](http://www.lumacurve.com/helpyourself)**

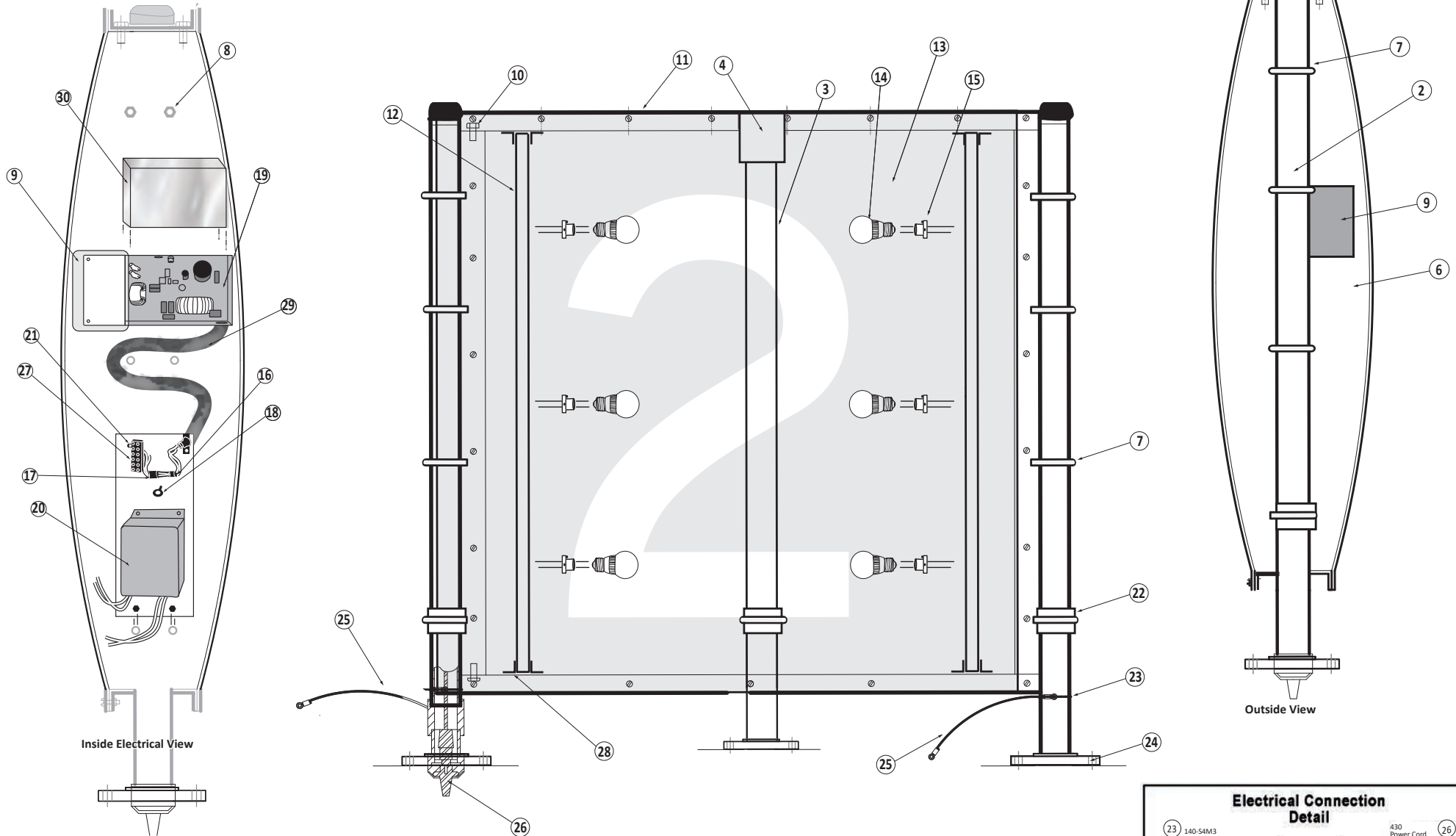
Use the chart below to identify the proper size isolation transformer:

		FAA Style 2 (4.8A-6.6A) FAA Style 3 (2.8A-6.6A)				FAA Style 5 (5.5A)		
SIGN SIZE & MODULE LENGTH	LAMPS	4W LED				4W LED		
		ISO XFMR	MAX VA	POWER FACTOR		ISO XFMR	MAX VA	POWER FACTOR
Size 1, 1-mod	2	100W	49	.94		100W	37	.94
2-mod	4	100W	64	.88		100W	48	.89
3-mod	6	100W	67	.89		100W	50	.90
4-mod	8	100W	73	.90		100W	56	.91
Size 2, 1-mod	3	100W	62	.87		100W	46	.88
2-mod	6	100W	67	.89		100W	50	.90
3-mod	9	100W	74	.90		100W	58	.92
4-mod	12	100W	78	.91		100W	62	.93
Size 3, 1-mod	3	100W	62	.87		100W	46	.88
2-mod	6	100W	67	.89		100W	50	.90
3-mod	9	100W	74	.90		100W	58	.92
4-mod	12	100W	78	.91		100W	62	.93
Size 5, 1-mod	3	100W	62	.87		100W	46	.88
Size 4, 1-mod	6	100W	67	.89		100W	50	.90

# LED MODE 3 LIGHTING SYSTEM

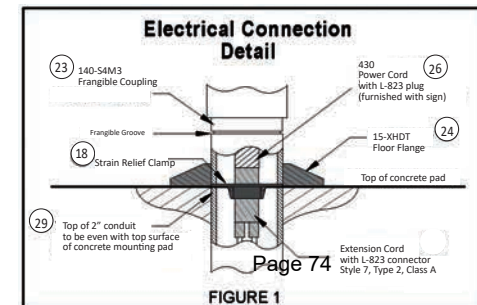
## Lumacurve Parts List

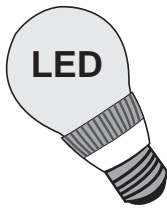
### Size 4 Distance Remaining Sign



Inside Electrical View

Outside View



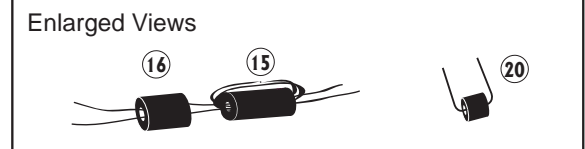


# LUMACURVE PARTS LIST

## Size 4 Distance Remaining Sign MODE 3 LED Lighting System

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ITEM	DESCRIPTION
1. DCLT-1A	Leg Cap
2. D-1-Mode-3-Outer	DM Leg (42.5" x 2" sched. 80 AL)
3. D-1-Mode-3-Inner	Center Column (40.375" x 2" sched. 80 AL)
4. 130*	Slip-fitter, Size 4, Mode 3
5. D-2 XHD	Top/Bottom Aluminum Channel
6. DTG-2	End Panel
7. D-4-Mode-3	SS U-Bolt - Mode - 3
8. D-4AA/370/360	Fender Washer/Lock Washer/Hexnut
9. D3-A/D3-B/D3-C	Access Door (handle on power side), Turn Fastener, Receptacle
10. 220/230/232/215	1/4" Hardware
11. 394	1/4" x 3/4" Hex Head - installing Legend Panel (28 per face)
12. D-8P	Light Bar Channel (Vertical)
13. D-15NCA	48" X 48" Legend Panel, non-crimped (mfd after 1-19-19)
14. LED Lamp	4W LED Lamp
15. 500	Lamp holder
16. G Ferrite A	Ferrite Core Split
17. G Ferrite B	Ferrite Core Not Split
18. 480	Strain Relief Clamp
19. L610	LED PCB Controller, DC
20. G Low Pass Filter	ALD Low Pass Filter
21. E416	Surge Protector
22. 2" AI Coupling	2" Pipe Coupling
23. 140-S4M3	Frangible Coupling - 2600ft/lbs
24. 15-XHDT	5" x 8" Galv. Floor Flange
25. 190 - 3/16" Assembly	Tether
26. 430	Cord and Plug
27. 420	Terminal Strip (6 block)
28. PS-Bracket	Panel Support Bracket
29. 3/8" Convoluted Conduit	Convoluted Conduit - 10ft long
30. G EMI Shield Screen	Controller Screen



\* Must indicate for Size 4, Mode 3 when ordering

### LUMACURVE AIRFIELD SIGNS, INC.

9115 Freeway Drive, Macedonia, OH 44056

Phone: 800.258.1997 / 330.467.2030

www.lumacurve.com

The purpose of this guide is to help contractors and airfield personnel remove old and install new Size 4 Distance Marker Sign Panels.

#### **28 HOLE INSTALLATION:** *(Signs manufactured after 12/15/12)*

**CAUTION:** Excessive downward force applied to the attachment screws can strip the fiberglass sign frame both during panel removal and during panel installation.

1. Carefully remove existing sign panel screws from the sign (do NOT strip fiberglass sign frame).
2. Remove panel.
3. Align the removed panel on top of the new panel.
4. Use the removed panel as a template and mark each hole location (28).
5. Pre-drill 28 holes in the new panel using a 17/64" drill bit.
6. Position the new panel on the sign frame.
7. Use a carefully selected torque setting to reinstall existing screws (28).

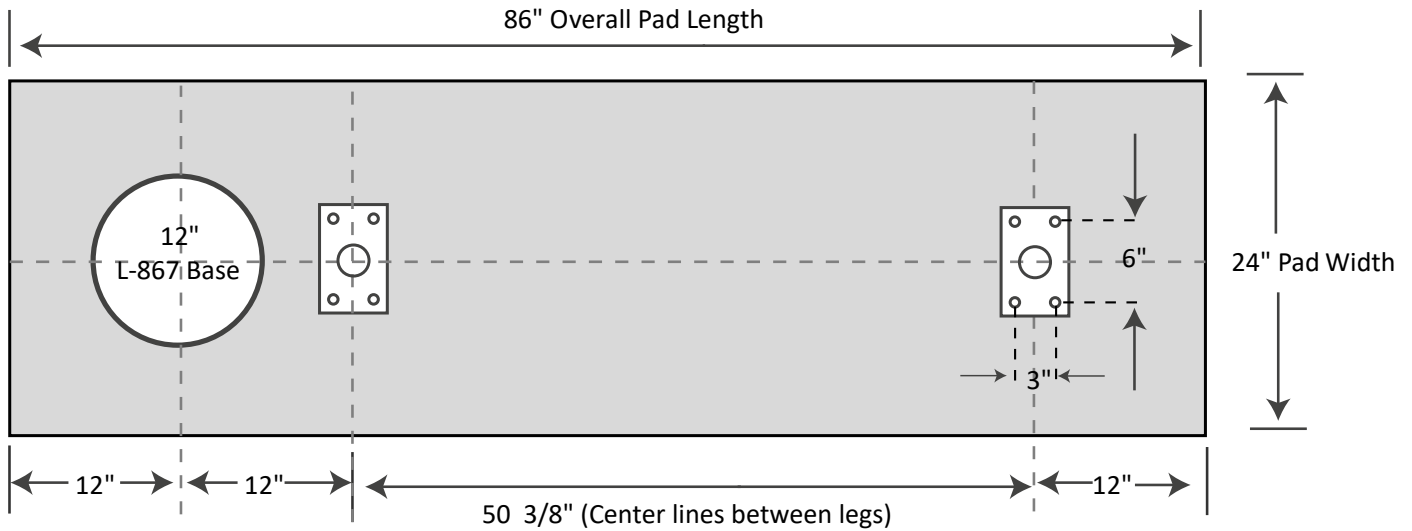
#### **24 HOLE INSTALLATION:** *(Signs manufactured before 12/15/12)*

**CAUTION:** Excessive downward force applied to the attachment screws can strip the fiberglass sign frame both during panel removal and during panel installation.

1. Carefully remove existing sign panel screws from the sign (do NOT strip fiberglass sign frame).
2. Remove panel.
3. Align the removed panel on top of the new panel.
4. Use the removed panel as a template and mark each hole location (24).
5. Pre-drill 24 holes in the new panel using a 13/64" drill bit.
6. Position the new panel on the sign frame.
7. Use a carefully selected torque setting to reinstall existing screws (24).

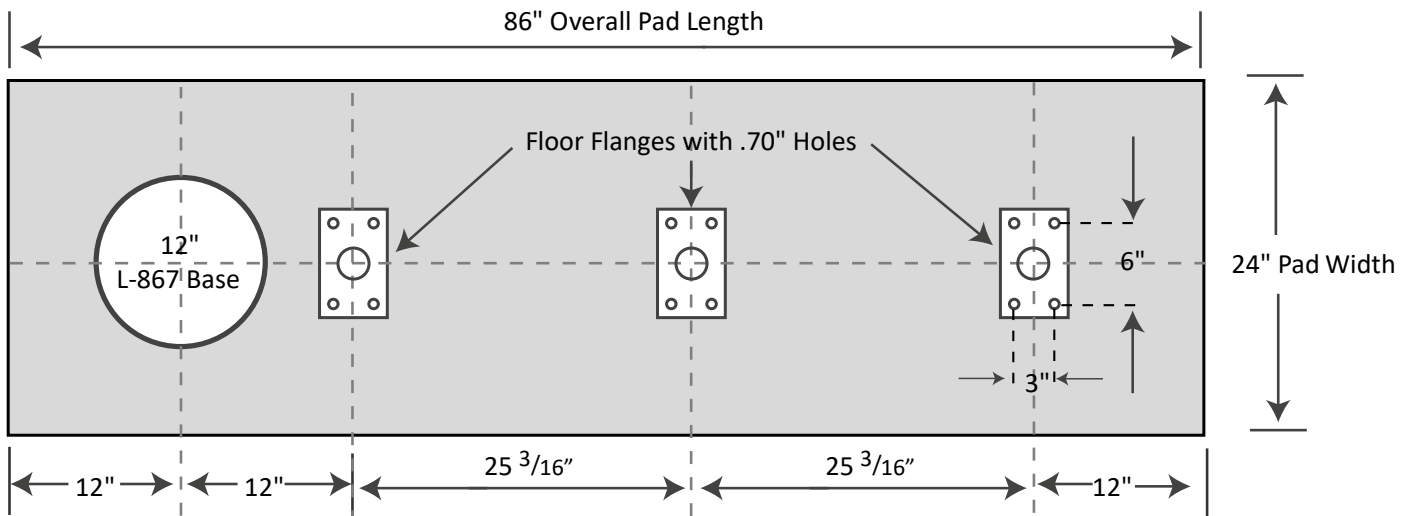
**NOTE:** If a hole in the fiberglass sign frame becomes stripped, drill a larger hole (3/16") in the corresponding location on the replacement panel, then use a larger screw to secure the panel to the sign frame. #10 screws are provided as original sign equipment. #12 screws are recommended as up-sized replacements in the event of stripped fiberglass sign frame.

**MODE 2**



Use 5/8" diameter anchor bolts for mounting to pad  
When setting bolts, allow for approximately 3/4" flange thickness.

**MODE 3**



Use 5/8" diameter anchor bolts for mounting to pad  
When setting bolts, allow for approximately 3/4" flange thickness.



# **LUMACURVE SIGN MAINTENANCE**

This document includes excerpts from:

# FAA Advisory Circular 150/5340-26

## Maintenance of Airport Visual Aid Facilities

Dated 4/4/2005

*We have included the information that we have found pertinent to the maintenance of our Lumacurve airfield signs.  
The Advisory Circular in its entirety can be found on the FAA's website: [www.faa.gov](http://www.faa.gov)*

### CHAPTER 3. MAINTENANCE MANAGEMENT.

#### 3.0 MAINTENANCE PHILOSOPHY.

The purpose of the maintenance management system is to ensure the maximum availability of any given system at a minimum cost in man-hours or funds. "Availability" and "costs" are relative terms; they must be interpreted for each airport. For example, a CAT I runway may still be considered operational with 15% of the edge lights out, while a PAPI system may be unserviceable with more than one lamp out per box. By the same reasoning, the cost of maintaining a spare regulator may be considered cost prohibitive, while stocking replacements for 10% of the runway edge lights may be considered a normal practice. In addition, operational factors are a major consideration in determining what maintenance is required. Airports with heavy traffic may require more frequent maintenance servicing than those used only by light traffic. The maintenance operations include maintenance planning, preventive maintenance inspection, visual inspection, repair, installation, calibration, and unscheduled maintenance procedures. Maintenance procedures, including the work order and documentation required, may vary between airports. The purpose of this document is to provide the minimum maintenance procedures required for safe and efficient movement of aircraft during takeoff, landing, and taxiing operations.

Regardless of the actual maintenance routines decided upon, the following elements are essential to any controlled maintenance program. The maintenance procedures in this AC are considered minimum guidelines:

- a. Document the service checks that comprise the maintenance program.
- b. Record the performance of each maintenance action, scheduled or unscheduled.
- c. Document repairs and troubleshooting performed on each piece of equipment and the results of those actions as well as the symptoms related to the malfunction. This allows for more rapid troubleshooting of similar problems at a later date.

#### 3.1 MAINTENANCE SCHEDULE.

Documenting the maintenance schedule by spelling out each item of routine maintenance is beneficial in several ways:

- a. It allows planned allocation of man-hours to the maintenance function.
- b. It helps to establish spare part stock levels.
- c. It identifies the necessary maintenance routines to new employees, decreasing training time needed for system familiarization.
- d. It identifies the scope of the maintenance task in terms of man-hours and material requirements.

#### 3.2 MAINTENANCE RECORDS.

Maintenance records are an important part of an effective maintenance management system; they provide a service history of each piece of equipment, ensure regular maintenance without duplication of effort, and provide a data base for statistical analysis of lighting system performance. Without records, knowledge gained from regular inspections will not be retained, and preventive maintenance will be difficult. An effective records system should

allow for the recording and retrieval of information with a minimum of effort. The records system should compile data that will document the effectiveness of the maintenance program. By checking the records, a manager should be able to determine whether a particular maintenance task is being done too frequently or not often enough. By such a trial-and-error process, a maintenance program uniquely tailored to the facility can be developed.

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### **3.3 PREVENTIVE MAINTENANCE PROGRAM.**

Reliable functioning of airport lighted visual aids is essential to airport safety, capacity, and operation especially for low visibility operations. Therefore, it is essential that a preventive maintenance program be established to ensure reliable service and proper equipment operation. Properly scheduled inspections, testing, and calibrations are essential to the proper functioning of these systems. Airport lighting systems are designed to be dependable and may continue to operate for long periods of time even if maintenance is neglected. Eventually a failure will occur and, if the failure occurs at a critical time, safety may be jeopardized. Lighted visual aid maintenance should receive high priority to prevent equipment failure, false signals, and deterioration of the system.

#### **3.3.1 Installation and Material.**

The first element in a preventive maintenance program is high quality, properly installed equipment. Preventive maintenance is difficult on equipment that has been installed haphazardly without consideration of maintenance requirements. When such conditions exist, they should be brought to the attention of the proper authority and corrected rather than trying to establish a preventive maintenance program to compensate for the condition.

Consult the electrical maintenance supervisor at an airport prior to and during the design of any installation of new or additional visual aid systems. By so doing, the airport can avoid costly problems during and after construction. Consideration should also be given to the method of selection and training of any contractor personnel involved in the installation of airfield lighting products. The need for specialized training for airport maintenance electricians applies to the contractor personnel also.

#### **3.3.2 Personnel.**

The second element in a preventive maintenance program is trained experienced personnel. Maintenance personnel should have a thorough knowledge of the equipment, should have experience with high voltage, and should be able to make careful inspections and necessary repairs. Special training is available and may be desirable, as most well-qualified electricians can be trained on-the-job if suitable supervision and instruction are provided. Considerable experience with the equipment and its operation is desirable. These individuals should be present, or on-call, during the operating hours of the airport to correct any deficiencies that may develop. In short, airport visual aid maintenance personnel should be specialists in the field.

#### **3.3.3 Tools and Test Equipment.**

The third element in a preventive maintenance program is the tools and test equipment required to perform the maintenance. This includes specialized tools and test equipment, adequate working space, adequate storage space, spare parts, and applicable technical manuals.

#### **3.3.4 Preventive Maintenance Inspection Program.**

The fourth element in a preventive maintenance program is an effective preventive maintenance inspection schedule for each visual aid. This schedule should also include all cable systems. The preventive maintenance inspection (PMI) schedule is the foundation for the successful maintenance of the equipment. If the PMI is performed properly and at the scheduled time, it will ensure top system performance and will minimize unscheduled interruptions and breakdowns. Review of the inspection records, checks, tests, and repairs provides a constant awareness of the equipment condition and gives maintenance personnel advanced warning of impending trouble.

#### **3.3.5 Preventive Maintenance Inspection Schedule.**

Scheduled inspections and tests are those accomplished on specific types of equipment on a periodic basis. The schedule may be based either on calendar or on hourly-use increments. The PMI schedules, based upon recommendations from the manufacturers and users of the equipment, are considered to be the typical requirements to keep the equipment in good condition. Adjust the frequency of a particular PMI after experience is gained under local operating conditions.

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### **3.4 RECORD RETENTION.**

There is no set period of time that maintenance records should be kept, but in keeping within the goals mentioned above, a period of twice the longest period recorded would appear to be the minimum (i.e., 2 years in the case of annual maintenance action). Records of daily inspection will, of course, lose their significance much sooner,

probably within a month. It should be noted however, that maintenance records should be retained permanently, if possible, as situations may develop years later in which those records can prove invaluable.

### **3.5 REFERENCE LIBRARY.**

Establish a reference library to maintain a master copy of all Equipment Technical Manuals (ETMs), ACs, as-built drawings, and other useful technical data. The electrical supervisor should establish and maintain responsibility for maintaining the technical reference library and ensure that technical manuals and drawings are kept up to date and not lost or damaged.

#### **3.5.1 Equipment Technical Manuals (ETMs).**

ETMs and other manufacturer's literature form an important part of the reference library. Obtain two copies of all technical manuals and related manufacturer's literature. Retain a master copy in the reference library, and provide a separate copy for the shop. In addition, keep a copy of each equipment manual at the equipment location. This facilitates troubleshooting and repairs without the necessity of traveling back to the shop location to retrieve the manual. Do not remove the master copy of the technical manual from the reference library as it can easily become misplaced or lost. In the event the shop copy is lost, make another photocopy of the technical manual from the reference library instead of releasing the master copy.

#### **3.5.2 Advisory Circulars.**

Important reference information on installation, design tolerances, and operation of visual aid equipment may be found in FAA ACs. Include a copy of the ACs covering the equipment at the facility, along with a copy of this AC, in the reference library.

#### **3.5.3 Other Technical Data.**

Other reference information that is occasionally useful should also be added to the library. This might include local electrical codes, engineer's handbooks, test equipment manuals, and other general information publications.

#### **3.5.4 As-Built Drawings.**

Maintain the master copy of all as-built (record) drawings as part of the reference library. Incorporate modifications to any equipment into the drawings as soon as the modification is completed. Give a copy of the "as-built" lighting plan, showing the location of all cable runs, runway lights, etc., and including the wiring diagrams for the lighting, engine generator, and the visual aid system, to the field technicians as a working copy. Install or identify test points at appropriate locations in the field circuitry and record locations of these test points on the "as-built" drawings. Immediately update any notations regarding test points or discrepancies in the drawings made in the field on the master set in the reference library.

### **3.6 SPARE PART PROVISIONING.**

This paragraph contains guidelines on how to establish a stock of spare parts to be used for quick repair of lighting equipment that fails unexpectedly. The purpose of a spare parts system is to have the necessary part on hand when 17 AC 150/5340-26A 4/4/2005 a piece of equipment fails; this will minimize the time the system is out of operation. However, the greater the number of spare parts stored, the greater the inventory costs. The optimum spare part system balances the cost of system downtime (lost operation, tenant inconvenience, safety, etc.) with the cost of purchasing and storing spare parts. A small airport with few operations may suffer little inconvenience with the loss of their lighting system and may, therefore, choose to stock few spare parts. A large airport may rely heavily on its lighting system for low visibility operations and would, therefore, require a substantial quantity of spare parts. In the case of a large airport, the funds lost by the tenants due to interrupted operations and the impact on the safety and security of the traveling public must also be taken into consideration. A malfunction at a major airport can have a far reaching effect on the national airspace system. When establishing a spare parts inventory, two questions must be answered:

(1) What parts should be stocked?

(2) How many of each part?

When new construction occurs or a project is funded for replacement of existing systems, fund and include a quantity of spare parts (fixtures, lamps, fuses, relays and spare CCR control boards, etc.) in the equipment furnished by the contractor. This gives the maintenance department a built-in stock of spare parts and lessens the time required to procure parts for the new equipment. This is especially true if the equipment being installed is different from what is currently in use.

#### **3.6.1 Choosing Spare Parts.**

To answer the two questions posed above, several factors must be considered, including failure rate, part availability, and effect of the part failure.

### 3.6.2 Failure Rate.

The failure rate (or replacement rate) is the product of the expected life of an item and the number of items in the system. For instance, if a lamp is expected to last six months, and we have 100 lamps in the system, then an average of 100 lamps will be replaced every six months or approximately four per week. Accurate records of parts used over time will help immensely in determining a failure rate.

### 3.6.3 Part Availability.

Part availability refers to the time it takes to secure a replacement part. This usually means procurement lead time. If a part can be readily procured from shelf stock of a local supplier, it might not be necessary to add the part to the spare parts inventory; as it could be purchased when needed or the number of spare parts in the inventory could be reduced. However, if there is a six-week lead time required by the supplier, then stock six times the weekly failure rate (24 lamps in the example above). Spare parts for constant current regulators and other special equipment fall into this category. For instance, a replacement printed circuit board or other assembly typically has a six to twelve week lead time and unless a spare regulator is maintained for emergency use, the loss of a circuit could have a serious effect on airport operations. There are methods of obtaining parts which may reduce the effect of a long lead time. These include substitution (the use of a functionally equivalent part from another manufacturer), cannibalization (replacing one of a pair of adjacent failed lamps by “borrowing” a lamp from elsewhere in the system), and temporary fixes (such as the use of portable lights in place of the fixed light installation) while awaiting corrective maintenance. It should be noted, however, that these solutions should be considered only as an emergency measure and that proper spare parts provisioning will eliminate the need for such techniques.

*(As a result of our “Wait-Less” service, it is not necessary to maintain a large inventory of Lumacurve spare parts. Common parts as well as custom legend panels will be produced & shipped same day if the order is received before 10AM eastern standard time.)*

### 3.6.4 Effect of the Failure.

The effect of the failure of a particular spare part depends on how important the part is to the equipment it is installed in, and how vital the equipment is to airport operations. The failure of a lamp in an edge light would not lead to any system downtime, but the failure of a circuit board in a constant current regulator would cause the loss of the entire lighting circuit that it powers. The equipment manufacturer will give guidance on recommended spare parts. As experience is gained with the system, other parts may be added or deleted from the inventory. The impact of a part’s failure should be considered when building a spare parts inventory.

### 3.6.5 Part Identification.

An important part of maintaining a spare parts inventory is accurately cataloging the parts on hand by manufacturer’s part number. This is important to ensure that the correct part is used in a broken piece of equipment; many optical parts are visually similar but vary significantly in performance. The use of the manufacturer’s part number is also vital when reordering; if a part is ordered by its generic name, the manufacturer may send a later version of the part which is incompatible with the existing system. It is extremely important to maintain manufacturer’s data which reflects your equipment, describing the type, model number, and serial number details.

### 3.6.6 Use of Original Equipment Manufacturer (OEM) Part.

The use of non-OEM parts or lamps in FAA approved equipment is strongly discouraged. The FAA has strict specifications for approval of all airport lighting equipment and use of non-OEM parts or lamps in such equipment or systems can render the equipment to be functionally non-FAA approved. This could possibly lead to serious liability consequences in case of an aircraft incident at an airport following these practices. In the case of runway and taxiway lighting fixtures, the use of a generic, non-approved lamp can render the photometric output of the fixture out of specification with disastrous results in light output and, consequently, safety of low visibility operations.

**Warning: The use of non-OEM replacement parts in Lumacurve signs will void the FAA certification (as noted in the ETL Certificate of Conformance), void manufacturer warranties as well as compromise future product support and upgrades.**

## **5.4 ILLUMINATED RUNWAY AND TAXIWAY GUIDANCE SIGNS.**

### **5.4.1 Cleaning.**

Most signs require minimal maintenance aside from lamp replacement. However, with the intrusion of dust, dirt and water it is necessary to inspect and clean the interior of signs periodically to ensure proper light output. Mice and other rodents are known to set up house-keeping in signs. Frequently, this results in damage to wires and other components and the presence of grass, trash and other bedding material. For these reasons, inspect and clean airfield guidance signs at least twice a year.

### **5.4.2 Lamp Replacement.**

As with all airport lighting systems, re-lamping should be accomplished with the sign de-energized to prevent the possibility of electric shock. This has been made an easier task by the addition of switches on signs to disconnect the power. The act of re-lamping has also been made easier and quicker by designs of both incandescent and fluorescent types that allow re-lamping without the use of tools.

### **5.4.3 Current Check.**

At least twice a year, the current through the lamp circuit should be checked to verify that it is correct for the sign in question. If not correct for all steps, make current adjustments on the sign internal regulator board or if a Style 5 sign, check the circuit CCR to make sure it is operating at 5.5A.



## LED LIGHTING SYSTEM

### Maintenance - Visual Inspections

#### EXTERIOR INSPECTION

For best overall sign performance and maximum airfield safety, we recommend regular visual inspections of the sign. The inspection should include carefully reviewing the sign frame, mounting legs with frangible couplings and legend panels. Most damage occurs as a result of impact with maintenance vehicles during mowing and snow removal. If evidence of impact damage is observed such as the cracking or bending of the sign frame, replacement parts may be identified on the parts list and ordered directly from Standard Signs Inc. With frame damage, there is often damage to the frangible couplings and may need replacement as well. Legend panels must be inspected for damage as well as wear. As legend panels age, UV damage will occur in the form of fading, delamination, and general material degradation. Panels should be replaced before legibility & color brilliance are compromised.

#### INTERIOR INSPECTION

Visual inspections of the sign's interior can be done while re-lamping the sign. The accumulation of dust, dirt, water, vegetation, or other debris inside the sign can result in the loss of light output. Mice and other rodents have also been known to nest in signs resulting in damaged wires and components. The interior must be cleaned and inspected at least twice a year for these reasons. Inspect for loose wire connections and deteriorated wire and components. Any suspect wire or components should be replaced. Gasketing in the base and top should also be inspected & replaced if necessary.

#### ELECTRICAL CURRENT CHECKS

Upon initial installation and at least twice a year thereafter, sign lighting systems should be verified as operating within recommended parameters. This ensures lighting complies with FAA specifications and promotes good lamp life. Please refer to your specific lighting system for the operating parameters and system settings. If needed, please call Standard Signs to receive technical assistance at 330.467.2030 or toll-free in the USA at 800.258.1997. We can also provide the appropriate data sheets and schematics.

#### LAMP REPLACEMENT

As with any fixture, Lamps will eventually burn out and require replacement. Lamp life will vary depending on local conditions, including weather, field vibration, airfield circuit condition, and load. The rated lamp life for the LED lighting systems used in LUMACURVE signs is 25,000 hours. We suggest checking lamps monthly or at regular intervals that meet airport requirements. Re-lamping should be done with the sign de-energized to prevent the possibility of electric shock.

*Warning: Use only OEM Lumacurve bulbs. The use of non-OEM, non-FAA approved replacement bulbs can cause damage to the internal electrical components and render the photometric output outside of FAA specifications, consequently creating an unnecessary safety liability.*





## LED LIGHTING SYSTEM

### *Maintenance - Weather Seal*

Gasketing installed in the sign top covers and bases should be replaced every 2-3 years or at a frequency deemed best by airports based on local conditions for best structural fit, strength, and seal.

The following are instructions for replacing structural gasketing in Lumacurve Taxiway and Runway Guidance Signs. This procedure, when performed regularly, helps to maintain sign structural fit and seal and protects lamps and internal lighting components from precipitation.

Material required is:

Standard gasketing, 7/16" wide by 1/4" deep, to replace gasketing installed in the grooves of the sign bases and top covers. If desired, 1/4" wide by 1/8" deep gasketing may be applied to the inside of the outer lips of the top covers. Gasketing can be purchased directly from Lumacurve or procured locally.

### **Gasket Replacement Installation:**

1. Loosen turn fasteners on sign tops and remove all top covers.
2. If necessary, slit silicone caulking with a straight edge where face panels meet the sign end panels.
3. Remove all sign face panels.
4. Remove the existing gasketing from the structural grooves in the top covers and sign bases .  
Clean away all debris.
5. Field cut new strips of the 7/16" wide by 1/4" deep gasketing to necessary lengths and install one strip in each groove in each of the top covers and bases.
6. Field cut new strips of the 1/4" wide by 1/8" deep gasketing to necessary lengths and adhere to the i inside of the outer lips of the top covers, per the detail on page 2.
7. Replace sign panels and top covers, and inspect sign seams for tightness.  
If desired, install an additional 7/16" wide by 1/4" deep gasketing in the sign bases to enhance the seal.
8. If desired, apply silicone sealant to seal panel edges to the sign frame and seams between panels



## LED LIGHTING SYSTEM

### Maintenance - Sign Panels

Legend face panels in Lumacurve signs consist of curved acrylic plastic, legend, and translucent, retro-reflective sheeting. The curved shape provides extra strength and inherently sheds precipitation and jet blast. The sophisticated retro-reflective sheeting ensures maximum legend readability at night through uniform light diffusion throughout the entire sign face.

### PERFORMANCE

Legend panels have a general performance life ranging from 3 to 8 years, depending on local conditions, especially climate. In milder climates, the face panels perform longer than in harsher environments, such as desert, coastal, and extremely cold weather areas, and/or extreme temperature changes over short periods. We recommend semi-annual inspections of face panels to monitor functionality.

### CLEANING

While powerfully effective on the airfield, legend panels require special handling to ensure maximum life. The white backing on the inside of the panels is especially delicate and should be handled with care. The sign may be cleaned with mild soap and a soft cloth. We do not recommend cleaning the inside of the legend panels. If the panel backing is extremely dirty, do no more than flush with free-flowing water, avoiding any scrubbing. If panels are stored for any reason, no more than five (5) should be stacked together to protect the integrity of the curved shape, and slip sheeting should be placed between the panels to protect against abrasion.

### SIGNS OF WEAR

Normal wear and tear over the life of the panel may include:

- Some loss of the white backing on the inside of the face panel.
- Limited delamination of the retro-reflective sheeting.
- Color degradation.

Loss of white backing commonly occurs at the edges due to abrasion with the face insert channels over time or when panels are removed and re-installed. The white backing can also appear to "fade" over time due to high heat buildup inside the sign cabinet. De-lamination occurs due to thermal expansion and/or water vapor transmission through acrylic plastic. Both acrylic and polycarbonate, common substrates used to fabricate airfield sign faces, allow some moisture transmission which can, over time, interfere with the adhesive bond between the panel and the sheeting. Color degradation will occur over time, especially in intense sun exposure.

### REPLACEMENT

Face panels are easily replaced by simply removing the top cover and sliding out the panel if needed. Replacement face panels are available directly from Lumacurve.

*Note: Sometimes, legend panels obstruct the top covers' re-installation. If panels are not engaging on the underside of the top cover into the gasketed channel, please try the following: Engage the turn fasteners loosely with the palms of your hands, slap or "pop" the centers of the opposing panels inward simultaneously. The internal pressure should apply a force that allows the top to drop into place. Apply pressure downward on the top. When the panels are appropriately engaged, the resistance to tightening the turn fasteners should be eliminated.*