LUMACURVE®
AIRFIELD SIGNS

Sign Management Program

A. Introduction: Signs Built to Last 50 Years...

- FAA/Intertek Certificate of Conformance
- Our 50 Year Sign; Features & Benefits
- Wait-Less Service
- We Do More Than Signs
- Example LED Lumacurve Specifications
- VA Loads, Power Factors & Transformer Requirements

B. Ordering Signs, Parts & More

- Technical Overview
- Determining the Sign You Need
- Lumacurve Catalog Numbers- A Part Numbering Key
- Submittal Sheets, Distance Markers
- Submittal Sheets, Lighted Signs
- Submittal Sheets, Unlighted Signs
- Terms & Conditions of Sale

C. Electrical Systems

- Certified Systems: VA Loads, Power Factors & Transformer Requirements
- LED lighting (style 2, 3 & 5)
- XTL lighting (style 2 & 3)
- 45W EXM & 45WT10P (style 5 only)

Supported Systems: No longer meets current FAA specifications

- Supported Systems: VA Loads, Power Factors & Transformer Requirements
- LOVA Lighting (style 2 & 3)
- 45W Incandescent Lighting: 45W EXM & 45W T10P (style 2 only)
- Train Lamp Lighting (style 3 only)

D. Installation & Modifications

- Sign Installation Instructions
- Footprint & Recommended Pad Dimensions, Inner-Mounting
- Footprint & Recommended Pad Dimensions, Outer-Mount
- Installation, Add-On Modules
- Installation, XTL Lighting Power Kits
- Installation, LED Lighting Power Kits
- Soft Start Instructions

LUMACURVE®
AIRFIELD SIGNS

Sign Management Program

E. Maintenance

Maintenance & Operation

Engraved Nameplates

Fading Panels- FAA Bulletin

Faded Panels

Replace Distance Marker Panels

Replacing the Surge Protector

XTL Lighting Troubleshooting

FAA AC 26A, Maintenance of Visual Aid Facilities

F. Upgrades

LED Comparisons

XTL Power Kit Components

LED Power Kit Components

Sign Identification System

External Switch

Performance Tops

High Jet Blast Mode 3 Signs

G. Distance Markers

Distance Markers (Size 4 RDR), Installation Instructions

Distance Markers (Size 4 RDR), Installation Instructions LED

Distance Markers (Size 4 RDR), Installation Instructions LED - MODE 3

Distance Markers (Size 4 RDR), Installation Instructions XTL

Distance Markers (Size 4 RDR), Installation Instructions Style 5 - EXM Quartz

Distance Markers (Size 4 RDR), Installation Instructions Style 5 - T10P Quartz

Distance Markers (Size 4 RDR),Pad Dimesions & Mounting

H. Unlighted Signs

Unlighted Signs (billboard style), UL Series

Unlighted Signs (billboard style), Footprint & Pad Dimensions

Intertek

ORIGINAL ISSUE DATE: May 18, 2011

Recertification due: June 2016

An Activity Sponsored and Administered by Intertek

PROGRAM ADMINISTRATOR
DEPARTMENT ALECP
INTERTEK
3933 U.S. ROUTE 11
CORTLAND, NY 13045-0950

STANDARD SIGNS INC
3190 EAST 65TH ST
CLEVELAND, OH 44127

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. The certification is not valid for a product modified with non-OEM replacements parts or non-production components.

L-858 – Signs, Runway and Taxiway
(AC 150/5345-44J)

Manufacturer	Type	Size	Style	Class	Mode	Manufacturer's Catalog Number
Standard Signs	Y, R, L	1	2, 3, 5	2	2, 3	SXL (442)
	Y, R, L	2	2, 3, 5	2	2, 3	MXL (442)
	Y, R, L	3	2, 3, 5	2	2. 3	LXL (442)
	B	4	2, 3, 5	2	2, 3	D1L (442)
	B	5	2, 3, 5	2	2, 3	DL1L (442)

NOTE: Lamp (442) L lamp 4W LED

Equipment meets the requirements of FAA Engineering Brief No. 67C additional requirements for "Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures" dated 12-29-10.

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: 3157626CRT-001; TP001; TP004809; 100324886CRT-001; 100385112CRT-001; QTP51211; 100385112MIN-002

(B) Date of Report: 10/2008; 10/2008; 8/2009;3/2011 5/2011; 5/2011; 4/2011

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: May 18, 2011

Form AL-3 1/2006

Intertek

REVISION DATE: May 18, 2011

ORIGINAL ISSUE DATE: November 3, 2008

Recertification due: June 2016

An Activity Sponsored and Administered by Intertek

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L-858 – Signs, Runway and Taxiway (AC 150/5345-44J)						
Manufacturer	Type	Size	Style	Class	Mode	Manufacturer's Catalog Number
Standard Signs	B	4	2, 3	1, 2	2, 3	D1x (373)
	B	5	2, 3	1, 2	2, 3	DL1x (373)
	Y, R, L	1	2, 3	1, 2	2	SXx (373)
	Y, R, L	2	2, 3	1, 2	2, 3	MXx (373)
	Y, R, L	3	2, 3	1, 2	2, 3	LXx (373)

1. This Equipment requires continuing validation in accordance with the requirements of AC 150/5345-53, and the Intertek Airport Lighting Equipment Certification Program.

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(A) Report No: 3157626CRT-001; TP001; TP004; TP004809; 100385112CRT-002; QTP51211; 100324886CRT-001

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REVISION DATE: May 18, 2011

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L-858 – Signs, Runway and Taxiway (AC 150/5345-44J)						
Manufacturer	Type	Size	Style	Class	Mode	Manufacturer's Catalog Number
Standard Signs	B	4	5	1, 2	2, 3	D1P (11A); D1Q (33)
	B	5	5	1, 2	2, 3	DL1P (11A); DL1Q (33)
	Y, R, L	1	5	1, 2	2	SXP (11A); SXQ (33)
	Y, R, L	2	5	1, 2	2, 3	MXP (11A); MXQ (33)
	Y, R, L	3	5	1, 2	2, 3	LXP (11A); LXQ (33)

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: 3157626CRT-001; TP001; TP004; TP004809; 100385112CRT-002; QTP51211

(B) Date of Report: 10/2008; 10/2008; 10/2008; 8/2009; 5/2011; 5/2011

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Approved for Certification by:

Jeremy N. Downs, P.E., Program Administrator
Date: May 18, 2011

Form AL-3 1/2006

ORIGINAL ISSUE DATE: **November 20, 2013**

Recertification due: **May 2021**

An Activity Sponsored and Administered by Intertek

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STANDARD SIGNS INC
3190 EAST 65TH ST
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AIRPORT LIGHTING EQUIPMENT CERTIFICATION PROGRAM

CERTIFICATE OF CONFORMANCE

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L-858 – Signs, Runway and Taxiway
(AC 150/5345-44J)

Manufacturer	Type	Size	Style	Class	Mode	Manufacturer's Catalog Number
Standard Signs	Y, R, L, C	1, 2, 3	4	N/A	2	SUL-4, MUL-4, LUL-4
	Y, R, L, C	1, 2, 3	4	N/A	2	SUL-6, MUL-6; LUL-6

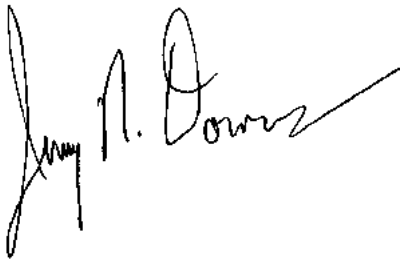
1. This Equipment requires continuing validation in accordance with the requirements of AC 150/5345-53, and the Intertek Airport Lighting Equipment Certification Program.

2. Product tested and Report issued by: Standard Signs; Intertek

(A) Report No: TP-UL-4/13; 101159266CRT-001 (B) Date of Report: 7/2013; 5/2013

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: November 20, 2013

Form AL-3 1/2006

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Our 50 Year Sign

Section A: "Our 50 Year Sign"

Four great reasons to insist on Lumacurve!

1. Reliability & Integrity

Lumacurve worked with the FAA to manufacture the *1st FAA airfield sign in 1955*. Our signs are backed by *years of manufacturing experience* and proven to be reliable in the airfield environment.

World class airports including Chicago O'Hare, Hartsfield Atlanta, Los Angeles Int'l and Dallas/Fort Worth prefer & depend on Lumacurve for their airfield signage needs.

2. True modular construction

Our modular design allows maximum flexibility & longevity. Future legend modifications are accomplished easily by simply adding additional modules or removing existing modules. Manageable module-length top covers combined with slide-in panels facilitate easy re-lamping, panel changes, internal inspection & maintenance.

3. Environmentally Friendly Design

Lumacurves solid, corrosion-free aluminum sign frames last forever. Maintain & upgrade your Lumacurves, don't discard them! Upgrade existing Lumacurves with new, energy efficient lighting systems. Energy efficient **"Drop-In" lighting kit** upgrades are simple to install.

Reduce, reuse, recycle…***Rebuild!*** Sign "bone yard" inventories take on a new meaning. Maintenance can easily build complete signs or modify existing signs out of Lumacurve's standardized modular parts.

4. Unrivaled "Wait-Less" service

Our "Wait-Less" program guarantees shipment of replacement signs & parts within 24 hours from receipt of order. Your order will ship **same day** if received by 10:00am (EST). **No extra charge!** Waiting 6-10 weeks for a replacement sign or face panels is unsafe. Replacing or repairing damaged signs in a timely manner using our "Wait-Less" service means happier supervisors & FAA inspectors. Maintenance costs and repair times are reduced. Immediate repairs allows more time for other projects. There is no longer a need to carry extensive sign parts inventories.

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Section A: "Our 50 Year Sign"

Our "Wait-Less" Program

The Problem

When an airfield sign gets damaged, what do you do?

The maintenance of airfield signs presents a unique problem. Unlike the other lighting fixtures on the field, every sign is different with its own message. Do you have inventory of every sign legend in the maintenance shop in case of damage? The industry lead-time for a ***replacement is 6-10 weeks!*** **Can you wait that long?**

The Solution

Lumacurve's "Wait-Less" program provides the ***most efficient*** and ***least costly*** way to maintain your airfield signs. This service is unparalleled in the airfield lighting industry. Only Lumacurve's "Wait-Less" delivers the ***highest level of safety*** possible in airfield sign maintenance, by manufacturing your custom, made-to-order request and shipping it that same day!

3 Simple Steps

Step 1 ***Call LUMACURVE immediately*** when an airfield sign is damaged or destroyed. **Even if the sign isn't a Lumacurve**, you are still eligible for our "Wait-Less" service.

Step 2 Place order with a verbal PO by 10AM (EST) and ***we will ship*** the replacement ***that same day*** at ***NO extra charge!***

Step 3 **Receive a NEW LUMACURVE Airfield Sign with a *3 year warranty!***

Why it's important

Improving airfield safety is everyone's responsibility.
A non-functioning sign is an incursion waiting to happen.
Waiting 6-10 weeks for a replacement sign or face panels **is unsafe**!

Maintenance costs and repair times are reduced! Same day shipment of signs & parts means ***NO NEED FOR INVENTORY!*** Replacing damaged signs in a timely manner means happier supervisors & FAA inspectors.
Immediate repair and replacement allows more time for other projects.

Standard Signs, Inc.
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www.lumacurve.com

Sample Specifications for Engineers and Planners

This document is available as a Word document for use in plans and specifications. Sign CAD drawings are also available. To request, call 800-258-1997.

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), 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

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 modules 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.

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 .92 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 170Vdc 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	45	55	65	70
Size 2	50	65	75	80
Size 3	50	65	75	80
Size 4	65			
Size 5	50			

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 Cleveland, 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.

LUMACURVE® AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

VA Loading & Power Factors

Certified to current FAA Advisory Circular 150/5345-44

Specification for Runway and Taxiway Signs

View our Certificate of Conformance

		LED Lighting Systems								
		FAA Style 2 (4.8A-6.6A) 4W LED			FAA Style 3 (2.8A-6.6A) 4W LED			FAA Style 5 (5.5A) 4W LED		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	2	45W	47	0.93	45W	47	0.93	45W	37	0.94
2-mod	4	100W	59	0.88	100W	58	0.88	100W	47	0.91
3-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93
4-mod	8	100W	73	0.92	100W	72	0.92	100W	61	0.94
Size 2, 1-mod	3	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	9	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	12	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 3, 1-mod	3	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	9	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	12	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 5, 1-mod	3	100W	57	0.87	100W	56	0.87	100W	44	0.89
Size 4, 1-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93

		XTL Lighting Systems					
		FAA Style 2 (4.8A-6.6A) XTL 20W Quartz			FAA Style 3 (2.8A-6.6A) XTL 20W Quartz		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	1	100W	71	0.89	100W	71	0.89
2-mod	2	100W	79	0.93	200W	78	0.92
3-mod	3	200W	102	0.93	300W	107	0.91
4-mod	4	200W	127	0.93	300W	131	0.92
Size 2, 1-mod	2	100W	79	0.93	200W	78	0.92
2-mod	4	200W	127	0.93	300W	131	0.92
3-mod	6	300W	167	0.93	500W	174	0.92
4-mod	8	300W	214	0.94	600W**	222	0.93
Size 3, 1-mod	2	100W	79	0.93	200W	78	0.92
2-mod	4	200W	127	0.93	300W	131	0.92
3-mod	6	300W	167	0.93	500W	174	0.92
4-mod	8	300W	214	0.94	600W**	222	0.93
Size 5, 1-mod	2	100W	79	0.93	200W	78	0.92
Size 4, 1-mod	4	200W	127	0.93	300W	131	0.92

** For less than ideal circuits, we recommend an upsized transformer to ensure adequate power to the sign.*

***A Siamese pigtail with two male L-823 plugs and one tennis ball female receptacle is supplied with these signs for connection to two isolation transformers making the required wattage sum.*

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AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

VA Loading & Power Factors

		Traditional Lighting Systems, Style 5					
		FAA Style 5 (Constant 5.5A)			FAA Style 5 (Constant 5.5A)		
		45W/T10P			45W EXM Qtz		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	**1**	45W	33	0.99	45W	39	0.99
2-mod	**2**	100W	65	0.99	100W	71	0.99
3-mod	**3**	100W	93	0.99	100W	101	0.99
4-mod	**4**	200W	127	0.99	200W	141	0.99
Size 2, 1-mod	**2**	100W	65	0.99	100W	71	0.99
2-mod	**4**	200W	127	0.99	200W	141	0.99
3-mod	**6**	200W	181	0.98	200W	192	0.98
4-mod	**8**	300W	236	1.00	300W	261	1.00
Size 3, 1-mod	**2**	100W	65	0.99	100W	71	0.99
2-mod	**4**	200W	127	0.99	200W	141	0.99
3-mod	**6**	200W	181	0.98	200W	192	0.98
4-mod	**8**	300W	236	1.00	300W	261	1.00
Size 5, 1-mod	**2**	100W	65	0.99	100W	71	0.99
Size 4, 1-mod	**4**	200W	127	0.99	200W	141	0.99

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LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Section B: "Ordering"

Technical Information

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. For information on size 4 Distance Remaining Signs, see literature sheet entitled**, Runway Distance Remaining Signs Technical Information**. Request **UL Series Unlighted Signs** sheets for data on signs that meet FAA style 4 unlighted sign requirements.

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 retroreflective, 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: A variety of dependable lighting systems are available for all airport circuit applications and regulator capacity needs, and can be supplied in new signs as well as 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 4W LED 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. See **Section C:** *Electrical Systems* for complete listing of VA loads, power factors, and isolation transformer requirements.
Traditional Systems: Style 5 (constant 5.5A input) signs are also available with 45W/6.6A/T10P or 45W EXM quartz lamps. Style 2 (4.8A – 6.6A) signs are wired in series with 45W/6.6A/T10P incandescent** or 45W/6.6A EXM quartz lamps** (**approved under FAA AC 150/5345-44G only).

For installation, adjustment, and parts list & diagram, see **Section D:** *Installation & Modification,* as well as **Section C:** *Electrical Systems* of this manual. Continue reading for sign dimensions, frangibility, packing & shipping, and warranty information. **LUMACURVE** is a registered trademark of Standard Signs Inc.

For further assistance, please call us at 800.258.1997.

Taxiway & Runway Guidance Sign Dimensions

FAA Sign Size	1(Small)		2(Medium)		3,5(Large)	
	in/lb	mm/kg	in/lb	mm/kg	in/lb	mm/kg
Letter Height	12.0	305.0	15.0	381.0	18.0	457.0
Face Height	18.0	457.0	24.0	610.0	30.0	762.0
Sign Height	25.3	643.0	31.3	795.0	37.3	947.0
Maximum Sign Depth	13.2	335.0	14.4	366.0	15.8	401.0
Leg Mounting Centers	14.6	371.0	18.2	462.0	20.9	531.0
Sign Length						
1-Module (size 3, 1-mod=size 5 Distance Marker)	29.4	747.0	36.6	930.0	42.0	1067.0
2-module	58.5	1486.0	73.0	1854.0	83.8	2129.0
3-module	87.6	2225.0	109.4	2779.0	125.5	3188.0
4-module	116.8	2967.0	145.8	3703.0	167.3	4249.0
Module Weight	41.0	18.5	52.0	23.6	70.0	31.8
Ground clearance on ALL signs =	*6.0*	*152.0*				

Wind Load Resistance & Frangibility

Per FAA specifications, LUMACURVE 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. LUMACURVE 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, see **Section D:** *Installation & Modification* in this manual. FAA suggests that signs be mounted at the following distances from the pavement edge:

	1(Small)	2 (Medium)	3, 5 (Large)
feet	10 to 20	20 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 ft or more from the pavement edge. All sign locations should be carefully selected to prevent frangible coupling failure from jet blast.

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:

	1(Small)	2 (Medium)	3, 5 (Large)
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 shipment will be corrected by repair or replacement by Standard Signs Inc, FOB our factory, Macedonia, Ohio.

Technical Information

Size 4, Distance Remaining Signs

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 retroreflective 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.

LUMACURVE® AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

UL Series

Section B: "Ordering"

Technical Information

ITS/ETL certified **UL series unlighted signs** are manufactured in accordance with FAA Advisory Circular No. 150/5345-44. Constructed in 4 foot and 6 foot lengths, single and double faced, UL Series Unlighted Signs accommodate numerous legend requirements. Signs can be mounted on a cement pad or with stakes.

Construction: Sign panels are made of .080 inch aluminum sheeting covered by a high intensity retroreflective material and secured to a frame made of 1" inch x 2" inch x .093" inch aluminum tubing. Frames are mounted to support columns constructed of 2-inch schedule 40 aluminum tubing which are joined to frangible couplings with 2-inch female connectors. Couplings are then screwed into either stake mounts or floor flanges.

Dimensions:

	Character Height	**Panel Height**
Size 1 (small)	12 inches	18 inches
Size 2 (medium)	15 inches	24 inches
Size 3 (large)	18 inches	30 inches
	Single Faced	**Double Faced**
Sign Width	6.5 inches	7 inches
Sign Length	4 foot or 6 foot	

Frangibility: Per FAA specifications, UL signs are available in two "modes" of frangibility. To meet the minimum strength requirements, signs must withstand a certain wind load produced by jet blast. At the same time, signs must break over at a given applied static load.

	Wind Load Minimum	**Break Over Load**
Mode 1	100 mph (161 km/h)	0.9 PSI (6.21 kPa)
Mode 2	200 mph (322 km/h)	1.3 PSI (9.96 kPa)

Packing & Shipping: As many as three signs are packed in a heavy weight corrugated carton (75 inch x 50 inch x 8 inch). The signs are shipped complete with couplings and floor flanges attached.

Installation: In accordance with FAA AC 150/5340-18 on signs systems, signs should be mounted at the following distances from the "defined taxiway/runway edge":

Size 1 (small)	10 – 20 feet (3 - 6 meters)
Size 2 (medium)	20 – 35 feet (6 -10.5 meters)
Size 3 (large)	35 – 60 feet (10.5 - 18 meters)

We recommend that signs be mounted at or beyond the maximum distances at airports where there is jet aircraft traffic. Airports with wide-body jet operations should use only Size 3 (large) signs mounted 60 or more feet from the pavement edge.

Warranty: Standard Signs Inc warrants that all UL Series Unlighted Signs are manufactured and will perform in accordance with FAA AC 150/5345-44. Any defect in design, materials, or workmanship which may appear during proper and normal use for a period of three (3) years from installation date or a maximum of three (3) years from shipment date will be corrected by repair or replacement by Standard Signs Inc, FOB factory, Macedonia OH.

For further assistance, please call us at 800.258.1997

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Section B: "Ordering"

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: One module submittal (Inner mount)
Two module submittal (Inner mount)
Three module submittal (Inner mount)
Four module submittal (Inner mount)

One module submittal (Outer mount)*
Two module submittal (Outer mount)*
Three module submittal (Outer mount)*
Four module submittal (Outer mount)*

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)
**Most signs are Inner Mount. Beginning 2005, the Outer Mount foot print was introduced for mode 3 signs (size 2 & 3 only).*

If you are uncertain as to how many modules are required or what fits on an unlighted sign, contact customer service @ 800.258.1997 or complete the submittal/s as best you can and the information can then be reviewed with a customer service representative.

Step 2 Complete the "Product" portion of the submittal form

- Select the product

  New sign *(complete with mounting feet, isolation transformer not included)*
  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
  Class 2: -40 degrees to +131 degrees F
  (all Lumacurve systems are Class 2 rated)

  Mode 2: withstands 200 mph wind loads
  (typical)
  Mode 3: withstands 300 mph wind loads
  (special high jet blast applications)

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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 20watt Quartz	
	*LowVA 20watt Quartz**	*45watt/T10P**	*45watt EXM Quartz**
STYLE 3: 2.8A-6.6A (5 step regulator):	"LED" 4W	XTL 20watt Quartz	
	*LowVA 20watt Quartz**	*30V/50W Train**	
STYLE 5: 5.5A fixed (dedicated sign circuit):	"LED" 4W	45watt/T10P	45watt EXM Quartz

**denotes supported systems that are not FAA certified per current FAA Advisory Circulars*

Step 4 Select any "Options" available for your sign

Signs come complete with frangible couplings & floor flanges for mounting as well as 1/8" galvanized tethers (one per sign module).

- On/Off Switch (weatherproof cover available)
- 2" Field reference numbers
- 3/16" Stainless Tethers
- Performance Tops

Step 5 Record sign message and indicate legend panel colors

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

"Y"	(Directional message/ black characters on yellow background)
"RO"	(Mandatory message/ white characters with a black outline on red background)
"L"	(Location message/ yellow characters on black background)
"B"	(Blank Panel)
"D"	(Distance remaining character/ white number on a black background)

If you are requesting panels only, the above designations should be followed by "*".

If you are uncertain as to how many modules are required, or where specific characters fall over the sign modules, contact customer service.

Step 6 Place your order

Fax your completed submittal/s with your contact information to 330.467.2076 or call us at 800.258.1997!
Requests can also be emailed.
Visit our website: www.lumacurve.com for customer service representative names & email addresses.

LUMACURVE AIRFIELD SIGNS

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Lumacurve Catalog Numbers

Part Numbering Key

Section B: "Ordering"

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	MODULE LENGTH	LAMP TYPE
S = Small, Size 1	1	L = "LED", 4W (St 2: 4.8A-6.6A, St 3: 2.8A-6.6A & St 5: 5.5A)
M = Medium, Size 2	2	X = "XTL", 20W Quartz (Style 2: 4.8A-6.6A and Style 3: 2.8A-6.6A)
L = Large, Size 3	3	P = 45W/T10P (Style 5: 5.5A)
D = Size 4 RDR	4	Q = 45W EXM Quartz (Style 5: 5.5A)
DL = Size 5 RDR		
B = Size 4 Barrier Engagemt Mkr		

Lighting Style: Style 2 and style 3 systems are available with "XTL" 20W Quartz & "L" 4W lamps in all sizes. Style 5 systems are available with 45W/T10P, 45W EXM or "L" 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 modes 2 and 3 in accordance with FAA AC 150/5345-44H.
Mode 2 (must withstand windloads of 200 mph (322kph) Mode 3 (must withstand windloads of 300 mph (483 kph)

EXAMPLES:	S1X	Size 1, 1-Module, Style 2 or 3, 10V 20W quartz lamp
	L4Q	Size 3, 4-Module, Style 5, 45W EXM quartz lamp
	M3P	Size 2, 3-Module, Style 5, 45W/T10P lamp
	DL1L	Size 5, 1-Module, Style 2 or 3, 4W LED lamp

Warning: These systems do not meet current FAA specifications!

Supported Lighting Systems

FAA SIGN SIZE	MODULE LENGTH	FAA LIGHTING STYLE**	LAMP TYPE	.	NO. OF FACES	.	MODE***
S = Small, Size 1	1	1 = 120V	P = 45W/T10P		SF		2G
M = Medium, Size 2	2	2 = (4.8A-6.6A)	Q = 45W EXM Quartz		DF		3G
L = Large, Size 3	3	3 = (2.8A-6.6A)	T = 30V/50W Train				
D = Size 4 RDR	4	5 = (5.5A)	R = 34V/25W Train				
DL = Size 5 RDR			V = Low VA 20W Quartz				
B = Size 4 Barrier Engagemt Mkr			H = 120V/25W Rgh Svs				

Please contact us at 800.258.1997 for additional assistance!

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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 44067 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 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 controversy or claim arising out of or relating to this Agreement or the breach thereof 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 within ten (10) days after the dispute, claim, or controversy arises. 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 $2500. 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 emin 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 SHIPMENT. 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 SHIPMENT. 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.

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9115 Freeway Drive Macedonia, OH 44056
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www.lumacurve.com
www.signsporcelain.com

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Parts & Electrical Information
for Taxiway & Runway Signs
LED Lighting Systems

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 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.

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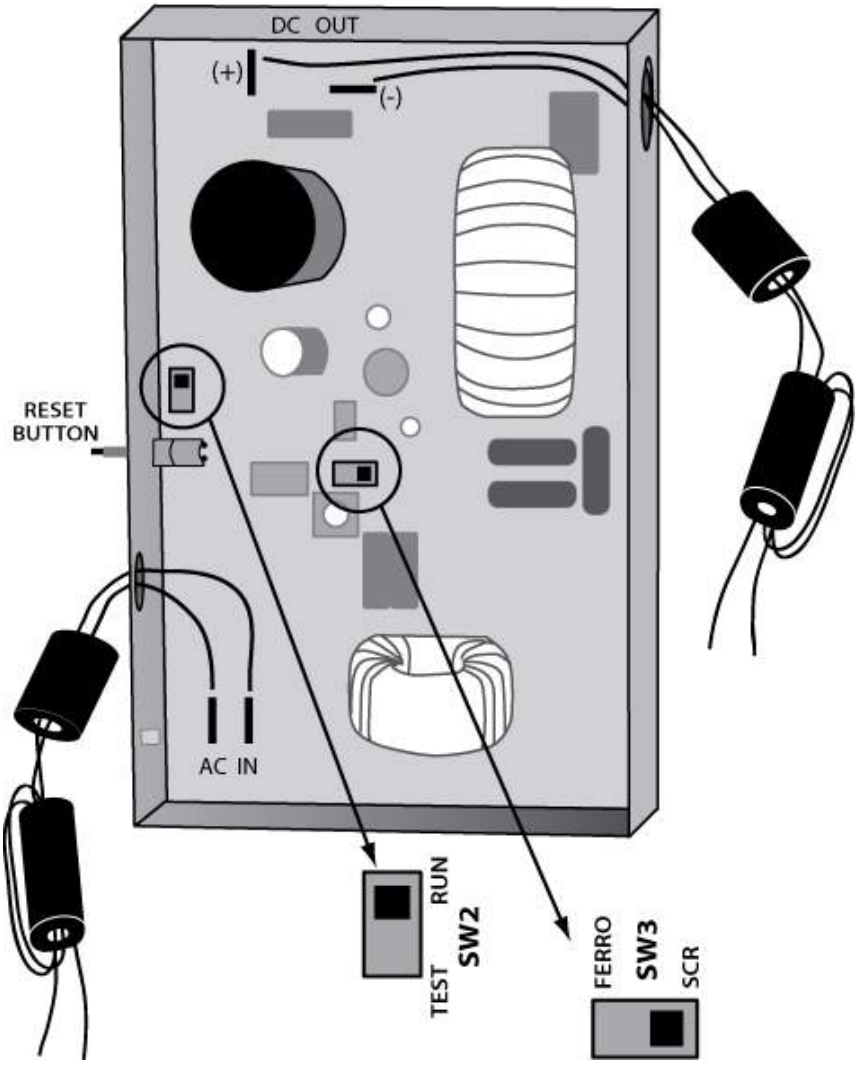
L610 – REV.07M

- 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)

"L610 – REV. 07M"



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LUMACURVE AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Parts & Electrical Information
for Taxiway & Runway Signs
LED Lighting Systems

Jumper position Based on Regulator Type for older versions of L610 Controllers

(December 2014 or older versions)

The L-828 and L-829 Constant current regulator maintain constant amperage to the airfield circuit. The L-829 is an SCR type (silicone rectifier) commonly known as a solid state (electronic based) regulator. The L-828 is a ferro-resonant that uses transformer technology.

For SCR type L-829 regulators, a jumper (photo #1) must be installed on the LED controller (as shown in figure #3 or figure #5). For ferro-resonant type L-828 regulators controller (as shown in figure #2 or figure #4).

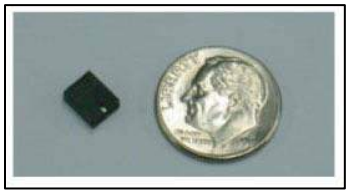

Photo #1

Instructions for installing the Jumper:

a. Identify the type of Constant Current Regulator powering this sign. ("SCR" solid state or "Ferro-Resonant" type)
b. Remove shield screen by loosening the fender washers.
c. Locate the small black jumper. The jumper is factory installed. (figure #2 or figure #4).
d. When using SCR regulator, remove jumper for ferro-resonant regulator application and reinstall over both pins as shown in photo (figure #3 or figure #5).
e. Reinstall shield screen.

"L610 – REV. 05 or older"

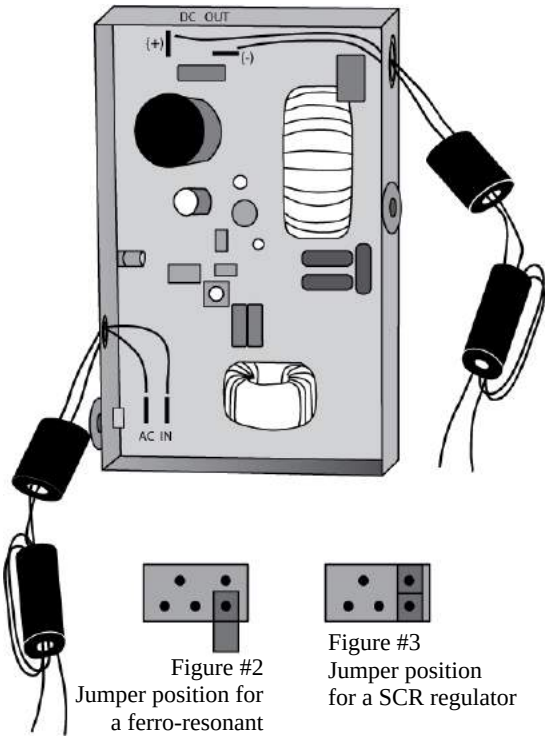

Figure #2
Jumper position for a ferro-resonant regulator

Figure #3
Jumper position for a SCR regulator

"L610 – REV. 06"

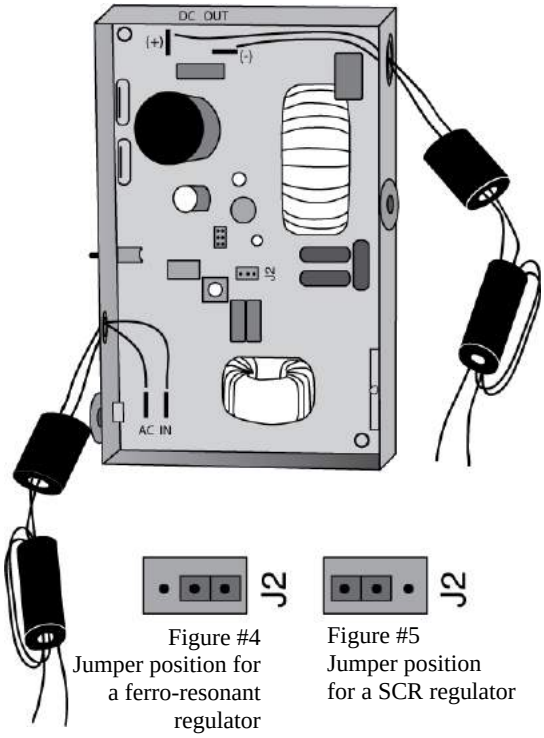

Figure #4
Jumper position for a ferro-resonant regulator

Figure #5
Jumper position for a SCR regulator

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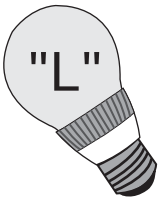
LUMACURVE PARTS LIST

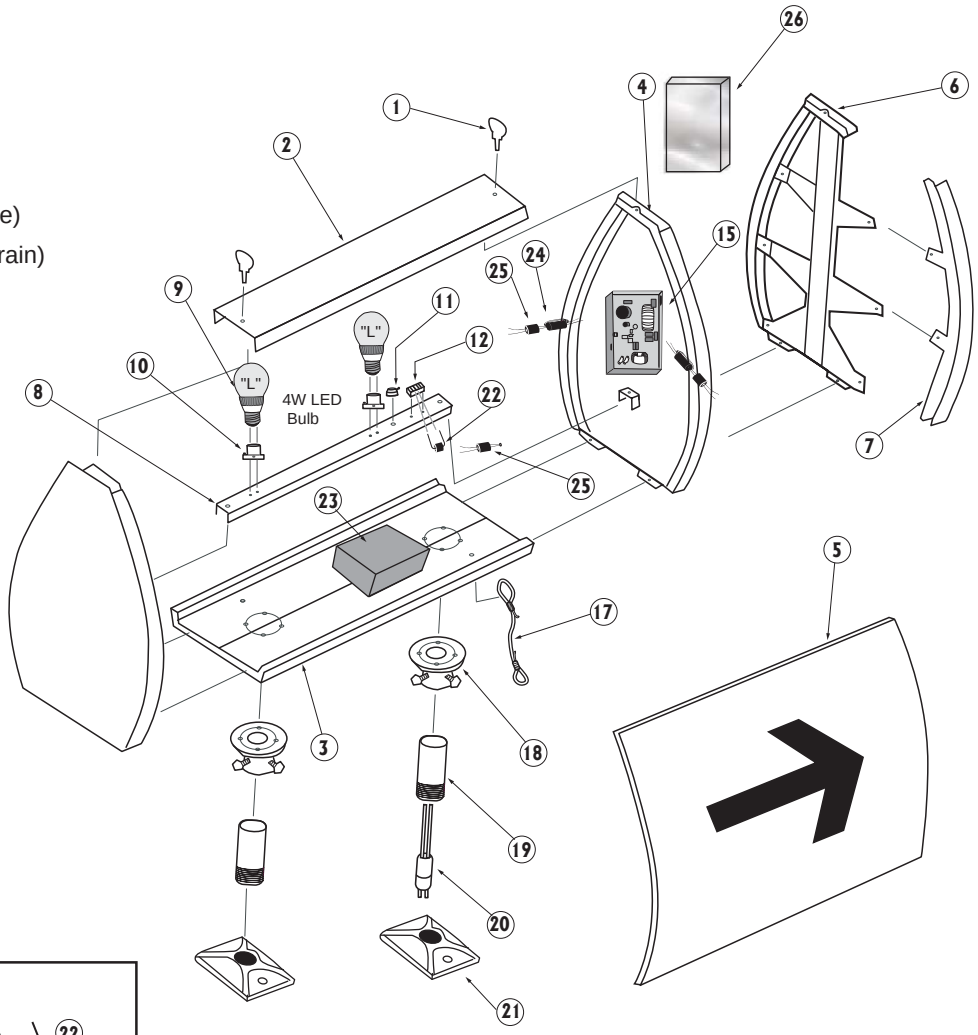


LED Lighting Systems

(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[1]
6.	*CLT-6	Multi-Module Insert (Tree)
7.	*7-A	Face Insert Channel[1](Train)
8.	*8-A	Light Bar
9.	L lamp 4W	4W LED Lamp
10.	500	Medium Screw Socket
11.	480	Cable Clamp
12.	420	Terminal Strip (section)
15	L610	LED PCB Controller
17.	CLT-19	Tether
18.	130	Slipfitter
19.	*140	6" Frangible Coupling
20.	430	Cord & Plug
21.	15	Floor Flange
22.	E416	Surge Protector
23.	Filter	ALD Low Pass Filter
24.	Ferrite A	Ferrite Core Split
25.	Ferrite B	Ferrite Core Not Split
26.	G EMI Shield Screen	Controller Screen



Enlarged Views

Experience our exclusive "Wait-Less" service!
Call by 10AM, complete signs & parts ship same day!
No extra charge! Call 800.258.1997

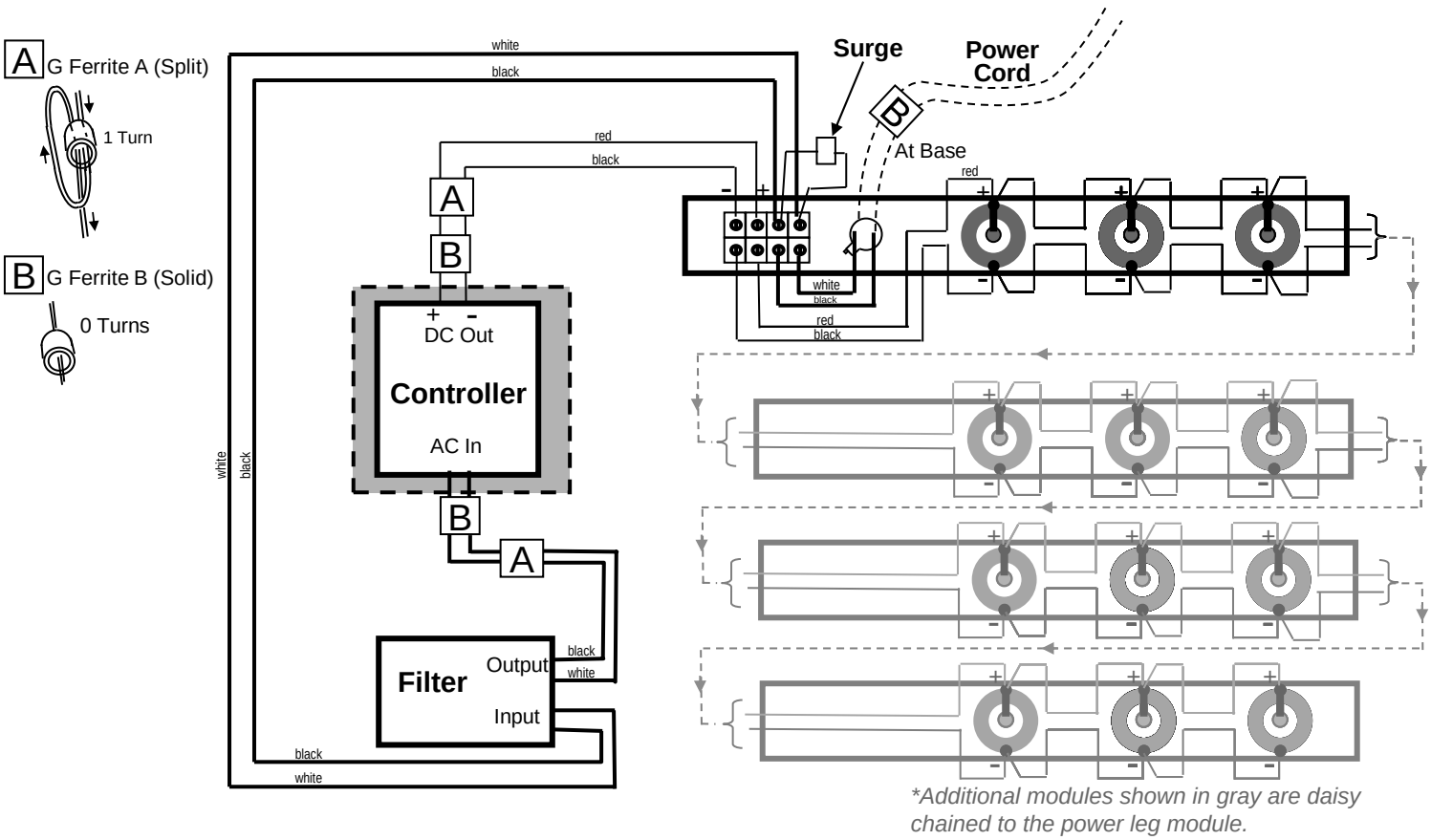
To help in placing your order:

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

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

LUMACURVE® AIRFIELD SIGNS

Wiring Diagram, LED Lighting System



**Additional modules shown in gray are daisy chained to the power leg module.*

LED VA Loads, Power Factors and Isolation Transformers

		LED Lighting Systems								
		FAA Style 2 (4.8A-6.6A) 4W LED			FAA Style 3 (2.8A-6.6A) 4W LED			FAA Style 5 (5.5A) 4W LED		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	**2**	45W	47	0.93	45W	47	0.93	45W	37	0.94
2-mod	**4**	100W	59	0.88	100W	58	0.88	100W	47	0.91
3-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93
4-mod	**8**	100W	73	0.92	100W	72	0.92	100W	61	0.94
Size 2, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	**9**	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	**12**	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 3, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	**9**	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	**12**	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 5, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
Size 4, 1-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93

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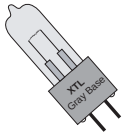

Parts & Electrical Information

XTL lighting systems (gray base bulbs)

Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs

LUMACURVE XTL System

The LUMACURVE XTL system maintains a 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 ensures delivery of a constant voltage to the 10V/20W halogen lamps at all constant current regulator (CCR) current steps without internal modification (true for both high (2.8A - 6.6A) and medium (4.8A - 6.6A) intensity circuits.) The lamps authorized for use in this system are Standard Signs, Inc. P/N #"XTL Quartz" with 10V/20W Bipin quartz halogen lamp & custom ceramic adapter base. They are available directly from Standard Signs, Inc.

Important: *The LUMACURVE XTL lighting system is designed exclusively for FAA styles 2 & 3 operation on a series circuit together with non-sign fixtures, such as edge lights, where the sign brightness control components are necessary to maintain constant sign brightness regardless of CCR step. Non-sign resistive load must be present on the circuit for proper CCR operation. Design consideration should be given to CCR loading at all current steps. XTL Signs should NOT be installed on a circuit that powers only signs. For circuits dedicated to signs, please request LUMACURVE lighting systems designed for FAA style 5 operation.*

DO NOT CHANGE LAMPS WITH SIGN ENERGIZED. A burned out lamp causes an E410/E610 controller to reach max power and exceed the lamps' rated voltage. Inserting a replacement lamp in an energized sign will shock the lamps and damage filaments.

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 white and brown leads at the sign terminal strip on the light bar (P/N #CLT 8A). If voltage varies from recommended settings (9.5V at lowest CCR step for all size signs), all signs on that circuit should be checked and adjusted. To adjust, turn the small screw in the upper left corner of the printed circuit board (E410/E610) controller mounted on the inside of the end panel (P/N #CLT-4).

Note: *The adjustment screw is designed only for fine-tuning and does not function as a dimmer. Signs must not be operated at less than 9.5 volts.*

There is a 10-minute warm-up period for lamps to come to set voltage but sign brightness meets FAA specifications even at cold voltages.

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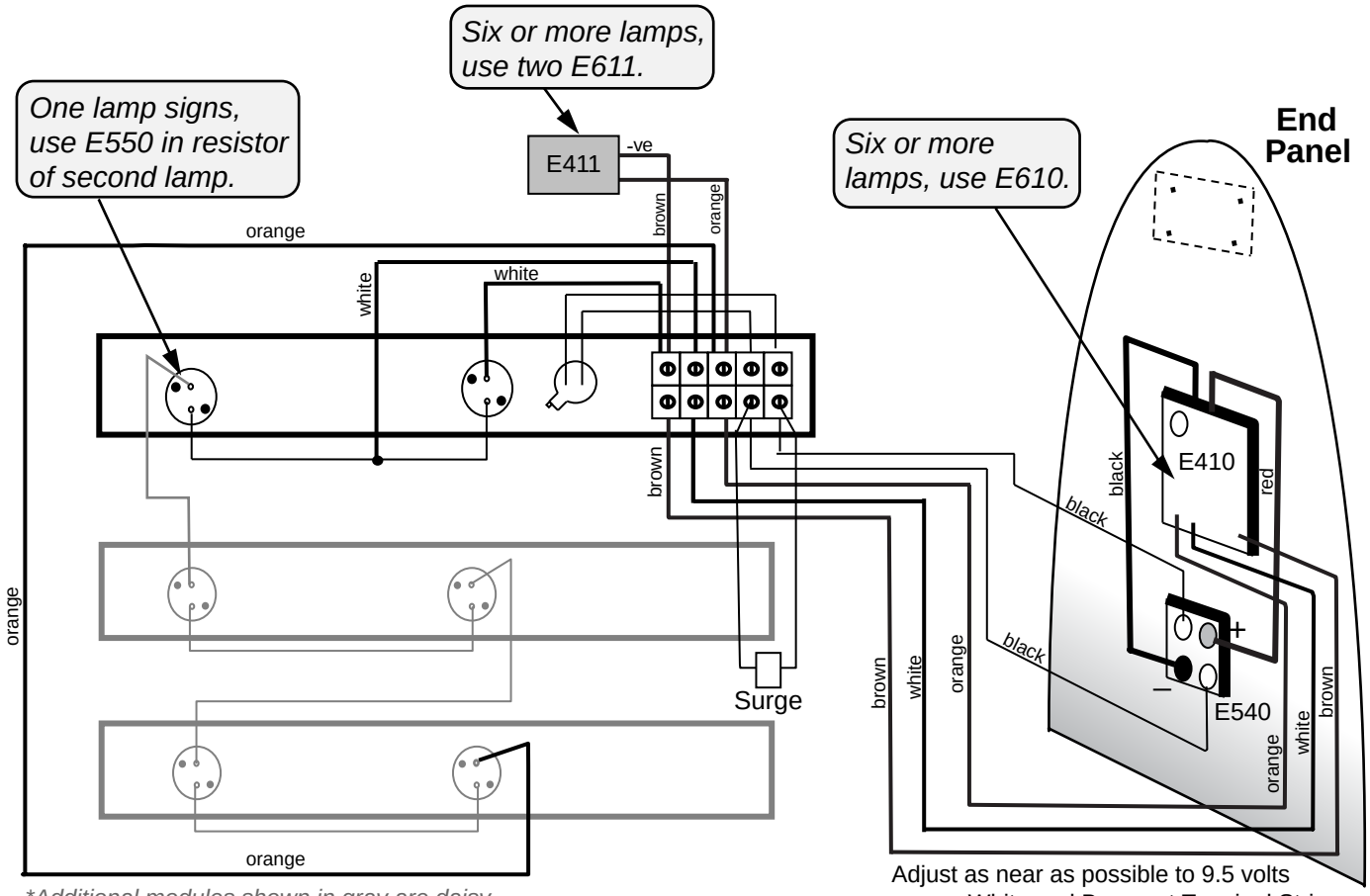
LUMACURVE AIRFIELD SIGNS

Parts & Electrical Information

XTL Wiring Diagram (Style 2 & 3)



**Additional modules shown in gray are daisy chained to the power leg module.*

Adjust as near as possible to 9.5 volts across White and Brown at Terminal Strip. *NOTE: Adjustments must be done at the lowest step of the Constant Current Regulator powering the circuit.*

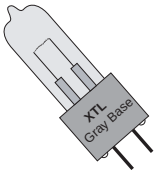
XTL VA Loads, Power Factors and Isolation Transformers

		XTL Lighting Systems					
		FAA Style 2 (4.8A-6.6A)			FAA Style 3 (2.8A-6.6A)		
Sign Size &		XTL 20W Quartz			XTL 20W Quartz		
Module Length	Lamps	Isol Xfmr	Max VA*	Pwr Factr*	Isol Xfmr	Max VA*	Pwr Factr*
Size 1, 1-mod	**1**	100W	71	0.89	100W	71	0.89
2-mod	**2**	100W	79	0.93	100W	78	0.92
3-mod	**3**	200W	102	0.93	300W	107	0.91
4-mod	**4**	200W	127	0.93	300W	131	0.92
Size 2, 1-mod	**2**	100W	79	0.93	200W	78	0.92
2-mod	**4**	200W	127	0.93	300W	131	0.92
3-mod	**6**	300W	167	0.93	500W	174	0.92
4-mod	**8**	300W	214	0.94	600W♦	222	0.93
Size 3, 1-mod	**2**	100W	79	0.93	200W	78	0.92
2-mod	**4**	200W	127	0.93	300W	131	0.92
3-mod	**6**	300W	167	0.93	500W	174	0.92
4-mod	**8**	300W	214	0.94	600W♦	222	0.93
Size 5, 1-mod	**2**	100W	79	0.93	200W	78	0.92
Size 4, 1-mod	**4**	200W	127	0.93	300W	131	0.92

♦ Two certified isolation transformers and one siamese pigtail required to satisfy 600W requirement.

* Measured at 6.6A.

LUMACURVE PARTS LIST



XTL Lighting Systems

(Gray Base 10V/20W quartz halogen lamps)

Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs
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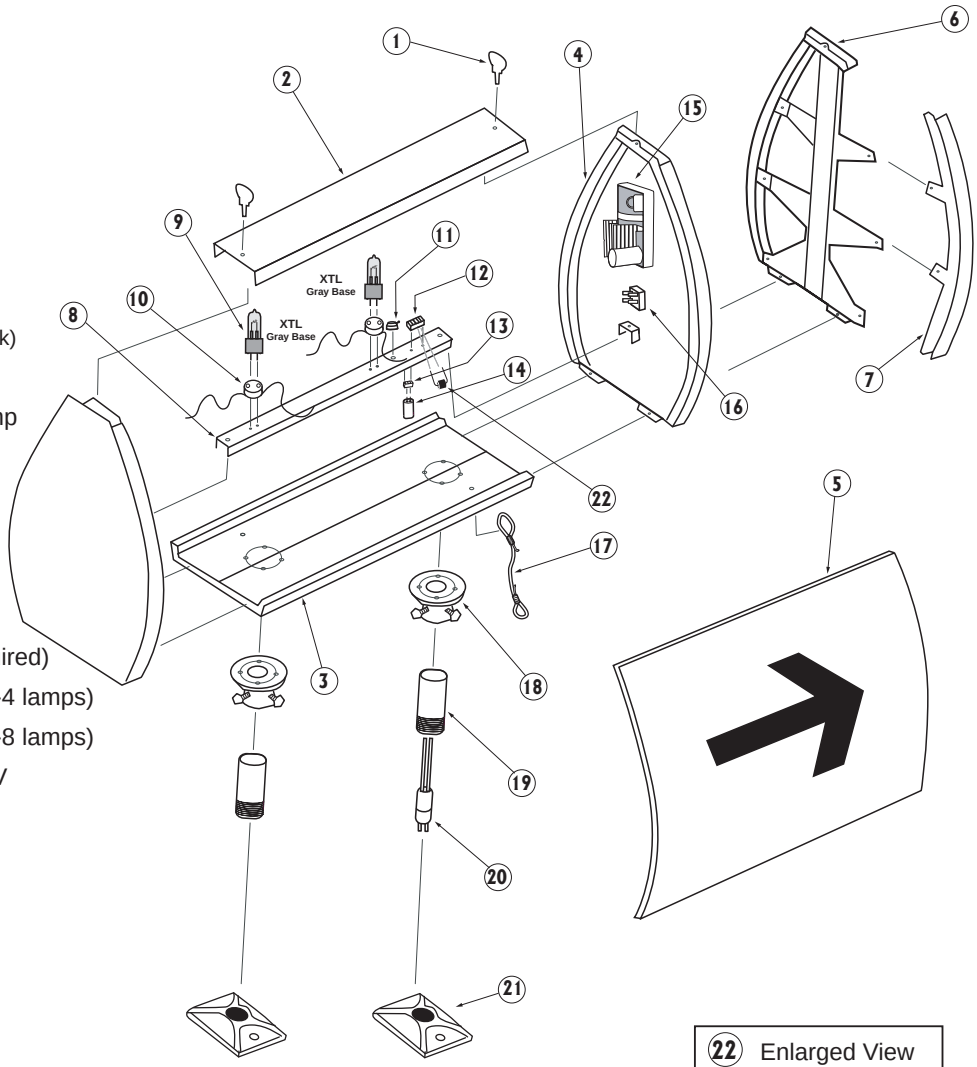
Experience our exclusive "Wait-Less" service!
Call by 10AM, complete signs & parts ship same day!
No extra charge! Call 800.258.1997

	Item	Description
1.	340/345	Turn Fastener
2.	*CLT-2	Cover
3.	*CLT-3	Base
4.	*CLT-4	End Panel
5.	*CLT-5	Legend Panel[1]
6.	*CLT-6	Multi-Module Insert (Tree)
7.	*7-A	Face Insert Channel[1] (Track)
8.	*8-A	Light Bar
9.	XTL Quartz	XTL 10V/20W Quartz Lamp
10.	E400A	Lampholder
11.	480	Cable Clamp
12.	420	Terminal Strip
13.	420	Terminal Strip (section)
14A.	E411	Capacitor for E410
14B.	E611	Capacitor for E610 (2 required)
15A.	E410	PCB Controller, 50 Volt (1-4 lamps)
15B.	E610	PCB Controller, 75 Volt (1-8 lamps)
16.	E540	Bridge Rectifier 35A/1000V
17.	CLT-19	Tether
18.	130	Slipfitter
19.	*140	6” Frangible Coupling
20.	430	Cord & Plug
21.	15	Floor Flange
22.	E416	Surge Protector



22 Enlarged View
E416 Surge

One lamp systems only require:

E550 Resistor 3 OHM 25w (and mounting brackets)

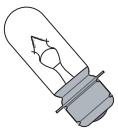
To help in placing your order:

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

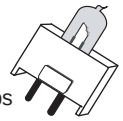
[1] Specify one of the following sign types: L-858Y ("**Y**"ellow), L-858R ("**R**"ed), L-858L ("**L**"ocation), or Blank/ Black

LUMACURVE®
AIRFIELD SIGNS

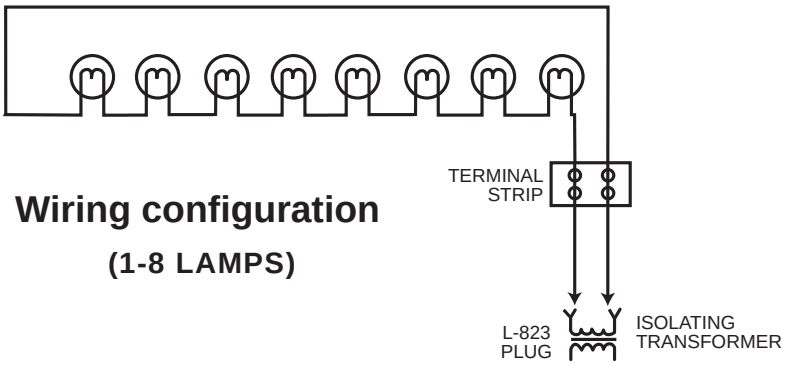
Parts & Electrical Information
for Taxiway & Runway Signs



Style 5 lighting systems
T10P 6.6A/45W incandescent & 45W/EXM quartz lamps



Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs
View our FAA Certificate of Conformance



Wiring configuration
(1-8 LAMPS)

Style 5 signs are for operation on a constant 5.5A circuit and have no brightness control transformer installed.

		Traditional Lighting Systems, Style 5							
		FAA Style 5 (Constant 5.5A) 45W/T10P				FAA Style 5 (Constant 5.5A) 45W EXM Qtz			
Sign Size & Module Length	Lamps	Cat #	Isol Xfmr	Max VA	Pwr Factr	Cat #	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	1	S1P	45W	33	0.99	S1Q	45W	39	0.99
2-mod	2	S2P	100W	65	0.99	S2Q	100W	71	0.99
3-mod	3	S3P	100W	93	0.99	S3Q	100W	101	0.99
4-mod	4	S4P	200W	127	0.99	S4Q	200W	141	0.99
Size 2, 1-mod	2	M1P	100W	65	0.99	M1Q	100W	71	0.99
2-mod	4	M2P	200W	127	0.99	M2Q	200W	141	0.99
3-mod	6	M3P	200W	181	0.98	M3Q	200W	192	0.98
4-mod	8	M4P	300W	236	1.00	M4Q	300W	261	1.00
Size 3, 1-mod	2	L1P	100W	65	0.99	L1Q	100W	71	0.99
2-mod	4	L2P	200W	127	0.99	L2Q	200W	141	0.99
3-mod	6	L3P	200W	181	0.98	L3Q	200W	192	0.98
4-mod	8	L4P	300W	236	1.00	L4Q	300W	261	1.00
Size 5, 1-mod	2	DL1P	100W	65	0.99	DL1Q	100W	71	0.99
Size 4, 1-mod	4	D1P	200W	127	0.99	D1Q	200W	141	0.99

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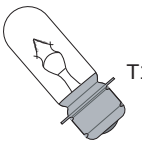
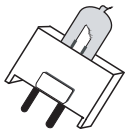
LUMACURVE PARTS LIST

Style 5 Lighting Systems



Incandescent
T10P 6.6A/45W lamps
(Shown below)

Quartz
45W/EXM lamps
(See Quartz insert)



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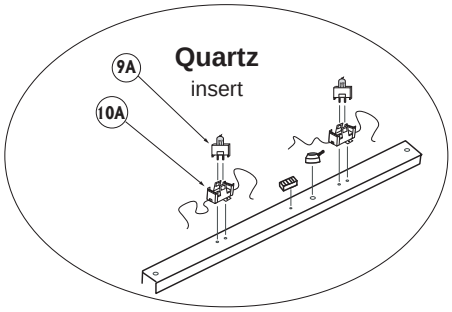
Specification for Runway and Taxiway Signs
View our FAA Certificate of Conformance



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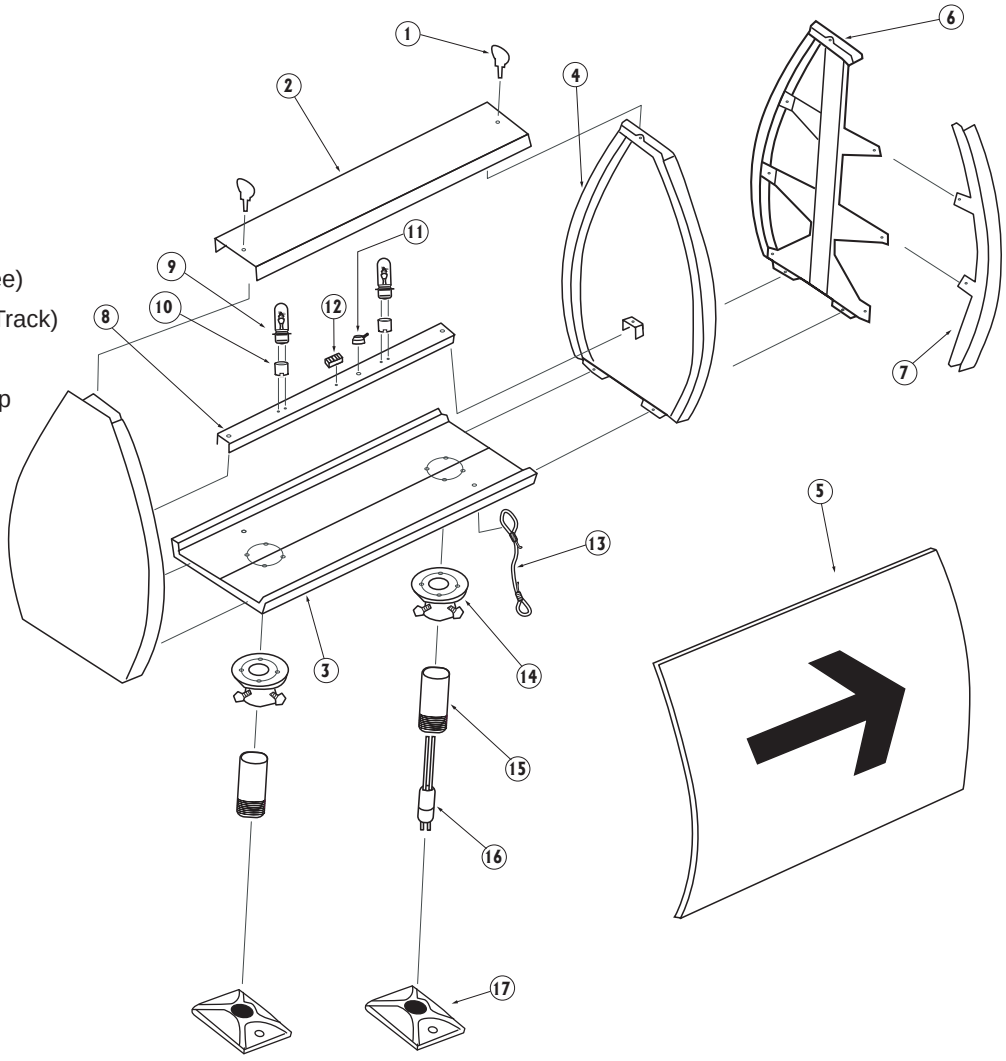
	Item	*Description*
1.	340/345	Turn Fasteners
2.	*CLT-2	Cover
3.	*CLT-3	Base
4.	*CLT-4	End Panel
5.	*CLT-5	Legend Panel[1]
6.	*CLT-6	Multi-Module Insert (Tree)
7.	*7-A	Face Insert Channel[1] (Track)
8.	*8-A	Light Bar
9.	6.6/T10P	45W Incandescent Lamp
9A.	45W EXM	45W EXM Quartz Lamp
10.	400	Prefocus socket
10A.	501	Quartz socket
11.	480	Cable Clamp
12.	420	Terminal Strip (section)
13.	CLT-19	Tether
14.	130	Slipfitter
15.	*140	6” Frangible Coupling
16.	430	Cord & Plug
17.	15	Floor Flange



To help in placing your order:

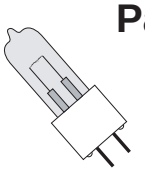
*Prefix part number with one of the following sign sizes: "**S**" (small/ size 1), "**M**" (medium/ size 2), "**L**" (large/ size 3 & 5)

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

Warning! For maintenance of previously installed equipment only!

This system has not been certified to meet the latest FAA Advisory Circular 150/5345-44

LUMACURVE®
AIRFIELD SIGNS



Parts & Electrical Information

for Taxiway & Runway Signs

LOVA lighting systems

(12V/20W quartz halogen lamps)

LUMACURVE LOVA system

The LUMACURVE LOVA system maintains a constant sign brightness in accordance with FAA A/C 150-5324-44 with appreciably higher efficiency relative to traditional lighting systems, and is available in new signs or in kit form for retrofit. This system ensures delivery of a constant voltage to quartz lamps regardless of constant current regulator (CCR) output to the primary circuit and operates on both high (2.8A - 6.6A) and medium (4.8A - 6.6A) intensity circuits without internal modification*. The lamps authorized for use in this system are Standard Signs Inc P/N #LOVA Lamp Assembly with GE #14131;Q20T4/CL Bipin quartz halogen 12V/20W lamp & custom ceramic adapter base. They are available directly from Standard Signs Inc.

IMPORTANT!

The LUMACURVE LOVA lighting system is designed exclusively for FAA styles 2 & 3 operation on a series circuit together with non-sign fixtures, such as edge lights, where the sign brightness control components are necessary to maintain constant sign brightness regardless of CCR step. Non-sign load must be present on the circuit for proper operation of this system. LOVA Signs should NOT be installed on a circuit that powers only signs. For circuits dedicated to signs, please request LUMACURVE lighting systems designed for FAA style 5 operation.

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 white and brown leads at the sign terminal strip on the light bar (P/N #CLT 8). If voltage varies from recommended settings (11.5V for Size 1 signs or 11.2V for sizes 2, 3, and 5), all signs on that circuit should be checked and adjusted. To adjust, turn the small screw in the upper left corner of the printed circuit board (PCB) controller(s) mounted on the inside of the end panel (P/N #CLT-4). Signs with over 6 lamps will contain 2 PCB controllers wired in series.

NOTE: The adjustment screw is designed only for fine-tuning and does not function as a dimmer.
Signs must not be operated at less than 11 volts.

There is a 10-minute warm-up period for lamps to come to set voltage but sign brightness meets FAA specifications even at cold voltages. Approximate average sign brightness for a yellow sign (white is 25% brighter) at recommended voltages for FAA sign sizes 1, 2 & 3 are as follows:

Size 1	Size 2	Size 3
11.5V	11.2V	11.2V
15-16 FLT	18-19 FLT	18-19 FLT

*Isolation transformer wattage requirements may vary for each application.

For further assistance please call 800-258-1997

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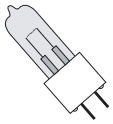
LUMACURVE PARTS LIST



LOVA lighting systems

(12V/20W quartz halogen lamps)

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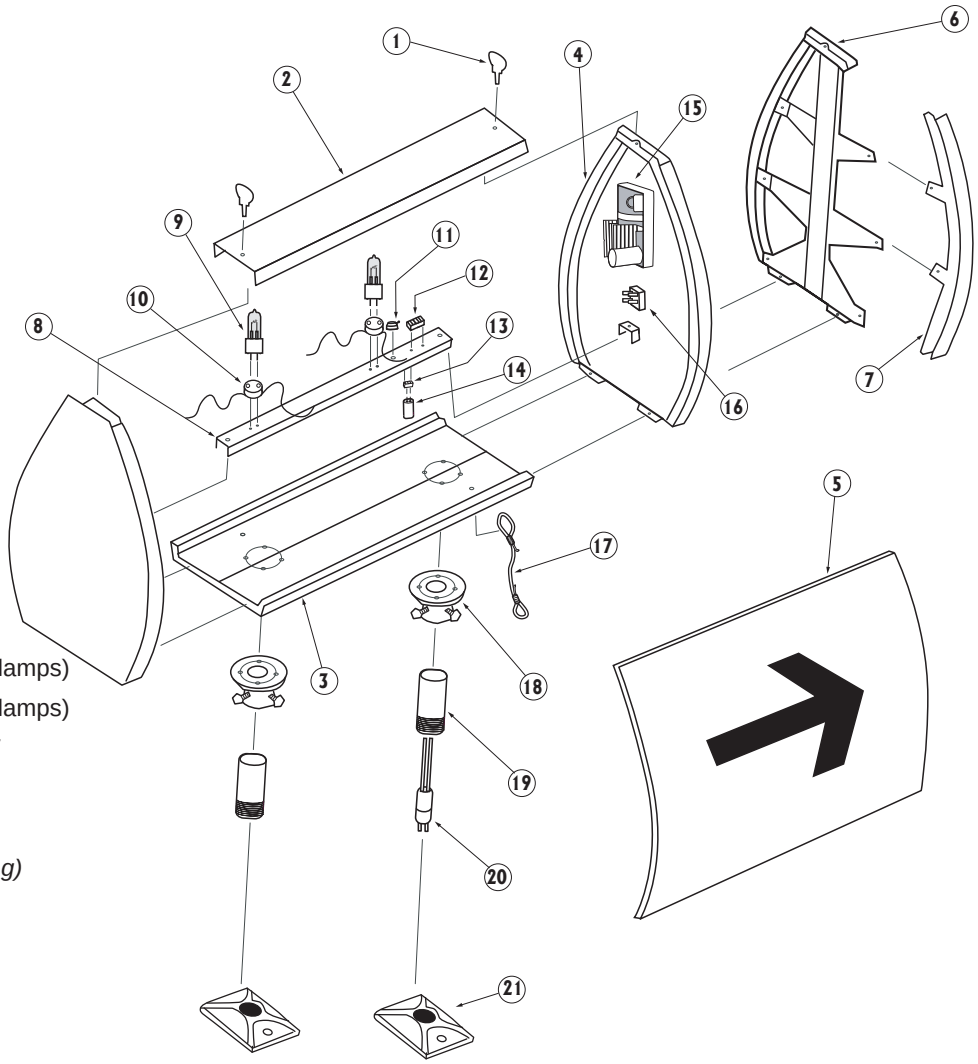
	Item	*Description*
1.	340/345	Turn Fasteners
2.	*CLT-2	Cove
3.	*CLT-3	Base
4.	*CLT-4	End Panel
5.	*CLT-5	Legend Panel[1]
6.	*CLT-6	Multi-Mode Insert
7.	*7-A	Face Insert Channel[1]
8.	*8-A	Light Bar
9.	LOVA Lamp	12V/20W Quartz Lamp
10.	E400A	Lampholder
11.	480	Cable Clamp
12.	420	Terminal Strip
13.	420	Terminal Strip (section)
14A.	E411	Capacitor for E410
14B.	E611	Capacitor for E610
15A.	E410	PCB Controller, 50V (1-4 lamps)
15B.	E610	PCB Controller, 75V (1-6 lamps)
16.	E540	Bridge Rectifier 25A/600V
17.	CLT-19	Tether
18.	130	Slipfitter
19.	*140	Frangible Coupling *(6" long)*
20.	430	Cord & Plug
21.	15	Floor Flange



One lamp systems only require:

E550 Resistor 10W/2 OHM

To help in placing your order:

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

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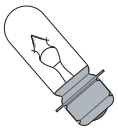
LUMACURVE® AIRFIELD SIGNS

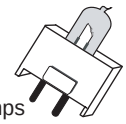
Parts & Electrical Information

for Taxiway & Runway Signs



Style 2 lighting systems

T10P 6.6A/45W incandescent & 45W/EXM quartz lamps



Making electrical adjustments:
There are one or more BRIGHTNESS CONTROL TRANSFORMERS in the LUMACURVE sign so that lighting will comply with the requirements of FAA Advisory Circular 150/5345-44. The transformer is wired according to the number of lamps in the sign. The higher tap in each case leads to the isolating transformer (along with the white lead). The lower tap leads to the lamp(s).

There is wiring diagram below showing the transformer lead color coding.

After installation, the current to the lamps must be checked with a "RMS" or "IRON VANE" ammeter.
(The current produced by airfield lighting regulators is non-sinesoidal.) Because of wave form variations in regulators, the factory setting might be too high (even over 6.6A) and severly shorten lamp life, or too low and the sign too dim. Required lamp inputs in amps are shown below for each size of sign:
Size S (FAA size 1) - 5.1 to 5.9A, Size M (FAA size 2) - 5.5 to 6.3A, Size L (FAA size 3 & 5) - 5.9 to 6.2A

Set the regulator on 4.8A and check the sign lamp current. If it is under the minimum shown above, first move the "isolating transformer" or the "lamp" tap (whichever one has an open step above it) up one step, then move the other tap (if necessary), to bring current as close as possible to above the minimum. Then set the regulator at 6.6A and make sure the lamp current is not over the maximum, although once the minimum is set, the maximum should fall in place. If it is over the maximum, make the minimal downward adjustment possible to bring lamp current under the maximum allowed.

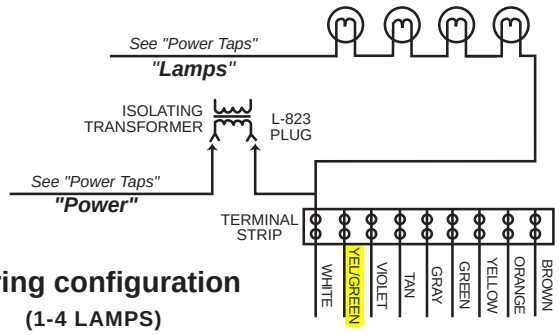
Style 2 Lighting System

6.6A/45W Incandescent lamps

CAT#	Power Taps		Lamps	Watts	Amps	Volts	VA	PF	ISO Xfmr
	LAMP	POWER							
S12P	YEL/GRN	GRAY	1	74	6.6	18	118.8	0.62	45W
S22P	TAN	YELLOW	2	133	6.6	31.1	205.26	0.65	100W
S32P	GREEN	ORANGE	3	168	6.6	32.1	211.86	0.79	100W
S42P	YELLOW	BROWN	4	190	6.6	36.5	240.9	0.79	200W
M12P	VIOLET	GREEN	2	105	6.6	25.7	169.62	0.62	100W
M22P	GREEN	ORANGE	4	158	6.6	34.9	230.34	0.69	200W
M32P	GRAY	YELLOW	6	255	6.6	61.9	408.54	0.62	300W
M42P	GREEN	BROWN	8	323	6.6	78.4	517.44	0.62	300W
L12P	GREEN	ORANGE	3	166	6.6	30.6	201.96	0.82	200W
L22P	GREEN	ORANGE	6	307	6.6	62.7	413.82	0.74	300W
L32P	GREEN	ORANGE	9	448	6.6	94	620.4	0.72	500W
L42P	GREEN	ORANGE	12	581	6.6	120	792	0.73	500W

45W EXM Quartz lamps

CAT#	POWER TAPS		Lamps	Watts	Amps	Volts	VA	PF	ISO Xfmr
	LAMP	POWER							
S12Q	YEL/GRN	TAN	1	72	6.6	14.9	98.34	0.73	45W
S22Q	TAN	GREEN	2	115	6.6	23.1	152.46	0.75	100W
S32Q	GREEN	YELLOW	3	150	6.6	26.3	173.58	0.86	100W
S42Q	YELLOW	BROWN	4	189	6.6	36.2	238.92	0.79	200W
M12Q	TAN	GREEN	2	115	6.6	23.1	152.46	0.75	100W
M22Q	YELLOW	BROWN	4	189	6.6	36.2	238.92	0.79	200W
M32Q	GREEN	YELLOW	6	276	6.6	53.2	351.12	0.79	300W
M42Q	YELLOW	BROWN	8	356	6.6	67.1	442.86	0.80	300W
L12Q	GREEN	YELLOW	3	152	6.6	26.7	176.22	0.86	100W
L22Q	GREEN	YELLOW	6	275	6.6	53	349.8	0.79	300W
L32Q	GREEN	YELLOW	9	402	6.6	79.7	526.02	0.76	500W
L42Q	GREEN	YELLOW	12	529	6.6	102.4	675.84	0.78	500W



Wiring configuration
(1-4 LAMPS)

(Factory setting may vary slightly from the diagram.)

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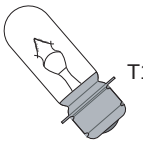
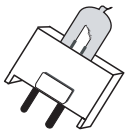
LUMACURVE PARTS LIST

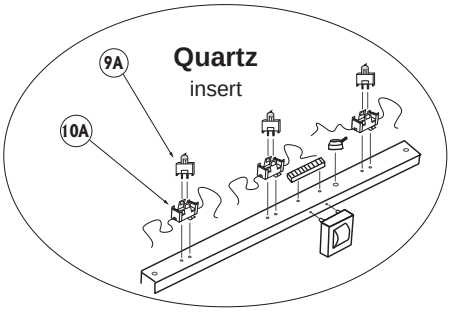
Style 2 Lighting Systems



Incandescent
T10P 6.6A/45W lamps
(Shown below)

Quartz
45W/EXM lamps
(See Quartz insert)





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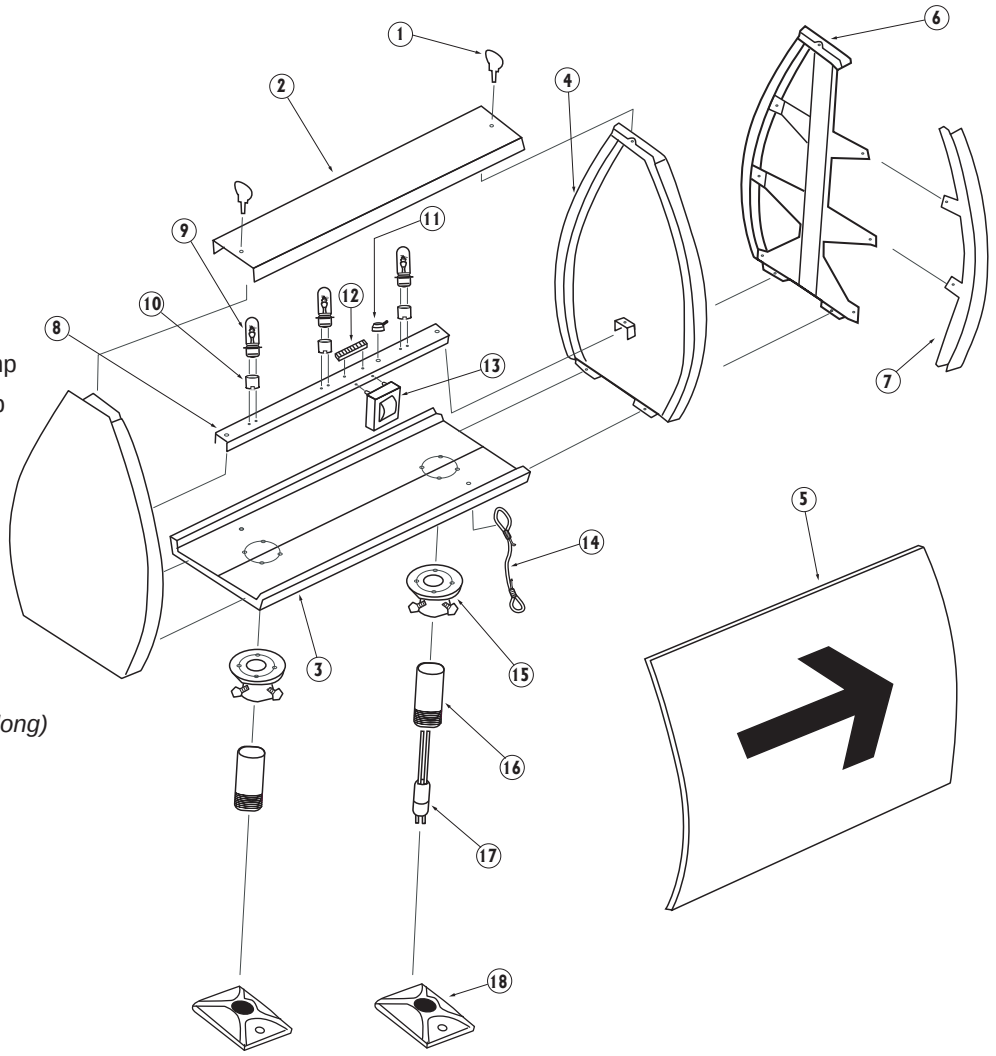
	Item	*Description*
1.	340/345	Turn Fasteners
2.	*CLT-2	Cover
3.	*CLT-3	Base
4.	*CLT-4	End Panel
5.	*CLT-5	Legend Panel[1]
6.	*CLT-6	Multi-Mode Insert
7.	*7-A	Face Insert Channel[1]
8.	*8-A	Lamp Socket Channel
9.	6.6/T10P	45W Incandescent Lamp
9A.	45W EXM	45W EXM Quartz Lamp
10.	400	Prefocus Socket
10A.	501	Quartz Socket
11.	480	Cable Clamp
12.	420	Terminal Strip
13.	410	Current Transformer
14.	CLT-19	Tether
15.	130	Slipfitter
16.	*140	Frangible Coupling *(6" long)*
17.	430	Cord & Plug
18.	15	Floor Flange



To help in placing your order:

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

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LUMACURVE® AIRFIELD SIGNS

Parts & Electrical Information

for Taxiway & Runway Signs

Style 3 lighting systems

25W/34V and 50W/30V train lamps

Making electrical adjustments:
The traditional Style 3 LUMACURVE sign lighting system utilizes 25W/34V (size 1 & 2 signs) or 50W/30V (size 3 signs) Train lamps and is designed exclusively for operation on a high intensity or 5 brightness step circuit. The system maintains a constant sign brightness in accordance with FAA Advisory Circular 150/5345-44 by converting primary circuit input current varying from 2.8A to 6.6A to a constant voltage delivered to the sign lamps. The system is wired in parallel and includes one internal adapter system.

All LUMACURVE lighting systems are factory set. However, for best results we recommend that lamp voltage be checked with a RMS voltmeter after installation. The factory setting may need adjustment due to wave form variations among regulators. We insist on using a RMS meter because the non-sinusoidal current produced by regulators cannot be accurately measured with meters designed for sine wave current. See "Lamp Volts" ranges to ensure meeting the FAA specified luminance.

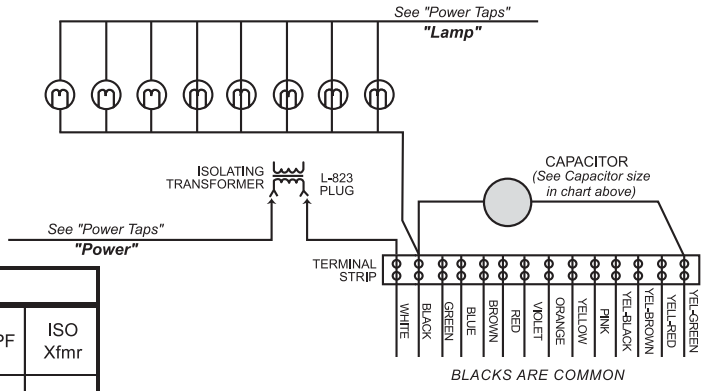
The lower the operating voltage, the longer the lamp will last. To adjust, please refer to the wiring diagrams below. To increase lamp volts, move the upper tap (to the lamps) up. To reduce lamp volts, move upper tap (to the lamps) down.

Parts unique to the traditional Style 3 system: Medium screw socket (#500), 30V/50W Train lamp (#50A21), 34V/25W Train Lamp (#50A21 25W), Train Transformer (#510), Train Lamp Capacitor 10MF (#541 G), Train Lamp Capacitor 15 MF (#540).

There are one or more BRIGHTNESS CONTROL TRANSFORMERS in the LUMACURVE sign so that lighting will comply with the requirements of FAA Advisory Circular 150/5345-44. The transformer is wired according to the number of lamps in the sign. The higher tap in each case leads to the isolating transformer (along with the white lead). The lower tap leads to the lamp(s).

The wiring diagram below shows the transformer lead color coding.

Wiring configuration
(2-8 LAMPS)



(Factory setting may vary slightly from the diagram.)

Style 3 (Train lamps) Lighting System

CAT#	Power Taps		CAP	Lamp Type & (Quantity)	Lamp Volts		Watts	Amps	Volts	VA	PF	ISO Xfmr
	Lamp	Power			Min	Max						
S13R	YEL	PINK	15	25W/34V (2)	22.25	22.75	91	6.6	62	409	0.22	100W
S23R	YEL	ORANGE	10	25W/34V (4)	23	23.75	112	6.6	86	568	0.20	200W
S33R	YEL	PINK	10	25W/34V (6)	22.25	23.5	151	6.6	83	548	0.28	200W
S43R	BROWN	YEL/BLK	15	25W/34V (8)	22.25	23.75	211	6.6	142	937	0.23	300W
M13R	ORANGE	PINK	15	25W/34V (2)	31.5	32	109	6.6	91	601	0.18	200W
M23R	BROWN	PINK	10	25W/34V (4)	31.25	32	184	6.6	130	858	0.21	300W
M33R	BROWN	PINK	10	25W/34V (6)	32.5	34	311	6.6	151	997	0.31	500W
M43R	RED	YEL/BLK	15	25W/34V (8)	32	33.5	328	6.6	177	1168	0.28	500W
L13T	YEL	PINK	10	50W/30V (2)	24.5	25.5	120	6.6	85	561	0.21	200W
L23T	ORANGE	YEL/BLK	10	50W/30V (4)	23.5	26.75	255	6.6	130	858	0.30	300W
L33T	BLUE	YEL/BLK	10	50W/30V (6)	24.25	27	373	6.6	172	1135	0.33	500W
L43T	BROWN	YEL/BLK	10	50W/30V (8)	23.75	27.5	477	6.6	174	1148	0.42	500W

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LUMACURVE PARTS LIST

Style 3 lighting systems

(25W/34V and 50W/30V train lamps)

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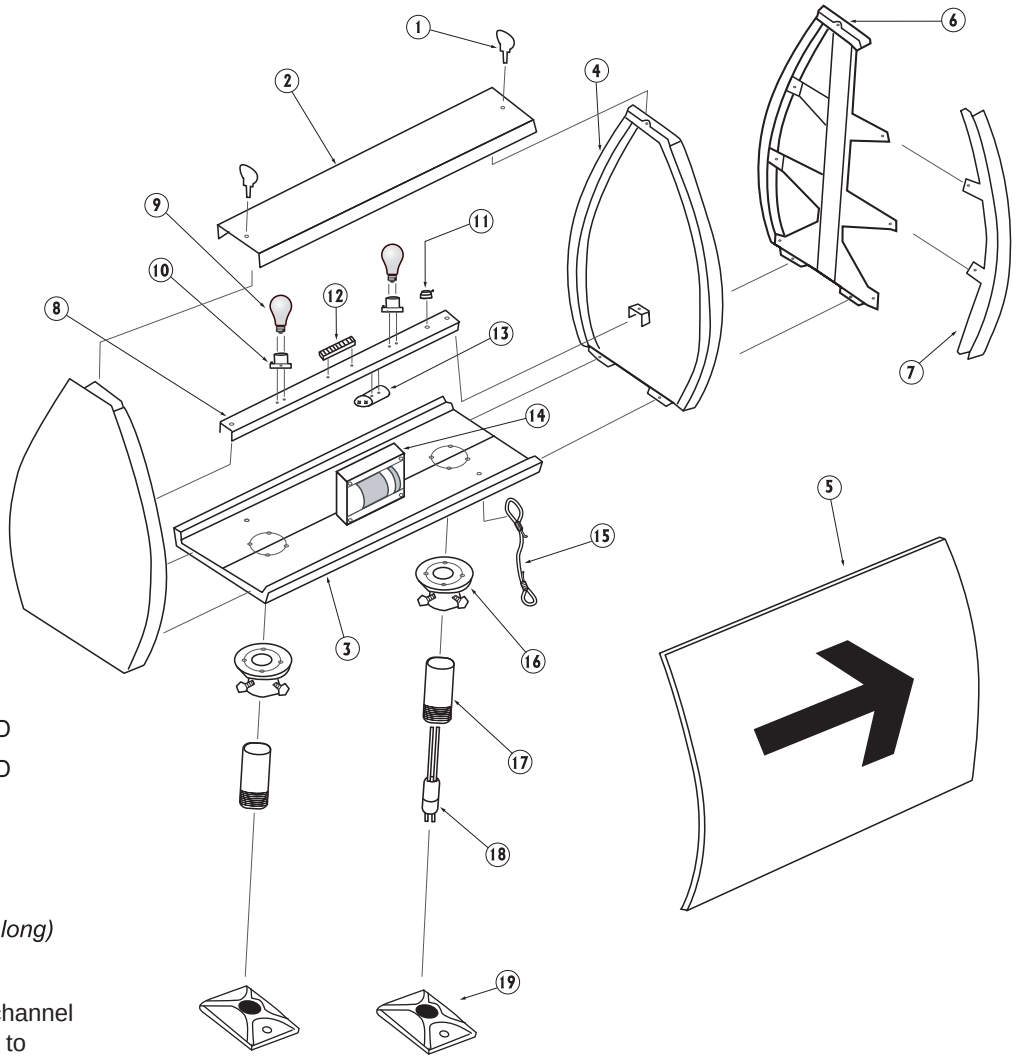
2.	*CLT-2	Cover
3.	*CLT-3	Base
4.	*CLT-4	End Panel
5.	*CLT-5	Legend Panel[1]
6.	*CLT-6	Multi-Mode Insert
7.	*7-A	Face Insert Channel[1]
8.	*8-A	Lamp Socket Channel
9.	50A21	30V/50W Train Lamp
9A.	50A21 25W	34V/25W Train Lamp
10.	500	Medium Screw Socket
11.	480	Cable Clamp
12.	420	Terminal Strip
13A.	541	Train Capacitor 10 MFD
13B.	540	Train Capacitor 15 MFD
14.	510	Train Transformer
15.	CLT-19	Tether
16.	130	Slipfitter
17.	*140	Frangible Coupling *(6" long)*
18.	430	Cord & Plug



Note: *Size 1 signs only:* Lamp socket channel configuration differs from diagram above to accommodate the train transformer

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)

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

LUMACURVE® AIRFIELD SIGNS

Installation Instructions

for Taxiway & Runway Signs

Size 1, Size 2, Size 3 & Size 5

—— DO NOT DISCARD ——

Important information for AIRPORT MAINTENANCE DEPT

To install:

Note: Recommended concrete pad dimensions and mounting measurements are shown "Inner Mount" and "Outer Mount".

1. Locate the frangible couplings (item #1 see ***Electrical Connection Detail*** on page 2) and floor flanges (#2) that are provided with the sign. *(For small sign orders, they may be packaged in the box with the sign. Larger order will have a seperate carton containing this hardware.)* Coat the threads of the frangible couplings with an anti-sieze compound or petroleum jelly, then screw them hand tight into the floor flanges .
Note: It is also important 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 slipfitter.
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 slipfitter (#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 perpedicular to sign base. For the power cord leg, pull enough power cord slack from the sign to allow a connection with the isolation transformer secondary extension cord (#6).
Note: The power cord that is provided 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, p*rovided 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. The cable clamp should nest on the under side 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 plug (female).
Note: As required by the FAA, this step in conjunction with step 6 ensures that the power cord will be disconnected/unplugged in the event that the sign is knocked over.

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LUMACURVE® AIRFIELD SIGNS

Installation Instructions

for Taxiway & Runway Signs

Size 1, Size 2, Size 3 & Size 5

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 lockwashers and nuts. Temporarily loosen the slipfitter 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 slipfitter set screws using a socket wrench.

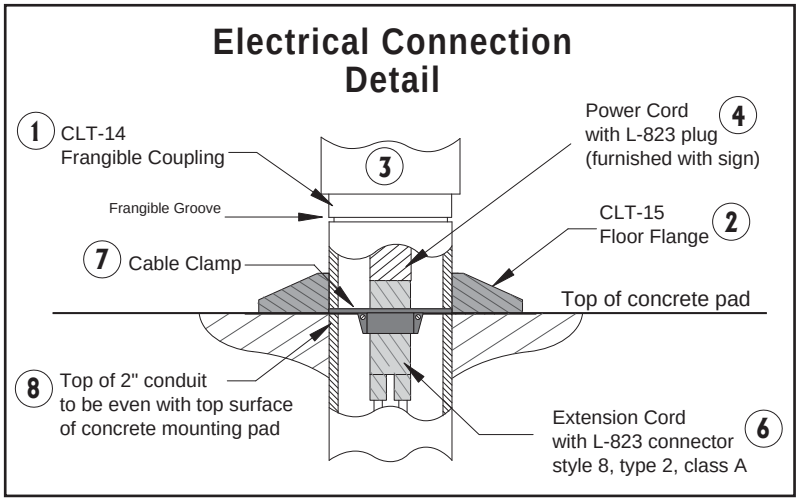
6. Locate the strain relief clamp (#9) on the inside of the sign. It can be found on the light bar (#10) on which the lamps are mounted. Remove the sign cover (#11) nearest to the nameplate on the end of the sign by unscrewing the two turn fasteners (#12) and then slide out the legend panels. Remove all slack in the power cord between the plug and the strain relief clamp, then tighten the set screw on the strain relief clamp. Extra cord can be coiled & placed 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.

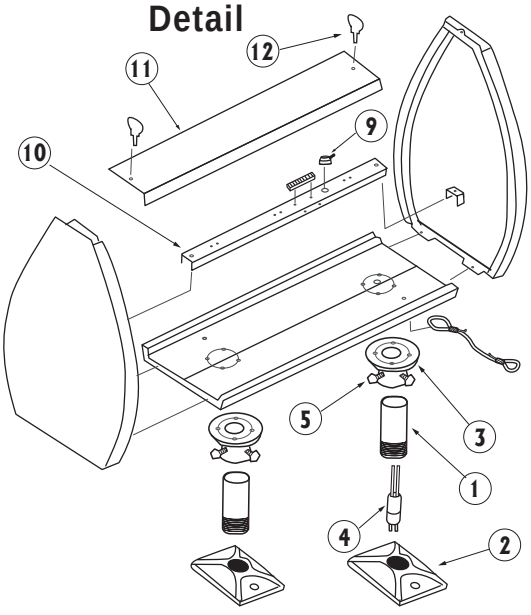
8. Replace any covers removed.

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 in to place. Apply pressure downward on the top. If the technique worked and the panels are engaged properly, the resistance (or obstruction) to tightening the turn fasteners should be eliminated.

Electrical Connection Detail



Sign Parts Detail



LUMACURVE®
AIRFIELD SIGNS

Installation Instructions

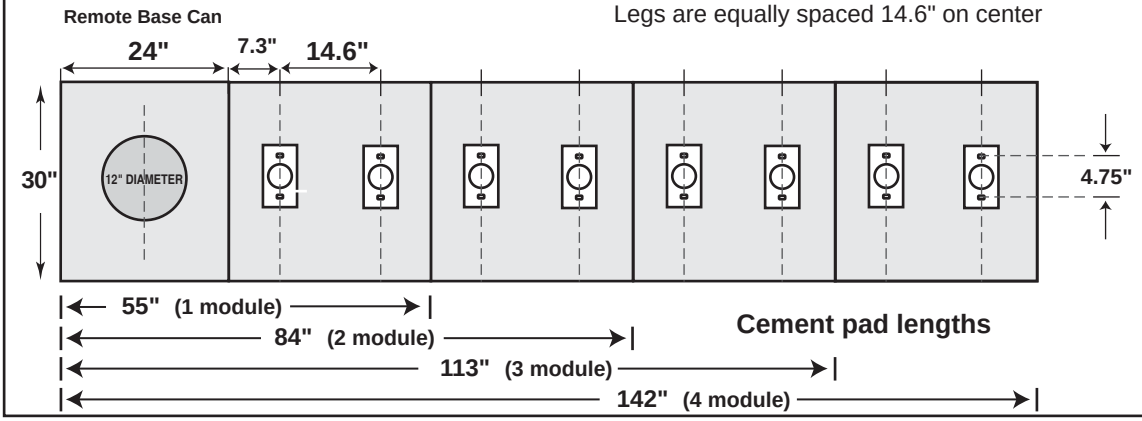
Pad dimensions & mounting locations

Sign Sizes: 1, 2, 3 & 5

Standard Mode 2 Installation (Inner Mount)

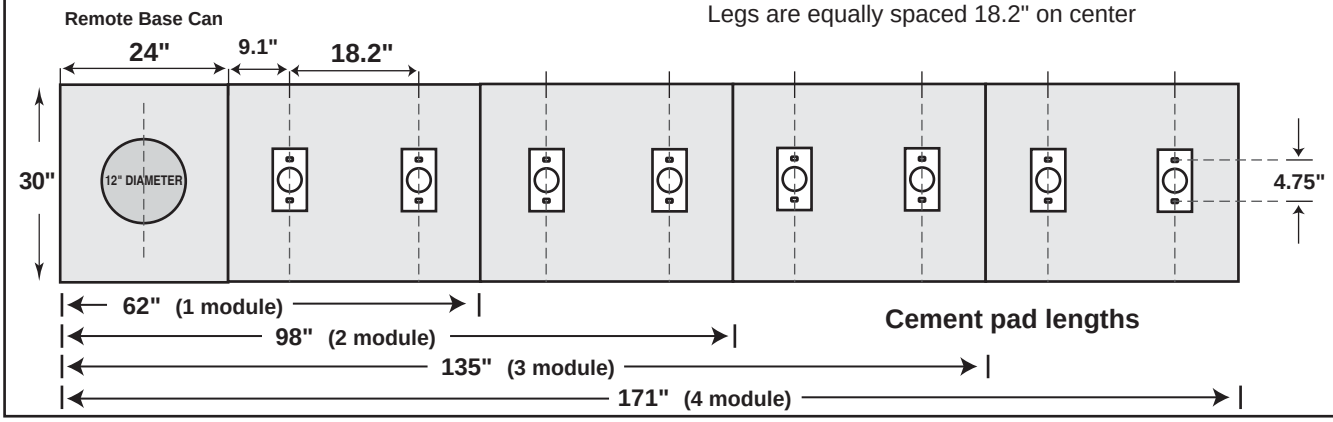
SIZE Small - FAA SIZE 1 (12" LETTERS)

Mounting hole center lines
Legs are equally spaced 14.6" on center



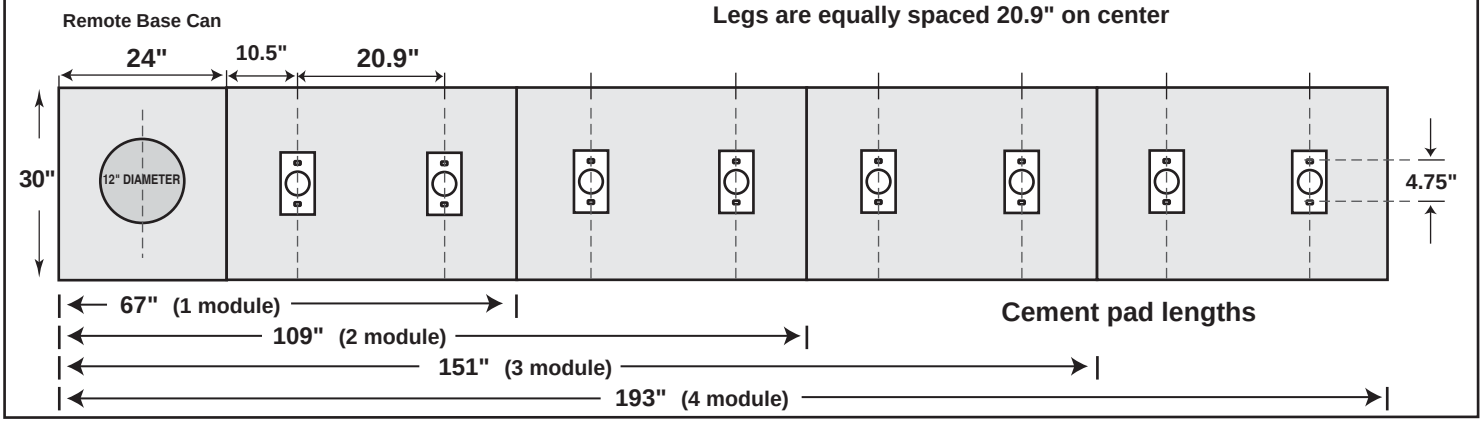
SIZE Medium - FAA SIZE 2 (15" LETTERS)

Mounting hole center lines
Legs are equally spaced 18.2" on center



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

Mounting hole center lines
Legs are equally spaced 20.9" on center



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

LUMACURVE®
AIRFIELD SIGNS

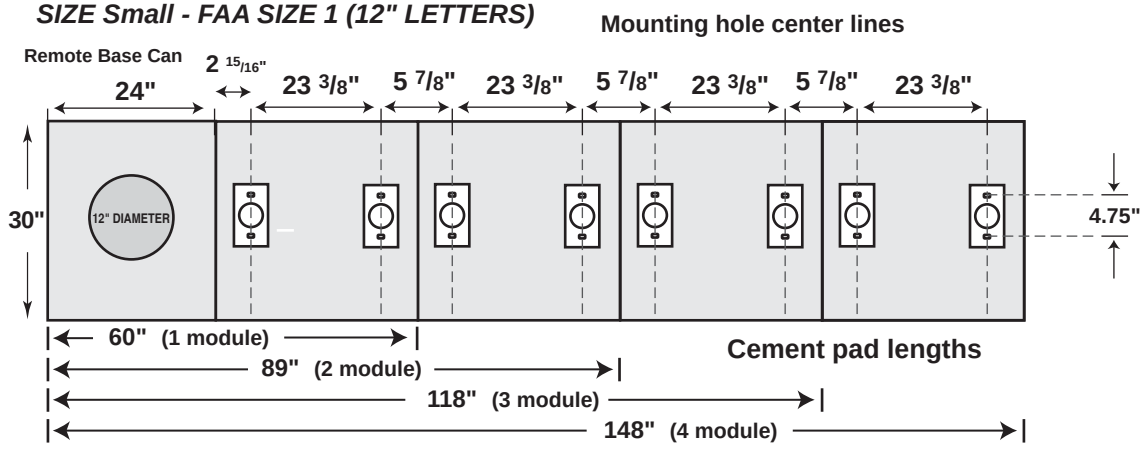
Installation Instructions

Pad dimensions & mounting locations

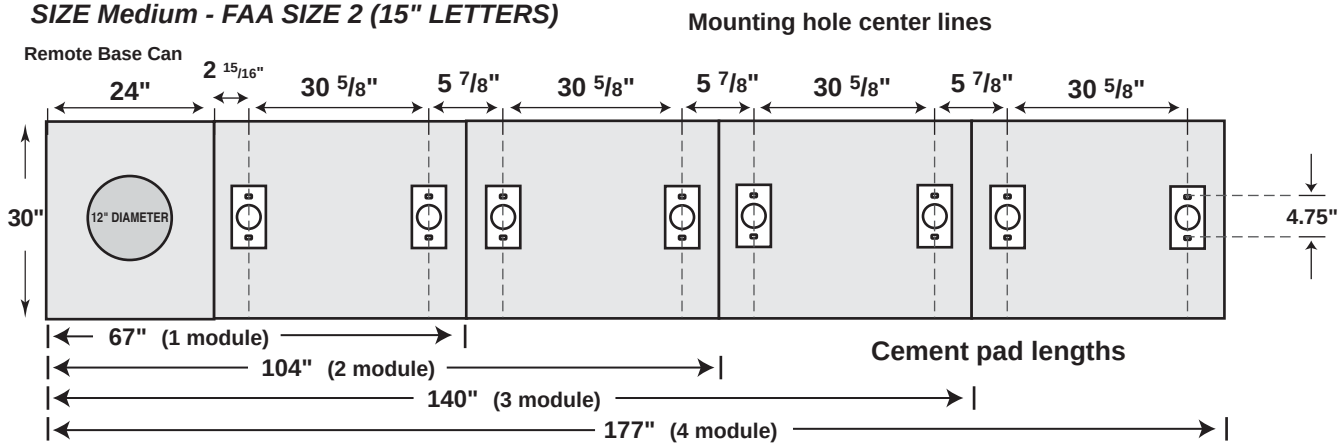
Sign Sizes: 1, 2, 3 & 5

Alternate Mode 2 Installation (Outer Mount)

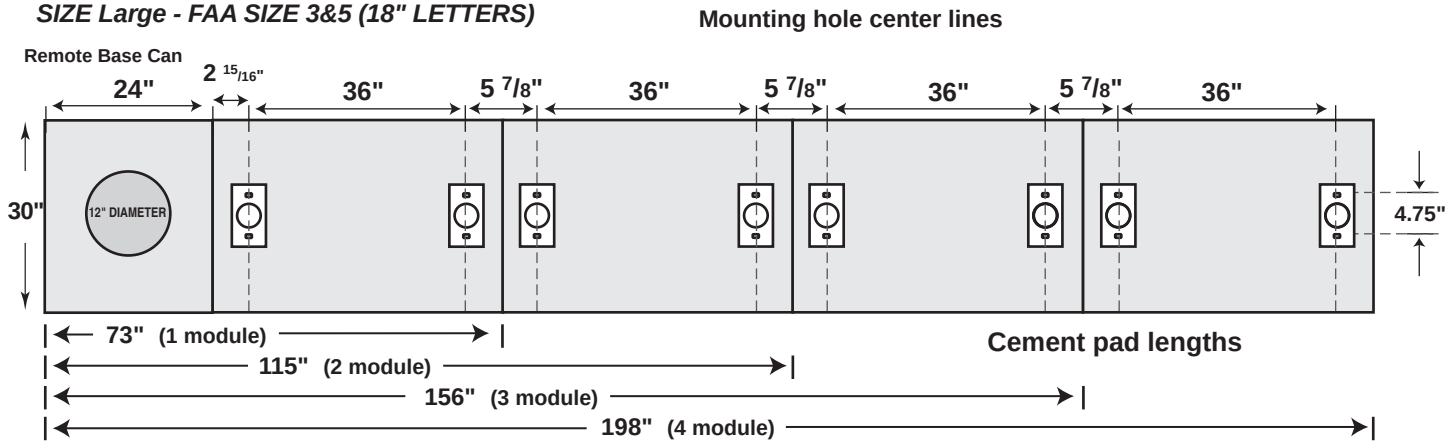
SIZE Small - FAA SIZE 1 (12" LETTERS)



SIZE Medium - FAA SIZE 2 (15" LETTERS)



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



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

LUMACURVE®
AIRFIELD SIGNS

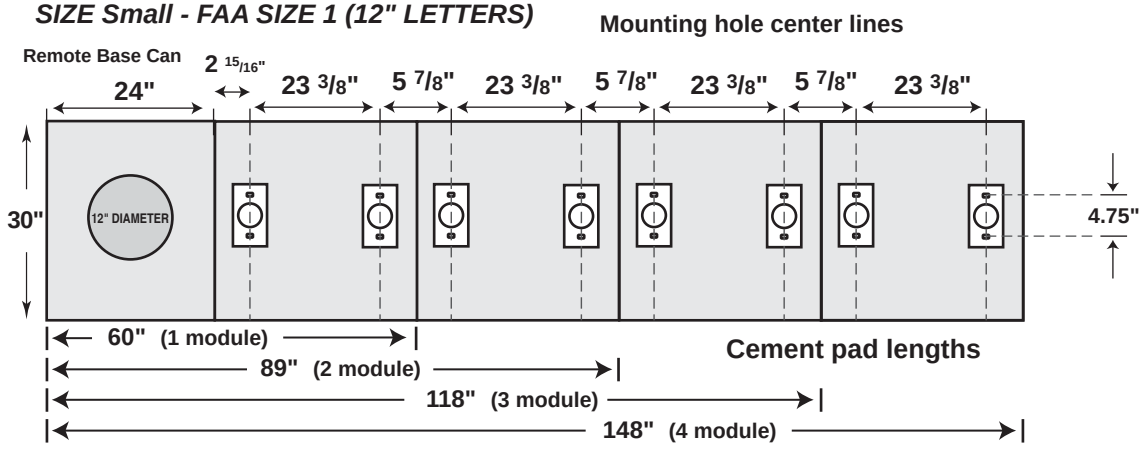
Installation Instructions

Pad dimensions & mounting locations

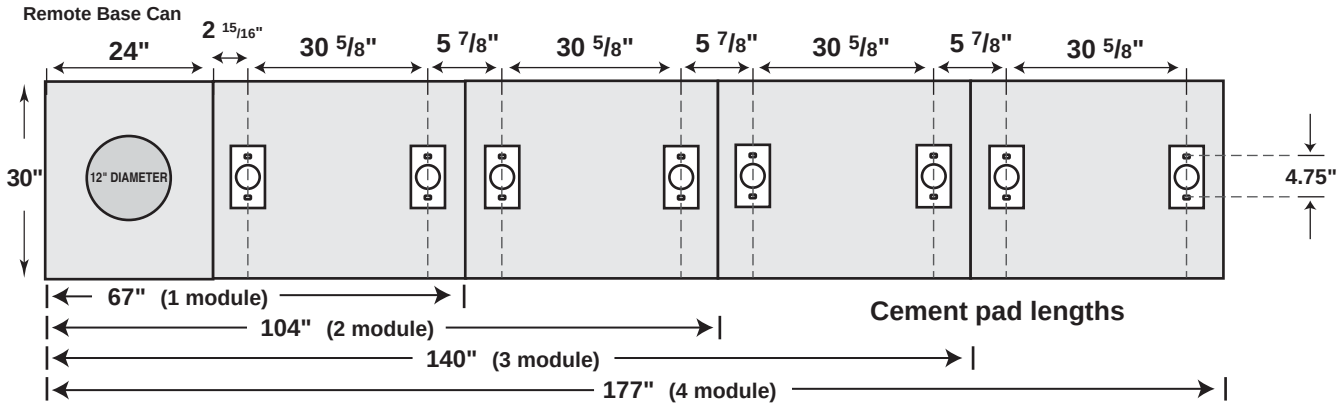
Sign Sizes: 1, 2, 3 & 5

Mode 3 Installation (Outer Mount Only)

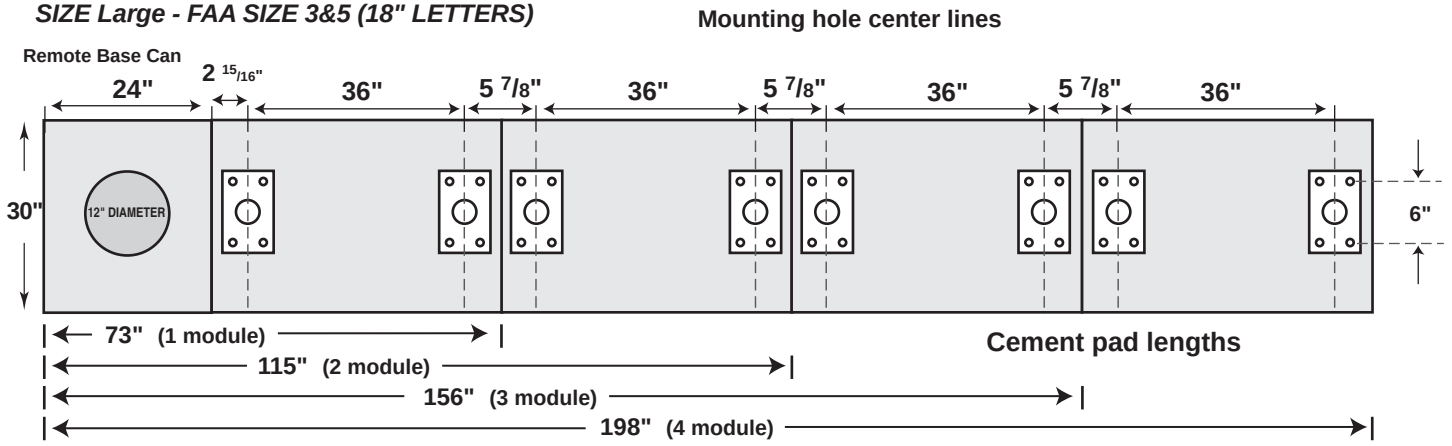
SIZE Small - FAA SIZE 1 (12" LETTERS)



SIZE Medium - FAA SIZE 2 (15" LETTERS)



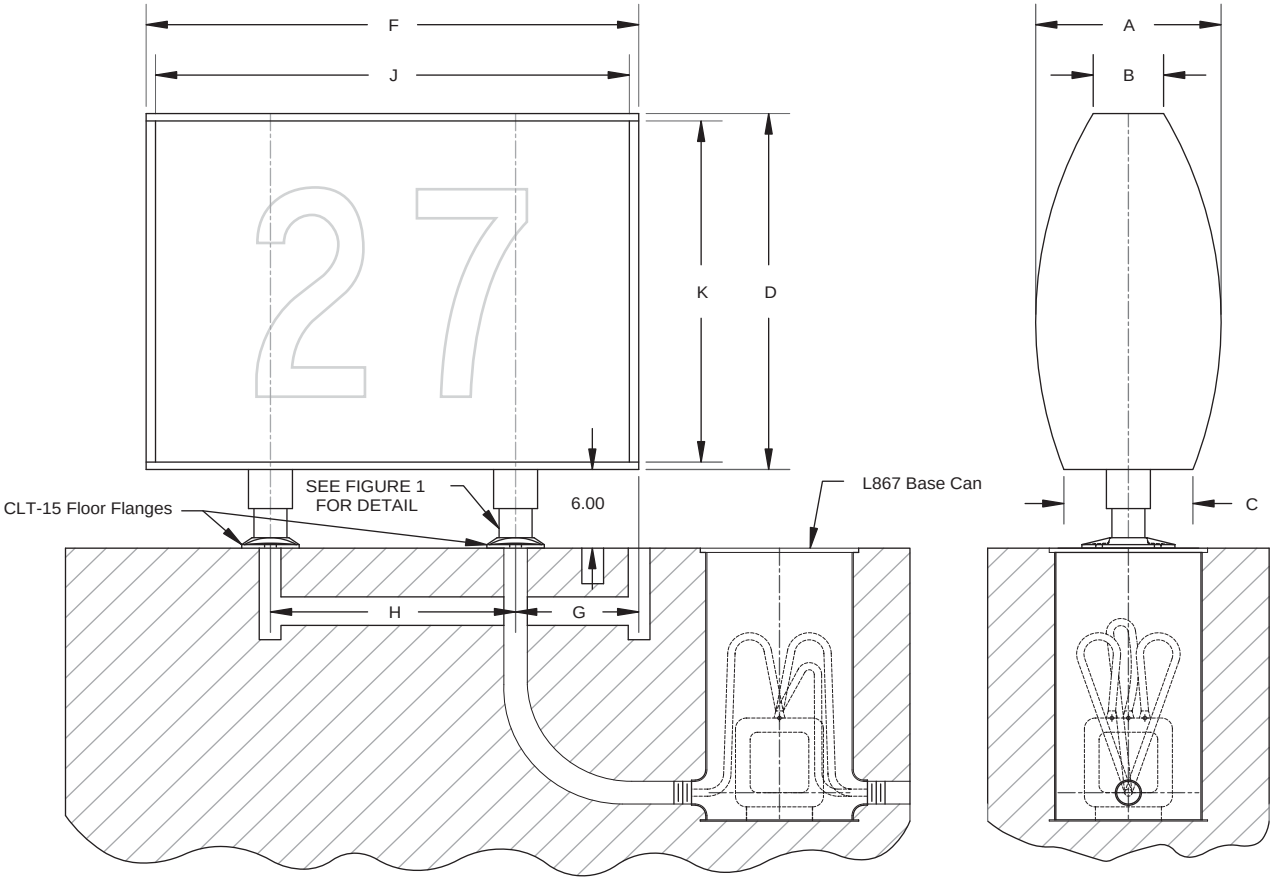
SIZE Large - FAA SIZE 3&5 (18" LETTERS)



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®
AIRFIELD SIGNS

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

*Note: Older size 3 lighting systems had 3 lamps per module prior to 2009.

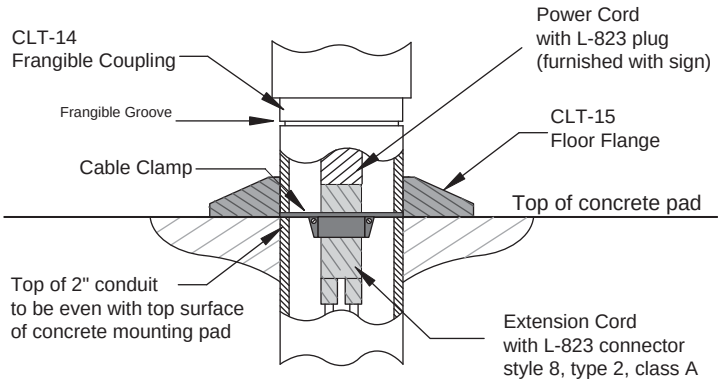


FIGURE 1

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Parts & Electrical Information
for Taxiway & Runway Signs
LED Lighting Systems

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 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.

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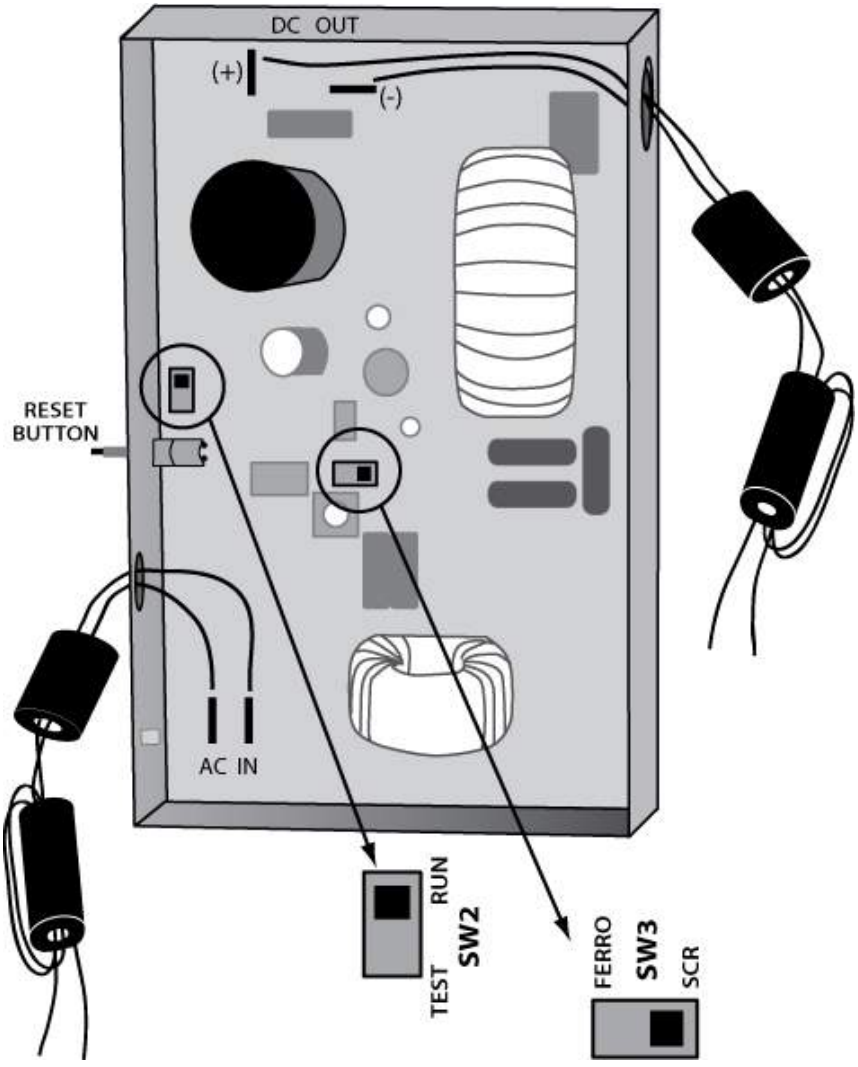
L610 – REV.07M

- 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)

"L610 – REV. 07M"



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LUMACURVE AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Parts & Electrical Information
for Taxiway & Runway Signs
LED Lighting Systems

Jumper position Based on Regulator Type for older versions of L610 Controllers

(December 2014 or older versions)

The L-828 and L-829 Constant current regulator maintain constant amperage to the airfield circuit. The L-829 is an SCR type (silicone rectifier) commonly known as a solid state (electronic based) regulator. The L-828 is a ferro-resonant that uses transformer technology.

For SCR type L-829 regulators, a jumper (photo #1) must be installed on the LED controller (as shown in figure #3 or figure #5). For ferro-resonant type L-828 regulators controller (as shown in figure #2 or figure #4).

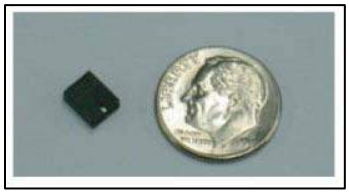

Photo #1

Instructions for installing the Jumper:

a. Identify the type of Constant Current Regulator powering this sign. ("SCR" solid state or "Ferro-Resonant" type)
b. Remove shield screen by loosening the fender washers.
c. Locate the small black jumper. The jumper is factory installed. (figure #2 or figure #4).
d. When using SCR regulator, remove jumper for ferro-resonant regulator application and reinstall over both pins as shown in photo (figure #3 or figure #5).
e. Reinstall shield screen.

"L610 – REV. 05 or older"

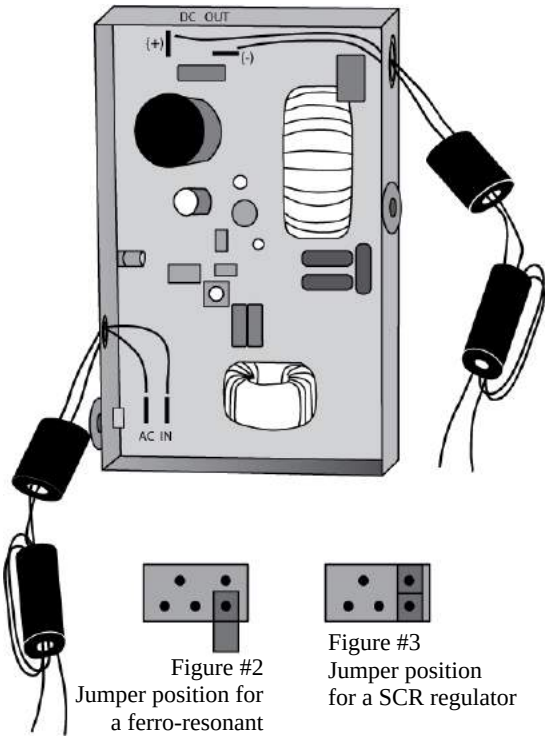

Figure #2
Jumper position for a ferro-resonant regulator

Figure #3
Jumper position for a SCR regulator

"L610 – REV. 06"

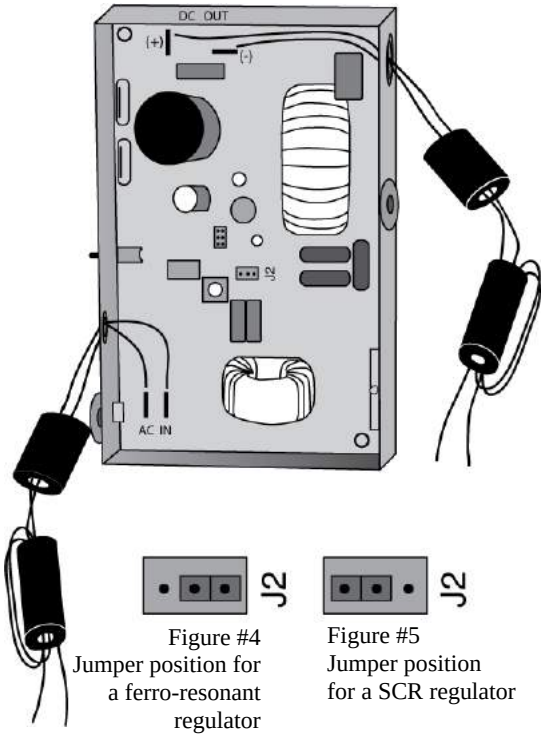

Figure #4
Jumper position for a ferro-resonant regulator

Figure #5
Jumper position for a SCR regulator

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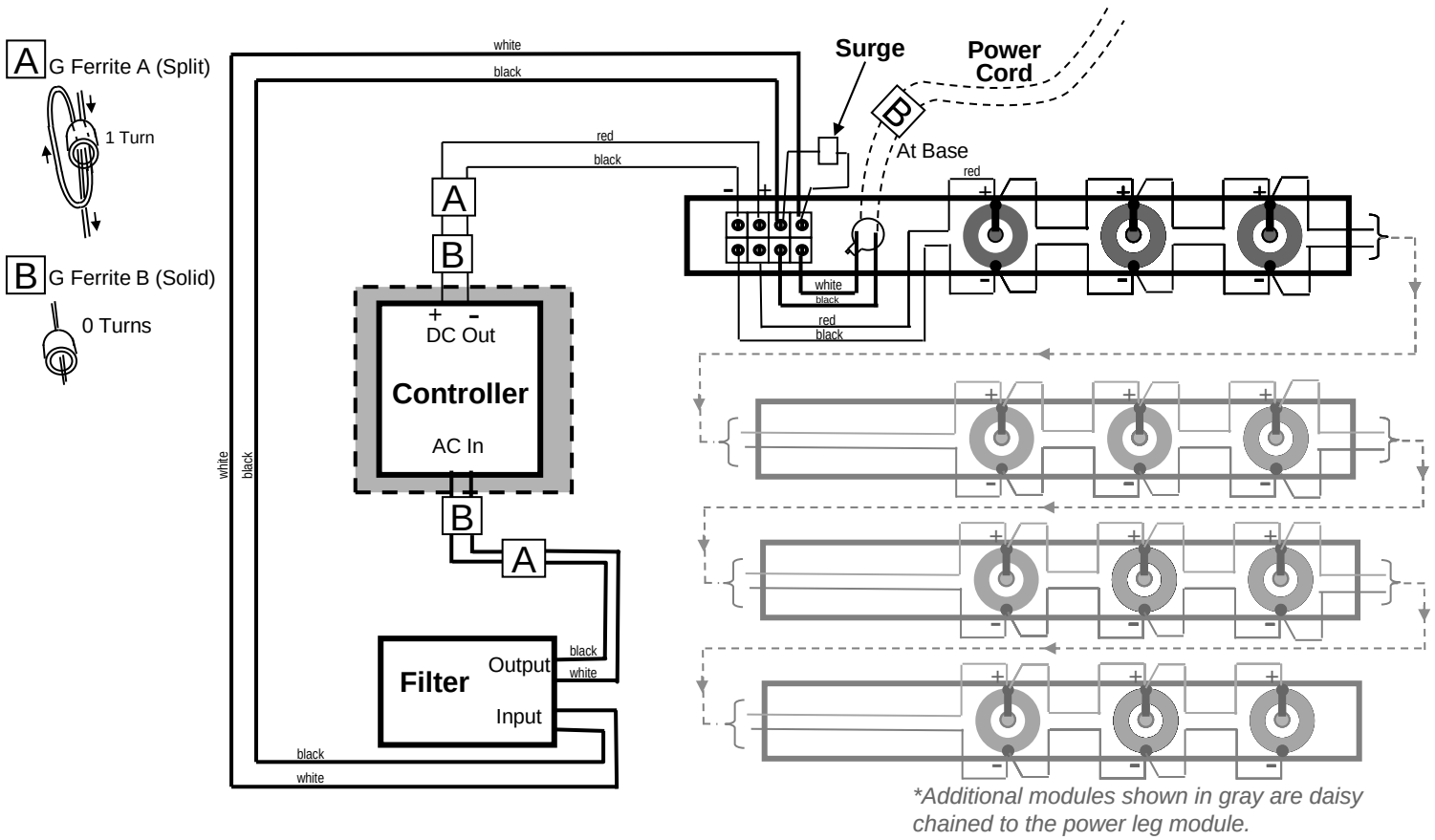
LUMACURVE® AIRFIELD SIGNS

Wiring Diagram, LED Lighting System



**Additional modules shown in gray are daisy chained to the power leg module.*

LED VA Loads, Power Factors and Isolation Transformers

		LED Lighting Systems								
		FAA Style 2 (4.8A-6.6A) 4W LED			FAA Style 3 (2.8A-6.6A) 4W LED			FAA Style 5 (5.5A) 4W LED		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	**2**	45W	47	0.93	45W	47	0.93	45W	37	0.94
2-mod	**4**	100W	59	0.88	100W	58	0.88	100W	47	0.91
3-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93
4-mod	**8**	100W	73	0.92	100W	72	0.92	100W	61	0.94
Size 2, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	**9**	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	**12**	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 3, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	**9**	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	**12**	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 5, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
Size 4, 1-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93

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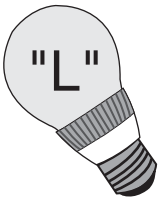
LUMACURVE PARTS LIST

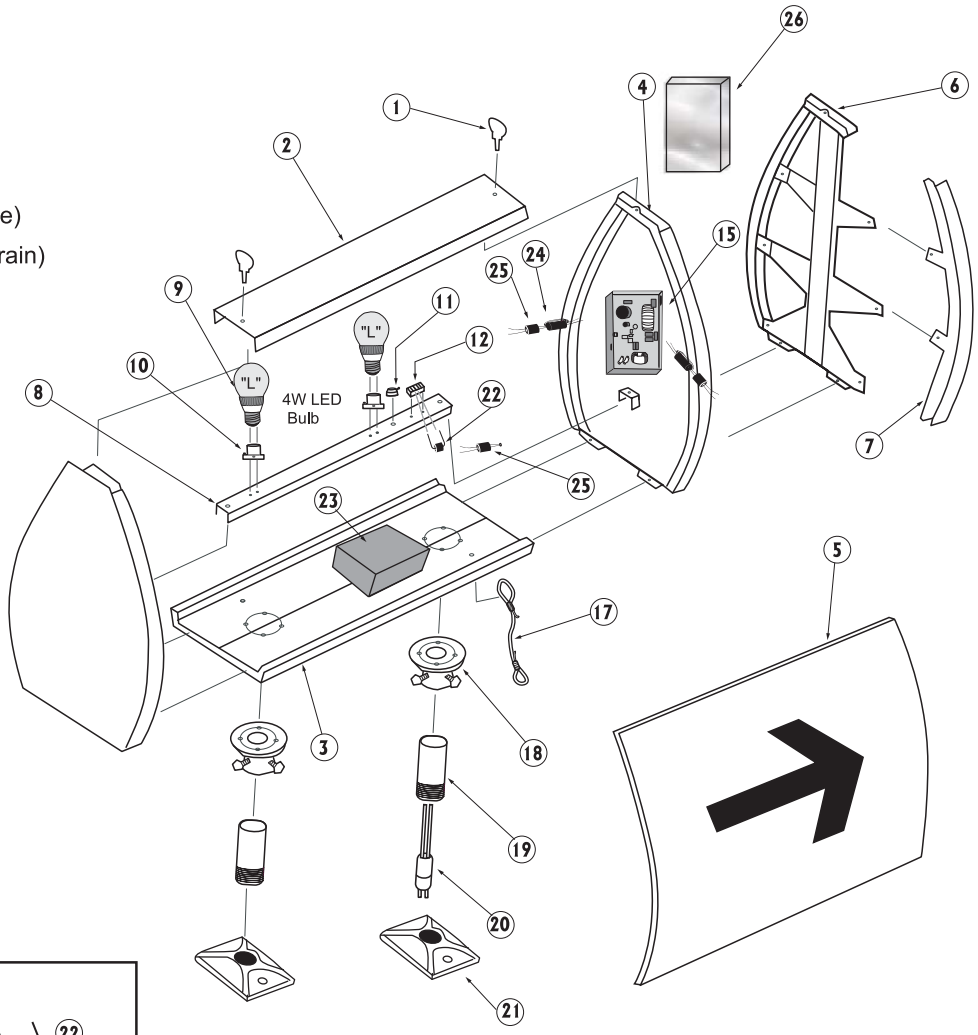


LED Lighting Systems

(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[1]
6.	*CLT-6	Multi-Module Insert (Tree)
7.	*7-A	Face Insert Channel[1] (Train)
8.	*8-A	Light Bar
9.	L lamp 4W	4W LED Lamp
10.	500	Medium Screw Socket
11.	480	Cable Clamp
12.	420	Terminal Strip (section)
15	L610	LED PCB Controller
17.	CLT-19	Tether
18.	130	Slipfitter
19.	*140	6" Frangible Coupling
20.	430	Cord & Plug
21.	15	Floor Flange
22.	E416	Surge Protector
23.	Filter	ALD Low Pass Filter
24.	Ferrite A	Ferrite Core Split
25.	Ferrite B	Ferrite Core Not Split
26.	G EMI Shield Screen	Controller Screen



Enlarged Views

Experience our exclusive "Wait-Less" service!
Call by 10AM, complete signs & parts ship same day!
No extra charge! Call 800.258.1997

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)

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

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Installation: Add-On Modules

Section D: "Installation & Modification"

The modular construction of **LUMACURVE** airfield signs provides for maximum flexibility in legend display through multiple module sign lengths. This is achieved through standard sign module and legend face panel sizes. Signs can be extended to a maximum length of 4 modules, per FAA specifications.

The cement pad should be extended to accommodate the new length required for the sign. Please refer to the **Taxiway and Runway Guidance Signs Installation Instructions** pamphlet for cement pad dimension recommendations for all sign lengths (page 4), a schematic for parts identification (page 3), as well as instructions for sign re-mounting (page 1) and electrical adjustment (page 2). Be sure to specify the lamp type in the existing sign when requesting the Taxiway and Runway Guidance Signs Installation Instructions pamphlet.

1. **VERY IMPORTANT:** Lock out power to the site. Remove the existing sign from the base. Remove the cover (CLT-2), legend panels (CLT-5), and the end panel (CLT-4) from the existing sign, opening the sign end that will receive the new module. Retain the original hardware for re-use.

2. Install the add-on module by joining it to the existing sign. Tabs on the bottom of the multi-module insert (CLT-6) slide into the base (CLT-3) of the existing sign. Fasten with retained hardware.

3. Refer to the wiring diagram on page 2 of the above referenced pamphlet and connect wiring in designated locations per the diagram with the number of the sign lamps matching those in the lengthened sign. Lamps must be wired in series as well as the internal brightness control transformers when there is more than one.

4. Install the original end panel (CLT-4) removed in step 2 onto the end of the newly lengthened sign (the end of the new add-on module).

5. Re-install the legend panels (CLT-5) and/or new legend panels to read the new desired legend message. Re-mount the sign.

6. Check lamp inputs (amps) in accordance with the electrical adjustment instructions on page 2 of the above referenced pamphlet, and adjust if necessary.

7. Re-install covers (CLT-2).

For further assistance, please contact us at 800-258-1997.

Installing Lumacurve XTL Powerkits
Replacing an Existing Lighting Systems

The purpose of this guide is to help contractors and airfield personnel install Lumacurve XTL 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: In order to maintain FAA Certification only Lumacurve Original Equipment Manufacturer parts can be used in Lumacurve airfield signs. Using Non-OEM after-market parts will void FAA Certification and void manufacturer warranties.

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

Kit Includes:

- **Assembled Lightbar(s)**
- **Controller & Bridge Rectifier installed on Mounting Plate**
- **Lamps**
- **Upgrade Label**

XTL Power Kit Components
(Medium Triple shown)

Recommended tools:

- **Small Standard Screwdriver**
- **#2 Phillips Screwdriver**
- **Power drill w/ 13/64" and ¼" drill bits**
- **7/16" Combination wrench**
- **3/8" socket wrench or nutdriver**
- **Rubber mallet**

1. Removal of existing lighting system

a) Remove sign tops and all panels.

b) Disconnect and remove the power cord from terminal strip. *(photo #1)*

c) Remove power wires from all the other transformers inside the sign. *(photo #2)*

d) Remove all the screws from the lightbars *(photo #3)*
(Tools: 3/8" socket of nutdriver and #2 Phillips screwdriver)

e) Remove the lightbars from the sign.

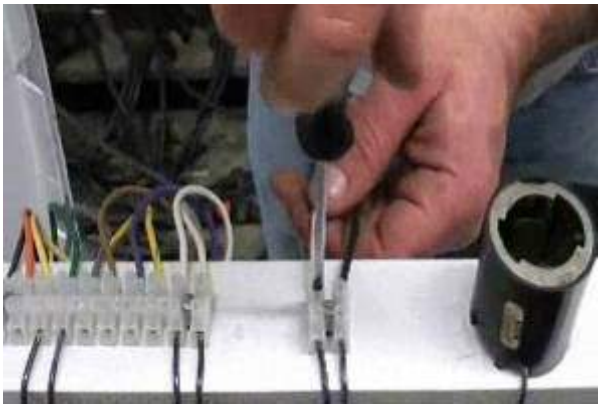


Photo #1

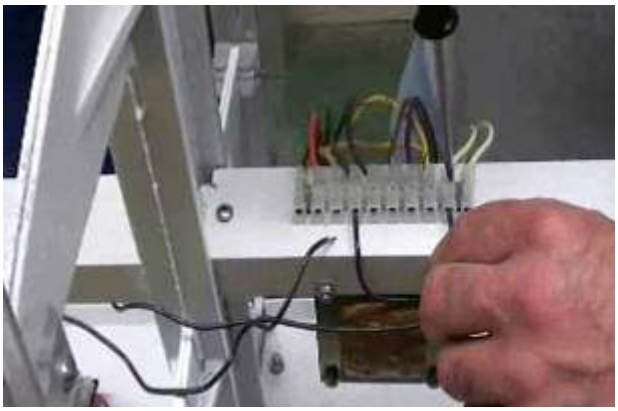


Photo #2

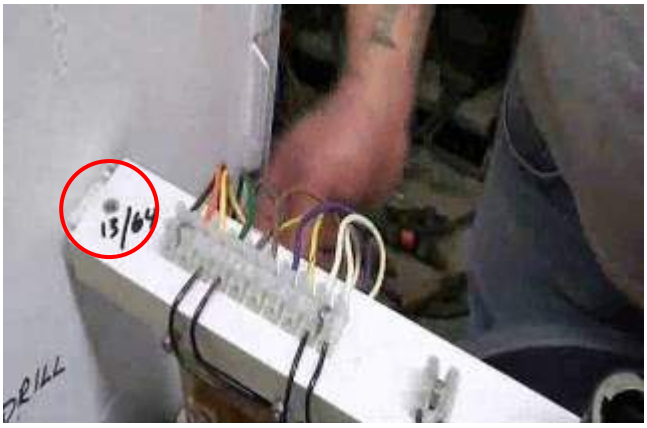


Photo #3

2. Installing the Lightbars

a) Install lightbar with terminal strip and strain relief clamp first. The terminal strip end must be installed closest to the power cord. *(photo #4)*

b) For signs with more than one module, the lightbars of the additional modules must pass through the second branch of the trees and installed in order. *(photo #5)*

c) Reinstall all the tops and tighten all the turnfasters. This must be done prior to tightening the lightbars into place. Reinstalling the tops prior to tightening the lightbars ensures that the sign frame is aligned and tops will fit properly.

d) After replacing tops and tightening turn fasteners take a rubber mallet and give a firm tap to the top of the end panel closest to the power cord. *(photo #6)*

Photo #4

Photo #5

Photo #6

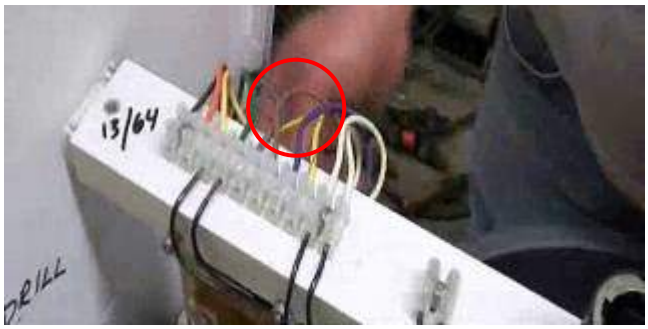


Photo #7

e) Drill new holes in the new lightbars. Reason: Existing holes don't always line up with new lightbars, ensures proper fit of lightbars in the frame. *(photo #7)*

f) Replace all screws in lightbars and tighten them with 3/8" socket or nutdriver and #2 phillips screwdriver

Note: Once lightbar screws are tightened and lightbar is secure, tops may be removed again to allow more light and headroom while installing components.

3. Installing Components on the End Panel

a) Install controller and bridge rectifier (both are mounted on an aluminum plate) on end panel closest to power cord. *(photos #8 & #9)*

i. Bottom of controller/bridge rectifier plate should be 2" up from top of lightbar, and the plate should be centered on the end panel.

ii. Drill 13/64" hole through end panel.

iii. Install, tighten and secure mounting plate (with electronics). Center plate if needed.

Photo #8

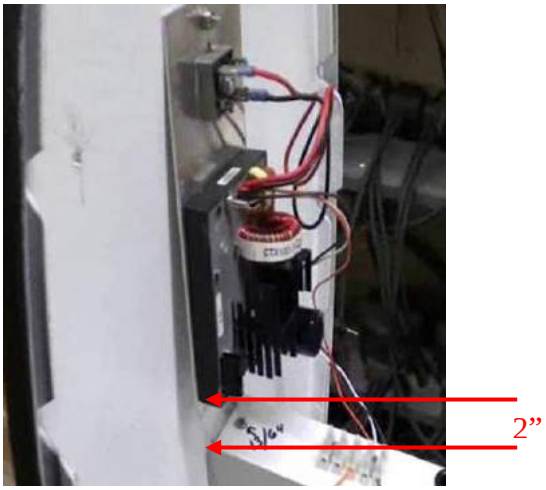


Photo #9

4. Making the Electrical Connections

Note: DC wires from controller shall be connected to the bridge rectifier. Red, (+) DC wire shall be connected to the bridge rectifier's positive (+) terminal (orientation 90° different from remaining three terminals). Black (-) DC wire shall be connected to the bridge rectifier's negative (-) terminal (diagonally opposite (+) terminal.)

a) Reinstall power cord

i. Feed the power cord through the cable clamp on lightbar. Pull the power cord so that there is no slack between the sign bottom and cable clamp. This ensures that the power cord will disconnect in the event the sign is knocked over, avoiding potential component damage. *(photo #10)*

ii. Tighten clamp around wires but do not over tighten. *(photo #10)*

iii. Reinstall the power cord leads to the first 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 reduce the likelihood of shadowing caused by excess wire.

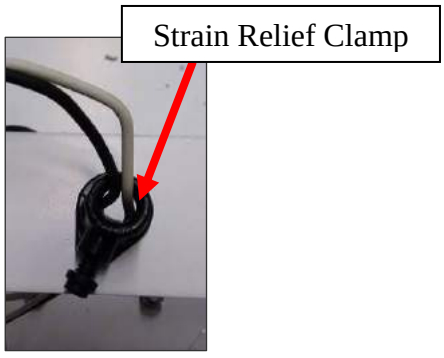


Photo #10

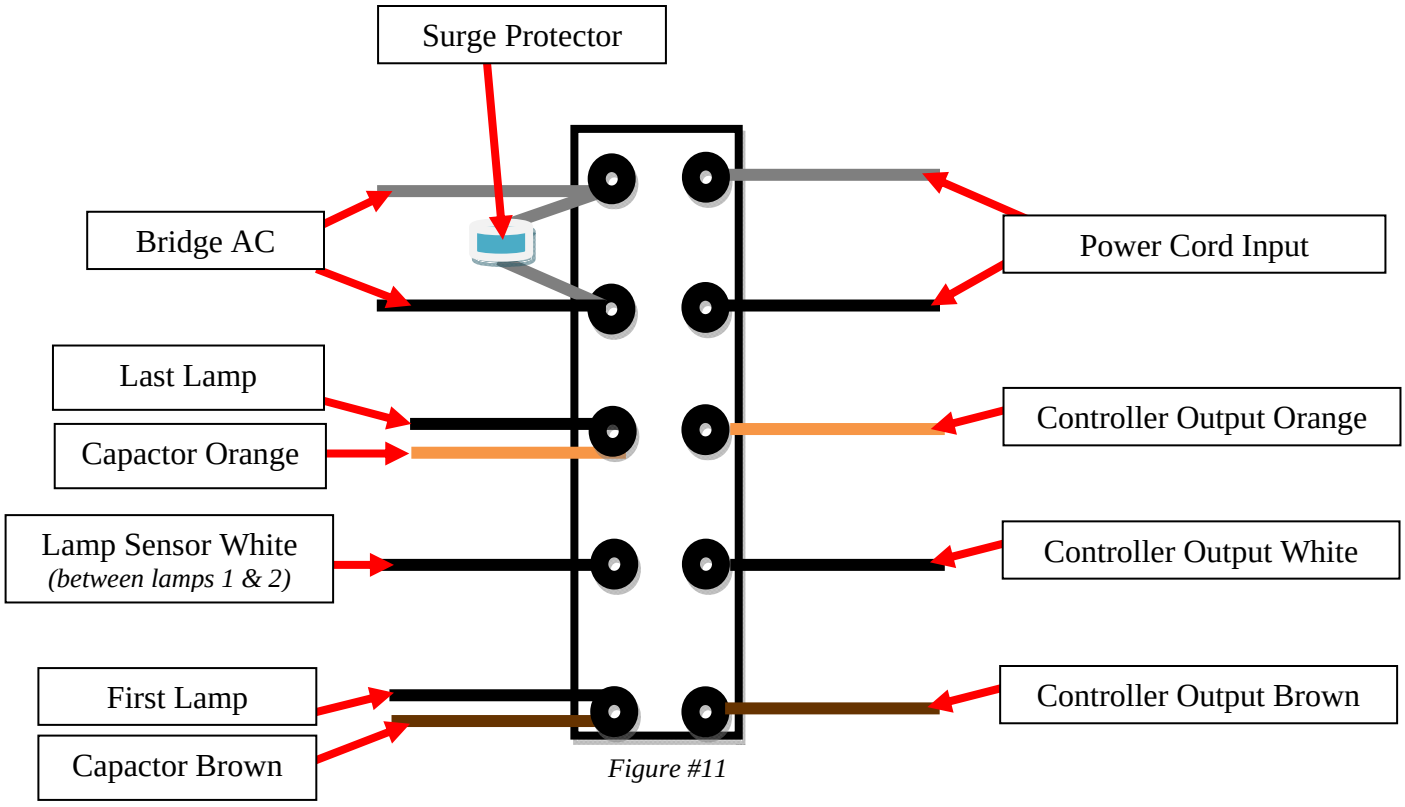
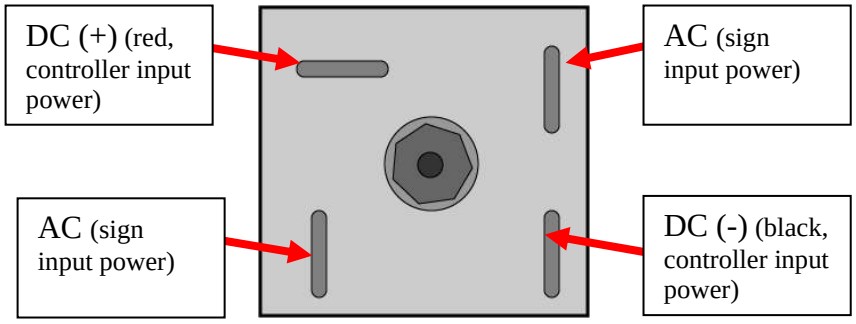


Figure #11

Photo #12



Bridge Rectifier
Figure #13

b) Connect the bridge rectifier. Install black power AC power leads on the terminal strip opposite the input power cord, and in parallel with the surge protector. These leads are not polarity sensitive. Bridge rectifiers DC power (red (+) and black (-)) should provide controller input power *(figure #13).*

c) Connect the controller electronics. Install controller output leads to three available terminals on the lamp-side of the terminal strip. Install controller output orange opposite capacitor orange. Install controller output white opposite lamp sensor white. Install controller output brown opposite capacitor brown *(figure #11).*

d) Install XTL lamps.

Note: Do not touch the lamp's globe. Dirt and oils from your fingers deposited on the globe will greatly reduce lamp life. New lamps come in individual plastic bags. Leave the bag over the globe portion of the lamp during installation to ensure you don't directly touch the glass. Just remember to remove the bag before powering up the sign. Dirt and oils can be cleaned from the globe using rubbing alcohol.

WARNING: the use of non-OEM replacement lamps may damage electrical components as well as cause premature lamp failure. Only OEM Lumacurve lamps will maintain FAA photometric requirement and factory warranties.

5. Adjusting the newly installed XTL system

Recommended tools:

- **True RMS Multimeter**
- **Slot head screwdriver (small)**

a) Set the meter's dial to volts and then go to DC (you will only adjust DC volts on the sign).

b) Connect the meter's leads into the brown and white wires on the terminal strip. *(figure #14)*

c) The adjustment screw is on the upper left hand corner of the controller. Using a tap screwdriver adjust to voltage to 9.5 volts DC. Important, the Constant Current Regulator (CCR) should be set to the lowest current step Counterclockwise decreases voltage; Clockwise increases voltage. *(photo #15)*

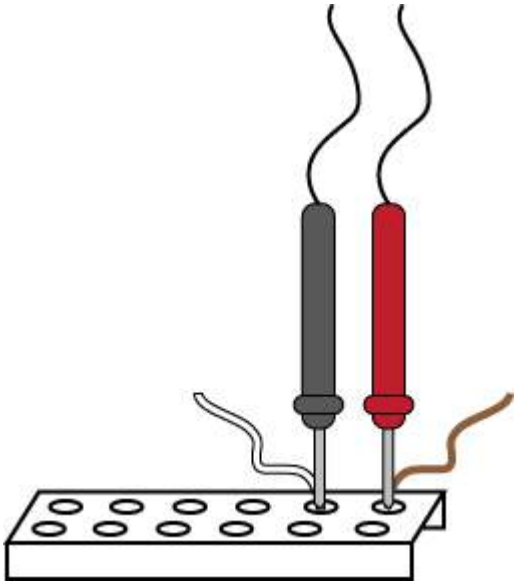


Figure #14

Photo #15

9. Installing the OEM Electrical Upgrade Nameplate

Each Lumacurve XTL Upgrade kit comes with an OEM upgrade nameplate *(Photo #16)* & (2) 1/8" pop-rivets. It is essential that the correct nameplate be installed after the electrical installation is completed. This is critical information for the future maintenance of the sign. With the exception of size one (small) LOVA & XTL signs, the nameplate should be mounted just below the original factory nameplate.

a) Identify the correct nameplate with the accurate sign number & catalog number for the power kit installed.

b) Identify a location to mount the nameplate on the end panel (power leg end). Be sure it is clear of any electrical components that may be mounted on the inside of the end panel. In most situations, just below the original factory nameplate is recommended.

c) While holding the nameplate in place, drill through the holes with a 1/8" or 9/64" drill bit.

d) Install the 1/8" pop-rivets securing the nameplate in place.

Photo #16

10. Checking system & restoring the sign to service

All 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 requirement and factory warranties.

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

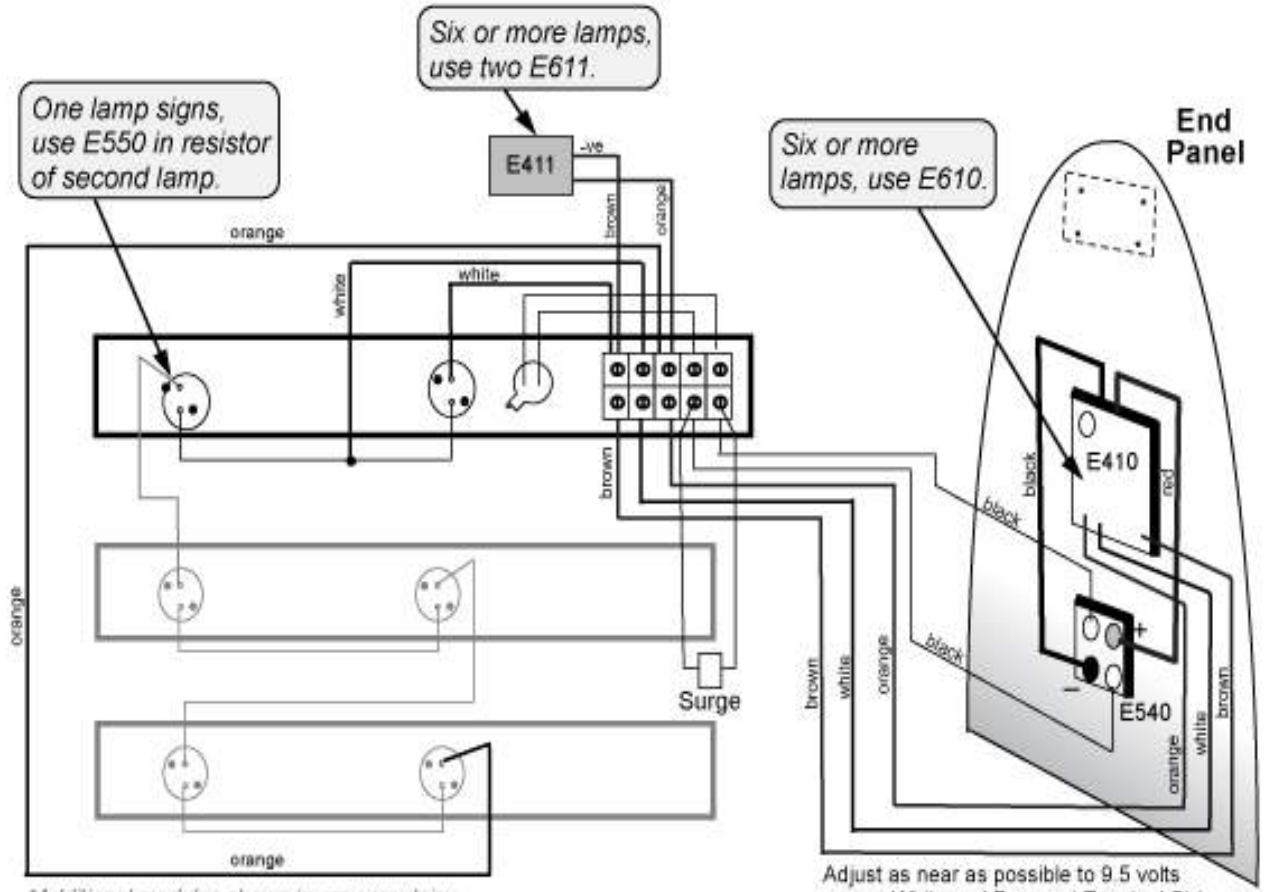
c) Power up sign and check that all lamps are functioning properly.
Note: If sign is not functioning, revisit above steps once again to ensure the sign is wired properly. If there are still problems, contact us for technical support at 800-258-1997.

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

LUMACURVE AIRFIELD SIGNS

Parts & Electrical Information

XTL Wiring Diagram (Style 2 & 3)



*Additional modules shown in gray are daisy chained to the power leg module.

Adjust as near as possible to 9.5 volts across White and Brown at Terminal Strip. *NOTE: Adjustments must be done at the lowest step of the Constant Current Regulator powering the circuit.*

XTL VA Loads, Power Factors and Isolation Transformers

		XTL Lighting Systems					
		FAA Style 2 (4.8A-6.6A)			FAA Style 3 (2.8A-6.6A)		
Sign Size &		XTL 20W Quartz			XTL 20W Quartz		
Module Length	Lamps	Isol Xfmr	Max VA*	Pwr Factr*	Isol Xfmr	Max VA*	Pwr Factr*
Size 1, 1-mod	1	100W	71	0.89	100W	71	0.89
2-mod	2	100W	79	0.93	100W	78	0.92
3-mod	3	200W	102	0.93	300W	107	0.91
4-mod	4	200W	127	0.93	300W	131	0.92
Size 2, 1-mod	2	100W	79	0.93	200W	78	0.92
2-mod	4	200W	127	0.93	300W	131	0.92
3-mod	6	300W	167	0.93	500W	174	0.92
4-mod	8	300W	214	0.94	600W*	222	0.93
Size 3, 1-mod	2	100W	79	0.93	200W	78	0.92
2-mod	4	200W	127	0.93	300W	131	0.92
3-mod	6	300W	167	0.93	500W	174	0.92
4-mod	8	300W	214	0.94	600W*	222	0.93
Size 5, 1-mod	2	100W	79	0.93	200W	78	0.92
Size 4, 1-mod	4	200W	127	0.93	300W	131	0.92

* Two certified isolation transformers and one siamese pigtail required to satisfy 600W requirement.

* Measured at 6.6A.

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	**Power Drill**	**Rubber Mallet**
#2 Phillips Screwdriver	**Drill Bits: 13/64", ¼", 5/32", 1/8"**	**Pop Rivet Tool 1/8"**
7/16" Combination wrench	**3/8" Socket Wrench or NutDriver**	

1. Removal of existing lighting system

a) Remove sign tops and all panels.
b) Unscrew power cord leads and remove from terminal strip. *(Photo #1)*
c) 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 bottom of sign for reconnection once LED light bars are installed.
d) Remove all the screws that attach the light bars to the vertical sign frame components (Tools: 3/8" socket or nutdriver and #2 Phillips screwdriver).
e) Remove the light bars from the sign.

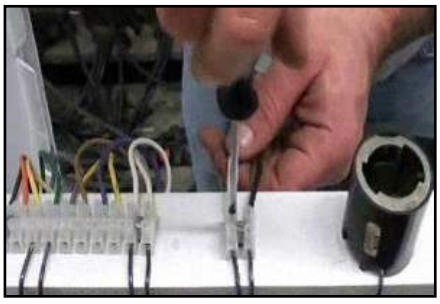


Photo #1

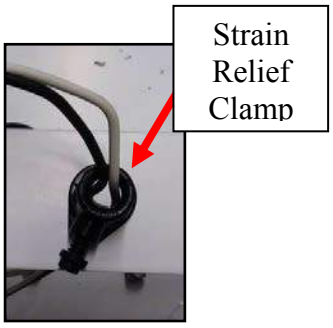


Photo #2

2. Installing the LED Light Bars

a) 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.

b) Reinstall the tops and tighten all the turn fasteners.

c) After tightening turn fasteners, take a rubber mallet and give a firm tap to the top of the end panel closest to the power cord. *(Photo #5) Note: Reinstalling the tops properly and eliminating any gaps, prior to mounting the light bars, ensures that the sign frame is aligned and the legend panels will fit squarely (and smoothly) into the frame.*

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.*

e) Place lockwashers and nuts (or nylon nuts) on the screws on the underside of the light bars. Tighten them with a 3/8" socket or nutdriver and #2 phillips screwdriver.

Note: Tops may now be removed again to allow more light and headroom while completing the rest of the installation.

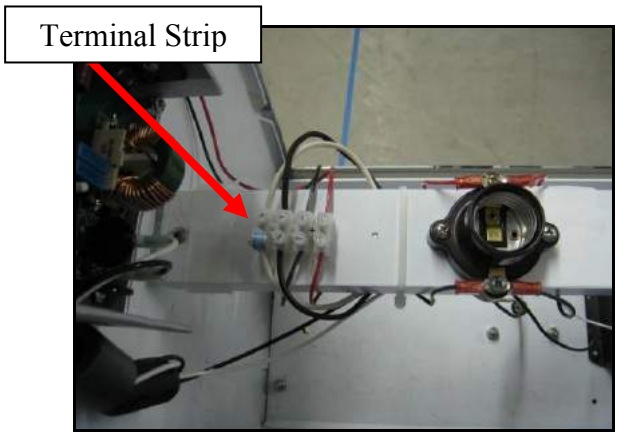


Photo #3

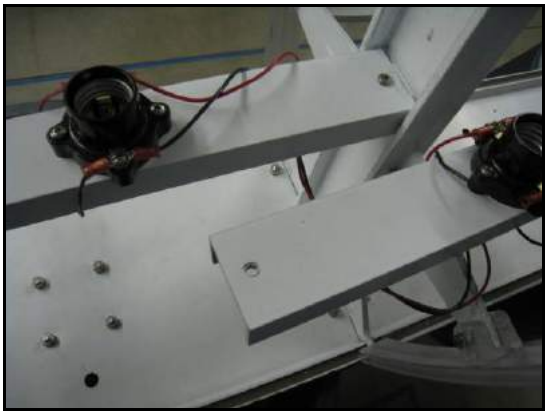


Photo #4

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" on the panel, closest to the powercord (above the lightbar). Using a 13/64" drill bit, drill 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 should be used for multiple LED Controller installations.

c) Insert the two 10 – 24 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 nylon nuts.

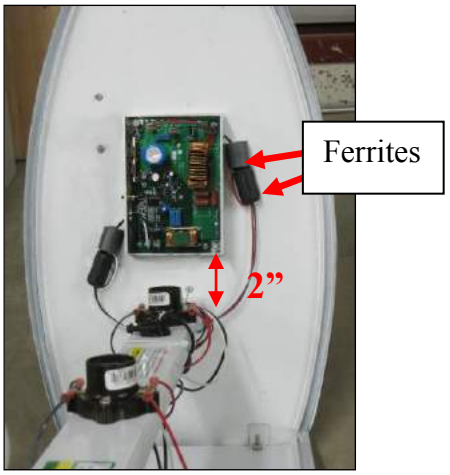


Photo #6

4. Installing the Line 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. 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 #10-3/4" hexhead self-tapping screws.

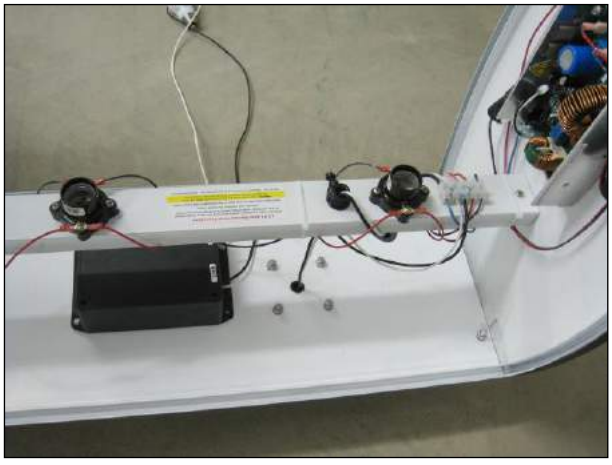


Photo #7

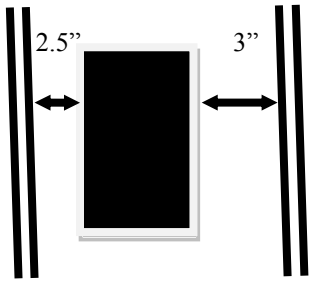


Figure #8

5. Reinstalling the Power Cord

a) 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 in the event the sign is knocked over.

b) Tighten the set screw on the strain relief cable clamp *(Photo #10)*. Do not over tighten.

c) Reinstall the power cord leads to first 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.

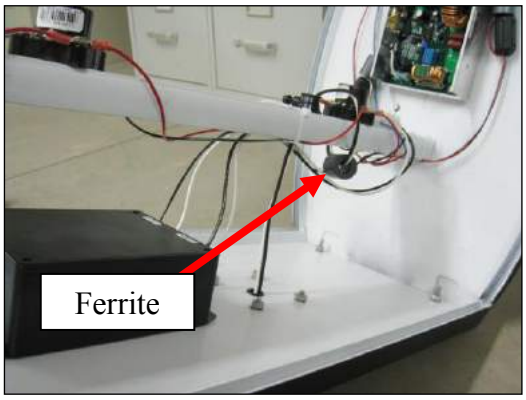


Photo #9

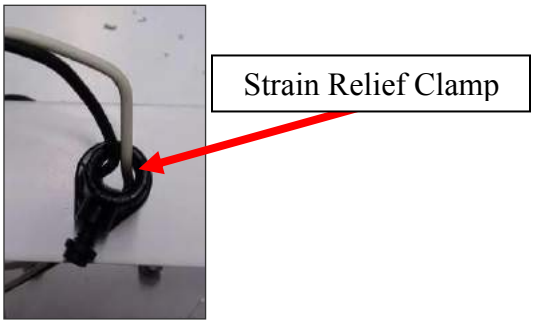


Photo #10

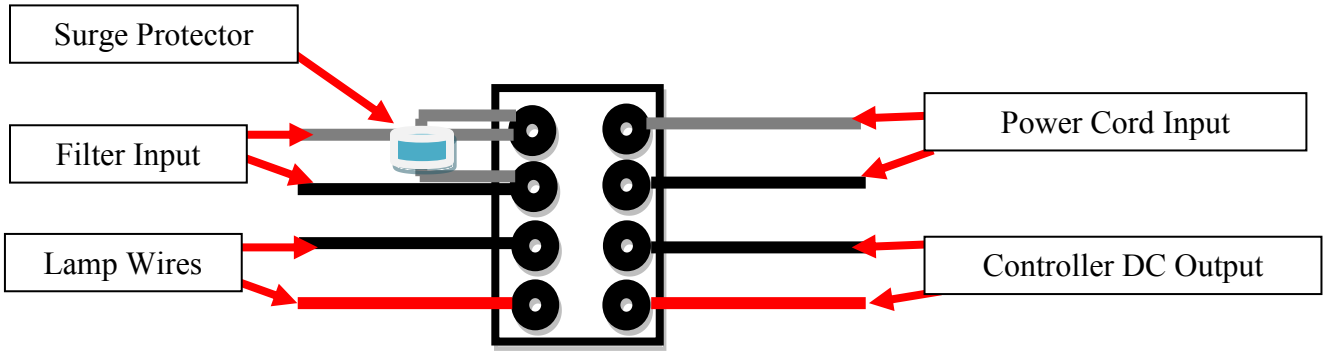


Figure #11

6. Connecting the Line Filter & DC Output Leads

a) Identify the input leads from the filter. Install these black and white leads into the terminal strip opposite of the power cord leads. These leads are in parallel with surge protector (*Figure #11*).

b) Identify the output leads from the filter. They will have 2 factory installed donut shaped black ferrites on one end. 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)*. Polarity for the AC input does not matter.

c) Identify the DC output leads *(Photo #14)*. Connect the ends without the spade connectors to the terminal strip *(Figure #11)*. Match them with their black and red factory installed counterpart. Route the ends with the spade connectors through the hole on the upper right side of the controller *(Photo #15)* and connect to the DC output of the controller *(Photo #15)*. Polarity is important: be sure to connect the red wire to the positive (+) DC output terminal and the black wire to the negative (-) DC output terminal.

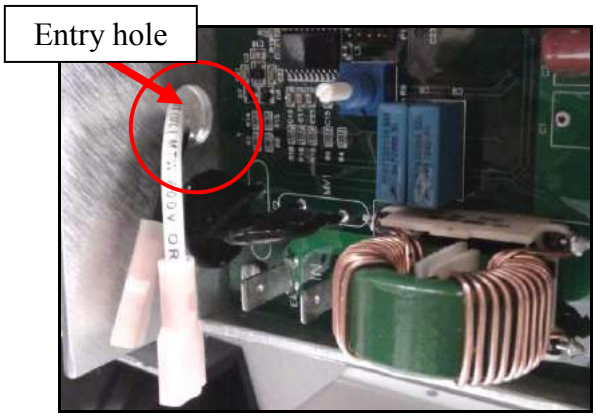


Photo #12

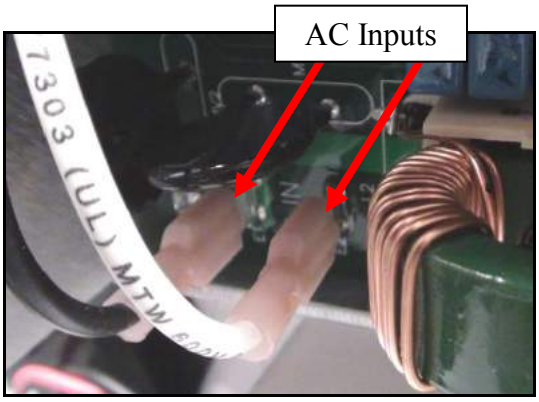


Photo #13

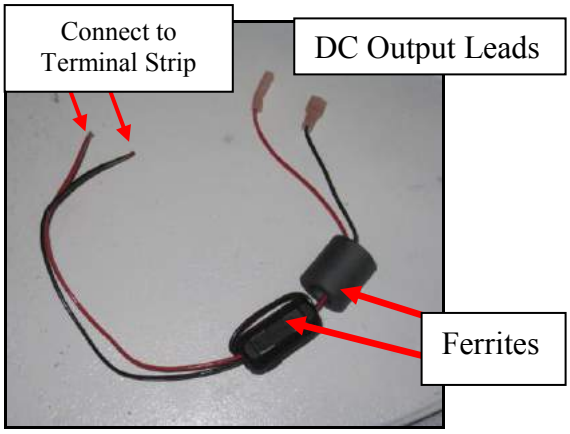


Photo #14

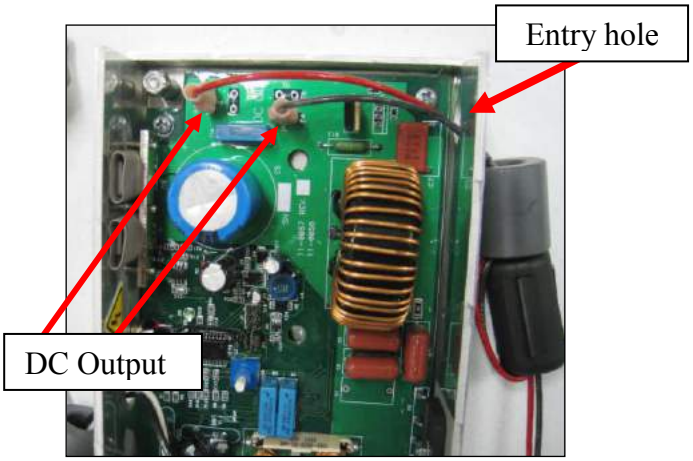
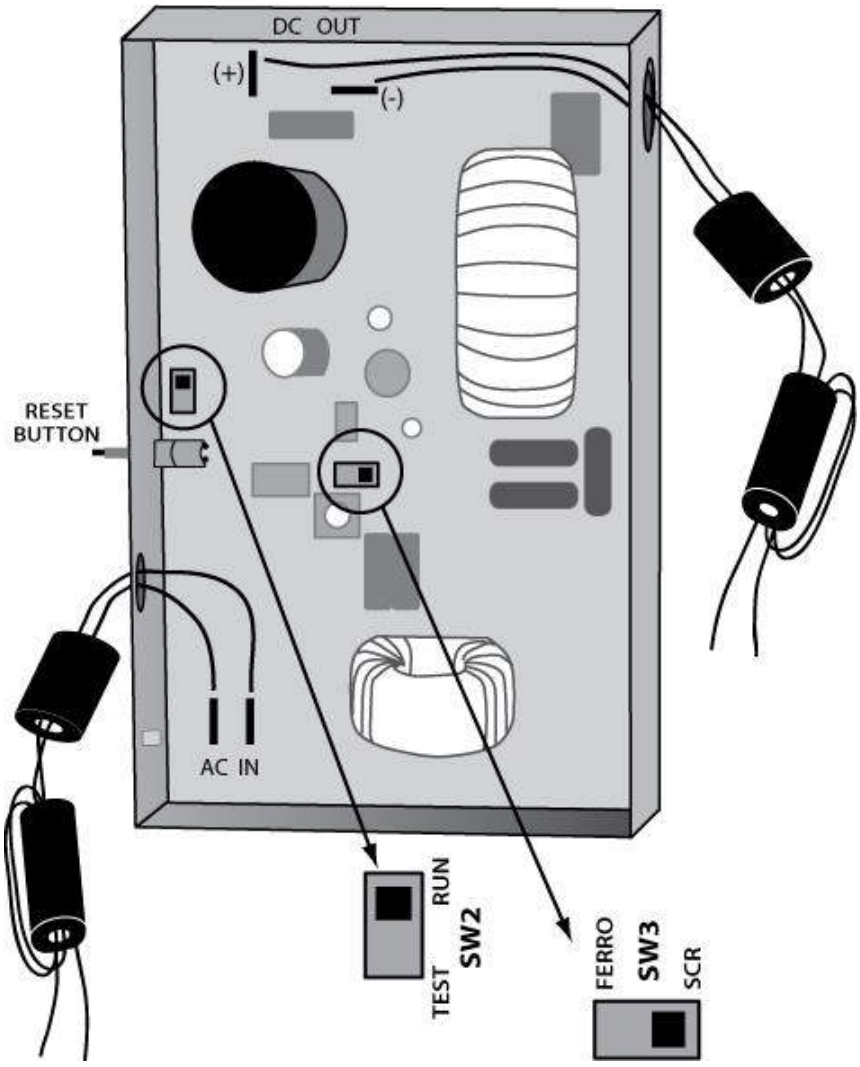


Photo #15

7. Using the switches on the revised L610 – REV.07M 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)

"L610 – REV. 07M"



Jumper position Based on Regulator Type for <u>older</u> versions of L610 Controllers

(December 2014 or older versions)

The L-828 and L-829 Constant current regulator maintain constant amperage to the airfield circuit. The L-829 is an SCR type (silicone rectifier) commonly known as a solid state (electronic based) regulator. The L-828 is a ferro-resonant that uses transformer technology.

For SCR type L-829 regulators, a jumper (photo #1) must be installed on the LED controller (as shown in figure #3 or figure #5). For ferro-resonant type L-828 regulators controller (as shown in figure #2 or figure #4).

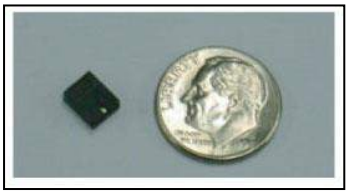


Photo #1

Instructions for installing the Jumper:

a. Identify the type of Constant Current Regulator powering this sign. ("SCR" solid state or "Ferro-Resonant" type)
b. Remove shield screen by loosening the fender washers.
c. Locate the small black jumper. The jumper is factory installed. (figure #2 or figure #4).
d. When using SCR regulator, remove jumper for ferro-resonant regulator application and reinstall over both pins as shown in photo (figure #3 or figure #5).
e. Reinstall shield screen.

"L610 – REV. 05 or older"

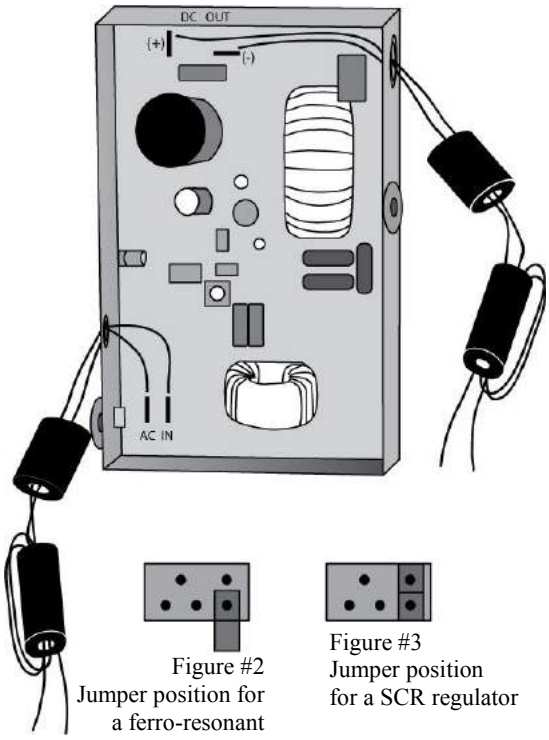


Figure #2
Jumper position for a ferro-resonant regulator

Figure #3
Jumper position for a SCR regulator

"L610 – REV. 06"

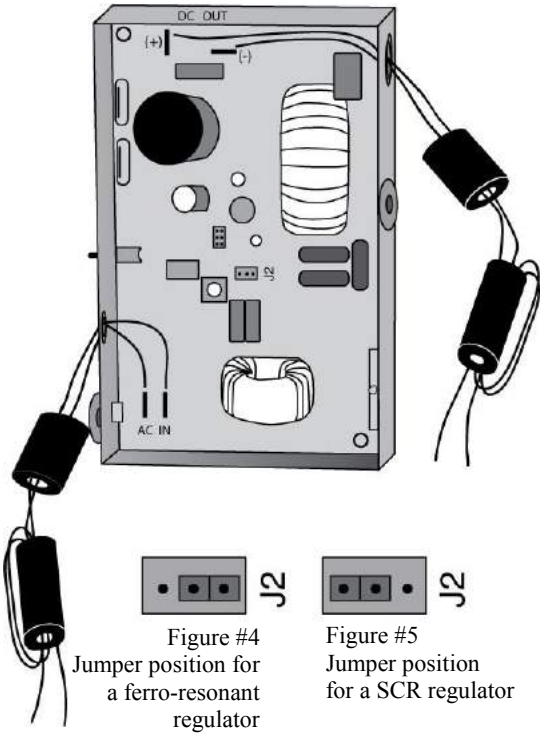


Figure #4
Jumper position for a ferro-resonant regulator

Figure #5
Jumper position for a SCR regulator

8. Installing the Shielding Screen

On each side of the controller are screws and fender washers *(Figure #17)*. 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.

9. Installing the OEM Electrical Upgrade Nameplate

Each Lumacurve LED Upgrade kit comes with an OEM upgrade nameplate *(Photo #18)* & (2) 1/8" pop-rivets. It is essential that the correct nameplate be installed after the electrical installation is completed. This is critical information for the future maintenance of the sign. With the exception of size one (small) LOVA & XTL signs, the nameplate should be mounted just below the original factory nameplate.

a) Identify the correct nameplate with the accurate sign number & catalog number for the power kit installed.

b) Identify a location to mount the nameplate on the end panel (power leg end). Be sure it is clear of any electrical components that may be mounted on the inside of the end panel. In most situations, just below the original factory nameplate is recommended.

c) While holding the nameplate in place, drill through the holes with a 1/8" or 9/64" drill bit.

d) Install the 1/8" pop-rivets securing the nameplate in place.

Photo #18

10. Checking system & restoring the sign to service

All 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 requirement and factory warranties.

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

c) Signs powered by L-828 SCR regulators (solid state) must have jumper in place on the controller. *(see step #7)*

d) Power up sign and check that all lamps are functioning properly.
Note: If sign is not functioning, revisit 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.

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

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

LUMACURVE AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

VA Loading & Power Factors

Certified to current FAA Advisory Circular 150/5345-44

Specification for Runway and Taxiway Signs

View our Certificate of Conformance

		LED Lighting Systems								
		FAA Style 2 (4.8A-6.6A) 4W LED			FAA Style 3 (2.8A-6.6A) 4W LED			FAA Style 5 (5.5A) 4W LED		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	2	45W	47	0.93	45W	47	0.93	45W	37	0.94
2-mod	4	100W	59	0.88	100W	58	0.88	100W	47	0.91
3-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93
4-mod	8	100W	73	0.92	100W	72	0.92	100W	61	0.94
Size 2, 1-mod	3	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	9	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	12	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 3, 1-mod	3	100W	57	0.87	100W	56	0.87	100W	44	0.89
2-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93
3-mod	9	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	12	100W	86	0.94	100W	86	0.94	100W	75	0.96
Size 5, 1-mod	3	100W	57	0.87	100W	56	0.87	100W	44	0.89
Size 4, 1-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93

Installing Lumacurve LED Upgrade kits
Replacing Existing Lighting Systems
Size 4

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

Small Standard Screwdriver
#2 Phillips Screwdriver
3/8" Socket Wrench or NutDriver
Round file
Power Drill
Drill Bits: 13/64", ¼", 5/32", 1/8"
9/16" Socket or Wrench
Pop Rivet Tool 1/8"
5/16" Nutdrivers

1. Removing of existing lighting system

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

2. Installing the Line Filter (image)

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

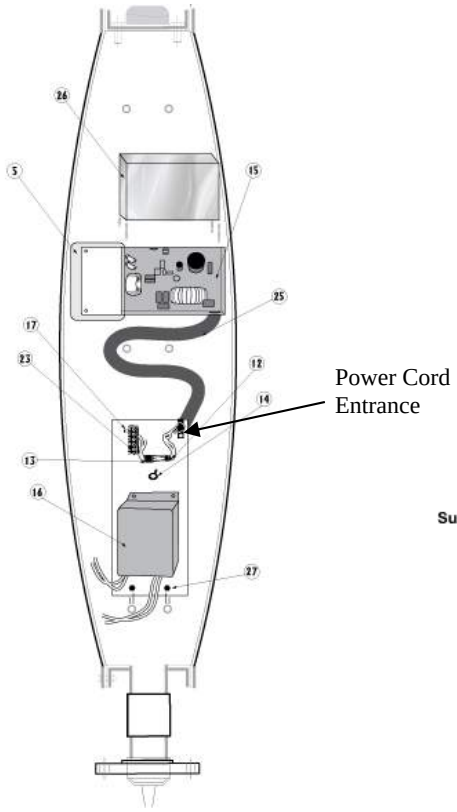


Figure 1

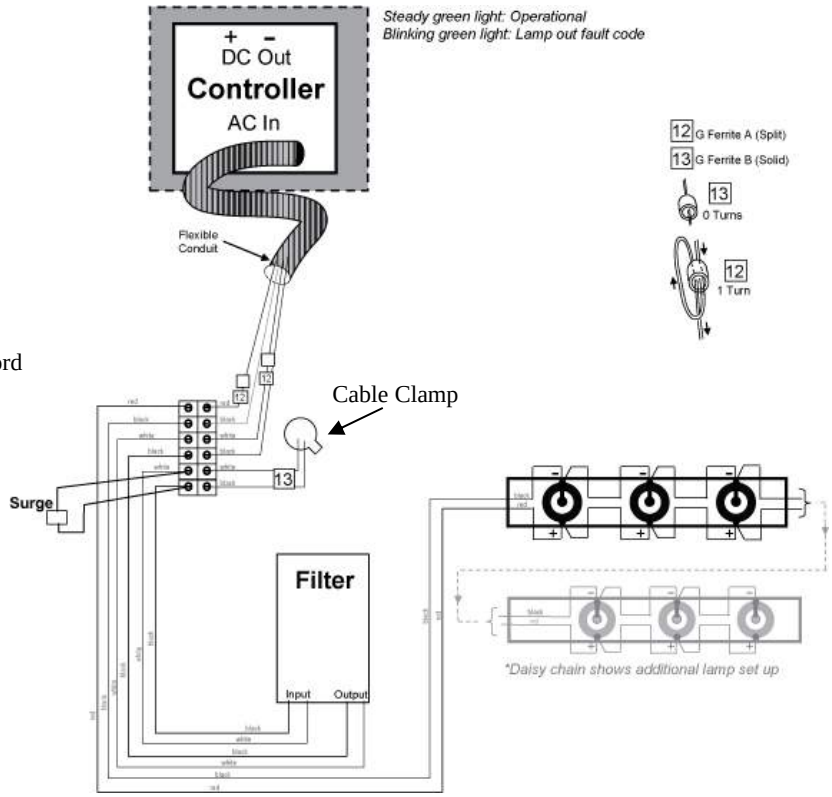


Figure 2

3. Installing the Distance Marker LED Light Bars

a) Install the light bars with lead wires into position first on the power side of sign.
b) Install the non-power side light bar.
c) Install lamp socket wiring in terminal strip as shown in *Figure #2*
d) Light bars need to be 3" from flat edge of the end panel.

4. Installing the Controller

a) Remove Power side access door.
b) Carefully install new access door (with controller and controller plate.)
c) Secure wire harness end furthest from controller to filter mounting plate at top right with #8 x 5/8" screw
d) Install controller leads in terminal strip as shown in in figure #2

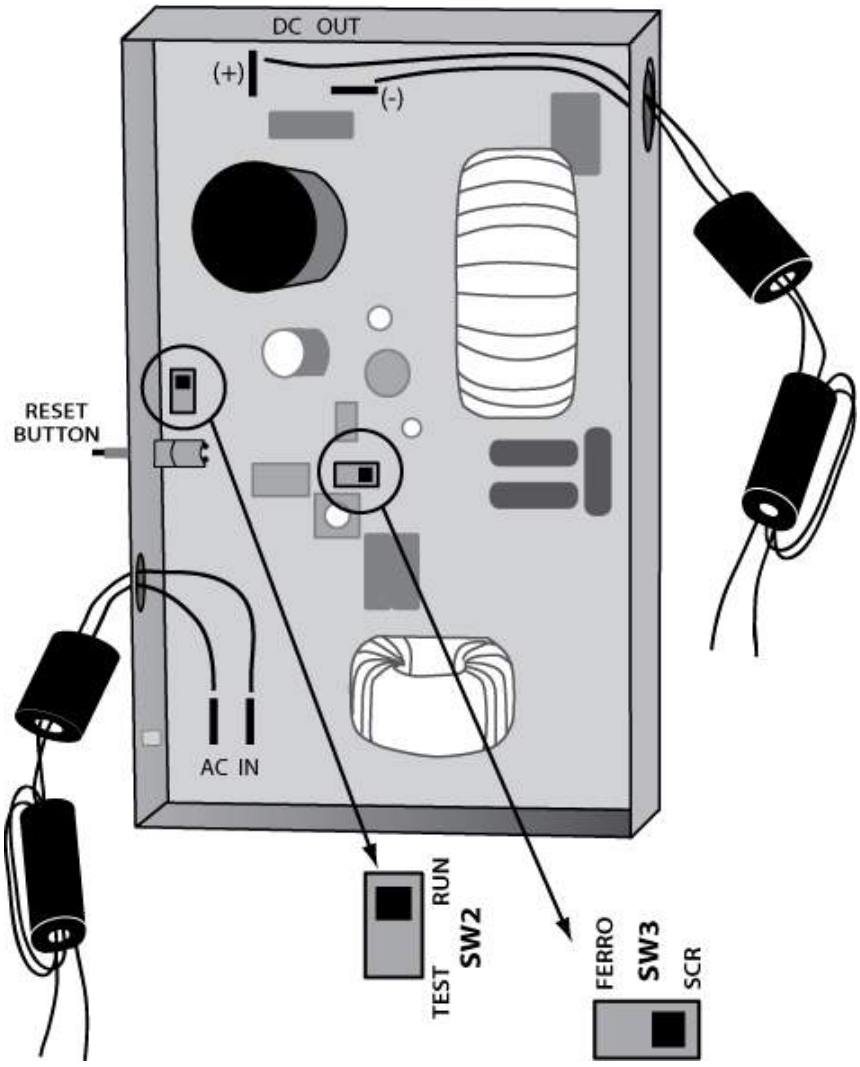
5. Making Electrical Connections

a) Identify the controllers input leads. Install these black and white leads into the terminal strip opposite of the power cord leads. These leads are in parallel with surge protector as shown in figure #2.
b) Identify the AC input leads from the filter shown in figure #3. Connect these black and white wires to the filter plate terminal strip as shown in figure #2.
c) Identify the DC output leads (Figure #3). 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.

6. Using the switches on the revised L610 – REV.07M 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)

"L610 – REV. 07M"



Jumper position Based on Regulator Type for <u>older</u> versions of L610 Controllers

(December 2014 or older versions)

The L-828 and L-829 Constant current regulator maintain constant amperage to the airfield circuit. The L-829 is an SCR type (silicone rectifier) commonly known as a solid state (electronic based) regulator. The L-828 is a ferro-resonant that uses transformer technology.

For SCR type L-829 regulators, a jumper (photo #1) must be installed on the LED controller (as shown in figure #3 or figure #5). For ferro-resonant type L-828 regulators controller (as shown in figure #2 or figure #4).

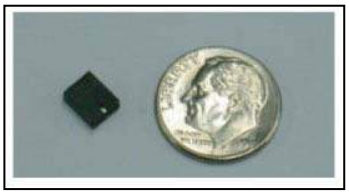


Photo #1

Instructions for installing the Jumper:

a. Identify the type of Constant Current Regulator powering this sign. ("SCR" solid state or "Ferro-Resonant" type)
b. Remove shield screen by loosening the fender washers.
c. Locate the small black jumper. The jumper is factory installed. (figure #2 or figure #4).
d. When using SCR regulator, remove jumper for ferro-resonant regulator application and reinstall over both pins as shown in photo (figure #3 or figure #5).
e. Reinstall shield screen.

<u>"L610 – REV. 05 or older"</u>

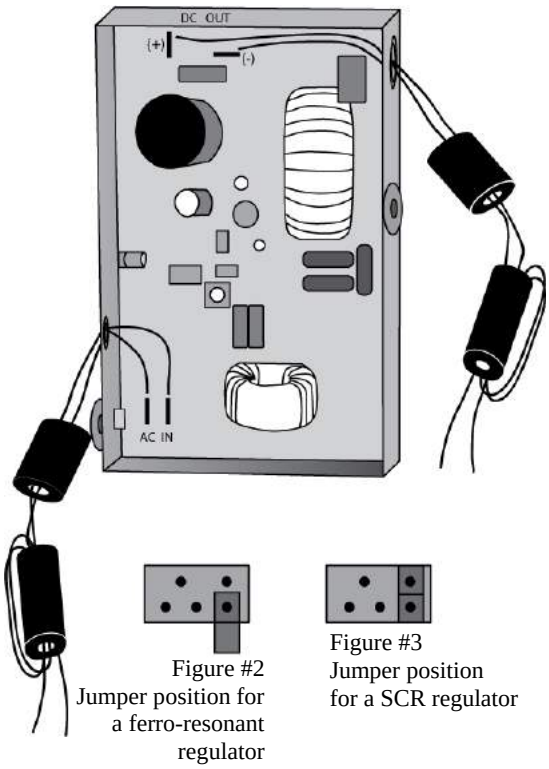


Figure #2
Jumper position for a ferro-resonant regulator

Figure #3
Jumper position for a SCR regulator

<u>"L610 – REV. 06"</u>

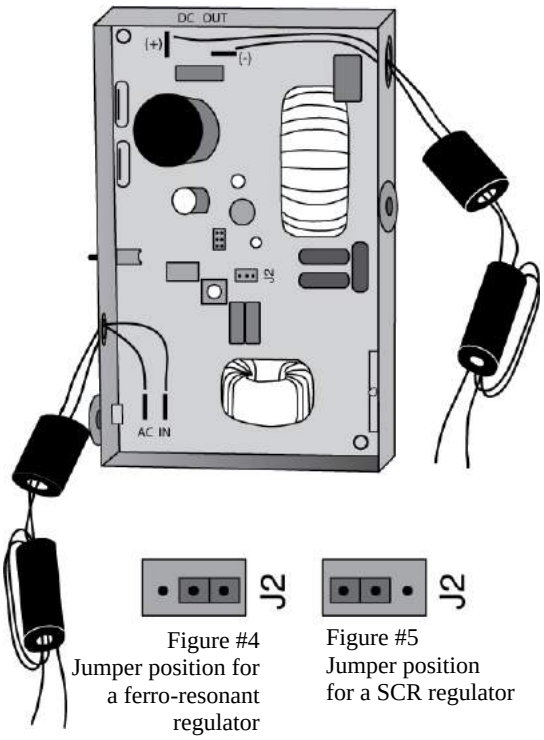


Figure #4
Jumper position for a ferro-resonant regulator

Figure #5
Jumper position for a SCR regulator

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.

8. Installing the OEM Electrical Upgrade Nameplate

Each Lumacurve LED Upgrade kit comes with an OEM upgrade nameplate *(Photo #4)* & (2) 1/8" pop-rivets. It is essential that the correct nameplate be installed after the electrical installation is completed. This is critical information for the future maintenance of the sign. The nameplate should be mounted adjacent to the original factory nameplate.

Photo 4

9. Checking system & restoring the sign to service

All 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 requirement and factory warranties.
b) Check that the properly sized isolation transformer is being used. *See chart.*
c) Signs powered by SCR regulators (solid state) must have jumper in place on the controller. *(see step #6)*
d) Power up sign and check that all lamps are functioning properly.
   Note: If sign is not functioning, revisit 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.
e) Reinstall the legend panel.

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

Sign Size & Module Length	Lamps	LED Lighting Systems								
		FAA Style 2 (4.8A-6.6A) 4W LED			FAA Style 3 (2.8A-6.6A) 4W LED			FAA Style 5 (5.5A) 4W LED		
		Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr	Isol Xfmr	Max VA	Pwr Factr
Size 1, 1-mod	**2**	45W	47	0.93	45W	47	0.93	45W	37	0.94
2-mod	**4**	100W	59	0.88	100W	58	0.88	100W	47	0.91
3-mod	**6**	100W	66	0.90	100W	66	0.90	10W	54	0.93
4-mod	**8**	100W	73	0.92	100W	72	0.92	100W	61	0.94
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Size 4, 1-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93

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

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3-mod	**9**	100W	76	0.92	100W	76	0.92	100W	64	0.94
4-mod	**12**	100W	86	0.94	100W	86	0.94	100W	75	0.96
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Size 5, 1-mod	**3**	100W	57	0.87	100W	56	0.87	100W	44	0.89
Size 4, 1-mod	**6**	100W	66	0.90	100W	66	0.90	100W	54	0.93

LUMACURVE® AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Soft Start Instructions

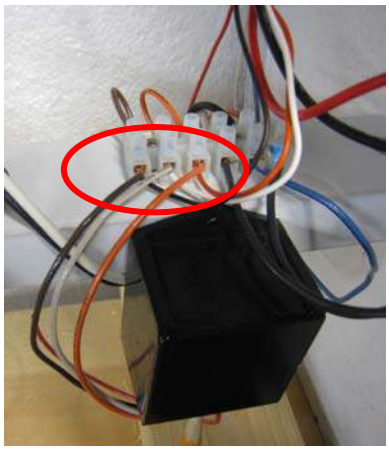
Lumacurve offers the Soft Start circuit for our XTL lighting style to dampen the impact of circuit irregularities occasionally found on some airfields.

1. Connect the Soft Start wires - brown, white and orange - to the terminal strip, sharing connection points with the brown, white and orange wires from the controller.

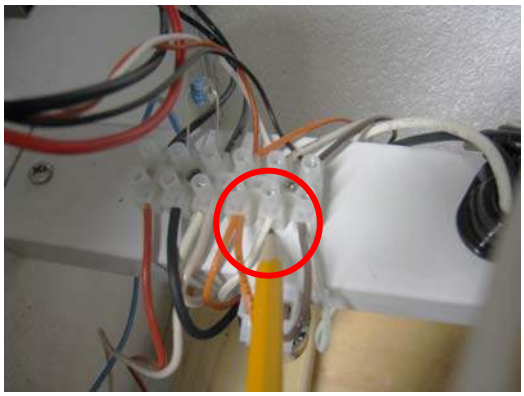
2. Locate the white wire from the controller at the terminal strip. Opposite this white controller wire is a white sensor wire (connects to the cabling between first and second lamps). Disconnect the white sensor wire from the terminal strip.

3. Connect the white sensor wire with the red Soft Start wire using the wire crimp cap provided.

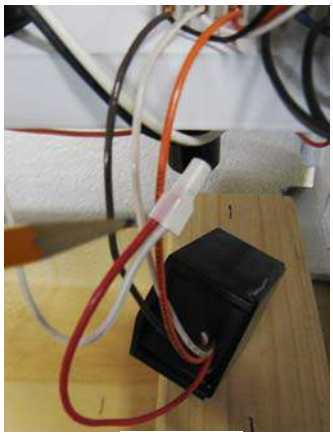
4. Using the screw provided (#4 Self Drilling Hex Head) secure the Soft Start to the light bar as shown. Orient the Soft Start wire exit hole at the bottom.



Step 1



Step 2



Step 3

Step 4

Standard Signs, Inc.
9115 Freeway Drive, Macedonia, OH 44056
P: 800.258.1997 / 330.467.2030 F: 330.467.2076
www.lumacurve.com

Lumacurve: The 50 Year Airfield Sign.

The only airfield sign designed to last 50 Years!

Introduced in 1982, **LUMACURVE Runway & Taxiway Guidance Signs** boast the following:

- "True Modular Construction" that allows maximum flexibility and product longevity
- Solid aluminum sign frames that last forever
- Easy to install, energy efficient "drop-in" lighting kit upgrades *(available for all existing Lumacurves!)*
- Unrivaled "Wait-Less" service that minimizes maintenance costs & repair times

Which means, you have the most environmentally friendly signs

that should serve you for 50 years plus!…

The Secret to a Long Life

To ensure reliable and efficient performance of your Lumacurve Airfield Signs, airport maintenance should adopt a preventative maintenance plan that incorporates the following:

- Visual Inspections
- Electrical Current Checks
- Lamp Replacement
- Maintaining Cabinet Weather Seal
- Legend Panel Care & Replacement
- Lighting Upgrades

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 a careful review of 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 & general material degradation. Panels should be replaced before legibility & color brilliance are compromised. See the *"Legend Panel Care & Replacement"* section for more information.

Interior Inspection
Visual inspections of the interior of the sign 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 which can result in damaged wires and components. For these reasons, the interior must be cleaned and inspected at least twice a year. Inspect for loose wire connections and deteriorated wire & components. Any suspect wire or components should be replaced. Gasketing in the base and top should also be inspected & replaced if necessary. See the *"Maintaining the Cabinet Seal"* section for more information.

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 as well as promotes good lamp life. Please refer to **Section C:** *"Electrical Systems"* of this manual for your specific lighting system for 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

Lamps, as with any fixture, will eventually burn out and require replacement. Lamp life will vary depending on local conditions, to include weather, field vibration, airfield circuit condition and load. Rated life for traditional and LowVA lighting systems used in LUMACURVE signs is 1,000 hours, with a theoretical life of approximately 2,500 hours. Rated life for the XTL lighting system is 2,000 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. Please refer to **Section C:** *"Electrical Systems"* of this manual for additional information on specific lighting systems.
Warning: Use only OEM Lumacurve bulbs. The use of non-OEM, non-FAA approved replacement bulbs can cause damage to the internal electrical components as well as render the photometric output outside of FAA specifications and consequently create an unnecessary safety liability.

Maintaining Cabinet Weather Seal

For best structural fit, strength and seal, the 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.

Following are instructions for the replacement of 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 Standard Signs Inc or procured locally.

Gasket Replacement Installation:

1. Loosen turn fasteners on sign tops and remove all top covers (CLT-2).
2. If necessary, slit silicone caulking with a straight edge where face panels (CLT-5) meet the sign end panels (CLT-4).
3. Remove all sign face panels.
4. Remove the existing gasketing from the structural grooves in the top covers and sign bases (CLT-3). 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 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 layer of 7/16" wide by 1/4" deep gasketing in the sign bases to further enhance seal.
8. If desired, apply silicone sealant to seal panel edges to the sign frame as well as seams between panels.

Legend Panel Care & Replacement

Introduction
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. In cases of sign internal lighting system or power source failure, aircraft landing lights illumine the retro-reflective sign face.

Maintenance

Section E: "Maintenance"

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

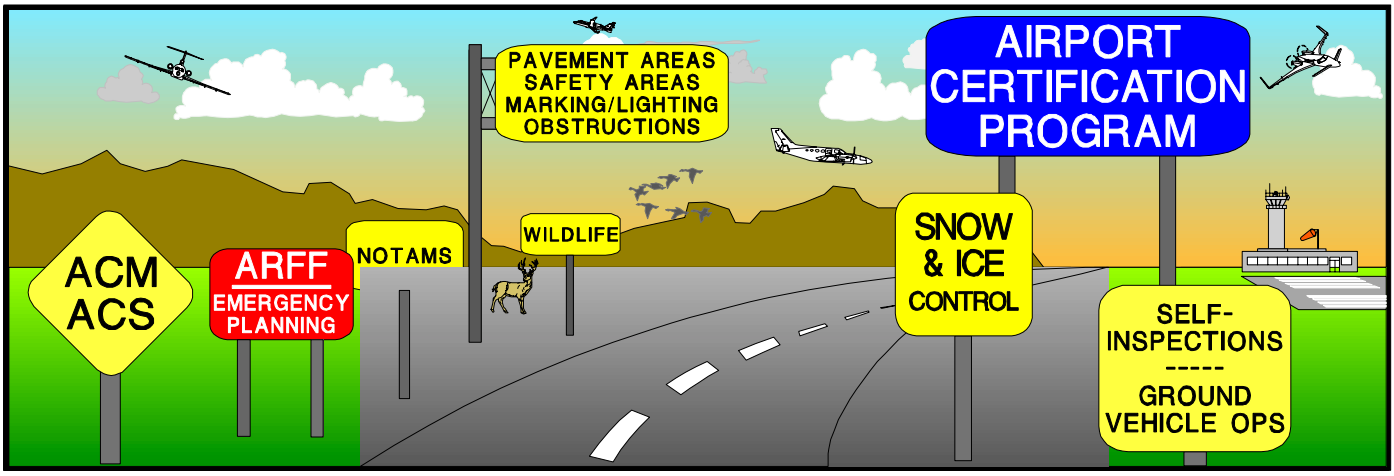
Cleaning
While powerfully effective on the airfield, legend panels require special handling to ensure maximum life. The white backing on the inside of the panels is especially delicate and should be handled with care. While the rest of the sign may be cleaned with mild soap and a soft cloth, we do not 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 in 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 de-lamination of the retro-reflective sheeting and 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 the transmission of water vapor through the acrylic plastic. Both acrylic and polycarbonate, common substrates used to fabricate airfield sign faces, allow some transmission of moisture which can, over time, interfere with the adhesive bond between the panel and the sheeting. Color degradation will occur over time, especially in environments where sun exposure is intense.

Replacement:
If needed, face panels are easily replaced by simply removing the top cover and sliding out the panel. Replacement face panels are available directly from Standard Signs Inc. Please use LUMACURVE "submittal forms" to ensure clear communication of legends needed.

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 in to place. Apply pressure downward on the top. If the technique worked and the panels are engaged properly, the resistance (or obstruction) to tightening the turnfasteners should be eliminated.

AIRPORT CERTIFICATION INFORMATION BULLETIN



DATE: 01/15/04, NUMBER: 04-06
Sign Panel Replacement

Sign panels usually consist of acrylic plastic sheeting with a laminated legend. Due to the harsh environmental conditions signs are often subjected to, panels will delaminate, fade in color, or become weak over time.

Many airfield signage projects were completed during the early 1990's. According to various manufacturers, the expected useful life of a properly maintained sign face panel is approximately eight years. Delamination and color degradation are the most prevalent forms of deterioration that are being noticed by inspectors during inspections.

14 CFR Part 139, section 311, outlines the need for an airport marking system that contains signs to identify taxi routes, hold position signs, and various other signs. These signs must be "properly maintained", which means replacement of sign panels that are faded, obscured, or otherwise not clearly visible.

Airport operators are encouraged to make sign panel replacement a priority, once the panel deteriorates to an unreadable condition. Whenever airfield construction projects are planned, include sign panels. Remember, panel replacement is AIP eligible and most often included with current airfield construction projects.

Contact your Airport Certification Inspector for additional information.

LUMACURVE® AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Section E: "Maintenance"

Distance Marker Panel Replacement

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

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.*

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

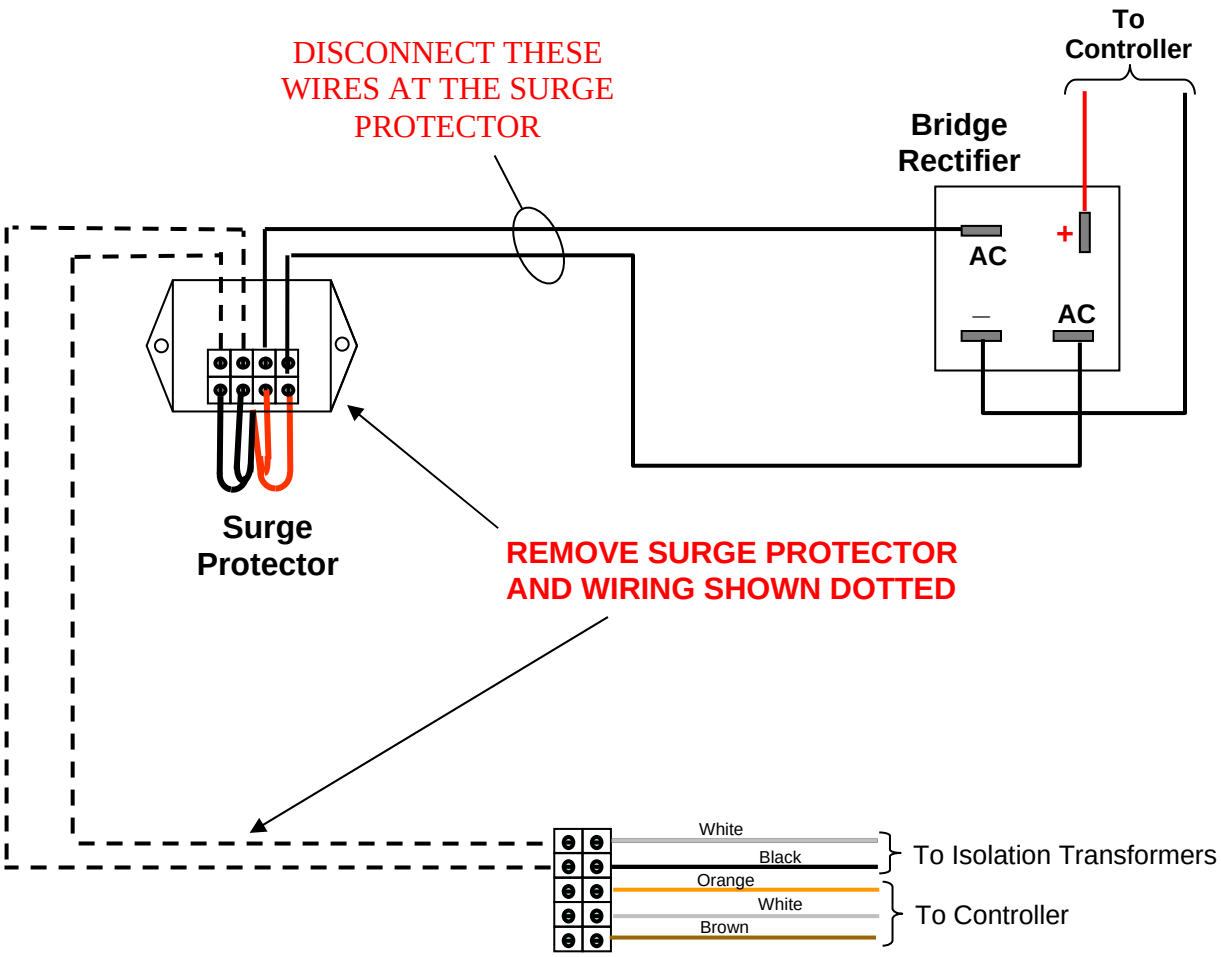
CAUTION: Excessive downward force applied to the attachment screws can strip the fiberglass sign frame both during panel removal and during panel installation.

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).

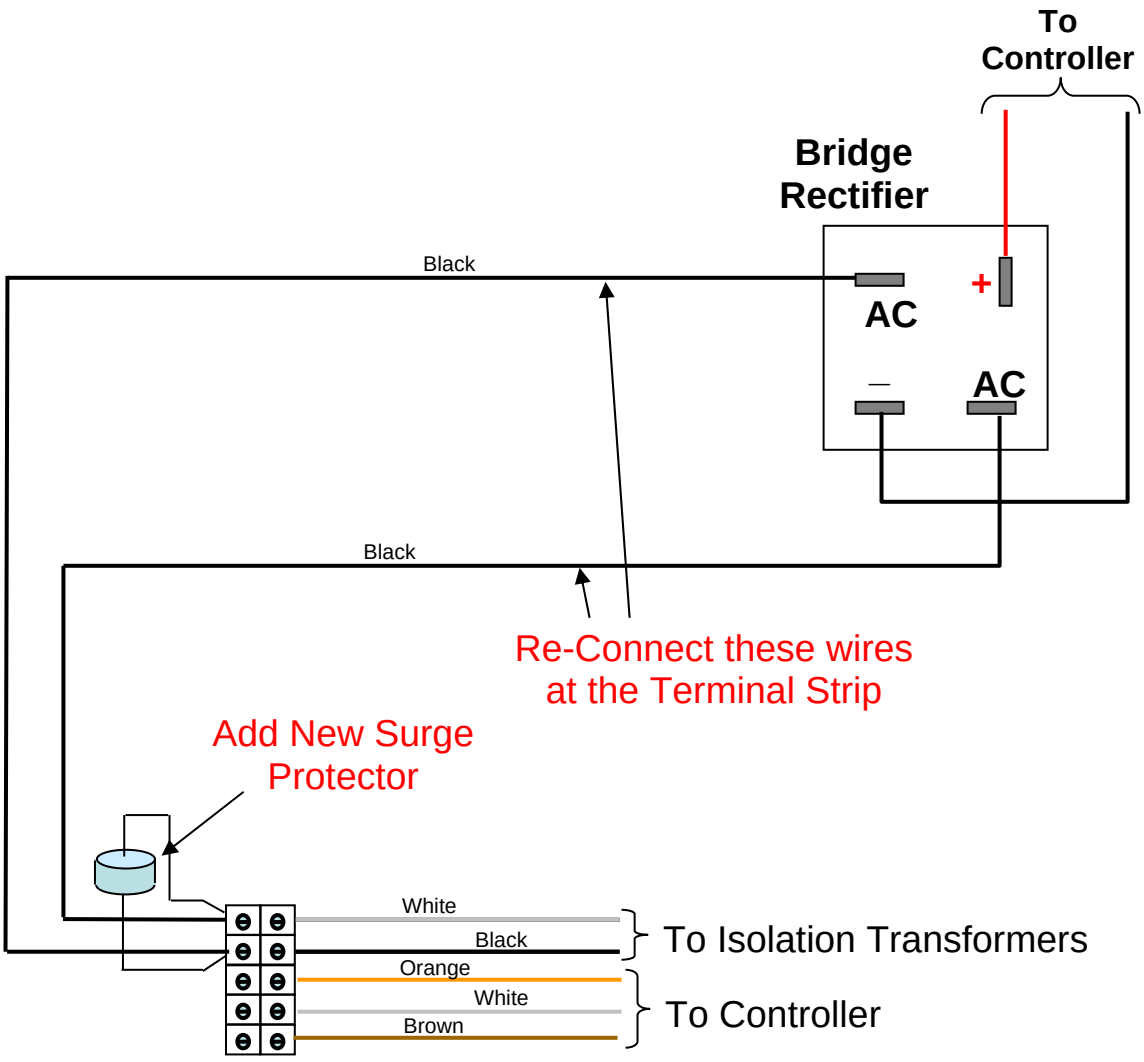
Replacing the Surge Protector

Section E: "Maintenance"

Existing *(prior to August 2011)*
XTL Surge Protector Wiring



Replacement
XTL Surge Protector Wiring



Troubleshooting the Lumacurve XTL Lighting System
And Identifying Non-functioning Components

The purpose of this guide is to help the airfield electrician troubleshoot a Lumacurve XTL airfield sign when the sign is not lighting.

WARNING: Before working on Lumacurve airfield guidance signs, the sign must be de-energized unless otherwise instructed. Failure to do so could result in a burned surge protector, damage to internal sign parts, or injury.

To isolate and identify non-functioning Lumacurve airfield sign components, we recommend the following steps:

1. Check External Switch
   - If the sign has an external switch, check to be certain the switch is in the "on" position.

2. Visual Check of Sign Electrical Components
   - Look for melted parts or obvious burn marks (surge protection potentially). If there are melted parts or burn marks, contact our technical department.

3. Check Lamps (test p. 4)
   - Replace bad lamps if necessary. If lamps are being replaced more frequently than expected, you may need to adjust the controller to recommended voltage settings (not part of this guide).

4. Check Bridge Rectifier (test p. 5)
   - Replace bridge rectifier if necessary. (be sure to use heat sink compound)

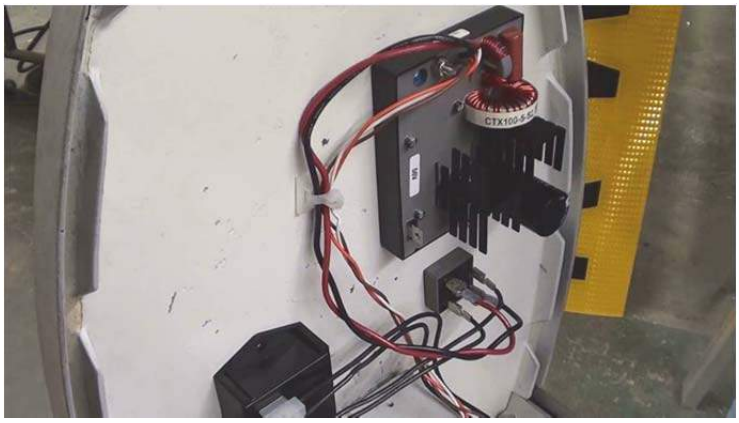
5. Check Controller (test p. 8)
   - Replace controller if necessary.

6. Check Isolation Transformer
   - If controller is good, the isolation transformer may be the source of problems. Check to ensure the transformer is appropriately sized and performing properly.

GETTING FAMILIAR WITH THE XTL SYSTEM COMPONENTS

Before testing, it is best to familiarize yourself with Lumacurve sign components. Illustrations 1 – 4 will help locate and identify the components. Illustration 5 shows the type of Multimeter recommended for testing.

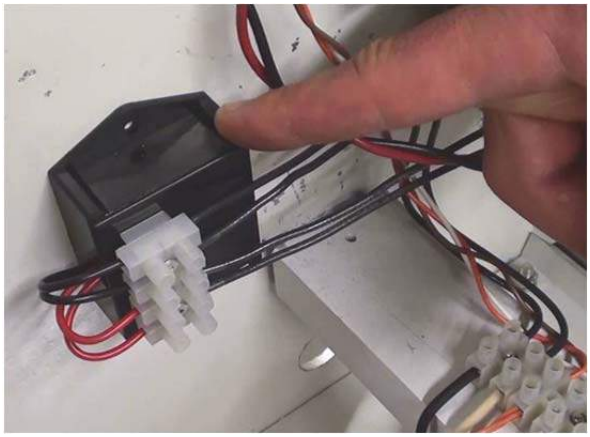
1. Lumacurve sign components are mounted on the end panel closest to the power cord.



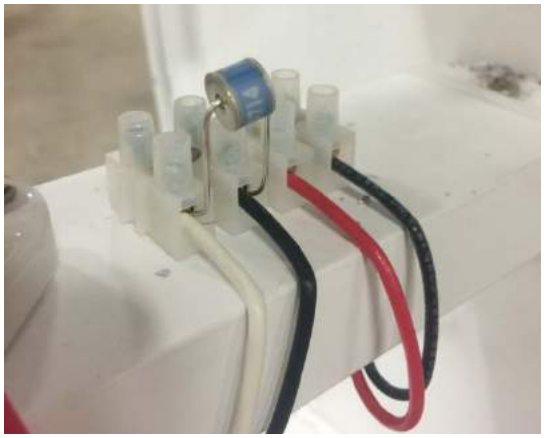
2. Top right of the end panel is the controller (in this case, the E410 marked “50V”)

3. Below the controller on the lower right is the bridge rectifier

4. Lower left is the surge protection system.



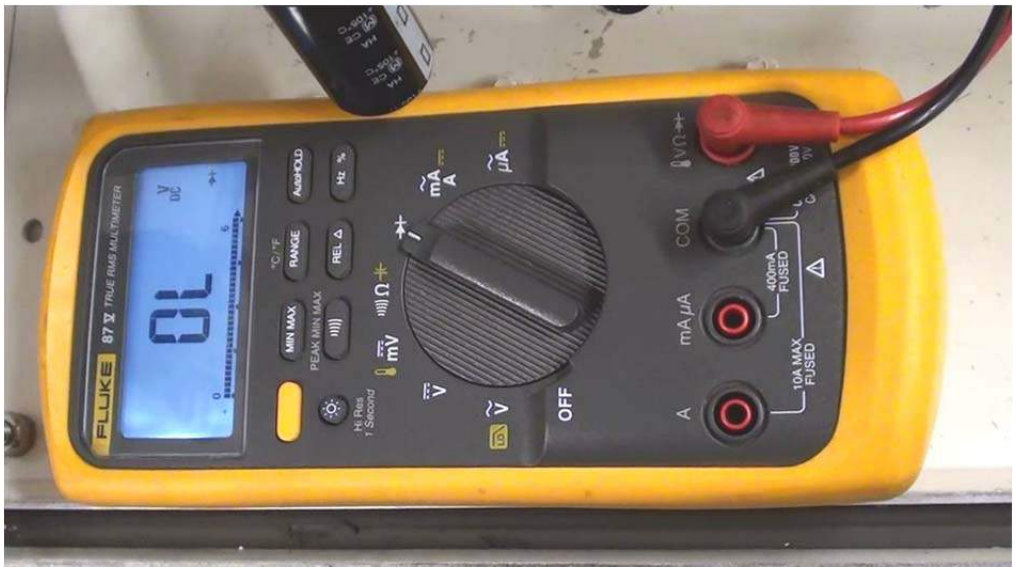
XTL surge prior to Aug 2011



XTL surge after Aug 2011

Use a True RMS Multimeter

It is recommended to use a True RMS (root – means - square) Multimeter. The True RMS readings do not fluctuate as much, and are more accurate than a regular Multimeter. For the purpose of this guide we are using a Fluke True RMS Multimeter (model 87 V) to troubleshoot the components.



STEP ONE: Checking for burned-out lamps.

Before checking the sign's electronic components, it is best to first check the sign lamps. A Multimeter can be used to test a lamp for continuity but we recommend using a Lumacurve Lamp Tester as shown in the dpicture below.

De-energize the sign and replace bad lamps before doing any further testing. **Do not touch the lamp's globe.** Dirt or oils from your finger deposited on the globe will greatly reduce lamp life. New lamps come in individual plastic bags. Leave the bag over the globe portion of the lamp during installation to ensure you won't directly touch the glass. Just remember to remove the bag before powering up the sign. Dirt and oils can be cleaned from the globe using rubbing alcohol.

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

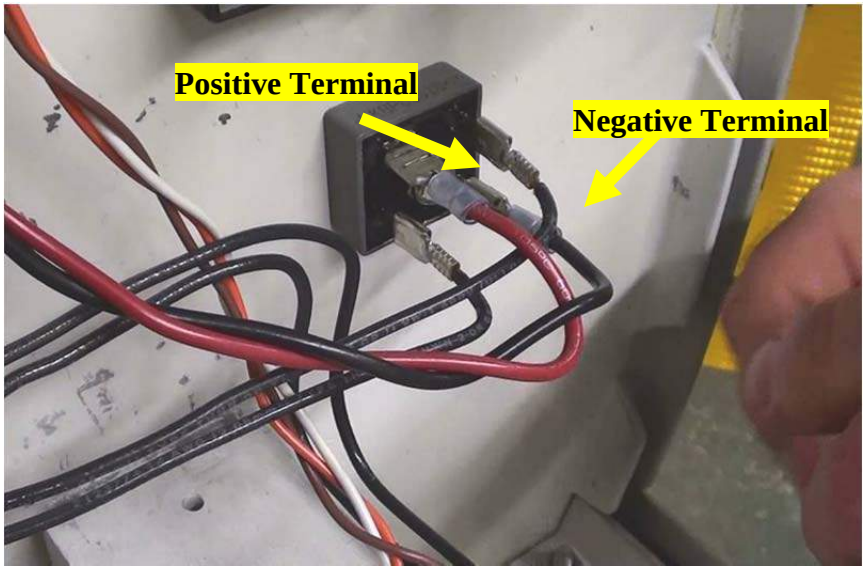
IMPORTANT NOTE: *XTL lamps have gray bases and labeled "PRT# XTL"; LOVA lamps have white bases and labeled "PRT# LOVA".* ***They are not interchangeable****.*

If no lamps are burned out, continue through this guide and check for faulty XTL electrical components.

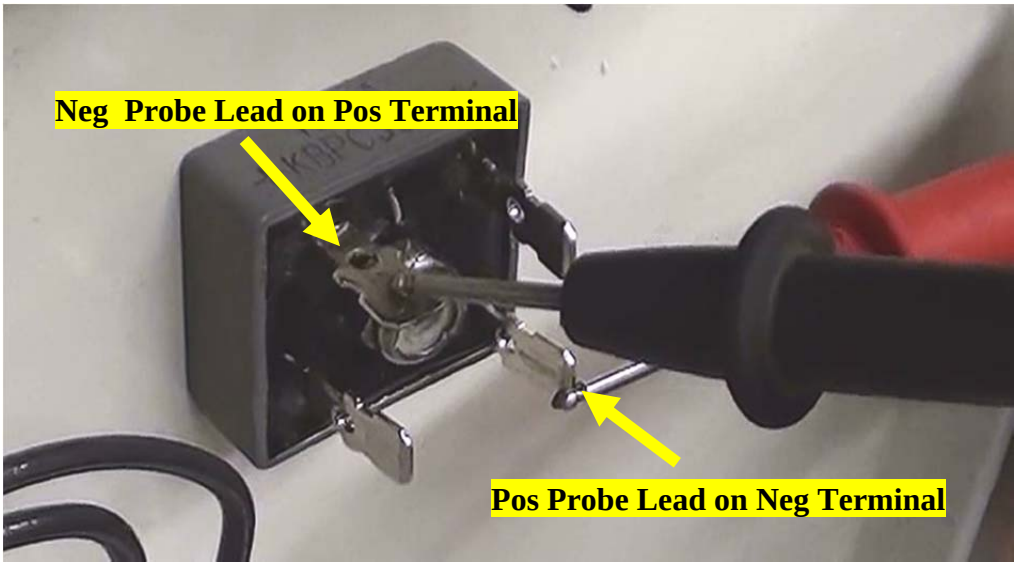
STEP TWO: Checking the Bridge Rectifier

Once burned out lamps are ruled out, the bridge rectifier is the first component to check. **For this test the power needs to be turned off.**

1. With the power off, pull the wires off the bridge rectifier. The red and black intertwined wires are DC from the controller. The other two black wires are AC from the surge protector. Note that the red wire on the upper left side is connected to the positive terminal. The positive terminal is always 90°, or perpendicular, to the other three terminals.



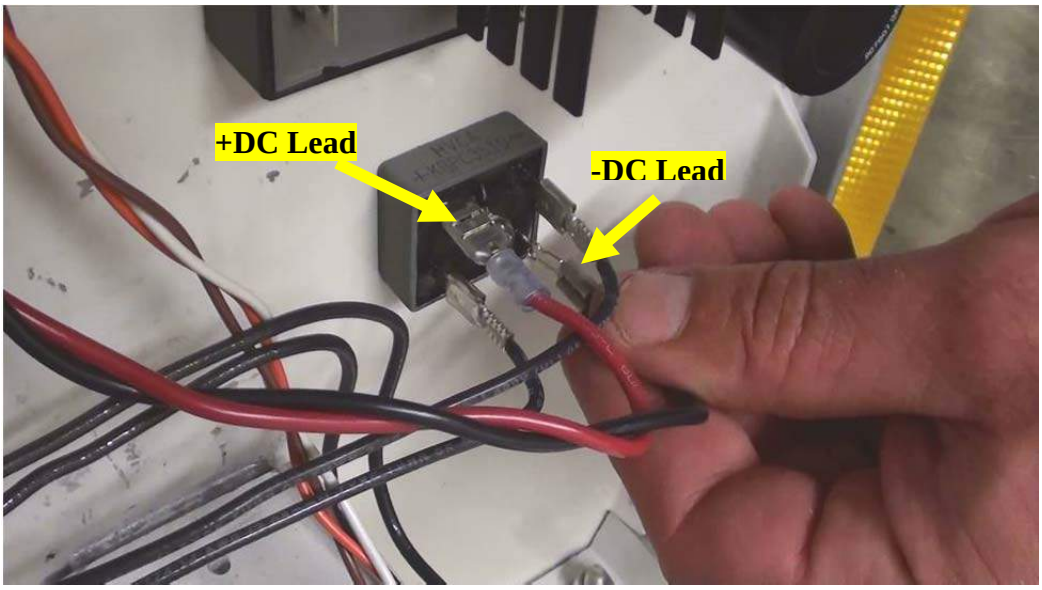
2. Next, set the Multimeter to a diode setting and place the meter's negative lead on the positive terminal of the bridge rectifier (90° from the other three terminals). Then place the positive lead on the negative terminal of the bridge rectifier (diagonal from the positive terminal).



3. You are looking for one of two possible voltage readings:
   If the meter reads approximately 1.0 volt the Bridge Rectifier is good.
   If the meter reads approximately 0.5 volt, the Bridge Rectifier is not good.

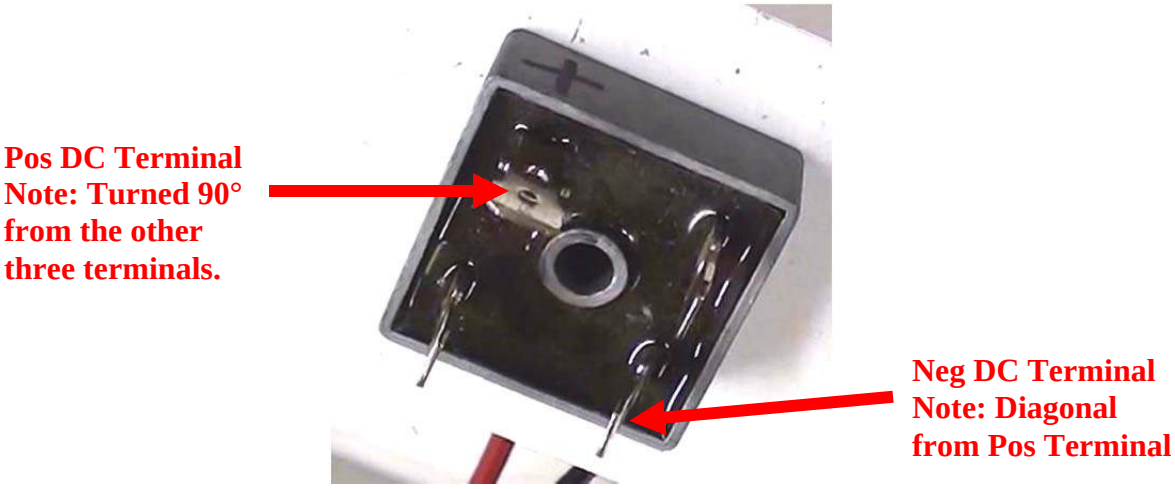
   NOTE: Meter readings are typically more precise than what is required for this test. Round the reading to the nearest 1/10th volt. (Rounding up is typically required.)

4. Be careful when re-connecting the bridge rectifier wires. Do not mistakenly reverse the positive and negative DC wires from the controller (twisted red and black wires) to the bridge rectifier.



Review: Identifying a faulty bridge rectifier

The positive terminal is normally on the upper left side of the bridge rectifier, and it will be the terminal turned 90 degrees from the other three.



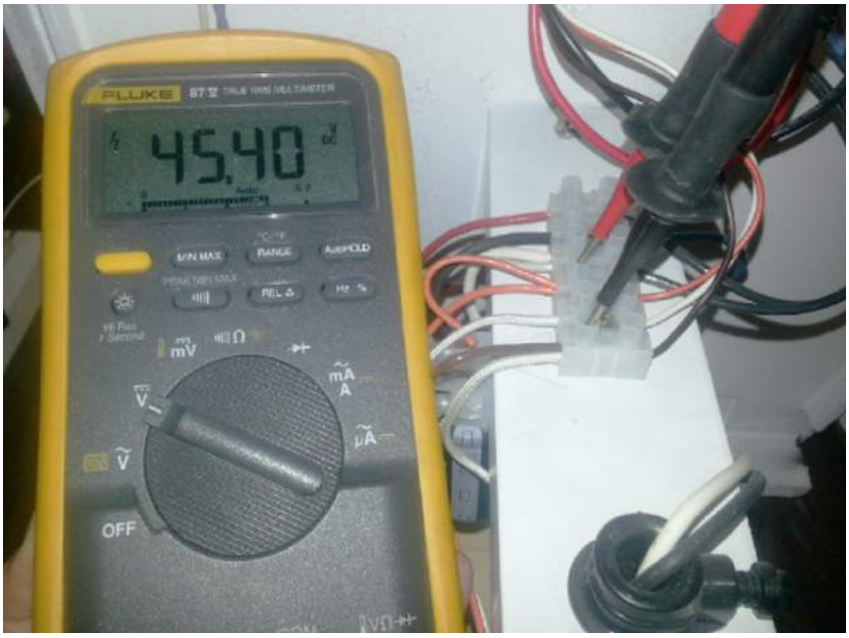
Place the meter's positive lead on the negative terminal, and the negative lead on the positive terminal. You are looking for a full 1.0 volt across it. On this example (as shown on the meter below) there is about 0.5 volt. This signifies a faulty bridge rectifier.

NOTE: If the reading is close to 1.0 volt then the bridge is good, closer to 0.5 then the bridge is faulty.

Step Three: Checking for a Faulty Controller

For the final test, we will check the controller to be certain it is functioning correctly. **To do this test properly the sign must be powered and one lamp removed.** This will cause an open circuit on the load side of the controller and the controller will go to maximum power.

Take meter readings across the terminal strip at the orange and brown wires coming from controller. Set the meter to DC volts. Locate the terminal strip and touch the meter's positive lead to the set screw of the orange wire and the negative lead to set screw of the brown wire.



Note: You are looking for voltage greater than maximum voltage of all the lamps in the sign. For example: if the sign has four XTL lamps at 10V each, the controller should be putting out 40V minimum. If the sign has six XTL lamps at 10V each, the controller should be putting out 60V minimum.

Conclusion:

There are several typical sources of problems that cause a Lumacurve XTL sign not to light. The airfield sign should light if the following components are functioning properly:

1. All lamps are good or have been replace
2. The bridge rectifier is verified as good
3. The controller is verified as functioning properly
4. The surge protection system shows no visual signs of damage (charring or melting)
5. The isolation transformer is properly sized and performing properly

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

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.

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.

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

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 compared to other Lumacurve lighting systems

Style 2 Systems Comparison

Sign Size	Modules	LUMACURVE LED Iso Rqd	VA Load	PF	Energy Consumed (VA x PF)	versus T10P: LUMACURVE T10P (45W) Style 2 Iso Rqd	VA Load	PF	Energy Consumed (VA x PF)	Energy Savings	versus LOVA: LUMACURVE LOVA (12V/20W) Syle 2 Iso Rqd	VA Load	PF	Energy Consumed (VA x PF)	Energy Savings
1	1	45W	47	0.93	**44**	45W	119	0.62	**74**	41%	100W	68	0.88	**60**	27%
1	2	100W	59	0.88	**52**	100W	205	0.65	**133**	61%	100W	77	0.98	**75**	31%
1	3	100W	66	0.90	**59**	100W	212	0.79	**167**	65%	200W	114	0.88	**100**	41%
1	4	100W	73	0.92	**67**	200W	241	0.79	**190**	65%	200W	140	0.87	**122**	45%
2	1	100W	57	0.87	**50**	100W	170	0.62	**105**	53%	100W	77	0.98	**75**	34%
2	2	100W	66	0.90	**59**	200W	230	0.69	**159**	63%	200W	137	0.87	**119**	50%
2	3	100W	76	0.92	**70**	300W	409	0.62	**254**	72%	300W	170	0.97	**165**	58%
2	4	100W	86	0.94	**81**	300W	517	0.62	**321**	75%	500W	224	0.88	**197**	59%
3	1	100W	57	0.87	**50**	100W	202	0.82	**166**	70%	100W	104	0.85	**88**	44%
3	2	100W	66	0.90	**59**	300W	414	0.74	**306**	81%	300W	170	0.97	**165**	64%
3	3	100W	76	0.92	**70**	500W	620	0.72	**446**	84%	500W	247	0.87	**215**	67%
3	4	100W	86	0.94	**81**	500W	792	0.73	**578**	86%	600W	309	0.91	**281**	71%
4	1	100W	66	0.90	**59**	300W	414	0.74	**306**	81%	300W	170	0.97	**165**	64%
		Avg. VA	68	**Avg.**	**61.62**	*Avg. VA	350	**Avg.**	**246.62**	**69% Savings**	**Avg. VA	154	**Avg.**	**140.64**	**50% Savings**

20X+ ***the Lamp Life of Incandescent Lamps***

71% ***more efficient that T10P***

54% ***more efficient that LOVA***

*Converting a circuit of T10P signs to our LED lighting system allows you to **power 4 times as many signs** on that same regulator.

Converting a circuit of LOVA signs to our LED lighting system allows you to **power more than 2 times as many signs on that same regulator.

Max VA of an airfield lighting fixture is used by engineers to calculate the loading of L828 constant current regulators. A fixture with a lower max VA allows more fixtures to be powered on a given regulator.

8/4/2011

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LED compared to other Lumacurve lighting systems

Style 3 Systems Comparison

Sign Size	Modules	LUMACURVE LED Iso Rqd	VA Load	PF	Energy Consumed (VA x PF)	versus Train Lamps: LUMACURVE Train Lamps Style 3 Iso Rqd	VA Load	PF	Energy Consumed (VA x PF)	Energy Savings	versus LOVA: LUMACURVE LOVA (12V/20W) Syle 3 Iso Rqd	VA Load	PF	Energy Consumed (VA x PF)	Energy Savings
1	1	45W	47	0.93	**44**	100W	409	0.22	**90**	51%	100W	68	0.88	**60**	27%
1	2	100W	59	0.88	**52**	200W	568	0.20	**114**	54%	100W	77	0.98	**75**	31%
1	3	100W	66	0.90	**59**	200W	548	0.28	**153**	61%	200W	114	0.88	**100**	41%
1	4	100W	73	0.92	**67**	300W	937	0.23	**216**	69%	300W	134	0.95	**127**	47%
2	1	100W	57	0.87	**50**	200W	601	0.18	**108**	54%	100W	77	0.98	**75**	34%
2	2	100W	66	0.90	**59**	300W	858	0.21	**180**	67%	300W	130	0.95	**124**	52%
2	3	100W	76	0.92	**70**	500W	997	0.31	**309**	77%	300W	170	0.97	**165**	58%
2	4	100W	86	0.94	**81**	500W	1168	0.28	**327**	75%	500W	224	0.88	**197**	59%
3	1	100W	57	0.87	**50**	200W	561	0.21	**118**	58%	200W	114	0.85	**97**	49%
3	2	100W	66	0.90	**59**	300W	858	0.30	**257**	77%	300W	170	0.97	**165**	64%
3	3	100W	76	0.92	**70**	500W	1135	0.33	**375**	81%	600W	259	0.87	**225**	69%
3	4	100W	86	0.94	**81**	500W	1148	0.42	**482**	83%	800W	315	0.92	**290**	72%
4	1	100W	66	0.90	**59**	300W	858	0.30	**257**	77%	300W	170	0.97	**165**	64%
		Avg. VA	68	**Avg.**	**61.62**	*Avg. VA	819	**Avg.**	**229.72**	**68% Savings**	**Avg. VA	156	**Avg.**	**143.52**	**51% Savings**

20X+ ***the Lamp Life of Incandescent Lamps***

70% ***more efficient that T10P***

54% ***more efficient that LOVA***

*Converting a circuit of Train Lamp signs to our LED lighting system allows you to **power 13 times as many signs** on that same regulator.

Converting a circuit of style 3 LOVA signs to our LED lighting system allows you to **power more than 2 times as many signs on that same regulator.

Max VA of an airfield lighting fixture is used by engineers to calculate the loading of L828 constant current regulators. A fixture with a lower max VA allows more fixtures to be powered on a given regulator.

8/4/2011

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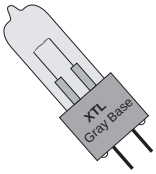
LUMACURVE PARTS LIST



XTL Lighting Systems

(Gray Base 20W quartz halogen lamps)

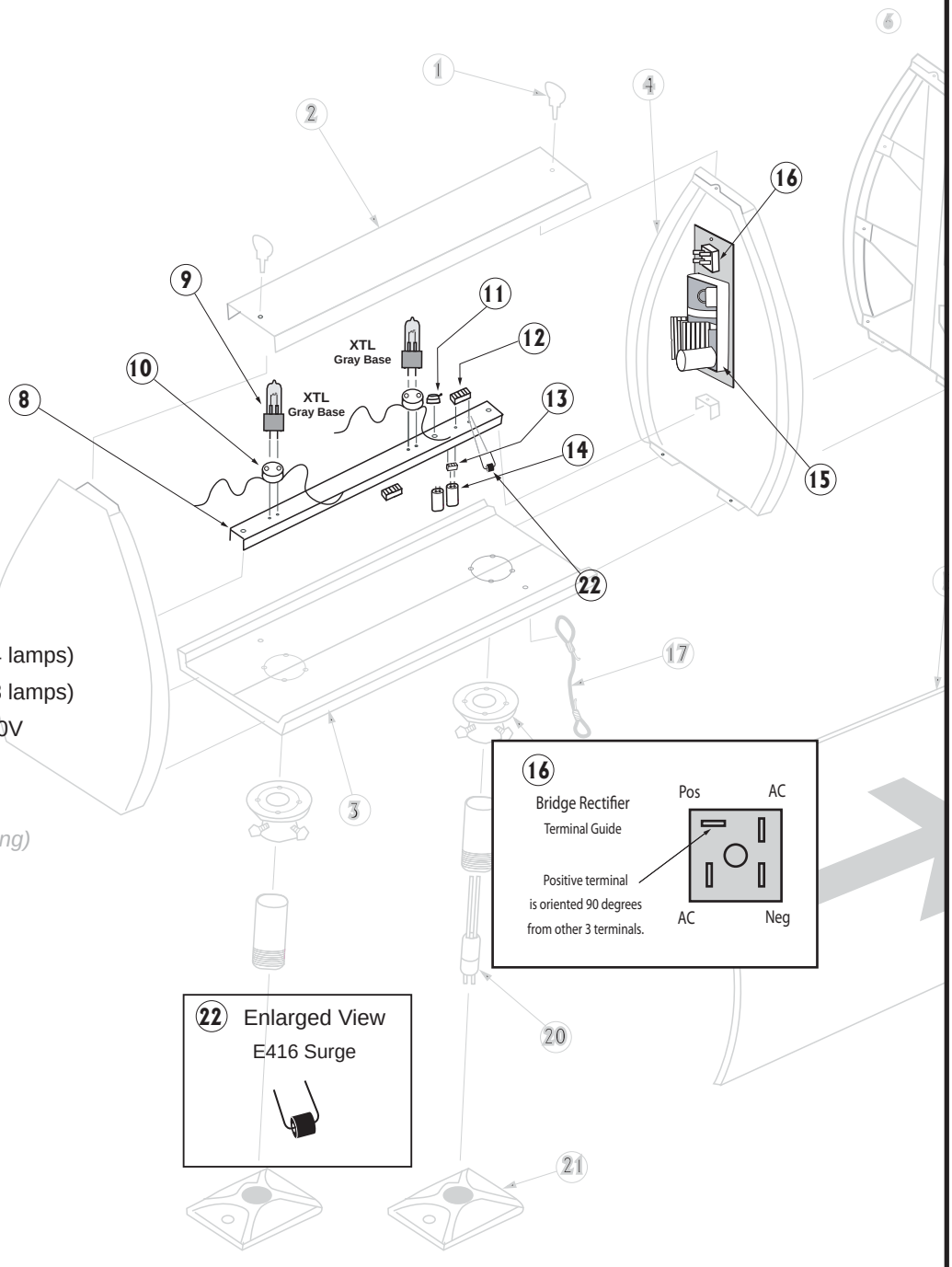
XTL Power Kit Components

All other components grayed out.

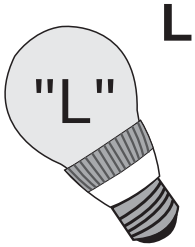
Item	Description
1. 340/345	Turn Fasteners
2. *CLT-2	Cover
3. *CLT-3	Base
4. *CLT-4	End Panel
5. *CLT-5	Legend Panel[1]
6. *CLT-6	Multi-Mode Insert
6A. *CLT-6A	Panel Spacer[2]
7. *7-A	Face Insert Channel[1]
8. *8-A	Lamp Socket Channel
9. XTL Quartz	XTL 20W Quartz Lamp
10. E400A	Lampholder
11. 480	Cable Clamp
12. 420	Terminal Strip
13. 420	Terminal Strip (section)
14A. E411	Capacitor for E410
14B. E611	Capacitor for E610
15A. E410	PCB Controller, 50V (1-4 lamps)
15B. E610	PCB Controller, 75V (1-8 lamps)
16. E540	Bridge Rectifier 35A/1000V
17. CLT-19	Tether
18. 130	Slipfitter
19. *140	Frangible Coupling *(6" long)*
20. 430	Cord & Plug
21. 15	Floor Flange
22. E416	Surge Protector

One lamp systems only require:

E550 Resistor 3 OHM 25w



LUMACURVE PARTS LIST



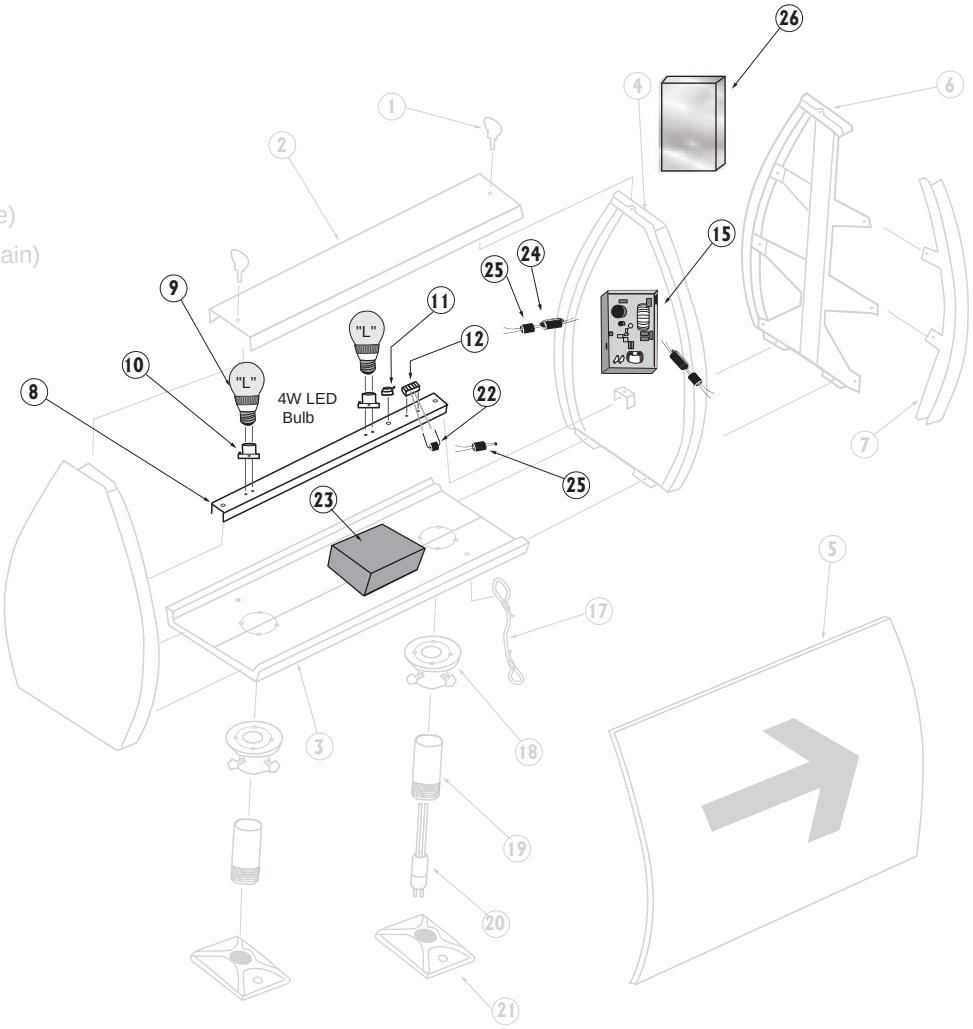
LED Lighting Systems

(4W LED screw base type lamp)

LED Power Kit Components

All other components grayed out.

	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[1]
6.	*CLT-6	Multi-Module Insert (Tree)
7.	*7-A	Face Insert Channel[1] (Train)
8.	*8-A	Light Bar
9.	L lamp 4W	4W LED Lamp
10.	500	Medium Screw Socket
11.	480	Cable Clamp
12.	420	Terminal Strip (section)
15	L610	LED PCB Controller
17.	CLT-19	Tether
18.	130	Slipfitter
19.	*140	6" Frangible Coupling
20.	430	Cord & Plug
21.	15	Floor Flange
22.	E416	Surge Protector
23.	Filter	ALD Low Pass Filter
24.	Ferrite A	Ferrite Core Split
25.	Ferrite B	Ferrite Core Not Split
26.	G EMI Shield Screen	Controller Screen



Enlarged Views

Permanent Engraved Nameplate

Item#: L858 Engraved ID Nameplate

Required by the FAA per AC 150/5345-44H

Accurate, comprehensive sign data is the start of good sign maintenance

Per FAA Advisory Circular 150/5345-44H:

3.2.5.12 Nameplate.

a) Each sign must have a nameplate showing:

(1) Type
(2) Size
(3) Style
(4) Class
(5) Manufacturer's name and address
(6) Date of manufacture
(7) Catalog number
(8) Lamp data including the lamp type and rating

b) The nameplate on Style 1 signs must show the total volt-amphere load and power factor of the sign, including any required ballasts or adapter units.

c) The nameplate on Style 2, 3 and 5 signs must show the total maximum volt-amp load and power factor measured on the primary side of the isolation transformer. The load indicated must represent the worst case volt-amp loading anticipated on the lighting circuit regulator including any ballasts and/ or adapter units required for sign operation.

d) Nameplates must be fabricated from materials that will resist fading and cracking arising from exposure to weather, salt laden air and sunshine.

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LUMACURVE®
AIRFIELD SIGNS

Sign Identification System

High Visibility Sign Reference

Clear and accurate reference for servicing signage

System of high visibility, 2" characters

Provides clear, readable reference for maintenance and operations

Lifetime warranty*. Engraved U.V. polyethylene ensures long life and readability.

4 self-drilling screws make installation simple

Flexible system allows easy changes if necessary

Facilitates accurate notations during inspections

Eliminates use of confusion and ambiguous location descriptions

Construction and Warranty

* The engraved finished tags carry a lifetime warranty for legibility. If during this period any tag fails to remain legible, a new tag will be provided free of charge. Engraved finish tags are made of co-extruded U.V. polyethylene and engraved to a depth of .025 inches to ensure long life and readability. They resist chemical and alkali attack, fading, chipping, peeling and cracking and are suited for application above and below ground in any environment.

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Electrical Modification – External Switch

Lumacurve offers an optional External Switch (with or without a weatherproof cover) for all lighted sign styles.

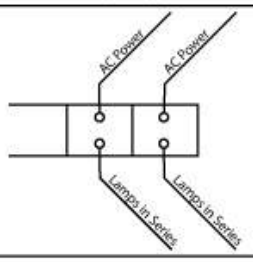
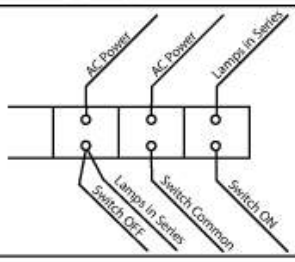
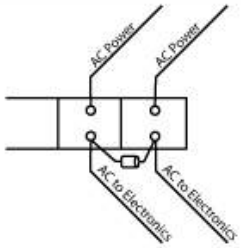
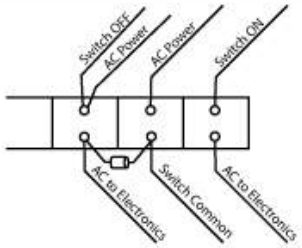
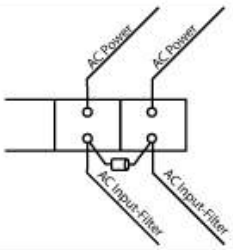
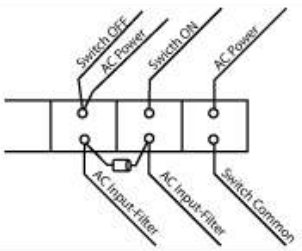
The purpose of this guide is to help contractors and airfield personnel understand how this switch operates (when installed as original sign equipment) and how to retrofit signs previously installed.

The switch provided is a “make-before-break” switch, effectively shunting the power before breaking the circuit.

When sign power is on, and the switch position is “ON”, power feeds through the switch “common” position to the switch “ON” position, then to the sign electronics (or directly to the lamps for Style-5 signs with no electronic controls).

When sign power is on, and the switch position is “OFF”, power feeds through the switch “common” position to the switch “OFF” position, effectively returning power back to the airfield circuit.

NOTE: Use switch and cover to mark end panel prior to pre-drilling mounting holes (above light bar, near electronic controller). Use ½” drill bit for switch; use 3/16” drill bit for cover.

	Without Switch	With Switch
Style 5 EXM or T10P		
XTL		
LED		

LUMACURVE® AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Installation: Performance Top

Section F: "Upgrades"

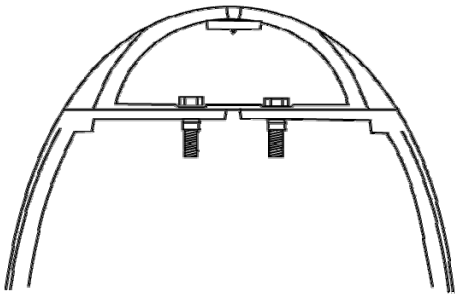
The newly released **Performance Top** retrofit kit for LUMACURVE Airfield Signs is a structural enhancement designed for installation on one module of a LUMACURVE airfield sign of any module length. For best results in using this sample kit, we recommend installation on a single module sign in order to realize the maximum benefits in improved overall sign strength, fit and seal.

The **Performance Top** retrofit kit consists of: 1 curved top cover; 2 turn fasteners with retainers; 2 end panel adapter castings [CLT-4A], 4 hex cap screws, and 4 hex nuts with lock washers. Tools recommended for field installation include a drill with ¼" bit, a ratchet with a 7/16th deep socket and pliers. Please refer to the exploded diagram on page 3 of the **TAXIWAY AND RUNWAY GUIDANCE SIGNS INSTALLATION INSTRUCTIONS** pamphlet for identification of sign parts.

TO INSTALL:

1. Remove the existing top cover [CLT-2] from one sign module and lay aside. Knock out the receptacle brackets riveted in the top lip of the end panels [CLT-4] (or multi-module insert(s) [CLT-6]).
2. Remove rivets from end panel holes by pushing up from the bottom; pliers may be needed to pull the rivets out. Ream out rivet holes to ¼" diameter with a drill bit.
3. Position one end panel adapter casting [CLT-4A] over the top lip of the end panel so that the smooth side is facing the outside of the sign module, with holes in the casting lip aligned with newly reamed holes in the end panel lip. Slip hex cap screws through the aligned holes from the top. Install hex nuts and lock washers from beneath and tighten with a ratchet. Pushing downward on the bolt into the slotted groove will stop the bolt from turning as you tighten.
4. Repeat step 3 for the other end panel (or multi-module insert).
5. Finish curved top cover assembly by installing turn fasteners into both ends. Insert the wing screw from the top of the cover. Press retainer over wing screw threads from beneath the top cover to hold in place.
6. Install curved top cover by holding the top in an upward slant over the sign with one end lined up and engaged loosely. Then push top down from the loosely engaged end to the opposite end, making sure that face panels fit into the center of the top cover channels. If needed, "pop" panels into place by smartly slapping inward on the center of both panels. Then tighten down the turn fasteners so curved top cover fits snugly.

CLT-4A



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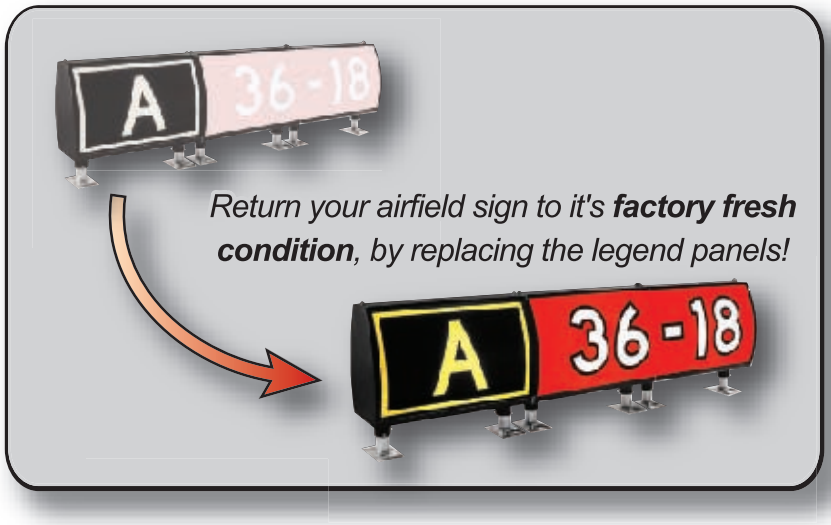
Got Panel Fading?

Got Panel Deterioration?

Airfield sign panels have a life of approximately ***3-8 years.***

- Harsh environmental conditions cause sign panels to fade within a few years
- Deterioration of the reflective material makes for bad sign visiblity
- Fading causes unreadable conditions
- Replacing sign panels cost less than replacing the whole sign
- Modularity of our frames makes replacing panels quick and easy



We can provide mandatory black outline panels. All of our panels meet latest FAA Advisory Circular 44. Panel replacements are AIP eligible!

LUMACURVE®
AIRFIELD SIGNS

Restore your signs face today!

Call our Customer Service for more information.

1-800-258-1997 ext. 207

Mon.-Fri 8-5 EST.

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Installation: Performance Top

Section F: "Upgrades"

The newly released **Performance Top** retrofit kit for LUMACURVE Airfield Signs is a structural enhancement designed for installation on one module of a LUMACURVE airfield sign of any module length. For best results in using this sample kit, we recommend installation on a single module sign in order to realize the maximum benefits in improved overall sign strength, fit and seal.

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TO INSTALL:

1. Remove the existing top cover [CLT-2] from one sign module and lay aside. Knock out the receptacle brackets riveted in the top lip of the end panels [CLT-4] (or multi-module insert(s) [CLT-6]).
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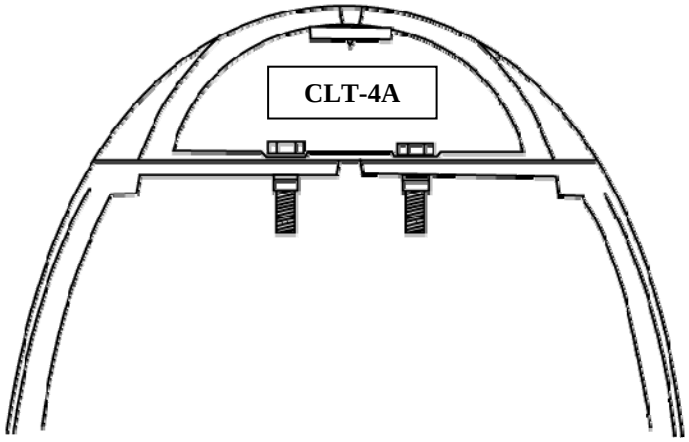

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Jet Blasts Knocking Down Signs?

What is a "mode 3" sign?

Airfield signs at certain critical areas at several major airports have been continuously damaged due to large aircraft jet engine blasts. After an Evalaution of Wind-Loading on Airport Signs, the FAA has allowed for a stronger mode 3 sign. This increases a signs resistance from 200MPH winds (mode 2) to 300 MPH winds. As a result, less signs will be damaged and the risk of foreign object damage (FOD) as well as the loss of visual guidance for other aircraft will be decreased.

LUMACURVE responds with a durable solution that exceeds minimum requirements for strength, visibility, and fast turn around time. We also offer our superior support service called "WAIT-LESS". Notification to the factory by 10am guarantees an airport same day manufacturing and shipment of replacement signs & parts.

Introducing, the new

EXTRA STRENGTH mode 3

- *Stronger aluminum alloy components*
- *Thicker castings w/ reinforcement webbing*
- *Mounting legs repositioned to channel strength*
- *Curved top exponentially stronger than flat top*
- *Internal panel support structure*

You'll also receive these great LUMACURVE features:

- *Modularity means changeability and lower costs for expansion*
- *Aerodynamic curved face increases strength and improves lighting uniformity and balance*
- *Unmatched "Wait-Less" service means no inventory required and safer, no-fixture-down airfield*
- *69 years mfg exp and 50 years of service on the field makes LUMACURVE the right investment!*

LUMACURVE AIRFIELD SIGNS

Call 1-800-258-1997 ext. 207

Mon.-Fri 8-5 EST.

LUMACURVE®
AIRFIELD SIGNS

Installation Instructions

Size 4 Distance Marker Signs

—— DO NOT DISCARD ——

Important information for AIRPORT MAINTENANCE DEPT

To install:

1. Locate the power cord (#1). It will be visible protruding from the power leg slipfitter aluminum column and coupling.

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 (#3) is fed through the conduit and connects the sign power cord plug to the isolation transformer secondary plug.

2. Locate the cable clamp (#4, provided with the sign for most new sign installations). Tighten the cable clamp (#4) onto the isolation transformer secondary extension cord female plug at grade level. The cable clamp should nest on the under side of the floor flange (#2) and on top of the conduit (#5) that is flush with the surface of the concrete mounting pad. Insert the power cord plug (male) into the isolating transformer secondary extension cord plug (female).

Note: As required by the FAA, this ensures that the power cord will be disconnected/unplugged in the event that the sign is knocked over.

3. 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 lockwashers and nuts.

4. 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.

5. Replace any covers or access doors that had been removed.

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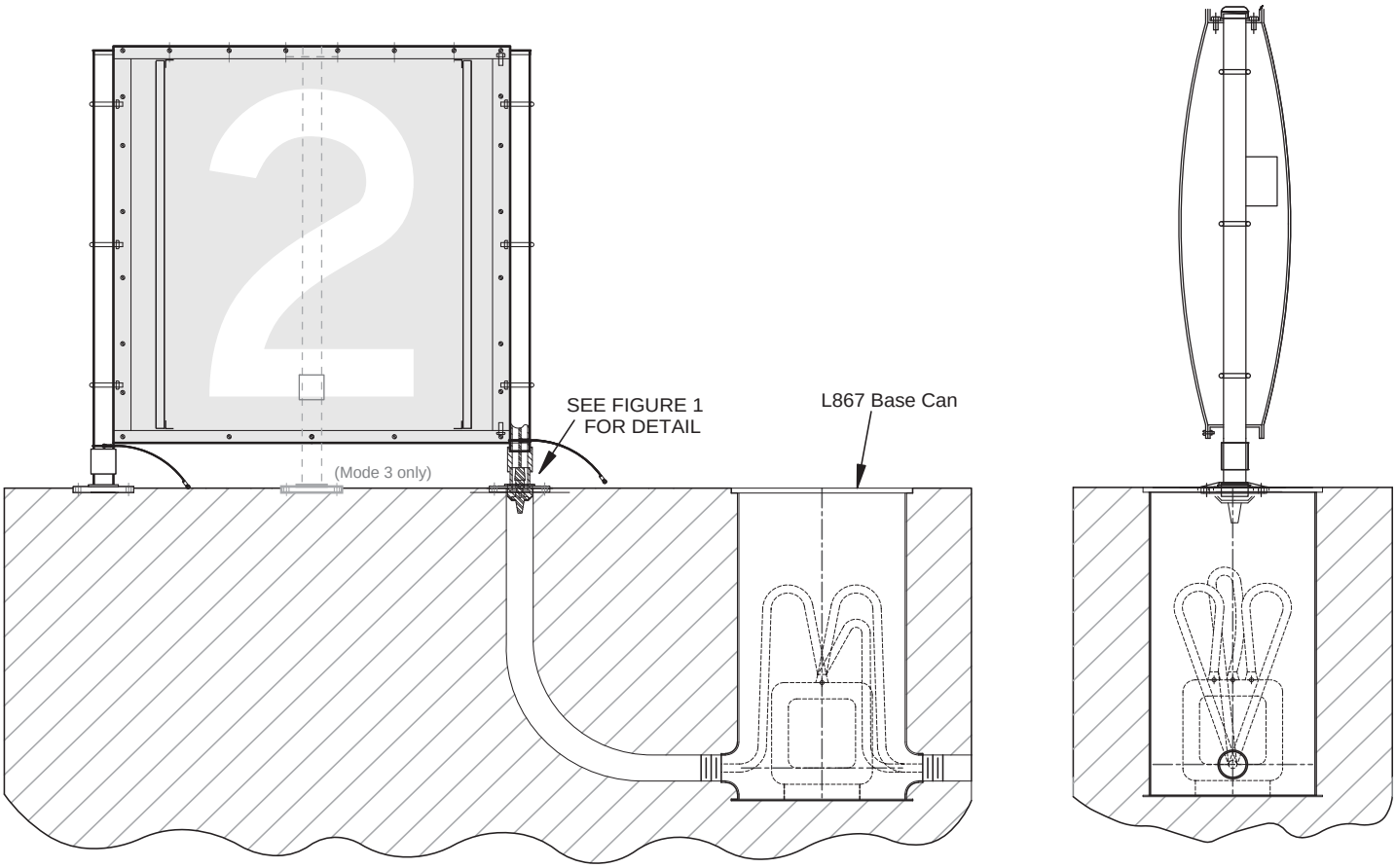
AIRFIELD SIGNS

Installation Instructions

Size 4 Distance Marker Signs



Electrical Connection Detail

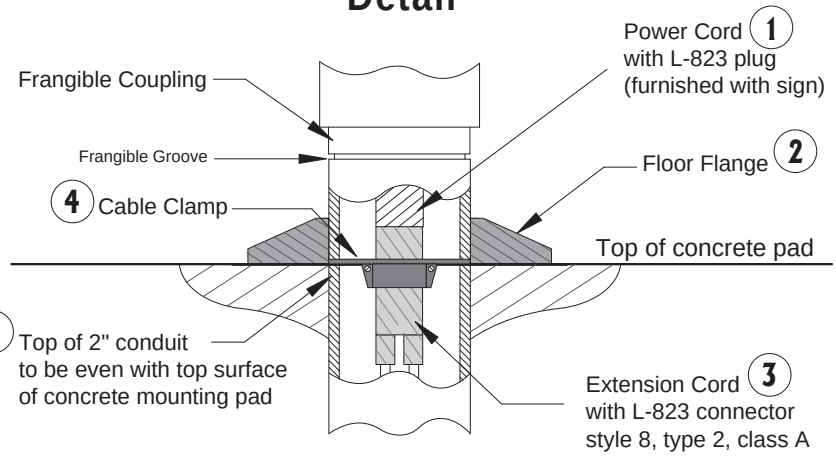


FIGURE 1

LUMACURVE®
AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Parts & Electrical Information
for Taxiway & Runway Signs
LED Lighting Systems

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 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.

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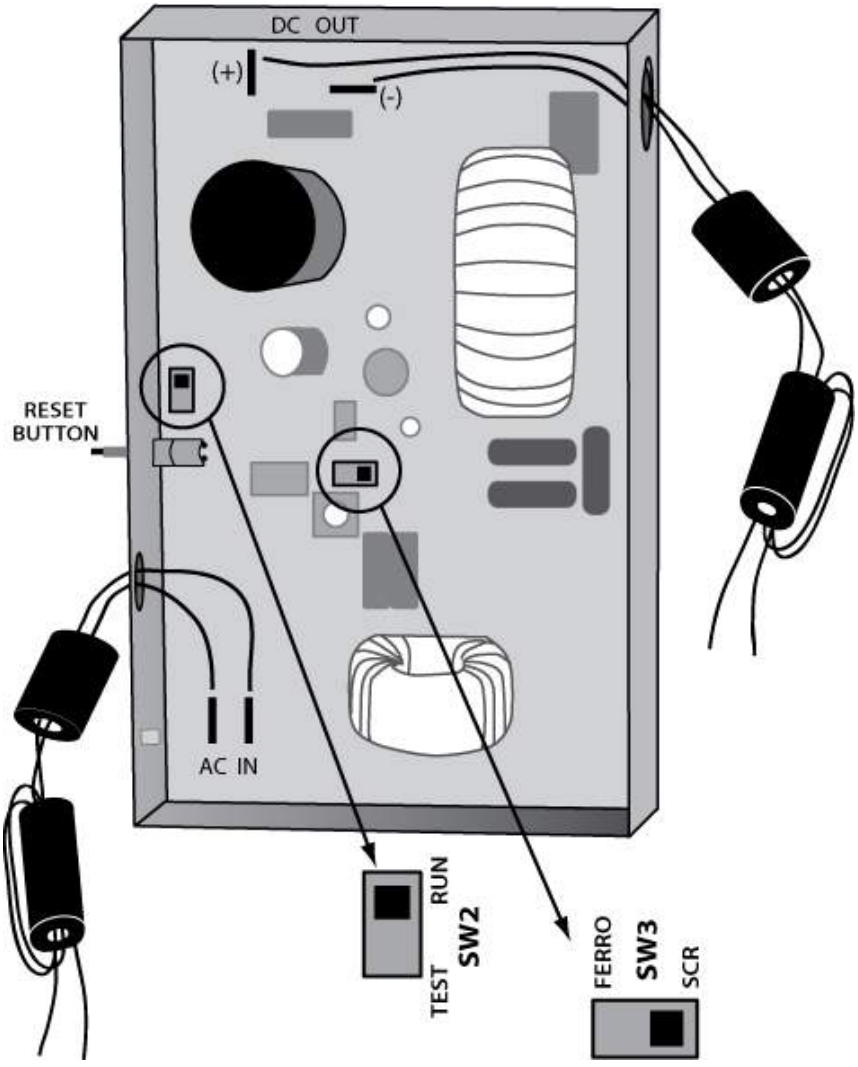
L610 – REV.07M

- 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)

"L610 – REV. 07M"



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LUMACURVE AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955

Parts & Electrical Information
for Taxiway & Runway Signs
LED Lighting Systems

Jumper position Based on Regulator Type for older versions of L610 Controllers

(December 2014 or older versions)

The L-828 and L-829 Constant current regulator maintain constant amperage to the airfield circuit. The L-829 is an SCR type (silicone rectifier) commonly known as a solid state (electronic based) regulator. The L-828 is a ferro-resonant that uses transformer technology.

For SCR type L-829 regulators, a jumper (photo #1) must be installed on the LED controller (as shown in figure #3 or figure #5). For ferro-resonant type L-828 regulators controller (as shown in figure #2 or figure #4).

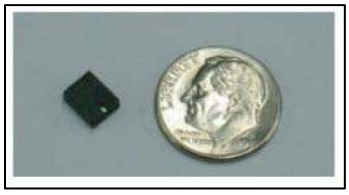

Photo #1

Instructions for installing the Jumper:

a. Identify the type of Constant Current Regulator powering this sign. ("SCR" solid state or "Ferro-Resonant" type)
b. Remove shield screen by loosening the fender washers.
c. Locate the small black jumper. The jumper is factory installed. (figure #2 or figure #4).
d. When using SCR regulator, remove jumper for ferro-resonant regulator application and reinstall over both pins as shown in photo (figure #3 or figure #5).
e. Reinstall shield screen.

"L610 – REV. 05 or older"

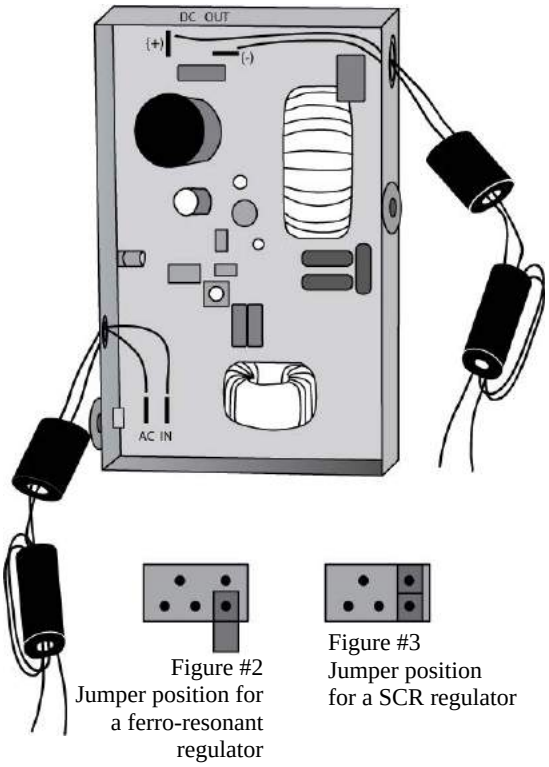

Figure #2
Jumper position for a ferro-resonant regulator

Figure #3
Jumper position for a SCR regulator

"L610 – REV. 06"

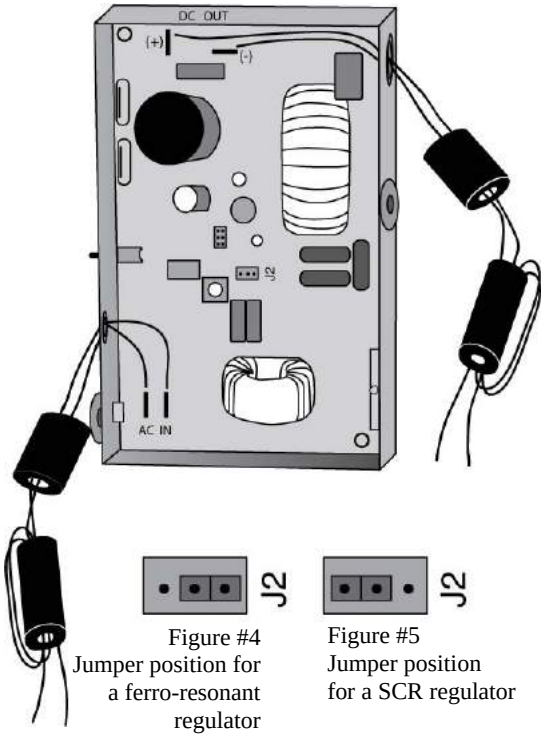

Figure #4
Jumper position for a ferro-resonant regulator

Figure #5
Jumper position for a SCR regulator

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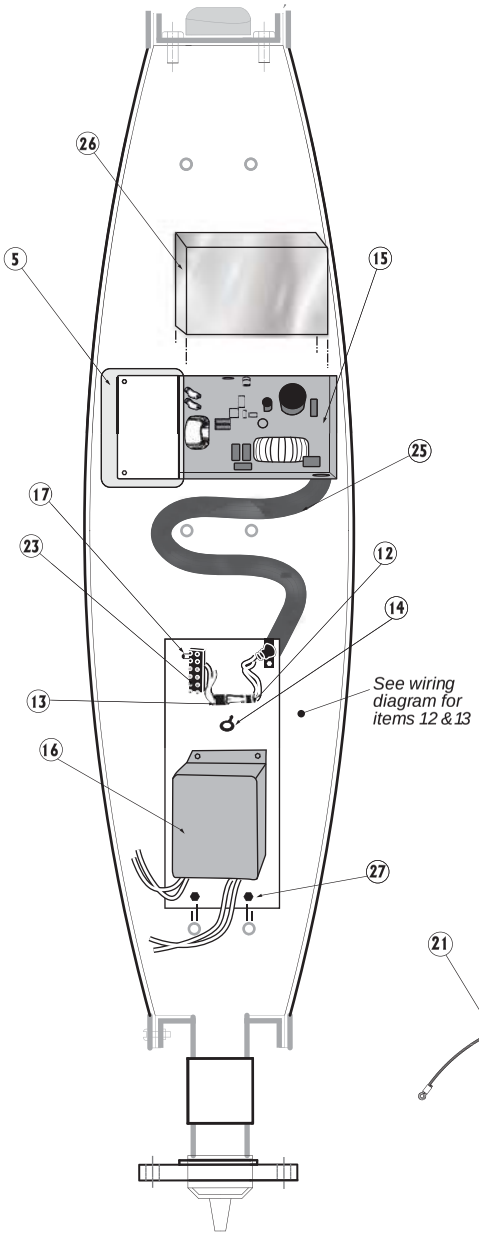
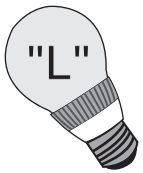
LUMACURVE PARTS LIST

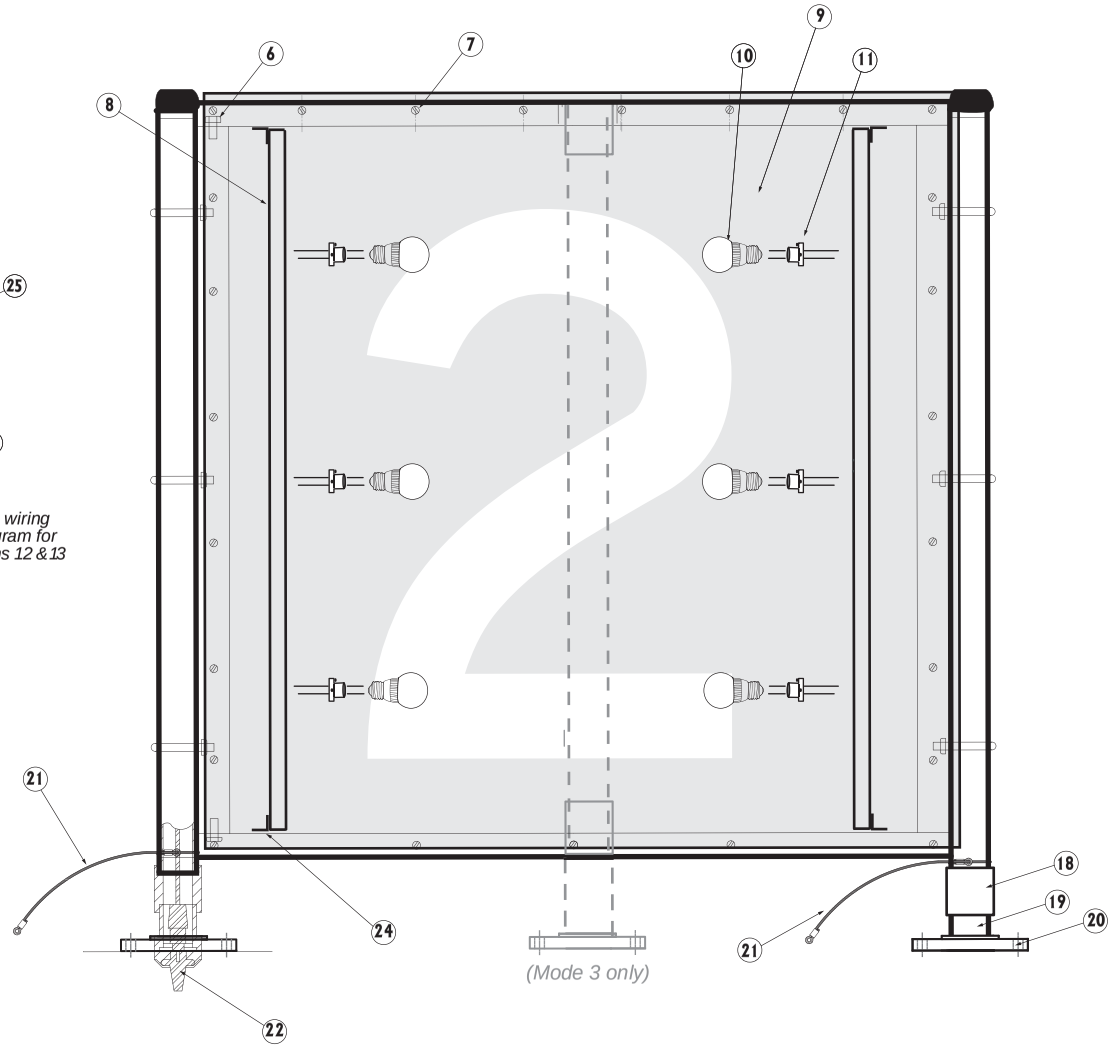
Size 4 Distance Remaining Sign

LED Lighting System

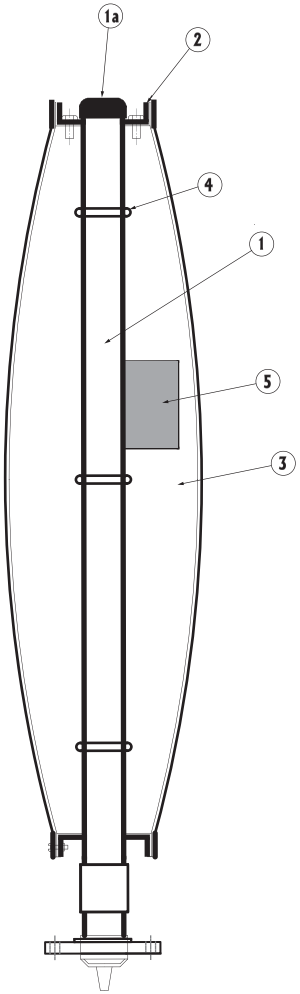
Inside Electrical View







Outside View



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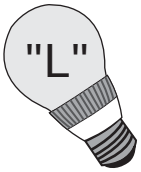

LUMACURVE PARTS LIST

Size 4 Distance Remaining Sign

LED Lighting System

Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs
View our Certificate of Conformance

LED Lighting System

	Item	Description
1a.	DCLT-1A	Leg Cap
*1.	D-1	Leg
2.	D-2	Top/Bottom Channel
3.	DTG-2	End Panel
*4.	D-4AB	U-Bolts w/ nuts & washers
5.	D-4ABC	Access Door (handle on power side)
6.	210/220/230/232	1/4” Hardware
7.	394	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-HD	5” x 8“ Galv. Floor Flange
21.	CLT-19	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.

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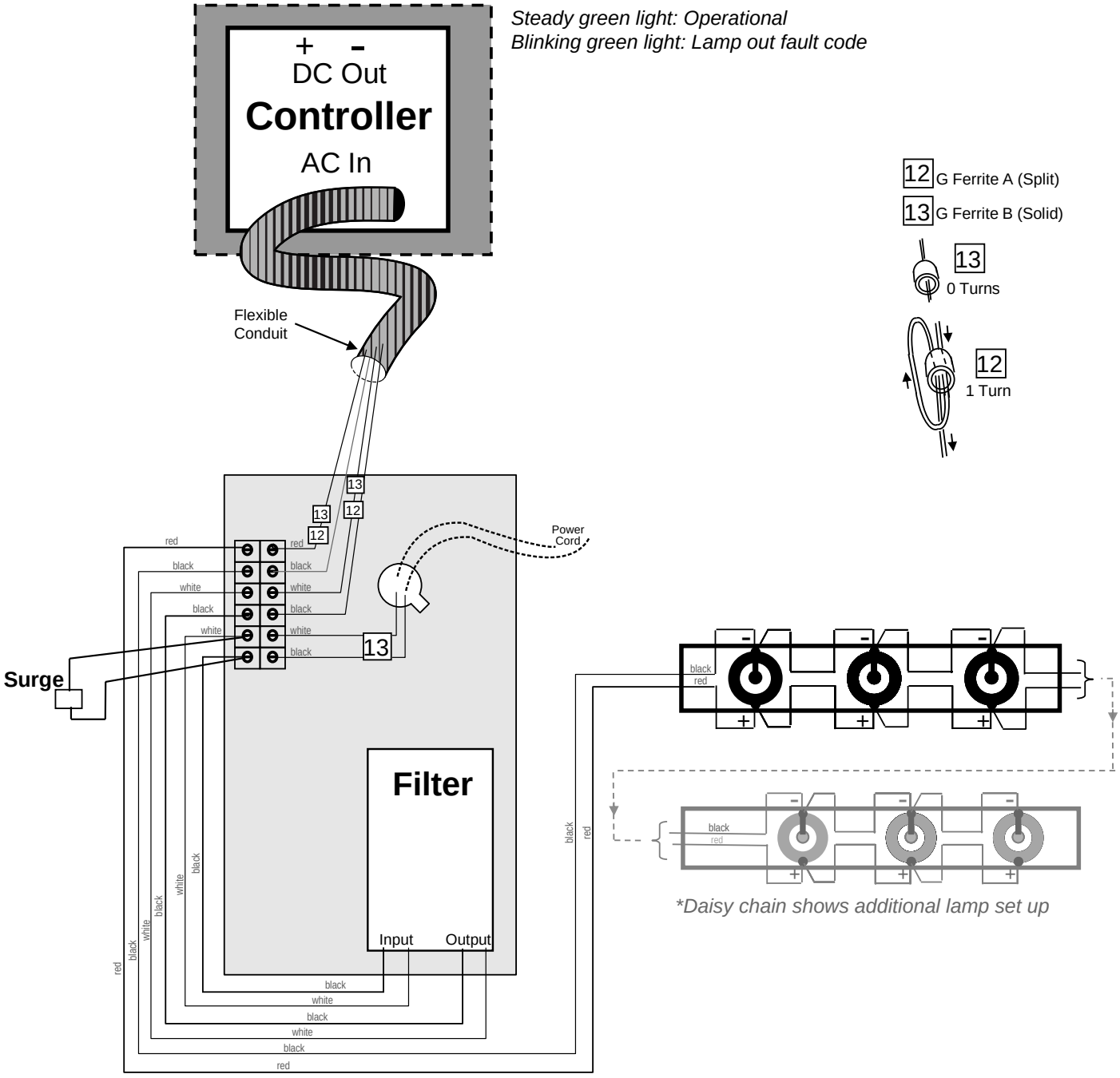
LUMACURVE® AIRFIELD SIGNS

Wiring Diagram, Size 4 Distance Remaining Sign LED (Style 2, 3 & 5)



LED VA Load, Power Factor and Isolation Transformer

		LED Lighting Systems								
		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 Isol Xfmr	Max VA	Pwr Factr	4W LED Isol Xfmr	Max VA	Pwr Factr	4W LED Isol Xfmr	Max VA	Pwr Factr
Size 4, 1-mod	6	100W	66	0.90	100W	66	0.90	100W	54	0.93

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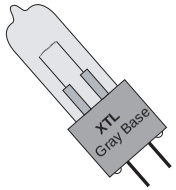
LUMACURVE PARTS LIST

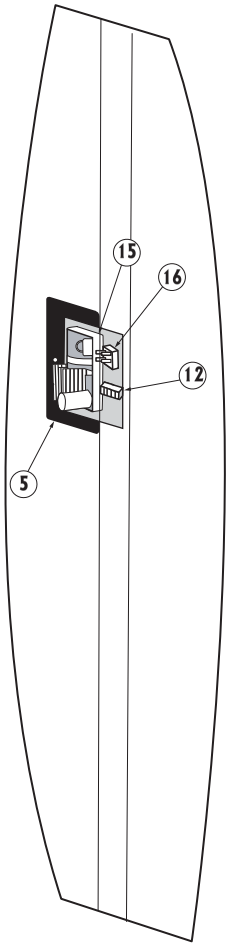
Size 4, Distance Remaining Sign

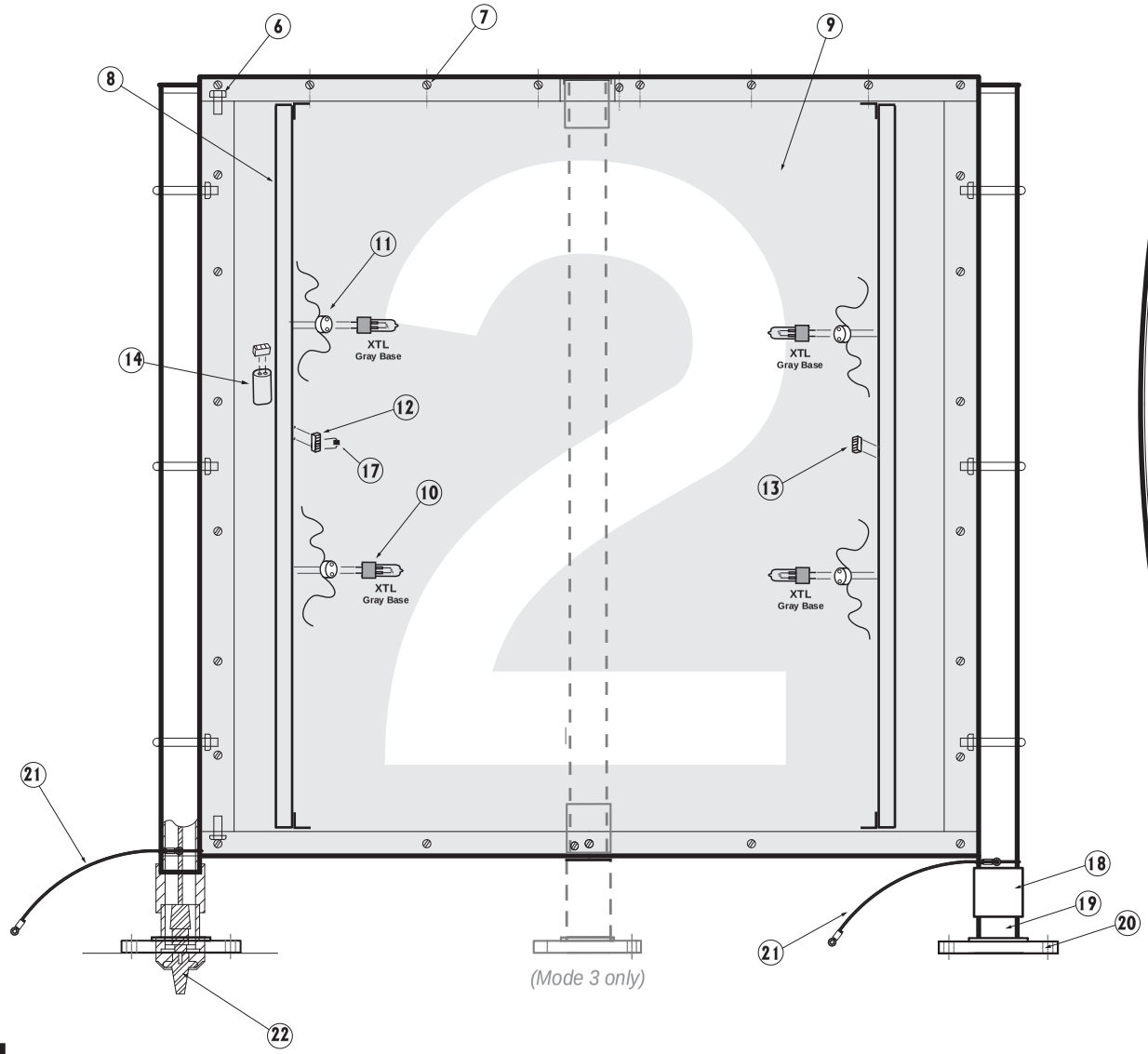
XTL Lighting Systems

(Gray Base 10V/20W quartz halogen lamps)

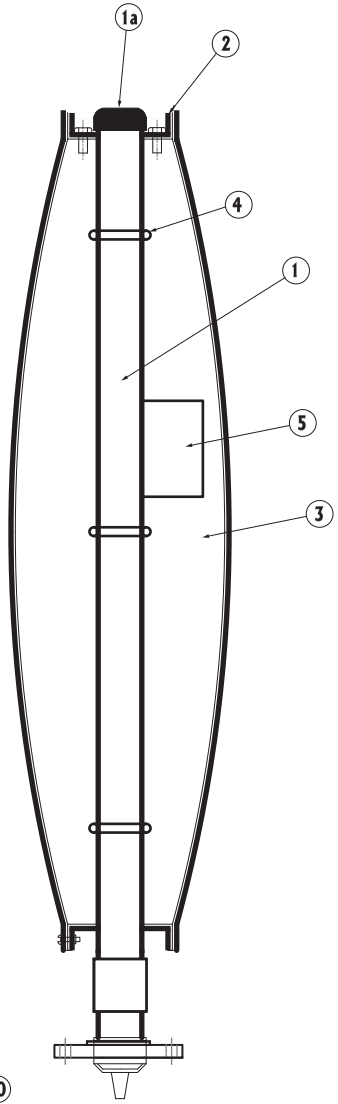


Inside Electrical View





(Mode 3 only)



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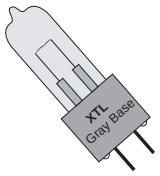
LUMACURVE PARTS LIST



Size 4, Distance Remaining Sign

XTL Lighting Systems

(Gray Base 10V/20W quartz halogen lamps)

Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs
View our Certificate of Conformance

XTL Lighting System

	Item	Description
1a.	DCLT-1A	Leg Cap
* 1.	D-1	Leg
2.	D-2	Top/Bottom Channel
3.	DTG-2	End Panel
* 4.	D-4AB	U-Bolts w/ nuts & washers
5.	D-4ABC	Access Door (handle on power side)
6.	210/220/230/232	1/4” Hardware
7.	394	1/4” x 3/4” Hex Head
8.	D8P	Light Bar Channel (Vertical)
9.	D-15	48" x 48" legend panel
10.	XTL Quartz	XTL 10V/20W Lamp
11.	E400A	XTL Socket
12.	420	Terminal Strip (6 block)
13.	420	Terminal Strip (2 block)
14.	E411	Capacitor for E410 (w/ 2 block)
15.	L610	LED PCB Controller, DC (1-12 lamps)
16.	E540	Bridge Rectifier 35A/1000V
17.	E416	Surge Protector
18.	2" Al Coupling	2" Pipe Coupling
* 19.	140A	Frangible Coupling-2600 ft/lbs
* 20.	15-HD	5” x 8“ Galv. Floor Flange
21.	CLT-19	Tether
22.	430	Cord & Plug
25.	480	Cable Clamp

Enlarged View

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

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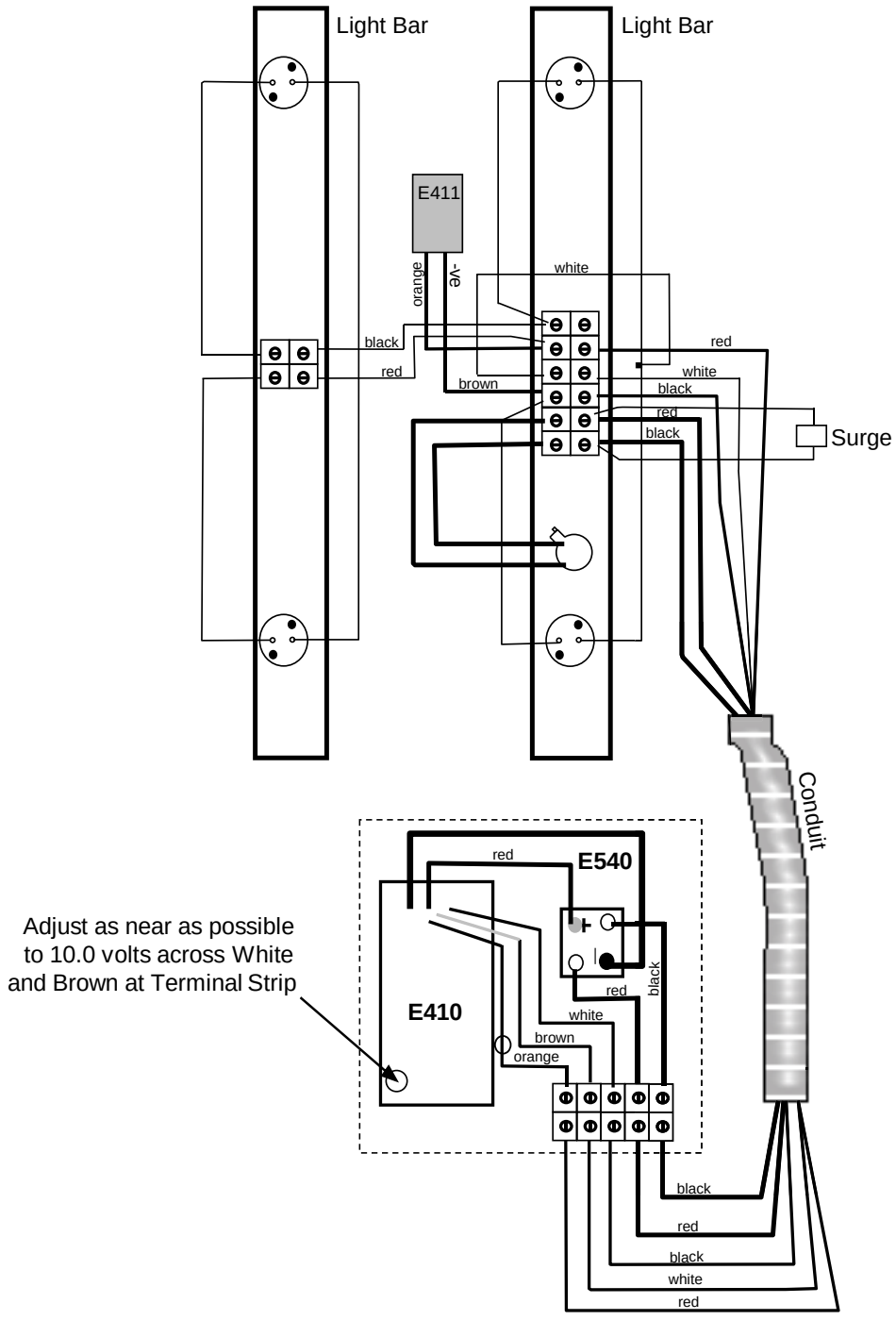
Wiring Diagram, Size 4 Distance Remaining Sign
XTL (Style 2 & 3)



XTL VA Load, Power Factor and Isolation Transformer

		XTL Lighting Systems					
		FAA Style 2 (4.8A-6.6A)			FAA Style 3 (2.8A-6.6A)		
Sign Size & Module Length	Lamps	XTL 20W Quartz Isol Xfmr	Max VA	Pwr Factr	XTL 20W Quartz Isol Xfmr	Max VA	Pwr Factr
Size 4, 1-mod	4	200W	127	0.93	300W	131	0.92

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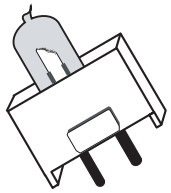
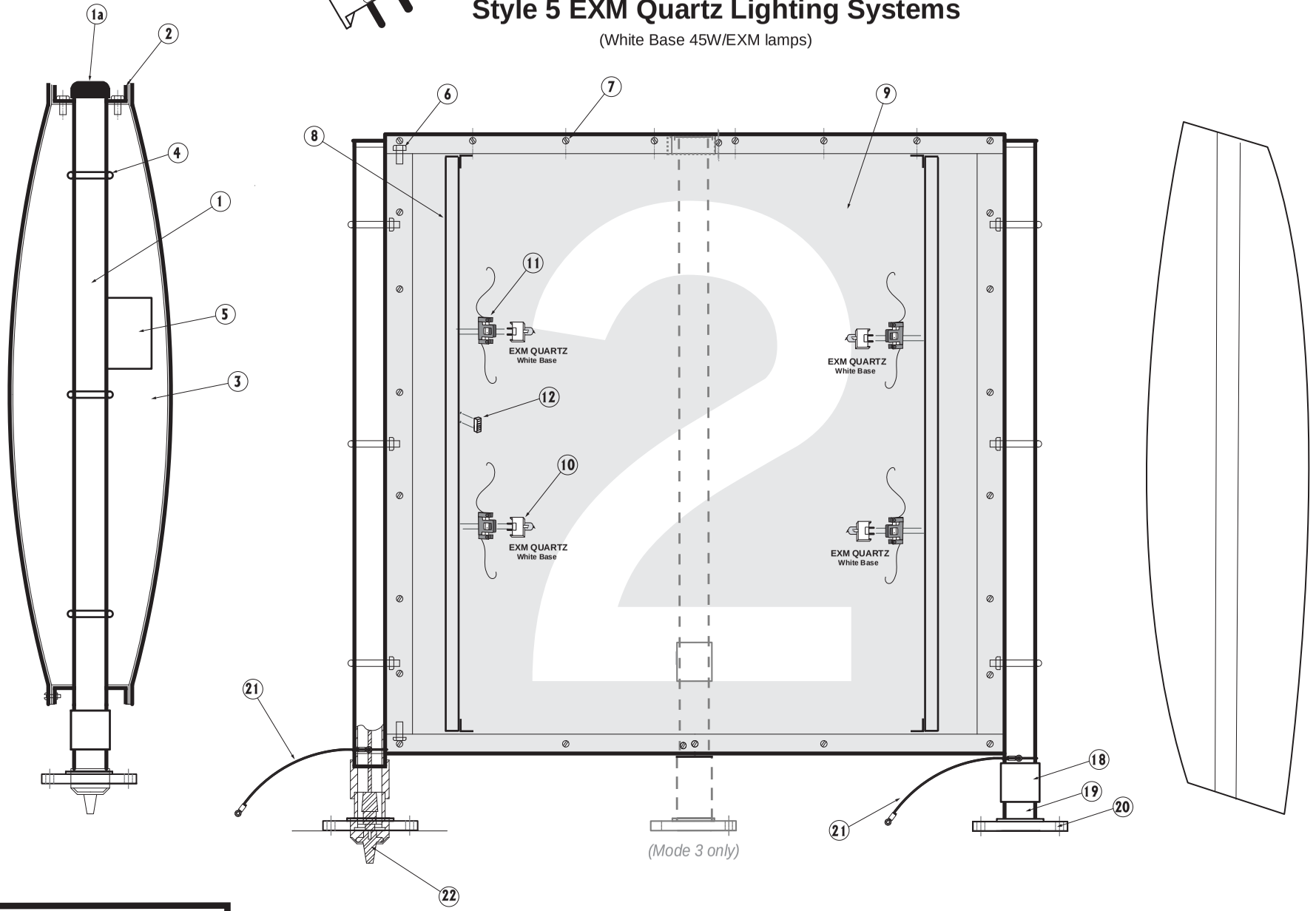


LUMACURVE PARTS LIST

Size 4, Distance Remaining Sign

Style 5 EXM Quartz Lighting Systems

(White Base 45W/EXM lamps)



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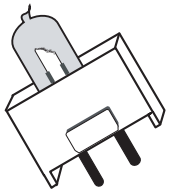
LUMACURVE PARTS LIST



Size 4, Distance Remaining Sign

Style 5 EXM Quartz Lighting Systems

(White Base 45W/EXM lamps)

Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs
View our Certificate of Conformance

EXM Lighting System

	Item	Description
1a.	DCLT-1A	Leg Cap
* 1.	D-1	Leg
2.	D-2	Top/Bottom Channel
3.	DTG-2	End Panel
* 4.	D-4AB	U-Bolts w/ nuts & washers
5.	D-4ABC	Access Door (handle on power side)
6.	215/220/230/232	1/4” Hardware
7.	394	1/4” x 3/4” Hex Head
8.	D8P	Light Bar Channel (Vertical)
9.	D-15	48" x 48" legend panel
10.	45W Quartz	EXM Lamp
11.	501	EXM Socket
12.	420	Terminal Strip (2 block)
18.	2" Al Coupling	2" Pipe Coupling
* 19.	140A	Frangible Coupling-2600 ft/lbs
* 20.	2234G	Circular Floor Flange (Galv, 4-hole)
21.	CLT-19	Tether
22.	430	Cord & Plug
25.	480	Cable Clamp

**Mode 3 parts may be different.*
Please call for more information.

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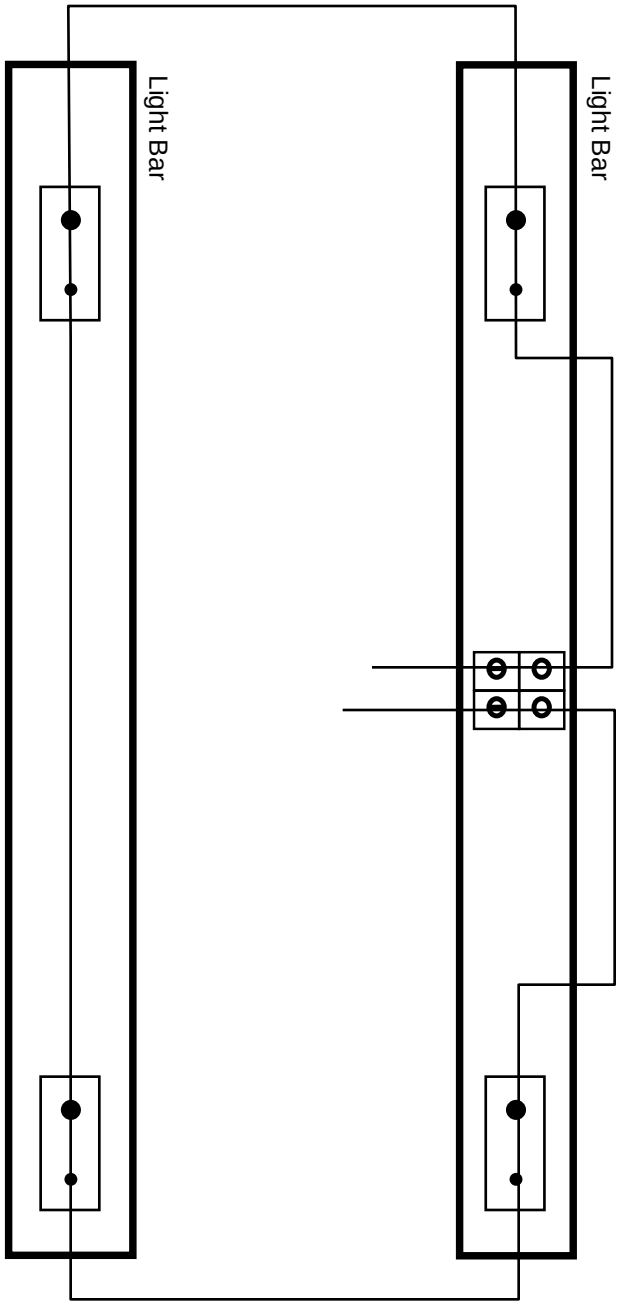
Wiring Diagram, Size 4 Distance Remaining Sign
EXM (Style 5)



EXM VA Load, Power Factor and Isolation Transformer

		EXM Quartz Lighting System		
		FAA Style 5 (Constant 5.5A)		
		45W EXM Qtz		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr
Size 4, 1-mod	4	200W	141	0.99

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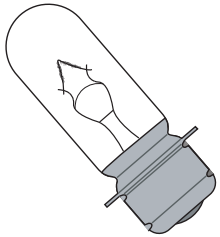
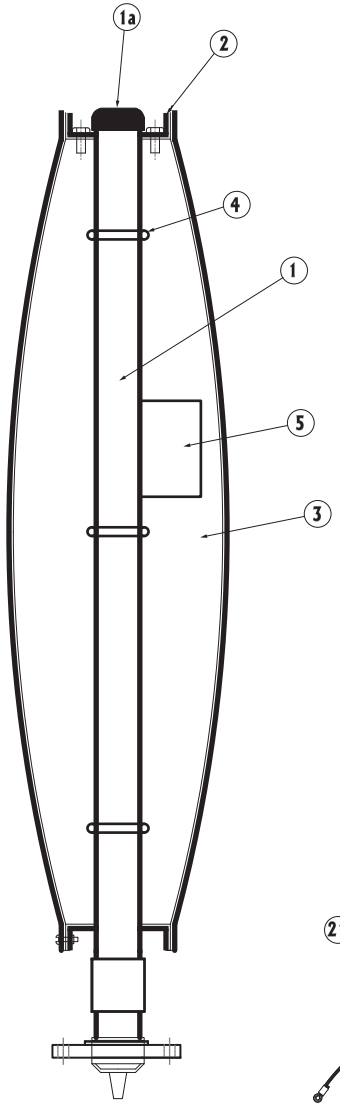
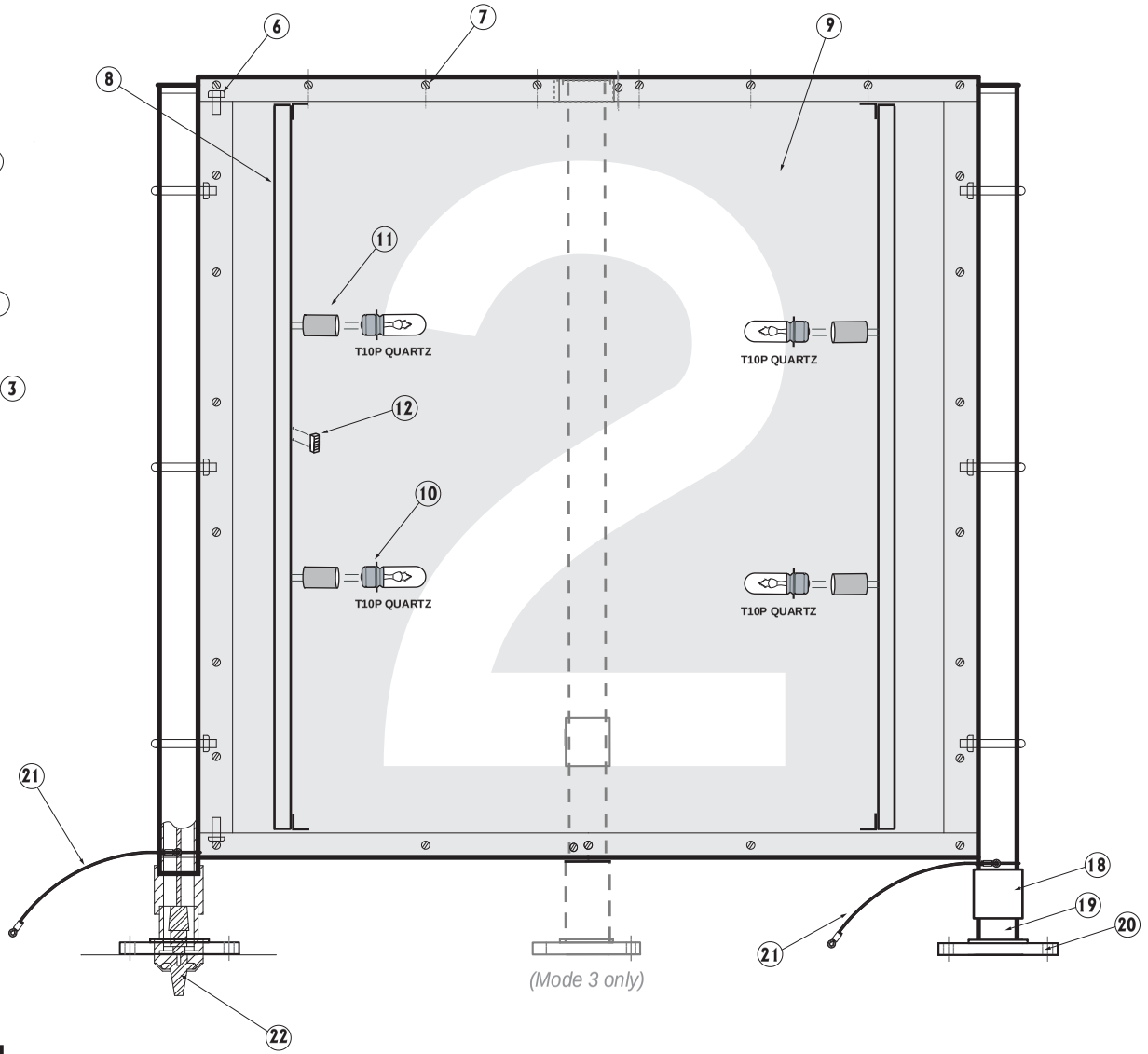
LUMACURVE PARTS LIST

Size 4, Distance Remaining Sign

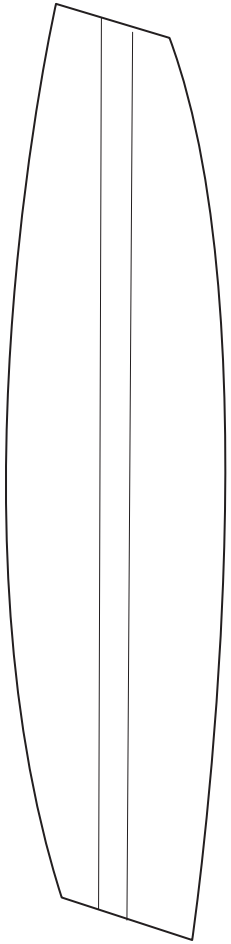
Style 5 T10P Quartz Lighting Systems







(Mode 3 only)



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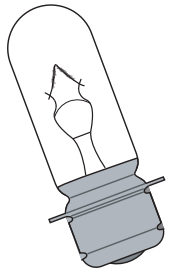

LUMACURVE PARTS LIST

Size 4, Distance Remaining Sign

Style 5 T10P Quartz Lighting Systems

Certified to current FAA Advisory Circular 150/5345-44
Specification for Runway and Taxiway Signs
View our Certificate of Conformance

T10P Lighting System

	Item	Description
1a.	DCLT-1A	Leg Cap
* 1.	D-1	Leg
2.	D-2	Top/Bottom Channel
3.	DTG-2	End Panel
* 4.	D-4AB	U-Bolts w/ nuts & washers
5.	D-4ABC	Access Door (handle on power side)
6.	215/220/230/232	1/4” Hardware
7.	394	1/4” x 3/4” Hex Head
8.	D8P	Light Bar Channel (Vertical)
9.	D-15	48" x 48" legend panel
10.	6.6A/T10P	T10P Lamp
11.	400	T10P Socket
12.	420	Terminal Strip (2 block)
18.	2" Al Coupling	2" Pipe Coupling
* 19.	140A	Frangible Coupling-2600 ft/lbs
* 20.	2234G	Circular Floor Flange (Galv, 4-hole)
21.	CLT-19	Tether
22.	430	Cord & Plug
25.	480	Cable Clamp

**Mode 3 parts may be different.*
Please call for more information.

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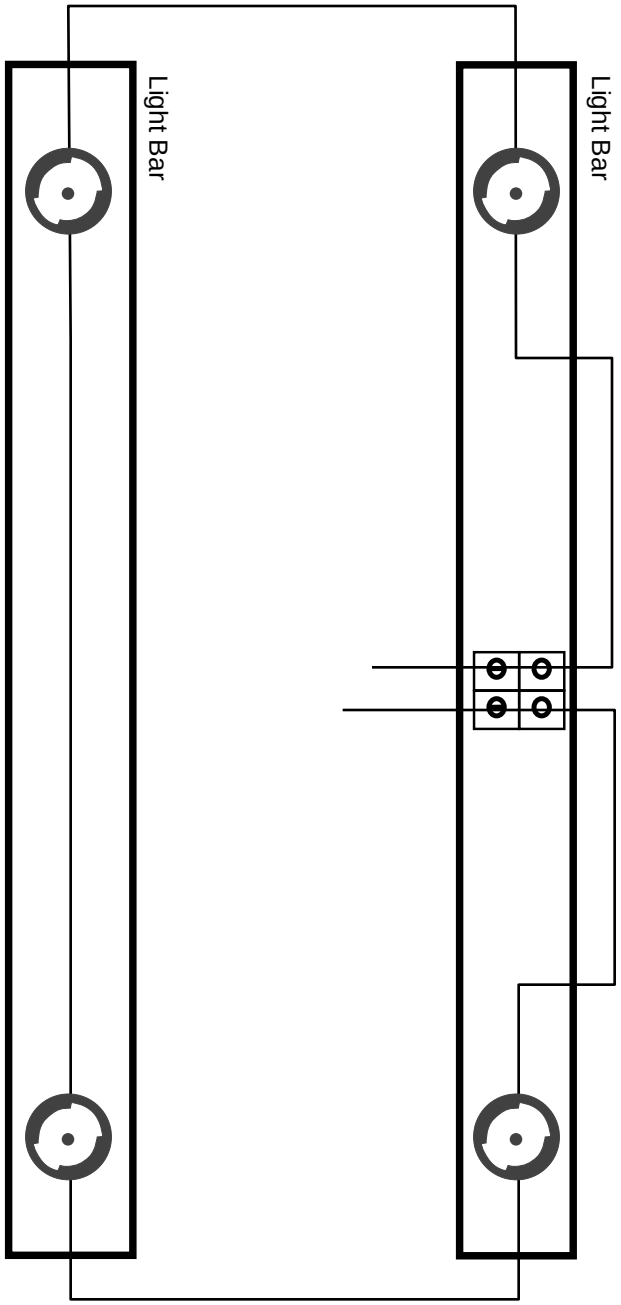
LUMACURVE®
AIRFIELD SIGNS

Wiring Diagram, Size 4 Distance Remaining Sign
T10P (Style 5)



T10P VA Load, Power Factor and Isolation Transformer

		EXM Quartz Lighting System		
		FAA Style 5 (Constant 5.5A)		
		45W/T10P		
Sign Size & Module Length	Lamps	Isol Xfmr	Max VA	Pwr Factr
Size 4, 1-mod	4	200W	127	0.99

STANDARD SIGNS, INC.
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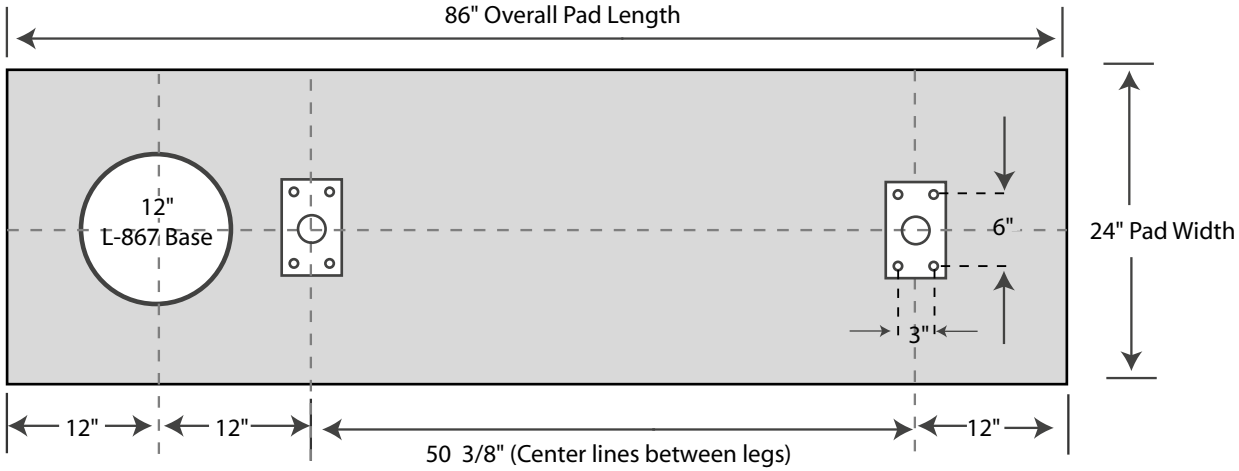
LUMACURVE®
AIRFIELD SIGNS

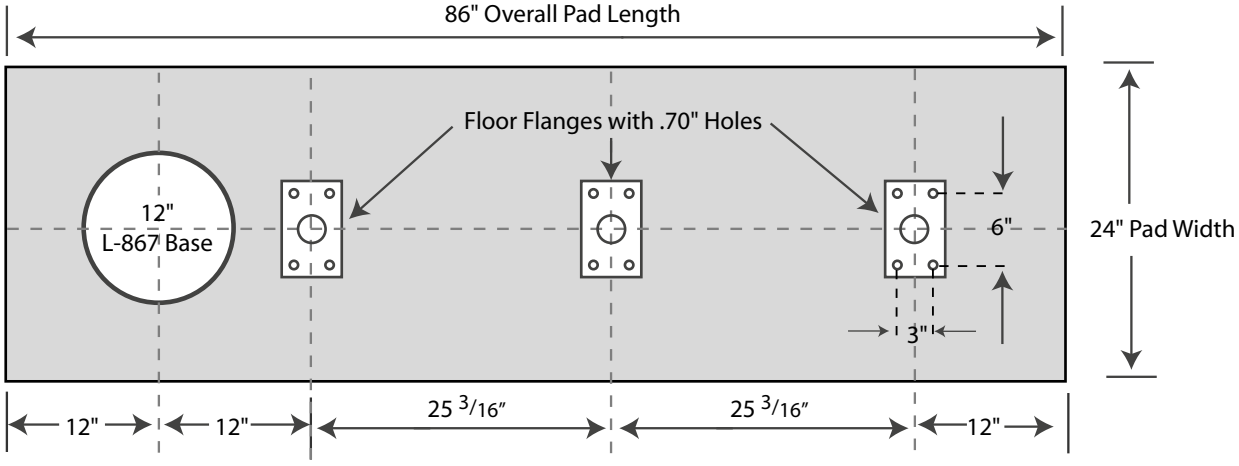
Pad Dimensions & Mounting Locations
Size 4 Distance Remaining Sign

MODE 2



Use 3/8" diameter anchor bolts for mounting to pad
When setting bolts, allow for approximately 1/4" flange thickness.

MODE 3



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

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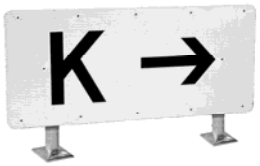
LUMACURVE® AIRFIELD SIGNS

Manufacturer of the First FAA Sign in 1955



UL Series Unlighted Signs

Section G: "Distance Markers & Unlighted Signs"

Standard Signs Inc, manufacturer of LUMACURVE internally lit Airfield Guidance Signs, also offers **UL SERIES UNLIGHTED SIGNS**. Manufactured in accordance with FAA Advisory Circular No. 150/5345-44, UL Series Unlighted Signs enhance airfield safety by clearly marking aircraft ground traffic routes without internal lighting. These signs are available in FAA sizes 1, 2, and 3. They are made in 48 inch and 72 inch lengths and can be either single or double faced.

ITS/ETL certified compliance with FAA specifications ensures the following benefits:

Proper legend layout, color uniformity & reflectivity ensure that signs are identifiable from up to 800 feet.

Rigorous temperature & solar radiation tests guarantee that signs will withstand harsh weather conditions.

Signs are frangible and can be manufactured to break over before 0.9 PSI (mode 1) or 1.2 PSI (mode 2), ensuring minimal to no damage to aircraft if signs are struck.

At the same time, signs are designed to withstand either 100 mph (mode 1) or 200 mph (mode 2) winds or jet blast and stand firm in the airfield environment.

Simple construction means easy maintenance:

Rigid, durable frames constructed of 1.5 inch aluminum angle are corrosion resistant.

"Billboard" style legend panels are made of aluminum sheeting and provide years of performance yet are easily replaced as legends change with airport expansion.

Signs knocked over are easily erected by replacing frangible couplings.

No lighting systems to maintain or lamps to replace.

Our sales staff will be happy to assist in determining signage requirements for legends needed on your airfield.

For further assistance, please call 800-258-1997.

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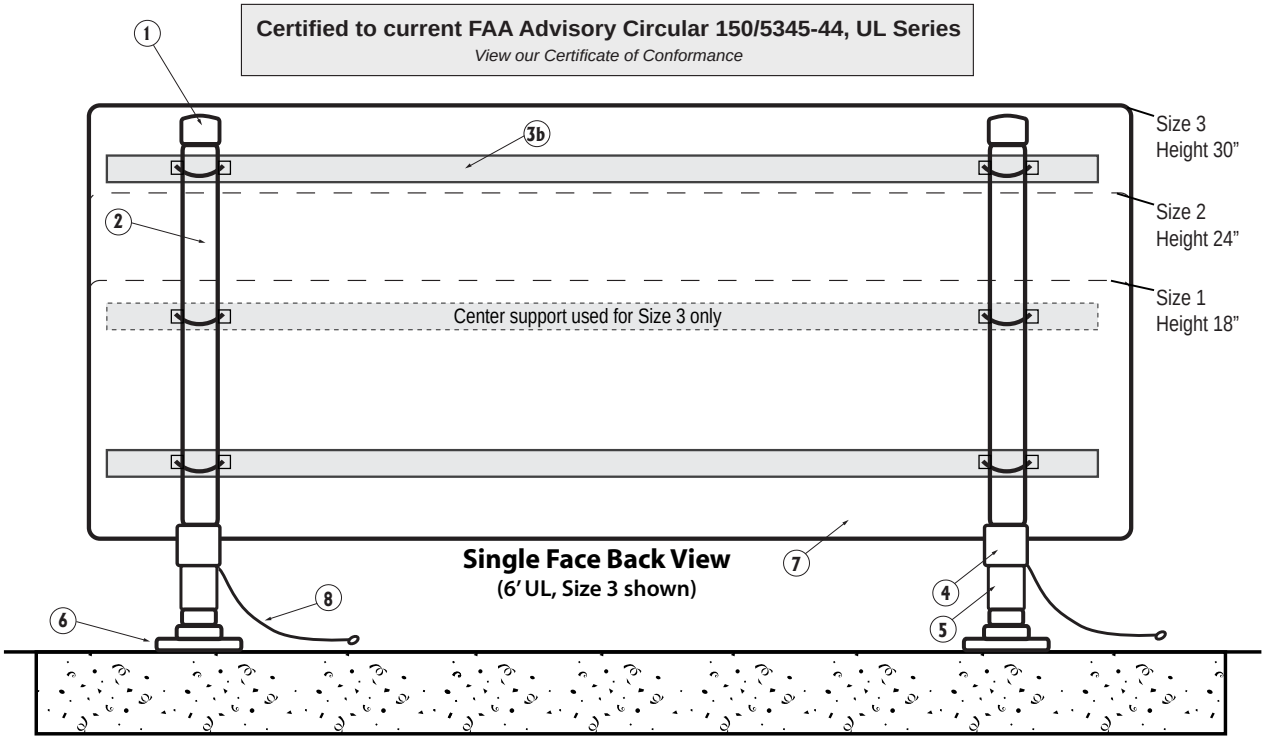
LUMACURVE PARTS LIST
Unlighted Guidance Sign

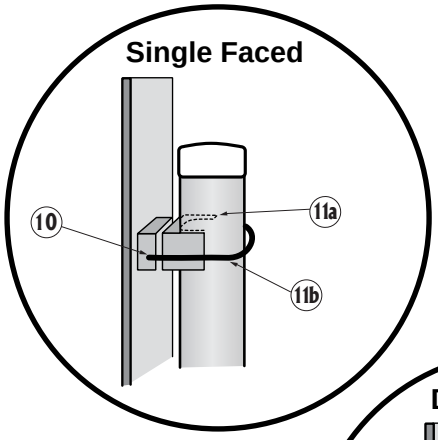
Certified to current FAA Advisory Circular 150/5345-44, UL Series
View our Certificate of Conformance



Single Face Back View
(6' UL, Size 3 shown)

Item		*Description*
1.	DCLT-1A	Leg Cap
2.	UL Column	See Chart A
3a.	RT44	44" UL Rectangular Tubing, 4' signs
3b.	RT68	68" UL Rectangular Tubing, 6' signs
4.	2" Aluminum Coupling	2" Aluminum Coupling
5.	140	Frangible Coupling
5a.	140B*	Frangible Coupling*
6.	15	Floor Flange
7.	Panel	See Chart B
8.	190 - 3/16"	Tether
9.	RTP	Tubing end plug (not shown)
10.	SN38	Serrated nut (hidden inside tube)
Single Face Signs Only		
	11a. SB214	Saddle Bracket
	11b. UB1	U-Bolt
Double Face Signs Only		
	12a. SB214S	Short Saddle Bracket
	12b. SB38	Straight Bolt

**Used on LUL-6' only.*



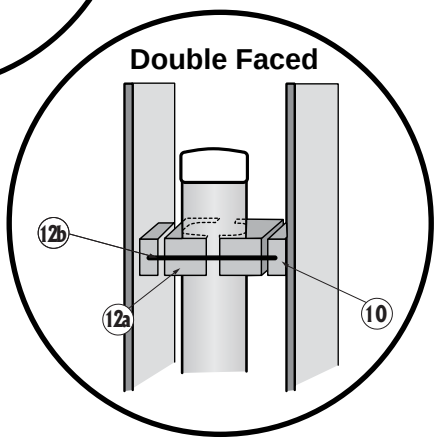


CHART A

UL Column:

Size 1 4ft SCH 40 length = 16.25"
Size 1 6ft SCH 40 length = 16.25"
Size 2 4ft SCH 40 length = 20.75"
Size 2 6ft SCH 40 length = 20.75"
Size 3 4ft SCH 40 length = 26.75"
Size 3 6ft SCH 80 length = 26.75"

CHART B

Panel Sizes	Item Description
SXL4-20	Size 1, 4' Panel,18" x 48"
SXL6-20	Size 1, 6' Panel,18" x 72"
MXL4-20	Size 2, 4' Panel, 24" x 48"
MXL6-20	Size 2, 6' Panel, 24" x 72"
LXL4-20	Size 3, 4' Panel, 30" x 48"
LXL6-20	Size 3, 6' Panel, 30" x 72"

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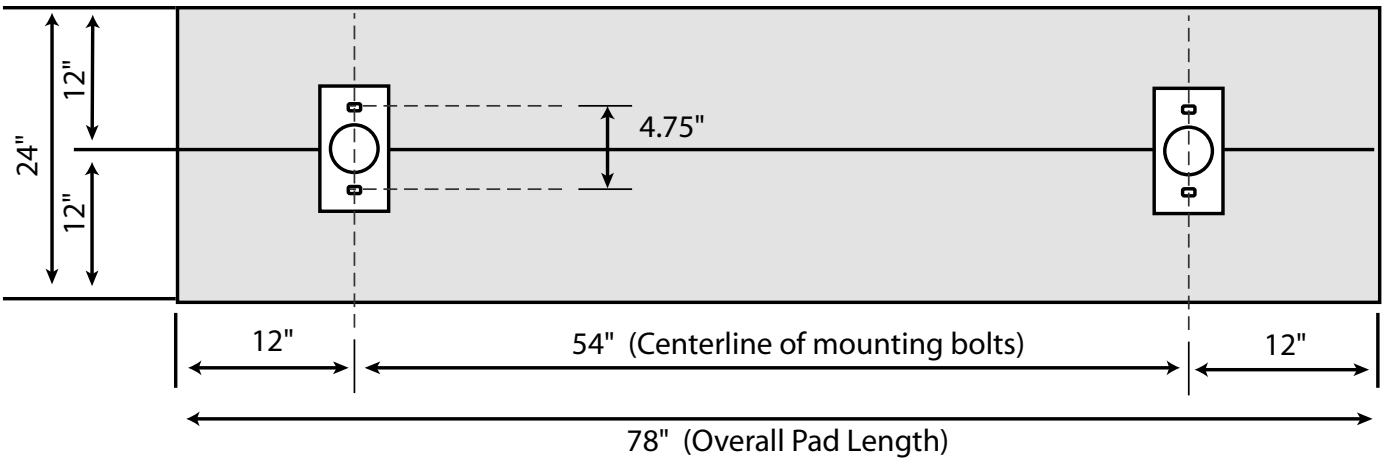
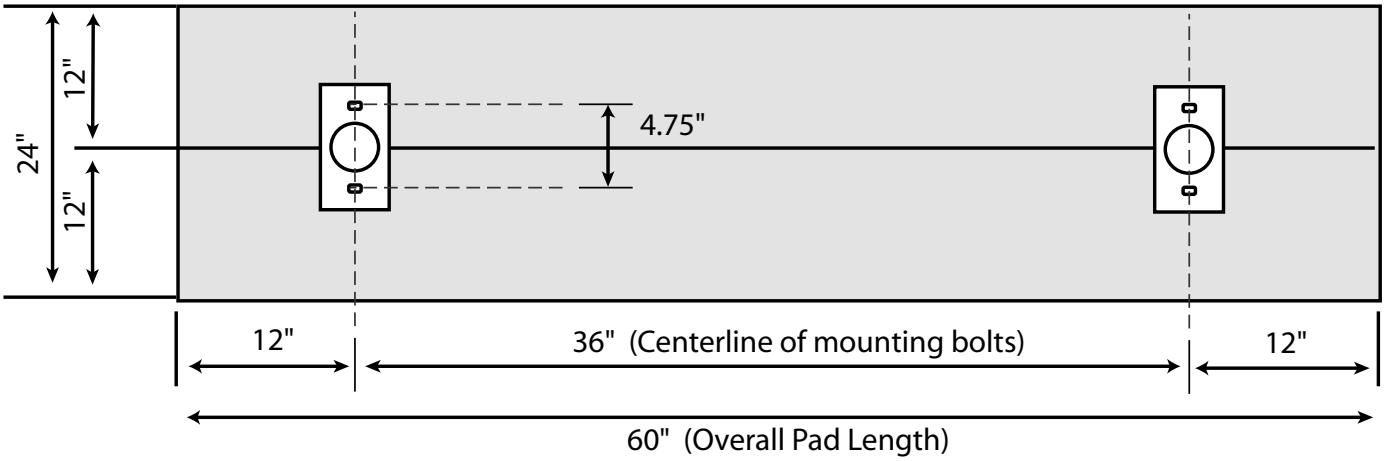
LUMACURVE®
AIRFIELD SIGNS

Pad Dimensions & Mounting Locations
Unlighted Sign

6' UL Pad Dimensions



4' UL Pad Dimensions



Above references recommended cement pad dimensions and mounting bolt locations for Lumacurve signs
Recommended anchor bolts: 3/8" x 5" with LOCK washers

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