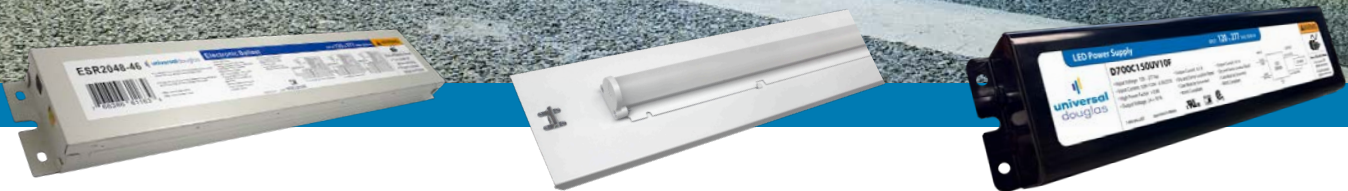


RETROFIT & DRIVERS

Applications

- Industrial
- Parking
- Signs
- Office
- Retail



SIGN & OUTDOOR SELECTOR GUIDE

Sign, Outdoor & Retrofit Products

A complete range of solutions for nearly every application

Universal makes it easy to upgrade your Sign and Outdoor Luminaires.
Universal's SOLUTIONS put you in CONTROL!

Universal Lighting Technologies has been on the cutting edge of high efficiency lighting design. For over 70 years the company has continued to push the industry towards increasingly higher standards of energy efficiency for LED systems and global systems.

The push for increased efficiency has contributed to an emerging line of LED sign products. This rapid growth is supported by the reliability of in-house LED design and decades of experience in ballast and driver North American manufacturing. When you think "Universal", you can be sure of reliability, exceptionally high-quality standards, precision engineering, and rugged reliability for both indoor and outdoor illumination needs. We look forward to meeting your sign and outdoor illumination needs with the following innovative solutions.

CONTENTS

PAGE 3	LED DRIVER & CHAIN SYSTEMS
PAGE 4	LED SIGN STICKS
PAGE 5	LED VAPOR TIGHT
PAGE 6	LED VAPOR TIGHT SLIM
PAGE 7	LED RETROFIT ASSEMBLY
PAGE 8	LED RETROFIT ASSEMBLY WITH CONTROLS
PAGE 9	LED 150W CONSTANT CURRENT DRIVERS
PAGE 10	LED 180W CONSTANT CURRENT DRIVERS
PAGE 11	ELECTRONIC SIGN BALLASTS (RAPID START - SERIES WIRED)
PAGE 12	ELECTRONIC SIGN BALLASTS (INSTANT START - PARALLEL WIRED)
PAGE 13	HID REPLACEMENT KITS (CORE & COIL)
PAGE 14	TECHNICAL & APPLICATION DATA

LED DRIVER & CHAIN SYSTEMS

Constant Voltage Drivers

- 12V & 24V
- Class 2 Output
- High efficiency operation
- Over voltage, current & short circuit protection
- Wide operation temperature range
- RoHS compliant
- Dry, damp, and wet location options
- 5 year warranty

Catalog Number	L12V60UNV-A	L12V60UNV-Q	L12V60UNV-R	L24V100UNV-A	L24V100UNV-Q
Input Voltage	120-277 VAC	120-277 VAC	120-277 VAC	120-277 VAC	120-277 VAC
Output Voltage	12VDC	12VDC	12VDC	24VDC	24VDC
Output Current Range	5.0 A Max	5.0 A Max	5.0 A Max	4.0 A Max	4.0 A Max
Output Power Max	60W	60W	60W	96W	96W
UL Rating	Dry & Damp Location	Dry, Damp, & Wet Location	Dry & Damp Location	Dry & Damp Location	Dry, Damp, & Wet Location
Operating Temperature	-40°F to 134°F (-40°C to 57°C)	-40°F to 131°F (-40°C to 55°C)	-40°F to 131°F (-40°C to 55°C)	-40°F to 122°F (-40°C to 50°C)	-40°F to 149°F (-40°C to 65°C)
Dimensions (L x W x H)	9.5" x 1.7" x 1.18"	12.13" x 2.1" x 1.5"	5.5" x 1.7" x 1.18"	9.5" x 1.7" x 1.18"	12.13" x 2.1" x 1.5"
IP Rating	N/A	IP67	N/A	N/A	IP67



Universal Douglas Chain Modules

Universal Douglas LED Chain Modules deliver high lumens, consistent color, and superior module fastening. From under counter displays to coves and backlit signage, the applications are as vast as your imagination.

- **Simple and flexible design**
 - Cut chains to length between any module
 - Attach additional chains in series or parallel
- **High efficiency LED technology maximizes system performance**
 - Up to 50' of chain (100 modules) per 60W power supply
- **Excellent lumen maintenance**
 - L80 > 60,000 hours
 - 80% of initial lumens at 60,000 hours of use
- **High consistency of color and brightness**
 - Consistent color
 - Consistent performance from product to product
 - Available in Daylight White (6500K) and Warm White (3500K)
- **Superior for UL dry, damp, and wet locations**
 - Not recommended for full water exposure or submersion.
- **Superior dual method fastening design**
 - 3M VHB tape provides powerful, long lasting adhesion
 - Screw tabs on each module
- **Compatible LED Drivers:**
 - L12V60UNV-A
 - L12V60UNV6-A
 - L12V60UNV-Q
 - L12V60UNV-R
 - L12V120UNV-S
 - L12V180UNV-E

Catalog Number	LSI653933CU-EV1
Description	True White
Input Voltage	12V
Viewing Angle	165°
Color Temp	6500K
Lumens/ Ft	300
Power/ Ft	2
LEDs/ Module	3
Module/ Ft	1
Module Length	2.85"
Module Width	0.6"
Module Height	0.3"
Operating Temperature	-30°C to 50°C
Carton Quantity	25 feet/50 Modules
Warranty (yr)	5 year



Universal can do design layouts to assist you with where to position LED Chains. Layouts can be submitted via website access.

LED SIGNS STICKS



SIGN STICKS | **UNIFORM**

The Universal Douglas Sign Sticks offers an easy to install LED replacement solution for signs currently using T12HO or T8HO lamps.



Part Number	Length	Power (W)	Lumens	CRI	CCT
Single Sided					
EVSS12-65-24	24"	3.9W	600lm	75	6500
EVSS12-65-36	36"	5.8W	900lm	75	6500
EVSS12-65-48	48"	7.8W	1200lm	75	6500
EVSS12-65-60	60"	9.7W	1500lm	75	6500
EVSS12-65-72	72"	11.6W	1800lm	75	6500
EVSS12-65-84	84"	13.6W	2100lm	75	6500
EVSS12-65-96	96"	15.5W	2400lm	75	6500
EVSS12-65-108	108"	17.5W	2700lm	75	6500
EVSS12-65-120	120"	19.4W	3000lm	75	6500
Double Sided					
EVDS24-65-24	24"	7.8W	1200lm	75	6500
EVDS24-65-36	36"	11.6W	4800lm	75	6500
EVDS24-65-48	48"	15.5W	2400lm	75	6500
EVDS24-65-60	60"	19.4W	3000lm	75	6500
EVDS24-65-72	72"	23.3W	3600lm	75	6500
EVDS24-65-84	84"	27.2W	4200lm	75	6500
EVDS24-65-96	96"	31W	4800lm	75	6500
EVDS24-65-108	108"	35W	5400lm	75	6500
EVDS24-65-120	120"	38.8W	6000lm	75	6500

Features:

Easy Installation

- 24V Constant voltage product allows for simple class II wiring.
- Run up to 32' of single sided (16' double sided) sticks on one 100W power supply.
- 90° Adjustable RDC style endcaps for correct lamp orientations.
- Ideal for Vertical or Horizontal installation.
- Utilizes the same spacing as standard fluorescent systems.
- Designed for daisy-chain or parallel wiring.

Superior Performance

- Up to 60% more efficient than fluorescent systems at over 129 lm/W.
- 340lm/ft delivered to the sign face for bright and even illumination.
- Mounts as close as 5" from the acrylic face.
- Rated for more than 140,000 hours of usable life at L70.
- 6500 CCT.
- 5 year warranty.



LED VAPOR TIGHT



VAPOR TIGHT | DURABLE

- Durable 4' and 8' LED vapor tight housing
- Equipped for 0-10V dimming
- IP65 rated for indoor or covered outdoor use
- NSF certified for food equipment
- Universal (120-277VAC) or 347VAC Options available
- Optional Stainless Steel latches
- 140K+ hour lumen maintenance at L70
- 5 year warranty



Part Number	Lumens	Watts	LPW	CRI	CCT	Voltage
VTL4: 4 Foot Enclosed & Gasketed Vapor Tight Luminaire						
VTL4-33L840-U	5,031	38.9	129	82	4000K	120-277VAC
VTL4-40L840-U	5,975	51.9	115	82	4000K	120-277VAC
VTL4-5K840-U	6,534	49.9	131	82	4000K	120-277VAC
VTL4-6K840-U	7,914	59.7	133	82	4000K	120-277VAC
VTL4-8K840-U	10,332	84.1	123	82	4000K	120-277VAC
VTL4-10L840-U	12,886	107.2	120	82	4000K	120-277VAC
VTL8: 8 Foot Enclosed & Gasketed Vapor Tight Luminaire						
VTL8-7K840-U	10,260	78.8	130	82	4000K	120-277VAC
VTL8-8K840-U	12,854	103.9	124	82	4000K	120-277VAC
VTL8-10K840-U	14,073	100.1	141	82	4000K	120-277VAC
VTL8-12K840-U	16,861	120.9	139	82	4000K	120-277VAC
VTL8-16K840-U	23,052	171.3	135	82	4000K	120-277VAC
VTL8-20L840-U	27,040	217.5	124	82	4000K	120-277VAC

Also available at 3500K & 5000K CCT and with a 347VAC voltage rating



For a list of DesignLights Consortium® QPL listed products please visit www.designlights.org



LED VAPOR TIGHT SLIM



VAPOR TIGHT | **DURABLE**

- Durable 4' LED vapor tight housing
- Equipped for 0-10V dimming
- IP65 rated for indoor or covered outdoor use
- NSF certified for food equipment
- Universal (120-277VAC) Options available
- No Mercury. Save on costly lamp recycling and/or hazardous waste disposal.
- 54K+ hour lumen maintenance at L85
- 5 year warranty



Part Number	Lumens	Watts	LPW	CRI	CCT	Voltage
VTLS4-LL850-U-33L	3,105	23.6	132	82	5000K	120-277VAC
VTLS4-ML850-U-44L	4,347	32.6	134	82	5000K	120-277VAC
VTLS4-ML850-U-55L	5,444	41.8	130	82	5000K	120-277VAC
VTLS4-ML850-U-70L	6,837	54.4	126	82	5000K	120-277VAC

Also available at 3500K & 5000K CCT



For a list of DesignLights Consortium® QPL listed products please visit www.designlights.org

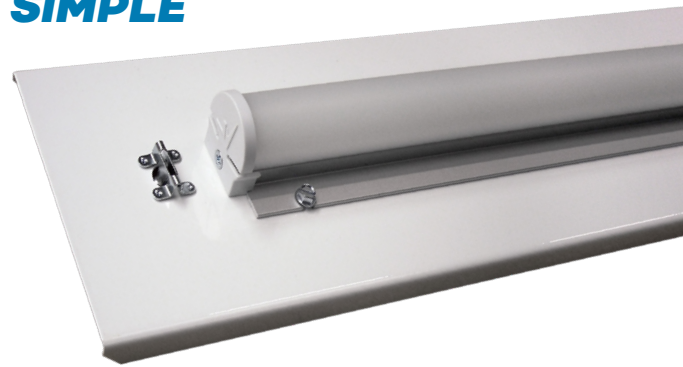


LED RETROFIT ASSEMBLY



LED RETROFIT ASSEMBLY | SIMPLE

- (1) or (2) LED lensed modules pre-mounted
- (1) LED driver (0-10V dimming) pre-mounted
- (1) or (2) 4' strip fixture panels
- Wiring, mounting hardware, installation instructions
- 23 gauge steel panels
- Compatible with multiple strip fixture manufacturers
- Light bars are rated for damp installations



Part Number*	Lamps/Kit	Panel Width	Lamp Length	Power (W)	Nominal Lumens	CRI	CCT (K)	Input Voltage
LRA4P14-HL8xx-U-70LC	1	4.5"	4ft	53	7000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P14-HL8xx-U-60LC	1	4.5"	4ft	44	6000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P14-ML8xx-U-42LC	1	4.5"	4ft	34	4200	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P14-ML8xx-U-30LC	1	4.5"	4ft	24	3000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P14-HL8xx-U-70LC	1	5.5"	4ft	53	7000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P14-HL8xx-U-60LC	1	5.5"	4ft	44	6000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-HL8xx-U-12KC	2	4.5"	8ft	85	11500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-HL8xx-U-10KC	2	4.5"	8ft	71	10000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-HL8xx-U-85LC	2	4.5"	8ft	60	8500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-HL8xx-U-70LC	2	4.5"	8ft	48	7000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-ML8xx-U-65LC	2	4.5"	8ft	48	6400	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-ML8xx-U-50LC	2	4.5"	8ft	38	5100	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4P28-LL8xx-U-40LC	2	4.5"	8ft	28	4100	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P28-HL8xx-U-12KC	2	5.5"	8ft	85	11500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P28-HL8xx-U-10KC	2	5.5"	8ft	71	10000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P28-HL8xx-U-85LC	2	5.5"	8ft	60	8500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P28-HL8xx-U-70LC	2	5.5"	8ft	48	7000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P28-ML8xx-U-50LC	2	5.5"	8ft	38	5100	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P28-LL8xx-U-40LC	2	5.5"	8ft	28.2	4100	82	35/3500K, 40/4000K, 50/5000K	120-277VAC

*xx= CCT (35/40/50)



For a list of DesignLights Consortium® QPL listed products please visit www.designlights.org



LED RETROFIT ASSEMBLY WITH CONTROLS



LED RETROFIT ASSEMBLY | SIMPLE

- Retrofits 4ft or 8ft fluorescent strip fixtures to LED
- LED system efficacies exceeding 115 LPW
- Universal mounting compatible with most strip manufacturers
- RoHS Compliant, contains no lead or mercury
- No redesign or revised layout needed
- Available as 120-277VAC
- Equipped with 0-10V dimmable LED driver to 1%



Part Number*	Lamps/Kit	Panel Width	Lamp Length	Power (W)	Nominal Lumens	CRI	CCT (K)	Input Voltage
LRA4C14-HL8xx-U-70LC	1	4.5"	4ft	54	6800	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4C14-ML8xx-U-42LC	1	4.5"	4ft	34	4200	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5P14-HL8xx-U-70LC	1	5.5"	4ft	53	7000	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5C14-ML8xx-U-42LC	1	5.5"	4ft	34	4200	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4C28-HL8xx-U-12KC	2	4.5"	8ft	85	11500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4C28-HL8xx-U-85LC	2	4.5"	8ft	60	8500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA4C28-ML8xx-U-65LC	2	4.5"	8ft	48	6400	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5C28-HL8xx-U-12KC	2	5.5"	8ft	85	11500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5C28-HL8xx-U-85LC	2	5.5"	8ft	60	8500	82	35/3500K, 40/4000K, 50/5000K	120-277VAC
LRA5C28-ML8xx-U-65LC	2	5.5"	8ft	48	6400	82	35/3500K, 40/4000K, 50/5000K	120-277VAC

*xx= CCT (35/40/50)



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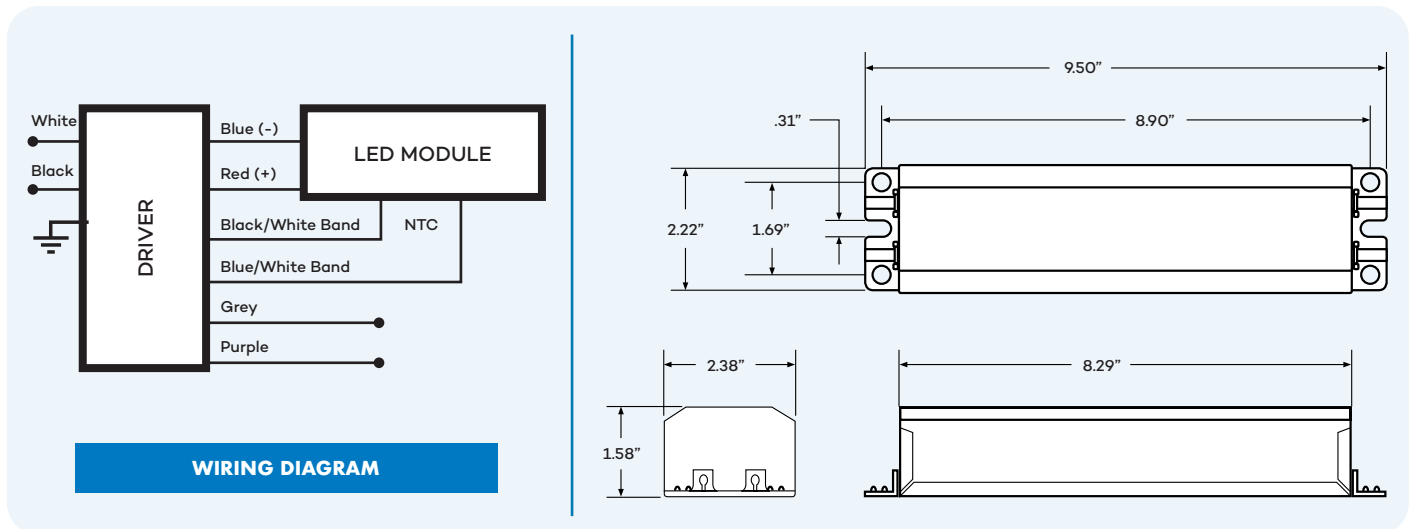


150W CONSTANT CURRENT DRIVERS

- Universal Voltage (120-277V) and High Range Voltage (347-480V) models
- Enhanced transient protection (6kV)
- 0-10V Dimming from 100% to 10%
- Reduced EMI allow multiple drivers in a single fixture.
- Thermal Foldback Control connects directly to NTC to sense module temperature
- Overload, Short Circuit, and Internal Thermal protection
- UL Dry and Damp Location Rated, Type HL



Part Number	Current (mA)	Max Power (W)	Voltage	Input Voltage	Control	Case Drawing
High-Wattage Drivers						
D530C150UVT-F	530	150	99V-285V	120-277	0-10V, Thermal NTC	F
D530C150HVT-F	530	150	99V-285V	347-480	0-10V, Thermal NTC	F
D700C150UVT-F	700	150	75V-214V	120-277	0-10V, Thermal NTC	F
D700C150HVT-F	700	150	75V-214V	347-480	0-10V, Thermal NTC	F
D10CC150UVT-F	1050	150	50V-143V	120-277	0-10V, Thermal NTC	F
D10CC150HVT-F	1050	150	50V-143V	347-480	0-10V, Thermal NTC	F
D14CC150UVT-F	1400	150	38V-107V	120-277	0-10V, Thermal NTC	F
D14CC150HVT-F	1400	150	38V-107V	347-480	0-10V, Thermal NTC	F

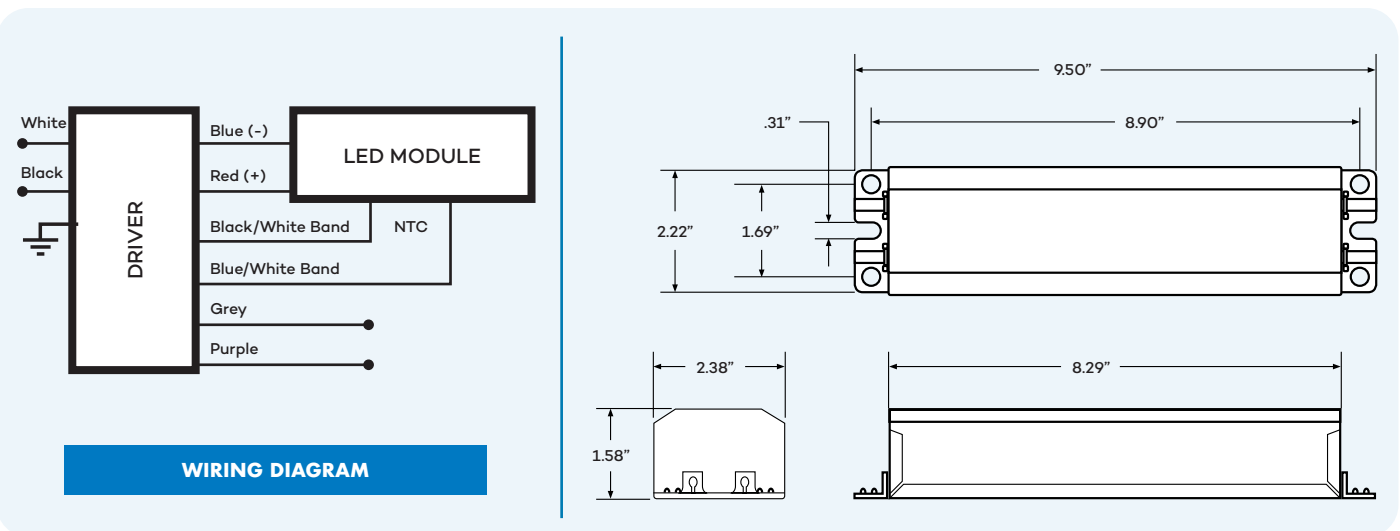


180W CONSTANT CURRENT DRIVERS

- < 0.5 W Standby Power
- 2.4W Auxiliary Output Power
- Wireless Programming through RFID
- Programmable Thermal Overload without an external NTC
- Advanced Programming Features
- Full Output Power from 640mA to 2000mA
- Class P / UL Listed



Part Number	Current (mA)	Max Power (W)	Voltage	Input Voltage	Control	Case Drawing
High-Wattage Drivers						
D950C180UNVPWX12-F	950	180	114V-285V	120-277	0-10V, Thermal NTC	F
D950C180HRVPWX12-F	950	180	114V-285V	347-480	0-10V, Thermal NTC	F
D14CC180UNVPWX12-F	1400	180	80V-192V	120-277	0-10V, Thermal NTC	F
D14CC180HRVPWX12-F	1400	180	80V-192V	347-480	0-10V, Thermal NTC	F
D20CC180UNVPWX12-F	2000	180	50V-130V	120-277	0-10V, Thermal NTC	F
D20CC180HRVPWX12-F	2000	180	50V-130V	347-480	0-10V, Thermal NTC	F



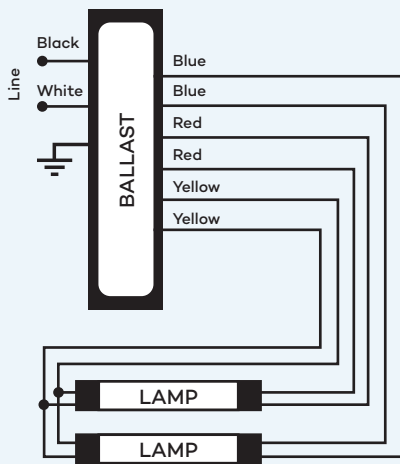
ELECTRONIC SIGN BALLASTS (RAPID START - SERIES WIRED)

In 2014 the Department of Energy banned the production of magnetic sign ballasts for use in the United States. The ESR Series Sign Ballast is a Rapid Start electronic sign ballast designed to be a direct replacement for existing magnetic sign ballasts. For use in series-wired applications, the ESR Series ballasts provides superior lamp life even in cold temperature environments.

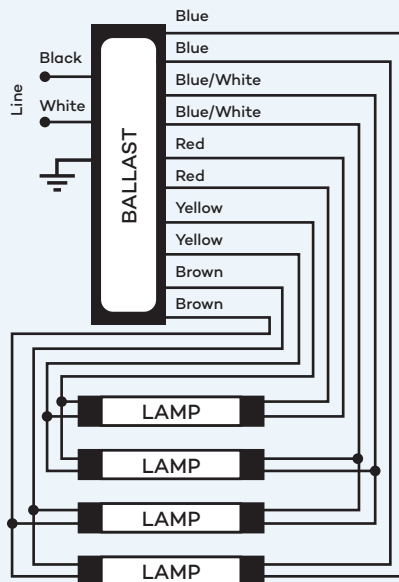
- Drop-In replacement for magnetic sign ballasts
(No rewiring required)
- Universal Voltage (120V to 277V)
- Series Rapid Start operation
- UL and CSA listed
- UL HL listing for hazardous locations
- For T8HO & T12HO lamps
- 4 year warranty



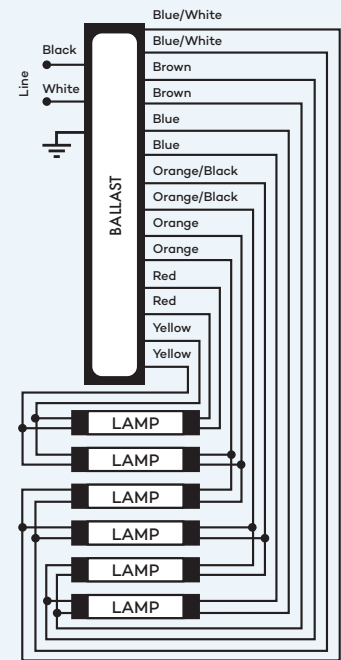
Catalog Number	Total Lamp Footage	Start Temp	Input Volts	Input Watts (max) (T12HO/T8HO)	Max Line Current (T12HO/T8HO)	Case Dimensions (Inches)			Weight (lbs.)	
						Case Length	Height	Width		
T12HO up to 8' long or T8HO up to 6' in length: 120 - 277Volts - 50/60 Hz										
ESR1232-24001I	12' min.	T12HO: 36' max 2, 3, or 4 Lamps	-20°F (-29°C)	120	282/256	2.35/2.13	14.3	1.2	3.15	3.75
		T8HO: 24' max 2, 3, or 4 lamps		277	275/252	0.99/0.90				
ESR416-12001I	4' min.	T12HO: 16' max 1 or 2 lamps	-20°F (-29°C)	120	142/129	1.18/1.07	11.75	1.2	1.7	2
		T8HO: 12' max 1 or 2 lamps		277	139/128	0.5/0.46				
ESR2048-46001I	20' min.	T12HO: 48' max 4, 5, or 6 lamps	-20°F (-29°C)	120	425/380	3.50/3.16	16.7	1.2	3.15	4.85
		T8HO: 36' max 4, 5, or 6 lamps		277	415/372	1.50/1.34				



**WIRING DIAGRAM
FOR 2 LAMP OPERATION
ESR416**



**WIRING DIAGRAM
FOR 4 LAMP OPERATION
ESR1232**



**WIRING DIAGRAM
FOR 6 LAMP OPERATION
ESR2048**

ELECTRONIC SIGN BALLASTS (INSTANT START - PARALLEL WIRED)

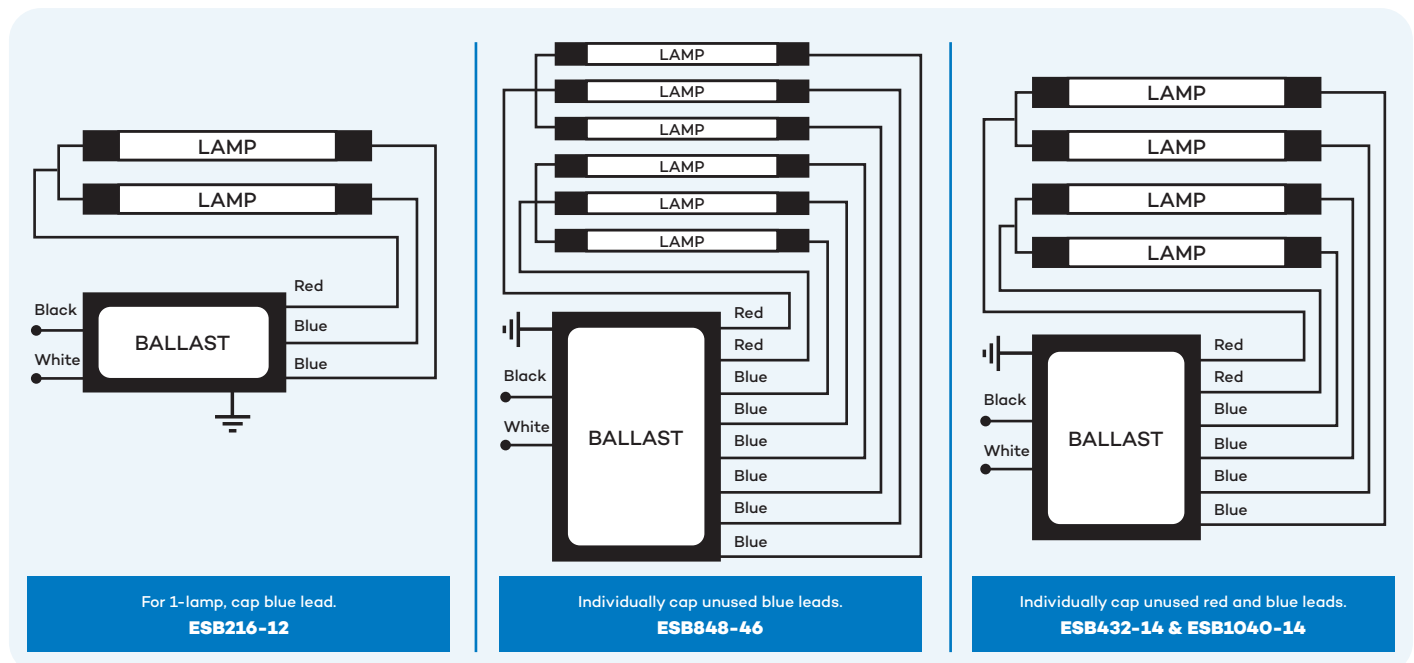
The ESB Series, Instant Start sign ballasts offer maximum energy efficiency for signs illuminated by fluorescent T8HO & T12HO lamps. Additionally, the universal input voltage ESB Series sign ballast uses parallel operation to maintain lamp illumination, even when one lamp fails.

- Maximum energy efficiency
- Fewer connections – easier to wire
- Universal Voltage (120V to 277V)
- Parallel Instant Start operation
- UL and CSA listed
- UL HL listing for hazardous locations
- For T8HO & T12HO Lamps
- 4 year warranty



Catalog Number	Total Lamp Footage		Min Starting Temp	Input Volts	Max Input Watts (T12HO/T8HO)	Max Line Current (T12HO/T8HO)	Case Dimensions (inches)			Weight (lbs.)
							Length	Height	Width	
T12HO up to 8' long or T8HO up to 6' long: 120 - 277 Volts - 50/60 Hz										
ESB216-12	2' min.	T12HO: 16' max, 1-2 lamps	-20°F (-29°C)	120	140/128	1.17/1.07	9.5	1.2	1.7	1.75
	4' min.	T8HO: 12' max, 1-2 lamps		277	137/124	0.49/0.45				
ESB432-14	4' min.	T12HO: 32' max, 1-4 lamps	-20°F (-29°C)	120	282/258	2.35/2.15	14.3	1.2	3.15	3.75
	4' min.	T8HO: 24' max, 1-4 lamps		277	275/252	0.99/0.91				
ESB848-46	8' min.	T12HO: 48' max, 4-6 lamps	-20°F (-29°C)	120	415/380	3.46/3.17	14.3	1.2	3.15	3.75
	16' min.	T8HO: 36' max, 4-6 lamps		277	410/373	1.48/1.35				
T12HO up to 10' long or T8HO up to 8' long: 120 - 277 Volts - 50/60 Hz										
ESB1040-14	10' min.	T12HO: 40' max, 1-4 lamps	-20°F (-29°C)	120	341/321	2.85/2.69	14.3	1.2	3.15	3.75
	8' min.	T8HO: 32' max, 1-4 lamps		277	331/313	1.25/1.19				

*See specification sheets for details on multiple lamp applications



HID REPLACEMENT KITS (CORE & COIL)

- High Pressure Sodium, Metal Halide, and Pulse Start Metal Halide Ballasts
- Wide range of lamp wattages
- All input voltages available including 5 taps in one ballast (120/208/240/277/480V)
- High efficiency and superior color rendering
- Includes adjustable brackets, capacitor, and starter (if required)
- Color-coded leads to save time and reduce wiring errors
- Pulse Start features cold weather starting benefits
- Cold weather reliable starting benefits down to -40°F (-40°C)



Most popular HID products are listed below. Need a different wattage or different input voltage? Call 1-800-225-5278

Lamp Type	Lamp Watts	ANSI Code	Input Volts	Catalog Number	Circuit Type	Input Power (Watts)	Max. Input Current
High Pressure Sodium	250W	S50	120/208/240/277/480	S250ML5AC4O500K	CWA	300	2.55/1.45/1.30/1.10/0.65
	400W	S51	120/208/240/277/480	S400ML5AC4M500K	CWA	465	4.00/2.30/2.00/1.70/1.10
	400W	S51	120/208/240/277/480	S400ML5AC5M500K	CWA	468	4.40/2.62/2.21/1.90/1.05
	1000W	S52	120/208/240/277/480	S1000ML5AC5M500K	CWA	1048	9.10/5.40/4.60/4.10/2.45
Metal Halide	175W	M57 or M107	120/208/240/277/480	M175ML5AC3M500K	CWA	208/183	1.90/1.10/0.95/0.85/0.50
	250W	M58	120/208/277/480	M250ML5AC3M500K	CWA	280	2.50/1.50/1.25/1.10/0.65
	250W	M58	120/208/240/277/480	M250ML5AC4M500K	CWA	282	2.42/1.40/1.20/1.00/0.60
	400W	M59	120/208/240/277/480	M400ML5AC4M500K	CWA	458	4.00/2.30/2.00/1.70/1.00
	1000W	M47	120/208/240/277/480	M1000ML5AC5M500K	CWA	1060	8.80/5.20/4.40/3.90/2.30
	1500W	M48	120/208/240/277	M1500MLTAC5M500K	CWA	1610	14.00/8.00/7.00/6.00
Pulse Start Metal Halide	250W	M138 or M153	120/208/240/277/480	P250ML5AC4M500K	CWA	285	2.45/1.42/1.22/1.05/0.62
	320W	M132 or M154	120/208/240/277/480	P320ML5AC4M500K	CWA	405	4.00/2.40/2.10/1.85/1.06
	400W	M135 or M155	120/208/240/277/480	P400ML5AC4L500K	CWA	454	3.90/2.25/1.90/1.65/0.95
	750W	M149	120/208/240/277/480	P750ML5AC5M500K	CWA	820	6.95/4.00/3.50/3.00/1.75

Universal offers a wide variety of lighting products for all lighting applications. Consider the Universal Douglas Wall Pack for HID upgrades.

Heat

Ballasts generate heat during normal operation. By design, fluorescent ballasts should operate so that their maximum hot-spot case temperature does not exceed 80°C (176°F). Operating at higher temperatures will shorten ballast life. The temperature the ballast reaches depends on the temperature of the area surrounding it— plus the heat-conducting surface touching the ballast. Ballasts should be installed in a manner that avoids future overheating. To maintain normal ballast temperature, you should:

1. Mount the ballast against a flat surface of heavy gauge metal such as the structural part of the sign.
2. Keep the ballast as far away as possible from other ballasts, lamps or reflective surfaces. (Lamps generate approximately three-fourths of the heat in a plastic sign.) The ends of the lamps are the hottest part, so you should mount the ballast as far away from the ends as possible.
3. Paint the inside of the sign with flat white paint.

Moisture Protection

1. Vent the sign as well as possible without allowing water to enter.
2. Ballasts should be mounted horizontally (except for weatherproof types). If the ballast must be mounted vertically, allow room for sufficient air circulation. Certain codes and standards may require lead wire protection on the leads as they exit the sign ballast. For these applications, a tee-pee cover can be used to protect the wires from mechanical damage. These tee-pee covers are available through electrical suppliers.

Grounding

The white lead of a 120V ballast must be connected to the neutral or ground side of the power supply. All metal parts of the sign, as well as the ballast case, must be grounded either through the conduit which holds the power supply or by direct connection with a grounding wire. An ungrounded sign is a potential hazard—and it can give misleading symptoms when looking for sign faults.

Proper Lamp Life and Starting

In rapid-start installations, proper filament heating is necessary for reliable starting and normal lamp life. To ensure that proper heating is taking place, the following steps are recommended:

1. Lamp leads should be kept as short as possible and with a minimum of splices.
2. All connections should be soldered.
3. Maintain proper alignment and spacing of lampholders to ensure good contact in the sockets.
4. Mount lamps within one inch of grounded metal. This is one lamp manufacturer's published requirement for reliable starting.

Flashing

Rapid-start lamps may be flashed without reduction in lamp life by using ballasts which are specifically designed for this operation. These ballasts are designed with slightly higher filament voltages than the conventional ballast to ensure satisfactory lamp life. Instant-start lamps cannot be flashed.

CAUTION: Use only one flasher contact per ballast.

Light Output vs. Temperature

The light output of a fluorescent lamp varies according to the mercury vapor pressure inside the lamp. This pressure is controlled by the coldest spot on the bulb wall. The ballast may start the lamp, but the light output can be very low if the bulb wall temperature is low. Several factors influence this, including ambient temperatures, wind, type of enclosure, etc. If maximum light output is critical, consult a lamp manufacturer for advice.

Lamp Starting Problems

Occasionally a field problem will arise involving improper lamp starting. The usual complaint is that the lamps start slowly (or not at all). Here are some of the causes:

1. Low line voltage
2. Improper sign grounding
3. Insufficient or no filament voltage
4. Insufficient or no open circuit voltage
5. Dirty lamps during high-humidity operating conditions
6. Lamps improperly inserted in the sockets

If lamp starting is a problem in your installation, check the sign grounding, filament voltage (3.4V - 3.9V), and open circuit voltage. If all are normal, the probable cause is dirty lamps. The lamps should be washed in clean water, drip-dried, and reinstalled. If this doesn't solve the problem, contact your nearest Universal Lighting Technologies representative for further assistance.

Short Lamp Life

If the lamp has not given proper length of service as specified by the lamp manufacturer, the following reasons for early failure should be considered:

1. Improper starting due to insufficient filament voltage
2. Frequent starting and short operating periods
3. Improper ballast
4. Improper voltage supply
5. Faulty wiring
6. Defective lamps
7. Lamps improperly inserted in sockets

Early lamp failure will be preceded by a dense blackening on either or both ends of the lamps. This blackening will extend three or four inches from the lamp base and should not be confused with a small dense spot, which is a mercury deposit that can occur any time during lamp life. Dense blackening due to early lamp failure should not be confused with the gray bands that sometimes appear toward the end of normal lamp life (about two inches from either end of the lamp).

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