

### TUNGSTEN HALOGEN AND INCANDESCENT LAMPS

- DANGER! Halogen lamps operate at extremely high temperatures that can cause serious physical injuries and property damage.
- Only use Halogen lamps in Halogen-approved fixtures. Fixtures should fully contain any parts of the Halogen lamp upon the event of a lamp burst.
- Do not use Halogen lamps in close proximity of paper, cloth or other combustible materials that can cause a fire hazard.
- Lamps are very fragile. Do not drop, crush, bend or shake them. Vibration or impact will cause filament breakage and short lamp life.
- Do not touch the Halogen bulb surface or inside reflectors with your bare hands. Oils from skin can lead to breakage or shorten the life of the lamp. Use clean gloves or lint-free cloth for installation and removal.
- Clean any dirt, oil, or lint away from the lamp with alcohol and a lint-free cloth or tissue. Any foreign particles or materials on the bulb surface can cause hot spots on the bulb and result in lamp failure.
- Never touch the lamp when it is on, or soon after it has been turned off, as it is hot and may cause serious burns.
- Do not look directly at the operating lamp for any period of time; this may cause serious eye injury.
- Always turn off the electrical power before inserting, removing, or cleaning the lamp.
- Affix the lamp securely in the socket. Improper installations will cause electrical arcing, overheating and short life to lamp and socket. Replace lamp holders and sockets when necessary.
- Keep the temperature of the Halogen lamp seal below 350° C.
- Keep the temperature of the Halogen bulb wall above 250° C.
- Keep the temperature of the Halogen lamp bulb wall below 800° C.
- Make sure lamps of specified wattage and voltage are only used in appropriately rated fixtures. Unspecified use will lead to short lamp life, breakage and overheating of fixture.
- Lamps should not be operated beyond the total rated voltage. Avoid the use of dimmers that may drive your lamp over its rated voltage.
- Operate the lamp only in the indicated burn position. Failure to do so will lead to overheating and shortened lamp life.
- Use an external fuse when required.
- Do not allow one lamp to directly expose another. This may lead to overheating and shortened lamp life.

### FLUORESCENT LAMPS

- Fluorescent lamps operate at high surface temperatures that can cause serious physical injuries. Turn power off and allow adequate time (approximately 10 minutes) for the lamp to cool before attempting replacement.
- In order to avoid the risk of electrical shock, make sure the power to the fixture is turned off when replacing a lamp.
- Lamps are very fragile. Do not drop, crush, bend or shake them. Fluorescent tubes may shatter with considerable force when broken.
- To ensure that the lamps remain in the sockets for the duration of the operation, make sure that the fixture's sockets are not worn prior to installation of the lamps. If the lamps are installed in worn sockets, the lamps could fall out of the fixture during operation.
- Never operate a lamp above or below its rated current voltage.
- Electrical connections should be clean and in good condition. Replace lamp holders and sockets when needed. Affix the lamp securely in the socket. Improper installations will cause electrical arcing, overheating and short life to the lamp and socket.
- Do not look directly at the operating lamp for any period of time; this may cause serious eye injury.
- Fluorescent lamp use is not recommended in extreme weather conditions. Excessive cold/warm temperatures dramatically affect starting, lamp life and lumen maintenance.
- There is a NEMA recognized industry issue where T2, T4 and T5 fluorescent and compact fluorescent lamps when operated on high frequency electronic ballasts may experience abnormal end-of-life phenomenon. This end-of-life failure can result in the bulb wall cracking near the base of the lamp, or the lamp overheating in the base location and possibly melting the base and/or the socket. NEMA recommends that if high frequency electronic ballasts are used that the ballast has an internal end-of-life protection circuit that will safely and reliably shut down the system in the rare event of an end-of-life failure as described above. For additional information please refer to NEMA papers on their website [www.nema.org](http://www.nema.org).

## FLUORESCENT LAMPS ( Continued)

- USHIO's Coilight lamps are suitable for indoor and outdoor use in non-severe temperature climates. Outdoor use of these lamps does require a weather-protected fixture.
- USHIO's Coilight lamps comply with part 18 of the FCC rules. These lamps may cause interference with AM radios, cordless phones and remote control devices. Interference may be caused after a brief 90-second lamp warm-up period. If interference continues, relocate the lamp away from the device or plug into a different outlet.

## METAL HALIDE & HIGH PRESSURE SODIUM DISCHARGE LAMPS

- **ANSI Type E = Enclosed Fixture Required**  
Lamps that are enclosed fixture rated should only be operated in an enclosed fixture that safely contains all lamp parts in the event of a lamp burst or rupture. These lamps operate at a high internal pressure and at high temperatures which can emit harmful ultraviolet light if the outer glass bulb is broken. A lamp may burst causing physical injury and property damage unless protective safety glass is used with the fixture. Use fixture that meets requirements per UL standard #1572.
- **ANSI Type O = Open Fixture Rated**  
Lamps that are open fixture rated are suitable for operation in open fixture designs. These types of lamps typically feature UV protective quartz and a secondary shroud surrounding the arc tube to prevent the scatter of glass in the event of a burst.
- Metal Halide discharge lamps can emit ultraviolet radiation that may be harmful to eyes and skin. Metal Halide discharge lamps that are not open fixture rated, should only be used in enclosed fixtures with ultraviolet absorbing filter glass. Do not operate these lamps if the ultraviolet absorbing filter glass is broken or not installed.
- Metal Halide and High Pressure Sodium discharge lamps should only be operated with the compatible ballast, rated fixture (open/closed, wattage), and socket. (See lamp specification page for ballast information.) PulseStrike™ pulse start Metal Halide lamps require a 4000 volt pulse rated socket. High Pressure Sodium lamps require a 4000 volt pulse rated socket.
- Only operate the lamp in its designated operating position. (See lamp specification page for lamp operation position)
- Metal Halide lamps should be turned off for a minimum of 15 minutes per week.
- Lamps should never be operated beyond their rated useful life. The risk of a lamp burst increases with lamp age, temperature, improper operation and improper handling. Replace the lamp at or before the end of its rated life. Group relamping is always recommended.
- Never bump, drop, apply excessive stress, or scratch the lamp. This could cause the lamp to burst! Do not operate any lamps with any traces of scratches, cracks, or physical damage.
- Never operate a lamp above or below its rated current or voltage. This may cause the lamp to leak or burst.
- Always turn off the electrical power before inserting, removing, or cleaning the lamp.
- Clean any dirt, oil, or lint away from the lamp with alcohol and a lint-free cloth or tissue. Dirt or other contaminants will affect light output and may cause the lamp to overheat and decrease lamp life.
- Electrical connections should be clean and in good condition. Replace lamp holders and sockets when needed. Affix the lamp securely in the socket. Improper installations will cause electrical arcing, overheating and short life to lamp and socket.
- Never touch the lamp when it is on, or soon after it has been turned off, as it is hot and will cause serious burns. Lamps should be allowed to cool for a minimum of ten (10) minutes after the lamp is turned off.
- Do not use lamp in close proximity of paper, cloth or other combustible material that can cause a fire hazard.
- Do not look directly at the operating lamp for any period of time; this may cause serious eye injury.

### **Hg** - CONTAINS MERCURY. Manage in Accord with Disposal Laws

**Metal Halide, Fluorescent and High Pressure Sodium discharge lamps contain Mercury.** USHIO realizes the importance of lamp recycling and we encourage all lamps to be properly disposed of in order to help preserve the environment and our Earth's precious natural resources. Please refer to your local environmental laws regarding disposal and recycling of Mercury containing lamps. To learn more about lamp recycling requirements in your area, you can contact your state environmental authorities or visit [www.lamprecycle.org](http://www.lamprecycle.org).

## LED SOLID STATE LAMPS

Please consider the following as to what is the proper use of the Synergy LED MR-16:

### FIXTURE & TRANSFORMER COMPATIBILITY

Three types of low-voltage power systems are used with traditional MR-16 lamps: Regulated DC, magnetic, and electronic. Please be aware of the following when selecting the appropriate transformer for use with Synergy LED MR-16.

- **REGULATED 12V DC:** The unit works best with regulated 12V DC power.
- **MAGNETIC (Standard iron core transformers):** The unit is compatible with all types of AC magnetic transformers used with 12V lighting.
- **ELECTRONIC:** The unit is not compatible with some electronic transformers due to its low power consumption of less than 5 watts. Most electronic transformers require a minimum load greater than 5 watts in order to function properly. This is especially true of lighting fixtures that have an integral transformer for each fixture. Accordingly, the Synergy LED MR-16 is not designed to work with these types of integral electronic AC transformers. Installing the Synergy LED MR-16 on an integral electronic transformer voids the warranty.

An electrician should confirm that the voltage on the line is 12 volts. Do not exceed 12.5 volts. The power consumption of the lamp on a circuit should not exceed the rated power consumption of the transformer. Failure to ensure this will void the warranty.

Please consider the following as to what is the proper use of the Pearl-Lux LED strings:

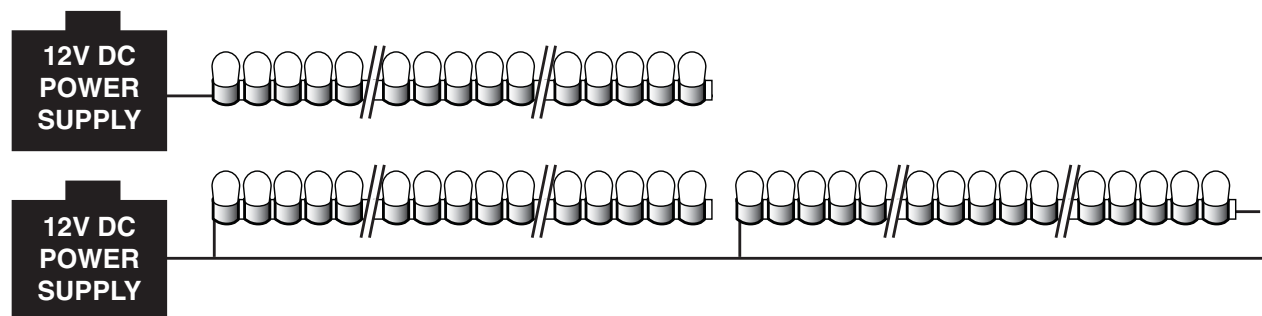
### INSTALLATION INFORMATION

#### Power Supply Information

- The LED strings contain no protection against short circuits, overload or overheating. Therefore, it is absolutely necessary to operate the strings on an electrically stable power supply with protection against the above mentioned safety risks.
- The Pearl-Lux™ LED strings require a 12V DC power supply. Each LED string has a maximum load rating of 6 watts.
- Never operate an LED load in excess of the capacity of the power supply.

#### Electrical Connection

- Pearl-Lux™ LED strings are equipped with polarized wires (red – positive, black – negative). To ensure correct electrical polarity, connect the low voltage load side of the power supply to the LED strings. When finished you may use silicone, shrink tubing, electrical tape or a wire nut to properly manage and protect the contact. Incorrect electrical polarity may destroy the strings.
- Up to 3 LED strings can be connected in series to a single power supply connection. For large installations you may connect multiple (3 string sets) in parallel.



The specifications in this publication supersede all previously published specifications and may be subject to change for design and specification improvement without prior notice.

**COLOR TEMPERATURE** – Each light source has a unique color temperature that sets the appearance for the environment in which it is used. The actual color of the light that is given off from the source is represented in Kelvin and referred to as Correlated Color Temperature (CCT). A lamp can have a warm, midrange or cool appearance depending on its color temperature. These different color temperatures can set a mood, create an environment, improve a person’s disposition, influence a person’s buying habits and has even been known to affect a person’s appetite.

“Warm” light sources have a lower color temperature, usually in the 2500K-3000K range. These lamps produce more light in the red/orange/yellow spectrum. As the color temperature of a lamp increases the lamps appearance becomes “cooler.” As the lamp’s color temperature increases so does the amount of light produced in the blue end of the spectrum.

USHIO America, Inc. offers lamps in a wide variety of color temperatures to suit the needs of most users and to create the best environment possible.

Color Temperature	Common Color Description	Typical Applications
2700K - 3400K	Warm; Warm White	Specialty Retailers, Restaurants, Hotel Lobbies, Residential
3500K	Neutral; Neutral White	Grocery Stores & Produce Markets, Retail Stores, Bank Lobbies
4100K	Cool; Cool White	Offices, Manufacturing, Schools, Hospitals
5000K - 6500K	Daylight; Daylight Plus; Full Spectrum	Printers, Paint Studios, Art Galleries, Car Dealerships

**COLOR RENDERING INDEX** – An object on display can take on many different appearances depending on the light source that is illuminating it. A lamp has the ability to render an object’s colors differently dependent upon the color rendering index properties of the lamp. Color Rendering Index (CRI) is measured on a scale from 0 to 100. The higher the CRI value, the more natural the colors will appear. Objects displayed under lamps with high CRI (usually 80+ CRI) look more appealing to the eye. This is why merchandise in retail stores is predominately lit using high CRI light sources such as the Halogen PAR lamps.

Applications	CRI Range	Color Rendering Properties
Art Galleries	90–100	Excellent
Banks	70–80	Good
Car Dealerships	70–80	Good
Classrooms	70–80	Good
Grocery Stores	70–90	Good – Very Good
Hospitals	70–90	Good – Very Good
Manufacturing Areas	70–80	Good
Offices	70–80	Good
Parking Lot Lighting	<60–70	Poor
Printing Companies	90–100	Excellent
Restaurants	80–90	Good – Very Good
Retail Stores	80–100	Very Good – Excellent
Roadway Lighting	<60–70	Poor
Security Lighting	70–80	Good
Sporting Arenas	70–80	Good
Warehouses	<60–70	Poor

## LAMP REFERENCE

**LONG LIFE** – Rising maintenance costs over the years has renewed an interest in lamp longevity. In one recent study it was said that 11% to the average customer's lighting dollar goes towards covering the maintenance expenses associated with lamp changes.

USHIO America, Inc. believes in extending lamp life whenever possible while minimizing or eliminating the tradeoffs commonly associated with long life lamps (i.e. reduced lumen output). USHIO has many unique products that offer additional operating hours gained by the user (see the list below).

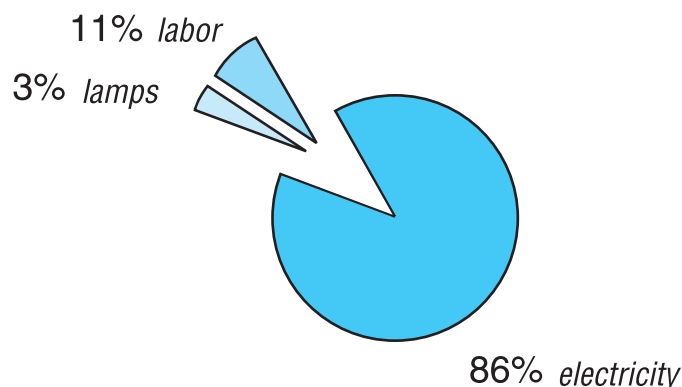
USHIO Long Life Products	USHIO Lamp Life In Hours	Competitors Lamp Life In Hours	Hours Gained
Ultra Service™ Sign Lamps	20,000	5,000	15,000
Ultraline™ MR-16 Lamps	10,000	5,000	5,000
PRO-PAR™ 5,000 Halogen PAR Lamps	5,000	2,500	2,500
Ultra 8™ T8 Fluorescent Lamps	30,000	20,000	10,000
Coilight™ Compact Fluorescent Lamps	12,500	10,000	2,000

**ENERGY SAVINGS** – These days, energy in the form of electricity is by far the largest portion of a users lighting expense. Over the lifetime of a lighting system, the electricity to operate the system will represent about 86% of the total costs. Obviously, if a user can reduce their energy consumption, they will reduce their costs.

The annual cost of a lighting system can be broken down into three areas (see pie chart):

1. The initial purchase costs of the lamps (3%).
2. The cost of the electricity to operate the lamps (86%).
3. The costs of labor to replace the lamps (11%).

USHIO America, Inc. understands the need for energy efficient lighting products that produce nearly the same light output (lumens) as their conventional counterparts, but consume considerably less energy doing so.



**ANNUAL ENERGY COST CALCULATION WORKSHEET –**

**Step 1. Calculate the total kilowatts saved by replacing the inefficient lamps with more efficient lamps**

<i>Original Lamp Wattage</i>	<i>Replacement Lamp Wattage</i>	<i>Watts Saved per Lamp</i>	<i># of Lamps to Replace</i>	<i>Total Watts Saved</i>	<i>Total Kilowatts Saved</i>
<input type="text"/> W	– <input type="text"/> W	= <input type="text"/> W	X <input type="text"/> lamps	= <input type="text"/> W	÷ 1000 = <input type="text"/> kW

**Step 2. Calculate the total kWh per year saved by this upgrade**

<i>Total Kilowatts Saved</i>	<i>Hours Used per Day</i>	<i>Days Used per Week</i>	<i>Weeks Used per Year</i>	<i>Total kWh Saved per Year</i>
<input type="text"/> kW	X <input type="text"/> hrs/day	X <input type="text"/> days/wk	X <input type="text"/> wks/yr	= <input type="text"/> kWh/yr

**Step 3. Calculate the total energy costs saved per year by this upgrade:**

<i>Total Kilowatts Saved per Year</i>	<i>Your Energy Cost per kWh (typically \$0.10)</i>	<i>Total Energy Cost Savings per Year</i>
<input type="text"/> kWh/yr	X \$ <input type="text"/>	= \$ <input type="text"/>

**Step 4. Compute the payback of the upgrade:**

<i>Initial Cost of Lighting Upgrade</i>	<i>Total Energy Cost Savings per Year</i>	<i># of Years for Payback on Investment</i>
<input type="text"/>	÷ <input type="text"/>	= <input type="text"/> years

For Fluorescent or PulseStrike™ Metal Halide lamps, be sure to use the total fixture wattage (which includes the new ballast wattage savings) to calculate your new true wattage savings.

**LAMP SPECIFICATION ABBREVIATIONS**

RATINGS		DIMENSIONS		BURN POSITION	
W	Watts	LL	Light Length (filament length)	BD	Base Down
V	Volts	LCL	Light Center Length	BD/Hor	Base Down to Horizontal
kV	kiloVolts	C-to-C	Contact to Contact	BU	Base Up
A	Amps	MOL	Maximum Overall Length	Horiz	Horizontal
h	hours	Dia	Diameter	H±4	Within ±4° of horizontal position
K	kelvin	max	Maximum	H±45	Within ±45° of horizontal position
lm	lumens	in	inches	H±60	Within ±60° of horizontal position
cd	candela	mm	millimeters	Univ	Universal 360° / Any Position
cp	candle power				
nm	nanometers				
CRI	Color Rendering Index				
			All dimensions are approximate measurements in inches (in) unless otherwise noted		