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American Lighting
Advanced LED Retrofit Bulb Instructions

American Lighting S14, C7 & C9 LED replacement bulbs are intended to replace the same style of 120V incandescent bulbs. All National Electric Code (US) and Canadian Electric Code (Canada) regulations must be followed as per string or socket instructions to ensure trouble free operation. These regulations are reflected in the UL and CSA ratings of the strings. Failure to follow UL and CSA requirements voids all warranties.

Basics

Power in Watts = Volts X Amps (e.g. 120V x 2 A = 240 Watts)

Terminology: Real Power is measured in Watts
Apparent Power is measured in Volt Amps

If the electrical load is a pure resistance such as an electric stove, heater or incandescent lamp, the Real Power in Watts and the Apparent Power in Volt-Amps are approximately equal. If however, the load contains coiled wire such as an electric motor, the voltage and the current are shifted out of phase with each other and the power is represented in Volt Amps.

e.g. Power consumption 2 Watts = 2 VA (technically with a zero degree phase angle)

The American Lighting S14, C7 and C9 bulbs are low power replacements for 120VAC incandescent lamps. The challenge in designing with LEDs is that they run on very low voltage - typically 3.5VDC for a white LED. To reduce the 120VAC line voltage to a few volts, the manufacturer uses a component called a capacitor. The capacitor is able to reduce the voltage without wasting power. A byproduct of the capacitor is that the current and voltage are shifted mostly out of phase with each other. The out-of-phase power must now be represented in Volt-Amps and the in-phase power in Watts.

The consequence of this phase shift is that there are two different power figures that must be used to design a 120V LED display. The Apparent Power of one American Lighting LED lamp is about 2 Volt-Amps (VA). In designing a display, this figure must be used to specify wire size, connector size, breaker, and fuse size. The good news is that the power consumption is proportional to the lower Real Power figure which is in the range of 0.35 to 0.65 Watts.

For example:

500 incandescent C7 bulbs (5 watts/lamp)	Real Power = 2500 Watts (~21 Amps)
500 LED C7 bulbs (~0.5 watts/lamp)	Real Power = 250 Watts (~3Amps) Apparent Power = 1000 VA (~8 Amps)

The electric components used to wire a display using these 500 American Lighting LED bulbs must accommodate the 8 Amps. However, the electric bill will reflect the lower 250 Watt power consumption.

In summary:

Choosing Electrical Components

Use the 2VA / bulb figure to determine the rating of all electrical components such as wire gauge, receptacle size and circuit breaker rating. The power figure will have to be converted to current for almost every electrical device.

For example:

800 bulbs x 2 VA/bulb = 1600 VA
Current = Power/voltage = 1600 VA / 120 V = 13.3 Amps

Note: Wire can carry it's maximum rated current but circuit breaker manufacturers recommend that breakers be loaded to no more 80% of maximum rating to prevent nuisance tripping. For example, a 15 Amp breaker should be loaded to 12 Amps. The lower the ambient temperature, the less breaker nuisance tripping will be an issue.

Calculating Power Costs

Use the 0.50W / bulb figure to calculate power cost

800 bulbs x 0.50W / bulb = 400 W

Cost = power consumption x time
= 400W x 1 hour = 400 Watt hours = 0.4 KWh

e.g. assuming a cost of $0.06 / KWh

Operating cost 0.4KWh = $0.06/KWh = $0.024 per hour

Specifications

Lamp Style	Real Power Watts/Lamp	Apparent Power Volt-Amps/Lamp
C7 LED	0.35	2
C9 LED	0.4	2
S14 LED	0.5	2
S14 LED Premium	0.7	2