

Lifetime of Electronic Fluorescent Dimming Ballasts

Overview

Ballast lifetime is defined as: Actual operating hours that a ballast can achieve at its specified performance when properly installed and with the correct lamps that the ballast is designed to illuminate.

Discussion

Lifetime of ballasts is determined by the lifetime of the components used. Maximum lifetime is not only achieved by using components with premium expected lifetime ratings, but also by operating those components within their specified electrical and thermal operating limits. The lifetime of most electronic components can be maximized by operating them at lower temperatures. Reducing the component temperature by 50 °F (10 °C) can extend the life of those components by as much as 100%. Therefore, in general, operating the ballast at a cooler temperature will maximize the lifetime of the ballast.

Ballast Temperatures

Lutron® ballasts are manufactured with superior quality components and are designed to operate at an optimum temperature that will maximize their lifetime. However, there are additional factors that can affect the ballast temperature:

- Ambient temperature
- Luminaire design
- Dimming level
- Thermal Foldback

Ambient Temperature

It may not be possible to significantly alter the ambient temperature where a luminaire is installed, but it is an important factor to consider when choosing a light source for a particular application. The ambient temperature in which the luminaire is located directly influences the luminaire and ballast temperatures.

Luminaire Design

Proper mounting in a luminaire can also significantly affect the operating temperature of the ballast. Mounting a ballast so that the mounting surface makes full contact with a flat metal surface exposed to the exterior of the luminaire generally allows for proper heat sinking. Luminaire design should also be such that heat generated by the lamps is isolated from the ballast. It is expected that the ballast installer will conduct temperature testing to ensure that the ballast operates within its specified temperature range when installed in a particular luminaire for an application.

Dimming Level

When fluorescent lighting is dimmed, the ballast delivers less power to the lamp(s) and therefore the components operate at a cooler temperature. On average, dimming the lamps by 20% reduces the case temperature of the ballast by 50 °F (10 °C). Most Lutron® dimming systems have a high-end trim adjustment that can be reduced to a lower level acceptable to the end user, if desired. This adjustment ensures that the light level can never be raised above the level specified by the end user.

Thermal Foldback

Thermal Foldback technology, patented by Lutron, is included in most Lutron® ballast models. This feature actively monitors the ballast temperature. When necessary, power delivery to the lamps is automatically reduced, or “folded back”, to regulate ballast temperature with minimal effect on light output. Thermal Foldback is designed to activate only if the ballast is operated in an environment that exceeds the ballast temperature rating. This technology prevents premature ballast failure due to overheating. In a properly designed application, Thermal Foldback will not activate.

Summary

Ballast lifetime is not only characterized by electrical design and choice of components, but is significantly affected by proper installation, luminaire application, and dimming levels. The cooler an electronic ballast operates, the longer it will last.

It is also important to know that fluorescent lamps have a specified range of temperature within which they must operate. This temperature range may be more limited in rapid-start dimming applications. Consult the lamp manufacturer for guidelines on lamp operating temperatures.

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