

# Interference Caused by Fluorescent Lighting Systems using Electronic Ballasts

Modern electronic ballasts typically operate in the 20 KHz to 60 KHz range and may cause interference with communication equipment that did not occur with traditional electromagnetic 60Hz ballasts. Electromagnetic Interference (EMI) can cause static on radio communications or interfere with the operation of any electronic device especially wireless communication devices.

## Types of EMI

**Conducted EMI** is injected back into the power system through the ballasts conductors. This type of EMI may cause interference with devices on the same electrical distribution network. **Radiated EMI** is radiated into the air by the fluorescent lamp, ballast, conductors, or ungrounded fixture.

## EMI requirements for Electronic Ballasts

Electronic devices sold in the United States must comply with the Federal Communications Commission standards. The FCC Rules and Regulations, Part 18, subpart C defines the limits for electronic fluorescent lighting ballasts for conducted frequencies between 450KHz to 30MHz. Although the FCC does require testing above 30MHz and does not cover radiated emissions, GE ballasts are designed to minimize all EMI emissions. FCC specification limits are defined for consumer and non-consumer lighting devices. These categories are commonly called Class A or B.

**Class A** (non-consumer) is intended for commercial installations. Most GE electronic fluorescent ballasts fall into this category.

**Class B** (consumer) is intended for residential applications and has more stringent requirements than Class A. GE residential grade electronic ballasts meet Class B requirements.

## Methods to Mitigate EMI in Fluorescent Systems

Proper installation of fluorescent systems is required to minimize electro-magnetic interference or radio frequency interference (EMI/RFI) with other devices. The physical distance between the devices can also affect the interference. Susceptible devices should be positioned as far away from the lighting as possible.

## Grounding

Proper grounding is the most important aspect to minimize EMI. A good ground path will shunt high frequency noise to earth, and a proper ballast ground is critical to meet the FCC requirements. A poorly grounded fixture will act like an antenna and radiate the noise externally. Most GE ballasts are grounded through the ballast metal case. The mounting fasteners should make a good electrical connection between the ballast case and the metal of the lighting fixture. Use a star washer and scrape the paint from the ballast mounting tab to ensure a good connection.

The fixture should be grounded back to the distribution panel using a dedicated ground wire. Using metal conduit as the ground conductor is not recommended. Separate metal fixture components, such as lens plates, should have a conductive path back to the fixture body.

### **Wiring practices**

The ballast wires should be as short as possible. Wire the ballast output leads directly to the lampholders. Large loops or wire bundles act as antennas to broadcast noise. The power wires can be twisted to close the effective loop area, use 2 to 3 turns per foot. The output leads can also be gently twisted, but no more than 1 to 2 twists per foot. Maintain separation between the power and output leads, do not twist these leads together.

### **EMI Filters and Shielding**

EMI filters or ferrite cores on the ballast power conductors can minimize the conducted EMI. EMI filters will not significantly affect radiated EMI. Shielding equipment or conductors will block radiated EMI. Wires should be run in metal conduit. Exposed conductors should be shielded type.

### **Other Interactions**

Fixture design, grounding scheme, ballast type, and even the lamp type can change the EMI effects of electronic ballasts. Using a reduced wattage lamp to replace a full wattage lamp can shift the operating frequency of the ballast and change the EMI characteristics. De-lamping the ballast to N-1 operation can also affect EMI.

Even with proper installation, electronic ballasts, especially Class A, can cause interference with other devices. Critical equipment that uses wireless or radio communications should be tested on a small scale for possible interference issues prior to the entire lighting system installation.

### **Disclaimer:**

The information in this document is believed to be accurate, but GE makes no warranty or guarantee (and our employees and representatives are not authorized to make any such warranty or guarantee), express or implied, (i) that the performance and results described herein will be obtained under end-use conditions, (ii) as to the effectiveness or safety of any design incorporating GE materials, products, recommendations or advice, or (iii) regarding the accuracy or completeness of the information, including the assumptions and formula on which such information is based. Applications and conditions of use are many and varied and beyond GE's control, and GE cannot possibly have the same degree of knowledge that the purchaser has with respect to the design of its equipment and the conditions of its use or as to the suitability of GE's materials, products, recommendations, or advice for the purchaser's particular use. Therefore, each purchaser/user bears full responsibility for making its own determination as to the suitability and safety of GE's materials, products, recommendations, or advice for its own particular use and to assume the responsibility for that determination. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating GE material or products will be safe and suitable for use under end-use conditions.