

FIFTH LIGHT TECHNOLOGY LTD.

ENGINEERING SPECIFICATION

Lighting Control System
2009 Edition R1.5



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Engineering Specification Lighting Control System

1. GENERAL

1.01 Instructions

- 1.01.1 The specifications presented herein are governed by and subject to the terms and conditions of the Contract and the provisions of the Division 1 General Requirements.

1.02 Summary

1.02.1 Scope

- 1.02.1.1 The term 'Lighting Control System (LCS)' is defined as the interconnected set of hardware and software components that collectively serve to regulate the illumination levels of an interior and/or exterior space. The components that comprise the LCS are sub categorized into two groups: control equipment and end-devices. Sections 1.02.2 and 1.02.3 present a list of acceptable control equipment and end devices respectively.

1.02.2 LCS Control Equipment

- 1.02.2.1 Lighting control panels
1.02.2.2 Low voltage daylight sensors, high and low voltage occupancy sensors, low voltage wall mount switches, wall mounted displays, touch screens and DALI scene controllers.
1.02.2.3 LCS server, database and end-user application(s).

1.02.3 LCS End Devices

- 1.02.3.1 DALI compliant linear fluorescent dimmable electronic ballasts
1.02.3.2 DALI compliant compact fluorescent dimmable electronic ballasts
1.02.3.3 DALI compliant field addressable relays
1.02.3.4 DALI compliant relay panels
1.02.3.5 DALI compliant general purpose dimming modules

1.02.4 General Requirements

- 1.02.4.1 The Lighting Control System shall meet all of the general criteria, operating characteristics and performance parameters specified herein.
- 1.02.4.2 The deployment team, defined as the electrical installer and commissioning agent, shall provide, connect and furnish all equipment necessary for the proper and complete operation and service of the Lighting Control System as indicated in the engineering drawings and specified herein.

1.03 Related Sections

- 1.03.1 Submittal Procedures.
- 1.03.2 Construction/Demolition Waste Management and Disposal.
- 1.03.3 Hazardous Materials.
- 1.03.4 Common Work Results – Electrical.
- 1.03.5 Lighting.
- 1.03.6 LEED Waste Management and Disposal

1.04 References

- 1.04.1 Canadian Standards Association (CSA): CSA C22.2 No. 184.1 – [96], Solid State Dimming Control (Bi-National Standard with UL 1472).
- 1.04.2 Underwriters Laboratories (UL): UL 935, Fluorescent Lamp Ballasts
- 1.04.3 International Electro-Technical Commission (IEC): IEC 60929 Annexes E and G.
- 1.04.4 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE): ANSI/IEEE C82.11-2002, American National Standard for Lamp Ballasts – High Frequency Lamp Ballasts and ANSI/IEEE C62.41, Category A Surge Protection.
- 1.04.5 International Organization for Standards (ISO)

1.05 System Description & Operation

1.05.1 Operating Requirements

- 1.05.1.1 All components of the Lighting Control System shall be fabricated, assembled and installed in a manner that maintains the performance criteria stated by the respective manufacturer.
- 1.05.1.2 All components of the Lighting Control System shall be provided free of defects, damage or failure.

1.06 Submittals

1.06.1 General

- 1.06.1.1 Provide a list of submittals in accordance with the conditions of the contract.

1.06.2 Bill of Materials

- 1.06.2.1 Complete list of all parts needed to install the Lighting Control System.

1.06.3 Product Data

- 1.06.3.1 Include data on features, components, ratings, and performance. Include dimensioned drawings with isometric projections of components and enclosures and details of the ballasts.
- 1.06.3.2 Shop Drawings and Wiring Diagrams
- 1.06.3.3 Detail all pertinent mechanical and electrical parameters of lighting equipment, including one-line diagrams and physical dimensions. Field wiring shall be distinguishable from factory wiring.

1.06.4 Samples

- 1.06.4.1 To be submitted upon request in order to provide a representation of the finish, color and texture.

1.06.5 Installation Instructions

- 1.06.5.1 Provide all device connection and mounting instructions as per manufacturer specifications.

1.06.6 System Manual

1.06.6.1 Describe system features, operation and architecture in electronic and printed documentation. Include user account information, network access information and technical support contact information. All project specific documentation shall be made available on a password protected section of the manufacturer's website upon request of the end user.

1.06.7 Warranty Documents

1.06.7.1 Provide all manufacturer warranty dates, registration documents and information.

1.07 Quality Assurance

1.07.1 Product Qualifications

1.07.1.1 All products shall meet all applicable CSA/UL regulations.

1.07.1.2 All products shall meet all applicable ANSI requirements.

1.07.1.3 All products shall meet all applicable FCC regulations.

1.07.1.4 All DALI products shall comply with the IEC Standard 60929 Annexes E and G.

1.07.1.5 All products shall be installed in accordance to all applicable national electrical and local building codes.

1.07.1.6 All products shall be subjected to a complete functional test at the factory prior to shipment.

1.07.2 Installer & Commissioner Qualifications

1.07.2.1 The system shall be commissioned by a company that has no less than 3 years of experience in the installation of DALI lighting systems. References shall be provided upon request.

1.07.2.2 The system shall be installed by a company that has experience in deploying dimmable lighting systems. References shall be provided upon request.

1.07.3 Manufacturer Qualifications

1.07.3.1 All products shall be fabricated in an ISO-9000 compliant facility.

1.07.3.2 The manufacturer shall be experienced in the fabrication of lighting control equipment.

1.08 Commissioning

- 1.08.1 The lighting system shall be commissioned as per system specifications upon installation and completion of the lamp burn-in period.
- 1.08.2 The commissioning agent shall visit the site on a scheduled basis as per contract provisions.
- 1.08.3 The commissioning agent shall perform the following on site activities as part of their deployment requirements.
 - 1.08.3.1 Training of Electrical Contractor: All personnel responsible for installing the system shall be trained by the commissioning agent prior to the commencement of the system deployment.
 - 1.08.3.2 Wiring and Hardware Review: All wiring connections and electrical equipment included in the scope of the lighting control system shall be assessed.
 - 1.08.3.3 Field Testing: All DALI loop communication connections, sensor connections and Ethernet connections shall be verified in accordance to a specified testing procedure.
 - 1.08.3.4 Final Inspection: All of the connections relating to the lighting control system shall be tested and verified.
 - 1.08.3.5 Training: The end customer or electrical contractor shall be trained in the usage of the system within 1 month of completion of the commissioning process. A second training session shall be scheduled within 6 months of final commissioning.

1.09 Warranty

- 1.09.1 Manufacturer's Warranty: All equipment shall be warranted to be free of material and workmanship defects.
- 1.09.2 Warranty Period: The manufacturer shall offer a limited five (5) year warranty on fluorescent lighting ballasts and a limited two (2) year warranty on all other components of the LCS (as listed in section 1.02.1.1 of this document).
- 1.09.3 Coverage Period: The warranty period of a given piece of equipment shall commence on the date of its purchase.

1.10 Maintenance

- 1.10.1 New equipment that can be used for system expansion, product replacement or spare parts shall be made available by the manufacturer for purchase by the end user.
- 1.10.2 An extended warranty period, which extends the factory limited warranty from three to five or six years, shall be made available by the manufacturer for purchase by the end customer (at the date of the initial equipment purchase).
- 1.10.3 Additional warranty coverage shall be made available by the manufacturer for purchase by the end customer on an annual basis following the expiration of the extended warranty period.

2. Products

2.01 Acceptable Manufacturers

2.01.1 Lighting Control System (Hardware and Software)

2.01.1.1 Fifth Light Technology Ltd.

2.01.2 Lighting End Devices (DALI Ballasts, Addressable Field Relays and Relay Panels)

2.01.2.1 Fifth Light Technology Ltd.

2.01.2.2 OSRAM Sylvania

2.01.2.3 Tridonic

2.01.2.4 Philips

2.01.3 Peripheral Devices (Daylight Sensors, Occupancy Sensors, Wall Mounted Controllers and Wall Switches)

2.01.3.1 Leviton

2.01.3.2 Wattstopper

2.02 System Requirements

2.02.1 Emergency Default: The lighting control system and lighting end devices must revert to a safe and acceptable default state in the event of a loss of power situation. In order for the default state to be considered safe and acceptable it must meet the following specifications:

2.02.1.1 Loss of Power to Lighting Relays: All relays being used for lighting control must default to the closed (on) position the instant that power is lost to their corresponding lighting circuit. Relays must remain in the closed (on) state until the supply of power is resumed, at which point all relays are to continue to remain in the closed (on) position until commanded otherwise.

2.02.1.2 Loss of Power to the Lighting Control Panels: All lighting control panels are to be supplied with power from non-emergency circuits. In the event that power is lost to the lighting control panel, all of the lighting relays and ballasts that are connected to it shall revert to the full power (on) state and remain in this state until power is restored and they are commanded to otherwise.

2.02.1.3 Loss of Power to Emergency Circuits: In the event that power is lost to the emergency circuits, all lighting relays that are supplied by

emergency fixtures shall automatically revert to the default closed (on) position. When back up power is activated, all relays that are supplied by emergency fixtures shall be in the closed (on) state and are to remain in this state until commanded otherwise. All ballasts that are supplied by emergency circuits shall revert to the full power state and remain in this state the instant that back up power is activated until commanded otherwise.

- 2.02.1.4 Tamper Proof Settings: The default settings (or any other settings that pertain to the operation of the lighting control system during emergency conditions) of all lighting control equipment, DALI ballasts and lighting relays shall not be capable of being modified through either a manual or software provision by the user of the lighting control system.
- 2.02.2 Central Control: All operating parameters of the lighting control system shall be configured from central point of access through a secure internet connection.
- 2.02.3 Remote Access: All operating parameters of the lighting control system shall be configurable from any internet enabled computer through a web-browser.
- 2.02.4 User Access: The end user shall be capable of applying administrative rules to restrict the access privileges of each user. Access restrictions shall be applicable to the set of fixtures as well as the feature set available for those fixtures.
- 2.02.5 System Clock: The time clock of the lighting control system shall be synchronized to internet standard time.
- 2.02.6 Power Failure
The lighting system shall resume operation after a power outage to the state that it would have been in if the power outage had never occurred.
- 2.02.7 Loss of Communication
DALI devices shall operate at a user specified level in the event that communication is lost to the control panel.
- 2.02.8 Time Scheduling: The daily power consumption cycle of each fixture shall be regulated by a programmable scheduling routine.
- 2.02.9 Daylight Harvesting: The lighting system shall adjust fluorescent light levels in response to varying ambient light levels in order to maintain a constant, user-specified light level at desk height. Ambient light levels shall be read from a network of daylight sensors that are distributed throughout areas that are candidates for daylight harvesting. Intelligent algorithms shall be used to minimize the number of sensors required.

- 2.02.9.1 Daylight Sensor Wiring: Daylight Sensors shall not be wired any lighting ballasts or any other lighting end device. Daylight Sensors shall only be wired to a low voltage lighting control panel through a three (3) conductor low voltage cable that meets the following specifications: 16AWG/3, plenum rated, FT6.
- 2.02.9.2 Daylight Sensor Groupings: The set of light fixtures that are controlled by a given Daylight Sensor can span multiple DALI communication busses, shall be configurable through software and shall not require any manual wiring to modify. The system shall allow for light fixtures to be added or removed from given Daylight Sensor group through web software.
- 2.02.9.3 Daylight Sensor Settings: All settings that govern the behavior of a given Daylight Sensor shall be adjustable through web software and shall not require any physical adjustment to the sensor itself.
- 2.02.9.4 Gradient Dimming: A single daylight sensor working in conjunction with lighting software shall be capable of providing separate control for up to 16 groups of light fixtures. Each group of light fixtures can have unique settings, including the lighting set point, so that location specific conditions can be accommodated by a single sensor. Gradient dimming will allow for the row of light fixtures closest to the window to dim more than the next closest row of light fixtures (the third closest row dims more than the second closest row and so on for the 4th,5th...16th rows) even though all rows are controlled by the same single sensor.
- 2.02.9.5 Electronic Enable/Disable: The daylight sensor shall be enabled and disabled through software in order to manage its operational on a scheduled daily basis.
- 2.02.10 Personal Control: Users shall customize the lighting levels in their own workspace. Building Management can apply restrictions to the range of lighting levels that can be programmed by each occupant to ensure conservation target are met. Access is provided from any computer or hand-held device that is connected to the internet. The light level of each fixture shall be controllable in increments from 0-100% in increments of 1% for a specified duration of time.
- 2.02.10.1 Number of Simultaneous Users: The system shall accommodate a minimum of five hundred (500) simultaneous web users.
- 2.02.11 Occupancy Detection: The system shall reduce the power consumption in vacant areas by reading the status of a network of low voltage occupancy sensors.
- 2.02.11.1 Occupancy Sensor Wiring: Occupancy sensors shall not be wired to switch the AC power line nor shall be wired directly to any lighting ballasts or any other lighting end device. Occupancy sensors shall only be wired to a low voltage lighting control panel through a three (3)

conductor low voltage cable that meets the following specifications:
16AWG/3, plenum rated, FT6.

- 2.02.11.2 Occupancy Sensor Groupings: The set of light fixtures that are controlled by a given occupancy sensor can span multiple DALI communication busses, shall be configurable through software and shall not require any manual wiring. The system shall allow for light fixtures to be added or removed from given occupancy sensor group through web software.
- 2.02.11.3 Occupancy Sensor Settings: All settings that govern the behavior of a given occupancy sensor shall be adjustable through web software and shall not require any physical adjustment to the sensor itself.
- 2.02.11.4 Occupancy Sensor Levels: Each occupancy sensor shall have a total of five (5) programmable lighting levels. These levels are defined as follows:
- 1- Occupied Level: The Occupied Level represents the light level that fixtures will be commanded to when occupancy is detected. Light levels will remain at the Occupied Level until occupancy is no longer detected.
 - 2- Transition Levels: Transition Levels provide a gradual change in light levels when occupancy is no longer detected. Three (3) Transition Levels, each of which can be programmed with different light levels and timer values shall be provided.
 - 3- Vacancy Level: The Vacancy Level represents the light level that fixtures will be commanded to when occupancy is no longer being detected and all Transition Levels have expired.
- 2.02.11.5 Electronic Enable/Disable: The occupancy sensor shall be enabled and disabled through software in order to manage its operational on a scheduled daily basis.
- 2.02.12 Monitoring: The operational status of all system hardware and software components shall be routinely checked. Faults with tubes, ballasts and every other component of the system shall be automatically detected and electronic notifications shall be distributed. These notifications clearly illustrate the location of the device on the floor plan and the time that the fault was detected.
- 2.02.13 Reporting: The energy consumption of the lighting system shall be viewed, tracked and recorded. Data shall be charted according to user defined zones, which can be as small as an individual fixture or as large as a portfolio of buildings. Savings shall be presented in terms of energy, dollars and green-house gas emissions (if requested). The data presented is a computed value and does not require the installation of additional hardware. Alternatively, this software can be integrated with a physical metering system to present revenue grade energy measurements.

- 2.02.14 Demand Response: The system shall be capable of linking a portfolio of facilities together so that their operating policy can be centrally managed in response to a load shedding event. Electrical demand shall be reduced on a priority basis; with low traffic areas being dimmed first while the illumination levels of high use areas is maintained. A transaction record of all demand response activities shall be created and distributed according to user specifications.
- 2.02.15 Off Hour Access: The system shall only activate the set of lights required by an occupant to perform their work during the off-hour time period. The system shall avoid turning on an entire quadrant or floor for when only an office, hallway and washroom are required. These lights can be activated in several ways including, a pass card, phone system or web software. Cleaning staff are accommodated by a programmed turn-on and shut-down sequence, which illuminates their work area in successive fashion.
- 2.02.16 Zoning: The system shall be capable of configuring zones via software and avert the need to re-wire certain power distribution circuitry and lighting equipment as tenancy patterns change.
- 2.02.17 Multi-Building Control: The lighting control system shall be capable of connecting to an offsite datacenter so that it can be operated as part of a multiple building control network.
- 2.02.17.1 Data Consolidation: Buildings operating on the multiple building network shall have all information consolidated to a single report and view on the web interface. This allows for the total energy consumed by all buildings to be displayed in a single graph rather than one graph for each building. Information relating to the all reporting and monitoring functions (as described in this specification) shall be consolidated in this manner.
- 2.02.18 Override Management: The system shall be capable of handling several different commands targeted at the same fixture in a manner that is logical, pre-defined and acceptable to the end customer.
- 2.02.19 Graphical User Interface: The visual interface of the software shall import the floor plan design file in DXF or DWG format. All lighting fixtures, sensors and other components of the lighting system contained in the floor plan design file shall be automatically recognized by the software and rendered into interactive objects on the graphical user interface.

2.03 Control Equipment

2.03.1 General

- 2.03.1.1 The project shall be commissioned per plans and specification utilizing products that comply with the system requirements.

2.03.2 Momentary Switches

- 2.03.2.1 Momentary Switches shall provide continuous dimming control via a low voltage connection to a Lighting Control Panel.
- 2.03.2.2 Momentary Switch Wiring: Momentary Switches shall not be wired to switch the AC power line nor shall be wired directly to any lighting ballasts or any other lighting end device. Momentary Switches shall only be wired to a low voltage lighting control panel through a three (3) conductor low voltage cable that meets the following specifications: 16AWG/3, plenum rated, FT6.
- 2.03.2.3 Momentary Switch Groupings: The set of light fixtures that are controlled by a given Momentary Switch shall be configurable through software and shall not require any manual wiring. The system shall allow for light fixtures to be added or removed from given Momentary Switch group through web software.
- 2.03.2.4 Momentary Switch Settings: All settings that govern the behavior of a given Momentary Switch shall be adjustable through web software and shall not require any physical adjustment to the Momentary Switch itself.
- 2.03.2.5 Dynamic Duration: All commands sent from the momentary switch shall expire after a specific time period. The duration of this time period shall be based on the time of day that the switch was activated. This will allow for the time duration to be longer in the morning (when there are several working hours left in the day) than in the afternoon (when the workday is near complete). Each momentary switch can have a different dynamic duration.
- 2.03.2.6 Momentary Switch Functionality: Momentary Switches shall provide one touch on/off functionality as well as press and hold dimming.

2.03.3 Scene Controllers

- 2.03.3.1 Shall accommodate Class 1 wiring strategies and be 100% DALI compatible.
- 2.03.3.2 Controls 4 scene presets.
- 2.03.3.3 Shall fit into standard switch box behind the switch plate.

2.03.4 Addressable Field Relays

- 2.03.4.1 Shall be Fifth Light Technology Ltd. or approved equivalent.

2.03.4.2 Shall be 100% DALI compatible and not draw more than 3.75 milli-Amps from the DALI communication bus.

2.03.4.3 Rated for 20 Amps/347 VAC (lower ratings acceptable based on application).

2.03.5 Relay Panels

2.03.5.1 Shall be Fifth Light Technology Ltd. or approved equivalent. Shall be 100% DALI compatible and not draw more than 3.75 milli-Amps from the DALI communication bus. Rated for 20 Amps inductive load at 120 VAC and 347 VAC.

2.03.6 Occupancy Sensors

2.03.6.1 Shall utilize passive infrared and/or ultrasonic technology as required to detect occupancy. Shall be powered by a low voltage supply and not have any connections to the power line or direct connections to ballast. The set of fixtures controlled by a given occupancy sensor shall be completely configurable through software.

2.03.7 Daylight Sensor

2.03.7.1 Shall be powered by a low voltage supply and not have any connections to the power line or ballast. The set of fixtures controlled by a given daylight sensor shall be completely configurable through software.

2.03.8 Lighting Control Panels

2.03.8.1 Internal circuitry shall be protected by a fused receptacle.

2.03.8.2 Shall provide Class I/II NEC separation

2.03.8.3 Lighting Control Panel shall provide the interface between the software application and lighting ballasts, sensors, keypads and low-voltage switches.

2.03.8.4 Lighting Control Panel shall provide 2-way communication to software application via an Ethernet protocol.

2.03.8.5 Lighting Control Panel shall provide 2-way communication to lighting ballasts via the DALI protocol.

2.03.8.6 The control hardware shall provide a general purpose interface to low voltage analog and digital inputs and outputs.

2.03.8.7 Lighting Control Panel shall be mounted in a tamper-proof electrical cabinet.

2.03.8.8 The Lighting Control Panel shall allow remote diagnosis of its operational status.

2.04 DALI Dimmable Electronic Ballasts

2.04.1 Physical Characteristics

- 2.04.1.1 The cross sectional dimensions of the ballast shall not exceed 1.2” in height and 1.5” in width.
- 2.04.1.2 The ballast shall be equipped with 18 AWG flying leads that are 2 feet long for power, DALI, red and blue wires and 4 feet long for yellow wires.

2.04.2 Performance Specifications

- 2.04.2.1 Ballast shall provide continuous dimming that is free of flicker despite poor power quality. Dimming range shall be from 1% to 100% (in increments of 1%) using a dimming curve that is optimized for eye sensitivity.
- 2.04.2.2 The ballast shall abide by the DALI protocol as outlined in the IEC 60929 specification.
- 2.04.2.3 Ballast shall have the following programmable settings
 - 2.04.2.3.1 Individual addresses: 64
 - 2.04.2.3.2 Group address: 16
 - 2.04.2.3.3 Scenes: 16
 - 2.04.2.3.4 Bi-directional digital communication
 - 2.04.2.3.5 Ballast shall returns the following programmable parameters
 - 2.04.2.3.6 Power on level
 - 2.04.2.3.7 Short, search and random addresses
 - 2.04.2.3.8 Groups 0-7 and 8-15
 - 2.04.2.3.9 Scenes 0-15
 - 2.04.2.3.10 Minimum and maximum dimming levels
 - 2.04.2.3.11 Fade time and fade rate
 - 2.04.2.3.12 System and power failure levels
 - 2.04.2.3.13 Physical minimum level
 - 2.04.2.3.14 Device type
 - 2.04.2.3.15 Version number
- 2.04.2.4 Returns the following status parameters:
 - 2.04.2.4.1 Actual dim level
 - 2.04.2.4.2 Ballast status and tube status
 - 2.04.2.4.3 Lamp power on
 - 2.04.2.4.4 Limit error
 - 2.04.2.4.5 Reset state
 - 2.04.2.4.6 Missing short address
 - 2.04.2.4.7 Contents of volatile memory
- 2.04.2.5 Ballast communication wires shall be polarity insensitive and shall not require shielding, twisting. Plenum rated 18 AWG 2 conductor cable shall be sufficient.

- 2.04.2.6 Ballast control wires shall be rated for the voltage of the power supply in order to be capable of being run in the same conduit as power wires.
- 2.04.2.7 Ballast communication wires shall be capable of withstanding connection to the line voltage for an indefinite period of time without any incurring any damage.
- 2.04.2.8 All control and communication operations of the ballast shall be immune to noise and power disturbances.
- 2.04.2.9 Ballast shall meet the following operating parameters:
- 2.04.2.9.1 Operating Voltage: 120VAC, 277 VAC or 347 VAC (+5%/-10%) as per application requirements.
- 2.04.2.9.2 Protection: End of lamp life and inrush current limiting circuitry.
- 2.04.2.9.3 Warranty: 5 years
- 2.04.2.9.4 Dimming range: T8: 1% - 100%, T5/T5HO: 3%-100% (in increments of 1%)
- 2.04.2.9.5 Ballast Factor: Field programmable (T8: 0.01-1.0, T5/T5HO: 0.03-1.0)
- 2.04.2.9.6 Power Factor: > 0.95 at all dimming levels while operating within rated voltage range
- 2.04.2.9.7 Total Harmonic Distortion: <10% at all dimming levels while operating within rated voltage range (3rd harmonic <8%)
- 2.04.2.9.8 Peak Inrush Current < 7 Amps
- 2.04.2.9.9 Lamp Operating Frequency: > 40KHz
- 2.04.2.9.10 Lamp Current Crest Factor: < 1.7
- 2.04.2.9.11 Maximum Enclosure Temperature: 167 F/75 C
- 2.04.2.9.12 Maximum Output Voltage: < 600Vrms
- 2.04.2.9.13 Standby Power consumption: <2W
- 2.04.2.9.14 Lamp Start: Programmed rapid start
- 2.04.2.9.15 Lamps Start Time: 1.5 Seconds
- 2.04.2.9.16 Lamp Start Power: Directly at any dimming level without flash to higher level.
- 2.04.2.9.17 Number of lamp starts: 200,000

2.04.3 Ballast Regulatory Requirements

- 2.04.3.1 CSA C22.2 / UL 935
- 2.04.3.2 ANSI C82.11 High Frequency Fluorescent Lamp Ballast Standard
- 2.04.3.3 ANSI/IEEE C62.41 Category A Surge Protection
- 2.04.3.4 FCC Part 15
- 2.04.3.5 Rated for Class I or Class II control applications

2.05 Deployment

2.05.1 Testing DALI Loop

- 2.05.1.1 Ensure standby voltage across the DALI lines (V_{DALI}) is within the following range: $9.5VDC < V_{DALI} < 22.5 VDC$, as specified in the DALI protocol.

2.05.1.2 Ensure that there is no continuity from one DALI communication line to the other.

2.05.1.3 Ensure that there is no continuity from the DALI loop to ground.

2.05.2 DALI Device Addresses

2.05.2.1 DALI devices shall either be addressed in-ceiling or upon manufacturing as requested by the electrical contractor.

2.06 Support

2.06.1 On Site Support: Shall be available within 24 hours of a service call anywhere in Canada and the U.S.A.

2.06.2 Phone Support: Toll free technical support shall be available 24 hours a day, 7 days a week.

2.06.3 Internet Support: The operational status of tubes, ballasts, critical programs, control hardware and computers can be monitored and diagnosed remotely.