

Bantam
STAND ALONE
Lighting Control Systems

PROJECT	
LOCATION	

Lighting Control Devices

Part 1 - General

1.01 INTRODUCTION

The work covered in this section is subject to all of the requirements in the General Conditions of the specifications. The contractor shall coordinate all of the work in this section with all the trades covered in the other sections of the specification to provide a complete and operative system.

1.02 DESCRIPTION OF WORK

Extent of lighting control system work is indicated by drawings, and by the requirements of this section. It is defined to include low voltage lighting control panels, switch inputs, and wiring. Type of lighting control equipment and wiring specified in this section include the following:

- *Low Voltage Lighting Control Panels*

Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring:

- *Not work of this section*

1.03 QUALITY ASSURANCE

A. UL Approvals

The control panels shall be tested and listed by a nationally recognized testing laboratory under UL 508A.

B. NEC Compliance

The control system shall comply with all applicable National Electrical Codes regarding electrical wiring standards.

C. NEMA Compliance

The control system shall comply with all applicable portions of the NEMA 1 standards regarding the types of electrical equipment enclosures.

D. Component Pre-testing

All control equipment shall undergo strict inspection standards. The equipment shall be previously tested and burned-in at the factory prior to installation.

E. System Checkout

A factory trained technician or factory authorized personnel or contractor shall functionally test the control system and verify performance after installation.

F. Manufacturer

Manufacturer shall have a minimum of 10 years of experience in control systems. Manufacturer shall provide off the shelf control products from its inventory. Control systems that require custom assembly and sizing shall not be acceptable.

1.04 SUBMITTALS

A. Product Data

Submit manufacturer's data on lighting control system and components.

B. Shop Drawings

Submit drawings of lighting control panel and accessories including, but not necessarily limited to the low voltage relay panels, power wiring, switch inputs, and sensor wiring.

Part 2 - Products

2.01 MATERIALS AND COMPONENTS

A. System Description

- 1. The lighting controller shall offer four (4) analog inputs and eight (8) control relays. The switch inputs shall consist of eight (8) programmable switch inputs and one (1) digital input capable of supporting up to sixteen (16) switches.*
- 2. Each low voltage lighting control panel shall be microprocessor controlled with an integral LCD display. The LCD screen shall provide relay status information. All normal and advanced programming features shall be permissible through the self-prompting LCD display.*
- 3. Programmable intelligence shall include Time-Of-Day control, default and programmable holiday dates, warn occupants of an impending off, timed inputs, preset control (patterns), auto daylight savings, astronomical clock with offsets, local control, analog control (photosensors), switch input control, group control and interface to digital wall control stations.*
- 4. The control panel shall be capable of determining how the relay will function for each location. The relays may be designated in software as Normal, Inverting, Sentry, AS100, HID and Beacon to allow various programming options. The controller shall be capable of reporting whether the relays are overridden via software, override switches, or via on board hardware overrides.*
- 5. Each control panel shall provide a Warn OFF (flash the lights) to inform the occupants of an impending OFF command. The occupants may exit the premises with adequate lighting or cancel the Warn OFF by overriding the lighting zone.*
- 6. The controller shall permit lighting to be overridden ON for after hours use. The controller shall provide optional switch timer assignments or timed overrides. The override choices for various relays shall provide special event occurrences and the controller shall return to the programmed state after the override event has expired. Also, the controller shall provide profile choices to customize the functions of switch inputs. Following are types of physical analog wired control switches that shall be provided.*
 - Momentary Push-Button (2-wire alternate action) - When ON terminal is pressed the switch state will toggle once from ON to OFF or OFF to ON depending on last state.*
 - Momentary ON/OFF (3-wire) – When ON terminal is pressed the switch goes ON. When OFF terminal is Pressed, switch goes OFF.*
 - Maintained ON/OFF (2-wire) – When ON terminal is Pressed the switch goes ON. When ON terminal is*

- released switch goes OFF.
 - *Motion Sensor ON/OFF (2-wire) – When ON terminal is pressed the switch goes ON. When ON terminal is released switch goes OFF. Multiple motion sensors connected to the same group wait until all sensors are OFF before turning the group OFF. Any sensor in the group will turn ON the group.*
 - *Cleaning Momentary Push-Button (2-wire alternate action) - When ON terminal is pressed the switch state will toggle once from ON to OFF or OFF to ON depending on last state. Cleaning switches have a higher priority than regular switches. When ON they override the ability of regular switches to turn OFF the load.*
 - *Cleaning Momentary ON/OFF (3-wire) – When ON terminal is pressed the switch goes ON. When OFF terminal is Pressed, switch goes OFF. Cleaning switches have a higher priority than regular switches. When ON they override the ability of regular switches to turn OFF the load.*
7. *Programming the controller shall be through the local integral LCD display and keypad. Descriptive information shall assist the user to employ the system without a programming manual.*
8. *Additional Features shall include:*

Time-Of-Day Scheduling

The controller shall have 48 (6 per group) Time-Of-Day/holiday schedules for 365 day programming.

Holidays

The controller shall have three holiday types: Perpetual (13) (self-adjusting), Single day floating holidays (16) and range holidays (16).

Warn Off

The controller shall have the ability to flash lights and provide a warn time of 10 minutes prior to lights going OFF. The controller shall provide special warn off types: No Warn, Warn Off, Sentry Warn, AS100 Warn, and HID Warn.

Presets (Patterns)

The controller shall have the ability to store pre-programmed relay patterns with user defined algorithms.

Hold ON Timer

The controller shall have Hold ON timers configurable for 1-999 minutes for the switch inputs. The Hold ON timer shall function such that the relay will return to the state it was in prior to receiving the input after the timer expires.

Astronomical Clock

The controller shall accept City and State input with sunset-sunrise offsets for astronomical control.

Auto Daylight Savings Adjust

The controller shall automatically adjust the clock at the appropriate dates for daylight savings. This feature shall be selectable by the user. The dates for daylight savings shall be programmable by the user.

Groups

The controller shall provide groups for linking control commands with multiple relay outputs for ease of use and rapid programming.

Analog Inputs

The controller shall have four (4) analog inputs, each having eight (8) control thresholds you can set. PLC photosensors and their associated ranges shall be included in the default set up of the controller.

Building Occupancy

The controller shall simplify programming by defining an Open and Close Time.

Data Logs

The controller shall provide the ability to record operating data and present that data in a useable format.

Alarms

The controller shall provide alarm indication when operations are outside of programmed parameters. This shall include relay status, switch status, and photosensor analog values.

B. Hardware Features

1. Diagnostic Aids

Each control panel shall incorporate diagnostic aids for confirmation of proper operation, or in case of failure these aids shall guide the individual in rapid troubleshooting of the system. The control panels shall employ an LCD screen and LED's to indicate:

- Status (LED)
- System Power (LED)
- ON/OFF Status of each relay (LED & display)
- System Clock – Time and Date (display)
- Programming Confirmation (display)
- Alarm Status (display)
- CAN bus TX/RX (LED)

Control systems that do not provide visual self-help diagnostics shall not be acceptable.

2. MicroSD

The controller shall provide the capability of performing firmware upgrades, programming backups, and programming downloads via a MicroSD slot.

3. USB Port

Each controller shall come equipped with a USB port that allows for direct connection to a PC for firmware upgrades, programming backups, programming downloads, and real-time programming without the need for any additional software.

4. Modular Design

All connections for the analog and physical switch inputs shall incorporate modular connectors. The relay board shall be modular and designed for rapid field replacement or upgrading. Systems that do not employ modular connectors shall not be acceptable.

5. Memory Back-Up

The system shall utilize a memory back-up device that is system integrated and shall be non-serviceable. The data in Flash Memory shall be protected against power interruptions for the life of the product. The power interrupt protection circuit shall be entirely maintenance-free.

C. Control Relays

The system shall provide status indication of all relays via the relay control LED's and through the LCD of each control panel. The visual indication shall disclose ON/OFF status and relay number. The relay design shall also provide indication to the user if the relay is in a hand actuation condition.

1. Relay shall be a UL Recognized component. Each relay shall be SPST, dual-coil latching relay with a manual override lever that allows for load power even when control power is not maintained at the panel. The relay shall be rated for the following:

- A. 20A Tungsten @ 120VAC
- B. 20A ballast @ 120VAC
- C. 20A Tungsten @ 277VAC
- D. 20A ballast @ 277VAC
- E. 1.5 Horse Power @ 120VAC

2. Each relay terminal shall be a box clamp style field connection with the capacity to accept one 8-20AWG wire, solid or stranded, copper only.

3. *Each relay terminal screw shall have a slotted drive.*
4. *Each relay shall be individually replaceable and shall directly connect to the relay interface board without the use of wires or soldering. Relay blanks shall be provided for each unpopulated slot.*
5. *Each relay shall be rated for a minimum of 300,000 ON and OFF cycles at full load.*

D. Multi-Tapped Transformer

The control panel shall incorporate the use of a multi-tapped transformer. The panel shall not require specification of voltage for each control location. The voltages of 120 & 277VAC shall be available with each control panel. The transformer shall be breaker protected with automatic shutdown in the event that an inappropriate electrical connection has occurred. The power supply shall have the capability of providing enough capacity to power up to eight (8) low voltage occupancy sensors.

E. Enclosure

The low voltage controller enclosure shall provide both class 1 and class 2 connection areas. The enclosure shall be NEMA 1 rated and have a physical size of: 12"H x 12"W x 4.25"D. The enclosure shall be manufactured out of 1/16" steel. The enclosure shall include a lockable hinged cover.

F. Operator Interface

The control panel programming interface shall reside in firmware in the control panel. The programming interface shall consist of a circuit board mounted LCD screen capable of linking switch inputs to relay outputs and schedule assignments. The integral LCD screen shall provide access to the main programming features. The LCD screen shall permit the user to manually command any or all relays individually.

G. Acceptable Products

Product shall be Bantam stand-alone controller manufactured by PLC or approved equal.

2.02 OVERRIDES / CONTROL

The controller shall provide timers for each override. Each override timer shall be capable of 1-999 minutes. Software shall enable or disable overrides based on time or other pre-assigned actions and / or profile designation.

A. Digital Wall Control Stations

The lighting controller shall support digitally addressable LED annunciated switches. The maximum total number of digital switches that shall be connected to one lighting controller is sixteen (16) with up to eighty (80) individual control buttons. The digital switches shall require a 4-conductor cable between control stations. The digital control stations shall control any relay group combination in the controller. Data communications status feedback for system checkout and troubleshooting (transmit and receive → LED'S) shall be visible on both the controller and interface. The digital control stations configuration system shall permit custom labeling for multiple button locations. The digital switch configuration shall be Decora™ form and function.

B. Dry Contact Inputs

The control system shall permit eight (8) dry contact inputs for override purposes. Momentary 3 wire or 2 wire (toggle) inputs shall be supported. Maintained contacts shall be supported as 2 wire (SPST) inputs. Inputs shall be dry contacts (24VDC internally supplied to the inputs). Any switch input shall be software linked to any number of relays for override control. Each switch input shall provide an LED to visually provide switch status on the controller for program verification and troubleshooting.

C. Lighted Switch Outputs (LSO)

The controller shall provide an output for pilot light wall switch annunciation of dry contact inputs. A fourth connec-

tion point on the controller board shall provide power to illuminate pilot light switches. This option shall confirm relay and switch operation. When a relay is in the "ON" position the pilot light switch shall be illuminated.

D. Photo Sensor

1. Photo sensors shall be specifically designed to operate with the environment in which they are placed, and shall provide 1-10VDC or 4-20mA signal ranges to the input of the controller. This signal shall be directly proportional to the amount of daylight entering the monitored area.
2. Sensor range shall be from a minimum of 0fc to an adjustable range of 7,500fc maximum. Actual range shall be; 0-55fc indoor low light, 0-100fc for indoor normal light, 0-250fc for outdoor, 1-1,000fc for atrium operation, and 10-2,000fc for skylight operation unless specified on the facility drawings. The sensor range shall be set at the factory and sealed against tampering in the field.
3. Foot-candle "ON" setpoint and "OFF" setpoint shall be preset at the factory and field tuning adjustments shall be made at the controller.
4. The location of sensor placement shall be specified on the drawings and placed in such a way to prevent interference from obstacles.
5. Sensors shall have an accuracy of +/- 1% at 70°F or +/- 5% over a 100°F temperature range.
6. The sensor shall have a focusing lens to provide the proper view for the area being monitored. Wiring of the sensor shall be with a shielded three-wire stranded cable rated at NEC Class 2 or 2P. It shall be #18 AWG or larger. Conductor shall be Belden type 27082AS or equal. (Colors must match sensor conductors and are Yellow = 1-10VDC signal; red = 24VDC supply; Black = -24VDC Return)
7. The Photo Sensor shall be PLC or approved equal.

E. Auto/Manual Override

The controller shall provide a single master override two-position switch with the option of a Manual (Hold) position and an Auto position. The master override shall not be accessible from the exterior. This master switch shall override all of the relays in their present state when the override is invoked by the user. This switch shall override and supersede all commands from the controller when the switch is in the Manual (Hold) position. The master switch shall function to override all the relays should the controller programming differ from the space function.

The system shall remember the last command to the individual relays. Upon returning the master override switch to the Auto position, the relays shall remain in their present state until the next command occurs.

Part 3 - Execution

3.01 EQUIPMENT INSTALLATION AND DOCUMENTATION

A. Installation

The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits and override wiring.

B. Documentation

The contractor shall provide accurate "as-built" drawings to the owner for correct programming and proper maintenance of the control system. The "as-builts" shall indicate the load controlled by each relay and the relay panel number.

C. Operation and Service Manuals

The factory shall supply all operation and service manuals.

3.02 PRODUCT SUPPORT AND SERVICE

A. Factory Support

Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment.

3.03 SYSTEM DELIVERY AND ACCEPTANCE

A. Delivery

The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements. The following items shall constitute factory standards and requirements:

- 1. All system equipment shall operate in accordance with specification and industrial standard procedures.*
- 2. An operational user program shall exist in the control system. The program shall execute and perform all functions required to effectively operate the site according to the requirements.*
- 3. Demonstration of program integrity during normal operation and pursuant to a power outage.*
- 4. Contractor shall provide a minimum of two training hours on the operation and use of the control system. Additional support services shall be negotiated between the contractor and the building owner or manager.*

3.04 WARRANTY

A. Warranty

Manufacturer shall supply a two (2) year warranty on all hardware and software.