

***GE LightSweep™ Lighting Control System
Guideform Specification***

If you have any questions at all regarding this specification, please contact your local GE Lighting Control representative, or call the GE Lighting Control Applications group at **877-584-2685 (877-LTG-CNTL)**. Thank you for allowing us to help with your project.

SECTION 16xxx - LIGHTING CONTROL SYSTEM

1.01 INTRODUCTION

The work covered in this section is subject to all of the requirements in the General Conditions of the Specifications.

Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system.

1.02 DESCRIPTION OF WORK

Extent of lighting control system work is indicated by drawings and by the requirements of this section. The intent is to provide an energy saving, networked lighting control system including lighting automation panels, programmable switches, occupancy sensors, photocells, daylight harvesting modules from a single supplier.

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

1.03 QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

Component Pretesting: All components and assemblies are to be factory pretested and burned-in prior to installation.

System Checkout: Factory trained technicians shall be available to functionally test each component in a programmable system after installation to verify proper operation, calibration and confirm that the panel wiring and addressing conform to the wiring documentation.

System Support: Factory applications engineers shall be available for on-site training as well as telephone support.

NEC Compliance: Comply to NEC as applicable to electrical wiring work.

NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

UL Approvals: Remote panels are to be UL listed under UL 916 Energy Management Equipment.

FCC Emissions: All assemblies are to be in compliance with FCC emissions Standards specified in Part 15 Subpart J for Class A application.

1.04 SUBMITTALS

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

Shop Drawings: Submit dimension drawings of all lighting control system components and accessories.

One Line Diagram: Submit a one line diagram of the system configuration proposed if it differs from that illustrated in the riser diagram included in these specifications.

Typical Wiring Diagrams: Submit typical wiring diagrams for all components including, but not limited to, relay panels, relays, low voltage switches, occupancy sensors, photocells, network switches, touchscreen scheduler data communications devices, etc.

1.05 MANUFACTURERS

The basis of the specified system is the LightSweep Lighting Control System manufactured by General Electric. Any other system considered must submit descriptive information 10 days prior to bid. Prior approval does not guarantee final approval by the electrical engineer. The contractor shall be completely responsible for providing a system meeting this specification in its entirety. All deviations from this specification must be listed and individually signed off by the consultant.

PART 2 - MATERIALS AND COMPONENTS

2.01 - Basic Low Voltage Switching System

A. System Description

1. The Lighting Control System shall consist of modular relay panel assemblies, touchscreen scheduler, network switches, low voltage switches, occupancy sensors and/or photocells, as well as their associated wiring.
2. The relay panels shall be mounted in electrical closets or in the field as indicated on the drawings. The numbered relays in the panel shall be wired to control the power to each load as indicated on the Panel Wiring Schedules included in the drawings. All power wiring will be identified with the circuit number controlling it at the load.
3. Low voltage switches, occupancy sensors, and/or photocells shall be mounted in the spaces as indicated on the Reflected Ceiling Plans. Low voltage wiring from the switches and sensors to the relay panel shall be CLASS 2 or CLASS 2P (plenum rated) as required by the National Electrical Code and local standards.
4. System shall be capable to integrate to Communication to BMS shall use the BACnet protocol.

B. Hardware Features

1. Modular Relay Panels shall be UL listed and consist of the following:
 - a. Tub: Empty NEMA 1 enclosure sized to accept up to 12, 24, 36 or 48 RR7P or RR9P relays and associated control modules.
 - b. Interior: Bracket with pre-mounted GE RR7P or RR9P relays. Interiors shall be sized to accept either up to 12, 24, 36 or 48 relays in multiple of 6. Interior shall have mounting clips to allow installing and removing the plug-in control modules. Relays shall attach to control modules using a single plug-in connector.
 - c. Plug-in control modules shall allow creating application specific panel configuration. Each module shall have two rotary address switches and LED indicators for: network traffic, module status, address conflict.
 - 1) Relay control module shall control up to 6 relays per module. Provide the number of modules and allow for space for future expansion as indicated in the panel schedules. Relay modules shall have two available configurations with or without switch inputs. Provide the correct model based on individual relay control requirement. Switch inputs shall allow for 2 or 3-wires momentary or maintained contacts. Each input shall control the associated relay.
 - 2) Group Switch Input module shall have eight programmable inputs. Each input shall have a pushbutton for programming or local override

capability and a status LED. Every input shall allow controlling any number of relays in the network in any of the three control modes (or scenes): ON/OFF, ON only, OFF only for any group transition. A selector jumper shall allow setting the input as switch or analog type. In switch mode, it shall allow to provide power to motion sensors or act as a pilot output, configured through the program. Group switch module shall provide power to relay modules and network devices.

- 3) Dimming Module shall have four analog inputs and four 0-10V dimming outputs. A single input – photocell – shall allow controlling multiple outputs with programmable offsets. Dimming outputs shall also be configurable to operate as scenes controlled by Group Switch inputs or network switches. Dimming module shall provide power to Relay modules and field devices.
 - 4) BACnet controller (optional) shall allow for system expansion, PC front-end programming, remote communication to the lighting control system, integration to BMS using the standard BACnet protocol.
- c. Power Supply: Transformer assembly with two dual-tap transformers (120/277V) with separate 24V outputs; one providing power to control modules installed in the panel, the second providing power network switches and other field mounted controllers. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against powerline spikes. 120 or 277 VAC, 50/60 Hz. +/- 10%.
 - d. Cover: Surface or Flush with captive screws in a hinged, lockable configuration. When opened, the cover shall expose only the low voltage section. A wiring schedule directory card shall be affixed to the cover's back to allow identification of circuits/relays/loads controlled if the door is open or the cover is off.
2. Dataline Scheduler shall install in one of the relay panels or remote in the field connecting to panels using CAT5 cable. The scheduler shall allow system programming, scheduling and troubleshooting using a password protected colored touchscreen. Screen displays shall be intuitive and provide relay/group status, photocell readings and calibration, dimming output levels and shall allow controlling any object in the network (relay, group, dimming channel).
2. Switches
 - a. Momentary Switches
 - i. Provide Specification Grade standard, pilot, or locator configuration momentary pushbutton type switches as shown on the plans for overriding the relays. Colors and markings as indicated on plans.
 - b. Programmable Network Switches
 - i. Network switches shall connect to panels in a daisy-chain topology using CAT5 cable.
 - ii. The soft touch Network Switch stations shall be field configurable for 1, 2, 4 or 8-buttons using software or the touchscreen programmer. Switches shall mount in a standard **single gang** box, using Decora plate. The switch face shall be transparent, allowing changing the switch color by replacing the label and the cover, without the need to remove the switch from the system.
 - iii. Each switch button shall be individually programmed to control any number of relays in the network and/or dimming channels. Programming shall be done using the programming pushbutton on the switch station, the touchscreen scheduler or the configuration software. Each button shall

have a two-color LED, indicating: RED for ON, off for OFF and GREEN for MIXED state.

3. Occupancy Sensors

a. General

- i. All sensors shall be directly compatible with the modular relay panels described above and shall wire directly to same (Class 2 or 2P wiring) without any auxiliary components or devices required.
- ii. Sensors shall be specifically designed for energy conservation using ultrasonic, infrared or dual technology detection method.
- iii. Separate sensitivity and time delay adjustments shall be readily accessible to the user with LED indication of sensed movement to simplify set up.
- iv. Operation shall be silent.

Sensors shall be designed specifically for the size and use of the area in which they will be used as indicated below.

b. General Purpose Room Sensors

- i. These units shall be available with either a single direction coverage pattern or a two-way pattern designed to detect the types of movement typical of an office, conference room, or classroom.
- ii. One-way sensors shall provide 900 sq. ft. coverage of "1/2 step" motion and 670 sq. ft. coverage of "working-at-desk" motion.
- iii. Two-way sensors shall provide 2,000 sq. ft. coverage of "1/2 step" motion and 1,344 sq. ft. coverage of "working-at-desk" motion. Multiple two way sensors may be wired in a "Master-Slave" format to extend their area of coverage.
- iv. User adjustable time-delay shall be from 30 seconds to 20 minutes.

c. Corridor and Hallway Sensors

- i. These sensors shall be specifically designed for use in corridors and warehouses where walking is the predominant motion detected.
- ii. They shall detect motion in a corridor 14' wide and 80' long with one sensor mounted 10' above the floor.
- iii. User adjustable time delay shall be from 30 seconds to 20 minutes.
- iv. Multiple sensors of this type may be wired Master/Slave to extend their area of coverage.

4. Photocells

a. General

Each photocontrol point shall consist of an architecturally compatible sensor mounted in the appropriate location for measuring the available daylight. The sensor shall connect to the group switch input or dimming module via a single 20/4 shielded conductor with a maximum distance of 500 ft.

b. Sensor devices

Four different sensors shall be available to match the specific application. Each sensor shall employ photodiode technology to allow a linear response to daylight in it's given footcandle range.

- i. For Exterior Lighting: A hooded sensor that can be horizontally mounted on a 1/2" KO or threaded conduit. Shall employ a flat lens, and work with a footcandle range between 1-10 or 10-100 in 10% increments. The entire sensor shall be encased in optically clear epoxy resin.
- ii. For Indoor Lighting: A sensor with a fresnel lens providing for a 60 degree cone shaped response area shall be employed to monitor indoor office

- lighting levels. The sensor shall require only a 3/8 inch penetration hole in the ceiling for mounting.
- iii. For Atriums: Sensor shall have a translucent dome with a 180 degree field of view and respond in the range of 100-1,000 footcandles. Sensor shall mount on a 1/2 inch KO or threaded conduit.
 - iv. For Skylights: Sensor shall have a translucent dome with a 180 degree field of view and respond in the range of 1,000-10,000 footcandles. Sensor shall mount on a 1/2 inch KO or threaded conduit.
5. Low Voltage Wire
- a. All low voltage wiring shall be color coded to match the relays, switches, and sensors. It must also be UL listed as conforming to Class 2 or Class 2P wiring requirements.
6. Network communication parameters
- a. Dataline used for the Relay Control cabinets, remote modules and programmable switches shall be CAT5 and installed in a daisy-chain topology as per factory recommendation:
 - i. Maximum dataline length = 3000 ft in a contiguous daisy-chain segment.
 - ii. Up to 99 devices connected into a dataline segment.
 - iii. Using the BACnet controller, the network can be extended beyond 3,000ft or 99 devices.

C. Approved Manufacturers

- 1. GE or approved equal.

Note: *The contractor shall be completely responsible for providing a system which meets this specification in its entirety. All deviations from this specification must be listed and individually signed off by the consultant.*

2.02 - Low Voltage Switching System With Fully Programmable Intelligent devices

A. System Description

- 1. Plug-in Dataline Scheduler and/or BACnet controller shall provide system programmability and networking capability. No changes to the low voltage switching system defined in Section 2.01 or to the panels themselves shall be required if adding the Scheduler and/or BACnet controller.
- 2. Occupant-Sensitive Operating Scenarios
The Dataline Scheduler and/or BACnet controller must support the following operating scenarios:
 - a. Flick warning before lights are scheduled off or the override time expires; Flick warning shall be enabled/disabled for individual relays.
 - b. Time delay – programmable from 1 minute to 24 hours.
 - c. Preemptive override capability (HID scenario). The override shall be initiated prior to schedule expiration.
 - d. Common area interlock – a common area shall turn ON when any associated zone is activated and shall go off after the last zone goes off and the time delay elapses.
 - e. Cleaning scenario – the switch shall turn OFF only relays that were turned ON by the cleaning switch.
 - f. Astronomical time clock function with programmable offset for sunrise and sunset.
 - g. Schedule/input interlock shall allow to enable/disable photocell; occupancy sensor or operation during programmed period of time.
 - h. One photocell shall allow configuring individual foot-candle level for different zones either for dimming channels or step dimming using relays.

- i. Programmable scenes – each programmable input or network switch shall allow creating ON/OFF and dimming scenes including multiple relays and dimming channels.
- 3. The Dataline scheduler shall provide 8 individual schedules, with 7 week days and 32 special events. Special events shall allow programming one-time events, re-occurring events or block events.
- 4. Each lighting group shall allow programming an offset to any schedule (store type scenario).
- 5. The BACnet controller shall allow system programming using a front-end computer, system expansion and integration with Building Management System via BACnet protocol. BACnet controller shall allow creating custom programming using any object in the system and any of the logic functions available.

B. Operator's Software

- 1. Software shall have a modular approach and shall include:
 - a. Basic system configuration – Menu driven – shall allow to configure all system parameters
 - b. Graphic module (optional) and ____ custom graphic screens
 - c. Historian (optional) for data logging.
 - d. WEB server (optional) and ____ custom graphic screens.

C. Approved Manufacturers

- 1. GE or approved equal.
- 2. GE LC Catalog Numbers
 - a. Group Module CLCGSM8
 - b. Relay Module – CLCRMS6 (w RR9P relays) or CLCRM6 (with RR7P relays)
 - c. Dataline scheduler – CLCDLS
 - d. 0-10V Dimming module – CLCDIM4
 - e. BACnet controller – CLCBNET
 - f. Base Software – CLC340LITE
 - g. Software with graphic module – CLC340NE
 - h. Software w/ graphic & historian – CLC340NLE-x
 - i. Web software – CLC340NW-LL

3.01 - Support Services

A. Service Description

- 1. System Startup
Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all system components.
- 2. Training
Manufacturer shall provide factory authorized application engineer to train owner personnel in the operation and programming of the lighting control system.
- 3. **(Option)** Documentation
Manufacturer shall provide system documentation including:
 - a. System 1-line showing all panels, number and type of switches and sensors, dataline, programmable system switches, telephone override modules, and central PC.

- b. Drawings for each panel showing hardware configuration and numbering.
- c. Panel wiring schedules
- d. Typical wiring diagrams for each component.

4. **(Option) Programming**

Manufacturer shall provide system programming including:

- a. Wiring documentation
- b. Programmable Panel and System Switch Operation
- c. Operating Schedules.

5. **(Option) Extended Warranty**

Manufacturer shall provide a **(specify)** ____ year extended warranty in addition to a required one year warranty for all system components.