

SECTION 260923

ROOM CONTROLLER SYSTEM EATON'S LIGHTING SYSTEMS ROOM CONTROLLER AND ROOM CONTROLLER NETWORK

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PART 1 – GENERAL

1.1 SUMMARY

B. Section Includes:

1. Occupancy, Vacancy and Daylighting Sensor Control
2. Emergency Lighting Control (if applicable)

C. Related Section

1. Section [260926 – Lighting Control Panel Boards:] Lighting panels (switching) controlled by ControlKeeper
2. Section [260936 – Modular Dimming Controls:] Room Controller QuickKit
3. Section [262726 - Wiring Devices:] Receptacles
4. Section [265113 – Interior Lighting Fixtures, Lamps, and Ballasts:] Fluorescent electronic dimming ballasts
5. Section [25000 – Integrated Automation] Building integrator shall provide integration of the lighting control system with Building Automation Systems
6. Electrical Sections, including wiring devices, apply to the work of this Section

D. Control Intent – Control Intent includes, but is not limited to:

1. Defaults and pre-defined calibration settings for such items as daylighting, occupancy sensor times, sensitivity, fade rates, etc.
2. Wallstation pre-defined control sequences
3. Scene Wallstation programmable control sequences
4. Daylight sensor and switching zones

5. Receptacle controls
6. Demand Response control (if applicable)
7. Emergency Lighting control (if applicable)

1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
- B. Underwriter Laboratories of Canada (ULC)
- C. International Electrotechnical Commission (IEC)
- D. International Organization for Standardization (ISO)
- E. National Electrical Manufacturers Association (NEMA)
- F. WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. NEMA WD7 -
- H. Underwriters Laboratories, Inc. (UL)
 1. 508 – Industrial Control Equipment
 2. 924 – Emergency Lighting

1.3 SYSTEM DESCRIPTION & OPERATION

- A. The Lighting Control and Automation system as defined under this section covers the following equipment:
 1. Room Controller QuickKit (RCQK) – Turn key solutions to meet typical applications and provide product necessary to help a space meet the requirements of California Title 24 or ASHRAE 90.1 2010 out of the box. The RCQK includes all defined equipment to meet the following applications.
 - a. Conference Room
 - b. Office
 - c. Classroom
 - d. Patient Room
 2. Room Controller Starter Kits – Pre-defined solutions to provide the Electrical Contractor the product they need to meet typical applications for rough in installation to help a space meet the requirements of California Title 24 or ASHRAE 90.1 2010 out of the box.

3. Room Controllers – Stand-alone three relay controller with 0-10 volt control for ballasts or LED drivers with integral UL 924 emergency relay (model dependent), that RCQK smart devices connect to over the RCQK communications network.
4. Network Room Controllers – Stand-alone three relay controller with 0-10 volt control for ballasts or LED drivers with integral UL 924 emergency relay (model dependent), that RCQK smart devices connect to over the RCQK communications network.
5. Occupancy Sensors – Auto adjusting, MicroSet technology NEMA WD7 compliant occupancy sensors.
6. Wallstations – Smart device that is pre-configured, pre-engraved digital pushbutton wallstations and dimmers.
7. Scene Wallstation – Smart device that is pre-configured, pre-engraved digital pushbutton scene wallstations, dimmers and programmable scene buttons.
8. Daylight Photosensor – Smart device that is a multi-zone open loop daylight sensor with two-way active infrared (IR) communications, which can provide dimming control for daylight harvesting and personal control and programming for the space.
8. Demand Response – OpenADR or other demand response input shall be connected to one or more Room Controllers. Each Room Controller shall respond to the demand response input and automatically reduce the light level by at least 15% but not more than 40% of target light level.
9. RCQK communication network – Pre-defined lengths of QuickConnect cable (RJ45) for power and data to smart devices.

1.4 LIGHTING CONTROL APPLICATIONS

- A. Minimum lighting control performance required, unless local Energy Code is more stringent.
 1. Occupancy/vacancy requirements – Provide an occupancy/vacancy sensors with Manual On/ Automatic Off or Automatic On/ Automatic Off functionality in all spaces. Manual On vacancy sensors should be used for any enclosed space with a Manual On switch that does not require hands free operation. Spaces with multiple occupants or where line of sight might be obscured ceiling or corner mount sensors and Manual wallstations would be required. Automatic On of lighting via occupancy sensor cannot exceed 30% of lighting. Systems that do

that allow the user to select Occupancy or Vacancy Mode shall not be acceptable.

2. Bi-Level switching – Provide multi-level switching and/or variable dimming for maximum energy savings.
3. Task Lighting / Receptacle Control – Provide automatic shut off of non-essential plug loads and task lighting in all spaces. Provide Manual On or Automatic On of receptacles whenever spaces are occupied. Receptacle Control will only be shut off when no occupancy is detected within the space. Systems that do not provide receptacle control for a full 20 Amp circuit shall not be acceptable.
4. Daylight Zones – Primary sidelit or toplit areas within an enclosed space shall be controlled separately and automatically by a multi-level photocontrol device without the need for programming. Adjustments to the daylight zones must be provided by a simple to use, intuitive remote handheld device.
5. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to dim electric light to the lowest light level.
6. Provide the ability to adjust the high end and low end trim of the dimmers to ensure the lighting automatically provides energy saving even when daylighting calls for full illumination.
7. Provide the ability for the dimmers and the relays to function separately. Systems where the 0-10V dimmers and relays are tied together reduce design capabilities and shall not be acceptable.
8. Provide the ability to provide occupancy status to a Building Automation System. Occupancy status shall happen automatically and be provided to the BAS without the need of programming any device in the Room Controller System. Systems that require programming for BAS occupancy status shall not be acceptable.
9. Shall be capable of automatically responding to a Demand Response Signal and adjusting the lighting level, without the need of programming or software. Systems that require software or commissioning to provide Demand Response integration shall not be acceptable.

B. Additional controls:

1. Provide occupancy or vacancy sensors (Auto On or Manual On) for any enclosed office, conference, meeting or training rooms. Spaces with multiple occupants or where line of sight may be obscured require ceiling or wall/corner mounted sensors with Manual On switches.

2. Conference, meeting, training, auditoriums and multi-purpose rooms shall have controls that allow for scene based and independent control of each output. Rooms larger than 300 square feet shall support at least four (4) pre-set lighting scenes. Occupancy or vacancy sensors shall ensure all lighting, receptacles, and HVAC in the space is turned Off when no occupancy.
3. Provide integral control of an adjustable toplight control system such as a Solatube® Daylight Dimmer. Coordinate the adjustable toplight control with wallstation push buttons for A/V Mode and presentations to automatically reduce the amount of toplight when pressed. Systems that require additional interfaces for connection and control or programming shall not be acceptable.
4. Egress lighting control shall be integral to the system. The system shall provide an automatic control of adjacent corridor and/or egress lighting based upon room occupancy without programming. Systems that do not ensure that adjacent corridor and/or egress lighting is controlled with room occupancy shall not be acceptable.

5. Provide integral connection for a healthcare patient pillow speaker for integration between the lighting control system, nurse call system and room entertainment system. The pillow speaker shall be provided from the same manufacturer as the lighting control system, which allows integration with multiple nurse call systems. The pillow speaker shall provide control of 0-10V dimming of up to three zones from the patient bed. Systems that utilize dry contact inputs from the nurse call system may not provide full dimming of up to three zones and shall not be acceptable. For pillow speaker, use the Eaton Lighting Systems catalog numbers: [RC3DEHC-PL] for Room Controller, [GG37-P], [GPCS-3Z-DIM].

1.5 PERFORMANCE REQUIREMENTS

- A. The Room Controller QuickKit shall be accompanied by: recessed or suspended luminaires specified as fluorescent or LED with defined CRI and lumen output, provided by the same manufacturer as the control systems.
- B. The Room Controller QuickKit shall include: the Room Controller (RC3-PL, RC3D-PL, or RC3DE-PL), wallstations, matching color screwless wallplates, occupancy sensor, Daylight Sensor, Receptacle Switchpack, QuickConnect cable (plenum or non-plenum pre-terminated and defined for package).
- C. The Room Controller Starter Kit shall include: the Room Controller (RC3D-PL, or RC3DE-PL), Receptacle Switchpack, plenum QuickConnect cable (defined for package).

1.6 SUBMITTALS

- A. Submittals Package: Submit the shop drawings and the product data specified below at the same time as a package.
- B. Shop Drawings:
 1. Composite wiring and/or schematic diagram of each control circuit, as proposed, to be installed (standard diagrams will not be accepted).
 2. Scale drawing for each area showing exact location of each sensor, room controller and digital switch.
- C. Product Data: Catalog sheets, specifications and installation instructions.
- D. Include data for each device which:
 1. Indicate best mounting and installation locations for each device. This may be contained within drawings or installation instructions depending upon the project.
- E. Warranties: Standard and special warranty information.

1.7 QUALITY ASSURANCE

- A. Manufacturer: Minimum [10] years' experience in manufacture of lighting controls.
- B. Products: All electrical components and devices shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for intended use.
- C. Comply with NFPA 70.
- D. Source Limitations: Obtain luminaires and control systems from a single manufacturer.

1.8 DELIVERY, STORAGE AND HANDLING

- A. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements.
- B. Packaging: All components of the lighting control system shall be packaged in a single box as a QuickKit or as individual components. The QuickKit catalog number will be marked on package label along with bill of materials. Individual component packages will be marked with product catalog number.
- C. Handling: Packaging will include clear installation instructions for all components with typical illustrations of installation locations and connections. The installing contractor can easily match each package to the layout on the design floor plans.

1.9 PROJECT CONDITIONS

- A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
 - 1. Ambient temperature: 0° to 40° C (32° to 104° F)
 - 2. Relative humidity: Maximum 90 percent, non-condensing
- B. Coordinate layout and installation of luminaires and controls with other construction.
- C. Coordinate site commissioning with manufacturer no less than 21 days prior to required date.

1.10 WARRANTY

- A. Manufacturer shall supply a 5-year warranty on all hardware and software. These warranties will be in effect for all installations. Systems that provide special warranties based on installation shall not be acceptable.

1.11 MAINTENANCE

- A. Provide extra materials described below when needed. Products shall match those that are installed. Extra materials should be stored and identified with labels describing contents. Inclusion of extra materials on the bill of materials is not the responsibility of the manufacturer.
- B. Recommended extra materials:
 - 1. Occupancy Sensors: Provide 1 of each product type for every 200 installed, to be used for maintenance.
 - 2. Daylight Sensors: Provide 1 of each product type for every 100 installed, to be used for maintenance.
 - 3. Wallstations: Provide 1 of each product type for every 200 installed, to be used for maintenance.
 - 4. Receptacle Switchpack: Provide 1 of each product type for every 100 installed, to be used for maintenance.
 - 5. Room Controller: Provide 1 of each product type for every 200 installed, to be used for maintenance.
 - 6. QuickConnect Cable: Provide 1 of each product type for every 200 installed, to be used for maintenance.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Eaton Lighting Systems
 - a. System: Room Controller QuickKit (RCQK)
 - b. System: Room Controller Starter Kit
 - c. System: Room Controller
 - d. System: Room Controller Network
 - 2. Basis of design product: Eaton Lighting Systems Room Controller is subject to compliance and prior approval with specified requirements of this section, one of the following:
 - a. Eaton Lighting Systems Room Controller
 - b. Eaton Lighting Systems Room Controller Network
 - c. <Insert manufacturer's name>

B. Substitutions: [Not Permitted]

1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
2. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate of [\$200.00] per hour.
3. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design, highlighted in an alternate color, to the engineer for review and approval prior to rough-in.

2.2 WALL OR CEILING MOUNTED OCCUPANCY PERFORMANCE REQUIREMENTS

A. Sensing mechanism:

1. [Infrared]: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
2. [Ultrasonic]:
 - a. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
 - b. Utilize Doppler shift ultrasonic detection technology.
3. [Dual technology]:
 - a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
 - c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be considered.

B. Power failure memory:

1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

C. Designed and tested to withstand discharges of 15,000 volts per IEC 801-2 without impairment of performance.

D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.

E. Sensor shall have time delays from 10 to 30 min.

F. When specified, sensors shall automatically adjust time delay and sensitivity settings.

G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.3 CEILING MOUNTED SENSORS

A. Product: [OAC-DT-2000], [OAC-DT-1000], [OAC-P-1500], [OAC-U-2000].

B. Provide all necessary mounting hardware and instructions.

C. Sensors shall be Class 2 devices.

D. Connect to Room Controller via Click & Go cable to eliminate wiring errors.

1. [OCC-RJ45] Room Controller accessory is used to allow any standard occupancy/vacancy sensor to utilize Click & Go cable connections.
2. Two RJ45 connection ports for connection to Room Controller.
3. Occupancy Sensor and Daylight sensor shall be capable of a daisy chain connection to the Room Controller.

E. Device calibration and features:

1. Sensitivity – 0-100% in 10% increments.
2. Time delay – 1-30, self-adjusts to 10 min based on room occupancy.
3. Test mode – Fifteen second time delay.
4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
5. Walk-through mode.
6. Ultrasonic and Dual Technology Sensors utilize two independent sensor detection circuits simultaneously to ensure optimum performance, regardless of location or proximity to walls and structures.
7. Ultrasonic and Dual Technology Sensors utilize Variable Drive Circuitry (VDC) in cases of over saturation from misapplication, which automatically adjusts the volumetric output without reducing detection capability. Systems that reduce detection coverage area shall not be acceptable.
8. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency, continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.
9. All load parameters including Automatic On/Manual On, blink warning and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.

F. Device Status LEDs including:

1. PIR Detection
2. Ultrasonic detection

G. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.

H. Manual override of controlled loads.

I. Multiple occupancy sensors may be installed in a room by simply daisy-chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required

J. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].

K. Sensors shall be RoHS compliant.

2.4 WALL/CORNER MOUNTED SENSORS

- A. Product: [OAWC-P-120W], [OAWC-P-009L-H], [OAWC-DT-120W],
- B. Provide all necessary mounting hardware and instructions.
- C. Sensors shall be Class 2 devices.
- D. Connect to Room Controller via Click & Go cable to eliminate wiring errors.
 - 1. [OCC-RJ45] Room Controller accessory is used to allow any standard occupancy/vacancy sensor to utilize Click & Go cable connections.
 - 2. Two RJ45 connection ports for connection to Room Controller.
 - 3. Occupancy Sensor and Daylight sensor shall be capable of a daisy-chain connection to the Room Controller.
- E. Device calibration and features:
 - 1. Sensitivity – 0-100% in 10% increments.
 - 2. Time delay – 1-30, self-adjusts to 10 min. based on room occupancy.
 - 3. Test Mode – Fifteen second time delay.
 - 4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - 5. Walk-Through Mode.
 - 6. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.
 - 7. All load parameters including Automatic On/Manual ON, blink warning, and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.
- F. Device Status LEDs including:
 - 1. PIR Detection
 - 2. Ultrasonic detection
- G. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.
- H. Manual override of controlled loads.
- I. Multiple occupancy sensors may be installed in a room by simply daisy chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required

J. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].

K. Sensors shall be RoHS compliant.

2.5 ROOM CONTROLLER ZONE WALLSTATIONS

- A. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:
1. Removable buttons for field replacement with engraved buttons and/or alternate color buttons [ENGRV-*BTNL-*], [ENGRV-*BTNS-*]. Button replacement may be completed without removing the switch from the wall.
 2. Intuitive button labeling to match application and load controls.
 3. Pre-defined digital button configurations. Each wallstation is shipped with pre-defined digital button configurations which are automatically sensed by the connected Room Controller and mapped to specific load controls for immediate out of the box functionality.
- B. Two RJ-45 ports for connection to the Room Controller local network.
- C. Multiple digital wallstations may be installed in a room by simply connecting them to the Room Controller local network. No additional configuration will be required to achieve multi-way switching.
- D. Room Controller digital wallstations are delivered with pre-defined functions including, raise, lower, A/V Mode, Quiet Time, manual and scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do not deliver maximum energy savings out of the box shall not be acceptable.
- E. Optional custom labeling is available for application or location specific wallstation button labels.
- F. Eaton Lighting Systems catalog numbers:

| | |
|---------------|---|
| RC-2TLB-ES1-* | Entry, All Off (2 large buttons *= W,V,B,G) |
| RC-6TSB-TS1-* | General, Whiteboard, Quiet Time, A/V Mode, Raise, Lower (6 small buttons *= W,V,B,G) |
| RC-6TSB-TS2-* | General, Whiteboard, Quiet Time, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-5TSB-TS3-* | General, Whiteboard, Quiet Time, A/V Mode, All Off (5 small buttons *= W,V,B,G) |

| | |
|----------------|--|
| RC-6TSB-TS4-* | General, Whiteboard, A/V Mode, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-4TSB-TS5-* | Entry, General, Whiteboard, All Off (4 small buttons *= W,V,B,G) |
| RC-6TSB-TS6-* | Entry, General, Whiteboard, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-TS7-* | Row 1, Row 2, Row 3, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-TS8-* | Uplights, Downlights, Accent, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-TS9-* | Entry, General, Quiet Time, Whiteboard, A/V Mode, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-TS10-* | Main, Whiteboard, A/V Mode, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-ZAD-* | Zone 1 UP, Zone 1 DN, Zone 2 UP, Zone 2 DN, Zone 3 UP, Zone 3 DN (6 small buttons *= W,V,B,G) |
| RC-3TLB-Z1D-* | Zone 1, Raise, Lower (3 large buttons *= W,V,B,G) |
| RC-3TLB-Z2D-* | Zone 2, Raise, Lower (3 large buttons *= W,V,B,G) |
| RC-3TLB-Z3D-* | Zone 3, Raise, Lower (3 large buttons *= W,V,B,G) |
| RC-4TSB-HC1-* | General, Exam, Reading, All Off (4 small buttons *= W,V,B,G) |
| RC-6TSB-HC2-* | General, Exam, Reading, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-3TLB-OS1-* | Half Lights, Full Lights, All Off (3 large buttons *= W,V,B,G) |
| RC-5TSB-OS2-* | Half Lights, Full Lights, Raise, Lower, All Off (5 small buttons *= W,V,B,G) |
| RC-6TSB-OS3-* | Half Lights, Full Lights, Undercabinet, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |
| RC-2TLB-OS4-* | All On, All Off (2 large buttons *= W,V,B,G) |

2.6 ROOM CONTROLLER SCENE WALLSTATIONS

- B. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:
 - 1. Removable buttons for field replacement with engraved buttons and/or alternate color buttons [ENGRV-*BTNL-*], [ENGRV-*BTNS-*]. Button replacement may be completed without removing the switch from the wall.

2. Intuitive button labeling to match application and load controls.
 3. Pre-defined digital button configurations. Each scene wallstation is shipped with a pre-defined digital button configuration which is automatically sensed by the connected Room Controller and mapped to specific load controls for immediate out-of-the-box scene based functionality.
- B. Two RJ45 ports for connection to the Room Controller local network.
 - C. Multiple digital wallstations may be installed in a room by simply connecting them to the Room Controller local network. No additional configuration will be required to achieve multi-way switching.
 - D. Room Controller Scene Wallstations are delivered with pre-defined scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do not deliver maximum energy savings out of the box shall not be acceptable.
 - E. Optional custom labeling is available for application or location specific wallstation button labels.
 - F. Scene wallstations scene control shall be adjustable through a simple interface or handheld control for flexibility of lighting scenes. This personal remote shall allow individual zone control, scene control and scene setting capabilities. [HHPR-RC]
 - G. Eaton Lighting Systems catalog numbers:

| | |
|--------------|--|
| RC-3TLB-P1-* | Scene 1, Scene 2, All Off (3 large buttons *= W,V,B,G) |
| RC-6TSB-P2-* | Scene 1, Scene 2, Scene 3, Scene 4, Scene 5, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-P3-* | All, On, Scene 1, Scene 2, Scene 3, Scene 4, All Off (6 small buttons *= W,V,B,G) |
| RC-6TSB-P4-* | Scene 1, Scene 2, Scene 3, Raise, Lower, All Off (6 small buttons *= W,V,B,G) |

2.7 DAYLIGHTING ADJUSTMENT HANDHELD REMOTE CONTROLS

- A. Battery-operated handheld 10 button configuration for remote daylight sensor configuration. Remote controls shall include the following features:
 1. Two-way infrared (IR) transceiver for line of sight communication with the Room Controller daylight sensors within up to 30 feet.
 2. Red communication LED on the daylight sensor confirms button press.
 3. Inactivity timeout to save battery life.

- B. Three intuitive daylight sensor range pushbuttons.
- C. Intuitive daylight zone adjustment raise/lower pushbuttons.
- D. Eaton Lighting Systems catalog numbers: [HHPRG-RC].

2.8 PERSONAL ADJUSTMENT HANDHELD REMOTE CONTROLS

- A. Battery-operated handheld 10-button configuration for remote daylight sensor configuration. Remote controls shall include the following features:
 - 1. Two-way infrared (IR) transceiver for line-of-sight communication with the Room Controller daylight sensors within up to 30 feet.
 - 2. Red communication LED on the daylight sensor confirms button press.
 - 3. Inactivity timeout to save battery life.
- B. Intuitive individual Control of each relay and 0-10V dimming zone.
- C. Six user adjustable scene pushbuttons for simple selection and control of space lighting.
- D. Eaton Lighting Systems catalog numbers: [HHPR-RC].

2.9 ROOM CONTROLLERS

- A. Room Controllers are fully functional out-of-the-box to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will include line voltage wiring space and will not require additional electrical junction boxes. The control units will include the following features:
- B. Fully functional room configuration to the most energy-efficient sequence of operation based upon the connected devices in the room.
- C. Simple replacement – Using the automatic configuration capabilities, a Room Controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
- D. Quick installation features including:
 - 1. Included line voltage space to simplify wiring and eliminate the need for separate junction boxes.
 - 2. Included emergency voltage space to simplify wiring of emergency luminaire connections.

3. Breakouts or knockouts for direct conduit connection.
4. Line and low voltage sections include conduit connection points. Systems that require special accessories for direct conduit connections may not comply with local building codes and shall not be acceptable.
5. Quick low voltage connections using standard RJ45 QuickConnect cable.
6. Dual voltage (120/277 VAC, 60 Hz).
7. Zero cross circuitry for each load.
8. Three relay configuration.
9. Efficient 150 mA switching power supply.
10. Six RJ45 Click & Go local network ports.
11. All models shall be available in either a plastic or metal enclosure for simplified installation in appropriate spaces
12. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.

E. On/Off/Dimming Room Controllers shall include:

1. Real time current metering (optional).
2. Room Controller metal enclosure options include a “-PL” in the catalog number.
3. Room Controller Network options include a “-N” in the catalog number.
4. Three relay, switching zone configuration [RC3, RC3-PL, RC3-PL-N]
 - a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
5. Three relay, three 0-10V dimming zone configuration [RC3D, RC3D-PL, RC3D-PL-N].
 - a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
 - b. Up to three 0-10V analog outputs per relay for control of compatible ballasts and LED drivers.

6. Three relay, three 0-10V dimming zone configuration with one emergency UL 924 relay [RC3DE, RC3DE-PL, RC3DE-PL-N].
 - a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
 - b. Up to three 0-10V analog outputs per relay for control of compatible ballasts and LED drivers.
7. Three relay, three 0-10V dimming zone configuration for patient rooms [RC3DEHC, RC3DEHC-PL, RC3DEHC-PL-N].
 - a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.
 - b. Up to three 0-10V analog outputs per relay for control of compatible ballasts and LED drivers.
- F. Eaton Lighting Systems networkable metal enclosure catalog numbers: [RC3-PL-N], [RC3D-PL-N], [RC3DE-PL-N], [RC3DEHC-PL-N].
- G. Eaton Lighting Systems metal enclosure catalog numbers: [RC3-PL], [RC3D-PL], [RC3DE-PL], [RC3DEHC-PL].
- H. Eaton Lighting Systems plastic enclosure catalog numbers: [RC3], [RC3D], [RC3DE], [RC3DEHC].

2.10 DAYLIGHT PHOTOSENSORS/ IR RECEIVER)

- A. Daylight photosensors work with Room Controllers to provide automatic daylight dimming capabilities for any load type connected to a room controller. Open loop daylight sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Daylight sensors shall be interchangeable without the need for rewiring. Daylight sensors shall be capable of daisy-chaining with occupancy sensors in each room.
- B. Digital daylight sensors include the following features:
 1. An internal photodiode that measures only within the visible spectrum and has a response curve that closely matches the photopic curve.
 2. The daylight sensor has three light level ranges: Low (3-300 lux), High (30-3000 lux), and Direct Sun (300-30000 lux).
 3. For dimming daylight harvesting, the daylight sensor shall provide the capability of controlling multiple (up to three) daylight zones immediately upon connection without programming.

4. Optional digital wallstations to allow occupants to reduce lighting level to increase energy savings and lower lighting levels for a selected period of time or cycle of occupancy.
5. Infrared (IR) transceiver for daylight sensor range and daylight zone gain adjustments via handheld remote programmer. [HHPRG-RC]
6. Infrared (IR) receiver for personal control and scene programming via handheld remote programmer. [HHPR-RC]
7. Red configuration LED that blinks to indicate data transmission.
8. Green Mode status LED that blinks to indicate Daylight Commissioning Mode.
9. Green Mode status LED that remains constant ON when daylight range is set to low for available natural light.
10. One RJ45 port for connection to Room Controller local network.
11. An adjustable head and an optional mounting bracket to accommodate multiple mounting methods and building materials. The daylight sensor may be mounted on a ceiling tile, skylight well, suspended lighting fixture or backbox.

C. Open loop digital daylight sensor includes the following additional features:

1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
2. Automatically establishes dimming set-points upon power up without any programming. Optional calibration using the wireless IR handheld programmer. [HHPRG-RC]
3. Eaton Lighting Systems Catalog Number: [DS-FMOIR].

2.11 ROOM CONTROLLER LOCAL NETWORK

A. The Room Controller local network is a physical connection and communication protocol designed to optimally control a space within a building. Room Controller devices connect to the local network using CAT 5e cables with RJ45 QuickConnect cables which provide both data and power to room devices. Features of the Room Controller local network include:

1. Click & Go default functionality of occupancy sensors, wallstations, daylight sensors, receptacle controls, BMS status output and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

B. Eaton Lighting Systems Catalog Number:

1. [GGRC-COUPLER] (Joins two cables)
2. [GGRC-SPLITTER] (Joins three cables)
3. NON PLENUM CABLES: [GGRJ45-006-G], [GGRJ45-03-G], [GGRJ45-10-G], [GGRJ45-25-G], [GGRJ45-50-G], [GGRJ45-100-G]
4. PLENUM CABLES: [GGRJ45-10P-G], [GGRJ45-25P-G], [GGRJ45-50P-G], [GGRJ45-100P-G]

2.12 ROOM CONTROLLER NETWORK

- A. The Room Controller network allows up to 254 lighting control panels to exist on a single communication network designed to optimally control a building. Digital communication shall be RS485 with each lighting control panel being a master to ensure no single point of failure.
- B. Each panel shall have a unique device address. This allows for unique identification of the lighting control panel on the network.
- C. Lighting control relays in any panel can be controlled via a network command sent from a panel on the network.
- D. Breaks in the physical RS485 network shall not inhibit local panel operation. Systems that do not use Master/Master architecture shall not be acceptable.
- E. The network shall be capable of connecting to the building LAN for easy TCP/IP access to the lighting control panels.
 1. Network access to the building LAN shall be provided by an Ethernet Interface Module [EIM]
 2. Access to computers on the building LAN shall be secured by site user name and password policies (provided by local site IT).
- F. Setup and programming of each panel on the network is performed using the Keeper Enterprise software. Network programming can be achieved by any factory certified personnel, which may include Electrical Contractors, Agents, Customer, Factory Representatives, or Factory Employees. System that require startup and programming to be performed only by Factory Employees shall not be acceptable.

2.13 NETWORK ACCESSORIES AND CONTROL INTERFACES

- A. Ethernet Interfaces; Eaton Lighting Systems Model Ethernet Interface Module
 1. Provide ability to communicate by means of TCP/IP over Ethernet to ControlKeeper lighting control system by means of user-supplied PC or digital audiovisual equipment. Control to be located within 300 feet (100 meters) of Ethernet source.
 2. Communications protocol to provide access to:

- a. Individual Relay Commands
 - b. Individual Relay Status
 - c. Input Status
 - d. Network Override Commands
- B. Network Programming Software; Eaton Lighting Systems Model Keeper Enterprise Programming software.
 - 1. The software permits the organization of the lighting control panels into Buildings and Networks.
 - 2. Multiple panels and panel types can exist in a building or network.
 - 3. Each Network permits the ability to have a dedicated IP address for communications.
 - 4. The software shall permit the following to be programmed for each Room Controller panel
 - a. Name descriptor
 - b. Panel address and communication method
 - c. Panel firmware updates over the network
 - d. Define, broadcast and log Output information
 - e. Define daylight gain settings for three dimming zones
 - f. Adjust High End/Low End trim settings for each panel
 - g. Adjust Demand Response values for each panel
 - h. Configure Remote network listener commands, to take action based on inputs from other panels on the network
 - i. Configure scene values for each panel
 - j. Copy/paste already programmed panels for template driven programming
- C. (Optional) Graphical floor plan software; Eaton Lighting Systems Model VisionTouch® 5.
 - 1. The software permits up to 255 floors or site plans to be illustrated for intuitive control. The software provides real-time feedback to the operator of network control overrides and relay status.
 - 2. Web-based user interface – Software that is not accessed through standard web browsers shall not be acceptable.
 - 3. Interactive floor plan – Floor plan software that does not provide immediate area status via defined color code or other readily available visible indication shall not be acceptable. Software that requires selecting an area to check overall status shall not be acceptable.
 - 4. Up to 500 simultaneous users – Software that is limited to less than 100 active users shall not be acceptable.
 - 5. Up to 10 simultaneous facility managers – Software that provides access for less than 5 facility managers or administrator accounts shall not be acceptable.

6. Supports multiple IP access connection points (at least 10) to different lighting control systems. Each IP access connection shall be capable of supporting up to 254 lighting control panels. Each IP access connection shall be capable of being remote to the VT5 server, however must be on the same IP network.
 7. Import AutoCAD (DXF), .PNG, .JPG, or .SVG files
 8. Calendar interface – Software provides a centralized calendar to schedule Day Event Schedules. Each day event schedule can be individual day or reoccurring. Each day event schedule can support multiple schedule items for any area that is defined on the Interactive floor plan.
 9. Calendar interface – Software supports multiple calendars based on defined floors and areas.
- D. (Optional) The lighting zones may be controlled using standard calendar based scheduling software. Create events which include individual and groups of relays and link them to any time and day on the calendar. This software package for lighting control event scheduling is called Event Manager. This software requires a SQL Server for operation connected to the lighting control system via the Ethernet Interface Module.
- E. BACnet Interface; Eaton Lighting Systems Model ProtoNode FPC-N34:
1. The Room Controller network shall permit data protocol translation through a building automation interface Gateway. The BACnet Gateway shall permit BACnet communication protocol to operate individual relays, relay groups and read the status of those relays. The Room Controller network shall respond efficiently to the requested information from the BACnet network.
 2. The ProtoNode provides up to 10,000 points of control and can communicate to multiple panel types.
 3. Provide PIC list definition and object model to other system manufacturers.
- F. LonWorks Interface; Eaton Lighting Systems Model FPC-N35:
1. Provide ability to communicate by means of LonWorks FTT-10 communication to centralized lighting system from user-supplied LonWorks FTT-10 twisted pair network.
 2. The Room Controller network shall permit data protocol translation through a building automation interface Gateway. The LON Gateway shall permit LonWorks communication protocol to operate individual relays, relay groups and read the status of those relays. The Room Controller network shall respond efficiently to the requested information from the LonWorks network.
 3. The ProtoNode provides up to 4,096 points of control and can communicate to multiple panel types.
 4. Provide LonWorks interface object model specification to secondary equipment manufacturers.
- G. The Room Controller Network has several other lighting control panels types that may be utilized to enhance your lighting control application. At least one ControlKeeper® lighting control panel must exist on a Room Controller network.
1. ControlKeeper® Metering or Metering with Breakers (CKM or CKMB)

- a. The CKM or CKMB shall provide additional flexibility by providing up to 48 - 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CKM or CKMB controllers, although accessible through the network, shall be fully stand-alone in their control capability. The CKM or CKMB provides full status indication of CPU status, network communication, power, and HOA overrides. The CKM or CKMB shall provide a TouchScreen panel processor for programming and control functionality. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 128 additional global commands for network control and shall reside in the CKM or CKMB. Networks that rely on a single time clock for system operation shall not be acceptable.
2. ControlKeeper® TouchScreen (CKT)
 - a. The CKT shall provide additional flexibility by providing up to 48 - 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CKT controllers, although accessible through the network, shall be fully stand-alone in their control capability. The CKT provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide thirty-two, 3-wire or 2-wire dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide four analog inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 128 additional global commands for network control and shall reside in the CKT. Networks that rely on a single time clock for system operation shall not be acceptable.
3. ControlKeeper® 4A (CK 4A)
 - a. The CK 4A shall provide additional flexibility by providing four 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 4A shall optionally provide four, 0-10VDC outputs to control dimming ballasts. The CK 4A controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 4A provides full status indication of CPU status, network communication, power and HOA overrides. The controller shall provide four, 3-wire or eight, 2-wire dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide four analog inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK

4A. Networks that rely on a single time clock for system operation shall not be acceptable.

4. ControlKeeper® 4 (CK 4)

- a. The CK 4 shall provide additional flexibility by providing four normally open or normally closed 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 4 controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 4 provides full status indication of CPU status, network communication, power and HOA overrides. The controller shall provide four dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 4. Systems that utilize the master slave topology shall not be acceptable.

5. ControlKeeper® 2 (CK 2)

- a. The CK 2 shall provide additional flexibility by providing two normally open or normally closed 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 2 controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 2 provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide two dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 2. Systems that utilize the master slave topology shall not be acceptable.

2.14 OPENADR VIRTUAL END NODE (VEN) FOR DEMAND RESPONSE

- A. The Room Controller shall be capable of receiving a signal from a Demand Response or OpenADR Virtual End Node device. When received the Room Controller will automatically adjust lighting to provide optimal energy savings and comply with Demand Response code requirements. Systems that do not support Demand Response capability out-of-the-box shall not be acceptable.
 - 1. Automatically adjust the target lighting level by at least 15% but not more than 50%.
 - 2. System does not permit user override of the Demand Response system except in the cases of emergency or normal power loss. Systems that allow the user to adjust the lights higher than the demand response target light level shall not be acceptable.
 - 3. Each Room Controller shall be configurable for individual Demand Response reduction levels. Systems that only support global Demand Response reduction levels shall not be acceptable.
- B. Eaton Lighting Systems Catalog Number:
 - 1. [EBOX-2B-DC], [EBOX-ASF]

2.15 EMERGENCY LIGHTING

- A. Room Controller with emergency relay – The Room Controller is a UL 924 listed device that monitors normal power circuit to the Room Controller. The Room Controller has a dedicated UL 924 output which includes emergency power line in and emergency power load out connections. The UL 924 relay will track with output 1 (Yellow) during normal power operations. Upon loss of normal power the UL 924 output will force the emergency lighting On and full bright (if dimming) until normal power is restored. Features include:
 - 1. 120/277VAC, 50/60 Hz, 3 amp ballast rating.
 - 2. Ladderless testing: Push the “All Off” button on any wallstation four times [e-mer-gen-cy], will turn off normal lighting and force UL 924 emergency output On and full bright.
 - 3. Auxiliary input for remote Alert Mode (All On, and full bright).
 - 4. Eaton Lighting Systems Catalog Number: [RC3DE], [RC3DE-PL].
- B. Emergency Power Control – A UL 924 listed device installs down line of an output that monitors a switched or dimmed circuit providing normal lighting to an area. The unit provides normal ON/OFF or 0-10V dimming control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120/277 volts, 50/60 Hz., 20 amp ballast rating.
2. Push to test button.
3. Eaton Lighting Systems Catalog Numbers:
 - a. [CEPC-1] (switching)
 - b. [CEPC-1-D] (0-10V dimming)

PART 3 – EXECUTION

3.1 INSTALLATION

- A. 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.
- B. All low voltage smart devices shall connect using QuickConnect wire provided by Eaton's Lighting Systems. When using wire for connections other than the QuickConnect low voltage wire (pre-defined lengths of RJ45 cable), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contractor termination requirements.
- C. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.
- D. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
 1. Sensor parameters, time delays, sensitivities and daylighting setpoints.
 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.).
 3. Load parameters (e.g. blink warning, etc.).

3.2 PRODUCT SUPPORT AND SERVICE

- A. 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.

3.3 FACTORY COMMISSIONING

- A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

- B. The electrical contractor shall provide both the manufacturer and the electrical engineer with twenty one working days written notice of the system startup and adjustment date.
- C. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

END OF SECTION