3 Things We Love About Acuity's nLight

As a controls and lighting company, Lite Rite Controls is often asked to bid jobs that have nLight as the Commercial Building Lighting Control Systems. For those of you not familiar with nLight, I have added a brief description below of both nLight and nLight Air.nLight is a networked digital lighting control system that provides both energy savings and increased user configurability by cost effectively integrating time-based, daylight-based, sensor-based and manual lighting control schemes. nLight creates an unmatched level of distributed intelligence.

nLight Air is a secure, high-performance wireless platform designed for integration into various lighting controls applications that seamlessly connect both indoor and outdoor lighting systems to Smart Building Ready solutions.

Benefits Include:

- Easier installation – fixture embedded smart sensor remove guesswork, saving time and money
- Industry leading 5-tier wireless security architecture
- Energy savings with occupancy and daylight sensing – up to 30% additional energy savings
- Aids in meeting and/or exceeding state and local energy codes
- A scalable and upgradeable smart building ready solution
- Choose from a wide range of nLight AIR wireless enabled fixtures from Acuity Brands

Check out this nLight Video: https://www.youtube.com/watch?v=jXlGJvN9x4Q

Renpeng Zhang, a Lite Rite Controls employee and recent graduate from Long Beach State University, recently attended training on Acuity nLight products. Renpeng has experience programming and designing many different commercial building control solutions currently on the market and I wanted to find out what his thoughts were on the nLight product.

Jerimiah Hubner Lite Rite Controls (LRC): How did the nLight training go?

Renpeng Zhang (RZ): Yeah, it went really well. I liked that nLight is completely customizable. The training was very hands on, which I enjoyed.

LRC: That’s cool. Can you tell me about nLights customizable features?

RZ: Well, there are more customizable control features for commercial building control systems. One of the features is the “grace period” timing controls*. This controls how much time the occupancy/vacancy sensor takes before turning off lights or plug loads. Most products have a 10 second grace period. nLight allows for control over this option, which is important for the usability and comfort of tenants.

The second customizable feature that I thought was important was that up to 16 virtual buttons can be added to the nPOD GFX. This allows for greater scene and setting control.

LRC: Sounds like nLight has taken notice that usability and

functionality are top priorities for tenants. What about EC's and installation?

RZ: Contractors say that it is easier to build rooms with the nLight product because it is systematic with zones or channels. The electrician can install nLight in a single room, test it individually and ensure that it is functioning. If rooms will be added to the system, the EC can connect / integrate the rooms via the nLight Gateway or Eclipse. If the EC is also programming the system, nLight's Sensor View software will be used. For less advanced and simple programming, nLight can be programmed with the nPOD GFX.

LRC: Can nLight connect with mobile devices?

RZ: Yes, but only with the Eclipse controller. This allows communication with the Eclipse interface on a secure web browser via PC, laptop or any other mobile device. This enables profiles for different rooms. Imagine there is a conference room that is mainly used for presentations. You could basically program a "presentation" scene or mode into the profile for that room and lights would automatically adjust. The possibilities are endless.

LRC: Thanks for sharing your experience with Acuity's nLight product, Renpeng.

Want to learn more about nLight and nLight Air? Click Here

Commercial Building Lighting Controls is a booming business (Click Here to see Forecast). With so many different types of commercial controls systems on the market it’s hard to keep up with the latest and greatest. That’s our job here at Lite Rite Controls. Send us your plans and we can help you with great pricing and assurance that any system you are installing will work seamlessly.

*Only available with Eclipse Interface

As a controls and lighting company, Lite Rite Controls is often asked to bid jobs that have nLight as a commercial building’s Lighting Control Systems. For those of you not familiar with nLight, I have added a brief description below of both nLight and nLight Air.

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COMMERCIAL BUILDING CONTROL WITH LUTRON VIVE

5 BENEFITS OF COMMERCIAL BUILDING CONTROL WITH LUTRON VIVE

Lite Rite Controls recently spoke with Chelsea Till, Senior Sales Engineer at Lutron about commercial building control with Lutron Vive. We wanted to find out what set **Lutron Vive** apart from other commercial building control systems. Here is our recent conversation:

Lite Rite Controls (LRC): Hello Chelsea and thank you for answering a few questions about Lutron Vive. Can you tell us what makes Lutron Vive offering superior to other commercial building control offerings on the market today?

Chelsea Till (CT): Lutron Vive is a great solution for commercial building control for a number of reasons. One, most of the products have been available for about 10 years and have been installed in many different scenarios, including historical buildings, medical treatment facilities, government, education, and retail. The system is compatible with many different types of light sources and dimming protocols. Its wireless backbone is Clear Connect, which in my

opinion is one of the biggest and most important differentiators of our product on the market.

LRC: Can you tell us a little more about Clear connect and why it's important for commercial building controls?

CT: Clear Connect technology was developed before Wi-Fi was even available. 434MHz is a channel with specific FCC mandates that limit the total amount of communication time between devices. Because of these mandates, very few wireless devices use this channel, which means no interference with other systems. Another reason why 434MHz is the best channel for commercial lighting control communication is the increased distance the signals can travel and the types of materials it can travel through. Load Controllers have a 30/60 ft. rule and the hub can talk through any construction material within 71ft.

LRC: How long has Lutron been developing and testing Vive technology?

CT: Clear Connect was created sometime around 1997. Energi TriPak first debuted in 2008. The Vive hub was in R&D for about two years before the full launch of the product last November (2017).

LRC: So Lutron Vive's technology has an established track record. That's great. Is there a challenging job that Vive was used on and will you talk about how Vive worked through those challenges? **Applications for Lutron Vive**

CT: We had a 100-year-old high school with asbestos and lead all over everything. The hallways are over 250 ft. long. The school wanted to use sensors to shut off lights when no one was in the hallway. However, running wire is too costly because of the required abatement. Using wireless load controllers and the Vive hub, we ended up using time clock functionality to save energy. This solution was the most cost effective because of the decreased wiring labor, much less

asbestos and lead interference (if any at all), and we removed sensors from the hallways that could be damaged in a high school environment.

Another solution was using the **Pico Remote** to solve ADA compliance. The same 100-year-old school with lead and asbestos. We kept the switch in its current location but replaced it with a **Maestro Wireless switch (or dimmer)**. The Pico was then placed at the correct ADA height. This gave proper control to both disabled and non-disabled occupants.

LRC: Great solution for a difficult situation. Overall, what are customers saying out there about installation and programming?

CT: General feedback is that this product is very simple to install, simple to program, and simple for the end user to understand. One of the great things about this product is the rolling commissioning. Once you commission a room, that space is up and running and you can add other spaces at any time without disturbing the initial rooms. This product also allows you to build a system that's right for you, by starting standalone only and adding a hub later, or jumping in head first, right away.

LRC: Simple, affordable and scalable solutions for today's demanding energy codes, even under the most demanding circumstances. It's no surprise that Vive by Lutron is generating so much interest. Thank you for taking the time to answer our questions.

Enjoy this five minute video with Edrei about Lutron Vive.

COMMERCIAL BUILDING AUTOMATION MARKET FORECAST

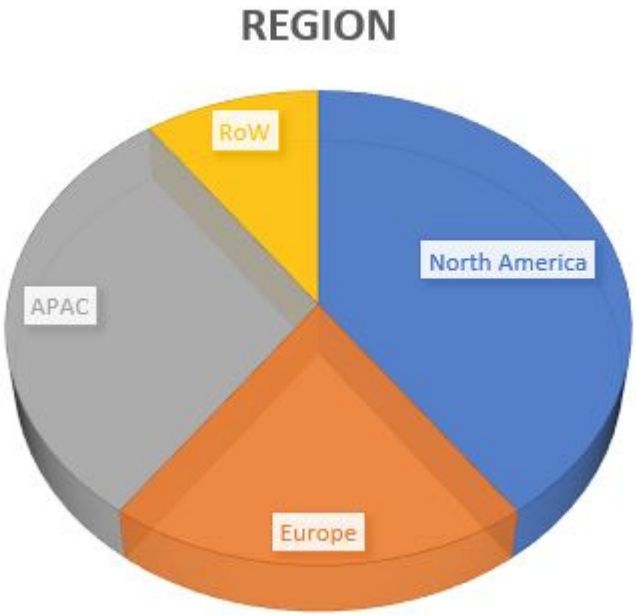
Building Automation Market Expected to Hit $99B by 2022

The Building Automation System (BAS) market was valued at $53.66 Billion in 2016 and is expected to reach $99.11 Billion by 2022. That is a CAGR of over 10.5% between 2017 and 2022. The growth of this market is driven by the increase in demand for energy-efficient systems, growing need for the automation of security systems in buildings, and advancement of IoT in BAS.

The increased rate of implementation of BAS in large shopping complexes, office buildings, and public transport areas such as airports and railway stations is encouraging the growth of the BAS market for commercial application.

The security and access control systems are expected to hold the largest size of the BAS market during the forecast period. Security and access control systems have become an integral part of the safety and security of the buildings and their occupants. This has revolutionized the building security and has eliminated the human interventions. These are installed in buildings to increase the security level, monitor the activities, and keep a record of people entering and exiting the buildings. These systems are used in several businesses to protect the assets, staff, and information, monitor the activities, as well as control the access to the building.

The North American building automation market held the largest share of the BAS market in 2016. The rising need for energy management along with the increasing demand for green businesses has resulted in the growth of the market in North America. Commercial applications hold the largest share of the North American BAS market.



Benefits of Building Automation Systems

Benefits of Building Automation Systems

Lowers Utility Costs: Building Automation Systems typically

save 15% of the operating costs of the equipment. For most buildings, this results in savings that range from $0.20 to $0.40/ ft².

Maintains Measured Comfort: Computerized controls help to maintain even temperatures and lighting levels within the facility to provide measured comfort. Maintaining consistent temperature and lighting levels cuts down on wasted energy.

Enhances Property Value: The value of most commercial buildings is related to the net operating income. Lowering utility costs increases the net operating income on a dollar for dollar basis. Every $0.10/ ft²saved in energy could increase the market value of the property by $0.80/ ft². A 100,000 ft² building could increase in value by $120,000 by reducing energy costs $0.15/ ft².

Reduces Occupant Complaints: A more comfortable building means fewer occupant complaints. This means less time resolving complaints, happier occupants, and a more productive business environment.

Increased Productivity: Better ventilation and air quality improve greater worker productivity and less sick time. The value benefits average $25.00/ ft². With decreased sick days translated into a net impact of about $5.00/ ft²and increased in productivity translated into a net impact of about $20.00/ ft².

Simplifies Building Operation: Computerized controls and real time graphical displays let you see exactly what is happening with the equipment in the building without having to go up on the roof or crawl up into the ceilings. This saves on costly troubleshooting visits, and simplifies operations.

Reduces Maintenance Costs: Running the equipment less and controlling it better reduces wear-and-tear and keeps maintenance costs down, and extends equipment life.

Avoids Business Interruptions: Unexpected equipment breakdowns can cause costly business interruptions. The cost of employees and/or processes in a building can be 75 to 100 times the facility operating cost on a square foot basis. The impact when customers are involved can be even more costly. Breakdowns and emergency repairs are very expensive. Computerized controls monitor equipment status and help you head-off unexpected problems.

A Great Investment: Most systems will pay for themselves in less than two years.

Typical numbers for an owner-occupied 100,000 ft^2 building would be as follows:

- Total system cost $200,000 ($2/ ft^2)
- Utility Company rebate $30,000 (15% rebate)
- Annual energy savings* $15,000 (15% savings)
- Annual productivity loss avoidance * $50,000 (1% savings)
- Annual O & M cost avoidance* $10,000 (10% savings)
- Simple payback 1.3 years

*Annual cost avoidance year after year.

How Does Building Automation Work?

HVAC and Lighting Controls: Stand-alone computerized controllers are installed to take over the control of building HVAC (heating, ventilation, and air conditioning) systems and lighting. The building is not only scheduled more closely but it is also operated more intelligently and efficiently.

Outside Air Optimization: The proper control of outside air provides necessary inside air changes for occupant comfort and health, minimizes energy costs by space pre-conditioning, allows for enthalpy-based free cooling (Learn more about Enthalpy), and reduces the use of outside air when it is not needed.

Coordinating Equipment: Orchestrating the operation of building systems, so that equipment works together, saves energy and improves comfort. Individual control systems that are not centrally monitored and coordinated can fight each other or malfunction, causing comfort problems and wasting considerable energy. BACnet based BAS can interface to existing or planned systems so that the building will run smoothly and at peak efficiency without expensive duplication of controls or unnecessary complexity.

Graphical Operation: Simplifying facility operation and integrating data from various systems in a unified manner is best accomplished with a graphical user interface. This eliminates the need to memorize commands or point numbers, and allows the operator to take a walking tour of the facility from the console. Existing systems can be easily upgraded to add this powerful operational tool. Point and click graphics empowers management by letting everyone see what is going on and taking the mystery out of proper operations.

Direct Digital Controls (DDC): Upgrade older existing equipment to DDC to match new equipment functionality. These controllers come standard on most new mechanical equipment and are more reliable, require less maintenance, provide more sophisticated control, and are less expensive to purchase and operate.

Tighter Scheduling: Conventional controls, such as analog time clocks, are inaccurate and are typically setup to run equipment longer than needed. By automating this function with computerized controls, the computer can predict the optimum time to start/stop equipment based on an astronomical smart schedule and eliminate waste caused by excessive runtime.

Smarter Control: HVAC equipment is typically sized to handle the building load under worst-case scenario (conditions). Most conventional controls are set up to always meet these design criteria. With the automation system, control set points and

strategies can be adjusted to meet only the actual load, eliminating unnecessary waste.

Interested in implementing commercial building controls?

Lite Rite Controls specializes in lighting controls which can integrate into your building automation system. We have Lutron Vive and Crestron Zum, systems that are scalable and easy to use. Contact us to learn more.

Visit – Lite Rite Controls

Call us at (562)294-0660

or

Email at info@literitecontrols.com or jerimiah@literitecontrols.com

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WATTSTOPPER – DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

Wattstopper

SECTION 26 09 43

DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

Display hidden notes to specifier. (Don’t know how? Click Here)

** NOTE TO SPECIFIER ** Wattstopper ; Digital Lighting Management products.

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This section is based on the products of Wattstopper , which is located at:

2700 Zanker Rd. Suite 168
San Jose, CA 95134
Toll Free Tel: 800-879-8585
Tel: 408-988-5331
Fax: 408-988-5373
Email:request info (sales_info@wattstopper.com)
Web:www.wattstopper.com
[Click Here] for additional information.

Wattstopper, a product line of Legrand, offers the most comprehensive line of simple, scalable and flexible energy efficient lighting controls and solutions for commercial and residential applications. The Wattstopper range of products, programs, and services have been helping customers save energy, meet green initiatives and comply with energy codes for more than 30 years.

A leading provider of products and systems for electrical installations and information networks wherever people live and work, Legrand delivers an unequaled depth and breadth of innovative solutions. Legrand North America and Legrand Canada companies include: Cablofil, Electrorack, Middle Atlantic, On Q, Ortronics, Pass & Seymour, Vantage and Wiremold.

- 1 GENERAL
  - SECTION INCLUDES
    1. Distributed Digital Lighting Control System: System includes

1. Digital Lighting and Plug Load Controls
2. Relay Panels
3. Emergency Lighting Control.

- RELATED SECTIONS

** NOTE TO SPECIFIER ** Delete any sections below not relevant to this project; add others as required.

1. Section 27 05 39 – Surface Raceways for Communications Systems
2. Section 26 50 00 – Lighting.
3. Section 26 52 00 – Emergency Lighting.
4. Section 25 55 00 – Integrated Automation Control of HVAC- Integrated Automation, Building integrator shall provide integration of the lighting control system with Building Automation Systems.

- REFERENCES

** NOTE TO SPECIFIER ** Delete references from the list below that are not actually required by the text of the edited section.

1. NFPA 70 – National Electrical Code; National Fire Protection Association.
2. NEMA – National Electrical Manufacturers Association
3. FCC emission standards
4. UL – Underwriters Laboratories, Inc. Listings
5. UL 2043 – Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products Installed in Air-Handling Spaces.
6. UL 20 – General Use Switches, Plug Load Controls
7. UL 924 – Standard for Emergency Lighting and Power Equipment
8. ULC – Underwriter Laboratories of Canada Listings

- DESIGN / PERFORMANCE REQUIREMENTS

1. Digital Lighting Management System shall accommodate the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories that suit the required lighting and electrical system parameters.
2. System shall conform to requirements of NFPA 70.
3. System shall comply with FCC emission standards specified in part 15, sub-part J for commercial and residential application.
4. System shall be listed under UL sections 916 and/or 508.

- SUBMITTALS
    1. Submit under provisions of Section 01 30 00 – Administrative Requirements.
    2. Product Data: Manufacturer’s data sheets on each product to be used, including:
        1. Catalog sheets and specifications.
        2. Ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
        3. Storage and handling requirements and recommendations.
        4. Installation instructions.
    3. Shop Drawings: Wiring diagrams a for the various components of the System specified including:
        1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
        2. Show location of all devices, including at minimum sensors, load controllers, and switches/dimmers for each area on reflected ceiling plans.
        3. Provide room/area details including products and sequence of operation for each room or

area. Illustrate typical acceptable room/area connection topologies.

4. Network riser diagram including floor and building level details. Include network cable specification. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

4. Manufacturer’s Certificates: Certify products meet or exceed specified requirements.
5. Closeout Submittals:
    1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
    2. Operation and Maintenance Manual:
        1. Include approved Shop Drawings and Product Data.
        2. Include Sequence of Operation, identifying operation for each room or space.
        3. Include manufacturer’s maintenance information.
        4. Operation and Maintenance Data: Include detailed information on device programming and setup.
        5. Include startup and test reports.
    3. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in Part 3 of this specification under “COMMISSIONING”.

- QUALITY ASSURANCE
    1. Manufacturer Qualifications: Company specializing in manufacturing of centralized and distributed

lighting control systems with a minimum of 10 years documented experience.

2. Installer Qualifications: Company certified by the manufacturer and specializing in installation of networked lighting control products with minimum three years documented experience.
3. System Components: Demonstrate that individual components have undergone quality control and testing prior to shipping.

- PRE-INSTALLATION MEETINGS
    1. Convene minimum two weeks prior to commencing Work of this section. Meeting to be attended by Contractor, Architect, system installer, factory authorized manufacturer’s representative, and representative of all trades related to the system installation.
    2. Review installation procedures and coordination required with related Work and the following:
        1. Confirm the location and mounting of all devices, with special attention to placement of switches, dimmers, and any sensors.
        2. Review the specifications for low voltage control wiring and termination.
        3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
        4. Discuss requirements for integration with other trades
    3. Inspect and make notes of job conditions prior to installation:
        1. Record minutes of the conference and provide copies to all parties present.
        2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
        3. Installation shall not begin until all

outstanding issues are resolved to the satisfaction of the Architect.

- DELIVERY, STORAGE, AND HANDLING
    1. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation
- PROJECT CONDITIONS
    1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
    2. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
        1. Ambient temperature: 32 to 104 degrees F (0 to 40 degrees C).
        2. Relative humidity: Maximum 90 percent, non-condensing.
- WARRANTY
    1. Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.
- EXTRA MATERIALS
    1. See Section 01 60 00 – Product Requirements.
    2. Deliver extra sets of items for Owner's use in maintenance as follows:

** NOTE TO SPECIFIER ** Insert project specific list below as required.

- 2 PRODUCTS
    - MANUFACTURERS
        1. Acceptable Manufacturer: Wattstopper , which

is located at: 2700 Zanker Rd. Suite 168; San Jose, CA 95134; Toll Free Tel: 800-879-8585; Tel: 408-988-5331; Fax: 408-988-5373; Email:request info (sales_info@wattstopper.com); Web:wattstopper.com

** NOTE TO SPECIFIER ** Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

1. Substitutions: Not permitted.
2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

- DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM
    1. System General: Provide a WattStopper, Provide Digital Lighting Management System (DLM) complete with all necessary enclosures, wiring, and system components to ensure a complete and properly functioning system as indicated on the Drawings and specified herein. If a conflict is identified, between the Drawing and this Specification, contact the Architect for clarification prior to proceeding.
        1. Space Control Requirements: Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality as indicated in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-

sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.

2. Task Lighting / Plug Loads: Provide automatic shut off of non essential plug loads and task lighting in spaces as required by the applicable energy code. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
3. Daylit Areas: Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:
    1. All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones.
    2. Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes.
    3. Multiple-level switched daylight harvesting controls may be utilized for areas marked on drawings.
    4. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at

dimmed level, rather than turning full-on prior to dimming.

4. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four preset lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to turn off all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.

2. Equipment Required: Lighting Control and Automation system as defined under this section covers the following equipment.
    1. Digital Lighting Management (DLM) local network: Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
    2. Digital Room Controllers: Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
    3. Digital Plug Load Controllers: Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities.
    4. Digital Fixture Controllers: Self-configuring, digitally addressable one relay fixture-integrated controllers for on/off/0-10V dimming control.
    5. Digital Occupancy Sensors: Self-configuring,

digitally addressable, calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

6. Digital Switches: Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
7. Handheld remotes for personal control: On/Off, dimming and scene remotes for control using infrared (IR) communications. Remote may be configured in the field to control selected loads or scenes without special tools.
8. Digital Daylighting Sensors: Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications for daylight harvesting using switching, bi-level, tri-level or dimming control.
9. Configuration Tools: Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away.
10. Digital Lighting Management (DLM) segment network: Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded) to connect multiple DLM local networks for centralized control.
11. Network Bridge: Provides BACnet MS/TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS) and automatically creates BACnet objects

representative of connected devices.

12. Segment Manager: BACnet MS/TP-based controller with web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
13. Programming and Configuration Software: Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.
14. Digital Lighting Management Relay Panel and Zone Controller: Provides up to 8, 24, or 48 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS). Zero relay Zone Controller primarily supports Digital Fixture Controller applications.
15. Emergency Lighting Control Unit (ELCU): Allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

3. Local Network LMRJ-Series: DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.

1. Features of the DLM local network include:
    1. Plug n’ Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
    2. Simple replacement of any device in the local DLM network with a standard off the shelf unit without requiring significant commissioning, configuration or setup.
    3. Push n’ Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
    4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.
2. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.
3. If manufacturer’s pre-terminated Cat5e cables are not used for the installation each cable must be individually tested and observed by authorized service representative following installation.

- DIGITAL LOAD CONTROLLERS (ROOM, PLUG LOAD AND FIXTURE CONTROLLERS)
    1. Digital Load Controllers: Digital controllers for lighting zones, fixtures and/or plug loads automatically bind room loads to the connected control devices in the space without commissioning or the use of any tools. Provide controllers to match the room lighting and plug load control requirements. Controllers are simple to install, and do not have dip switches/potentiometers, or require special configuration for standard Plug n' Go applications. Control units include the following features
        1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
        2. Simple replacement using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf device.
        3. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so that individual load numbers are assigned starting with load 1 to a maximum of 64, assigned based on each controller's device ID's from highest to lowest.
        4. Device Status LEDs to indicate:
            1. Data transmission
            2. Device has power
            3. Status for each load
            4. Configuration status
        5. Quick installation features including:
            1. Standard junction box mounting
            2. Quick low voltage connections using standard RJ-45 patch cable

6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
    1. Turn on to 100 percent
    2. Turn off
    3. Turn on to last level
7. Each load be configurable to operate in the following sequences based on occupancy:
    1. Auto-on/Auto-off (Follow on and off)
    2. Manual-on/Auto-off (Follow off only)
8. Polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
9. BACnet object information shall be available for the following objects:
    1. Load status
    2. Schedule state, normal or after-hours
    3. Demand Response enable and disable
    4. Room occupancy status
    5. Total room lighting and plug loads watts

** NOTE TO SPECIFIER ** When metering is present in the Room Controller, these additional objects shall also be available.

1. Electrical current
2. Total watts per controller
3. Total room watts/sq ft.
4. Force on/off all loads

10. UL 2043 plenum rated
11. Manual override and LED indication for each load
12. Zero cross circuitry for each load
13. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of

no less than 10 years.

14. Dimming Room Controllers shall share the following features:
    1. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.
    2. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
    3. The following dimming attributes may be changed or selected using a wireless configuration tool:
        - Establish preset level for each load from 0-100 percent
        - Set high and low trim for each load
        - Initiate lamp burn in for each load of either 0, 12 or 100 hours
    4. Override button for each load provides the following functions:
        - Press and release for on/off control
        - Press and hold for dimming control
    5. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver. LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
    6. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100 percent dimming range defined by the minimum and maximum calibration trim.
    7. Calibration and trim levels must be set per output channel. Devices that set calibration or trim

levels per controller (as opposed to per load) are not acceptable.
8. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

15. On/Off Room Controllers shall include:
    1. Dual voltage (120/277 VAC, 60 Hz) capable rated for 20A total load
    2. One or two relay configuration
    3. Simple 150 mA switching power supply (Only 4 100 series devices on a Cat 5e local network)
    4. Three RJ-45 DLM local network ports with integral strain relief and dust cover
    5. WattStopper product numbers: LMRC-101, LMRC-102
16. On/Off/0-10V Dimming KO Mount Room Controllers shall include:
    1. Dual voltage (120/277 VAC, 60 Hz) capable rated for 10A total load
    2. Optional real time current and voltage monitoring (with – M Monitoring option).
    3. One or two relays configurations
    4. Smart 150 mA switching power supply
    5. Two RJ-45 DLM local network ports. Provide molded strain relief ring
    6. One dimming output per relay
        1. 0-10V Dimming – Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting
    7. Units capable of providing both Class 1 or Class 2 wiring for the 0-10V output
    8. WattStopper product numbers: LMRC-111, LMRC-111-M, LMRC-112, or LMRC-112-M.
17. On/Off/0-10V Dimming Enhanced Room Controllers shall

include:

1. Dual voltage (120/277 VAC, 60 Hz) capable or 347 VAC, 60 Hz. 120/277 volt models rated for 20A total load; 347 volt models rated for 15A total load
2. Built in real time current monitoring
3. One, two or three relays configurations
4. Smart 250 mA switching power supply
5. Four RJ-45 DLM local network ports. Provide integral strain relief
6. One dimming output per relay
    1. 0-10V Dimming – Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting (LMRC-110 series and 210 series).
7. WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213.

18. On/Off/ Forward Phase Dimming Room Controllers shall include:
    1. Dual voltage (120/277 VAC, 60 Hz) rated for 20A total load, with forward phase dimmed loads derating to 16A for some load types
    2. Built in real time current monitoring
    3. One or two relays configurations
    4. Smart 250 mA switching power supply
    5. Four RJ-45 DLM local network ports. Provide integral strain relief
    6. One dimming output per relay
        1. Line Voltage, Forward Phase Dimming – Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and

incandescent loads. (LMRC-220 series)

7. WattStopper product numbers: LMRC-221, LMRC-222

19. Plug Load Controllers shall include:
    1. 120 VAC, 60 Hz rated for 20A total load. Controller carries application-specific UL 20 rating for receptacle control.
    2. One relay configuration with additional connection for unswitched load
    3. Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated).
    4. Factory default operation is Auto-on/Auto-off, based on occupancy
    5. Real time current monitoring of both switched and un-switched load (LMPL-201 only)
    6. Switching power supply
        1. Simple 150mA – Only 4 100 series devices on a Cat 5e local network (LMPL-101)
        2. Smart 250mA (LMPL-201)
    7. RJ-45 DLM local network ports
        1. Three RJ-45 ports (LMPL-101)
        2. Four RJ-45 ports (LMPL-201)
    8. Provide a wireless transmitter that can be connected to any Cat 5e network of the lighting controls that will communicate the room’s occupancy state to receptacles mounted in the area with integral relays. Binding of the transmitter to the receptacles shall be accomplished by pressing a test button on the transmitter, and then a test button on the receptacle.
    9. WattStopper product numbers:
        201. Plug Load Controllers: LMPL-101, LMPL-201.
        202. Wireless Transceiver and Receptacles: WRC-TX-LM, WRC-15-1/2, WRC-20-1/2

10. Fixture Controllers shall include
    1. A form factor and product ratings to allow various OEM fixture manufacturers to mount the device inside the ballast/driver cavity of standard-sized fluorescent or LED general lighting fixtures.
    2. One 3A 120/277V rated mechanically held relay.
    3. Programmable behavior on power up following the loss of normal power:
        1. Turn on to 100 percent
        2. Turn off
        3. Turn on to last level
    4. Requirement for 7 mA of 24VDC operating power from the DLM local network.
    5. Fixture Controller does not require a connection to a neutral conductor to operate, and unlike other types of Load Controllers it does not contribute power to the DLM local network to drive accessory devices.
    6. Power to drive the LMFC Fixture Controller electronics can come from any Room or Plug Load Controller, LMPB-100 Power Booster and/or LMZC-301 Zone Controller (described later in the LMCP LIGHTING CONTROL PANELS specification section).
    7. 0-10V dimming capability via a single 0-10 volt analog output from the device for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Fixture Controller.
    8. Connect to a single or dual RJ-45 adaptor with 24 inch leads. Single adaptor mounts in a 1/2 inch KO and dual adaptor in a 2.2 by 1.32 inch rectangular hole for connection to

the DLM local network.

9. Adaptor leads are insulated for use in a fixture cavity, and the lead length allows the OEM fixture manufacturer flexibility to position the Fixture Controller and the RJ45 jack in the best locations on each fixture.
10. A complete set of dimming features described above in the paragraph detailing On/Off/Dimming Enhanced Room Controllers.
    100. WattStopper product numbers: Fixture Controller: LMFC-011, DLM Cable Connector: LMFC-RJ-50-24 or LMFC-2RJ, Power Booster: LMPB-100.

- DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR
    1. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
        1. Digital calibration and pushbutton configuration for the following variables:
            1. Sensitivity, 0-100 percent in 10 percent increments
            2. Time delay, 1-30 minutes in 1 minute increments
            3. Test mode, Five second time delay
            4. Detection technology, PIR, Ultrasonic or Dual Technology activation and/or re-activation.
            5. Walk-through mode
        2. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
        3. Programmable control functionality including:
            1. Each sensor may be programmed to control specific loads within a local

network.
2. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
3. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
4. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
5. Ultrasonic and Passive Infrared
6. Ultrasonic or Passive Infrared
7. Ultrasonic only
8. Passive Infrared only
9. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.

4. One or two RJ-45 port(s) for connection to DLM local network.
5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
6. Device Status LEDs, which may be disabled for selected applications, including:
    1. PIR detection
    2. Ultrasonic detection
    3. Configuration mode
    4. Load binding

7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
8. Manual override of controlled loads.
9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

2. BACnet object information shall be available for the following objects:
    1. Detection state
    2. Occupancy sensor time delay
    3. Occupancy sensor sensitivity, PIR and Ultrasonic
3. Units shall not have any dip switches or potentiometers for field settings
4. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.
5. WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

- DIGITAL WALL SWITCH OCCUPANCY SENSORS
    1. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
        1. Digital calibration and pushbutton configuration for the following variables:
            1. Sensitivity: 0-100 percent in 10 percent increments
            2. Time delay: 1-30 minutes in 1 minute increments
            3. Test mode: Five second time delay
            4. Detection technology: PIR, Dual Technology activation and/or re-activation.

5. Walk-through mode
6. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

2. Programmable control functionality including:
    1. Each sensor may be programmed to control specific loads within a local network.
    2. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
    3. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
    4. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
        - Ultrasonic and Passive Infrared
        - Ultrasonic or Passive Infrared
        - Ultrasonic only
        - Passive Infrared only
    5. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
    6. Two RJ-45 ports for connection to DLM local network.
    7. Two-way infrared (IR) transceiver to

allow remote programming through handheld configuration tool and control by remote personal controls.

8. Device Status LEDs including
    1. PIR detection
    2. Ultrasonic detection
    3. Configuration mode
    4. Load binding
9. Assignment of any occupancy sensor to a specific load within the room without wiring or special tools.
10. Assignment of local buttons to specific loads within the room without wiring or special tools
11. Manual override of controlled loads
12. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.

3. BACnet object information shall be available for the following objects:
    1. Detection state
    2. Occupancy sensor time delay
    3. Occupancy sensor sensitivity, PIR and Ultrasonic
    4. Button state
    5. Switch lock control
    6. Switch lock status
4. Units shall not have any dip switches or potentiometers for field settings.
5. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

6. Two-button wall switch occupancy sensors, when connected to a single relay dimming room or fixture controller, shall operate in the following sequence as a factory default:
    1. Left button
        1. Press and release – Turn load on
        2. Press and hold – Raise dimming load
    2. Right button
        1. Press and release – Turn load off
        2. Press and hold – Lower dimming load
    3. Low voltage momentary pushbuttons shall include the following features:
        1. Load/Scene Status LED on each switch button with the following characteristics:
            1. Bi-level LED
            2. Dim locator level indicates power to switch
            3. Bright status level indicates that load or scene is active
        2. The following button attributes may be changed or selected using a wireless configuration tool:
            1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
            2. Individual button function may be configured to Toggle, On only or Off only.

3. Individual scenes may be locked to prevent unauthorized change.
4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
5. Ramp rate may be adjusted for each dimmer switch.
6. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.
7. WattStopper part numbers: LMPW, LMDW. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

- DIGITAL WALL SWITCHES
    1. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
        1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
        2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
        3. Configuration LED on each switch that blinks

to indicate data transmission.

4. Load/Scene Status LED on each switch button with the following characteristics:
    1. Bi-level LED
    2. Dim locator level indicates power to switch
    3. Bright status level indicates that load or scene is active
    4. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
5. Programmable control functionality including:
    1. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
    2. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
6. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.

2. BACnet object information shall be available for the following objects:
    1. Button state
    2. Switch lock control
    3. Switch lock status
3. Two RJ-45 ports for connection to DLM local network.
4. Multiple digital wall switches may be installed in a room by simply connecting them to the free

topology DLM local network. No additional configuration shall be required to achieve multi-way switching.

5. Load and Scene button function may be reconfigured for individual buttons from Load to Scene, and vice versa.
    1. Individual button function may be configured to Toggle, On only or Off only.
    2. Individual scenes may be locked to prevent unauthorized change.
    3. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
    4. Ramp rate may be adjusted for each dimmer switch.
    5. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.
    6. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.

- DLM HANDHELD USER INTERFACE REMOTES
    1. Battery-operated handheld devices in 1, 2 and 5 button configurations for remote switching or dimming control. Remote controls shall include the following features:
        1. Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet.
        2. LED on each button confirms button press.
        3. Load buttons may be bound to any load on a load controller or relay panel and are not

load type dependent; each button may be bound to multiple loads.
4. Inactivity timeout to save battery life.

2. Provide with a wall mount holster and mounting hardware for each remote.
3. WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105.

- DIGITAL DAYLIGHTING SENSORS
  1. Digital daylighting sensors shall work with load controllers and relay panels to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to the controller or panel. Daylighting sensors shall be interchangeable without the need for rewiring.
     1. Closed loop sensors measure the ambient light in the space and control a single lighting zone.
     2. Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones.
     3. Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone
  2. Digital daylighting sensors shall include the following features:
     1. Sensor’s internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode’s spectral response curve shall closely match the entire photopic curve. Photodiode shall not measure energy in either the ultraviolet or infrared spectrums. Photocell shall have a sensitivity of less than 5 percent for any wavelengths less than 400 nanometers or

greater than 700 nanometers.

2. Sensor light level range shall be from 1-6,553 foot-candles (fc).
3. Capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of load controller(s) and load binding to controller(s).
4. For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling excessively after they turn off.
5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.
6. Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
7. Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.
8. Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.
9. Integral infrared (IR) transceiver for configuration and/or commissioning with a

handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

10. Configuration LED status light on device that blinks to indicate data transmission.
11. Status LED indicates test mode, override mode and load binding.
12. Recessed switch on device to turn controlled load(s) ON and OFF.
13. BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
    1. Light level
    2. Day and night setpoints
    3. Off time delay
    4. On and off setpoints
    5. Up to three zone setpoints
    6. Operating mode – on/off, bi-level, tri-level or dimming
14. One RJ-45 port for connection to DLM local network.
15. A choice of accessories to accommodate multiple mounting methods and building materials. Photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62 inch thick (LMLS-400, LMLS-500). Extended tube photosensors accommodate mounting materials from 0.62 to 1.25 inches thick (LMLS-400-L, LMLS-500-L). Mounting brackets are compatible with J boxes (LMLS-MB1) and wall mounting (LMLS-MB2). LMLS-600 photosensor to be mounted on included bracket below skylight well.

16. Any load or group of loads in the room can be assigned to a daylighting zone
17. Each load within a daylighting zone can be individually enabled or disabled for discrete control (load independence).
18. All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.

3. Closed loop digital photosensors shall include the following additional features:
    1. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
    2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
    3. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads.
    4. WattStopper Product Number: LMLS-400, LMLS-400-L.
4. Open loop digital photosensors shall include 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 application-

specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

3. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.
4. WattStopper Product Number: LMLS-500, LMLS-500-L.

5. Dual loop digital photosensors shall include the following additional features:
    1. Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from sources outside of this con
    2. Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room.
    3. Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load.
    4. Device must reference closed loop photosensor information as a base line

reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is required.

5. Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes.
6. Device must include extendable mounting arm to properly position sensor within a skylight well.
7. WattStopper product number LMLS-600

- DIGITAL PARTITION CONTROLS
    1. Partition controls shall enable manual or automatic coordination of lighting controls in flexible spaces with up to four moveable walls by reconfiguring the connected digital switches and occupancy sensors.
    2. Four-button low voltage pushbutton switch for manual control.
        1. Two-way infrared (IR) transceiver for use with configuration remote control.
        2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
        3. Configuration LED on each switch that blinks to indicate data transmission.
        4. Each button represents one wall; Green button LED indicates status.
        5. Two RJ-45 ports for connection to DLM local network.
        6. WattStopper part number: LMPS-104. Available

in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening.

** NOTE TO SPECIFIER ** Coordinate the following paragraph with Movable Walls and Partitions with automatic controls specified in other section of this specification.

1. Coordinate contact closure interface for automatic control via input from limit switches on movable walls specified in Section 10 22 43 – Sliding Partitions .
    1. Operates on Class 2 power supplied by DLM local network.
    2. Includes 24VDC output and four input terminals for maintained third party contract closure inputs.
    3. Input max. sink/source current: 1-5mA
    4. Logic input signal voltage High: > 18VDC
    5. Logic input signal voltage Low: < 2VDC
    6. Four status LEDs under hinged cover indicate if walls are open or closed; supports LMPS-104 as remote status indicator.
    7. Two RJ-45 ports for connection to DLM local network.
    8. WattStopper part number: LMIO-102

- HANDHELD CONFIGURATION TOOLS
    1. Provide a wireless configuration tool to facilitate customization of DLM local networks using two-way infrared communications, and/or PC software that connects to each local network via a USB interface.
    2. Features and functionality of the wireless configuration tool shall include but not be limited to:
        1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
        2. High visibility organic LED (OLED) display,

pushbutton user interface and menu-driven operation.

3. Must be able to read and modify parameters for load controllers and relay panels, occupancy sensors, wall switches, daylighting sensors, network bridges, and identify DLM devices by type and serial number.
4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
8. Verify status of building level network devices.

3. WattStopper Product Numbers: Handheld LMCT-100

- DLM SEGMENT NETWORK
  1. Provide a segment network using linear topology, BACnet-based MS/TP subnet to connect DLM local networks (rooms) and LMCP relay panels for centralized control.
     1. Each connected DLM local network shall include a single network bridge (LMBC-300), and the network bridge is the only room-based device that is connected to the

segment network.

2. Network bridges, relay panels and segment managers shall include terminal blocks, with provisions for separate “in” and “out” terminations, for segment network connections.
3. Segment network utilizes 1.5 twisted pair, shielded, cable supplied by the lighting control manufacturer. Maximum cable run for each segment is 4,000 feet. Conductor-to-conductor capacitance of the twisted pair shall be less than 30 pf/ft and have a characteristic impedance of 120 Ohms.
4. Network wire jacket is available in high visibility green, white, or black.
5. Substitution of manufacturer-supplied cable is not permitted and may void the warranty, if non-approved cable is installed, and if terminations are not completed according to manufacturer’s specific requirements.
6. Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device.
7. Segment networks shall be capable of connecting to any of the following: BACnet-compliant BAS (provided by others) directly via MS/TP, or BACnet/IP via an NB-ROUTER or LMSM Unit. Systems whose room-connected network infrastructure require gateway devices to provide BACnet data to a BAS are unacceptable

2. WattStopper Product Number: LM-MSTP, LM-MSTP-W, LM-MSTP-B, LM-MSTP-DB

- NETWORK BRIDGE

1. Network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, relay panels and a

segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. Network bridge shall use industry standard BACnet MS/TP network communication and an optically isolated EIA/TIA RS-485 transceiver.

1. Network bridge shall be provided as a separate module connected on the local network through an available RJ-45 port.
2. Provide Plug n' Go operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
3. Network bridge shall automatically create standard BACnet objects for selected DLM devices to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM devices on each local network. BACnet objects will be created for the addition or replacement of any given DLM device for the installed life of the system. Products requiring that an application-specific point database be loaded to create or map BACnet objects are not acceptable. Systems not capable of providing BACnet data for control devices via a dedicated BACnet Device ID and physical MS/TP termination per room are not acceptable. Standard BACnet objects shall be provided as follows:
    1. Read/write the normal or after hours schedule state for the room
    2. Read the detection state of each occupancy sensor

3. Read the aggregate occupancy state of the room
4. Read/write the On/Off state of loads
5. Read/write the dimmed light level of loads
6. Read the button states of switches
7. Read total current in amps, and total power in watts through the load controller
8. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
9. Activate a preset scene for the room
10. Read/write daylight sensor fade time and day and night setpoints
11. Read the current light level, in foot-candles, from interior and exterior photosensors and photocells
12. Set daylight sensor operating mode
13. Read/write wall switch lock status
14. Read watts per square foot for the entire controlled room
15. Write maximum light level per load for demand response mode
16. Read/write activation of demand response mode for the room
17. Activate/restore demand response mode for the room

4. WattStopper product numbers: LMBC-300

- LMCP LIGHTING CONTROL PANELS AND LMZC ZONE CONTROLLER
    1. Hardware: Provide LMCP lighting control panels in the locations and capacities as indicated on the Drawing and schedules. Each panel shall be of modular construction and consist of the following components:
        1. Enclosure/Tub shall be NEMA 1, sized to

accept an interior with 1 – 8 relays, 1 – 24 relays and 6 four-pole contactors, or 1 – 48 relays and 6 four-pole contactors.

2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. LMCP panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. Interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. Interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. Panel interiors shall include the following features:
    1. Removable, plug-in terminal blocks with connections for all low voltage terminations.
    2. Individual terminal block, override pushbutton, and LED status light for each relay.
    3. Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only.
    4. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO modules capable of receiving

momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices.

5. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.
6. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
7. Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99.
8. Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.

4. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:

1. Electrical:
    - 30 amp ballast at 277V
    - 20 amp ballast at 347V
    - 20amp tungsten at 120V
    - 30 amp resistive at 347V
    - 5 HP motor at 120V
    - 14,000 amp short circuit current rating (SCCR) at 347V
    - Relays shall be specifically UL 20 listed for control of plug-loads
2. Mechanical:
    - Replaceable, 1/2 inch KO mounting with removable Class 2 wire harness.
    - Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
    - Dual line and load terminals each support two #14 – #12 solid or stranded conductors.
    - Tested to 300,000 mechanical on/off cycles.
3. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
4. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

5. Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon loss of normal power. Panels shall be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 – Article 700.
6. Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control.
    1. Each panel shall include digital clock capability able to issue system wide automation commands to up to 11 other panels for a total of 12 tnetworked lighting control panels. Clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups.
    2. Clock capability of each panel shall support the time-based energy saving requirements of applicable local energy codes.
    3. Clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for clock function and program retention in non-volatile FLASH memory. Clocks

that require multiple events to meet local code lighting shut off requirements shall not be allowed.

4. Clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
    - Scheduled ON / OFF
    - Manual ON / Scheduled OFF
    - Astro ON / OFF (or Photo ON / OFF)
    - Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
5. User interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)
6. Clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years.
7. Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of

executing events independently of the global network shall not be acceptable.

7. Lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions, as configured in a Segment Manager controller, via a segment network connection.
8. Lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet protocol.
    1. Panel shall have provision for an individual BACnet device ID and shall support the full 222 range (0 – 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network.
    2. Panel shall support MS/TP MAC addresses in the range of 0 – 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second.
    3. Lighting control relays shall be controllable as binary output objects in the instance range of 1 – 64. The state of each relay shall be readable and writable by the BAS via the object

present value property.

4. Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 – 64.
5. The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 – 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode.
6. Setup and commissioning of panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:
    - Binary output objects in the instance range of 1 – 64 (one per relay) for on/off control of relays.
    - Binary value objects in the instance range of 1 –

99 (one per channel) for normal hours/after hours schedule control.

- Binary input objects in the instance range of 1 – 64 (one per relay) for reading true on/off state of the relays.
- Analog value objects in the instance range of 101 – 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.

7. Description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.
8. BO and BV 1 – 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel

object described in addendum aa. (http://www.bacnet.org/Addenda/Add-135-2010aa.pdf)

9. Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object.
10. Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196.

9. In addition to the LMCP Relay Panels, an LMZC Zone Controller panel shall be available for zero-relay applications. The panel is designed for applications where LMFC-011 Fixture Controllers or other distributed load controllers are used to switch and/or dim the controlled loads. Key similarities to and differences from the LMCP panel design shall include:
    1. Use the same intelligence board as the LMCP relay panel.
    2. Shall not include relay driver boards or relays.
    3. Have a removable interior section to facilitate installation, and a Tub/Cover. Cover is for surface mounting applications only.
    4. Tub shall have two interior KOs to allow installation of

LMPB-100 Power Boosters. Each installed Power Booster can provide an additional 150 mA for either of the two available DLM local networks provided by the LMZC.

5. All programming and networking (whether DLM Local Network and/or Segment Network) capabilities in the LMZC Zone Controller shall be similar to capabilities for LMCP relay panels, except for functions designed for panel-mounted HDR relays.

10. To aid in project start up, if LMFC Fixture Controllers are connected to an LMZC Zone Controller, Plug n' Go automatic configuration will establish a unique sequence of operation so that all LMFC-controlled fixtures will turn on to 50 percent output when any digital occupancy sensor detects motion.
11. WattStopper Product Number: Relay Panels: LMCP8, LMCP24 or LMCP48, Zone Controller: LMZC-301.

5. User Interface: Each lighting control panel system shall be supplied with at least one handheld configuration tool (LMCT-100). As a remote programming interface the configuration tool shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. User interface shall have the following panel-specific functions as a minimum:

1. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
2. Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.
3. Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.
4. Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.
5. Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished

from the digital switch station.

6. Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.
7. WattStopper Product Number: LMCT-100

- SEGMENT MANAGER
    1. For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443).
    2. Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external BACnet-to-IP interface routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the Drawings.
    3. Operational features of the Segment Manager shall include the following:
        1. Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic.
        2. Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser. The Segment Manager shall not require installation of any lighting control software on an end-user PC.

3. Log in security capable of restricting some users to view-only or other limited operations.
4. Segment Manager shall provide two main sets of interface screens – those used to initially configure the unit (referred to as the config screens), and a those used to allow users to dynamic monitor the performance of their system, and provide a centralized scheduling interface. Capabilities using the Config Screens shall include:
    1. Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels.
    2. Allow information for all discovered DLM devices to be imported into the Segment Manager via a single XML based site file from the WattStopper LMCS Software, significantly reducing the time needed to make a system usable by the end user. Importable information can include text descriptions of every DLM component and individual loads, and automatic creation of room location information and overall structure of DLM network. Info entered into LMCS should not have to be re-entered manually via keystrokes into the Segment Manager
    3. After discovery, all rooms and panels shall be presented in a standard

navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.

4. Ability to view and modify DLM device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.
5. Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control. Any of above items shall be capable of being moved into an “Export Table” that will provide any integrator with only the data they need, and by using the Export Table effectively create a firewall between the integrator’s request for info and the overall system performance.

5. Capabilities using the Segment Manager’s Dashboard Screens shall include:
    1. A dynamic “tile” based interface that

allows easy viewing of each individual room’s lighting and plug load power consumption, and lighting and plug load power density (power consumption information requires Enhanced DLM Room and Plug Load Controllers with integral current transducers such as LMRC-21x).Tiles will be automatically organized according to location so a single tile for the building summarizes all information for tiles beneath it on every floor, in every area, in every room. Tiles use three color coded energy target parameters, allowing an owner to quickly identify rooms that are not performing efficiently. Tiles for rooms with occupancy sensors shall include an icon to indicate whether that room is occupied. Tiles shall be clickable, and when clicked the underlying hierarchical level of tiles shall become visible. Tile interface shall be accessible via mouse, or touch screen devices. Tiles shall be created automatically by the segment manager, based on the information found during the device discovery and/or information included in a file imported in from LMCS (such as tagged descriptions for each room) without any custom programming.

2. Ability to set up schedules for DLM local networks (rooms) and panels. Schedules shall be capable of controlling individual rooms with either on/off or normal hours/after

hours set controlled zones or areas to either a normal hours or after hours mode of operation. Support for annual schedules, holiday schedules and unique date-bound schedules, as well as astro On or astro Off events with offsets. Schedules shall be viable graphically as time bars in a screen set up to automatically show scheduled events by day, week or month.

3. Ability to provide a simple time vs. power graph based on information stored in each Segment Manager's memory (typically two to three days' data).

6. If shown on the Drawings, Segment Managers shall be integrated into a larger control network by the addition of a Network Supervisor package. The Supervisor is a server level computer running a version of the Segment Manager interface software with dedicated communication and networking capability, able to pull information automatically from each individual Segment Manager in the network. By using a Supervisor, information for individual Segment Managers can be accessed and stored on the Supervisor's hard drive, eliminating the risk of data being overwritten after a few days because of Segment Manager memory limits.
7. Segment Manager shall allow access and control of the overall system database via Native Niagara AX FOX connectivity. Systems that must utilize a Tridium Niagara controller in addition to the programming, scheduling and configuration server are not

acceptable.

4. Segment Manager shall support multiple DLM rooms as follows:
    1. Support up to 120 network bridges and 900 digital in-room devices (LMSM-3E).
    2. Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches (LMSM-6E).
5. WattStopper Product Numbers: LMSM-3E, LMSM-6E, LM-SUPERVISOR, NB-ROUTER, NB-SWITCH, NB-SWITCH-8, NB-SWITCH-16.

- PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE
    1. PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.
    2. Additional parameters exposed through this method include but are not limited to:
        1. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
        2. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
        3. Separate fade time adjustments per load for

both normal and after hours from 0 – 4 hours.
4. Configurable occupancy sensor re-trigger grace period from 0 – 4 minutes separate for both normal hours and after hours.
5. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
6. Load control polarity reversal so that on events turn loads off and vice versa.
7. Per-load DR (demand response) shed level in units of percent.
8. Load output pulse mode in increments of 1second.
9. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.

3. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
    1. Device list report: All devices in a project listed by type.
    2. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
    3. BACnet points report: Per room Device ID report of the valid BACnet points for a given site’s BOM.
    4. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
    5. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M

documentation.

6. Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100 percent, 2 = all loads 75 percent, 3 = all loads 50 percent, 4 = all loads 25 percent, 5-16 = same as scene 1).
7. Occupancy sensor report: Basic settings including time delay and sensitivities for all occupancy sensors.

4. Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations:
    1. Set, copy/paste an entire project site of sensor time delays.
    2. Set, copy/paste an entire project site of sensor sensitivity settings.
    3. Search based on room name and text labels.
    4. Filter by product type (i.e. LMRC-212) to allow parameter set by product.
    5. Filter by parameter value to search for product with specific configurations.
5. Network-wide firmware upgrading remotely via the BACnet/IP network.
    1. Mass firmware update of entire rooms.
    2. Mass firmware update of specifically selected rooms or areas.
    3. Mass firmware upgrade of specific products
6. WattStopper Product Number: LMCS-100, LMCI-100

- EMERGENCY LIGHTING CONTROL DEVICES
    1. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF 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. Auxiliary contact for remote test or fire alarm system interface

2. WattStopper Product Numbers: ELCU-100, ELCU-200.

- 3 EXECUTION
  - PREPARATION
    1. Do not begin installation until measurements have been verified and work areas have been properly prepared.
    2. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
    3. Verify that required pre-installation meeting specified in Part 1 of this specification has been completed, recorded meeting minutes have been distributed and all outstanding issues noted have been resolved prior to the start of installation.
  - INSTALLATION
    1. Install system in accordance with the approved system shop drawings and manufacturer’s instructions.
    2. Install all room/area devices using manufacturer’s factory-tested Cat 5e cable with pre-terminated RJ-45 connectors.
       1. If pre-terminated cable is not used for room/area wiring, each field-terminated cable shall be tested following installation and testing results submitted to the Manufacturer’s Representative for approval prior to proceeding with the Work.
       2. Install all room to room network

devices using manufacturer-supplied LM-MSTP network wire. Network wire substitution is not permitted and may result in loss of product warranty.

3. Low voltage wiring topology must comply with manufacturer's specifications.
4. Route network wiring as indicated on the Drawings as closely as possible. Document final wiring location, routing and topology on as built drawings.

3. All line voltage connections shall be tagged to indicate circuit and switched legs.
4. Test all devices to ensure proper communication.
5. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.
6. Provide written or computer-generated documentation on the configuration 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.)
7. Post start-up tuning – Adjust sensor time delays and sensitivities to meet the Owner's requirements 30 days from beneficial occupancy. Provide a detailed report to the Architect / Owner of post start-up activity.

8. Tighten all panel Class I conductors from both circuit breaker and to loads to torque ratings as marked on enclosure UL label.
9. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.
10. Run separate neutrals for any phase dimmed branch load circuit. Different types of dimming loads shall have separate neutral.
11. Verify all non-panel-based lighting loads to be free from short circuits prior to connection to room controllers.

- FIELD QUALITY CONTROL
    1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Notify Architect and Manufacturer in writing a minimum of 3 weeks prior to system start-up and testing.
    2. Tests and Inspections: Manufacturer’s service representative shall perform the following inspections and prepare reports.
        1. Verify Class I and II wiring connections are terminated properly by validating system performance.
        2. Set IP addresses and other network settings of system front end hardware per facilities IT instructions.
        3. Verify / complete task programming for all switches, dimmers, time clocks, and sensors.
        4. Verify that the control of each space complies with the Sequence of Operation.

5. Correct any system issues and retest..

3. Provide a report in table format with drawings, or using a software file that can be opened in the manufacturer’s system software including each room or space that has lighting control installed. Indicate the following:
    1. Date of test or inspection.
    2. Loads per space, or Fixture Address identification.
    3. Quantity and Type of each device installed
    4. Reports providing each device’s settings.

- COMMISSIONING ASSISTANCE
    1. Title 24 Acceptance Testing Service; Include additional costs for Lighting Control Manufacturer to provide a technician for one additional day while the CLCATT performs lighting control acceptance testing in accordance with CAL TITLE 24 P6 including submission of required documentation.
- DEMONSTRATION AND TRAINING
    1. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:
        1. Confirmation of entire system operation and communication to each device.
        2. Confirmation of operation of individual relays, switches, and sensors.
        3. Confirmation of system Programming, photocell settings, override settings, etc.
        4. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.

- PRODUCT SUPPORT AND SERVICE
    1. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION

Switch Advance Programming Compatibility

http://literitecontrols.com/wp-content/uploads/2017/04/Knowlege-base-AP-issue.pdf

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How to replace LC&D relays

Blue Box LT panel with Dual

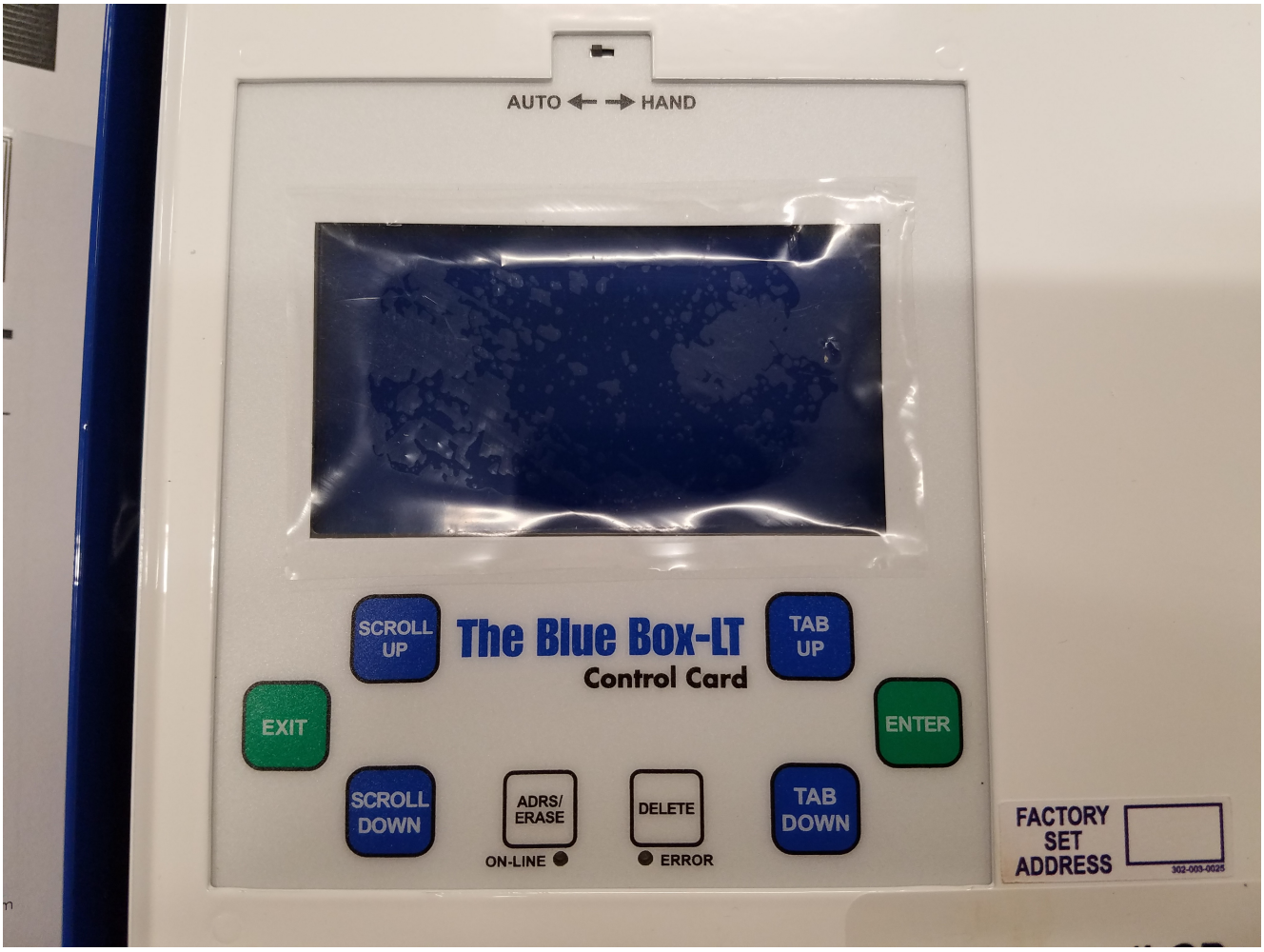
Pole relays

A Blue Box LT master panel does not have the depth to support the extra height required on the dual pole relays.

Only a Blue Box Classic or GR2400 will be needed to support the dual pole relays if they need to exist in a master panel.

However, a Blue Box LT remote panel does have the depth to support the height required for dual pole relay.

Navigating the DTC on Blue Box



Tab Up & Tab Down

The TAB UP and TAB DOWN keys are used to move the cursor forward and backwards across the display. They change which parameter on the screen is selected.

Scroll Up & Scroll Down

The SCROLL UP and SCROLL DOWN keys are used to adjust the selected parameter. They are also used to override groups, copy switch programming, and disable or enable selected schedules. Scrolling up or down on a page number will bring you to the next page on the screen.

Enter/Exit

The ENTER button enters into the selected sub menu. It is also used to toggle loads from the manual override screen, and add loads into a switch or group. The EXIT button brings you back

to the previous menu.

Delete

The delete key is used to delete groups and schedules.

Setting the Contrast

To set the contrast on the GR2400, hold the CONTRAST key, and then press SCROLL UP or SCROLL DOWN. To adjust the contrast on a Blue Box, there is a contrast adjustment screw on the back of the DTC.

Auto/Hand Switch

The Auto/Hand switch can be set to HAND to close all relays in the panel. This is useful for testing relays, and verifying line voltage is present on the relays. The panel must be in AUTO mode under normal operation.

General Photocell Programming

Photocells

PCC1 and PCC3

PCC1 & PCC3 cards are photocell input cards. A PCC 1 card is a single input card that cannot be digitally disabled and a PCC3 card is a 3 input cartally disabled. PCC cards read the light level from a 2-wd that can be digiire analog photocell, and communicate the reading back to the system controller. To program a PCC card, select PROGRAM SWITCH from the USER MENU and press ENTER. Select the ID# of the photocell card and PRESS ENTER (PCC cards will appear as ANALOG/DIGI in the

PROGRAM SWITCH screen). You will see a list of triggers.

PCC cards are programmed using triggers. A trigger defines two things: The lighting levels at which the loads will turn on and off, and which loads are being triggered at those levels. To program a trigger, select a TRIGGER# and press ENTER. Here you can enter which loads are to be controlled by that trigger the same way you would enter loads into a Chelsea switch.

The mode of the TRIGGER will appear in the top right hand corner of the trigger screen. The default mode is MAINTAIN. If you press enter while the mode is selected, you can adjust the on and off triggering levels:

If you press SCROLL UP or SCROLL DOWN while ANALOG is selected, you can choose which input number on the PCC card the trigger is referencing. In the image above, input #1 on the PCC card is reading 32. TIME DELAY indicates how long the photocell must be beyond the triggering points before it will switch the loads. You can SCROLL UP or SCROLL DOWN on the on and off triggering levels to adjust them here as well.

Disabling PCC Inputs

On a PCC3 card, inputs 1-3 are disabled using triggers 11-13. If a load programmed to trigger 11 is ON, trigger 1 is disabled. If a load programmed to trigger 12 is ON, trigger 2 is disabled. If a load programmed to trigger 13 is ON, trigger 3 is disabled. This assumes triggers 11-13 are programmed in ON MODE.

Adjusting Input Sensitivity

Below each photocell input on a PCC3 card, is a dial that can

be adjusted to change the sensitivity of that input. Turning the dial clockwise will decrease the sensitivity of the input to work better outdoors. Turning the dial counter clockwise will increase the sensitivity of the input to work better indoors.

Micropanel (iDIM/iDH) Photocells

If an LC&D system uses a photocell hooked up to a MicroPanel, the photocell may only control loads from within that MicroPanel. The Micropanel photocell is a 3-wire photocell and it is wired to the control card as shown below:

MicroPanel Photocell Setup and Operation

If you have a DIM channel set to PC, and you press ENTER while PC is selected, you will see this screen:

You can SCROLL UP or SCROLL DOWN on IN1 here to select a different photocell input for that channel to reference. FADE UP and FADE DN are the amounts of time it will take for the dimmer to sweep along the full dimming range up and down respectively. START indicates the light level where the channel starts to dim. MID indicates that lighting level where the dimmer will output 50%, and OFF indicates the lighting level at which the channel will turn completely OFF. If the brightness is above the MUST Turn ON level, the channel will turn on regardless of the fade times. Time Out from Off is the amount of time after the dimmer has turned off before it will turn on again.