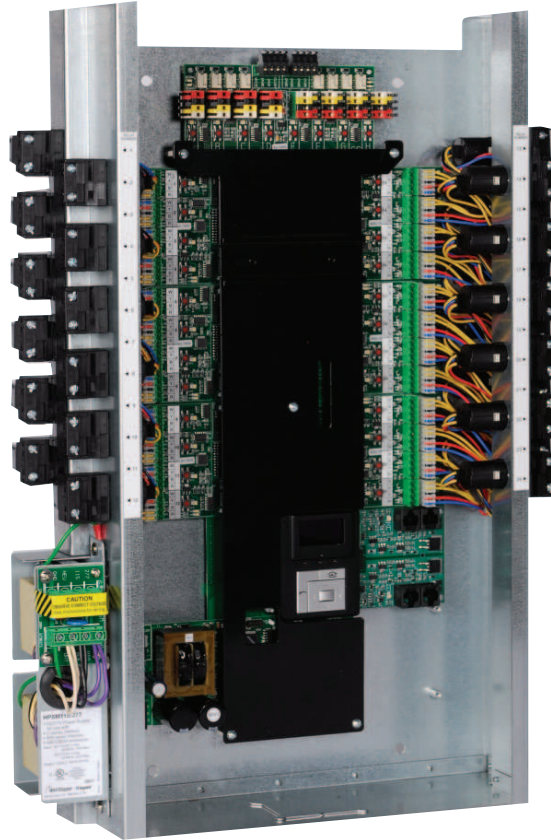


# Lighting Integrator

Panel with Digital Lighting Management Support

Models: LILM8, LILM24, LILM48



Installation Instructions

## SPECIFICATIONS

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Supply Voltages.....	per selected power supply		
P115/277 Power Supply.....	120 or 277VAC		
P240 Power Supply.....	240VAC		
P115/347 Power Supply.....	120 or 347VAC		
Accessory Power Output .....	800mA@24VDC/VAC/ACR		
Relay Load Ratings .....	@120VAC	@277VAC	@347VAC
Ballast .....	20 Amp	20 Amp	20 Amp
Tungsten.....	20 Amp	N/A	N/A
Resistive .....	N/A	20 Amp	20 Amp
Motor .....	1 1/2 HP	N/A	N/A
Short Circuit Current Rating.....	14,000 A @ 347 volts		
Environmental			
Maximum Ambient Temperature.....	60°C		
Maximum Humidity .....	5% to 90% RH, non-condensing		
UL & CUL Listed			

**WattStopper**®

Santa Clara, CA 95050

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## INTRODUCTION

The Lighting Integrator (LILM) is a relay based lighting control panel. Relays can be directly controlled from LVSW series digital switches or LM series digital occupancy sensors. They can be automatically controlled by schedules or photocell when used with the LSM-201 or LSM-603 Segment Manager. Relays can also be controlled from a BACnet compatible building automation system.

After installation and set up, a secure outer cover, when closed, offers protection from the high voltage area.

On the following page is a photograph of a fully assembled 24 relay Lighting Integrator panel that shows installed components for reference. The illustrations show component locations for 8 relay and 48 relay LILM panels. Note that not all of the components shown may be fitted in every Lighting Integrator panel depending on the application.



**Figure 1: Panel interiors and enclosures**

As a minimum, each panel will require an interior assembly and an enclosure. These components may have shipped separately.

Depending on the functional capabilities ordered, the interior will include the LM-U module attached to the LM-I card and it may also include the Group Switching card and contactors.

The panel interior assembly provides isolation between the line- and low-voltage sections of the panel, as well as the mounting frame for relays, the power supply and the circuit board assemblies. The separate interior assembly protects the low voltage wiring and components while allowing easy user access to the user interface for DLM component configuration and network setup. Inside the low voltage area are LEDs for visual indication of relay status, plus manual push-buttons to turn individual relays ON or OFF, and to perform smartwiring.

Smartwiring is a WattStopper innovation that enables easy push-button relay grouping for convenient group control. Smartwiring offers flexible grouping of lighting loads for control of individual relays, groups of relays, or channels.



**CAUTION**



**RISK OF ELECTRIC SHOCK**

**Before installing the LILM, read the instructions completely. If you have any questions, call our Technical Support team at: 800.879.8585.**

### Important Installation Notices

- All power must be turned OFF prior to wiring, installation or service.
- More than one disconnect may be required to de-energize power to the LILM.
- External circuit protection to the LILM is required (e.g., circuit breaker).
- Installation shall be in accordance with all applicable regulations, wiring practices, and codes.
- Care should be taken to separate high voltage power from low voltage (Class 2) control wiring.
- Do not energize wiring until the unit is fully assembled and connected circuits have been tested and found to be free of electrical shorts.



**WARNING**



**IMPROPER INSTALLATION OR CONNECTION OF THIS PANEL MAY RESULT IN SERIOUS PERSONAL INJURY AND/OR DAMAGE TO THE PANEL AND OTHER DEVICES.**

# COMPONENT LOCATIONS

The illustration below shows a Lighting Integrator panel installed inside an enclosure with the cover removed.

Note the location of components when the panel is fully assembled.

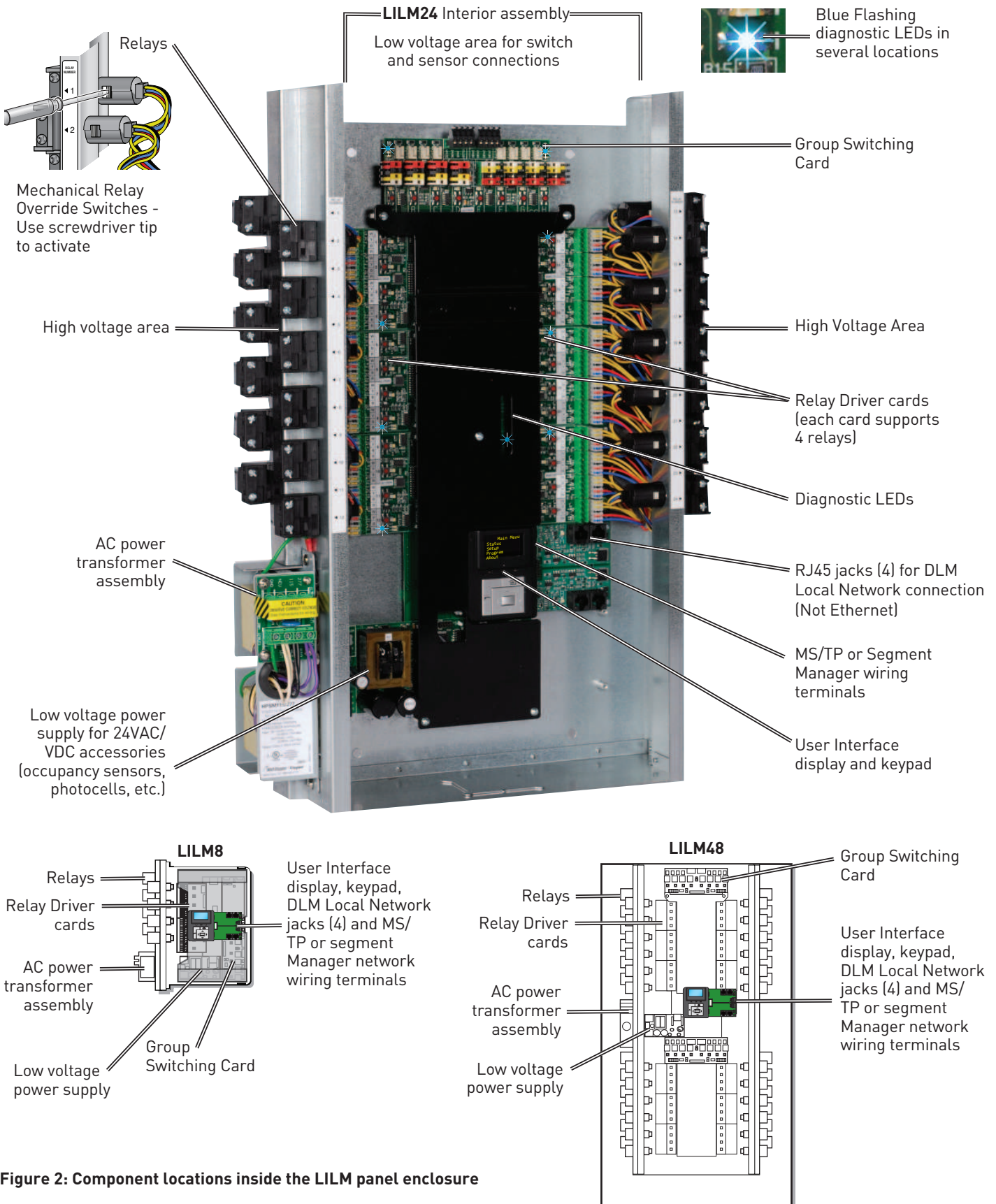


Figure 2: Component locations inside the LILM panel enclosure

# I. BASIC INSTALLATION AND SETUP

## A. Mount the LILM Enclosure

1. Attach the enclosure to the wall. The enclosure should be level, plumb and rigidly installed. Refer to the instructions provided with the enclosure for flush or surface mounting procedures.
2. Determine the appropriate wire entry locations. Make sure that all line and low voltage wiring entry locations are confined to the appropriate compartments as shown in the figure below.

**Do not run low voltage wiring with line voltage or power wiring.**

3. Drill or knock out openings to bring wiring conduit into the enclosure.

## B. Install the LILM Interior

Do not install the interior assembly until after the LILM enclosure has been securely mounted to the wall and the conduit/wiring holes have been drilled or knocked out.

Note: If this enclosure includes the optional DMP-1 Din Rail Mounting Plate, place DMP Plate over lower studs before installing the interior.

1. Place the interior in the enclosure and align the interior with the studs provided in the enclosure.
2. Attach the interior assembly to the back of the enclosure using the four sets of nuts and washers provided.
3. After all wiring is completed, attach the cover according to the instructions provided with the enclosure.

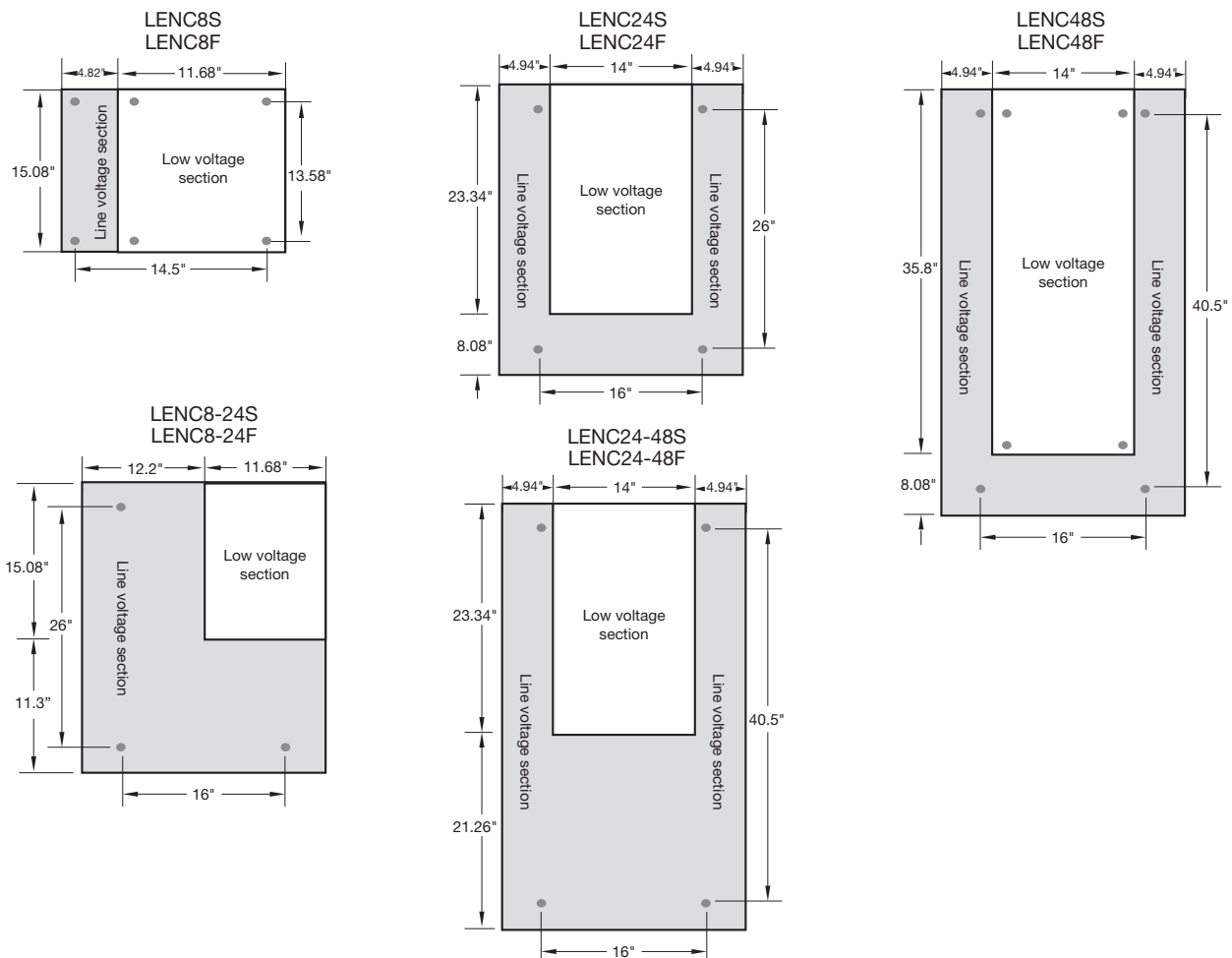
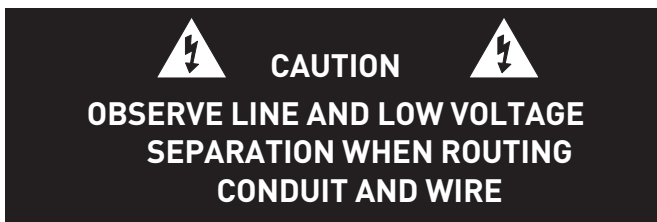


Figure 3: Enclosure dimensions

### C. Connect the AC Power Supply to Power Source

The LILM has several power supply options that allow it to operate with 115VAC, 240VAC, 277VAC or 347VAC line voltage. These power supplies function with either 50 or 60 Hz. They have internal overcurrent protection. The transformer automatically turns OFF when overloaded and resets when the fault is removed. The power supply contains MOVs to protect all downstream electronics from transient powerline voltage surges.

CAUTION

VERIFY WHETHER YOUR SUPPLY LINE VOLTAGE IS 115VAC, 240VAC, 277VAC, OR 347VAC AND THAT THE POWER SUPPLY IN THIS PANEL MATCHES THAT LINE VOLTAGE. WIRING TO THE INCORRECT VOLTAGE TERMINAL MAY RESULT IN DAMAGE TO THE POWER SUPPLY AND/OR THE PANEL, AND WILL VOID THE PRODUCT WARRANTY.

1. Read and remove the CAUTION label covering the terminals.
2. Note that there are different terminals for supply voltage input. Wire to **ONLY ONE** of these terminals. Match your input voltage to the correct terminal.

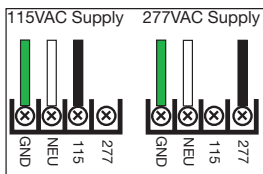


Figure 4: P115/277 wiring

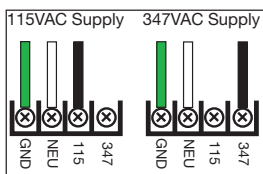


Figure 5: P115/347 wiring

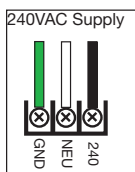


Figure 4: P240 wiring

### D. Connect Load and Line Voltage to Relays

Before making any connections to the relays, make sure that none of the load circuits are shorted. Route conductors from the circuit breaker through each relay's SPST output terminals, and from there to the loads. Confirm that each circuit is wired to the relay specified in the electrical construction drawings and relay schedule forms provided with the panel.

Lighting Integrator Panel Wiring Documentation - 24 relay							
Panel ID	Name	Location	Type	Interior/Enclosure Size	Circuit		
				1/1	2424		
Relay	Circuit	Description	LV Switch	Relay	Circuit	Description	LV Switch
1				13			
2				14			
3				15			
4				16			
5				17			
6				18			
7				19			
8				20			
9				21			
10				22			
11				23			
12				24			
Group Switch Card 1							
Channel	Function* (Circle One)	Description	Load Controller				
A	ON/OFF, Pattern, Group						
B	ON/OFF, Pattern, Group						
C	ON/OFF, Pattern, Group						
D	ON/OFF, Pattern, Group						
E	ON/OFF, Pattern, Group						
F	ON/OFF, Pattern, Group						
G	ON/OFF, Pattern, Group						
H	ON/OFF, Pattern, Group						

\* Functions: ON/OFF and Pattern are for relays within the same panel. Group Codes are only available with the Communication Card and are available system wide (see Group Code Form).

Figure 5: Relay Schedule form

### Power Up and Test Relays

1. Apply power to the LILM power supply **ONLY**. Do NOT apply power to the controlled circuit loads.
2. As shown in the illustration below, locate the relay control buttons on the Relay Driver card next to each relay's 5-wire plug-in termination. Press the relay control button to toggle it ON/OFF. The relay clicks, the relay's mechanical override switch moves and the LED status indicator changes.
3. Confirm the operation by measuring the continuity at the line voltage terminations of each relay.
4. Apply power to the relays.
5. Being careful not to touch any line voltage wiring, toggle each relay ON/OFF again and confirm that each relay controls the appropriate load.

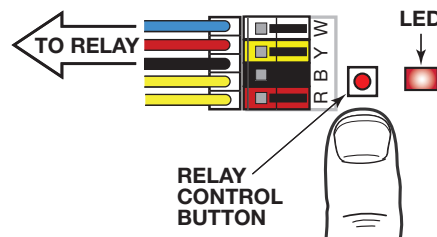


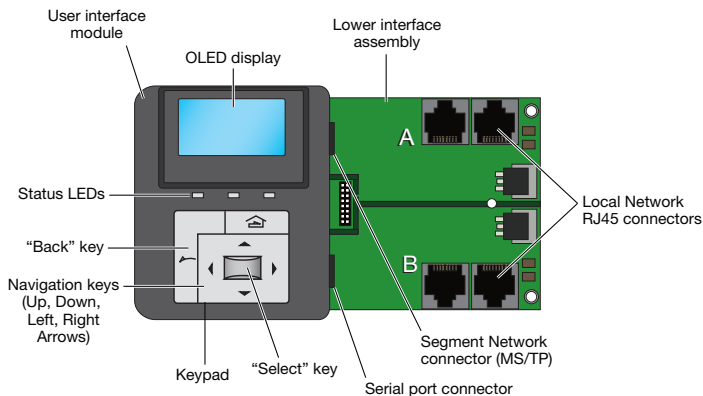
Figure 6: Relay Control Button

## E. DLM Local Network Low Voltage (Class 2) Wiring

The LILM panel supports manual control of relays from buttons on WattStopper DLM LVSW series digital switches and automatic control of relays from DLM series digital occupancy sensors. There are four (4) RJ45 receptacles provided in the panel for making field connections to DLM switches and sensors.

The DLM local network uses WattStopper model LMRJ Series cables, which are standard Category 5e cable with RJ45 plug-in connections. This connection uses free-topology wiring practice. Best practice dictates minimal use of splitters to route the Cat5e wiring.

If not using LMRJ Series cables, we strongly recommend using a Cat5 test set (WattStopper LMRJ-TK or equal) to verify the function of the cables prior to installation.



There are two pairs of RJ45 connectors supplied for connection of DLM switches and sensors. These are labeled pair A and pair B. Each pair supports up to 30 DLM switches on a maximum of 1000' of Cat5e cable. Consult the factory if more switches are required.

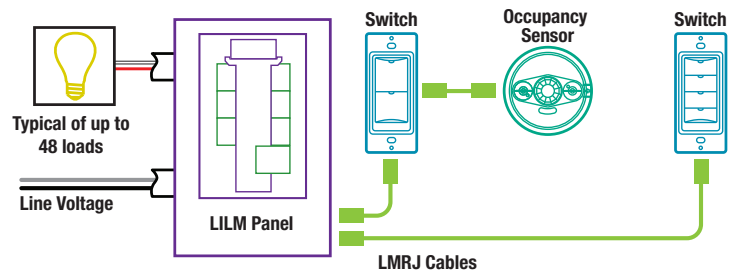
### Substitution of Occupancy Sensors for Switches:

- One LMPC-100 or LMPX-100 PIR sensor = 1 switch
- One LMDX-100, LMDC-100 or LMUC-100 = 2 switches

## F. Programming DLM Switches and Sensors to control relays

Each button on any model LVSW switch can be programmed to control any one or more relays within the panel to which it is connected. Likewise, an LM series digital occupancy sensor can be programmed to control relays.

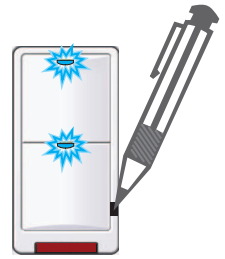
**IMPORTANT:** Quick Start Guides provided with the DLM devices provide information regarding the switch in local networks using DLM room controllers. To program the devices for use with the LILM panel use the



procedures that follow.

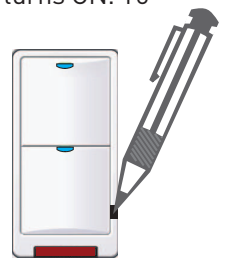
### DLM Switch Programming

1. Using a pointed object, press and release the Config button on the switch.  
All blue LEDs on the switch start blinking
2. Press and release the button to be programmed.  
Now, only the blue LED associated with this button is blinking and all of the red LEDs associated with the relays in the panel are extinguished.
3. At the panel, press and release the Relay Control Button associated with each relay to be controlled by the blinking switch button (see Figure 8).



The relay's associated red status LED turns ON. To un-associate a relay from the button, press the relay override button to extinguish the red LED.

4. When all relays to be controlled by the blinking switch button have been selected (red LEDs are lit) press and release the Config button on the switch.



The blue LED on the switch button stops blinking.

The panel returns to normal status. The red LEDs associated with the relays now show the ON/OFF state of the relays.

5. Repeat the process for each button to be programmed.

### DLM Sensor Programming

The process for programming a sensor to control a relay(s) is as follows:

1. Press and release the Configure (Config) button on the DLM sensor.
2. Press the Relay Control Button in the LILM panel that is associated with each relay to be controlled by the sensor. The LED will blink.
3. Press and release the Configure (Config) button on the DLM sensor to save the assignment.
4. Test the assignment by using the Up and Down

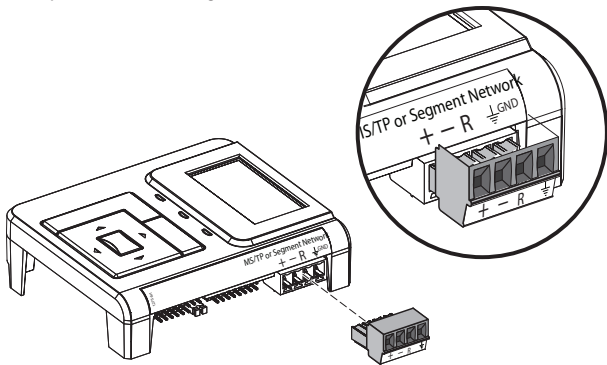
buttons on the sensor to turn the relay(s) ON and OFF.

## II. MS/TP NETWORK INSTALLATION & SETUP

### G. Network Wiring

Up to a maximum of 96 LILM panels can be networked together on a single DLM segment network. The network allows the LMSM-201 (one network segment) or the LMSM-603 (three network segments) to communicate with the panels (see fig x) and provide automation via schedules, astronomic clock or photocell.

Use WattStopper #LM-MSTP network wire to connect the panels to the segment manager. Follow installation instructions provided with the segment manager for making terminations to the segment manager. The segment network must be installed in conformance with RS485 wiring standards. The network must be configured in a linear fashion with no T-taps or star configurations.



Connect the + terminal on the network connector in each panel using the white conductor in the LM-MSTP wire. Connect the - terminal using the black conductor. Connect the "R" terminal using the green conductor.

**Do NOT connect the shield conductor in the LM-MSTP cable to the panels.** Twist the shield conductors together at each panel termination and secure it to maintain continuity of the shield for the entire network length. Connect the shield conductor to the earth ground at the segment manager only.

A 120 Ohm end-of-line resistor is required between the - and + wires connected to the last DLM segment network device at each end of the MS/TP segment. If a panel is the last network device on the segment network, be sure to connect the 120 ohm resistor.

**Note: Termination resistors are provided with the segment manager.**

With the network wire connected and the panels and segment manager powered, the right hand green LED on the front of the panel user interface module blinks rapidly. If the LED is not blinking green, check the network wire for shorts, reversed polarity or broken connections.

### H. Using the On-Screen Keyboard to Enter Data into the LILM User Interface



An on-screen keyboard is used to enter text and numbers into the UI whenever this is required of the user. Pressing Select while over a highlighted field that requires user entry will bring the keyboard up on the screen. The output from "typing" on the on-screen keyboard will appear on the top line of the display.

#### Navigating the Keyboard

The on-screen keyboard contains the numbers 0 through 9, the letters of the alphabet, and three special function characters:

"<" is a backspace key, it moves the cursor to the left on the top line and deletes numbrs or letters as it moves.

"-" is a space key, it is used to enter a space between characters.

"e" is the enter key, it is used to accept the typing and send you back to the main display.

Move the on-screen cursor around using the right/left/up/down arrow keys on the main keyboard. The cursor will move to the right, left, up or down based on the key presses. When the cursor is highlighting the desired character or number, press Select to enter the character on the top line of the display. Note, that it might first be necessary to erase the line using the "<" backspace character to make room for your text or numbers.

When the entry is complete, move the cursor to the "e" (enter) character and press Select to save your entry.

#### I. Panel Setup for Network Operation

In most installations, the factory default network settings will not need to be changed and the panel should work with the segment manager as it shipped.

#### Panel ID

It is important that each panel have a unique Panel ID that is different from any other ID on the network including LMRC-300 series room controllers or LMBC-300 network bridge modules. The ID as shipped is based on the serial number of the panel, therefore it should be unique.

To change the Panel ID, navigate on the User Interface Module: [Main Menu > Setup] select the Panel ID setting and press Select to open the on-screen keyboard and change it as required.

Using Panel ID's in the range of 1,2, 3,4, etc. will always guarantee uniqueness as no other WattStopper devices will ever have these numbers by default.

## MS/TP MAC

The factory default setting is <255>, this effectively means that it is automatic. If the panel is to be used on a non WattStopper network, it may be necessary to set the MS/TP MAC of the panel to a specific number between 0 and 127 to suit the third party network requirements. Navigate to MS/TP-MAC and press Select to open the on-screen keyboard. Set the MAC as required.

## Max Master

The factory default setting is <127>. If the panel is to be used on a non WattStopper network, it may be necessary to set the Max Master of the panel to a specific number between 1 and 127 to suit the third party network requirements. Navigate to Max Master setting and press Select to open the on-screen keyboard. Set the Max Master as required.

## Baud Rate

The baud rate is the effective speed of network communications. All devices on a network must have the same baud rate setting. The factory default is <38400> for use with WattStopper devices. If the panel is to be used on a non WattStopper network, the baud rate can be changed to suit network requirements. Available baud rates are 9600, 19200, 38400, or 76800. Navigate to Baud Rate and use the right and left arrows on the keypad to select the baud rate. Press Select to save the setting.

## J. Programming the Panel to Respond to Schedules

The LILM panel does not have an internal means to set up or run schedules. The schedules are set up on the segment manager or BAS and can affect each of the eight (8) automation channels in the panel. The relays that are assigned to a channel respond to the schedule based upon the settings for that channel. To program settings for a channel use the keypad arrows to navigate [Program > Channel >]

Use the right and left arrows on the keypad to choose the channel letter (A – H). Press Select to display the current settings for the channel.

**Manual/Auto** – This setting tells the relays assigned to the channel how to react when the channel is transitioned from

after hours to normal hours by a schedule. Navigate to the Manual/Auto setting. Use the right and left arrows to choose either <Manual> or <Auto>. Auto means that the relays turn ON when the schedule transitions the channel to normal hours mode. Manual means that the relays will not turn ON when the schedule transitions the channel to normal hours.

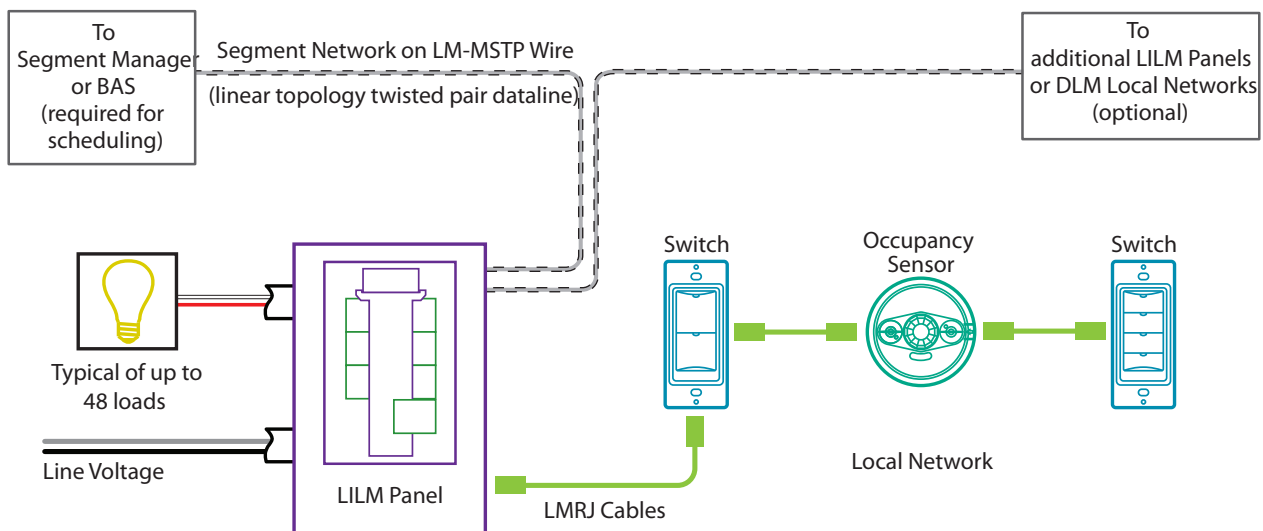
**Blink** – This setting tells the relays assigned to the channel if they should blink before turning OFF to warn the occupants. Navigate to the Blink setting. Use the right and left arrows on the keypad to select either <yes>, blink before OFF or <no> don't blink before OFF. Note: Select the AS-100 setting for Blink if using this channel to control AS-100 Automatic Wall Switches.

**Time Delay** – This setting is used in conjunction with override switches. The time delay setting is the amount of time that an override switch will keep the lights ON when activated during the after hours schedule period. Navigate to the Time Delay and press Select to display the on-screen keyboard. Set the time delay to the desired length of time between 1 and 240 minutes. Setting 0 will disable the time delay for the channel. Note that the time delay is automatically disabled during normal hours schedule periods. Note: If Blink is set to AS-100 mode, the time delay setting becomes the time interval between automatic off sweeps. See the AS-100 installation instructions for more information on using the AS-100 mode.

## K. Assigning Relays to the Channels

See the instructions on page 11 for manually assigning relays to channels using the Group Switch Card. The process described below is interchangeable with the manual method using the push buttons in the panel.

1. On the UI navigate to **Program > Channel** and select the channel letter to program.
2. Press the down arrow 4 times until **Select Relays** displays on the screen. Press select to open the relay selection screen.
3. Use the navigation keys to highlight the relays that are to be included in the channel.



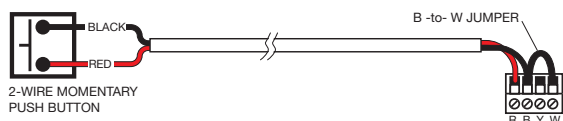
## L. Optional DLM Low Voltage (Class 2) Wiring

The low voltage (Class 2) section of the panel provides terminal connections for a variety of optional switches and other devices. See Figure 3 for location of the low voltage section. All wire entering this section must be Class 2 only. Do not allow line voltage conductors to pass through the Class 2 section for any reason.

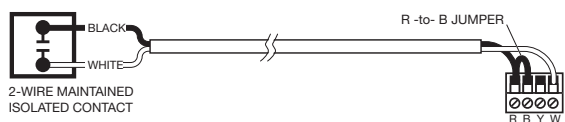
An individual relay can be controlled from a switch or non-DLM sensor by hardwiring it to the corresponding connector on the Relay Driver card (see Figure 2 for locations). Alternatively, several relays can be grouped together so that they can be controlled from a single LV switch or sensor that is hardwired to the Group Switching card (see Optional Group Switching Card and Smartwire Procedure section). A group of relays is assigned to a group channel via smartwiring. Up to 8 groups labeled A through H are available with a single Group Switching card (refer to Figure 10). A 48 relay panel can support two Group Switching cards, for up to 16 group channels.

### Hardwire Low Voltage Switch Wiring

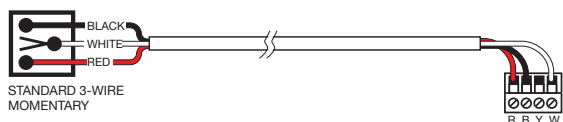
**Two-wire momentary** — Operates as push ON/push OFF in an alternate action. This type of control is recommended for applications where the user can clearly see the lighting being controlled. This switch can not be hardwired to multiple inputs. If multiple relays need to be controlled by this type of switch, use a Group Switch card input.



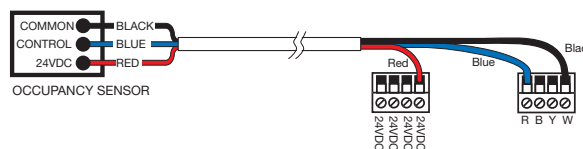
**Two-wire maintained** — Operates as a standard ON/OFF toggle switch. This type of control should not be used where the lighting is being controlled by scheduled or other automatic means. If the lighting is turned OFF by automatic means, the switch will need to be moved through the OFF position before it will once again synchronize with the status of the lighting.



**Three-wire momentary** — Operates in a dual momentary action mode with an independent contact for the ON and OFF signals. This operation can be provided by a SPDT momentary toggle switch or a variety of WattStopper low voltage switch options. This is the most common type of direct wired switch option used with LILM relay panels.

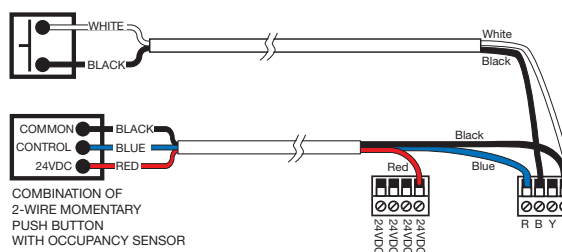


**Non-DLM Occupancy Sensor** — LILM switch inputs are designed to automatically sense the connection of a WattStopper occupancy sensor. The operation of the input will configure for proper operation as soon as the sensor activates the input for the first time. Operation of the relay will be determined by motion detection in the space and the scheduled occupancy state of the relay or channel its is controlling. During scheduled occupied periods the sensor will turn lighting ON when motion is detected but will not turn the lighting OFF. During unoccupied periods, the sensor will turn the lighting ON and OFF based only on motion being detected.



### Manual ON/OFF with Non-DLM Occupancy Sensor

Allows a two-wire momentary switch to have manual ON/OFF control of the lighting in conjunction with occupancy sensor control. Unlike the occupancy sensor this switch will turn the lighting ON or OFF regardless of the status of the sensor or scheduled occupancy status relay or channel it is controlling.



### Switches with Pilot Lights

The "Y" (yellow) terminal on the Switch Input Terminal Blocks supplies 24V rectified for use with pilot light switches.

To power a pilot light from the "Y" (yellow) terminal of a Group Switching (GS) card, install a jumper wire from 24VR to Yelcom on the GS card.

Voltage is present when the associated relay is ON.

Contact the Factory for configuring the panel for use with switch pilots requiring other voltages.

## M. Optional group switching and smartwire procedure

The Group Switching card (Figure 8) provides eight channels (A-H), which may be Smartwired to relays within the panel. Channels are used to group relays for common control from non DLM switches.

1. On the Group Switching card, press and hold the Group channel push button for several seconds. Release the button when the red channel LED and the LEDs for relays currently controlled by that input begin to flash.

2. On each Relay card, select the relays to be controlled.

If a relay was previously “smartwired” to the channel input selected, the LED will be flashing, otherwise the LED will be OFF. Press the associated Relay Control Button to add/delete that relay to/from the group. The LED for each relay included in the group will be flashing.

3. On the Group Switching card, press the Group Channel Push-button again for several seconds. Release the button when all LEDs stop flashing. The input switch will now control the relays selected.

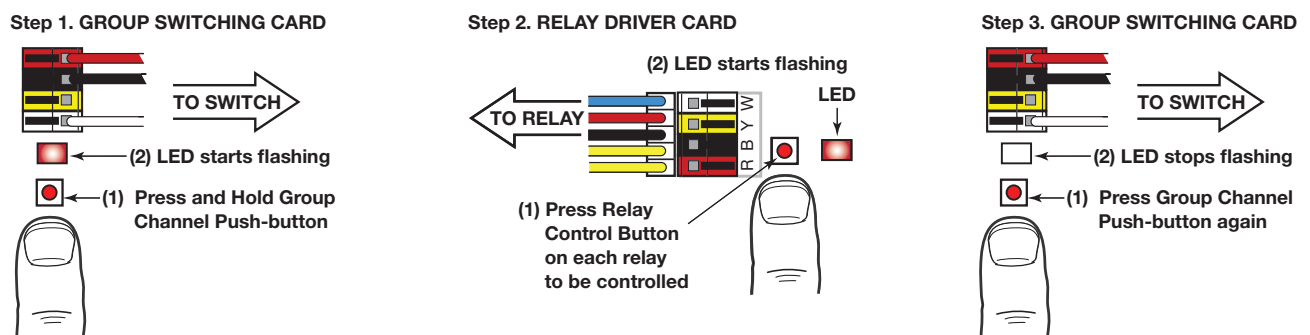


Figure 7: Manual relay channel setup for the Group Switching Card

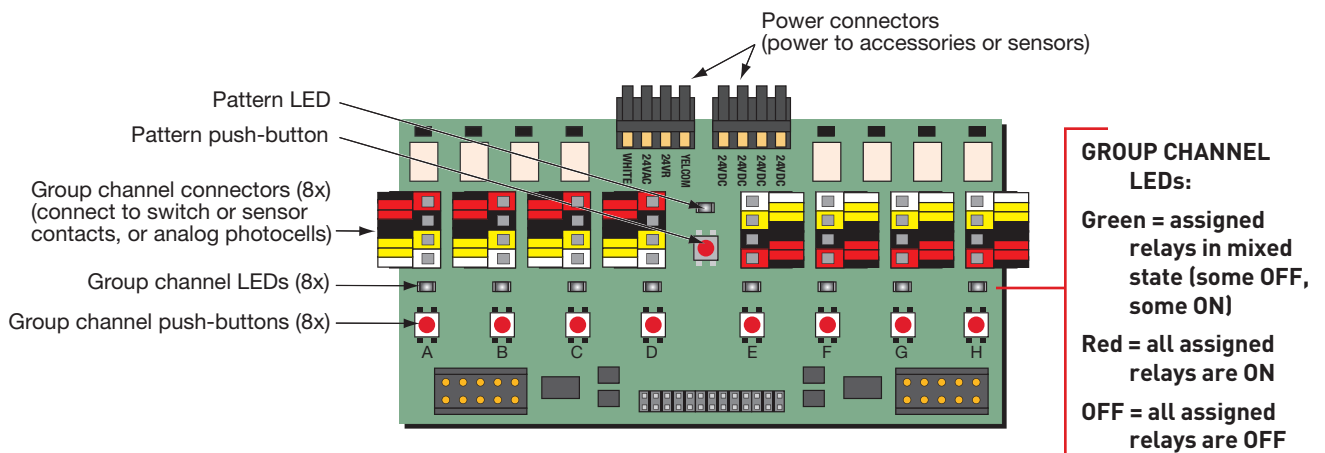


Figure 8: Group Switching card connections and components

### Test Smartwired Relay Group Channels

1. Press the Group channel Push-button ON/OFF/ON to toggle the group ON/OFF/ON.
2. The Group channel LED tracks the last action. With all relays in the group ON the Group channel LED is Red.

3. Turn OFF each relay in the group using the individual Relay Control Buttons. The Group channel LED turns Green to indicate that the relays assigned to that channel are in mixed states – some are OFF, some are ON.
4. When the last relay is turned OFF, the Group Channel LED should also go OFF.

### III. BACNET OPERATION WITH BAS

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#### Theory of Operation

The lighting control panel can perform typical lighting control automation features without full time supervision from the Building Automation Systems (BAS.) These include occupant initiated overrides, after hour time out of overrides, blink warn for an impending OFF and selection of Auto ON or Manual ON for lighting in occupied zones.

The above automation features of the panel are selectively set for each of the eight channels (A – H). Relays assigned to follow these channels assume the features selected for the respective channel. The channels can assume either of two possible states, normal hours or after hours. The behavior of the relays assigned to the channel is determined by a combination of the feature set for the channel and the normal hours/after hours status of the channel. It is highly recommended that the channels (BV 1 - BV 8) be the primary means of controlling the relays. This will take full advantage of the features provided in the panel. A description of each feature behavior follows this section.

**IMPORTANT:** while the panel supports BACnet priority arrays, by design, the panel assigns ultimate priority for controlling the lighting to the human operator or occupant of the controlled space. Wall switches and override push buttons within the panel take precedence over the DDC and will always control the lighting (relays) regardless of the priority arrays. In order to reconcile this functionality with the DDC, operation of a wall switch or override push button will first NULL the entire priority array of the affected relays (BO) and then command the relay(s) at priority level 16.

#### Assigning Relays to Channels

Relays can be assigned to follow channels in either of two ways:

- Manually at the panel using the UI Display or the Smartwired pushbutton programming feature of the group switch card. (Refer to the Lighting Integrator Installation Instructions for information on Smartwiring.)
- Using workstation commands. The AV objects 1 – 48 are used for this purpose. These correspond to each of 48 possible relay positions within the panel. Commanding present value equal to the number of the channel (1 – 8 = A – H) for an AV will assign the corresponding relay to that channel. Commanding 0 removes the relay from all channels. For example, writing an 8 to AV 24 assigns relay 24 to follow channel H. Note that when channels are configured using smartwiring, the appropriate value is automatically written to the AV object representing the channel.

#### Command Channels Normal Hours/After Hours

A key benefit of the panel is realized when the lighting is scheduled through the channels rather than scheduling individual relays. The panel has internal logic that will automatically adjust the behavior of the lighting based on the occupancy state of the channel. It is not necessary to repeat occupancy commands to the channels.

The normal hours/after hours mode for channels is determined by the present value of the BV1 – BV8 objects. For example, commanding 1 to BV8 will put channel H into the normal hours mode. Commanding 0 or NULL will put the channel into the after hours mode. These actions will turn the associated relays on and off if the channel is set to the Auto ON mode (this is the factory default). See Auto ON - Manual ON below. Note that the present value of the BV object will reflect the net result of the commanded values in the BV priority array such that the highest (lowest priority level number) wins. The relinquish default for the BV priority arrays is after hours.

A common use for the channels will be scheduling the lighting to follow the BAS. In order to allow flexible override of individual relays, the panel applies the following rule to channel control of relays: Commanding a BV on (normal hours) will turn on the member relays (assuming the channel is set to Auto On). The BO objects for the member relays will be commanded on by the channel at priority level 16 and the remainder of the BO priority array will be set to NULL. This is similar to the functionality of panel overrides described for switch overrides. It should be noted that the present value of the BV objects represents the normal hours/after hours status of the channel and not necessarily the status of the relays controlled by the channel. A series of Multi-State Value objects are provided for channel relay status. See Channel Relay Status below. The “description” property of the BV and MV objects is writable and may be used to provide a meaningful name for the channels.

#### Channel Relay Status

The aggregate on/off status of relays assigned to channels can be monitored using the Present Value property of the Multi-State Value objects (MV1 – MV8) provided for this purpose. A group of relays that is assigned to a channel can have four possible states: All ON (all relays are on), Blink (the relays have blinked and are currently running the blink warn timer before going off) , Mixed (some relays are on and some are off) , and All Off (all relays are off). The actual state of individual relays can also be monitored via the BI objects. See Relay Control.

## Auto ON - Manual ON

This feature can be used to maximize the energy savings by not turning on the lighting until the first person arrives in the area. To use the Manual ON setting requires that a wall switch or occupancy sensor be installed in the area to provide the arrival signal to the panel. The wall switch can be connected to an individual relay for localized control or connected as a channel master override. This feature is set for channels A – H via the BV101 – BV108 objects. Command 0 to set the channel to Auto ON (factory default). Command 1 to set the channel to Manual ON.

## Blink Warn

The blink warn feature provides a means to warn occupants that their lights are going to be turned off. When enabled for a channel, the relays associated with the channel will blink off and on when the channel transitions from occupied to unoccupied. The lighting will then turn off after five minutes unless an occupant signals the panel by pressing a wall switch. This action will cancel the impending off for the relay that is controlled by the switch and will start the time delay count down for this relay.

Blink warn is set for channels A - H via the AV101 – AV108 objects. Command 5 to set the blink warn interval to five minutes. Command 0 to set the channel to no blink warn. Note that the current firmware version only supports a five minute interval.

## Time Delay

The time delay feature insures that relays that are overridden on by a wall switch will not remain on indefinitely during unoccupied periods. When an occupant uses a wall switch to turn lighting on, the time delay counter starts counting down. At the end of the time delay period, the lights will either turn off (blink warn is not set) or will blink warn. Pressing the wall switch during the warn period will cancel the off and again start the time delay count down. Note that the time delay feature is automatically disabled during occupied periods.

The time delay feature has the added benefit of allowing the BAS to provide just a one time unoccupied signal to an area rather than “sweeping” the area off at intervals as would be required to meet state energy codes. The time delay is set in the range of 0 – 240 minutes for channels A – H via the AV201 - AV 208 objects. For example, writing the value 120 to AV208 will set a time delay of two hours for channel H. Setting 0 for the time delay disables the feature for this channel. The time delay is also used to set the “sweep” interval when also using the Automatic Wall Switch (see below).

## Relay Control

Relays may be controlled and monitored individually and independently from the channels. However, this behavior should be limited to individual override of relays when required. It is recommended that simultaneous control of multiple relays be performed using the channel feature of the panel. Each relay is represented as a binary output object (BO). The present value property of the BO is used to control the relay.

BI Objects are provided for relay status. The present value will reflect the net result of the values written in the priority array such that the highest (lowest priority level number) wins. The relinquish default for the priority array is NULL or off. The “description” property of the BO objects is writable and may be used to provide a meaningful name for the relays. Note that a description written to a BO will automatically be assigned to the corresponding BI object. The description property of the BI is not writable.

## Support for Automatic Wall Switch Device

The panel is provided with integral support for the WattStopper AS-100/AS-110 Automatic Wall Switch. This device can be installed in place of a standard line voltage wall switch and enable the BAS to provide automatic shut off of the lighting while maintaining the ability for occupants of individual offices to override their lighting on. This is done without the requirement for low voltage control wiring.

This feature can be activated for each channel by assigning a value of 250 to the Blink Warn property of the channel (AV101 – AV108). When set to this value, the channel will automatically turn the relays off for a period of one second then back on when the channel is commanded unoccupied. This brief power interruption, signals the Automatic Wall Switch to start its 5 minute grace period timer. At the end of the grace period, the lights will turn off unless the user cancels the off by activating the integral override switch on the AS-100. This process will automatically repeat after the time interval is set in the “time delay” (AV201 - AV208). See Time Delay above for additional information. See the documentation for the AS-100 or AS-110 for more

## COMPLETE LIST OF BACnet OBJECTS

Object	Instance #	Object Name	Present Value
BO	# 1-48	RELAY # (1-48)	1 = ON, 0 = OFF (read/write)
BI	# 1-48	RELAY # (1-48)	1 = ON, 0 = OFF (read only)
AV	# (1-48)	RELAY CHANNEL (1-48)	1-8 (channel assignment)
BV	1	CHANNEL A	1 = Occupied, 0 = Unoccupied.
BV	2	CHANNEL B	1 = Occupied, 0 = Unoccupied
BV	3	CHANNEL C	1 = Occupied, 0 = Unoccupied
BV	4	CHANNEL D	1 = Occupied, 0 = Unoccupied
BV	5	CHANNEL E	1 = Occupied, 0 = Unoccupied
BV	6	CHANNEL F	1 = Occupied, 0 = Unoccupied
BV	7	CHANNEL G	1 = Occupied, 0 = Unoccupied
BV	8	CHANNEL H	1 = Occupied, 0 = Unoccupied
MV	1	CHANNEL A STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	2	CHANNEL B STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	3	CHANNEL C STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	4	CHANNEL D STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	5	CHANNEL E STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	6	CHANNEL F STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	7	CHANNEL G STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
MV	8	CHANNEL H STATUS	ON (4), Mixed (3), OFF (1), Blink (2)
BV	101	MANUAL/AUTO 1	0 = Auto ON, 1 = Manual ON
BV	102	MANUAL/AUTO 2	0 = Auto ON, 1 = Manual ON
BV	103	MANUAL/AUTO 3	0 = Auto ON, 1 = Manual ON
BV	104	MANUAL/AUTO 4	0 = Auto ON, 1 = Manual ON
BV	105	MANUAL/AUTO 5	0 = Auto ON, 1 = Manual ON
BV	106	MANUAL/AUTO 6	0 = Auto ON, 1 = Manual ON
BV	107	MANUAL/AUTO 7	0 = Auto ON, 1 = Manual ON
BV	108	MANUAL/AUTO 8	0 = Auto ON, 1 = Manual ON
AV	101	BLINK WARN 1	5 = Five Min., 0 = No Blink
AV	102	BLINK WARN 2	5 = Five Min., 0 = No Blink
AV	103	BLINK WARN 3	5 = Five Min., 0 = No Blink
AV	104	BLINK WARN 4	5 = Five Min., 0 = No Blink
AV	105	BLINK WARN 5	5 = Five Min., 0 = No Blink
AV	106	BLINK WARN 6	5 = Five Min., 0 = No Blink
AV	107	BLINK WARN 7	5 = Five Min., 0 = No Blink
AV	108	BLINK WARN 8	5 = Five Min. 0 = No Blink
AV	201	TIME DELAY 1	1 - 240 Min., 0 = No Time Delay
AV	202	TIME DELAY 2	1 - 240 Min., 0 = No Time Delay
AV	203	TIME DELAY 3	1 - 240 Min., 0 = No Time Delay
AV	204	TIME DELAY 4	1 - 240 Min., 0 = No Time Delay
AV	205	TIME DELAY 5	1 - 240 Min. 0 = No Time Delay
AV	206	TIME DELAY 6	1 - 240 Min., 0 = No Time Delay
AV	207	TIME DELAY 7	1 - 240 Min., 0 = No Time Delay

## Notes to the System Integrator

- The WattStopper LILM panel will handle the tasks unique to lighting control - Multiple Off sweeps, After hours Time Delays, etc.
- Each Panel supports 8 channels (functional groups). Decide which relays will go into each channel (relays can only be assigned to one channel). Control these 8 channels, not the individual relays, by the schedules. You can either "smartwire" the relays to the channels, or use AV-# variable to assign relays to channels at the workstation.
- When the Channel is set to "Normal Hours"
 

Some spaces should have lights go ON automatically in the morning, but in others people should manually turn on the lights - use BV-10# variable to define which scenario should happen when you turn the channel go "normal hours". In either case, time delays will be disabled.
- When the Channel is set to "After Hours"
 

Most people appreciate a warning before lights go off, but there are some lights and hardware that should not be "blinked" - HID lights for example. Set the AV-10# variable to "5" and when the channel goes unoccupied the lights will "blink" and 5 minutes later they'll go off, unless an occupant overrides the sweep by pressing a local low voltage switch during the 5 minute grace period.
- WattStopper's AS-100 switches wire to the line voltage circuit and need to be pulsed Off for 2 seconds to go into their after hours mode. By setting a 250 value to the AV-10# variable, the panel will automatically take care of this pulsing behavior.
 

Note that AS-100 switches will not go ON automatically in the morning, and that since these relays are now basically Normally Closed contacts, their state will almost always be ON regardless of whether their channel is a normal hours or after hours state.
- Direct wired low voltage switches always control the relay. Whether the relay stays on it's channel's time delay or until the occupancy state is changed will be handled by the panel automatically.

## TESTING AND TROUBLESHOOTING

### Basic power-up testing

Test	Response	What next? If the panel continues to fail a test, call Technical Support
Observe the Blue LEDs on the C8 or C24 board	Blue LED blinks at a regular tempo.	Go to next Test.
	Blue LED OFF or continuously lit.	Reset panel power. Check LED again.
Observe Blue LED (at DS6) on RD boards (and on GS card if installed)	Blue LED flashes at regular intervals on both boards.	Go to next Test.
	Blue LED OFF or continuously lit.	Reset panel power. Check LED again.
Observe the Green Status LEDs on the C8 or C24 board	All 6 Green Status LEDs are continuously lit.	Go to next Test.
	Any Green Status LED is OFF.	Reset panel power. Check LEDs again.
Observe the two green Power LEDs at DS1 & DS2 on the PS board	Both green Power LEDs are continuously lit.	Go to next Test.
	Either Green Power LED is OFF.	Turn OFF power to panel and check red and black wire connections to the J2 terminal block on the PS board. Reset panel power. Check LEDs again.
Look for any lit Amber LEDs on the RD (and GS if installed).	No Amber LEDs observed.	Go to next Test.
	An Amber LED is lit or blinking.	Reset panel power. Check for Amber LEDs again.
Relay Operation: Press each Relay control push-button	Red LED for each relay lights and relay clicks. Press button again, relay clicks and Red LED goes OFF.	Ok to wire low voltage devices to relay card terminals.
	Red LED doesn't light and/or relay doesn't click.	Make sure a jumper is installed on PS board between YELCOM and 24VR terminals.

### Troubleshooting

	Problem	Test Steps	Next
1	A button on a DLM switch does not control any relays.	Does the button's LED light when pressed?	No – Check the wire connection. The switch must be connected to the local network. Replace the switch. Yes – the LED blinks several times but goes out. The button has not been programmed. Follow directions to program the button.
2	Buttons do not reliably control the relays.	Temporarily connect the switch to the panel with a short cable. Does it work reliably?	No – Replace the switch. Yes – check that the length of wire and number of switches connected, are OK based on the table on page x. Long wire runs with many switches might require a booster. Contact technical service.

## **WARRANTY INFORMATION**

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WattStopper warrants its products to be free of defects in materials and workmanship for a period of one (1) year. There are no obligations or liabilities on the part of WattStopper for consequential damages arising out of, or in connection with, the use or performance of this product or other indirect damages with respect to loss of property, revenue or profit, or cost of removal, installation or reinstallation.



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13572r1 6/2011