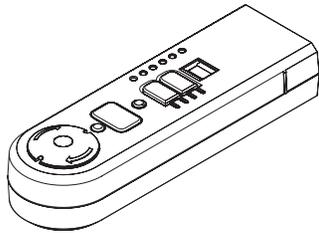


**Catalog Number • Numéro de Catalogue • Número de Catálogo: LMLS-600**

Country of Origin: Made in China • Pays d'origine: Fabriqué en Chine • País de origen: Hecho en China



## DESCRIPTION

The LMLS-600 is a dual loop photosensor specially designed to optimally dim or switch lighting in applications using skylights or other top-lighting daylight sources. It is part of a Digital Lighting Management (DLM) system, and sends commands to control loads connected to DLM switching or dimming room controllers. The LMLS-600 incorporates two separate photodiodes to independently monitor the available daylight and the delivered indoor light levels. Both photodiodes have photopic correction to mimic the human eye for precise measurement of visible light.

The photosensor installs to the curb or frame of a skylight using the supplied adjustable mounting bracket. Once in place, the LMLS-600 is fully self-calibrating, requiring no special knowledge or light meters to achieve optimal operation. This automated process, directed from floor level with a handheld configuration tool (LMCT), or from a program running on a laptop computer (LMCS/LMCI), learns the characteristics and response curves of the controlled lighting and reflectances of the interior space, and establishes appropriate setpoints. These parameters can be adjusted, if desired, to customize operation.

The unique dual-loop control algorithm delivers optimal energy conservation and light-level maintenance, even in changing conditions such as low sun angles and partly cloudy sky conditions, as well as changes to interior reflectances caused by changing décor. The photosensor continuously commissions after installation, accounting for changing lumen output of light sources and redecoration of interior spaces. The LMLS-600 operates on Class 2 power supplied to a DLM local network by one or more DLM room controllers.

### Sensor Installation and Configuration Overview

1. Mount the LMLS-600 under a skylight so that the sensors can measure light both up and down without obstructions..
2. Complete all wiring and turn ON power to the room controller.
3. Use the LMCS-100 or LMCT-100 configuration tool to complete the configuration process. The LMLS-600 will not operate properly until the configuration and calibration is successful.
  - a. Select the LMLS-600 to be configured, from the Daylighting menu.
  - b. Use Zone Setup to select the operating mode for the controlled zone (Switched, Bi-Level, Tri-Level, or Dimmed).
  - c. Assign individual loads to the LMLS-600 controlled zone.
  - d. Calibrate the LMLS-600 automatically. Further adjustment can be done through manual calibration (a light meter is required).
  - e. Adjust Zone Settings and Advanced Settings to meet specific sequence of operation requirements.
  - f. Use Test Mode to verify the LMLS-600 operation.

## SPECIFICATIONS

Open Loop Sensor.....	0 to 6,500 fc
Closed Loop Sensor.....	0 to 65 fc
Voltage.....	24VDC
Current Consumption.....	max 13mA, typical 3mA
Power Supply.....	Wattstopper Room Controllers
Connection to the DLM Local Network.....	1 RJ45 port
Environment:	
Operating Temperature.....	32° to 131°F (0° to 55°C)
Storage Temperature.....	23° to 140°F (-5° to 60°C)
Relative Humidity.....	5 to 95% (non condensing)

Other:

RoHS compliant

Dimensions:

Length.....	3.9" (99mm)
Width.....	1.2" (30mm)
Depth.....	1.0" (25mm)

### Factory Defaults After Calibration

Switching Operation:

ON Setpoint*.....	120% of maximum electric light level
OFF Setpoint (Bi-Level, Tri-Level)*..	180% of maximum electric light level
OFF Setpoint (Switched)*.....	240% of maximum electric light level
ON Time Delay.....	20 sec
OFF Time Delay.....	10 min

Dimming Operation:

Dimming Setpoint*.....	107% of maximum electric light level
Ramp Rate Up.....	5% per sec
Ramp Rate Down.....	5% per sec
Cut Off Delay.....	Never

Advanced Parameters:

Allow Override.....	No
Override Time.....	Infinity
Hold Off.....	No
Scenes Stop Daylighting.....	No
Ignore After Hours.....	No
Force Open Loop.....	No
Recommissioning Threshold.....	2 fc
Recommissioning Delay.....	0 Min
Enable Diagnostic Messages.....	LED

\* Setpoints change automatically upon calibration

## PLACEMENT GUIDELINES

The LMLS-600 switches or dims electric light in response to daylight. For proper operation, the photosensor must be mounted underneath the skylight using the supplied bracket.

Use the mounting bracket to position the photosensor directly in the center of the skylight. The sensor box must be held in the correct orientation underneath the middle of the skylight, and be able to observe both up and down without obstructions. Figure 1 shows a typical placement location for a flat roof application.

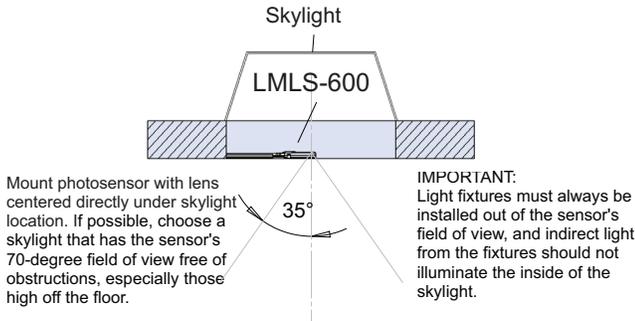


Fig 1: Flat Roof Skylight Location

When the skylight is installed on a slanted roof, the sensor bracket must be affixed to one of the slanted sides so that the LMLS-600 is held parallel to the floor, with the closed-loop sensor oriented to view straight down. Refer to Figure 2.

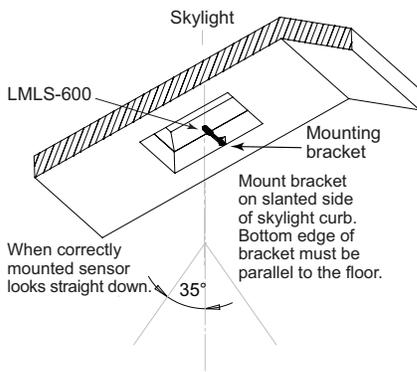


Fig 2: Slanted Roof Skylight Location

## MOUNTING THE PHOTSENSOR

The photosensor installs to the curb or frame of a skylight using the adjustable mounting bracket provided.

The mounting bracket includes an extensible metal mounting arm to accommodate different types of mounting, together with a clip that holds the sensor at the end of the arm. The arm also includes an internal channel to hold the LMRJ cable.

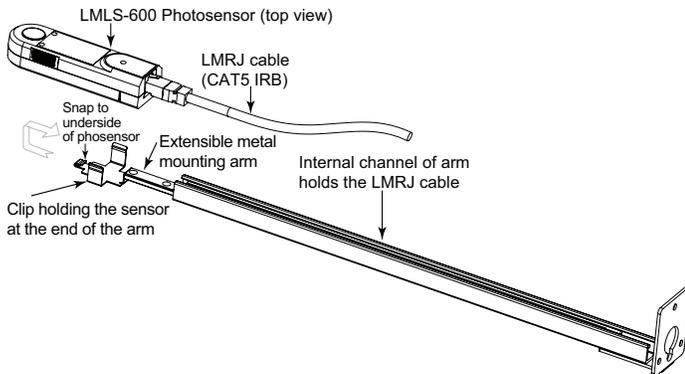


Fig 3: Adjustable Mounting Bracket System

Determine placement of bracket using the mounting bracket to position the photosensor directly in the center of the skylight. Adjust the size of the mounting arm as shown. Refer to Figure 4.

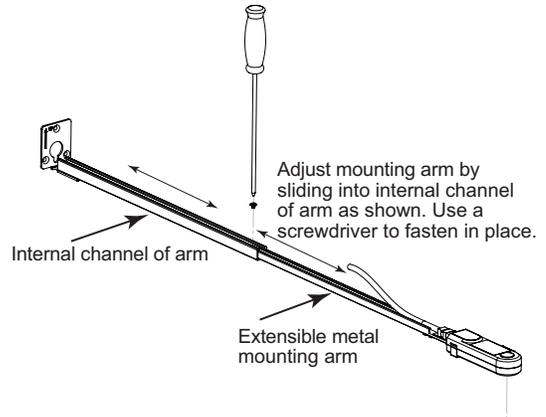
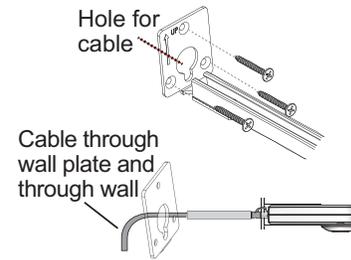


Fig 4: Adjust Mounting Bracket

## MOUNTING OPTIONS

Determine cable routing using the mounting plate as a template if needed to mark the hole positions for either the cable or screws.

Mounting when running the RJ-45 cable through wall.



Mounting when running the RJ-45 cable on the wall surface.

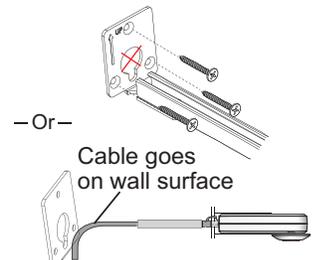


Fig 5: Determine Cable Routing

## CONNECT THE LMRJ CABLE

The LMLS-600 receives power, and communicates with other DLM devices through an LMRJ cable that plugs into the RJ45 socket on the end of the unit. Attach as shown.

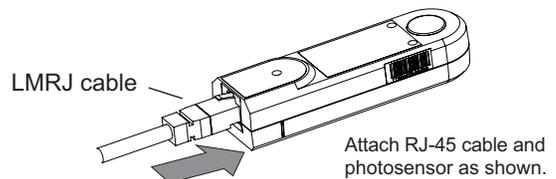


Fig 6: Attaching the LMRJ Cable

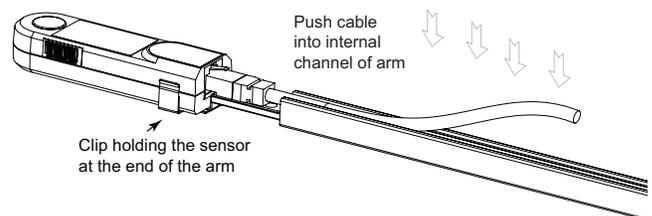


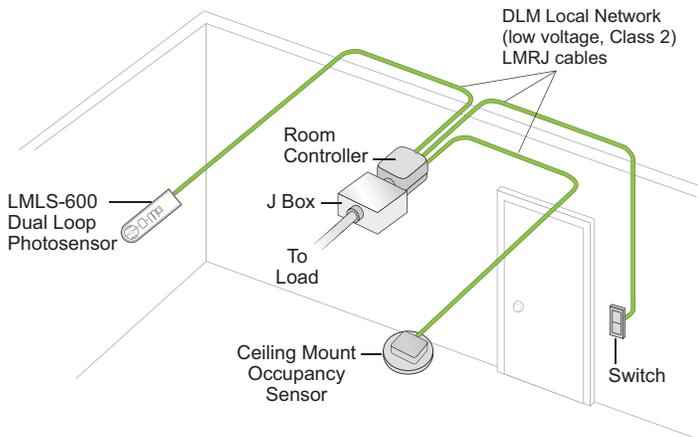
Fig 7 Pushing the LMRJ Cable into internal channel of arm



**CAUTION: TO CONNECT A COMPUTER TO THE DLM LOCAL NETWORK USE THE LMCI-100. NEVER CONNECT THE DLM LOCAL NETWORK TO AN ETHERNET PORT – IT MAY DAMAGE COMPUTERS AND OTHER CONNECTED EQUIPMENT.**

## WIRING DIRECTIONS

Installation shall be in accordance with all applicable regulations, wiring practices, and codes. The DLM Local Network is free topology low voltage wiring. The LMLS-600 can connect anywhere on the DLM Local Network. The following illustration is for example only.



## IR COMMUNICATION

The photosensor is designed to communicate with the LMCT commissioning tool, either directly (through an IR transceiver built into the bottom of the sensor), or through any other IR-equipped DLM device on the same local network.

Because of the great mounting heights of skylight sensors in high-bay applications, it is important to stand directly underneath the photosensor, with the LMCT held in a vertical orientation pointed at the bottom of the sensor.

In some cases, direct communication between the LMCT and the LMLS-600 may be difficult to achieve due to interference from very high ambient light when looking up, from direct sunlight, high intensity fluorescent fixtures (such as a T5HO) mounted close to the sensor, as well as some other intense light sources. In these cases, communication can be established with the photosensor by aiming the LMCT at another DLM product on the network (such as a wall switch or occupancy sensor).

## OPERATION

The LMLS-600 communicates with all other Lighting Management devices connected to the DLM Local Network. It is dependent on a DLM Room Controller (LMRC-100 series for ON/OFF switched loads, LMRC-200 series for ON/OFF switched loads and dimming capable loads). Options: A DLM Switch for override control, a DLM Occupancy Sensor for motion detection.

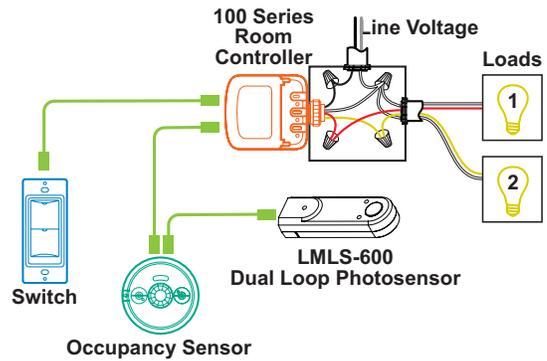


Fig. 8: DLM Local Network Example for Switched Loads

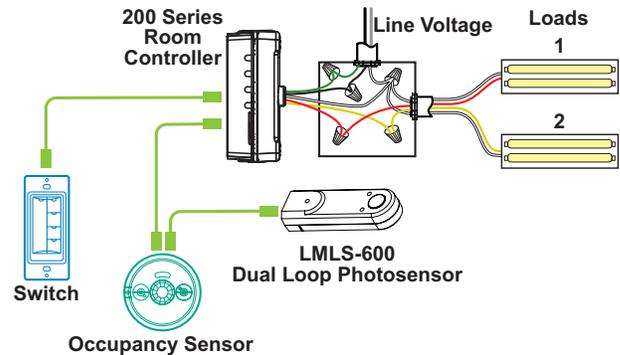


Fig. 9: DLM Local Network Example for Dimmed or Switched Loads

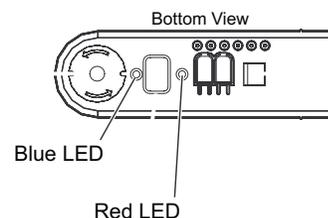
## STATUS LEDs

Blue and red status LEDs are located in the sensor body and are visible from all angles when lit or flashing.

- Normal Operation (LEDs: red off, blue off)
- Sensor Failure (LEDs: red on, blue off)
- Daylighting Disable (LEDs: red on for three seconds, then off for one second, repeating, blue off)
- Uncalibrated (LEDs: red off; blue on for three seconds, then off for one second, repeating)
- IR Communications (LEDs: red flicker @ 4Hz, for 0.5 seconds, after IR reception; blue off)
- PnL Mode (LEDs: red flashing once per second, blue solid on or off, depending on load binding state)
- Test Mode (LEDs: red off, blue flashing once per second)
- Override (LEDs: red off, blue flashing once every four seconds).

**NOTE:** This pattern is also displayed during Calibration.

- Occupant Interference (LEDs: red flashing once every four seconds, blue off).



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## SENSOR PUSHBUTTONS

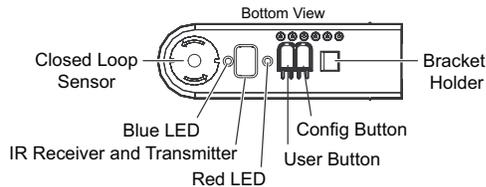
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### USER Button

- **Quick press** – Cycle through load binding verification test.
- **Press and hold for two seconds** – Start automatic calibration.
- **Press and hold for ten seconds** – Enter test mode for five minutes.

### CONFIG Button

- **Quick press** – If the system is in PnL, the system will select the next load on sequence of the system (not just the daylighting configured loads).
- **Press and hold for two seconds** – Enter or exit PnL.
- **Press and hold for 10 seconds** – LMLS-600 will clear its own bindings, but not internal parameters.
- **Press and hold for 20 seconds** – LMLS-600 will reset to factory defaults.



The light level can always be reduced (by turning off loads in a switched zone, or by lowering the level of loads in a dimmed zone) without restriction. When a load is dimmed down from its daylighting-permitted level, the new level set becomes the maximum electric light level for that load (a “cap” level), regardless of daylight contribution, until the load is turned off and back on again, or until the level is adjusted upward. If a load has been dimmed, a single tap on the top of a controlling switch’s rocker will return the level to the maximum allowed by daylighting at that time, and cancel the level restriction (“cap”) set by the earlier user adjustment.

Increasing the light level above that set by daylighting is possible only if **Allow Override** is set to **Yes** (the default is **No**). For switched modes configured with Hold Off set to Yes, this means that the loads can be turned on even when the present ambient light level is above the On Setpoint. In the case of dimmed mode, a load will turn on and adjust to its daylighting-permitted level, but a subsequent tap on the top of a controlling switch will increase the level to maximum. In either mode, the affected loads will be temporarily removed from daylighting control, and be placed in an “override” state. The levels of the overridden loads can be changed or adjusted, and they will not return to daylighting control unless they are turned off and back on again (for example, by a cycle of occupancy).

If the **Override Time** parameter is changed from its default (**Infinity**) to a fixed time (for example, 1 hour), all loads presently overridden will return to automatic daylighting control after the selected time period lapses.

Any loads not affected by the switch actions causing the override will continue to be controlled by daylighting; overrides occur on a load-by-load basis.

If any daylighting loads are presently overridden, the blue LED in the sensor head will flash once every four seconds.

To provide the ability to set arbitrary light levels in Dimmed applications, a switch with a dimming control rocker (such as LMDM-101 or LMSW-105) should be used.

### Scene Control and Daylighting

Setting a new light level using a scene switch is always permitted. Such a light level change is not considered an override. If daylighting control is active when the new scene is selected, daylighting control suspends until the new scene is displayed, and then resumes, with the new light level established by the scene as the maximum electric light level (“cap” level), on a load-by-load basis, until a subsequent user action changes the level. Any daylighting loads not included in the scene will continue to operate as before the recall.

Optionally, daylighting control can be temporarily disabled for any loads on which a scene has been recalled. If **Scenes Stop DL** is set to **Yes**, daylighting control for a load affected by a scene will not resume until the level of the load is changed by another user action, or the load is turned off and on again.

### Recommissioning

The sensor performs an automatic recommissioning, typically once per day, to adjust to changes in electric light output and to alterations in décor. This process starts when the daylight (as measured by the open-loop sensor) drops below the Recommissioning Threshold and stays there for at least the Recommissioning Delay.

During Recommissioning, the sensor will turn all of the configured loads on to full output, until they reach their maximum intensity (typically, about 2-3 minutes). Then it will make some measurements, and return the loads to their state prior to recommissioning.

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## OPERATING MODES

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### Plug n’ Go

The LMLS-600, unlike most other DLM components, will not auto-configure. The LMLS-600 must be manually configured using the LMCT-100 or LMCS-100.

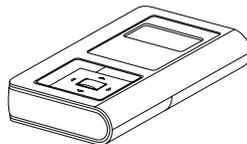


Fig. 10: LMCT-100

### Push n’ Learn

Push and Learn™ (PnL) provides for remote load binding and configuration within the room, without requiring direct access to the Room Controller(s). While the LMLS-600 must be configured through the use of a configuration tool (for example, LMCT-100), the CONFIG button can be used to force the system into or out of PnL, and/or to step to the next load in sequence.

### Confirmation of Load Binding

To provide a confirmation of load bindings after installation, a quick press on the USER button sequences through three states:

**1st press** - All controlled loads forced ON at 100%

**2nd press** - All controlled loads forced OFF at 0%

**3rd press** - Exit load binding confirmation mode and resume normal control. (Confirmation mode cancels automatically after 5 minutes if no further action is taken after the 1st or 2nd press.)

### Test Mode

In Test Mode, time delays are reduced to 15 seconds (to create near-immediate reactions to changes in measured light levels), and the ramp rate increases to 20%/second (to cause the changes to be immediately visible).

To activate Test Mode, press and hold the USER button for 10 seconds or use a configuration tool. If not cancelled by the user, the controller automatically exits Test Mode after 5 minutes.

### User Override of Levels Set by Daylighting Control

The electric light levels of loads configured for daylighting control can be adjusted from DLM wall switches, within limitations established by LMLS parameters that are set using the Advanced Settings screen of the LMCT-100.

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## CONFIGURATION

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The configuration process establishes the appropriate parameters for operation. This is done through the use of an LMCT-100 configuration tool.

The LMCT-100 Wireless IR Configuration Tool is a handheld tool for setup and testing of Wattstopper Digital Lighting Management

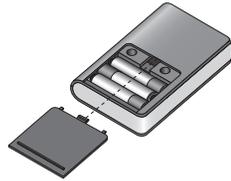
(DLM) devices. It provides wireless access to occupancy and daylighting sensors for setup and parameter changes, Wattstopper Push n' Learn™ (PnL) technology for load configuration, switch and dimmer assignment and operating parameter changes. The LMCT-100's display shows menus and prompts to lead you through each process. The navigation pad provides a familiar way to navigate through the customization fields. The LMCT-100 allows modification of the system without requiring ladders or tools; simply with a touch of a few buttons.

### Operation

The LMCT-100's IR transceiver allows bi-directional communication between DLM devices and the LMCT-100. Simple menu screens let you see the current status of the system and make changes. For systems including the LMLS-600 daylighting sensor the LMCT-100 can also set or change the daylight parameters. The LMCT-100 can change dimming system options such as scene assignments, ramp rates and other options not available through the standard user interface.

### Batteries

The LMCT-100 operates on three standard 1.5V AAA Alkaline batteries, or three rechargeable AAA NiMH batteries. The battery status displays in the upper right corner of the display. Three bars next to BAT= indicates a full battery charge. A warning appears on the display when the battery level falls below a minimum acceptable level. To conserve battery power, the LMCT-100 automatically shuts OFF 10 minutes after the last key press.



### Navigation

You navigate from one field to another using ▲ (up) or ▼ (down) arrow keys. The active field is indicated by flashing (alternates between yellow text on black background and black text on yellow background). Once active, use the **Select** button to move to a menu or function within the active field.

Value fields are used to adjust parameter settings. They are shown in "less-than/greater-than" symbols: <value>. Once active, change them using ◀ (left) and ▶ (right) arrow keys. In general the ▶ key increments and the ◀ key decrements a value. Selections wrap-around if you continue to press the key beyond maximum or minimum values. Moving away from the value field (using ▲/▼ keys) overwrites the original value.

The Home button takes you to the main menu.

The Back button can be thought of as an undo function. It takes you back one screen. Changes that were in process prior to pressing the Back key are lost.

### Home Menu

The Home (or Main) menu displays after the powerup process completes. It contains information on the battery status and six menu choices.

Press ▲/▼ to locate the desired function, then press **Select**.

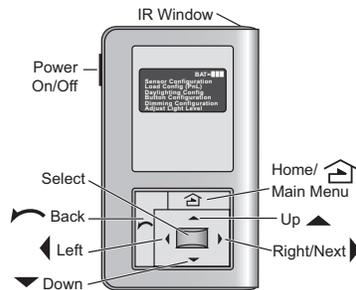
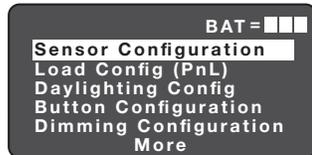
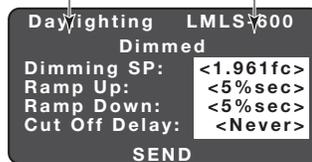


Fig. 11: LMCT-100 Controls

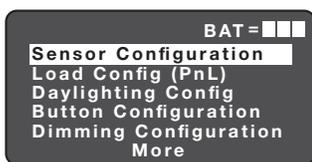
Function Fields (on Home Menu)



Parameters Value Fields



Press Left/Right arrow to select a value



Up or Down Button Select Button

## LMLS-600 CONFIGURATON PROCESS

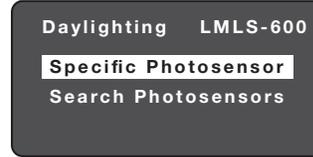


Choose Daylighting Config Press Select



Choose LMLS-600 Press Select

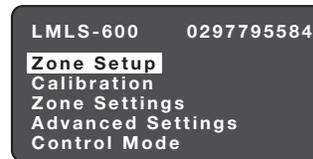
### Specific Photosensor



Press Select



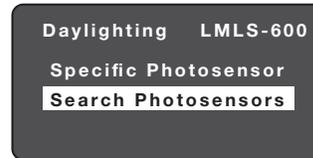
Point and Press Select



Serial number will be different for each LMLS-600

### Search Photosensor

The Search Photosensor function allows you to identify which LMLS-600 will be commissioned. After enabling and pointing the LMCT-100 at any DLM device, a list of all LMLS-600s in the DLM Local Network appears on the screen. Each LMLS-600 has its own unique serial number.



Choose Search Photosensors Press Select



Point and Press Select



Choose Desired Photosensor Press Select



Point and Press Select



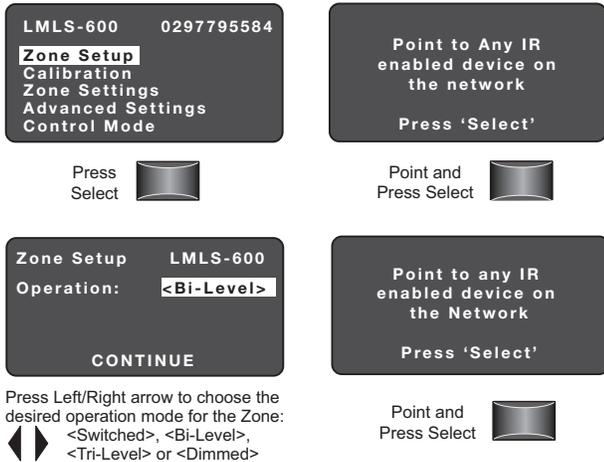
Serial number will be different for each LMLS-600

LMLS-600 Daylighting Menu

## ZONE SETUP

### Selecting the Operation Mode

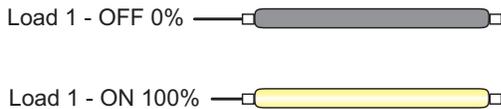
Zone Setup allows you to change the operation mode of a zone, specify if a selected load is to be controlled by Daylighting and to bind loads to the LMLS-600.



After choosing **Zone Setup** and pressing **Select**, the current operation mode is displayed. This can be changed to Switched, Bi-Level, Tri-Level, or Dimmed.

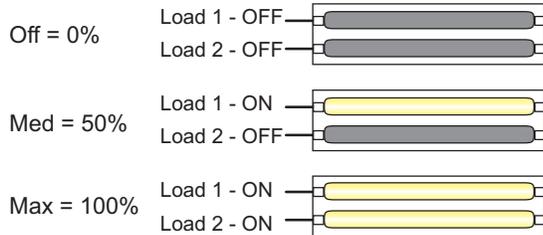
### Switched

Switched mode provides ON/OFF switching within the daylighting zone controlled by the photosensor.



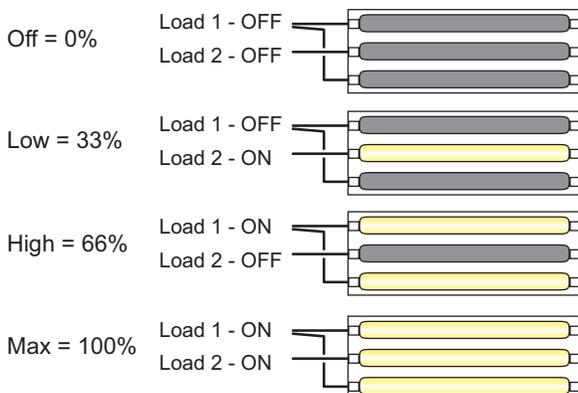
### Bi-Level

Bi-level mode provides three light levels within the daylighting zone controlled by the photosensor by using 2 load circuits.



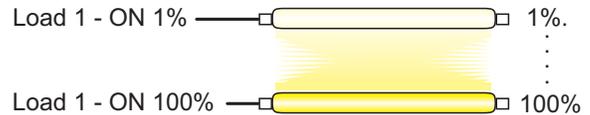
### Tri-Level

Tri-level mode provides four light levels within the daylighting zone controlled by the photosensor by using 2 load circuits.



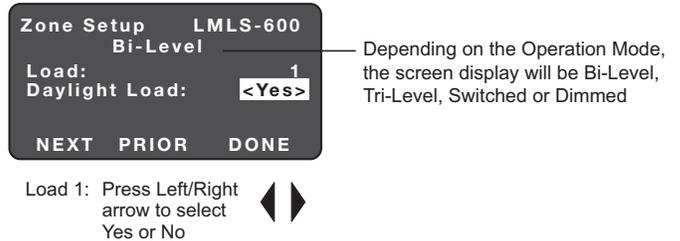
### Dimmed

Dimmed mode provides continuous dimming within the daylight zone controlled by the photosensor.

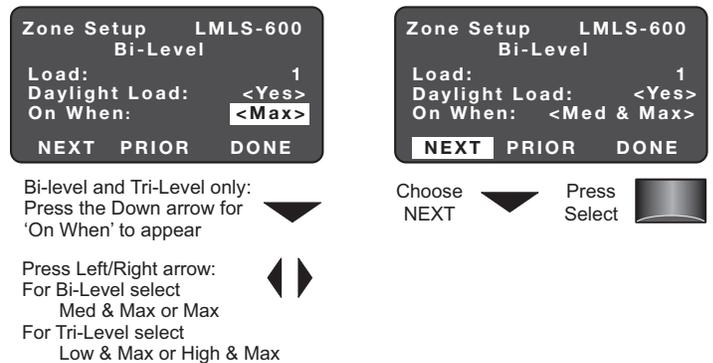


### Load Assignments

To do load binding, the load needs to be assigned.

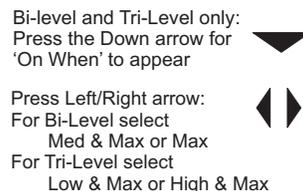
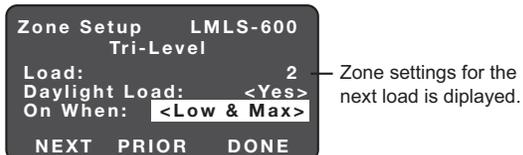
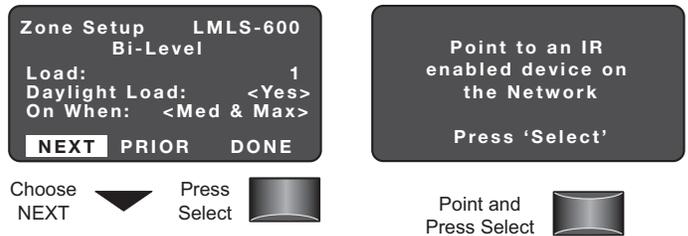


For Bi-level and Tri-level only, press the **Down** arrow for **On When** to display.



### Next

To continue to assign Daylight Load binding to load 2, choose **NEXT**.



## Prior

To continue to assign Daylight Load binding to the previous load, choose **PRIOR**. This function behaves the same for all Operation Modes.



Choose PRIOR  Press Select 



Point and Press Select 

## Done

When you have completed all load bindings, choose **DONE**. This function behaves the same for all Operation Modes.



Choose DONE  Press Select 



Point and Press Select 



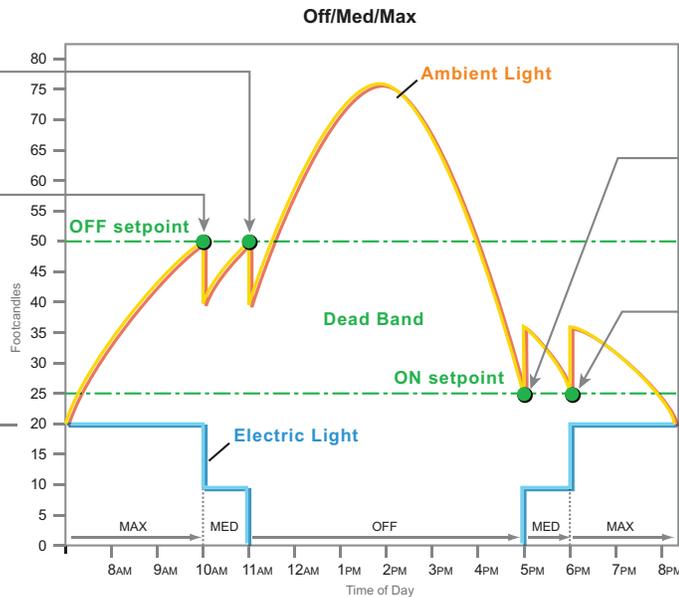
Zone Setup settings have been saved. The screen returns to the Daylighting Parameters menu.

## BI-LEVEL SEQUENCE OF OPERATION

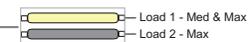
When the ambient light level reaches the **OFF Setpoint** again, the **Med & Max** assigned load turns **OFF**.



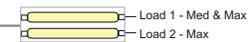
When the ambient light level reaches the **OFF Setpoint**, the **Max** assigned load turns **OFF**.



When the ambient light level reaches the **ON Setpoint**, the **Med & Max** assigned load will turn **ON**.

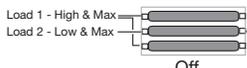


When the ambient light level reaches the **ON Setpoint** again, the **Max** assigned load turns **ON**.

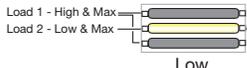


## TRI-LEVEL SEQUENCE OF OPERATION

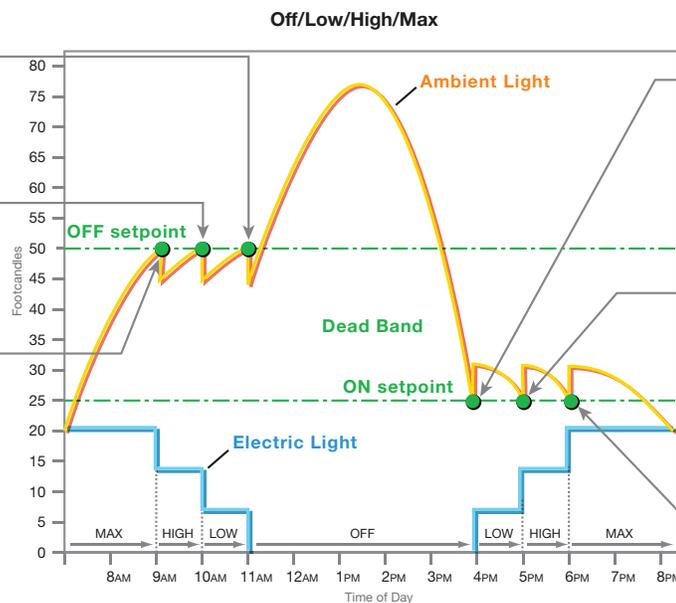
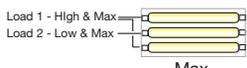
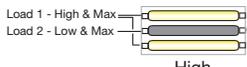
When the ambient light level reaches the **OFF Setpoint** three times, the **Low & Max** load turns **OFF**.



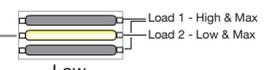
When the ambient light level reaches the **OFF Setpoint** twice, the **Low & Max** load turns **ON** and the **High & Max** load turns **OFF**.



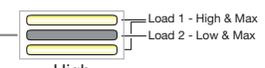
When the ambient light level reaches the **OFF Setpoint**, the **High & Max** load turns **OFF**.



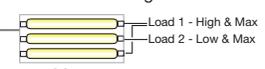
When the ambient light level reaches the **ON Setpoint**, the **Low & Max** load turns **ON**.



When the ambient light level reaches the **ON Setpoint** twice, the **Low & Max** load turns **OFF** and the **High & Max** load turns **ON**.



When the ambient light level reaches the **ON Setpoint** three times, the **Low & Max** assigned load turns **ON**.



## CALIBRATION

The role of the calibration process is to establish, for the controlled zone, the appropriate setpoint for operation, to learn the dimming curves of the controlled loads, and to create an initial daylight ratio for closed-loop versus open-loop sensors. The Automatic Calibration step must always be performed after any changes in Zone Setup (operating mode choices or load bindings).

### Automatic Calibration

Automatic Calibration can be started by the LMCT-100, a similar menu in LMCS, or by pressing and holding the user pushbutton (located on the bottom of the sensor, farthest from the RJ45 connection) for two seconds.

The calibration process starts with the 'Zone Setup Calibration' screen, where 'Calibration' is selected. This leads to the 'Automatic Calibration' screen, where 'Manual Calibration' is chosen. The 'Calibrating' screen displays the desired and actual light levels at the workplane and instructs the user to press 'SEND'. The 'Sensor Configuration' screen shows the battery level (BAT) and lists configuration options like Load Config (PnL), Daylighting Config, Button Configuration, and Dimming Configuration. A 'Main Menu' label is positioned below the Sensor Configuration screen.

**NOTE:** It is critical that, during the Automatic Calibration process, the area under the sensor, as well as the skylight area, remain free of any obstructions, and that no changes occur (including human foot traffic) within the cone-of-view of the closed loop sensor. Please clear the area before starting the Automatic Calibration, and wait for the calibration completion (when the blue LED stops flashing once every 4 seconds) before reentering the area.

The Calibration process consists of:

- Pausing for 15 seconds to allow the user to vacate the area under the sensor.
- Turning off all configured loads, for about 10 seconds, to compute an initial daylight ratio.
- Warming up the controlled loads, at maximum level, until they reach full output (typically, this requires several minutes).
- Switching or Fading the level of the controlled loads from maximum to minimum level very slowly (over approximately two minutes) while observing both sensors, to determine the ballast curve.
- Turning the controlled loads off completely, and observing both sensors for several seconds, to calculate daylight ratios.
- Validating the data collected, and marking the sensor as calibrated (and active) if a good calibration has been established. If the calibration should fail, the LEDs will revert to the **Awaiting Calibration** state and the process must be repeated.

### Manual Calibration

Manual Calibration allows you to refine the setpoint for the controlled zone.

**NOTE:** Even if you wish to refine the setpoints using the Manual Calibration feature, you **MUST** first complete an Automatic Calibration to establish the other critical installation parameters.

The first screen shows the 'LMLS-600' ID and '0293611935' with 'Calibration' selected under 'Zone Setup'. The second screen shows 'Daylighting' mode with 'Manual Calibration' selected under 'Automatic Calibration'. Both screens include 'Choose' and 'Press Select' instructions with arrow icons.

Choose a reference location within the daylighting zone inside the area viewed by the sensor.

The 'Calibrating' screen shows 'Desired Light Level at the workplane: <50fc>' and 'Actual Light Level at the workplane: <35fc>' with a 'SEND' button. The next screen prompts the user to 'Point to any IR enabled device on the network' and press 'Select'.

To set the Dimming and On and Off Setpoints automatically to best match a designed light level for the workplane, enter the desired level, along with the present measured level (from a light meter), and then press **SEND**.

## ZONE SETTINGS

Zone Settings allows you to modify the photosensor Daylighting Setpoints, Time Delays, and Ramp Rates.

The 'Zone Settings' screen shows the 'LMLS-600' ID and '0293724909' with 'Zone Settings' selected under 'Zone Setup'. It includes 'Choose Zone Settings' and 'Press Select' instructions.

When **Zone Settings** is selected, one of two screens is displayed, depending on the Operation Mode of the Zone (Switched, Bi-Level, or Tri-Level) or (Dimmed).

### Switched, Bi-Level or Tri-Level

The 'Switched' screen shows 'ON Setpt: <2.199fc>', 'OFF Setpt: <4.398fc>', 'ON Time Delay: <20 sec>', and 'OFF Time Delay: <10 min>' with a 'SEND' button.

### Dimmed

The 'Dimmed' screen shows 'Dimming SP: <1.900fc>', 'Ramp Up: <5%sec>', 'Ramp Down: <5%sec>', and 'Cut Off Delay: <Never>' with a 'SEND' button.

### Switched, Bi-Level, or Tri-Level

#### ON Setpoint

The target illuminance level below which the LMLS-600 turns the lights ON. Range: minimum of 1 fc; maximum of 32 fc (for Switched) or 48 fc (for Bi-Level or Tri-Level).

The 'ON Setpoint' screen shows 'ON Setpt: <0.300fc>', 'OFF Setpt: <0.450fc>', 'ON Time Delay: <20 sec>', and 'OFF Time Delay: <10 min>' with a 'SEND' button.

Press Left/Right arrow to raise or lower ON Setpoint footcandles



#### OFF Setpoint

The target illuminance level. The level above which the LMLS-600 turns the lights OFF. The OFF Setpoint corresponds to the ON Setpoint multiplied by 1.25, 1.50, 1.75 or 2.0. This ensures that the OFF Setpoint is always higher than the ON Setpoint.

The 'OFF Setpoint' screen shows 'ON Setpt: <0.300fc>', 'OFF Setpt: <0.525fc>', 'ON Time Delay: <20 sec>', and 'OFF Time Delay: <10 min>' with a 'SEND' button.

Press Left/Right arrow to raise or lower OFF Setpoint footcandles



## ON Time Delay

The time interval that must elapse, with the measured level below the ON Setpoint, before the controlled lights turn ON.

Range: 15 sec to 60 sec.

```
Daylighting LMLS-600
Bi-Level
ON Setpt: <0.300fc>
OFF Setpt: <0.525fc>
ON Time Delay: <20 sec>
OFF Time Delay:<10 min>
SEND
```

Press Left/Right arrow  
to raise or lower  
ON Time Delay <15 sec - 60 sec>

## Dimmed

### Dimming Setpoint

The desired light level to be maintained by daylighting control, as measured at the down looking sensor. When the present measured light level differs from this setpoint by more than approximately 7%, the sensor will attempt to adjust the electric lighting to compensate.

Range: 0 to 65 fc

```
Daylighting LMLS-600
Dimmed
Dimming SP: <1.900fc>
Ramp Up: <5%sec>
Ramp Down: <5%sec>
Cut Off Delay: <Never>
SEND
```

### Ramp Up

Determines the speed (or rate) at which the light level of bound loads increases. The default is 5% per second.

Range: 1% per second to 100% per second.

```
Daylighting LMLS-600
Dimmed
Dimming SP: <1.900fc>
Ramp Up: <20%sec>
Ramp Down: <5%sec>
Cut Off Delay: <Never>
SEND
```

### Ramp Down

Determines the speed (or rate) at which the light level of bound loads decreases. The default is 5% per second.

Range: 1% per second to 100% per second.

```
Daylighting LMLS-600
Dimmed
Dimming SP: <1.900fc>
Ramp Up: <20%sec>
Ramp Down: <2%sec>
Cut Off Delay: <Never>
SEND
```

### Cut Off Delay

The time that the controlled lighting will remain at a minimum dimmed level, even with high daylight contribution, before the lights will be switched OFF.

Range: Never to 60 min.

```
Daylighting LMLS-600
Dimmed
Dimming SP: <1.900fc>
Ramp Up: <20%sec>
Ramp Down: <2%sec>
Cut Off Delay: <10min>
SEND
```

## ADVANCED SETTINGS

Advanced settings allows you to see the light level at the photocell and to adjust the override mode and the override time delay.

```
LMLS-600 0293611935
Zone Setup
Calibration
Zone Settings
Advanced Settings
Control Mode
```

Choose Press Select

### Up and Down Light Levels:

Present light level measured at the up and down looking photodiode.

Up looking range: 0 to 6500 fc

Down looking range: 0 to 65 fc

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

### Allow Override

Determines if override mode is permitted, while daylighting control is active.

Available choices: **Yes** or **No**

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

## Override Time

Override Time selects the time delay, after daylighting control has been disabled due to an observed external user or system action, before automatic control resumes.

Range: Infinity or 1 to 24 hours.

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

## Hold OFF

The Hold Off setting selects the behavior of daylighting loads when they are turned ON, by a switch or occupancy sensor. If Hold Off = <No> (default), the loads can always be turned on to their previous level, and then will begin to adjust based upon daylight. If Hold Off = <Yes>, the sensor will limit the loads to the level presently allowed by daylight contribution. This means that the loads may not initially turn ON (if the ambient light level is high - above the ON or Dimming Setpoint), but will become active for daylighting control, and will turn ON or dim up as daylight contribution drops.

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

## Scenes Stop DL

When set to **No** the sensor adjusts levels, up to that recorded in the scene, even though a scene is active. When set to **Yes**, daylighting control is disabled for any loads on which a scene is recalled until a change is manually made to the level of the load, or until the next cycle of occupancy.

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

## Ignore After Hours

When set to **Yes**, the photosensor will ignore After Hours and will continue to operate as normal. When set to **No**, the daylighting controlled loads that are set to After Hours are removed from daylighting control for the duration of the After Hours period.

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

## Send

Choose **SEND** to save the new settings.

```
Daylighting LMLS-600
2.0fc / 3.990fc
Allow Override: <Yes>
Override Time: <Infin>
Hold Off: <No>
Scenes Stop DL: <No>
Ignore Aft Hrs: <No>
SEND NEXT
```

Point to Any IR  
enabled device on  
the network  
  
Press 'Select'

Choose Press Select

Point and  
Press Select

```
LMLS-600 0293725909
Zone Setup
Calibration
Zone Settings
Advanced Settings
Control Mode
```

Settings have been saved.  
The screen returns back to the  
previous menu.

## Next

To set the Recommissioning Threshold and Recommissioning Delay, choose **NEXT**.

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <No>
Recomm Thresh:  <2fc>
Recomm Delay:   <0min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

```

Point to Any IR
enabled device on
the network

Press 'Select'
    
```

Choose NEXT  Press Select 

Point and Press Select 

```

LMLS-600      0293725909
Zone Setup
Calibration
Zone Settings
Advanced Settings
Control Mode
    
```

Settings have been saved.  
The screen returns back to the previous menu.

## Maximum Electric Light

Maximum Electric Light shows the maximum output of all of the controlled electric lights, as seen in the closed-loop (down-looking) sensor.

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <No>
Recomm Thresh:  <2fc>
Recomm Delay:   <0min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Maximum Electric Light shown in footcandles.

## Daylight Ratio

Shows the latest average ratio between the daylight contribution seen in the closed-loop (down-looking) sensor and that measured by the open-loop (up-looking) sensor.

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <No>
Recomm Thresh:  <2fc>
Recomm Delay:   <0min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Average Daylight Ratio of the closed-loop daylight only and the open loop.

## Force Open Loop

When set to **Yes**, this parameter causes the sensor to always reference the Open-Loop sensor during control operations, and use the Closed-Loop sensor only for Automatic Calibration process. For true dual-loop control, this parameter must be set to **No**.

Available choices: **Yes** or **No**

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <Yes>
Recomm Thresh:  <2fc>
Recomm Delay:   <0min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Press Left/Right arrow to choose Yes or No 

## Recomm Thresh

The open-loop light level below which the LMLS-600 enters recommissioning mode. If this parameter is set to 0, automatic daily recommissioning is disabled.

Range: 0 to 255 fc

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <Yes>
Recomm Thresh:  <10fc>
Recomm Delay:   <0min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Press Left/Right arrow to raise or lower Recomm Thresh footcandles 

## Recomm Delay

The time that must elapse, with the open-loop light level remaining below the Recommissioning Threshold, before Recommissioning starts.

Range: 0 to 240 min

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <Yes>
Recomm Thresh:  <10fc>
Recomm Delay:   <20min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Press Left/Right arrow to raise or lower Recomm Time Delay <0min - 240min> 

## Enable Diagnostic Messages

Controls reporting of diagnostic information, visually and over the DLM IRB. Select **LED** (default) to enable the red LED flash pattern indicating Occupant Interference. Choose **None** to disable the red LED indication and all other messages. Select **All** only if directed by Wattstopper technicians.

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <Yes>
Recomm Thresh:  <10fc>
Recomm Delay:   <20min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Press Left/Right arrow to choose 

## Send

When you have completed adjusting the settings, choose **SEND**.

```

Daylighting      LMLS-600
Max EL Light:    1.833fc
Daylight Ratio:  0.0762
Force Open Loop: <No>
Recomm Thresh:  <10fc>
Recomm Delay:   <20min>
Enab Diag Msgs  <All>
NEXT SEND
    
```

Choose SEND  Press Select 

```

Point to Any IR
enabled device on
the network

Press 'Select'
    
```

Point and Press Select 

```

LMLS-600      0293725909
Zone Setup
Calibration
Zone Settings
Advanced Settings
Control Mode
    
```

Settings have been saved.  
The screen returns back to the previous menu.

## CONTROL MODE

Control Mode allows you to select the control status of the photosensor. After choosing Control Mode and pressing **Select**, point to the LMLS-600 and press **Select**. The current control mode is displayed. This can be changed to Normal, Test, Demo, or Disable.

LMLS-600 0293611935

Zone Setup  
Calibration  
Zone Settings  
Advanced Settings  
**Control Mode**

Daylighting LMLS-600  
Control Mode

Control Mode <Normal>

SEND CANCEL

Choose Control Mode Press Select

Press Left/Right arrow to scroll to the desired control mode <Normal> <Test> <Demo> or <Disable>

Press the left/right arrow to scroll through the options.

### Normal

Normal mode allows the photosensor to take control of the daylighting loads. The sensor should be operated in this mode at all times, except when the Test, Demo, or Disable function is explicitly needed.

Daylighting LMLS-600  
Control Mode

Control Mode <Normal>

SEND CANCEL

Point to any IR enabled device on the Network

Press 'Select'

Press Left/Right arrow to choose <SEND> or <CANCEL>

Point and Press Select

LMLS-600 0293724909

Zone Setup  
Calibration  
Zone Settings  
Advanced Settings  
**Control Mode**

Control Mode has been saved.  
The screen returns to the Daylighting Parameters menu.

### Demo

Demo mode operates identically to Test mode in the LMLS-600, except that it does not time out after 5 minutes.

Daylighting LMLS-600  
Control Mode

Control Mode <Demo>

SEND CANCEL

Point to any IR enabled device on the Network

Press 'Select'

Press Left/Right arrow to choose <SEND> or <CANCEL>

Point and Press Select

LMLS-600 0293724909

Zone Setup  
Calibration  
Zone Settings  
Advanced Settings  
**Control Mode**

Control Mode has been saved.  
The screen returns to the Daylighting Parameters menu.

### Disable

Disable mode allows you to temporarily prevent the LMLS-600 from controlling its assigned loads. While in this mode, the sensor will continue to report light levels, but will not adjust any loads. This parameter is mostly used for troubleshooting purposes.

Daylighting LMLS-600  
Control Mode

Control Mode <Disable>

SEND CANCEL

Point to any IR enabled device on the Network

Press 'Select'

Press Left/Right arrow to choose <SEND> or <CANCEL>

Point and Press Select

LMLS-600 0293724909

Zone Setup  
Calibration  
Zone Settings  
Advanced Settings  
**Control Mode**

Control Mode has been saved.  
The screen returns to the Daylighting Parameters menu.

### Test

Test Mode shortens timeouts for switching operation, and speeds ramp rates for dimming operation, to allow quick verification. Test Mode cancels automatically after 5 minutes.

Daylighting LMLS-600  
Control Mode

Control Mode <Test>

SEND CANCEL

Point to any IR enabled device on the Network

Press 'Select'

Press Left/Right arrow to choose <SEND> or <CANCEL>

Point and Press Select

LMLS-600 0293724909

Zone Setup  
Calibration  
Zone Settings  
Advanced Settings  
**Control Mode**

Control Mode has been saved.  
The screen returns to the Daylighting Parameters menu.

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## TROUBLESHOOTING

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### Lights do not switch or dim when desired, under daylight control.

- Use the pushbutton on the photosensor face to manually test load control (see SENSOR PUSHBUTTONS). If the lights do not switch ON and OFF, check Zone Settings to rebind the loads. If the lights do switch ON and OFF, use the Zone Settings screen to verify that the setpoints are correct (Dimming Setpoint if configured for dimming control, else ON and OFF setpoints, for Switched/Bi-Level/Tri-Level operation). Place the photosensor in Test Mode to quickly verify daylighting operation; shine a flashlight into the sensor, or cover the sensor, to simulate major light level changes.
- The calibration may not be completed. To check calibration status, check the last screen in the Advanced Settings menu. If the electric light maximum electric light (Max EL) is 0, perform the calibration process.

### Red LED is ON, not flashing.

- There is an internal failure in the LMLS-600 sensor. Try unplugging the sensor from the DLM network, then plug it back in and wait for ten seconds. If the red LED comes back on, and is not flashing, the sensor is defective and must be replaced.

### Red LED is flashing ON for three seconds, OFF for one second (repeating).

- The LMLS sensor is in **Control Mode <Disable>**. Use the LMCT-100 to change the Control Mode parameter to **<Normal>** to resume daylighting operation.

### Red LED is flashing.

- If the blink is slow (one flash every four seconds), the photosensor has detected an occupant interference condition, due to a change in the space under the sensor, and has temporarily switched to open-loop control. This condition will automatically cancel if caused by a temporary change or obstruction; any permanent change to the environment will be accounted for during the next automatic Recommissioning (generally, once per day, during the night).
- If the red LED display of occupant interference is not desired, use the Enab Diag Msgs menu and select <None> instead of <LED>.

### Blue LED is flashing.

- If the blink is slow (one flash every four seconds), the photosensor is in an override condition, either due to an override from a wall switch or due to commissioning operation. If the latter, complete the commissioning operation first; otherwise, use a wall switch to turn off the controlled loads to terminate the override.
- If the blink is faster (one flash every second), the photosensor is in Test Mode or Demo Mode. Test Mode will cancel automatically after five minutes. Alternatively, Test Mode or Demo Mode can be turned off by selecting the Control Mode menu from the LMLS-600 main screen in the LMCT-100.

### Reset to Factory Defaults.

- If the photosensor has been moved to a different location, or its internal parameters are unknown and an LMCT-100 is not immediately available, it can be reset to factory defaults by pressing and holding the CONFIG button for 20 seconds (see SENSOR PUSHBUTTONS). After reset, it will be necessary to reconfigure the sensor and rerun the Automatic Calibration step before load control is again possible.

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