DLM Dimming System Addendum

This addendum shows you how to install, configure and use dimming features in a WattStopper Digital Lighting Management (DLM) system. Carefully read all instructions provided with products. This addendum assumes you are familiar with the features, products and installation practices used in a DLM system based on LMRC-1xx series room controllers. If you have not had training on the basic system, you should read the DLM System Installation Guide before installing a dimming system. To download the complete guide go to: www.wattstopper.com -> Resources-> Downloads-> Installation Instructions-> Digital Lighting Management.

All wiring must comply with applicable electrical and safety codes. All electrical installation work should be carried out by an experienced electrician.

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The DLM system integrates load control with occupancy sensors, daylight sensors, switches, and other devices to provide simple code compliant solutions for lighting. It is a powerful, flexible, scalable, easy to install lighting control system designed to provide maximum energy savings. It uses plug-in low voltage connections to create a DLM Local Network. Room Controllers serve as the foundation of any DLM system. The room controllers manage communication between DLM devices, control line voltage outputs to lighting loads and provide low voltage power to all connected DLM devices.

**Wiring**

### Device Wiring (Low Voltage Class 2)

All DLM devices connect to room controllers using WattStopper LMRJx cables in a free-topology DLM Local Network. The table below compares the system capacity of LMRC-10x series-based and enhanced LMRC-2xx/3xx series-based DLM networks.

<table>
<thead>
<tr>
<th>Local Network Spec</th>
<th>Only LMRC/LMPL-1xx series</th>
<th>At least one LMRC/LMPL-2xx or 3xx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max LMRJ cable</td>
<td>1000 feet (150’ allowance per DLM device)</td>
<td>1000 feet (150’ allowance per DLM device)</td>
</tr>
<tr>
<td>Total Loads</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>Communicating DLM devices</td>
<td>24*</td>
<td>48*</td>
</tr>
<tr>
<td>LMRC/LMPL-1xx allowed</td>
<td>4*</td>
<td>4*</td>
</tr>
<tr>
<td>LMRC/LMPL-2xx or 3xx allowed</td>
<td>N/A</td>
<td>48*</td>
</tr>
</tbody>
</table>

* Each room/plug load controller counts as a communicating DLM device, along with all other DLM devices with a configuration LED.

0-10V dimming control is through low voltage Class 2 wires connected to removable terminal blocks under the LMRC-21x/31x cover.

### Line and Load (High Voltage) Wiring

All line voltage flying leads on room and plug load controllers are #12 AWG. Wire connections shall be suitable for the wire gauge [lead and building wiring] employed. **Installation shall be in accordance with all applicable regulations, wiring practices, and NEC codes.**

### SETUP AND CONFIGURATION

#### Plug n’ Go™ (PnG): Default Operation

Upon initial power up, the DLM system automatically identifies the devices on the Local Network and performs load control arbitration [see page 6]. The system then enters the WattStopper patented Plug n’ Go™ configuration to allow basic operation of all DLM devices in an energy efficient configuration as described in the examples below:

- When room controllers are connected only to occupancy sensors, the system defaults to automatic ON/OFF for all loads.
- If a wall switch or dimmer plus an occupancy sensor is on the local network:
  - When only one load is on the local network, it defaults to manual-ON/automatic-OFF operation.
  - When more than one load is on the local network they default to bi-level automatic-ON/automatic-OFF. This means that load 1 turns ON automatically, while load 2 [and all additional loads] default to manual-ON control; all loads turn OFF automatically.

At system startup, default dimming parameters are established including: levels for scene presets 1-4; fade times; and ramp rates. Dimming and system parameters may be customized.

A description of system PnG operation for each device is included in the device section.

#### Push n’ Learn™ (PnL): Custom Operation

A configuration [Config] button on most DLM devices allows easy access to the WattStopper patented Push n’ Learn™ technology to modify system operation. For instructions see the Quick Start Guide provided with the device, the Push n’ Learn (PnL) Procedure section at the end of this guide or consult the user manual for the advanced configuration tool that you are using, such as the LMCT-100 or LMCS-100.
DLM LOCAL NETWORK LAYOUT EXAMPLES

One load DLM Local Network configuration example

- Ceiling Mount Sensor
- LMRC-211 or 311 Room Controller
- J-Box
- 0-10V Dimming control wires
- Dimmer
- Local Network LMRJ Cables

Two load DLM Local Network configuration example

- Corner Mount Sensor
- Switch
- Daylight Sensor
- LMRC-212 or 312 Room Controller
- Load
- Line Voltage
- J-Box
- 0-10V Dimming control wires
- Dimmer
- Ceiling Mount Sensor

Three load DLM Local Network configuration example

- Corner Mount Sensor
- Daylight Sensor
- Ceiling Mount Sensor
- LMRC-102 Room Controller
- J-Box
- Loads
- 0-10V Dimming control wires
- Manual ON
- Auto OFF and Manual OFF

PnG Operation

9-device network, but DLM Local Network limit = 1000’ max for cable

Five load DLM Local Network configuration example

- Corner Mount Sensor
- Daylight Sensor
- Scene Switch
- LMRC-213 or 313 Room Controller
- J-Box
- Loads
- 0-10V Dimming control wires
- Dimmer
- Ceiling Mount Sensor

DLM Local Network limit = 1000’ max for cable

Max 48 devices, including up to four LMRC-100 series or LMPL-101 controllers.
Room Controllers

DIMMING ROOM CONTROLLERS

Enhanced Features for Dimming-capable Room Controllers and Devices

- On/Off/Dim button for each load
- Recall up to 16 Scenes and adjust light level
- Integral current monitoring of total connected load
- Increased local network capacity
- Up to 250mA 24VDC Class 2 output to local network
- 4 RJ45 ports for local network connections

Dimming Options available through advanced configuration tools

- Dimming Load Adjustments: high and low trim, preset ON level, lamp burn-in period
- Switch Load Adjustments: Trip point (when a relay switches during a fade)
- Convert switch button to/from a load or scene button
- Change individual button operation from the default “toggle” to “ON-only” or “OFF-only”
- Change fade ON, fade OFF times and manual ramp rates
- Access to button configuration parameters for up to 16 Scenes
- Adjust light level without installing a dimmer

Controls and Indicators

Load ON/OFF/DIM Button(s)
The Load ON/OFF/DIM button is used primarily during installation to verify proper operation of the relay and dimming outputs and wiring. It temporarily overrides automatic control signals from an occupancy sensor or a daylight sensor. Pressing and releasing the Load ON/OFF/DIM button toggles the state of the associated relay to turn the load ON or OFF. Pressing and holding the button causes a connected dimmable load to turn ON then ramp down; continuing to press and hold the button causes the load to cycle through its dimming range.

LED Indicators
The room controllers contain two different colored LEDs. Blue status LEDs indicate the load relay status; they are solid ON when the relay is closed and OFF when the relay is open.

A red LED blinks about once every three seconds when the room controller is in standard operating mode. When the room controller enters Push n’ Learn mode, the red LED blinks twice each second.

Current Monitoring
Dimming-capable room controllers have built-in current monitoring capability. There must be a network bridge (LMBC-300 or LMRC-3xx) on the room controller’s DLM local network to expose current data readings to a WattStopper DLM Segment Manager or compatible BAS. See the DLM Networking Addendum for more information.
Mounting and Placement

LMRC-21x series room controllers mount as the cover for a four square deep junction box or one fitted with an extension ring. They are equipped with a lash and hook so you can hang the controller from a j-box cover tab while connecting the line voltage wires. After securely connecting the ground, load and line wires, unhook the hanger from the j-box and secure the controller to the j-box cover tabs using two screws.

Wiring

Line Voltage Wiring

The dimming room controllers are powered by 120VAC or 277VAC, 50/60Hz. Connect only one 120VAC or one 277VAC circuit to a room controller. If there are mixed voltages in the room, install at least two room controllers to segregate load control according to voltage.

Local Network Connectivity

A DLM local network that includes a dimming room controller supports up to 64 load addresses and 48 communicating devices including up to 4 LMRC-10x series controllers.

Low Voltage Wiring

Each dimming room controller provides up to 250mA @ 24VDC to class 2 devices on the DLM Local Network via LMRJ-x Cat 5e cables. During the Load Arbitration process the “master” room controller enables or disables certain room controllers’ 24VDC outputs in order to limit the total current on the DLM Local Network to 800mA.

To access the LMRJ receptacles, lift the “clamshell” cover on the controller. Plug the cables into the receptacles then secure them under the strain relief hooks. Cover any unused receptacle with a black rubber plug [provided].

For applications requiring that low voltage wiring be run inside conduit, order an LMRC-CA conduit adaptor.

Power Up Functionality

On power up, the DLM system automatically starts the “load control arbitration” process and uses the PnG configuration appropriate to the number of loads and types of devices on the DLM Local Network [see next page]. In common applications, the relationship between quantity of loads, switches and occupancy sensors won’t require any adjustments.

To customize operation of the system see Push n’ Learn (PnL) Process or consult the user manual for the advanced configuration tool that you are using, such as the LMCT-100 or LMCS-100.
Room Controllers

Load Control Arbitration

To take full advantage of automatic PnG configuration, review these simple rules about load control arbitration.

Once room controllers are connected to the DLM Local Network and powered up they automatically negotiate to determine which controller becomes the Master and to assign the load numbers for each relay.

The Master is the controller with the highest serial number.

Controllers with more than one relay are labeled with sequential letters to identify loads. For example, the LMRC-213 has loads A, B, and C, which if it is the Master, would be Load 1, Load 2 and Load 3 on the DLM Local Network. The LMRC-213 with the next highest serial number on the DLM Local Network would have Load 4 connected to its A load wire and Load 5 on its B load wire, and so forth.

Push n’ Learn (PnP)

If the automatic PnG configuration needs to be modified for your installation see the Push n’ Learn (PnP) Process section near the end of this guide.

General Specifications for Dimming Capable LMRCs

<table>
<thead>
<tr>
<th>Serial Number</th>
<th>Room Controller</th>
<th>Load Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0461373638</td>
<td>LMRC-212</td>
<td>A, B</td>
</tr>
<tr>
<td>0461373679</td>
<td>LMRC-213</td>
<td>A, B</td>
</tr>
<tr>
<td>0427350315</td>
<td>LMPL-101</td>
<td>A, B, C</td>
</tr>
</tbody>
</table>

Serial numbers are assigned in groups according to model:

<table>
<thead>
<tr>
<th>Highest</th>
<th>LMRC-313</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LMRC-312</td>
</tr>
<tr>
<td></td>
<td>LMRC-311</td>
</tr>
<tr>
<td></td>
<td>LMRC-213</td>
</tr>
<tr>
<td></td>
<td>LMRC-212</td>
</tr>
<tr>
<td></td>
<td>LMRC-211</td>
</tr>
<tr>
<td></td>
<td>LMRC-102</td>
</tr>
<tr>
<td></td>
<td>LMRC-101</td>
</tr>
</tbody>
</table>

Lowest LMPL-101

Pull n’ Learn (PnL)

If the automatic PnP configuration needs to be modified for your installation see the Push n’ Learn (PnP) Process section near the end of this guide.

General Specifications for Dimming Capable LMRCs

- Input Voltage: 120/277VAC, 50/60Hz
- Load Ratings: Not to exceed 20A total
  - Incandescent: 20A @ 120VAC
  - Ballast: 20A @ 120/277VAC
  - Motor: 1Hp @ 120VAC
- Output to DLM Local Network: up to 250mA @ 24VDC

DLM Local Network Characteristics with at least one Dimming Capable LMRC installed:

- Provides low voltage power over Cat 5e cable (LMRJ); max current 800mA. Supports up to 64 load addresses, 48 communicating devices including up to 4 LMRC-10x series and/or LMPL-101 controllers. Free topology up to 1,000’ max.
- Environment:
  - Operating Temperature: 32° to 158°F (0° to 70°C)
  - Storage Temperature: 23° to 176°F [-5° to 80°C]
  - Relative Humidity: 5 to 95% (non condensing)
- Plenum Rated
0-10V DIMMING ROOM CONTROLLERS

- Up to 3 load relays per room controller
- Up to 3 0-10V dimming control wiring terminal blocks
- Class 2 dimming output(s) sink up to 100mA per channel [at least 50 ballasts]

Relays and 0-10V Dimming

The LMRC-211 and 311 have one load relay, the LMRC-212 and 312 have two relays and the LMRC-213 and 313 have three. Each of these controllers has wiring terminals for 0-10V dimming control capability associated with each load relay and an integral load control button with ON/OFF and DIM functionality.

0-10V Dimming Control Wiring

The LMRC-21x and LMRC-31x series room controllers provide a removable terminal block in the low voltage section of the room controller for connecting 0-10V ballast control wiring associated with each load control relay.

In the illustration below, the 0-10V control wires for load C connect to the Load C terminals in the low voltage section of the room controller. There are no connections to the removable terminal blocks for Load A or Load B since these loads are not dimmable.

Troubleshooting

| Dimmable 0-10V loads are at full bright and don’t dim | 1. Check to be sure that the 0-10V terminal connections are routed to the correct ballast for the load. |
| Dimmable 0-10V loads are ON at minimum light level and don’t go higher | 2. Check for an open circuit on either the violet or grey wire between the 0-10V terminals on the room controller and the inputs on the ballasts. | Check for a short circuit or polarity reversal on the violet and grey wires between the 0-10V terminals on the room controller and the inputs on the ballasts. |
Switches

LMSW-101, 102, 103, 104, 105, 108 & LMDM-101

The LMSW-10x series are DLM low voltage momentary switches. In a dimming system, you can configure the buttons on LMSW switches to be either load control or scene control buttons (see Advanced Configuration Options). The switches and dimming switch (dimmer) operate on 24VDC supplied by WattStopper room controllers. Their current consumption is 5mA each. They communicate with other DLM devices over the DLM Local Network. Each switch has two RJ-45 ports for DLM Local Network connections.

The LMSW-105 is designed specifically for dimming systems. As shipped, each of its four small scene buttons recalls one of four scenes and its rocker paddle is a load dimming switch. The scene buttons can be changed to load buttons using advanced configuration tools.

The LMDM-101 is designed as a dimming switch with a single rocker paddle and seven vertically aligned LEDs to indicate the relative light level of the load(s) it controls. When it is bound to more than one load these LEDs show the highest level of any load.

Mounting

Pull the LMRJ Cat 5e cable(s) into the top of the wall box. Plug the RJ-45 connector(s) into the switch, looping at the rear bottom of the switch.

Mount the switch using the holes that align with a standard single gang electrical box.

LED Indicators: Load -vs- Scene Behavior

Each button and paddle has a blue load status LED.

- In load button mode, the LED is solid ON when any bound load is turned ON, and OFF when all bound loads are OFF.
- In scene button mode, the LED is lit only when all members of the scene are at the exact light level recorded into the scene.

Each DLM communicating device has a red Configuration LED. On switches the red LED is under the right side of the IR lens on the face of the unit.

- In normal operating mode it is OFF.
- In PnL mode the LED blinks rapidly.
- It flashes briefly in response to certain commands from IR handheld remotes and configuration tools.
**Power Up Functionality**

Upon initial power up, the system automatically enters the default PnG configuration allowing immediate operation.

**Plug n’ Go Operation**

On a switch by switch basis, each button is sequentially assigned to a load(s).*

- If the number of buttons on a switch is greater than the number of loads, the extra button(s) do nothing and blink when pressed.
- If the number of buttons on a switch is less than the number of loads, the last button controls all remaining loads.
- Rocker paddles are bound to all loads.
- All loads are bound to all LMSW-105 scene switch buttons.

By default, pressing a switch button toggles the room controller relay, turning bound loads ON/OFF.

Pressing the top of a rocker paddle turns ON bound loads. Touching the bottom of a rocker paddle turns OFF bound loads.

With the default PnG configuration, if an occupancy sensor is connected to the DLM Local Network containing DLM switches or dimmers, Load 1 operates in Auto-ON mode and all other loads operate in Manual-ON mode. If there is only one load and it is connected to an LMRC-101, LMRC-2x1, LMRC-3x1, it defaults to Manual-ON. All loads turn OFF automatically when the sensor time delay expires.

*Plug loads are not bound to a button by PnG. They can be bound to buttons using PnL.

**Customizing Operation**

Advanced configuration tools such as the LMCT-100 (v21 or higher) and the LMCS-100 can be used to change basic operating characteristics of switch buttons, scene buttons, and rocker paddles. See the next page for more information. If the load binding configuration needs to be modified for your installation see the Push n’ Learn (PnL) Process section near the end of this guide.
LMSW & LMDM continued

Advanced Configuration Options

You can change the function and operating mode of any LMSW button using advanced configuration tools [LMCT-100(v21) or LMCS-100]. The options for button type are load button or scene button.

A load button is intended to turn one or more loads ON or OFF. By default, loads turn ON to their last used light level. The options for a load button’s operation mode are Toggle (default), On-only, and Off-only. You can also program Fade On and Fade Off times from 0 seconds (immediate) to 18 hours individually for each load button.

A scene button controls a collection of one or more loads, each set to user defined levels, also referred to as a preset. Loads in a scene can be set individually at the desired light level, or they can be OFF. The user can re-record the scene’s light level from any associated scene button unless the button is locked using an advanced configuration tool.

Advanced configuration tools allow you to program up to 16 scenes and assign them to individual buttons. A scene can be assigned to multiple buttons that carry individual characteristics such as operating mode and fade times.

The default operating mode for a scene button is to Recall a scene. Using an advanced configuration tool, you can change the button’s operating mode to Scene Off or Recall/Off.

- **Scene Off** turns OFF all members of the scene when the button is pressed.
- **Recall/Off** recalls the scene, then once the scene is recalled pressing the scene button again turns OFF all members of the scene.

Using advanced configuration tools, you can change fade times and ramp rates for the rocker paddle on LMSW-105 and LMDM-101 dimmers.

For complete instructions and programming options see the instructions provided with the advanced configuration tool you are using.

LMDM-101 Operation

LEDs

In addition to the standard blue load status and red configuration LEDs, the LMDM-101 has a column of small blue LEDs on the left side. These LEDs show relative light level. When bound loads are ON the LEDs glow brightly. As you press and hold the rocker the LEDs mimic the ramping action. The first LED at the bottom lights to indicate the load is ON at a low light level. All the LEDs glow brightly to indicate the brightest light level. The LEDs always indicate the highest light level of all the bound loads. When bound loads are OFF, one LED is dimly lit to indicate the highest light level on any bound dimmed load before the load(s) was turned OFF.

Rocker Paddles

The LMDM-101 and LMSW-105 each include a rocker paddle. Rocker paddles are load buttons and cannot be changed to scene buttons. Rocker paddles have attributes and characteristics that are unique to these devices. The basic operation of a rocker paddle is as shown in the illustration above.

Rocker paddles control all of the loads to which they are bound. In addition, during Active Dim, any rocker with its LED blinking can be used temporarily to control the loads or scene bound to the button that has been placed into Active Dim. (See page 12 for a description and operating instructions for Active Dim.)
LMSW-105 Operation

The scene switch operates on a DLM local network, typically within a single room. When initially installed, PnG binds all lighting loads in the local network to all the scene buttons and the rocker on the scene switch. Plug loads are not bound to any switch by PnG.

The scene buttons are preset at the factory as shown in the illustration below. The rocker paddle operates as described for the LMDM-101.

- Activate a scene by pressing one of the scene buttons.
- Press and hold the top or bottom of the master paddle to raise or lower light levels.
- With the lights OFF, tap the top portion of the paddle to turn lights ON to their previous light level. Tap it again to go to the maximum light level.
- Tap the bottom portion of the paddle to turn lights OFF.

Setting Scenes

Scenes can be easily customized. You can exclude load(s) from a scene by unbinding the load from the scene before recording the scene’s light level [see the Push n’ Learn (PnL) Process section near the end of this guide]. When a load is excluded from the scene, recalling that scene has no effect on the excluded load(s).

If there are lights in the room that you want turned OFF for a particular scene, make sure that those lights are included in the scene and OFF when you record the scene.

To change light levels for a scene:

1. Press the button for the scene that you want to record.
2. Adjust the light level of the loads that are included in the scene to any level or OFF.

The light level can be adjusted by various means:

- using a dimmer bound to the load (shown here)
- using Active Dim with any rocker paddle on the network (see next page)
- using the Adjust Light Level feature on the LMCT-100

3. Press and hold the scene button until the button’s LED begins to blink (approximately 5 seconds).

Repeat steps 1-3 for each scene you want to adjust.
Switches

LMSW & LMDM continued

LMSW-105 Resets

Load binding clear - To un-bind the rocker paddle from all loads, press and hold the configuration button until the red LED goes solid ON (approximately 10 seconds). Scene buttons still recall scenes. To exclude loads from scenes, perform the PnL steps for unbinding loads from scenes. The excluded loads are then excluded from the scene number associated with the button regardless of what device recalls the scene number.

Device reset - To re-bind the LMSW-105 rocker paddle to all loads, press and hold the configuration button for 20 seconds. A load is not bound to a scene button, it is included in the scene number that the button is configured to recall; scene buttons still recall their associated scene number. Scene number/button associations can be changed using advanced configuration tools.

System Reset - This reset returns ALL DLM devices to their factory default PnG settings. All system and device settings will be reset to factory defaults; all customized binding relationships will be lost. All PnG functionality will be restored. To reset the system:

1. Press and hold the configuration button until the red LED starts blinking to put the DLM local network into PnL, about 3 seconds.
2. Press and hold the configuration button for approximately 20 seconds, until the red LED on the DLM devices resume blinking rapidly. Release the configuration button.

Active Dim

Active Dim allows any rocker paddle on the local network to temporarily adjust the light level of the loads bound to any button on the local network.

You can adjust:
• An individual load if it is the only load bound to a selected button.
• All loads bound to a selected button.
• All loads included in a scene.

The illustration on this page shows an example of adjusting a single load within a scene. Active Dim is temporary, but if desired, you can re-record the scene using the new setting.

You can also use Active Dim to adjust an entire scene - even if there is no LMSW-105 as might be the case if you changes a load button to a scene button using advanced configuration.

If more than one scene is active at the same time, this operation can be performed to select the scene the rocker paddle will adjust.

• A quick double tap of a button puts the button into Active Dim for 5 seconds or until another button is pressed.
• Press and hold the top or bottom of any blinking rocker paddle to raise or lower the bound load(s). Tap the rocker top or bottom to turn ON/OFF loads bound to the button.

Active Dim is indicated by brightly blinking the blue LED on the button and all rockers that can be used in the Active Dim session.

Once Active Dim automatically times out, all of the rocker paddles in the room return to controlling only the load to which they are bound.

Example: Using Active Dim to adjust the light level for a load in a scene.
WattStopper DLM occupancy sensors operate on 24VDC supplied by WattStopper Room Controllers. Every sensor communicates with other DLM devices over the DLM Local Network. Sensors are available with passive infrared, ultrasonic and dual-technology detection methods. They are available in a low-profile ceiling mount style, and in a pivoting corner-mount design suitable for mounting on either a wall or ceiling. Sensors and their programming are explained in detail in the main DLM System Installation Guide.

**Power Up Functionality**

There is a 30 second warm up period. Upon establishing communications, the sensors’ red LEDs become active and each sensor displays its firmware version on its LCD screen. The detection LEDs start blinking with occupancy detection.

### PnP Load Parameters

<table>
<thead>
<tr>
<th>ON Mode Operation*</th>
<th>Load 1</th>
<th>Loads 2-8 or more***</th>
<th>Plug Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO-ON **</td>
<td>MANUAL-ON if switch is connected.</td>
<td>AUTO-ON if switch is not connected.</td>
<td></td>
</tr>
</tbody>
</table>

* Blink Warning (B-W) OFF OFF OFF
** Daylighting (DL) ON OFF OFF

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**Plug n’ Go Operation**

Upon initial power up, the system automatically takes inventory of the devices on the DLM Local Network. It sets up a Plug n’ Go™ (PnP) configuration allowing immediate operation of devices in the most energy efficient manner. In most common applications, the relationship between loads, switches and occupancy sensors does not require any adjustments.

**LCD Display and Control Buttons**

The sensors share a common user interface consisting of an LCD screen and a set of control buttons. On corner mount sensors, the interface is located behind a hinged assembly that swings downward. On ceiling sensors the interface is located underneath a the removable cover.

Sensor displays and adjustments are described in the main DLM System Installation Guide.

**Feature button** - While the sensor is operating in run mode, press to enter sensor parameter programming and view customizable features.

**Up ‡ and Down † buttons** - Press to view/change selections for sensor parameters. While in run mode turns ON/OFF the load(s) bound to sensor.

**Config button** - Press to enter Push n’ Learn mode to re-configure load bindings and load control parameters.
INFRARED COMMUNICATION OVERVIEW

IR-Capable Devices

DLM handheld devices use an infrared (IR) transmitter and receiver to communicate wirelessly with a Digital Lighting Management (DLM) network. A DLM handheld device is battery operated and communicates wirelessly by sending an IR signal to a DLM IR enabled device within its range and line of sight.

Handheld IR devices include controls such as the LMRH-101, LMRH-102 and LMRH-105, as well as an advanced configuration tool, the LMCT-100 Digital IR Configuration Tool.

To send signals to the DLM network, the user simply points the handheld remote at any IR enabled DLM device within its range and presses a button. To identify an IR enabled device, look for a dark translucent lens on the face of the device.

Helpful Communication Tips

Infrared signalling can be affected by high ambient light such as direct sunlight, floodlights, and some halogen or fluorescent lamps, as well as plasma screens.

Be sure to point the remote at a DLM IR enabled device that is within range. To test, see if you can put the local network into PnL using the remote from your current position.

- If not successful, move closer to the IR enabled local network device and more directly in front of it, or try pointing toward a different IR enabled device.
- If still not successful, turn OFF bright lights, close blinds and try again.
- If still not successful, the IR lenses on the DLM devices may be dirty. Clean the lenses with a soft material such as an eyeglass lens cleaning cloth.
The LMCT-100 Digital 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 an intuitive interface 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.

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 sensor and load changes. You can use it to change any of the DLM occupancy sensor parameters such as sensitivity, time delay and more. With the LMCT-100 you can also change load configurations, without any new wiring. For systems including daylighting sensors the LMCT-100 can set or change the daylight level parameters. The LMCT-100 can change dimming system options such as scene assignments, fade rates, scene and load button characteristics, and other options not available through the standard user interface.

The instructions for using the LMCT-100 are provided with the unit. They are also available at www.wattstopper.com. To download the complete user guide, go to: Resources->Downloads->Installation Instructions->Digital Lighting Management.

To access the advanced configuration options for dimming systems, the LMCT-100 must be equipped with version 21 or higher firmware. The version of firmware in the LMCT-100 displays on the start-up screen when you turn ON the unit.
The LMRH-101 Digital Dimming IR Remote Control uses an infrared (IR) transmitter to send commands to a Digital Lighting Management (DLM) network. It allows the user to turn lights ON/OFF and dim without going to a wall box device.

The LMRH-101 operates on three AAA batteries. It communicates wirelessly with other DLM devices by sending an IR signal to a DLM IR enabled device within its range and line of sight.

The LMRH-101 uses IR technology to wirelessly send control signals to the DLM system. Point the handheld remote at any IR enabled DLM device within its range and press a button to send signals to the DLM network. To identify an IR enabled device, look for a dark translucent lens on the face of the device.

Transmitting range

**Default Functionality: Plug n’ Go™ (PnG)**

As shipped from the factory, the rocker paddle controls all loads on the DLM local network. To change the loads that are controlled by the LMRH-101 see UNIT ADJUSTMENT.

**Button Functions**

Press the top of the rocker paddle to turn load(s) ON. The blue LED on the paddle also turns ON. Switched loads turn ON. Dimmable loads turn ON to the last light level set before they turned OFF. Press the bottom of the rocker paddle to turn load(s) OFF.

Dimmable loads ramp down or up in response to pressing and holding the top or bottom of the paddle. ON/OFF loads turn OFF when the ramp level dims below 50% and turn ON when the ramp level rises above 50%.

**Battery Installation**

The battery compartment holds three standard 1.5V AAA Alkaline batteries (supplied). Rechargeable NiMH batteries can be used. Do not mix battery types. Do not mix old batteries with new batteries.

To conserve battery life, the LMRH-101 shuts down 5 seconds after the last key press unless the LMRH-101 and the DLM local network is in configuration mode (Push n’ Learn, PnL).

**WARNING:** DO NOT USE THE DLM SYSTEM TO CONTROL LOADS OTHER THAN LIGHTING IF THE LOAD IS NOT IN VIEW OF A PERSON AT ALL CONTROL LOCATIONS. DO NOT USE DLM TO CONTROL ANY LOAD THAT MIGHT BE DANGEROUS OR CAUSE A HAZARDOUS SITUATION IF ACCIDENTALLY ACTIVATED.
Unit Adjustment

A “configuration” button inside the battery compartment allows access to the WattStopper Push n’ Learn™ technology to change the operation of the LMRH-101.

Step 1: Enter Push n’ Learn (PnL)

a. Locate the configuration button inside the LMRH-101 battery compartment.
b. Point the LMRH-101 at a DLM IR device.
c. Press and hold the configuration button until the red LED in the battery compartment begins blinking (approximately 3 seconds), then release the button. Make sure the LMRH-101’s red LED continues to blink, then observe the following:
   - The Red LEDs on all other DLM devices on the network start blinking rapidly (2x/second). The LEDs continue to blink until you exit PnL.
   - All loads on the DLM local network turn OFF immediately after entering PnL. After 1 second, load 1 turns ON.

Step 2: Load Selection

A quick press on the LMRH-101’s configuration button turns OFF load 1 then turns ON the next load in sequence. When a load turns ON the blue LED is lit brightly on all switch buttons and sensors bound to the load.

- To bind the load to the LMRH-101: While the load is ON press the paddle making sure that the blue LED turns ON brightly.
- To unbind a load: While the load is ON and the blue LED is brightly lit, press the paddle. The LED goes dim to indicate the paddle on the handheld remote no longer controls this load.
- A quick press on the configuration button turns ON the next load.
- Repeat until the paddle is bound to all the loads you want it to control.

Note: more than one load can be assigned to the paddle and a load can be assigned to multiple devices in the DLM network.

Step 3: Exit Push n’ Learn (PnL)

a. Point the LMRH-101 at a DLM IR device.
b. Press and hold the LMRH-101 configuration button until the red LED in the battery compartment stops blinking (approximately 3 seconds), then release the button.

Reset Process

Load binding reset - To clear the unit so that it is not bound to any load:
1. Do not point the LMRH-101 toward any DLM IR enabled device.
2. Press and hold the configuration button in the battery compartment until the red LED goes solid ON (approximately 10 seconds).

Device reset - To get the unit back to its default Plug n’ Go state (bind to all loads):
1. Do not point the LMRH-101 toward any DLM IR enabled device.
2. Press and hold the configuration button in the battery compartment for 20 seconds.

System Reset - This reset returns ALL DLM devices to their factory default PnG settings. All system and device settings will be reset to factory defaults; all customized binding relationships will be lost. All PnG functionality will be restored. To reset the system using the LMRH-101:
1. Point the LMRH-101 at an IR enabled DLM local network device.
2. Press and hold the configuration button in the battery compartment until the red LED starts blinking to put the DLM local network into PnL (see Step 1 in UNIT ADJUSTMENT for details). Release the button.
3. Press and hold the configuration button again for approximately 20 seconds, until the red LED on the DLM devices resume blinking rapidly (approximately 2x/second).
LMRH-105 HANDHELD SCENE CONTROL

The WattStopper LMRH-105 scene remote control uses an infrared (IR) transmitter to send commands to a Digital Lighting Management (DLM) network. It allows the user to record and recall scenes, turn lights ON/OFF and dim without going to a wall box device.

The LMRH-105 operates on three AAA batteries. It communicates wirelessly with other DLM devices by sending an IR signal to a DLM IR enabled device within its range and line of sight.

The LMRH-105 uses IR technology to wirelessly send control signals to the DLM system. Point the handheld remote at any IR enabled DLM device within its range and press a button to send signals to the DLM network. To identify an IR enabled device, look for a dark translucent lens on the face of the device.

Transmitting range
The transmitting range is the same as the LMRH-105: up to 32 feet at a maximum angle of 40°.

Default Functionality: Plug n’ Go™ (PnG)
As shipped, the rocker paddle and scene buttons control all loads on the DLM local network. To change the loads controlled by the LMRH-105 and to record scenes see UNIT ADJUSTMENT.

Default Button Functions
Press the top of the rocker paddle to turn load(s) ON. The blue LED on the paddle also turns ON. Switched loads turn ON. Dimmable loads turn ON to the last light level set before they turned OFF. Press the bottom of the rocker paddle to turn load[s] OFF.

Dimmable loads ramp down or up in response to pressing and holding the top or bottom of the paddle. ON/OFF loads turn OFF when the ramp level dims below 50% and turn ON when the ramp level rises above 50%.

To recall a scene press one of the four scene buttons.

Loads in scenes and dimmable load fade times are two seconds. The rocker ramp rate is 17% or approximately six seconds to go from 0-100%.

Battery Installation
The battery compartment holds three standard 1.5V AAA Alkaline batteries (supplied). Rechargeable NiMH batteries can be used. Do not mix battery types. Do not mix old batteries with new batteries.

To conserve battery life, the LMRH-105 shuts down 5 seconds after the last key press unless the DLM local network is in configuration mode (Push n’ Learn, PnL).
Unit Adjustment

The LMRH-105 is pre-set for operation as described in the Default Functionality section. Adjustment is optional. A “configuration” button in the battery compartment allows access to the WattStopper Push n’ Learn™ technology to change the operation of the LMRH-105.

**Step 1: Enter Push n’ Learn (PnL)**

a. Locate the configuration button inside the LMRH-105 battery compartment.
b. Point the LMRH-105 at a DLM IR device.
c. Press and hold the configuration button until the red LED in the battery compartment begins blinking (approximately 3 seconds), then release the button. Make sure the LMRH-105’s red LED continues to blink* then observe the following:

- The Red LEDs on all other DLM devices on the network start blinking rapidly [2x/second]. The LEDs continue to blink until you exit PnL.
- All loads on the DLM local network turn OFF immediately after entering PnL. After 1 second, load 1 turns ON.

**Step 2: Load Selection**

A quick press on the LMRH-105’s configuration button turns OFF load 1 then turns ON the next load in sequence. Keep pressing the configuration button to step through all the loads connected to the DLM local network.*

The blue LED is lit brightly on all switch buttons, scene buttons, dimmer paddles, and sensors that are bound to the load that is currently ON.

- To bind the load to one of the buttons and/or the paddle on the LMRH-105, press the desired button making sure that the LED turns ON brightly.
- To unbind a load, press the button. The LED goes dim to indicate the button or paddle on the handheld remote no longer controls this load.
- A quick press on the configuration button turns ON the next load.
- Repeat until the paddle and scene switches are bound to the loads you want them to control.

**Note:** more than one load can be assigned to the paddle or a scene button and a load can be assigned to multiple devices and buttons in the DLM network.

**Step 3: Exit Push n’ Learn (PnL)**

a. Point the LMRH-105 at a DLM IR device.
b. Press and hold the LMRH-105 configuration button until the red LED in the battery compartment stops blinking (approximately 3 seconds), then release the button. The red LED on the local network devices stop blinking to indicate that the network exited PnL.

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**WARNING:** DO NOT USE THE DLM SYSTEM TO CONTROL LOADS OTHER THAN LIGHTING IF THE LOAD IS NOT IN VIEW OF A PERSON AT ALL CONTROL LOCATIONS. DO NOT USE DLM TO CONTROL ANY LOAD THAT MIGHT BE DANGEROUS OR CAUSE A HAZARDOUS SITUATION IF ACCIDENTALLY ACTIVATED.

* All the blue LEDs on the LMRH-105 flash rapidly if the LMRH-105 does not have proper IR communication with the local network. Make sure to aim the LMRH-105 toward an IR enabled device that is in range then press the button again.
**Recording Scenes**

The LMRH-105 comes from the factory set to recall scenes 1-4. Scenes 1-4 control all loads on the DLM local network if they have not been customized using PnL or an advanced configuration tool. The default light levels are shown in the Default Functionality: Plug n’ Go section.

To change the recorded light levels for any of the scenes simply adjust the lights in the room to the desired levels and then press and hold the desired scene button for 5 seconds.

- If there are lights in the room that you want turned OFF for a particular scene, make sure that those lights are OFF when you record the scene.
- If there are lights in the room that you want to be unaffected by the scene, then you will need to unbind those lights from the scene button by following the instructions listed under UNIT ADJUSTMENT.

**Reset Process**

**Load binding clear** - To un-bind the rocker paddle from all loads:

1. Do not point the LMRH-105 toward any DLM IR enabled device.
2. Press and hold the configuration button in the battery compartment until the red LED goes solid ON (approximately 10 seconds).

**Device reset** - To re-bind the LMRH-105 rocker paddle to all loads (its default PnG state):

1. Do not point the LMRH-105 toward any DLM IR enabled device.
2. Press and hold the configuration button in the battery compartment for 20 seconds.

**System Reset** - This reset returns ALL DLM devices to their factory default PnG settings. All system and device settings will be reset to factory defaults; all customized binding relationships will be lost. All PnG functionality will be restored. To reset the system using the LMRH-105:

1. Point the LMRH-105 at an IR enabled DLM local network device.
2. Put the DLM local network into PnL: Press and hold the configuration button in the battery compartment for approximately 3 seconds until the red LED starts blinking [see Step 1 in UNIT ADJUSTMENT for details].
3. Press and hold the configuration button for approximately 20 seconds, until the red LED on the DLM devices resume blinking rapidly [approximately 2x/second]. Release the configuration button.

**Changing controlled scene numbers**

Using the advanced configuration tool, you can program up to 16 scenes on the DLM local network. The LMRH-105 can control one of the four groups of scene numbers as shown in the illustration.

To change the scene numbers that the LMRH-105 controls, use the DIP switches inside the battery compartment.

When executing any scene from the LMRH-105, the scene and load fade times are two seconds and cannot be changed.

Remember that when you include or exclude loads from a scene on the LMRH-105, the associated scene is affected on all other scene buttons to which that scene is assigned. To determine the scene number that executes from any button, use the Button Configuration menu in the LMCT-100 advanced configuration tool.
Troubleshooting

If you’re having any of these problems when using the remote, look here for possible solutions.

<table>
<thead>
<tr>
<th>LEDs on the remote don’t light</th>
<th>Press any button. If an LED doesn’t light:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Check to see if the LEDs are actually lit, but very dim. This is normal. Press the top of the paddle or any button to fully turn ON the button’s LED.</td>
</tr>
<tr>
<td></td>
<td>• Check batteries. Replace if needed.</td>
</tr>
<tr>
<td>The wrong lights are controlled</td>
<td>Configure the buttons to control the desired lights using the Push n’ Learn adjustment procedure.</td>
</tr>
<tr>
<td>Remote LEDs turn ON and OFF but light levels don’t change or switch</td>
<td>1. Make sure the DLM local network is not in PnL.</td>
</tr>
<tr>
<td></td>
<td>2. Be sure you’re pointing the remote at a DLM IR enabled device that is within range. To test, see if you can put the network into PnL using the remote from your current position.</td>
</tr>
<tr>
<td></td>
<td>• If successful, exit PnL and go on to step 3.</td>
</tr>
<tr>
<td></td>
<td>• If not successful, move closer to the IR enabled local network device and more directly in front of it, or try pointing toward a different IR enabled device.</td>
</tr>
<tr>
<td></td>
<td>3. The scene button may be set for the same light level. Try a different button. Re-record the scene if two scenes are duplicated.</td>
</tr>
<tr>
<td></td>
<td>4. Make sure the buttons are bound to the loads you want to control. Configure the buttons to control the desired loads using the Push n’ Learn adjustment procedure.</td>
</tr>
<tr>
<td>Button LED blinks; light levels don’t change</td>
<td>The button is not bound to any load. Configure the buttons to control the desired loads using the Push n’ Learn adjustment procedure.</td>
</tr>
<tr>
<td>Glossary of DLM Dimming System Terms</td>
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<tr>
<td><strong>Channel</strong></td>
<td>See Zone.</td>
</tr>
<tr>
<td><strong>Day/Night Setpoint (Closed Loop)</strong></td>
<td>The desired light level during Day and Night time.</td>
</tr>
<tr>
<td><strong>Daylight Ratio (Open Loop)</strong></td>
<td>Daylight contribution measured at the work plane.</td>
</tr>
<tr>
<td><strong>Dimming Setpoint (Open Loop)</strong></td>
<td>Desired target level to maintain when automatically dimming.</td>
</tr>
<tr>
<td><strong>Electric Light Multiplier</strong></td>
<td>Multiplier that the photosensor uses to calculate the setpoint based on the electric light contribution.</td>
</tr>
<tr>
<td><strong>Fade</strong></td>
<td>A control process initiated by a momentary action (tap) where one or more loads transition smoothly from one level to the requested level.</td>
</tr>
<tr>
<td><strong>High Trim</strong></td>
<td>Highest light level that the system allows.</td>
</tr>
<tr>
<td><strong>Lamp Burn In</strong></td>
<td>Period of time during which a load can only be set to 0 (OFF) or 100% (ON).</td>
</tr>
<tr>
<td><strong>Load</strong></td>
<td>Lighting, fan, motor, or other appropriately rated line voltage device connected to a line voltage output of a room controller.</td>
</tr>
<tr>
<td><strong>Load Button</strong></td>
<td>Turns loads ON/OFF. Its LED lights when any load bound to the button is ON at any level.</td>
</tr>
<tr>
<td><strong>Low Trim</strong></td>
<td>Lowest light level that the system allows.</td>
</tr>
<tr>
<td><strong>On/Off Setpoint (Open and Closed Loop)</strong></td>
<td>Target light level that must be reached before the lights turn ON or OFF in a particular zone.</td>
</tr>
<tr>
<td><strong>Preset Level</strong></td>
<td>Light level that a load goes to when it turns ON.</td>
</tr>
<tr>
<td><strong>Ramp</strong></td>
<td>A control process initiated by a maintained manual action [e.g., press and hold a rocker paddle] where one or more loads increase or decrease in light level.</td>
</tr>
<tr>
<td><strong>Rocker Paddle</strong></td>
<td>A load button that turns bound loads ON/OFF and is capable of ramping dimmable loads. Its blue load status LED lights when any of the bound loads are ON at any level. A rocker cannot be configured as a scene button.</td>
</tr>
<tr>
<td><strong>Scene</strong></td>
<td>Lighting effect created by adjusting one or more zones of lighting to desired levels.</td>
</tr>
<tr>
<td><strong>Scene Button</strong></td>
<td>Recalls a previously recorded scene. Its LED lights only when all members of the scene are at their exact level as recorded into that scene.</td>
</tr>
<tr>
<td><strong>Trip Point</strong></td>
<td>A setting on a scale of 0-100% that defines at what point in a fade or ramp a non-dimmed load will switch ON or OFF.</td>
</tr>
<tr>
<td><strong>Zone</strong></td>
<td>A collection of lighting loads intended for simultaneous control. (Also referred to as a channel.)</td>
</tr>
</tbody>
</table>
Push n’ Learn (PnL)

A configuration button [Config] on all communicating DLM devices allows access to the WattStopper patented Push n’ Learn™ technology to change binding relationships between sensors, switches/dimmers, and loads. This process also allows you to include/exclude loads from scenes.

### 1. Enter Push n’ Learn (PnL)

Press and hold the Config button (on any DLM device) for approximately 3 seconds.

The red LED on the device begins to blink. When you release the button, the red LEDs on other communicating devices connected to the DLM Local Network begin to blink. They continue to blink until you exit PnL mode.

All loads in the room turn OFF immediately after entering PnL, then one load turns ON. This is Load #1, which by PnG is bound to the first button on every switch, every dimmer and all occupancy sensors in the room. All switch buttons, rocker paddles and sensors that are bound to this load have their blue LED solid ON.

All scene buttons that are assigned to scene numbers that include this load also have their blue LED solid ON.

### 2. Select, Bind/Unbind Load

Press and immediately release the Config button on any DLM device in the room to step through the loads connected to the DLM Local Network. As each load turns ON note the devices (switch buttons, rocker paddles and sensors) that are showing a bright solid blue LED. These devices are currently bound to the load that is ON. The blue LED on the room controller or plug load controller connected to the load is also lit.

- To unbind a switch button rocker paddle from a load, press the switch button while its blue LED is ON bright. The blue LED goes OFF to indicate the button no longer controls the load that is currently ON.
- To unbind an occupancy sensor, press the up (↑) or down (↓) adjustment button while its blue LED is ON. The blue LED turns OFF to indicate the sensor no longer controls the load that is currently ON.

Pressing the switch button or the sensor up (↑) or down (↓) again while the load is ON rebinds the load to the button or sensor and the blue LED illuminates brightly.

### 3. Exit PnL

Press and hold the Config button (on any DLM device) until the red LED turns OFF, approximately 3 seconds.

Advanced configuration tools and handheld remote IR devices can also initiate PnL. See the instructions provided with those devices for more information.
WattStopper LMRJ cables are Cat 5e B-to-B pre-terminated and are available in lengths from 3 feet to 100 feet in both plenum and non-plenum rating. A 6 inch non-plenum rated jumper is available for use in multi-gang switch applications. The DLM local network does NOT use ethernet, therefore ethernet cable bend radius restrictions do NOT apply to cables in the DLM local network. WattStopper cannot assure proper performance of the DLM system using any other cable. LMRJ cables are not recommended for general data use in other than DLM local network applications.

150’ of cable is allowed per device; a two device network is allowed 300’, 3 devices 450’, 4 devices 600’, 5 devices 750’, 6 devices 900’, 7 or more devices up to 1,000’ maximum.

When installing multiple controllers, it is best practice to spread them throughout the DLM Local Network with devices connected to each controller, rather than all the controllers at one end with LMRC cable connections only to other controllers.

**Notice: For Class 2 DLM Devices**
- Connect only to a Class 2 power source.
- Do Not Reclassify and Install as Class 1, or with Power and Lighting Wiring.

**WARNING:** Do Not install to cover a Junction Box Having Class 1, 3 or Power and Lighting Circuits.

**SAFETY**

**WARNING:** Do not use the DLM system to control loads other than lighting if the load is not in view of a person at all control locations. Do not use DLM to control any load that might be dangerous or cause a hazardous situation if accidentally activated.

**CAUTION:** Turn the power OFF at the circuit breaker or remove the fuse before working on any electrical wiring.

**PATENTS**

The DLM system and products described in this guide may be covered by one or more of the following U.S. patents: 5,189,393 • 5,640,113 • 6,885,300 • 7,277,012 • Other Patents Pending.

**WARRANTY INFORMATION**

WattStopper warrants its products to be free of defects in materials and workmanship for a period of five (5) years. 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.