Light control solutions
Classrooms

Total Light Management™ in classrooms

Classrooms are multifunctional spaces that benefit from various lighting scenes, enable video presentations, and support new teaching methods.

The challenge: Enhance the learning environment by creating unique lighting scenes for different activities. Control multiple zones of light to reduce lighting energy costs.

The opportunity: Utilize energy-saving light control strategies, to enhance the quality of light and reduce costs.

Functions:

• Classroom instruction
• Video presentations
• Use of whiteboards, electronic smart boards, and computers

Requirements:

• Meet energy code requirement for automatic shut-off
• Provide multiple preset lighting conditions
• Control at entry door and teacher station
• Comply with ASHRAE/IES 90.1-2007 Lighting Power Density (LPD) requirements of 1.24 W/sq. ft.
• Comply with CHPS and LEED requirements

LUTRON®
## Classroom Examples

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<th>Control functionality</th>
<th>Basic - multi-level switching</th>
<th>Basic - multi-level dimming with daylighting</th>
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<td>• Classroom instruction</td>
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<td>• Video presentations</td>
<td>• Video presentations</td>
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<td><strong>Typical interior finish level</strong></td>
<td>Basic finish level</td>
<td>Basic finish level</td>
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<td><strong>Lights and shades</strong></td>
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</tr>
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</tr>
<tr>
<td><strong>Code-required strategies</strong></td>
<td>Occupancy sensor</td>
<td>• Occupancy sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Daylight sensor</td>
</tr>
<tr>
<td><strong>Additional strategies</strong></td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

### Light control strategies

**Note**: Use the Lutron® PowPak™ CCO module to integrate Radio Powr Savr™ sensors with HVAC and other building system, and to maximize energy savings. For information, contact your Lutron representative, or visit www.lutron.com/EnergiTriPak
<table>
<thead>
<tr>
<th>Intermediate</th>
<th>Advanced</th>
</tr>
</thead>
</table>
| · Classroom instruction  
  · Video presentations | Classroom with permanent AV equipment and computer stations |
| Intermediate finish level | High-end finish level |

<table>
<thead>
<tr>
<th>3 dimmed lighting zones</th>
<th>6 dimmed lighting zones</th>
</tr>
</thead>
</table>
| · Pendant linear fluorescent  
  · Linear whiteboard fixture | · Pendant linear fluorescent fixture  
  · Linear whiteboard fixture  
  · Plug-in load control (computer monitors)  
  **1 shade zone**  
  · Blackout shades |

| · Occupancy sensor  
  · Daylight sensor | · Occupancy sensor  
  · Daylight sensor |

| · Preset scenes  
  · 1% fluorescent dimming | · Preset scenes  
  · 1% fluorescent dimming  
  · AV integration  
  · Shades |
Basic classroom - multi-level switching

Interior space classroom for general use. Incorporates a recessed fluorescent lighting system plus whiteboard lighting.

**Control strategies:**
- Occupancy sensing
- Switched fluorescent lighting

### Key

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>2x4, 2-lamp 32W T8 recessed direct/indirect - with bi-level switching ballast</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Recessed linear whiteboard 32W T8 - with switching ballast</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>Maestro Wireless® switch with 3-gang Claro® wallplate</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>Radio Powr Savr wireless, ceiling-mount, occupancy sensor</td>
</tr>
</tbody>
</table>

* Not shown in reflected ceiling plan

**Maestro Wireless switch**
- Easy to operate
- Installs in as little as 15 minutes
- Allows control of up to 10 sensors and wireless controls

**Radio Powr Savr wireless, ceiling-mount, occupancy sensor**
- Installs in as little as 15 minutes
- Communicates with compatible Lutron® dimmers, switches and light control systems
- Uses reliable Clear Connect™ Radio Frequency (RF) Technology, which ensures smooth, consistent performance
One-line diagram:

Radio Powr Savr wireless, ceiling-mount, occupancy/vacancy sensors

Maestro Wireless fluorescent switches
Entry control
3-gang Claro wallplate

120 or 277V Power

(2) Recessed bi-level fluorescent fixtures

Recessed whiteboard fluorescent fixtures

Wiring Symbols
- 2 #12AWG + Ground
- 3 #12AWG + Ground
- □ 120V or 277V Input Power
- ▼ RF Communication

Bill of materials

<table>
<thead>
<tr>
<th>Control</th>
<th>Qty.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRF2-8S-DV-WH</td>
<td>3</td>
<td>Maestro Wireless fluorescent switch</td>
</tr>
<tr>
<td>LRF2-OCR2B-P-WH</td>
<td>2</td>
<td>Radio Powr Savr wireless, ceiling-mount, occupancy sensor</td>
</tr>
<tr>
<td>CW-3-WH</td>
<td>1</td>
<td>3-gang Claro wallplate</td>
</tr>
</tbody>
</table>

Materials cost (suggested list price, labor not included) = $585.00
Basic classroom - dimming with daylighting

Perimeter classroom for general use, incorporating recessed fluorescent lighting plus whiteboard lighting.

**Control strategies:**
- Occupancy sensing
- Preset, dimmed fluorescent lighting
- Daylight sensing

<table>
<thead>
<tr>
<th>Key</th>
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</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="2x4, 2-lamp 32W T8 recessed indirect - with EcoSystem H-Series ballast" /></td>
<td>2x4, 2-lamp 32W T8 recessed indirect - with EcoSystem H-Series ballast</td>
</tr>
<tr>
<td><img src="image" alt="Recessed linear whiteboard 32W T8 - with EcoSystem H-Series ballast" /></td>
<td>Recessed linear whiteboard 32W T8 - with EcoSystem H-Series ballast</td>
</tr>
<tr>
<td><img src="image" alt="PowPak® dimming module with EcoSystem" /></td>
<td>PowPak® dimming module with EcoSystem</td>
</tr>
<tr>
<td><img src="image" alt="Pico wireless controls with 1-gang and 2-gang Claro® wallplate" /></td>
<td>Pico wireless controls with 1-gang and 2-gang Claro® wallplate</td>
</tr>
<tr>
<td><img src="image" alt="Radio Powr Savr™ wireless, ceiling-mount, occupancy sensor" /></td>
<td>Radio Powr Savr™ wireless, ceiling-mount, occupancy sensor</td>
</tr>
<tr>
<td><img src="image" alt="Radio Powr Savr wireless daylight sensor" /></td>
<td>Radio Powr Savr wireless daylight sensor</td>
</tr>
</tbody>
</table>

* Not shown in reflected ceiling plan
** Located above ceiling

**Pico wireless control**
- Provides wireless dimming control of lighting loads; communicates with PowPak dimming module with EcoSystem

**PowPak dimming module with EcoSystem**
- Allows connected lighting loads to be dimmed in response to wireless occupancy/vacancy sensors, daylight sensors, and Pico controls

**Radio Powr Savr wireless, ceiling-mount, occupancy sensor**
- Installs in as little as 15 minutes
- Communicates with compatible Lutron® dimmers, switches and light control systems
- Uses reliable Clear Connect™ Radio Frequency (RF) Technology, which ensures smooth, consistent performance

**Radio Powr Savr wireless daylight sensor**
- Allows connected dimmers, switches, and lighting control systems to automatically adjust light level based on available daylight
Bill of materials

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<thead>
<tr>
<th>Control</th>
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<tbody>
<tr>
<td>RMJ-ECO32-DV-B</td>
<td>1</td>
<td>PowPak dimming module with EcoSystem</td>
</tr>
<tr>
<td>MRF2-3BRL-L-WH</td>
<td>2</td>
<td>Pico wireless controls</td>
</tr>
<tr>
<td>LRF2-OCR2B-P-WH</td>
<td>2</td>
<td>Radio Powr Savr wireless, ceiling-mount, occupancy sensor</td>
</tr>
<tr>
<td>LRF2-DCRB-WH</td>
<td>1</td>
<td>Radio Powr Savr wireless, ceiling-mount, daylight sensor</td>
</tr>
<tr>
<td>EHD T832 C U 2 10</td>
<td>9</td>
<td>EcoSystem dimming H-Series ballast - (2) T8 lamps¹</td>
</tr>
<tr>
<td>EHD T832 C U 1 10</td>
<td>3</td>
<td>EcoSystem dimming H-Series ballast - (1) T8 lamp¹</td>
</tr>
<tr>
<td>CW-1-WH</td>
<td>1</td>
<td>1-gang Claro wallplate</td>
</tr>
<tr>
<td>CW-2-WH</td>
<td>1</td>
<td>2-gang Claro wallplate</td>
</tr>
</tbody>
</table>

Materials cost (suggested list price, labor not included) = $1,534.70

¹ Ballasts typically purchased with fixtures. Price does not include cost of fixtures.
Intermediate classroom

Perimeter classroom for general use. Incorporates linear pendant fluorescent lighting with independent uplight and downlight, plus recessed whiteboard lighting.

**Control strategies:**
- Occupancy sensing
- Preset, dimmed fluorescent lighting
- Daylight sensing

**Pico® wireless controls**
- Provides wireless dimming control of lighting loads; communicates with PowPak™ dimming module with EcoSystem™

**PowPak dimming module with EcoSystem**
- Allows connected lighting loads to be dimming in response to wireless occupancy/vacancy sensors, daylight sensors, and Pico controls

**Radio Powr Savr™ wireless, corner-mount, occupancy sensor**
- Installs in as little as 15 minutes
- Communicates with compatible Lutron® dimmers, switches and light control systems
- Uses reliable Clear Connect™ Radio Frequency (RF) Technology, which ensures smooth, consistent performance

**Radio Powr Savr wireless daylight sensor**
- Allows connected dimmers, switches, and lighting control systems to automatically adjust light level based on available daylight
- Uses reliable Clear Connect™ Radio Frequency (RF) Technology, which ensures smooth, consistent performance
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<tr>
<th>Icon</th>
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</tr>
</thead>
<tbody>
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<td><img src="image" alt="2/1 32W T8 pendant linear independent uplight/downlight - with EcoSystem H-Series dimming ballast" /></td>
<td>2/1 32W T8 pendant linear independent uplight/downlight - with EcoSystem H-Series dimming ballast</td>
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<tr>
<td><img src="image" alt="Recessed linear whiteboard 32W T8 - with EcoSystem H-Series dimming ballast" /></td>
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<td>Radio Powr Savr® wireless, corner-mount, occupancy sensor</td>
</tr>
<tr>
<td><img src="image" alt="Radio Powr Savr wireless daylight sensor" /></td>
<td>Radio Powr Savr wireless daylight sensor</td>
</tr>
</tbody>
</table>

* Not shown in reflected ceiling plan
** Located above ceiling

Controls not to scale with reflected ceiling plan

① Indicates control zone
Intermediate classroom

One-line diagram:

Radio Powr Savr™ wireless, corner-mount, occupancy/vacancy sensor

Radio Powr Savr wireless daylight sensor

120 or 227V Power

PowPak™ dimming module with EcoSystem

EcoSystem® H-Series ballasts Typical of (10)

EcoSystem H-Series ballasts Typical of (10)

EcoSystem H-Series ballasts Typical of (3)

Zone 1 Pendant uplight fluorescent

Zone 2 Pendant downlight fluorescent

Zone 3 (1) Whiteboard wallwash

Pico® wireless dimming controls Instructor control station

Pico wireless dimming control Entry control

2-gang Claro® wallplate

1-gang Claro wallplate

Pico® wireless dimming controls Instructor control station

Pico wireless dimming control Entry control

2-gang Claro® wallplate

1-gang Claro wallplate

Wiring Symbols

- 2 #12AWG + Ground
- EcoSystem loop 2 #12AWG through 2 #18AWG
- Input Power
- RF Communication
### Bill of materials

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<td>1</td>
<td>PowPak dimming module with EcoSystem</td>
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<td>MRF2-3BRL-L-WH</td>
<td>2</td>
<td>Pico wireless controls</td>
</tr>
<tr>
<td>MRF2-2B-L-WH</td>
<td>1</td>
<td>Pico wireless control</td>
</tr>
<tr>
<td>LRF2-OKLB-P-WH</td>
<td>2</td>
<td>Radio Powr Savr wireless, corner-mount, occupancy sensor</td>
</tr>
<tr>
<td>LRF2-DCRB-WH</td>
<td>1</td>
<td>Radio Powr Savr wireless daylight sensor</td>
</tr>
<tr>
<td>EHD T832 C U 2 10</td>
<td>10</td>
<td>EcoSystem H-Series fluorescent dimming ballast - (2) T8 lamps¹</td>
</tr>
<tr>
<td>EHD T832 C U 1 10</td>
<td>13</td>
<td>EcoSystem H-Series fluorescent dimming ballast - (1) T8 lamp¹</td>
</tr>
<tr>
<td>CW-2-WH</td>
<td>1</td>
<td>2-gang Claro wallplate</td>
</tr>
<tr>
<td>CW-1-WH</td>
<td>1</td>
<td>1-gang Claro wallplate</td>
</tr>
</tbody>
</table>

Materials cost (suggested list price, labor not included) = $2,419.70

¹ Ballasts typically purchased with fixtures.
Advanced classroom and computer lab

Perimeter computer lab for computer training. Incorporates linear pendant fluorescent lighting with independent uplight and downlight, plus recessed whiteboard lighting and shade control.

**Control strategies:**
- Occupancy sensing
- Daylight harvesting
- Preset, dimmed fluorescent
- Blackout shades

**Pico® wireless controls**
- Provides wireless dimming control of lighting loads; communicates with Energi Savr Node™ with EcoSystem® and shades

**Energi Savr Node with EcoSystem and shades**
- Allows easy integration of sensors, lighting fixtures with digital ballasts, dimming and switching loads
- Can also integrate with other building systems

**Sivoia® QS Wireless shades**
- Ultra-quiet control of daylight at the touch of a button

**Radio Powr Savr™ wireless, wall-mount, occupancy/vacancy sensor**
- Installs in as little as 15 minutes
- Communicates with compatible Lutron® dimmers, switches and light control systems
- Uses reliable Clear Connect™ Radio Frequency (RF) Technology, which ensures smooth, consistent performance

**Radio Powr Savr wireless daylight sensor**
- Allows connected dimmers, switches, and lighting control systems to automatically adjust light level based on available daylight
### Key

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<tr>
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</tr>
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<tbody>
<tr>
<td><img src="image1.png" alt="Symbol" /></td>
<td>2/1 32W T8 pendant linear independent uplight/downlight - with EcoSystem H-Series dimming ballast</td>
</tr>
<tr>
<td><img src="image2.png" alt="Symbol" /></td>
<td>Recessed linear whiteboard 32W T8 - with EcoSystem H-Series dimming ballast</td>
</tr>
<tr>
<td><img src="image3.png" alt="Symbol" /></td>
<td>seeTouch control for instructor control location</td>
</tr>
<tr>
<td><img src="image4.png" alt="Symbol" /></td>
<td>Pico wireless controls with 2-gang Claro® wallplates</td>
</tr>
<tr>
<td><img src="image5.png" alt="Symbol" /></td>
<td>QS Sensor module</td>
</tr>
<tr>
<td><img src="image6.png" alt="Symbol" /></td>
<td>Sivoia QS Wireless shades</td>
</tr>
<tr>
<td><img src="image7.png" alt="Symbol" /></td>
<td>Radio Powr Savr wireless, wall-mount, occupancy sensor</td>
</tr>
<tr>
<td><img src="image8.png" alt="Symbol" /></td>
<td>Radio Powr Savr wireless ceiling-mount daylight sensor</td>
</tr>
<tr>
<td><img src="image9.png" alt="Symbol" /></td>
<td>Energi Savr Node with EcoSystem and shades</td>
</tr>
<tr>
<td><img src="image10.png" alt="Symbol" /></td>
<td>Plug-in appliance module</td>
</tr>
</tbody>
</table>

* Not shown in reflected ceiling plan
** Located above ceiling
Advanced classroom and computer lab

One-line diagram:

120 or 227 Power

QS sensor module

seeTouch® controls
Instructor control station

2-gang Claro® wallplate

Energi Savr Node™
with EcoSystem®
and shades

Radio Powr Savr™ wireless, corner-mount, occupancy/vacancy sensor

Radio Powr Savr wireless daylight sensor

EcoSystem®
H-Series ballasts
Typical of (10)

EcoSystem®
H-Series ballasts
Typical of (10)

EcoSystem®
H-Series ballasts
Typical of (3)

Zone 1
Pendant upright
fluorescent

Zone 2
Pendant downlight
fluorescent

Zone 3
(1) Whiteboard
wallwash

Sivoia QS wireless
blackout shades
(Typical of 3)

Wiring Symbols

- 2 #12AWG + Ground
- EcoSystem loop
  2 #12AWG through 2 #18AWG
- Input Power
- QS Link: Lutron cable GRX-CBL-346S
  or GRX-PCBL-346S
- 2 #18AWG
- RF Communication
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>MRF2-3BRL-L-WH</td>
<td>2</td>
<td>Pico wireless controls</td>
</tr>
<tr>
<td>QSR4P-3R-WH-E09</td>
<td>2</td>
<td>Pico wireless controls for shades</td>
</tr>
<tr>
<td>QSWS2-5BRLI-WH</td>
<td>1</td>
<td>seeTouch instructor control station</td>
</tr>
<tr>
<td>QSWS2-2BRLI-WH</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CW-2-WH</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>QSN-2ECO-PS120</td>
<td>1</td>
<td>Energi Savr Node with EcoSystem and shades</td>
</tr>
<tr>
<td>LRF2-OKLB-P-WH</td>
<td>2</td>
<td>Radio Powr Savr wireless, corner-mount, occupancy sensor</td>
</tr>
<tr>
<td>LRF2-DCRB-WH</td>
<td>1</td>
<td>Radio Powr Savr wireless, ceiling-mount, daylight sensor</td>
</tr>
<tr>
<td>QSM2-4W-C</td>
<td>1</td>
<td>QSM Sensor module</td>
</tr>
<tr>
<td>CW-2-WH</td>
<td>2</td>
<td>Claro 2-gang wallplate</td>
</tr>
<tr>
<td>MRF2-15APS-1-WH</td>
<td>12</td>
<td>Plug-in appliance modules</td>
</tr>
<tr>
<td>EHD T832 C U 2 10</td>
<td>10</td>
<td>EcoSystem H-Series fluorescent dimming ballast - (2) T8 lamps¹</td>
</tr>
<tr>
<td>EHD T832 C U 1 10</td>
<td>13</td>
<td>EcoSystem H-Series fluorescent dimming ballast - (1) T8 lamp¹</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>Sivoia QS Wireless blackout shades²</td>
</tr>
</tbody>
</table>

**Materials cost: Contact Lutron for pricing**

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1 Ballasts typically purchased with fixtures. Price does not include cost of fixtures.
2 Contact Lutron Representative for shades model numbers and pricing.