



Installation Manual
for
ProLight III
Lighting Systems

by PMMI Lighting, LLC

Table of Contents	
<i>Important Notes and Procedures</i>	4
<i>Cable Guide</i>	5
<i>RJ45 Pinout and Cable Termination</i>	6
<i>Internet Connectivity</i>	7
<i>Installation Process Overview</i>	8
<i>Control Center Installation</i>	9
Placement	9
<i>Monitor, Keyboard, Mouse</i>	10
<i>A/C Interface (aka Relay Panel)</i>	11
<i>Power Supplies</i>	12
<i>Building Fixture Daisy Chains</i>	13
<i>Wiring the Fixture Daisy Chains</i>	14
<i>Fixture Installation</i>	15
<i>Mounting Holes: LED Recessed Down Light Fixture & Gimbal</i>	15
<i>Fixture Can Installation (optional)</i>	15
<i>Switch Installation</i>	16
Switch Cables	16
Understanding Chaining Switches	16
Switch Jumpers.....	17
Installing / Chaining Switches	18
Connecting Switch Chains in the Control Center	19
<i>Motion Sensor Installation</i>	21
Motion Sensor Cables	21
Connecting Motion Sensor Cables in the Control Center	21
<i>Daylight Harvesting Sensor Installation</i>	23

Connecting Daylight Harvesting Cables in the Control Center23

Start Up Process Overview..... 24

Verify LED Drivers are Working Correctly..... 25

Testing as you go - Verify Single Fixture Operation on a Channel25

Complete the Daisy Chain by Connecting Multiple Fixtures26

Remaining Channels.....27

Warranty 28

Contact Information..... 28

Important Notes and Procedures

- All switches, motion and daylight harvesting sensors in the ProLight Series interconnect using CAT5/6 cables and RJ45 connectors. (not included)
- All light fixtures and bulbs interconnect using 16 or 18 AWG 2 conductor zip cord. (Connectors for the zip cord are included with system, wire is not.)
- Use ONLY solid copper CAT5/6 cables cable with the ProLight Series and stranded copper zip cord. **NEVER USE COPPER CLAD ALUMINUM WIRE.** You can find links to the proper cable on the website (<https://pmmi-lighting.com/monitor-cabling-power/>).
 - Pre-terminated jumper cables often use stranded copper wire. This is ok if the cables are factory terminated. We do not recommend re-terminating stranded wire, but if it's required, make sure to use RJ45 connectors specifically designed for stranded wire.
- TESTING CAT5/6 Cables: After cables are terminated, test EVERY cable with an RJ45 CAT5/6 cable tester before plugging them into the ProLight Series system. This will ensure continuity on all eight wires in the CAT5/6 cable, it will ensure they are connected in the correct order.
 - **DO NOT connect the tester to a cable that is plugged into the ProLight Series system as this can damage the tester.**
- No-Ox connector compound is provided at no cost with each ProLight Series order and should be used on all connections to prevent corrosion in the connectors that can occur over time.
 - No-Ox is already applied to all female RJ45 connectors and all zip cord connectors.
 - Apply No-Ox to all RJ45 male connectors BEFORE plugging into the system, switches or sensors. website: <https://pmmi-lighting.com/videos/>

Cable Guide

- Red/Black 16 or 18 AWG 2 conductor zip cord – Light fixture cables
 - 18 AWG zip cord can be used if your run is 200' or less.
 - 16 AWG zip cord should be used if your run is in excess of 200' but less than 750'.
- Green Cat5/6 - Wall switch cables
- Yellow Cat5/6 - Motion sensor cables
- Purple Cat5/6 - Daylight harvesting sensor cables

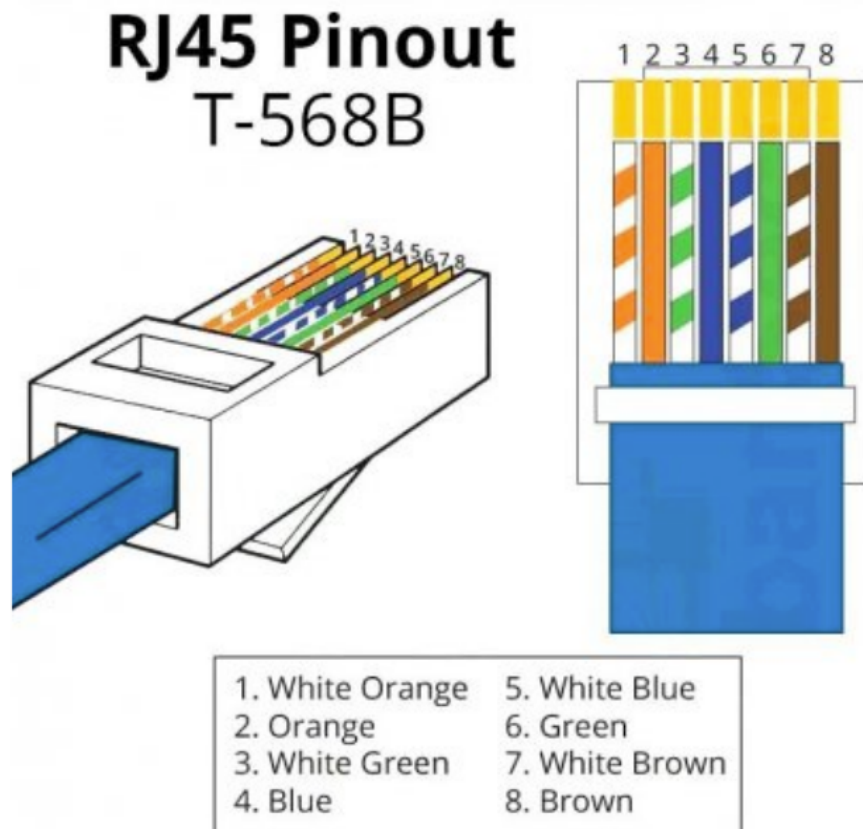
Using color-coded cable (see above) is important to distinguish between the different type cables, and also to distinguish between cable used for the ProLight Series system and cables used for computer networks, audio visual, and other purposes.

WARNING: Plugging PMMI Lighting RJ45 cables, into network ports on laptops, routers, or other computing hardware can damage that equipment and/or PMMI Lighting ProLight Series system and components.

RJ45 Pinout and Cable Termination

All switch, motion and daylight harvesting cables should be terminated using RJ45 male connectors. We use the T-568B termination standard. **Be sure to leave excess cable at both ends.**

All switch, motion and daylight harvesting cables should be terminated using RJ45 male connectors using the T-568B Termination Standard.



Internet Connectivity

The ProLight III system supports Internet connectivity via Ethernet cable or WiFi. When connected, PMMI Lighting LLC can provide diagnostic support and system updates upon customer request.

WiFi is preferred

To connect the WiFi, connect a monitor, keyboard, and mouse to your system. Hook up to your Wifi just as you would your personal computer.

If Ethernet cable is use to provide connectivity, it should be connected using the following information to limit power surges from the router passing through into the the lighting system electronics. It is suggested that the router Rj45 connector is first plugged into a surge suppressor and then into the Raspberry Pi on the system controller.

- Run a Cat 5 cable between the surge suppressor and the Raspberry Pi in the control center.
- Run a cable between the surge suppressor and the and the location or intended location of the LAN router.
- Use any color you choose except red, green, yellow or purple to distinguish the Ethernet cable from lighting system cables.

Installation Process Overview

The suggested order of installation is as follows. For detail of each phase see detailed sections below.

- 1) Decide on the location for the Control Center, Power Supplies & AC Interface (optional) and install.
- 2) Run fixture cables to Control Center area.
- 3) Run switch cables to Control Center area.
- 4) Run motion sensor cables to Control Center area. (optional)
- 5) Run daylight harvesting sensor cables to Control Center area. (optional)
- 6) Install Ethernet cable for Internet connectivity. (optional but suggested for PL III)
- 7) Organize cables in the Control Center according to cable type and which system board they are to attach. (do not plug them in yet)
- 8) Terminate RJ45 Cables at both ends, with an extra 5 feet at the control center and extra length to connect to switch or sensor.
- 9) Test EVERY RJ45 cable with a Cat5/6 cable tester.
 - a. Testing cables at this time prevents discovery of a bad cable after insulation and sheetrock are installed or cables are otherwise covered up.
 - b. This not only confirms continuity on all 8 wires and correct wiring order, but also is an opportunity to verify labeling.
 - c. It's possible that cables can be damaged after testing and during construction. If a cable does not appear to behave properly at that time, retest the cable and repair as necessary.
- 10) Cover all connectors in the living space to prevent damage and prevent paint, texture, or other material from contacting the connectors.

Control Center Installation

Placement

The ProLight III is typically installed in a utility closet or mechanical room. For ease of working on your system and restarting/rebooting your system, it is recommended that the power outlets and/or breaker box be located near the control center.

Mounting tips:

- The ProLight III is surface mounted using a hinge located on the left side of the cabinet. This is necessary as all the switch, motion, daylight harvesting and light wires enter the lower right rear of the cabinet.
- When closed, the enclosure is held on the right side by a push pin that must be installed on the wall.
- Mounting cabinets at eye level when standing or sitting on a stool is recommended as the installer will need to easily read all the markings on the circuit boards and on the rear of the panel.
- A multitude of cables will be terminated in the control center, so allow room for organizing cables.
- See website for wiring tips. <https://pmmi-lighting.com/prolight-series-videos/>
- Notes for CAT5/6 Cable: when routing cable, 5 feet of extra CAT5/6 cable should extend from the point where the lower right portion of the cabinet will be mounted
- Notes for ZIP Chord: when routing cable, 6 feet of extra of the 16 / 18 AWG zip cord should extend from the point where the lower right portion of the cabinet will be mounted.
- This extra wire is necessary to allow for routing of cables and opening and closing of the enclosure

Monitor, Keyboard, Mouse

Monitors are not a necessity for the functionality of the systems, however, whenever a Raspberry Pi is present, hooking a monitor and keyboard up to the Raspberry Pi makes viewing the system activity, and controlling your system effortless. The Raspberry Pi has an HDMI input for the monitor and USB ports that connect a keyboard and mouse.

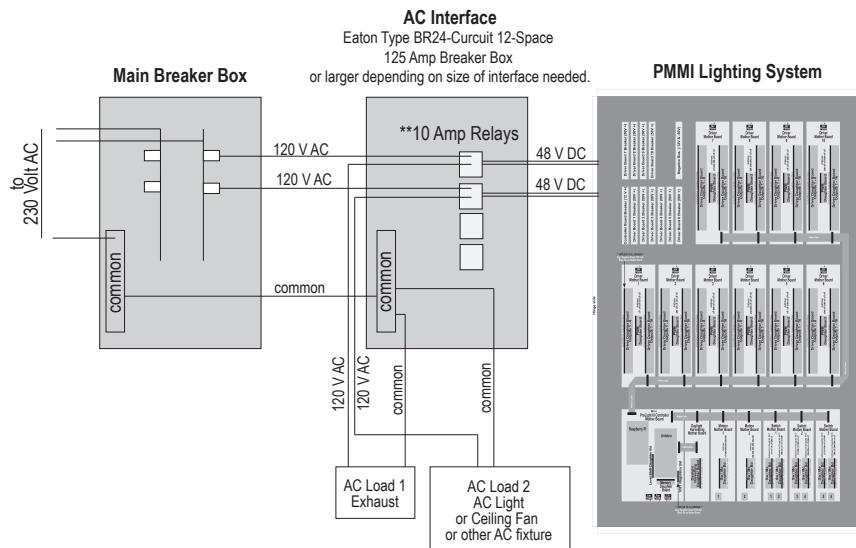
Links to a suggested monitor can be found on our accessories page on the website, but many others can be used. <https://pmmi-lighting.com/monitor-cabling-power/>

A/C Interface (aka Relay Panel)

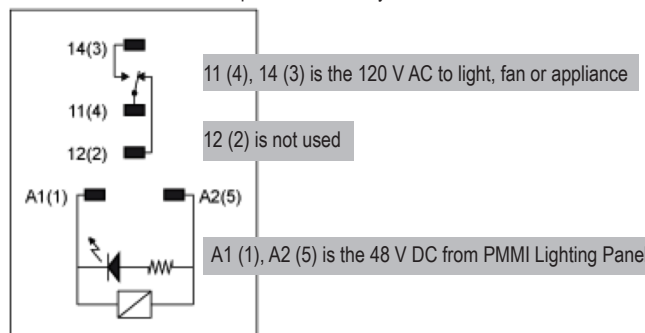
If your system has an A/C Interface, the A/C Interface should be installed by an electrician and located near the Control Center.

- Each relay can accommodate 120 or 240V loads and up to 10A per relay.
- The relays are used to switch AC loads (on/off only, no dimming) based on low-voltage current input to each relay coming from drivers on LED driver boards using red/black zip cord.

Typically, the high leg from 120/240V breakers are routed to the relays as a source of power, and output from the relays go to the intended loads.



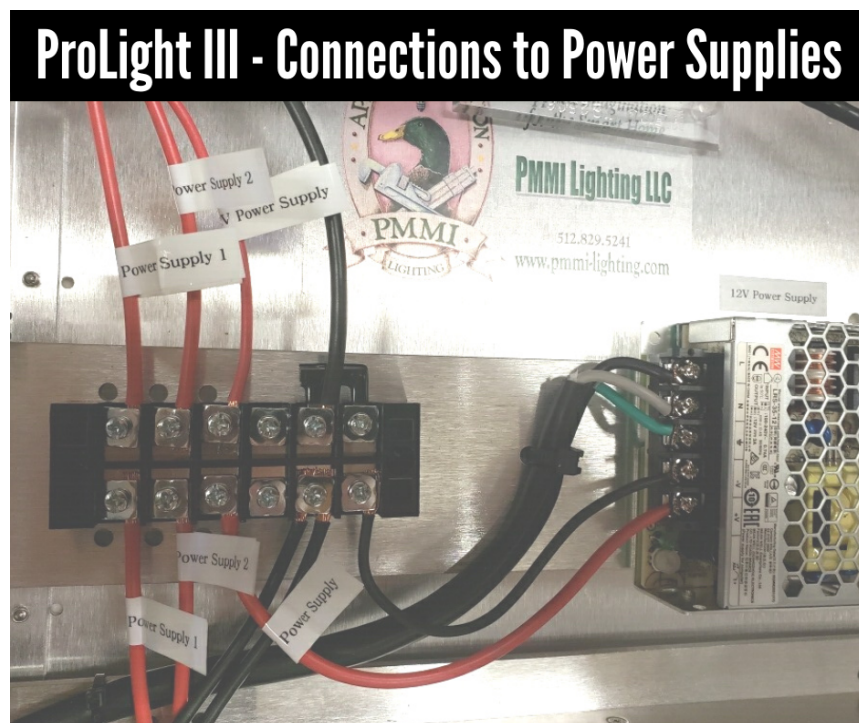
** RXG12ED 48 V DC 10 Amp Schneider Relays



In AC Interface, all 48 V DC relay coil terminals are in a separate partition on right side of box.
All 120 V DC relay contacts are on left side of partition

Power Supplies

1. Every system has a 12V DC power supply to power the system electronics, and a separate DC power (V2) supply for lighting fixtures. V2 can be 12V, 24V, 36V, or 48V and must provide enough power to drive all fixtures in the systems.
2. AC/DC power supplies tie into the breaker panel and/or electrical outlets, installed by an electrician. Depending on the power supply selected, power input is typically 120 or 240 VAC and 50 or 60Hz.
3. Where multiple supplies are used, all must connect to a common AC ground.
4. Where multiple power supplies are used, all DC negatives must be tied together.
5. Some power supplies have a switch to select input voltage. **SELECT PROPER INPUT VOLTAGE CONSISTENT WITH LINE VOLTAGE OR DAMAGE CAN OCCUR.**
6. If you are using a PMMI Power Supply Enclosure, everything comes pre-wired



Building Fixture Daisy Chains

The number of fixtures that can be daisy chained on a channel depends on the V2 voltage and on the voltage drop per fixture. Fixtures can be daisy chained in any combination so long as the total voltage drop across fixtures does not exceed V2.

The voltage drop for common PMMI fixtures are:

- Down lights – 6V
- Gimbal Lights – 9V
- Double Floods – 24V
- 24W Strips – 24V

So, for example, using a 48V (V2) system:

- Eight down lights ($6 \times 8 = 48$) can be daisy chained together
- Four down lights and one double flood ($4 \times 6 + 24 = 48$) can be daisy chained together
- Five gimbals ($5 \times 9 = 45$) can be daisy chained together
- One double flood ($1 \times 24 = 24$)
- On one chain you can have anywhere from ONE 6V light to more as specified, combining the fixtures up to 48V.

Fixture Installation

Mounting Holes: LED Recessed Down Light Fixture & Gimbal

The standard recessed down light is a light weight, flush mounted fixture that can be installed directly into sheet rock, artificial ceiling, or other ceiling material with no physical mounting to the ceiling joist.

- Locate and mark fixture location on the ceiling or mounting surface being careful to locate fixtures clear of ceiling joists or other obstructions.
- Using a 3 1/2" hole saw, cut a hole through the ceiling material at the fixture location. A carbide saw will be required for cement-based ceiling material.
- Marking and cutting holes should be done when raw ceiling material is in place. We recommend ceiling finish (float, texture, paint, etc.) be done after holes have been cut.

Fixture Can Installation (optional)

Because the fixtures operate at low voltage and low temperature (100°F), use of a “fixture can” behind the ceiling material is optional. Cans are available from PMMI Lighting.

Switch Installation

Switch Cables

- Home run cables between the first switch on each switch chain and the control center, and jumper cables between each switch location on the chain.
- Use GREEN Cat5/6 cable for all switch cables.
- Label all wires as you go.

Every ProLight III system delivered by PMMI Lighting is pre-configured. Label cables as designated on the Cable Plan provided with system. Plugging cables into proper inputs allows the system to operate correctly from the start.

No Ox must be applied to all cable ends BEFORE plugging into switches.

Understanding Chaining Switches

- Wall switches are connected in a daisy-chain manner using CAT5/6 cable.
- Each switch cable has one common wire and seven active wires, allowing seven unique functions to be processed on each cable.
- Any number of switches can be daisy chained in any combination and order.

Switch Jumpers

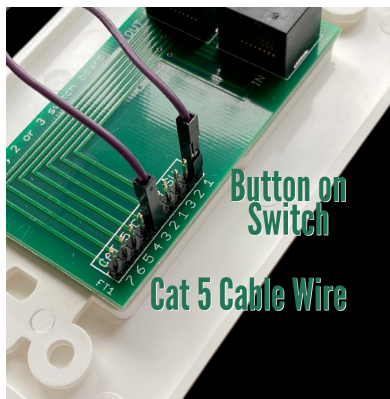
Reference the Cable Plan of your system for notes about the switch jumpers.

Four and Six Button Switches

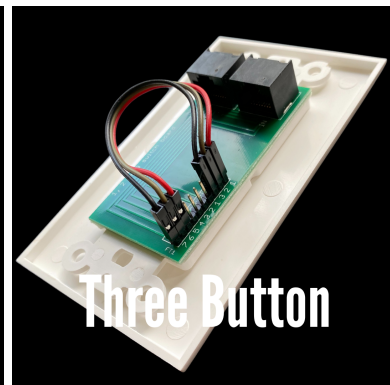
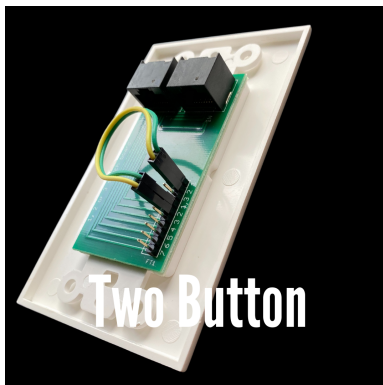
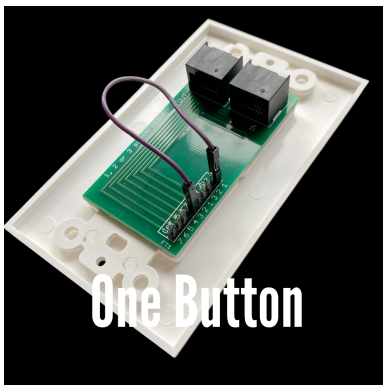
- There are no jumpers on four and six button switches
- 4 Button switches connect to cable 1 - 4 on the CAT5/6 cable
- 6 Button switches connect to cable 1 - 6 on the CAT5/6 cable.

One, Two, and Three Button Switches

- The back of the switches have pins. Link the pins together as is specified on your Cable Plan before installing in gang box.



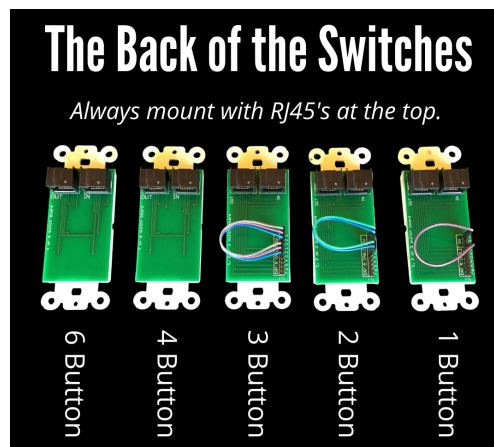
- A one button switch, might connect the one button to wire 1,2,3,4,5,6 or 7.
- A three button switch, might be desired to set buttons 1, 2, and 3 to connect to wire 5, 6, and 7. To do this jumper 1 to 4, 2 to 5, and 3 to 6.



Installing / Chaining Switches

Switches should be mounted in a standard single or multi-gang electrical box. If you need to install both a low voltage light switch and an AC switch in the same location, you can use a two gang combo electrical / low voltage shielded switch box, which allows high and low voltage to go into the same gang box. Just bring the low voltage CAT5/6 cable and the ROMEX in from opposite sides of the box and use maximum separation of the cables, preferably routed down separate studs.

- Do not run switch cables parallel to or in close proximity to high voltage ROMEX as EMF emissions from high voltage cable can cause switch signal distortion.
- Switch should be mounted with the RJ45 connectors to the TOP of the switch.
- Buttons are numbered from left to right, top to bottom, so if installed upside down, this can cause confusion.



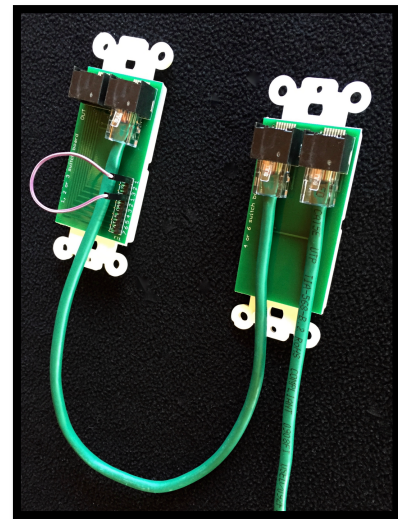
- No Ox must be applied to all cable ends BEFORE plugging into switches.
- After the switch jumpers have been set properly (see explanation above), plug the green CAT5/6 cables at the switch locations into the RJ45 connectors on the back of the switch.
- For switches in the middle of a switch chain, two cables are present.

- One from the preceding fixture on the chain or from the home run from the control center
- A second to the next fixture on the chain
- Plug one of those cables into one RJ45 connector and the other into the other connector (doesn't matter which one)
- If the switch is the final switch on a switch chain, only one cable is present. Plug the cable into either one of the RJ45 connectors on the switch and leave the other connector empty.

Connecting Switch Chains in the Control Center

Do this section AFTER system has been powered up and is functional.

- Up to three Switch Mother Boards can be installed in the Control Center. Each Switch Mother Board has 2 Daughter Boards each with each read 8 switch cable inputs. There are labels on the back of the system for Switch 1, 2, 3, 4, 5, and 6. Each has eight RJ45 switch cable connectors. Each of the three Switch Mother Boards
- Cables should be labeled with the cable number and/or location identifier as specified in Cable Plan.
 - Example 2.4.28 Flood N – *this is Switch Board 2 – Output 4 – Sequence port #12 – Location Flood North*
 - *This label tells you to route the cable to Switch Board 2, then find Output 4 and insert it into the RJ45 female connector*



- *The Sequence port # corresponds with a sequence port number in the configuration document on the switch tab*
- *The Location is obviously the physical location of the switch, ex: Kitchen, Flood, Bath1, etx.*
- Repeat this for all remaining switch cables.

Motion Sensor Installation

Motion Sensor Cables

- Home run cables between each motion sensor and the control center, and jumper cables between sensors if more than one sensor is used per motion input.
- Use YELLOW CAT5/6 cable for all motion cables.
- Label all wires as you go.
- Motion sensor cables carry 5V DC to power the motion sensor and signal wires to return signals to the lighting controller in the control center.
- The system has a configuration file that corresponds with the planning document, showing which sensor is to be used in each area. Plugging cables into proper inputs allows the system to access data correctly from the start of installation.
- No Ox should be applied to all cable ends BEFORE plugging into motion detectors or boards.
- Motion sensors connect to the Motion Boards located in the control center. Any number of motion sensors can be daisy chained on the same input, expanding the coverage area.
- Three types of sensors are available, see website for details.
- Motion sensor should be mounted in a standard single gang electrical box.

Connecting Motion Sensor Cables in the Control Center

Motion Boards are installed in the Control Center and are labeled Motion Board 1 and 2 and each has sixteen RJ45 switch cable connectors labeled 1-16. Cables should be labeled with the cable number and/or location identifier as specified in Cable Plan.

- Example 2.7.15 Pantry – *this is Switch Board 2 – Input 7 – Cable 15 – Location Pantry*
- *This label tells you to route the cable to Switch Board 2, then find Input 7 and insert it into the RJ45 female connector*
- *The Cable number corresponds with a sequence port number in the configuration document*
- *The Location is obviously the physical location of the sensor, ex: Pantry, Kitchen, Flood, Bath1, etc.*
- Repeat this for all remaining motion detector cables.

Daylight Harvesting Sensor Installation

- Home run cables between each daylight harvesting sensor and the control center.
- Use PURPLE Cat5/6 cable for all Daylight Harvesting Sensor cables.
- Label as you go.

Connecting Daylight Harvesting Cables in the Control Center

- Daylight Harvesting Board is installed in the Control Center, and is labeled Daylight Harvesting.
- The Daylight Harvesting board has sixteen RJ45 cable connectors. Inputs are labeled 1-16.
- The Cable Plan specifies appropriate area to each input.
- Cables should be labeled with the cable number and/or location identifier as specified in Cable Plan.
 - Example 1.4.4 Pantry – *this is Daylight Harvesting Board 1 – Input 4 – Cable 4 – Location Pantry*
 - *This label tells you to route the cable to Daylight Harvesting Board 1, then find Input 4 and insert it into the RJ45 female connector*
 - *The Cable number corresponds with a sequence port number in the configuration document*
 - *The Location is obviously the physical location of the sensor, ex: Pantry, Kitchen, Flood, Bath1, etc.*
- Repeat this for all remaining Daylight Harvesting cables.

Start Up Process Overview

The suggested order of startup is as follows. For detail of each phase see detailed sections below.

- 1) Install all Daughter Boards in system. See video for details on how to do this.
www.pmmi-lighting.com/prolightvideos
- 2) Install Thumb Drive & SD card in Raspberry Pi in system.
- 3) Connect power supplies to control center.
- 4) Power Up system.
- 5) Turn on toggle switch located on each PWM Daughter Board, confirm all LEDs light on Driver Board.
- 6) Turn off toggle switch located on each PWM Daughter Board.
- 7) Using push switches on System Switch Board, make sure that each switch lights illuminates corresponding lights on Driver Daughter Board.
- 8) Install and test fixtures according to the procedure outlined below.
- 9) Install and test switches according to the procedure outlined below.
- 10) Install and test motion sensors according to the procedure outlined below.
- 11) Install and test daylight harvesting sensors according to the procedure outlined below.

Verify LED Drivers are Working Correctly

1. Once the control center is installed and powered, and before fixture cables are connected to driver boards in control center, test the LED Drivers.
2. For LED driver testing and fixture installation and testing purposes, each system has a switch board installed in the cabinet.
3. Press the corresponding button to turn on and off each driver board.
4. Observe the yellow and green LEDs on each driver board to see if the drivers are operating properly.
5. The yellow led indicates that the controller is sending a signal to the driver to turn on.
6. The Green led indicates if the driver is on or off.
7. If the yellow led is illuminated and the green one isn't it indicates that the driver is bad or there is no V2 power to the driver board.

Testing as you go - Verify Single Fixture Operation on a Channel

Fixtures should be tested as they are installed to verify the viability of the cable and fixture. Instructions to test each fixture as you create channels is as follows:

- Each channel has one 2 conductor zip cord cable that runs to the control panel and plugs into a LED driver output.
- Step 1: Turn on all light channels for the driver board you are using with the switch described in the previous section.
- Step 2: Plug one end of the home run cable into the appropriate LED driver output in the Control Panel.
- Step 3: Connect the other end of the Zip Cord to the last fixture in the daisy chain using the connector attached to the fixture. Red to Red and Black to Black. The fixture should light. *To keep from being blinded each time you hook up another*

fixture, use the switch button in the panel to dim to their lowest level but pushing and holding button until the LED dims to a low level.

- Step 4: Connect to the fixture going towards the system
- Step 5: Cut the black wire on the zip cord and strip it.
- Connect the black end that came from the last fixture to the red connector on the next to the last fixture and the end that goes to the third from last fixture into the black connector. Now both the last fixture and the next to the last fixture should light. If you connect the wires backwards, no problem, just reverse them and it will light.
- Do not cut the red wire on the zip cord while daisy chaining fixtures. This will make it very hard to diagnose any problems.
- IF this is the last fixture in the chain skip to the “Installing in Ceiling” section. If it is NOT the last fixture in the daisy chain, continue to the next step and the next fixture.
- Label all cables. All home run cables, cables terminating in the control center, should be labeled on each end designating the cable# or the location identifier.
- No-Ox has already been applied to all connectors that the zip cord connects to. This is necessary to prevent corrosion in the connectors that can occur over time.
- Use Red/Black 16 or 18 AWG, 2 conductor zip cord for all FIXTURE cables.
- Home run cables between the last light fixture on a chain and the control center, looping about 3-4 feet of cable in the location of each desired fixture in the chain.
- Label all wires as you go.

Complete the Daisy Chain by Connecting Multiple Fixtures

To connect multiple light fixtures to that same channel:

Remaining Channels

- Repeat this procedure for every channel/daisy-chain in the system.
- Once completed, every light in the system should turn ON and OFF with the ALL TOGGLE button installed in the control center.

Warranty

PMMI Lighting offers a 3-year limited warranty against manufacturer defects and workmanship on all PMMI Lighting components. No-Ox must be used on all connections. If it is not, then the warranty is VOID. Solid copper and or stranded copper wire must be used to connect all fixtures, switches, motion sensors and daylight harvesting sensors. If specified cable is not used, warranties are VOID.

For 3rd party components including power supplies, the manufacturer warranty applies.

Contact Information

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