The Lutron Quick Reference Guide

P/N 032496a

Introduction

How do I make my install and project a success?

By looking at lessons learned from projects of all sizes, we have learned that a successful install comes down to a few key factors. In this document you will find some best practices that will help make your project, install, and startup of your Lutron system go as smoothly as possible. We also want to make sure you have the appropriate contact information, and that you know who to contact with various questions.

How do I know when I am ready for startup?

Find out from the Lutron project manager what the estimated startup time is. Use the estimated startup time and the turn over date to determine the appropriate start date. Everything needs to be installed on the day the tech is scheduled to commence startup. Use the electrical contractors (EC) pre-startup checklist to ensure you have everything complete that is required to commence startup. Lutron has a lead time of approximately 2 weeks for site visits. Call LSC Scheduling at 1-844-588-7661 with enough time to schedule visit.

What if I'm not going to be ready when the tech is scheduled to arrive?

- Call LSC Scheduling to reschedule at least 48 hours prior to the scheduled visit.
- Notify the Lutron project manager or your Lutron sales representative
- Failure to reschedule before 48 hours may lead to cancellation charges.
- Failure to reschedule when Lutron equipment isn't ready for startup may lead to cancellation charges.

What is the EC pre-startup checklist?

Lutron's goal is to help complete a project on time and on budget. There are certain things that need to be done to prepared for our visit. Having these things done can prevent needing to move dates and avoid any last minute cancellation charges. It will also ensure the startup is completed on time.

The submittal for a Quantum system has several sections to it. One of those sections is the EC pre-startup checklist. Historically jobs that do not fully complete this checklist have extensive troubleshooting to be done when the technician arrives to program. To ensure a successful startup, this checklist **MUST** be completed by the installing electrician that knows the status of the install first hand. Follow the EC pre-startup check list, noting any deviations from the check list or from submittals, and return them to the project manager.

For non-Quantum jobs a check list can be emailed by lscscheduling@lutron.com, the tech that will perform startup, or the Field Service Territory Leader.

How do I wire Lutron components and perform the testing on the EC pre-startup check list?

- Refer to the Quick Start Guide, submittal, or install guides at www.lutron.com
- If steps are still not clear on how to test, please call Lutron Customer Assistance at 1-844-LUTRON1, the engineer that did your prewiring, or your Lutron project manager.

Quick Start Guide to Wiring a Quantum System

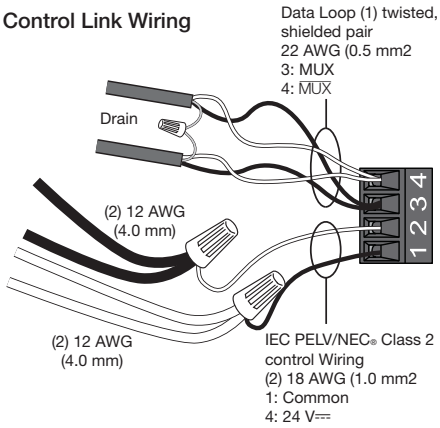
Three different kinds of low voltage wiring we use with the Quantum system

1. QS Link

QS Link wiring is the wiring going between devices which allows them to communicate. It consists of 4 wires plus a drain. The length of the QS link will determine the wire gauge for terminals 1 and 2. ALL 4 WIRES ARE POLARITY SENSITIVE. The QS Link must be wired per the submittal drawings. However, the devices don't have to be in the exact order they are found in the submittal as long as the Power Draw Unit (PDU) counts are not violated. Your Lutron project manager can help you determine PDU counts. Do not connect pin 2, between power supplying devices.

QS Link Wiring Distance	Wire Gauge	Available from Lutron in one cable
Less than 500 ft (152.4 m)	**Power (terminals 1 and 2):** 1 pair 18 AWG (1.0 mm^2)	GRX-CBL-346S (non-plenum) GRX-PCBL-346S (plenum)
	Data (terminals 3 and 4): 1 pair 22 AWG (0.5 mm^2), twisted and shielded	
500 ft (152.4 m) to 2000 ft (610 m)	**Power (terminals 1 and 2):** 1 pair 12 AWG (4.0 mm^2)	GRX-CBL-46L (non-plenum) GRX-PCBL-46L (plenum)
	Data (terminals 3 and 4): 1 pair 22 AWG (0.5 mm^2), twisted and shielded	

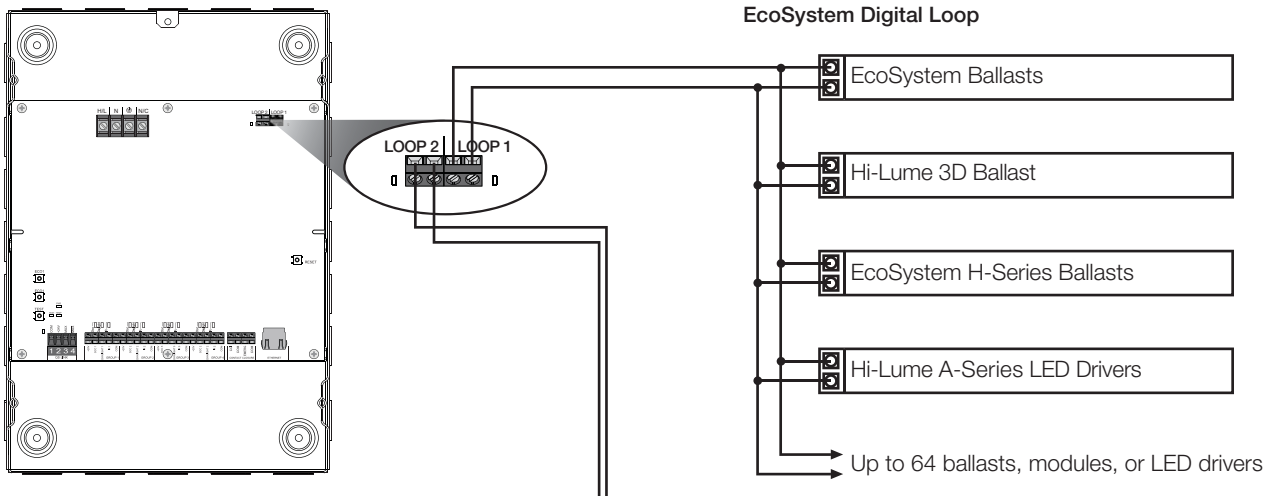
Control Link Wiring



2. EcoSystem

EcoSystem wiring goes between the device controlling the ballasts, and all of the ballasts. It allows for control of up to 64 EcoSystem compatible devices (ballast, modules, or LED drivers) per EcoSystem digital wire loop. It will have 2 conductors of 12 AWG to 18 AWG (4.0 mm^2 to 1.0 mm^2) depending on length of the run. The device running the ballasts can be a QS GRAFIK Eye, ESN-Eco, or a bus supply mounted directly in the panel with the processor. The 2 wires are NOT POLARITY SENSITIVE, meaning, that the only way wiring would be incorrect, is if you have a direct short between the two wires or ground, or if you have an open.

Energi Savr Node Unit with EcoSystem



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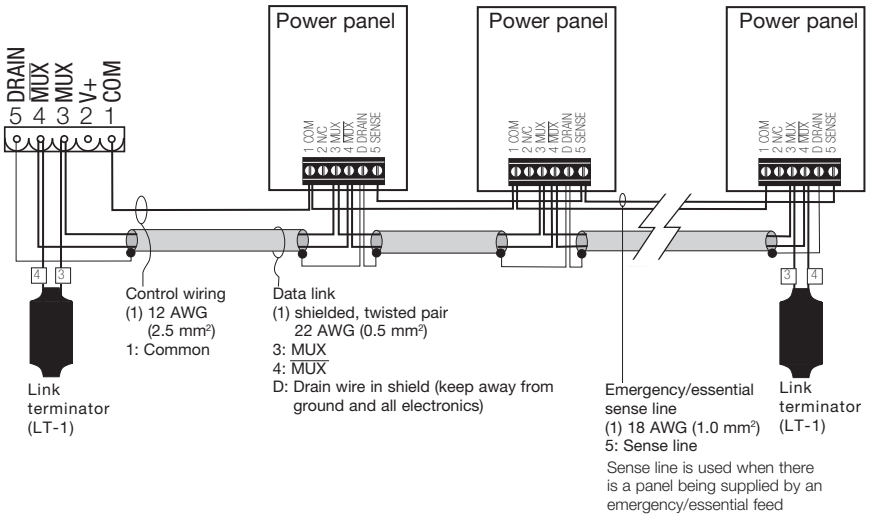
Quick Start Guide to Wiring a Quantum System *(continued)*

Three different kinds of low voltage wiring we use with the Quantum system *(continued)*

3. Power Panel

Power panel wiring goes between the processor and the power panels. This cable can be the same model number as the QS link cable. The main difference is the #5 (Emergency Sense) wire. The wiring is DAISY CHAIN ONLY (T-Tap, Star, Home Runs are NOT allowed). Link terminators must go on the end of line power panel or the beginning of the line. They are wired between 3 & 4.



Verify the Wiring Before the Startup Visit

QS Wiring

1. **Indications that the QS wiring is CORRECT**
   a. The LEDs on the QS link come on or are solid for all devices. This is the indication that pins 1 and 2 are wired correctly.
   b. If all 4 conductors are connected properly, the keypad LEDs should be on solid.

2. **Indications that the QS wiring is INCORRECT**

   Note: Look for LEDs on the QS link keypads or Energi Savr Nodes for one of the patterns detailed below.

   a. **Reverse Waterfall - LEDs scrolling from the bottom to the top:** This indicates that a device is powered up but cannot communicate with the processor. Check to make sure that pins 3 and 4 are not miswired or open or that the terminal block is off of the processor.

   b. **None of the LEDs on the QS Link devices are on:**
      - Check for 24 V⎓ between pins 1 and 2 of the device.
      - If it is a device which supplies power, you should check to make sure it's feedbreaker is on.
      - If it is a power consuming device, such as a keypad, pins 1 and 2 need to get power to them. There must be an open circuit somewhere upstream of this device.
      - Check voltage in between pins 1 (common) and 3, then between pins 1 and 4. Each of them should be near 2 V⎓. If one of those is much higher (7 V+), it is most likely shorted to power at some point in the link circuit somewhere upstream of this device.

   Note: If all wiring seems correct, but the QS link is still not working, it is important to verify that the Power Draw Units are within spec. Please visit http://bit.ly/29VqmRI to verify that the devices being powered are not consuming too many PDUs.

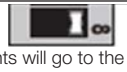
Verify the Wiring Before the Startup Visit *(continued)*

EcoSystem Wiring

Choose the type of device below that is controlling the EcoSystem ballasts/drivers.

Note: Both devices will flash red on the loop, if E1/E2 wires are shorted together.

1. **Digital Ballast Interfaces (DBI):** There are dipswitches on the bus supply which will override lights to high, low, or off. **DO NOT** reconfigure dipswitches 1, 2, or 3.
   a. Each DBI has 2 ECO loops on them. The green loop is controlled from dipswitches 4 and 5. The blue loop is controlled from dipswitches 6 and 7.
   b. Move dipswitches 4, 6, and 8 to the left while keeping 5 and 7 to the right. This will trigger all ballasts in the loops of that DBI to low-end.
   c. Walk through the space and see if any of the ballasts or devices are still at high-end on the associated loop. If some are still at high end, there is an open circuit between the last ballast that is at low-end and the first ballast at high-end. If none of the ballasts on that loop respond, check for 17 V⎓ between the E1/E2 wires. It is likely that there is an open wire preventing communication. Half-split the loop, and see if that fixes the issue. If this fixes the issue, half-split the loop further down the link. If this does not fix the issue, half-split the loop closer to the processor. Repeat until the wiring issue is resolved.
   d. Turn the power off to the processor, using the dial switch on the top of the panel. This will automatically turn those EcoSystem lights on to full brightness and keep them there. Walk through the space again to make sure all fixtures come back up to full brightness from low-end.
   e. Once all wiring issues are corrected, move dipswitch 8 back to the right.
   f. **DO NOT** reconfigure dipswitches 1, 2, or 3.

1 2 3	Addressing Set address for bus supply loops (2 loops per bus supply)	 Bus Supply 1 Addresses 1, 2	 Bus Supply 2 Addresses 3, 4	 Bus Supply 3 Addresses 5, 6	 Bus Supply 3 Addresses 5, 6
4 5	Green Loop (right side) Manual override levels	 Lights stay at current level	 Lights go to “high” level	 Lights go to “low” level	 Lights go to Off
6 7	Blue Loop (left side) Manual override levels	 Lights stay at current level	 Lights go to “high” level	 Lights go to “low” level	 Lights go to Off
8	Manual override	 Manual override levels will be used		 Lights will go to the level specified by the system	

Verify the Wiring Before the Startup Visit *(continued)*

EcoSystem Wiring *(continued)*

2. ESN-ECO-(QSN-*ECO):

a. Press and hold the test button until the 'Test' LED flashes green*.

b. Tap the ECO1 and ECO2 buttons to cycle each link through low-end, high-end, flashing, and off respectively.

c. Upon completion, press and hold the test button until the 'Test' LED turns off.

d. Follow steps b through e from section 1 on the previous page to verify that the wiring is correct.

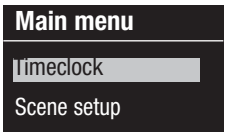
e. Walk through the space and see if any of the ballasts or devices are still at high-end on the associated loop. If some are still at high end, there is an open circuit between the last ballast that is at low-end and the first ballast at high-end. If none of the ballasts on that loop respond, check for 17 V⎓ between the E1/E2 wires. It is likely that there is an open wire preventing communication. Half-split the loop, and see if that fixes the issue. If this fixes the issue, half-split the loop further down the link. If this does not fix the issue, half-split the loop closer to the processor. Repeat until the wiring issue is resolved.

f. See the LED Behavior table below for further help with Energi Savr Node troubleshooting.

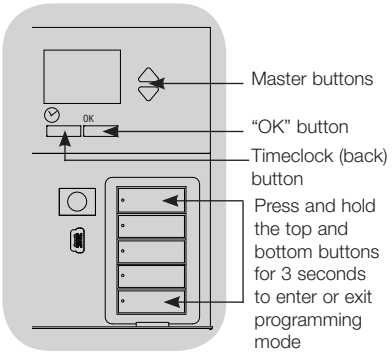
LED Behavior

LED	Normal Operation	Problem Indicator	Probable Cause
PWR (Power)	Green: Continuous On	Green: 5 flashes per second	General system failure
ECO1 ECO2 (EcoSystem Status)	Green: 1 flash per second	Red: Continuous On	EcoSystem link externally shorted, miswired, or link error.
		Red/Green: alternating 1 flash per second	Link slowed because of over-temperature
		Red: 1 flash per second	Link stopped because of over-temperature
		Red: 5 flashes per second	Emergency mode
		Red: 1 flash per 7 seconds	More than one supply is powering a link

3. GRAFIK Eye QS:

a. 

Enter programming mode by pressing and holding the top and bottom scene buttons simultaneously for 3 seconds. The LEDs in the scene buttons will scroll from top to bottom, confirming that you are in programming mode and the info screen will display the main menu.



b. In the main menu, go to EcoSystem > Overrides > Select Low-end

c. Follow steps b through e from section 1 on the previous page to verify that the wiring is correct.

d. 

Exit programming mode by pressing and holding the top and bottom scene buttons simultaneously for 3 seconds. The info screen will go to Scene 1.

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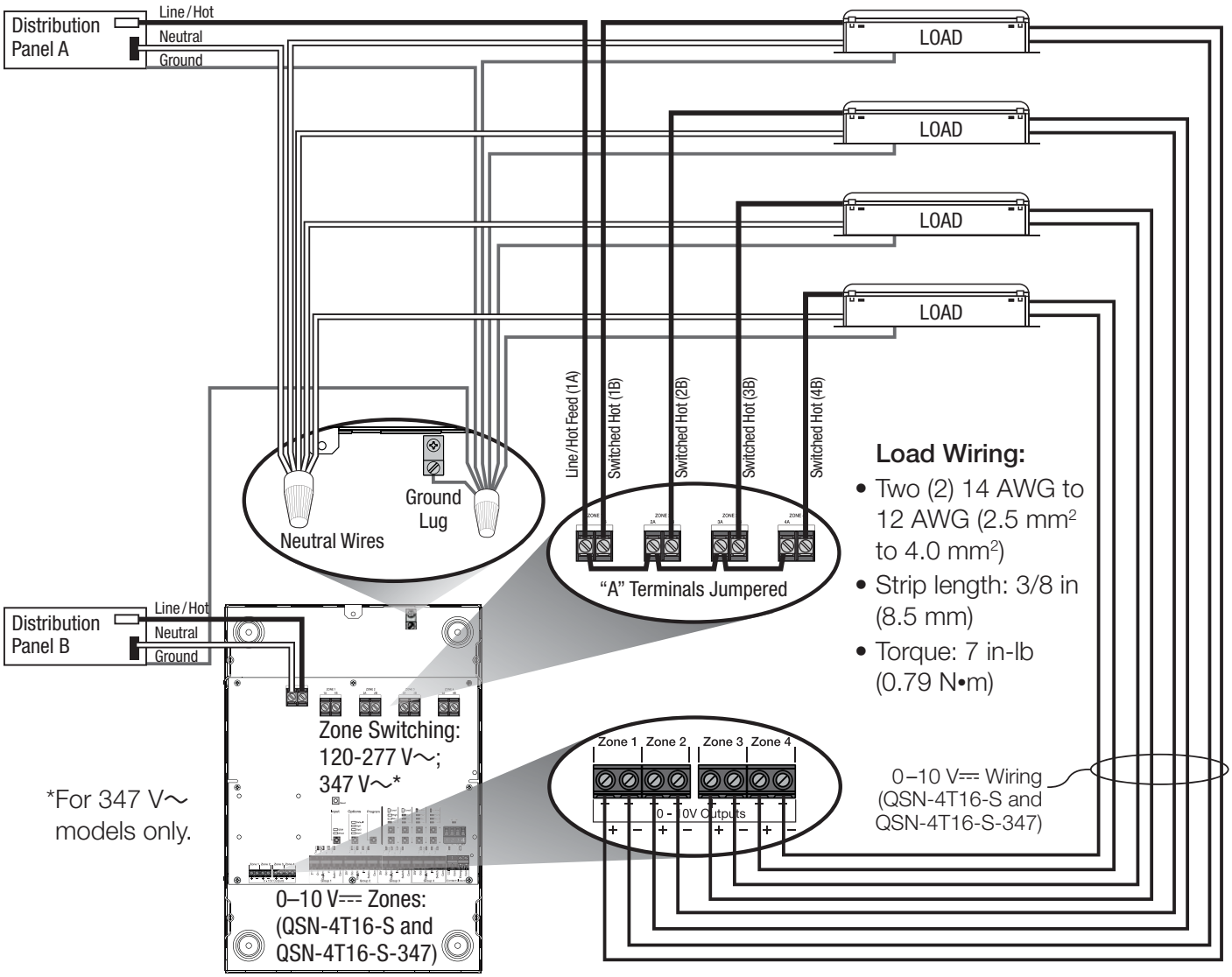
Verify the Wiring Before the Startup Visit *(continued)*

0–10 V⎓ and Switching Wiring

Unlike Ecosystem wiring, 0–10 V⎓ wiring is polarity sensitive. It matters which wire is (+) and which is (–). The wire colors usually dedicated to these are purple and grey. It is very important that you stay consistent with each wire as you terminate the ballasts/drivers. 0–10 V⎓ Energi Savr Nodes, and Switching Energi Savr Nodes will be tested the same way. 0–10 V⎓ models will simply have a dimming range, where as switching models will simply be On/Off.

1. **Wire Energi Savr Nodes** per installation guide that comes with them or see below.

2. **0–10 V⎓ control wire must follow the same switch leg.** This means that the control wire for Zone 1 must go to the same lights that the switch leg for Zone 1 goes to.



3. **Before removing the metal bypass jumpers (between the hot feed and the switched hot leg)** turn on the feed breakers going into the unit. If lights come on, and feed breakers do not trip, you can shut off all power to the unit and remove the bypass jumpers.

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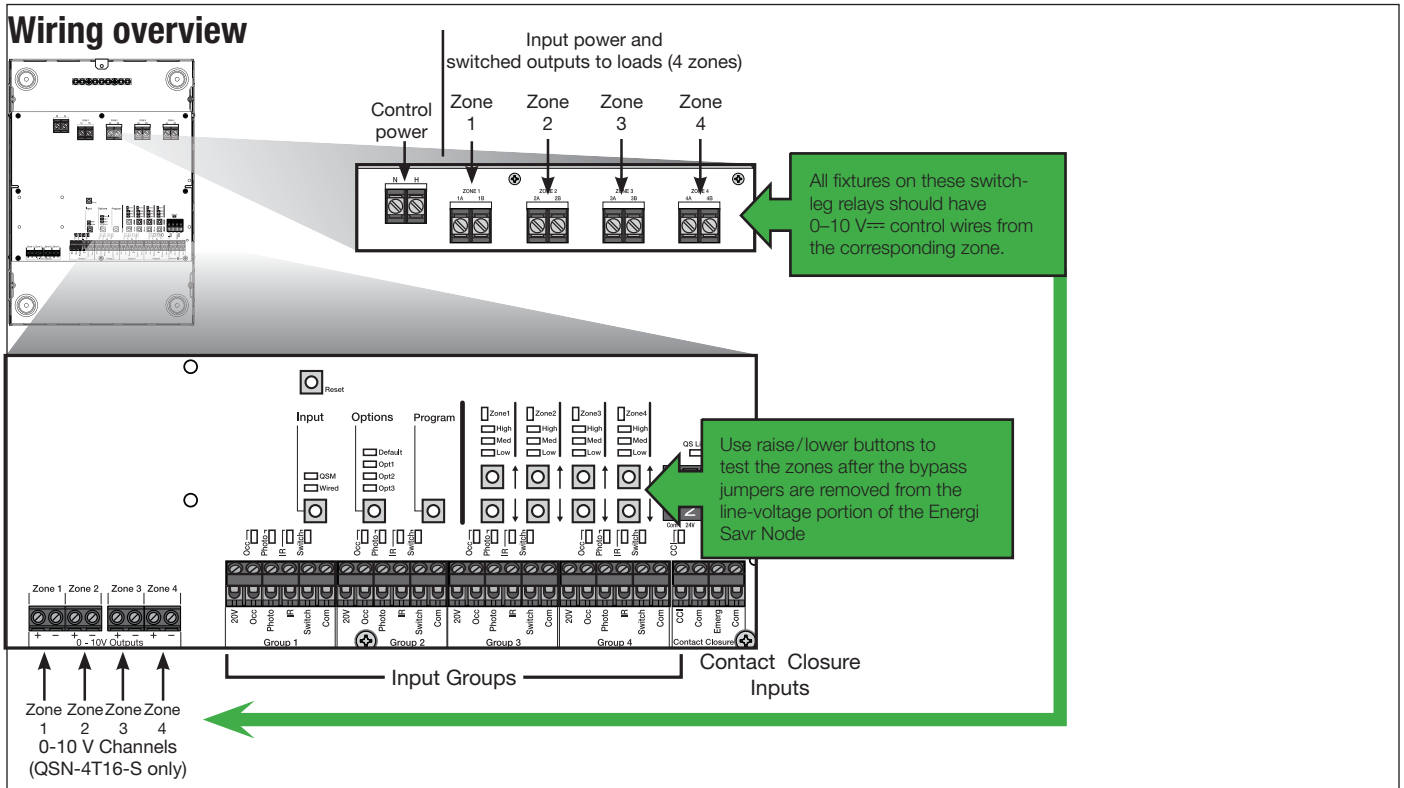
Verify the Wiring Before the Startup Visit *(continued)*

0–10 V⎓ and Switching Wiring *(continued)*

4. **Use the Raise/Lower buttons shown below** to individually test zones of lighting. Switching Energi Savr Nodes will simply turn lights On or Off.



Normal Operation

In normal operation, the following buttons allow the user to access certain basic functions:

↑ **(Raise)** - QSN-4T16-S: Raises zone light level in 1% increments from 0-100%
- QSN-4S16-S: Turns selected zone On

↓ **(Lower)** - QSN-4T16-S: Decreases zone light level in 1% increments from 100-0%
- QSN-4S16-S: Turns selected zone Off

Using LEDs to troubleshoot

Warning! Danger of Shock. May result in serious injury or death. DO NOT WIRE WHEN LIVE! Switch off the power to all power feeds via the circuit breaker before wiring or servicing the Energi Savr Node unit.

Buttons or LEDs in the unit are used for programming and troubleshooting. If the line voltage shield is removed, the unit must be accessed by a certified electrician, following local codes.

5. **If the 0–10 V⎓ fixtures don't change intensity at all,** take the 0–10 V⎓ wires off of the Energi Savr Node, and follow the method of testing fixtures below:

   a) Short/touch the 0–10 V⎓ wires together to dim fixtures down to low end.

   b) Open/separate the 0–10 V⎓ wires to make fixtures go full bright.

6. **Half split the 0–10 V⎓ wiring run as necessary** to find, and eliminate wiring faults in the 0–10 V⎓ cabling.

7. **Once all 0–10 V⎓ wiring has been verified and corrected,** place wires back on Energi Savr Node and use the Raise/Lower buttons to test the lights again.

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What do I do if I still have questions on how to wire equipment in the system?

If steps are still not clear on how to install or test any equipment, call the Lutron Field Service Technician tech that did your prewire, Customer Assistance at 1.844.LUTRON1 (588-7661), or the Lutron project manager for further assistance. If a prewire has not been completed yet, a prewire can be scheduled by calling LSC Scheduling at 1.844.LUTRON1 (588-7661).

What do I need to do about the network?

The network is important to have in place at time of startup so that all of the hubs can communicate with each other. If the network is not in place, this may delay startup. Determine what type of network the customer wants or is expecting. The main two options are a Lutron standalone network, or a building network. Talk with your Lutron project manager for information on the network and server needed. See the following link for more details. www.lutron.com/TechnicalDocumentLibrary/qs-eo.pdf

What else should I focus on to make startup successful?

- Note serial numbers and locations on the Lutron one-lines or reflective ceiling drawings for the following devices:
  - – Wall Stations
  - – Wireless Occupancy and Daylight Sensors
  - – QSMs
  - – GRAFIK Eye
  - – ESN/QSN
- Sensor wiring to inputs
  - – Ensure that the wired sensors are landed on the inputs per the one-lines in the submittal. Note any deviations from one-lines.
- Focus on good Craftsmanship
  - – Ensure all of the strands of copper are in the terminal
  - – Ensure not too much copper is showing
  - – Ensure insulation isn't under the terminal screw
  - – Perform pull checks on each wire to ensure the terminal is tight enough, and wire is secure
  - – Label wires
    - Note incoming and outgoing
    - Label switch legs, and control wires, like 0–10 V⎓

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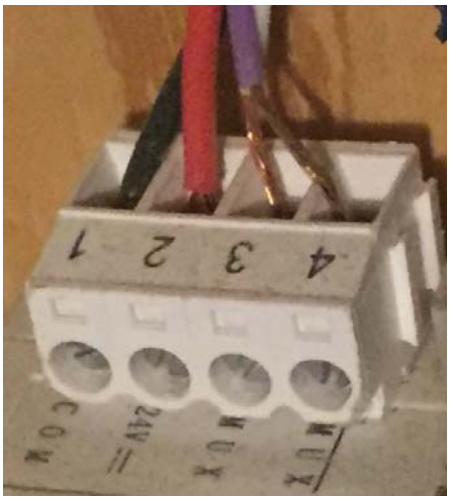
What else should I focus on to make startup successful? *(continued)*

– Example: (See picture to the right)



- The black wire on terminal 1 has insulation too long, and is contacting terminal, which could prevent good contact between wire and terminal
- The wires on terminals 3 and 4 have too much insulation stripped off and these wires are touching, which will shut down communication.
- The red wire is making good contact and is not in danger of touching another wire.
- You also want to ensure there are no stray strands of wire that are not secured in the terminal.\

How long should my start up take?

- Startup time is based on scope and not days, but the approximate time for your startup should be: _____ JN: _____. The Lutron project manager can help you with this information if it is unknown.
- Based on when you need Lutron to be done, use the above days/weeks, and count backwards to figure out when Lutron MUST be onsite to start programming. If equipment is installed and ready for startup, you can schedule the startup visit prior to this date, but Lutron needs to start no later than this.
- It may be important to figure out two schedules using the substantial completion date, and the move-in date. Often the substantial completion date is weeks before turn over to the end user. You should consider both dates, and determine what is realistic. Remember you need to have everything installed, and the Lutron technician still needs the required time to complete programming and testing.
- Example: If Lutron's estimated time is 15 days or 3 weeks, and my drop dead date (day Lutron and EC must be out of building) to be finished with startup is Jan 30th, startup needs to be scheduled for approximately Jan 9th. All equipment and network should be installed and EC startup check-list complete prior to Jan 9th.
- Estimated Lutron start: _____ Estimated Lutron completion: _____
- If the project will not be ready by this date, review the schedule with your Lutron project manager to assess options.

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Contact information

Lutron PM contact info:

Name: _____

Phone: _____

Email: _____

Lutron FSE contact info:

Name: _____

Phone: _____

Email: _____

Web sites and videos for help (Add links and/or QR scan codes)