## Summary

This application note describes in detail the Lantern occupancy sensor cascade operation. This document should be read along with relevant datasheets and white papers. The document is written with installers and consumers of the sensors in mind.

## Introduction

Occupancy sensor controlled lighting, which turns lights ON and OFF in response to occupancy can provide significant saving of electrical energy used for lighting. When the daylight harvesting is combined with occupancy sensing, it can lead to even more savings. Daylight harvesting is a means of saving energy used for lighting in response to ambient lighting available at a place. Occupancy sensors have finite coverage area. In order to provide more area coverage with a common trigger, it is necessary to cascade multiple occupancy sensors together. When the sensors are cascaded, all the lights connected to each of the sensor are turned ON when any one of the sensors detects occupancy and turned OFF when none of the sensors detects occupancy. This is a very useful feature in places like big meeting rooms or large work areas with multiple entrances. Problem with this system is that the daylight harvesting cannot be very effective if different sensors receive different amount of ambient light. For example, the sensor close to the window will receive more light than the one far from the window. Since the sensors are configured to provide minimum required light for the entire area, it is inevitable that some areas receives more light than necessary which will result in less optimal savings.

It would be great if the sensors can respond to occupancy trigger from any sensor but provide minimum required lighting for the coverage area it is responsible while maximizing savings from daylight harvesting. Lantern Dimmable and cascade sensors are equipped with a special feature to address this situation. These sensors are designed to provide to different artificial lighting for each of its coverage area in response to the available ambient light while at the same time responding to occupancy trigger to any one of the sensor.

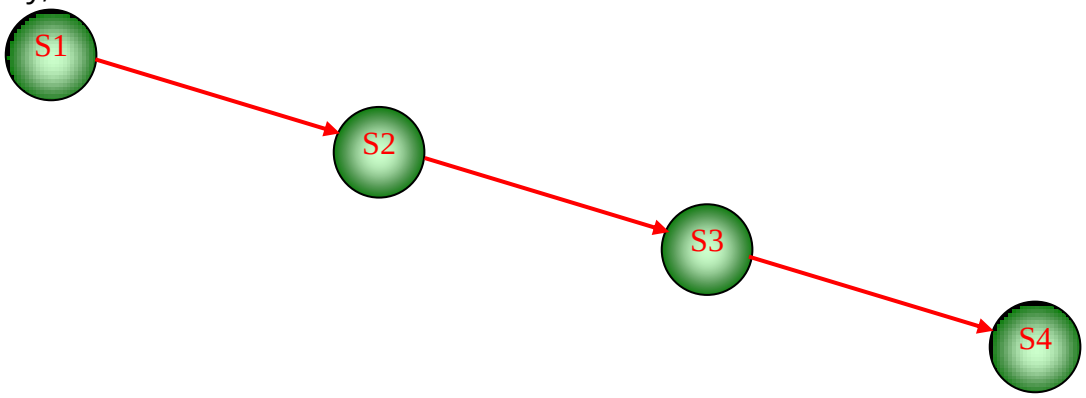
## Cascade Operation

Daylight dimmable sensors can be cascaded together to increase the load driving capacity or to provide task specific lighting based on local ambient light conditions while still responding to occupancy event from any of the sensor. Only occupancy sensor can be cascaded. Vacancy sensors or three way sensors can not be cascaded. There are two modes of cascade operation: Master-slave configuration and Peer-peer configuration. To cascade multiple sensors together, the sensors are connected in a serial manner by connecting “Line Out” from one sensor to the “Auxiliary input” next sensor.

## Master-Slave Configuration

In the master slave configuration, the sensor in the head of line has more priority than the ones after it. The sensor next to the head of line has lesser priority than the head of line sensor but more than rest of the sensor in the chain. Diagram below shows the four sensors S1 through S4 cascaded together in master-slave configuration. Sensor S1 is head of the line sensor chain while

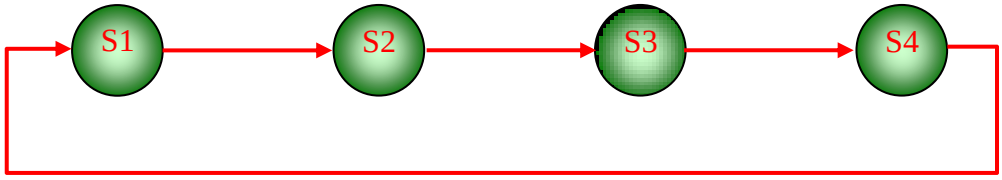
S4 is the tail of the chain. As mentioned above, S1 sensor has highest priority while S4 has lowest priority. So if S1 detects occupancy, it will switch ON the loads connected all the sensors. If S2 detects occupancy, it will switch ON the loads connected to itself and those connected to S3 and S4




and so on. When S4 detects occupancy, it will switch ON only those loads that are connected to it but not those connected to S1 or S2 or S3.

**Peer-Peer Configuration**

In peer-peer configuration, all the sensors will have equal priority. Occupancy detected by any sensor will trigger the load connected to all the sensors. Diagram below shows the four sensors S1 through S4 cascaded together in peer-peer configuration. All sensors are part of the link in the




chain; no sensor is head or tail. When S1 detects occupancy, it will switch ON the load connected to all the sensors. Similarly when S4 detects occupancy, it will switch ON the load connected to all the sensors including the one connected to S1.

**Sensor Connection Terminals**

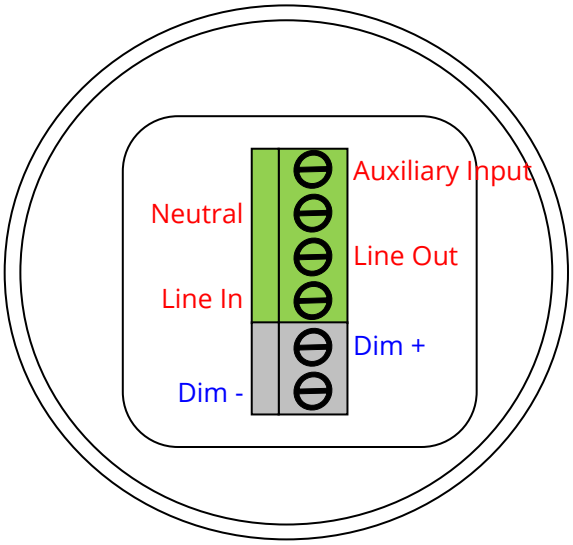


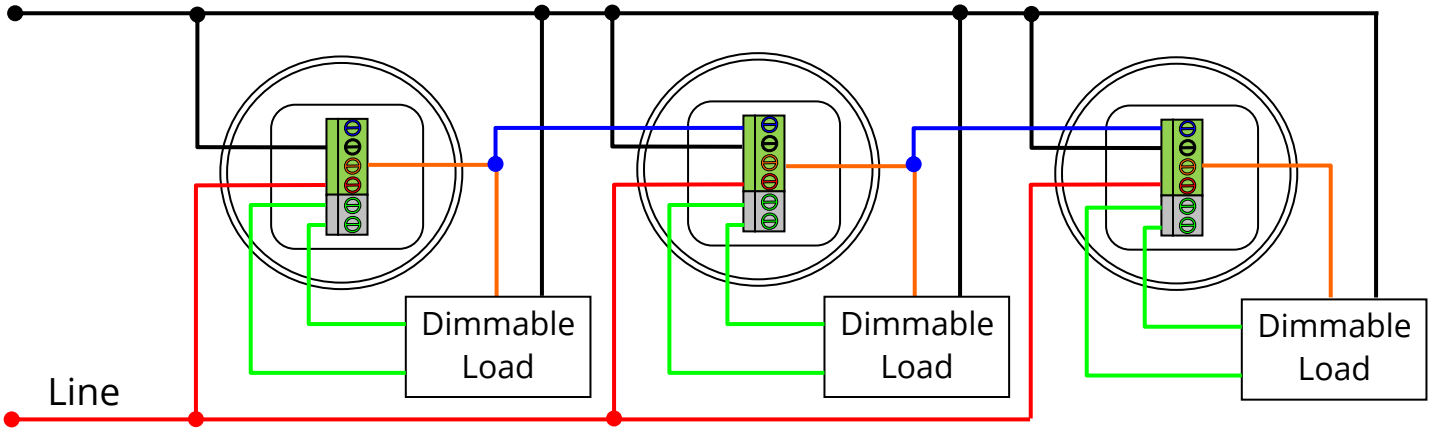

Diagram above shows the screw connector terminals of Lantern Dimmable occupancy sensor. It has one high voltage connector and low voltage connector. High voltage connector is green in color and has four terminals. Low voltage connector is grey in color and has two terminals. In the high

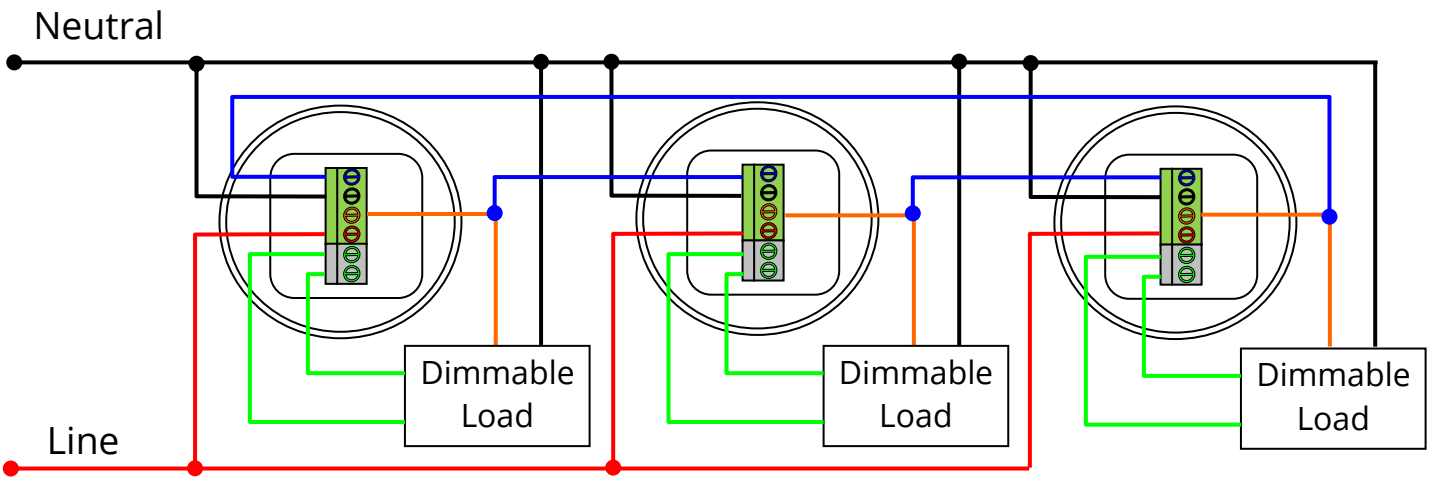
voltage connector, terminal that is farthest (top most terminal in the diagram) from the low voltage connector is “Auxiliary input” used for cascade connection among other things. Second one is “Neutral input” used to carry the neutral to the sensor. Third one is “Line out” that is the output of the sensor that is connected to the load. Fourth one is “Line in” used to carry AC line input to the sensor. Two voltage terminals in a dimmable sensor are either Dim+ and Dim- respectively (for the 0-10v Analog output sensor) or PWM and GND respectively (for the PWM output sensor). It has to be noted that when the sensor is connected to AC input, even Dim+ and Dim- can carry lethal voltages so always disconnect the sensor from power before handling. Also, make sure that the neutral terminal of the sensor connected directly to the AC neutral and not to the load. In other words, load neutral has to be drawn directly from the AC but not from the sensor.

**Wiring Diagram**

To cascade multiple sensors together, the sensors are connected in a serial manner by connecting “Line Out” from one sensor to the “Auxiliary input” next sensor. Second sensor “Line out” in-turn is connected to the “Auxiliary input” of the third sensor and so on. In the case of master-slave configuration, “Line out” from the last sensor is **not** connected to “Auxiliary input” of the first sensor. In the case of peer-peer configuration “Line out” from the last sensor is connected to “Auxiliary input” of the first sensor.

**Master – Slave Configuration**




**Peer - Peer Configuration**

**Where To Find More Details?**

1. Lantern occupancy (cascade) sensor datasheet -
2. Lantern cascade sensor white paper – LWP-XXX
3. Lantern Website – www.lanternlite.com

**Have Questions?**

Please write to us: mailto:support@lanternlite.com?subject=Documentation

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