

## Common Neutral Interaction

Common neutral interaction is interaction or “cross talk” between dimmers on separate phases in a 3-phase system that share the same neutral wire. When solid-state dimmers are operating, voltage and current spikes occur and are transmitted onto the neutral wire. Normally this is of little concern, except when the neutral wire is common to two or more phases of a 120 V~/208 V~, 3-phase, or 4-wire system. Under this condition, the voltage/current spikes may feed back to the dimmers via the common neutral wire, causing interaction between the dimmers.

**Note:** Common neutral interaction should not be confused with dimmer-to-dimmer interaction, which is between two dimmers on the same phase.

### Symptoms

- Lights flicker steadily at certain dimmer settings.
- Lights flash to “full” output at certain dimmer settings.
- Light level of a dimmer on one phase inadvertently changes when a dimmer on another phase is adjusted.

### Recommendations

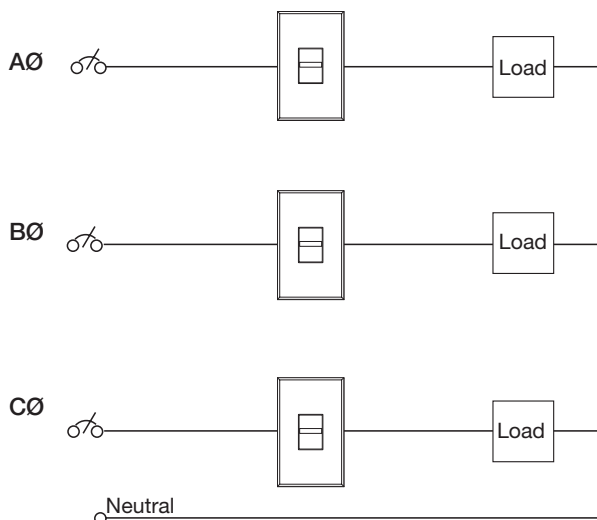
Lutron recommends the following methods to avoid common neutral interaction:

1. Separate neutrals
  2. Reverse-phase dimmers
  3. Lamp Debuzzing Coils (LDCs)
  4. Do not mix load types (LED, halogen, CFL, etc...) on a dimmer output channel.
- Note: LED Luminaires on the same circuit with different drivers may have different light outputs for a given dimmer setting.

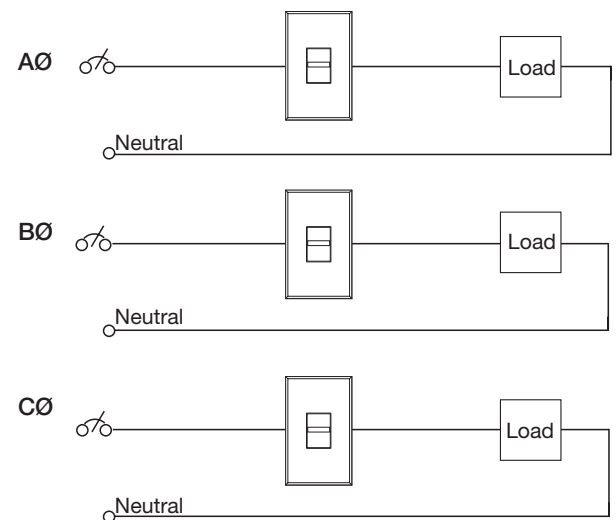
#### 1. Separate Neutrals

The best way to avoid common neutral interaction is to run a separate neutral wire for each phase of the 3-phase system (see below).

##### Shared Neutral (Not Recommended)



##### Separate Neutrals



## 2. Reverse-Phase Dimmers

If it is not possible to run separate neutrals for each phase, then the use of reverse-phase dimmers should be used where possible (e.g., incandescent, ELV, reverse-phase capable LEDs). Reverse-phase dimming (trailing-edge or ELV) with these loads has lower current spikes than forward-phase dimming (leading-edge or MLV) and will have less interaction when common neutral wiring is installed.

## 3. Lamp Debuzzing Coils (LDCs)<sup>1</sup>

If it is not possible to run separate neutrals for each phase (e.g., an application with existing wiring) and reverse-phase dimmers cannot be used (e.g., MLV loads), an LDC can be used to “clean up” the voltage/current spikes creating the interaction. When an LDC is wired in series with the dimmer, it slows down the inrush of current during the rapid switching cycle of the dimmer. As the current inrush is slowed down, the interaction between separate phase dimmers is reduced.

Lutron has four LDC models available to help reduce common neutral interaction. The type of LDC required depends on the total wattage of the lighting load. Listed below are the model numbers and their respective capacities.

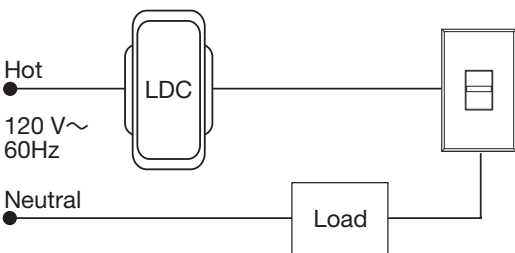
Model	Ratings
CPW0035	100–200 W
CPW0036	200–400 W
CPW0037	400–800 W
CPW1346-OCP	600–1200 W

**Note:** For loads over 1200 W, call Lutron Customer Assistance at 1.844.LUTRON1

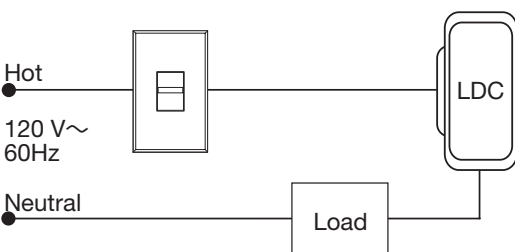
### LDC Installation

LDCs may be wired in series with the dimmer on the line side or load side. Each dimmer requires its own LDC. During normal operation, LDCs may make an audible buzz and, therefore, should be mounted in an area where the noise will not be objectionable (e.g., an electrical closet, a basement, or above a drop ceiling). LDCs are designed to easily mount onto a standard 4 in x 4 in (101 mm x 101 mm) junction box.

#### Line Side Installation



#### Load Side Installation



<sup>1</sup> LDCs are not to be used with reverse-phase dimmers

## Common Neutral within Fixtures

Some lighting fixtures such as track lighting are designed with only one neutral and two inputs to provide separate control of two circuits of lighting. This type of fixture can be controlled with Lutron products if the following conditions are met; to avoid issues often seen with common neutral wiring:

1. Within the fixture, the effective wire gauge (current capacity) of the neutral conduction is a minimum 2x the current capacity
2. Wiring to and from the fixture, the wire gauge of the neutral wire must be properly oversized. For example, 20 A lighting circuits:

Wiring length of circuits	Wire gauge
150 ft (45.7 m) or less	10 AWG (6 mm <sup>2</sup> )
150 ft (45.7 m) to 250 ft (76.2 m)	8 AWG (10 mm <sup>2</sup> )
More than 250 ft (76.2 m)	NOT RECOMMENDED

3. Recommend the use of reverse-phase dimmers for these applications
4. Do not mix different types of loads (LED, halogen, CFL, etc... ) within fixture. Multiple LED loads on the same circuit using different drivers may have different light outputs for a given dimmer setting.

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