

# LUTRON®

## FOR YOUR INFORMATION...

### Guide to Dimming Low-Voltage Lighting

APPLICATION  
NOTE

#19

#### Overview

This Guide to Dimming Low-Voltage Lighting answers typical questions encountered by Lutron's Technical Assistance and Applications personnel concerning low-voltage dimming applications. Lutron manufactures low-voltage dimmers for low-voltage fixtures using magnetic transformers. These dimmers are available in the following product families: Nova T\*, Vareo, Nova, Luméa 2, Maestro, Diva, Skylark, Ariadni, and Glyder. In response to the need to control electronic (solid-state) transformer-supplied low-voltage lighting, Lutron developed special Sol-Lo (solid-state low-voltage) dimming circuitry after an extensive engineering research and development program. Sol-Lo technology has been incorporated into the Nova T\*, Nova, Luméa, Diva, and Skylark dimmer product families.

#### Facts About Low-Voltage Lighting

##### Why Use Low-Voltage Lighting?

- Low-voltage lighting provides an excellent source of illumination when a precise, concentrated beam of light is required.
- Low-voltages contribute to extended lamp life and increased safety.
- Small fixture sizes permit lamps to be easily aimed and reconfigured.
- Common applications include residences, display lighting, task lighting, and product highlighting.

##### What Is Low-Voltage Lighting?

Low-voltage lighting uses a transformer to reduce a 120VAC line voltage to a low-voltage signal, usually 12VAC or 24VAC. This lower voltage is then used to power an incandescent low-voltage lamp.

##### Where Is the Transformer Located?

Depending upon the fixture style, a low-voltage transformer may be mounted remotely or as an integral part of the fixture.

##### Does Dimming Affect Lamp Life?

Dimming will not affect the already long life expectancy of low-voltage lamps.

Occasionally, darkening of a low-voltage lamp may occur. If this happens, simply turn on the lamp at 100% illumination for 10 minutes and the black residue (the result of tungsten evaporation) will disappear. Darkening of the lamp does not affect lamp life.

#### Dimming Low-Voltage Lighting

When dimming a low-voltage fixture, you are controlling the 120VAC line side of the transformer feeding the low-voltage lamps. There are two types of transformers manufactured for low-voltage lighting:

- Magnetic (core and coil)
- Electronic (solid-state)

**Important:** Before selecting a control, determine what type of transformer is in the lighting fixture. Different characteristics of the two transformer types require special dimming considerations. If you have a question concerning what type of transformer a fixture uses, refer to the fixture manufacturer's literature.

Note: Some low-voltage fixtures cannot be dimmed. Read the literature from the fixture manufacturer for details.

#### Differences Between Magnetic and Electronic Transformers -- What Dimmer Should I Use?

##### Magnetic:

Magnetic transformers step down 120VAC line voltage to 12VAC or 24VAC. Magnetic transformers use copper wound around a steel core which is inductive by nature (inductance is the ability of a device to store energy in the form of a magnetic field). Magnetic transformers are relatively large and often quite heavy. To dim low-voltage fixtures using magnetic transformers, use one of Lutron's magnetic low-voltage dimmers. See chart for options.

##### Electronic:

Electronic transformers also step down 120VAC line voltage to 12VAC or 24VAC. This is done with electronic circuitry which is capacitive by nature (capacitance is the ability of a device to store an electric charge). Electronic transformers are compact and lightweight. To dim low-voltage fixtures using electronic solid state transformers, use one of Lutron's electronic low-voltage dimmers. See chart for options.

**Note:** Line voltage incandescent and low-voltage fixtures can be mixed on the same circuit, but the correct low-voltage dimmer (for the given low-voltage load) must be used. The total load **must not** exceed the dimmers capacity. **Do not** mix magnetic and electronic transformers on the same dimming circuit.

These products may be covered by one or more of the following U.S. Patents 4,876,498 4,954,768 5,038,081 and corresponding foreign patents. Lutron, Ariadni, Diva, Glyder, Nova, Nova T\*, Skylark, and Vareo are registered trademarks. Luméa 2 and Hi-Power 2\*4\*6 are trademarks of Lutron Electronics Co., Inc.

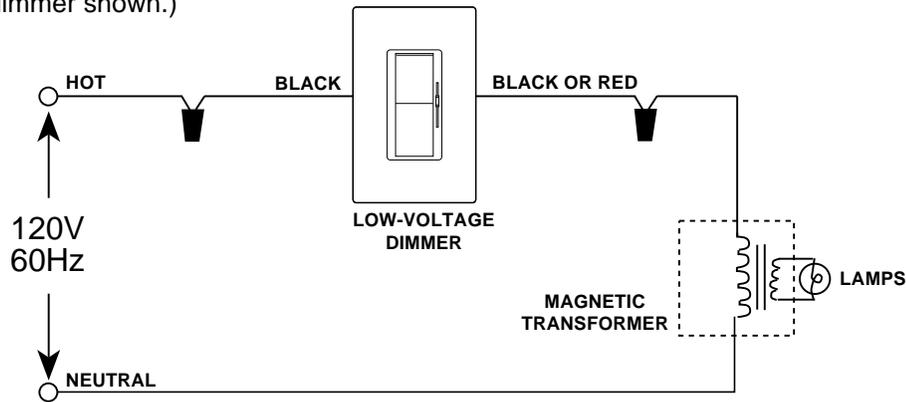
## Dimming Magnetic Transformers

### Why Use Lutron Low-Voltage Dimmers?

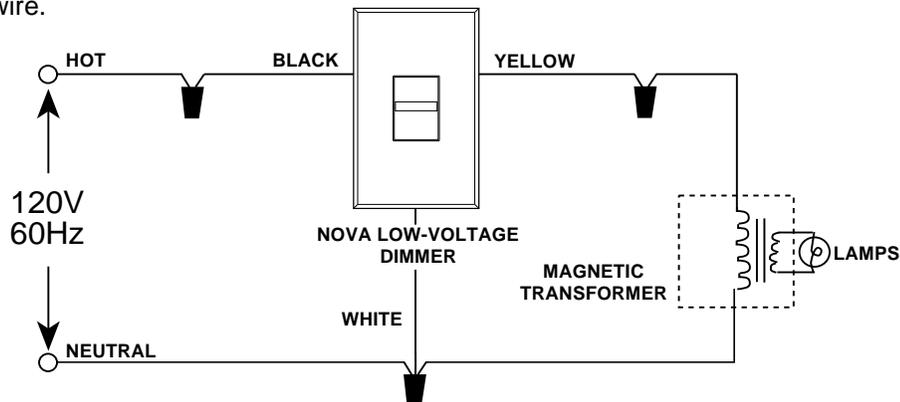
1. Magnetic transformers are inductive loads and are sensitive to DC voltages. A magnetic transformer subjected to DC voltage can overheat.
2. Do not use regular incandescent dimmers for magnetic low-voltage lighting. Regular incandescent dimmers often contain a small amount of DC voltage, which is harmless to a regular incandescent load but may damage magnetic transformers. Use Lutron low-voltage dimmers, which are designed to prevent DC voltage from being applied to the transformer.  
**Note:** A dimmer controlling an inductive load such as a magnetic transformer is also subjected to large voltage spikes and current surges. Lutron low-voltage dimmers are designed to withstand these surges.

### Wiring

Typical wiring for magnetic low-voltage dimmers (Diva low-voltage dimmer shown.)



Wiring for a Nova magnetic low-voltage dimmer (NLV-600, NLV-1000, NLV-1500). Note that only the Nova single pole, slide-to-off series requires a neutral wire.



## Dimming Electronic Transformers

### Why Use Lutron Electronic Low-Voltage Dimmers?

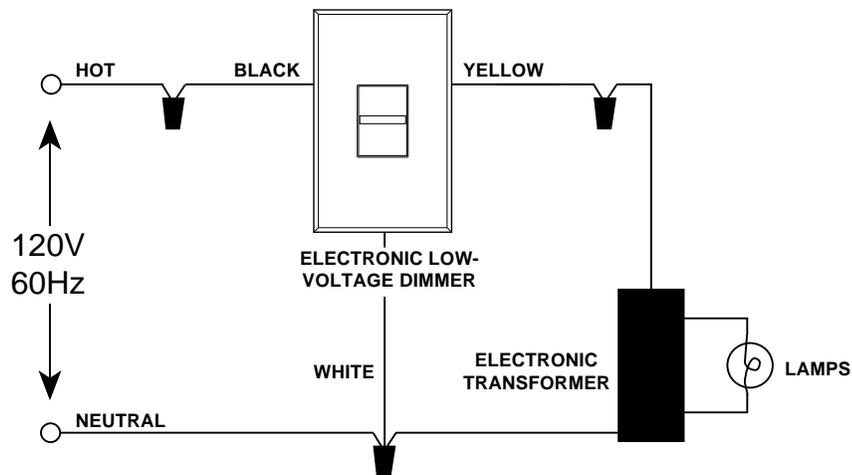
1. Lutron's electronic low-voltage dimmers are designed specifically for the special electrical requirements of electronic transformers. The electrical characteristics of an electronic transformer are capacitive (as opposed to an inductive magnetic transformer) and require special dimming considerations.
2. *Do not use regular incandescent dimmers for electronic low-voltage lighting.* When a standard low-voltage or incandescent dimmer is used on electronic transformers, there is interaction between the fixture and the dimmer. This interaction will cause any combination of the following: dimmer buzz, fixture buzz, lamp flickering, interaction between circuits, and radio frequency interference (RFI), and may damage the dimmer. To eliminate these problems, use Lutron's electronic low-voltage dimmers. Lutron's electronic low-voltage dimmers have overload protection. This protection reduces power to the lighting circuit when dimmer capacity is exceeded, thus preventing problems that could occur if the circuit is overloaded.

### Lutron Pre-Pack Architectural Dimming Systems for Dimming Low-Voltage Lighting

Pre-Pack architectural dimming systems are custom-designed for a particular application. The Pre-Pack Dimming System can be supplied with dimming modules to dim low-voltage lighting. Specify which type of transformer (electronic or magnetic) will be used.

## Wiring

Typical wiring for electronic low-voltage dimmers (Nova electronic low-voltage dimmer shown). Note: All electronic low-voltage dimmers require a neutral wire.



## Control Options for Low-Voltage Lighting

Product Family	Magnetic Low-Voltage				Electronic Low-Voltage	
	600VA	1000VA	1500VA	2000VA	300W	450W
<b>Glyder</b> Single Pole slide to off	GLV-600-				Note 1	
<b>Ariadni</b> Single Pole 3-Way	AYLV-600P- AYLV-603P-				Note 1 or Note 2	
<b>Skylark</b> Single Pole 3-Way	SLV-600P- SLV-603P-				SELV-300P- SELV-303P-	
<b>Diva</b> Single Pole 3-Way	DVLV-600P- DVLV-603P-	DVLV-10P- DVLV-103P-			Note 1 or Note 2	
<b>Maestro</b> Single Pole 3-Way	MALV-600- use MALV-600 with remote	MALV-1000- use MALV-1000 with remote			Note 1	
<b>Lum�a 2</b> Single Pole/3-Way	LTLV-603PH-				LTELV-303P	
<b>Nova</b> Single Pole slide to off Single Pole/3-Way	NLV-600- NLV-603P-	NLV-1000- NLV-1003P-	NLV-1500- NLV-1503P-	NLV-2003P-		NELV-450-
<b>Nova T*</b> Single Pole slide to off Single Pole/3-Way	NTLV-600- NTLV-603P	NTLV-1000- NTLV-1003P-	NTLV-1500- NTLV-1503P-		NTELV-300-	
<b>Vareo</b> Single Pole 3-Way	V-600 use V-600 with VETS-R	V-1000 use V-1000 with VETS-R			Note 1	

**NOTES:**

1. To dim electronic low-voltage lighting with this control type, use of a Hi-Power 2-4-6 Dimming Module is required in addition to a 600W incandescent dimmer in this product family.
2. To dim electronic low-voltage lighting with this control type, use of an electronic low-voltage interface (ELVI-1000) is required in addition to a fluorescent dimmer in this product family. This will provide dimming for up to 1000W of an ELV load.

**For loads other than those listed, please contact the toll-free Lutron Technical Assistance Hotline.**