Control type: 0-10V

0-10V is an analog lighting control protocol. Basically, a 0-10V control applies a voltage between 0 and 10 volts DC to produce a varying intensity level. There are actually two existing 0-10V standards. They are not compatible with each other, so it is essential to understand which type is required. The original 0-10V control was used for controlling theatrical lighting. A lighting console provides a separate 0-10V output for each dimming channel that connects to the input to dimmer modules located in a remote panel. The other 0-10V control method was developed for, and is used as, a standard means for controlling fluorescent dimming ballasts. It has now become popular for some drivers used for LED lighting.

0-10V Basics

The two 0-10V control types are *current source* (a theatrical dimming standard) and *current sink* (a dimming ballast standard).

There is an IEC standard for current sink controls - Standard 60929 Annex E. The standard requires that the ballast (or driver) provides full light output when the control voltage is 10 Volts (or above). As the control voltage is reduced by the control, the light level is reduced. At a control voltage of 1 volt, the ballast (driver) provides it's minimum light level. Any voltage less than 1 volt is defined as minimum. Some drivers' minimum is off, while other drivers' minimum is the lowest light level of the driver. It is important to understand what minimum is for a particular driver. For drivers that do not go to off at minimum, a separate relay or switching device is required.

An additional specification that needs to be considered is the current carrying capacity of the control. Standard 60929 Annex E requires the ballast (driver) to limit the current draw to 2.0 mA maximum. This means that a control with a 50mA capacity can operate 25 ballasts (drivers) if they have a specified current of 2.0mA.

For more information and to purchase the IEC standard, visit the IEC website at www.webstore.iec.ch.

Current sourcing controls for 0-10V are supported by the standard ESTA E1.3, Entertainment Technology – Lighting Control System – 0-10V Analog Control Protocol, Draft 9 June 1997. It defines 10V as 100% light level and 0V as off. Drivers using this protocol require the control to provide (source) the voltage.

0-10V Applications

- Basic Applications

  - One or more LED zones of a single color that require the intensity level to be adjusted to one or more preset levels.

  - Simple three color Red, Green, Blue (RGB) or four color Red, Green, Blue, White (RGBW) where one zone is assigned to each color. The controller adjusts the intensity of each of these colors so that any possible color can be produced. This color mixing is either static or sequences in 10-20 steps.

  - These applications can be for indoor or outdoor lighting and exist in retail spaces, high-end residences, and many commercial spaces.

- Complex Applications

  - A large number of LED zones are required for advanced lighting effects with color changing LEDs. There are multiple groups of RGB or RGBW LEDs and they require multiple cues and sequences. Nova, Nova T*, and Diva 0-10V controls with PP-120H relay module

  - These applications are mainly seen on building facades, retail, and entertainment spaces and in theatrical applications, but can be used in any space that calls for advanced color mixing effects.Grafik Eye 3000/4000 systems with either GRX-TVI interfaces or LP/GP panels containing TVM modules

  - Although 0-10V drivers and controls can be used, it is advisable to use DMX512 protocol products for complex applications.Grafik Eye QS products with GRX-TVI interface

Lutron Products

- Basic Applications – Lutron products conform to the 0-10V sink type controls as specified in IEC 60929 Annex E.

  - Wallbox dimmers

  - Nova, Nova T*, and Diva 0-10V controls with PP-120H relay module

  - RadioTouch RF wireless control systems

  - Grafik Eye 3000/4000 systems with either GRX-TVI interfaces or LP/GP panels containing TVM modules

  - Grafik 5000-7000 systems with LP/GP panels containing TVM modules

  - Grafik Eye QS products with GRX-TVI interface

  - Quantum products with LP/GP panels containing TVM modules

The capabilities of the Grafik Eye products listed above conform well to the basic LED functional requirements. Multiple scenes can be programmed with zones set at different intensity levels and fade rates.

The Lutron products listed above can interface with 0-10V LED products that follow the IEC standard for current sinking. If current sourcing is necessary, the only control type that can be used is a TVM interface in LP/GP Grafik System panels.