

Application Note – Compatible 0-10V Dimmers for XIM

Version 20151108

The purpose of this document is to provide customers with a list of 1-10V / 0-10V dimmers that are compatible with the XIM 1-10V module. (<http://www.xicato.com/xim-led-module/overview>). Compatibility between dimming controls and LED modules is a key factor for success in solid state lighting applications, since not all controls share the same functionality. The only way to know if a particular dimmer will work with a particular LED module is to test it. The maximum load on a control switch (main on/off) is outside of scope of this application note.

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 two existing 0-10V technical standards as mentioned below.

1. ESTA E1.3 Entertainment Technology - Lighting Control Systems - 0 to 10V Analog Control:
This standard is based on “current source” (a theatrical dimming standard), and is used for, controlling theatrical lighting. It defines 10V as 100% light level and 0V as off. Drivers using this protocol require the control to provide (source) the voltage.
2. IEC standard for current sink controls - Standard 60929 Annex E:
This standard is based on “current sink” (a dimming ballast standard), and is used for, controlling LED lighting. At a control voltage of 1 volt, the driver provides its minimum light level and provides maximum light output when the control voltage is 10 volts.

Thus, 1-10V dimming is sufficient for architectural lighting applications whereas 0-10V dimming is primarily intended for controllers and dimmers, typically found in a theatrical / entertainment control applications.

XIM is compatible with a wide range of both 0-10V and 1-10V control types from leading industry manufacturers. When the XIM is commanded to turn its light off (intensity is 0%), then the 1-10V voltage must be set to at least 0.75V in order to turn on the light. When the XIM is on, then the 1-10V voltage must be set to less than 0.5V to turn off the light.

Xicato selected 0-10V dimmers from leading control manufacturers and performed testing to determine compatibility. XIM19803013A3A modules were utilized during these tests. Refer to the table below, which shows dimmer information and resulting light output intensity.

0-10V Dimmer Manufacturer	Series	Model-Number	Max. # of XIM	Trim potentiometer	Interface	Sink or Source type	Command-Off-(Yes/No)	Intensity @ (1) XIM *	Intensity @ (6) XIM *
WattStopper	Miro	DCLV1	416	None	Digital	Sink	Yes	1-100%	1-100%
HUNT Dimming	Simplicity	PS-LED-010-120	Contact mfg.	None	Analog	Sink	Yes	1-100%	1-100%
HUNT Dimming	Simplicity	PS-LED-010-3W-120	Contact mfg.	None	Analog	Sink	Yes	1-100%	1-100%
Lutron Electronics	DIVA	DVTV	250	2	Digital	Sink	Yes	1-100%	1-100%
Lutron Electronics	Nova T	NTFTV	Contact mfg.	None	Analog	Sink	Yes	1-100%	1-100%
Lutron Electronics	Nova T	NFTV	Contact mfg.	1	Analog	Sink	Yes	1-100%	1-100%
Synergy Lighting Controls	Synergy	SYRSP 1G 3BT BJ4 EXT	166	None	Digital	Sink	Yes	1-100%	2-100%
Wall-Stoppers-	Architectural	ADF120277	416	None	Analog	Sink	Yes	1-91%	1-100%
Synergy Lighting Controls	Synergy	ISD BC 120/277	208	1	Analog	Sink	Yes	1-93%	1-100%
Legrande-Pass-Seymour	Titan	CD4FB	Contact mfg.	None	Analog	Sink	Yes	1-90%	1-100%
Philips	Sunrise	SR1200ZTUNV	Contact mfg.	1	Analog	Sink	Yes	1-93%	1-100%
Leviton	Renoir	AWSMG-7DW	625	None	Analog	Sink	Yes	5-94%	10-100%
Leviton	Renoir	AWRMG-7DW	625	None	Analog	Sink	Yes	4-91%	10-100%
Leviton	Renoir	AWSMT-7DW	625	None	Analog	Sink	Yes	8-93%	12-100%
Leviton	Illumatech	IP710-DL	Contact mfg.	1	Analog	Sink	Yes	1-95%	1-100%

* The intensity may vary according to actual field conditions due to a number of factors.

In these systems, the XIM sources the control current and the dimmer position determines the control voltage. The control signal is a DC voltage that varies between 0 and 10V for a XIM. When a XIM is on and the control voltage is between 0.5V and 1.0V, the intensity will be 1.0%. When the control voltage is greater than 9.0V, the intensity will be 100%. When the voltage is between 1V and 9V, the minimum intensity of light output can be calculated based on the below formula.

$$\text{Minimum Intensity} = 12.375\% * (V_{1to10V} - 1V) + 1\%$$

For example, if the measured output voltage of the XIM dimming circuit at minimum dim position is 1.3V then,

$$\begin{aligned} \text{Minimum Intensity} &= 12.375\% * (1.3 - 1) + 1\% \\ &= 4.7\% \end{aligned}$$

The last two columns in the above table represent intensity for 0-10V dimmers based on above formula and measured voltages using a voltmeter.

0-10V Dimmer Considerations

1. Light output level is directly controlled by a DC voltage (control signal) applied to the control interface of the device. 0-10V / 1-10V is the direct relationship between a controller (i.e., dimmer) and lights. 0V to 1V is the minimum/off value and 1V to 10V is increasing linearly from minimum value to maximum value.
2. When pairing a dimmer with a XIM, it is important to identify the maximum number of XIMs that the dimmer can support. Each XIM module should budget a maximum of 0.12mA being sourced into the control lines. For example, if a dimmer control wires are rated for 30mA maximum, the maximum number of XIMs this dimmer can operate would be

$$\frac{30 \text{ mA}}{0.12 \text{ mA}} = 250$$

Consult the dimmer manufacturer for dimmer ratings and do not overload the dimmer control.

3. Xicato recommends using only one type of LED module (i.e. XIM) on 0-10V dimmers. Combining different types of LED modules, such as XIM with XTM, may result in diminished performance.

Potentiometer (pot) dimming

If you are utilizing a pot dimming, logarithmic (log) or audio taper must be used in a 1:1 (1 pot per XIM module) to ensure excellent performance and control range. The recommended resistance pot value is 100k ohms. Control voltage is based on the pot resistance setting (knob position).

Conclusion

XIM 1-10V is compatible with a wide array of standard 1-10V and 0-10V dimmers. Performance results may vary based upon dimmer model, manufacturer, circuit wiring and circuit loading. Absence of a dimmer from the above table does not imply incompatibility. If another 1-10V / 0-10V dimmer is not listed, and you wish to know more about its compatibility with XIM, please contact your Xicato technical representative.