



**ANSI E1.3 - 2001 (R2011)
Entertainment Technology
Lighting Control Systems
0 to 10 V Analog Control Specification**

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This document is a reaffirmation without substantive changes of ANSI E1.3 -
2001.

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The Control Protocols Working Group, which authored this Standard, consists of a cross section of entertainment industry professionals representing a diversity of interests. PLASA is committed to developing consensus-based standards and recommended practices in an open setting.

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1 Scope

This standard describes a method of controlling equipment by means of an analog control voltage. It is primarily intended for lighting control equipment (controllers and dimmers) although any equipment which might be controlled by a lighting controller (intelligent lighting, strobe lights, fog machines, etc.) could use this control method.

Some 0 to 10 V controlled devices (such as dimmable fluorescent ballasts) require current-sink controllers. E1.3 controllers are current-source devices and cannot control these receivers without modification or additional interface components.

This standard does not address electro-magnetic compatibility (EMC) issues, which might result from control line oscillations caused by poorly designed controllers or cabling practices.

2 History

Prior to digital and analog multiplex control systems, most remote control of lighting dimmers was done using a wire-per-dimmer system. Each dimmer had a dedicated control wire (or pair of wires). The output voltage of the dimmer was proportional to the signal on the control wire. Some of these wire-per-dimmer systems required that the control voltage be the same frequency and in phase with the dimmer's AC output. Some systems used high voltage control signals. Some systems used low voltage direct current control signals.

The safety and flexibility of the low voltage DC control system gradually made it the system of choice. Many different low voltage systems were used. Some common control signals were 0 to 10 V, 0 to 15 V, 0 to 24 V, 0 to 28 V. In most cases zero volts was considered "off." Negative control voltages were also common: 0 to -10 V, 0 to -15 V, 0 to -28 V. Again in most cases zero volts was off. Some control signals used a voltage other than zero for off; for example 2 to 7.6 V and 2 to 10.5 V. In these, the lower voltage was typically "off."

Over time the 0 to 10 V control system became the most popular. As of the writing of this specification, 0 to 10 V control systems are popular not only in lighting but for motor control and industrial automation as well. Many digital to analog converters have a standard 0 to 10 V setting. The 0 to 10 V control system is easy to convert to percentage (add a zero), is easy to implement using operational amplifiers and consumer circuits, is a low enough voltage to be safe and is a high enough voltage to avoid most noise problems.

3 Purpose

The purpose of this specification is to document the now common 0 to 10 V direct current control system as typically used in lighting applications and provide specifications for new designs.

4 Applicability

This specification is intended for the use of:

- System specifiers who wish to insure that the equipment they specify meets an industry standard control system.
- Equipment manufacturers seeking to adopt an industry standard control system for basic controller/receiver interfacing.
- Lighting technicians who wish to understand and troubleshoot analog control systems.

Adoption of this standard is strictly voluntary. It is not intended as a replacement for existing protocols already in use, but as an addition to existing protocols and a basis for future products. The goal is to broaden the installed base of controllers, dimmers and other equipment that can communicate with each other.