Entertainment Services and
Technology Association

American National Standard
E1.3 - 2001 (R2006)
Entertainment Technology
Lighting Control Systems
0 to 10V Analog Control Specification

CP/1997-1003r10

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The ESTA Technical Standards Program

The ESTA Technical Standards Program was created to serve the ESTA membership and the entertainment industry in technical standards related matters. The goal of the Program is to take a leading role regarding technology within the entertainment industry by creating recommended practices and standards, monitoring standards issues around the world on behalf of our members, and improving communications and safety within the industry. ESTA works closely with the technical standards efforts of other organizations within our industry including USITT, PLASA, and VPLT as well as representing the interests of ESTA members to ANSI, UL, and the NFPA. The Technical Standards Program is accredited by the American National Standards Institute as Accredited Standards Committee E1, Safety and Compatibility of Entertainment Technical Equipment and Practices.

The Technical Standards Committee (TSC) was established by ESTA's Board of Directors to oversee and coordinate the Technical Standards Program. Made up of individuals experienced in standards-making work from throughout our industry, the Committee approves all projects undertaken and assigns them to the appropriate working group. The Technical Standards Committee employs a Technical Standards Manager to coordinate the work of the Committee and its working groups as well as maintain a "Standards Watch" on behalf of members. Working groups include: Camera Cranes, Control Protocols, Electrical Power, Floors, Fog and Smoke, Followspot Position, Photometrics, and Rigging.

ESTA encourages active participation in the Technical Standards Program. There are several ways to become involved. If you would like to become a member of an existing working group, as have over two hundred people, you must complete an application which is available from the ESTA office. Your application is subject to approval by the working group and you will be required to actively participate in the work of the group. This includes responding to letter ballots and attending meetings. Membership in ESTA is not a requirement. You can also become involved by requesting that the TSC develop a standard or a recommended practice in an area of concern to you.

The Control Protocols Working Group, which authored this standard, consists of a cross section of entertainment industry professionals representing manufacturers, consultants, dealers, and end-users. ESTA is committed to developing consensus-based standards and recommended practices in an open setting. Future Control Protocols Working Group projects will include updating this publication as changes in technology and experience warrant, as well as developing new standards and recommended practices for the benefit of the entertainment industry.

Contents

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 10V 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 10V, 0 to 15V, 0 to 24V, 0 to 28V. In most cases zero volts was considered "off." Negative control voltages were also common: 0 to -10V, 0 to -15V, 0 to -28V. Again in most cases zero volts was off. Some control signals used a voltage other than zero for off; for example 2 to 7.6V and 2 to 10.5V. In these, the lower voltage was typically off.

Over time the 0 to 10V control system became the most popular. As of the writing of this specification, 0 to 10V 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 10V setting. The 0 to 10V 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 10V 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: