



**ANSI E1.3 - 2001 (R2016),  
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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B-Hive Industries, Inc.	LDI	Ken Vannice
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Candela Controls Inc.	ProSight Specialty Insurance	Steve A. Walker & Associates*
Clark-Reder Engineering	Sapsis Rigging	Ralph Weber
Columbus McKinnon	Theatre Safety Programs	

### INVESTOR

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Entertainment Structures Group	Musique Xpress Lights, Inc.*	Arjan van Vught
Tony Giovannetti	Oasis Stage Werks	Stephen Vanciel
IATSE Local 514	See Factor Industry	Vincent Lighting Systems*

\*Investor for over 15 years

## **Contact Information**

### **Technical Standards Manager**

Karl G. Ruling  
Entertainment Services and Technology Association  
630 Ninth Avenue, Suite 609  
New York, NY 10036  
USA  
1-212-244-1505  
karl.ruling@esta.org

### **Assistant Technical Standards Manager**

Erin Grabe  
Entertainment Services and Technology Association  
630 Ninth Avenue, Suite 609  
New York, NY 10036  
USA  
1-212-244-1505  
erin.grabe@esta.org

### **Technical Standards Council Co-chairpersons**

Mike Garl	Mike Wood
Mike Garl Consulting LLC	Mike Wood Consulting LLC
1-865-389-4371	1-512-288-4916
mike@mikegarlconsulting.com	mike@mikewoodconsulting.com

### **Control Protocols Working Group Co-chairpersons**

Michael Lay	Maya Nigrosh
Philips Color Kinetics	Electronic Theatre Controls, Inc.
1-781-418-9145	1-608-831-4116
michael.lay@philips.com	mnigrosh@etconnect.com

## Acknowledgements

The Control Protocols Working Group members when this document was approved by the working group on 28 December 2015 were:

### Voting members (Name; Representing; Interest category)

Daniel W. Antonuk; Electronic Theatre Controls, Inc.; MP  
Paul Beasley; Walt Disney Company; U  
Robert Bell; Acuity Brands Inc.; MP  
Marcus Bengtsson; LumenRadio AB; MP  
Scott M. Blair; Full Throttle Films/ VER; DR  
Brent Boulnois; Candela Controls, Inc.; DR  
Ian Campbell; Doug Fleenor Design, Inc.; MP  
Milton Davis; Doug Fleenor Design, Inc.; MP  
Adam De Witt; Adept Anomaly; U  
Gary Douglas; Acuity Brands Inc.; MP  
Bill Ellis; Candela Controls, Inc.; DE  
Doug Fleenor; Doug Fleenor Design, Inc.; MP  
Randy L. Fox; Walt Disney Company; U  
Andrew Frazer; Stellascapes.com; MP  
Robert Goddard; Goddard Design Co.; MP  
Dennis Grow; I.A.T.S.E. Local 728; U  
Mitch Hefter; USITT; U  
Jeremy Hochman; Full Throttle Films/ VER; DR  
Harrison Hohnholt; City Theatrical, Inc.; MP  
John Huntington; I.A.T.S.E. Local 1; U  
Michael Karlsson; LumenRadio AB; MP  
Jonathan Kemble; Barco; MP  
Paul Kleissler; City Theatrical, Inc.; MP  
Edwin S. Kramer; I.A.T.S.E. Local 1; U  
Ulrich Kunkel; E3 Engineering & Education for Entertainment GmbH; U  
Roger Lattin; I.A.T.S.E. Local 728; U  
Hans Lau; LumenRadio AB; MP  
Michael Lay; Royal Philips; MP  
Joshua Liposky; Lex Products Corp.; CP  
Dan Lisowski; University of Wisconsin - Madison; DE  
Kevin Loewen; Acuity Brands Inc.; MP  
Tyrone Mellon, Jr.; Lex Products Corp.; CP  
Joshua Moyerman; Stellascapes.com; MP  
Peter Newman; Open Lighting Project; G  
Simon Newton; Open Lighting Project; G  
Maya Nigrosh; Electronic Theatre Controls, Inc.; MP  
Andrew Nikel; City Theatrical, Inc.; MP  
Kimberly Corbett Oates; Schuler Shook; DE  
Jim Ohrberg; Candela Controls, Inc.; DR  
Claude Ostyn; Full Throttle Films/ VER; DR  
Edward A. (Ted) Paget; Electronic Theatre Controls, Inc.; MP  
Jason Potterf; Cisco; MP  
Charles Reese; Production Resource Group; DR  
Alan M. Rowe; I.A.T.S.E. Local 728; U  
Larry Schoeneman; DesignLab Chicago, Inc.; DR  
Dane Styczynski; University of Wisconsin - Madison; DE  
Steve Terry; Electronic Theatre Controls, Inc.; MP  
Maurits van der Hoorn; Acuity Brands Inc.; MP

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Ken Vannice; Ken Vannice LLC; G  
Peter Willis; Howard Eaton Lighting Ltd.; CP

Observer members (Name; Representing; Interest category)

Christian Allabauer; Lighting Innovations, Hermann Sorger GmbH; CP  
Simon Alpert; Lighttech Event Technologies; CP  
Klaus Amling; Licht-Technik; MP  
Matthew Ardine; IATSE Local 728; U  
Robert Barbagallo; Solotech Inc.; U  
Adam Bennette; Electronic Theatre Controls, Inc.; MP  
David Bertenshaw; David Bertenshaw; G  
Stephen Bickford; T. Kondos Associates; U  
Torrey Bievenour; Vision Quest Lighting; G  
Lee J. Bloch; Bloch Design Group, Inc.; G  
David A. Boller; Organic Machines LLC; CP  
Ron Bonner; PLASA EU; G  
Stef Bressers; MagicFX B.V.; MP  
André Broucke; André Broucke; G  
Ken Bruns; Lumenpulse Lighting Inc.; MP  
Justyn Butler; JBOTS; CP  
Jean-Francois Canuel; A.C. Lighting Ltd.; CP  
Steve Carlson; High Speed Design, Inc.; MP  
Sang-II Choi; Kyungpook National University; G  
Jon Chuchla; Audio Visual Systems, Inc.; G  
Soo-Myong Chung; Bloch Design Group, Inc.; G  
Paul J. Clark; HxDx; CP  
Edward R. Condit; Edward R. Condit; G  
Fraser Connolly; Artistic Licence Holdings; DE  
Eric Cornwell; West Side Systems; U  
Stuart Cotts; Oregon Shakespeare Festival; U  
Klas Dalbjorn; TC Group; MP  
Ben Darrington; Wireless Solutions Sweden AB; MP  
Jeremy Day; Lumenpulse Lighting Inc.; MP  
Gilray Densham; CAST Group Inc; MP  
Larry Dew; W.A. Benjamin Electric Co.; DE  
Gary Dove; Dove Systems; MP  
Tucker Downs; Tucker Downs; U  
Yongshun Duan; Macostar International Ltd.; CP  
Hamish Dumbreck; James Embedded Systems Engineering; MP  
Lauren E. Dunn; Lauren E. Dunn (Larry); DE  
Jerry Durand; Durand Interstellar, Inc.; CP  
James Eade; ABTT; G  
Andrew Eales; Rhodes University ; U  
Matthew Earnshaw; acdc LED Ltd.; MP  
Paul K. Ericson; Sparling & IES; DE  
Jon R. Farley; Sixteenth Avenue Systems; CP  
Martin Farnik; Robe Show Lighting s.r.o.; MP  
Derek R. Flickinger; Interactive Homes, Inc.; U  
Trevor Forrest; Helvar Lighting Control; MP  
Howard Forryan; Harting KGAA; G  
Steve Friedlander; Auerbach Pollock Friedlander; U  
Ed Garstkiewicz; Harting KGAA; G  
Philip Gartner; AusChristmasLighting; U  
Jerry Gorrell; Theatre Safety Programs; G



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---

Tom Grimes; Barco; MP  
Rob Halliday; Rob Halliday; U  
Sean Harding; High Output, Inc.; G  
Douglas Heriot; Douglas Heriot; MP  
Bill Hewlett; Hewlett Electronics; CP  
Jim Holladay; Luxence; G  
Wayne David Howell; Artistic Licence Holdings; DE  
Il Soon JANG; Electronics and Telecommunications Research Institute; G  
Sierk Janszen; Ground Zero; U  
Eric Johnson; Eric Johnson; G  
Rob Johnston; Interactive Technologies, Inc.; MP  
Jussi Kallioinen; Eastway Sound & Lighting; U  
Tae Gyu Kang; Electronics and Telecommunications Research Institute; G  
Hyun Jong Kim; Electronics and Telecommunications Research Institute; G  
Peter Kirkup; Peter Kirkup; G  
Hiroshi Kita; Marumo Electric Co., Ltd.; MP  
Phil Klapwyk; IATSE Local 891; U  
Mark T. Kraft; Lehigh Electric Products Co.; MP  
Kristen Kuipers; Newcomb & Boyd; DE  
Jason Kyle; JPK Systems Ltd.; MP  
Rick Leinen; Leviton Manufacturing Co., Inc.; MP  
Hans Leiter; Electronic Theatre Controls, Inc.; MP  
Jon Lenard; Applied Electronics; MP  
Maarten Lepelaars; eldoLED; MP  
Sang-Kyu Lim; Electronics and Telecommunications Research Institute; G  
Mark Manthei; Shure Inc.; G  
Paul F. Mardon; Pulsar Ltd.; MP  
Mick Martin; ShowCAD Control Systems; MP  
Paul Kenneth McEwan; Cooper Controls Ltd.; MP  
Brian McKelvey; Brian McKelvey; G  
John Mehlretter; Lehigh Electric Products Co.; MP  
Avraham "Avi" Mendall Mor; Lightswitch; U  
Jeff T. Miller; Walt Disney Company; U  
John Musarra; John Musarra; U  
Tobin Neis; Barbizon Companies; DR  
Dan T. Nguyen; LynTec; MP  
Lars F. Paape; Scientific Algorithms and Embedded Systems; U  
Ben Peoples; Pittsburgh Hoist & Sandbag Company; CP  
Gary Pritchard; LSC Lighting Systems PTY Ltd; MP  
Torben Kaas Rasmussen; Martin Professional A/S; G  
Charlie Richmond; Richmond Sound Design Ltd.; CP  
Bernardo Benito Rico; Ben-Ri Electronica S.A.; MP  
Steve Roberts; Carr & Angier; G  
Erwin Rol; Erwin Rol; G  
Dietmar Rottinghaus; Connex GmbH; MP  
Richard Salzedo; Avolites Ltd.; MP  
Yngve Sandboe; Sand Network Systems, Inc.; MP  
Nicolai Gubi Schmidt; Gobo & Highlight A/S; DR  
Martin Searancke; Dream Solutions Ltd.; MP  
John Sellers; AIM Northwest; G  
Ford Sellers; Chauvet Lighting; MP  
Andrew Sherar; Lightmoves PLC; MP  
Sean Sill; Open Lighting Project; G  
Ashley Simper; TMB; DR

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---

Storm K. Staley; Stormwerx; U  
Eckart Steffens; Soundlight, the DMX Company; CP  
Ralph Stillinger; Royal Philips; MP  
Bart Swinnen; Luminex LCE; MP  
Arnold Tang; Arnold Tang Productions; U  
Geoffrey O. Thompson; IEEE 802.3/Nortel Networks; G  
Christopher Tilton; Westlake Reed Leskosky; DE  
Robert Timmerman; Royal Philips; MP  
David Timmins; Jands Electronics; MP  
Victoria Tisdale; Google Summer of Code 2013; G  
J. B. Toby; Avolites Ltd.; MP  
James Tomlinson; Team Tomlinson; G  
Bob Toms; Catalyst Microsystems LLC; G  
Robert Tooker; Robert Tooker; U  
Tad Trylski; Tad Trylski; U  
Stephen J. Tyrrell; Quantum Logic; MP  
Tracy Underhill; 4U Consulting; G  
Steve Unwin; Pulsar Ltd.; MP  
Samuli Valo; Picturall Ltd.; MP  
Carlo Venturati; Clay Paky S.P.A.; MP  
Will Wagner; Carallon Ltd.; MP  
Oliver Waits; Avolites Ltd.; MP  
John Warwick; Royal Philips; MP  
Colin Waters; TMB; DR  
Ralph Weber; ENDL Texas; G  
Lars Wernlund; Capture Visualisation AB; MP  
Michael (Mike) Whetstone; Integrated Theatre, Inc.; CP  
Loren Wilton; Showman Systems; CP  
C. S. Wong; Macostar International Ltd.; CP  
Jiantong Wu; Beijing Special Engineering Design & Research Institute; G  
Kehang Wu; Shure Inc.; G  
David Yellin; LightMinded Industries, Inc.; MP  
Larry Zoll; Zoll Design & Consulting, LLC; U

**Key to Interest Categories**

CP = custom-market producer  
DR = dealer rental company  
MP = mass-market producer

DE = designer  
G = general interest  
U = user

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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.