



Illuminating
ENGINEERING SOCIETY

ANSI/IES TM-23-17

Lighting Control Protocols

Currently in preview, click buy full version



Lighting Control Protocols

Publication of this Technical Memorandum
has been approved by the IES.
Suggestions for revisions
should be directed to IES.

Prepared by:
By the Control Protocols Committee

Copyright 2017 by the Illuminating Engineering Society.

Approved by the IES Standards Committee, November 28, 2017, as a Transaction of the Illuminating Engineering Society of North America.

Approved by the American National Standards Institute, October 27, 2017, as an American National Standard.

All rights reserved. No part of this publication may be reproduced in any form, in any electronic retrieval system or otherwise, without prior written permission of the IES.

Published by the Illuminating Engineering Society of North America, 120 Wall Street, New York, New York 10005

IES Standards and Guides are developed through committee consensus and produced by the IES Office in New York. Careful attention is given to style and accuracy. If any errors are noted in this document, please forward them to the Brian Liebel, Director of Standards and Research at the above address for verification and correction. The IES welcomes feedback and comments.

ISBN# 978-0-87995-252-5

Printed in the United States of America.

DISCLAIMER

IES publications are developed through the consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on lighting recommendations. While the IES administers the process and establishes policies and procedures to promote fairness in the development of consensus, it makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

The IES disclaims liability for any injury to persons or property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document.

In issuing and making this document available, the IES is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the IES undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The IES has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the IES list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or statement of compliance with the requirements of this document shall not be attributable to the IES and is solely the responsibility of the certifier or maker of the statement.

Prepared by the IES Control Protocols Committee:

Howard Wolfman, *Chair*

Joe Bokelman, *Vice Chair*

Rick Miller, *Secretary*

P. Baselici*	M. Goren	M. Maloney*	L. Schoeneman
J. Beaver*	D. Hameed*	R. McAnally	S. Segal
S. Berjansky*	T. Hamilton*	R. McBride*	A. Sproelich*
J. Briscoe	R. Harvey	R. Luhrs*	L. Stefans*
S. Carlson*	M. Hefter	A. Mor*	J. Sundry*
D. Cavalcanti*	L. Henry	D. Nichols*	J. Tan*
D. Christensen*	Y. Hiebert	D. Noiseux*	M. Timmings*
C. Curtis*	J. Hu*	B. Palmer*	F. Ulloa*
R. Dagostino*	A. Jayawardena*	J. Perucho*	M. Wilbur*
S. Djokic*	M. Jouaneh*	E. Poland*	H. Yappe*
W. Ellis	C. Kinder*	M. Poplawski	D. Your*
P. Ericson	N. Lal*	R. Pustinger*	S. Ziegemeis*
J. Farrar*	A. Levine*	T. Reemtsma	
B. Feagin*	M. Lunn*	B. Renouf*	
J. Frazer*	J. Mabray*	F. Rubinstein*	

AMERICAN NATIONAL STANDARD

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether that person has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation to any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of approval. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Currently in preview, click buy full version

Please refer to the IES Bookstore after you purchase this IES Standard, for possible
Errata, Addenda, and Clarifications, www.ies.org/bookstore

Please refer to ANSI/IES RP-16-17 Nomenclature and Definitions,
www.ies.org/standards/ansi-ies-rp-16/

Contents

FOREWORD	1
1.0 INTRODUCTION	1
1.1 Scope	1
1.2 Document Structure	1
2.0 CORE DEFINITIONS AND CONCEPTS	2
2.1 ASCII (American Standard Code for Information Interchange)	2
2.2 Ballast, Drivers, and Transformers	2
2.3 Bus	2
2.4 Cobtroller	2
2.5 Gateway	2
2.6 Graphical User Interface (GUI)	3
2.7 Interchangeability	3
2.8 Conformance vs Compliance	3
2.9 Interoperability	3
2.10 Multiple Protocols in one System	4
2.10.1 Front-End Protocols	4
2.10.2 Back-End Protocols	4
2.11 Network	4
2.12 Open Systems Interconnection (OSI)	4
2.12.1 Layer 1: Physical Layer	4
2.12.2 Layer 2: Data Link Layer	4
2.12.3 Layer 3: Network Layer	4
2.12.4 Layer 4: Transport Layer	4
2.12.5 Layer 5: Session Layer	5
2.12.6 Layer 6: Presentation Layer	5
2.12.7 Layer 7: Application Layer	5
2.13 Program	5
2.14 Protocol and Communication Mode and Method	5
2.14.1 Open Protocols	5
2.14.2 Proprietary Protocols	6
2.15 Topology	6
2.16 User	6
2.17 XML (Extensible Markup Language)	6
3.0 SYSTEM LIGHTING CONTROL ARCHITECTURES	6
4.0 METHODS OF DIMMING CONTROL OF LIGHT SOURCES	9
4.1 Two-Wire Line-Voltage Forward Phase Control for Dimming	9
4.3 Three-Wire Line Voltage (Power or Class 1) for Fluorescent or SSL Dimming	9
4.4 Four-Wire 0-10VDC Sinking (Class 1 or Class 2 Low Voltage) for Fluorescent or SSL Dimming	9
4.5 Dali (Class 1 or 2) for Dimming	10
4.6 Pulse-Width Modulation (PWM) for LED Dimming	10

4.7	Analog or Constant-Current LED Dimming.....	10
4.8	Power Wiring vs. Class 1 Wiring vs. Class 2 Wiring vs. Communications Wiring	11
5.0	TOPOLOGY.....	11
5.1	Daisy Chain.....	12
5.2	Bus	12
5.3	Star (A.K.A. Hub and Spoke).....	12
5.4	Ring.....	12
5.5	Mesh	12
5.6	Free (Topology Free).....	12
6.0	THE PHYSICAL LAYER	12
6.1	RS232 (Currently TIA-232).....	13
6.2	RS485 (Currently TIA-485).....	13
6.3	Ethernet.....	13
6.4	USB (Universal Serial Bus).....	13
6.5	Wireless.....	14
6.6	Other Physical Layers	14
7.0	PROTOCOLS	14
7.1	Common Name: 0-10VDC (1-10VDC) Current Sinking.....	14
7.2	Common Name: 0-10VDC Front End (Current Source).....	15
7.3	Common Name: ACN.....	15
7.4	Common Name: BACNET	16
7.5	Common Name: DALI	17
7.6	Common Name: DMX512.....	18
7.7	Common Name: ENOCEAN	19
7.8	Common Name: KONNEX (KNX).....	19
7.9	Common Name: LONWORKS	20
7.10	Common Name: MIDI and MID. Scene Control.....	20
7.11	Common Name: MODBUS	21
7.12	Common Name: RDM	22
7.13	Common Name: SMT.....	22
7.14	Common Name: IP-Based Protocols (Commonly Referred to as TCP/IP).....	23
7.15	Common Name: WPANS – Wireless Personal Area Networks (Including Zigbee and Snap).....	24
7.16	Common Name: Microwave	25
7.17	Automatic Demand Response	25
7.18	WI-FI.....	25
7.19	Bluetooth.....	26
7.20	Common Name: Elms	27
7.21	Other Protocols	28
8.0	COMMISSIONING	28
	REFERENCE STANDARDS	29
	ANNEX A – PHYSICAL LAYERS.....	30
	ANNEX B – INTEROPERABILITY: THE OSI 7-LAYER MODEL AND VLC	35