American National Standard
E1.11 – 2008 (R2013)
Entertainment Technology
USITT DMX512-A
Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories

CP/2007-1013r3.1

This document was approved as an American National Standard by the ANSI Board of Standards Review on 13 March 2013. It is a reaffirmation of the 2008 edition of the Standard.

This standard was originally published when the Entertainment Services and Technology Association was operating under the name of PLASA North America. ESTA has reverted to its original name, and this document has been rebranded with the current corporate name and logo. No changes have been made to the contents of the standard.

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The ESTA Technical Standards Program

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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. ESTA is committed to developing consensus-based standards and recommended practices in an open setting.

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CP	Custom-market Producer
DE	DEsigner incorporating the subject matter of the working group in projects
DR	Dealer or Rental company
G	General interest
MP	Mass-market Producer
U	User

Contents

Foreword
(This foreword contains no requirements and is not part of E1.11.)

This Standard describes a method of digital data transmission between controllers and controlled lighting equipment and accessories, including dimmers and related equipment. This Standard is intended to provide for interoperability at both communication and mechanical levels with controllers made by different manufacturers.

There are five normative annexes in this Standard. These address extensions of the base standard and are considered part of the Standard, which means that when an extension described in an Annex is implemented, compliance with the annex is mandatory. However, a product compliant with the Standard can be manufactured without implementing these annexes.

The original version of the DMX512 Standard was developed in 1986 by the Engineering Commission of the United States Institute for Theatre Technology, Inc. (USITT). Minor revisions were made in 1990. DMX512 has gained international acceptance throughout the entertainment industry, even though USITT is not formally accredited as a standards making body. The earlier versions of this Standard covered only data used by dimmers. In practice this Standard has been used by a wide variety of devices; this version recognizes this fact.

In 1998, it became evident that additional updates to the Standard were necessary and formal recognition through an internationally recognized standards organization was required. USITT issued a Call for Comments in order to solicit recommendations for changes to the Standard. At the same time, USITT transferred maintenance of DMX512 to ESTA's ANSI-accredited Technical Standards Program, now operating as ESTA's Technical Standards Program.

A Task Group established under the TSP’s Control Protocols Working Group acted on the proposals received in response to the Call for Comments. The primary goal was to make editorial updates to DMX512 appropriate for current times, including the addition of technical features while maintaining a balance with backward compatibility. Many proposals, while technically innovative, could not be accepted because their implementation would not have been backward compatible and would have immediately rendered obsolete most of the installed base of equipment.

In 2004, as a result of the actions taken on those proposals and subsequent development under the *Policies and Procedures* of the ESTA Technical Standards Program, E1.11-2004 was approved as an American National Standard. Despite being an American National Standard, development has had strong international participation and support.

Beginning in 2007, based on comments and requests from users and manufacturers, minor revisions were made to E1.11-2004 and submitted to the public for review and comment. These changes included defining one of the reserved Alternate START Codes for UTF-8 text packets, a note emphasizing refresh timings, and removal of the informative PICS (Protocol Implementation Compliance Statement) clauses. The PICS clauses were simply a summary of the mandatory requirements of the standard, but often had to employ language that used double negatives and led to confusion about some requirements. The 2008 edition was the result of those revisions to the 2004 edition. This edition is a reaffirmation of the 2008 edition.

1 General

1.1 Scope

This Standard describes a method of digital data transmission between controllers and controlled equipment as described in Clause 1.4 and accessories, including dimmers. It covers electrical characteristics, data format, data protocol, and connector types.

This Standard is intended as a guide for:

1. Equipment manufacturers and system specifiers who wish to integrate systems of lighting equipment and accessories, including dimmers, with controllers made by different manufacturers.
2. Equipment manufacturers seeking to implement a standard digital transmission protocol in their lighting control and accessory products.
3. System specifiers and designers to gain detailed information about allowed connectors and allowed system topologies.

This standard is not intended to replace existing protocols other than USITT DMX512 and DMX512/1990. Cable requirements and premises wiring are not within the scope of this Standard.

Equipment compliant with this Standard will be marked DMX512-A or USITT DMX512-A in order to distinguish it from the previous (informally recognized) versions. Unless otherwise noted, references to DMX512 in this document refer to DMX512-A.

1.2 Overview and Architecture

This standard uses a simple asynchronous eight-bit serial protocol consisting of an untyped byte stream produced by standard UARTs, The physical media, not addressed in this document, is normally, but not exclusively, a two-pair cable, with each pair serving as a data link. The media is driven using ANSI/TIA/EIA-485-A-1998 (hereafter referred to as EIA-485-A in this document) balanced data transmission techniques. Physical connection at devices is via 5-pin XLR connectors or by “hard-wiring” to terminals. Restricted use of connectors other than 5-pin XLR is allowed if certain conditions apply (see clause 7).

Data on the primary data link is sent in packets of up to 513 slots. The first slot is a START Code, which defines the information in the subsequent slots in the packet. The interoperability of equipment complying with the Standard is largely due to the use of the NULL START Code by transmitting devices. Proper function is dependent upon the receiving device(s) extracting the pertinent data for processing from each transmitted packet.

Data on the secondary data link, when implemented, is used for a variety of purposes, all of which fall within the scope of EIA-485-A. Identification of the required circuit topology for any particular implementation is defined.

1.3 Appropriate uses of this Standard

Equipment designers and general users of this Standard will recognize that this Standard is intended to fill only a limited range of uses. Other standards will be more appropriate for different uses. This is not intended to support a venue wide network that can carry data for lighting, sound, and scenery mechanization, for example, all on the same wire.

This Standard does not require mandatory error checking of NULL START Code packets. There is no assurance that all DMX512 packets will be delivered. It is common practice for merge units and protocol converters to drop packets that they cannot process in a timely manner. The 1986 and 1990 versions of the USITT Standard specifically allow dimmers to ignore packets that they cannot process in a timely manner, and this concept survives in this version of the Standard with respect to NULL START Code packets.

