ANSI E1.27-1 - 2006 (R2016)
Entertainment Technology—Standard for Portable Control Cables for Use with ANSI E1.11 (DMX512-A) and USITT DMX512/1990 Products

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This document is a reaffirmation without substantive changes of ANSI E1.27-1 - 2006.

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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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Foreword

(This foreword contains no mandatory requirements.)

This standard describes the types of portable cable used to interconnect products which comply with ANSI E1.11, Entertainment Technology – USITT DMX512-A: Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories.

In 2003, The Control Protocols Working Group of ESTA's Technical Standards Program authorized the formation of a DMX512 Cabling Task Group. Writing an American National Standard for the use of portable DMX512-A cables was one of the projects assigned to this Task Group. This document is the result. It was developed under the Policies and Procedures of the ESTA Technical Standards Program, and reaffirmed under the Policies and Procedures of the PLASA Technical Standards Program

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1 General

1.1 Scope

This Standard describes the types of portable cable for the transmission of digital data among products which comply with ANSI E1.11, Entertainment Technology—USITT DMX512-A. It covers recommended cable types, connectors and their internal wiring.

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. System specifiers and consultants who wish to gain detailed information about recommended cable types and allowed connectors.

This standard is intended to supplement ANSI E1.11, Entertainment Technology—USITT DMX512-A - Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories. References to ANSI E1.11, and DMX512-A within this standard all refer to this document.

This standard is not intended to replace existing portable digital data cabling standards or recommended practices other than those described in USITT DMX512 and DMX512/1990.

Unless otherwise noted, references to DMX512 in this document refer to DMX512-A.

1.2 Overview and Architecture

The means of transport of DMX512-A digital data from one compliant device to another is normally a two-pair cable, with each pair serving as a data link. Single pair cables are allowed when properly marked to differentiate them from two-pair cables. Portable cable shall be shielded to protect the data links from interference (RFI and EMI). The physical connection of portable cables at any device is via a 5-pin XLR connector.

The first pair of wires in any DMX512 portable data cable is used as the primary data link. The second pair is used for a variety of purposes, all of which fall within the scope of DMX512-A.

1.3 Compliance

Compliance with this standard is strictly voluntary and the responsibility of the manufacturer. Disclosures and identification or other claims of compliance do not constitute certification or approval by ESTA. See clause 7 for Disclosure requirements.

2 Normative references

ANSI E1.11 *Entertainment Technology—USITT DMX512-A - Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories*

ANSI/TIA/EIA-568-B-2001 *Commercial Building Telecommunications Cabling Standard*

ANSI/TIA/EIA-485-A-1998 *Electrical Characteristics of Generators & Receivers for Use in Balanced Digital Multipoint Systems.* This standard will be referred to as EIA-485-A in this document.

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Note: EIA-485-A is compatible with: *ISO/IEC 8482:1993 Information Technology - Telecommunications and information exchange between systems - Twisted pair multipoint interconnections*.

ISO/IEC 11801	*Information Technology – Generic cabling for customer premises*
ISO/IEC 646	*Information Technology - ISO 7-bit Coded Character Set for Information Interchange*
IEC 60603-7	*Connectors for Frequencies Below 3 MHz for Use with Printed Wiring Boards – Part 7: Detail Specification for Connectors, 8-Way, Including Fixed and Free Connectors with common Mating Features, with Assessed Quality*

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3 Definitions

3.1 Circuit Common: the common reference (zero volt supply) of the EIA-485-A driver or receiver circuitry.

3.2 Common: see Data Link, Signal Common, and Circuit Common.

3.3 Data+: signal true.

3.4 Data-: signal complement.

3.5 Data Link: The physical connection between transmitting and receiving devices.

3.6 Data Link Common: the connection to circuit Common at the point of interconnection (DMX512 Port) of the product.

3.7 Declaration: Declared in a manual and optionally marked on the device.

3.8 DMX512 Port: a DMX512 signal connection point (connector or terminal strip).

3.9 Earth Ground: the common, zero potential available from the mains electricity supply and usually connected to the metal chassis of equipment. Earth Ground is referred to as Earth in Europe and Ground in the USA.

3.10 EMI: Electromagnetic Interference.

3.11 Legacy (as used in this Standard): transmitting and receiving devices complying with the original USITT DMX512 or DMX512/1990 in all aspects of those standards. (Exception: receiving devices that are not dimmers but comply with all other aspects of DMX512/1990 shall be considered to be Legacy Equipment.)

3.12 RFI: Radio Frequency Interference.

3.13 Receiver (Receiving Device): a piece of equipment that accepts a DMX512 signal.

3.14 Signal Common: the common reference conductor of the physical media (e.g., the cable shield).

3.15 Transmitting Device: a piece of equipment that produces a DMX512 signal.

4 Electrical Characteristics

4.1 Background

The data transmission rate (250 kbits/s) used by DMX512 requires the selection of a portable DMX512 cable that does not significantly distort the signal or give rise to spurious signal reflections. Cables intended for use with audio systems (such as microphone cables), while having the convenience of flexibility, availability and relative low cost, may not be suitable for use with DMX512 because of their high capacitance and incorrect characteristic impedance; at DMX512 data rates this will give rise to bit time distortion and signal reflections/overshoot.

4.2 Maximum and minimum cable lengths

Maximum and minimum run lengths are specifically omitted from this standard. A number of factors, including signal quality, device operating characteristics including capacitive values, and installation environment can affect these lengths, and is beyond the scope of this standard.

4.3 Construction

Portable DMX512 cables shall use twisted pair conductors. Conductors shall be of stranded construction. The raw cable used for a DMX512 cable assembly shall be declared by its manufacturer as suitable for use with EIA-422/EIA-485/EIA-485-A systems. Shielding shall be on individual pairs or overall shielding of pairs, or both. The portable cable itself shall be flexible and rugged enough for the repeated coiling and uncoiling to which it will be subjected.

4.3.1 Cables implementing only the Primary Data Link shall consist of at least one twisted pair and be marked according to Clause 7.1.

4.3.2 Cables implementing both Data Links shall consist of at least two twisted pairs and be marked according to Clause 7.1.

4.3.3 Cables implementing only the Secondary Data Link shall not be allowed.

4.4 Impedance

Portable DMX512 cables shall have a characteristic impedance in the range 100 to 120 ohms. Due to the characteristic impedance of 120 ohms in EIA-485 systems, 120 ohms is preferred.

4.5 Capacitance

Capacitance between conductors within a shield shall not exceed 19.8 pF/ft (65 pF/m). Capacitance between any conductor and the shield shall not exceed 35 pF/ft (115 pF/m).

4.6 Dielectric Withstanding Protection

Dielectric rating for portable DMX512 cables shall conform to prevailing electrical codes. Requirements for specific voltage ratings, insulation types, jacket materials and other characteristics vary with location and application, and are beyond the scope of this Standard.

5 Connection Methods

5.1 Required Connector

Portable cables shall use 5-pin XLR connectors. The physical pin designations of the 5-pin XLR shall be in accordance with Table 1.

Any use of alternate connectors shall comply with ANSI E1.11.

6 Electrical Specifications and Physical Layer

6.1 General

This standard addresses portable cables for use in DMX512 systems that conform to EIA-485-A and additional physical layer requirements. Where a conflict exists, DMX512-A shall govern. The physical layer of a DMX512 data link is constrained by earth grounding practices, termination methods, signal levels, EMI, and accidental damage by connection to other devices.

6.2 DMX512 Portable Cables

6.2.1 General

A DMX512 Portable Cable is a digital data transmission cable designed for the provisional interconnection of two DMX512 devices. Portable cables shall each have two prescribed connectors, a male 5-pin XLR at the end nearest the transmitting device and a female 5-pin XLR at the end nearest the receiving device. Pins shall be designated 1 through 5. There shall be no connection to the shell.

6.2.2 Compatibility with Legacy Equipment/Adaptors

Some legacy equipment placed voltages on the second pair of data conductors that may damage other connected DMX512 devices. Portable adaptors intended to break the second pair for the purpose of protecting DMX512 devices are beyond the scope of this standard.

Adaptors such as turnarounds, gender changers, taps, etc. are beyond the scope of this standard.

Users are cautioned that E1.27-1 cables may be connected to adaptors that change the functionality of the E1.27-1 cable.

6.3 Data link common and grounding topologies

In all cases Pin 1 of DMX512 portable cable connectors shall act as Data Link Common. The wire connected to Pin 1 shall be no smaller than the wire used for the twisted pairs in the cable.

6.4 Data Link signal designations summary

Table 1 - Signal designations summary

Use	5-Pin XLR Pin	DMX512 Function
Common Reference	1	Data Link Common
Primary Data Link	2	Data 1 -
	3	Data 1 +
Secondary Data Link	4	Data 2 -
	5	Data 2 +

Each data link shall consist of a separate twisted pair.

7 Required Portable Cable Disclosures

7.1 Portable DMX512 cables shall come with the following declaration: “Complies with ANSI E1.27-1 – Standard for Portable Control Cables for Use with ANSI E1.11 (DMX512-A) and USITT DMX512/1990 Products”.

7.2 The cable assembly shall be marked with "ANSI E1.27-1" at both ends of the cable. Cables shorter than 6.6 feet (2m) long shall be permitted to be labeled at one end only.

7.3 Cables which implement both Data Links shall be additionally marked with the text, “Two Pair” or “2-Pair”.

7.4 Cables which implement only the Primary Data Link shall be additionally marked with the text, “Single Pair” or “1-Pair”. Such cables shall also be marked with a violet colored band a minimum of 1/2-inch (12.7 mm) wide around the entire circumference of the cable jacket within 2 inches (50.8 mm) of the required text markings.

7.5 All marks shall be made in a durable manner.

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Key to Interest Categories

CP = custom-market producer	DE = designer
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