lamaPLC Communication: DMX512

DMX512 is a standard for digital communication networks that are commonly used to control lighting and effects. It was originally intended as a standardized method for controlling stage lighting dimmers, which, prior to DMX512, had employed various incompatible proprietary protocols. It quickly became the primary method for linking controllers (such as a lighting console) to dimmers and special effects devices such as fog machines and intelligent lights.

DMX512 has also expanded to uses in non-theatrical interior and architectural lighting, at scales ranging from strings of Christmas lights to electronic billboards and stadium or arena concerts. It can now be used to control almost anything, reflecting its popularity in all types of venues.

DMX512 uses a unidirectional EIA-485 (RS-485) differential signaling at its physical layer, in conjunction with a variable-size, packet-based communication protocol. DMX512 does not include automatic error checking and correction and therefore is not an appropriate control for hazardous applications,[1] such as pyrotechnics or movement of theatrical rigging. However, it is still used for such applications. False triggering may be caused by electromagnetic interference, static electricity discharges, improper cable termination, excessively long cables, or poor quality cables.

The DMX standard is published by the Entertainment Services and Technology Association (ESTA), and can be downloaded from its website.

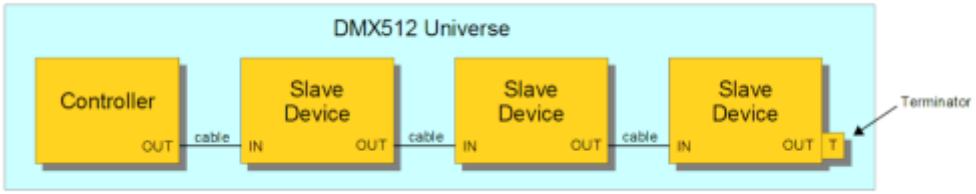
DMX512-A

In 1998 the ESTA began a revision process to develop the standard as an ANSI standard. The resulting revised standard, known officially as *“Entertainment Technology—USITT DMX512-A—Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories”*, was approved by the American National Standards Institute (ANSI) in November 2004. It was revised again in 2008, and is the current standard known as “E1.11 – 2008, USITT DMX512-A”, or just “DMX512-A”.

Network topology

A DMX512 network employs a multi-drop bus topology with nodes strung together in what is commonly called a daisy chain. A network consists of a single DMX512 controller – which is the master of the network — and one or more slave devices. For example, a lighting console is frequently employed as the controller for a network of slave devices such as dimmers, fog machines and intelligent lights.

Each slave device has a DMX512 *“IN”* connector and usually an *“OUT”* (or *“THRU”*) connector as well. The controller, which usually has only an OUT connector, is connected via a DMX512 cable to the IN connector of the first slave. A second cable then links the OUT or THRU connector of the first slave to the IN connector of the next slave in the chain, and so on. For example, the block diagram below shows a simple network consisting of a controller and three slaves.



The specification requires a '*terminator*' to be connected to the final OUT or THRU connector of the last slave on the daisy chain, which would otherwise be unconnected. A terminator is a stand-alone male connector with an integral 120 Ω resistor connected across the primary data signal pair; this resistor matches the cable's characteristic impedance. If a secondary data pair is used, a termination resistor is connected across it as well.

Although simple systems (i.e., systems having few devices and short cables) will sometimes function normally without a terminator, the standard requires its use. Some DMX slave devices have built-in terminators that can be manually activated with a mechanical switch or by software, or by automatically sensing the absence of a connected cable.

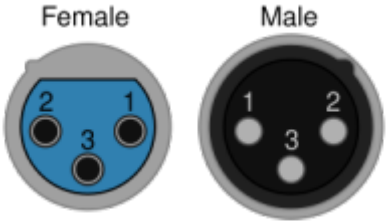
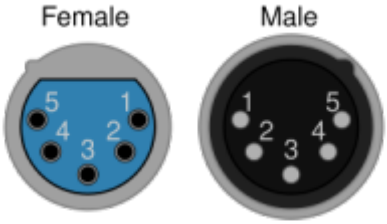
Hardware

DMX512 data is transmitted over a differential pair using EIA-485 (RS-485) voltage levels. DMX512 electrical specifications are identical to those of the EIA-485-A standard, except where stated otherwise in E1.11[example needed].

DMX512 is a bus network no more than **400 metres** (1,300 ft) long, with not more than 32 unit loads (individual devices connected) on a single bus. If more than **32 unit** loads need to communicate, the network can be expanded across parallel buses using DMX splitters. Network wiring consists of a shielded twisted pair, with a characteristic impedance of **120 Ω**, with a termination resistor at the end of the cable furthest from the controller to absorb signal reflections. DMX512 has two twisted pair data paths, although the specification currently only defines the use of one of the twisted pairs. The second pair is undefined but required by the electrical specification.

The E1.11 (DMX512 2004) electrical specification addresses the connection of DMX512 signal common to earth ground. Specifically, the standard recommends that transmitter ports (DMX512 controller OUT port) have a low impedance connection between signal common and ground; such ports are referred to as grounded. It is further recommended that receivers have a high impedance connection between signal common and ground; such ports are referred to as isolated.

Connectors

Name	**XLR3**	**XLR5**
Connector		

Name	XLR3	XLR5
General specifications	Hot pluggable: Yes Daisy chain: Yes External: Yes Pins: 3 Connector: 1	Hot pluggable: Yes Daisy chain: Yes External: Yes Cable: 2 pair, 24 AWG, 7×32 stranded, tinned copper, 6.9 left-hand twist/ft Pins: 5 Connector: 1
Electrical	Max. voltage: +6 VDC per pin Max. current: 250 mA	
Data	Bitrate: 250 kbit/s Protocol: asynchronous, half-duplex, serial protocol over a two-wire bus	
XLR-3 Pinout:	Pin 1: Ground Pin 2: Data 1- or 1+ (Primary Data Link) Pin 3: Data 1+ or 1- (Primary Data Link)	
XLR-5 Pinout:	Pin 1: Signal Common Pin 2: data 1- Pin 3: data 1+ Pin 4: data 2- Pin 5: data 2+	
RJ-45 pinout	Pin 1: Data 1+ Pin 2: Data 1- Pin 3: Data 2+ Pin 4: Not Assigned Pin 5: Not Assigned Pin 6: Data 2- Pin 7: Signal Common (0 V) for Data 1 Pin 8: Signal Common (0 V) for Data 2	

Termination

The DMX512 signal lines require a single **120 Ω** termination resistor to be fitted at the extreme end of the signal cable. Some of the more common symptoms of improper termination are flashing, uncontrollable or incorrect light operation, or other undesired random special effects.

Some equipment has automatic termination, others a physical switch, while the remainder requires a physical terminator (e.g. male XLR-5 plug fitted with a resistor) to be installed by the user.

It is important for users to check whether their devices have automatic or switched termination, as otherwise they may end up with the DMX line being terminated multiple times or not at all when they believed it to be correct.

Additionally, terminating the DMX line often exposes physical cable faults - for example, if the “Data −” wire is broken, an unterminated DMX run may partially work, while fitting the terminator immediately exposes the problem.

Sources

Wikipedia (here)

DMX512 topics on lamaPLC

Page	Date	Tags
• lamaPLC Communication: DMX512	2024/11/16 01:16	bus, communication, dmx512, dmx512-a, rs-485, xlr3, xlr5

bus, communication, DMX512, DMX512-A, RS-485, XLR3, XLR5

This page has been accessed for: Today: 8, Until now: 407