DMX-512 Fundamentals
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Overview
• DMX Technology
• DMX-512 Standard
• DMX Input vs. Output

Lutron Product Solutions
• GRAFIK Eye QSG
• Grafik 4000
• LCP Panel
• Grafik 7000
• Quantum
• HomeWorks

Application Examples
What is DMX-512?

• A standard protocol for digital communication
• Commonly used to control stage lighting and theatrical effects (ex: moving lights, color changing lights, fog machines, etc.)
• Also commonly used for color changing LED applications
DMX-512 Standard

• DMX512-A is the current standard and is maintained by ESTA (Entertainment Services and Technology Association)

• The DMX 512 signal is a set of 512 separate intensity levels (channels) that are constantly being updated

• One DMX link of 512 channels is defined as a Universe
  – Typical theatrical consoles have multiple Universe outputs

• Each level has 256 steps divided over a range of 0 to 100 percent.
DMX-512 Standard

- The DMX signal repeats all 512 intensities as fast as 44 times per second

\[\text{Intensity for dimmer 1}\]

\[\text{Intensity for dimmers 1 & 2}\]

\[\text{Intensity for dimmers 1-512}\]

Repeat up to 44 times per second
DMX Wiring

- The DMX512 wiring follows the RS-485 standard (similar to QS digital link)
- Digital cable is run in a daisy-chain to each DMX device
- Each device is addressed to specific DMX channels

[Diagram showing DMX link wiring and Grafik Eye link wiring]
DMX Addressing

- 512 individual device addresses available per universe
- Device address is stored inside and set at the device
- Various methods used to assign an address
  - DIP switch, LED display, Rotary Dial, Software
DMX Future

- **RDM** (Remote Device Management)
  - Two way communication between controller and DMX device

- **ACN** (Architecture for Control Networks)
  - Primarily designed for use on Ethernet networks
  - Aimed primarily at theatrical applications

- Lutron DMX interfaces do not currently support RDM and ACN but can be connected to RDM compatible equipment
Output vs. Input

We define DMX signals as Output or Input

- **DMX Output** – signals sent from a control system

- **DMX Input** – signals received by a lighting instrument or control system
Combining and Splitting DMX

- Isolation Interfaces are required to combine or split DMX signals
DMX Solutions

Basic Applications – DMX Output

• One or more zones of DMX devices
• Need static preset levels or scenes (called cues)
DMX Solutions

Basic Applications – DMX Output

- Applications with simple three color mixing of
  - RGB (red, green, blue)
  - CMY (cyan, magenta, yellow)
Basic Applications – DMX Output

- Simple three color mixing
- A zone is assigned to each of the three RGB colors
  - The zone intensity of the RGB colors is adjusted so when blended together they produce a new color
  - The resulting color is fixed in a scene
  - Scenes of different colors can be selected manually (keypad) or automatically (timeclock or sequencing functions)
Application Example

Lutron DMX Output

CHAUVET COLORstrip Mini

OSRAM OT DMX RGB DRIVER
Basic Applications – **Sequencing**

- Automated selection of multiple scenes
- A repeating pattern of changing color or functions over a period of time
- Simple sequences (4 - 16 scenes) that are “stepped” in timed intervals (1 second - 10 minutes)
Complex Applications – **Output or Input**

- Require many channels (zones) of control
  - Color changing applications
- Require a large number of scenes (cues)
  - Sequencing of colors and levels
  - Rapidly changing scenes
COLOR KINETICS

Lutron Contact Closure Output

AuxBox

iPlayer3

DMX FIXTURES
DMX Solutions

- Project requires DMX integration
  - Lutron to control DMX Lighting (DMX-Output)
    - Simple Static Presets <36 zones
    - Basic Sequencing/color mix <36 zones
  - DMX controller operates Lutron system (DMX-Input)
    - Complex color mix / control moving lights
    - Theatrical System/Playback control
      - Operates Lutron zones
DMX Solutions

DMX-Input
DMX controller operates Lutron

Theatrical System/
Playback control
Operates Lutron zones

2Link Circuit Selector
GP/LP/XP

ODMX-512 Interface
GRAFIK 5/6/7000
LPS Panels
DMX-512 Product Solutions
Contact Closure Integration

QSE-IO, GRX-IO, OMX-IO, HW-CCO-8 - Output Only

• Works with all Lutron systems discussed in this presentation

• Button presses/timeclock events can activate external “cues” or “shows”

• Lutron system can trigger more sophisticated color mixing

• Multiple interfaces are needed for additional selections
2Link™ Circuit Selector – Input Only

- Provides a DMX input and a Lutron input to any GP, LP, XP, or CCP panel (ordered with 2Link control).
- Allows for architectural and theatrical (DMX) lighting control to be mixed within the Lutron lighting system.
GRAFIK Eye QS

QS DMX Control Interface - Output Only

- Allows any or all zones on a GRAFIK Eye QS unit to control DMX512-controlled devices
QS DMX Control Interface – Output Only

- Any zone can be mapped to a single DMX channel for intensity control
- Alternately, a single zone can control three separate channels for RGB/CMY color-control applications.
- RGB/CMY table can be customized by using our Color Configuration Tool
  - PC application available on the CD packaged with the QSE-CI-DMX, and on www.lutron.com/grafikeyeqs
  - Allows you to specify the color for each intensity of a specific zone
  - Easily interpolate between colors for a smooth transition from one color to the next as you dim up and down
## QS DMX Color Configuration Tool

This page displays the QS DMX Color Configuration Tool interface. The tool is used for programming color configurations for DMX lighting systems. The interface includes options for setting color formats and value formats. The main part of the interface shows a table of color values in RGB (Red, Green, Blue) format for different zones.

### Color Format Options
- **Red-Green-Blue**: Selected option for color representation.
- **Cyan-Magenta-Yellow**: Optional color format.

### Value Format Options
- **Decimal**: Selected option for value representation.
- **Hexadecimal**: Optional value format.

#### Color Table

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<th>Blue</th>
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This tool is a part of the Lutron QS DMX Color Configuration suite, which helps in managing and programming color configurations for DMX lighting systems.
QS DMX Rules

• Sequencing limited to scenes 1-4 or 5-16
  – Steps through scenes (in order) at programmed fade rate
  – Cannot sequence in parallel with controlling other lighting scenes
  – Number of DMX channels is limited to the number of QSG zones

• One QS DMX interface per QS link
• DMX zone cannot be used with any other load type
• No daylighting of DMX zones
LUT-DMX - Output Only

- Reads zone intensities from the GRAFIK Eye 3000/4000 control units and converts them into DMX
- Limited to the first 64 DMX channels
- The GRAFIK Eye Zone to DMX mapping is based on the GRAFIK Eye Address, and the particular zone on that main unit
LCP System

ODMX-512 – Input Only

- Multiple ODMX-512s (max of 32) can be on the link
- Supports 32 contiguous channels from the entire range of 512 channels
- Each channel can be mapped to one or more circuits on LCP system
- Control can be shared by DMX and LCP system
LCP Typical Application

LCP Panel

GRX

ODMX-512
Input Interface

NT-DMXJ-IN-WH
DMX Input Receptacle

DMX

DMX Stageboard

LTC-24
DMX Stageboard
GRAFIK 7000

LUT-DMX – Output Only

- All of the GRAFIK 7000 Zones (up to system maximum of 512) are mapped to respective DMX-512 channels
- Provides only 127 intensity values instead of 256, skipping some values in between
- Designed primarily for DMX lighting loads. Limited control for non lighting DMX loads like positional motors, slide projectors, etc
RS232/Ethernet – Output Only

- Allows selection of “cues” or “shows” to an external system
- GRAFIK 7000 can send custom commands
- Some 3rd party control systems can also monitor the GRAFIK 7000 system by listening for Lutron-specific commands from the GRAFIK 7000 processor
ODMX-512 – Input Only

- Multiple ODMX-512s (max of 32) can be on the link
- Supports 32 contiguous channels from the entire range of 512 channels
- Each channel can be mapped to one or more zones
- Control can be shared by DMX and Lutron system
HomeWorks Illumination

LUT-DMX – Output Only

- Limited channels (1-256)
- Limited intensities (101 distinct levels)
- Connects to Link 1 – no address required
- One required for each processor with DMX lighting channels
  - Multiple LUT-DMX units allowed on same processor (up to 16)
  - One DMX universe per processor
**HomeWorks Illumination**

**RS232/Ethernet – Output Only**

- Allows selection of “cues” or “shows” to an external system
- HomeWorks can send custom commands
- Some 3rd party control systems can also monitor the HomeWorks system by listening for Lutron-specific commands from the HomeWorks processor
HomeWorks Typical Application

LUT-DMX

To DMX-512 Fixture

Remote Power Panels

Wallbox Power Modules

Wired Processors

GRAFIK Eye+ Control Unit

Dimmers

Switches

Keypads

To Additional Processors

To RS-232

To Ethernet

Sivoia QED+ Shades and Draperies
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<th>Interface Product</th>
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