

DMX-512 Fundamentals



Agenda

DMX-512 Fundamentals

Overview

- DMX Technology
- DMX-512 Standard
- DMX Input vs. Output

Lutron Product Solutions

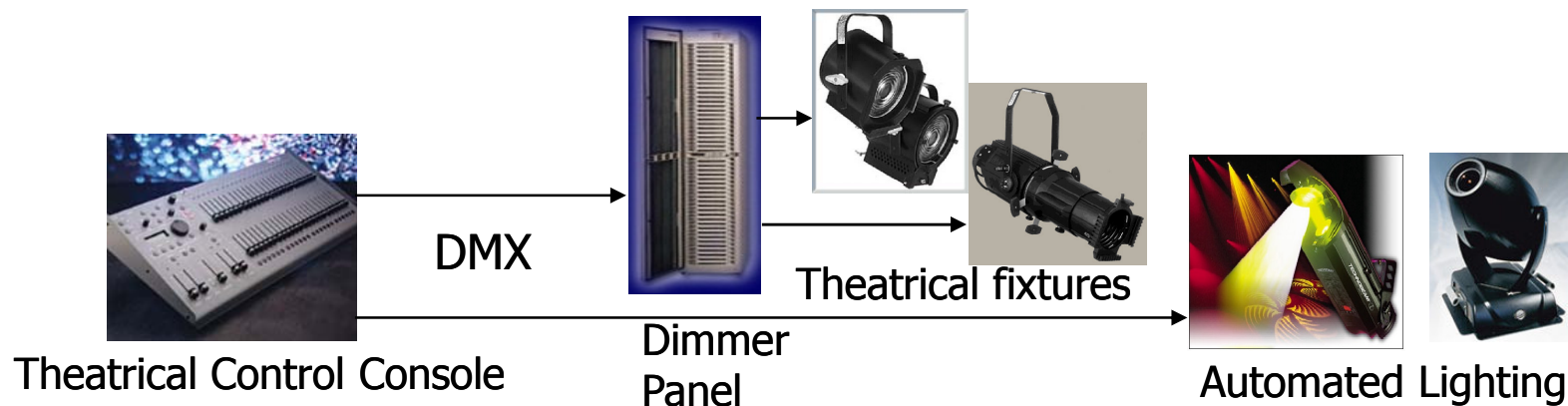
- GRAFIK Eye QSG
- Grafik 4000
- LCP Panel
- Grafik 7000
- Quantum
- HomeWorks



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

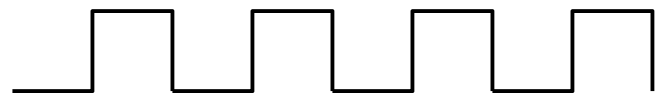


DMX-512 Standard

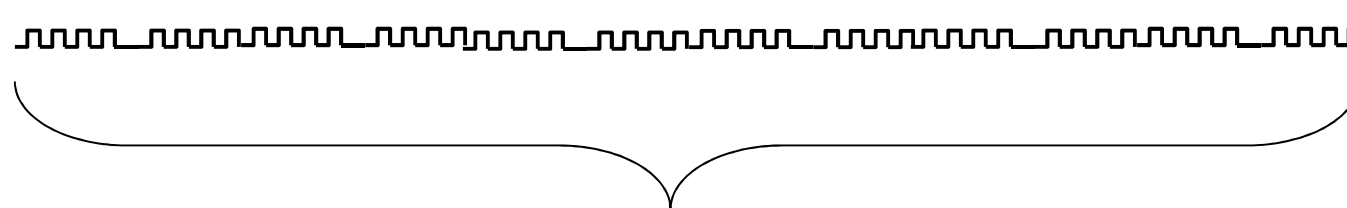
- DMX512-A is the current standard and is maintained by ESTA (Entertainment Services and Technology Association)
- The DMX 512 signal is a set of 512 separate intensity levels (channels) that are constantly being updated
- One DMX link of 512 channels is defined as a Universe
 - Typical theatrical consoles 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

 = intensity for dimmer 1

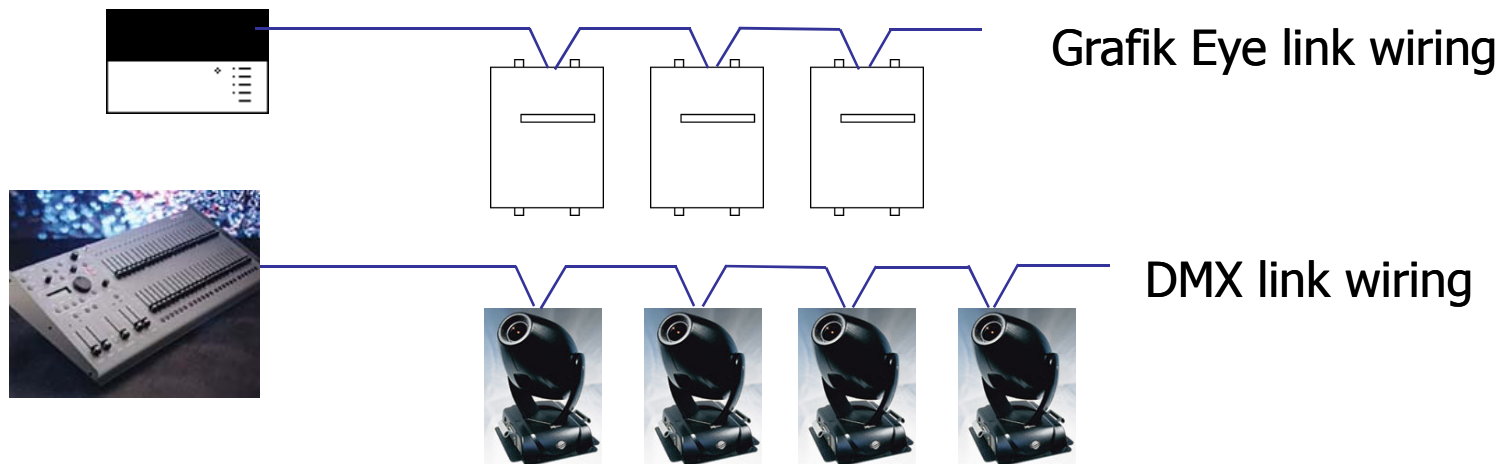
 = intensity for dimmers 1 & 2

 = intensity for dimmers 1-512

Repeat up to 44 times per second

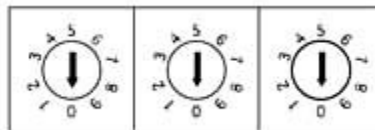
DMX Wiring

- 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



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



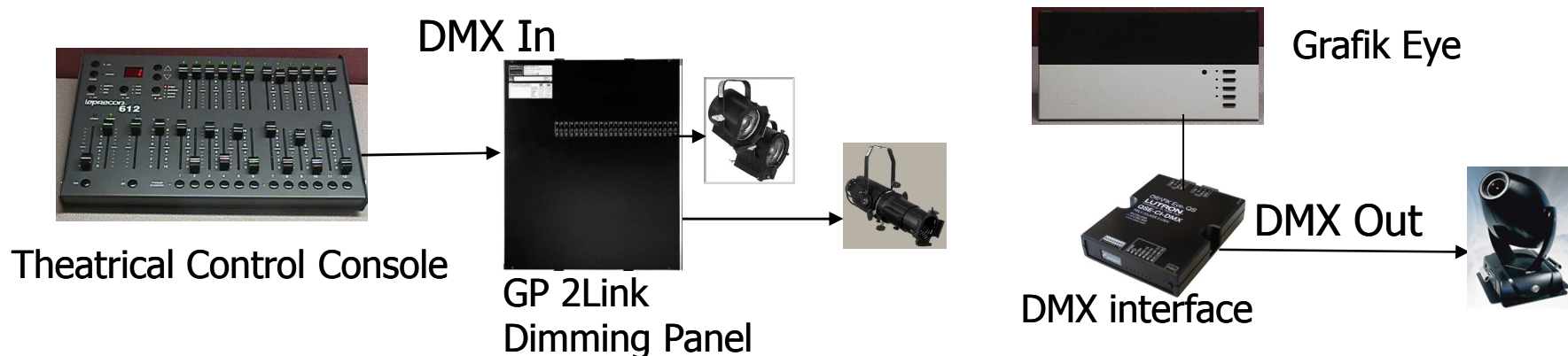
DMX Future

- 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

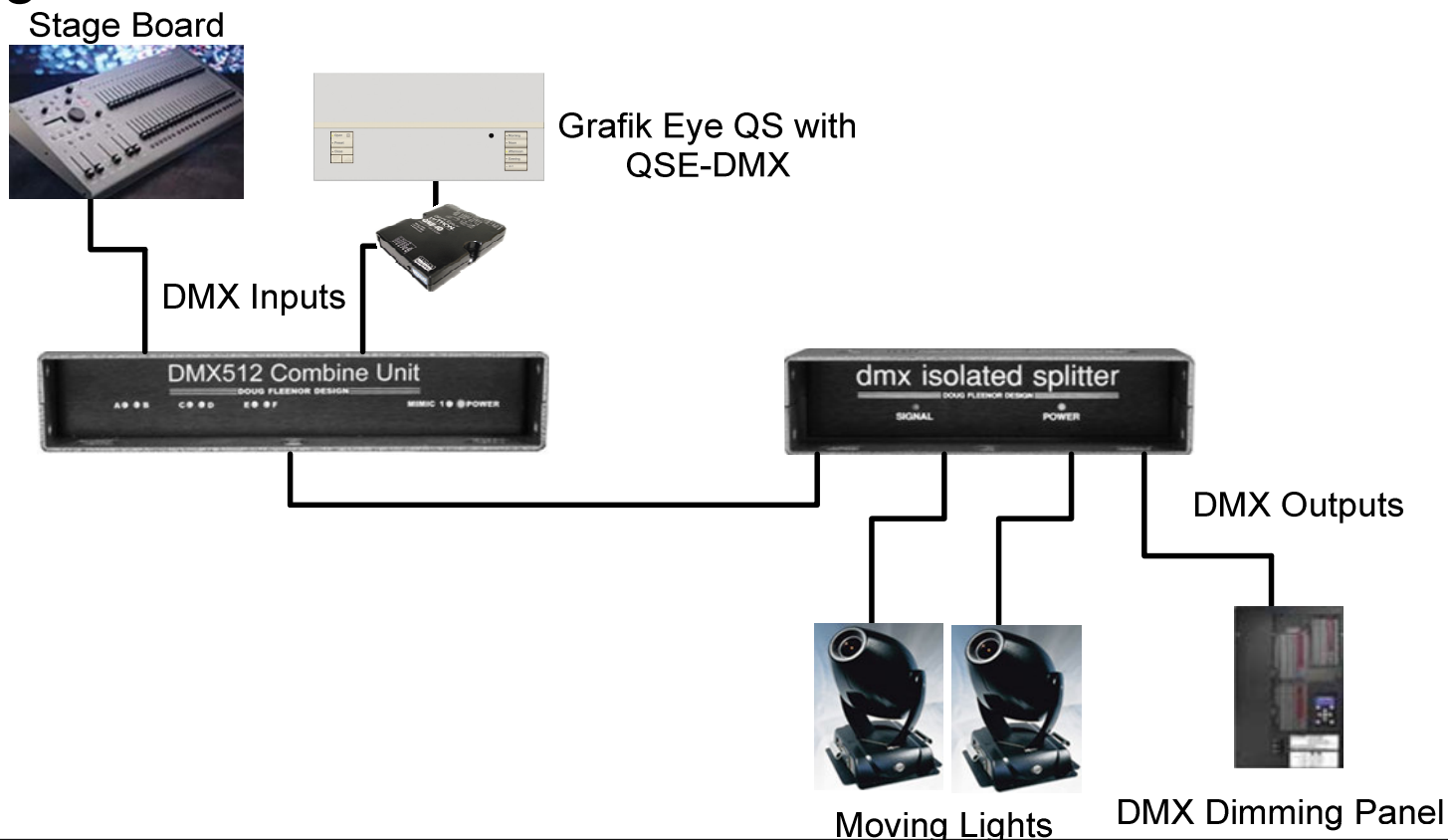
- DMX Output – signals sent from a control system
- DMX Input - signals received by a lighting instrument or control system



Output vs. Input

Combining and Splitting DMX

- Isolation Interfaces are required to combine or split DMX signals



DMX Solutions

Basic Applications – DMX Output

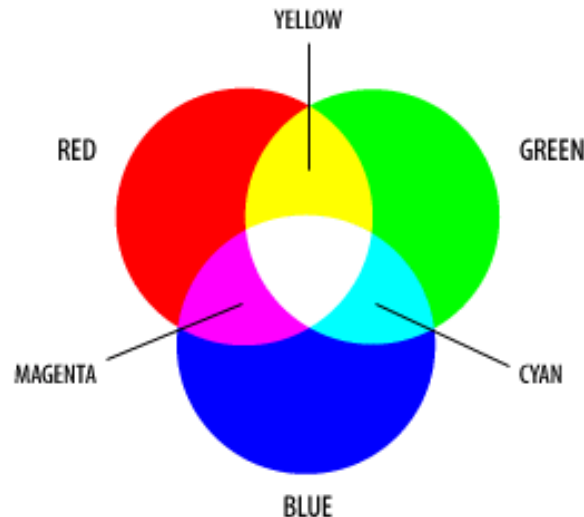
- One or more zones of DMX devices
- Need static preset levels or scenes (called cues)



DMX Solutions

Basic Applications – DMX Output

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



DMX Solutions

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

COLOR*strip* Mini



OSRAM

OT DMX RGB
DRIVER



DMX Solutions

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)



DMX Solutions

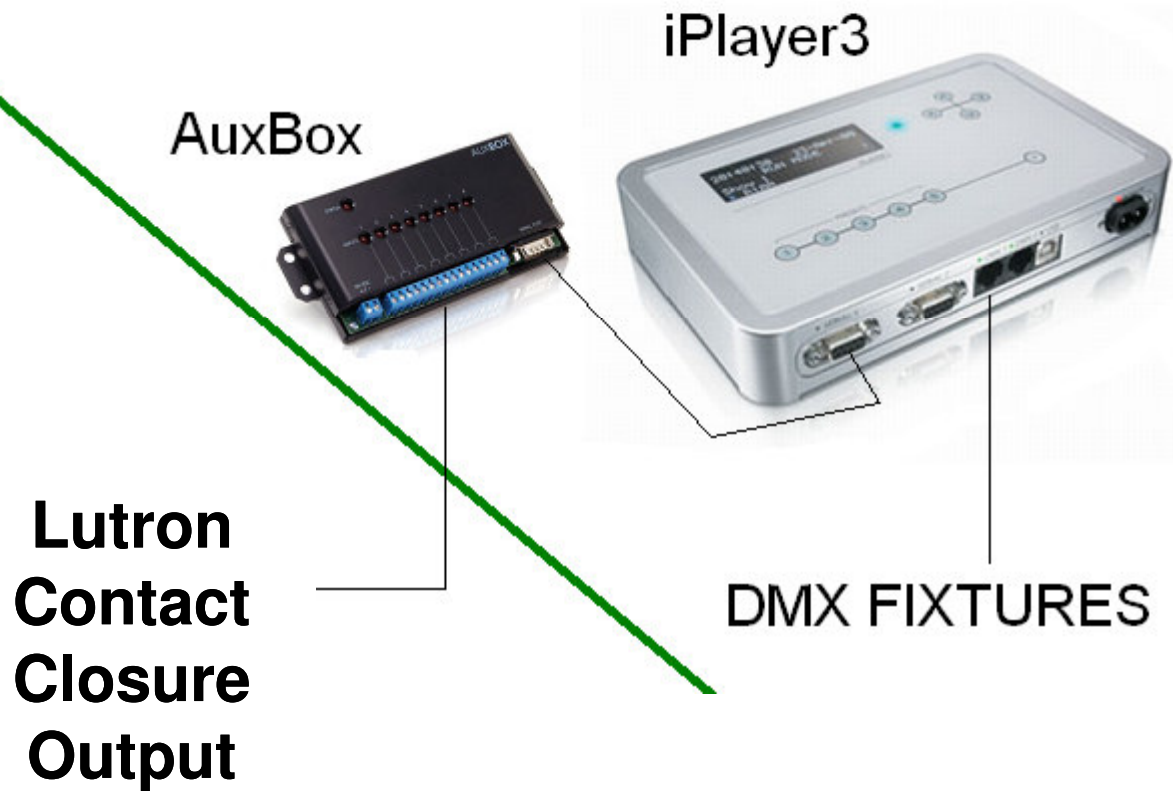
Complex Applications – Output or Input

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

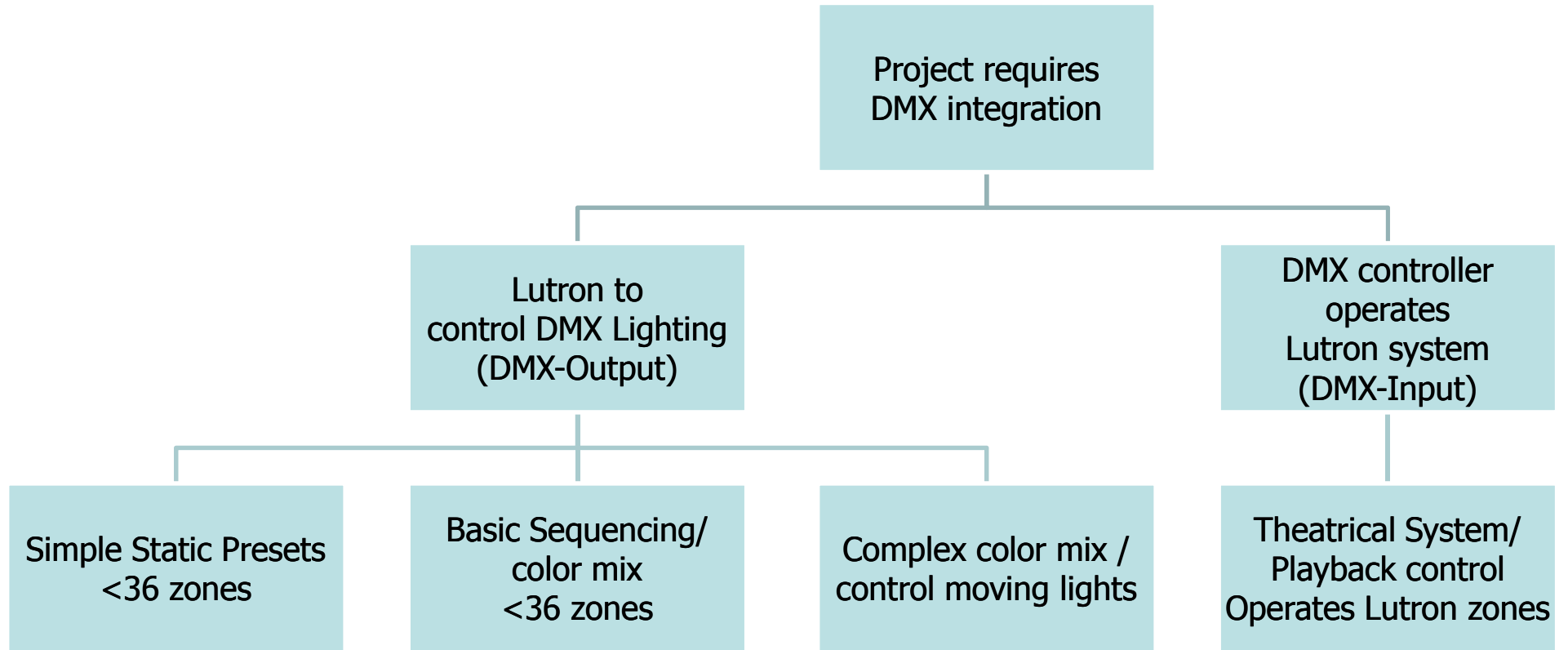


Application Example

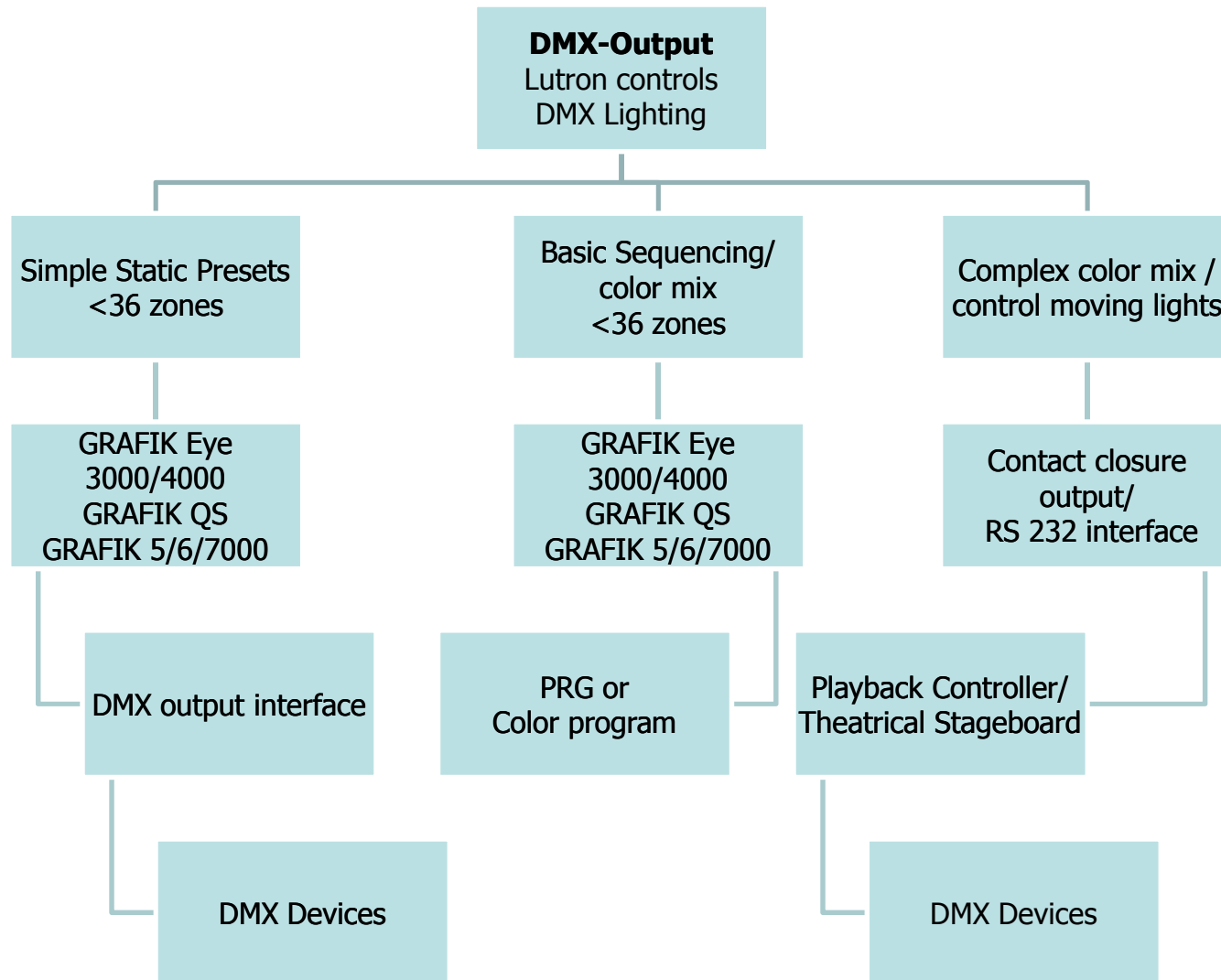
COLOR KINETICS



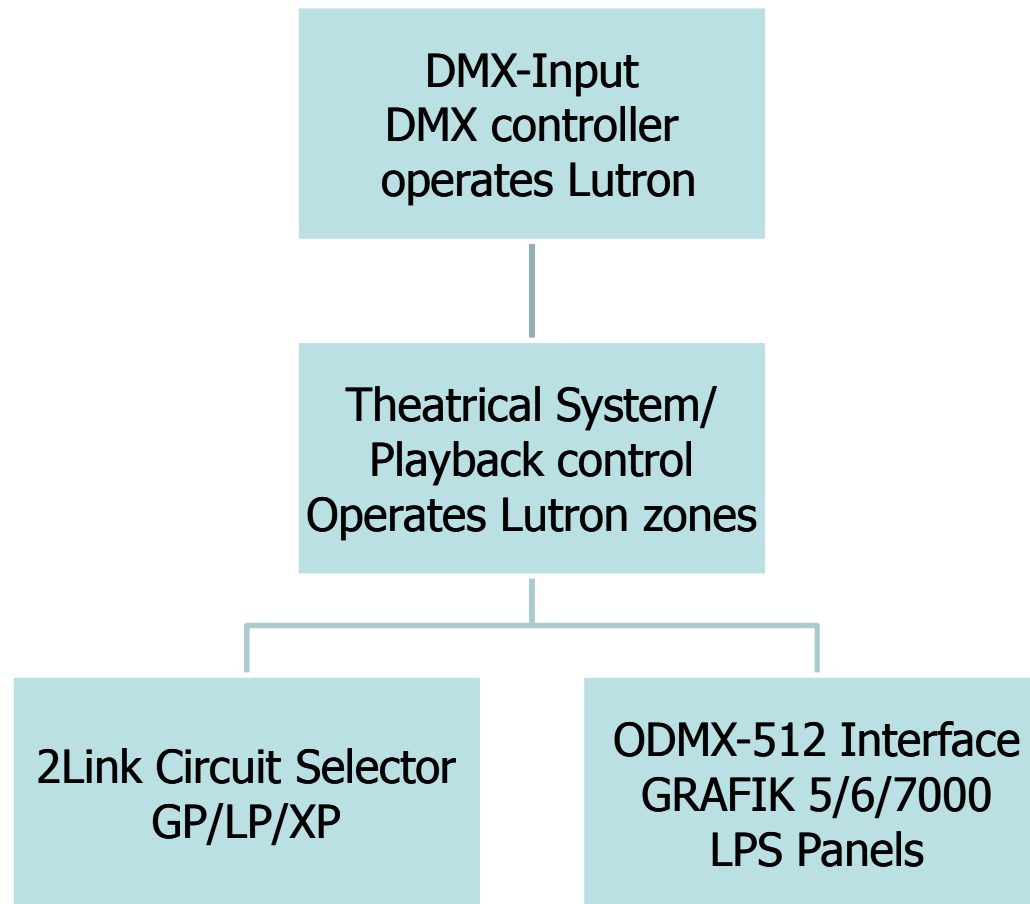
DMX Solutions



DMX Solutions



DMX Solutions



DMX-512 Product Solutions



Contact Closure Integration

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

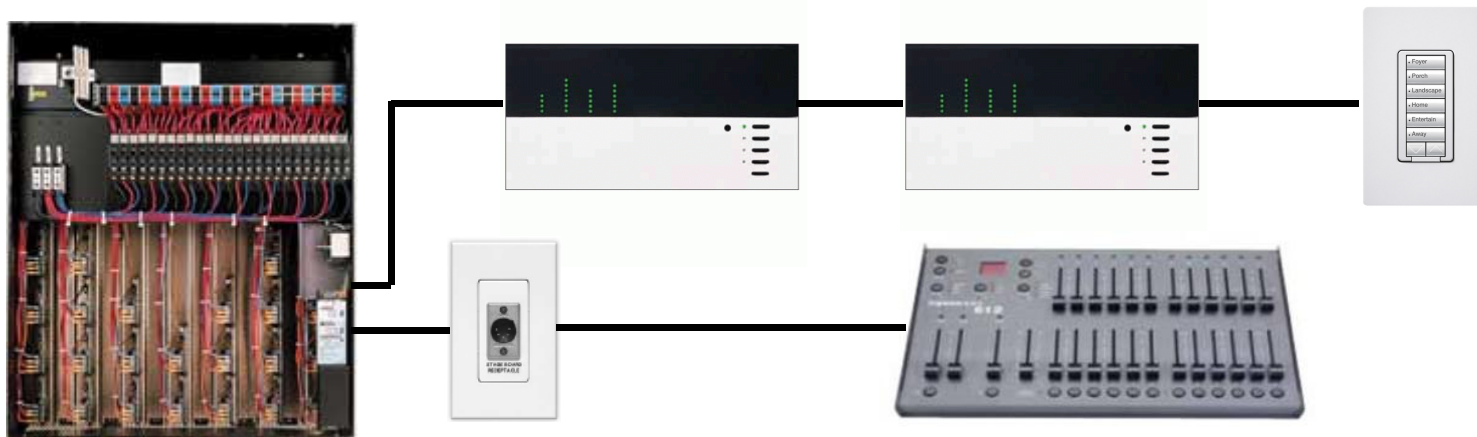
- Works with all Lutron systems discussed in this presentation
- Button presses/timeclock events can activate external “cues” or “shows”
- Lutron system can trigger more sophisticated color mixing
- Multiple interfaces are needed for additional selections



Power Panels

2Link™ Circuit Selector – Input Only

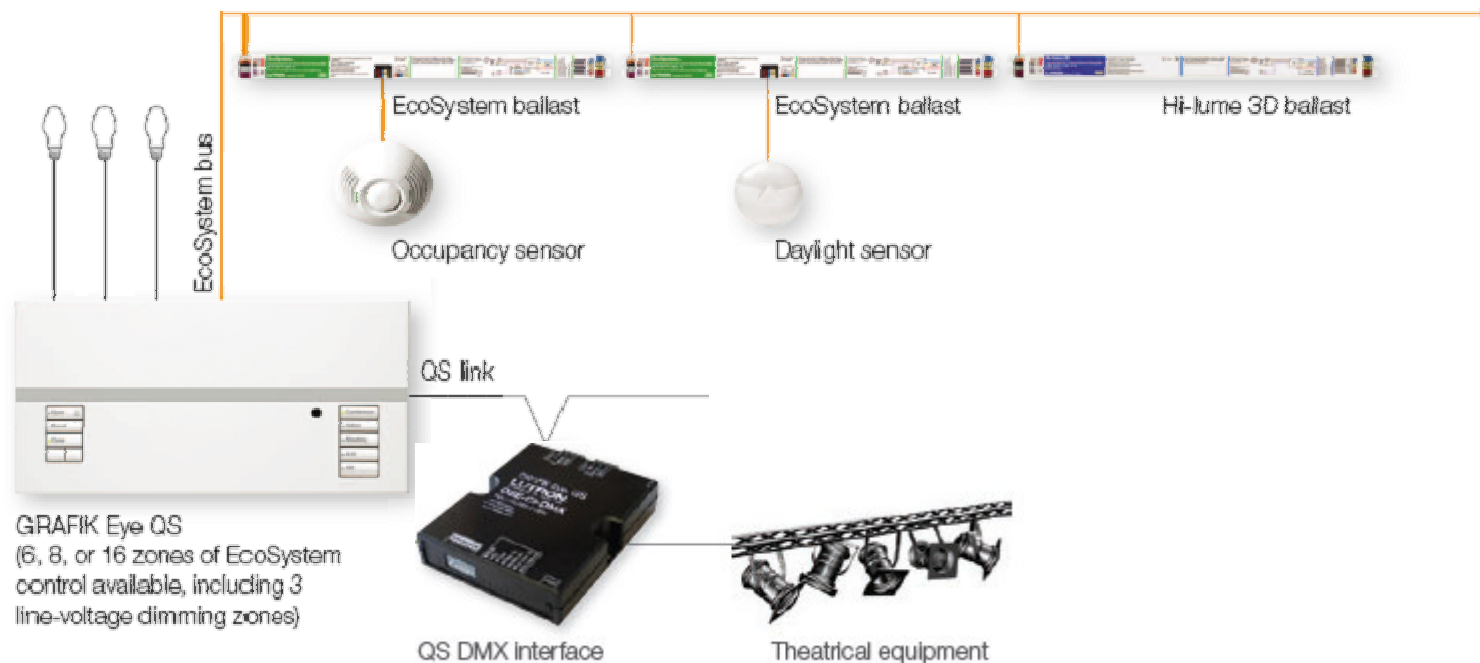
- Provides a DMX input and a Lutron input to any GP, LP, XP, or CCP panel (ordered with 2Link control).
- Allows for architectural and theatrical (DMX) lighting control to be mixed within the Lutron lighting system.



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



GRAFIK Eye QS

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

Lutron QS DMX Color Programming Tool Version 1.0

File Transfer Test Interpolate

Project Name

Technical Support: 1 800 523 9466 (USA/Canada)
+1 610 282 3800 www.lutron.com

Color Format: Red-Green-Blue Cyan-Magenta-Yellow

Value Format: Decimal HexaDecimal

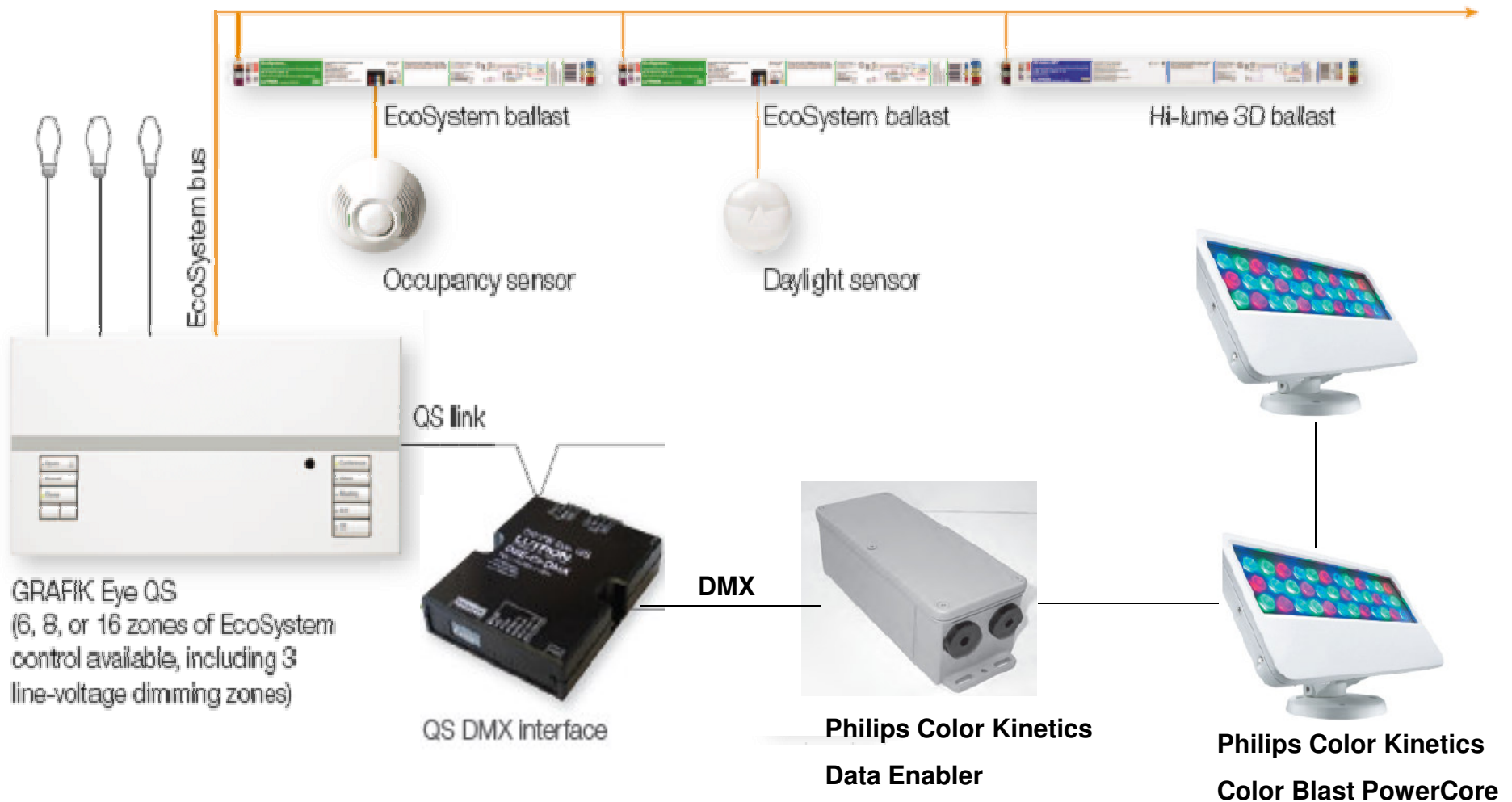
Zone Intensity	Red	Green	Blue	Color
0	255	1	1	
1	230	26	1	
2	204	52	1	
3	179	77	1	
4	153	103	1	
5	128	128	1	
6	103	153	1	
7	77	179	1	
8	52	204	1	
9	26	230	1	
10	1	255	1	
11	1	255	1	
12	1	227	29	
13	1	199	57	
14	1	170	86	
15	1	142	114	
16	1	114	142	
17	1	86	170	
18	1	57	199	
19	1	29	227	
20	1	1	255	
21	1	1	255	
22	29	29	227	
23	57	57	199	
24	86	86	170	
25	114	114	142	
26	142	142	114	
27	170	170	86	
28	199	199	57	
29	227	227	29	
30	255	255	1	
31	176	80	80	

GRAFIK Eye QS

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

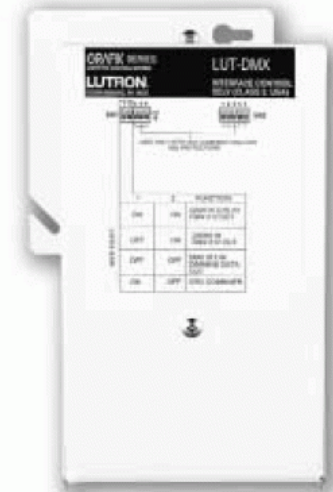
QS Typical Application



GRAFIK 4000

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

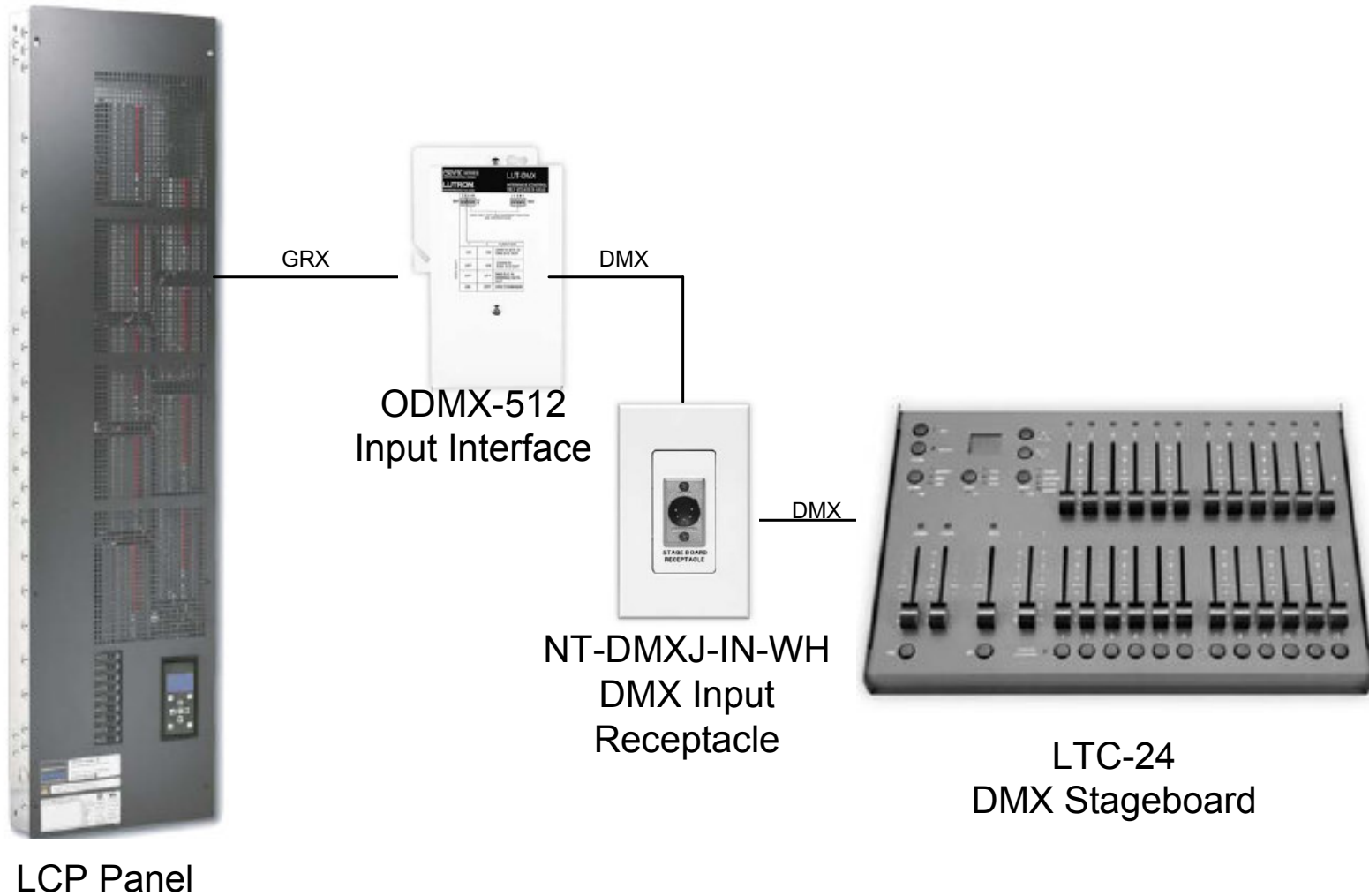


LCP System

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



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

GRAFIK 7000

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

GRAFIK 7000

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

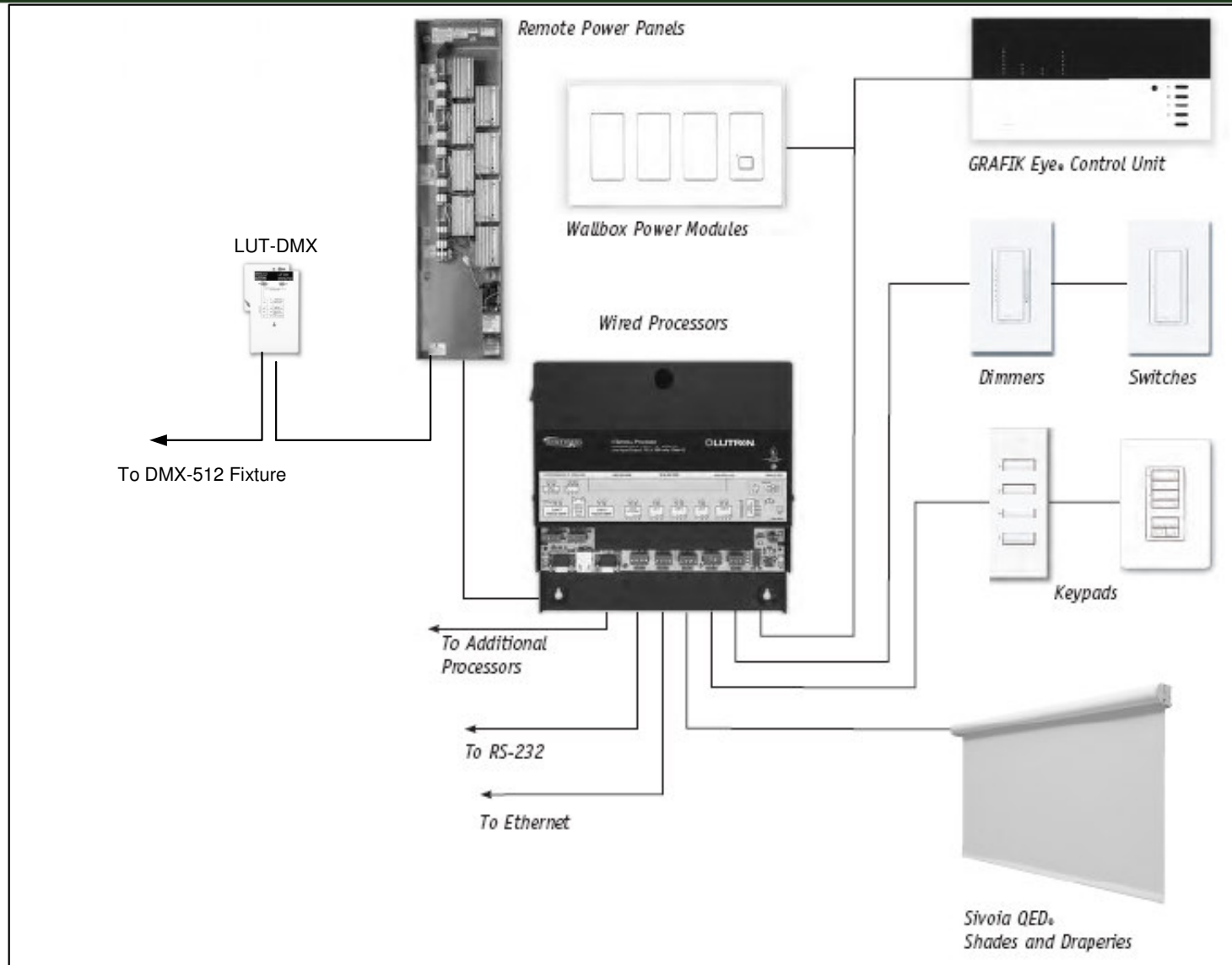
- Limited channels (1-256)
- Limited intensities (101 distinct levels)
- Connects to Link 1 – no address required
- One required for each processor with DMX lighting channels
 - Multiple LUT-DMX units allowed on same processor (up to 16)
 - One DMX universe per processor

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



Compatibility Summary

Interface Product	Protocol Used	Type	System					
			G7000	G4000	QS	LCP	Quantum	HomeWorks
2Link Circuit Selector	DMX	Input	Yes	Yes			Yes	Yes
ODMX-512	DMX	Input	Yes			Yes		
LUT-DMX	DMX	Output	Yes	Yes				Yes
QSE-CI-DMX	DMX	Output			Yes			
QSE-IO	Contact Closure	Output			Yes		Yes	
GRX-IO	Contact Closure	Output		Yes				
OMX-IO	Contact Closure	Output	Yes			Yes		
HW-CCO-8	Contact Closure	Output						Yes
OMX-CI-RS232	RS232/Ethernet	Output	Yes					
HomeWorks P5 Processor	RS232/Ethernet	Output						Yes