



Using HWQS to Control DMX Outputs

Revision A

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Overview

DMX-512 is a standard protocol for digital communication that is commonly used to control stage lighting and theatrical effects (moving lights, color changing lights, fog machines, etc.). Even though DMX-512 has primarily been used in stage and theater applications, over time residential applications have become more common. With the ability to have single-channel or 3-channel DMX fixtures (primarily LED) homeowners have the ability to change the intensity and/or color of a variety of fixtures such as cove lighting or an illuminated water feature (fountains, waterfalls, etc.). This application note describes how to set up and configure the QSE-CI-DMX (refer to the specification sheet for more information) with the HomeWorks QS system. There are two DMX topologies described in this document.

Scenario 1: Unique DMX Universes with Less Than 32 Channels per Universe **Page 3**

Scenario 2: Combined DMX Universe with More Than 32 Channels **Page 4**

Concepts and Definitions

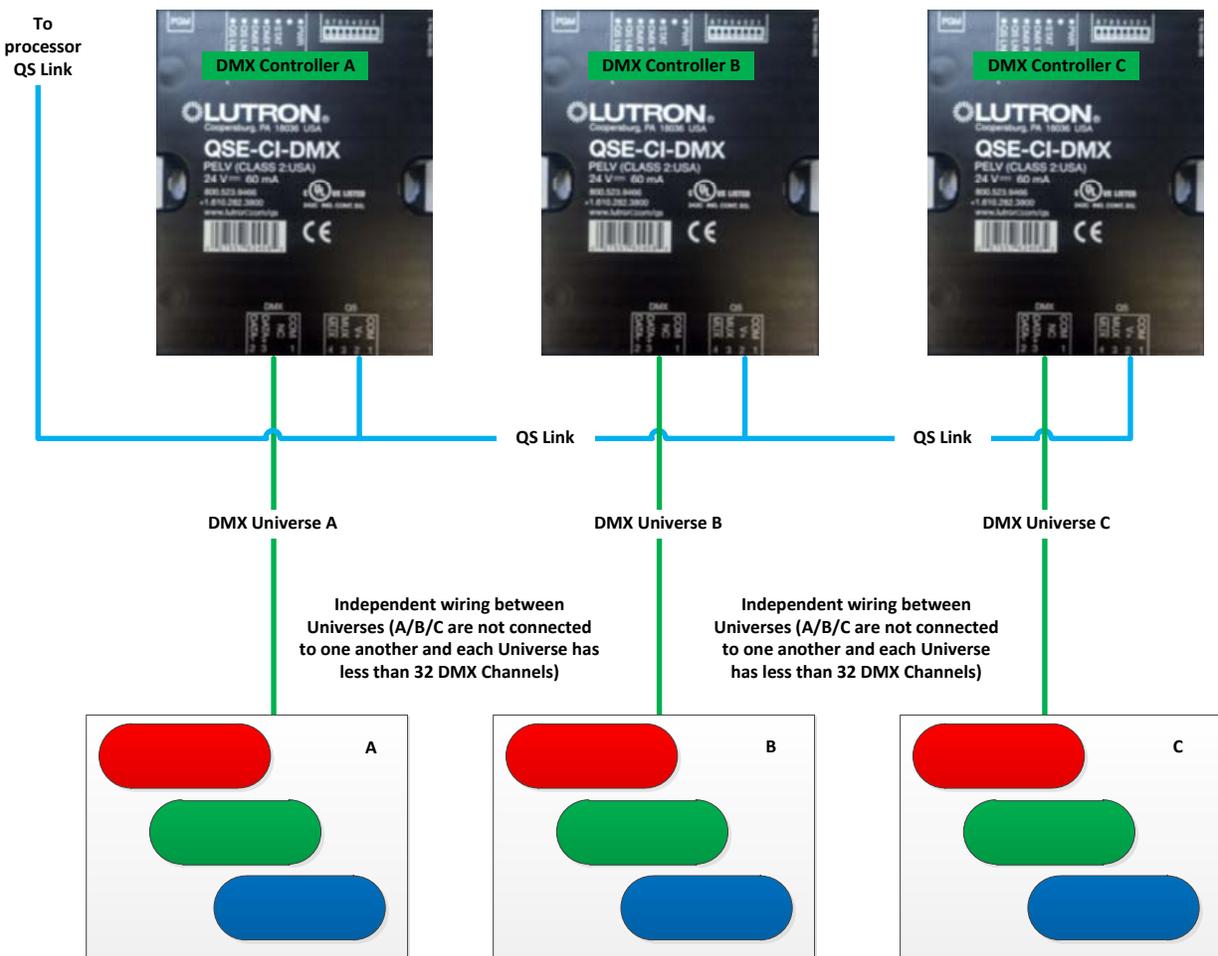
1. **DMX Controller**—The primary interface in a DMX system that will send intensity commands (0 to 255) out to the DMX devices.
2. **DMX Channel**—The DMX-512 protocol utilizes a channel concept. Each DMX output can have a channel from 1 to 512 (set at device/output). A collection of DMX devices can also have the same channel numbers if grouping is required.
3. **DMX Universe**—A collection of DMX devices that originates from a single DMX Controller, are daisy-chained together and have channels from 1 to 512 (unless multiple outputs are grouped) is called a Universe. Multiple DMX Controllers can exist in one Universe if a DMX Combiner is used.
4. **DMX Combiner**—Due to the structure of the DMX-512 message packet if multiple DMX Controllers are on the same Universe collisions will occur and the system will have erratic behavior. A DMX Combiner will process all the DMX-512 packets and repackage the message and send out to the single Universe.
5. **1-Channel vs. 3-Channel DMX**—A single DMX device regardless of color (or function if non-lighting load) that can change intensity only is a 1-Channel DMX device. A three color (RGB/CMY) output that can change the perceived color by mixing intensities of RGB or CMY is a 3-Channel DMX fixture. 1-Channel will use one DMX channel and 3-Channel will use 3. Some DMX devices may require more than 3 channels (lights with motors, fog machines, etc.), in this case the HWQS software would need to be programmed to have a scene with a combination of 3-Channel and 1-Channel outputs assigned to a trigger event (button press, timeclock, etc.).

Scenario 1: Unique DMX Universes with Less Than 32 Channels per Universe

Description:

In this scenario, the total number of channels for any given Universe is less than 32 which is the maximum number of channels the QSE-CI-DMX can control. The QSE-CI-DMX can send commands to any of the 512 possible channels but no more than 32 unique channels can be controlled from a given control interface. See Figure 1 below for a graphical representation.

Figure 1

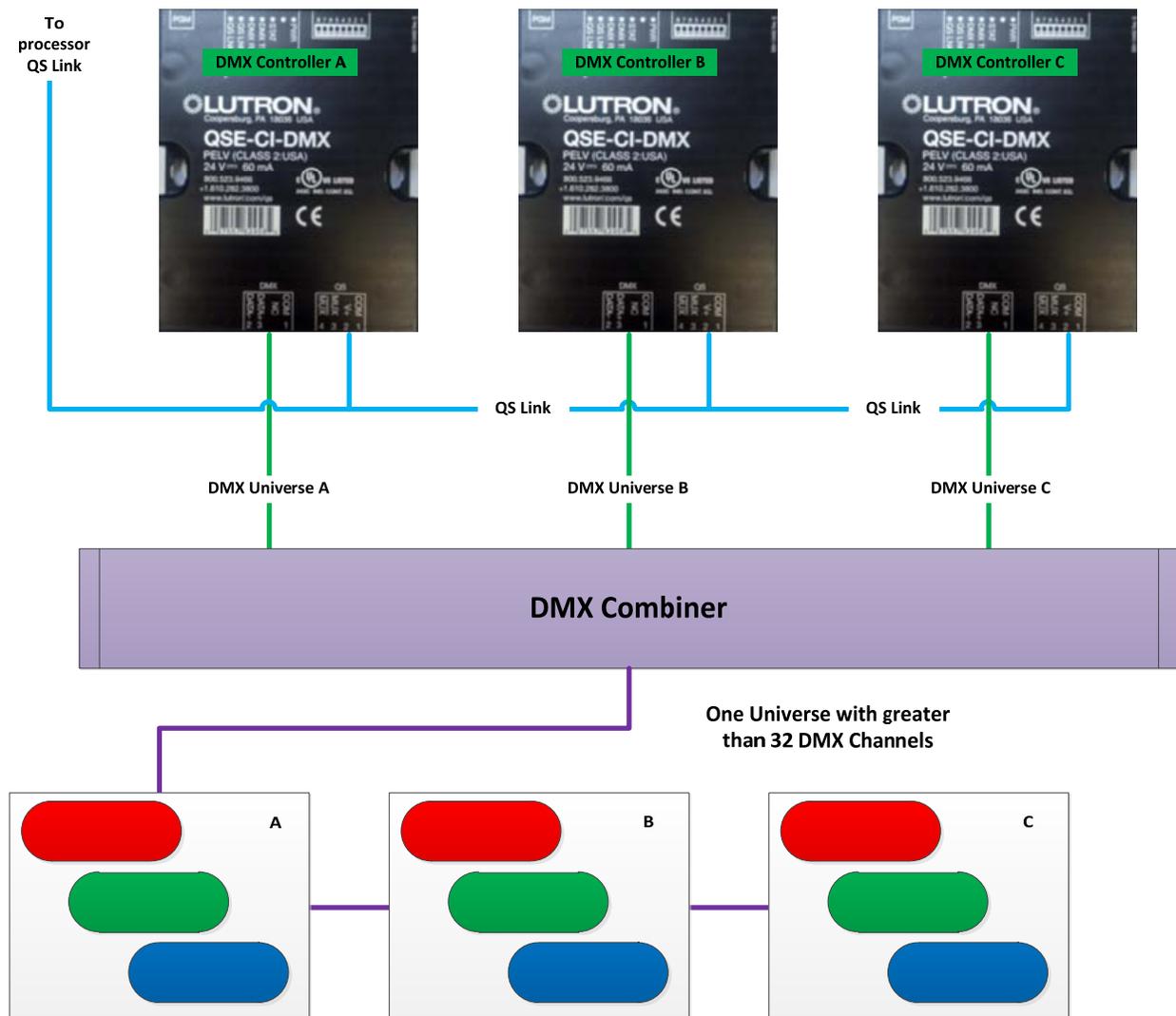


Scenario 2: Combined DMX Universe with More Than 32 Channels

Description:

In this scenario, the total number of channels is greater than 32 which exceeds the maximum number of channels the QSE-CI-DMX can control for any given Universe. The QSE-CI-DMX can send commands to any of the 512 possible channels but no more than 32 unique channels can be controlled from a given control interface. If the total number of daisy-chained DMX channels is greater than 32 then multiple QSE-CI-DMX units will be needed as well as a 3rd party DMX combiner. See Figure 2 below for a graphical representation.

Figure 2

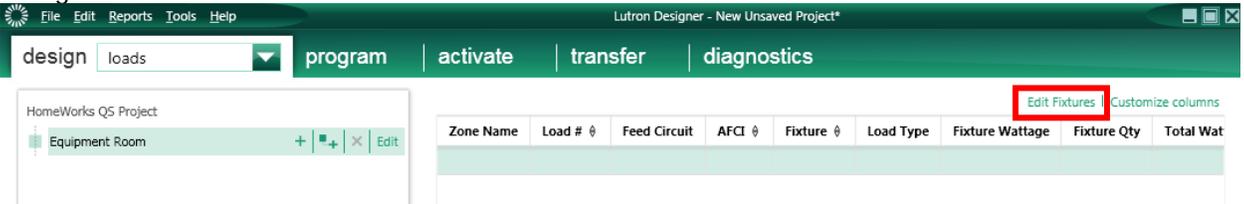


HWQS 1-Channel Integration DMX Software Setup:

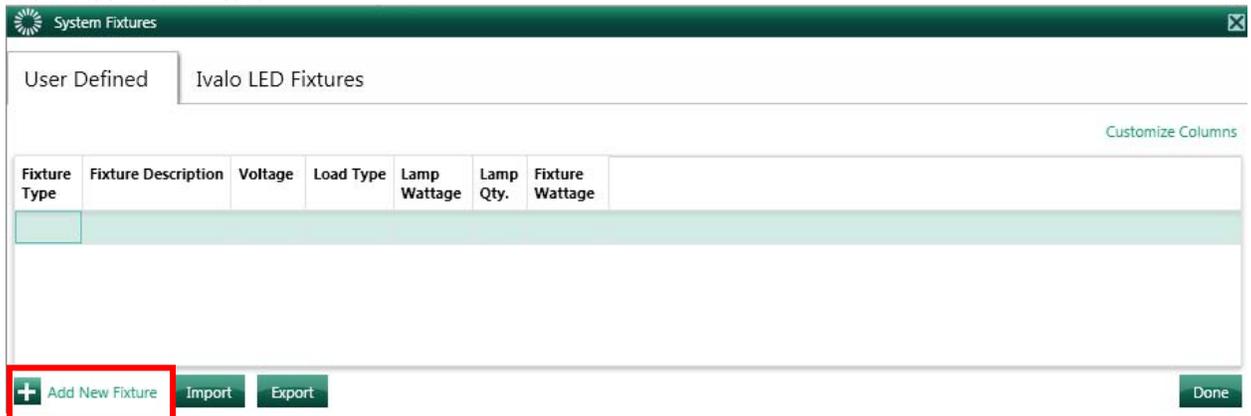
When using DMX devices that are not lighting loads such as shades, motors or fog machines you will need to use 1-Channel Integration fixtures in the HWQS software. The following section will take you through the set-up process for these device types. For a more detailed explanation of how to set-up and program DMX devices in the software refer to the video tutorials on the resource site (resi.lutron.com).

- **Part 1—DMX Design Tab**
- **Part 2—DMX Program Tab**

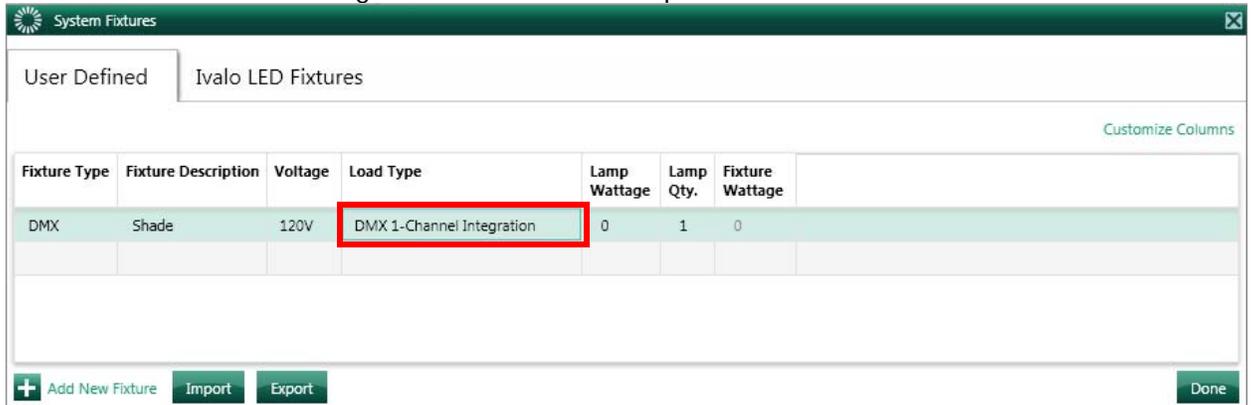
1. Create proper DMX fixture by entering the “Edit Fixture” option under the “Loads” option on the “Design” tab



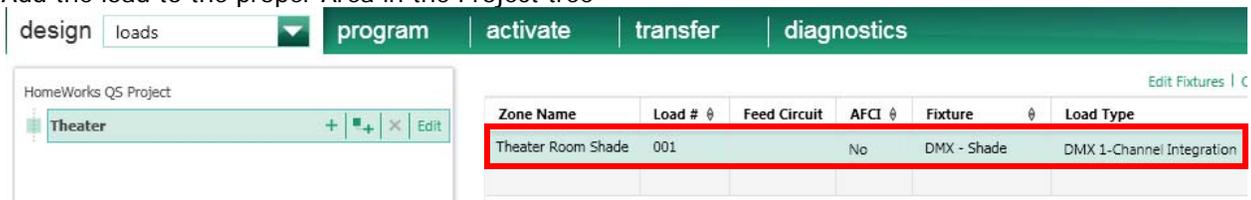
2. Click “Add New Fixture”



3. Create a “DMX 1-Channel Integration” fixture that will represent a DMX controlled shade



4. Add the load to the proper Area in the Project tree



- After you add a OSE-CI-DMX you will need to assign the DMX 1-Channel Integration fixture to the Output

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

DMX Channels 0 of 32

Output					
	Name	Load Name	Ch A	Ch B	Ch C
1	Assign...				

- Assign proper DMX 1-Channel Integration Output to the correct OSE-CI-DMX Controller

Assign

Expand all | Collapse all | Advanced Settings

Theater | Assign

Theater Room Shade (001) (DMX 1-Channel Integration) | Assign

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

DMX Channels 1 of 32

Output					
	Name	Load Name	Ch A	Ch B	Ch C
1	Theater Room Shade	001	1	-	-
2	Assign...				

- For a single channel DMX device you will be able to assign a channel number between 1 and 512 under the "Ch A" box on the Output

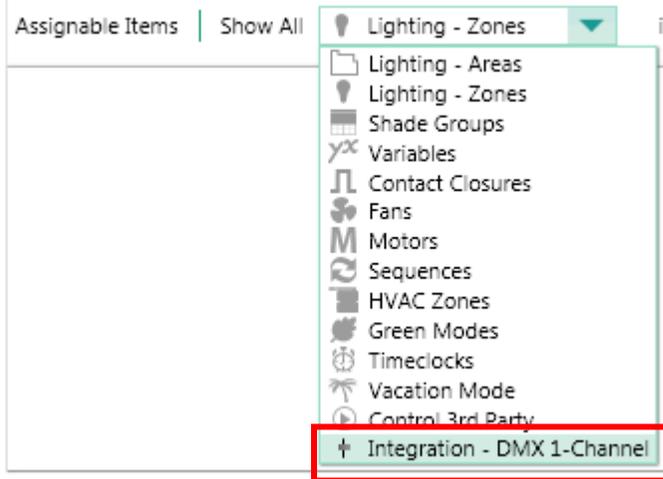
Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

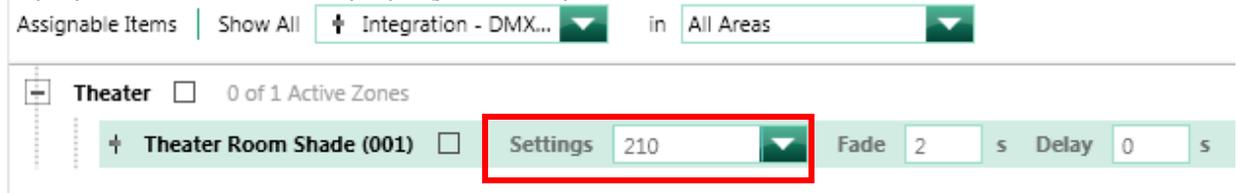
DMX Channels 1 of 32

Output					
	Name	Load Name	Ch A	Ch B	Ch C
1	Theater Room Shade	001	1	-	-
2	Assign...				

8. Under the "Program" tab on "Devices" change the "Assignable Items" to "Integration DMX 1-Channel"



9. When programming to a button or other system trigger the "Setting" for a DMX 1-Channel Integration zone can be any value from 0 to 255. The device manufacturer will need to provide the proper value to be sent to properly move/stop the shade.

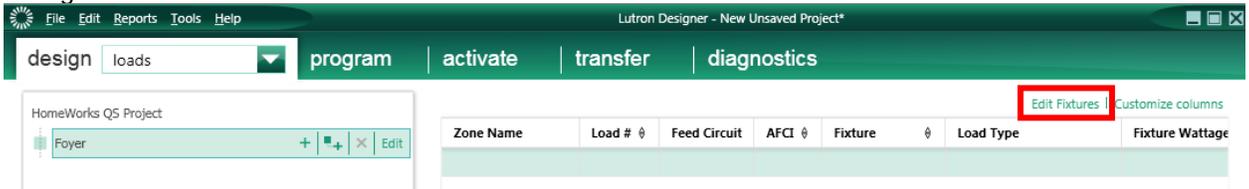


HWQS DMX 1-Channel Lighting Software Setup:

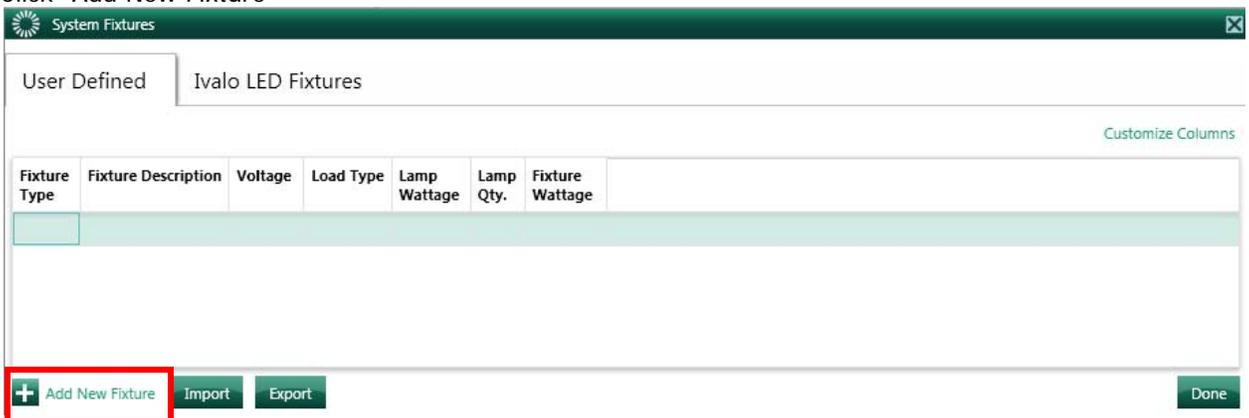
When using DMX devices that are a single channel lighting load you will need to use DMX 1-Channel Lighting fixtures in the HWQS software. The following section will take you through the set-up process for these device types. For a more detailed explanation of how to set-up and program DMX devices in the software refer to the video tutorials on the resource site (resi.lutron.com).

- **Part 1—DMX Design Tab**
- **Part 2—DMX Program Tab**

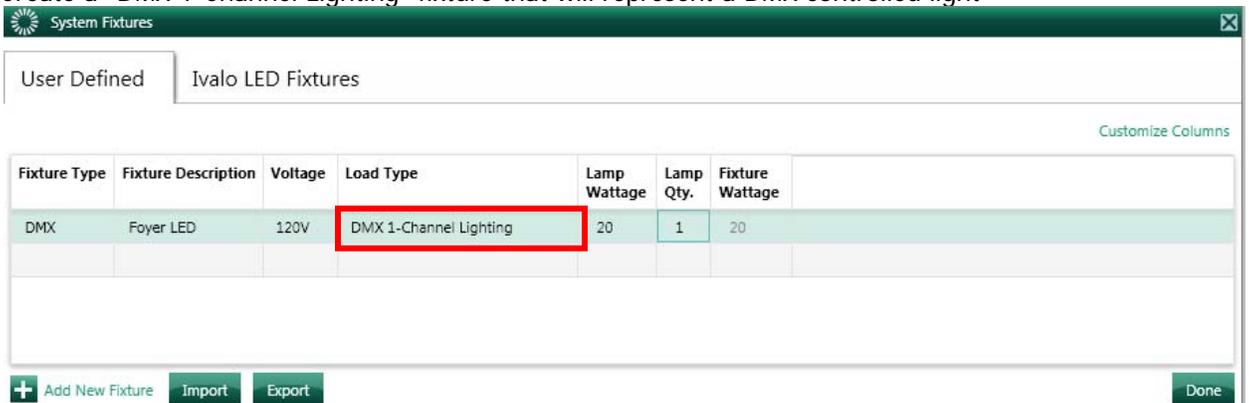
1. Create proper DMX fixture by entering the “Edit Fixture” option under the “Loads” option on the “Design” tab



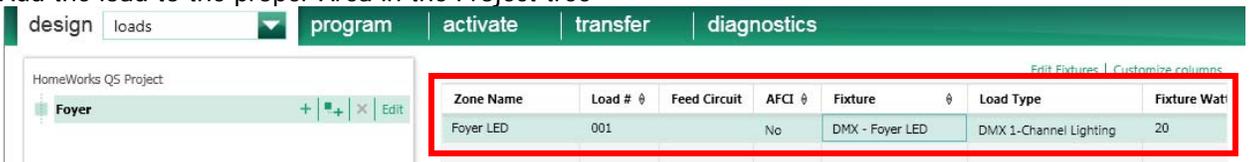
2. Click “Add New Fixture”



3. Create a “DMX 1-Channel Lighting” fixture that will represent a DMX controlled light



4. Add the load to the proper Area in the Project tree



- After you add a QSE-CI-DMX you will need to assign the DMX 1-Channel Lighting fixture to the Output

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

DMX Channels 0 of 32

Output

	Name	Load Name	Ch A	Ch B	Ch C
1	Assign...				

- Assign proper DMX 1-Channel Lighting Output to the correct QSE-CI-DMX Controller

Assign

Expand all | Collapse all | Advanced Settings

Foyer

Foyer LED (001) (DMX 1-Channel Lighting) Assign

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

DMX Channels 1 of 32

Output

	Name	Load Name	Ch A	Ch B	Ch C
1	Foyer LED	001	1	-	-
2	Assign...				

- For a single channel DMX device you will be able to assign a channel number between 1 and 512 under the "Ch A" box on the Output

Equipment Locations | Expand all | Collapse all | Customize columns

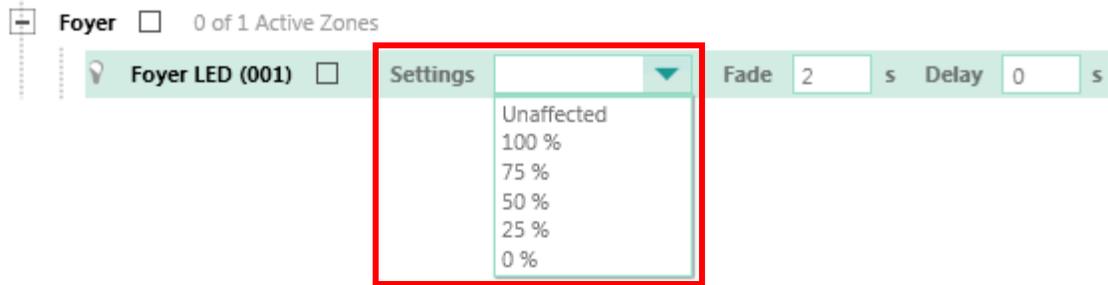
DMX 001 | X | Edit | Edit Color Table

DMX Channels 1 of 32

Output

	Name	Load Name	Ch A	Ch B	Ch C
1	Foyer LED	001	1	-	-
2	Assign...				

8. When programming to a button or other system trigger you set the intensity (0-100%) under the Program tab and in the Settings dropdown. 1-Channel DMX outputs are intensity values only regardless of color since there is no RGB/CMY color mixing.

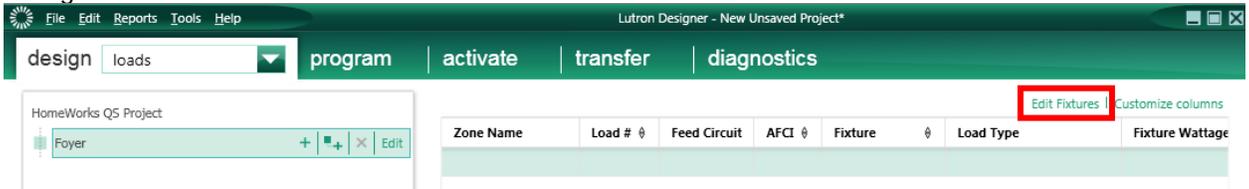


HWQS DMX 3-Channel Lighting Software Setup:

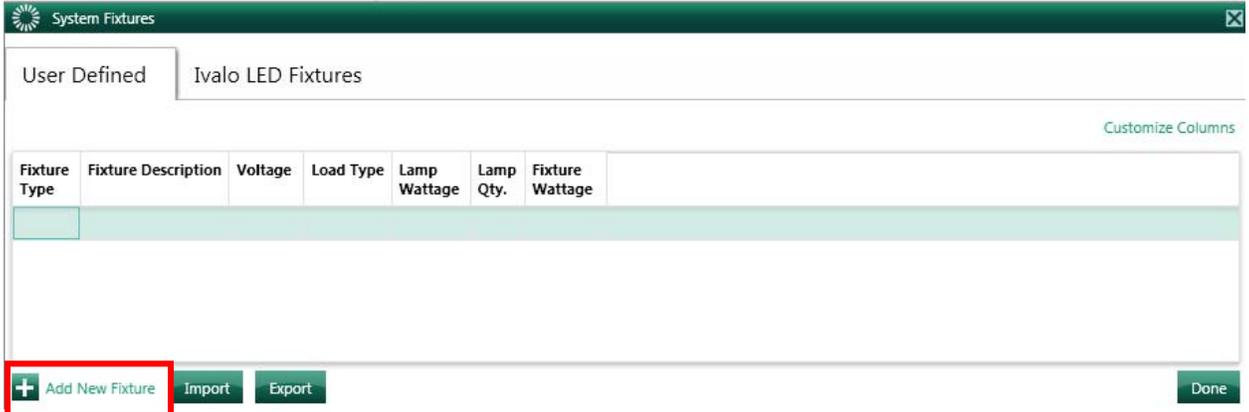
When using DMX devices that are a three channel lighting loads (also known as 3-color RGB or CMY) you will need to use DMX 3-Channel Lighting fixtures in the HWQS software. The following section will take you through the set-up process for these device types. For a more detailed explanation of how to set-up and program DMX devices in the software refer to the video tutorials on the resource site (resi.lutron.com).

- **Part 1—DMX Design Tab**
- **Part 2—DMX Program Tab**

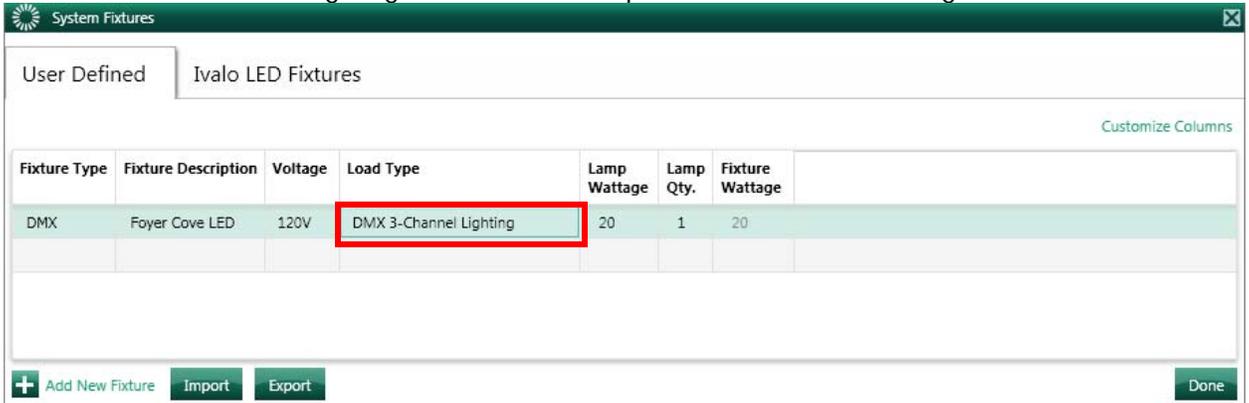
1. Create proper DMX fixture by entering the “Edit Fixture” option under the “Loads” option on the “Design” tab



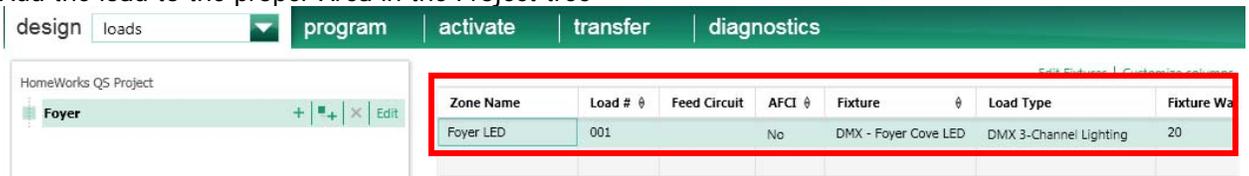
2. Click “Add New Fixture”



3. Create a “DMX 3-Channel Lighting” fixture that will represent a DMX controlled light



4. Add the load to the proper Area in the Project tree



- After you add a QSE-CI-DMX you will need to assign the DMX 3-Channel Lighting fixture to the Output

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

Output

	Name	Load Name	Ch A	Ch B	Ch C
1	Assign...				

DMX Channels 0 of 32

- Assign proper DMX 3-Channel Lighting Output to the correct QSE-CI-DMX Controller

Assign

Expand all | Collapse all | Advanced Settings

Foyer Assign

Foyer LED (001) (DMX 3-Channel Lighting) Assign

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

Output

	Name	Load Name	Ch A	Ch B	Ch C
1	Foyer LED	001	12	13	14
2	Assign...				

DMX Channels 3 of 32

- For a three channel DMX device you will be able to assign a channel number between 1 and 512 under the "Ch A" box on the Output. "Ch B and Ch C" will auto-populate with the next contiguous value. For this example "Ch A" was changed to 12 and then "Ch B" automatically became 13 and "Ch C" 14 respectively.

Equipment Locations | Expand all | Collapse all | Customize columns

DMX 001 | X | Edit | Edit Color Table

Output

	Name	Load Name	Ch A	Ch B	Ch C
1	Foyer LED	001	12	13	14
2	Assign...				

DMX Channels 3 of 32

- Edit Color Table in order to select the desired programmable colors for the DMX 3-Channel Lighting fixture

The screenshot shows the 'Equipment Locations' interface. At the top, there are buttons for 'Expand all', 'Collapse all', and 'Customize columns'. Below this, a row for 'DMX 001' is shown with an 'Edit' button and a red-bordered 'Edit Color Table' button. To the left is a small image of a lighting fixture. Below the image is a 'DMX Channels' indicator showing '3 of 32'. To the right is an 'Output' table:

	Name	Load Name	Ch A	Ch B	Ch C
1	Foyer LED	001	12	13	14
2	Assign...				

- Select/Name "Color Name" and assign corresponding channel intensities manually or by using the color palette to the right.

The 'Edit Color Table' dialog box is shown. It has a title bar 'Edit Color Table' and a close button. Below the title bar is 'DMX 001' and buttons for 'Import' and 'Export'. The main area is a table with columns: 'Color Name', 'Red', 'Green', 'Blue', and 'Color'. The 'Orange' row (index 3) is highlighted in light blue. To the right is a color palette and 'Recently Used Colors' section. Below the palette are input fields for Red (242), Green (65), and Blue (21), with an 'Apply' button. At the bottom right is a 'Done' button.

	Color Name	Red	Green	Blue	Color
0	Off	0	0	0	Black
1	Pink	243	53	182	Pink
2	Purple	132	76	195	Purple
3	Orange	242	65	21	Orange
4		28	0	0	Dark Red
5		35	0	0	Dark Red
6		42	0	0	Dark Red
7		49	0	0	Dark Red
8		56	0	0	Dark Red
9		63	0	0	Dark Red
10		70	0	0	Dark Red
11		77	0	0	Dark Red
12		84	0	0	Dark Red
13		91	0	0	Dark Red
14		98	0	0	Dark Red
15		105	0	0	Dark Red
16		112	0	0	Dark Red

- Set DMX light color under the Program tab and in the Settings dropdown. 3-Channel DMX outputs are listed by color name, intensity values for color mixing were set in the previous step

The screenshot shows the 'Assignable Items' interface. At the top, there are filters for 'Show All', 'Lighting - Zones', and 'All Areas'. Below this, a list of items is shown. The first item is 'Foyer' with a checkbox and '0 of 1 Active Zones'. Below it is 'Foyer LED (001)' with a checkbox. A red-bordered dropdown menu is open for 'Settings', showing options: 'Unaffected', '0 - Off', '1 - Pink', '2 - Purple', and '3 - Orange'. To the right of the dropdown are 'Fade' (2 s) and 'Delay' (0 s) fields.

Other Resources:

1. QSE-CI-DMX specification sheet found on www.lutron.com
2. Online training videos found at resi.lutron.com
 - a. Part 1—DMX Design
 - b. Part 2—DMX Programming

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