



DLP® LightCommander™ Control Software

User Manual

Software Documentation

Logic PD // Products
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Revision History

REV	EDITOR	DESCRIPTION	SW Version	APPROVAL	DATE
A	JCA	Official release of document; Added 64-bit Windows XP to supported OS list; Updated all LED Strength parameter instructions to set at no value greater than 60%	1.0	JCA	07/29/11

Table of Contents

1	Introduction.....	1
1.1	Overview of Setup and User Manual	1
1.2	Host PC System Requirements	1
2	DLP LightCommander Control Software Overview	2
2.1	Views.....	2
2.1.1	Block Diagram View	3
2.1.2	Timeline View	4
2.1.3	Workflow View	6
2.1.4	Mini Player	6
2.1.5	Log Window	7
2.2	Menu Items	7
2.3	Status Indicators	9
3	DLP LightCommander Control Software Installation	11
3.1	Register your Development Kit	11
3.2	Download Control Software	12
3.3	Install DLP LightCommander Control Software	14
4	Setup DLP LightCommander for Software Control.....	20
4.1	Connect DLP LightCommander to Host PC.....	20
4.2	Install Drivers	21
5	Run a Demo Project	24
6	Use the DLP LightCommander Control Software Wizard.....	27
7	Project Control Settings	31
7.1	DLP LightCommander Mode	32
7.2	Data Source	33
7.2.1	Video Mode.....	33
7.2.2	Structured Light Mode	34
7.3	Test Pattern Generator	35
7.4	Frame Trigger (VSYNC).....	36
7.5	Degamma.....	38
7.6	Frame Rate	39
7.6.1	Video Mode.....	39
7.6.2	Structured Light Mode	40
7.7	LED Illumination Time (Camera Exposure Time)	41
7.8	Image Flip	42
7.9	Illumination Control (LED Driver)	43
7.10	Output Syncs.....	44
7.11	Block Diagram View	45
8	Example Project: Display a Static Image	46
9	Troubleshooting	49
	Appendix A: Buttons and Icons	50

1 Introduction

The purpose of this document is to present examples and usage instructions to get the most out of the DLP LightCommander Control Software.

1.1 Overview of Setup and User Manual

If this is your first time using the DLP LightCommander Development Kit and associated LightCommander Control Software, it is important to proceed through this manual in the order provided.

Section 2 provides a general overview of the LightCommander Control Software and how it operates, including descriptions of menu items (Section 2.2).

Sections 3 and 4 give detailed instructions for installing the LightCommander Control Software and setting up the DLP LightCommander. The following is a brief overview of the setup process:

1. Download the LightCommander Control Software from Logic PD's website (Section 3.2)
2. Install the LightCommander Control Software on host PC (Section 3.3)
3. Connect the DLP LightCommander to host PC (Section 4.1)
4. Power-on the DLP LightCommander (Section 4.2)
5. Launch the LightCommander Control Software (Section 5)

After launching the LightCommander Control Software, you will be able to run through a demo project (Section 5), create a project using the LightCommander Software Wizard feature (Section 6), or open a saved project.

Section 7 describes the individual control settings that you can manipulate to control the DLP LightCommander.

Section 8 provides a step-by-step example of downloading a static image from your host PC to the DLP LightCommander.

The conclusion of this manual provides a troubleshooting guide (Section 9) and a list of the icons and buttons used in the LightCommander Control Software (Appendix A).

1.2 Host PC System Requirements

- **Operating System:** 32- or 64-bit Windows XP; not tested on Windows Vista or Windows 7
- **Processor:** 400 MHz Pentium processor or equivalent (minimum); 1 GHz Pentium processor or equivalent (recommended)
- **RAM:** 96 MB (minimum); recommend more memory to support greater number of patterns
- **Hard Disk:** Up to 500 MB of available space may be required
- **USB:** USB 2.0 Hi-Speed port
- **CD or DVD Drive:** Not required
- **Display:** 1024 x 768 high color, 32-bit
- **Internet Connection:** Required to download software; if Microsoft .NET Framework 3.5 is not currently installed on host PC, the installer will need an Internet connection to download .NET Framework 3.5 from Microsoft's website

2 DLP LightCommander Control Software Overview

The LightCommander Control Software uses Projects and Solutions to configure the DLP LightCommander. A Project acts as a container for Solutions; this means that one Project can contain several Solutions (for example, a different Solution can be created for each possible method of approaching an application but they all exist as means to reaching the same result of the Project).

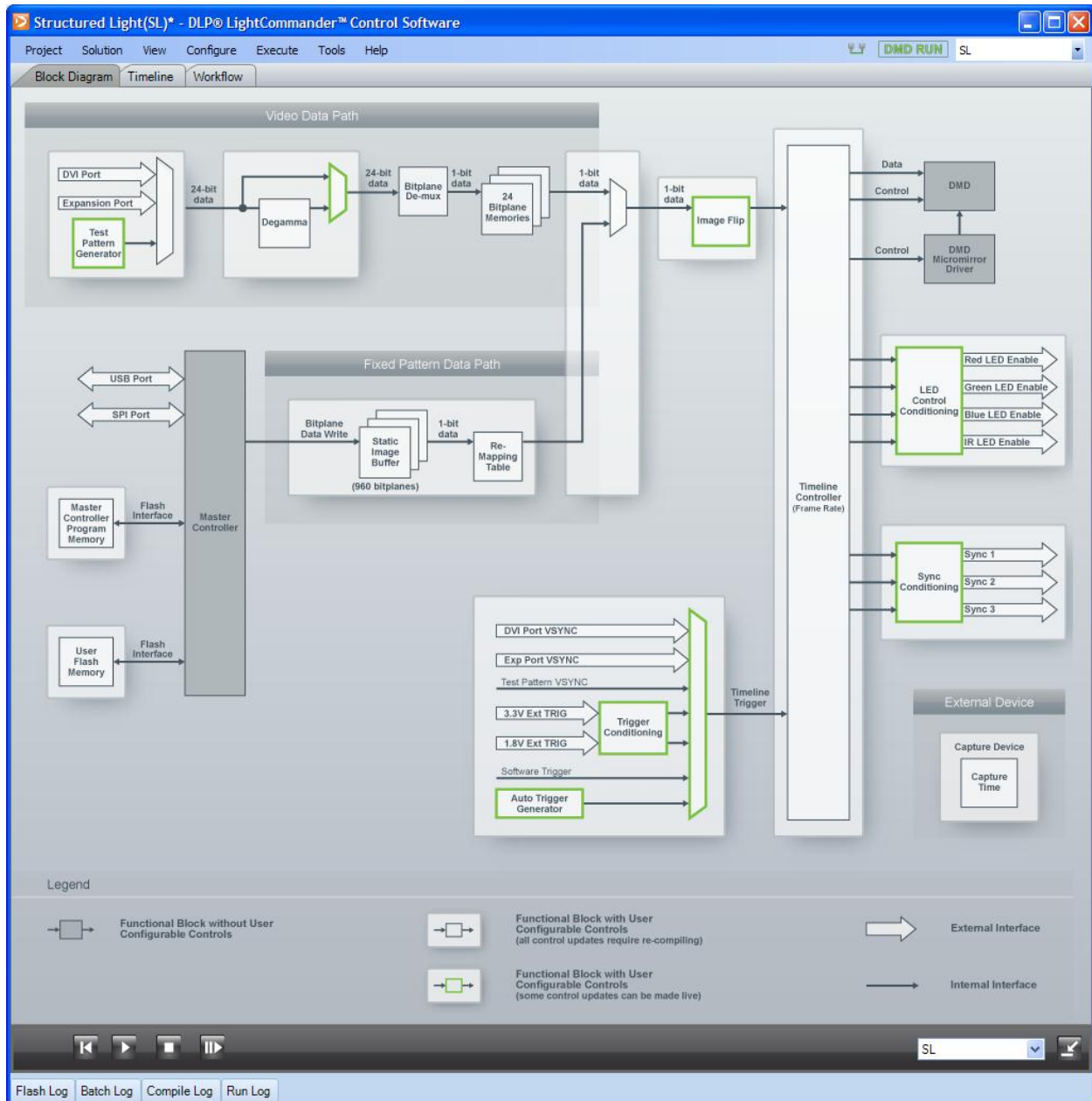
At a high level, the process for using the LightCommander Control Software involves:

1. Opening a new Project and Solution
2. Selecting the Operating Mode (Video, Real Time Structured Light, or Structured Light)
 - Video Mode projects a color video from the DLP LightCommander
 - Real Time Structured Light Mode displays a grayscale pattern captured from either the HDMI/DVI port or expansion port and through the DLP LightCommander while synchronized by the video source (VSYNC)
 - Structured Light Mode displays patterns from the timeline controller buffer that have been downloaded to the LightCommander at different rates based upon trigger settings
3. Configuring the other LightCommander Controls (such as Frame Rate, Illumination Control, Output Sync Control, etc.)
4. Compiling the Solution (this creates the "program" that will be run by the LightCommander Timeline Controller)
5. Downloading the Solution to the DLP LightCommander (this includes downloading configuration information and the Timeline Controller program)
6. Commanding the Timeline Controller to run (by clicking the Run button)

2.1 Views

The LightCommander Control Software provides three views that allow for different approaches to creating a Solution: Block Diagram, Timeline, and Workflow.

2.1.1 Block Diagram View



The Block Diagram view creates a visual depiction for assembling a Solution. Click on the different building blocks of the Solution to open dialogue boxes and then select the pertinent information for that segment of the Solution.

In the Block Diagram view, items that are highlighted in green represent commands that will immediately be sent to the DLP LightCommander and activated, assuming the DLP LightCommander is connected to the host PC when making the change in the LightCommander Control Software.

A Legend for the Block Diagram view is available at the bottom of the window.



Functional Block without User Configurable Controls



Functional Block with User Configurable Controls
(all control updates require re-compiling)



Functional Block with User Configurable Controls
(some control updates can be made live)

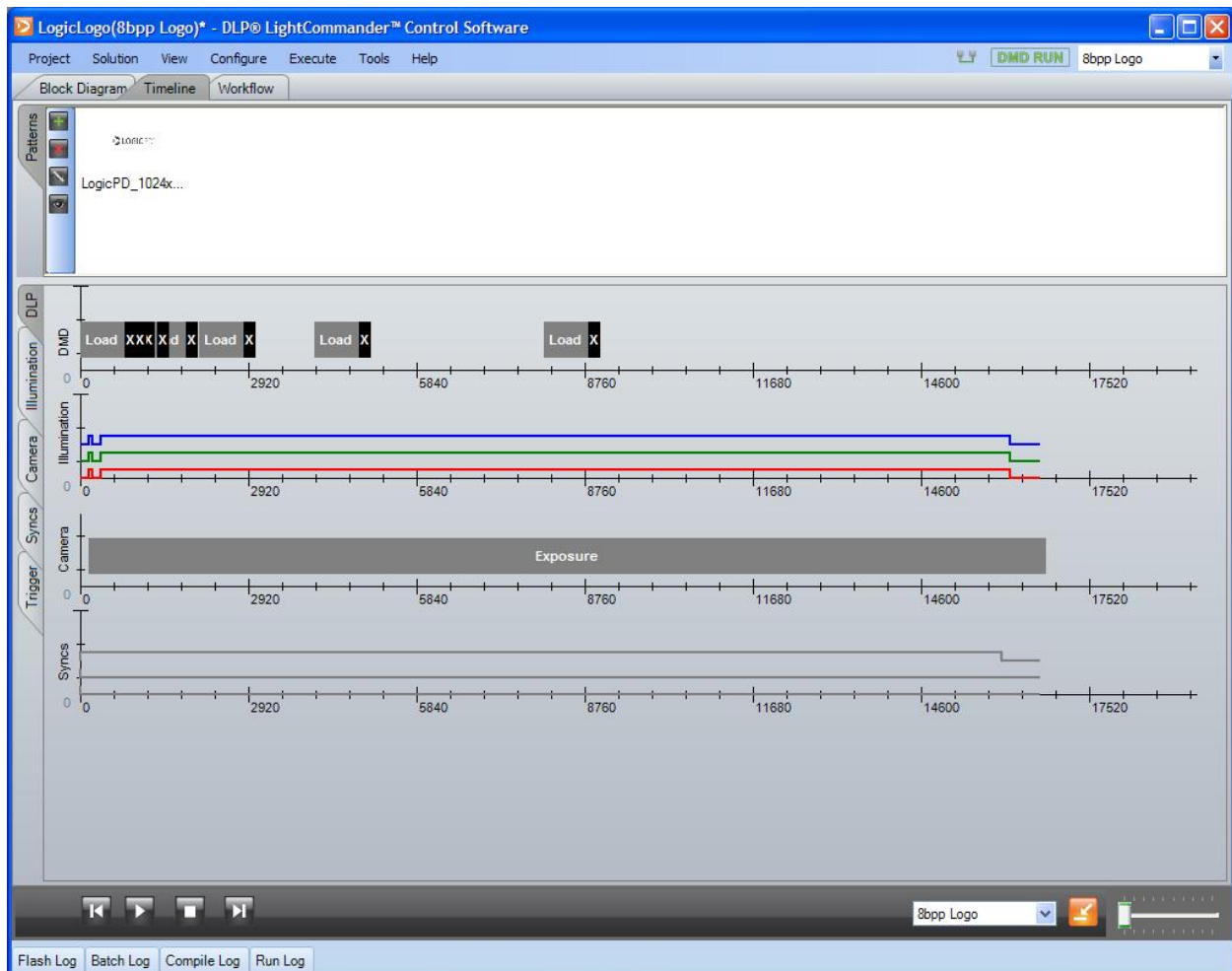


External Interface



Internal Interface

2.1.2 Timeline View



The Timeline provides both a visual and workflow perspective for creating a Solution. The top window in Timeline view provides pattern management for the Solution. Using the icons at the left of the window, you can:



Add Pattern (must be 1024 x 768)



Delete Pattern




Hide Pattern



Show Pattern

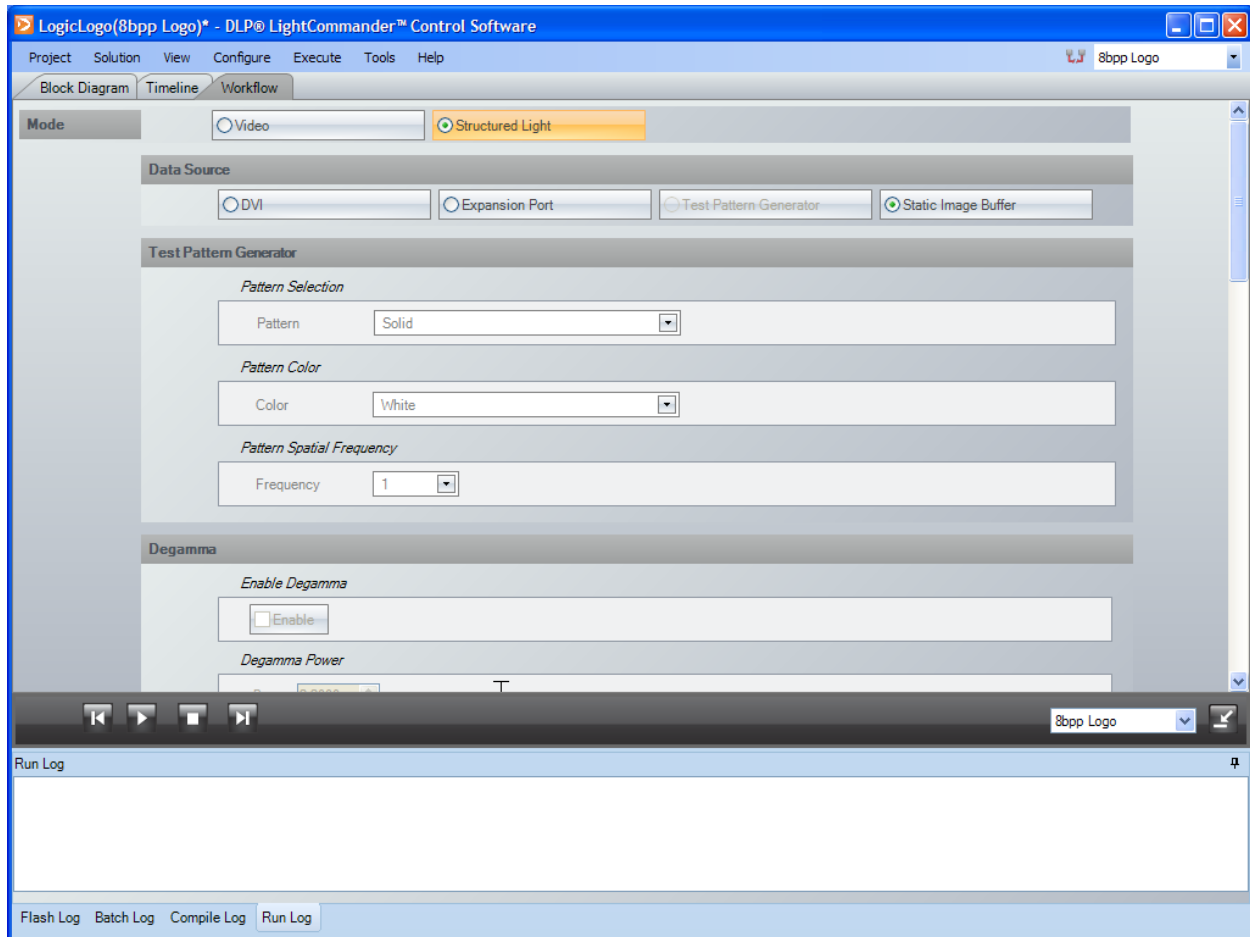
Tabs allow you to go straight to specific segments of the Solution to make configuration changes. The available Tabs are DLP (see Section 7), Illumination (see Section 7.9), Camera (see Section 7.7), Syncs (see Section 7.10), and Trigger (see Section 7.4).



The slide in the lower right corner of the window  allows you to control the scale of the timeline view. Set to the far left shows more of the timeline in the window; set to the far right zooms in to show shorter time increments in the window.

The Timeline view is read-only and will only display changes after compiling the Solution.





2.1.3 Workflow View




The Workflow view provides a step-by-step perspective of the Solution creation process. The Workflow view progresses through the configuration settings in the order they are executed after compiling the Solution.

2.1.4 Mini Player

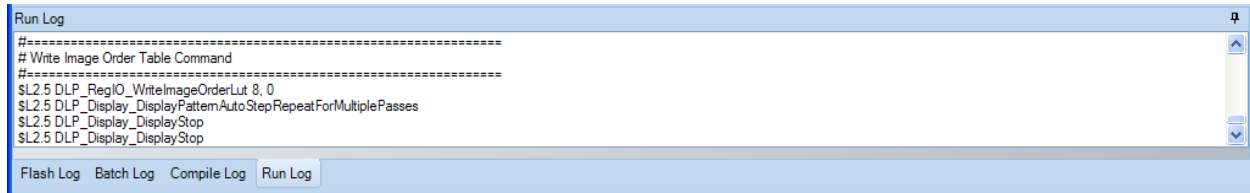
The Mini Player displays the following controls:

-  Resets the display to manual and returns to the first pattern.
-  Plays all patterns from the active solution in a continuous loop. If necessary, it compiles the solution and re-generates the commands.
-  Stops the display of patterns.
-  Steps through the patterns and displays them one at a time.





The Mini Player compact mode can be activated by selecting **View -> Mini Player** from the menu or by clicking on the compact Mini Player button . To exit the compact Mini Player mode and return to the full window, click the compact Mini Player button.

2.1.5 Log Window



The bottom pane of the main Solutions window provides visual output of the different Log files, which can be viewed by clicking the name of the Log file at the bottom of the window.

- Flash Log—captures and displays all related Flash Build activities
- Batch Log—captures and displays all Run Batch File activities
- Compile Log—captures and displays all Compile related activities
- Run Log—captures and displays all application related activities (e.g., project management)

To hide the Logs Window, click the pushpin icon . This will hide the Logs Window from view until the mouse cursor hovers over a Log file name. To unhide the Logs Window, hover over a Log file name and then click the pushpin icon .

2.1.5.1 Undocking/Docking Log Window

You can undock the Log Window by clicking and holding on the Log title bar and then dragging the window away from the main LightCommander Control Software window.

To dock the Log Window, click and hold on the Log title bar and then drag back onto the main LightCommander Control Software window. As you drag the Log window over the main window, four icons will appear at the top, right, bottom, and left of the main Control Software window. Dragging the Log Window to any of those icons will dock the Log Window at that location.

NOTE: Docking the Log Window requires the “Show window contents while dragging” effect to be active in Microsoft Windows. This setting can be found at **Start -> Control Panel -> Display -> Appearance -> Effects**.

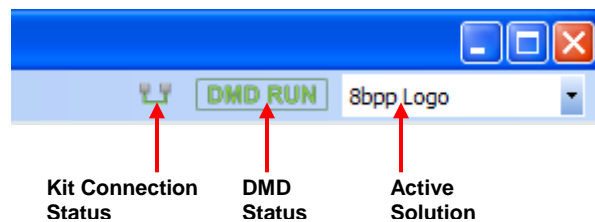
2.2 Menu Items

Project	Demo (Ctrl+D)	Sets the project to demo mode. If checked, exits demo mode.
	Wizard (Ctrl+W)	Sets the project to Wizard mode. If checked, exits Wizard mode.
	New... (Ctrl+N)	Creates a new project.
	Open... (Ctrl+O)	Opens the project selector window.
	Save (Ctrl+S)	Saves the current project.
	Save As... (Ctrl+A)	Saves the current project as a different name.
	Properties...	Opens the project properties dialog window.
	Import... (Ctrl+I)	Imports a project.
	Export... (Ctrl+E)	Exports current project as ZIP file.




	Recent	Provides a list of recent projects.
	Quit (Ctrl+Q)	Quits the LightCommander Control Software program.
<hr/>		
Solution	New... (Alt+N))	Adds a new solution to the current project.
	Switch	Lists the open solutions and allows you to select the active solution.
	Save (Alt+S)	Saves the active solution.
	Save As... (Alt+A)	Adds a copy of the active solution to the project and sets the copy as the active solution.
	Properties...	Opens the active solution properties dialog window.
	Delete	Deletes the active solution.
<hr/>		
View	Block Diagram (Ctrl+B)	Displays the Block Diagram view.
	Timeline (Ctrl+T)	Displays the Timeline view.
	Workflow (Ctrl+W)	Displays the Workflow view.
	Mini Player (Ctrl+M)	Displays the compact Mini Player mode.
	Log Windows	Un-hides the Log Windows.
<hr/>		
Configure	DLP System (F1)	Displays DLP tab in Timeline view.
	Pattern Arranger (F2)	Opens Pattern Arranger window.
	Frame Trigger (F3)	Displays Frame Trigger tab in Timeline view.
	Illumination Control (F4)	Displays Illumination Control tab in Timeline view.
	Camera System (F5)	Displays Camera System tab in Timeline view.
	Sync Control (F6)	Displays Sync Control tab in Timeline view.
<hr/>		
Execute	Connect (Ctrl+Alt+A)	Establishes a connection with the DLP LightCommander
	DMD Run / Park...	Places the DMD in Run or Park position.
	Compile (Ctrl+C)	Creates a sequence from all changes/inputs to commands that do not send live updates to the DLP LightCommander.
	Restart (Ctrl+L)	Resets the display to manual and returns to the first pattern.
	Play (Ctrl+Y)	Plays all patterns from the active solution in a continuous loop. If necessary, it compiles the solution and re-generates the commands.
	Step to Next (Ctrl+X)	Steps through the patterns and displays them one at a time.
	Stop (Ctrl+P)	Stops the display of patterns.

	Build Flash Image (Ctrl+Alt+I)	Assembles all commands that are immediately transferred to the DLP LightCommander and user defined system inputs to create a flash persistent image that can be run on the LightCommander without connection to a host PC. Stores the sequence locally on the host PC.
	Program Flash (Ctrl+F)	Downloads flash image from host PC to the DLP LightCommander. This process replaces the existing flash image.
Tools	Log Files... (Alt+F)	Opens log configuration allowing you to save the log file in the project folder. Allows you to toggle the Activity Log control.
	Run Batch File... (Alt+B)	Opens a browser window to select a batch file to run. Batch files can be created from the Run Log to generate often repeated commands.
	Comment Window... (Alt+1)	Adds a comment to batch log file.
	Command Line Window... (Alt+2)	Runs a batch command interactively.
	Update Master Controller Program Memory... (Alt+C)	Updates DLP LightCommander firmware.
	Preferences...	Opens Preferences window.
Help	Users Manual (Ctrl+H)	Opens a PDF of this manual.
	www.logicpd.com	Launches a web browser window to Logic PD's home page.
	www.ti.com	Launches a web browser window to TI's home page.
	Contact Us	Launches a web browser window to Logic PD's technical support form.
	Check for Updates (Alt+U)	Determines if an updated version of the LightCommander Control Software is available on Logic PD's website.
	About LightCommander Control	Displays the LightCommander Control Software splash screen with version numbers and system status.

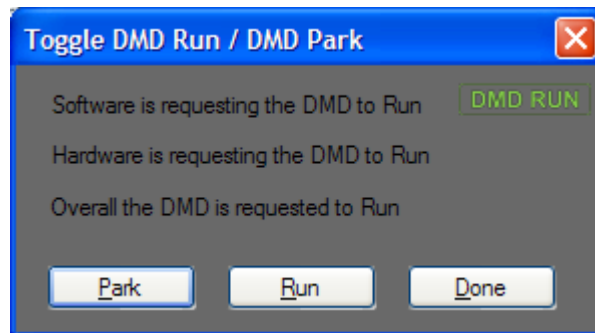
2.3 Status Indicators



The top right corner of the LightCommander Control Software window provides status information for kit connection, DMD, and active solution.

Kit Connection Status: The default setting is connected . A connected status means that setting changes for live update controls (see Section 7) will immediately be activated on the DLP LightCommander. Clicking the kit connection status icon will toggle between connected  and off-line . Setting the kit to off-line allows you to create a program without affecting the DLP LightCommander or without having the DLP LightCommander connected to the host PC.

DMD Status: The DMD status icon indicates whether the DMD is set to Run or Park. Clicking on the DMD status icon will open a dialog window that can instruct the LightCommander Control Software to request the DMD to Run or Park. This dialog window will also indicate whether the DLP LightCommander hardware switch has the DMD set to Run or Park.



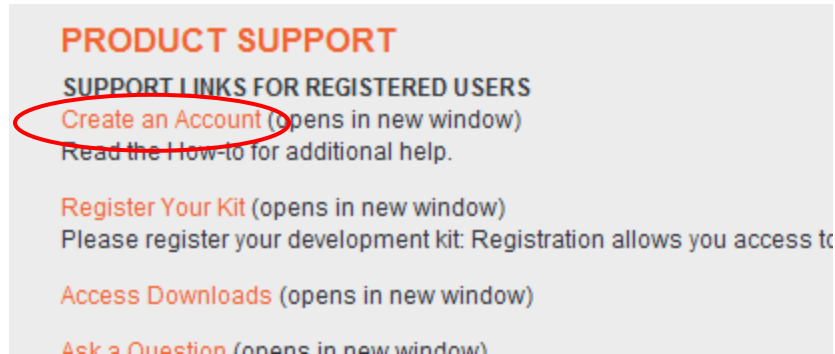
Active Solution: The active solution drop down menu allows you to select between available solutions; the selected solution is the active solution.

3 DLP LightCommander Control Software Installation

The DLP LightCommander Control Software is available for download from Logic PD's website after registering your DLP LightCommander Development Kit. If you have already registered your product on Logic PD's website, as described in the QuickStart Guide, you can proceed to Section 3.2 "Download Control Software"; otherwise, continue with the next section to register your kit.

3.1 Register your Development Kit

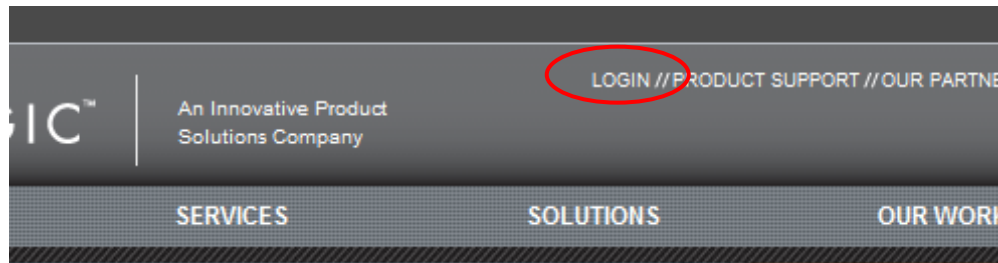
1. To register, visit the Logic PD Support web page at www.logicpd.com/product-support and click on the **Create an Account** link.



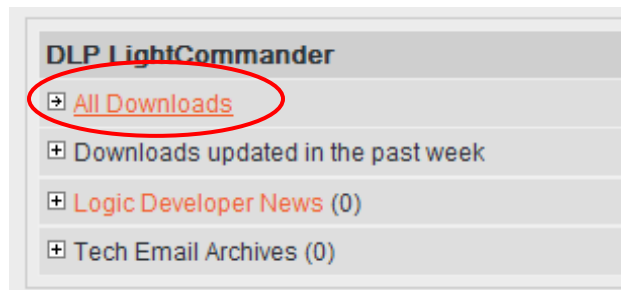
2. Fill in the on-screen form and click the **Submit** button.
3. You will receive an e-mail with a URL link to confirm account creation. Click on the link to finalize account creation.
4. You will be directed to a page on Logic PD's website that states "Account Activated." At this point you can register your product.
5. Click on the **register your development kit and get access to downloads** link.
6. Fill in the on-screen form (all fields are required) and click the **Submit** button.
7. Your product is now registered. Click on the **Return to your Account Overview** link and you will see the list of registered products for your account.
8. Proceed to Step 3 in the next section to download the DLP LightCommander Control Software.

3.2 Download Control Software

1. Log into your account page by clicking on the **LOGIN** link at the top of any www.logicpd.com web page.



2. Enter your username (email address) and password that you used during registration and click the **Submit** button.
3. Under your REGISTERED PRODUCTS list, click on the **All Downloads** link for the DLP LightCommander.



4. Locate the "Software Development Tools" heading and click on the **DLP LightCommander Control Software** link.

NOTE: Clicking on download title link (in this case **DLP LightCommander Control Software**) will always provide you the most recent version of the download. Clicking on the + icon next to a download title link will reveal a list of all the available versions for that download, allowing you to choose which version to download.

DOWNLOADS FOR DLP LIGHTCOMMANDER

Hardware Documents

Date	Document
3/10/2010	+ DLP Controller Board Hardware Specification
3/10/2010	+ DLP DMD Board Hardware Specification

User Manuals

Date	Document
3/10/2010	+ DLP LightCommander QuickStart Guide
3/10/2010	+ DLP LightCommander Development Kit User Manual
3/10/2010	+ DLP LightCommander Software User Manual

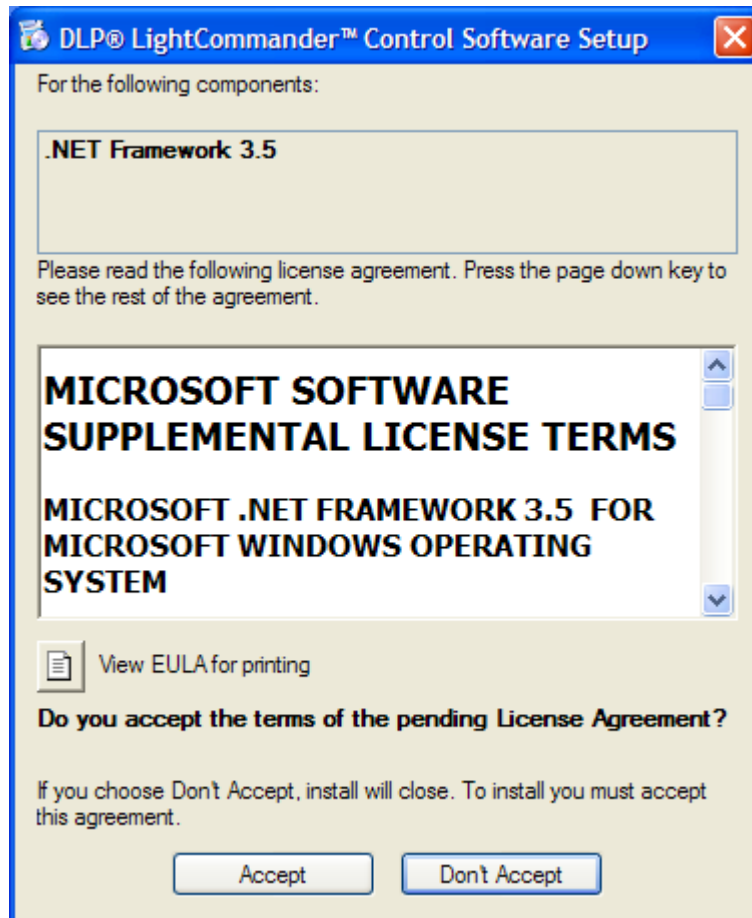
Software Development Tools

Date	Document
3/11/2010	+ DLP LightCommander Control Software

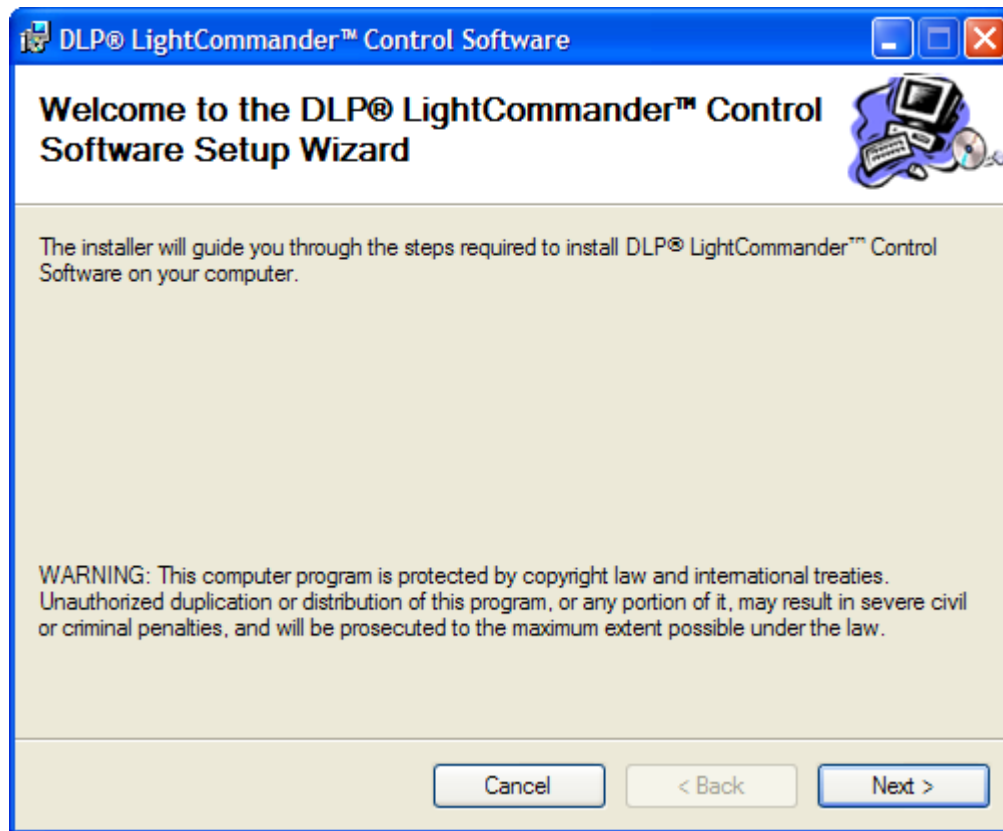
5. You will be prompted to save the software install file to the host PC's local drive. Remember where the file is saved; you will need to locate it on the local drive.

3.3 Install DLP LightCommander Control Software

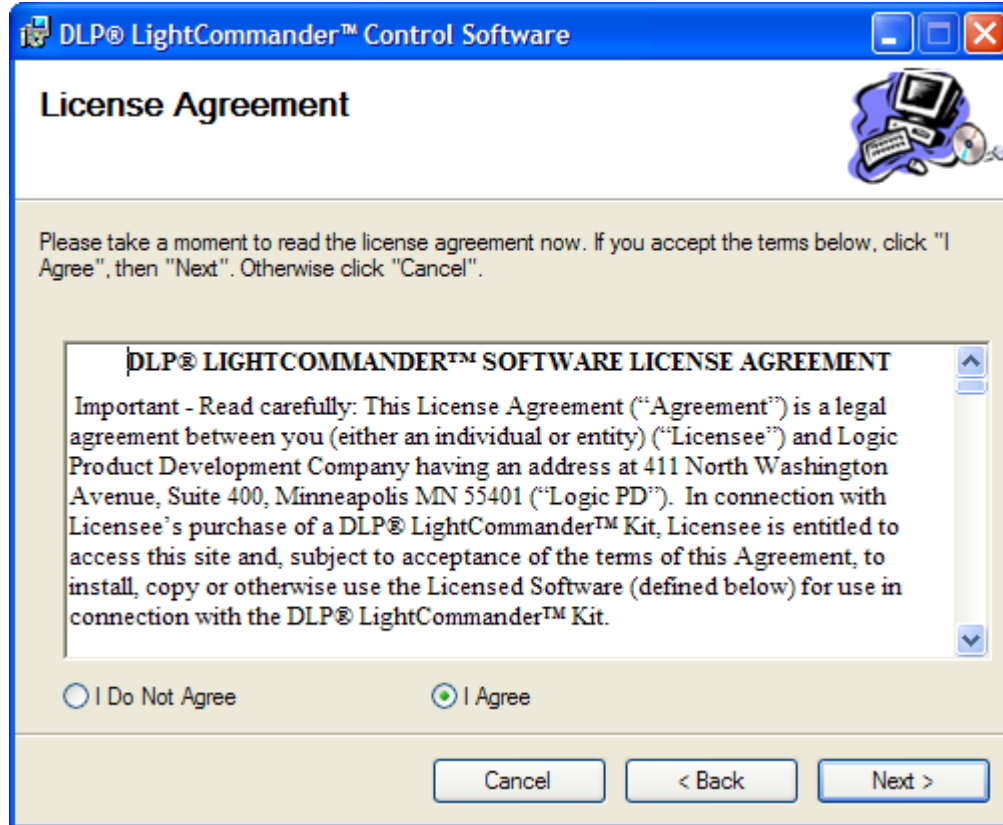
1. Locate the LightCommander Control Software installation files that you saved to your local drive.
2. Double-click on the **setup.exe** icon.
3. If the host PC does not currently have .NET Framework 3.5 installed, the following window will appear. Click the **Accept** button and the installer will download and begin installing .NET Framework 3.5 from Microsoft's website. This may take several minutes.



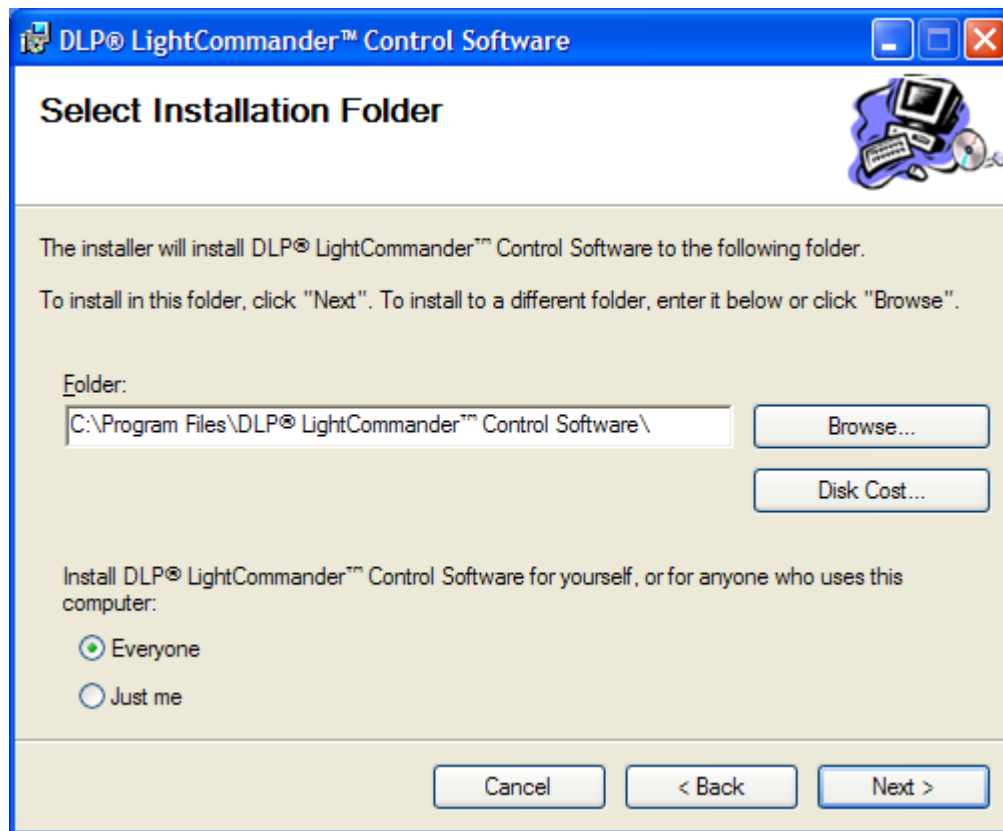
4. After the welcome screen appears, click the **Next>** button.



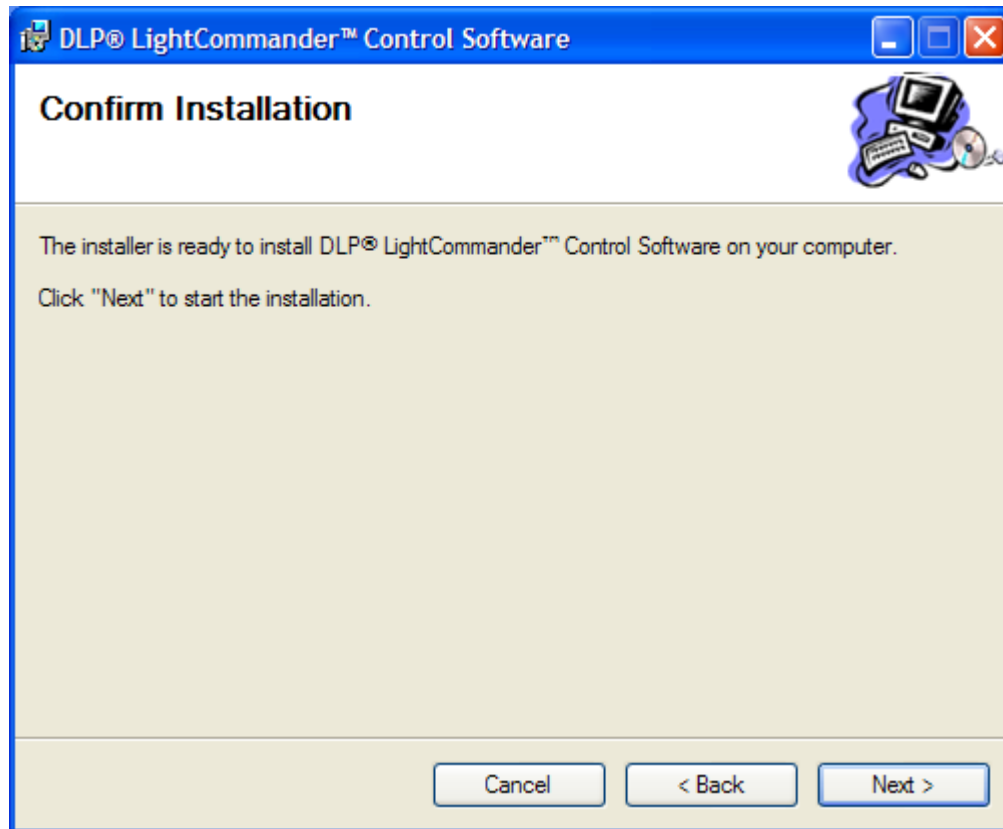
5. Read the License Agreement. If you agree to the terms, check the ☒ **Agree** button and click the **Next>** button.



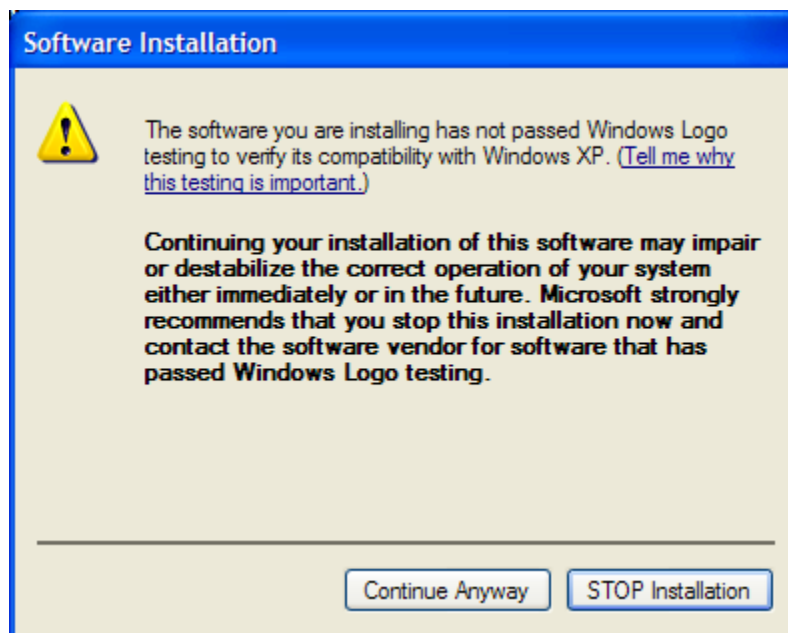
6. Select the installation folder and access level; the default settings are recommended. Then click the **Next>** button.



7. Click the **Next>** button to begin installation. Installation will complete in less than one minute, depending upon the host PC specifications.

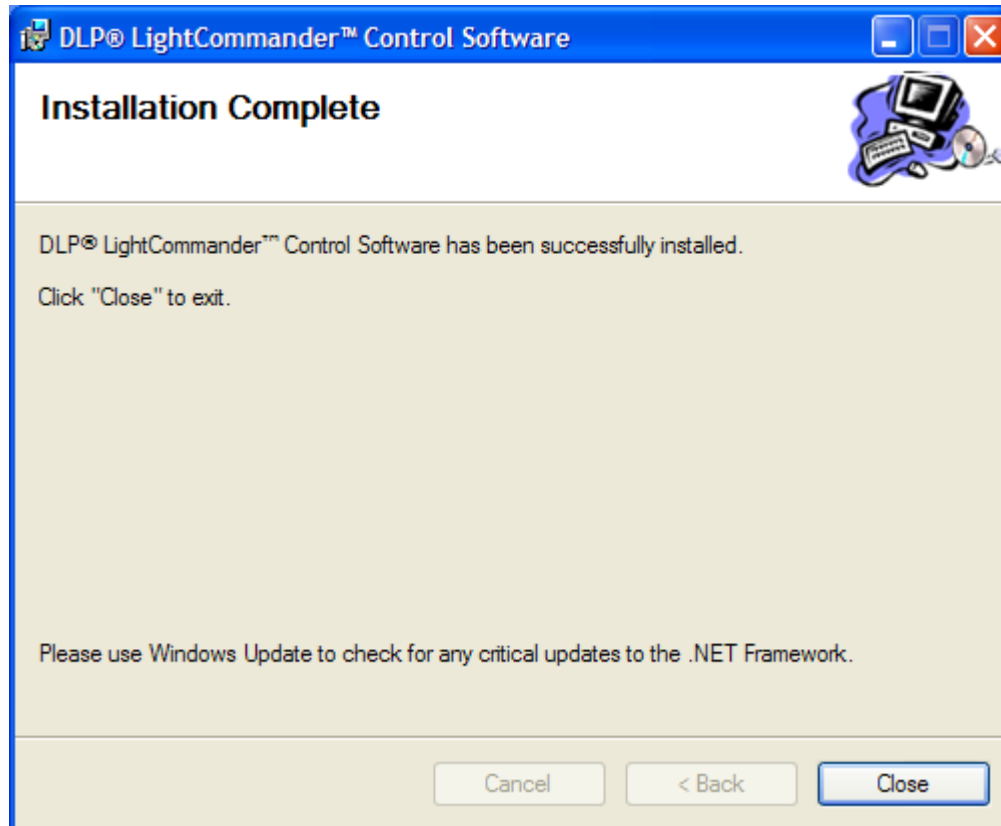


8. A warning message may appear stating the software has not passed Windows XP compatibility testing. Click the **Continue Anyway** button.



9. An “Installation Complete” message will appear when the software has been successfully installed. Click the **Close** button to exit the installer.

NOTE: The DLP LightCommander Control Software requires .NET Framework 3.5. Please check the Windows Update website to see if there are any critical updates available for version 3.5; installing the latest critical updates helps maintain a stable software environment.



4 Setup DLP LightCommander for Software Control

The LightCommander Control Software communicates with the DLP LightCommander through the included USB cable.

4.1 Connect DLP LightCommander to Host PC

IMPORTANT NOTE: Before connecting the DLP LightCommander to the host PC, please make sure the LightCommander Control Software has been installed. The LightCommander Control Software includes the necessary drivers that will be required for connecting the DLP LightCommander.

1. With the DLP LightCommander powered off, connect the USB mini-B end of the cable to the USB connector on the side of the DLP LightCommander.



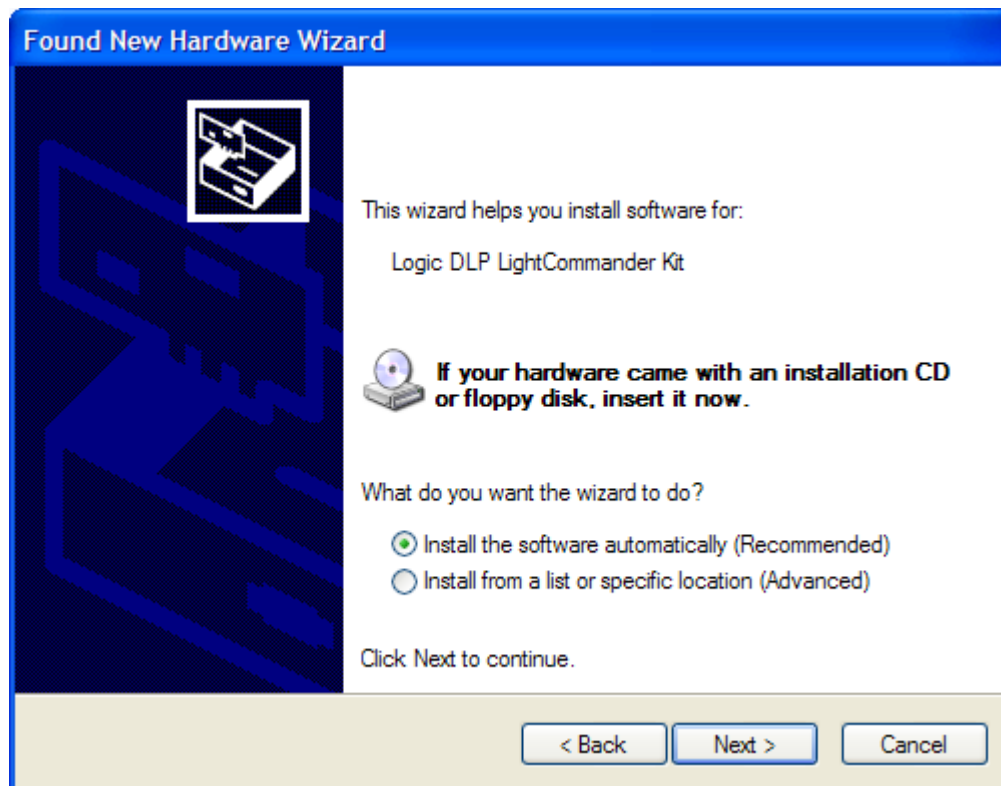
2. Connect the USB A end of the cable to an available USB 2.0 port on the host PC.
3. If the power cord is not connected to the DLP LightCommander, connect the power cord for the appropriate region in which you're using the kit and plug it into a power outlet.
4. Make sure the Park / Run switch is set to "Run," then power on the DLP LightCommander.

4.2 Install Drivers

1. After the DLP LightCommander is powered on, the Windows “Found New Hardware Wizard” will launch. When asked if Windows can connect to Windows Update, select “No, not this time” and then click the **Next>** button.



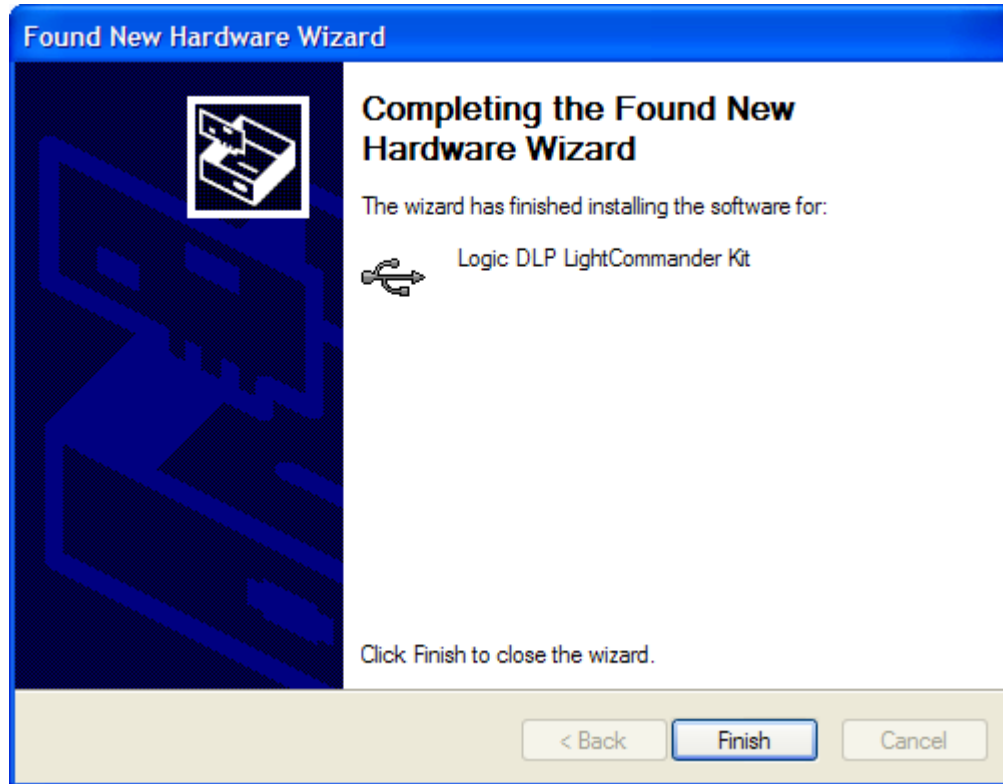
2. Select the "Recommended" option to let the Wizard automatically install the software. Click the **Next>** button.



3. A warning message may appear stating the software has not passed Windows XP compatibility testing. Click the **Continue Anyway** button.



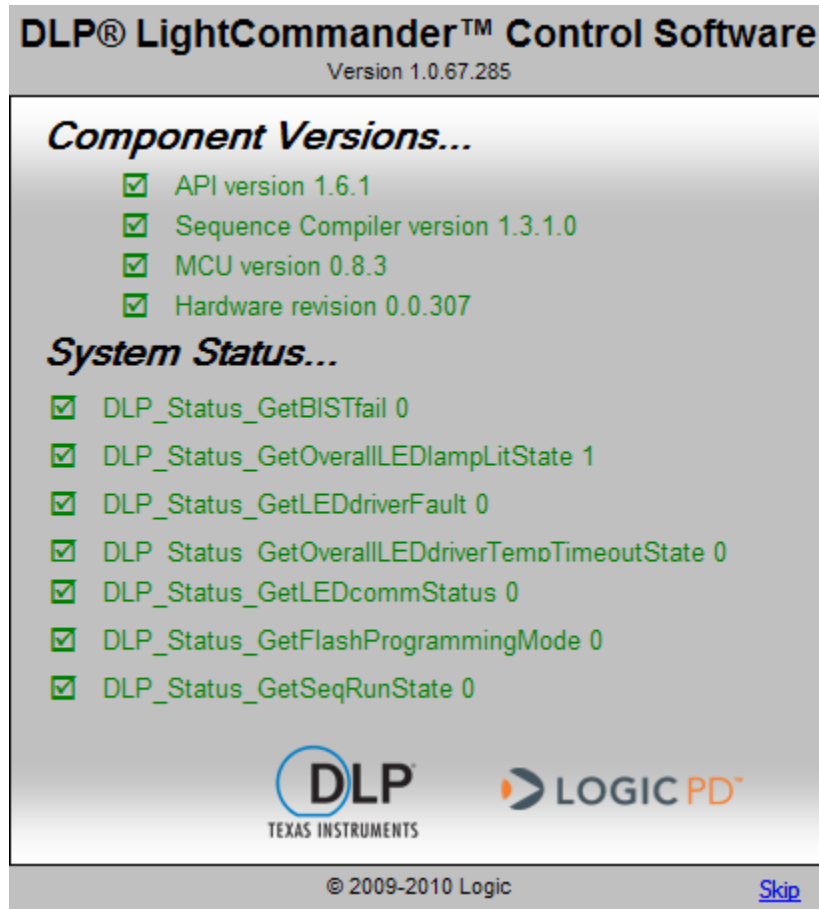
4. The Wizard will provide a message that it has finished installing the software for the DLP LightCommander. Click the **Finish** button to close the Wizard.



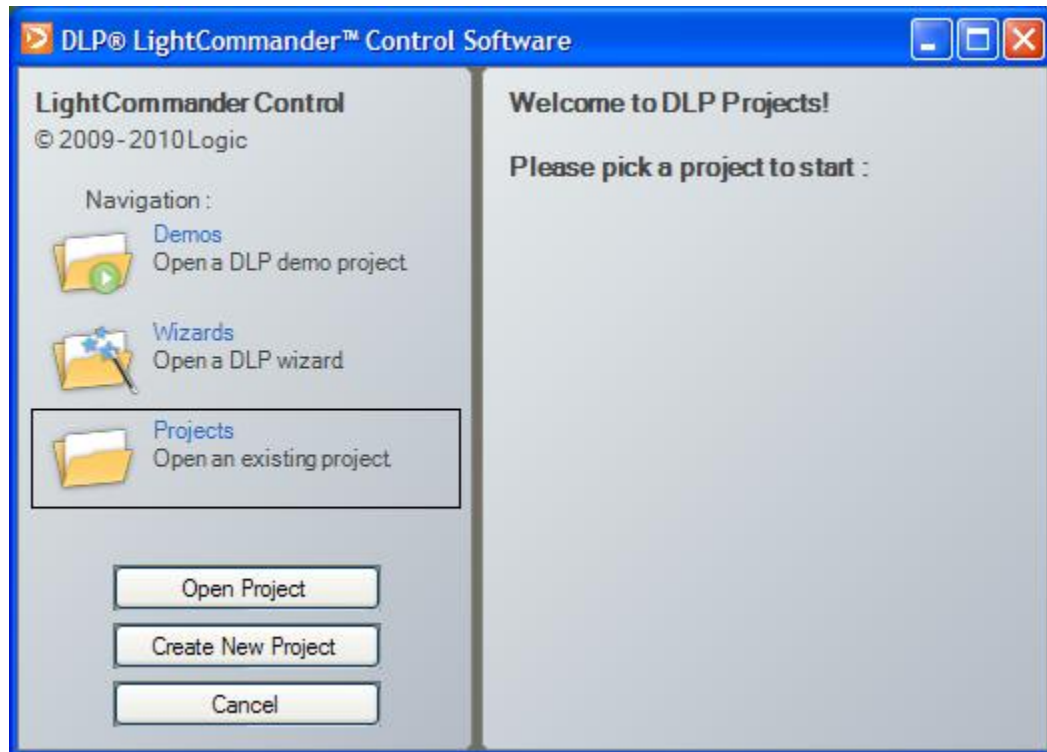
5. A Windows message balloon will appear on the taskbar stating the new hardware has been installed and is ready for use. You are now ready to use the LightCommander Control Software to communicate with the DLP LightCommander.

5 Run a Demo Project

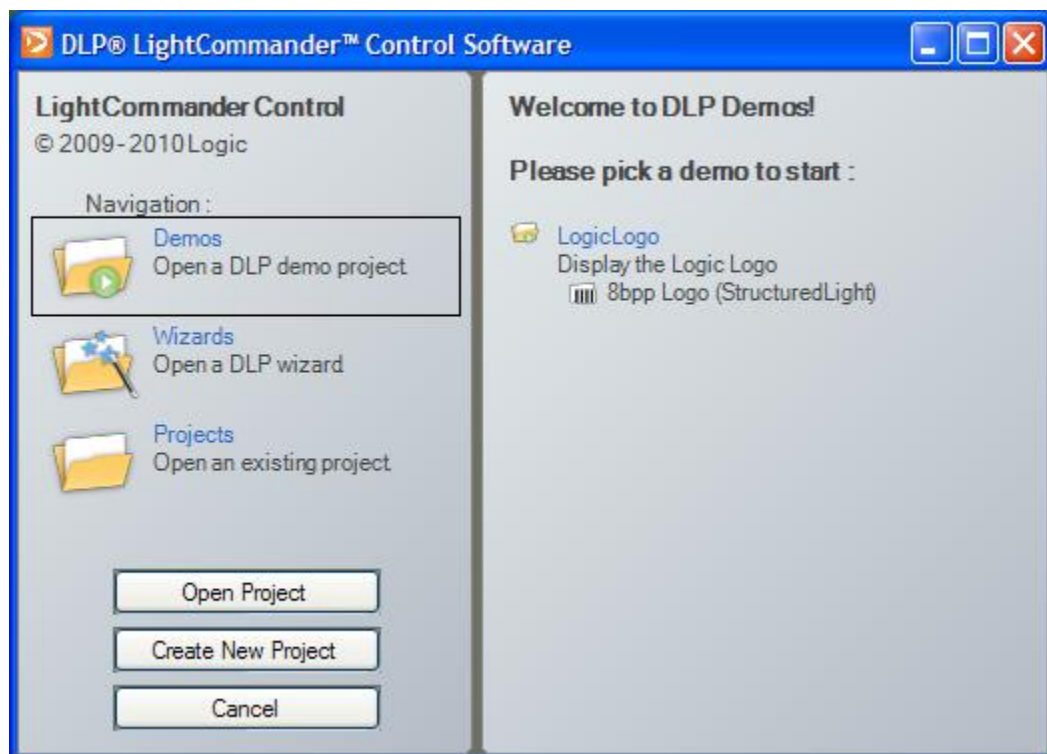
1. Launch the DLP LightCommander Control Software by double-clicking on the **DLP LightCommander Control Software** shortcut on your desktop or by selecting the program from the Start menu (**Start -> All Programs -> DLP LightCommander Control Software -> DLP LightCommander Control Software**). The LightCommander Control Software splash screen will appear.



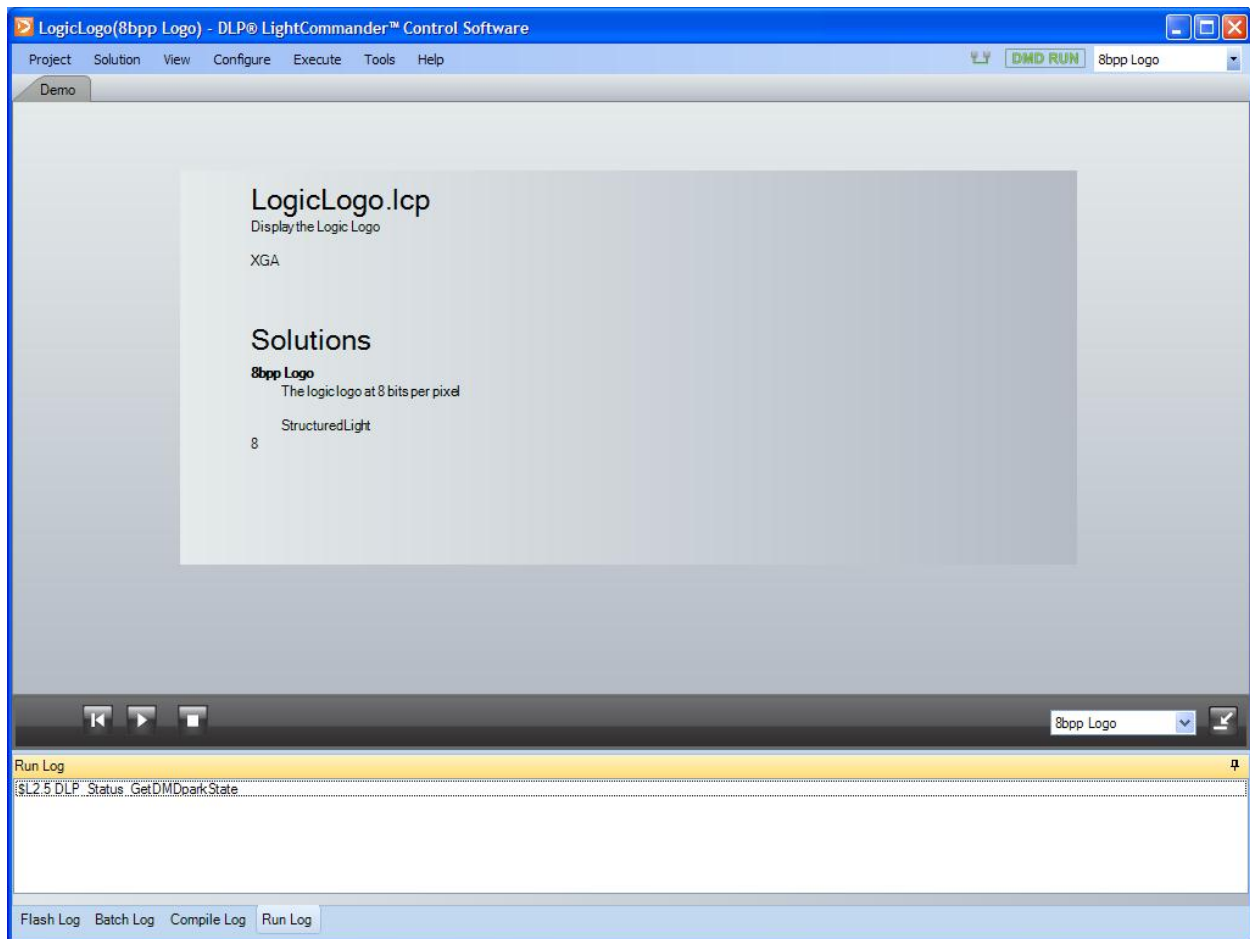
2. After a few moments, the main project selection window will appear. In the pane on the left, click the **Demos** link under the “Navigation:” menu.




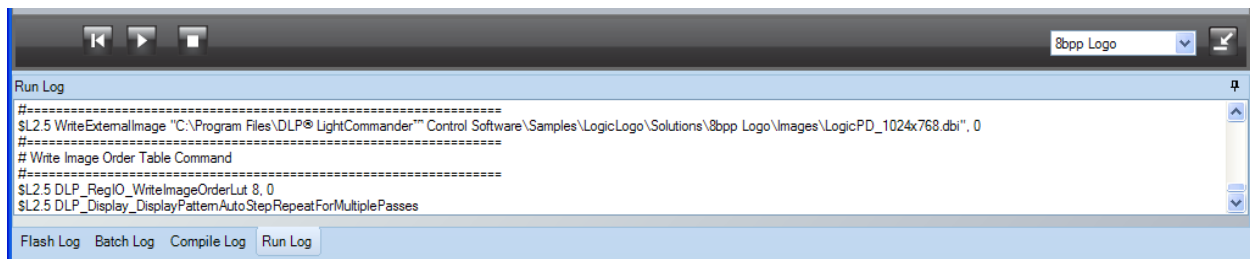
3. In the pane on the right, click on the **LogicLogo** link.



4. The “LogicLogo(8bpp Logo)” window will open.



5. To run the demo, click the Play button  on the Mini Player. The DLP LightCommander will display the Logic PD logo on the projected surface. The Run Log at the bottom of the window will output project information.

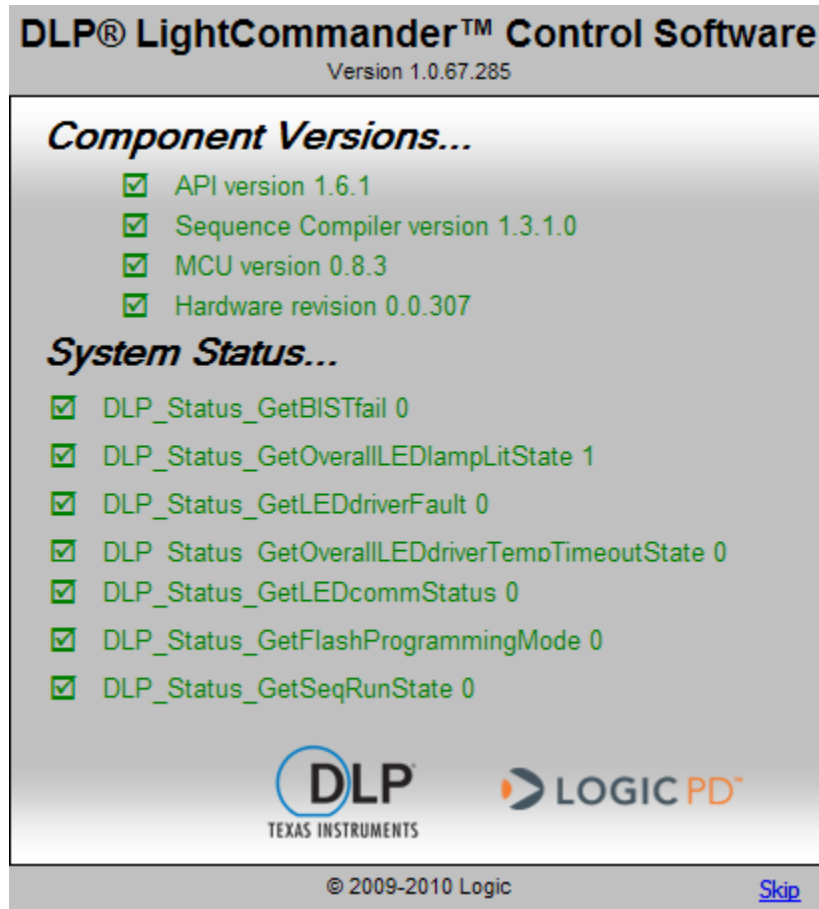


6. Click the Stop button  to end the demo.

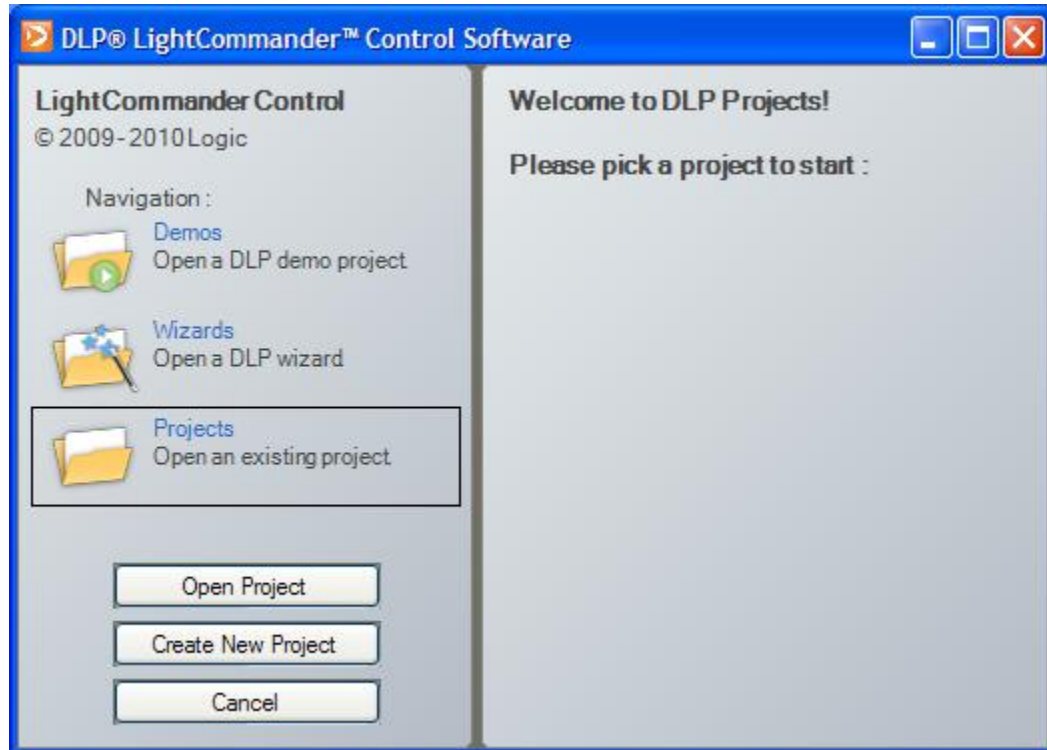
6 Use the DLP LightCommander Control Software Wizard

The LightCommander Control Software features a wizard setting that will walk you through the different setting options for a particular project type: Real Time Structured Light, Structured Light, or Video.

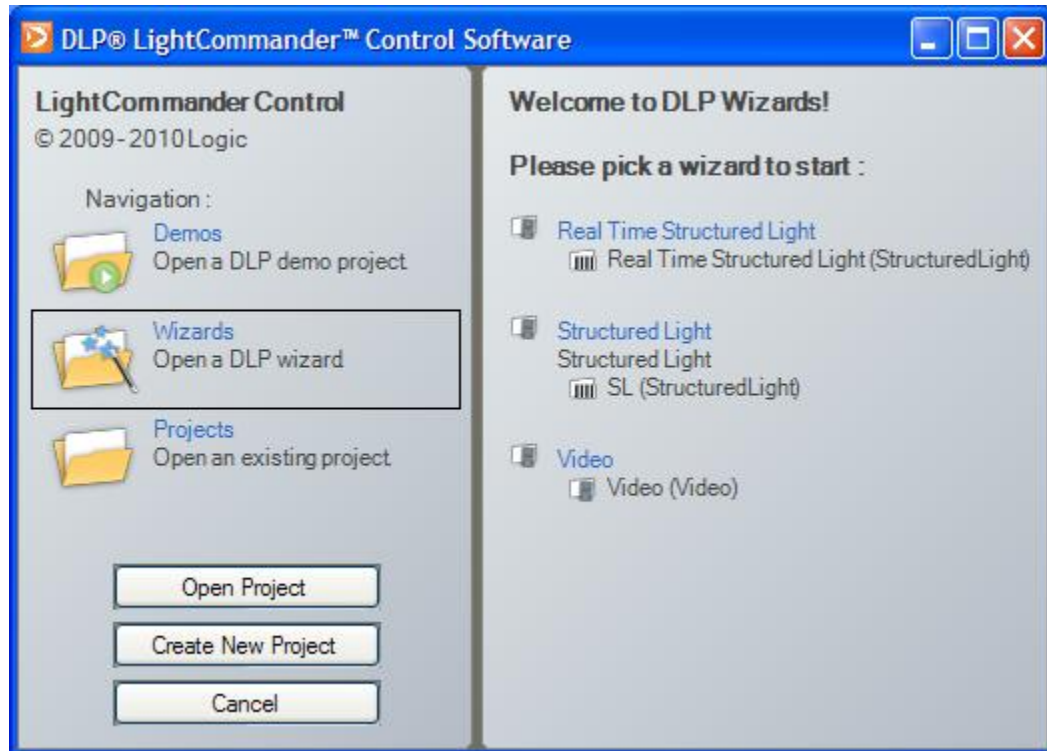
1. Launch the DLP LightCommander Control Software by double-clicking on the **DLP LightCommander Control Software** shortcut on your desktop or by selecting the program from the Start menu (**Start -> All Programs -> DLP LightCommander Control Software -> DLP LightCommander Control Software**). The LightCommander Control Software splash screen will appear.



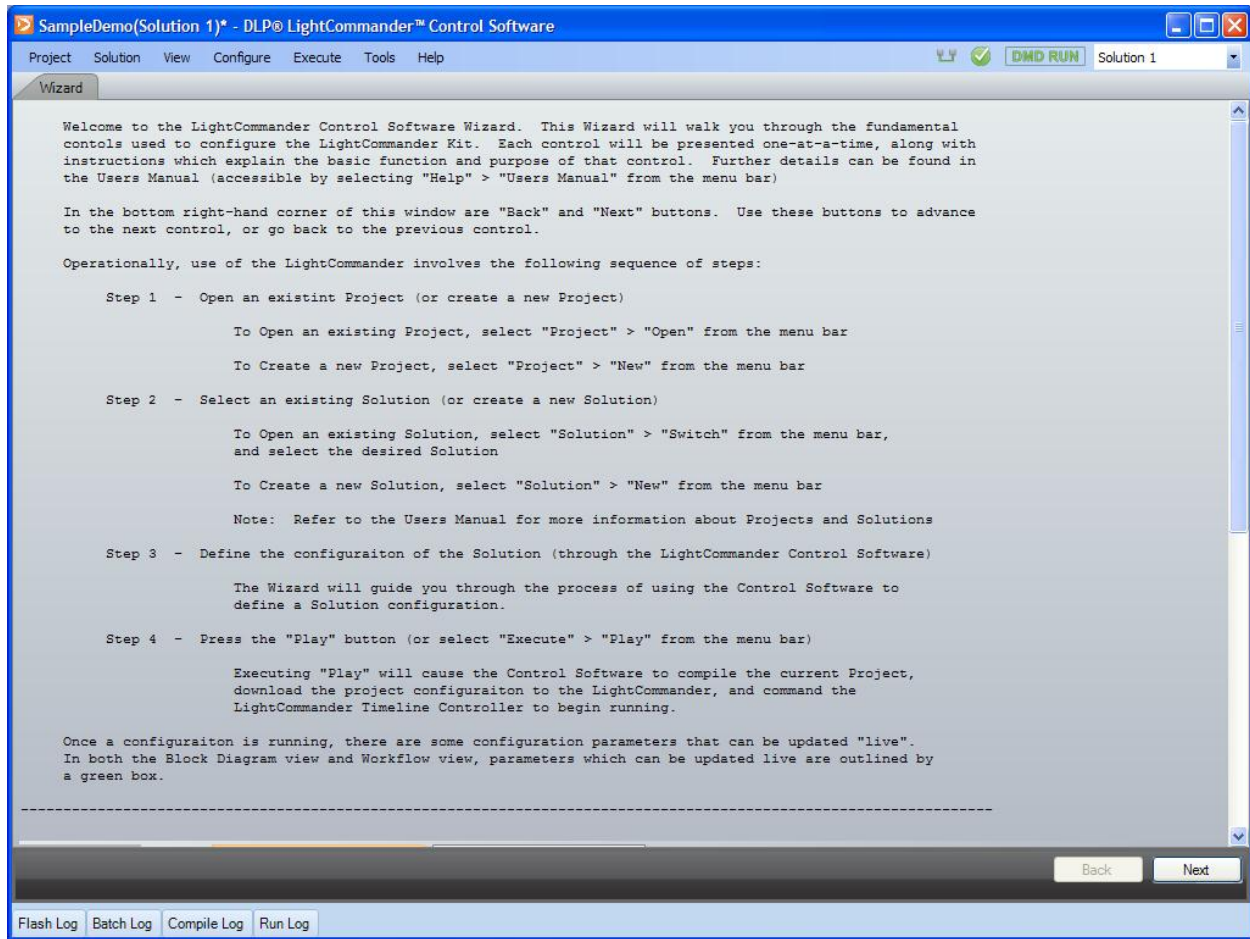
2. After a few moments, the main project selection window will appear. In the pane on the left, click the **Wizards** link under the “Navigation:” menu.



3. In the pane on the right, click the link that is specific to the project you wish to create.
- Real Time Structured Light Mode displays a grayscale pattern captured from either the HDMI/DVI port or expansion port and through the DLP LightCommander while synchronized by the video source (VSYNC)
 - Structured Light Mode displays patterns from the timeline controller buffer that have been downloaded to the LightCommander at different rates based upon trigger settings
 - Video Mode projects a color video from the LightCommander



4. The solution window will open.



5. The wizard proceeds step-by-step through the DLP LightCommander project control settings. You will be able to select your desired setting and then click the **Next** button in the bottom right-hand corner to proceed to the next control. Section 7 describes the different control settings and options.

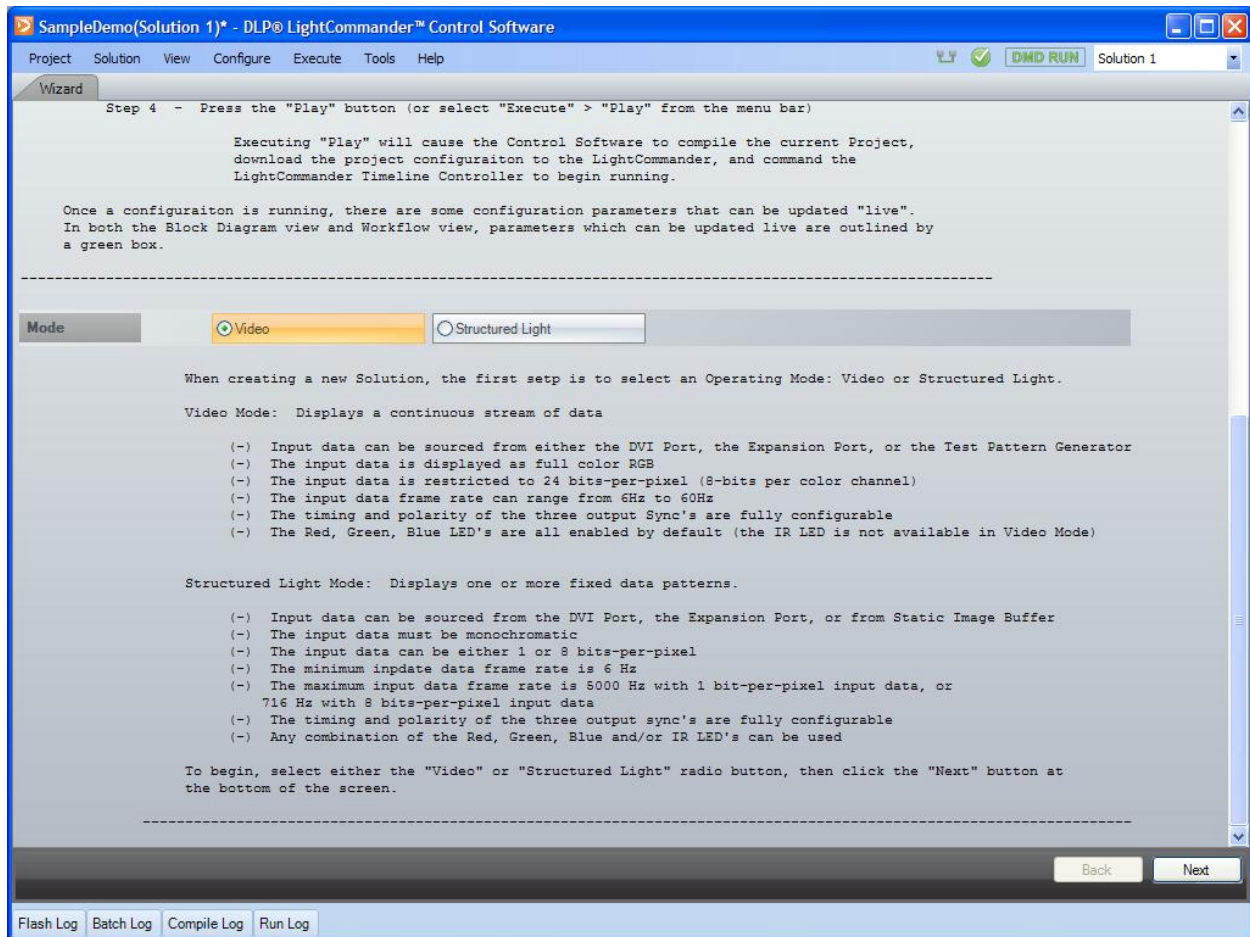
7 Project Control Settings

LightCommander Control Software projects are created by setting a number of controls that send instructions to the DLP LightCommander. This section provides descriptions for the available controls. Table 7.1 presents an overview of which controls are available in the each mode, as well as which controls have the LIVE UPDATE feature (LIVE UPDATE means that changes made to the control are immediately sent to the DLP LightCommander, provided there is an active connection).

Table 7.1: Project Controls Overview

Control	Video Mode	Structured Light Mode	LIVE UPDATE
Data Source (Section 7.2)	YES	YES	—
Test Pattern Generator (Section 7.3)	YES	—	YES
Frame Trigger—VSYNC (Section 7.4)	YES	YES	YES
Degamma (Section 7.5)	YES	—	Degamma Enable Only
Frame Rate (Section 7.6)	YES	YES	—
LED Illumination Time (Section 7.7)	—	YES	—
Image Flip (Section 7.8)	YES	YES	YES
Illumination Control (Section 7.9)	YES	YES	LED Enable and LED Strength Only
Output Syncs (Section 7.10)	YES	YES	YES

7.1 DLP LightCommander Mode



When creating a new Solution, the first step is to select an operating mode: Video or Structured Light.

Video: Selecting Video displays a continuous stream of data.

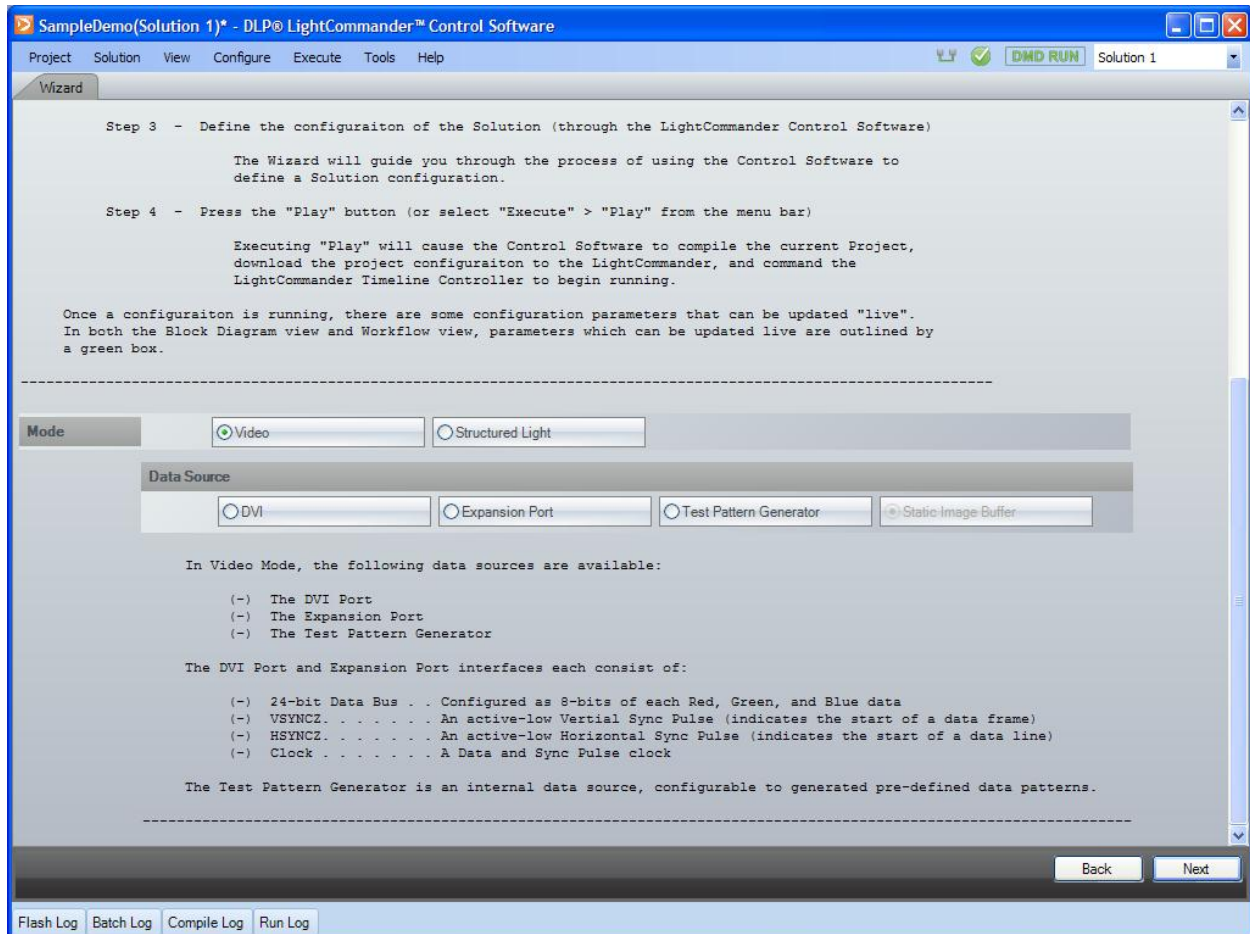
- Input data can be sourced from the HDMI/DVI Port, Expansion Port, or Test Pattern Generator
- The input data is displayed as full color RGB
- The input data is restricted to 24 bits per pixel (8 bits per color channel)
- The input data frame rate can range from 6 to 60 Hz
- The timing and polarity of the three user syncs are fully configurable
- The Red, Green, and Blue LEDs are all enabled by default (the IR LED is not available in Video Mode)

Structured Light: Selecting Structured Light displays one or more fixed data patterns.

- Input data can be sourced from the HDMI/DVI Port, Expansion Port, or Static Image Buffer
- The input data must be monochromatic
- The input data can be either 1 or 8 bits per pixel
- The minimum input data frame rate is 6 Hz

- The maximum input data frame rate is 5000 Hz with 1 bit per pixel input data or 716 Hz with 8 bits per pixel input data
- The timing and polarity of the three user syncs are fully configurable
- Any combination of the Red, Green, Blue, and/or IR LEDs can be used

7.2 Data Source



The Data Source controls the input source into the solution. Only one data source can be selected.

7.2.1 Video Mode

In Video Mode, the following data sources are available:

- The DVI Port
- The Expansion Port
- The Test Pattern Generator

The DVI Port and Expansion Port interfaces each consist of:

- 24-bit Data Bus: Configured as 8 bits of each Red, Green, and Blue data
- VSYNCZ: An active-low Vertical Sync Pulse (indicates the start of a data frame)
- HSYNCZ: An active-low Horizontal Sync Pulse (indicates the start of a data line)

- Clock: A Data and Sync Pulse clock

The Test Pattern Generator is an internal data source that can be configured to generate pre-defined data patterns.

7.2.2 Structured Light Mode

In Structured Light Mode, the following data sources are available:

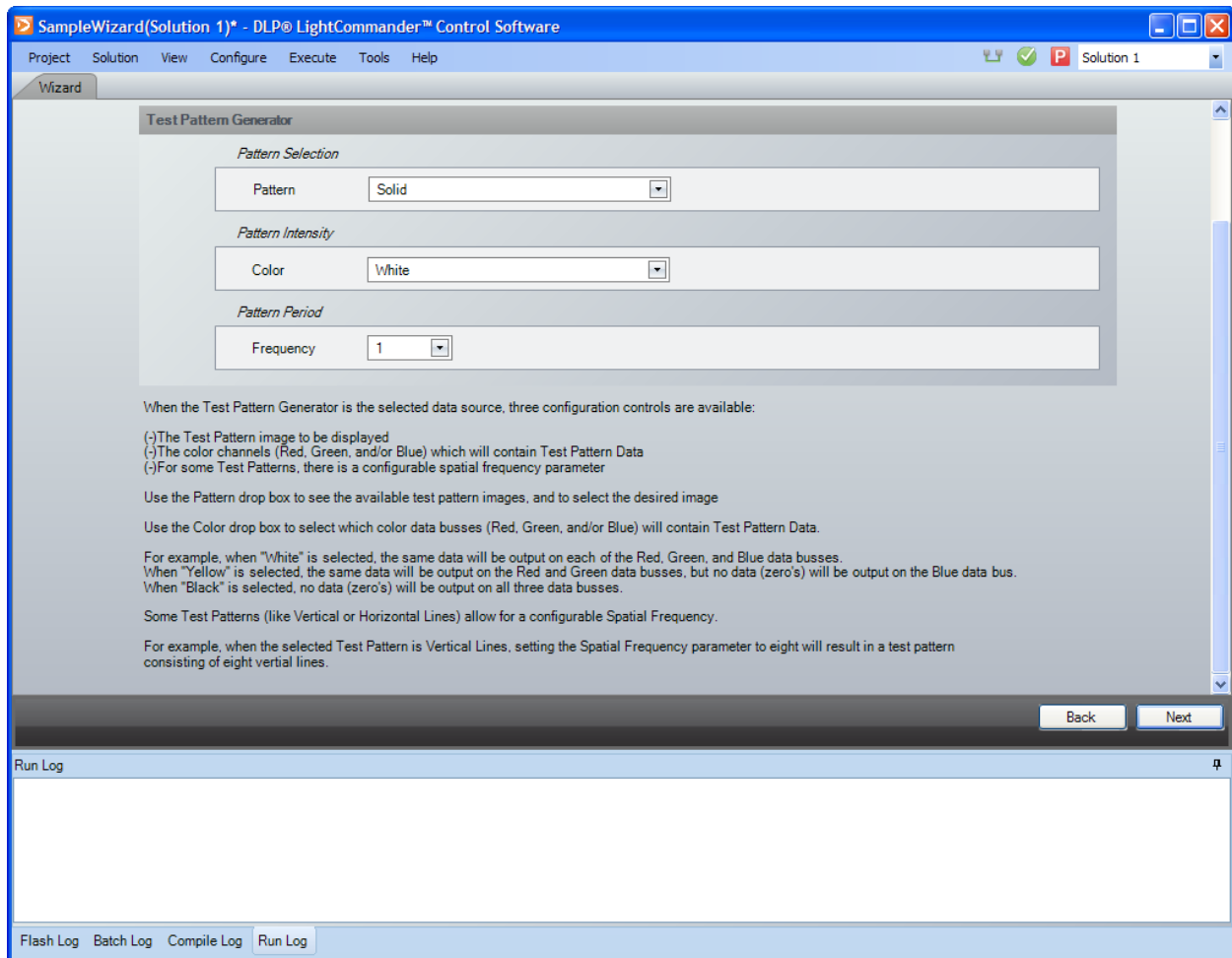
- The DVI Port
- The Expansion Port
- The Static Image Buffer

The DVI Port and Expansion Port each consist:

- 24-bit Data Bus: Configured as 8 bits of each Red, Green, and Blue data
- VSYNCZ: An active-low Vertical Sync Pulse (indicates the start of a data frame)
- HSYNCZ: An active-low Horizontal Sync Pulse (indicates the start of a data line)
- Clock: A Data and Sync Pulse clock

If the Static Image Buffer is the selected data source, then selecting **Configure -> Pattern Arranger** from the menu bar will open a dialog box through which you can configure the static images to be downloaded to the Static Image Buffer.

7.3 Test Pattern Generator



When the Data Source is set to Test Pattern Generator it will control the pattern attributes to be applied to the source. Only one data source can be selected. The Test Pattern Generator is only valid when in Video Mode.

When configuring the built-in Test Pattern Generator, three parameters are available: Pattern Selection, Pattern Color, and Pattern Spatial Frequency.

Pattern Selection: The type of pattern can be any one of the following:

- | | |
|---|--|
| <input type="checkbox"/> Solid | A Solid color field |
| <input type="checkbox"/> Horizontal Ramp | An 8-bit (per color) ramp, transitioning 0 to 255, left to right |
| <input type="checkbox"/> Vertical Ramp | An 8-bit (per color) ramp, transitioning 0 to 255, top to bottom |
| <input type="checkbox"/> Horizontal Lines | Single-pixel horizontal lines |
| <input type="checkbox"/> Diagonal Lines | Single-pixel diagonal lines |
| <input type="checkbox"/> Vertical Lines | Single-pixel vertical lines |
| <input type="checkbox"/> Horizontal Stripes | N-pixel wide horizontal stripes |
| <input type="checkbox"/> Vertical Stripes | N-pixel wide vertical stripes |
| <input type="checkbox"/> Grid | A grid of single-pixel wide horizontal and vertical lines |
| <input type="checkbox"/> Checkerboard | A two dimensional array of square blocks |

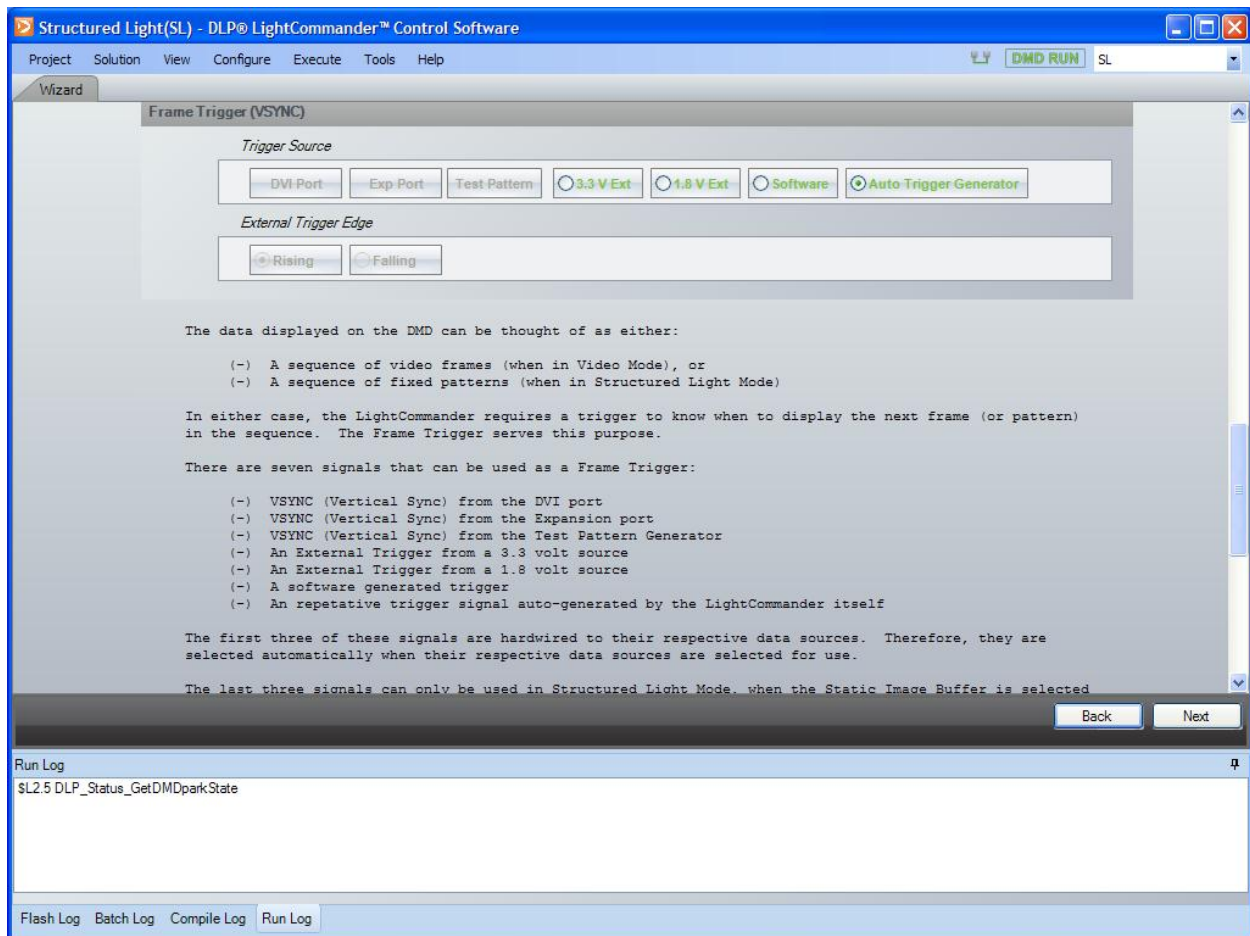
Pattern Color: The color channels (data sub-busses) onto which test pattern data is driven

Pattern Spatial Frequency: The spatial frequency of pattern (see details below):

- | | |
|---|--|
| <input type="checkbox"/> Horizontal Ramp | The number of ramps to be tiled horizontally |
| <input type="checkbox"/> Vertical Ramp | An increasing number of ramps to be tiled vertically |
| <input type="checkbox"/> Horizontal Lines | An increasing number of horizontal lines |
| <input type="checkbox"/> Diagonal Lines | An increasing number of diagonal lines |
| <input type="checkbox"/> Vertical Lines | The number of evenly spaced vertical lines |
| <input type="checkbox"/> Horizontal Stripes | An increased number of horizontal stripes |
| <input type="checkbox"/> Vertical Stripes | The number of evenly spaced vertical stripes |
| <input type="checkbox"/> Grid | The number of vertical grid lines |
| <input type="checkbox"/> Checkerboard | The number of block/space pairs displayed horizontally |

LIVE UPDATE: All of the Test Pattern Generator controls can be updated live.

7.4 Frame Trigger (VSYNC)



The data displayed on the DMD can be thought of as either a sequence of video frames (when in Video Mode) or a sequence of fixed patterns (when in Structured Light Mode). In either case, the LightCommander requires a trigger to know when to display the next frame (or pattern) in the sequence. The Frame Trigger serves this purpose.

There are six signals that can be used as a Frame Trigger:

- VSYNC (Vertical Sync) from the DVI port
- VSYNC from the Expansion port
- VSYNC from the Test Pattern Generator
- An external trigger from a 3.3V source

- An external trigger from a 1.8V source
- A software generated trigger
- A repetitive trigger signal auto-generated by the LightCommander

The first three VSYNC signals listed above are hardwired to their respective data sources (DVI port, Expansion port, and Test Pattern Generator); therefore, they are selected automatically when their respective data sources are selected for use. The last three signals can only be used in Structured Light Mode, when the Static Image Buffer is selected as the active source. These use constraints are shown in Table 7.2.

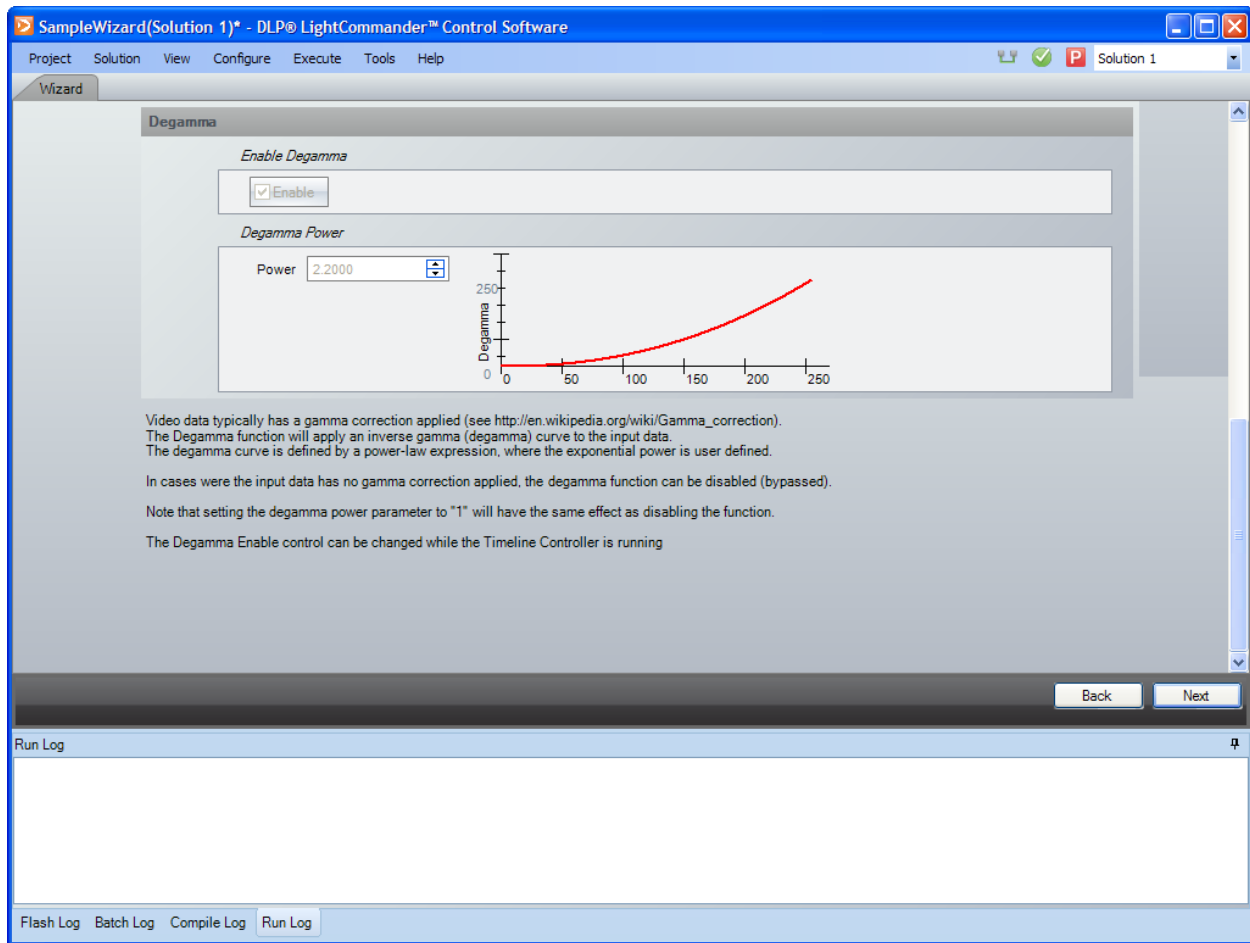
Table 7.2: Frame Trigger Use Constraints

	DVI Input	Expansion Port Input	Test Pattern	Fixed Data Pattern
DVI VSYNC	YES	—	—	—
Expansion Port VSYCN	—	YES	—	—
Test Pattern Generator VSYNC	—	—	YES	—
3.3V External Trigger	—	—	—	YES
1.8V External Trigger	—	—	—	YES
Software Trigger	—	—	—	YES
Auto-Gen Trigger	—	—	—	YES

When using either of the two External Triggers (the 3.3V and 1.8V triggers), the LightCommander can be configured to trigger on either the rising or falling edge of the received signal.

LIVE UPDATE: The Frame Trigger selection and External Trigger polarity settings can be updated live.

7.5 Degamma



Gamma correction is a nonlinear (exponential) transformation that is typically applied to video data. To correctly display data which has gamma correction applied, the inverse transformation (degamma) must be applied. Degamma is available in Video mode only.

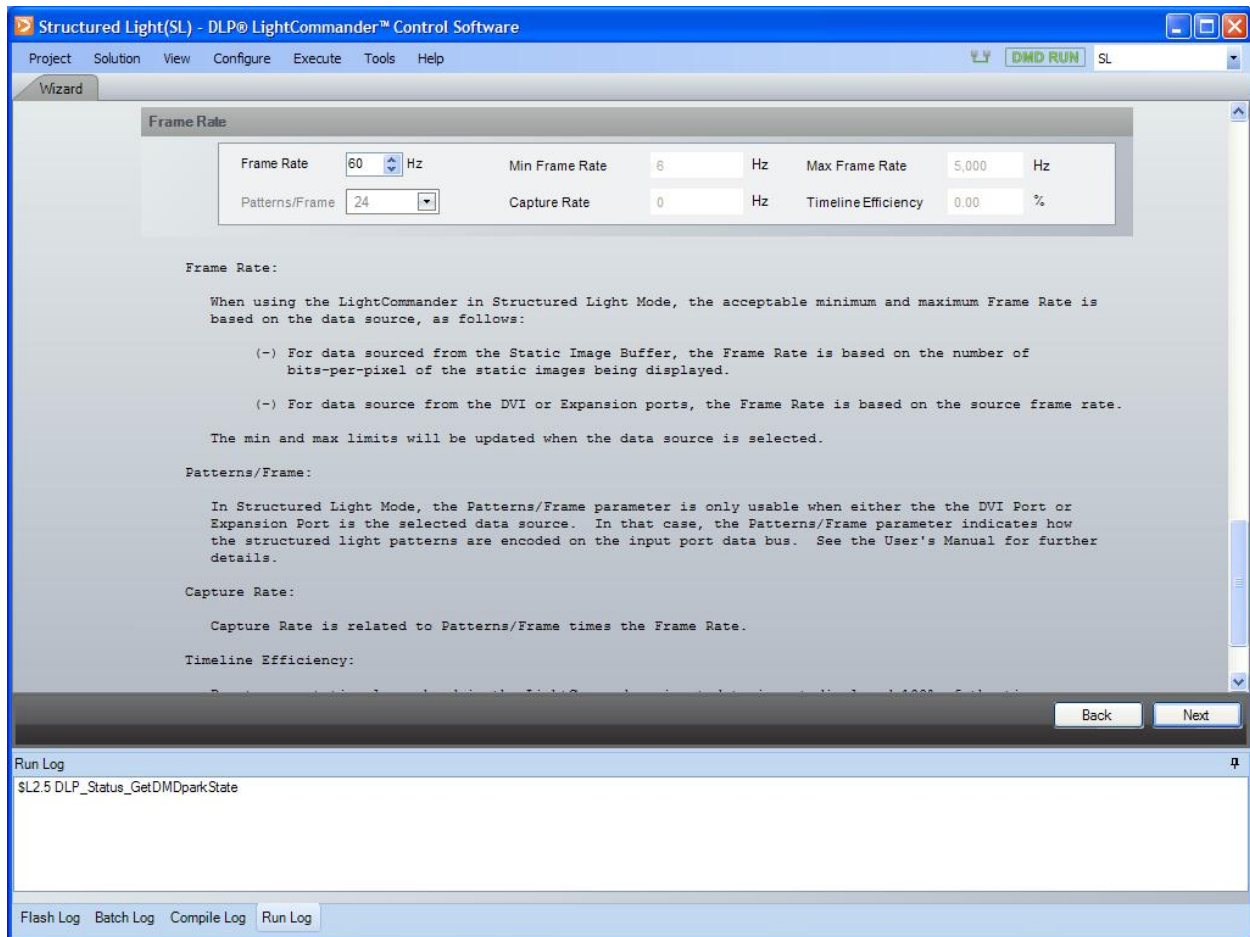
To apply degamma, first enable the Degamma function, then enter the appropriate Degamma Power. The corresponding degamma curve is displayed for reference.

If the incoming data does not have gamma correction applied, then the Degamma function should be disabled.

NOTE: Enabling the Degamma function and setting the Degamma Power equal to 1.0 has the same effect as disabling the function.

LIVE UPDATE: The Degamma Enable can be updated live, but changes to the Degamma Power settings require a recompile.

7.6 Frame Rate



The Pattern Timeline (executed by the Timeline Controller) repeats at a periodic rate (known as a Frame Rate). You may specify the Frame Rate, provided that it falls between the minimum and maximum allowable rates.

7.6.1 Video Mode

Frame Rate: When using the LightCommander in Video Mode with either DVI or the Expansion Port as the selected data source, this parameter must equal the source Frame Rate.

When using the LightCommander in Video Mode with the Test Pattern Generator as the selected data source, this parameter determines the frame rate of the Test Pattern Generator.

Patterns/Frame: In Video Mode, the Patterns/Frame parameter has no effect.

Capture Rate: Capture Rate has no meaning in Video Mode.

Timeline Efficiency: Due to system latencies and overhead in the LightCommander, input data is not displayed 100% of the time; this is related to latencies associated with the memory and DMD interface. The Timeline Efficiency indicates what percentage of time data is actually being displayed. The Timeline Efficiency output numerically describes how much light is coming out of the DLP LightCommander based on the compiled solution; the higher the value, the more efficient use of the hardware. The efficiency level of a solution can be altered by changing different configuration settings; changes to the frame rate make the biggest impact but multiple settings

can affect the efficiency rating. The Timeline Efficiency value is only available after compiling the solution.

7.6.2 Structured Light Mode

Frame Rate: When using the LightCommander in Structured Light Mode, the acceptable Frame Rate range is based on the data source, as follows:

- For data sourced from the Static Image Buffer, the Frame Rate is based on the number of bits-per-pixel of the static images being displayed.
- For data source from the DVI or Expansion ports, the Frame Rate is based on the source frame rate.

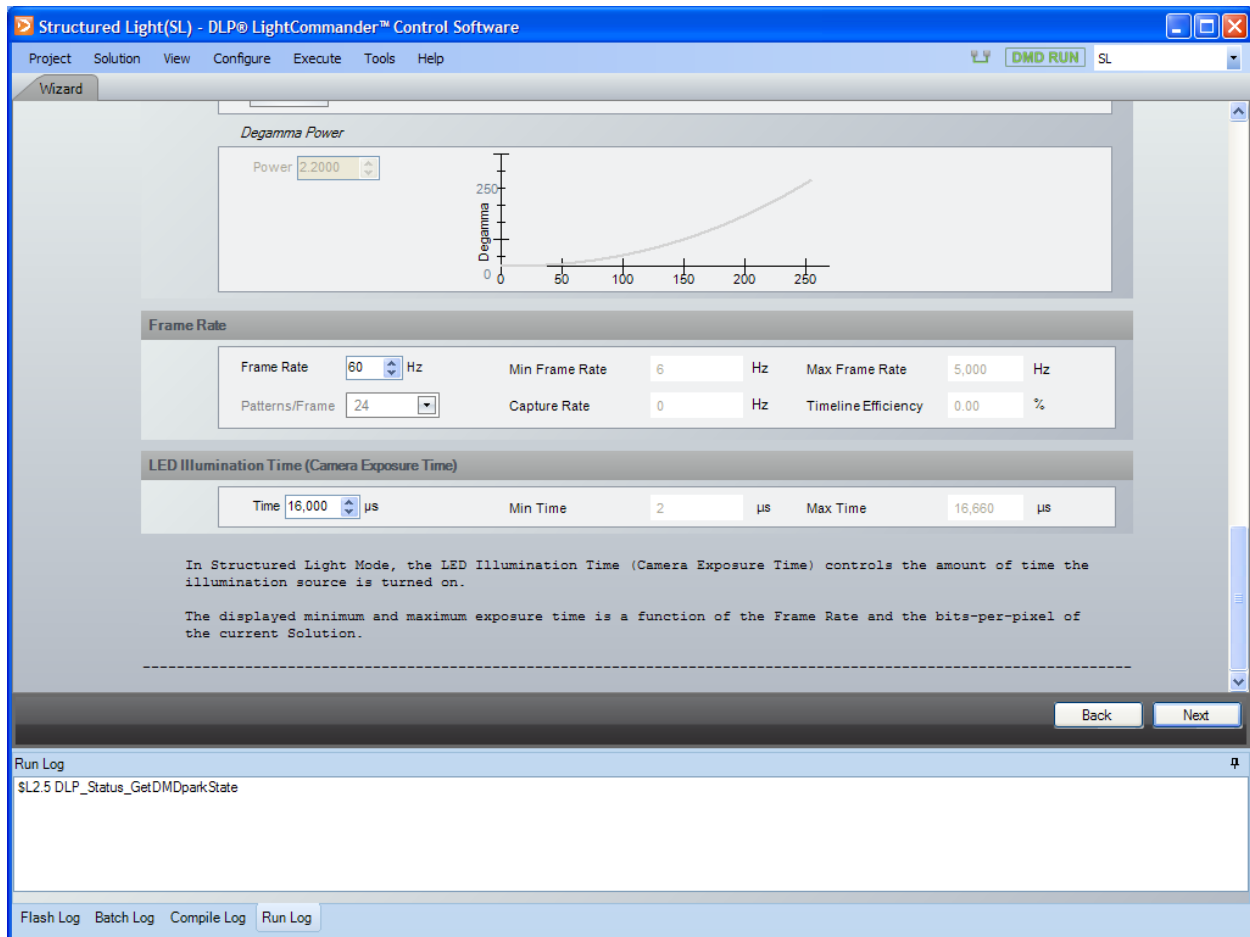
The min and max limits will be updated when the data source is selected.

Patterns/Frame: In Structured Light Mode, the Patterns/Frame parameter is only usable when either the DVI Port or Expansion Port is the selected data source. In that case, the Patterns/Frame parameter indicates how the structured light patterns are encoded on the input port data bus.

Capture Rate: Capture Rate is related to Patterns/Frame times the Frame Rate.

Timeline Efficiency: Due to system latencies and overhead in the LightCommander, input data is not displayed 100% of the time; this is related to latencies associated with the memory and DMD interface. The Timeline Efficiency indicates what percentage of time data is actually being displayed. The Timeline Efficiency output numerically describes how much light is coming out of the DLP LightCommander based on the compiled solution; the higher the value, the more efficient use of the hardware. The efficiency level of a solution can be altered by changing different configuration settings; changes to the frame rate make the biggest impact but multiple settings can affect the efficiency rating. The Timeline Efficiency value is only available after compiling the solution.

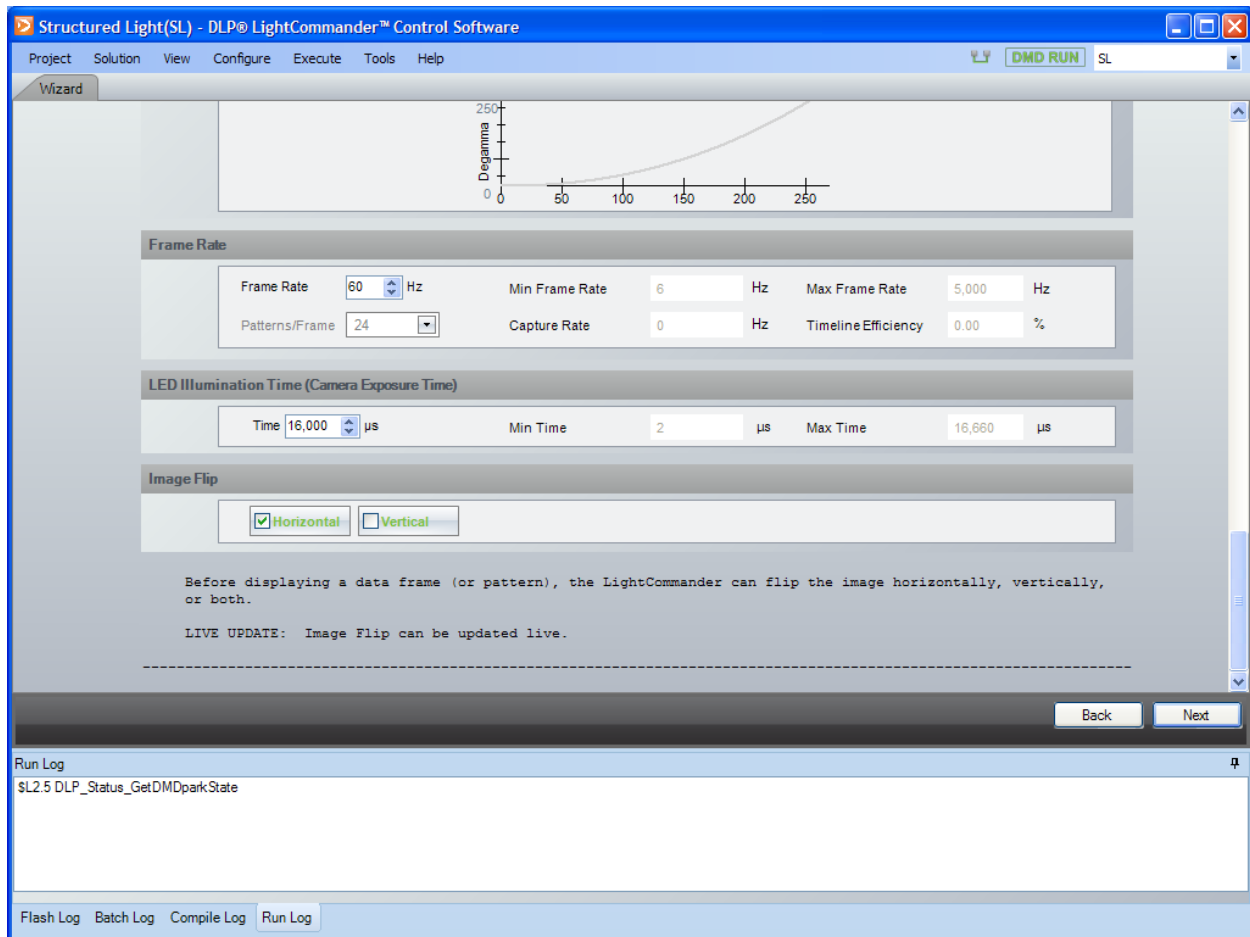
7.7 LED Illumination Time (Camera Exposure Time)



In Structured Light Mode, the Camera Exposure Time controls the amount of time the illumination source is turned on.

The displayed minimum and maximum exposure time is a function of the Frame Rate and the bits-per-pixel of the current Solution.

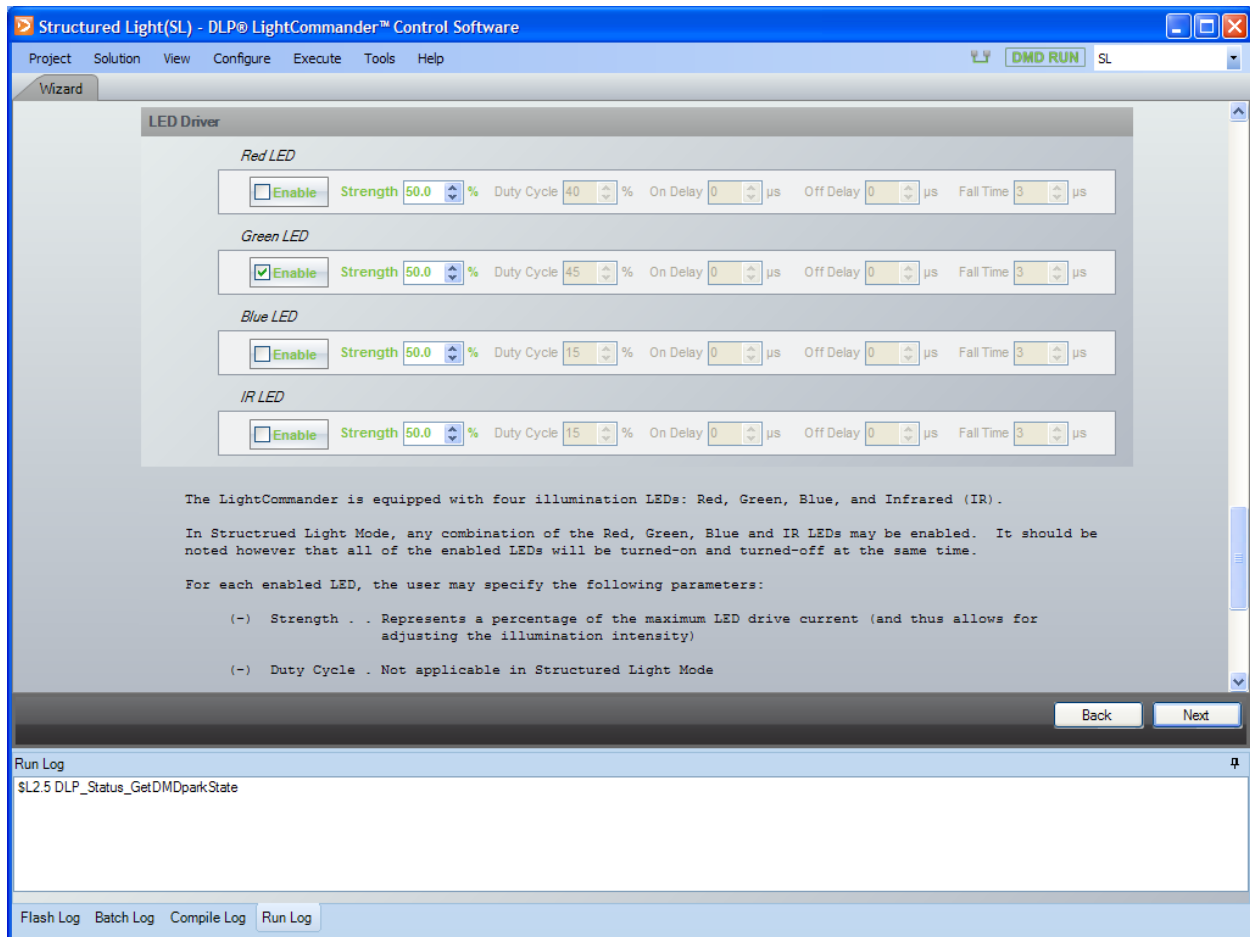
7.8 Image Flip



Before displaying a data frame (or pattern), the LightCommander can flip the image horizontally, vertically, or both horizontally and vertically.

LIVE UPDATE: Image Flip can be updated live.

7.9 Illumination Control (LED Driver)



The DLP LightCommander Illumination Module contains four LEDs: Red, Green, Blue and Infrared (IR). In Video Mode, the Red, Green, and Blue LEDs are available for use; in Structured Light Mode, all four LEDs are available.

In Structured Light Mode, any combination of the Red, Green, Blue and IR LEDs may be enabled; however, all of the enabled LEDs will be turned-on and turned-off at the same time.

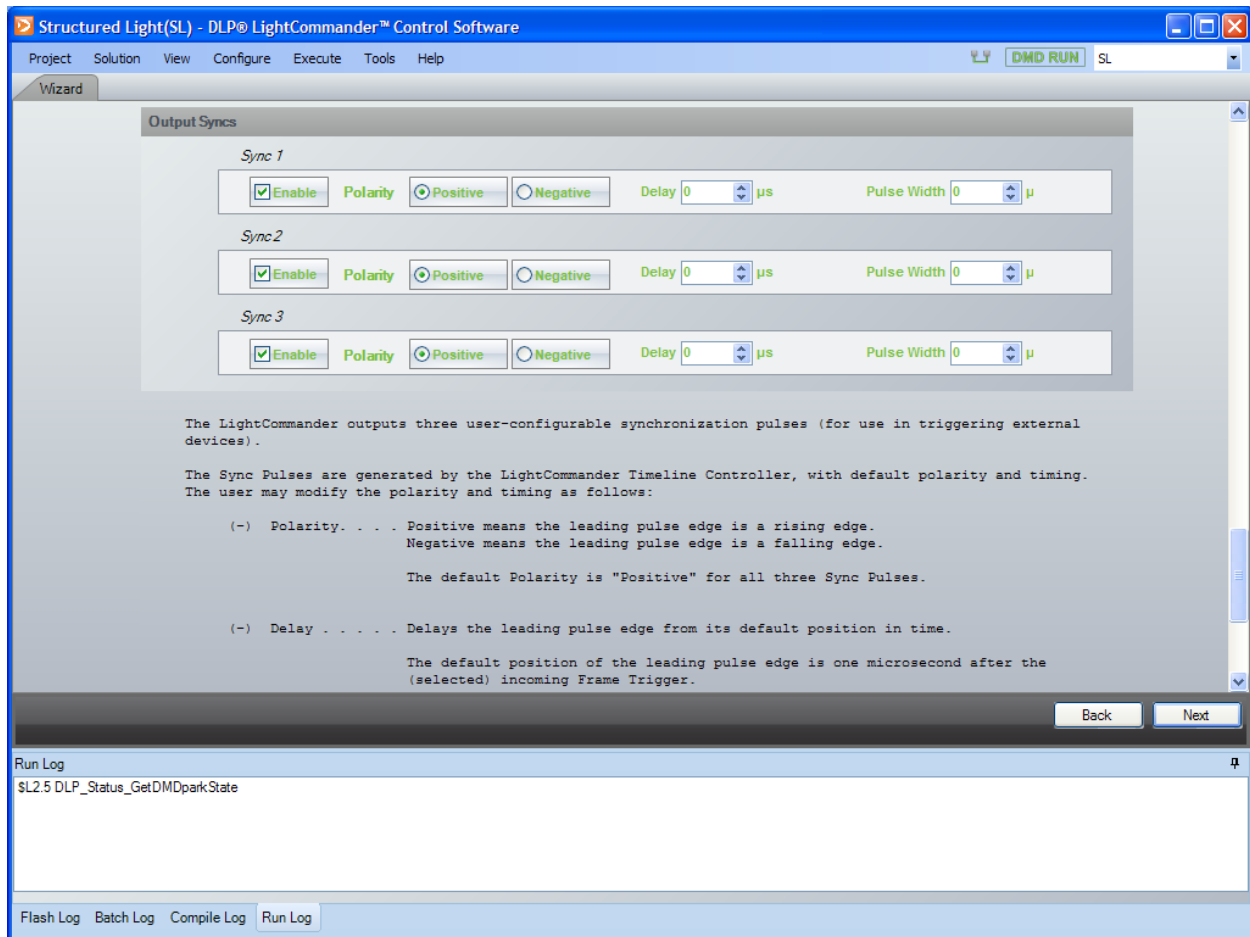
For each enabled LED, you may specify the following parameters:

- **Strength:** Represents a percentage of the maximum LED drive current (and thus allows for adjusting the illumination intensity). **IMPORTANT NOTE: DO NOT** set the LED Strength parameter to any value greater than 60%. See [errata E0031](#)¹ for more details.
- **Duty Cycle:** Not applicable in Structured Light Mode
- The **On Delay**, **Off Delay**, and **Fall Time** parameters are provided to support other (third-party) illumination modules. Please contact [Logic PD customer support](#) for additional details.

LIVE UPDATE: The LED Enables and LED Strength can be updated live (all other parameters require recompile). **NOTE:** For a particular LED Enable to be updated live, it must have been enabled when the Project was last compiled.

¹ <http://support.logicpd.com/downloads/1417/>

7.10 Output Syncs



This control configures the specified output sync. The LightCommander outputs three user-configurable synchronization pulses (for use in triggering external devices).

The Sync Pulses are generated by the LightCommander Timeline Controller, with default polarity and timing. You may modify the polarity and timing as follows:

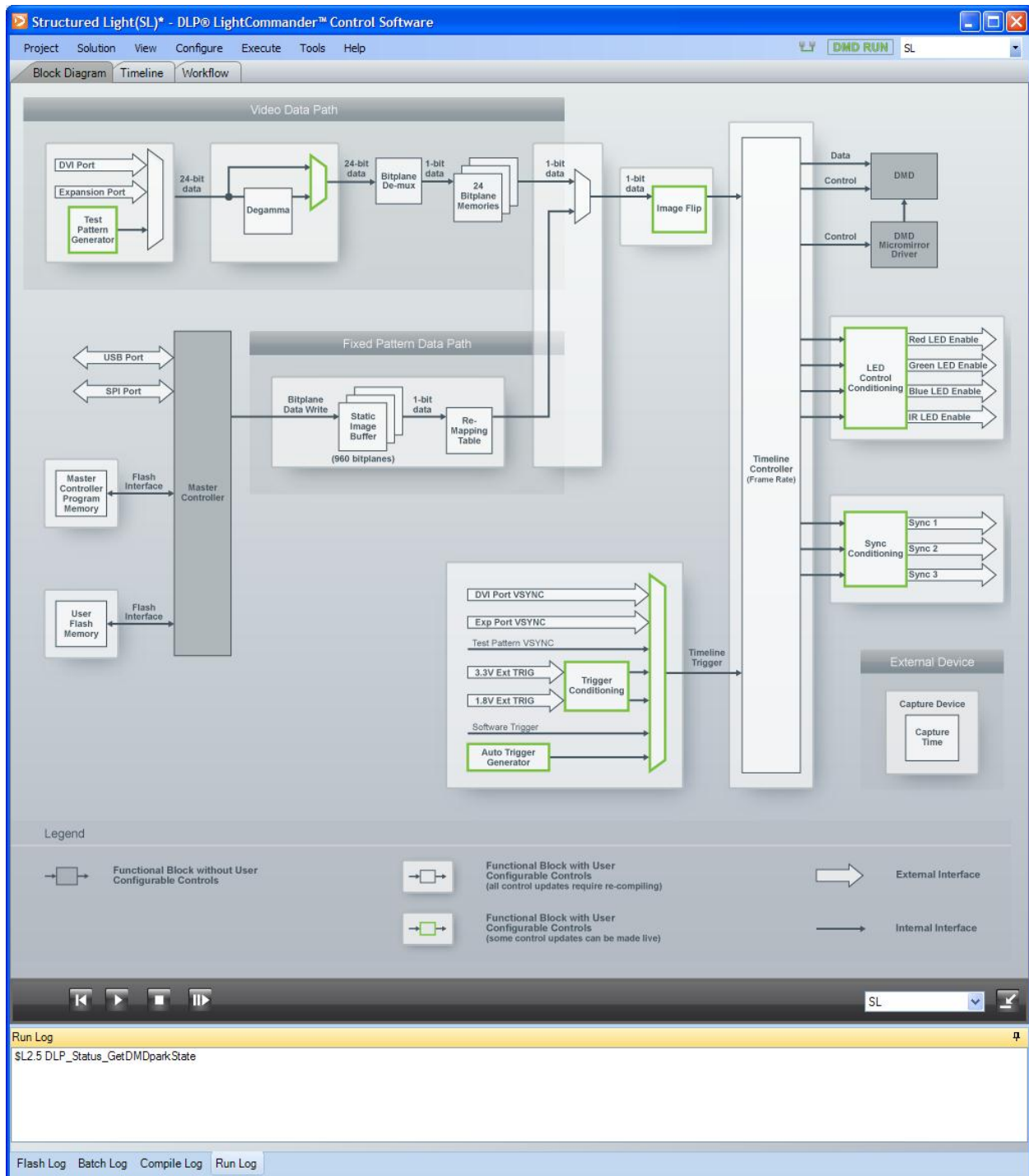
- **Polarity:**
 - Positive means the leading pulse edge is a rising edge.
 - Negative means the leading pulse edge is a falling edge.
 - The default Polarity is "Positive" for all three Sync Pulses.
- **Delay:** Delays the leading pulse edge from its default position in time. The default position of the leading pulse edge is one microsecond after the selected incoming Frame Trigger.
- **Pulse Width:** Positions the trailing pulse edge relative to the leading pulse edge
 - For Sync1 and Sync2, the default position of the trailing pulse edge is 10 microseconds after the leading pulse edge.
 - For Sync3, the default position of the trailing pulse edge is coincident with the end of the LED Illumination Time.

NOTE: To utilize the default values of Delay and/or Pulse Width, enter a parameter value of zero.

LIVE UPDATE: All Sync parameters can be updated live.

7.11 Block Diagram View

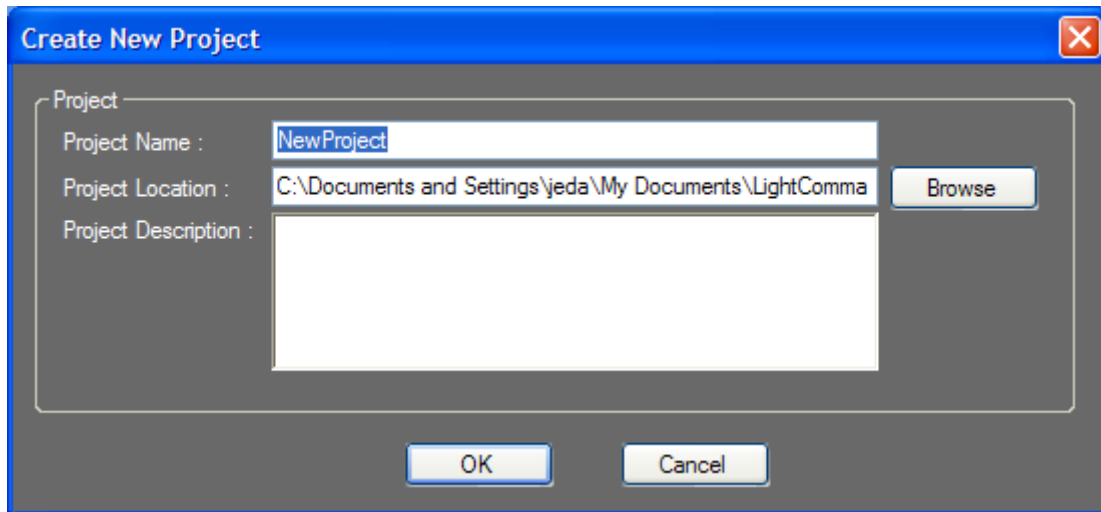
After clicking the final **Next** button, the block diagram view of your newly created project will be displayed.



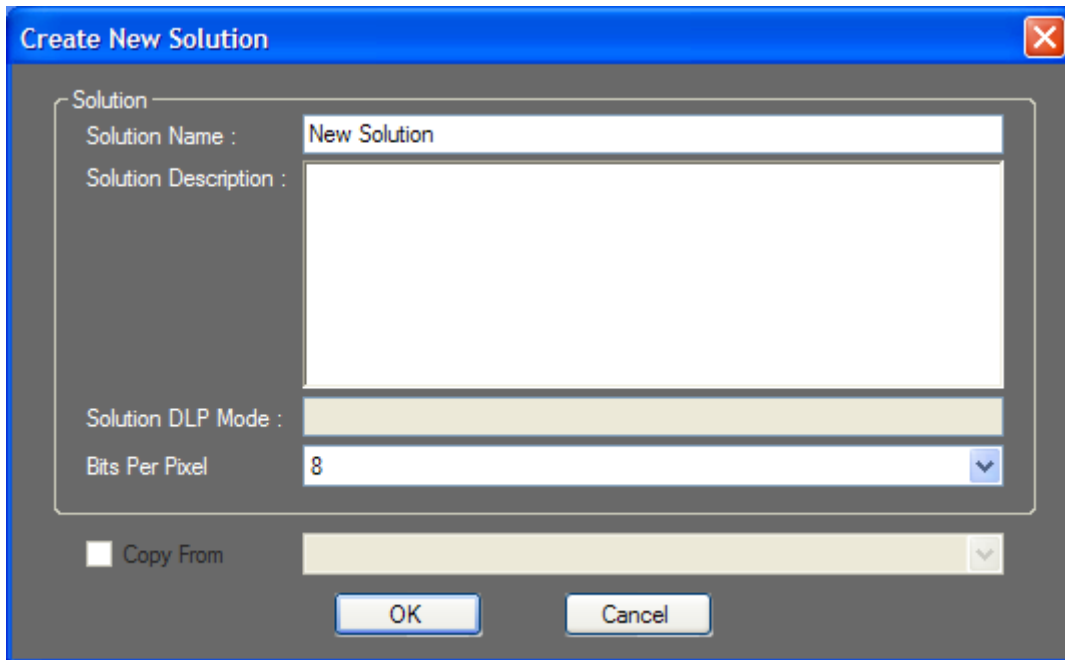
8 Example Project: Display a Static Image


This section will walk you through the steps required to send a static image from your host PC to the LightCommander.

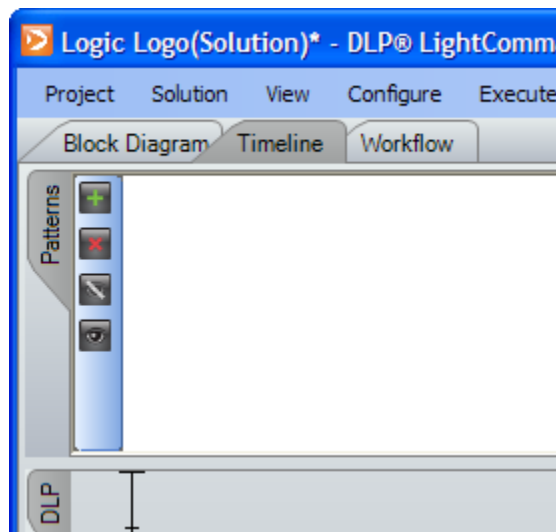
1. Make sure you have an image that is formatted to 1024 x 768 pixels on your host PC.
2. With the LightCommander powered on, launch the LightCommander Control Software.
3. Click the **Create New Project** button.
4. Create a name for your project and select a save location; add a description if you'd like. Click the **OK** button to save the project to your host PC.



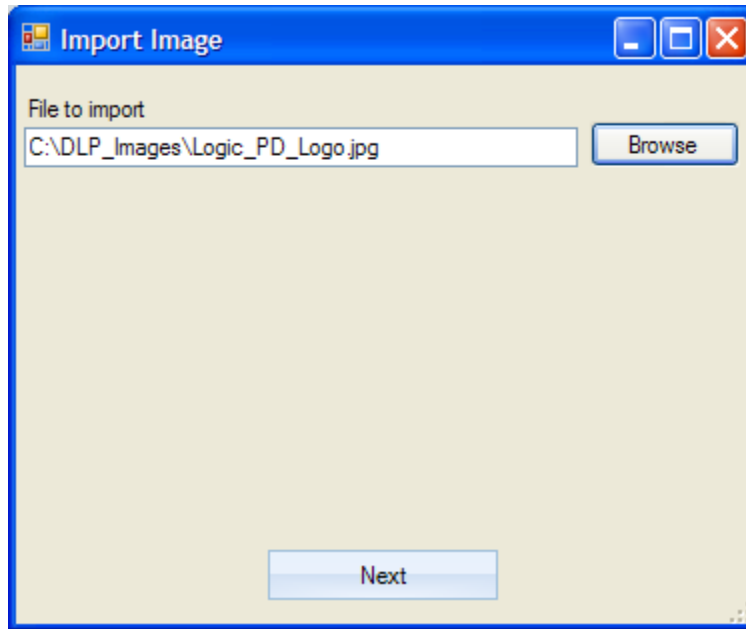
5. A window will open to create a new solution. Enter a name for the solution and select whether the solution will be 1 or 8 bits per pixel; add a description if you'd like. Click the **OK** button to create the new solution.



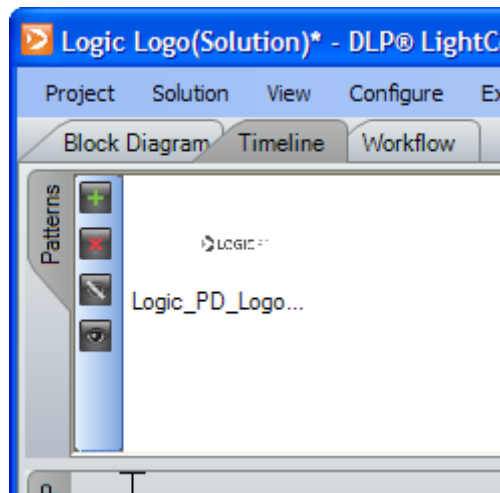
6. In the solution window that opens, click on the **Timeline** tab and then click on the Add Pattern icon .




7. Click the **Browse** button to navigate to the image that resides on your host PC.
8. Once the image has been selected, click the **Next** button.



9. Click **Next** on the Grayscale conversion screen. Your image will appear in the Patterns tab on the Timeline.



10. Click on the **Workflow** tab.
11. Scroll down to LED Driver and enable the Red, Green, and Blue LEDs. Change the strength for each LED to 60%.
12. Click the Play button  and the LightCommander will project your image on the surface the lens is pointing toward.

9 Troubleshooting

This section is under development and will contain troubleshooting information when it becomes available.

Appendix A: Buttons and Icons



Functional Block without User Configurable Controls; in Block Diagram View (Section 2.1.1)



Functional Block with User Configurable Controls (all control updates require re-compiling); in Block Diagram View (Section 2.1.1)



Functional Block with User Configurable Controls (some control updates can be made live); in Block Diagram View (Section 2.1.1)



External Interface; in Block Diagram View (Section 2.1.1)



Internal Interface; in Block Diagram View (Section 2.1.1)



Add pattern; in Timeline View (Section 2.1.2)



Delete pattern; in Timeline View (Section 2.1.2)



Hide pattern; in Timeline View (Section 2.1.2)



Show pattern; in Timeline View (Section 2.1.2)



Timeline View scale slide (Section 2.1.2)



Compact Mini Player mode (Section 2.1.4)



Resets the display to manual and returns to the first pattern. Mini Player button (Section 2.1.4)



Plays all patterns from the active solution in a continuous loop. If necessary, it compiles the solution and re-generates the commands. Mini Player button (Section 2.1.4)



Stops the display of patterns. Mini Player button (Section 2.1.4)



Steps through the patterns and displays them one at a time. Mini Player button (Section 2.1.4)



Logs window remains displayed (Section 2.1.5)



Logs window automatically hides / displays on hover (Section 2.1.5)



Connected to DLP LightCommander (Section 2.3)



Off-line from DLP LightCommander (Section 2.3)



DMD set to Run. Click to toggle between Run and Park. (Section 2.3)



DMD set to Park. Click to toggle between Run and Park. (Section 2.3)