DLP® Display and Light Control EVM GUI Tool

Contents

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1 Overview

The DLP® Display and Light Control evaluation module (EVM) includes a Windows®-based GUI tool used to control the EVM through SPI and I^2C commands. This document provides instructions on how to use features provided by the GUI tool to communicate with the DLP Display and Light Control EVM.

2 System Requirements

The minimum recommended system requirements for the DLP Display and Light Control EVM GUI tool are:

- PC with 1.4-GHz Pentium IV CPU or higher
- Windows 7 or greater
- 4 GB of RAM
- 1920 × 1080
- 200 MB of free HD space
- USB port

3 Software Installation and Driver Installation

Download the installer for the DLP Display and Light Control EVM GUI tool. Execute the DLP Display and Light Control EVM GUI tool **DLPPicoDisplayAndLightControl.x.x.x.x.Setup.exe** and follow the instructions for software installation. The driver needed to communicate with the EVM is part of the installation, so no other installer is needed.

Table 1 lists all the tools that the file setup.exe installs.

Table 1. Table of Tool Variations

EVM	Simple Mode	Product in Advanced Mode
DLP2010EVM-LC	DLP Pico Display and Light Control x.x.x.x (DLP2010LC)	DLPC347x Pico Display and Light Controller (0.2 WVGA, 0.3 720p)
DLP3010EVM-LC	DLP Pico Display and Light Control x.x.x.x (DLP3010LC)	
DLP4710EVM-LC	DLP Pico Display and Light Control x.x.x.x (DLP3010LC)	DLPC347x Pico Display and Light Controller (0.47 1080p)

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4 User Interface Overview

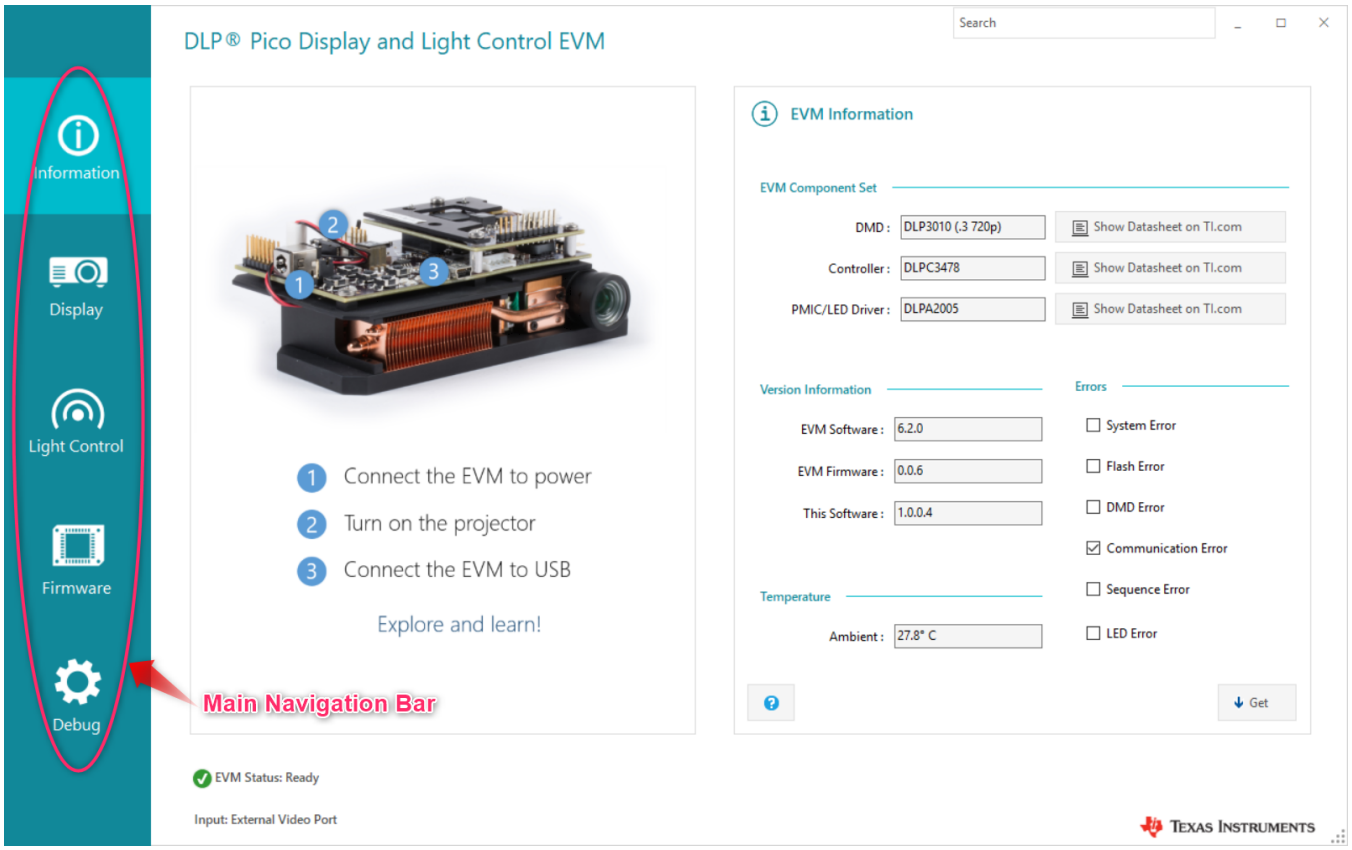

Figure 1. Information Page

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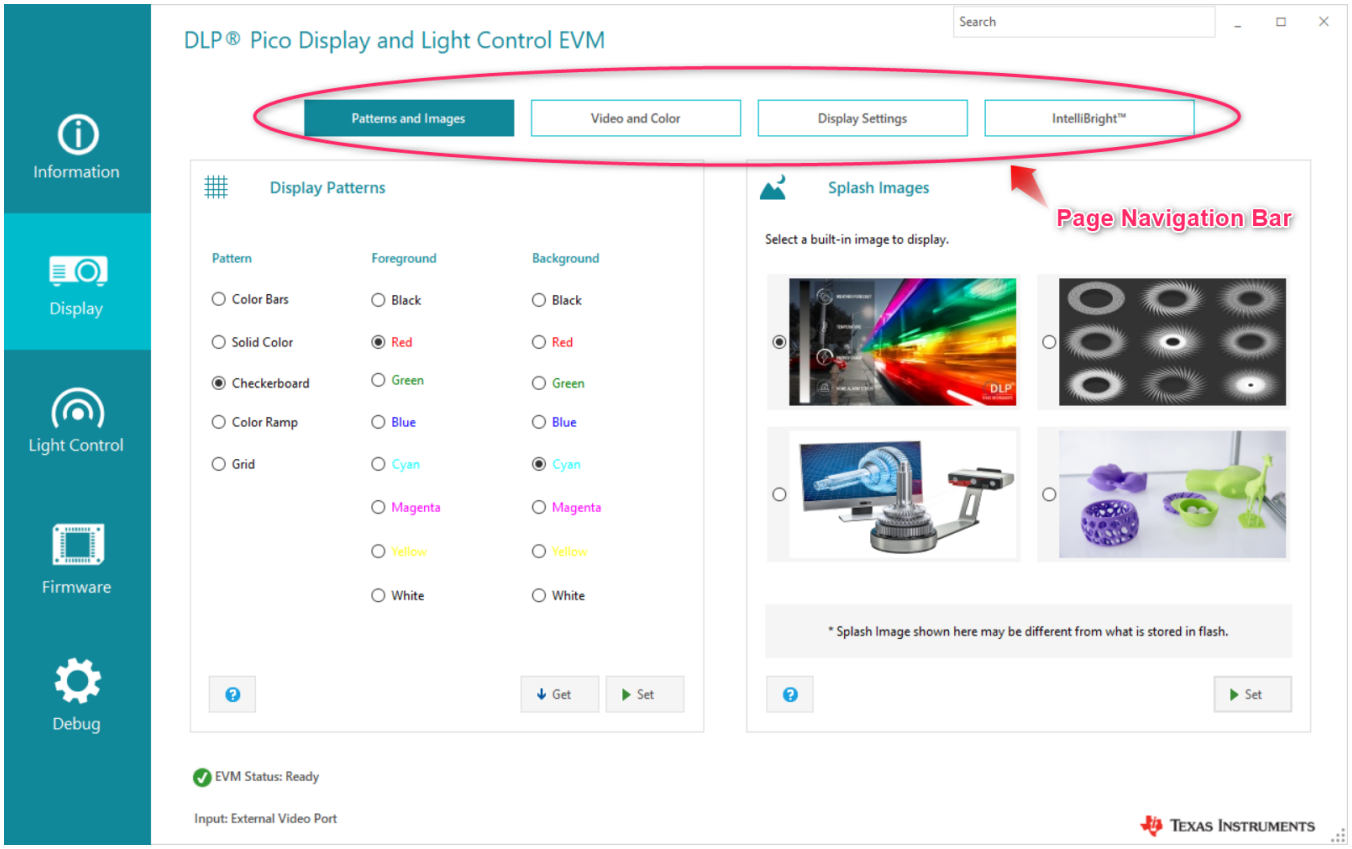

Figure 2. Display Pages

Figure 1 shows the DLP Display and Light Control GUI tool. The GUI tool has 5 tabs on the left with 1 or more pages for each tab, which will communicate with the EVM by issuing SPI or I^2C commands. To access a specific page, select the desired tab from the Main Navigation bar on the left (Figure 1) and then select the specific page from the Page Navigation bar on the top (Figure 2). Table 2 provides a brief description of the 13 pages.

Table 2. Page Description

Tab	Page	Section	User Control Description
Information	EVM Information	EVM Information	Get the status of the EVM
Display	Patterns and Images	Display Patterns	Set display patterns and checks which pattern is displayed
		Display Images	Set display images to the device
	Video and Color	Video Information	Modify the type of video output given to the device
		Color Temperature	Choose from select color temperatures
	Display Settings	Display Settings	Modify display and keystone settings
		Keystone Correction	Modify display and keystone settings
	IntelliBright™	IntelliBright™	Modify IntelliBright settings
		LED Current	Modify LED current settings
Light Control	External Patterns		Configure and display external patterns
	Internal Patterns		Configure and display internal patterns
	Splash Patterns		Configure and display splash patterns
Firmware	Backup Firmware		Backup the firmware on the device
	Update Firmware		Update the firmware on the device
	Update Flash Image		Create new firmware image for the device

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Table 2. Page Description (continued)

Tab	Page	Section	User Control Description
Debug	Event Viewer		View the event occurred on the device
	Command Log		View the command(s) issued to the device with the option to export to a batch file

In addition, there is a separate GUI tool installed for the advanced user/mode (Section 4.6). This advanced mode contains additional pages and commands that can be used with the EVM.

Use the questionmark icon (**?**) in the bottom-left corner of each section to provide access information on that section and display the commands.

4.1 Information Tab

4.1.1 Information Page

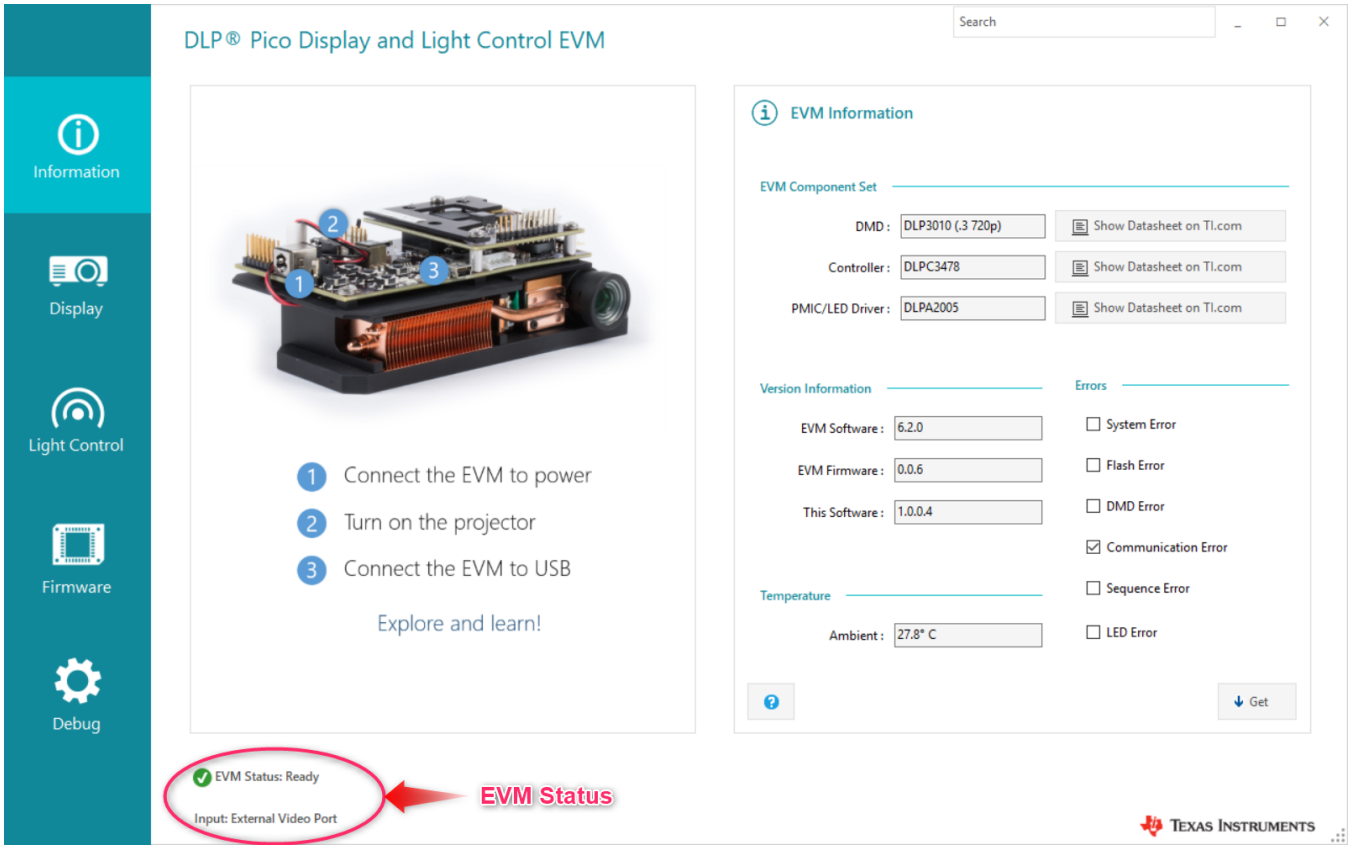

Figure 3. Information Page

The information page shows status information the EVM after it is connected and powered on. Refer to the guide on the left portion of the Information page to see how to set up the EVM.

The status of the EVM is displayed on the bottom-left corner of the Information page. The EVM Status shows one of the following:

- Ready
- Connected, Incompatible EVM
- Connected, Powered off
- Not connected

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In addition to the EVM connection status, the page shows the Input Source or Operating Mode. When connected, the Input shows one of the following:

- External video port
- Test pattern generator
- Splash screen
- External pattern streaming
- Internal pattern streaming
- Space coded pattern streaming

After the EVM is connected, if the tool used (DLPC2010LC or DLPC3010LC) does not match the EVM being accessed (DLP2010EVM-LC or DLP3010EVM-LC) the EVM Status displays "Incompatible".

After the EVM is connected, click **Get** on the bottom-right corner to get the information and status of the EVM. The Information page also lets user checks if any errors have occurred, checkmark(s) indicates specific errors.

The following commands are used to obtain information about the EVM:

- Read short status (0xD0)
- Read system status (0xD1)
- Read DMD device ID (0xD5)
- Read controller device ID (0xD4)
- Write PAD register address (0xEC)
- Read PAD register (0xED)
- Read system software version (0xD2)
- Read flash build version (0xD9)
- Read system temperature (0xD6)

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4.2 Display Tab

4.2.1 Patterns and Images Page

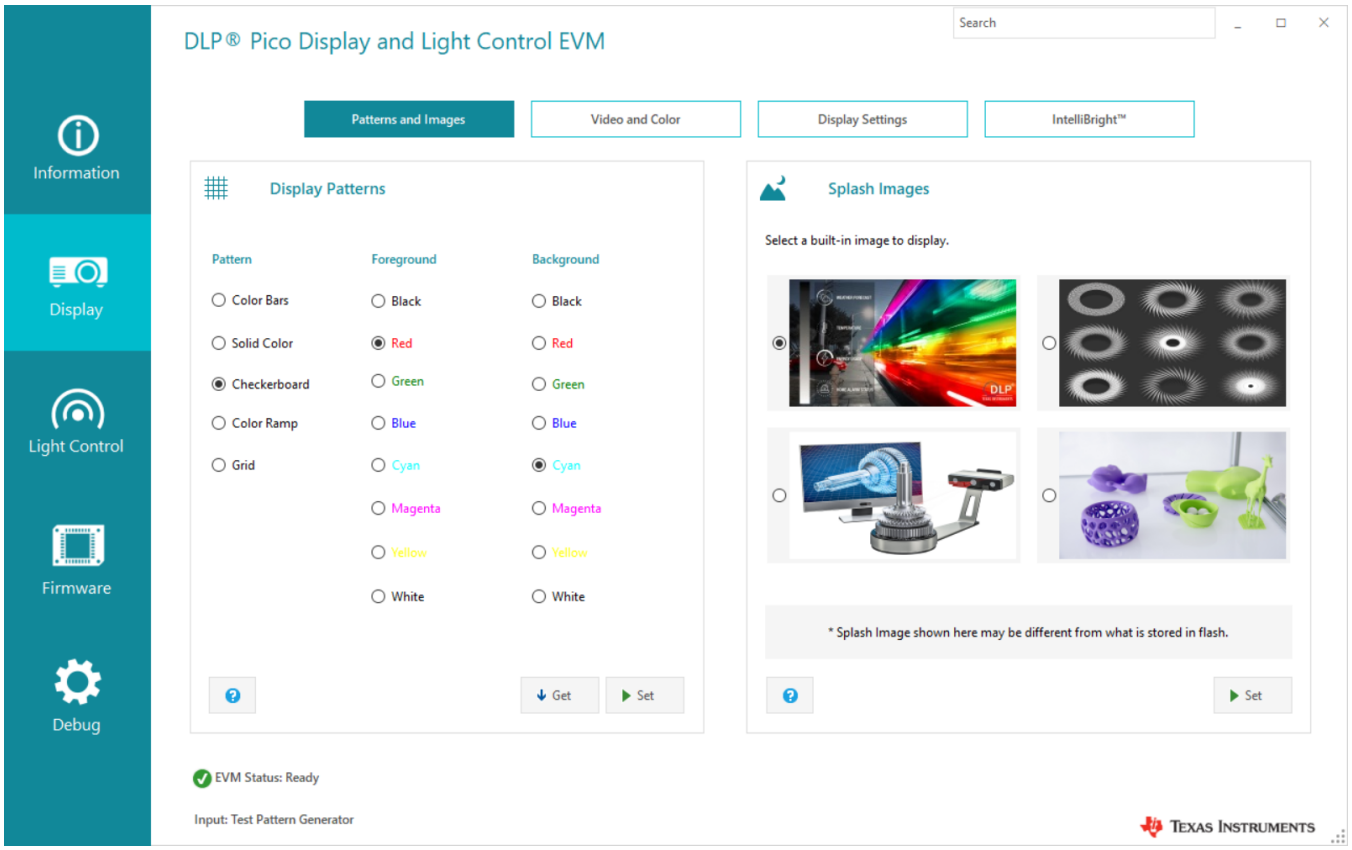

Figure 4. Patterns and Images Page

The Patterns and Images page has two sections

- Display Patterns
- Splash Image

To set a display pattern, select the desired pattern, foreground, and background colors, and then click **Set** in the Display Patterns section on the middle of the page. To confirm the display pattern, click **Get** .

To set a splash image, select the desired image, then click **Set** in the Splash Images section on the right.

Depending on what is stored in the flash memory, the actual image displayed may be different from what is shown on the section.

Use these commands to set the display pattern:

- Write image freeze (0x1A)
- Write operating mode select (0x05)
- Write input image size (0x2E)
- Write image crop (0x10)
- Write test pattern select (0x0B)
- Read Test Pattern Select (0x0C)

The following commands are used to set the display image:

- Write Image Freeze (0x1A)
- Read Splash Screen Header (0x0F)

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- Write Input Image Size (0x2E)
- Write Image Crop (0x10)
- Write Display Size (0x12)
- Write Splash Screen Select (0x0D)
- Write Operating Mode Select (0x05)
- Write Splash Screen Execute (0x35)

4.2.2 Video and Color Page

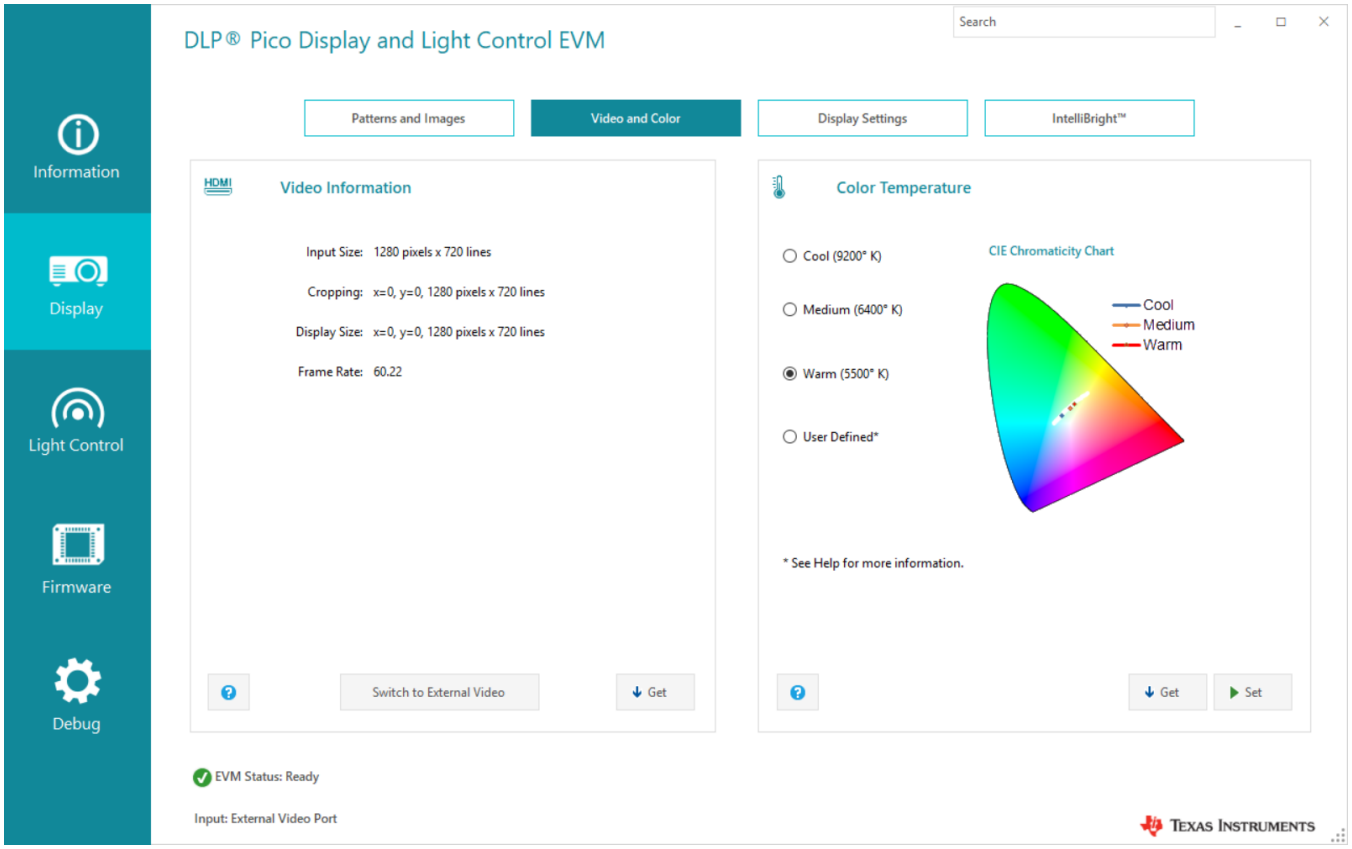

Figure 5. Video and Color Page

The Video and Color page has two sections:

- Video information
- Color temperature

When the EVM is displaying video, click **Get** on the Video Information section lets user sees the input size, cropping size, display size, and frame rate. Click **Switch to External Video** to toggle (return) the EVM to video mode (HDMI).

To set the desired look, select cool, medium, warm, or user defined, and then click **Set**. Click **Get** to see the current color temperature setting, To modify the user defined look, refer to Section 4.2.4 to set the LED Current settings.

The following commands are used in the Video Information section:

- Write input image size (0x2E)
- Write display size (0x12)
- Write image crop (0x10)
- Write operating mode select (0x05)

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- Read operating mode select (0x06)
- Read input image size (0x2F)
- Read display size (0x13)
- Read image crop (0x11)
- Read look select (0x23)

The following commands are used in the Color Temperature section:

- Read RGB LED current (0x55)
- Write RGB LED current (0x54)
- Write flash data type select (0xDE)
- Write flash data length (0xDF)
- Read flash start (0xE3)
- Write look select (0x22)
- Read operating mode select (0x06)
- Write splash screen execute (0x35)
- Read look select (0x23)

4.2.3 Display Settings Page

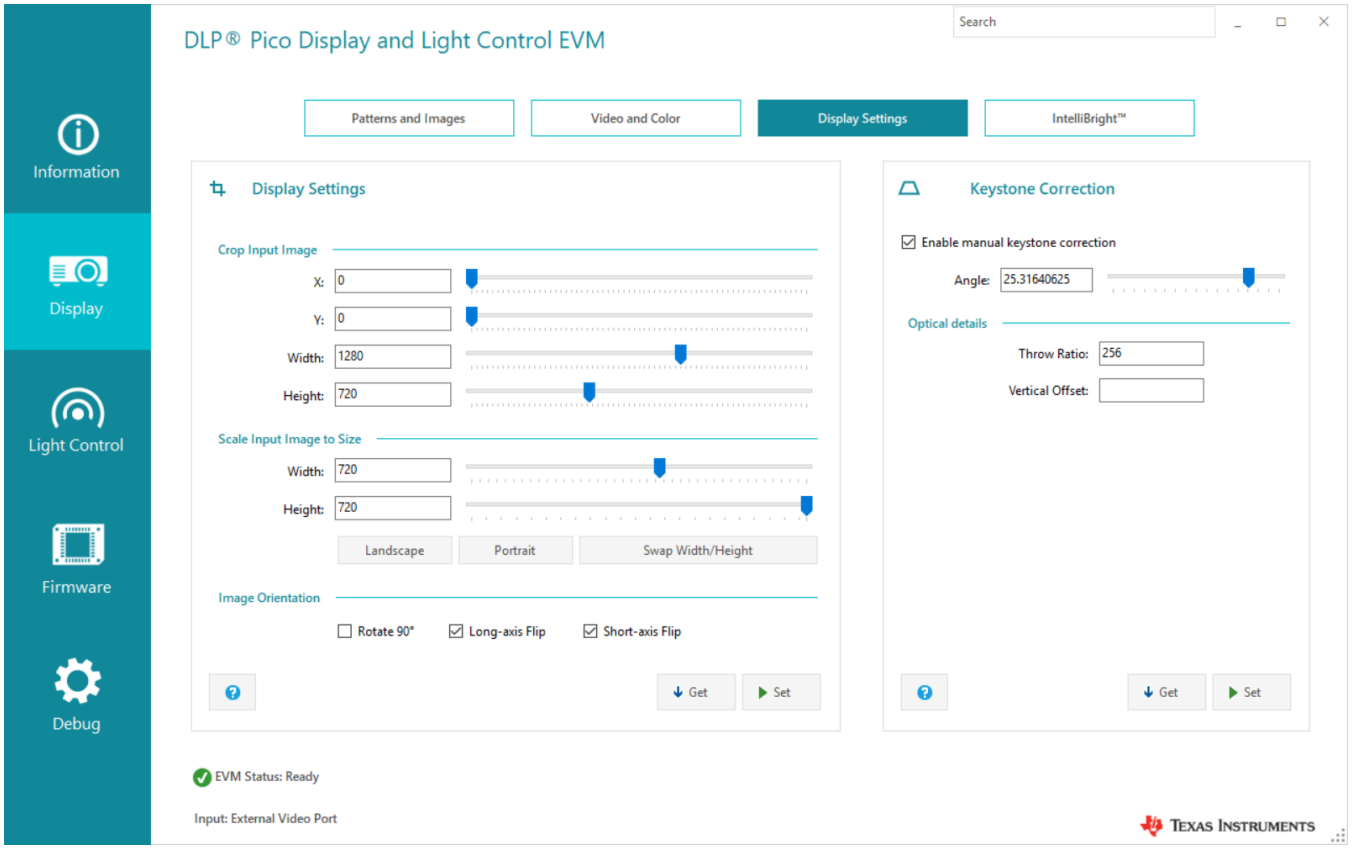

Figure 6. Display Settings Page

The Display Settings page has two sections; the Display Settings section and the Keystone Correction section.

The Display Settings section lets user crops, scales, and rotates the input image. After all the desired values are selected, clicking **Set** to send the new information to the EVM. Click **Get** lets user sees the current display settings on the EVM.

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The Keystone Correction section lets user enables keystone on the EVM. Keystone is used when the EVM is not located on a flat surface and has a vertical tilt of ±40 degrees. Keystone correction ensures that the image displayed is rectangular.

Please note, not all functions shown on this page are supported on all EVMs.

The following commands are used in the Display Settings section:

- Write image crop (0x10)
- Write display size (0x12)
- Write display image orientation (0x14)
- Read operating mode select (0x06)
- Read splash screen select (0x0E, if display splash image)
- Read splash screen header (0x0F, if display splash Image)
- Write input image size (0x2E, if Display Splash Image)
- Write splash screen select (0x0D, if display splash image)
- Write operating mode (0x05; if display splash image)
- Write splash screen execute (0x35; if display splash image)
- Read display size (0x13)
- Read image crop (0x11)
- Read display image orientation (0x15)

The following commands are used in the Keystone Correction section:

- Write image freeze/unfreeze (0x1A)
- Write Keystone correction control (0x88)
- Write Keystone projection pitch angle (0xBB)
- Read operating mode select (0x06)
- Read splash screen select (0x0E; if display splash image)
- Read splash screen header (0x0F; if display splash image)
- Write operating mode (0x05; if display splash image)
- Write splash screen execute (0x35; if display splash image)
- Read Keystone correction control (0x89)
- Read Keystone projection pitch angle (0xBC)

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4.2.4 IntelliBright™ Page

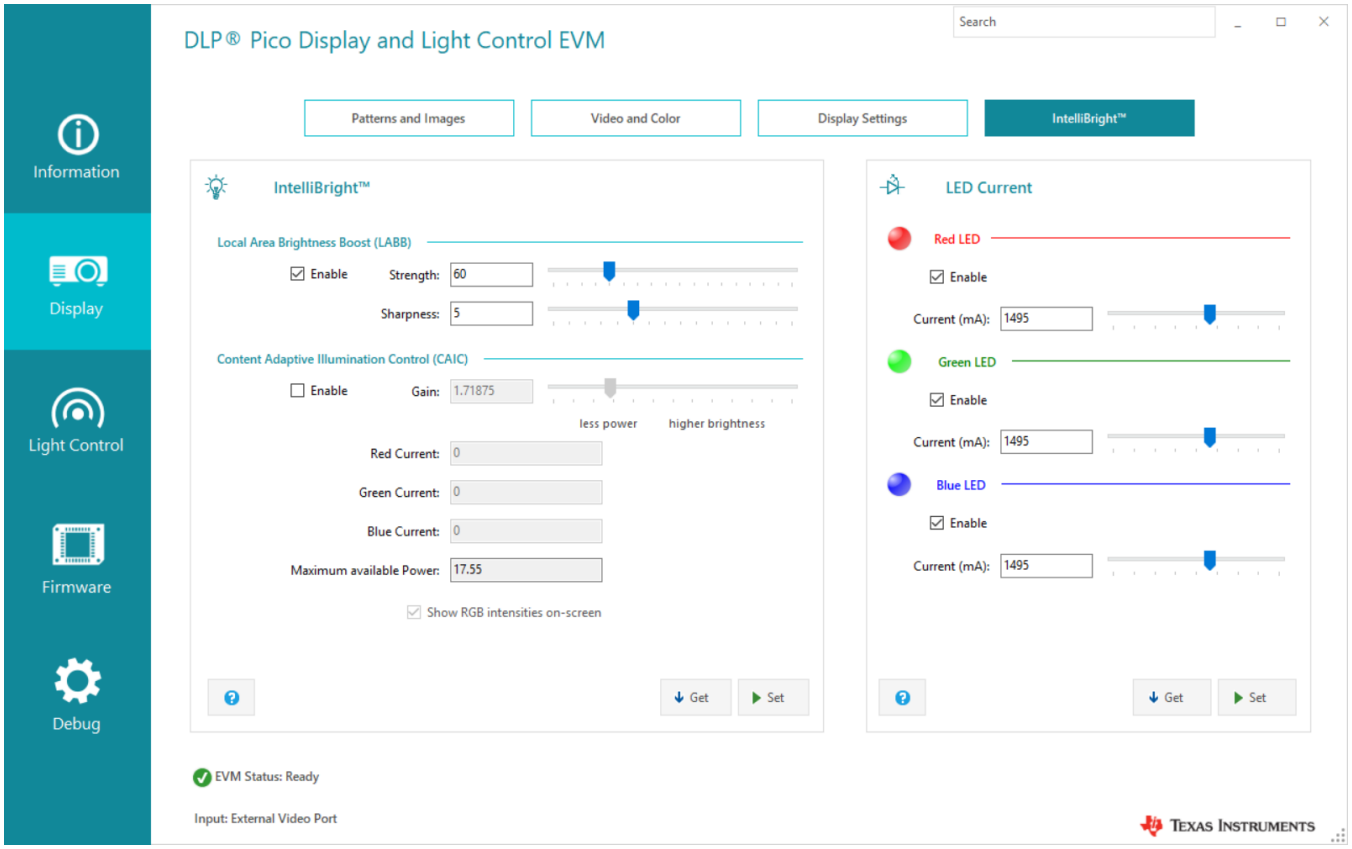

Figure 7. IntelliBright Page

The IntelliBright™ page has two sections:

- IntelliBright™
- LED Current

IntelliBright™ is the name given to two image-processing algorithms designed to dynamically optimize the brightness or power consumption on per frame basis. The IntelliBright™ section lets user changes settings specific to each algorithm and check which settings are currently running on the EVM.

The EVM has three LEDs whose currents can be changed to reduce power consumption and change the perceived color temperature of the displayed image. The LED Current section lets user modifies the current values and see what the EVM is using at any moment.

The following commands are used in the IntelliBright™ section:

- Write local area brightness boost control (0x80)
- Write CAIC image processing control (0x84)
- Write LED output control method (0x50)
- Read CAIC maximum available power (0x57)
- Read CAIC RGB LED current (0x5F)
- Read operating mode select (0x06)
- Read splash screen select (0x0E; if display splash image)
- Read splash screen header (0x0F; if display splash image)
- Write operating mode (0x05; if display splash image)
- Write splash screen execute (0x35; if display splash image)
- Read local area brightness boost control (0x81)

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- Read CAIC image processing control (0x85)
- Read LED output control method (0x51)

The following commands are used in the LED Current section:

- Write RGB LED enable (0x52)
- Write RGB LED current (0x54)
- Read RGB LED enable (0x53)
- Read RGB LED current (0x55)

4.3 Light Control Tab

4.3.1 External Patterns Page

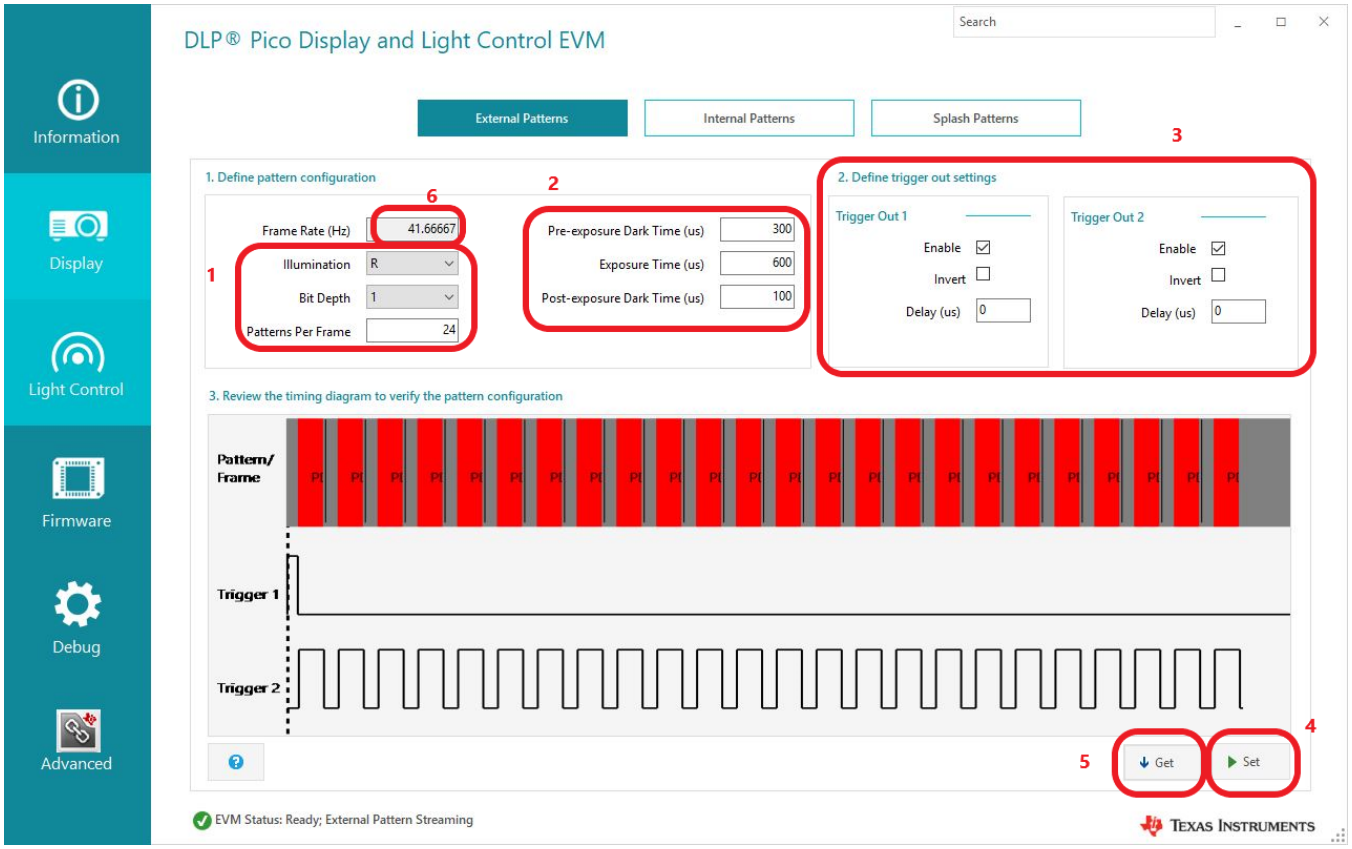

Figure 8. External Patterns Page

External pattern streaming mode involves the projection of patterns input via the projector's video parallel port through the DLP controller board onto the DMD.

On the External Patterns page, users define and check these pattern configurations:

- illumination selection
- bit depth
- patterns per frame
- exposure time
- pre-exposure dark time
- post-exposure dark time

On the External Patterns page, users define and confirm these trigger-out settings:

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- enable
- invert
- delay for trigger out 1
- delay for trigger out 2

4.3.1.1 Set Up External Pattern Mode

Follow these steps to set up External Pattern mode:

1. Enter illumination type, bit depth and number of patterns per frame.
2. Enter required exposure time and dark time.
3. Establish trigger outputs if required.
4. Ensure that the EVM is connected and click **Set**. If an invalid timings error message displays, adjust the patterns timings in step 2 to ensure that the timings are within the supported range and click **Set** again.
5. To verify that the image projected by the EVM has been updated accordingly, click **Get**.
6. The frame rate field updates. The frame rate field is not editable. The frame rate mentioned in this field is calculated as follows:

Frame Rate (Hz) = 1000/[(Exposure Time (µs) + Pre-exposure Dark Time (µs) + Post-exposure Dark Time (µs)) × Patterns per Frame] (1)

Consult the Help section for more information and the list of commands used in this page. Access the Help section from the bottom left of the page

4.3.2 Internal Patterns Pages

Internal Patterns streaming mode involves projection of patterns created internally by the functional block of the controller. Select a group of one row or one column patterns to be replicated through the array by the Controller. The order of display of groups of patterns is configurable.

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4.3.2.1 Internal Patterns Pattern Sets Page

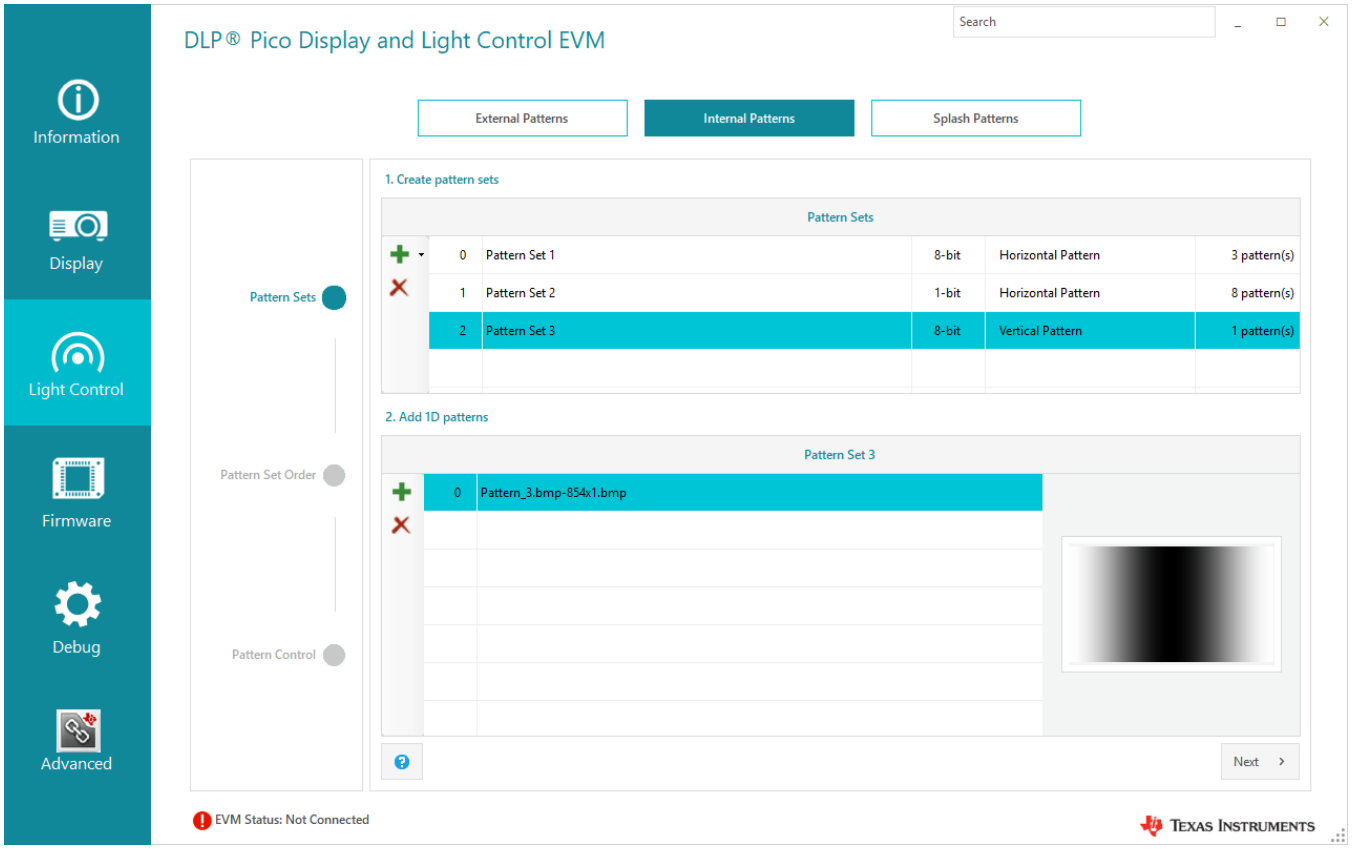

Figure 9. Internal Patterns, Pattern Sets Page

On the the Pattern Sets page, user can add or delete pattern sets and add or delete patterns to and from each pattern set. Apreview window on the right shows the pattern selected. Click **Next** on the bottom-right or any of the tab (Pattern Order or Pattern Control) on the left to continue.

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4.3.2.2 Internal Patterns Pattern Order Page

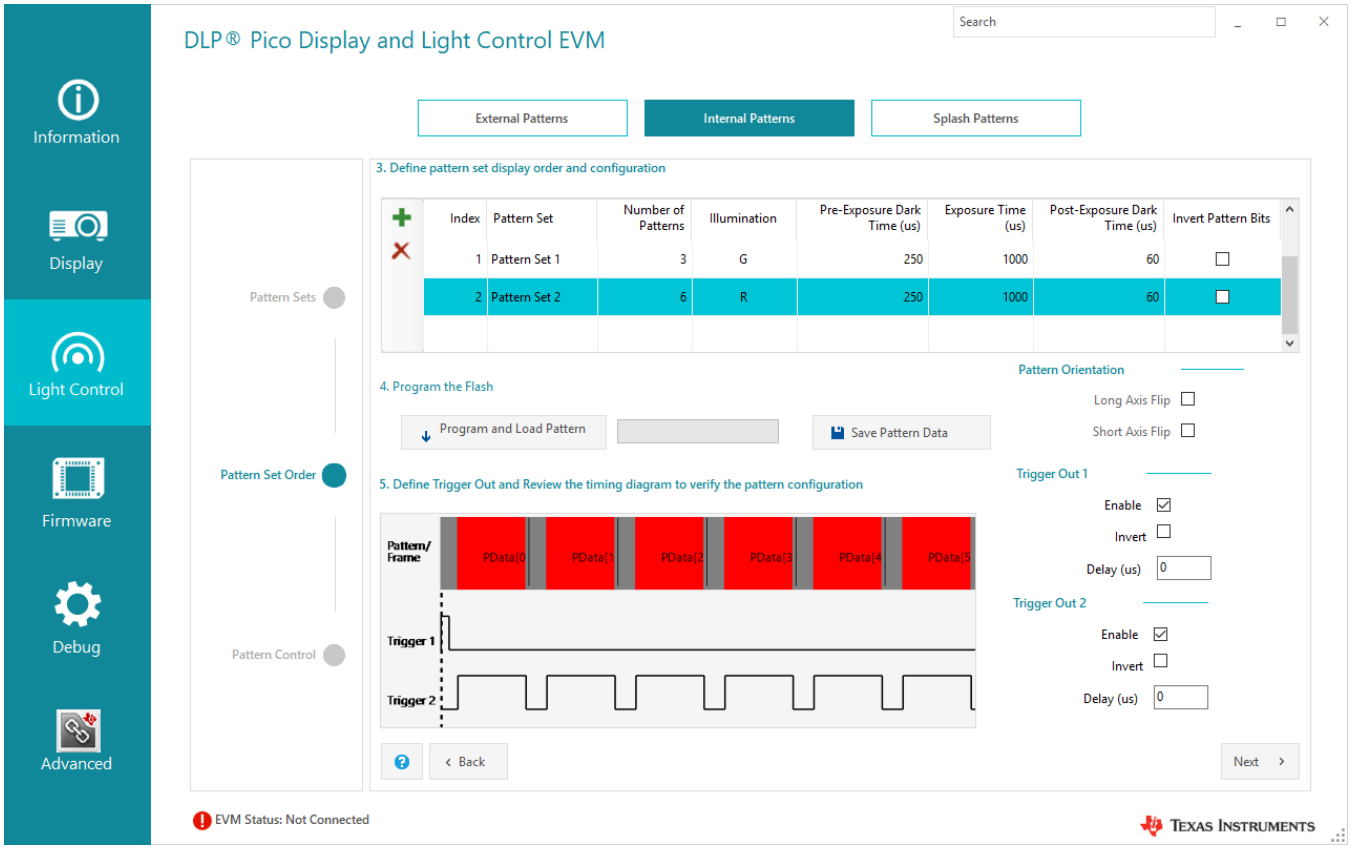

Figure 10. Internal Patterns, Pattern Order Page

On the Pattern Order page, users can configure the default order for pattern sets to display. It also allows users to configure these pattern sets:

- number of patterns
- illumination selection
- exposure time
- pre-exposure dark time
- post-exposure dark time

After setting the pattern order table and the pattern orientation, the user can either load the pattern data directly flash to run the patterns or save the pattern data on the computer to update the firmware later. Review the timing diagram to ensure that the patterns and trigger signals are output as desired.

NOTE: Trigger controls available on this page are used to draw the timing diagram only, they do not affect the functionality of the EVM.

Click **Next** on the bottom-right or any of the tab (Pattern Sets or Pattern Control) on the left to continue.

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4.3.2.3 Internal Patterns Pattern Control Page

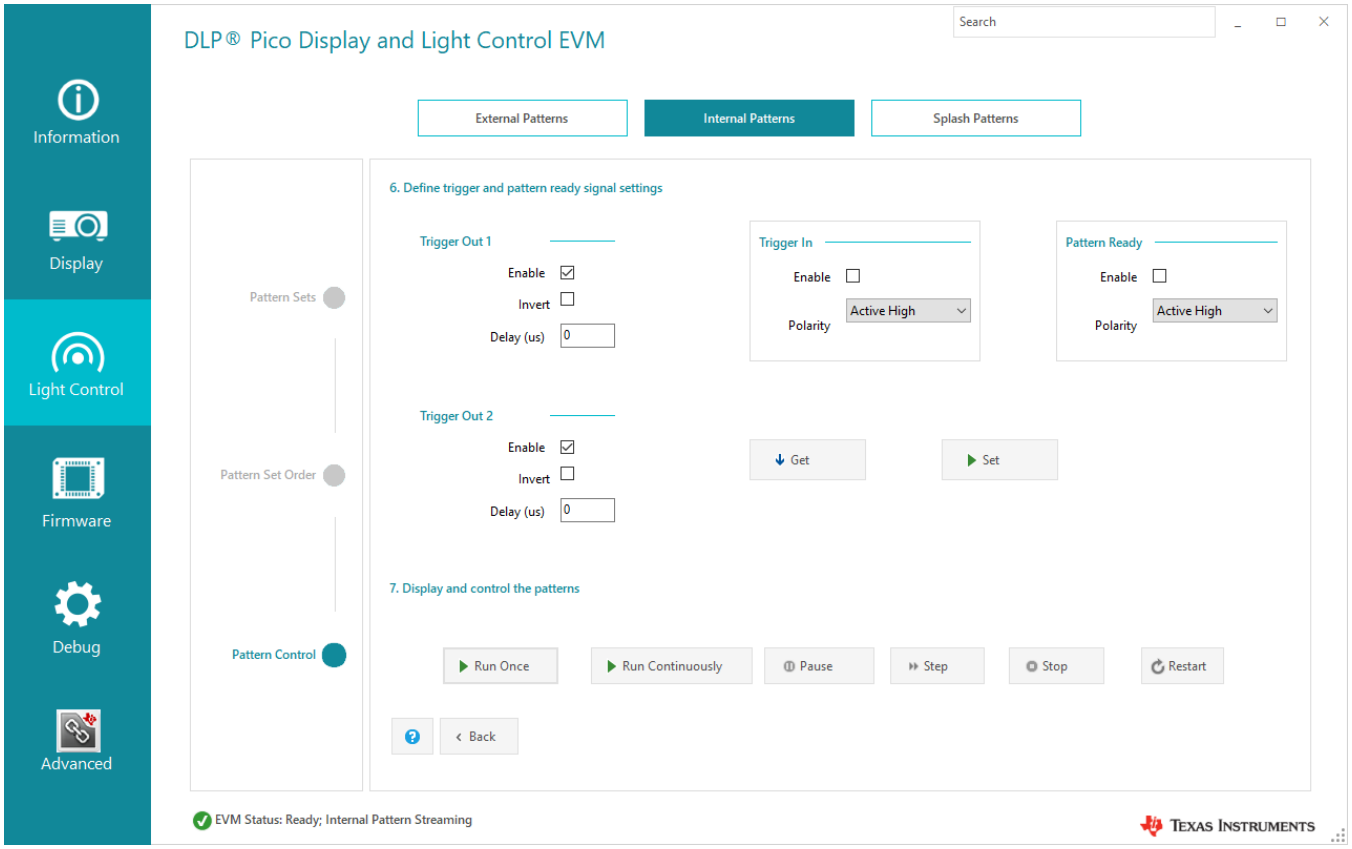

Figure 11. Internal Patterns, Pattern Control Page

On the Pattern Control page, users can configure the trigger out, trigger in and pattern ready signals and to control the display of patterns in internal patten mode. This page requires the EVM to be connected to the GUI in order to work.

Configure the triggers and pattern ready signal as required and click **Set**. To view the current configuration of these signals, click **Get**. After all the configurations are set, the user can select and control how to run these patterns:

- run once
- run continuously
- pause
- step
- stop
- reset

The following commands are used on this page:

- Write trigger out configuration (0x92)
- Write trigger in configuration (0x90)
- Write pattern ready configuration (0x94)
- Write pattern order table entry (0x98)
- Write operating mode select (0x05)
- Write internal pattern control (0x9E)
- Read trigger out configuration (0x93)
- Read pattern configuration (0x97)

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- Read pattern ready configuration (0x95)

4.3.3 Splash Patterns Page

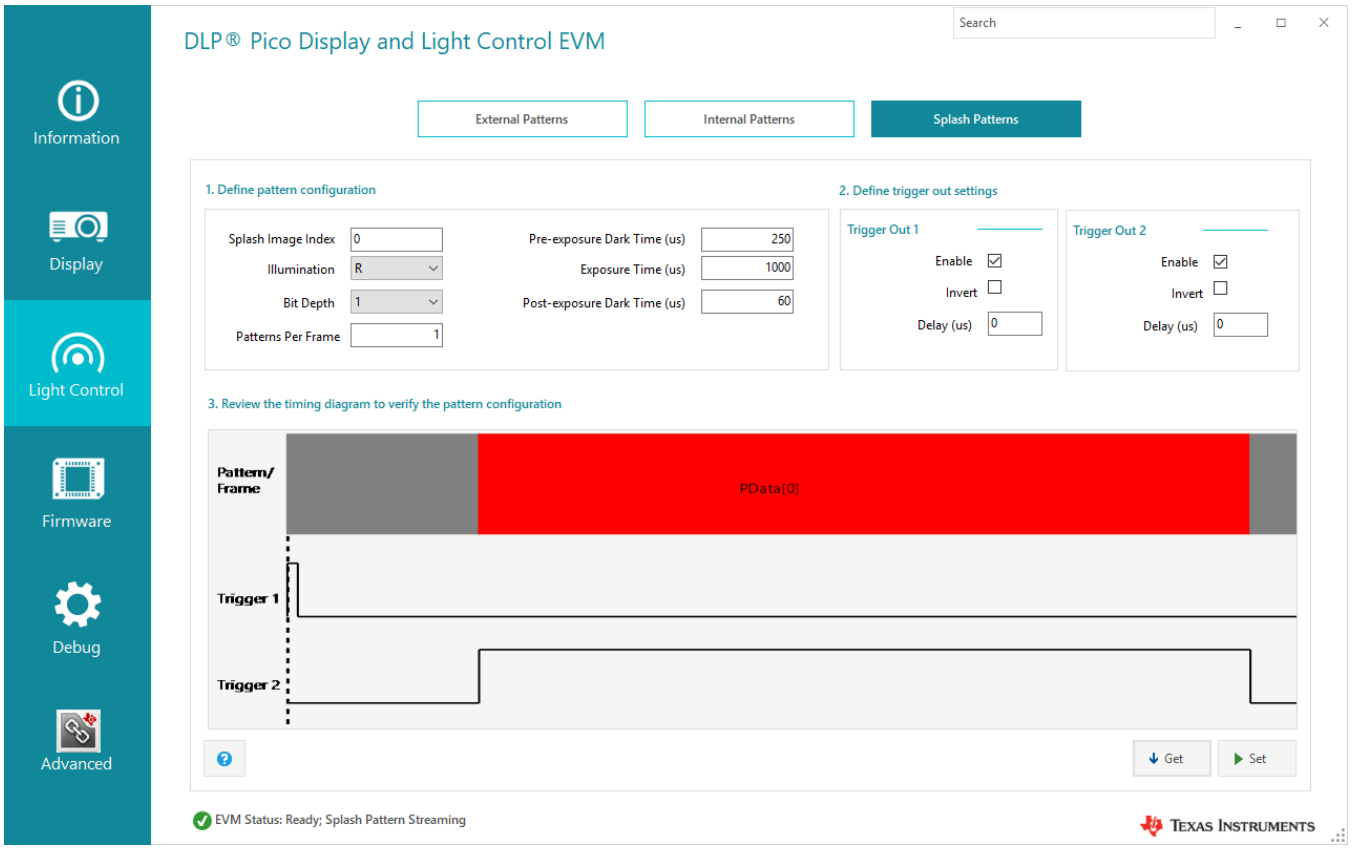

Figure 12. Space-Coded Patterns Page

Splash Patterns display images stored in flash memory. On the Space-Coded Patterns page, users define these pattern configurations:

- splash image index
- illumination selection
- bit depth
- patterns per frame
- exposure time
- pre-exposure dark time
- post-exposure dark time

On the Space-Coded Patterns page, users define these trigger out settings:

- enable
- invert
- delay for both triggers

The following commands are used on this page:

- Write trigger out configuration (0x92)
- Write pattern configuration (0x96)
- Write operating mode select (0x05)
- Write splash screen select (0x0D)

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- Read splash screen header (0x0E)
- Write display size (0x12)
- Write image crop (0x10)
- Write input image size (0x2E)
- Write splash screen execute (0x35)
- Read trigger out configuration (0x93)
- Read pattern configuration (0x97)

4.4 Firmware Tab

4.4.1 Backup Firmware Page

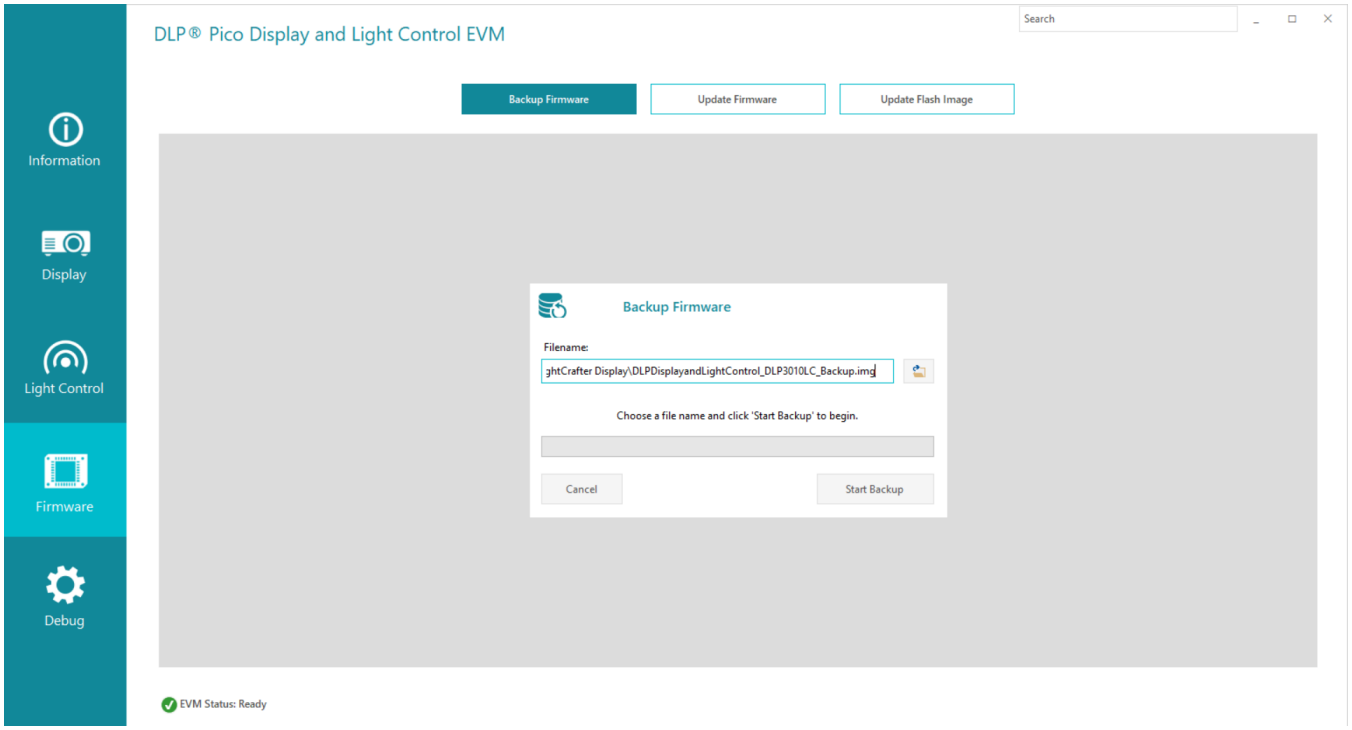

Figure 13. Backup Firmware Page

On the Backup Firmware page, users can backup the EVM firmware. Click the browser button to select the folder and image filename for the backup.

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4.4.2 Update Firmware Page

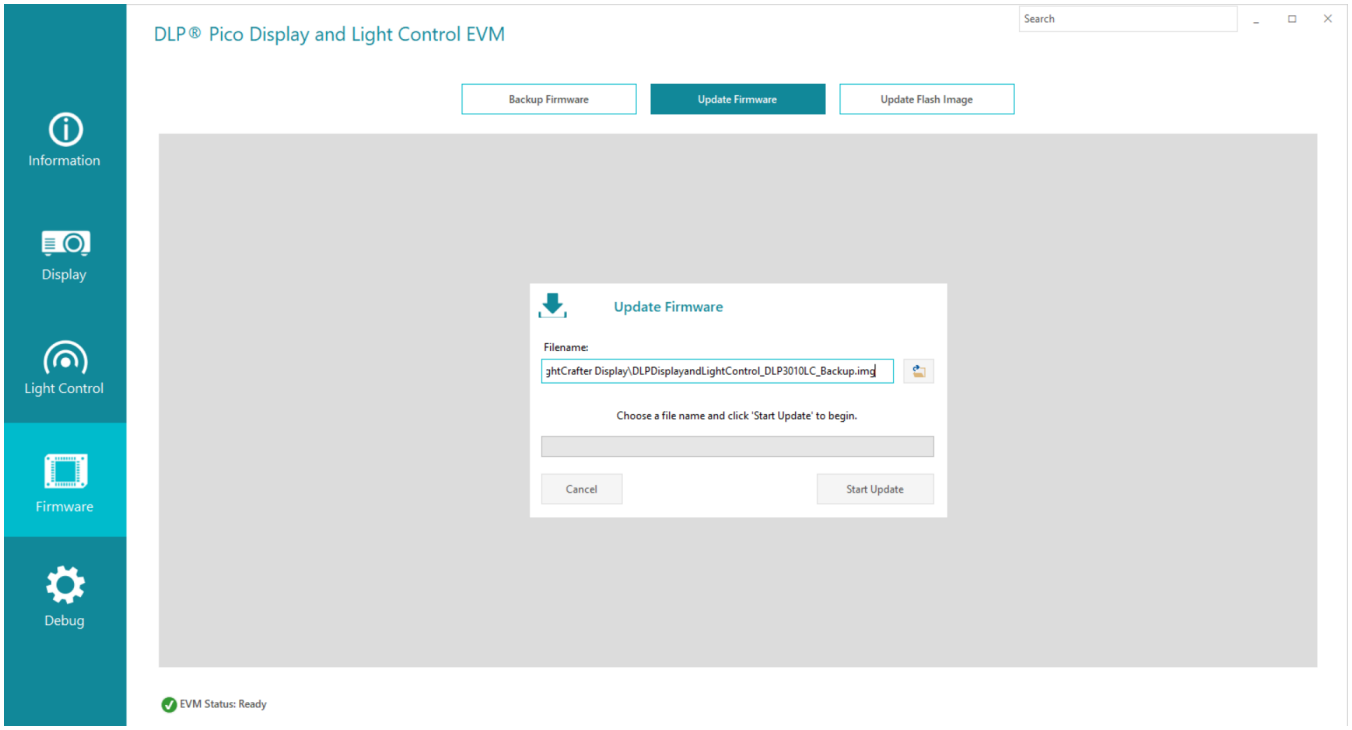

Figure 14. Update Firmware Page

The Update Firmware page allows the user to update the EVM firmware. Click the browser icon to select folder and image filename for the update.

4.4.3 Update Flash Image Pages

The user has the option to modify settings in the flash image through the Update Flash Image wizard.

The DLP Display and Light Control EVM GUI Tool gives users the ability to customize the default flash image provided on ti.com. The customizable components of the flash image are:

- Splash images
- Start-up image orientation
- Start-up splash image
- Start-up LED current
- Auto-initialization routine

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4.4.3.1 Update Flash Image Start Page

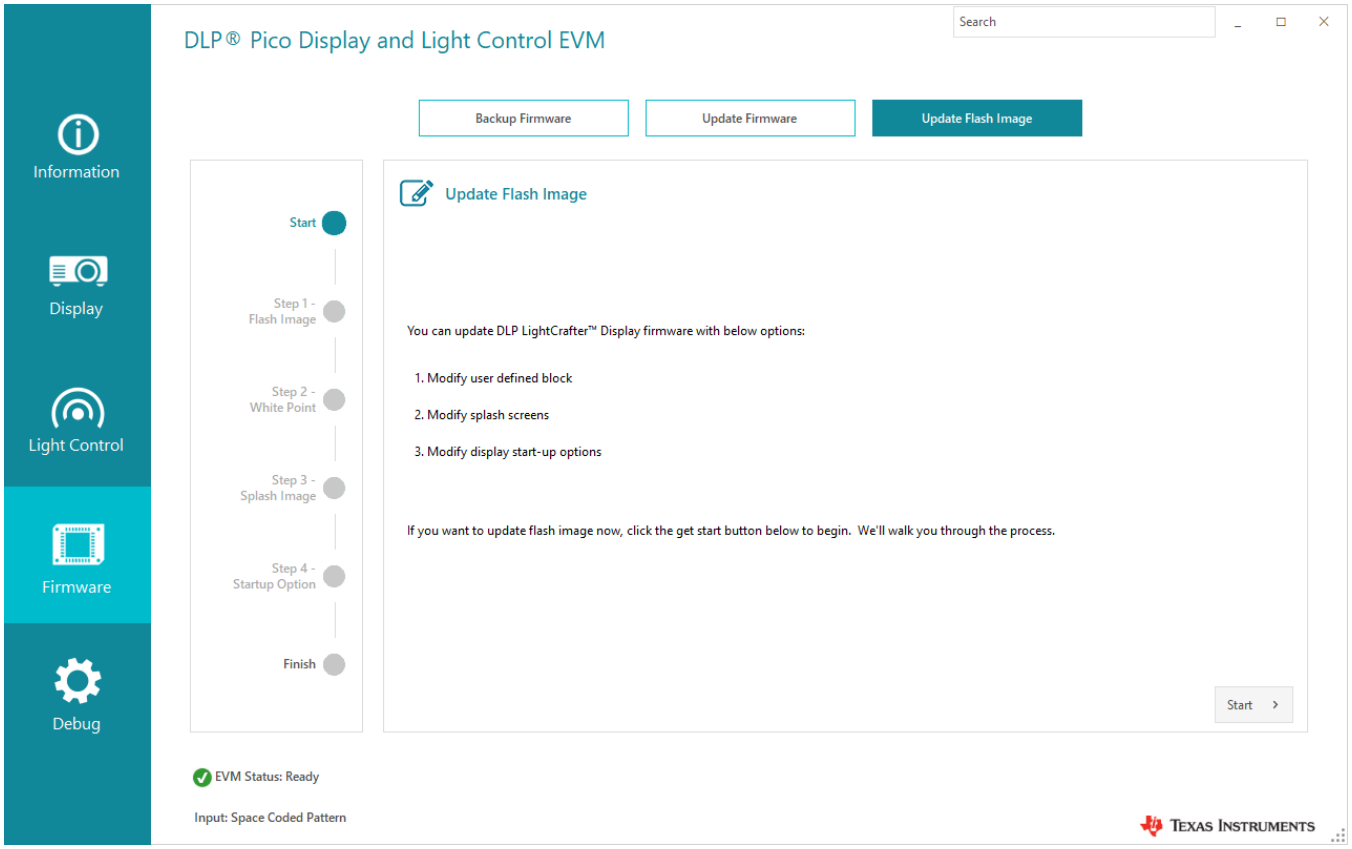

Figure 15. Update Flash Image - Start Page

The start page for Update Flash Image outlines the options that can be modified in the flash. Click **Start** on the bottom-right corner or **Step 1 - Flash Image** on the left to continue. The user can also select any of the options (Step 1, 2, 3, or 4) on the left to move to the other pages.

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4.4.3.2 Update Flash Image Flash Image Page

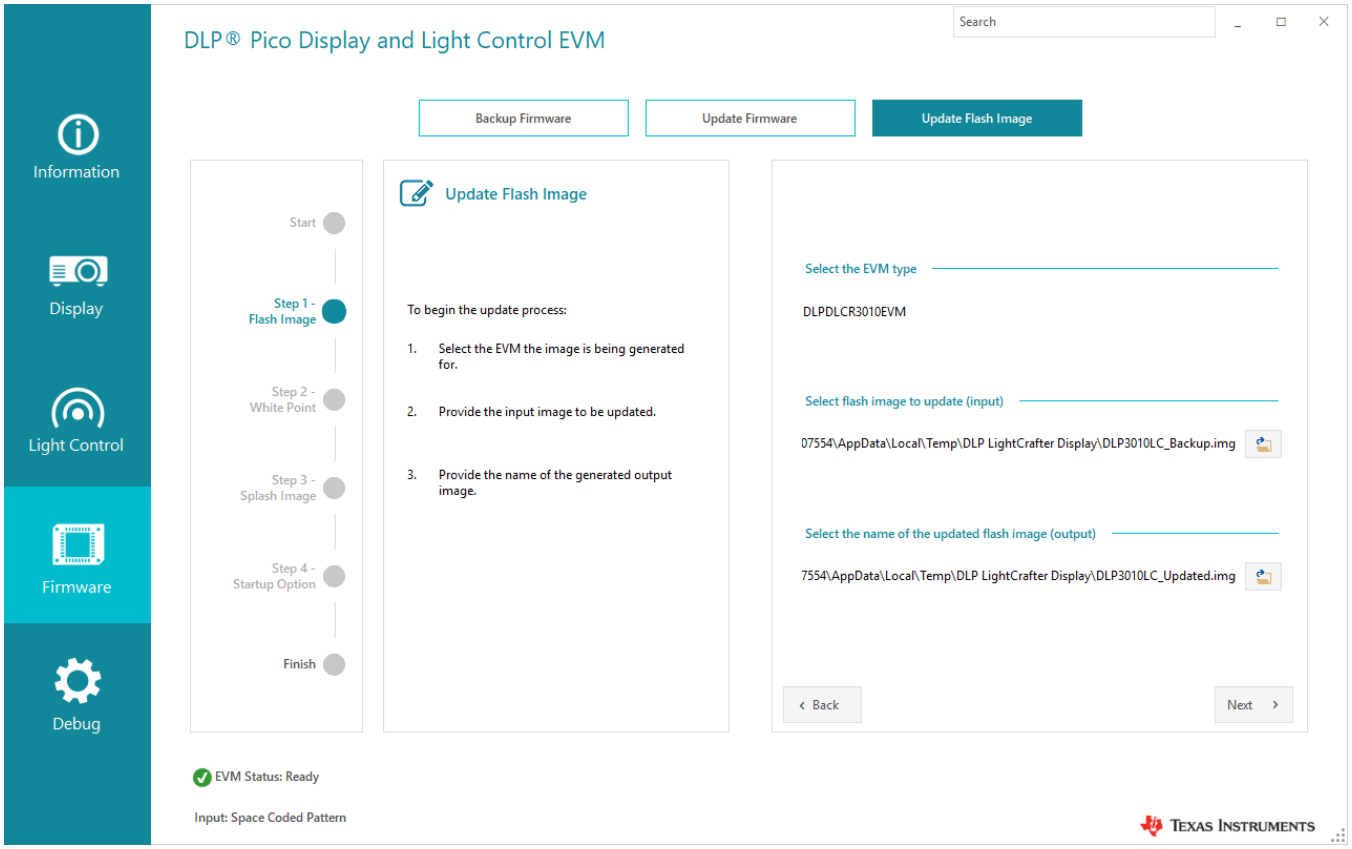

Figure 16. Update Flash Image - Flash Image Page

The flash image page for Update Flash Image allows the user select these options:

- EVM Type
- input flash image file
- output flash image file

Click **Next** on the bottom-right corner or **Step 2 - White Point** on the left to continue. Click the **Back** button at the bottom-left of the section to go back to the start page or any of the options (Step 1, 2, 3, or 4) on the left to move to other pages.

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4.4.3.3 Update Flash Image White Point Page

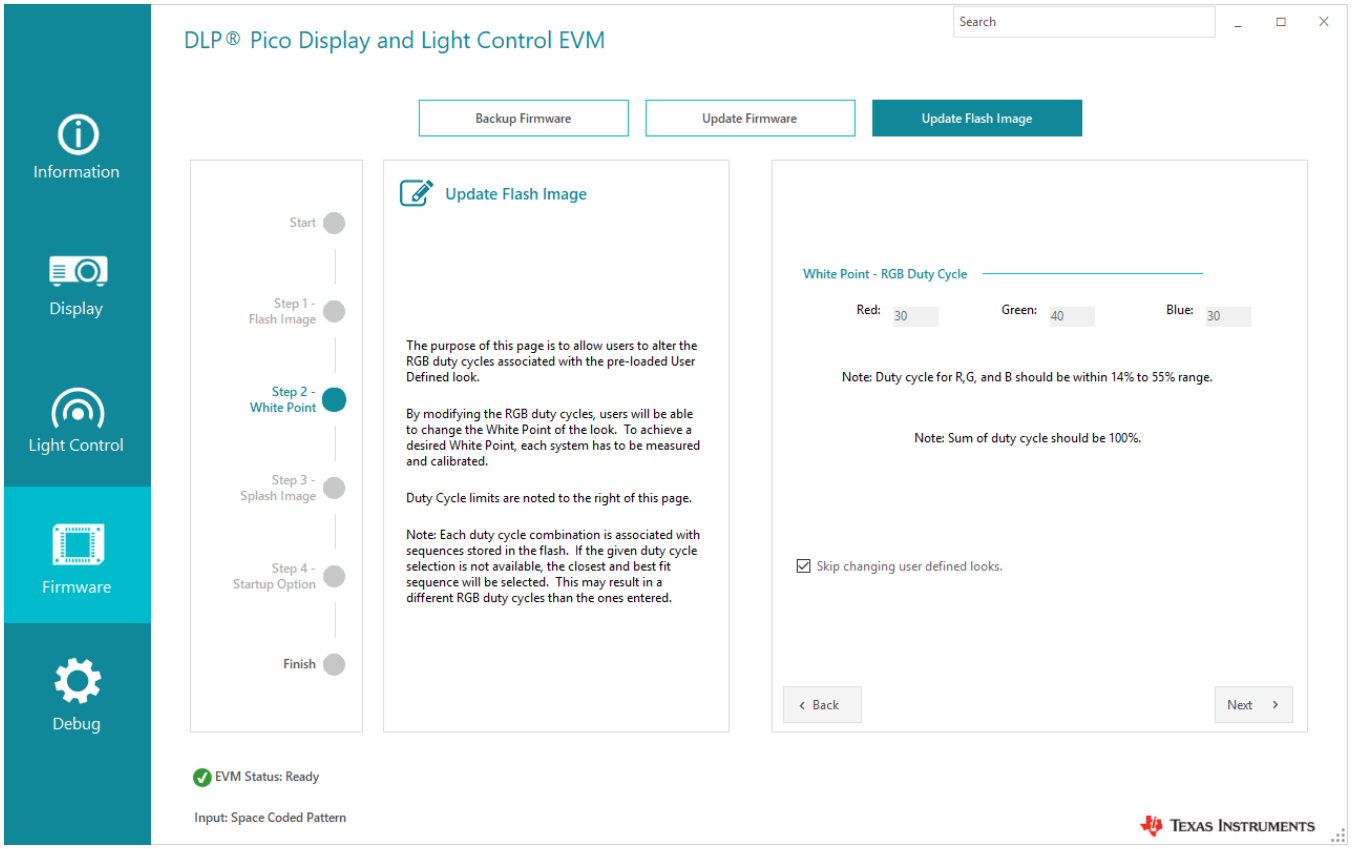

Figure 17. Update Flash Image - White Point Page

On the white point page, the user can overwrite the Red, Green, or Blue Duty Cycle values. The user can also opt to not change the values. Click **Next** on the bottom-right corner or **Step 3 - Splash Image** on the left to continue. The user can also click the **Back** button at bottom-left of the section to go back to the Step 1 - Flash Image page or any of the options (Step 1, 2, 3, or 4) on the left to move to other pages.

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4.4.3.4 Update Flash Image Splash Image Page

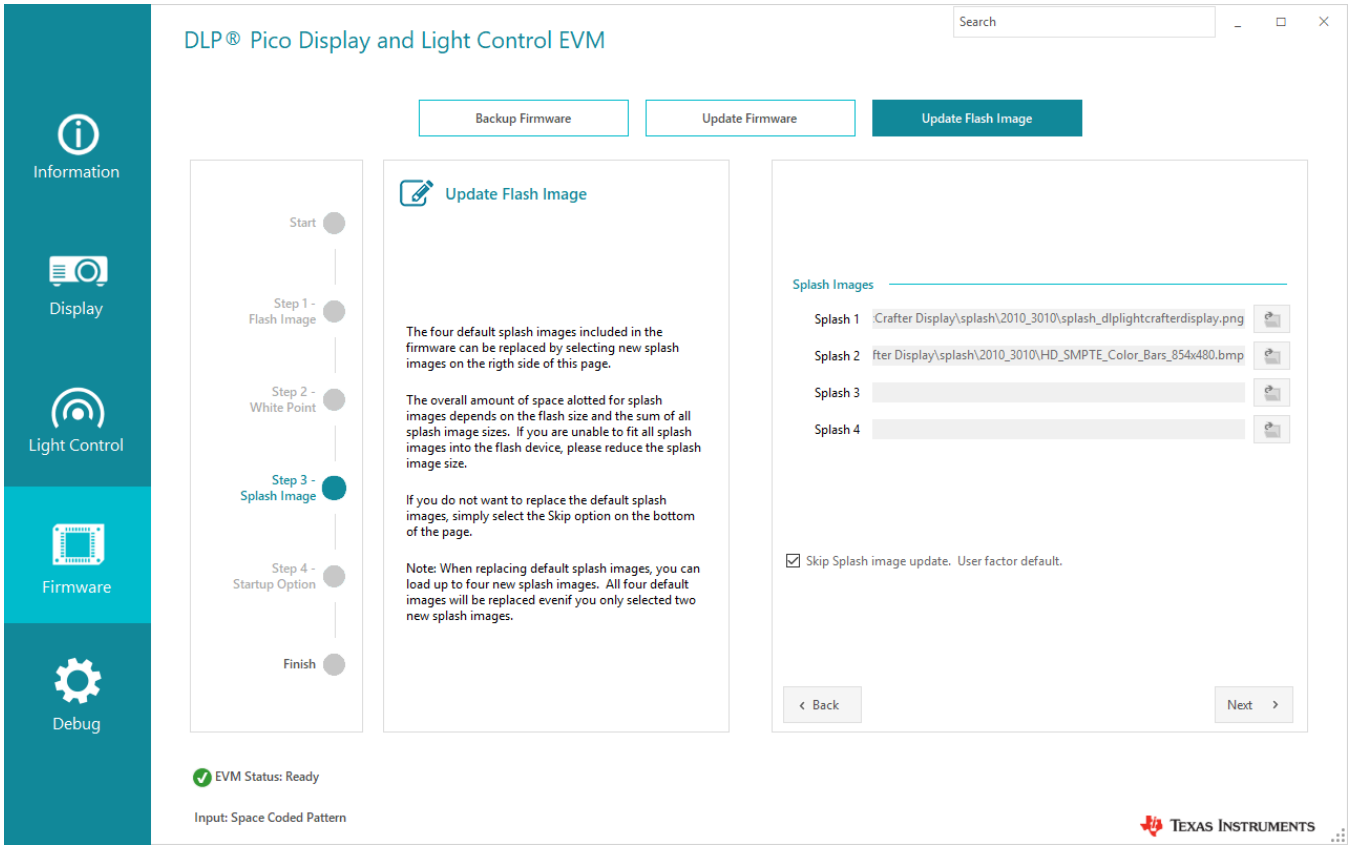

Figure 18. Update Flash Image - Splash Image Page

On the iplash image page for Update Flash Image, the user can overwrite and select image files to store in flash memory. The user has the option to skip the splash image update screen. Click **Next** on the bottom-right corner or **Step 4 - Startup Option** on the left to continue. Click the **Back** button at the bottom-left of the section to go back to the Step 2 - White Point page or any of the options (Step - 1, 2, 3, or 4) on the left to move to other pages.

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4.4.3.5 Update Flash Image Startup Option Page

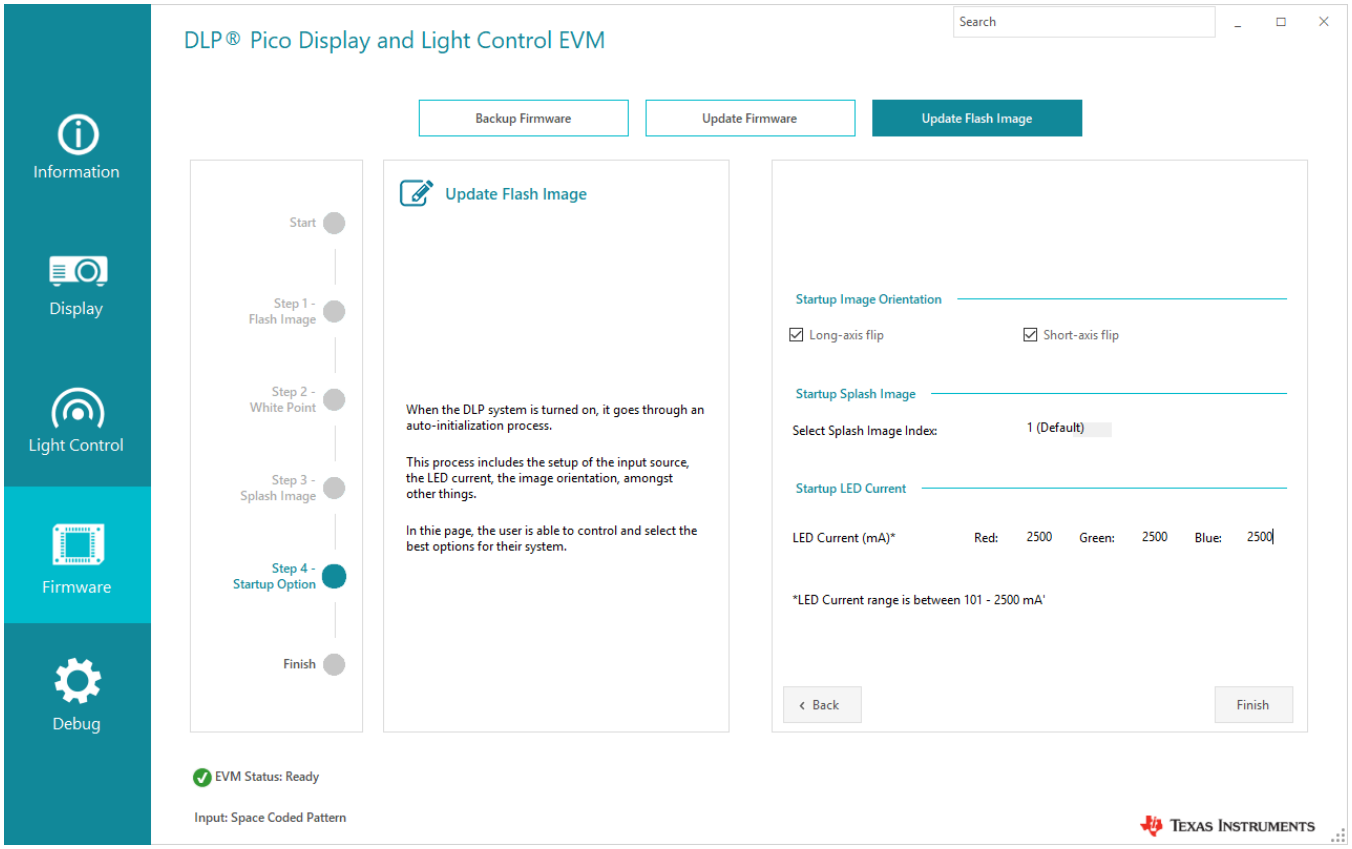

Figure 19. Update Flash Image - Startup Option Page

on the option page for Update Flash Image, users can overwrite these startup options:

- long or short-axis flip
- startup image file
- startup Red, Green, or Blue LED current

Click **Finish** on the bottom-right corner to build the flash image. The user can also click the **Back** button at the bottom-left of the section to go back to the Step 3 - Splash Image page or any of the oprtions (Step 1, 2, 3, or 4) on the left to move to other pages.

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4.4.3.6 Update Flash Image Finish Page

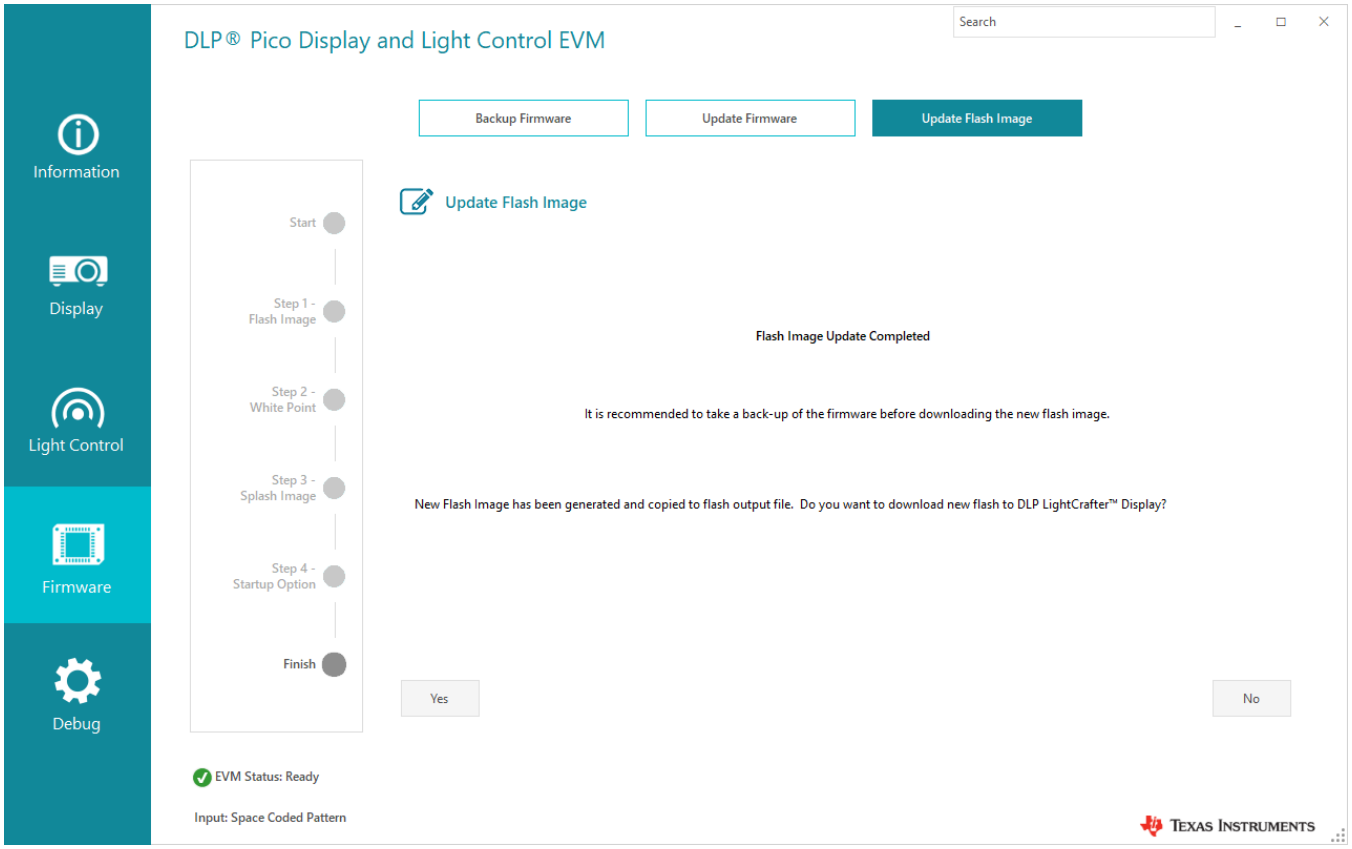

Figure 20. Update Flash Image - Finish Page

The Finish Page page is not selectable. When the flash image build is completed, the finish page for Update Flash Image display the information. To run the backup, click **Yes** on the bottom-left to go to the Backup Firmware page. Click **No** on the bottom-right to go to the Update Firmware page to update the EVM with the newly created flash image.

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4.5 Debug Tab

4.5.1 Event Viewer Page

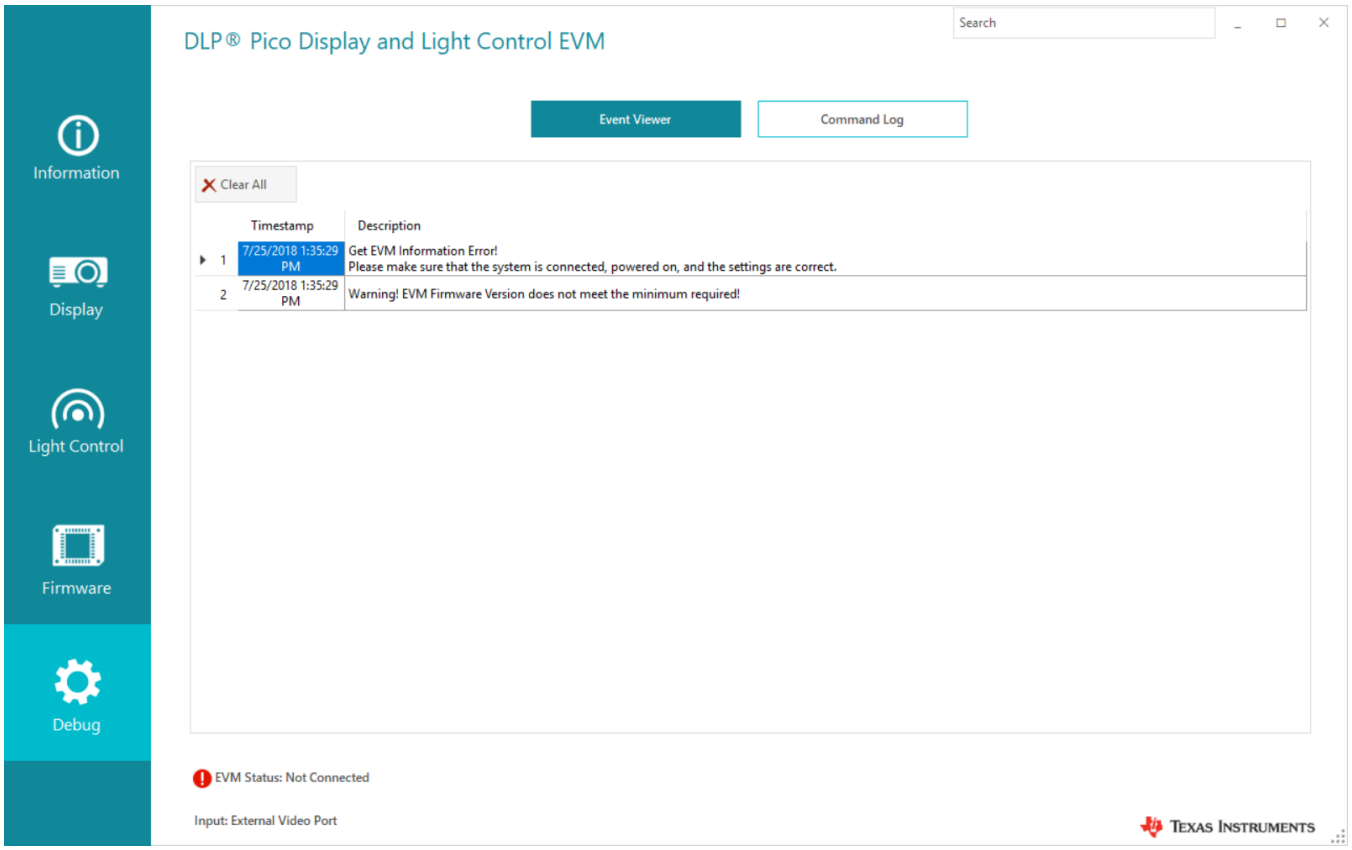

Figure 21. Event Viewer Page

The Event Viewer Page lists the timestamp and description of the events occurred on the EVM system.

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4.5.2 Command Log Page

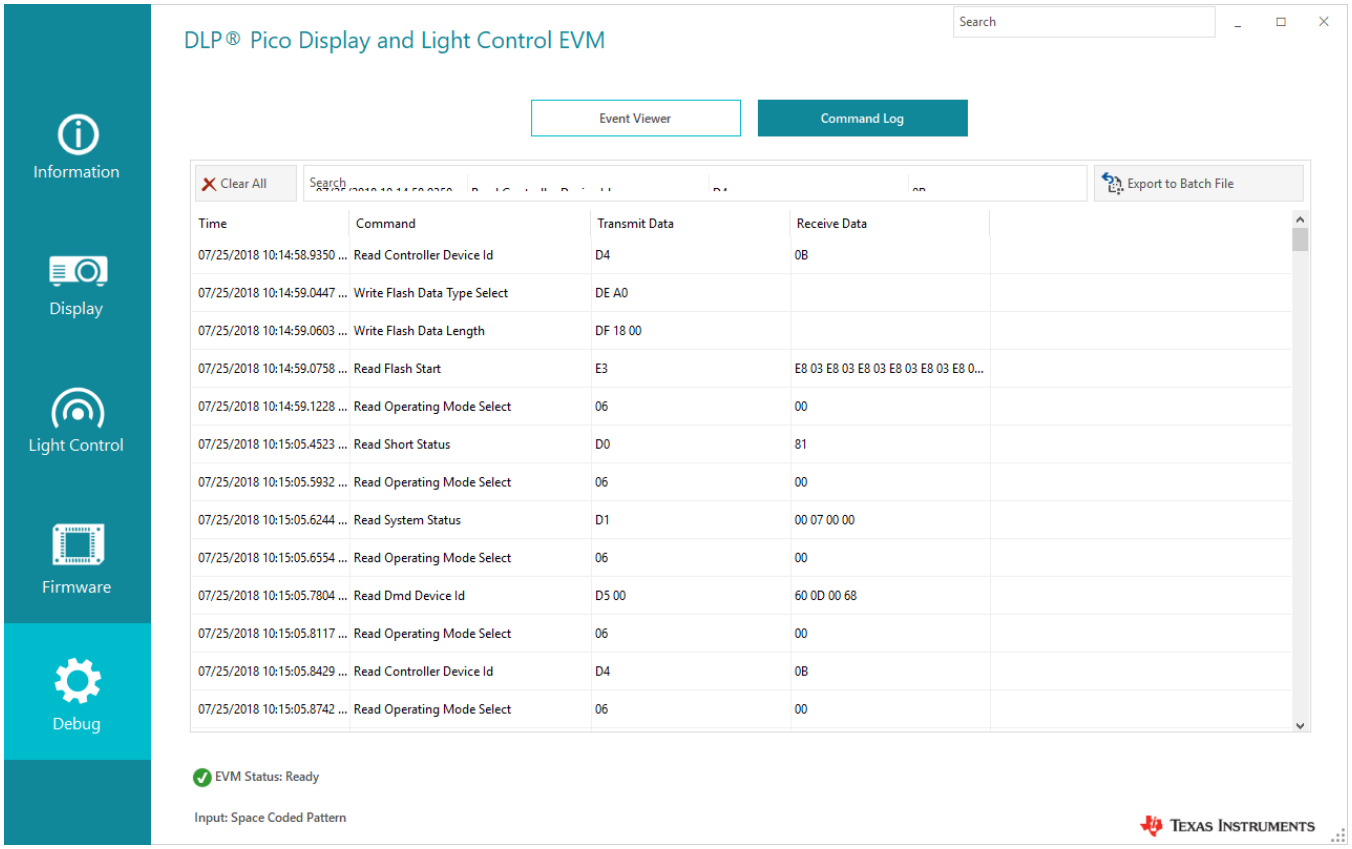

Figure 22. Command Log Page

The Command Log Page lists the commands sent to the EVM System with the option to clear all entries or export the allowable write commands to a batch file.

4.6 Advanced Tool

Advanced GUI Tool allows more experienced users more control of the EVM system with utilities such as:

- connection settings
- scripting
- direct command communication with the EVM

The tool also offers an Event Viewer and Command Log as does the simple tool, but also includes:

- console
- watch variables
- variable list when working with the scripting tool

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4.6.1 Connection Page

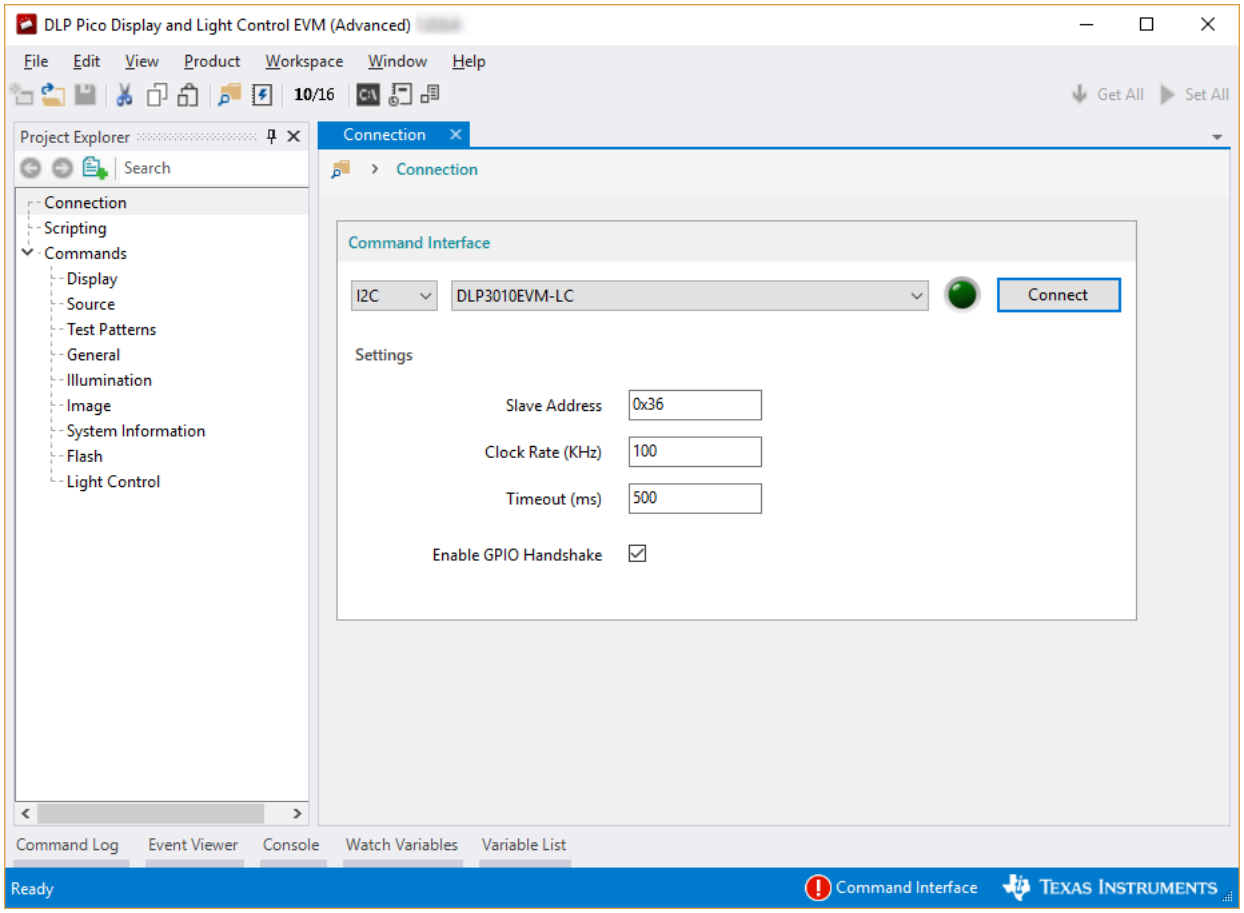

Figure 23. Connection Page

While the EVM is disconnected, the Connection page allows users to select these settings:

- I^2C or SPI
- EVM type
- additional interface settings

It then connects or disconnects from the system. Always ensure that the EVM status set to *Connected* before attempting to send any I^2C commands in Advanced mode.

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4.6.2 Scripting Page

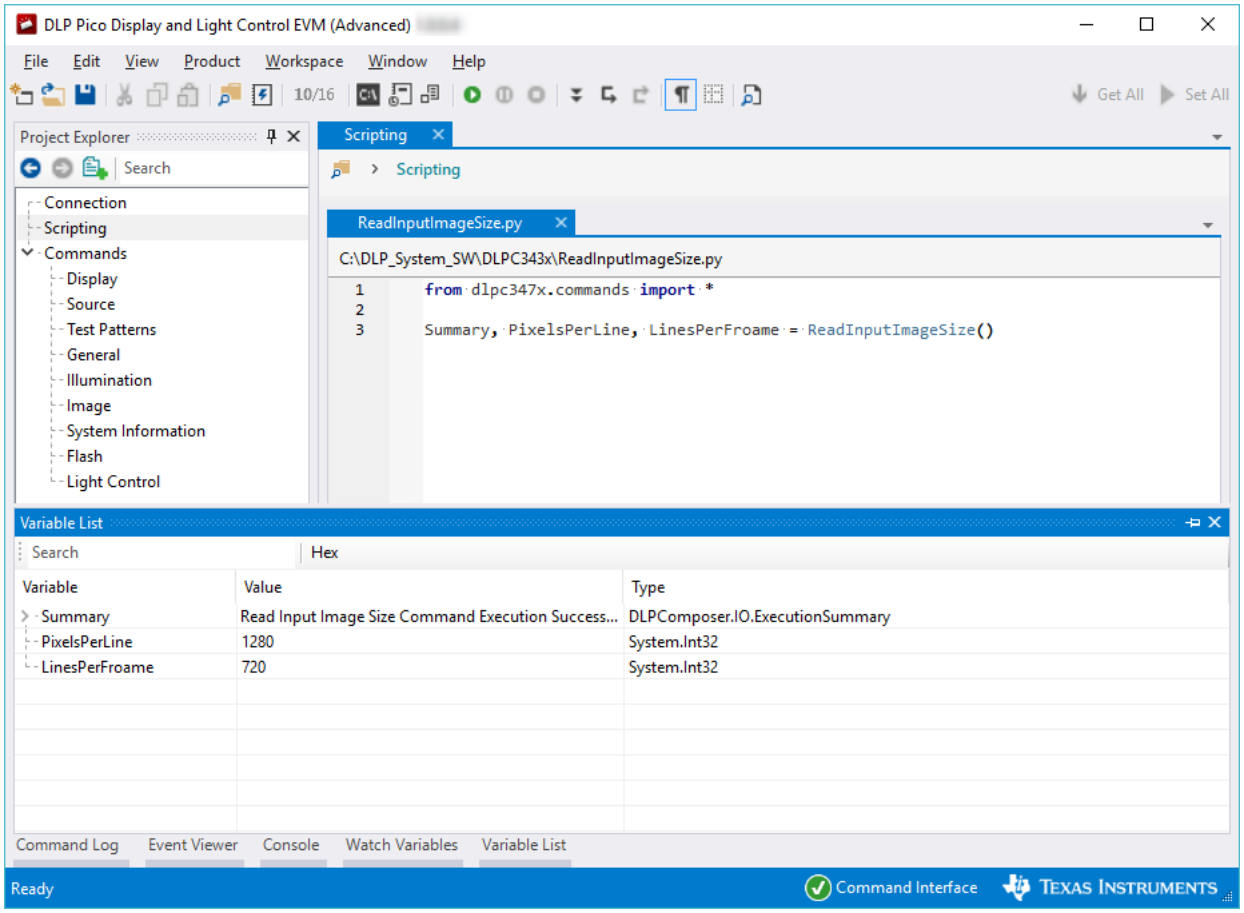

Figure 24. Scripting Page

On the Scripting page, users can write command scripts to execute on the EVM system. The user can monitor the execution of the script through the console, watch variables, and variable pages listed on the bottom of the page. Click **Scripting Reference** from the Help menu to see the list of commands available and the syntax for each command.

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4.6.3 Command Pages

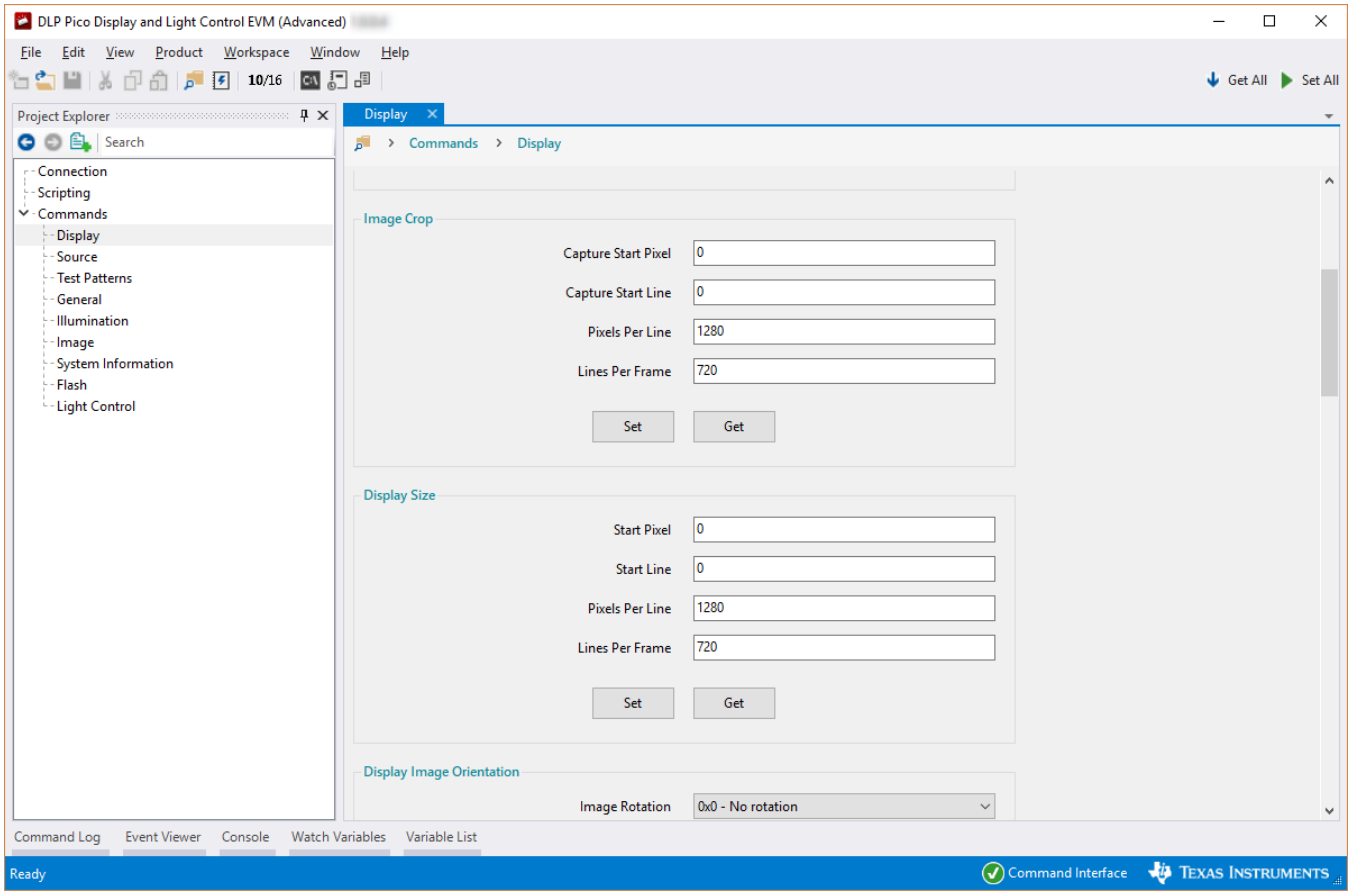

Figure 25. Command Pages

On the Command Pages, users can issue the command **Set** or **Get** from the GUI. Click on the command group (for example Display, Source or Test Pattern) on the left to display the list of commands available for that group. Users can set the parameters of the individual commands or get the parameters for the command. Click **Get All** or **Set All** at the top-right corner to send all the commands for the group selected.

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Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (August 2018) to A Revision **Page**

- Changed free HD space from "60 MB" to "200 MB" 1
- Updated Table 1 1
- Updated Table 2 3
- Updated instructions in Section 4.3.1.1 12

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