DLP® LightCommander™ Development Kit User Manual

Hardware Documentation

Logic PD // Products
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Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
A	SMC	-Initial release	JCA	05/19/11
B	SO	-Added Table of Figures and Table of Tables; -Added Section 1.1 and included new link to TI instructional video; -Section 5.4: Added manufacturer part number for light engine; updated manufacturer part number for LED driver.	SO	10/13/11

FCC Certification

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Table of Contents

Table of Figures

Table of Tables

1 Introduction

The DLP LightCommander is a highly versatile and easy-to-use development kit for incorporating DLP technology into light processing applications. This user manual provides an overview of the DLP LightCommander Development Kit, instructions for how to set-up the DLP LightCommander, and details about the subcomponents that make up the DLP LightCommander.

1.1 Additional Documentation Resources

The following documents and documentation are referenced within this user manual and are available on your Account Summary[1] page on the Logic PD website.

- *DLP LightCommander Control Software User Manual*[2]
- *DLP LightCommander QuickStart Guide*[3]
- *DLP Controller Board Hardware Specification*[4]
- *DLP Controller Board BOM, Schematic, and Layout*[5]
- *DLP DMD Board Hardware Specification*[6]
- *DLP DMD Board BOM, Schematic, and Layout*[7]
- *Core Optical Module Interface Control Drawing*[8]

In addition to this documentation, a Texas Instruments (TI) instructional video[9] is available that shows how the DLP LightCommander can be opened and how the individual modules within can be removed.

[1] http://support.logicpd.com/auth/
[2] http://support.logicpd.com/downloads/1302/
[3] http://support.logicpd.com/downloads/1300/
[4] http://support.logicpd.com/downloads/1303/
[5] http://support.logicpd.com/downloads/1323/
[6] http://support.logicpd.com/downloads/1304/
[7] http://support.logicpd.com/downloads/1322/
[8] http://support.logicpd.com/downloads/1380/
[9] http://focus.ti.com/general/docs/video/Portal.tsp?entryid=0_2n1j76gq&lang=en

2 Unpacking the Box

The DLP LightCommander Development Kit includes the following items:

- DLP LightCommander
- Nikon AF NIKKOR 50 mm f/1.8D lens
- Power cables for US, UK, Japan, and Europe regions (only the US power cable is shown in Figure 2.1)
- DVI to HDMI cable
- USB A-to-mini-B cable
- *DLP LightCommander QuickStart Guide* document (not shown in Figure 2.1)
- *Development Kit Important Notice* document (not shown in Figure 2.1)

Figure 2.1: Development Kit Contents (Hardware Only)

3 DLP LightCommander Overview

3.1 DLP LightCommander Component View

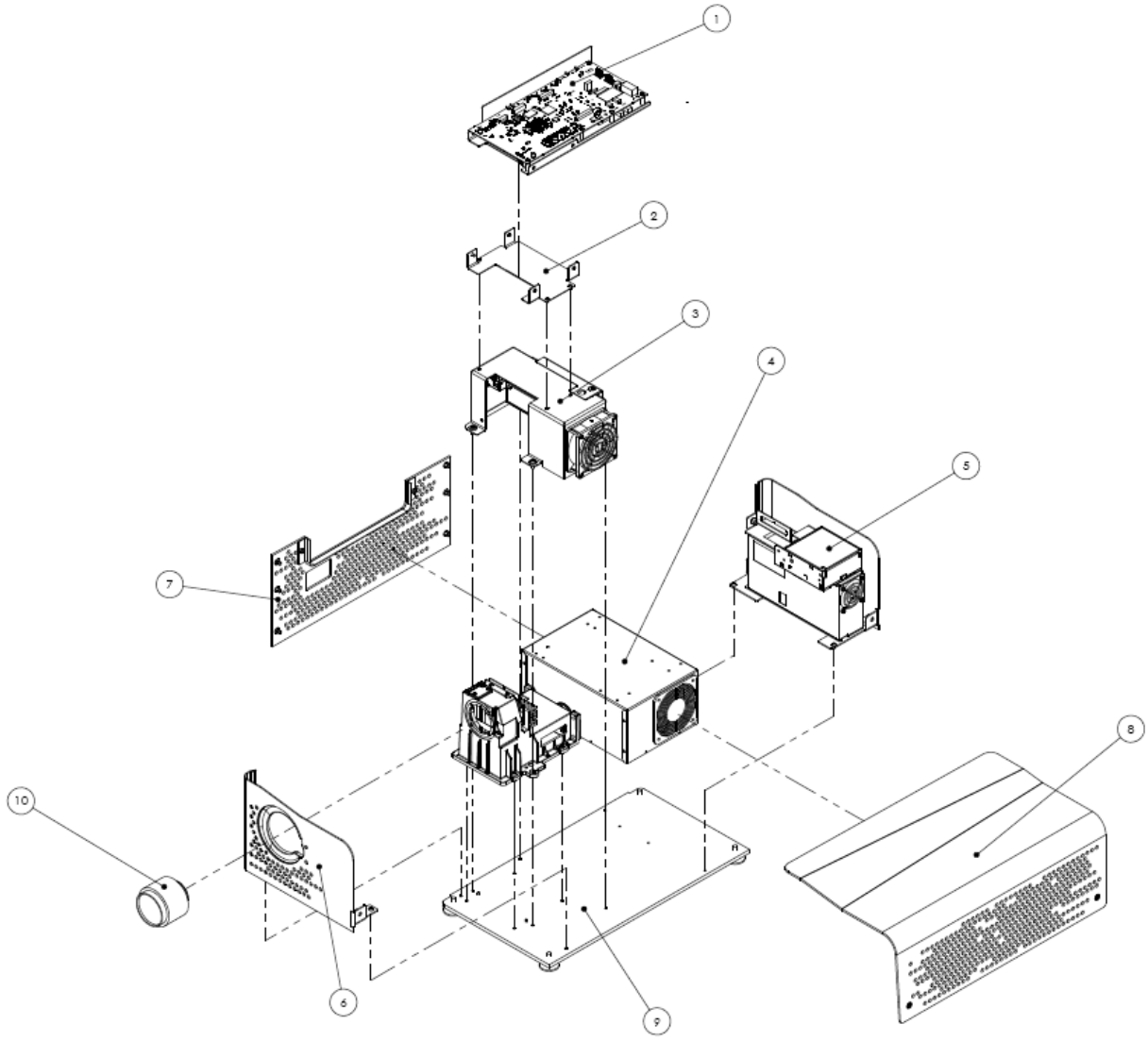

Figure 3.1: DLP LightCommander Component View

Diagram #	Component Description
1	Controller Board Assembly
2	Controller Board Mounting Bracket
3	Controller Board Power Supply and DMD Cooling Enclosure
4	Light Engine and DMD Board Assembly
5	Light Engine Power Supplies and Rear Enclosure Assembly
6	Front Enclosure Assembly
7	Side Enclosure Assembly
8	Top/Side Enclosure Assembly
9	Base Plate Assembly
10	Nikon AF NIKKOR 50mm f/1.8D Lens

3.2 System Block Diagram

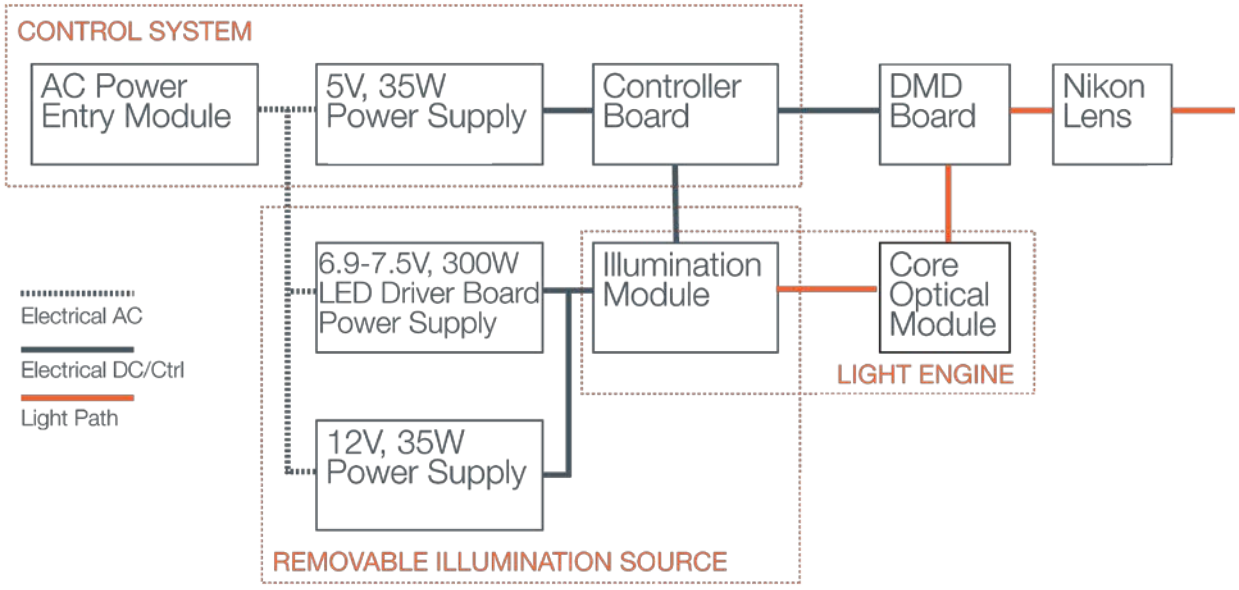

Figure 3.2: DLP LightCommander System Block Diagram

3.3 External Connectors & Switches

The right side of the DLP LightCommander contains external connectors and switches for operating the development kit.

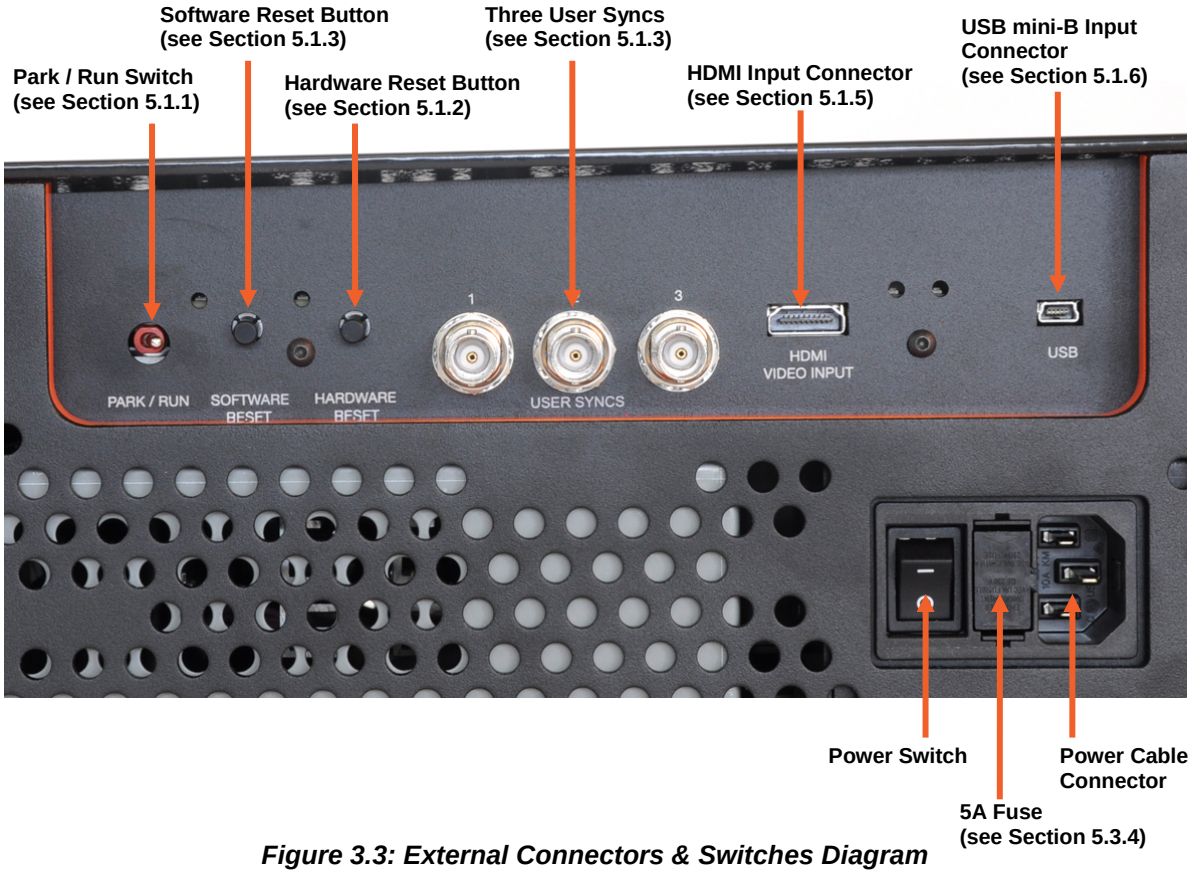

Figure 3.3: External Connectors & Switches Diagram

3.4 DLP LightCommander Mechanical Characteristics & Operating Conditions

Table 3.1: Mechanical Characteristics

Parameter	Typical	Unit	Notes
Dimensions	241(w) x 463(l) x 179(h)	mm	1
Weight	9.5	kg	

TABLE NOTES:

1. Length measurement includes attached lens. Height measurement includes the adjustable feet set closest to the underside of the DLP LightCommander.

Table 3.2: Temperature Specifications/Restrictions

Parameter	Min	Max	Unit
Operating Temperature	0	45	°C
Storage Temperature	-40	80	°C

Table 3.3: AC Input Specifications/Restrictions

Parameter	Min	Max	Unit
AC Input Voltage	120	240	VAC
AC Input Frequency	50	60	Hz
Current	5		A

4 DLP LightCommander Set-up & Initial Power-on

This section describes how to set-up the DLP LightCommander for the first time and display a test pattern indicating that the hardware is in good operating condition.

4.1 Position DLP LightCommander

1. Set the DLP LightCommander on a flat, sturdy surface.
2. Position the DLP LightCommander so that the front faces a surface where a projected image can be viewed.
3. The feet on the bottom of the DLP LightCommander can be adjusted to increase or decrease height. Twist the feet clockwise to raise or counter-clockwise to lower the unit until it sits level on the surface.

4.2 Attach Lens to DLP LightCommander

1. Remove the Nikon NIKKOR lens from its box.
2. Remove the cap from the lens mount on the DLP LightCommander unit by turning clock-wise as indicated by the arrow on the cap (see Figure 4.1).

Figure 4.1: Remove Cap from Lens Mount

3. Remove the white protective cover from the NIKKOR lens (see Figure 4.2).
4. Align the white dot on the NIKKOR lens (see Figure 4.2) with the dot on the lens mount (see Figure 4.3).

Figure 4.2: Lens Protective Cover & Alignment Dot

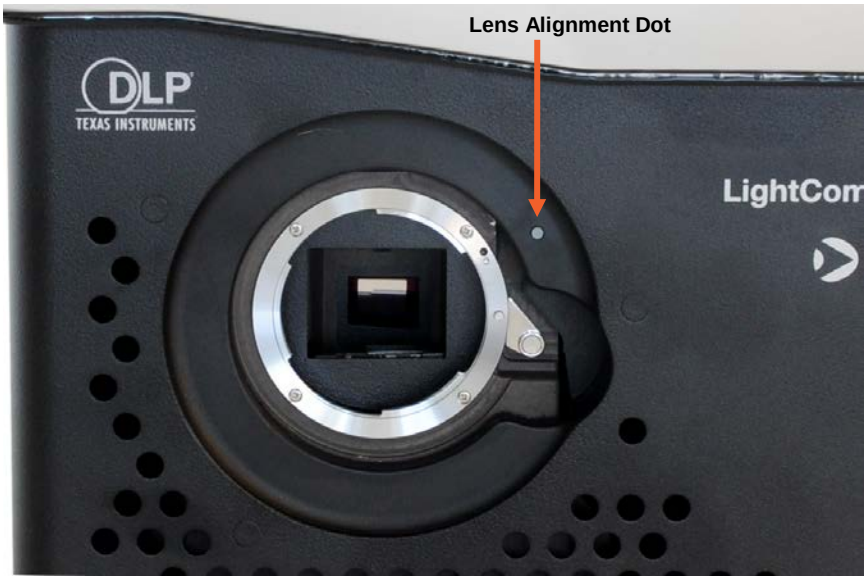

Figure 4.3: Lens Mount Alignment Dot

5. With the dots aligned, insert the lens into the lens mount cavity (see Figure 4.4).

Figure 4.4: Attach Lens

6. Secure the NIKKOR lens to the lens mount by turning counter-clockwise until you hear a click and the white dot on the lens is at the 12 o'clock position (see Figure 4.5).

Figure 4.5: Secure Lens to Lens Mount

7. Unlock the aperture ring on the NIKKOR lens by sliding the tab so the two orange dots **are not** aligned (see Figure 4.6).

Figure 4.6: Unlock Aperture Lock

8. Open the aperture to its largest setting (f/1.8) by rotating the aperture ring on the lens until the 1.8 is aligned with the white line (see Figure 4.6).

4.3 Power-on and Display Test Pattern

To display the test pattern, it is only necessary to attach the power cable to the DLP LightCommander; none of the other included cables are required to display the test pattern.

NOTE: Do not connect the USB cable to the DLP LightCommander and the host PC at this time. The DLP LightCommander Control Software must be installed on the host PC prior to connecting the USB cable. This procedure is described in the *DLP LightCommander Software User Manual*.

1. Attach the power cable for the region in which you are using the DLP LightCommander to the power cable connector (see Figure 4.7).

Figure 4.7: Power Cable Connector

2. Plug the power cable into a power outlet.
3. Remove the lens cap.

4. Make sure the Park/Run switch is set to Run (see Figure 4.8) and then power on the DLP LightCommander unit by pressing the — mark on the power switch (see Figure 4.7).

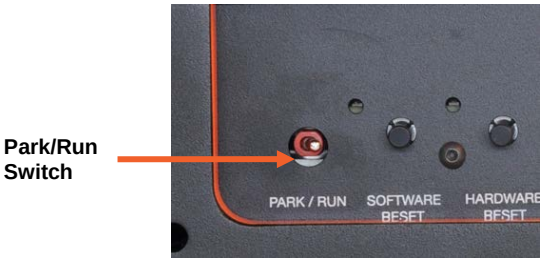

Figure 4.8: Set Park/Run Switch to Run

5. A sample static image will be displayed on the target surface. You may have to adjust the focus ring on the lens for the image to display clearly. The image size should be approximately 15 x 11.5" when the DLP LightCommander is positioned 6' away from the target surface.

4.4 Beyond the Test Pattern

Displaying the test pattern is the first step to using your DLP LightCommander. The remainder of this document provides details about the various hardware subcomponents that make up the DLP LightCommander.

The next steps for interacting with the DLP LightCommander can be found in the *DLP LightCommander Software User Manual*. Logic PD provides a PC-based software application with a graphical user interface (GUI) that controls the DLP LightCommander. The *DLP LightCommander Software User Manual* discusses that software application and covers the following topics:

- Registering your DLP LightCommander Development Kit[10] (this is required to download the DLP LightCommander Control Software)
- Downloading and installing the DLP LightCommander Control Software
- Connecting the DLP LightCommander to a host PC and installing the necessary drivers
- Running a demo project from the DLP LightCommander Control Software
- Using the wizard within the DLP LightCommander Control Software to create projects

[10] http://support.logicpd.com/auth/login.php?request_uri=http://support.logicpd.com/auth/register_product.php

5 System Subcomponents

This section lists the DLP LightCommander subcomponents and describes how they are configured to operate within the kit. Additionally, links to more detailed documentation are provided where appropriate.

5.1 Controller Board

The controller board handles all system control for the DLP LightCommander. The controller board, which contains the TI DLP5500 controller chip (DLPC200) and DMD analog driver chip (DLPA200), manages the different IOs of the system and controls the DLP5500 DMD.

The following sections provide a glimpse of the controller board features. With the exception of the expansion connectors, all of these switches, buttons, and connectors are available externally on the side panel of the DLP LightCommander. More detailed technical information can be found in the *DLP Controller Board Hardware Specification.*

5.1.1 Park/Run Switch

The Park/Run switch enables or disables the DLP5500 DMD. When set to Run, the mirrors will function normally; when set to Park, the mirrors will move to their relaxed position. During normal use of the DLP LightCommander, this switch should be set to the Run position.

5.1.2 Hardware Reset Button

The hardware reset button issues a reset to the DLPC200, NOR flash, and USB components.

5.1.3 Software Reset Button

The software reset button forces the DLPC200 to reconfigure and then issues a hardware reset.

5.1.4 User Sync Connectors

There are three user sync RF/coaxial connectors on the controller board that connect directly to the DLPC200 for synchronization with external hardware (e.g., camera).

5.1.5 HDMI Input

The controller board contains one high-definition multimedia interface (HDMI) input connector. This input is video only and does not support audio capability. The HDMI input is an XGA interface that operates at 60 Hz.

5.1.6 USB Port

The controller board contains one USB 2.0 mini-B device port that allows for connecting a host PC to the DLP LightCommander.

NOTE: It is important to install the DLP LightCommander Control Software before connecting the USB cable; instructions can be found in the *DLP LightCommander Software User Manual*.

5.1.7 Expansion Connectors

The controller board includes two expansion connectors at reference designators J500 and J505. These expansion connectors provide the ability for users to interface directly with the controller board. More detailed technical information can be found in the *DLP Controller Board Hardware Specification* and the *DLP Controller Board Schematic*.

5.2 DMD Board

The DMD board contains the TI DLP5500 DMD. This board connects directly to, and is controlled by, the controller board.

The following sections provide a glimpse of the DMD board features. More detailed technical information can be found in the *DLP DMD Board Hardware Specification.*

5.2.1 DLP5500 DMD

From the DLP5500 DMD Datasheet: "The DLP5500 Digital Micromirror Device (DMD) is a digitally controlled MOEMS (micro-opto-electromechanical system) spatial light modulator (SLM). When coupled to an appropriate optical system, the DLP5500 can be used to modulate the amplitude, direction, and/or phase of incoming (illumination) light."

More details pertaining to the DLP5500 DMD can be found in TI documentation on the DLP5500 product page.[11]

5.3 Power Supplies

The DLP LightCommander has three internal power supplies to provide system-wide power. All three power supplies are available as off-the-shelf components.

IMPORTANT NOTE: These power supplies were selected and configured to operate with the modules that came with the DLP LightCommander. If any of the modules or components are replaced or modified, it is the user's responsibility to verify the supplies provide the correct power to the components.

5.3.1 Power Supply #1

Power supply #1 is a 5V, 35W supply that provides power to the controller board and DMD board. The power supply's datasheet can be found on TDK's website.

Manufacturer	Manufacturer P/N	Product Website
TDK-Lambda	LS35-5	http://us.tdk-lambda.com/lp/products/ls-series.htm

5.3.2 Power Supply #2

Power supply #2 is a 7.5V, 300W supply that provides power to the LED driver within the Light Engine. The power supply's datasheet can be found on TDK's website.

Manufacturer	Manufacturer P/N	Product Website
TDK-Lambda	SWS300A-7R5	http://us.tdk-lambda.com/lp/products/sws-series.htm

Early versions of the DLP LightCommander utilized a 5V (adjusted to 6.9V), 300W supply for this purpose; the performance of the LightCommander is the same with either power supply. The 5V, 300W power supply's datasheet can be found on TDK's website.

Manufacturer	Manufacturer P/N	Product Website
TDK-Lambda	SWS300-5	http://us.tdk-lambda.com/lp/products/sws-series.htm

[11] http://www.ti.com/product/dlp5500

5.3.3 Power Supply #3

Power supply #3 is a 12V, 35W supply that provides power to the controller interface board within the Light Engine. The power supply's datasheet can be found on TDK's website.

Manufacturer	Manufacturer P/N	Product Website
TDK-Lambda	LS35-12	http://us.tdk-lambda.com/lp/products/ls-series.htm

5.3.4 Fuse

The DLP LightCommander includes a 5A fuse on line and neutral. This fuse is accessible on the exterior side panel of the DLP LightCommander, between the power switch and power cable connector (see Figure 3.3).

IMPORTANT NOTE: This fuse exists as a safety mechanism and should never be replaced with anything other than a 5A fuse. If the fuse blows, there is a problem with the electrical setup of the DLP LightCommander.

5.4 Light Engine

The core optics module and the illumination module make up the Light Engine within the DLP LightCommander. The Light Engine is powered by four LEDs: one each of RGB and one IR. Details for the LEDs can be found on their respective specification sheets found at the links provided below.

The DLP LightCommander is capable of generating a broad spectrum of illumination options with the LEDs and illumination optics provided. The DLP LightCommander Control Software allows the user to manipulate and customize the illumination to varying intensities, wavelengths, and duty cycles. The illumination optics provided with the Light Engine are reflective; this allows the advantage of experimentation with the DLP LightCommander over a broad spectrum. It also means that illumination performance for a specific application may be improved through incorporation of a light source and optics that more closely fit the end application.

IMPORTANT NOTE: Although the illumination module and core optical module are designed to be modular components, the LEDs and LED driver within these modules should not be modified.

Description	Manufacturer	Manufacturer P/N	Product Website
Light Engine	Visitech	6501280	http://www.visitech.no/
LED Driver	OSRAM	RAPCUR® F4515AIR	http://www.osram.com/osram_com/News/Trade_Press/LED_OptoSemiconductor/2008/081215_Full-HD_Projector.jsp
IR LED	OSRAM	SFH 4750	http://catalog.osram-os.com/catalogue/catalogue.do?favOid=0000000400033d4a042e0023&act=showBookmark
RGB LED	Luminus Devices	PT54 LEDs	http://www.luminus.com/products/PT-54.html

5.5 External Lens

The DLP LightCommander Development Kit includes a Nikon AF NIKKOR 50mm f/1.8D lens. The lens mount on the DLP LightCommander body is a Nikon f-mount interface that will fit lenses conforming to f-mount specifications. For best results, it is recommended to use lenses with an aperture number of f/2.8 or lower.

Manufacturer	Model	Product Website
Nikon	AF NIKKOR 50mm f/1.8D	www.nikonusa.com/Find-Your-Nikon/Product/Camera-Lenses/2137/AF-NIKKOR-50mm-f%252F1.8D.html

6 Troubleshooting Guide

6.1 DLP LightCommander does not power on when the power switch is pressed

Is the power cable plugged into the DLP LightCommander and a power outlet (see Section 4.3)?

If so, is the power cable the correct one for the region (see Section 2)?

If so, is the 5A fuse okay (see Section 5.3.4)?

If these steps have not resolved the issue, please visit TI's E2E Community to see if the issue has been discussed in an FAQ or discussion thread (see Section 7).

6.2 DLP LightCommander does not display the test pattern

Is the DLP LightCommander powered on? If not, see the steps in Section 6.1.

If so, has the lens cap been removed (see Section 4.3)?

If so, is the Park / Run switch set to Run (see Section 4.3)?

If these steps have not resolved the issue, please visit TI's E2E Community to see if the issue has been discussed in an FAQ or discussion thread (see Section 7).

6.3 Cannot connect to the DLP LightCommander from the host PC

Did you install the DLP LightCommander Control Software before connecting the DLP LightCommander to the host PC (see the *DLP LightCommander Software User Manual* referenced in Section 1.1)?

If so, please refer to the troubleshooting section in the *DLP LightCommander Software User Manual,* referenced in Section 1.1, for next steps.

7 FAQ & Technical Discussion Thread

Visit TI's E2E Community[12] for frequently asked questions (FAQs) and to join technical discussions about the DLP LightCommander. Once there, click on the "DLP & MEMS" support link to locate the LightCommander Development Platform forum.

[12] http://e2e.ti.com/

