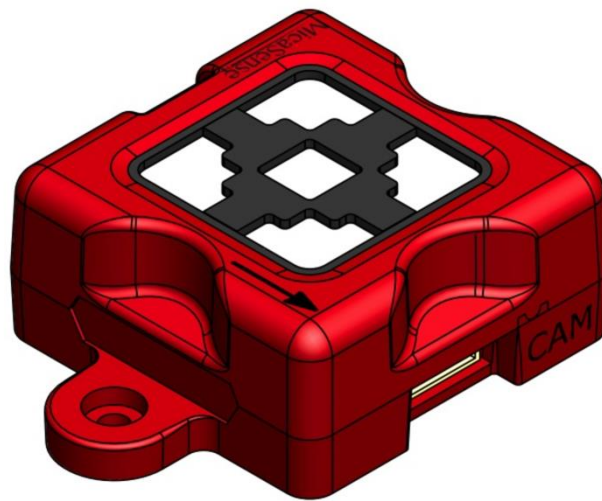


Downwelling Light Sensor (DLS) Integration Guide and User Manual



Rev 04 – April 2016



MicaSense, Inc.
Seattle, WA

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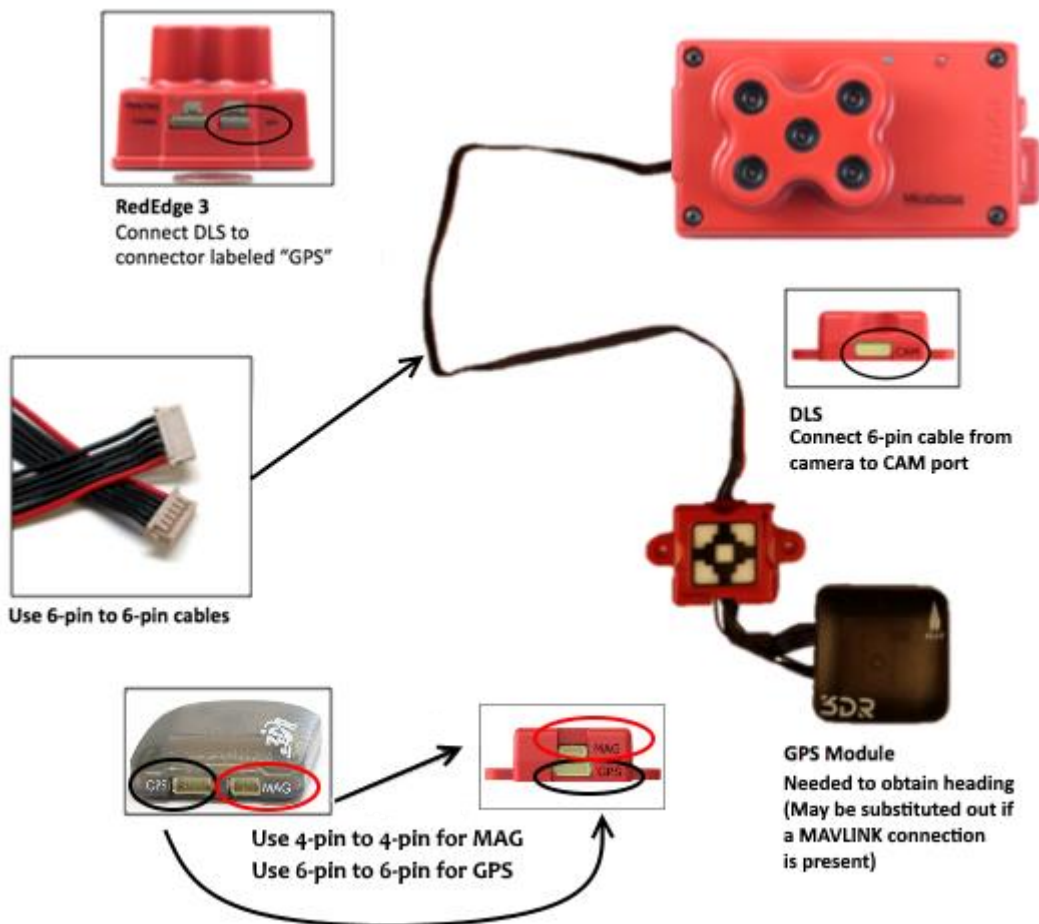
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1. Overview

The DLS is a 5-band incident light sensor that connects directly to a MicaSense RedEdge camera. The DLS measures the ambient light during a flight for each of the five bands of the camera and records this information in the metadata of the TIF images captured by the camera. This information can then be used to correct for lighting changes in the middle of a flight, such as those that can happen due to clouds covering the sun during a flight.

2. Connections

The DLS is connected to a RedEdge camera through the RedEdge's 6-pin connector labeled "GPS". If a GPS Module is used with RedEdge, the DLS is a "passthrough" for communications between the GPS Module and the camera.



CAUTION

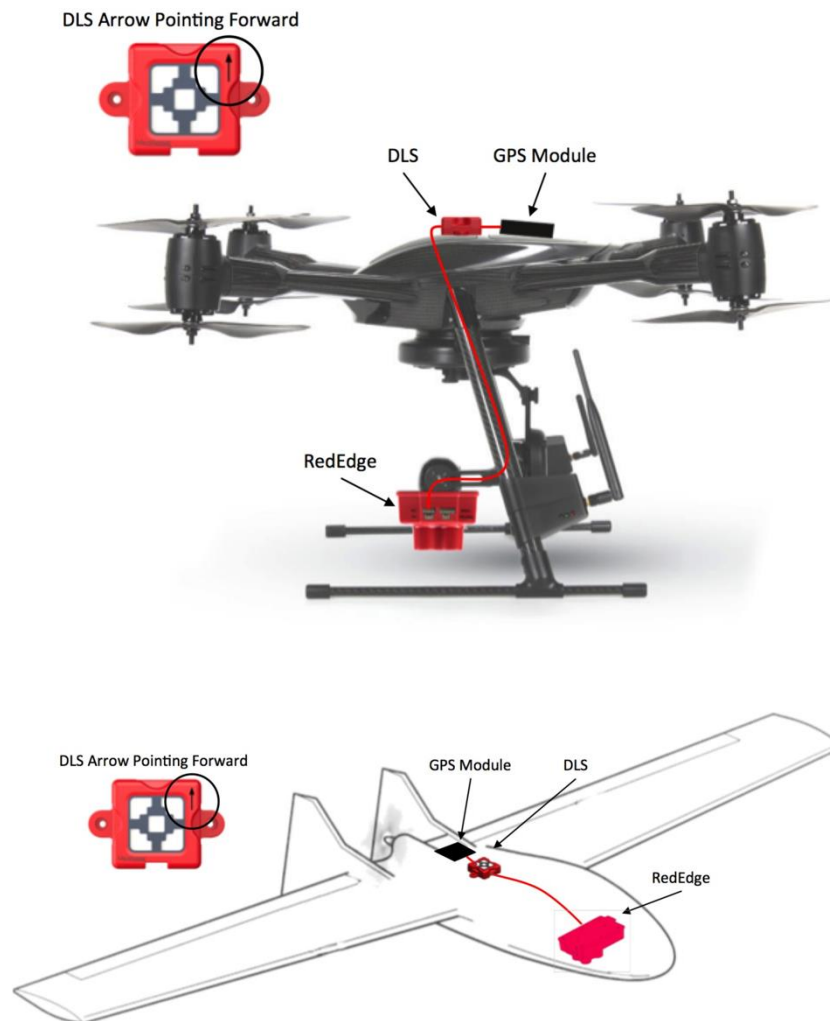
All connections should be done **BEFORE** applying power to the camera. Failure to do so could result in damage to the DLS or GPS Module, or both.

3. Mounting Considerations

3.1. Mounting Location

The DLS should be mounted on TOP of the aircraft such that the DLS is pointing straight up, with a clear view of the sky. The DLS should not be shadowed by any objects.

If a GPS Module is used, it is also typically located on top of the aircraft. As such, it is expected that the GPS Module will be close to the DLS and the cable that connects them can have a short run. Secure any excess wire length with a tie.



NOTE

Both the GPS Module (if used) and DLS should have a clear, unobstructed view of the sky.

3.2. Orientation

The DLS should be mounted such that the arrow on the top surface is pointing forward (in the direction of flight).



Note square notch

NOTE

If the DLS module does not have an arrow printed in the housing, use the figure above to determine the forward direction.

Also, the DLS should be mounted such that in straight and level flight (fixed wing aircraft) or hover in no-wind conditions (multicopters/helicopters), the top surface of the DLS is parallel to the horizon (pitch and roll angle of approx. zero with respect to the earth).

3.3. Securing

Use either double-sided tape (a strong-adhesive tape such as VHB is recommended) or the two screw mounts to secure the DLS to the top of the aircraft. The screw holes are sized for a #2 screw or bolt.

4. Power-On and Configuration

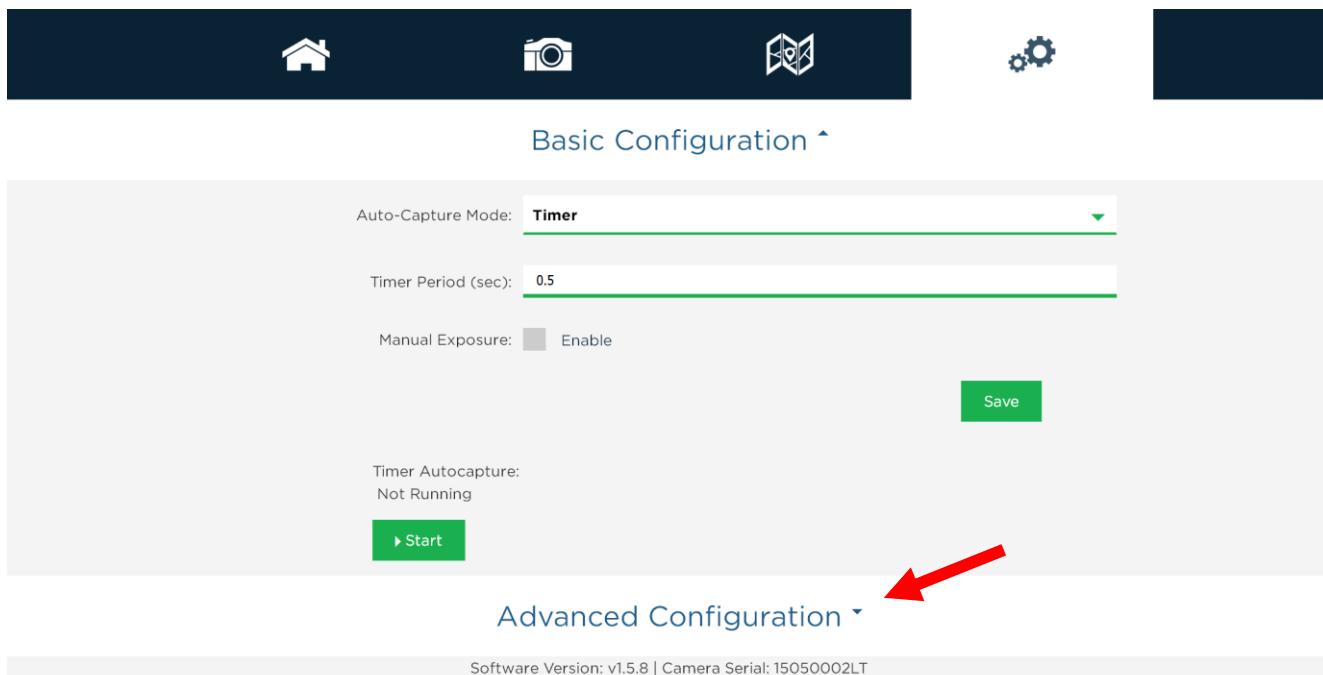
After all connections have been completed, apply power to the camera in the standard way (5 Volts DC, 5 Watts).

There are two green LED lights on the DLS, one on either side of the unit. The meaning of the LEDs is as shown in the table below. a

LED Signal Type	Meaning
4 simultaneous flashes on both LEDs	This occurs upon boot-up of the DLS
Sporadic flashing	Communications received. The LED next to the GPS connector should be flashing continuously. The LED next to the CAM connector should only flash during initialization (right after the four boot up flashes).
Alternating blinking between the two LEDs	Indicates a software/hardware problem – contact MicaSense at support@micasense.com
Both LEDs solid ON	

Connect to the Wi-Fi user interface of the camera per the instructions in the RedEdge User Manual. Verify that the software version is 1.5.X or later (the version number is viewable in the Settings page) – update the firmware if needed.

In the Settings page, click on the Advanced Configuration link.



In the Advanced Configuration section, verify that the DLS is present in the table as shown below. Note that the software version shown for the DLS is the software of the microcontroller in the DLS itself. It is a different software version than the one that powers the RedEdge camera. The Multi-Camera Configuration and Ethernet Configuration menus are for advanced uses. These settings should not be modified.

Basic Configuration ▾

Advanced Configuration ▲

Format for RAW files

DNG: **Smaller files, not compatible with all software**

TIFF: **Larger files, most compatible file format**

RAW format: **TIFF (16-bit)**

Enabled SD Output files

Select type of file(s) to be saved to SD card for each band

Camera	Raw
1	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>
3	<input checked="" type="checkbox"/>
4	<input checked="" type="checkbox"/>
5	<input checked="" type="checkbox"/>

Multi-Camera Configuration

Network Mode: **Master**

Multi-camera setups must have exactly one master

The camera must be rebooted for a mode change to take effect

Type	Mode	Serial	Software	GPS
camera	master	15050002LT	v1.5.8	
dls	slave	DL01-1532009-MS	v0.2.36	direct

5. Operation

There are no special operations with the DLS (except for slight changes in reflectance panel captures as indicated below). For every capture done by the RedEdge camera, the value of each of the 5 sensors of the DLS (each with its own filter that matches the filters in the camera) is automatically recorded in the metadata of the TIF files created by the camera.

An image of the calibrated reflectance panel is still needed both before and after flight (to confirm the calibrations of the camera and DLS). When performing the panel capture, ensure that **both** the panel and the DLS are being exposed to direct light from the sky, without shadowing and without reflections from other objects.

It is also important that the aircraft (and therefore the DLS) is as close to straight and level as possible during panel captures. Adjust the position of the aircraft and the panel such that the camera is as close to directly overhead the panel as possible, without causing shadows on the panel, and at a level attitude.

6. Post-Processing

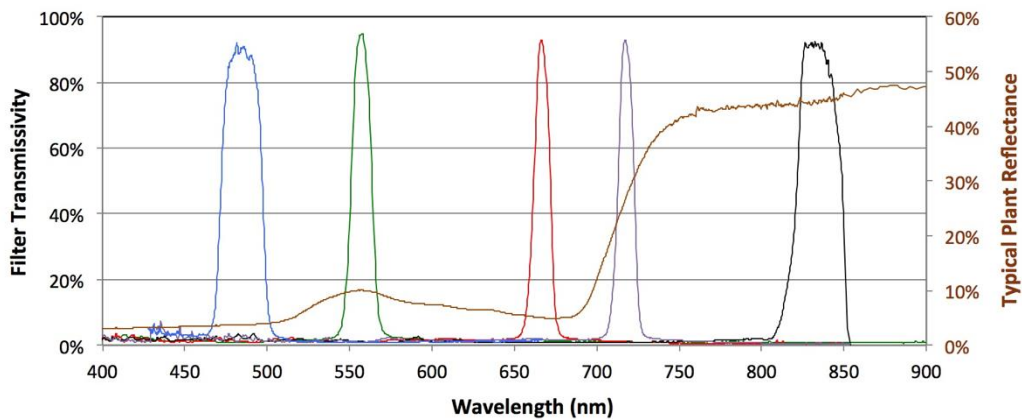
MicaSense's ATLAS includes a workflow that makes use of the information provided by the DLS. Further information regarding the ICD for reading the data from the DLS will be provided in future versions of this manual.

7. Specifications

Basic Specifications

Weight	14 g
Dimensions	3.3 cm x 3.3 cm x 1.5 cm (1.3" x 1.3" x 0.6")
Spectral Bands	Narrowband: Blue, Green, Red, Red Edge, Near IR
Capture Speed	1 capture per second (all bands)

Spectral Bands (Standard Configuration)



Band Number	Band Name	Center Wavelength (nm)	Bandwidth FWHM (nm)
1	Blue	475	20
2	Green	560	20
3	Red	668	10
4	Near IR	840	40
5	Red Edge	717	10

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MicaSense, Inc.
1300 N Northlake Way
Suite 100
Seattle WA 98103

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