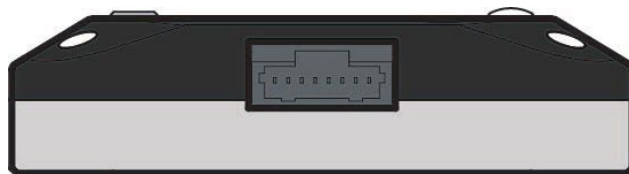
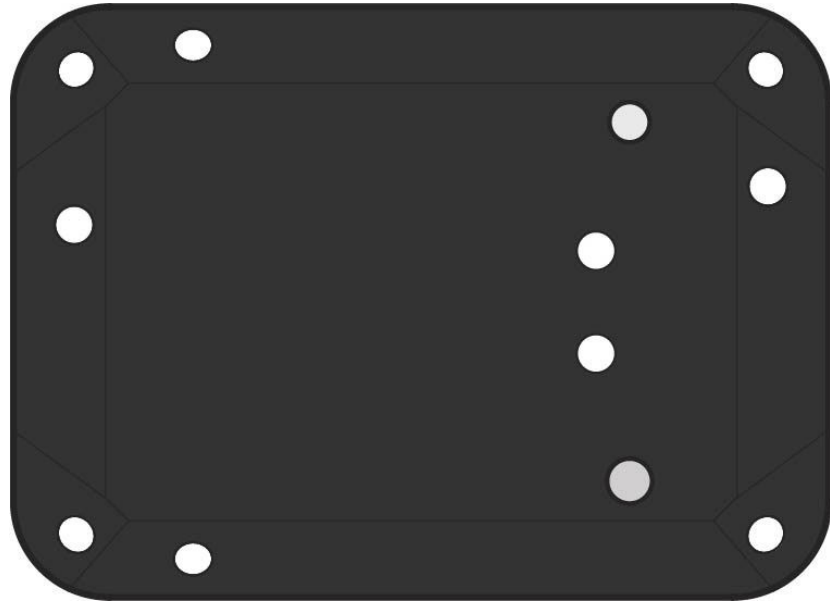


Downwelling Light Sensor 2 (DLS 2) Integration Guide



Revision 03, Jan 2020

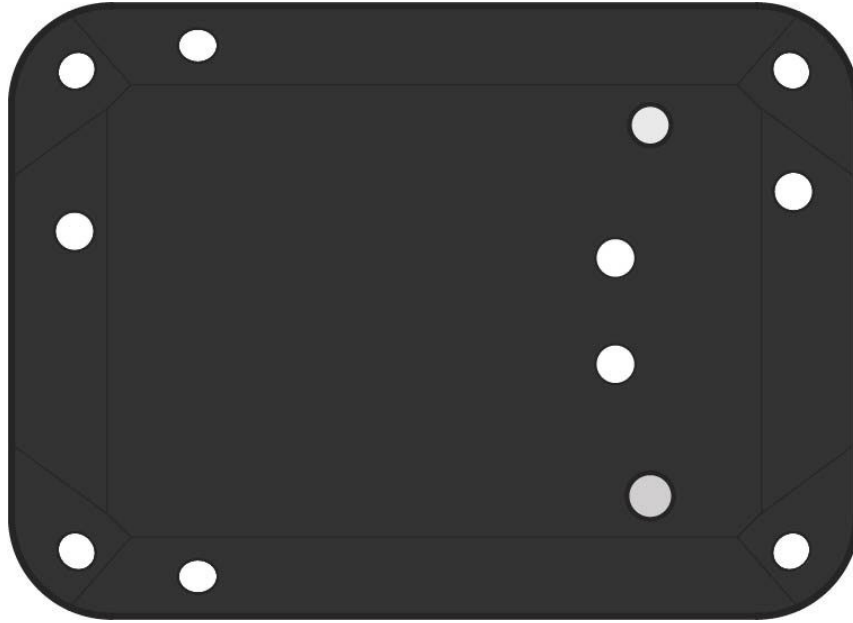


Seattle, WA

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Overview and Scope

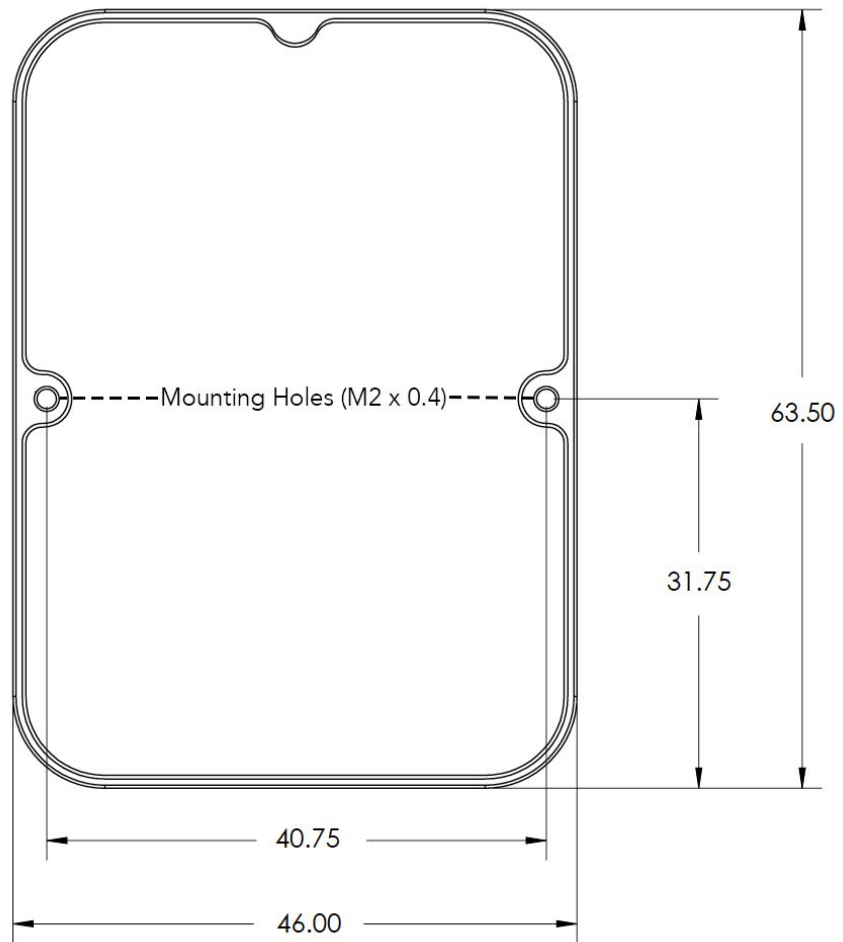


The Downwelling Light Sensor (DLS 2) is an advanced incident light sensor that connects directly to your MicaSense sensor (RedEdge 3, RedEdge-M, RedEdge-MX, and Altum). During a mission, the DLS 2 measures the ambient light and sun angle for each of the five bands of the camera and records this information in the metadata of the TIFF images captured by the camera. This information can then be used by specialized processing tools (like Pix4Dmapper) to correct for global lighting changes in the middle of a flight, such as those that can happen due to clouds covering the sun.

In addition, the DLS 2 provides GPS data to the MicaSense sensor unless GPS data is provided from an external source (for more information see the connections section). If using an alternative GPS source, the GPS receiver will remain on at very low power (uBlox C/A code GPS @ 5 Hz).

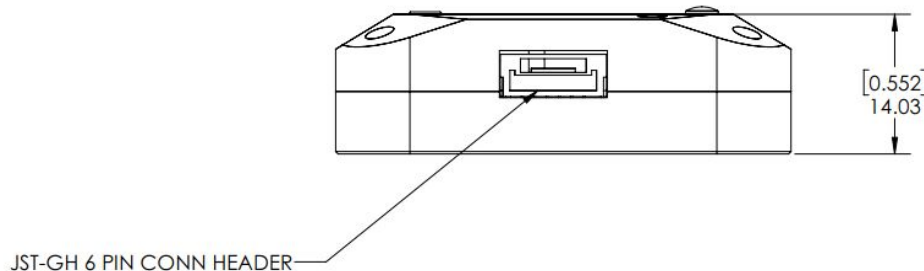
Measurements and Attachment Points

BOTTOM



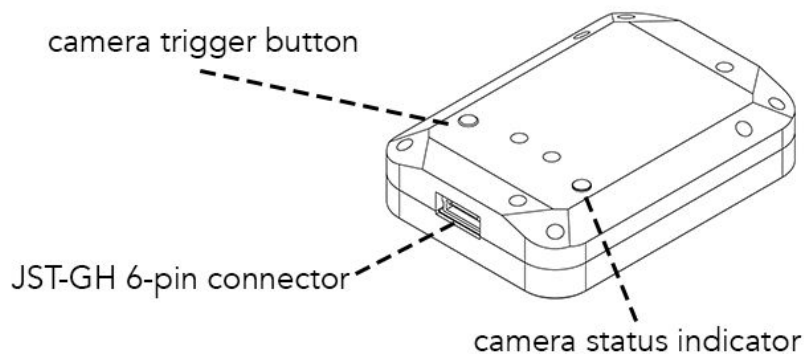
Height	14.03 mm
Width	46.00 mm
Length	63.50 mm
Weight	49 g

SIDE

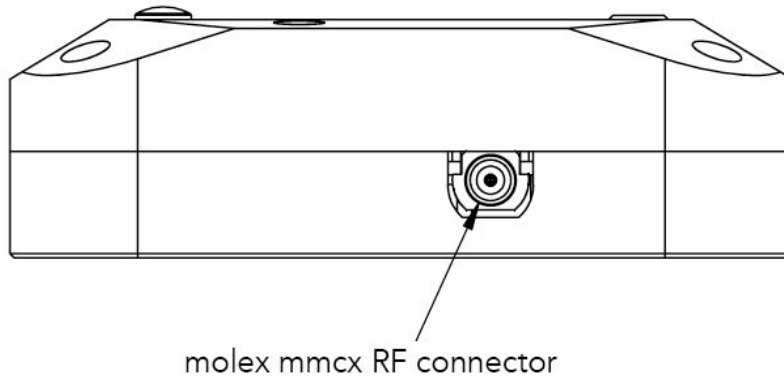


DLS 2 Connectors and Buttons

The sensor kit includes all required interface cables to connect to the DLS 2.



The LED camera status indicator mimics the LED signals on the MicaSense sensor. The signal types are outlined in the Sensor Firmware Guide. The camera trigger button will command a capture on the MicaSense sensor. This is useful for capturing a preflight image of the calibration panel.



The RF connector is not available for use at this time but may be used as in the future. When it is available, we will update this guide.

DLS 2 Installation Guidelines

The DLS 2 should always be the highest object on the aircraft in order to avoid shadows or reflections. It contains an integral GPS sensor that may be utilized for geotagging of the MicaSense sensor imagery if system GPS signals are not provided to the sensor by other means. Install the module where it will have a clear view of the sky, far away from any devices that could interfere with it (like a data link or video transmitters).

When the DLS 2 starts up, it attempts to calibrate, which requires it to be still and motionless. Ensure that there is no vibration or movement until the DLS 2 has completed this procedure, indicated by normal LED status lights (shown in the Firmware Guide).

NOTE

The 6-pin connector on the DLS 2 should be facing forward in the flight direction. Mounting it in the opposite direction will cause the magnetometer calibration process to be backwards.

Fixed-wing

Always install the DLS 2 at the high-point of the fuselage (if possible) to avoid any shadowing or reflections from aircraft fuselage or rotors.

Do not recess or embed the DLS 2 sensor body below the metallic base.

Local reflections could impact light sensor measurements. Avoid bright or metallic paint near the DLS 2 light sensor as this may interfere with incoming light values.

Multicopter

Install the DLS 2 on a rigid post such that it is the highest object on the aircraft, with a minimum of 5 cm above the rotor plane.

Ensure that there are no obstructions in the DLS 2's field of view to the sky, including propellers and other items on the aircraft.

Keep the DLS 2 away from the aircraft GPS. Installing the DLS 2 near the aircraft GPS may impact the aircraft's GPS reception.

DLS 2 Firmware Upgrade

MicaSense Sensor firmware upgrades will periodically contain DLS 2 firmware updates as well.

To update the firmware on your DLS 2, you can either have it plugged into the camera at the time you are upgrading the camera's firmware, or plug the DLS 2 in later after you have upgraded the camera's firmware and are ready to use the DLS 2. Remember to not connect the DLS 2 to the camera with the camera powered ON.

The camera will automatically update the firmware on the DLS 2 if it contains a newer version.

Magnetometer Calibration

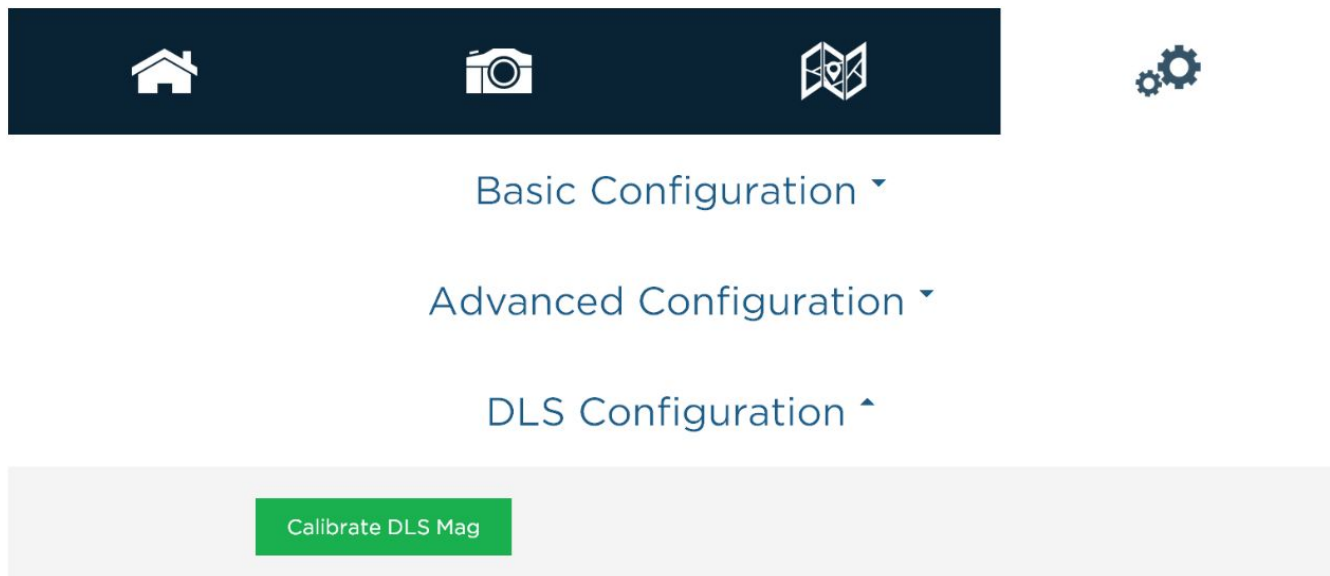
This procedure is for the included GPS only and is not required for configurations that provide GPS and attitude information via the serial or Ethernet connection. If the

configuration for your sensor is one that uses the provided module for GPS and magnetometer data, a calibration process for the magnetometer is needed.

NOTE

You will need a compass to verify the calibration once completed.

From the Settings page, access the DLS Configuration section.



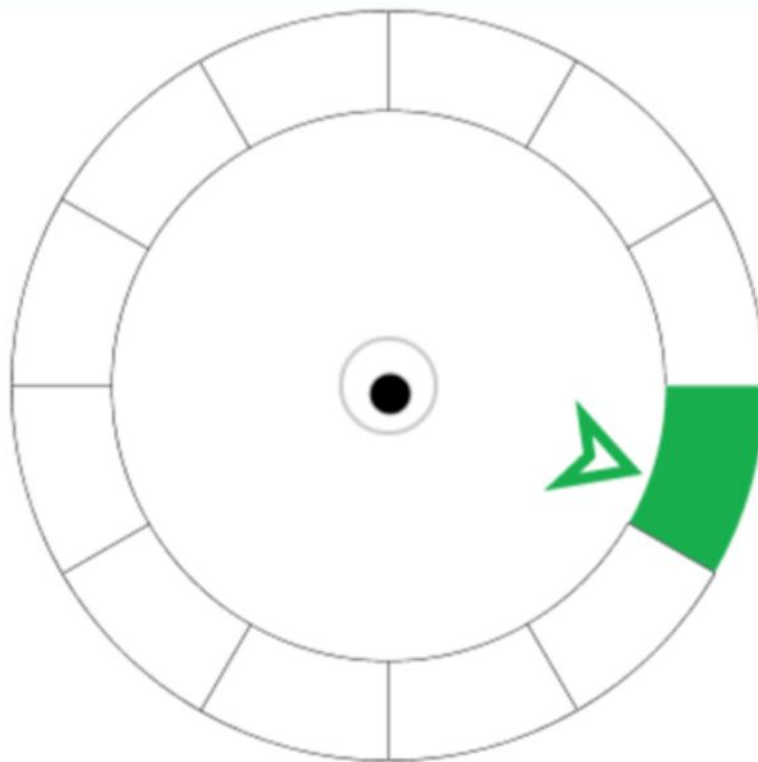
“Calibrate DLS Mag” is a clickable button that will start the calibration process. This calibration process is for the magnetometer sensor that is inside the DLS 2 module.

Ensure that the DLS 2 is connected to the Sensor using the provided cables. Additionally, your DLS 2 module should be rigidly mounted to your aircraft frame.

NOTE

Before beginning the calibration routine, position yourself and the drone away from large metal objects such as cars and buildings. Also avoid paved areas, which may have metal rods inside the cement. An open field is preferred to avoid interaction with any sources of magnetic interference or objects that may perturb the Earth's natural magnetic field.

Once the startup sequence has finished, you will be guided through the orientations your drone should be in for each of the calibration steps.



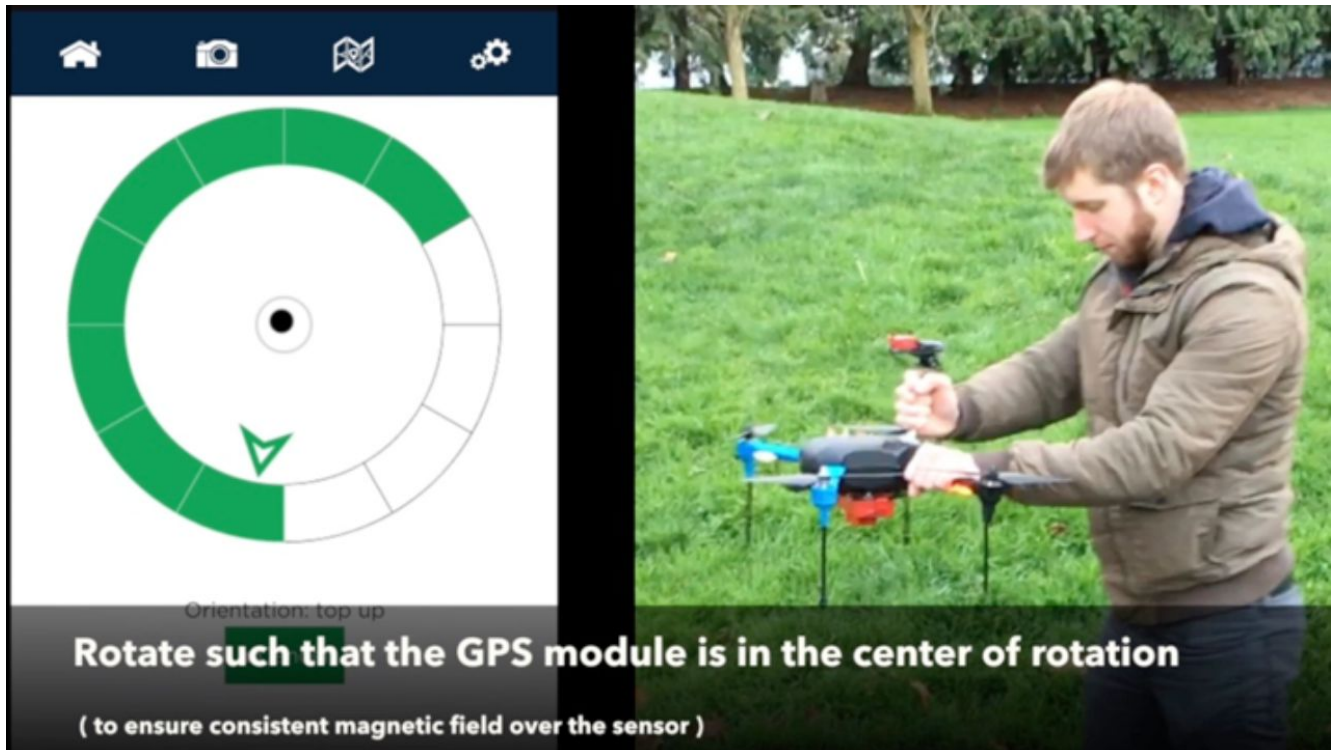
Orientation: top up



To calibrate the magnetometer, a 6-axis calibration routine needs to be performed. During the routine, the drone (specifically the DLS 2 module) should remain in a fixed position while being rotated, i.e. the user performing the calibration should be moving around the magnetometer. The drone and DLS 2 module should also be kept level to the plane they are on in each position. The on-screen rotation guide will show you when you have successfully completed one orientation and can move on to the next.

NOTE

The black dot is a level (like a bubble level), indicating how level the unit is compared to the plane it is on. It does not indicate how far away from the center of rotation the unit is.



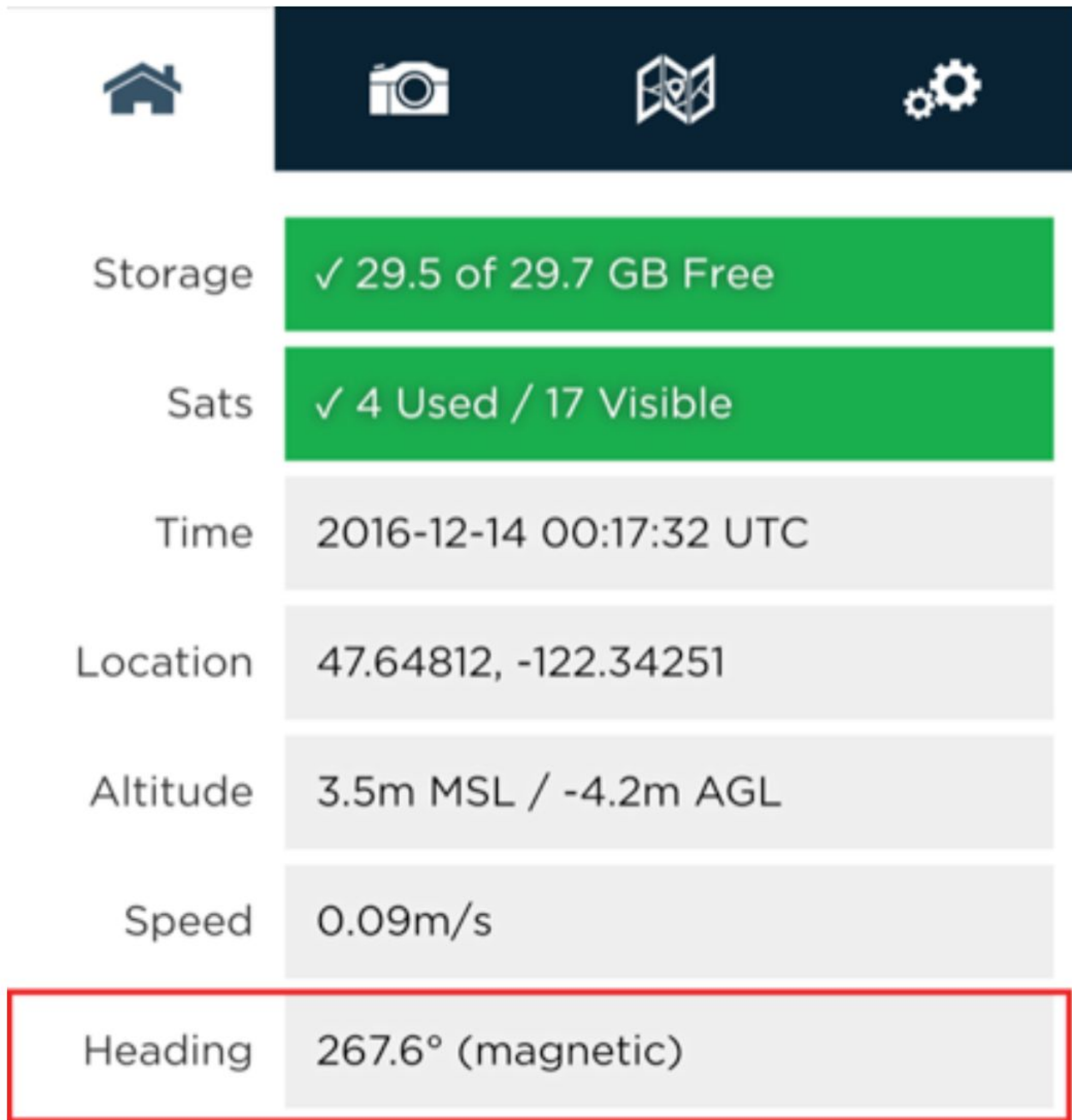
NOTE

If you are using a Serial or HTTP connection to supply GPS and attitude information to the sensor, you do not need to perform the magnetometer calibration described above.

Magnetic Heading Check

Once the calibration routine has been completed, it is important to verify that the magnetometer information displayed in the Heading section of the sensor's Home Page is accurate.

A handheld compass has been provided with your kit that will allow you to verify this in the field. Access the sensor's Home Page and use the "Heading" field to check the four cardinal directions (North, East, South, West) and ensure a good match between the compass and the reading by the sensor. You should see an error of less than +/- 5 degrees. If this error is exceeded, redo the magnetometer calibration.



The screenshot displays a mobile application interface for drone status. At the top, there is a dark blue navigation bar with four icons: a home icon, a camera icon, a map icon, and a settings icon. Below this, several status metrics are listed in a vertical stack. The 'Storage' and 'Sats' metrics are highlighted with green bars, indicating good status. The 'Heading' metric is highlighted with a red border, indicating it is the focus of the document. The metrics shown are: Storage (29.5 of 29.7 GB Free), Sats (4 Used / 17 Visible), Time (2016-12-14 00:17:32 UTC), Location (47.64812, -122.34251), Altitude (3.5m MSL / -4.2m AGL), Speed (0.09m/s), and Heading (267.6° (magnetic)).

Storage	✓ 29.5 of 29.7 GB Free
Sats	✓ 4 Used / 17 Visible
Time	2016-12-14 00:17:32 UTC
Location	47.64812, -122.34251
Altitude	3.5m MSL / -4.2m AGL
Speed	0.09m/s
Heading	267.6° (magnetic)

Additionally, you will want to perform a magnetic interference test to verify that your drone will not affect the heading readings during flight.

Magnetic Interference Check

A test procedure should be conducted any time electrical equipment is added or removed from the drone to ensure the magnetic field profile of the aircraft has not changed.

To test for any magnetic interference from the drone that is affecting the magnetometer, start by placing your drone facing North (you can use the magnetic heading from the Wi-Fi page to align yourself).

⚠ WARNING

The next section involves spinning up the motors of your drone.

If you have a fixed wing aircraft this will require holding the aircraft in place while keeping clear of the propeller.

If using a multi-rotor, setup the aircraft as if it was ready for a normal take off, but you do not need to actually take off, just spin up of motors.

You **DO NOT** need to provide full power to the motor(s).

Throttle up the motor(s) on your drone and ensure that the heading reading has not changed, then throttle back down. Repeat this for each direction (North, East, South, West) to ensure there is no magnetic interference in any of the four cardinal directions.

⚠ WARNING

**FAILURE TO FOLLOW INSTRUCTIONS TO KEEP CLEAR OF SPINNING BLADES
COULD RESULT IN INJURY OR DEATH.**

NOTE

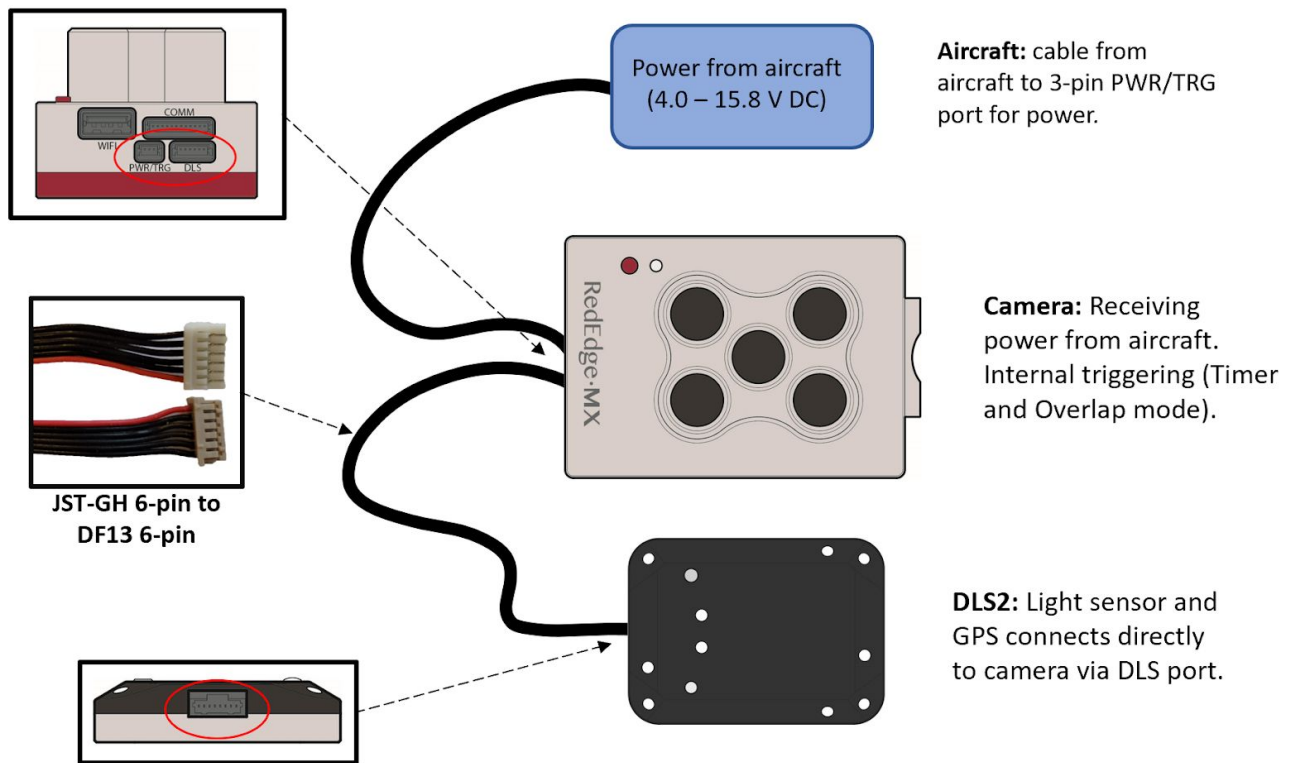
Electromagnetic interference during the operation of your drone can cause errors in the magnetic heading readings. This can cause the irradiance data generated by the DLS 2 to be not usable during processing.

Basic Integrations

MicaSense sensors are designed for integration into a variety of platforms. Below are some common integration configurations.

1. Standalone Integration Using RedEdge-MX and DLS 2

The standalone integration option requires only that power is provided to the RedEdge-MX system. Triggering is configured via the WiFi interface to either "Overlap" or "Timer" mode. GPS information is provided by the integrated GPS receiver within the DLS 2.

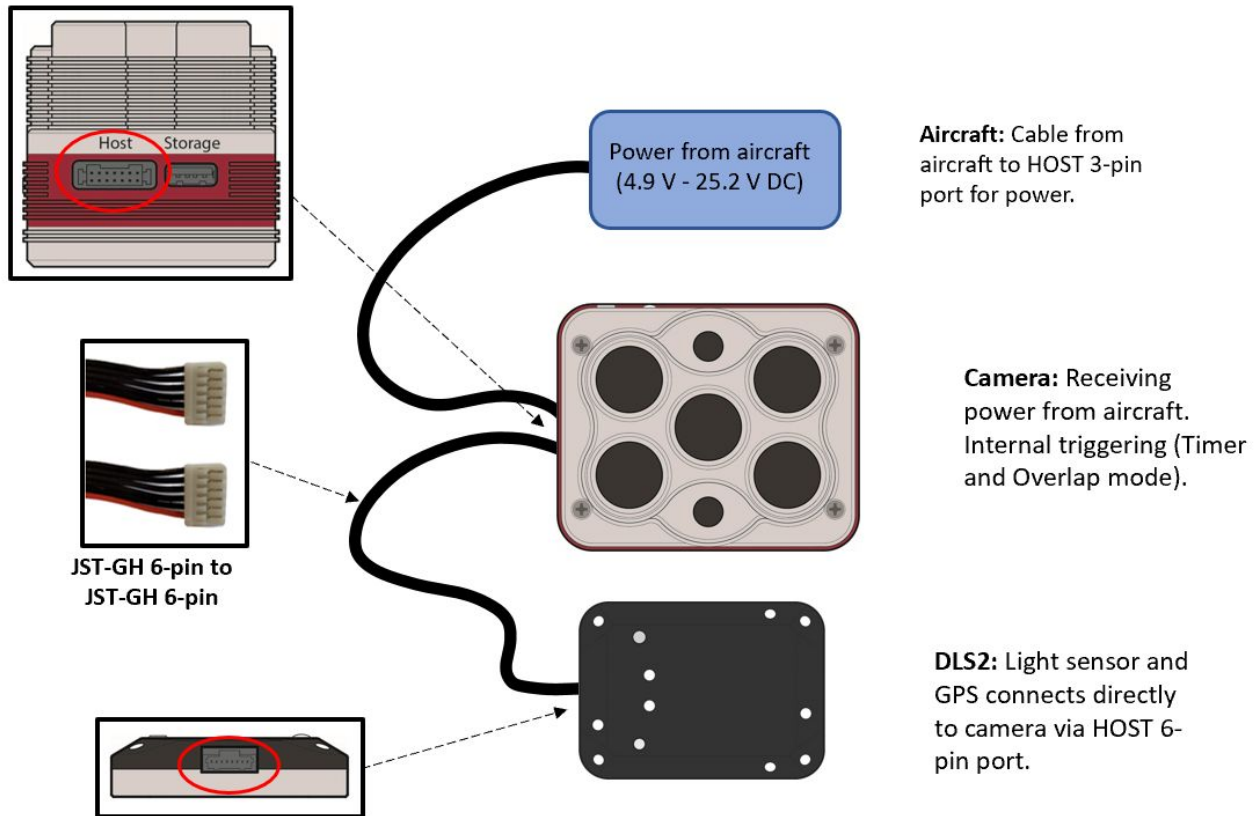


Example RedEdge-MX + DLS 2 Integration



2. Standalone Integration Using Altum and DLS 2

The standalone integration option requires only that power is provided to the Altum system. Triggering is configured via the WiFi interface to either "Overlap" or "Timer" mode. GPS information is provided by the integrated GPS receiver within the DLS 2.



Example Altum + DLS 2 Integration



MicaSense Downwelling Light Sensor 2
Integration Guide
Rev 03 – Jan 2020

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