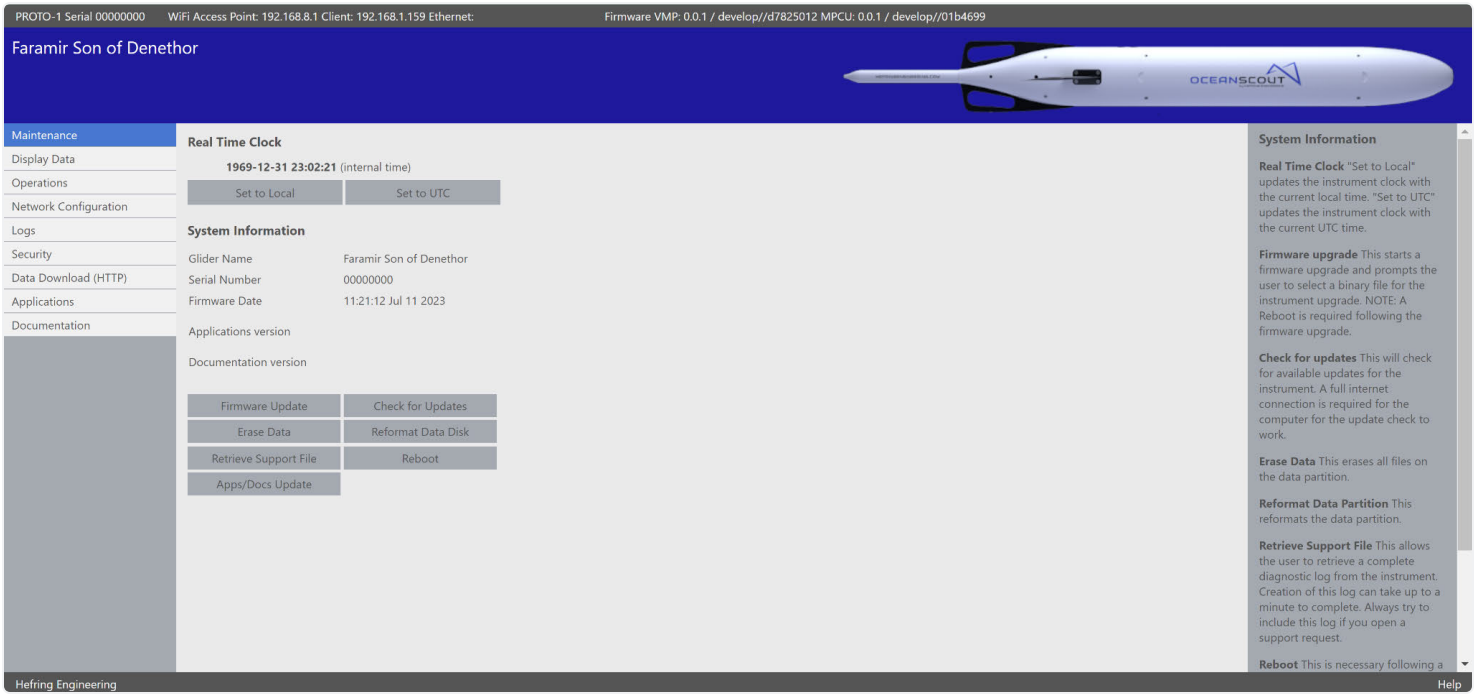
Firmware

Connecting to the Glider

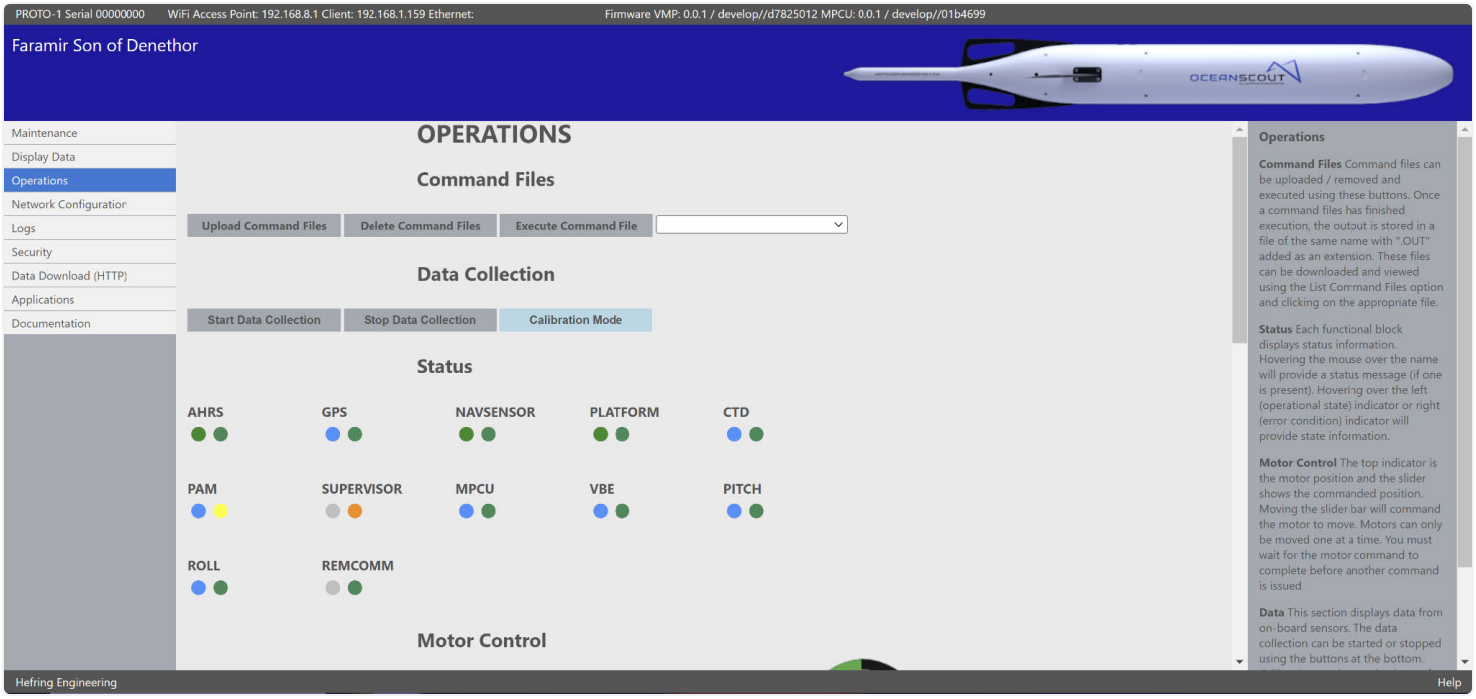
Once you are logged onto [name]Glider WiFi (see “Powering up the Vehicle”) you can access the glider’s internal webpage using Chrome or Firefox as your web browser. Navigate to the webpage by typing the glider’s IP into the address bar (**192.168.8.1**).



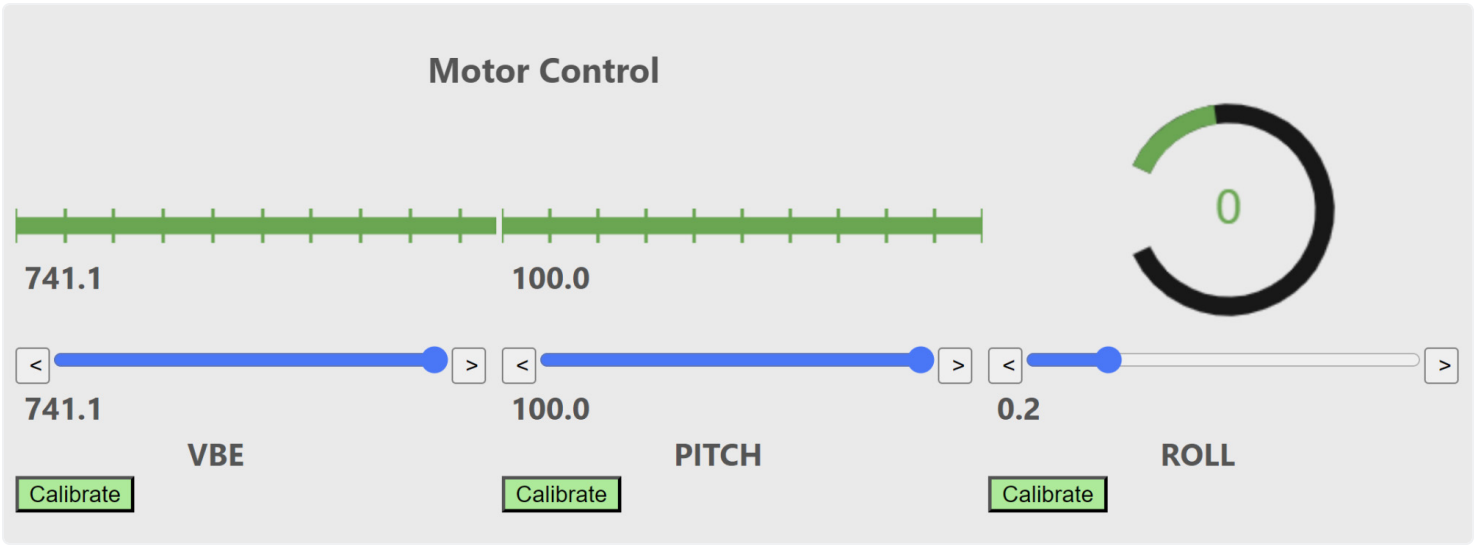
You should start on the maintenance page. This allows you to check the date of the firmware, and update the glider when necessary (see “Updating Glider Firmware” for more information).

Calibrating Motors

Once connected to the glider webpage click on the “Operations” tab along the left hand side of the page. Here you can see the status of the different sensors and motors in the glider and interact with it outside of running a mission.

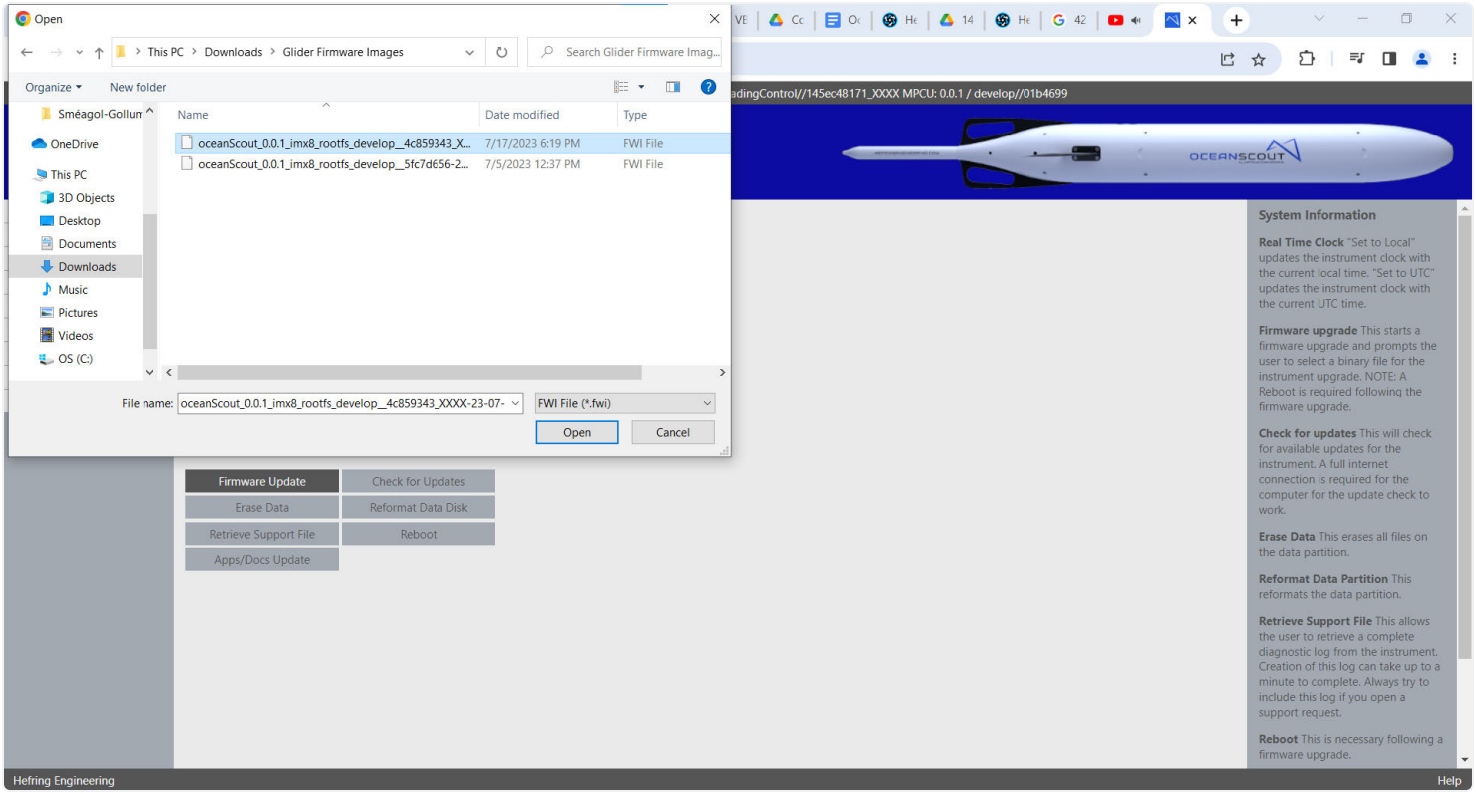


In the motor control section you will see buttons available to calibrate each motor. Be sure to calibrate all three motors or a mission will not begin.

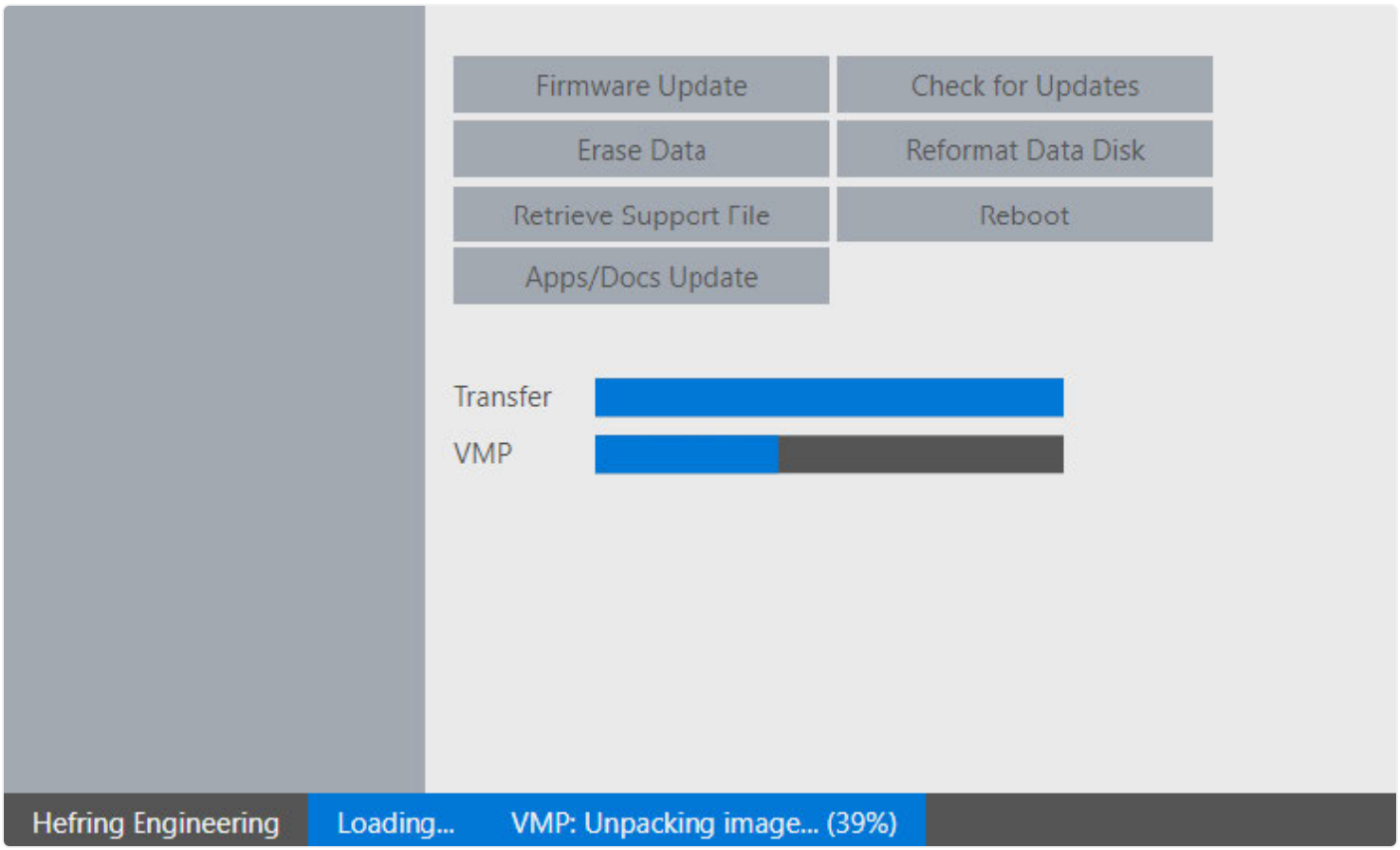


Updating Glider Firmware

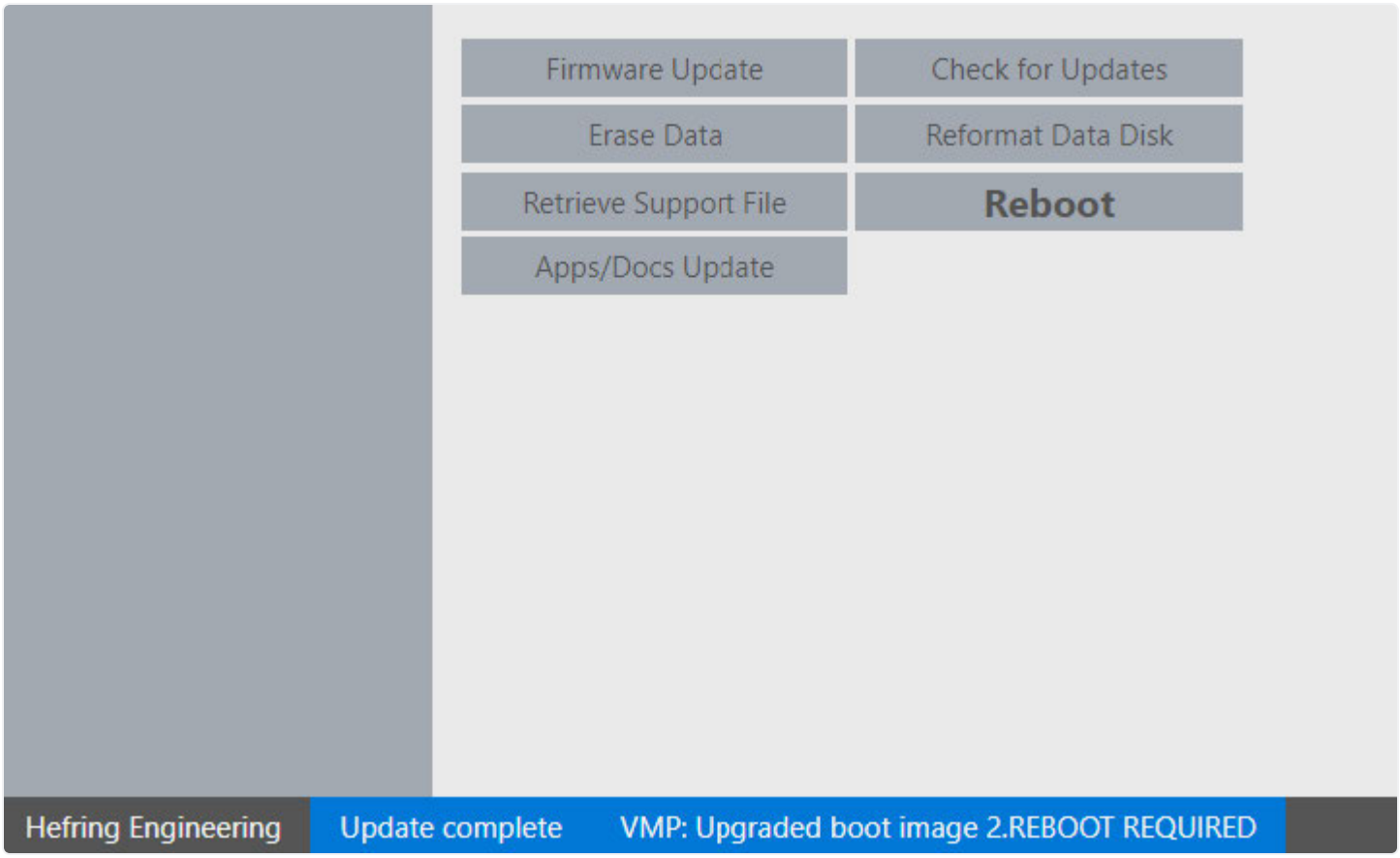
To update the glider, select **Firmware Update** on the Maintenance page. This will open a window to choose the firmware image to upload.



The update has 2 progress bars: transferring the image to the glider, and unpacking the image on the glider's processor.



Once both have reached 100%, the glider must be rebooted. Select the Reboot button (now displayed in bold). Wait 30 seconds, then power cycle the glider using the remote.



Ocean Scout Operation

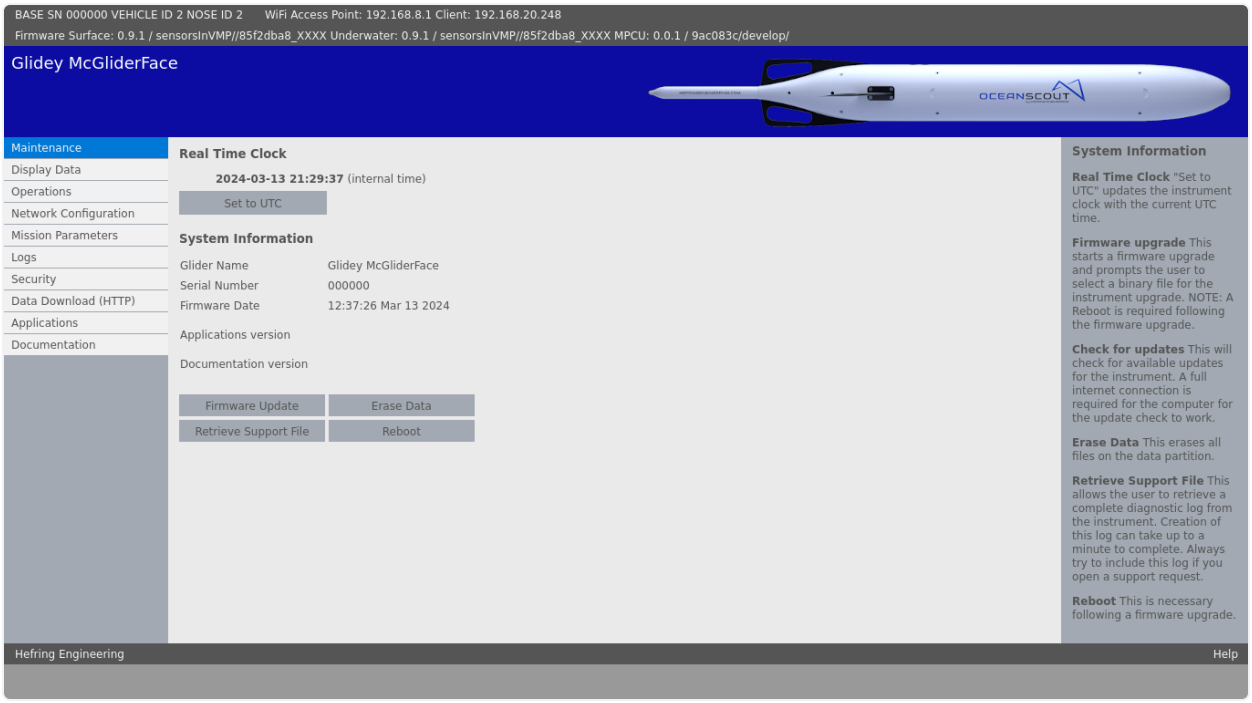
Connecting over WiFi

Access Point

The glider creates a WiFi network with default SSID “HefringGlider”. Other devices, for example a laptop, can join it using the WPA2 password “hefringglider”. On this network the glider has IP address 192.168.8.1. Devices that join will be assigned an IP address in the 192.168.8.xxx subnet via DHCP.

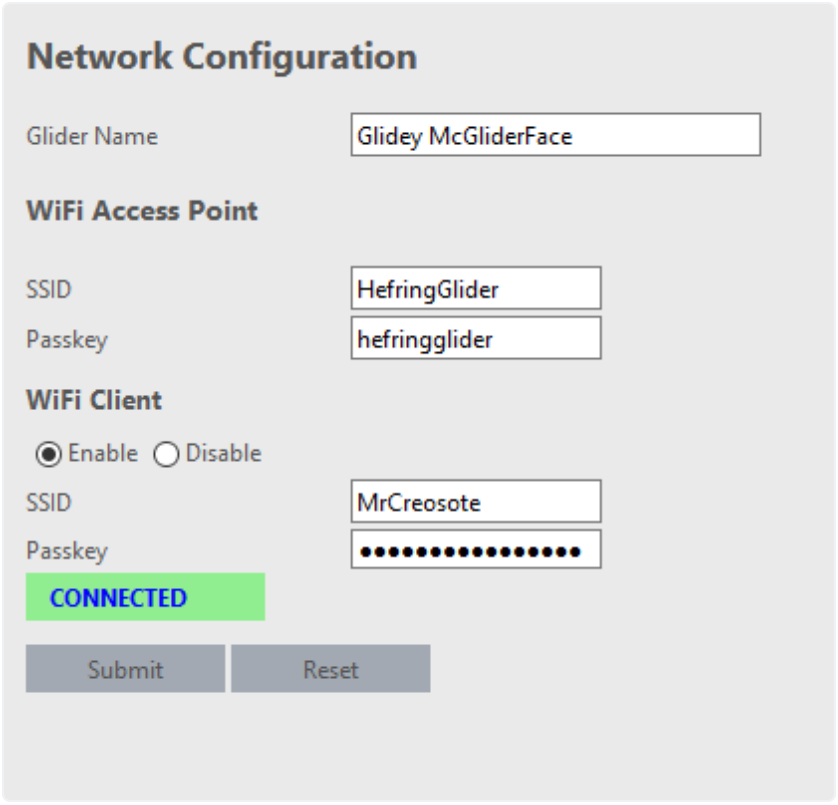
This interface allows multiple clients to connect to the glider, but only allows the user to communicate with a single glider.

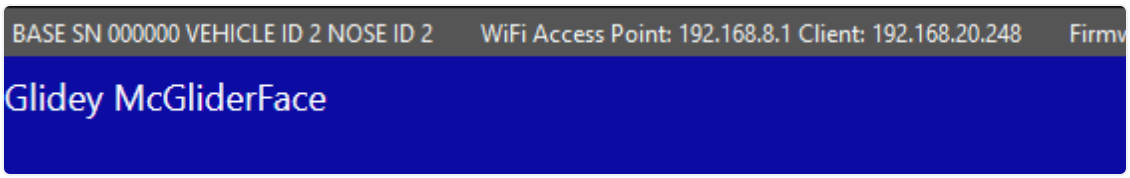
Once a connection has been made, the glider's web interface can be accessed at http://192.168.8.1



Client Mode

The WiFi interface can also be configured to connect into an existing access point by configuring the client mode of operation. Click on the "Network Configuration" tab.





This web page allows both the access point and client modes to be configured.

- Select the radio button WiFi Client enable
- Provide the SSID and password for the existing network
- click “Submit”.
- Reload the web page after ~ 15 seconds. A CONNECTED message is shown (see above) when the connection is made successfully. The IP address used by the client is displayed in the banner at the top of the web page

At this point, if desired, the user can disconnect from the glider access point, connect to the new access point and the client IP address can be be used to connect to the glider.

Changing cloud communications from Iridium to internet requires connecting into the command line (see below) and issuing the command:

=> comm.setModeInternet

To change back to Iridium mode, use:

=> comm.setModeIridium

Setting the Internal Clock

The glider's internal clock can be seen on the web interface at the top of the Maintenance page. Setting the clock before performing any tests will correlate logs with wall time. In the absence of internet connectivity or GPS signal, this is the only mechanism available for setting the internal clock.

NTP (Network Time Protocol) has been enabled and starts automatically. The default ntp.conf file uses NTP servers from pool.ntp.org as clock sources. NTP will only work when connected to an existing network with full internet connectivity.

Outdoors, once the GPS acquires lock and produces good data, the internal clock is automatically updated with the correct time.

Command Line Operation

Once the WIFi connection has been established, SSH is used to connect to the glider to access the command line interface.

From a command prompt on the computer, (*ip_address* = 192.168.8.1 if connected to the glider AP and the client IP address if connected to an existing network):

ssh hefringcli@*ip_address*

Password: hefringCLI

ssh hefringcli@192.168.20.248

hefringcli@192.168.20.248's password:

Glidey McGliderFace Ocean Scout CLI (Level 20)

=>

The Help command provides a list of all available commands and parameters. Commands and parameters can be auto-completed using the tab key. Commands are not case sensitive.

platform commands are used to interface with the VMP in the nose cone.

mpcu commands interface with the Motor and Peripheral Control Unit in the glider body.

mission commands are used to set / view mission parameters.

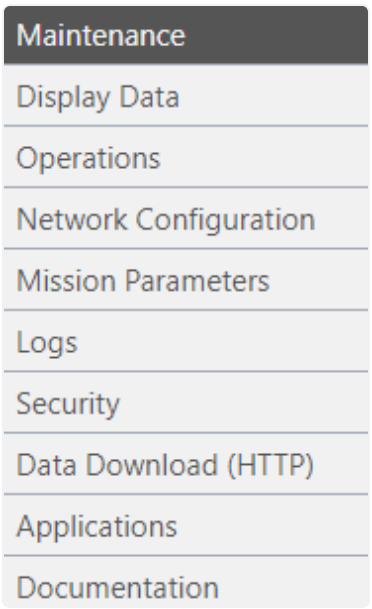
sensor commands control individual sensors in the nose cone.

super commands interface with the supervisor that controls the glider flight and navigation capabilities.

comm commands are used to access the remote communications device.

Web Pages

Web page displays are selected using the page selection tab:



The **Maintenance** tab is used to set the glider clock, do firmware updates, erase the data disk and retrieve support files. *Check for Updates* is not currently functional.

Firmware will be provided in the form of a *.fwi* file that updates all required processors within the glider. Note that once an update has been started, closing the web page loses track of the current firmware update. The update continues on the glider (and progress can be seen using the command line: platform.upgradeStatus

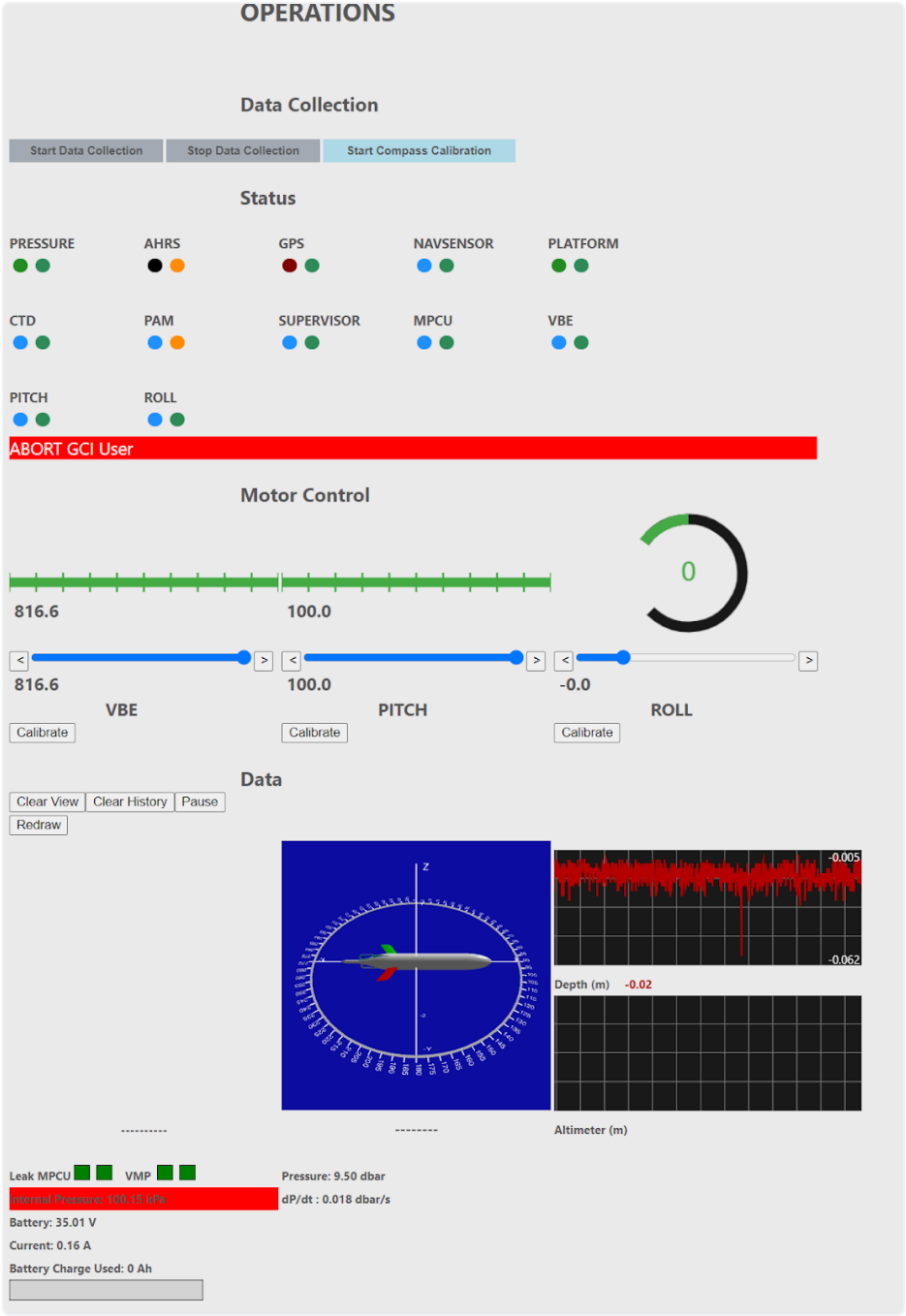
The **Display Data** tab displays in real-time data collected by any sensor that are running. Sensors can be turned on / off using the *sensor.start* and *sensor.stop* commands in the CLI.

The **Operations** page details information about the current glider state. Each subsystem has two buttons (state and severity) that have associated hover text. Hovering the mouse over the subsystem name will provide more detailed information if available.

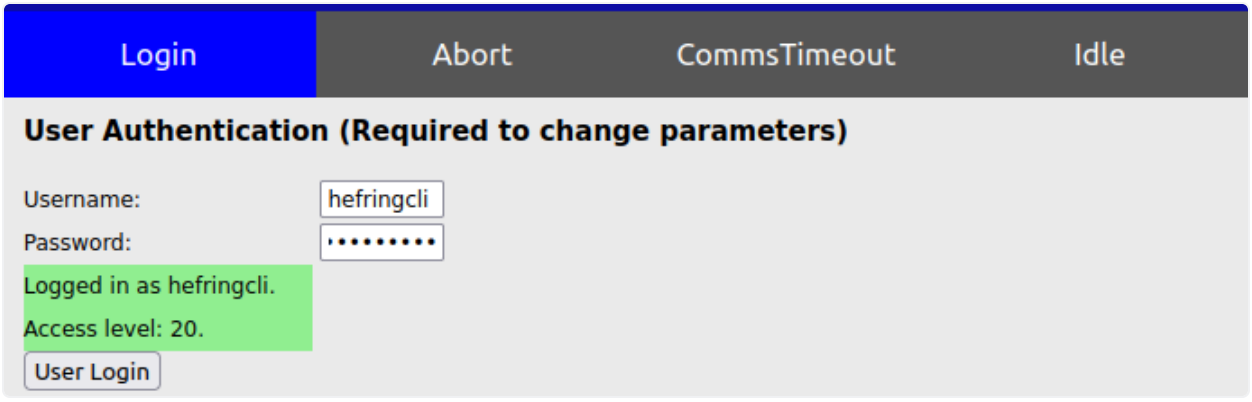
Any abort condition is highlighted in red at the bottom of the states.

The *Motor Control* block shows the current motor positions and commanded positions. Motors can be moved by moving the commanded motor position slider as required. Motor calibration (used to determine the full travel range allowed for each motor) is required after power on. The calibration process can be initiated for each motor using the associated calibration button.

The data displays show GPS position, orientation and depth / altimeter data. Note that these displays will only be updated when the corresponding sensor is running. While these displays are typically used during engineering / simulation testing, they are also useful for ensuring that the relevant sensors are working correctly.



Mission Parameters

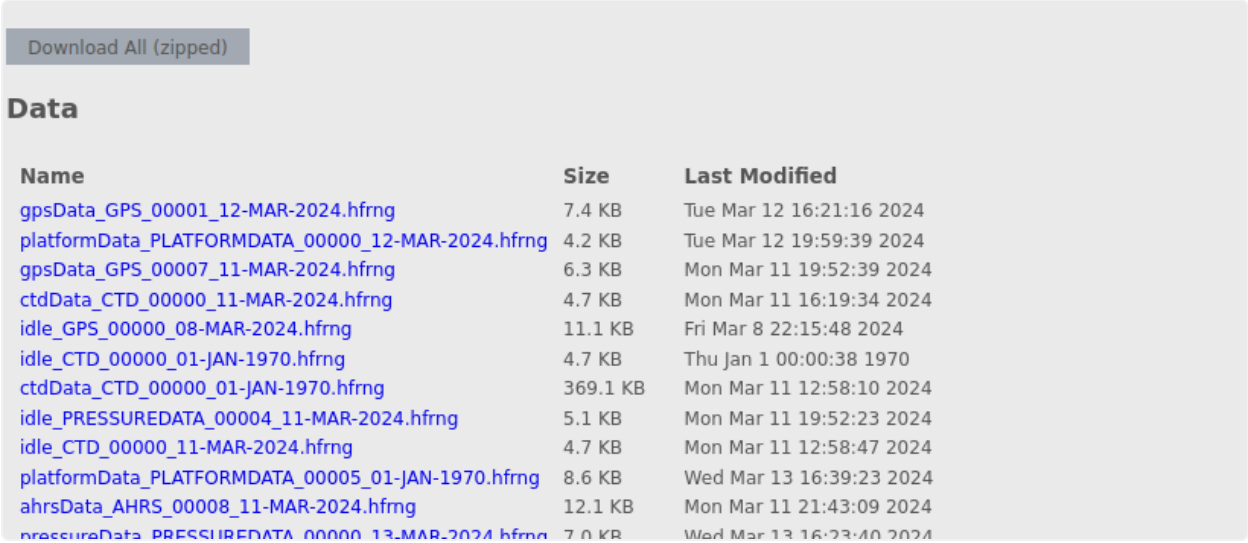


Mission parameters can be updated by logging into the Login Page. The login credentials are the same as for the command line interface. If not logged in, parameters can be viewed, but not changed. Note that a cloud configuration may overwrite values set by the user, so the glider is typically programmed through the cloud first before any other parameters are fine tuned.

Security

This page is a work in progress. Functionality has not yet been implemented.

Data Download (HTTP)



The entire data disk can be zipped and downloaded at once using the *Download All* button. Alternatively, individual files can be downloaded by clicking on the appropriate file name.

The entire data disk (including logs) can also be downloaded using the command prompt:

scp -r hefring@*ip_address*:/mnt/data .

Password: **HefrinG**

The data and logs are stored in the subdirectory “data” .

Applications / Documentation

When available, these pages will provide documentation and applications for interfacing to the glider.

Compass Calibration

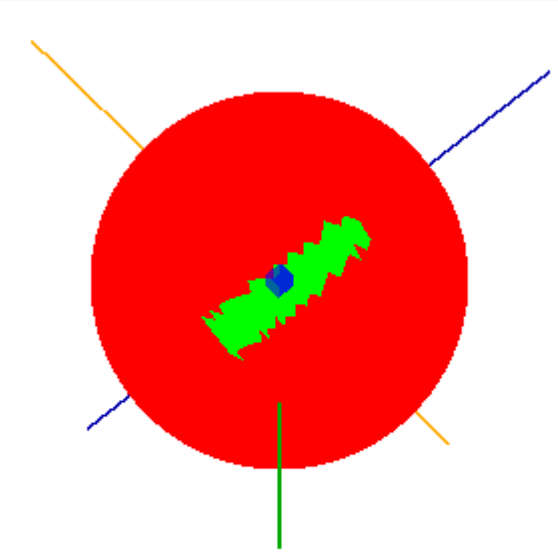
OceanScout includes an attitude heading reference sensor that produces heading, pitch and roll data for navigation purposes. The on board compass should be recalibrated occasionally to ensure that any magnetic interference from other onboard components is removed from the heading data.

The compass can be calibrated started using the Operations web page and progress / results viewed using the Data Display tab.

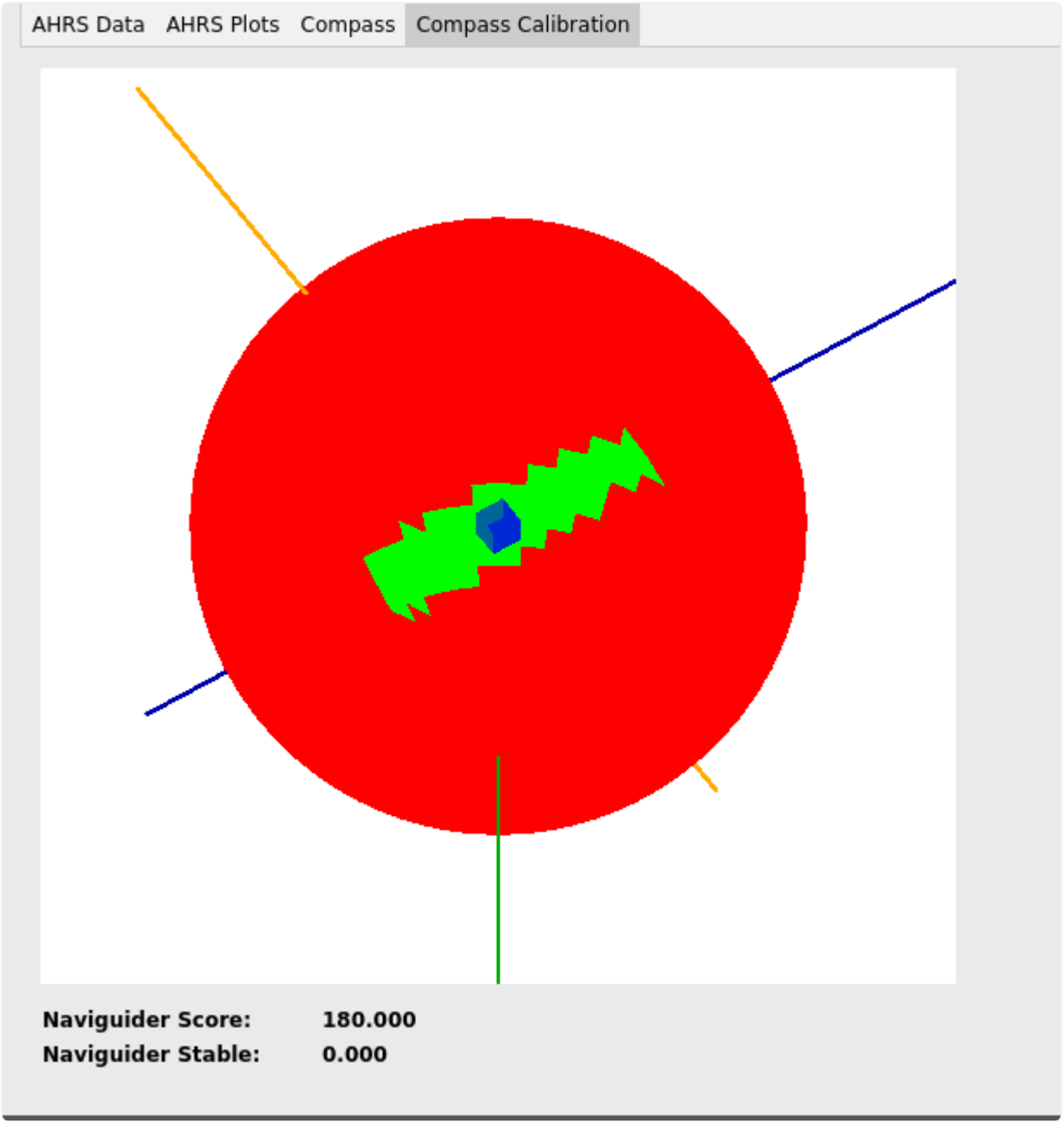
The glider should be hung in an area free of any metals or other magnetic anomalies using a mounting mechanism that allows the glider to rotate freely around all axes.

Pressing the "Start Compass Calibration" button in the operations page starts data collection and displays a sphere showing which orientation positions have been covered (green) and which need to be covered.

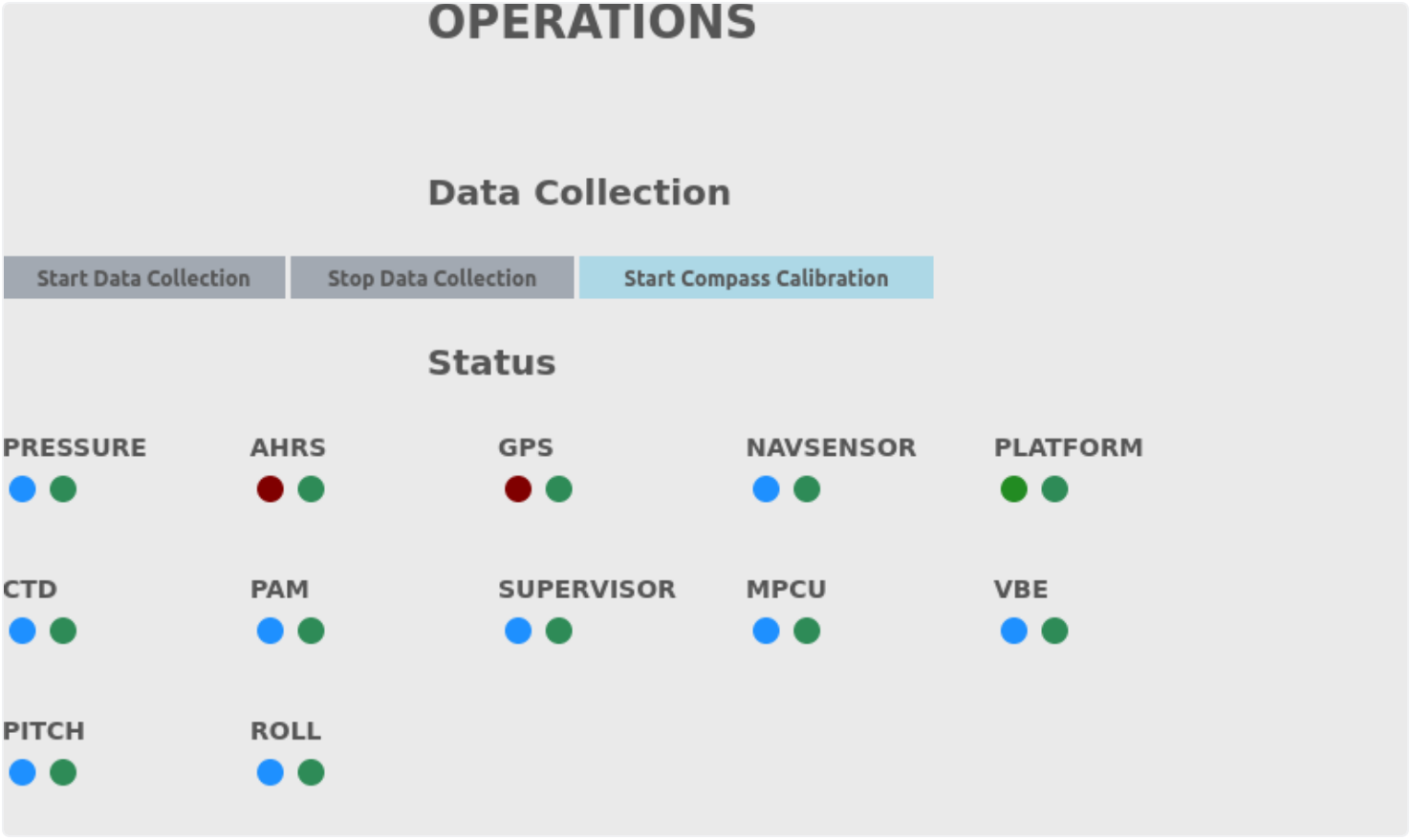
The Data Display tab incorporates progress information on the calibration.



Compass Calibration



The Data Display tab also includes information on how the calibration is proceeding:

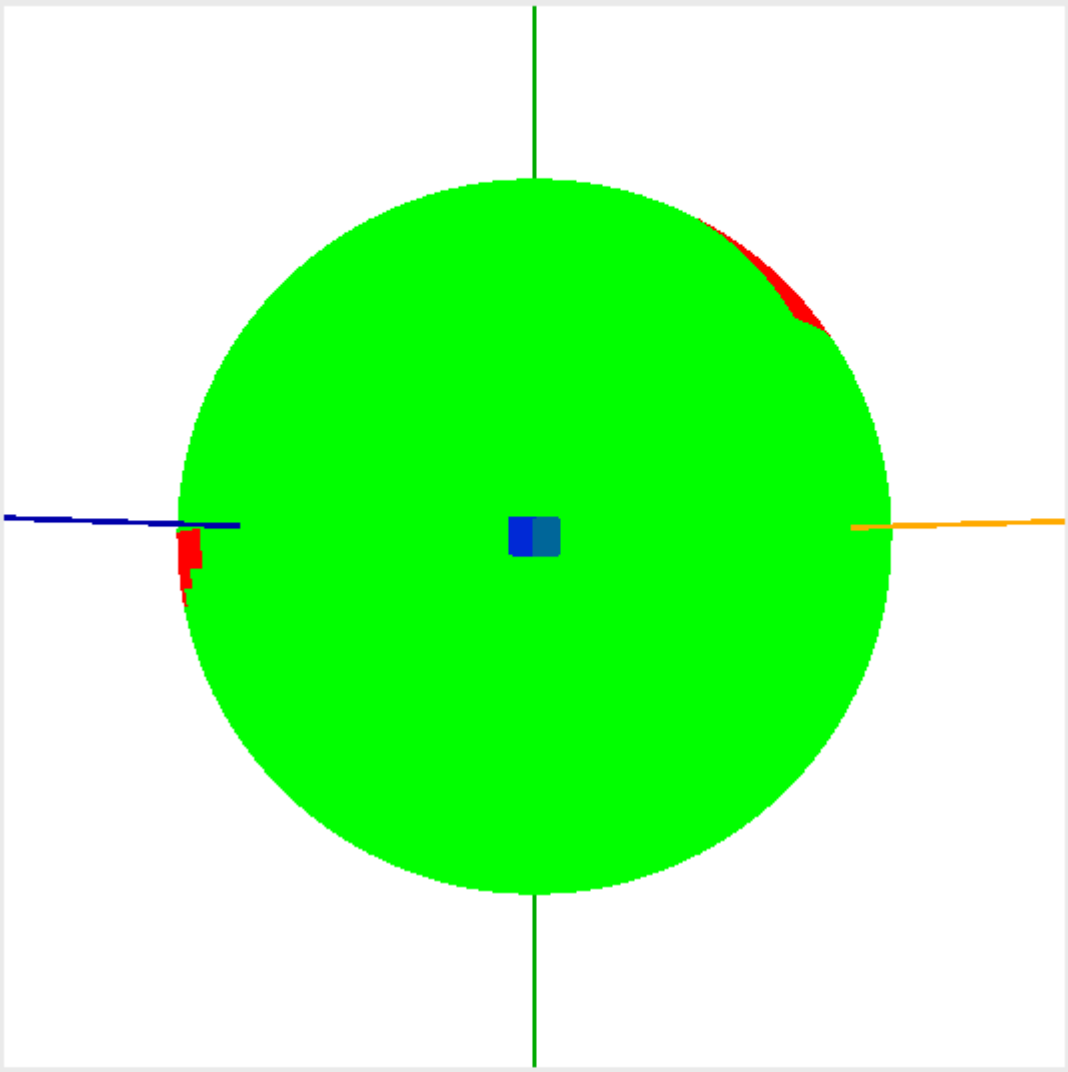


The score represents an approximate RMS error for the heading. A value of 180 is uncalibrated and the goal is to produce a value < 2.5. The calibration may or may not be stable depending upon the environmental conditions.

To change the calibration score, the glider should be slowly rotated in around all axes in an attempt to fill in as much of the sphere as possible.

Once a suitable score is achieved, the calibration is marked complete and relevant calibration data is displayed on the web page. The calibration is automatically saved within the AHRS to be preserve when the glider is power cycled.

AHRS Data | AHRS Plots | Compass | Compass Calibration



Calibration COMPLETED

Offsets	**0.0015**	**0.0026**	**0.0043**
Scaling	**1.0114**	**-0.0193**	**0.0140**
	-0.0193	**0.9720**	**-0.0646**
	0.0140	**-0.0646**	**1.0220**

Data Normals

Avg = 0.1736 σ = 0.0070

Raw Avg = 0.1092 σ = 0.0444

Naviguider Score: **2.242**
Naviguider Stable: **0.000**