

# MōVI FW 5.0 Akira

MōVI just got smarter and more stable

USER MANUAL



Revision B | 07.2016

## REVISION HISTORY

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REVISION	DATE	DESCRIPTION
A	February 2016	Initial Release
B	July 2016	Edits for Stable Release

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WHAT'S NEW

## SOFTWARE VERSIONS & COMPATIBILITY

Please verify that all Freely Products are up to date. Reference the chart below

	COMPATIBILITY	PREVIOUS STABLE	AKIRA (NEW STABLE)
<b>MōVI</b>	M5, M10, M15	4.2	5.0.1
<b>MōVI Controller</b>	(all units)	2.0.5	2.2.2
<b>MōVI Apps</b>	Android: 4.1 or later	1.630	2.1
	iOS: iOS 8.0 or later	1.630	2.1
	Mac: OS X 10.10 or later, 64-bit CPU	1.630	1.800
	PC: Windows XP or later	3.10	3.30
<b>MIMIC</b>	(all units)	1.3	1.4
<b>WEDGE</b>	(all units)	1.0.1	no new update

## TIMELAPSE MODE

MōVI timelapse sequences can be set up through the MōVI App (iOS, Android, Mac, PC) or MōVI Controller. Set timed keyframes of pan and tilt positions using the Timelapse graphical user interface. Timelapse Interval, Target Clip Length and Target Clip FPS are adjustable within the App to align the MōVI's movement with the camera's intervalometer or an external intervalometer.

### NOTE

Timelapse graphical user interface is only available on iOS and Android v2.1 beta versions.

## HIGH PERFORMANCE (HIPER) STABILIZATION

HiPer is a complete improvement on software performance for the MōVI. Control loop computations run twice as fast as before and advanced tuning configurations like independent output filters are now available. With HiPer Stabilization longer focal lengths can be used without sacrificing stability. Set up and adjustments are set via the MōVI App or the MōVI Controller.

## TARGET MODE

Target Mode allows the MōVI to automatically track the MIMIC sensor or a GPS coordinate. In Target Mode, the MōVI autonomously frames a subject using the positional data from the MōVI and/or MIMIC sensor. Target Mode can be used as a standalone feature with just a MōVI, or paired with a MIMIC as the target. This feature requires strong GPS signal and works best outdoors in clear weather.

## NEW MOBILE APPS

The updated mobile apps for iOS and Android have a brand-new user interface with enhanced usability features.

## OTHER

### MōVI KILL

“Double tap” on the MIMIC to cut power to the MōVI’s motors. This is useful when a MōVI attached to a multi-rotor like the ALTA. This prevents the MōVI from spinning the ALTA when on the ground. Using the kill feature can also save battery life between takes.

### UPDATED COMMUNICATION PROTOCOLS

Communications protocols used by the MōVI, MōVI Controller, MIMIC, WEDGE, and apps have been updated for compatibility.

### YAW DRIFT DURING BOOTUP

Some customers on previous versions of the firmware had reported yaw drift during bootup. This firmware version eliminates yaw drift during bootup.

### MōVI CONTROLLER ENHANCEMENTS

We’ve made enhancements and fixes to the MōVI Controller (see MōVI Controller section, pg. 25).

## HOW TO UPDATE



# UPDATES

All Stable Software downloads and links to the app stores, can be found on the Freelyfly website. [www.freelyflysystems.com/software-manuals](http://www.freelyflysystems.com/software-manuals)

<b>MōVI</b>	Download the new MōVI Firmware and update via Android, PC or Mac app.
<b>MōVI Controller</b>	Download the new MōVI Controller Firmware which comes with Firmware Updater app for Mac or Windows. Refer to MōVI Controller Firmware Update Guide for detailed instructions.
<b>MōVI Apps</b>	Android: Download from Play Store. iOS: Download from App Store. PC: Executable is available on website. (Windows might require uninstalling the previous version before new installation). Mac: Download from the App Store.  INSTALLATION GUIDES ARE AVAILABLE ON AKIRA WEBSITE
<b>MIMIC</b>	Download the new MIMIC Firmware and update via one of the following apps: Android v2.1, Mac v1.800 or PC v3.30. (iOS apps do not support MIMIC).  UPDATE PROCEDURE IS THE SAME AS UPDATING A MōVI.



# MōVI APP (ANDROID, iOS, PC, MAC)



## MōVI APP OVERVIEW

- » **Redesigned Mobile Apps:** iOS and Android apps have a brand-new user interface with enhanced usability features.
- » **New:** Timelapse Setup with keyframes, preview and custom duration. iOS and Android versions also include an advanced graphical user interface.
- » **New:** Configurations for advanced tuning such as independent output filters. iOS and Android apps also has streamlined tuning interface with noise indicators.
- » **New:** Target Mode configurations, charting and status indicators. Mac and PC apps can also be used to repurpose MIMIC into an active Target.
- » Support for new MōVI firmware and iOS 9.
- » Bugfixes and stability improvements across all platforms.

### MOBILE APPS

iOS v2.1 (Requires Wi-Fi dongle)

Android v2.1

### DESKTOP

PC v3.30

Mac v1.800

MōVI 5.0



## MōVI 5.0 OVERVIEW

- » **New Feature:** HiPer (High-Performance) Stabilization. Control loop computations run twice as fast as before. Advanced tuning configurations like independent output filters are now available. With HiPer Stabilization longer focal lengths can be used without sacrificing stability. Setup and adjustments are set via the MōVI App or the MōVI Controller.
- » **New Feature:** Timelapse Mode. MōVI can now be setup via iOS, Android, Mac and PC apps, or via MōVI Controller to perform Timelapse and pre-programmed sequences.
- » **New Feature:** Target Mode. MōVI can be set to keep pointing at a GPS position or dynamically follow a MIMIC as its target. Requires strong GPS signal.
- » **Bugfix:** Yaw drift at boot.
- » **Bugfix:** Oscillation in parked mode on ALTA.
- » **Bugfix:** MōVI starts spinning if booted camera facing up or down.
- » Support MIMIC for double tap to kill MōVI.
- » Updated communications protocol to support compatibility with other MōVI line products.

# TIMELAPSE FEATURES

## NOTE

This section is specific for [iOS v2.1](#) and [Android v2.1](#) versions of the MōVI App. See the next section for set up on Desktop Apps or refer to MōVI Controller section.

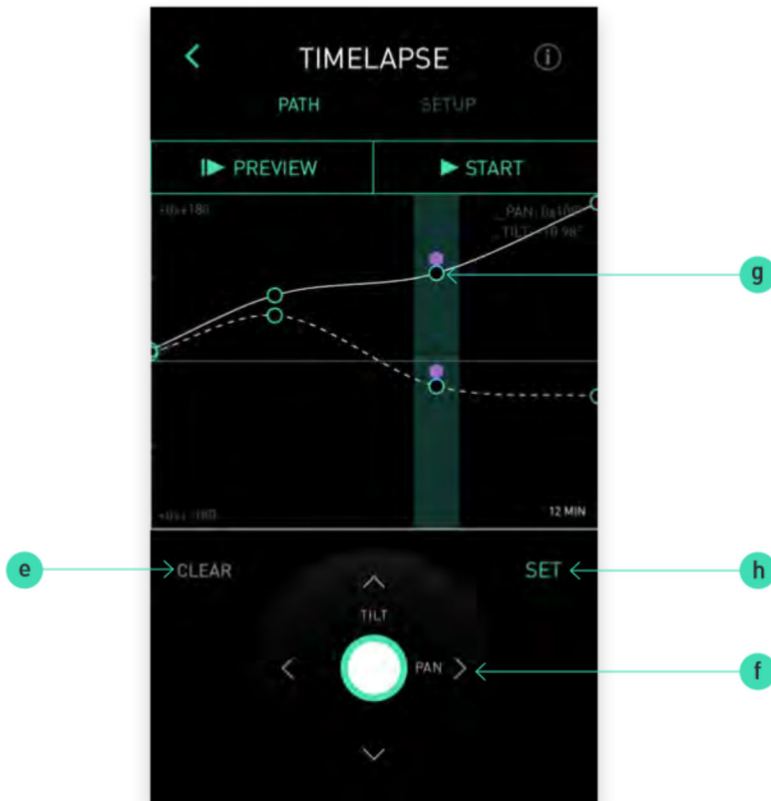
MōVI App's Timelapse interface lets you create stunning camera movements for timelapses in seconds. Create and edit keyframes of the desired motion under the **PATH (a)** section. Change variables such as Timelapse Interval and Duration under the **SETUP (b)** section.



**PREVIEW (c)** will drive the MōVI through the motion path in the duration of the Target Clip Length, under **SETUP (b)**. **START (d)** will drive the MōVI through the motion path for the entire Timelapse Duration as defined under **SETUP**.

## PATH

Tap **CLEAR (e)** to remove all existing keyframes. Add 2 to 8 keyframes, when finished, press **DONE**. Fine tune keyframes with the graphic path editor.



Position MōVI for each keyframe with the graphical **JOYSTICK (f)** or by manually positioning the MōVI.

Each keyframe is represented with a pair of vertical circles on graph. One for Tilt (dashed line), and the other for Pan (solid line). **Tap a keyframe (g)** to select it. Doing so will move MōVI to that keyframe.

### **NOTE**

After tapping a keyframe, wait until the MōVI settles to that key frame before making changes to it. If keyframe has multiple revolutions for pan, then MōVI will go through each revolution.

After selecting a keyframe, MōVI can be repositioned as described above. Tap **SET (h)** to apply the changes to the selected keyframe.

Tap and hold a selected keyframe to **remove** it. First and last keyframes can not be removed.

Tap and hold an empty portion of the motion path to **add a keyframe**.

Keyframes can be selected and **dragged horizontally** to change their time. First and last keyframes will be fixed and keyframes can't overlap.

Up to **8** keyframes can be added, and minimum of **2** keyframes are required to define a path. Keyframes support multiple revolutions of pan.

## SETUP

### TIMELAPSE INTERVAL (Match these values with an intervalometer)

Timelapse interval usually determines how dramatic the video will look once edited. Here are some common scenes with possible intervals:

- » 1 Second: Moving traffic. Fast moving clouds.
- » 1-3 Seconds: Sunsets. Crowds.

### TARGET CLIP LENGTH

The target length of the finished result. Helps in calculating your timelapse event duration.

### TARGET CLIP FPS

The target frames per second (FPS) you are planning to have for your video when you edit your timelapse. Helps in calculating your timelapse event duration.

### TIMELAPSE DURATION

The total duration it will take for MōVI to execute the complete timelapse path.

Timelapse Duration = Timelapse Interval × Target Clip FPS × Target Clip Length

### TOTAL PHOTOS

The calculated total number of photos that will be taken.

Total Photos = Target Clip Length × Target Clip FPS

### CURVE FIT

Pan and tilt curve fits can individually be changed to cubic or linear. Cubic smooths the transition between camera moves. Observe the difference by looking at the graph.

## HEADING ASSIST

iOS and Android apps will automatically set heading assist to fixed mount if heading assist is currently set to off, and revert it back to normal when the timelapse screen is exited.

## TIMELAPSE SETUP ON DESKTOP APPS

Follow these steps to configure a Timelapse from Mac or PC Apps.

1. Set up the **Heading Assist** mode (MōVI Expert menu) to Fixed Mount. This will eliminate drift when shooting from a tripod or other stationary mount.
2. Open the Timelapse Menu. Switch Shooting Mode from Normal to Timelapse. MōVI will enter Timelapse mode, where pan and tilt is smooth locked, allowing for manual repositioning of MōVI by hand.
3. Change the desired **Number of Keyframes**.
4. Select Keyframe **Index** to be 1, and set a **Duration** for the time between the first two keyframes via Keyframe Hours, Minutes and Seconds. This is the real-time duration between the selected Index keyframe and the next.
5. **Move** the camera to the desired starting position for the Timelapse manually by hand. When in position, select Keyframe **Set Here** and increment its value by clicking right arrow.
6. Select Keyframe **Index** to be 2 and move the camera to the second Keyframe position. (If you're only using two Keyframes, this would be the ending position of the Timelapse.) select Keyframe Set Here and increment its value by clicking right arrow.
7. If you're planning to have more than two keyframes, set the Duration for the time between Keyframes 2 and 3. Otherwise, you can skip this step.
8. Continue setting Durations and Keyframe positions (using Set Here) as desired for up to eight Keyframes.
9. When you've finished setting Keyframes, select Pan and Tilt Fit types. These determine how the camera's path transitions between Keyframes.
10. Set the Interval to the desired shutter interval. If you're using an external intervalometer, this setting should match the interval on it.
11. Set the Output FPS to match the expected frames per second of the output video clip. (This is only used to calculate the Clip Length for Preview speeds)
12. Once everything is set up select **Manual Shutter** and increment its value to start the Timelapse Sequence. Optionally **Timelapse Preview** can be set to On, which will run the MōVI in preview mode based on Timelapse Interval, Target Clip FPS and total duration between all keyframes. Timelapse sequence can be monitored on the bottom TL Progress Bar.



## HIGH-PERFORMANCE (HIPER) FEATURES

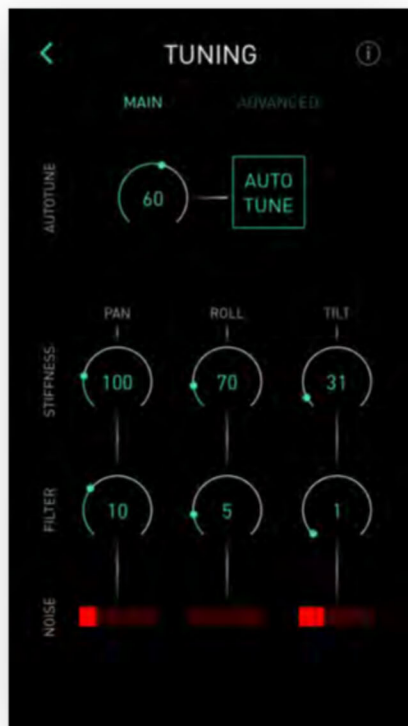
This firmware update includes several new features that enable higher stabilization performance:

- » Higher Inertial Measurement Unit (IMU) bandwidth.
- » Reduced IMU latency.
- » 2x higher control loop rate.
- » 2x faster signal filtering with independent filters for Pan, Tilt, and Roll.

No action is required to turn on these new features. Re-tune your MōVI to take advantage of the improvements.

## TUNING INTERFACE

The new streamlined tuning interface in iOS and Android Apps include filter and stiffness settings per axis with a noise indicator to observe results. Tuning tutorials can be found at [www.freeflysystems.com/video-tutorials](http://www.freeflysystems.com/video-tutorials).



# TUNING GUIDE

## BASIC TUNING

1. Make sure the camera payload, including all accessories (follow focus system, batteries, range finders, etc.) are in place, tightly secured, and well-balanced. For tutorials on MōVI balancing, see <http://freelysystems.com/video-tutorials>.

 **NOTE**

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Loose hardware attached to the camera can limit the stabilization performance by causing unwanted vibrations.

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2. Run Autotune to tune the Pan, Tilt, and Roll Stiffness values of the MōVI. In order for Autotune to work, the camera should be completely free to move. It will pan 90° during the Autotune process. You can fine-tune the Autotune Percentage to configure how much margin for error the Autotune algorithm leaves. Higher Autotune Percentage results in higher performance, but with less margin for error for changing payloads or balance. Suggested values are given in the table below.

 **NOTE**

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During Autotune, the MōVI should be on its stand and the camera should be free to move.

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MōVI	Configuration / Condition	Suggested Autotune Percentage
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M5, M10, M15	Full cage, connected to the top and bottom of the camera. One lens configuration.	70%
M5, M10, M15	Full cage, connected to the top and bottom of the camera. Frequent lens changes and rebalancing.	50%
M5, M10, M15	Half cage, bottom camera connection only <sup>1</sup> .	50%

<sup>1</sup> USING ONLY THE BOTTOM CAMERA CONNECTION REDUCES THE STIFFNESS OF THE TILT STAGE, WHICH CAN LIMIT THE MAXIMUM STABILIZATION PERFORMANCE. KEEP THIS IN MIND WHEN DECIDING HOW TO MOUNT YOUR CAMERA PAYLOAD.

3. Test the MōVI in a variety of camera positions. Listen for vibrations or oscillations. If there are any, try to determine which axis is causing them and reduce the Stiffness for that axis. If you can't eliminate the vibration or oscillation, or if it requires lowering the autotuned Stiffness value more than 25%, see the Advanced Tuning section for more tuning options.

## ADVANCED TUNING

If you're already comfortable with basic MōVI tuning as described above and want more control of tuning, the following provides some guidance on advanced MōVI tuning options. Often, higher stabilization performance can be achieved by taking advantage of these advanced options.

### FILTERS

The MōVI has a number of software filters that are applied to remove vibration and noise from the system. After Stiffness, the Filter settings are the second most important setting for achieving maximum stabilization performance. In previous MōVI firmware, two adjustable filters were available in the Expert Menu of the Freely Configurator App:

- » **Gyro Filter:** Filters the signal from the Inertial Measurement Unit (IMU). This filter applies to all three axes (Pan, Tilt, Roll).
- » **Output Filter:** Filters the control signal sent to the three motors. This filter applies to all three axes (Pan, Tilt, Roll).

The purpose of the filters is to eliminate noise and vibration due to structural

resonances in the camera, lens, or gimbal. However, setting them too high causes a delay of information that can reduce the overall responsiveness of stabilization. This usually results in low-frequency oscillation or artificially limited Stiffness values. It takes some experience to recognize the symptoms of too-high or too-low filters, and some trial-and-error to find the optimum values for a particular set up. A practical approach to filter tuning is given in the table below:

Symptom	Filter Action
High frequency buzzing or vibration. Usually a rougher sound.	Increase filter values.
Low-frequency oscillation or rocking at high Stiffness values. Usually a smoother sound.	Decrease filter values.

In this MōVI firmware update, three additional filters have been made available that can be used to fine-tune performance on each individual axis:

- » **Output Tilt Filter:** Filters the control signal sent to the Tilt motor, only.
- » **Output Roll Filter:** Filters the control signal sent to the Roll motor, only.
- » **Output Pan Filter:** Filters the control signal sent to the Pan motor, only.

These filters can be used to remove vibration from one axis without slowing down the responsiveness of other axes. To use these filters, set the **Output Filter** to a value of one (1) and configure each axis filter independently. If Output Filter is set to a value greater than one (1), its value overrides all three independent filters.

#### **NOTE**

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After adjusting the filters, re-run Autotune to see if the Stiffness values have improved.

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## HOLD STRENGTH

Whereas Stiffness values set how much the camera resists moving (with respect to the outside world) in the first place, Hold Strength sets how aggressively it tries to return to its target position if it does move. Indirectly, this also sets how aggressively it follows pointing commands from a second operator using a MōVI Controller or MIMIC.

The default Hold Strength values are set low (8) for all MōVIs. Increasing Hold Strength has pros and cons that should be weighed depending on the shooting situation:

Higher Hold Strength Values	
Pros	Cons
Better rejection of disturbances, such as wind, cable tugging, and inertial forces due to imbalance. Better performance at long focal length.	Disturbances that do make it through can be more jolting, since the camera tries to react faster. See the section on Jolt Rejection below.
Faster tracking of commands from a second operator using a MōVI Controller or MIMIC. Faster pan moves possible.	More possibility for overshoot if the second operator stops a pan or tilt more abruptly.

To tune the Hold Strength, increase it incrementally on each axis and test the response by pushing on and then releasing the axis. The maximum value to use would be where the axis returns its original position as quickly as possible without overshooting. Any value lower than that is acceptable, and the final value should be set by weighing the pros and cons listed above and with practical testing and footage review.

## JOLT REJECTION

To help enable higher Hold Strength settings while mitigating some of the cons listed above, this firmware includes a new feature called Jolt Rejection. Setting this to a value greater than one (1) allows the MōVI to soften the response when an axis is disturbed from its target location. The higher the setting, the softer the recovery.

## MAX RATE

The maximum rate of camera movement can also be used to enable higher Hold Strengths while reducing the possibility of overshoot. For example, to shoot with a very long focal length, you may want to increase the Hold Strengths and reduce the Max Rate.

## TARGET MODE (BETA)

Target mode brings the ability for any of the MōVI product line to automatically track the MIMIC sensor or a GPS coordinate. This allows for autonomous framing of a subject using the positional data from the MōVI and/ or MIMIC sensor. Target Mode can be used standalone, with just a MōVI, or paired together with a MIMIC as the target.

### NOTE

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It is crucial that you read and understand all instructions. Particular versions of the MōVI app communicate with different devices.

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### MōVI (STANDALONE)

MōVI can be configured to track a GPS coordinate when Target Mode is enabled. This feature depends heavily on the quality of GPS signal and good compass calibration. Running the compass calibration procedure before first use is highly recommended (New iOS and Android App: Under General > Expert configurations. Mac and PC App: System Menu > Start Compass Calibration, pg. 25).

#### TO ENABLE TARGET MODE

1. Connect to MōVI via the app.
2. From the Configurations menu go to Expert > Heading Assist and set it to Compass.
  - » With Heading Assist: Compass selected, a Declination value should be set. Local magnetic declination values can be found online.
  - » Although Compass gives the best results, Heading Assist can also be set to GPS if a declination value can't be found on set.
3. **Mobile Apps:** Open Target Mode screen and turn the toggle ON.  
**Desktop Apps:** Set the Target Enable to On to track the target indefinitely.
4. Check that required conditions are met: **GPS:GOOD** and **POSITION:LOCK**.
5. Tap **Set Here** to set the target to MōVI's current position. (Or on desktop apps, from the target configurations menu, press the plus button on Target Here). A new position can be set anytime by the Target Here option again.

#### TO DISABLE TARGET MODE

**Mobile Apps:** Open Target Mode screen and turn the toggle OFF.

**Desktop Apps:** Set the Target Enable to On Off

## MōVI + MIMIC

With this combination MōVI can be set to track MIMIC's position in real-time. In order to achieve this, first configure MōVI in Standalone Target Mode (Steps 1-2) as explained above. Then, configure the MIMIC.

### TO ACTIVATE MIMIC AS THE TARGET

1. Connect to the MIMIC via MōVI App via same procedure as the MōVI (Note: iOS doesn't have MIMIC support).
2. From the Configurations menu, go to General > Aux Port Function and set it to Target.
3. Check that GPS Assist is set to ON.
4. Also make sure that Heading Assist is set to Compass as explained in previous section above (step 2) for MōVI. Now MōVI will actively track MIMIC's position.

### TO DEACTIVATE MIMIC AS THE TARGET

Connect to the MIMIC via the Mac or PC app and set General > Aux Port Function to Headtracker.

## LIMITATIONS OF THE TECHNOLOGY

This feature depends heavily on the quality of GPS signal and good compass calibration. Running the compass calibration procedure (System Menu > Start Compass Calibration) before first use is highly recommended.

Open areas, away from trees and buildings, usually get stronger GPS signals. GPS performance can be improved by upgrading the MōVI's GPS antenna to the Maxenna, available from the Freefly System website or your local Freefly Systems vendor.

Check the app for the following status indicators when using Target Mode:

**GPS:** GOOD

**POSITION:** LOCK

**HACC:** Less than 3 meters for ok quality, less than 1 meter for very good quality (hacc can be found under GPS Charting or under Target screen in Android and iOS App v2.1)

## TROUBLE SHOOTING

If tracking is working, but there is a pan offset, try compass cal on MōVI and check if you entered a Declination value for your geographic location

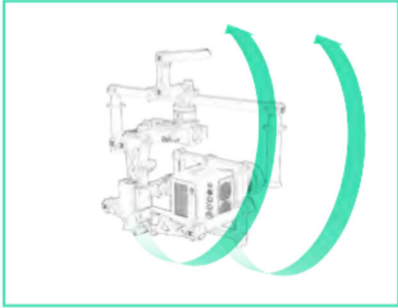
If tracking is working, but there is a tilt offset, try Target Height Offset parameter.

# COMPASS CALIBRATION

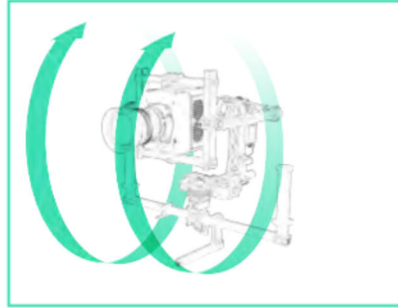
To improve GPS and Heading accuracy, the MōVI's compass should be calibrated with the proper declination. The value of your declination is determined by your current geographical location and is set by you. Local magnetic declination values can be found online.

It is recommended that you recalibrate when planning to use Heading Assist or Target Mode.

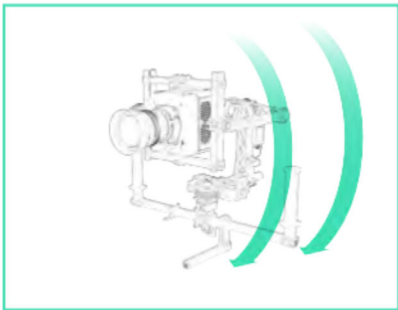
Compass Calibration requires the MōVI app and is found under {Configurations > General > Expert > Start Compass Calibration} on Mobile apps and {System Menu > Compass Calibration} on Desktop Apps.



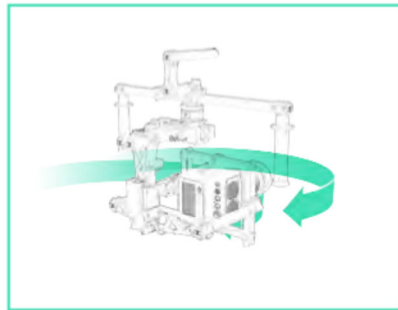
1. Face North, Pitch -180°



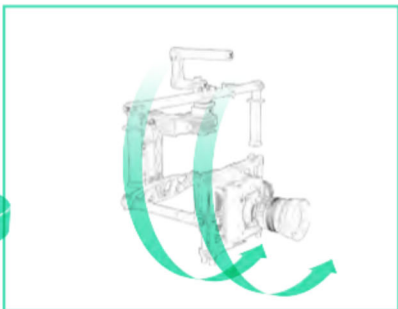
2. Pitch 360°



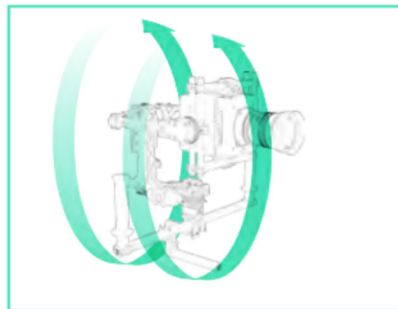
3. Pitch 180°



4. Yaw 90° (Face East)



5. Roll -180°



6. Roll 360°



# MōVI CONTROLLER V2.2



## MōVI CONTROLLER V2.2 OVERVIEW

- » **New Feature:** A new top-level menu has been added to support the Timelapse features of the MōVI.
- » **Usability Improvement:** The Majestic (M) and Kill (K) positions on the MōVI Controller Mode Switch now work the same way in both Normal and MIMIC Mode.
- » More MōVI Configuration options are available. The MōVI Config menu has been split into two: MōVI Basic and MōVI Expert.
- » **New Feature:** RF Tools help monitor and improve RF performance in noisy RF environments.
- » The top-level menus have been reorganized and grouped by device for easier navigation.
- » Support for Redrock microRemote firmware (v3.0) through the Aux Port and Follow Focus Kit.
- » Support compatibility with new MōVI firmware version.

# TIMELAPSE

A new top-level menu has been added to support the Timelapse features of the MōVI. It can be accessed from the Home menu if the MōVI connected has firmware that supports it.

## TIMELAPSE MENU

### Timelapse Options:

- » **Preview:** Runs the Timelapse sequence for Clip Length (see below) based on the configured Interval and Output FPS.
- » **Start:** Runs the Timelapse sequence in real-time for the total Duration between all Keyframes. Once the Timelapse is started, it's safe to turn off the MōVI Controller.
- » **Cancel:** While the Timelapse sequence is running, a progress bar is displayed. Press the Menu Set button at any time to cancel the Timelapse.

**Mode:** Set this to Timelapse to enable Timelapse Mode and Normal to switch back to Majestic Mode.

**Duration [A–B]:** Set the real-time duration between Keyframes A and B. The time is displayed and set in HH:MM:SS format. Use the Menu Set button to cycle between hours, minutes, and seconds.

### Keyframe Action:

- » **Set Here:** Set a Keyframe at the current pan and tilt angle by pressing Menu Set. This will automatically increment the current Keyframe so you can set them sequentially.
- » **Go Here:** Moves pan and tilt to the location of the Keyframe selected, if it has already been set.
- » **Clear All:** Clears Keyframes to start over.

**Keyframe Number:** Displays the current Keyframe and the total number of Keyframes set. You can move back to a previous Keyframe to edit its position or the duration between it and the next Keyframe. See Timelapse Step-by-Step instructions.

### Pan/Tilt Fit Type:

- » **Linear:** Linear motion between Keyframe positions.
- » **Cubic:** Fit a smooth curve that passes through the Keyframe positions.

**Interval(s):** Set the time, in increments of 0.1s, between shutter firings. Match this value with the external intervalometer you are using.

**Output FPS:** Set the frames per second of the output clip. This is only used to drive the clip time estimate and Preview speed.

**Clip Length (s):** (Read-Only) The calculated time of the output clip in seconds, based on the Interval, Output FPS, and total Duration between all the Keyframes. Use Preview to move the camera at this speed, to see what the final clip would look like once edited.

## TIMELAPSE STEP-BY-STEP

Follow these steps to configure a Timelapse from the MōVI Controller.

1. Set up the **Heading Assist** mode (MōVI Expert menu) as required:
  - a. Timelapse works best shooting from a tripod or other stationary mount and heading assist is set to **Fixed Mount**.
2. Open the Timelapse Menu and change **Mode** to Timelapse. MōVI will enter Timelapse mode, where pan and tilt is smooth locked, allowing for manual repositioning of MōVI by hand.
3. Set a **Duration** for the time between the first two keyframes. (This is the real-time duration).
4. **Move** the camera to the desired starting position for the Timelapse using the Joystick or manually by hand. When it's in position, select Keyframe Action: **Set Here** and press the Menu Set button.
5. If you're planning to have more than two keyframes, set the Duration for the time between Keyframes 2 and 3 next. Otherwise, you can skip this step.
6. Move the camera to the second Keyframe position. (If you're only using two Keyframes, this would be the ending position of the Timelapse). Select Keyframe Action: Set Here and press the Menu Set button to set the second Keyframe.
7. Continue setting Durations and Keyframe positions (using Set Here) as desired for up to eight Keyframes.
8. When you've finished setting Keyframes, select Pan and Tilt Fit types. These determine how the camera's path transitions between Keyframes.
9. Set the Interval to the desired shutter interval. If you're using an external intervalometer, this setting should match the interval on it.
10. Set the Output FPS to match the expected frames per second of the output video clip. (This is only used to calculate the Clip Length and Preview speeds).
11. Select Timelapse Option: Preview and press the Menu Set button. The MōVI will run the Timelapse sequence at output clip speed. Monitor the Preview to see if it matches the path you want.
12. If you want to change the position or duration of any Keyframes, you can scroll to the Keyframe and do so.
13. When you're happy with the set up, select Timelapse Option: Start and press the Menu Set button. This will start the Timelapse sequence in real-time.

14. A progress bar is displayed showing the overall progress of the Timelapse. You can monitor this, or turn the MōVI Controller off. (The Timelapse will continue; the MōVI will not return to Majestic mode while running a Timelapse sequence).

## MIMIC MODE IMPROVEMENTS

This release includes some usability improvements that have been made to MIMIC Mode on the MōVI Controller.

### MAJESTIC AND KILL

The Majestic (M) and Kill (K) positions on the MōVI Controller Mode Switch now work the same way in both Normal and MIMIC Mode. Majestic returns framing control to the operator carrying the MōVI. Kill turns off the motors.



#### NOTE

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You can also use a combination of MIMIC + Majestic to have Majestic-like control in Dual Operator Mode. (MIMIC Mode with Majestic Smoothing/Window settings applied to the movement of the Controller itself). In this case, the MōVI Controller Mode Switch should still be in the Dual (D) position. See the section below on More MōVI Configuration for more details.

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## MORE MōVI CONFIGURATIONS

More MōVI Configuration options are available. The MōVI Config menu has been split into two: MōVI Basic and MōVI Expert.

### MōVI BASIC



The most common MōVI Configuration settings are here. Tilt, Roll, and Pan Stiffness (the primary tuning controls) are here, as well as Autotune. Hold Strength, Majestic Mode settings, and Dual Operator settings are also in this menu. It should be familiar if you've used the previous MōVI Config menu on the MōVI Controller. For more information on basic MōVI configuration and tuning, refer to the manuals or tutorial videos as [www.freeflysystems.com](http://www.freeflysystems.com).



### MōVI EXPERT

If you're already comfortable with basic configuration, this menu has some more advanced MōVI configuration settings that can help optimize MōVI stabilization performance, especially when combined with the MōVI High Performance improvements. See the MōVI section for more information on tuning for High Performance.

**Filters:** These are low-pass filters applied to different signals the MōVI uses for stabilization. Generally speaking, it's best to use the lowest settings possible that still filter out structural vibrations. If you get high frequency buzzing, try increasing a Filter. If you get low frequency oscillation, try decreasing it.

- » **Gyro Filter:** Filters all three axes of the IMU rate sensor used to measure camera movement.
- » **Output Filter:** Filters all three motor outputs evenly. If this is greater than one, it overrides the independent Tilt, Roll and Pan filters below.
- » **Tilt Filter:** Filters only the Tilt motor output.

- » **Roll Filter:** Filters only the Roll motor output.
- » **Pan Filter:** Filters only the Pan motor output.

**Max/Min Tilt:** Configure the maximum and minimum tilt angle with respect to the horizon.

**Max Roll:** Configure the maximum roll joint angle. (Not with respect to the horizon).

**Max Control Rate:** Configure the maximum control rate for all axis. For shooting with longer lenses, reducing this often helps controllability.

**Motion Boot:** Set to On to allow booting while in motion (e.g. on a boat). It's best to leave it Off when not needed, to allow the gyro to recalibrate on boot.

**Jolt Rejection:** Permits softer recovery if the MōVI gets bumped. Higher values give softer recoveries. Use in conjunction with higher Hold Strengths for more precise stabilization and pointing accuracy with less overshoot.

**Heading Assist:** Choose what external reference the MōVI uses to determine its heading (absolute Pan angle).

- » **Off:** Use only the gyro. This setting can have a slow pan drift.
- » **Fixed Mount:** Use the pan motor angle sensor. This is useful if shooting from a tripod or other stationary platform.
- » **GPS:** Use the GPS position to calculate heading. This is useful if outdoors and in motion.
- » **Compass:** Use the compass heading. Make sure to calibrate the compass before use.

**MIMIC Mode:** Advanced configuration for MIMIC Mode.

- » **Direct:** Controller movements, including Roll, are translated to the MōVI as quickly as possible.
- » **Level Roll:** Same speed as Direct, but Roll is forced to be level. This is equivalent to setting the MIMIC Roll Scale in the Tx Config menu to 0.0.
- » **Majestic Pan:** Apply Majestic Mode Smoothing and Window settings to the Pan Axis while in MIMIC Mode. (Tilt Axis is still Direct).
- » **Maj Pan+Tilt:** Apply Majestic Mode Smoothing and Window settings to the Pan and Tilt Axes while in MIMIC Mode.

## RF TOOLS

The MōVI Controller firmware now has a variety of tools to help monitor and improve RF performance in noisy RF environments. These can be accessed from the Radio Config menu. At the end of this section, some general tips and tricks for maximizing the RF performance of the MōVI Controller are provided.

### PACKET COUNTERS



The Radio Config menu has packet counters for telemetry returned from the MōVI and WEDGE. These can be used as general indicators of the quality of the radio link between the MōVI Controller and the MōVI and WEDGE. The maximum values are as follows:

MōVI FW v4.3.0 and earlier	50 Rx/s
MōVI FW v4.4.x and later (TK)	25 Rx/s
WEDGE	25 Rx/s

#### NOTE

in all cases the MōVI and WEDGE receive control data at 50 Tx/s.  
The packet counters just show data coming back from each.

### SIGNAL STRENGTH INDICATOR

The signal strength indicator in the status bar at the top of the MōVI Controller display is now tied to the MōVI packet counter. It will begin to lose bars when the MōVI telemetry packets come in below the target rate, indicating a drop in round-trip signal strength. The MōVI may continue to operate if one-way radio commands are still being received, but the signal strength indicator can be used to get a good idea of range limits.



## 2.4GHZ CHANNEL SCAN



Use Radio Action: Scan or Radio Action: Fast Scan to perform a scan of all 2.4GHz channels and plot the maximum recorded energy on each. Set the Channel on the MoVI Controller and Receiver to a channel with low energy to minimize interference. (Using Channel 0 does this automatically, but takes slightly longer to re-link).

- » **Scan:** Performs a 10-second energy scan. This is useful for detecting intermittent Wi-Fi traffic.
- » **Fast Scan:** Performs a 3-second energy scan. Use this to filter out frequency hopping radios like aircraft RC transmitters. These have minimal interference with the MoVI Controller, since they're rarely on the same frequency, but can clutter the energy scan with their traffic. (See General RF Tips and Tricks for more details).

## GENERAL RF TIPS AND TRICKS

Below are some general notes for maximizing the RF performance of the MoVI Controller.

### COMMON HARDWARE ISSUES

If your controller is having severely limited range, it might be due to a hardware issue, such as a damaged or disconnected antenna.

- » Check that the antenna on the MoVI Controller is present and fully seated on the SMA connector.
- » If not using the stock antenna, make sure the antenna being used is a 2.4GHz antenna with an RP-SMA type connection.
- » IMAGE OF ANTENNA
- » Check that the antenna on the MoVI Controller Receiver is present and not cut or damaged.
- » Open the Receiver and check that the antenna is connected to the Radio module.

### RECEIVER PLACEMENT

Placing the MoVI Controller Receiver optimally can help improve performance. Ideally, it should be placed where its antenna has clear line of sight to the MoVI

Controller in the configuration being used. This isn't always possible, so at minimum keep the antenna clear of metal or carbon MōVI parts and wires.

#### **ANTENNA ORIENTATION**

The preferred antenna orientation for the Controller and the Receiver is vertical.

#### **THIRD-PARTY ANTENNAS**

It's possible to use third party antennas with higher gains on the MōVI Controller and/or the Receiver. If you do so, follow these guidelines:

- » If using a third-party Controller antenna is 2.4GHz and has an RP-SMA style connection (see photo above).
- » If using a third-party Receiver antenna, make sure it is 2.4GHz and has a u.FL style connection.
- » Longer antennas move the active portion of the antenna further from the Controller or MōVI chassis, which can improve performance.
- » The MōVI Controller and Receiver output power is +18dBm. Make sure the total radiated power with the antennas you use are within local regulations.

#### **RANGE EXTENDERS / POWER AMPLIFIERS**

2.4GHz Wi-Fi range extenders / power amplifiers can be used on the MōVI Controller to get extended range. Follow these guidelines if you want to use a range extender:

- » Make sure the output power complies with local regulations.
- » Make sure to safely range test other RC equipment, especially aircraft transmitters, if using a power amplifier on the MōVI Controller.
- » Make sure the connector used to connect to the MōVI Controller antenna output is an RP-SMA type connection.
- » Power for the amplifier can be drawn from the 5V or 12V outputs of the Controller if the total power for all 5V or 12V accessories plus the amplifier is less than 2A. Power can also be drawn from the D-Tap connection on the IDX battery plate.
- » Do not operate the amplifier without an antenna.

#### **COEXISTENCE AND INTERFERENCE**

The MōVI Controller operates on a fixed frequency within the 2.4GHz band. Other 2.4GHz transmitters may interfere with the operation of the Controller or limit the range, depending on the type, power and proximity of the other source.

- » **RC Transmitters:** Aircraft RC transmitters such as Futaba and Spektrum are frequency-hopping. They may occasionally occupy the same channel as the MōVI Controller, but only for brief periods of time too short to affect control performance. The MōVI Controller has been tested for coexistence

with Futaba and Spektrum transmitters.

- » **Wi-Fi:** 2.4GHz Wi-Fi operates on a fixed frequency at very high bandwidth and data rates. If the Wi-Fi channel is close to the MōVI Controller channel and the Wi-Fi source is near the MōVI Controller Receiver, it can interfere with operation or range. Use the Scan available in the Radio Config menu to check for Wi-Fi and other 2.4GHz traffic and choose the channel with minimum energy for MōVI Controller operation. MōVI Controller Channels **4** and **9** are generally the most Wi-Fi-immune.
- » **Bluetooth:** Bluetooth also uses multiple frequencies in the 2.4GHz band to transmit data. It's relatively low data rate and power, so it should not interfere with the MōVI Controller in a significant way. It's still good practice to keep the MōVI Controller Receiver away from the MōVI Bluetooth antenna.
- » **2.4GHz Video/FPV Transmitters:** These are continuously transmitting 2.4GHz sources and should be avoided when using 2.4GHz for control. If you have to use a 2.4GHz video transmitter, make sure it's operating on a frequency that is away from the MōVI Controller frequency. (Use the Scan in Radio Config while the 2.4GHz video transmitter is running to see what channels it occupies).
- » **Other 2.4GHz Follow-Focus Systems:** Other follow-focus systems using fixed-frequency 2.4GHz radios can interfere with or be interfered with by the MōVI Controller. If using third-party follow-focus systems, set them to a different channel than the MōVI Controller. Check the MōVI Controller manual for a table of frequencies and channel numbers for other follow-focus systems. Note: The WEDGE should be set to the same channel as the MōVI Controller since they work on the same radio network.

## OTHER NEW FEATURES AND BUG-FIXES

### REDROCK MICROREMOTE V3.0 FIRMWARE SUPPORT

The MōVI Controller now has support for Redrock microRemote firmware (v3.0) through the Aux Port and Follow Focus Kit. Select this option in Aux Port menu under System.

### MENU REORGANIZATION

The top-level menus have been reorganized and grouped by device (MōVI, WEDGE, Transmitter) for easier navigation.

### MōVI COMPATIBILITY

Communication protocols have been expanded to allow compatibility with the latest MōVI firmware.

# MIMIC V1.4



## MIMIC V1.4 OVERVIEW

**New Feature:** Target Mode. MIMIC can now be configured as an active target for MōVI for automatic framing. See the MōVI Target Mode section for details and set up guide.

**New Feature:** Double tap handle button to kill MōVI. Double tap again to reactivate.

### **NOTE**

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When MIMIC is in Target Mode, it will communicate with MōVI only when it has Position Lock. If you are experiencing that double tap is not killing MōVI in Target Mode, this might be the reason.

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