

MōV WHEELS

TECHNICAL MANUAL



REV 1.0 | NOVEMBER 2018

To download the most current user manual for MōVI
Wheels and all other Freefly Products, please visit
<http://freeflysystems.com/support>.



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Revision History

Revision	Date	Description
A	10/24/18	Initial Release

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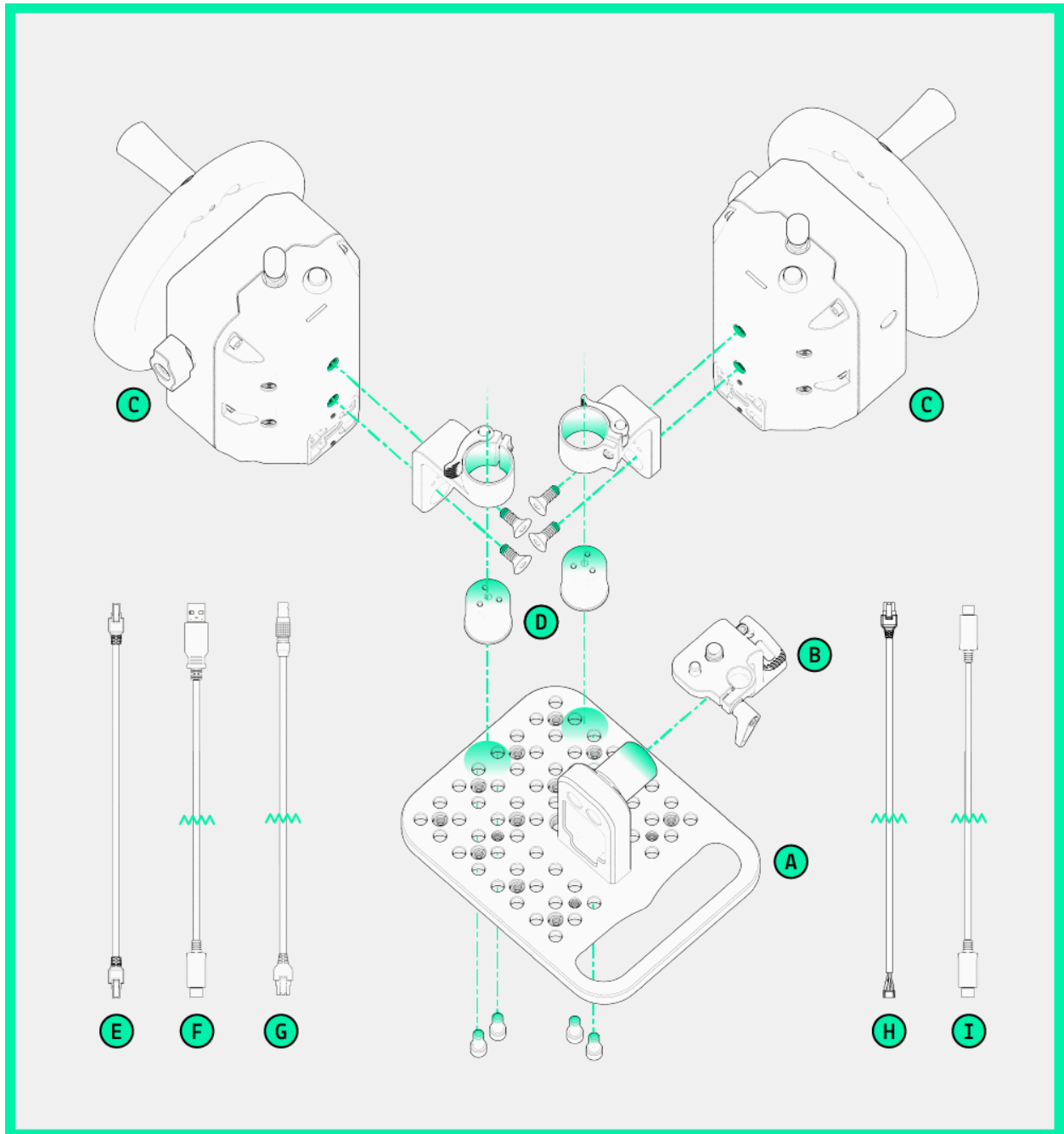
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Overview

System Description



- A - Cheeseplate
- B - MōVI Controller Mount Bracket
- C - MōVI Wheel Module (2)
- D - Quick Release 25mm Post

- E - CAN Cable (250mm) - Module to module communication
- F - USB Cable (USB C to USB A) - Power and firmware update
- G - MōVI Controller to Wheel Cable
- H - MIMIC to Wheel Cable
- I - USB Cable (USB C to USB C) - external power for MIMIC or module

How to Get More

If you would like to order additional parts or accessories, they are available at the [Freefly store](#).

910-00333-S/B/C MōVI Wheel - 1 axis (Stainless/Brass/Cutout)

910-00331 CAN Cable (250mm)

910-00332 MōVI Controller to Wheel Cable

910-00334 Quick Release 25mm post

910-00330 Brass Wheel

910-00339 Cutout Stainless Steel Wheel

910-00378 Ball-End Hex Driver 5/32"

910-00379 Ball-End Hex Drive 3/16"

Future features

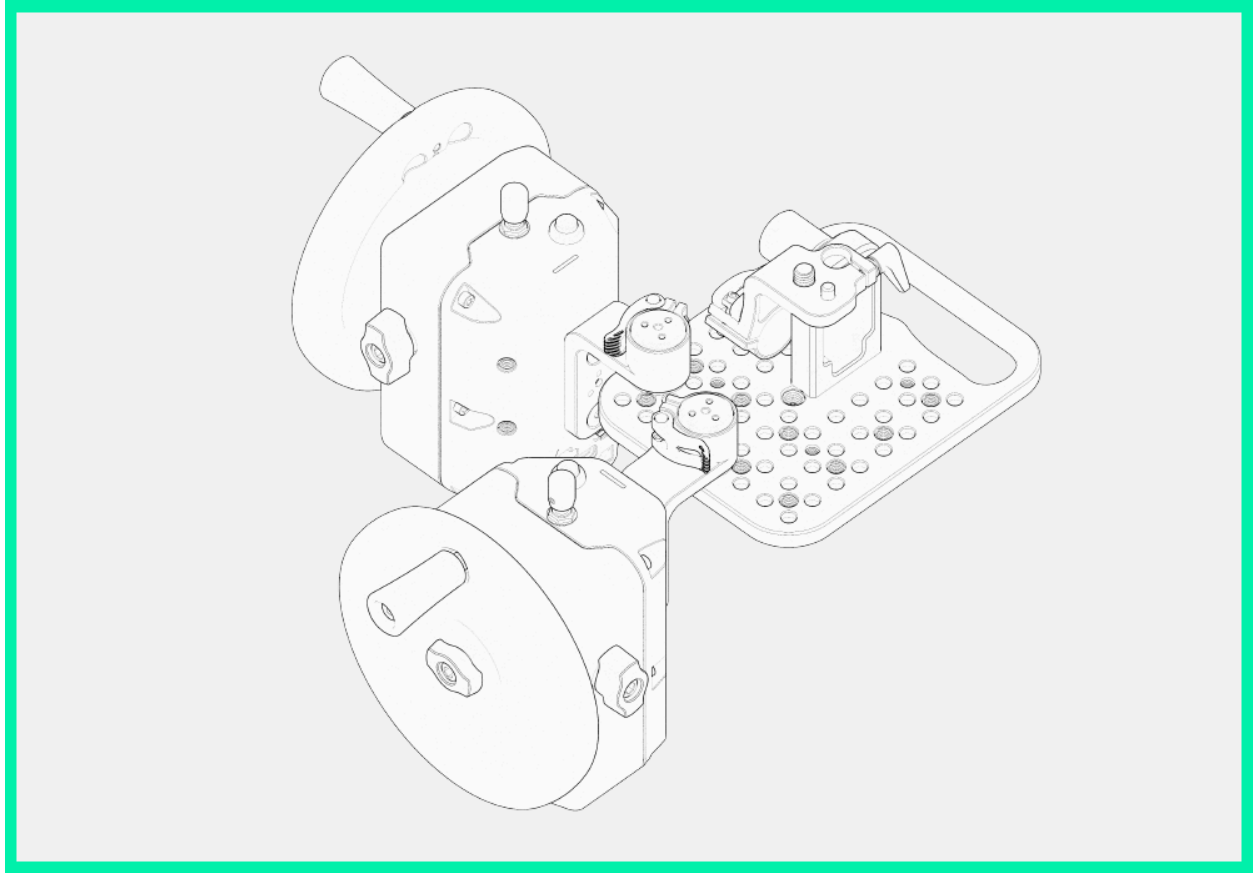
MIMIC support and control of the roll axis will be released by the end of November.

Setting Up

Quickstart

Mechanical Setup

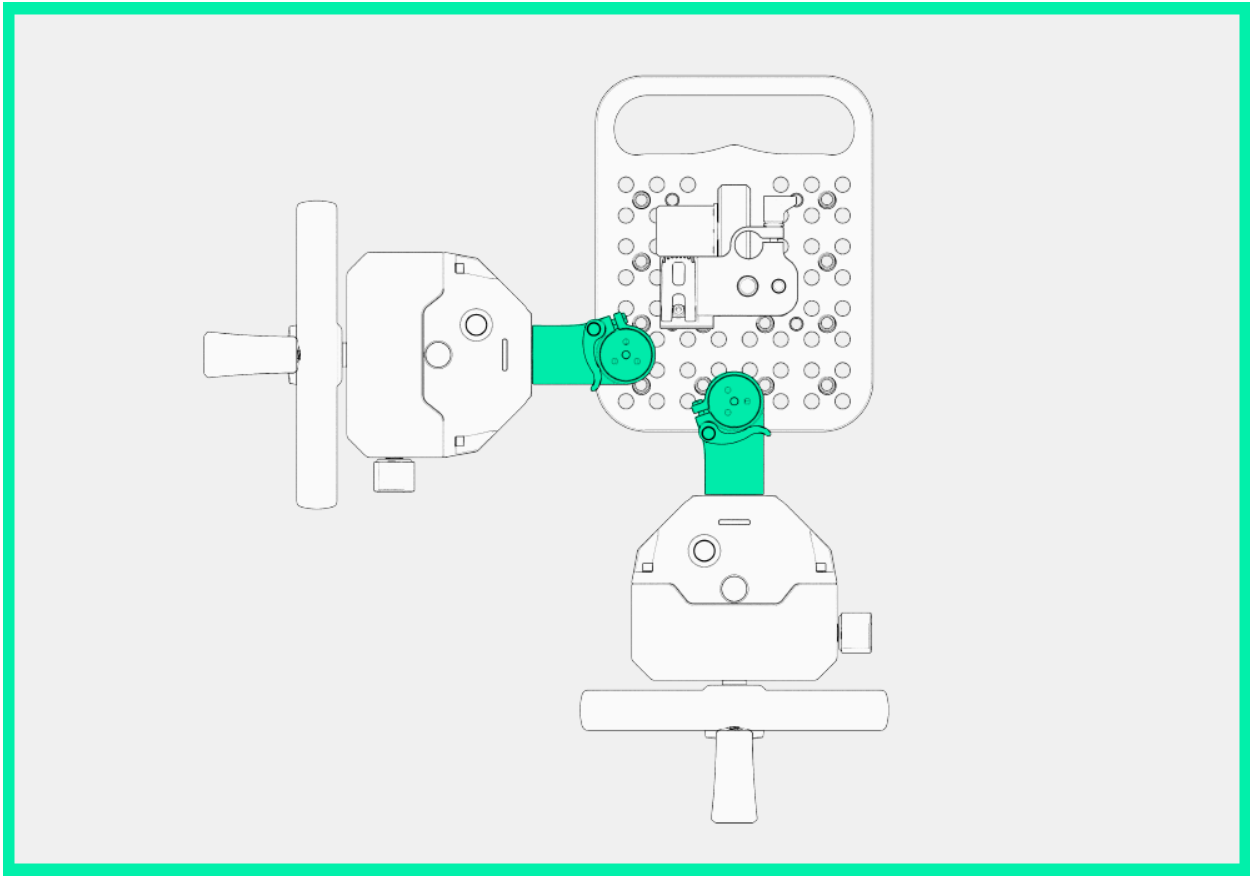
If you've purchased a two-module package, your wheels are already assembled. Simply lift the assembly out of the foam packaging and attach it to your tripod mounting plate via the cheese plate.

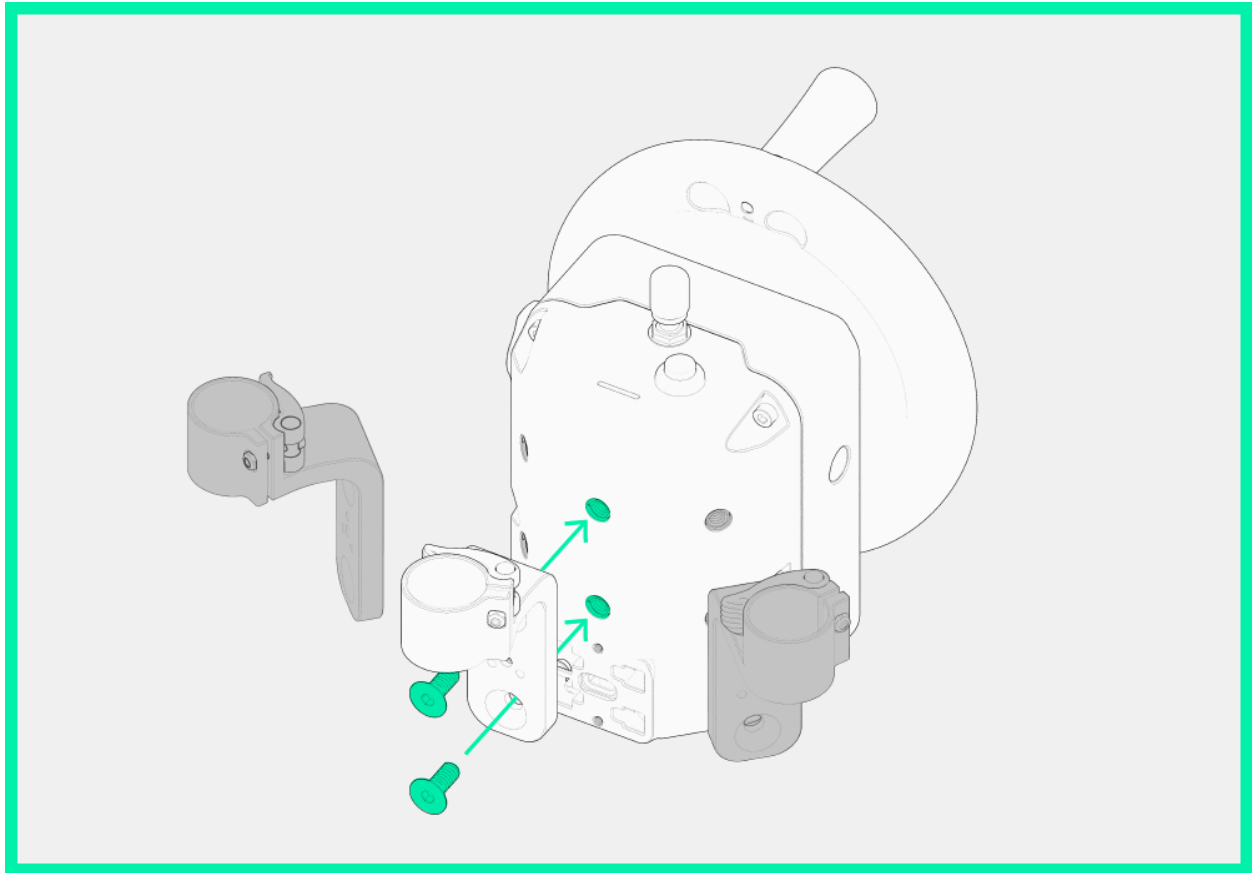


The cheeseplate has $\frac{1}{4}$ " counterbored holes in a 15mmx15mm grid pattern for mounting quick release posts. It also has $\frac{1}{4}$ "-20 threaded holes and pair of $\frac{3}{8}$ "-16 holes for mounting to tripod plates and accessories of your choice.

Quick release posts are used to mount MōVI Wheels and MōVI controller to the cheeseplate via the included clamping quick release post brackets. The quick release posts are 25mm in diameter and can be positioned anywhere on the cheeseplate via the 15mm grid pattern.

To adjust the locations of MōVI Wheels, you can either change placement of the quick release posts or loosen the clamp and rotate them. Additionally, you can pick any of the 3 faces on the rear of the wheel module to mount the quick release post bracket.

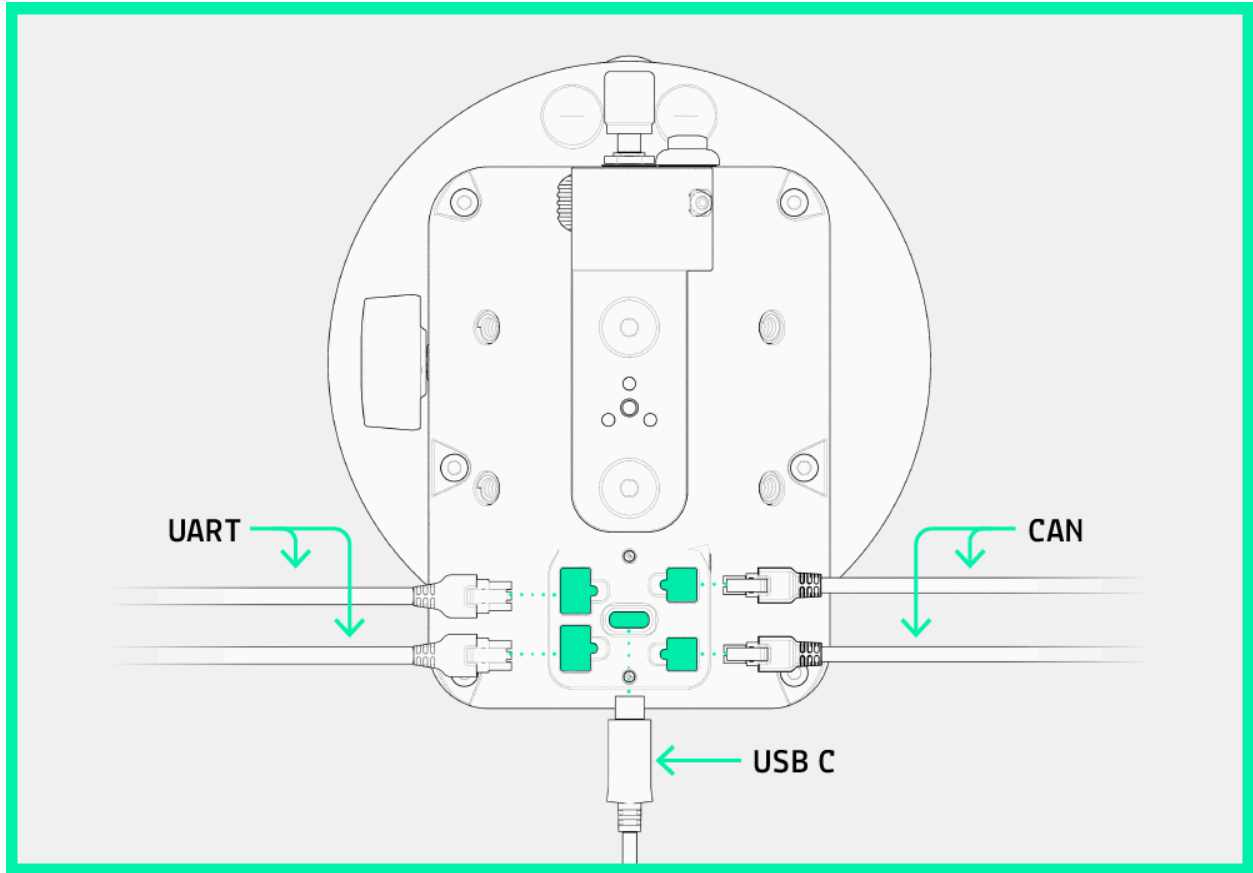




The MōVI controller is also attached to a quick release post bracket so that it can be easily lifted out of the way during setup and battery swap.

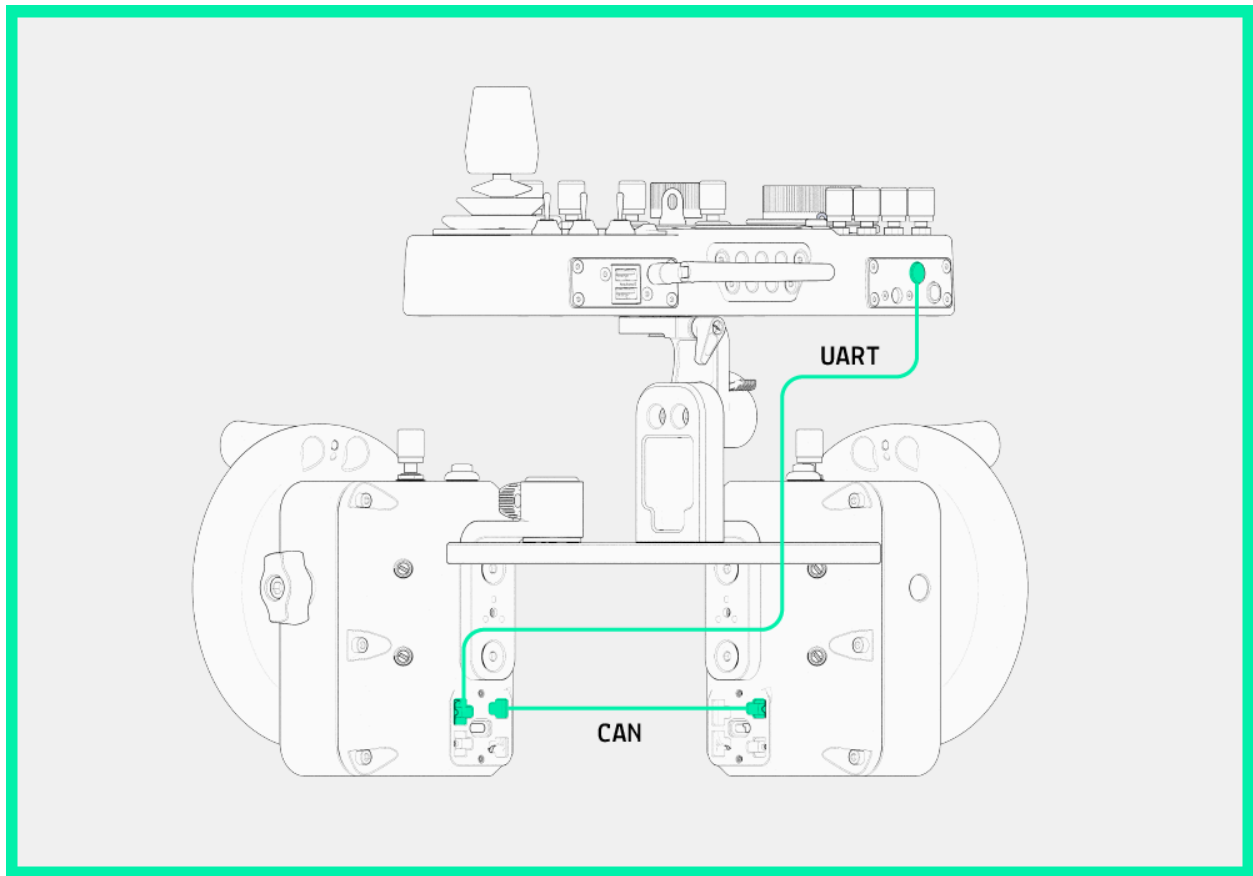
Cabling

The assembly provided has the CAN chaining cable installed. You will need to select a controller to wheel data cable depending on whether you're using a MōVI Controller or MIMIC.



The CAN cables can be plugged into either four-pin port. MōVI Wheel to controller cables can be plugged into either six-pin port. There is also a USB port for external power and firmware updates. To chain multiple units, connect them together using the CAN cables, ensuring one unit is connected to the controller.

Integration into MōVI Controller



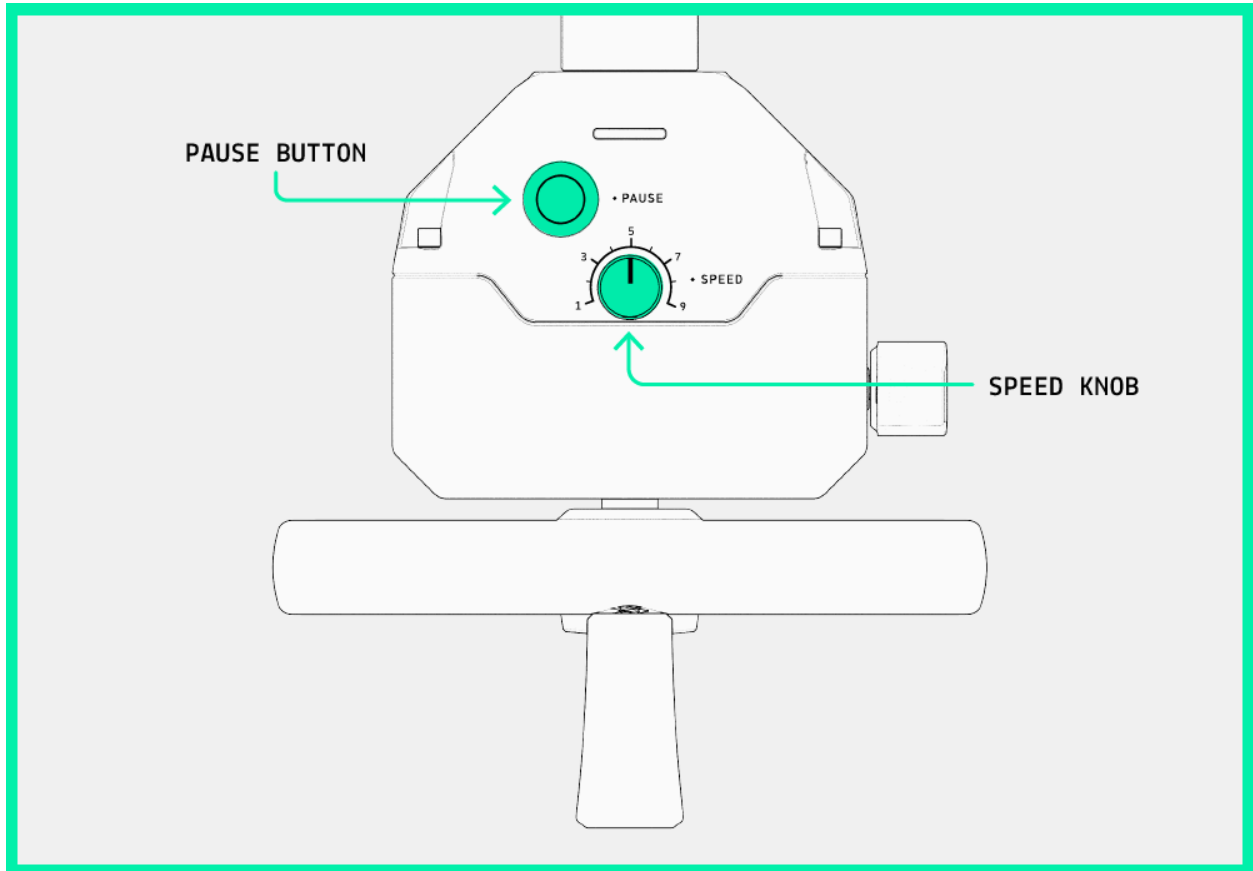
Follow the steps below to set up MōVI Wheels with a MōVI controller:

1. Update to MōVI Controller firmware version 3.7.0 or later
1. Set MōVI Controller mode
 - Go to the TX Config screen
 - Change TX mode to “Movi Wheels”
 - Change TX Action to “Save” and press with “menu set” knob to perform the action. This will ensure MōVI Controller is still in Wheels mode the next time it is powered on.
2. Plug in MōVI Wheels
 - Confirm the wheels are connected by checking to see if they are listed in the TX Config screen.
3. Map Wheels
 - Select a wheel (e.g. “Wheel 1”) in TX Config screen
 - Rotate the “menu set” knob to select the mapping
 - Once mappings are selected, select “Save” at the top of the menu to ensure changes remain the next time MōVI Controller is powered on.
4. Turn off filtering
 - For the best performance, zero the MōVI’s joystick pan and tilt “Window,” “Smoothing,” and “Expo” settings. Starting at MōVI Pro Firmware version 2.0, these settings are set automatically when you are in “FF Wheels” mode and have wheels connected. See Settings section below for more details.

Pause Button and the Speed Knob

The button is used to pause and unpaue wheel communication. The handwheel can continue to turn, and when the module is unpaused, motion in your MōVI will resume without jumping or catching up.

The knob is used for adjusting the speed of the gimbal compared to the speed of the wheel.



Using MōVI Wheels

Firmware Update

To update the firmware of your MōVI Wheels module, connect it to your computer through the provided USB cable.

1. Download the latest firmware from the [support page](#).
2. Plug in the USB cable to your computer.
3. Turn off the wheel module, and disconnect all cables.
4. Press the pause button while, at the same time, plugging the USB cable into the wheel module.
5. The LED should turn purple, this means the wheel module is in “firmware update” mode.
6. The wheel should appear on your computer as a storage drive called “FF-Wheels”
7. Drag the firmware file into the “FF-Wheels” drive.
8. Unplug the USB cable, and then **plug it back in**.
9. The wheel will then update firmware and reboot.
10. On successful update, the LED will blink green. On a failed update, the LED will blink red.

Each wheel module must be updated separately.

Care and Cleaning

MōVI Wheels are designed with harsh environments in mind, and with proper care can withstand extreme temperatures, dust/sand, and water.

In order to keep your MōVI Wheels working at optimal performance, wipe them dry with a clean towel before storing them. We do not recommend powering the modules while they are submerged or very wet. If your brass wheels become tarnished, we recommend *Pine-Ola Copper and Brass Polish* to restore them.

LED Colors

Color	Meaning
White, Blinks 3 times	Startup
White, Solid	Operating
Blue	Paused
Red	Error
Purple (Blinks green on success, Blinks red on failure)	Firmware Update

Settings and Defaults

Wheels Settings

Physical controls on the module

Setting	Range and Function
Speed knob	Controls speed
Pause	On/Off - pauses input from the module to the controller

Settings on the controller

Setting	How to Edit
Flip direction	Menu Set Knob press on a wheel in TX Config
Axis mapping	Menu Set Knob rotate on wheel in TX config

MōVI Settings

The following MōVI settings affect the feel and performance of MōVI Wheels operation.

Remote Rate Scale

This is the maximum rate at which MōVI can be commanded for pan, tilt and roll. This setting is useful for controlling the maximum rate possible on a joystick, but for use with MōVI Wheels we recommend setting it to it's maximum - 200 deg/sec.

Hold Strength

Hold strength values control how strongly each of MōVI's axes follows and holds the commanded position. Increase the hold strengths to increase responsiveness. Note: setting this value too high can result in oscillations.

Suggested values:

- 50-60 for MōVI Pro
- 15-25 for MōVI XL

Joystick Settings

Pan/Tilt Joystick Window, Smoothing and Expo settings are automatically set to zero when MōVI Controller is in TX Config: Freefly Wheels mode. This is to ensure MōVI Wheels are directly input without additional filters, enabling precision control of camera movement.

If you have other inputs to MōVI such as a spektrum controller, make sure you have windows set on the controller side to prevent slop or drift. In this mode, MōVI Controller does this by default.

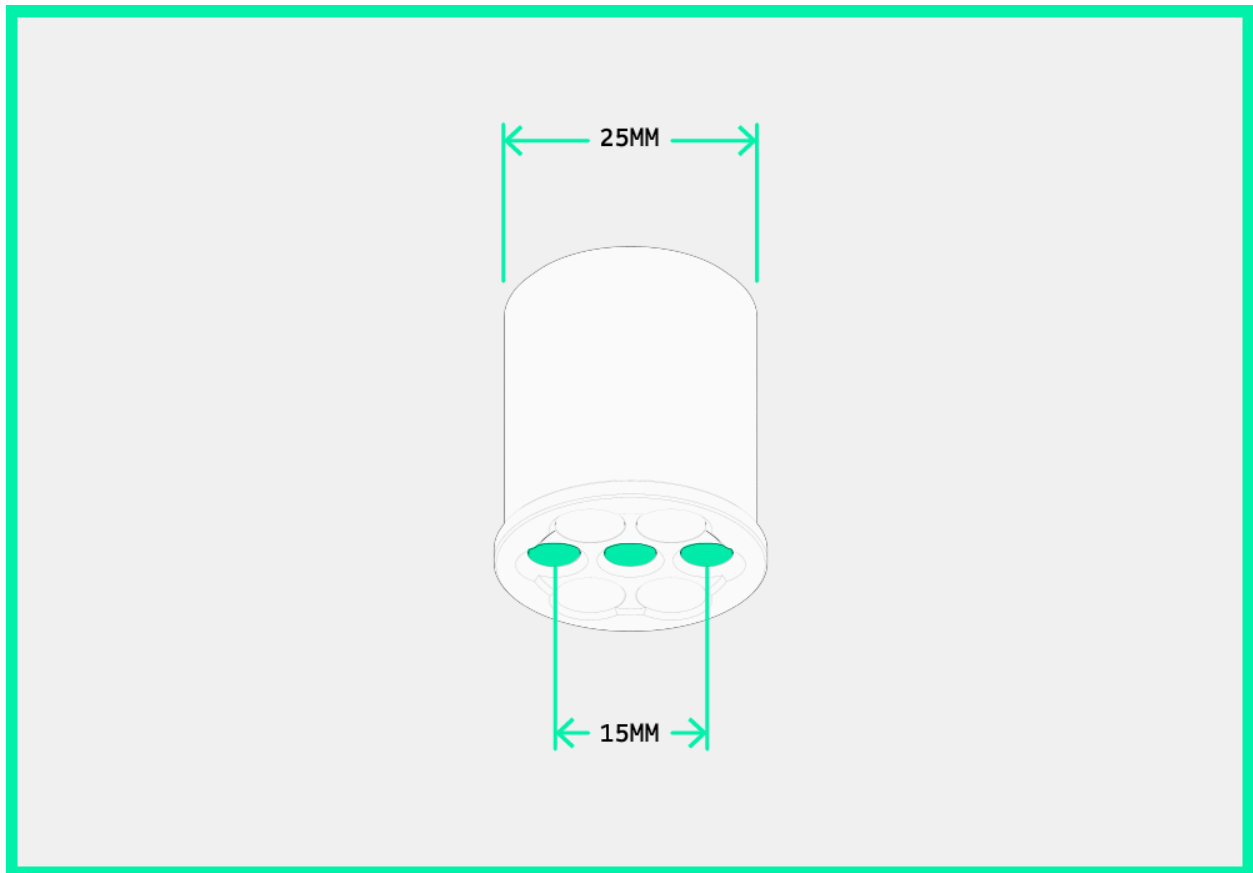
Interface Definitions

Quick Release Posts

25mm diameter

3x 1/4"-20 threaded holes (one centered, and two 15mm apart)

Bolt pattern for standard Freely Rosette



Brackets

2 included - MöVI Controller and Wheel Brackets

25mm clamping bore

2x 1/4" countersunk holes spaced 40mm apart

Works with standard Freely Rosette

Module

2x 1/4"-20 at 40mm spacing (on 3 faces)

1x 1/4"-20 on underside

Cabling

5 cables included:

- 850-00272 CAN to CAN (250mm) - Module to module communication
- 850-00271 UART to MC AUX LEMO (500mm) - Module to MöVI Controller

- 850-00257 USB-C to USB-C (1m) - For Providing Power to Modules & MIMIC
- 850-00270 UART to MIMIC UART (500mm) - Module to MIMIC
- 850-00286 USB-C to USB-A (450mm) - For Providing Power to Modules & MIMIC; also used for Module Firmware update.

Extra cables are available at the [Freefly store](#).

Module Electrical Interface

Six-pin microfit serial ports (UART)

- Two per module
- 5V tolerant
- Custom pinout

Four-pin microfit CAN ports

- Two per module
- 12V-24V
- Custom pinout

USB C 2.0 port

- One per module
- 5V tolerant

Troubleshooting

Support and Knowledgebase

[Support request form](#)

[Knowledgebase reference articles](#)

[Freefly Forum](#)

Troubleshooting Guide

My MōVI is Not Moving!

- Do you have all modules connected to each other and the controller?
- Make sure “Mode” is set to “Dual”
- Make sure “TX Mode” is set to “FF Wheels”
- Check the MōVI Controller or gimbal manual (available [on our website](#)) for troubleshooting connectivity
- Reboot the controller
- Check the cable connections (unplug and replug)

Not Turning On

Make sure your unit is plugged into the controller and that the controller is powered on.

Red Light

This means there has been an error.

- Check the cable connections (unplug and replug)
- Power cycle the controller
- Make sure controller has enough battery power

MōVI has Poor Performance with MōVI Wheels

See [recommended settings](#)

Check the MōVI Controller or gimbal manual (available [on our website](#)) for troubleshooting connectivity.

Technicals

Disclaimer and Warning

IMPORTANT - Please read this disclaimer and warning carefully and review the MōVI Wheels Operation Manual prior to use. If you have any questions, please contact support@freeflysystems.com prior to using MōVI Wheels. You can review the most current version of this Operation Manual at www.freeflysystems.com/software-manuals/.

By using MōVI Wheels, you acknowledge that you have read, understand, and agree to this disclaimer. You agree that you are solely responsible for your conduct while using MōVI Wheels and for any direct or indirect consequences that may result from its use.

Freefly Systems reserves the right to revise this User Manual and make changes from time to time without obligation to notify any persons of such revisions or changes. In no event shall Freefly Systems, its employees or authorized agents be liable for any damages or losses, direct or indirect, arising from the use of any technical or operational information contained in this document.

- Always check Wheels and its components prior to operation.
- Always maintain awareness of your surroundings when operating MōVI Wheels.
- It is your responsibility to perform a full system check of MōVI Wheels prior to every use.
- It is your responsibility to learn how to safely operate MōVI Wheels.
- MōVI Wheels is a tuned system with custom integrated components. Modification to, removal, or substitution of MōVI Wheels components will void the warranty.
- It is your responsibility to create shots that amaze the world.

Limitation of liability

IN NO EVENT SHALL FREEFLY SYSTEMS BE LIABLE TO THE BUYER FOR ANY INDIRECT, CONSEQUENTIAL, PUNITIVE, INCIDENTAL, OR SPECIAL DAMAGES, OR ANY DAMAGES WHATSOEVER RESULTING FROM THE USE OF PRODUCT OR FROM LOSS OF USE, DATA OR PROFITS (HOWEVER CAUSED AND UNDER ANY THEORY OF LIABILITY), EVEN IF FREEFLY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL FREEFLY'S LIABILITY FOR A PRODUCT (WHETHER ASSERTED AS A TORT CLAIM, A CONTRACT CLAIM OR OTHERWISE) EXCEED THE

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Freefly shall not be liable for damages or injuries incurred directly or indirectly from the use of MōVI Wheels including, but not limited to, the following situations:

- Failure of operator to follow proper instructions and safety warnings found at www.freeflysystems.com.
- Failure of the operator to understand and operate the gimbal within the operating limitations described in this manual.
- Failure of the operator to follow onboard safety warnings while using MōVI Wheels .
- Failure of the operator to inspect MōVI Wheels and its components prior to operation.
- Failure of the operator to properly maintain and/or service MōVI Wheels through an authorized Freefly Service Center with genuine MōVI Wheels parts.
- Use of third-party products on MōVI Wheels .
- Use of MōVI Wheels in unsafe conditions, including but not limited to, bad or severe weather, such as rain, wind, snow, lightning, dust storms, etc.
- Improper operation, misjudgment or risky behavior while using MōVI Wheels .
- Infringement of third party data, audio or video rights recorded when using MōVI Wheels.

Warranty

Specifications

Freefly warrants all products will be of good quality and workmanship and free from material defects. Upon the expiration of the time periods below, all liabilities of Freefly will terminate. In no event shall Freefly be liable for consequential damages. Freefly may use refurbished parts for repairs or replacements. Certain products may be subject to a separate software license agreement.

Standard Warranty

A Standard Warranty is granted to the original purchaser by Freefly for a period of one (1) year, parts and labor. The Standard Warranty does not apply to MōVI Pro Battery Packs. The Standard Warranty covers parts and labor charges for Product that has been returned with

pre-paid shipment to an Authorized Service Center by Buyer. Service or replacement decisions are at the sole discretion of Freefly. Proof of purchase is required for warranty claims. All warranty returns shall be done in accordance with Freefly's warranty Return Merchandise Authorization ("RMA") policy, which can be found on our website. Any repaired or replaced Product shall be warranted as set forth in this section for a period the greater of (a) the balance of the applicable warranty period relating to such Product or (b) ninety (90) days after it is received by Buyer. Only the components that were repaired or replaced will be eligible for the 90-day period as set forth above. The Standard Warranty effective date is the date of "ex works" from Woodinville, Washington.

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Product that no longer qualifies for Warranty Repair may be sent to an Authorized Freefly Service Center subject to an evaluation fee. Freefly will provide a quotation for the repair of the Product. The Customer is responsible for all costs associated with such refurbishment, such as troubleshooting, diagnosis, repair, test, calibration, storage, and shipping costs. The evaluation fee will be applied to the cost of the refurbishment if the cost of the refurbishment is greater than the evaluation fee. Any repaired or replaced product shall be warranted for ninety (90) days after it is received by Buyer. Only the components that were repaired or replaced will be eligible for the 90-day period. Any parts replaced by Freefly during non-warranty repair are the property of Freefly and will not be returned to Buyer. Freefly may use refurbished parts for non-warranty repair.

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