



MōVI XL

OPERATION MANUAL

770-00051 | REVISION A | 5.19.2017

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MōVI XL and all other Freefly products, please visit

<http://freeflysystems.com/software-manuals>



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REVISION HISTORY

REVISION	DATE	DESCRIPTION
A	May 2017	Initial Release

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TERMINOLOGY

2.4 GHz	An industrial, scientific, and medical (ISM) radio band (2.4-2.5GHz) that is used for radio control.
Accelerometer	An accelerometer is a device that measures the force per unit mass acting on an object, including the force of gravity.
BLE	Bluetooth Low Energy (BLE) is a low power and application friendly version of Bluetooth.
Center of Gravity (CG)	The point about which an object is balanced. A force applied to the CG causes the object to move without rotation.
DSMX	A UART-based serial protocol used by Spektrum radio control systems.
ESC	Electronic Speed Controller (ESC) is an integrated module that controls brushless 3-phase motors by regulating the input power to the motors.
FIZ	An acronym referring to a lens's Focus, Iris, and Zoom.
FPS	Frames Per Second (FPS) also known as frame frequency, is the frequency at which an imaging device displays consecutive images called frames.
FRX	Freely Receiver (FRX) refers to the receiver that is used for communication between the MōVI XL and the MōVI Controller.
Function Side	The side of the connector that interfaces with another connector.
GCU	Gimbal Control Unit (GCU) refers to the MōVI XL's central processor and housing, which is attached to the pan arm.
GPS	Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 31 satellites that can be used to determine global position.
Gyroscope	Gyros are sensors that measure the angular velocity of an object they are mounted on.
HACC	A GPS value indicating the horizontal accuracy (HACC) of the position fix.
HDMI	High-Definition Multimedia Interface (HDMI) is an audio/video interface for transferring uncompressed video data and compressed or uncompressed digital audio data.
INS	An inertial navigation system (INS) is an electronic device that measures and reports a body's specific force, position, angular rate, and sometimes the magnetic field, using a combination of accelerometers, compasses, magnetometers, gyroscopes, and GPS.
LOS	Loss of Signal (LOS) refers to a condition where radio control inputs or telemetry are not present.

MEMS	Acronym referring to MicroElectroMechanical Systems (MEMS).
Mitchell Mount	Mitchell mount is an industry standard mounting method for cinema equipment.
RCP	REDLink Command Protocol (RCP) is the unified command protocol used for the RED EPIC and SCARLET cameras, regardless of sensor type.
RX	RX is an acronym for receive, receiver, or reception.
S.Bus	A UART-based serial protocol used by Futaba radio control systems.
Solder Side	This is the side of the connector where the wires are soldered to the connector.
TSU	Tilt Stage Unit (TSU) is the platform underneath the camera mount on the MöVI XL that provides orientation feedback to the GCU and can provide power and control to the camera and mounted accessories.
TX	TX is an acronym for transmit or transmitter.
UART	A Universal Asynchronous Receiver/Transmitter (UART) is a block of circuitry responsible for implementing serial communication.



OVERVIEW

DISCLAIMER AND WARNING

IMPORTANT - Please read this disclaimer and warning carefully, and review the MōVI XL Gimbal Operation Manual prior to use. If you have any questions, please contact support@freeflysystems.com prior to using the MōVI XL.

You can review the most current version of this Operation Manual at www.freeflysystems.com/software-manuals.

By using MōVI XL, 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 XL and for any direct or indirect consequences that may result from its use.

Freefly Systems reserves the right to revise this Operation 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 MōVI XL and its components prior to operation.
- » Always maintain awareness of your surroundings when operating MōVI XL.
- » It is your responsibility to perform a full system check of MōVI XL prior to every use.
- » It is your responsibility to learn how to safely operate MōVI XL.
- » MōVI XL is a tuned system with custom components selected for each application. Modification to, removal, or substitution of MōVI XL components will void the warranty.
- » It is your responsibility to create shots that amaze the world.

BATTERIES AND CHARGING

You must read these safety instructions and warnings carefully before charging or using your MōVI XL Battery Pack. Failure to exercise caution while using the MōVI XL Battery Pack, a Lithium Polymer (LiPo) battery, and failure to comply with the following warnings can result in battery malfunction, electrical issues, excessive heat, fire, personal injury, and/or property damage.

BATTERY SAFETY AND WARNINGS

You must read these safety instructions and warnings carefully before charging or using the MōVI XL Battery Pack. Improper use may result in damage to the batteries, severe personal injury, and even fire.

- » Do not leave the MōVI XL Battery Packs and charger unattended during use.
- » Stop using or charging the MōVI XL Battery Pack immediately if the battery pack becomes or appears damaged, starts to balloon or swell, leaks, becomes deformed or gives off an odor, exceeds a temperature of 140°F (60°C), or if anything else abnormal

occurs. Disconnect the battery and observe in a safe area outside of any building or vehicle for at least 45 minutes, as a damaged battery can experience a delayed chemical reaction that could possibly result in fire.

- » Never disassemble, modify, puncture, shock, crash, short circuit, and/or expose the MōVI XL Battery Packs to a flame. Leakage, smoke emission, ignition, explosion or fire can occur, which may result in personal injury or property damage.
- » Never drop the charger or MōVI XL Battery Packs.
- » Never allow an electrical short between the battery's positive and negative terminals.
- » Never allow minors to charge or use MōVI XL Battery Packs without adult supervision.
- » Never allow MōVI XL Battery Packs to come in contact with moisture at any time.
- » Never charge or store MōVI XL Battery Packs in extreme heat (40°C) or cold (0°C). Recommended temperatures for storage are between 10°-26°C. High temperatures may cause fire, even with undamaged MōVI XL Battery Packs.
- » Never leave MōVI XL Battery Packs in an automobile or direct sunlight.
- » Never place or carry MōVI XL Battery Packs in your pockets or clothing.
- » Do not store MōVI XL Battery Packs that are fully charged for long periods of time.
- » MōVI XL Battery Packs should be stored in a vented, fire-proof container. No more than two MōVI XL Battery Packs should be placed in a container to avoid chain reactions. Storage temperatures should not fall below 32°F/0°C or above 86°F/30°C.
- » Damaged batteries are extremely sensitive to temperature fluctuation and care should be taken in their immediate disposal.
- » Do not charge MōVI XL Battery Packs to more than 4.25V per cell, over-charging may lead to a reduced battery capacity.
- » Do not discharge MōVI XL Battery Packs past 3.3V per cell, over-discharging can lead to permanent battery damage. Batteries that have been damaged in this way should no longer be used to power MōVI XL.
- » Always discharge in a fireproof location.
- » In purchasing a MōVI XL Battery Pack, the buyer agrees to bear all responsibilities of the risks and not hold Freely Systems, its owners and employees, its distributors, and/or its retailers responsible for any accidents, injury to persons, and property damage. If you do not agree to these conditions, please return the MōVI XL Battery Pack to the place of purchase in a new and unused condition.



All instructions and warnings must be followed exactly. Mishandling of MōVI XL Battery Packs can result in fire. By handling, charging, or using the included MōVI XL Battery Packs, you assume all risks associated with MōVI XL Battery Packs. If you are not prepared to accept complete liability for the purchase and/or use of the batteries, you are advised to return them in new and unused condition to the place of purchase immediately.

CHARGING PROCEDURE SAFETY AND WARNINGS

You must read these safety instructions and warnings carefully before charging your MōVI XL Battery Packs.

- » Always charge MōVI XL Battery Pack with a qualified LiPo battery charger. An unqualified charger may cause damage to the batteries or a fire.
- » Never charge or use a MōVI XL Battery Pack that shows any damage or disfigurement of any kind, as this may be a sign of internal damage. Any damage to the protective cover or connector is also reason to discontinue use.
- » Never charge a MōVI XL Battery Pack unattended.
- » Always inspect MōVI XL Battery Packs before charging.
- » Never charge near moisture, extreme temperatures, flammable or combustible materials.
- » Never charge a MōVI XL Battery Pack while inside a vehicle.
- » Never attempt to charge a MōVI XL Battery Pack that is damaged or is completely “dead”.
- » Always monitor the temperature of the MōVI XL Battery Pack while charging. If the MōVI XL Battery Pack becomes hot to the touch or begins to deform, discontinue charging immediately. Disconnect the battery from the charger and observe it in a safe place for at least 45 minutes.

BATTERY DISPOSAL PROCEDURE

LiPo batteries require special handling for safe disposal. The following steps must be taken to avoid damage or injury to yourself, your property or anyone who comes in contact with the battery.

1. Contact your state or local HAZMAT agency to inquire about disposal procedures for LiPo batteries with battery management systems.
2. Follow any instructions provided by your state or local HAZMAT agency for the disposal of LiPo batteries.



Do not transport or ship batteries which have more than 1.0V per cell charged or show signs of damage without following the instructions given by the HAZMAT agency

LIMITATIONS 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 AMOUNTS PAID TO FREEFLY FOR SUCH PRODUCT. NOTWITHSTANDING ANYTHING HEREIN, IN NO EVENT SHALL FREEFLY'S LIABILITY FOR ALL CLAIMS ARISING OUT OF OR RELATING TO THIS AGREEMENT EXCEED THE AMOUNTS PAID BY BUYER TO FREEFLY FOR PRODUCT IN THE LAST TWELVE (12) MONTHS. IN NO EVENT WILL FREEFLY OR ITS LICENSORS BE LIABLE FOR COSTS OF PROCUREMENT OF SUBSTITUTE GOODS BY BUYER. IN NO EVENT WILL FREEFLY OR ITS LICENSORS BE LIABLE FOR DAMAGES ARISING OUT OF ANY LATE DELIVERY. THE LIMITATIONS SET FORTH HEREIN SHALL APPLY TO ALL LIABILITIES THAT MAY ARISE OUT OF THIRD-PARTY CLAIMS AGAINST BUYER. THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. THE LIMITATION SET FORTH IN THIS SECTION SHALL APPLY WHERE THE DAMAGES ARISE OUT OF OR RELATED TO THIS AGREEMENT.

Freefly shall not be liable for damages or injuries incurred directly or indirectly from the use of MōVI XL 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 XL.
- » Failure of the operator to inspect MōVI XL and its components prior to operation.
- » Failure of the operator to properly maintain and/or service MōVI XL through an authorized Freefly Service Center with genuine MōVI XL parts.
- » Use of third-party products on MōVI XL.
- » Use of MōVI XL 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 XL.
- » Infringement of third party data, audio or video rights recorded when using MōVI XL.

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 XL Battery Packs. The Standard Warranty covers parts and labor charges for Product that has been returned with shipment to an Authorized Service Center by the 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.

EXCLUSIVE BATTERY WARRANTY

Freefly warrants that MōVI XL Battery Packs purchased or included with the Product will be free from defects in materials and workmanship at the date of purchase by Buyer. Battery product warranty is limited to original defects in material and workmanship. Due to the nature and use of these batteries, there is no term warranty. Misuse, abuse, incorrect charging, failure to comply with applicable battery warnings and guidelines, and other inappropriate use of the batteries are not covered under this warranty.

WARRANTY LIMITATIONS

All Freefly warranties do not cover (a) maintenance, repair or replacement necessitated by loss or damage resulting from any cause other than normal use and operation of the Product in accordance with Freefly's specifications and owner's manual, including but not limited to: theft, exposure to weather conditions, operator negligence, misuse, abuse, improper electrical/power supply; (b) alterations, modifications, or repairs by Buyer or unauthorized third parties; (c) accident, disaster, improper handling or storage, droppage, modification, opening sealed components, use of third party accessories or acts of nature or any other peril originating from outside the Product; (d) transportation damage, lack of or improper maintenance, defective batteries, battery leakage; and (e) cosmetic damage or other non-operating parts. Removal or modification of sealed components, including but not limited to, motors or electronics, voids any and all warranties. Breaking the seal on any sealed components, including but not limited to motors or electronics, is prohibited and voids any and all warranties unless otherwise approved

by Freefly. Any parts replaced by Freefly during warranty repair are the property of Freefly and will not be returned to Buyer. Freefly may use refurbished parts for repairs or replacements.

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EXCEPT AS SPECIFICALLY SET FORTH ABOVE, FREEFLY AND ITS LICENSORS MAKE NO WARRANTIES, CONDITIONS, REPRESENTATIONS OR TERMS, EXPRESSED OR IMPLIED, WHETHER BY STATUTE, COMMON LAW, CUSTOM, USAGE OR OTHERWISE AS TO THE FREEFLY PRODUCT OR ANY COMPONENT THEREOF, INCLUDING BUT NOT LIMITED TO NON-INFRINGEMENT OF THIRD PARTY RIGHTS, INTEGRATION, MERCHANTABILITY, SATISFACTORY QUALITY, OR FITNESS FOR ANY PARTICULAR PURPOSE. FREEFLY AND ITS LICENSORS DO NOT WARRANT THE PERFORMANCE OR RESULT OF THE FREEFLY PRODUCT. THE SOLE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT FOR DEFECTIVE PARTS AS STATED ABOVE. THIS WARRANTY IS THE SOLE WARRANTY GIVEN BY FREEFLY AND IS IN LIEU OF ANY OTHER WARRANTIES EITHER EXPRESS OR IMPLIED. THIS WARRANTY EXTENDS TO THE BUYER AND IS NON-TRANSFERABLE TO OTHER THIRD PARTIES. FREEFLY SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY, REGARDLESS OF WHETHER SUCH CLAIM IS BROUGHT IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY, EVEN IF FREEFLY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE LIABILITY OF FREEFLY EXCEED THE INDIVIDUAL PRICE OF THE PRODUCT ON WHICH LIABILITY IS ASSERTED.

THIRD PARTY WARRANTY

Freefly does not honor warranty agreements extended by third parties. Only warranty agreements granted by Freefly will be honored by Freefly.

NON-WARRANTY REPAIR

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.

LAW GOVERNING

These terms are governed by Washington State law (without regard to conflict of law principles or the United Nations Convention on Contracts for the International Sale of Goods.) Freefly reserves the right to change or modify this warranty at any time without notice. For up-to-date warranty information, visit www.freeflysystems.com

INTRODUCTION

The Freefly MōVI XL represents the next generation of digital 3-axis stabilization systems. Designed and built with the goal of creating the world's most versatile camera movement system, the MōVI XL will revolutionize and democratize the creation of professional motion picture content. Using active and inertial stabilization the MōVI XL allows filmmakers precise, intuitive, and creative control of the camera; and its new features grant even more possibilities to create world-class content quickly and easily.

This manual will teach you how to set up, balance, and tune your MōVI XL. It also includes detailed descriptions of the MōVI XL's features and capabilities to familiarize you with the possibilities of using it in conjunction with the rest of the Freefly ecosystem of products.

WARNINGS, CAUTIONS AND NOTES

Throughout the manual, warnings, cautions and notes are used to highlight various important procedures. These are defined as follows:



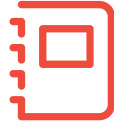
WARNING

Warnings are used to highlight procedures which, if not strictly observed, may result in personal injury or loss of life.



CAUTION

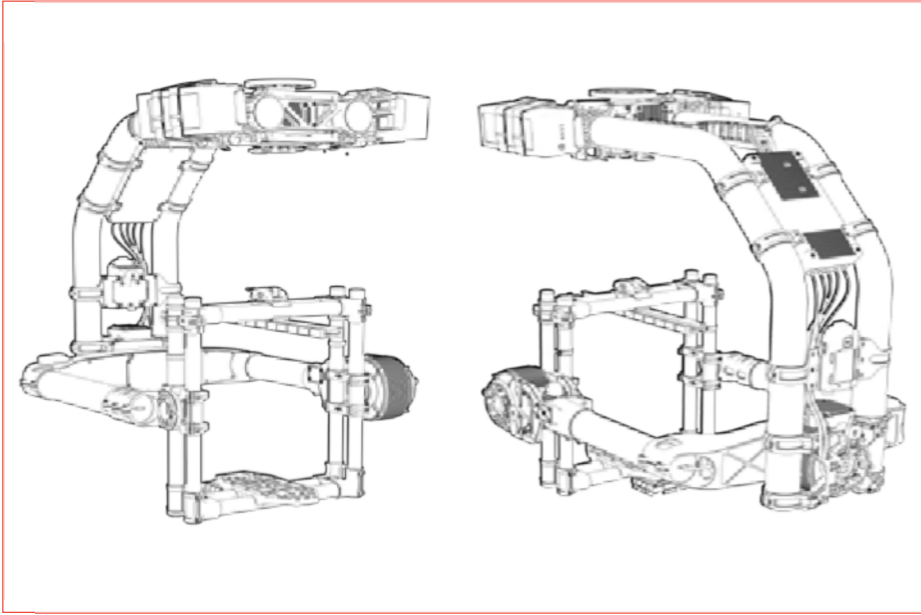
Cautions are used to highlight procedures which, if not strictly observed, may cause damage to equipment.



NOTE

Notes are used to highlight specific operating conditions or steps of a procedure.

FEATURES



MECHANICAL FEATURES

- 1. High Torque Lightweight Motors** In-house electric motor design is the key to the powerful and lightweight motors that let the MōVI XL capture stable shots even in the most demanding environments.
- 2. 100MPH** Custom motors, drives, and high power batteries let MōVI XL hit speeds of up to 100mph (160km/h) without sacrificing control or stability.
- 3. Wireless** MōVI XL's power and control systems are completely self-contained, granting unrestricted movement between mounts without the loss of gimbal power or control.
- 4. Quick Release** Use the MōVI XL's optional quick release to move from shot to shot while not sacrificing precious time or gimbal security.
- 5. Travel Ready** Designed with travel in mind, the MōVI XL makes setup and pack-down a cinch. Its custom travel case fits everything you need and uncomplcates any trip.
- 6. Modular Construction** Freely's modular design principles allow users to tweak, tune and adjust the MōVI XL to meet the needs of any shot.
- 7. Durable/Tough/Rugged (IP 52)** Designed as a precision instrument that likes to play in the mud; the MōVI XL has the toughness to withstand every environment from the set to the back-country.

POWER FEATURES

- 8. Intelligent Batteries** MōVI XL Battery Packs come with built-in power indicators, intelligent storage self-discharge, and balancing functions.
- 9. 1500W Peak Power** Top to bottom custom electronics give MōVI XL the capability of providing 600 W of continuous power and up to 1500 W of peak power.
- 10. Camera and Accessory Power** Using the combined power of two 10Ah batteries; the MōVI XL can power itself, the camera, and more for up to five hours.

CONTROL FEATURES

- 11. Custom Motor Drives** Freely's pioneering sinusoidal motor drives found on the MōVI Pro and Alta create the foundation of the MōVI XL's custom motor drives and give it the ability to deliver 500W peak power while maintaining perfect control.
- 12. MIMIC** MIMIC is at the heart of MōVI XL and allows users long range bidirectional control of MōVI orientation, settings, camera controls, and real time telemetry.
- 13. PILOT** The filmmakers multi-tool; small, versatile, and completely customizable, Pilot gives users the means they need to capture any shot with MōVI XL. Users will have long range bidirectional control of MōVI orientation, settings, camera controls, and real time telemetry.
- 14. REDLink Command Protocol** Integrated REDLink Command Protocol grants users full control over RED camera adjustments, even when the user is hundreds of feet away from the camera.
- 15. Built in FIZ and Power** Utilizing the world's smallest fully integrated 3-axis FIZ controller, the MōVI XL reduces shooting weight and FIZ setup time with all industry standard motors while also providing uninterrupted power to the camera.

SOFTWARE FEATURES

- 16. MōVI XL App** Users can connect to their MōVI XL instantly from within the Android or iOS app to update, tune, adjust, and monitor the MōVI XL.
- 17. Instant Booting** Advances in sensor initialization allow ultra fast boot times; maximizing productivity and minimizing downtime.
- 18. Autotuning** Tuning gains is now a thing of the past; MōVI XL features a high performance tuning algorithm that achieves optimum filters and stiffness in ~10 seconds.
- 19. Stability** MōVI XL updates camera orientation one thousand times per second. This means stable shots in the most demanding environments.

SPECIFICATIONS

DIMENSIONS

MōVI XL	664 x 507 x 700mm (L*W*H)
Camera Cage	399 x 255 x 289mm (L*W*H)

MECHANICAL

Pan Range of Motion	360° Continuous Rotation
Tilt Range of Motion	Software adjustable up to +90°/-170°
Roll Range of Motion	Software adjustable up to ±90°
Max Pan Rate	200°/s
Max Tilt Rate	200°/s
Max Roll Rate	200°/s
Weight	11kg
Max Payload	23kg
Max Operating Speed*	160 kph
	*Varies based on mounting and payload
Operating Temperatures	-20°C to 50°C
Ingress Protection	IP52, resistance to dust and dripping water
Mounting System	MōVI XL Quick Release, Mitchell Mount
Materials	Carbon Fiber, 6061-T6 Aluminum, Glass Reinforced Polymers

ELECTRONICS

Data Logging Rate	5, 10, and 25 Hz
Connections	Bluetooth Low Energy v4.2 and 2.4GHz Custom FHSS Radio
Motor Type	Direct-drive 3-phase Brushless
Rotor Magnet Material	Neodymium
Peak Motor Power	1300W
Data Storage	microSD

Port Types

GCU ports -

COM1, 12V, COM 2

TSU Ports -

LTC Timecode In/Out, EXP, CANbus + Battery Voltage,
CAM, 12-14V CAM, 12V AUX, F, I, Z, USB Type C

Aux Ports -

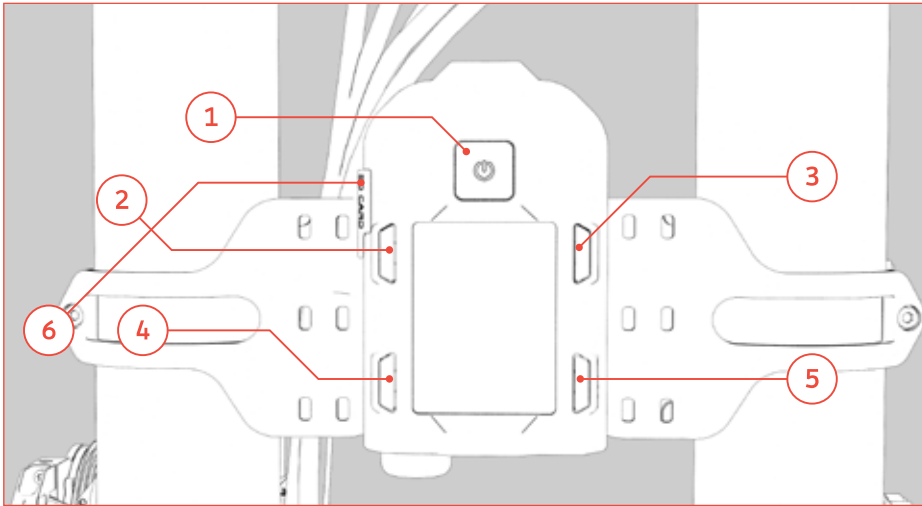
Auxiliary Power

BATTERY

Nominal Battery Voltage	22.2V
Max Battery Voltage	25.2V
Battery Capacity	10000 mAh
Cells	6 Cells
Max Battery Quantity	2 Battery
Min Battery Quantity	1 Battery*
*Using a single battery may decrease performance	
Max Continuous Discharge Rate (Per Pack)	25C
Max Peak Discharge Rate (Per Pack)	50C

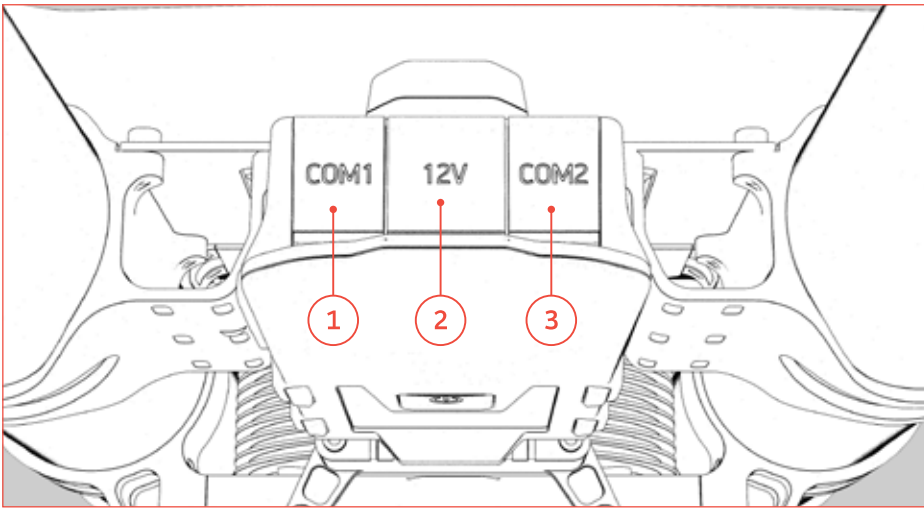
GCU AND TSU LAYOUTS

VV



GCU LAYOUT

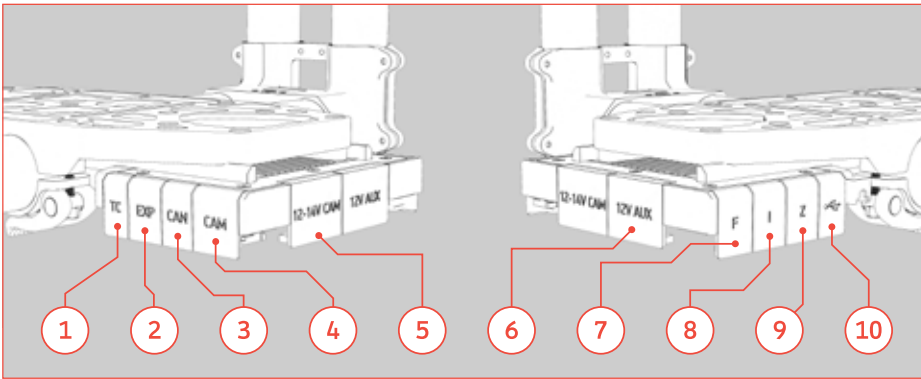
- 1. Power Button
 - a. Push (ON)
 - b. Hold (OFF)
 - c. Double Tap (Pause/Resume)
- 2. Back Button
- 3. Forward Button
- 4. Select Option (-)
- 5. Select Option (+)
- 6. microSD Card Slot



GCU CONNECTOR LAYOUT

- 1. COM 1
- 2. 12V
- 3. COM 2

TILT STAGE UNIT



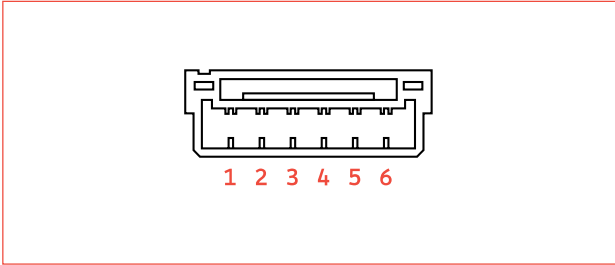
TSU CONNECTOR LAYOUT

- | | |
|------------------|---------------|
| 1. TC | 6. 12V 2A AUX |
| 2. EXP | 7. Focus |
| 3. CAN | 8. Iris |
| 4. CAM | 9. Zoom |
| 5. 12-14V 6A CAM | 10. USB C DRP |

GIMBAL CONTROL UNIT CONNECTORS AND PINOUTS

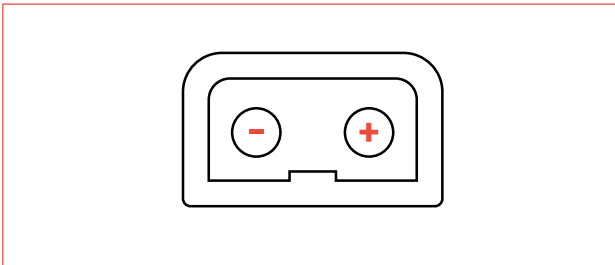
All connector pinouts are shown looking into the function side of the connectors on the GCU and TSU, unless stated otherwise.

CONNECTOR: **COM 1**
TYPE: **JST GH 6-PIN**



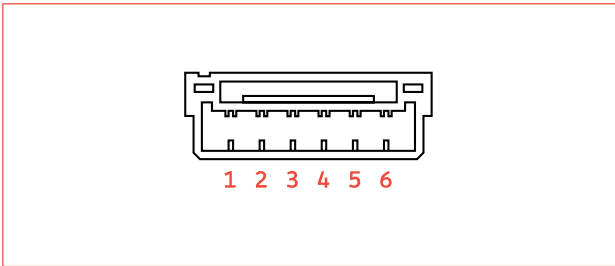
1. GND
2. +5V
3. UARTn_TX
4. UARTn_RX
5. UARTn_CTS
6. UARTn_RTS

CONNECTOR: **12V**
TYPE: **FEMALE D-TAP**



1. (+) 12V DTAP V+
2. (-) 12V DTAP GND

CONNECTOR: **COM 2**
TYPE: **JST GH 6-PIN**

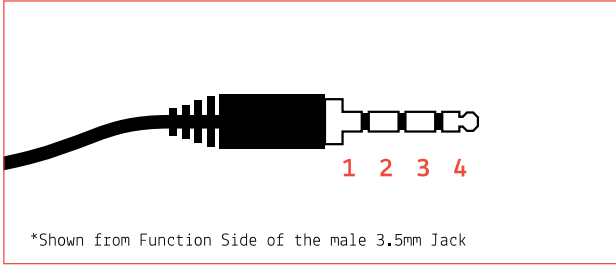


1. GND
2. +5V
3. UARTn_TX
4. UARTn_RX
5. UARTn_CTS
6. UARTn_RTS

TILT STAGE UNIT CONNECTORS AND PINOUTS

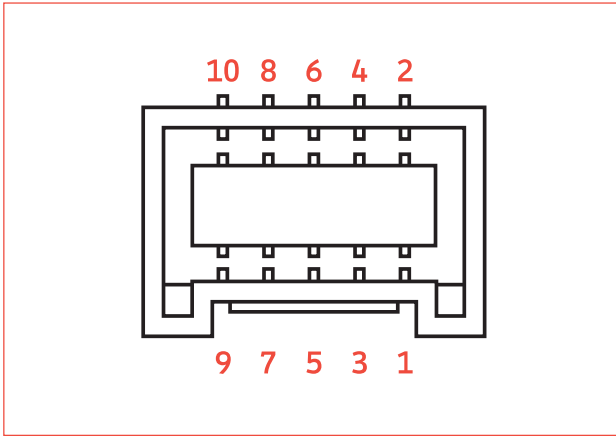
All connector pinouts are shown looking into the function side of the connectors on the GCU and TSU, unless stated otherwise.

CONNECTOR: **TC (LTC TIMECODE)**
TYPE: **3.5MM JACK**



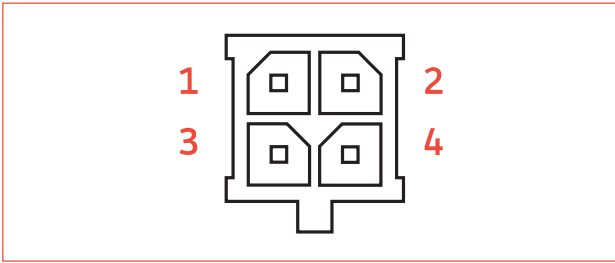
1. (Base, Mic) - LTC IN
2. (Ring, Gnd) - GND
3. (Ring, Right) - SYNC IN
4. (Tip, Left) - LTC OUT

CONNECTOR: **EXP (EXPANSION)**
TYPE: **JST ZPH 10 PIN**



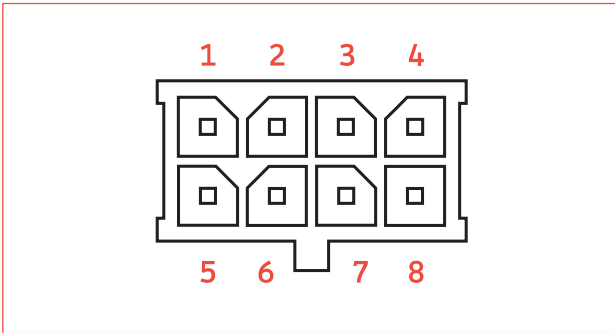
1. GND
2. +12V
3. GND
4. +5V
5. TxD1/Tx-
6. RxD1/Rx+
7. TxD2/Tx+
8. RxD2/Rx-
9. GPI/UART RX
10. GPO/UART TX

CONNECTOR: CAN (CANBUS)
TYPE: MOLEX MICROFIT RA 4 PIN



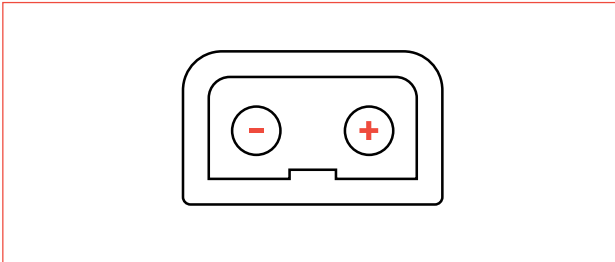
1. GND
2. +V Ba
3. CAN H
4. CAN L

CONNECTOR: CAM (CAMERA)
TYPE: MOLEX MICROFIT RA 8 PIN



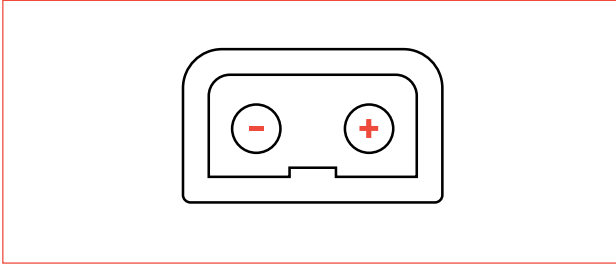
1. GND
2. +5V
3. RxD
4. TxD
5. LANC Power
6. LANC Signal
7. GPO/UART TX
8. GPI/UART RX

CONNECTOR: 12-14V CAM (CAMERA POWER)
TYPE: FEMALE D-TAP



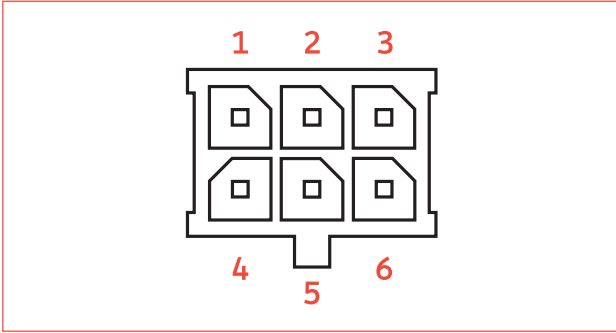
1. (+) 14V DTAP V+
2. (-) 14V DTAP GND

CONNECTOR: 12V (AUXILIARY POWER)
TYPE: FEMALE D-TAP



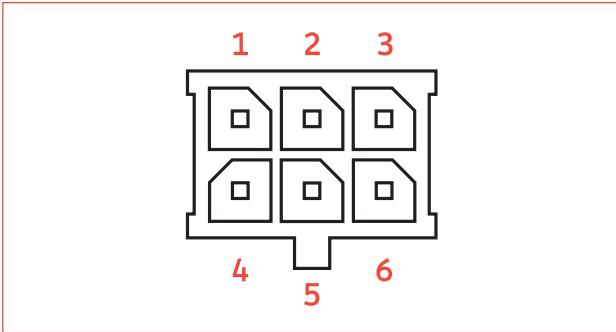
1. (+) 12V DTAP V+
2. (-) 12V DTAP GND

CONNECTOR: F (FOCUS MOTOR)
TYPE: MOLEX MICROFIT RA 6 PIN



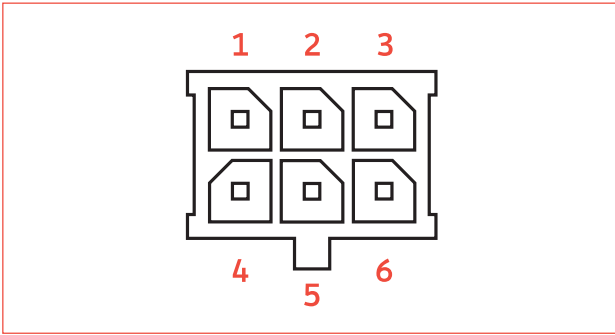
1. Motor A
2. Motor B
3. +5V
4. GND
5. Encoder A
6. Encoder B

CONNECTOR: I (IRIS MOTOR)
TYPE: MOLEX MICROFIT RA 6 PIN



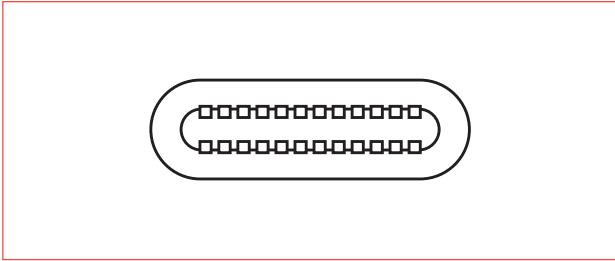
1. Motor A
2. Motor B
3. +5V
4. GND
5. Encoder A
6. Encoder B

CONNECTOR: Z (ZOOM MOTOR)
TYPE: MOLEX MICROFIT RA 6 PIN

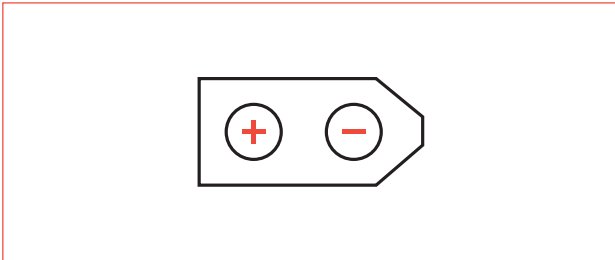


1. Motor A
2. Motor B
3. +5V
4. GND
5. Encoder A
6. Encoder B

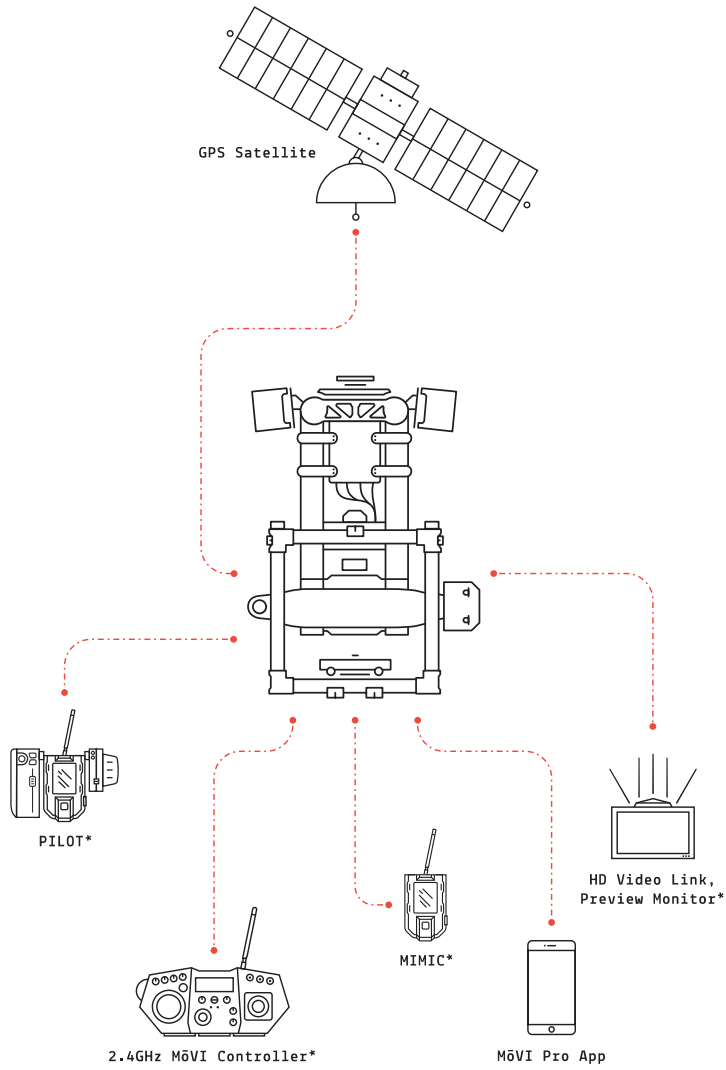
CONNECTOR: USB PORT
TYPE: USB TYPE C DRP (SOURCE AND SINK 5V)



CONNECTOR: AUX POWER
TYPE: XT60-L FEMALE

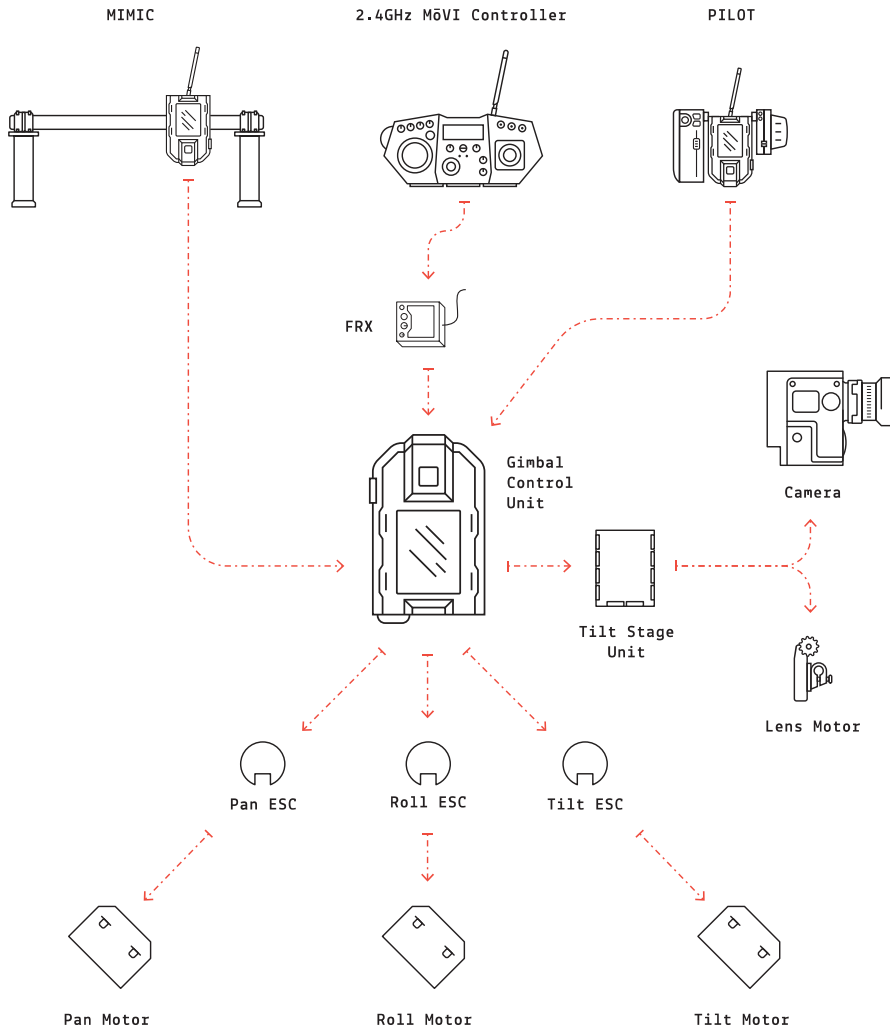


MōVI XL OVERVIEW

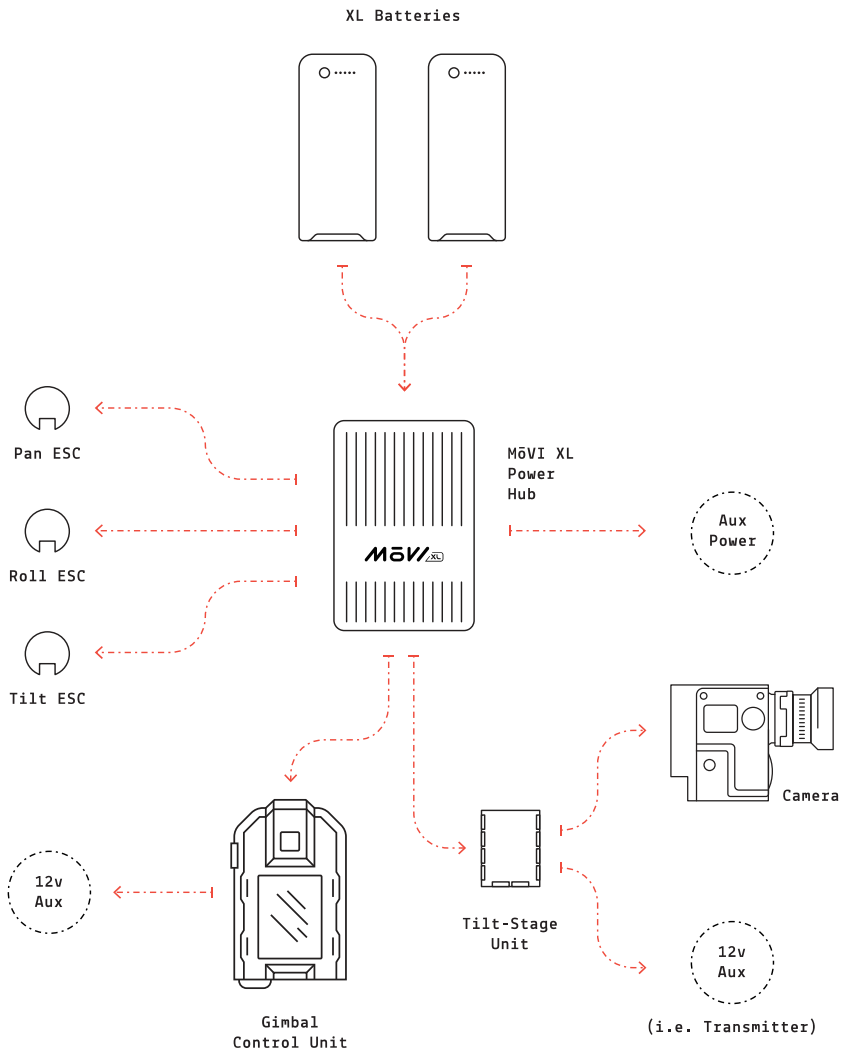


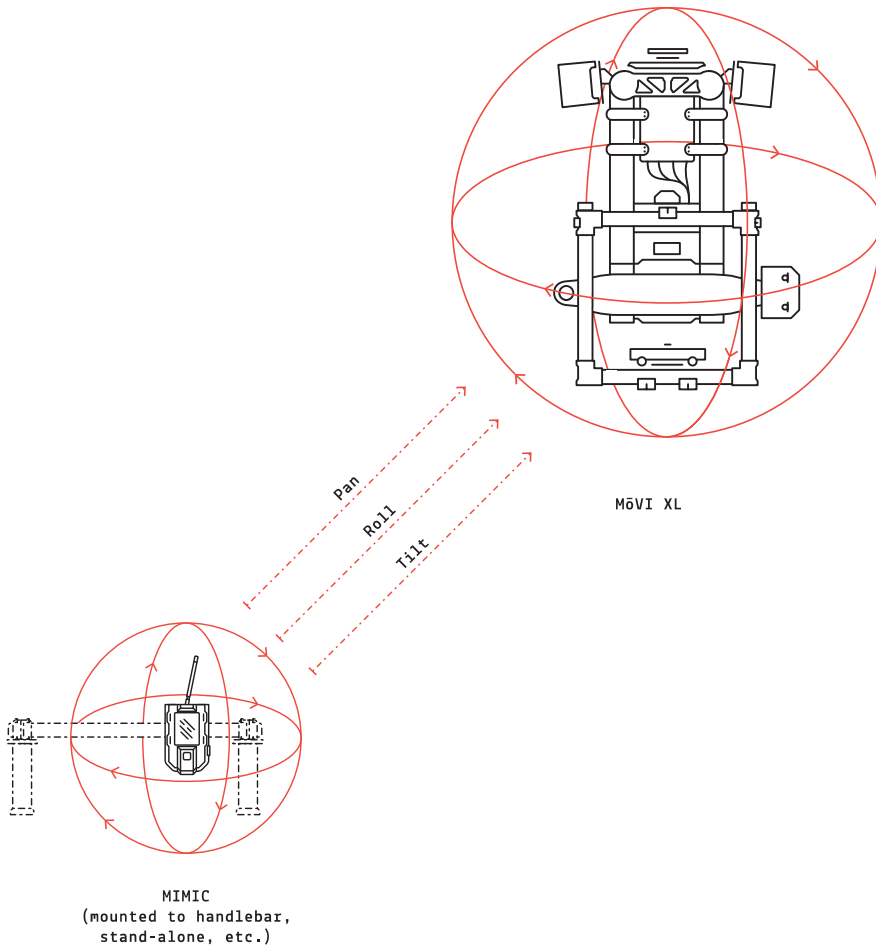
*NOT INCLUDED

MōVI XL CONTROL PATHS

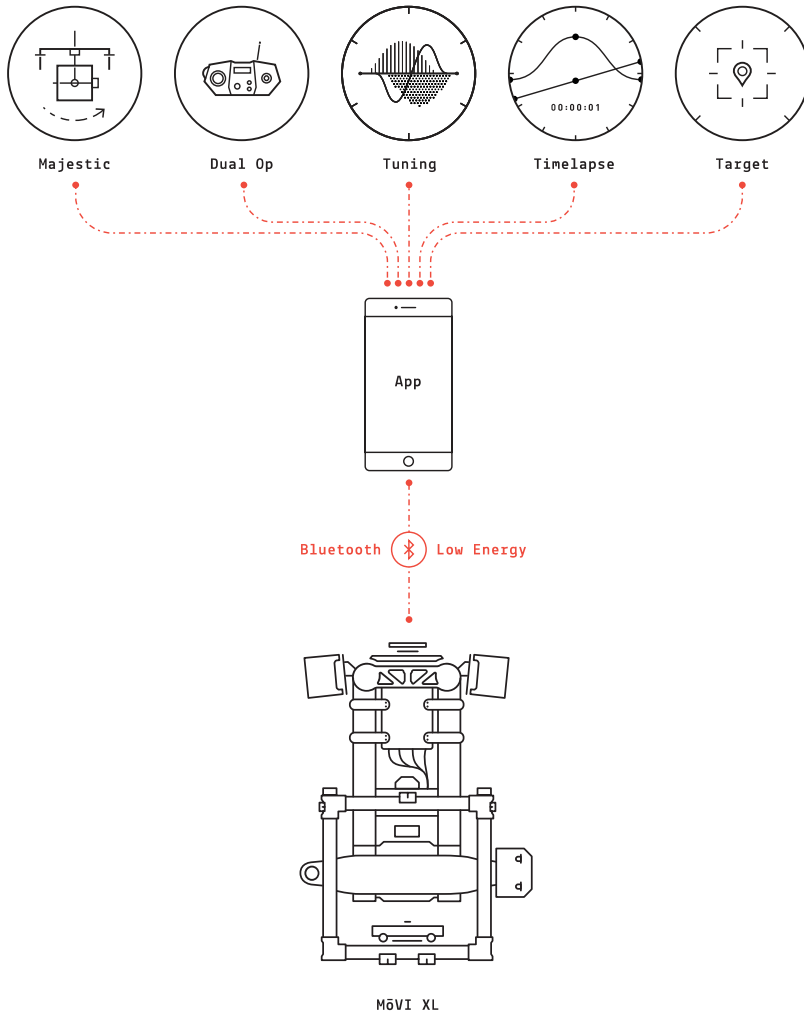


MōVI XL POWER SYSTEM



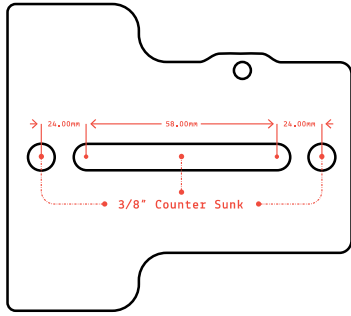


MōVI XL APP

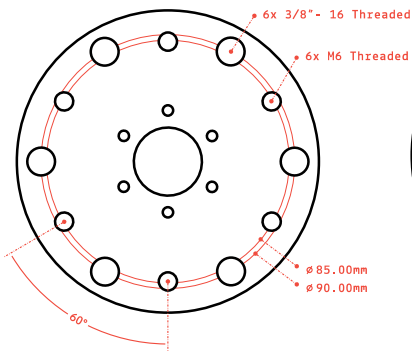


MōVI XL CAMERA PLATE

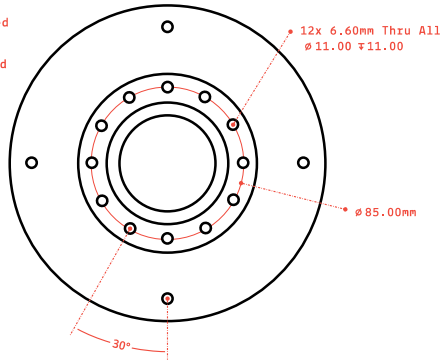
MōVI XL Camera Plate



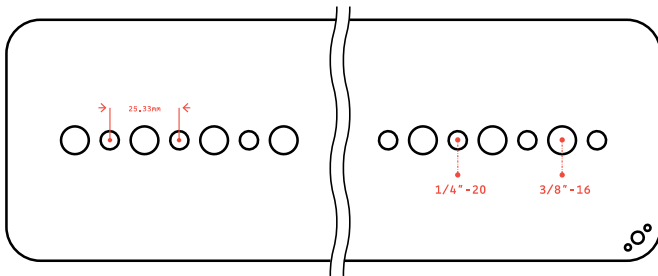
MōVI XL Mounting Plate
ø108.00mm



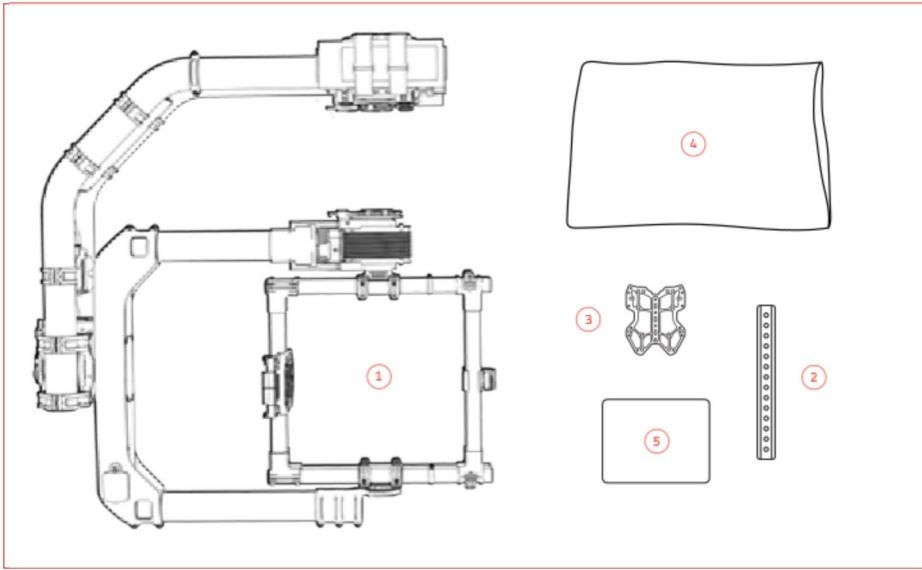
Mitchell Mounting Plate
ø180.00mm



XL Dovetail



MōVI XL KIT



INCLUDED WITH THE MōVI XL

1. MōVI XL
2. XL Top Rail
3. XL Camera Top Plate
4. XL Accessory Bag
5. Product Card

***ACCESSORIES**

1. MIMIC
2. Pilot
3. MōVI Controller
4. MōVI XL Batteries
5. MōVI XL Battery Charger
6. MōVI XL to Mitchell Adapter
7. XL Vibration Isolator
8. XL Camera Plate
9. XL Dovetail
10. XL Lens Support
11. XL Lens Support Anchor
12. XL Top Rail
13. XL Quick Release Kit
14. 19mm Carbon Lens Support Rods
15. MōVI XL Travel Case
16. Pop-N-Lock Quick Release
17. Wiring Harness Spare Kit

*Optional accessories are available for purchase separately



SETTING UP
MōVI XL

MōVI XL SETUP AT A GLANCE

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When your MōVI XL arrives it will be securely packed along with all of the items in the MōVI XL base gimbal. This section will take you through each of the steps needed to set up the MōVI XL and prepare it for use. If you are looking for a specific section skip ahead using the table of contents at the beginning of the chapter.

SETTING UP YOUR CAMERA PACKAGE

Before you can use your MōVI XL you must first build out your camera package. Freefly has created a family of MōVI XL accessories that make camera setup quick and easy. The following sections will cover how to set up a few of the most popular camera options. It is important that you fully build your camera package prior to mounting and balancing it on the MōVI XL, adding accessories such as FIZ motors, transmitters, batteries, etc. to a balanced MōVI XL will require a rebalance for optimum performance.

BUILDING THE CAMERA PACKAGE

These instructions will show you how to set up your MōVI XL with popular cinema cameras, FIZ controls, a video transmitter and a monitor.

*Some of the items in these instructions are not part of the MōVI XL Kit.

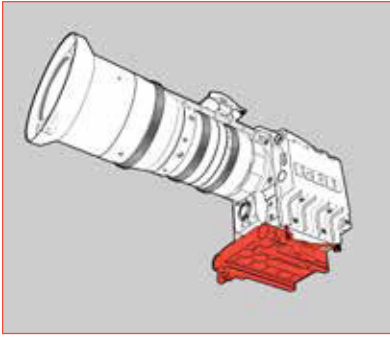
MOUNTING RED EPIC/WEAPON CAMERAS TO THE XL CAMERA PLATE

Items Needed

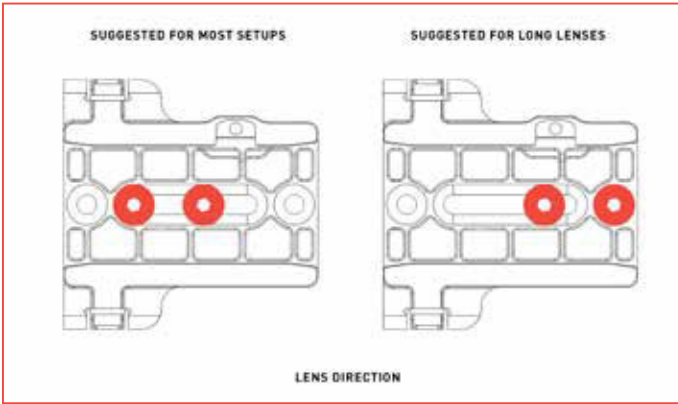
- » Camera Package*
- » XL Camera Plate*
- » XL Top Rail
- » [2] 1/4 -20 x 1/2 FHCS Bolt
- » [4] 1/4 -20 x 1/2 SHCS Bolt
- » [2] 3/8 -16 x 5/8 FHCS Bolt*
- » 3/16" Hex Driver*
- » 5/32" Hex Driver*
- » 7/32" Hex Driver*

*Not included in base MōVI XL

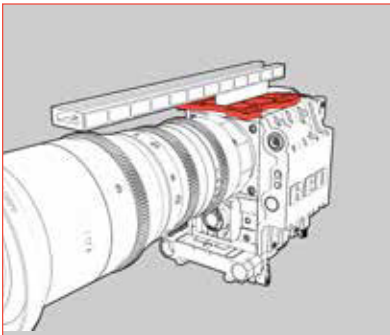
1. Use the 3/8 -16 bolts to attach the XL Camera Plate to the Camera Package.



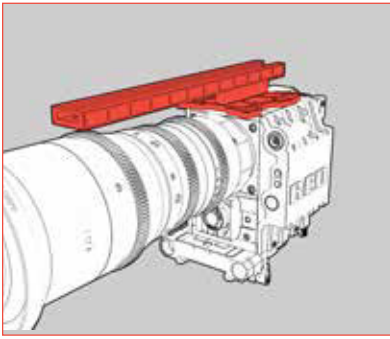
2. RED cameras can be mounted using two of the 3/8-16 bolt locations on the XL Camera Plate. Use a 7/32" hex driver to fasten the XL Camera Plate to the bottom of the RED camera. See the diagram for suggested XL Camera Plate placement.



3. Using the diagram above for plate placement, fasten the XL Top Rail Plate to the top of the RED Camera with four 1/4 -20 SHCS bolts and a 3/16" hex driver.



4. Attach the XL Top Rail to the XL Top Rail Plate with two 1/4 -20 FHCS bolts and a 5/32" hex driver. Make sure that the CG of the Camera Package falls within the length of the rail.



5. Proceed to pg48 for instructions on how to mount the FIZ motors to the camera package.

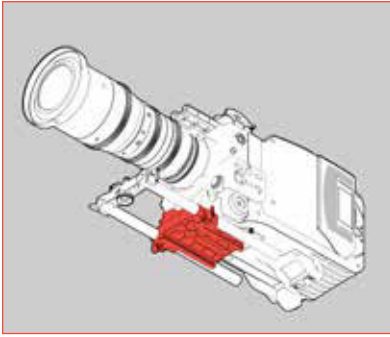
MOUNTING ARRI ALEXA XT/65 CAMERAS TO THE XL CAMERA PLATE

Items Needed

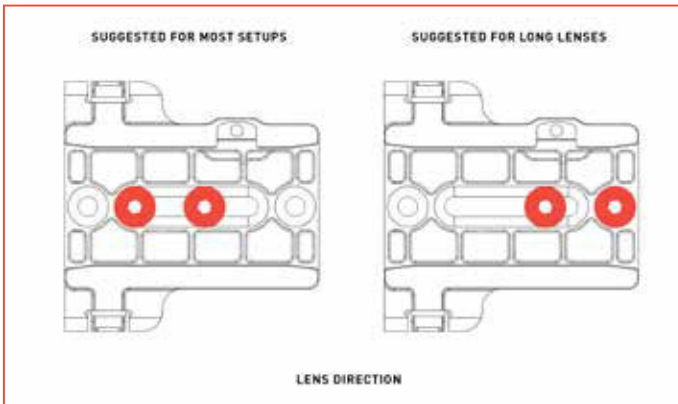
- » Camera Package*
- » XL Camera Plate*
- » XL Top Rail
- » (6) M4 x 10 SHCS Bolt
- » (2) 1/4 -20 x 1/2 FHCS Bolt
- » (2) 3/8 -16 x 1 3/8 or 5/8 FHCS Bolt*
- » 3mm Hex Driver
- » 5/32" Hex Driver*
- » 7/32" Hex Driver*

*Not included in base MōVI XL

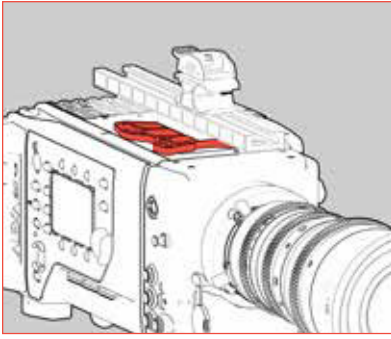
1. Use the 3/8 -16 bolts to attach the XL Camera Plate to the Camera Package.



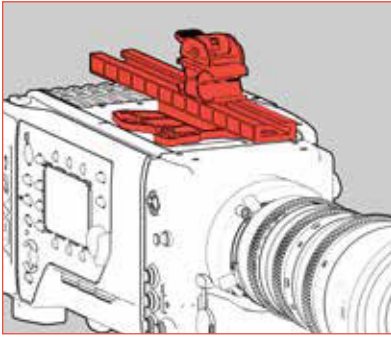
2. ARRI cameras can be mounted using two of the 3/8 -16 bolt locations on the XL Camera Plate. Use a 7/32" hex driver to fasten the XL Camera Plate to the bottom of the ARRI Camera. See the diagram for suggested XL Camera Plate placement.



3. Remove the ARRI's carrying handle and any additional accessories mounted to the top of the camera.
4. Using the diagram above for plate placement, fasten the XL Top Rail Plate to the top of the ARRI camera with six M4 x10 SHCS bolts and a 3mm hex driver.



5. Attach the XL Top Rail to the XL Top Rail Plate with two $\frac{1}{4}$ -20 FHCS bolts and a $\frac{5}{32}$ " hex driver. Make sure that the CG of the Camera Package falls within the length of the rail.



6. Proceed to pg48 for instructions on how to mount the FIZ motors to the camera package.

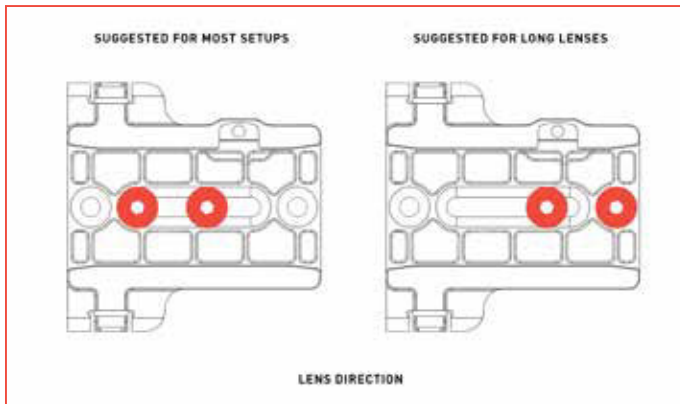
MOUNTING PHANTOM FLEX 4K TO THE XL CAMERA PLATE

Items Needed

- » Camera Package*
- » XL Camera Plate*
- » XL Top Rail
- » [2] 1/4 -20 x 1/2 FHCS Bolt
- » [4] 1/4 -20 x 1/2 SHCS Bolt
- » [2] 3/8 -16 x 5/8 FHCS Bolt*
- » 3/16" Hex Driver*
- » 5/32" Hex Driver*
- » 7/32" Hex Driver*

*Not included in base MōVI XL

1. Use the 3/8-16 FHCS bolts to attach the XL Camera Plate to the Camera Package.
2. The Flex 4K can be mounted using two of the 3/8-16 bolt locations on the XL Camera Plate. Use a 7/32" hex driver to fasten the XL Camera Plate to the bottom of the Flex 4K. See the diagram for suggested XL Camera Plate placement.



3. If the Flex 4K's carrying handle is attached, remove it using the appropriate tools.
4. Using the diagram above for placement, fasten the XL Top Rail Plate to the top of the Flex 4K with four 1/4 -20 SHCS bolts and a 3/16" hex driver.
5. Attach the XL Top Rail to the XL Top Rail Plate with two 1/4 -20 FHCS bolts and a 5/32" hex driver. Make sure that the CG of the Camera Package falls within the length of the rail.
6. Proceed to pg48 for instructions on how to mount the FIZ motors to the camera package.

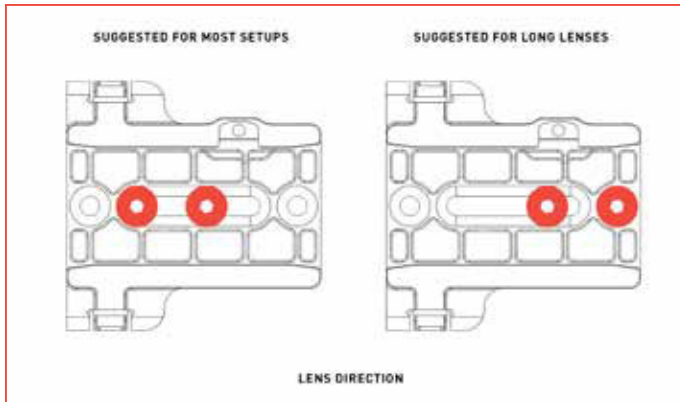
MOUNTING A SONY F55 CAMERA TO THE XL CAMERA PLATE

Items Needed

- » Camera Package*
- » XL Camera Plate*
- » XL Top Rail
- » [2] 1/4 -20 x 1/2 FHCS Bolt
- » [4] 1/4 -20 x 1/2 SHCS Bolt
- » [2] 3/8 -16 x 5/8 FHCS Bolt*
- » 3/16" Hex Driver*
- » 5/32" Hex Driver*
- » 7/32" Hex Driver*

*Not included in base MōVI XL

1. Use the 3/8 -16 FHCS bolts to attach the XL Camera Plate to the Camera Package.
2. The Sony F55 can be mounted using two of the 3/8 -16 bolt locations on the XL Camera Plate. Use a 7/32" hex driver to fasten the XL Camera Plate to the bottom of the Sony F55. See the diagram for suggested XL Camera Plate placement.



3. If the Sony F55's carrying handle is attached, remove it using the appropriate tools.
4. Using the diagram above for plate placement, fasten the XL Top Rail Plate to the top of the Sony F55 with four 1/4 -20 SHCS bolts and a 3/16" hex driver.
5. Attach the XL Top Rail to the XL Top Rail Plate with two 1/4 -20 FHCS bolts and a 5/32" hex driver. Make sure that the CG of the Camera Package falls within the length of the rail.
6. Proceed to pg48 for instructions on how to mount the FIZ motors to the camera package.

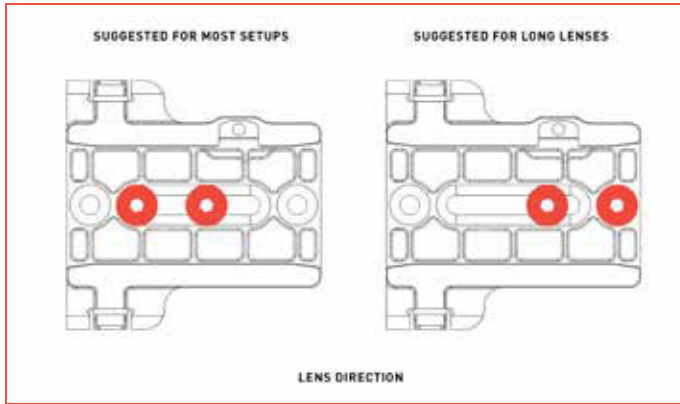
MOUNTING CANON C500 SERIES CAMERAS TO THE XL CAMERA PLATE

Items Needed

- » Camera Package*
- » XL Camera Plate*
- » XL Top Rail
- » C500 Camera Cage*
- » [2] 1/4 -20 x 1/2 FHCS Bolt
- » [2] 3/8 -16 x 5/8 FHCS Bolt*
- » 5/32" Hex Driver*
- » 7/32" Hex Driver*

*Not included in base MōVI XL

1. Use the appropriate mounting tools and hardware to mount a C500 camera cage to your C500 camera. Make sure the cage has 1/4 -20 and 3/8-16 threaded holes on its top and bottom, respectively.
2. Use the 3/8-16 FHCS bolts to attach the XL Camera Plate to the C500 camera cage



3. Cameras can be mounted to the XL Camera Plate in multiple configurations. Use a 7/32" hex driver to fasten the XL Camera Plate to the bottom of the C500 camera cage. Camera packages with very large lenses often need to be mounted in the furthest back mounting location.
4. The XL Top Rail can be mounted directly to the top of the C500 Camera cage using 1/4-20 screws and a 5/32" hex driver. Make sure that the CG of the Camera Package falls within the length of the rail.
5. Proceed to pg48 for instructions on how to mount the FIZ motors to the camera package.

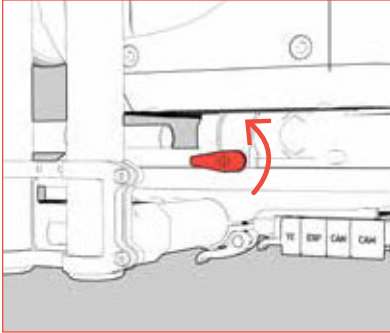
SETTING UP FIZ AND LENS SUPPORT

Items Needed

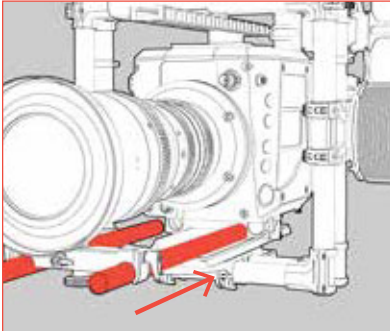
- » Camera Package*
- » 19mm Carbon Lens Rod*
- » XL Lens Support*
- » FIZ Motors*

*These items are not included with the MōVI XL.

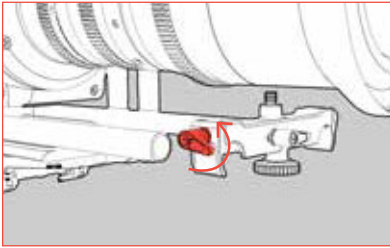
1. Loosen the two thumbscrews on the XL Camera Plate until they are no longer able to clamp the 19mm Carbon Lens Rods.



2. Insert both 19mm Carbon Lens Rods so they protrude past the furthest lens gear or support mounting hardpoint from the camera. Tighten the thumbscrews to secure the lens rods. Freely offers 19mm Carbon Lens Rods with lengths of 300, 450, and 600mm to accommodate a variety of lens lengths.



3. One by one, slide the FIZ Motors onto the 19mm Carbon Lens Rods and align them with their respective lens gears. Once you have meshed the gear teeth on the motors and lens, secure them in place.
4. Loosen the thumbscrews on the XL Lens Support until it can be placed on both 19mm Carbon Lens Rods.



5. Build up the lens support post so its terminating piece can thread into the lens support thread on the lens. Align the XL Lens Support with the lens support thread on the lens.
6. Push the lens support post through the center of the XL Lens Support and thread it into the lens. Tighten the outer thumbscrews to secure the lens support to the 19 mm carbon rods, then tighten the center thumbscrew to lock the lens support post in place.

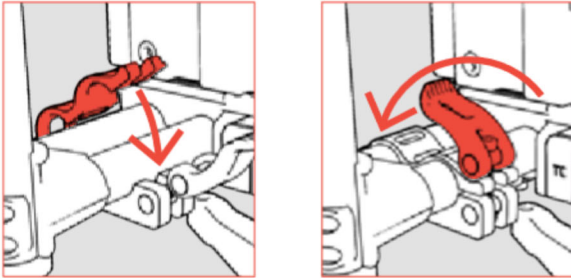
ATTACHING A VIDEO TRANSMITTER

Items Needed

- » MōVI XL
- » Video Transmitter*
- » Pop-N-Lock 25mm Quick Release*
- » 1/4-20 Bolt*
- » 5/32 Hex Driver*

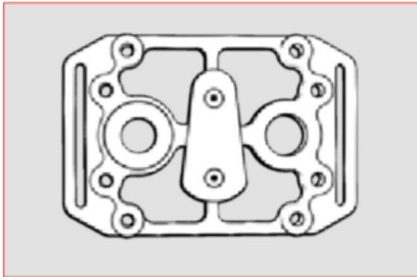
*These items are not included with the MōVI XL.

1. Open the clamp on the female part of the Pop-N-Lock QR and attach it to one of the suggested transmitter mounting locations*. The tilt cage is an ideal location to mount the transmitter to minimize movement relative to the camera. Close the clamp and secure the Pop-N-Lock receiver on the MōVI XL.

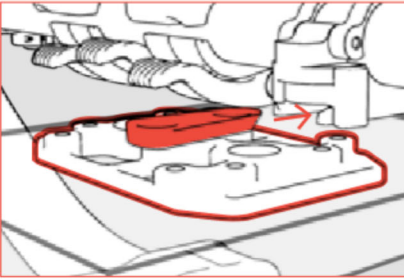


*The Pop-n-Lock QR's size will determine possible mounting locations.

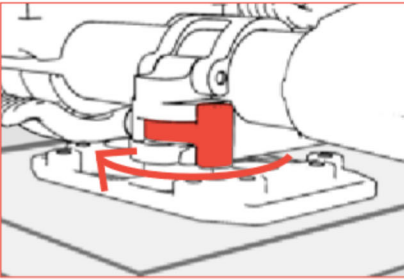
2. Attach the male part of the Pop-N-Lock QR to the wireless transmitter with a 1/4 -20 bolt.



3. Engage the two parts of the dovetail to mount the transmitter to the MōVI XL.



4. Lock the transmitter by closing the Pop-N-Lock's latching mechanism.



When mounting the wireless transmitter to the camera cage make sure it does not interfere with tilt range of motion.

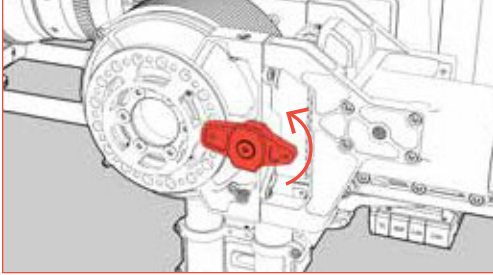
MOUNTING THE CAMERA PACKAGE

Items Needed

- » MōVI XL Gimbal
- » XL Dovetail Plate*
- » XL Lens Support Anchor*
- » Camera Package*
- » (3) 1/4 -20 x 1/2 Bolt SHCS*

*These items are not included with the MōVI XL.

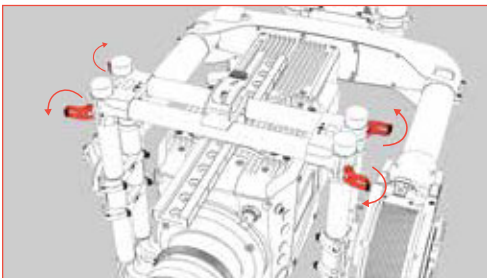
1. Pull out and twist the lock lever so the locking pin engages the limit wheel.
Do this on each motor locking the axes to your preferred position.



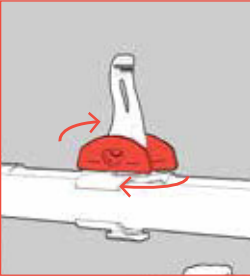
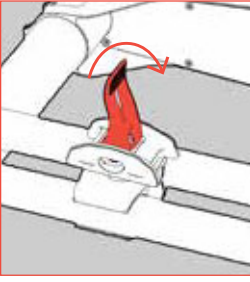
2. Align the XL Dovetail Plate so one of its 1/4 -20 threaded holes lines up with both the forward and rearward mounting location on the dovetail mount, then use three 1/4 -20 bolts to attach the XL Dovetail to the MōVI XL. If you are using a third party dovetail plate, find the position that allows for the best screw compatibility and camera mounting position.

*You may need to shift the XL Dovetail forward or backward in order to balance various Camera Packages

3. Open all the clamps on the upper tilt cage crossbar and move the bar up so the Camera Package has room to fit in the tilt cage.

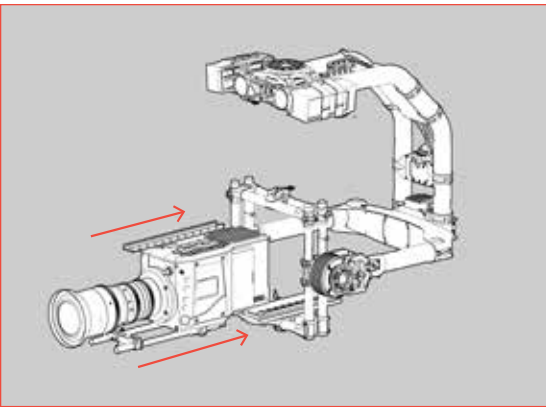


4. Ready the camera mount clamp by opening and twisting it 90 deg counter-clockwise.



5. Make sure the XL Camera Plate lock lever is set to open and carefully slide the Camera Package onto the XL Dovetail plate. Slide it back until the CG of the Camera package is roughly aligned with the tilt cage. Secure the Camera Package in place by placing the XL Camera Plate lock lever in its closed position.

*When removing the camera package from the XL Dovetail plate remember to pull the release pin on the front of the XL Dovetail.



6. Bring down the upper tilt cage crossbar while making sure the camera mount clamp lines up with the XL Top Rail. When the camera mount clamp's foot is seated inside the XL Top Rail, twist the camera mount clamp 90 deg clockwise and close the clamp.
7. Close the two additional clamps on the upper tilt cage crossbar.
Leave all axes locked until you begin balancing the MōVI XL.
8. Loosen the thumbscrews on the XL Lens Support Anchor and slide it over the 19mm Carbon Lens Support Rods and the XL Dovetail Plate. See image for correct anchor mounting.
9. Tighten the thumbscrews to secure the XL Lens Support Anchor to the XL Dovetail Plate and 19mm rods.

MōVI XL BATTERY OPERATION AND CAMERA WIRING

MōVI XL uses two 22.2V 10Ah batteries to power the gimbal, camera, FIZ, and more for over three hours. Custom Freely wire harnesses and accessory cables reduce clutter and are designed to accommodate even the largest camera packages. The following section will walk you through the MōVI XL Battery workflow and accessory cable selection.

CHARGING BATTERIES

Follow the charging procedure below to maintain a safe charging environment.

1. Plug the power cord, charger leads, and balancing cable adapter into their respective connectors on the MōVI XL Charger.
2. Set the input voltage slider 110V or 220V depending on the available input voltage. Then plug the power cord into the wall.
3. Turn the MōVI XL Charger 'On' and use the touchscreen to set the charger to 'LiPo' mode.
4. Select the charge mode by tapping 'CHG' on side '1'.
5. Ensure that the following settings are selected on side '1' of the MōVI XL Charger.
 - » Pack Voltage - 22.2V/6S
 - » End Voltage - 4.15V/Cell
 - » Capacity - 10000mAh
 - » Charge Mode - Balance
 - » Current - 10A

*Recommended Charging Current: 1C (10A)
Fast Charge Current: 2C (20A), Charging at this current may decrease battery lifecycle
6. Connect the MōVI XL Battery to the MōVI XL Charger's side '1' using the charger leads. Then plug in the balancing cable to the MōVI XL Battery and the MōVI XL Charger.
7. Hold the 'ENTR' key on side '1' until you hear a beep signifying that the battery is now charging. A charger timer will begin to count up on the screen. Your MōVI XL Battery will stop charging once the battery is full.
8. To charge two batteries simultaneously, repeat steps 4 through 7 for side '2'.



CAUTION

For all warnings concerning the batteries and chargers please refer to the Warning section (pg9).



WARNING

3rd party LiPo chargers are not recommended for use with MōVI XL Batteries. Using a 3rd party LiPo charger may result in battery malfunction, electrical issues, excessive heat, fire, personal injury, and/or property damage; use at your own risk.

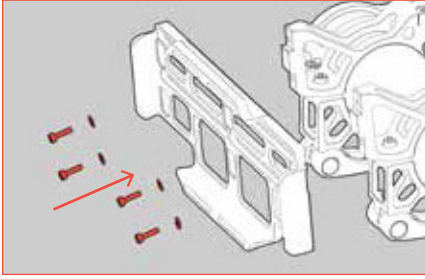


WARNING

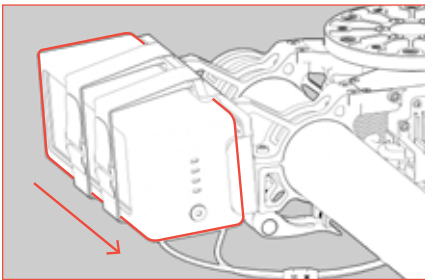
The MōVI XL batteries are not protected against over-discharge. When the batteries report empty you must disconnect them from the MōVI XL. Never leave a battery, even a fully charged battery, connected to the MōVI XL for a long period of time. The battery may slowly drain and eventually over-discharge. An over-discharged battery will suffer permanent damage and may completely cease to function.

BATTERY INSTALLATION AND HOT SWAPPING

1. If you are using your MōVI XL for the first time attach the battery trays to the pan motor using the provided screws and washers as shown. Note orientation! The recommended position for the battery trays is fully forward, away from the GCU.



2. Attach the 4 velcro straps to the battery cages as shown, but leave them untightened.
3. Place the MōVI XL Battery into one of the battery trays. Make sure that the battery's leads are pointing down and that the battery lights are visible from the back of the gimbal.



4. While holding the MōVI XL Battery in place tighten the velcro straps so the battery is secure.
5. Repeat steps 3-4 to attach the MōVI XL battery to the battery tray on the opposite side.
6. Once both MōVI XL Batteries are attached, connect them to the MōVI XL using the battery harnesses. The battery harnesses are not discrete and can be used for the right or left battery.
7. To perform a hot-swap, remove and replace the MōVI XL Batteries one at a time with a fully charged battery. When connecting the charged battery to the MōVI XL try to complete the motion in one quick movement. When hot-swapping, you must replace both batteries immediately after one another. Leaving one fully charged and one partially charged battery connected for a long period of time may damage the batteries



CAUTION

Always fully connect MōVI XL's battery connectors; plugging connectors in halfway may result in an unexpected loss of power to the gimbal and could result in camera damage.



WARNING

If you are using the MōVI XL to power the camera, a loss of battery power will result in a sudden loss of power to the camera. This can damage the camera and result in a loss of data. Monitor the battery levels using the GCU display and swap the batteries out as needed to avoid this.

FREELY CABLE GUIDE

Use this list of cables offered by Freely and the cable guide below to assist in the wiring of some popular cameras. For information on the MōVI XL's Connectors and Pinouts see pg25; to order any Freely cables please visit the Freely Online Store at <http://store.freelysystems.com>.

FREELY CABLES	CONNECTOR SIDE A	CONNECTOR SIDE B
MōVI XL/XL ARRI ALEXA Mini Power Cable - Long	DTAP	LEMO 2B 8 pin
MōVI XL/XL ARRI Run Stop Cable - Long	MicroFit 8 Pin Double Row	LEMO 1B 7 Pin
MōVI XL/XL Connex Air Unit Control Cable	GH 6 pin	GHR-05V-S
MōVI XL/XL Connex Ground Unit Control Cable	LEMO 1B 7 Pin	2.5mm Headphone jack
MōVI XL/XL Connex Power Cable	DTAP	GHR-04V-S
MōVI XL/XL FRX Control Cable	GH 6 pin	ZH 5 pin
MōVI XL/XL Futaba Radio Control Cable	GH 6 pin	JR Universal Connector
MōVI XL/XL LANC Serial Cable - Long	MicroFit 8 Pin Double Row	2.5MM Stereo Jack
MōVI XL/XL Straight Lens Motor Cable - Long	MicroFit 6 Pin Double Row	LEMO 1B 7 Pin
MōVI XL/XL RED Power Cable - Long	DTAP	LEMO 1B 6 Pin
MōVI XL/XL RED RCP Serial Cable - Long	MicroFit 8 Pin Double Row	LEMO 00 4 Pin
MōVI XL/XL Spektrum Radio Control Cable	GH 6 pin	ZHR-3
MōVI XL/XL Phantom RS - Long	MicroFit 8 Pin Double Row	Fischer 12 Pin

RED EPIC/WEAPON

CABLE PURPOSE	WHAT DOES IT CONNECT	PORT NAMES	CABLE
Camera Power	Gimbal > Camera	12-14V CAM > DC-IN	MōVI XL/XL RED Power Cable - Long
Camera Control	Gimbal > Camera	CAM > CTRL	MōVI XL/XL RED RCP Serial Cable - Long
FIZ Motor Power and Control	Gimbal > FIZ Motor	F,I,Z > FIZ Motor Cnctr	MōVI XL/XL Straight Lens Motor Cable - Long
Transmitter Power	Gimbal > Transmitter	12V AUX > DC IN	MōVI XL/XL Connex Power Cable DTap > LEMO 0B 2-Pin (Paralinx Tomhawk)
Video Signal	Camera > Transmitter	SDI > SDI Or HDMI > HDMI IN	BNC > BNC HDMI > HDMI

ARRI ALEXA XT/65

CABLE PURPOSE	WHAT DOES IT CONNECT	PORT NAMES	CABLE
Camera Power	Gimbal > Camera	D-Tap > DC IN	D-Tap > Fischer 2 Pin
FIZ Motor Power and Control	Gimbal > FIZ Motor	F,I,Z > FIZ Motor Cnctr	M6VI XL/XL Straight Lens Motor Cable - Long
Transmitter Power	Gimbal > Transmitter	12V AUX > DC IN	M6VI XL/XL Connex Power Cable DTap > LEMO 0B 2-Pin (Paralinx Tomahawk)
Video Signal	Camera > Transmitter	SDI > SDI	BNC > BNC

PHANTOM FLEX 4K

CABLE PURPOSE	WHAT DOES IT CONNECT	PORT NAMES	CABLE
Camera Power	Gimbal > Camera	12-14V CAM > DC-IN	DTap > Fischer 3 Pin
Camera Control	Gimbal > Camera	CAM > LANC	M6VI XL/XL Phantom RS - Long
FIZ Motor Power and Control	Gimbal > FIZ Motor	F,I,Z > FIZ Motor Cnctr	M6VI XL/XL Straight Lens Motor Cable - Long
Transmitter Power	Gimbal > Transmitter	12V AUX > DC IN	M6VI XL/XL Connex Power Cable DTap > LEMO 0B 2-Pin (Paralinx Tomahawk)
Video Signal	Camera > Transmitter	SDI > SDI	BNC > BNC

SONY F55

CABLE PURPOSE	WHAT DOES IT CONNECT	PORT NAMES	CABLE
Camera Power	Gimbal > Camera	12-14V CAM > DC-IN	DTap > CCDD-X2
FIZ Motor Power and Control	Gimbal > FIZ Motor	F,I,Z > FIZ Motor Cnctr	M6VI XL/XL Straight Lens Motor Cable - Long
Transmitter Power	Gimbal > Transmitter	12V AUX > DC IN	M6VI XL/XL Connex Power Cable DTap > LEMO 0B 2-Pin (Paralinx Tomahawk)
Video Signal	Camera > Transmitter	SDI-OUT (1-4) > SDI Or HDMI OUT > HDMI	BNC > BNC HDMI > HDMI

CANON C500

CABLE PURPOSE	WHAT DOES IT CONNECT	PORT NAMES	CABLE
Camera Power	Gimbal > Camera	12-14V CAM > DC-IN	DTap > Canon DC Plug
Camera Control	Gimbal > Camera	CAM > Remote	M6VI XL/XL LANC Serial Cable - Long
FIZ Motor Power and Control	Gimbal > FIZ Motor	F,I,Z > FIZ Motor Cnctr	M6VI XL/XL Straight Lens Motor Cable - Long
Transmitter Power	Gimbal > Transmitter	12V AUX > DC IN	M6VI XL/XL Connex Power Cable DTap > LEMO 0B 2-Pin (Paralinx Tomahawk)
Video Signal	Camera > Transmitter	HDMI OUT > HDMI SDI > SDI	HDMI > HDMI BNC > BNC



WARNING

Always use lightweight Freefly cables for best results. Use of third party or custom cables which have incorrect pinouts can result in damage to the MōVI XL and the item being plugged into the MōVI XL. The use of third party cables may also void the MōVI XL's warranty.



WARNING

Avoid using heavy gauge or long wiring when possible. Secure all excess wires to prevent snagging of wires during use, potentially causing damage to MōVI XL, the camera, or the wires.

CABLE ROUTING

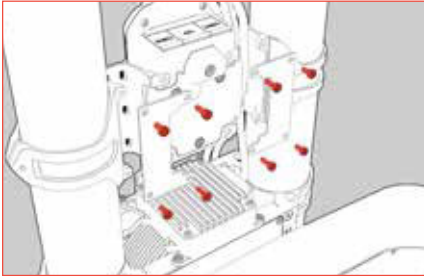
MōVI XL was designed to allow users to route their own wires using MōVI XL's existing structure. See the diagram below for a full description of all wire routing features.

GCU MOUNT

Items Needed

- » 2.5mm Hex Driver

1. Remove the four M3 screws that are holding the carbon GCU Mount Closeout in place. Only remove one of the two carbon GCU Mount Closeouts at a time.



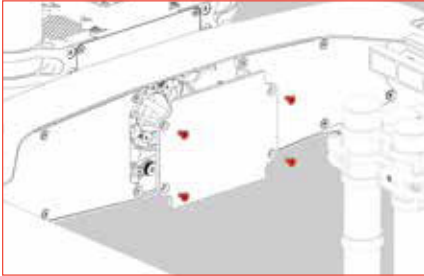
2. You can now remove the carbon closeout and insert your cables.
3. Once you have routed your cables, re-attach the carbon closeout.

ROLL BEAM STAGE

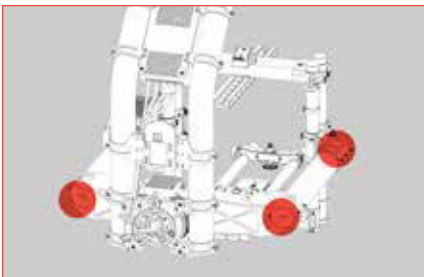
Items Needed

- » 2mm Hex Driver

1. Use the 2mm hex driver to remove the carbon closeouts on the roll beam.



2. Pull out the foam plugs from the roll beam tubes. There are two on the tilt bearing side of the roll beam and one on the motor side.



3. You may pass your cables through Roll motor and Tilt bearing, they have been specifically designed with through holes for this application.
4. Once all cables are routed, replace the foam plugs and re-attach the carbon closeouts.

BALANCING THE MōVI XL

MōVI XL's balancing procedure is an integral part of the setup process. A properly balanced MōVI XL will offer the best stabilization performance and the longest battery life.

Items Needed

- » MōVI XL Gimbal
- » MōVI XL to Mitchell Adapter*
- » Quick Release Kit*
- » Camera Package*

*These items are not included with the MōVI XL.

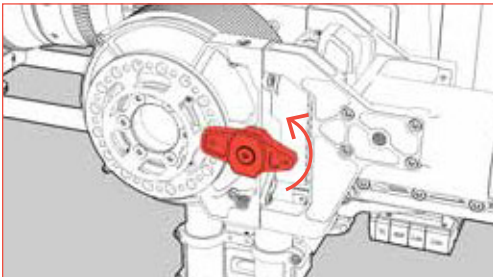
BALANCE PREP

1. Use the MōVI XL to Mitchell Adapter or the Quick Release Kit to attach the MōVI XL to your preferred mounting solution.

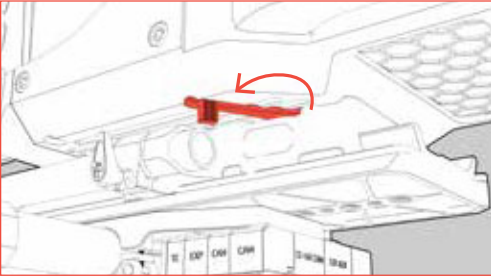
*For instructions on how to use the MōVI XL to Mitchell Adapter or the Quick Release Set see Pg 81 and 80 respectively.

TILT BALANCE (FRONT-BACK)

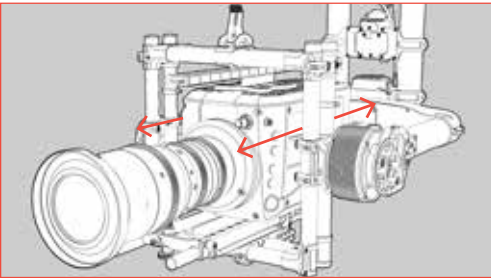
1. Unlock the Tilt Axis by pulling out and twisting the lock lever so the locking pin no longer engages the limit wheel.



2. Open the camera mount clamp and set the locking lever on the XL Camera Plate to open.



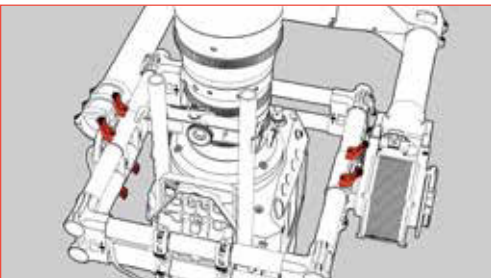
3. Slide the camera forward or backwards until the camera remains level.



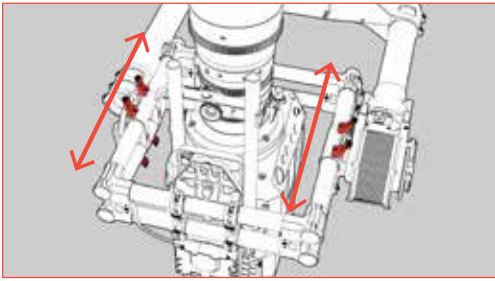
4. Close the camera mount clamp and set the locking lever back to its closed position.

TILT BALANCE (VERTICAL)

1. Rotate the tilt axis so that the camera lens is pointing straight up.
2. Open the eight vertical adjustment clamps.



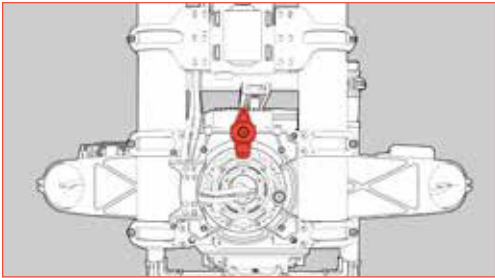
3. Slide the camera cage and camera up or down until the camera remains pointing straight up when released.



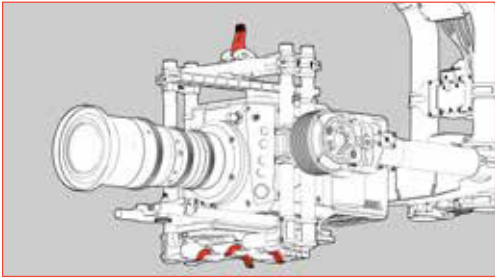
4. Close the clamps.
5. Confirm tilt balance by moving the camera to several tilt angles and confirming that the camera does not move in the tilt axis once released.

ROLL BALANCE

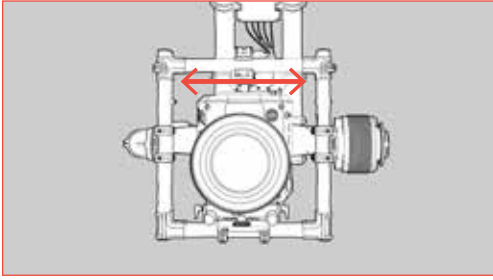
1. Unlock the Roll axis.



2. Open the camera mount clamp and the four clamps located on the dovetail mount.



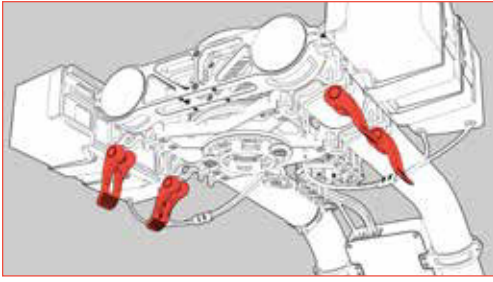
3. Slide camera and platform side-to-side until the camera does not roll once let go.



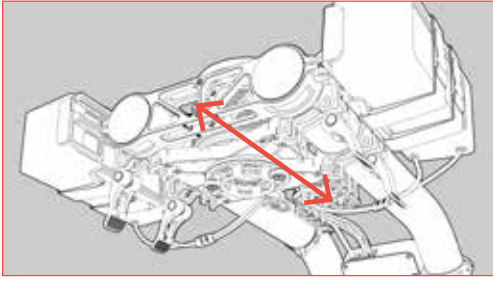
4. Close camera mount clamp and the dovetail mount clamps.
5. Confirm roll balance by moving the camera to several roll angles and confirming that the camera does not move in the roll axis once released.
6. The MōVI XL has an adjustable Roll Beam to help balance very large and uneven camera packages.
*Lock the Roll and Tilt axes, and remove the camera package if attempting to adjust the Roll beam.
7. Loosen the four M5 screws with a 4mm hex driver. Once the screws have been loosened, slide the Roll Beam toward the side needing more weight.
8. Tighten the four M5 screws to 3.0 N/m of torque; if no torque wrench is available firmly hand tighten.
9. Once the gimbal is balanced, unlock the Roll axis and continue with the balancing process.

PAN BALANCE

1. Mount the MōVI XL to the rig on which it will be used. This can be done using the MōVI XL to Mitchell Adapter, the Quick Release Kit, or by mounting directly to the Pan axis plate.
2. Use your rigging to tilt the MōVI XL 5-10 degrees and observe which way pan rotates.
 - a. If the lens points to the low side, it indicates that the MōVI XL is nose heavy and the pan arm needs to slide backwards.
 - b. If the back of the gimbal points to the low side, it indicates that the MōVI XL is tail heavy and the pan arm needs to slide forwards.
3. Open the four clamps underneath the Pan Motor which secure the pan arm in place.



4. Slide the gimbal in the direction needed as indicated in Step 2 until the gimbal does not swing left or right when tilting it.



5. Close the four clamps and confirm that the camera does not swing left or right when the MoVI XL is tilted 5-10 degrees.

TURNING ON THE MōVI XL

QUICK GUIDE

1. Make sure the camera payload, including all accessories are in place, tightly secured, and well-balanced. All axis locks should be set to the unlocked position.
2. Turn on the MōVI XL by pushing the power button on the GCU. Allow the gimbal to initialize. The status UI will appear on the screen of the GCU.
3. MōVI XL boots in disabled mode, with no power to motors. On the status screen of the GCU, you may choose activate, then confirm activation. This will arm the MōVI XL.
4. Once you have activated the MōVI XL, it will ramp up power over ten seconds and begin stabilizing.



WARNING

Activating a gimbal that is unloaded or untuned can result in strong vibrations that could damage the gimbal and anything attached to the gimbal. Press any of the four keys on the GCU to disable the gimbal, correct the loading or tuning problem, and attempt the enable process again.

TUNING THE MōVI XL

Once the MōVI XL is balanced, it will need to be tuned. This maximizes the stability and will allow for the smoothest camera movements possible.



Ensure that the Camera Package is securely mounted to the MōVI XL using the Top Rail and all clamps are closed before tuning the MōVI XL. Failure to create a rigid Camera Package will limit the gains and filters of the system resulting in subpar stabilization performance.



Hardware that is mounted to the camera or the MōVI XL must be firmly secured; loose hardware can limit the stabilization performance by causing unwanted vibrations.

BASIC TUNING

1. Make sure the camera payload, including all accessories are in place, tightly secured, and well-balanced.
2. Turn on the MōVI XL by pushing power button on the GCU. Allow the gimbal to initialize.
3. After the gimbal has initialized, arm the motors via the "Activate Motors" option on the main screen.
4. Once the connection has been established open the Tuning Menu under "Configurations."
5. In order for Autotune to work, the MōVI XL should be completely free to move. This means making sure none of the axes are locked.
6. The Autotune feature's margin of error can be adjusted to reach a higher Autotune Percentage. This will increase the gimbal's performance, but can affect the gimbal's sensitivity to being unbalanced. Refer to the table below for suggested Autotune Percentages.
7. Select 'Start' to initiate the Autotune sequence. This will tune the Pan/Tilt/Roll stiffness and filter values for the MōVI XL. Stay clear of the MōVI XL while it is autotuning.

8. After the Autotune process is complete, test the MōVI XL for vibrations or oscillations during use. If any vibrations or oscillations exist, determine what axis they are related to and reduce the stiffness of the axis using the Tuning Menu on the app.
9. If the vibrations and oscillations continue please refer to the Advanced Tuning guide.

MōVI XL CONFIGURATION**SUGGESTED AUTOTUNE PERCENTAGE**

Full cage, connected to the top and bottom of the camera; most standard configurations.

60.0%

**NOTE**

Autotuning can only be initiated through the MōVI App or from the MōVI Controller. This is to encourage operators to remain at a safe distance while the MōVI XL motors are armed.

ADVANCED TUNING

The advanced tuning options give the user direct control over the MōVI XL's camera stabilization. This allows users to customize the MōVI XL to meet their exact needs with features such as Filters, Jolt Rejection, and more. Advanced tuning is not recommended for normal usage.



FILTERS

The MōVI XL has a number of software filters that are applied to remove unwanted vibrations from the system. The Filter settings are the second most important setting for achieving maximum stabilization performance. The purpose of the filters is to eliminate noise and vibration due to structural resonances in the camera, lens, or gimbal. Setting them too high or too low causes signal disturbances that can reduce the overall stabilization.

1. Pan, Roll, and Tilt Filters

These control the strength of the filter that is applied to the motor controller signal. The filters apply to each respective axis individually and can be found under the Main page of the Tuning menu.

2. Gyro Filter

This controls the strength of the filter applied to the Inertial Measurement Unit's (IMU) signal. Adjusting the Gyro filter can be done by going to the "Advanced" page under the tuning menu and selecting Gyro Filter. This filter applies to all three axes.



It will take experience to recognize the symptoms of too-high or too-low filters, and trial-and-error to find the optimum values for a particular set up.

TUNING FILTER SYMPTOMS

1. If the gimbal is vibrating at a high frequency after tuning, increase the filter values.
2. If the gimbal is oscillating or rocking at a low frequency after tuning, decrease the filter values.

HOLD STRENGTH

Whereas Stiffness values set how much the camera resists moving in the first place, Hold Strength sets how aggressively it tries to return to its target orientation if it is disturbed. Hold Strength also sets how aggressively it follows orientation commands from a second operator using a MōVI Controller or MIMIC. The default Hold Strength values are set to 8 for the MōVI XL. Increasing Hold Strength has pros and cons that should be weighed depending on the shooting situation.

Higher Hold Strengths PROS

- » Better rejection of disturbances, such as wind, cable tugging, and inertial forces due to imbalance.
- » Better performance at long focal length.
- » Faster tracking of commands from a second operator using a MōVI Controller or MIMIC.

Higher Hold Strengths CONS

- » Disturbances that do make it through can lead to jolts, since the camera will react faster to outside forces. This can be limited through Jolt Rejection. (See the next section for information on Jolt Rejection.)
- » Possibility of overshoot if the second operator stops a pan or tilt abruptly.

TUNING HOLD STRENGTH

1. To tune hold strength, increase the hold strength of an axis and use a dual-op device to control the orientation of the MōVI XL.
2. If the axis follows the dual-op control slowly, increase the hold strength.
3. If the axis overshoots the dual-op control, decrease the hold strength.

4. The final value should be set by weighing the Pros and Cons and testing the setup to see if the camera behaves as intended

JOLT REJECTION

To help enable higher Hold Strength settings while mitigating some of the cons listed above Jolt Rejection can sense jolts and soften the gimbals recovery effort.

Tuning Jolt Recovery

Jolt Rejection helps prevent the MōVI XL from overshooting its target orientation when responding to a sudden disturbance. A higher Jolt Rejection value increases the softening of the response; however values that are too high can cause the MōVI XL to react too slowly to disturbances.

MAX CONTROL RATE

The maximum rate of camera movement can be used to enable higher Hold Strengths while reducing the possibility of overshoot. This is especially helpful when shooting with longer focal lengths.

Tuning Max Control Rate

1. To increase the control over the camera's movements increase the Max Control Rate.
2. To increase the smoothness of the camera's movements decrease the Max Control Rate. This will reduce the operator's control over the camera's movements.

MōVI XL SETUP COMPLETE

Once you have adjusted the MōVI XL's parameters to suit your requirements, the setup is complete! Save the setting by power cycling the MōVI XL via the power button.



When saving the MōVI XL's setting power cycle the MōVI XL via the power button. Powering down by unplugging batteries will result in losing changed settings.

UPDATING THE MōVI XL

Before using the MōVI XL, update the MōVI XL's firmware to the latest version. To do this follow the steps below. When future firmware versions are released users can update the MōVI XL using the same process.

1. Download the latest version of the MōVI XL app to your mobile device from the App Store or Google Play.



2. Turn on the MōVI XL and make sure it is fully charged and has finished booting.
3. Open the MōVI XL app on your mobile device and connect to the MōVI XL.
4. If there is a new firmware update, your mobile device will prompt you to update the MōVI XL.
5. If you wish to update the MōVI XL select "update" to initiate the update process.
6. Once the update has completed, reboot the MōVI XL.



NOTE

Do not power down the MōVI XL, remove its microSD card, or interrupt its connection with the mobile device for the duration of the update.

ECOSYSTEM SETUP

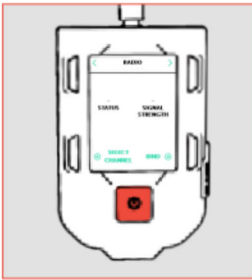
The MōVI XL was designed to integrate seamlessly with the current ecosystem of Freely products. Through the use of our industry favorite quick release connector and features specifically designed and programmed for product synthesis, the MōVI XL is the world's most versatile camera movement system.

MIMIC + MōVI XL

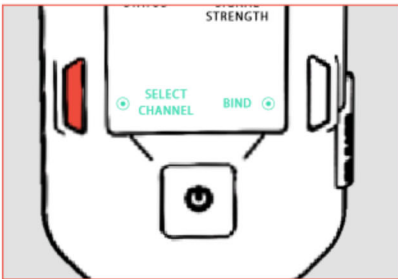
MIMIC is the next generation in the MIMIC family of products; an added display with controls, upgraded processor, and new features make it the most intuitive camera controller available. To use a MIMIC with your MōVI XL, you will first have to bind the devices as described in the following steps.

SETTING UP MIMIC BETA AND MōVI XL

1. Turn on the MIMIC by pushing the Power button. Use the display controls to move to the Radio Screen.



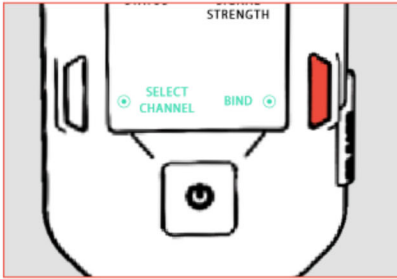
2. Select "Select Channel" and choose the channel you wish to use to pair the MIMIC with your MōVI XL.



3. Turn on the MōVI XL and proceed to the Radio Screen. Use "Select Channel" to set the MōVI XL to the same channel as the MIMIC. Press the Bind button on the MōVI XL; a progress

bar will appear showing the amount of time remaining to bind the device to a MIMIC.

4. Press the Bind button on the MIMIC within 5 seconds of pressing the Bind button on the MōVI XL. The devices will bind automatically.



MIMIC uses a very powerful wireless transmitter to control the MōVI XL; when this transmitter is in close proximity to its receiver, the receiver can be oversaturated with input causing unwanted movements. This is normal behavior for power wireless transmitters.

MōVI CONTROLLER + MōVI XL

A MōVI Controller can take complete control of the MōVI XL's camera movement, settings, and receive telemetry from the camera, allowing users to make on the fly adjustment to key MōVI XL parameters.

SETTING UP MōVI CONTROLLER AND MōVI XL

Items Needed

- » MōVI XL
- » MōVI RX*
- » MōVI Controller*

*These items are not included with the MōVI XL.

1. Select the desired channel on MōVI RX and connect it to the COM1 port on the MōVI XL GCU.



2. Power up the MōVI Controller and set the channel on MōVI Controller to match the channel on the MōVI RX.
 - a. Home > Radio Config > Channel (cycle and select with Menu Set knob)
3. Set Radio Action to Write.
 - a. Home > Radio Config > Radio Action (select Write with Menu Set knob)
4. Press Menu Set knob to enact the write command.
5. Power up the MōVI XL and hold the Bind button on the MōVI RX for 2-3 seconds.
6. Set Radio Action to Bind.
 - a. Home > Radio Config > Radio Action (select Bind with Menu Set knob)
7. Press Menu Set knob to enact Bind command.
8. Wait 20 seconds until MōVI Controller and MōVI RX are bound.



NOTE

For instructions on the operating procedure and other information on the MōVI Controller, please visit [freeflysystems.com/software-manuals](https://www.freeflysystems.com/software-manuals) and download the MōVI Controller User Manual.

MULTI CONTROLLER SETUP

The MōVI XL was designed to support multi-controller network to achieve advanced control from multiple remote devices. This means a MIMIC can be used to control gimbal orientation while simultaneously operating a camera's FIZ through MōVI Controller.

MōVI CONTROLLER + MIMIC + MōVI XL

1. Setup MIMIC and MōVI XL as described in the previous section.
2. Setup MōVI Controller on COM1 as described in the previous section.

In this configuration MIMIC controls the MōVI XL's orientation while the MōVI Controller controls FIZ.

MōVI CONTROLLER + SPEKTRUM/FUTABA RADIO + MōVI XL

1. Setup MōVI Controller on COM1 as described in the previous section.
2. Setup Spektrum/Futaba on COM2 as described in the previous section.

In this configuration the Spektrum/Futaba radio will control the MōVI XL's orientation while the MōVI Controller controls FIZ.

MōVI CONTROLLER + 2ND MōVI CONTROLLER + MōVI XL

1. Setup MōVI Controller on COM1 as described in the previous section.
2. Setup a second MōVI Controller on COM2.

In this configuration the second MōVI Controller controls the MōVI XL's orientation while the first MōVI Controller controls FIZ.



When a single MōVI Controller is connected to the MōVI XL it will control both the orientation of the gimbal and all FIZ control. Adding a second MōVI Controller to COM 2 will reassign orientation control to the second MōVI Controller.

QUICK RELEASE + MōVI XL

MōVI XL's Quick Release allows users to quickly and easily move the MōVI XL from mount to mount.

SETTING UP MōVI XL + QUICK RELEASE KIT

Items Needed

- » MōVI XL
- » Quick Release Kit*
- » 5mm Hex Driver*
- » (6x) M6x12 SHCS*

*These items are not included with the MōVI XL.

1. Use M6 bolts to attach the Quick Release (Female) to your preferred rig.
*Make sure that the Quick Release lever is in its open position.
2. Align the Quick Release (Male) with the M6 threaded holes on the Pan mount plate and fasten it to the MōVI XL using a 5mm hex driver and M6x12 bolts.
3. Once both parts of the Quick Release have been mounted, pick up the MōVI XL and slide the Quick Release (Male) into the Quick Release (Female).
4. Once you hear an audible 'click', tighten the Quick Release lever.
5. To remove the Quick Release (Male) from its counterpart; open the Quick Release lever, push in one of the two release buttons, and then pull the MōVI XL out.

MITCHELL MOUNT ADAPTER + MōVI XL

The MōVI XL's Mitchell Mount Adapter will facilitate mounting to most film tools including cranes, dollies, jibs, russian arms, and much more.

SETTING UP MITCHELL MOUNT ADAPTER AND MōVI XL

Items Needed

- » MōVI XL
- » [6x] M6x12mm SHCS*
- » XL Mitchell Mount Adapter*
- » 5mm Hex Driver*

*These items are not included with the MōVI XL.

1. Use the M6x12mm bolts and the 5mm hex driver to attach the XL Mitchell Mount Adapter to the MōVI XL.
2. Pick up the MōVI XL and slide the XL Mitchell Mount Adapter through female part of the Mitchell Mount on your preferred camera rig.
3. Align the XL Mitchell Mount Adapter's key feature with its counterpart on the female part of the Mitchell Mount.
4. Thread the nut onto the XL Mitchell Mount Adapter until it is tight.
5. If desired, the Mitchell Nut can be safety wired using the 4mm through holes on the nut's vertical post.

EXTERNAL POWER + MōVI XL

When battery power is not an option, the MōVI XL can quickly switch to an external power source. In this configuration the MōVI XL can continuously run on a external power source for as long as the shot requires.

SETTING UP EXTERNAL POWER AND MōVI XL

Items Needed

- » MōVI XL
- » External Power Cable*
- » External Power*

*These items are not included with the MōVI XL.

1. Before using external power be sure to read through the Cable and Power Source guides below as well as the cautions and warnings associated with external power.

2. To use your MōVI XL with external power, attach an external power source to the MōVI XL using a cable which terminates in a female XT-90 connector. Make sure that your cable pinout is correct before hooking up any power source to MōVI XL.
3. Once the MōVI XL is connected to the power source it is ready to use.

Cable Guide

CABLE LENGTH	AWG SIZE
Less than 2m	10AWG
2 - 5m	8AWG
5 - 10m	6AWG
Greater than 10m	Not recommended. Any cable longer than 10m must meet the maximum resistance and inductance specifications below.

Power Source Guide

CHARACTERISTIC	REQUIREMENT
Remote Supply Voltage	24V ±1V
Remote Supply Current	80A
Cabling Maximum Resistance	30mΩ
Cabling Maximum Inductance	10μH



CAUTION

For optimum performance and safety, observe the following requirements.

1. Make sure the positive and negative cables are grouped tightly in parallel for the entire length, to minimize inductance.
2. Do not route the cable around a steel structure or chassis. This increases the cable's inductance and will reduce the maximum cable length.
3. Always keep cable length as short as possible, shorter cables will minimize voltage drop and power loss in the cable.



WARNING

The auxiliary 24V power connection on the MōVI XL is raw and not protected from inrush current and voltage. Equipment powered from this connection may have its own external cable length limits, which must be observed.



USING
MōVI XL

CONFIGURING THE MōVI XL

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Configuring the MōVI XL is easy! With a built in control screen and a mobile app that can assume complete control over the MōVI XL's settings a user can adjust tuning values, remote controller setup, and switch modes on the fly. This grants the user complete freedom of customization and allows for endless creativity. The following section will walk through the configuration options available to a MōVI XL user.

USING MōVI XL SAFELY

Due to the MōVI XL's size and motor strengths it needs to be used with caution and the correct safety protocols. This section will describe the safety protocols that should be used while operating the MōVI XL as well as some of the safety features and functions.

SAFETY PROTOCOL

Follow the steps below when using MōVI XL to avoid injury due to the gimbal.

1. MōVI XL Setup

The MōVI XL should be powered off during setup.

2. MōVI XL Tuning

Supply power and activate the MōVI XL through the main GCU screen.

Once the gimbal is active no person should be within the gimbal's area of movement unless they are disarming the gimbal.

3. MōVI XL Use

When the MōVI XL is active no one should be within the gimbal's swept area.

4. MōVI XL Adjustments

MōVI XL should be disarmed by pushing any button on the GCU before any adjustments are made to the gimbal itself or any accessories mounted to the gimbal. Once the adjustments are complete the gimbal can be reactivated.

5. MōVI XL Pack Down

Once the MōVI XL is ready to be packed down it should be disarmed, powered down, and batteries unplugged.



Never rely on the kill function on the MōVI Controller or MIMIC to disarm the MōVI XL, this can lead to an accidental activation of the MōVI XL while adjustments are still taking place. Always disarm the MōVI XL from the GCU before servicing.

SAFETY FEATURES

Ramp Activation

Once activated the MōVI XL will begin stabilizing over ten seconds. It will ramp up the power supplied to the motors to avoid sudden movements and allow for operators to move away from the gimbal.

Instant Disarm

Pressing any button on the GCU while the MōVI XL is active will instantly kill all motors. This should always be done before entering the MōVI XL's range of motion.

ESC Failsafes

In the event of an ESC failure or severed cable, the MōVI XL will immediately enter a disarmed state to prevent erroneous signals from causing unwanted gimbal motion.

Overheating Protection

To protect users from overheated motors the MōVI XL uses software features to control the temperature and optimize power. If a motor begins to overheat, the software will reduce the power to allow the motor to cool.

Fuses

In the event of a power cable short, the GCU, TSU, and all motors have over current protection. This will reduce the likelihood of damage to the MōVI XL.

COMPASS CALIBRATING THE MōVI XL

The MōVI XL uses the compass to act as an absolute sensor which assists the Pan Gyro in keeping its frame fixed in the Compass Heading Assist Mode. This is not the default configuration, and can be set via the Heading Assist parameter in the app. Every MōVI XL goes through compass calibration at the factory, however when a MōVI XL is used in a new location this calibration is less accurate. Follow the steps below to recalibrate your MōVI XL's compass and bring the best performance out of the MōVI XL.

Items Needed

- » MōVI XL
- » [2x] MōVI XL Technicians

1. Connect your mobile device to the MōVI XL using the MōVI XL app.
2. Select 'Configurations', then proceed to the 'Expert' tab under the 'General' icon.
3. Make sure that the MōVI XL is not mounted to a rig and that all axes are locked.
*For ease of use, perform the compass calibration before mounting your camera package and camera accessories.
4. Select 'Start' on the top right of the screen to initiate compass calibration.
5. Follow the step by step instruction shown in the app using two people. Move slowly and carefully.
6. Set local declination value in the app for shooting location. This information is used when Heading Assist is set to Compass. Local magnetic declination values can be found online.



Compasses are sensitive to magnetic interference. Moving close to steel structures can affect performance when compass assist is enabled. Always try to calibrate the MōVI XL's compass in the environment it will be used.

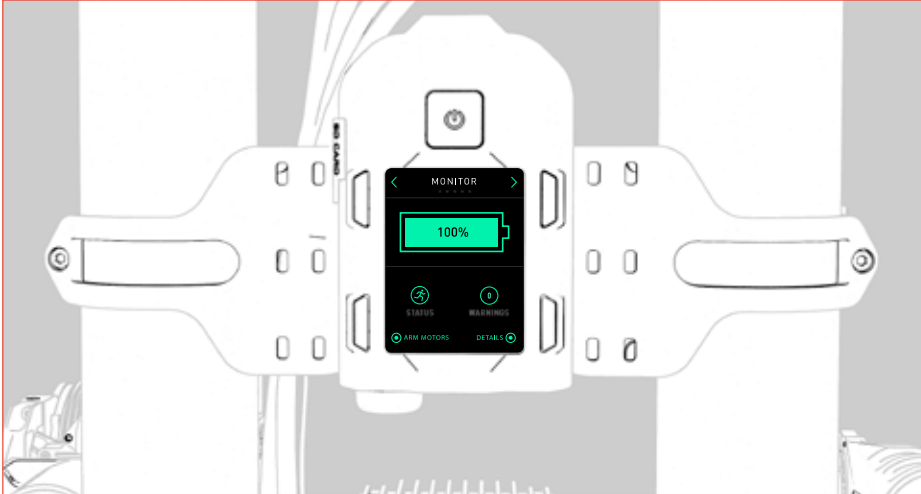
SETTING CONFIGURATIONS

SETTING CONFIGURATIONS VIA THE MōVI XL EMBEDDED DISPLAY

The MōVI XL is equipped with a built in display and display navigation system. This allows a user to check the MōVI XL's system status and make quick adjustments to tuning, tilt mode, radio options, and more.

MONITOR SCREEN

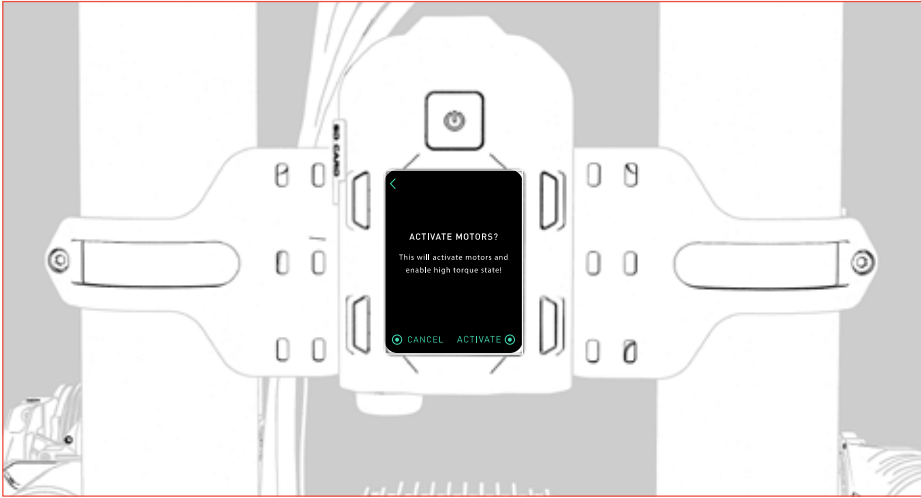
This screen monitors the MōVI XL's battery levels and system details including warnings and device statuses.



OPTIONS	DESCRIPTION
1. Battery Power (%)	Displays the energy remaining in the MōVI XL Batteries.
2. Next Screen Button	Takes users to the next GCU screen.
3. Details Button	Takes user to the MōVI XL's component status.
4. Activate Function	Initiates the activation sequence for the MōVI XL.
5. Status Icon	Displays the current status of the MōVI XL, for example whether booting or stabilization has initialized.
6. Warning Icon	Displays warnings about the MōVI XL. To view these warnings select the Details button.

ACTIVATION SCREEN

This screen prevents the MōVI XL from accidentally becoming live.



OPTIONS

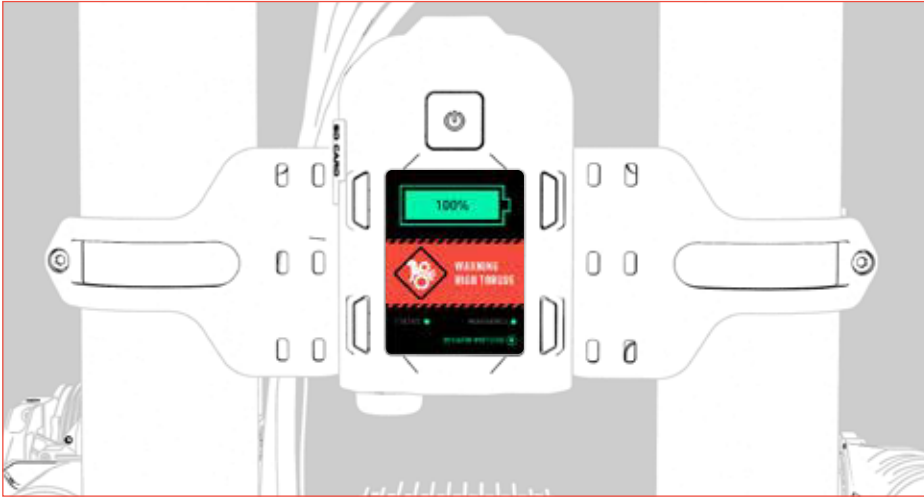
1. Cancel
2. Continue

DESCRIPTION

- This button cancels the gimbal activation process.
- Completes the MōVI XL activation process, the MōVI XL will ramp up its motors over ten seconds and begin stabilizing the camera package.

LIVE GIMBAL SCREEN

This screen is active at all times when the gimbal is activated.



OPTIONS

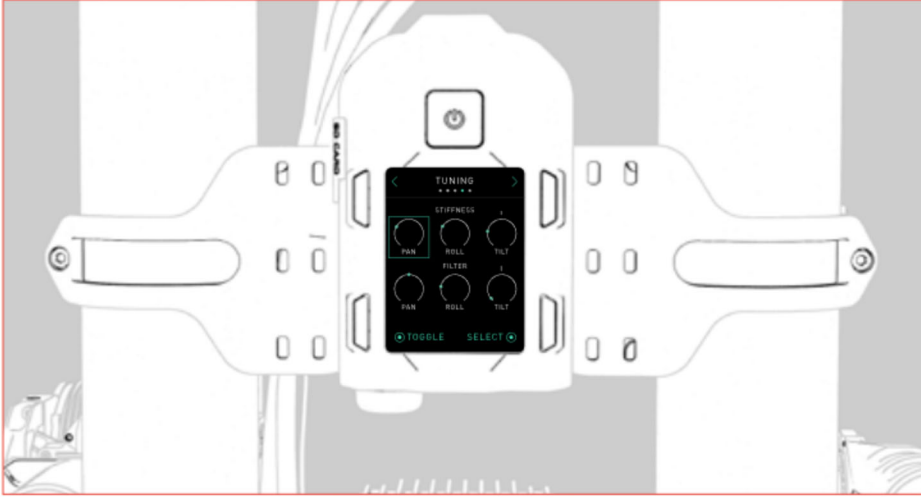
1. Disarm

DESCRIPTION

While the gimbal is live, hitting any of the four control buttons will disarm the gimbal immediately.

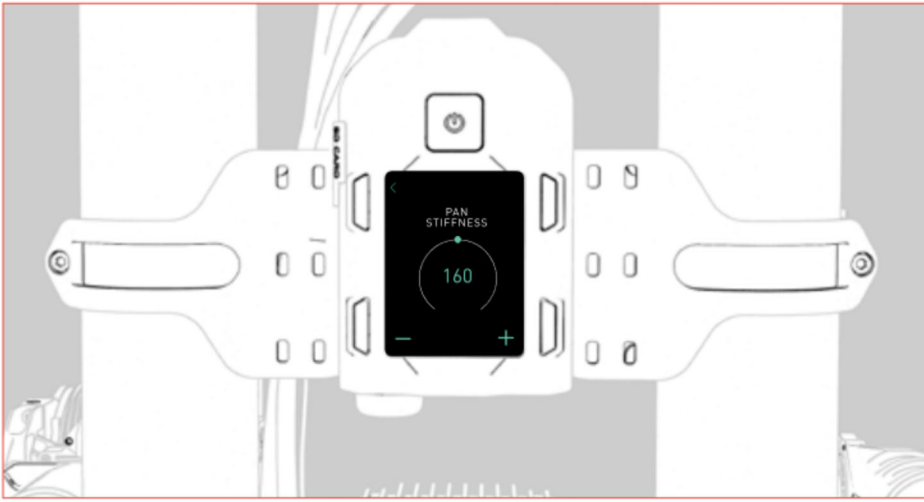
TUNING SCREENS

These screens allow users to instantly autotune or perform manual tuning adjustments to the MōVI XL without needing to connect to another device. Tuning through the GCU is only accessible when the Gimbal is disarmed. Autotune is not accessible through the GCU, please use the MōVI XL app to perform Autotuning.



Tuning Screen

OPTIONS	DESCRIPTION
1. Toggle	Toggles through the stiffness and filter parameters for each axis.
2. Select	Selects the highlighted parameter and moves to the respective parameter adjustment screen.
3. Stiffness Values (Pan, Roll, Tilt)	Displays a visual of the Pan, Roll, or Tilt stiffness values.
4. Filter Values (Pan, Roll, Tilt)	Displays a visual of the Pan, Roll, or Tilt filter values.
5. Next Screen Button	Takes users to the next GCU screen.
6. Previous Screen Button	Takes users to the previous GCU screen.

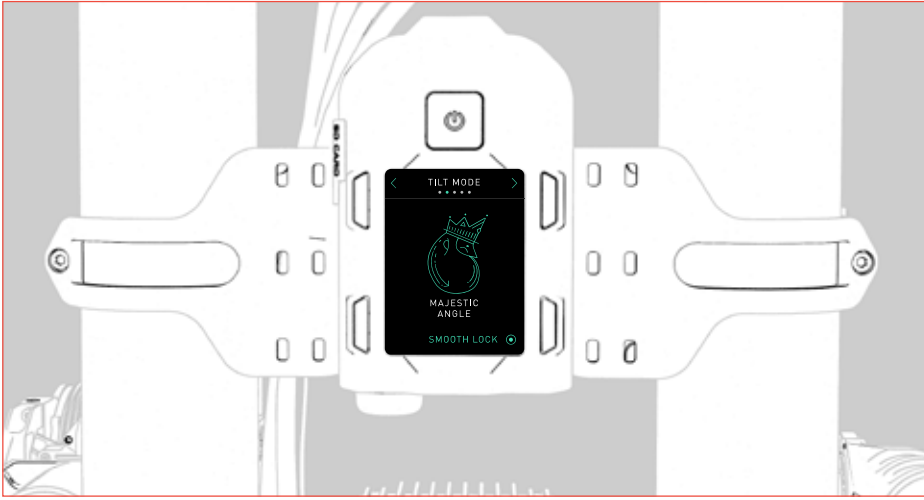


Stiffness/Filter Parameter Adjustment Screen

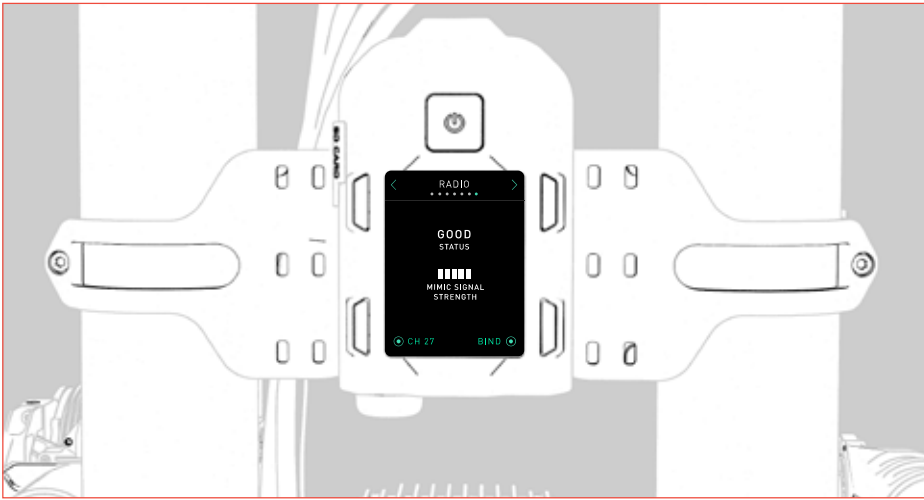
OPTIONS	DESCRIPTION
1. Previous Screen Button	Takes users to the previous GCU screen.
2. "+" Button	Increases the selected stiffness or filter value by (1) if pressed and (5) if held.
3. "-" Button	Decreases the selected stiffness or filter value by (1) if pressed and (5) if held.

TILT MODE SCREEN

This screen allows users to control the MōVI XL's tilt mode without the need of a second device.



OPTIONS	DESCRIPTION
1. Tilt Mode Status	Displays the current Tilt Mode status.
2. Majestic Angle/Smooth Lock	Switches the Tilt Mode from Smooth Lock to Majestic Angle. Pressing the same button will return the Tilt Mode to Smooth Lock.
3. Next Screen Button	Takes users to the next GCU screen.
4. Previous Screen Button	Takes users to the previous GCU screen.



RADIO SCREEN

This screen allows users to select the MōVI XL's receiver channel and bind the MōVI XL to a MōVI Controller, MIMIC, or approved radio control device.

OPTIONS	DESCRIPTION
1. Radio Statuses	Displays the signal status and strength.
2. Select Channel	Allows the user to select the MōVI XL's receiver channel.
3. Bind	Allows the user to bind the MōVI XL to a Dual-Op device.
4. Previous Screen Button	Takes users to the previous GCU screen.

SETTING CONFIGURATION VIA THE FREEFLY MōVI XL APP

The Freefly MōVI XL App grants users complete control over MōVI XL and all of its settings. The app is designed to be intuitive and easy to use while not limiting MōVI XL's versatility.

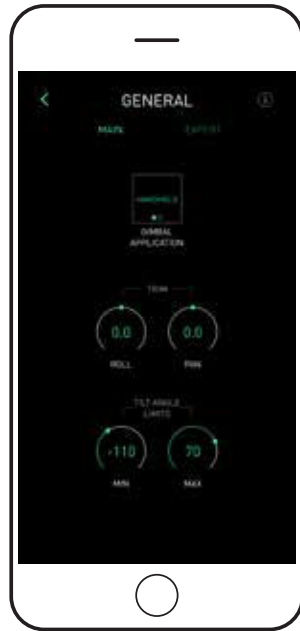
CONNECTION TO THE MōVI XL USING BLE

Before you can use a mobile device to configure your MōVI XL you must first connect the two devices using BLE. The following instructions will help you connect your MōVI XL to any compatible iOS or Android device.

1. Turn on the MōVI XL by pushing the power button and allow the gimbal to initialize.
2. Open the Freefly MōVI XL app on an iOS or Android mobile device. Connect to the MōVI XL by selecting "Connect" on the app's home screen and then choosing the MōVI XL you are using.

GENERAL MENU

MōVI XL's settings are accessible through the General icon under the Configurations menu.



Main Panel

OPTIONS	DESCRIPTION
1. Gimbal Application Icon	Select whether the MōVI XL will be used in "Handheld" or "Airborne" mode. This selection will affect the center position of the Mode switch while in Dual-Op by enabling Majestic Pan in "Handheld" mode or locking each axis for take-off and landing in "Airborne" mode.
2. Roll Trim	Increase or decrease the roll trim angle to level the camera during Majestic Mode.
3. Pan Trim	Increase or decrease the pan trim angle and set a new neutral pan angle when the MōVI XL is hard mounted. This can be used when the MōVI XL needs to be aligned in a certain direction
4. Min Tilt Angle Limit	Set the minimum angle of the tilt axis (downward tilt). This can be used to place a soft stop and prevent a camera, lens, or wiring from becoming a mechanical stop.
5. Max Tilt Angle Limit	Set the maximum angle of the tilt axis (upward tilt). This can be used to place a soft stop and prevent a camera, lens, or wiring from becoming a mechanical stop.



Min and Max Tilt Angle Limits use the world frame as reference for the limits and do not take the pan, roll, and tilt joint angle into account. This means that the limits are dependant on the orientation of the TSU and not the individual axes.



Expert Panel

OPTIONS	DESCRIPTION
1. Heading Assist	Use to orient the MōVI XL under different circumstances. "Fixed Mount" should be used when the MōVI XL is stationary to avoid any pan drift; "GPS" should be used in high acceleration situations commonly observed when using the MōVI XL with an aerial platform, and "Compass" can be used when the MōVI XL is handheld or aerial.
2. Declination	Set the declination angle when using the "Compass" Heading Assist mode. A declination angle is used to adjust for the Earth's magnetic variance due to global position. These values can be found online.
3. Compass Calibration	Calibrate the compass on the MōVI XL to increase the performance of the Compass Heading Assist mode. Follow the instructions provided by the app when initializing a compass calibration.
4. Motion Booting	Enable "Motion Booting" to allow MōVI XL to boot in situations where there is significant movement during the initialization process of the gimbal such as on a boat. For optimum performance in normal use, motion booting should be turned off.

OPTIONS	DESCRIPTION
5. Setdown Sleep	Enable "Setdown Sleep" to allow MōVI XL to enter sleep mode when motors are stalled for more than 4 seconds. MōVI XL will exit sleep mode when joint motion is detected.
6. Logging Rate	Select MōVI XL's data logging rate.
7. Data Logging	Enable the MōVI XL's data logging function via a MicroSD card in the GCU.
8. Pan Shaky Cam	Enable Shaky Cam for the pan axis. Shaky Cam deliberately disturbs the orientation of the gimbal to create a lead or lag effect.
9. Tilt Shaky Cam	Enable Shaky Cam for the tilt axis. Shaky Cam deliberately disturbs the orientation of the gimbal to create a lead or lag effect.

FIZ SETTING CONFIGURATION VIA THE MōVI CONTROLLER

Use the MōVI Controller for complete command over your MōVI XL's FIZ motor setup. Real time focus, iris, and zoom control in addition to individual axis configuration tools provide users with a fully customizable FIZ system.

FIZ CONFIGURATIONS

These configurations can be changed using the MōVI Controller and MōVI XL in tandem.

FIZ Config

OPTIONS	DESCRIPTION
Settings Action	Select MōVI Controller setting action. This only affects settings that are persistent and not state dependent.
Camera Type	Select the camera type so the MōVI Controller can use the correct signal protocol when communicating with the camera. This must be done in addition to using the correct remote R/S or control cable.
Focus Scale	Set the focus scale to Linear or Stretched. Stretched causes more of the focus knob travel to be used in the longer focal distance range where the scale gets compressed.
Focus Std/Metric	Select Standard or Metric units for focus distance measurements.
Lens Unit Focus	Set lens focus position to physical units or percent. A lens must be selected on the MōVI Controller to show physical units.
Lens Unit Iris	Set lens iris position to physical units or percent. A lens must be selected on the MōVI Controller to show physical units.
Lens Unit Zoom	Set lens zoom position to physical units or percent. A lens must be selected on the MōVI Controller to show physical units.

FIZ Axis Config

OPTIONS	DESCRIPTION
Axis Selection	Select the FIZ axis that will be edited.
Settings action	Select MōVI Controller setting action. This only affects settings that are persistent and not state dependent.
Motor Model	Select motor model to adjust control loop gains, fault settings and other settings that are specific to the motor.
Dampening	Change the strength of the low pass filter being used on the input control knob.
Knob Direction	Change the control direction of the input interface.
Motor Direction	Change the motor direction.
Torque Limit	Limit the max amount of current allowed to FIZ motor.
Speed Limit	Limit the max rotational speed of the FIZ motor.
Control Input	Change the control input interface for a FIZ axis. Default Input Interface Focus: Large knob Iris: Small Knob Zoom: Rocker

MODES

The creation of professional cinematographic content is made simple through the use of MōVI XL's modes; from intuitive orientation control, to custom dynamic time lapses, and more. All of the MōVI XL's modes are accessible through the MōVI XL app and the MōVI Controller.

MAJESTIC MODE

Majestic mode allows a single user to have complete control over the MōVI XL by stabilizing the camera and following movement inputs from the user. The Majestic mode GUI allows a user to configure the Majestic mode to suit a particular shot.



OPTIONS

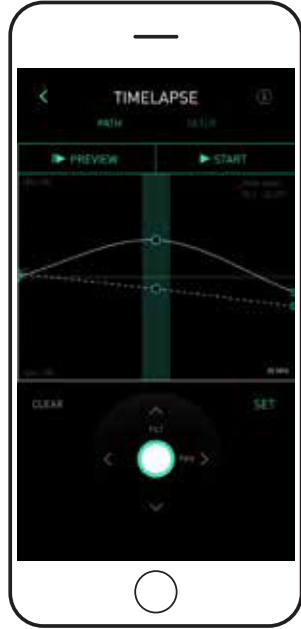
DESCRIPTION

1. Tilt Smoothing	Adjust the smoothing value applied to the tilt axis. Smaller values will result in gimbal movements that are more directly related to handle movements.
2. Tilt Window	Define the range of handle movement that will be ignored by the MōVI XL in Majestic Mode. This will allow for unintentional movements to be ignored.
3. Tilt Mode	Select "Smooth Lock" or "Majestic Angle" as the tilt mode. Smooth Lock will maintain a set tilt angle regardless of handle position. Majestic Angle links the tilt axis to the handle movement, allowing a single user to control the tilt angle.

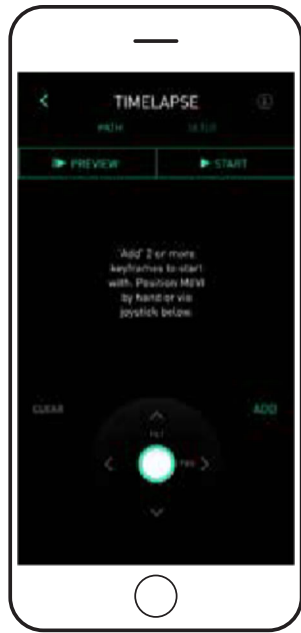
OPTIONS	DESCRIPTION
4. Pan Smoothing	Adjust the smoothing value applied to the pan axis. Smaller values will result in gimbal movements that are more directly related to handle movements.
5. Pan Window	Define the range of handle movement that will be ignored by the MōVI XL in Majestic Mode. This will allow for unintentional movements to be ignored.

TIMELAPSE MODE

Timelapse mode lets users create stunning camera movements for timelapses in seconds. Users can create and edit keyframes of the desired motion and quickly adjust variables such as Timelapse Interval and Timelapse Duration.



Timelapse works best when Heading assist is set to "Fixed Mount". This can be set on the Expert panel in the General Menu.



Path Panel

OPTIONS	DESCRIPTION
1. Preview	Initiate condensed preview of the timelapse path.
2. Start	Initiate the timelapse progression through all keyframes using the total duration calculated on the Setup panel.
3. Clear	Delete all keyframes.
4. Keyframe Display	Display each of the keyframes being used and the pan and tilt path used to travel from one keyframe to the next.
5. Virtual Joystick	Use to set or edit keyframe positions.
6. Add, Set, Done	Use to add and edit the timelapse keyframes. Select "Add" to place a keyframe in the current pan and tilt orientation of the MōVI XL. To reposition a keyframe tap the desired keyframe on the keyframe display and reposition it using the virtual joystick, the MōVI Controller, or an authorized 3rd party radio controller. Once desired keyframes are repositioned, select "Set" and then "Done" to exit the keyframe editing mode.



MōVI XL Keyframe positions may be set by hand or remotely via the MōVI Controller or an authorized 3rd party radio controller.



Setup Panel

OPTIONS	DESCRIPTION
1. Timelapse Interval	Select the time interval between shots. An intervalometer (not included) must be used to operate the camera's shutter and set to the same time interval used in the app.
2. Target Clip Length	Select the desired length of the video resulting from the timelapse images.
3. Target Clip FPS	Select the desired frames per second (FPS) in the video resulting from the timelapse images.
4. Total Photos	Displays the total number of photos that will be taken during the timelapse. Total Photos = Target Clip Length * Target Clip FPS
5. Timelapse Duration	Displays the time duration of the timelapse. Timelapse Duration = Timelapse Interval * Target Clip FPS * Target Clip Length
6. Pan Curve Fit	Toggle between linear and cubic paths between keyframes on the Pan axis.
7. Tilt Curve Fit	Toggle between linear and cubic paths between keyframes on the Tilt axis.

DUAL OP MODE

Dual Op mode allows one operator to concentrate on framing and lens control while another operator has control of movement. Dual Op is possible using the MIMIC, M6VI Controller, or certain 3rd party RC controllers.



Setup Panel

OPTIONS	DESCRIPTION
1. Controller	Select the type of radio controller being used in Dual Op mode.
2. Mode	Select the radio channel for Gimbal Mode. This should be mapped to a three-position switch to control modes (Kill, Majestic, Dual Op).
3. Pan	Select the radio channel for pan. It is recommended that the pan should be mapped to the right joystick's horizontal axis.
4. Pan Rate	Select the radio channel for pan rate. It is recommended that the pan rate should be mapped to the left joystick's vertical axis or a rotary knob.
5. Roll Trim	Select the radio channel for roll trim.
6. Tilt Curve Fit	Select the radio channel for tilt. It is recommended that the tilt should be mapped to the right joystick's vertical axis.
7. Tilt Rate	Select the radio channel for tilt rate. It is recommended that the tilt rate should be mapped to the left joystick's vertical axis or a rotary knob.
8. Shutter	Select the radio channel for remote shutter release or start/stop function.

Use the following guide to map Spektrum and Futaba radios.

Mapping for Spektrum Transmitter

RADIO TYPE	S. DSMX 2048
Map Remote Mode	6
Map Remote Pan	-2
Map Remote Pan Rate	1
Map Remote Tilt	-3
Map Remote Tilt Rate	-7
Map Remote Roll Trim	-4



NOTE

Mapping for Futaba Transmitter

RADIO TYPE	S. BUS
Map Pan Rate Clamp	-7
Map RC Mode	-5
Map RC Pan	1
Map RC Roll Trim	4
Map RC Tilt	2
Map RC Tilt rate Clamp	6



NOTE

The MōVI Controller or MIMIC do not require channel mapping through the MōVI XL App. All channel mapping for the MōVI Controller is done through the controller itself.



Adjustments Panel

OPTIONS	DESCRIPTION
MIMIC Mode	Select the mode (Direct, Level Roll, Majestic Pan, Majestic Pan/Tilt) in which the MIMIC controls the MōVI XL. <ul style="list-style-type: none"> » Direct mode allows the MIMIC to control MōVI XL's pan, tilt, and roll movement. » Level Roll mode allows the MIMIC to control the MōVI XL's pan and tilt movement. » Majestic Pan mode allows the MIMIC to control the MōVI XL's pan movement in majestic mode. » Majestic Pan/Tilt mode allows the MIMIC to control the MōVI XL's pan and tilt movement in majestic mode.
Shutter Mode	Select the shutter type (Pulsed, Latched, Camera I/F).
Pan/Tilt Speed Adj	Select whether the pan and tilt rates are controlled together (Combined) or separately (Independent).
Tilt Control Mode	Select tilt control mode (Rate, Angle). Angle mode is recommended for remote single operator use while Rate mode is recommended for all other situations.
Remote Rate Scale	Select the Remote Rate Scale value. A higher value will increase the maximum pan and tilt rates when in Dual Op mode.
Pan Joystick Smoothing	Sets how much smoothing is applied to the pan joystick in Dual Operator mode. A higher number will apply more smoothing.
Pan Joystick Window	Define a range of pan joystick movement from center that will be ignored.

OPTIONS	DESCRIPTION
Pan Joystick Expo	Set the exponential curve value that controls the pan movement. A higher value will reduce the sensitivity in the center of the joystick's range and increase the sensitivity toward the edges.
Tilt Joystick Smoothing	Sets how much smoothing is applied to the tilt joystick in Dual Operator mode. A higher number will apply more smoothing.
Tilt Joystick Window	Define a range of tilt joystick movement from center that will be ignored.
Tilt Joystick Expo	Set the exponential curve value that controls the tilt movement. A higher value will reduce the sensitivity in the center of the joystick's range and increase the sensitivity toward the edges.

TARGET MODE

Target Mode allows the MōVI XL to track a GPS coordinate automatically. In Target Mode, the MōVI XL autonomously frames the subject using the positional data from the MōVI XL sensors.



OPTIONS	DESCRIPTION
1. Toggle	Turn Target mode on and off by selecting the virtual toggle.
2. Mode	Select the MōVI XL's targeting mode. <ul style="list-style-type: none">· Position mode will target a specific location.· Position/Alt mode will target a specific location and altitude.
3. Height Offset	Compensate height during Pos/Alt mode.
4. Target Here	Mark the current GPS location of MōVI XL as it's target.
5. HACC Display	Displays the horizontal accuracy of the GPS.
6. Heading Assist Display	Displays the Heading Assist mode. This needs to be set to Compass or GPS for Target Mode to work
7. Tracking Display	Displays the MōVI XL's Target mode status.



Target Mode performance relies significantly on the quality of the GPS signal and a good compass calibration. Experimentation with target mode in different situations and environments is recommended before use in productions.



TROUBLESHOOTING
AND MAINTENANCE

TROUBLESHOOTING GUIDE

GIMBAL WON'T TURN ON

POSSIBLE CAUSE	POSSIBLE SOLUTION
Batteries are discharged	Replace discharged batteries with fully charged batteries
Batteries are damaged	Replace all damaged batteries Dispose of damaged batteries properly
Batteries unplugged or connections not seated properly	Check that the battery connections are properly seated

GIMBAL ON BUT NO STABILIZATION ON ONE OR MORE AXIS

POSSIBLE CAUSE	POSSIBLE SOLUTION
Axis Stiffness is set to 0	Use GCU Display or Mobile App to raise the stiffness values on axes with (0) stiffness
A Motor Drive has been reset due to voltage, temperature, or current protection	Restart the MōVI XL
Dual Operator Radio Controller is in Kill Mode	Use the Mode Switch on the Radio Controller to activate Dual Operator Mode
Gimbal is still initializing	Make sure the gimbal is steady for 5 seconds
Gimbal is disarmed	Activate the MōVI XL using the GCU

OSCILLATION ON ONE OR MORE GIMBAL AXIS

POSSIBLE CAUSE	POSSIBLE SOLUTION
Stiffness setting is too high	Reduce the Stiffness setting of the axis that is oscillating using the Tuning menu on the GCU or MōVI XL app
An Adjustment Clamp is not tightened	Check all Adjustment Clamps for adequate tightness; they must all be locked securely during operation
Camera mounting is not stiff enough	The camera must be mounted rigidly to the Tilt Axis. Use a wedge or spacer under the lens and/or on the sides of the camera to increase mounting stiffness if necessary
Filter settings are incorrect <i>Note: The Gyro and Output filters are advanced settings and should only be modified if other methods of reducing oscillation have failed</i>	If the oscillations are fast (buzzing), try increasing the Filter settings under Expert Settings on the GCU or MōVI XL App. If they are slow (rocking), try decreasing the Filter settings

HORIZON (ROLL AXIS) IS NOT LEVEL

POSSIBLE CAUSE	POSSIBLE SOLUTION
Roll Trim not set	Adjust the Roll Trim setting to achieve a level horizon

HORIZON (ROLL AXIS) IS NOT LEVEL UNDER HARD ACCELERATIONS

POSSIBLE CAUSE	POSSIBLE SOLUTION
GPS signal not present	Wait for GPS status to lock
Heading Assist not set	Select compass or GPS assist via the MōVI XL App

NO CONTROL IN DUAL OPERATOR MODE

POSSIBLE CAUSE	POSSIBLE SOLUTION
Dual Operator Radio Controller is off, or set to Kill or Majestic Mode	Turn on Radio Controller and set Mode Switch to Dual Operator (DUAL) Mode
Radio Controller Mapping is misconfigured	If you are using the Spektrum DX7, ensure that the Radio Mapping settings in the GUI are correctly mapped. (Refer to the Dual Op Mode Configuration section)
Incorrect "Radio Type" selected	Ensure the correct 'RADIO TYPE' has been chosen and matches the type of Transmitter you are using (i.e DSMX/DSM2 for Spektrum, SBUS for Futaba, MōVI Controller for MōVI Controller). To select "Radio Type" go to the 'Controller' sub menu' in the DUAL OP main menu in the MōVI XL App

REPLACING THE MōVI XL'S WIRE HARNESS

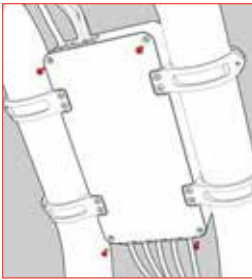
WIRE HARNESS REPLACEMENT PREPARATION

Items Needed

- » MōVI XL
- » 2mm Hex Driver
- » Diagonal Cutting Pliers*

*Not included in base MōVI XL

1. Use the 2mm hex driver to remove the screws holding the carbon closeouts to the power hub and roll beam.



2. Use the diagonal cutting pliers to cut the zip ties which are securing the cable(s) you are trying to replace.
3. You are now ready to replace any of the MōVI XL's serviceable cables.

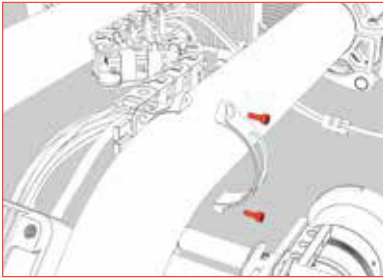
BATTERY HARNESS OR PAN MOTOR CABLE

Items Needed

- » MōVI XL
- » Battery Harness*
- » Pan Motor Cable*
- » 2mm x 100mm Ziptie*
- » 2.5mm Hex Driver

*Not included in base MōVI XL

1. Use the 2.5mm hex driver to remove the two screws attaching the back of the E-Chain to the bracket in the 50mm Pan Tubes.



2. Unclasp all latches in the E-Chain and remove the broken Battery Harness or Pan Motor Cable.
3. Make sure to plug in both sides of the cable to their respective connectors.
4. Insert the new connector into the E-Chain and close all the latches. Reattach the E-Chain to the Pan Tube Bracket and route the cables through its grommet.
5. Replace the zip tie used to secure the cables and reattach the Power Hub's carbon closeout.

GCU CABLE

Items Needed

- » MōVI XL
- » GCU Cable*
- » 2mm x 100mm Ziptie*
- » 2mm Hex Driver
- » 2.5mm Hex Driver

*Not included in base MōVI XL

1. Use the 2.5mm hex driver to remove the carbon closeout and the back cover from the GCU.
2. Remove the broken GCU Cable and replace it with a new cable. Reattach the back of the GCU and its closeout with the 2.5mm hex driver.
3. Replace the zip tie used to secure the cables and reattach the Power Hub's carbon closeout.

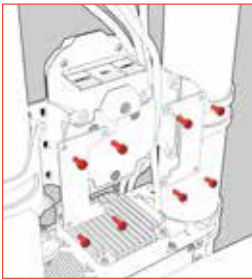
TSU CABLE AND TILT MOTOR CABLE

Items Needed

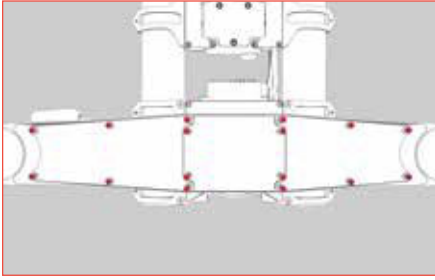
- » MōVI XL
- » TSU Cable
- » Tilt Motor Cable*
- » Diagonal Cutting Pliers*
- » 2mm x 100mm Ziptie*
- » 1.5mm Hex Driver*
- » 2mm Hex Driver
- » 2.5mm Hex Driver

*Not included in base MōVI XL

1. Use the 2.5mm hex driver to remove the carbon closeout that is attached on the right GCU.

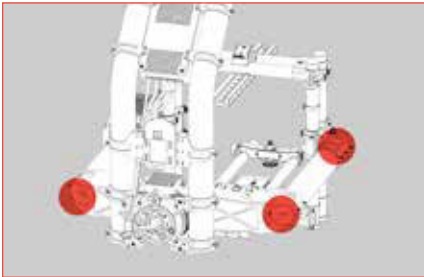


2. Remove the carbon closeouts on the Roll Beam using a 2mm hex driver.

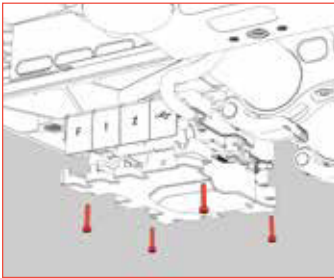


3. Clip the two zip ties holding the cables on the Wire Retention Bridge using the diagonal cutting pliers.

4. Remove the three foam plugs from the Roll Beam's 50mm carbon tubes.



5. If the TSU cable is damaged, use the 1.5mm hex driver to remove the bottom of the TSU.



6. If the Tilt Motor Cable is damaged, use the 2.5 mm driver to remove the wire cover from the Tilt Motor Drive Enclosure.

7. Replace the broken cable and make sure to plug in both sides of the cable to their respective connectors.

8. Close up the TSU; if the TSU Cable has been replaced then

insert the foam plugs into the 50mm carbon tubes.

9. Reattach the GCU's carbon closeout using the 2.5mm hex driver.
10. Use a zip tie to secure the replaced cable to the Power Hub, then remove most of the cable slack between the Power Hub and the Wire Retention Bridge and use two more zip ties to secure the cable to the underside of the wire retention bridge.
11. Coil up the excess wire in the Roll Beam and replace the carbon closeouts on the Roll Beam.
12. Reattach the Power Hub's carbon closeout.

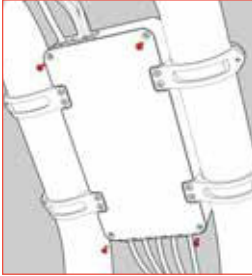
REPLACING THE MōVI XL'S FUSES

Items Needed

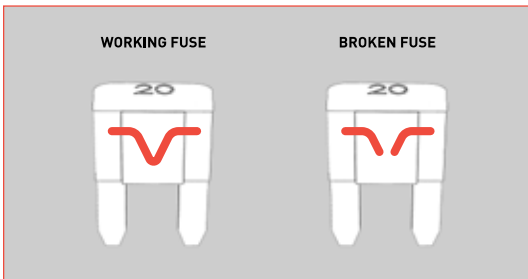
- » MōVI XL
- » 30A Fuse
- » 20A Fuse
- » 10A Fuse
- » 2mm Hex Driver

*Not included in base MōVI XL

1. Use the 2mm hex driver to remove the carbon closeout from the Power Hub.



2. Remove the blown fuse or fuses and replace them with the appropriate replacement fuses included in the MōVI XL base gimbal. Blown fuses can be identified by the lack of a connection between the two blades.



3. Reattach the Power Hub's carbon closeout using the 2mm hex driver.



DEFAULT TUNING VALUES

PARAMETER	DEFAULT VALUE
Autotune Percentage	60 %
Declination	0 deg
Gyro Filter	5
Jolt Rejection	0
Map Remote Mode	RC Channel 6
Map Remote Pan	RC Channel -2
Map Remote Pan Rate	RC Channel 1
Map Remote Roll Trim	RC Channel -4
Map Remote Shutter	RC Channel 0
Map Remote Tilt	RC Channel -3
Map Remote Tilt Rate	RC Channel -7
Max Control Rate	200 deg/s
Max Roll Angle	45 deg
Max Tilt Angle	70 deg
Min Tilt Angle	-110 deg
Motor Current	40.0A
Output Filter	1
Output Pan Filter	10
Output Roll Filter	5
Output Tilt Filter	1
Pan Hold Strength	15
Pan Joystick Expo	10 %
Pan Joystick Smoothing	5
Pan Joystick Window	8 μ s
Pan Majestic Span	135 deg
Pan Smoothing	10
Pan Stiffness	0
Pan Trim	0
Pan Window	10 deg
Remote Rate Scale	100 %
Roll Hold Strength	15
Roll Stiffness	0
Roll Trim	0
Shaky-cam Pan	0
Shaky-cam Tilt	0
Shutter Speed	0.5 s
Target Clip Length	15 s

PARAMETER	DEFAULT VALUE
Target FPS	24 fps
Target Height Offset	0 m
Tilt Hold Strength	15
Tilt Joystick Expo	10 %
Tilt Joystick Smoothing	5
Tilt Joystick Window	8 μ s
Tilt Majestic Pan	90 deg
Tilt Smoothing	10
Tilt Stiffness	0
Tilt Trim	0
Tilt Window	5
Timelapse Interval	2 s

DATA LOGGING FIELDS

FIELD	FIELD	DESCRIPTION
Accel East	m/s ²	The IMU derived eastward acceleration
Accel North	m/s ²	The IMU derived northward acceleration
Accel Up	m/s ²	The IMU derived upward acceleration, without gravitational acceleration
Baro Height	m	Height derived by barometric pressure measurement
East	m	GPS measured positional change in the lateral axis; where positive values indicate movement to the East
GPS Alt	m	The altitude determined by received GPS signals
GPS Time	HH:MM:SS	The Universal Coordinated Time determined by received GPS signals
Hacc	m	Horizontal position accuracy reported by GPS
IMU Time	s	Measurement of time elapsed since IMU initialization
Lat	deg*10 ⁷	GPS determined latitude
Long	deg*10 ⁷	GPS determined longitude
North	m	GPS measured positional change in the longitudinal axis; where positive values indicate movement to the North
Pan ESC Temp	deg Celcius	ESC temperature estimate
Pan Motor Current	amp	Instantaneous measurement of current being used by the motor
Pan Motor Temp	deg Celcius	Motor temperature estimate
Pan Winding Temp	deg Celcius	Motor winding temperature estimate
Pitch	deg	The IMU derived pitch angle where positive values indicate pitch up
Pitch Rate	deg/s	The IMU derived pitch rate where positive values indicate an upward pitch
Radio Pitch	µs	RC pulse width (1000-2000µs) where increasing values are for pitch up
Radio Roll	µs	RC pulse width (1000-2000µs) where increasing values are for roll right
Radio Yaw	µs	RC pulse width (1000-2000µs) where increasing values are for yaw to the right
Roll	deg	The IMU derived roll angle where positive values indicate a roll to the right
Roll ESC Temp	deg Celcius	ESC temperature estimate
Roll Motor Current	amp	Instantaneous measurement of current being used by the motor
Roll Motor Temp	deg Celcius	Motor temperature estimate
Roll Winding Temp	deg Celcius	Motor winding temperature estimate
Roll Rate	deg/s	The IMU derived roll rate where positive values indicate a rightward roll
S1 Drops	packets	Number of packets dropped during a communication cycle with control signal 1
S1 Rx/s	packets	Number of packets received per second from control signal 1; max of 76 packets

S2 Drops	packets	Number of packets dropped during a communication cycle with control signal 2
S2 Rx/s	packets	Number of packets received per second from control signal 2; max of 76 packets
Sacc	m/s	Horizontal speed accuracy reported by GPS
Sats	#	Number of satellites used for position calculation by GPS
Temperature	deg Celcius	The IMU derived temperature inside the GCU
Tilt ESC Temp	deg Celcius	ESC temperature estimate
Tilt Motor Current	amp	Instantaneous measurement of current being used by the motor
Tilt Motor Temp	deg Celcius	Motor temperature estimate
Tilt Winding Temp	deg Celcius	Motor winding temperature estimate

To download the most current user manual for the MōVI XL and all other Freefly products, please visit <http://freeflysystems.com/software-manuals>



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