



*evolution*LCS User Guide

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cmotion GmbH
Wiedner Hauptstraße 135/B3
1050 Wien
Fbnr.: FN220240H – HG Wien
UID-Nr.: ATU 54026806
<http://www.cmotion.eu>
sales@cmotion.eu
+43 1 7891096

Technical specifications are
subject to change without notice!

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Before Use

Dear Customer, we would like to take this opportunity to thank you for purchasing the *cvolution* Lens & Camera Control System. Please read these operating instructions carefully and keep them handy for future reference.

Information for Your Safety

- Danger of operational error!
- Danger of injury!
- Damage to equipment possible!

General Safety Precautions

- In order to ensure optimal performance, please read the instructions!
- Do not put your fingers near the motors while motors are moving!
- Make sure all components (*camin*, lens motors, etc.) are securely mounted!
- Remove batteries from components before transport or storage!
- Repairs should only be made only by authorized service centers!
- Use only original cmotion replacement parts!
- In the case of wet weather, routine safety precautions for handling electrical equipment in wet weather should be taken!
- Do not remove any screws that are secured with paint!
- Do not remove any warranty seals!

Important

- If you have questions, or you need to order parts, please note the components' model and serial number.
- For support requests, also supply the installed firmware number of all system components.
- **WARNING:** cmotion can only guarantee operation if original cmotion products are used.

Using this Guide

This manual is split in three parts. The first introduces you to the *cvolution* lens control system, explaining components and concepts. The second takes you step by step through the setup of the system. The third part guides you through operation and menu options. The table of contents provides a reference guide to specific sections of this user guide for quick information.

Note: Notes indicate important information related to the respective sections of this user's guide.

Warning: Warnings indicate important safety information. Ignoring these could lead to equipment damage or injury.

All cmotion components are written in italics throughout this manual.

Cables

When a cable is referred to in this user's manual, it is identified by its connectors. E.g. Fi 16p, Le 4p. Connectors are manufactured by W. W. Fisher, Lemo or Hirose and are referred to as Fi, Le and Hi respectively. The cable identification begins with the connector that is attached to the cmotion product (**cam**in) followed by the connector which is attached to non-cmotion product or cmotion accessory. Each connector also takes reference from the number of pins it has. E.g. Fi 16p, Hi 12p means that the cmotion connector is a 16pin Fischer and the other end is a 12pin Hirose.

Cables may also be referred to by their commonly used names e.g. CBUS (Le 8p, Le 8p). Occasionally, cable connectors are referred to as 'm' or 'f' to identify whether the connector is male or female. For a full overview of cables, please download the cmotion cable guide from www.cmotion.eu.

Necessary Tools

A 4mm Allen key may be required to complete steps laid out in the manual.

Frequently Used Terms

To Power Cycle: Turn your unit off and on again

1. Component Overview

This section of the User Guide deals with the description of the components and their respective functions, LEDs and buttons.

1.1. *camin 3M*

The new *cvolution camin 3M* is a compact, lightweight and low profile interface for focus, iris and zoom control. Motors can be controlled wirelessly or by cable using modular *cvolution hand units*. Popular broadcast controllers can also be used through a new analog interface. The discrete CAL button triggers auto motor calibration while the EXT connector provides an interface for wireless run/stop for a wide range of cameras. The unique LBUS connector allows for up to 3 daisy-chained *cforce/cforce mini* motors to be used independently or synchronized for a totally flexible 6 motor set up.



The *camin 3M* is an advanced model driving up to six motors.



1.2. Connectors and Controls on the camin 3M

Connectors and Controls, Top Side

ON-Switch	Turn <i>camin</i> on or off. Note: The voltage boost on the <i>camin 3M</i> is activated via the <i>hand unit</i> menu.
Channel Dial	Set the desired RF channel. Channel 1-9 for Black RF. Channels 0-7 for ARRI White RF.
Antenna port	Connect the supplied antenna to this port. To achieve optimum wireless range the antenna is required.

Connectors and Controls, Motor Side

LBUS port	You can connect up to 3 <i>cforce/cforce mini</i> motors to the LBUS port in a daisy chain fashion. Assign these motors to axis via the <i>hand unit</i> menu.
Motor ports	The <i>camin 3M</i> offers three Fi or Le motor ports. The standard axis assignment on these is as follows: M1 Focus, M2 Iris, M3 Zoom but can be changed via the <i>hand unit</i> menu.

Connectors, CBUS Side

RS	9-35 V power connector with standard ARRI pinout.
ANA	To control motors using traditional broadcast controllers. Optional CEN-1 / CEN-2 cables required.
CBUS	The CBUS port allows accessories like the <i>cfinder</i> to connect to the <i>camin</i> . It is also used for cable operation and software updates.
EXT	Camera /3rd party interface. If your camera is capable of communicating with the <i>camin</i> , it can be connected to the EXT port for camera control. You can also connect two cameras to EXT via split cable.

1.2.1. Technical Specifications *camini 3M*

General

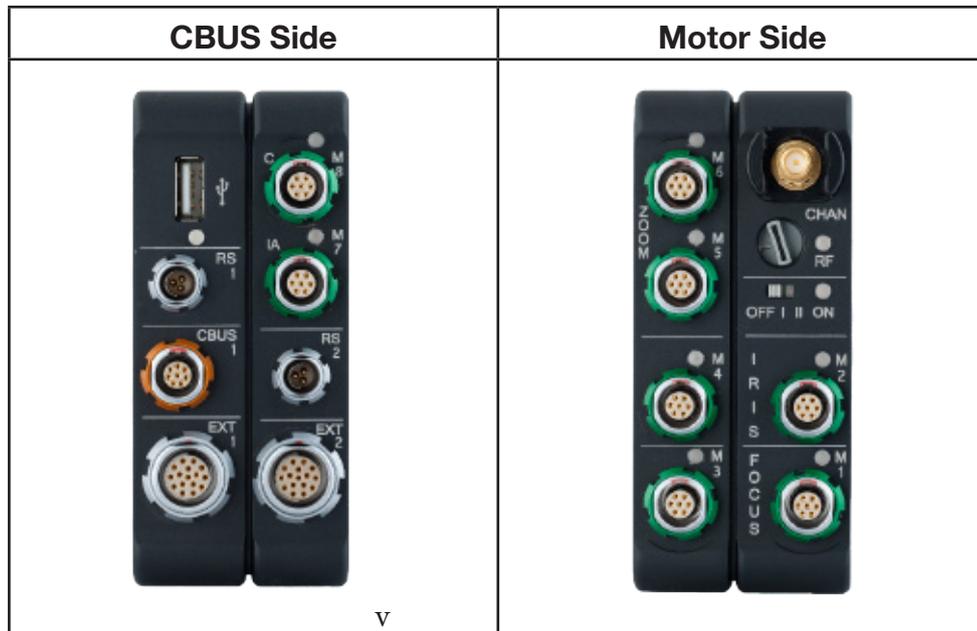
- Wireless communication: 2.4Ghz RF*
- Temperature range: -20 °C to + 50 °C
- Power Supply Voltage: 9 - 35 V
- Height 105 mm (4 1/8 in)
- Width 64 mm (2 1/2 in)
- Depth 24 mm (1 in)
- Weight 245 g (8 3/4 oz)

*For information on the RF module refer to section 1.4 on page 12.

1.3. *cam*in 8M/8M-TC 3D, Panoramic and Virtual Reality

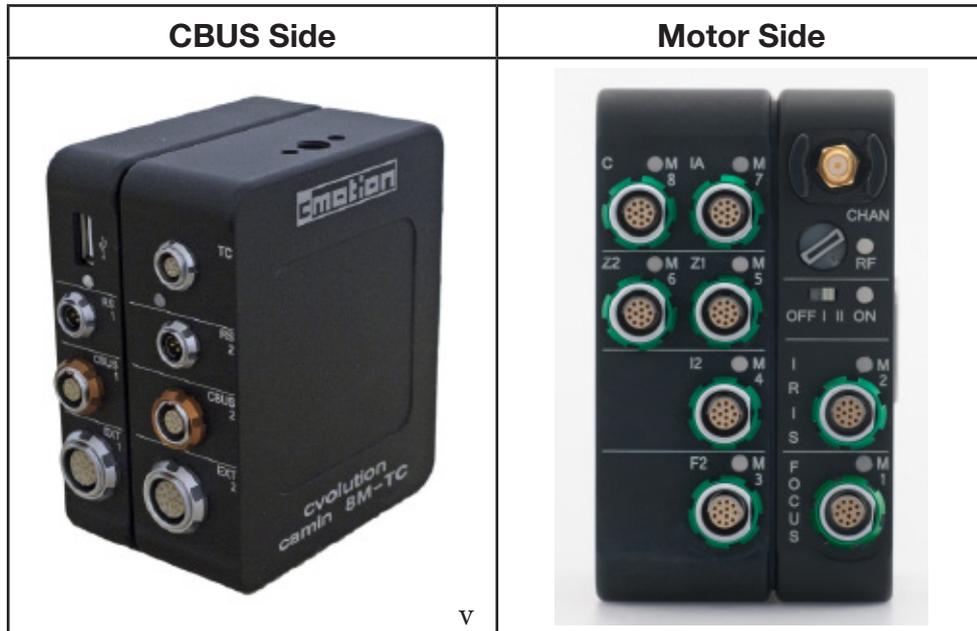
1.3.1. *cam*in 8M

The *cam*in 8M is capable of driving up to 8 passive motors plus/or up to 3 active motors. Thus, it is ideally suited for complex setups including 3D, panoramic and virtual reality.



1.3.2. *camin 8M-TC*

The **camin 8M-TC** is the **camin 8M**'s big brother. In addition to the regular *8M* features, *8M-TC* has a 5pin SMPTE TC input allowing it to record lens and rig meta data synchronised with time code. This data can be recorded to a USB stick or output via the CBUS serial output.



1.3.3. Technical Specifications *camion 8M/8M-TC*

General

- Wireless communication: 2.4Ghz RF
- Temperature range: -20 °C to + 50 °C
- Power Supply Voltage: 9 - 35 V
- Weight: 650 g (approx. 23 oz)

*For information on the RF module refer to section 1.4 on page 12.

1.3.4. Connectors and Controls on the *camin 8M/8M-TC*

Connectors and Controls, Motor Side

ON-Switch	Turn <i>camin</i> on or off		
	In position I the motor voltage equals the input voltage.		
	In position II the motor voltage is boosted internally to 26V but draws a higher current. If using position II, make sure your camera or power supply is capable of providing sufficient Amps.		
	Typical current requirements per motor connected are:		
	Supply voltage	24V	12V
	ON=I	0.5A	0.5A
	ON = II	0.6A	1.1A
Channel Dial	Set the desired RF channel. Channel 1-9 for Black RF Channels 0-7 for ARRI White RF		
Antenna port	Connect the supplied antenna to this port. To achieve optimum wireless range the antenna is required.		
Motor ports	Depending on your camin model there are up to 8 passive motor ports on this side of the <i>camin</i> . Connectors are either Fi 12p or Le 7p connectors.		

Connectors, CBUS Side

USB connector	The USB port is used for import/export of User Settings and recording of meta data (<i>camin 8M-TC</i> only)
RS-1	9-35 V power connector with standard ARRI pinout. This is the primary power connector for <i>camin 8M-TC</i>
RS-2	9-35 V power connector with standard ARRI pinout. This is the primary power connector for <i>camin 4M</i> and <i>8M</i> Note: When using more than 4 motors, it is highly recommended that you use both RS jacks to power the <i>camin</i> .
CBUS ports	The CBUS port allows accessories like the <i>cfinder</i> to connect to the <i>camin</i> . It is also used for cable operation and software updates. Please note: Second CBUS port available on <i>camin 8M-TC</i> only. CBUS 2 is also used for serial meta data output.
EXT-1, EXT-2	Camera and 3rd party interface. Up to two cameras can be controlled through EXT-1 via a split cable. The <i>camin</i> can be powered through the EXT ports, preferably EXT-2..
Motor ports	On the <i>camin 8M</i> , motor ports 7 and 8 are found on this side of the <i>camin</i> .
TC	SMPTE LTC Time Code In. Use this port to input time code from any time code generator capable of putting out SMPTE TC (camera, TC slate etc). Please note: TC port available on <i>camin 8M-TC</i> only.

1.3.5. LED Status *camin* 8M/8M-TC

	RF LED	ON LED	<i>camin</i> Status	Solution
RF LED/ON LED (Operation Status)	Off	Off	<i>camin</i> off	check <i>camin</i> ON/OFF switch check power supply voltage (9 V minimum) check for cable damage
	Off	Flashing Red/Green	<i>camin</i> ready, (cable mode, channel selector set at 0 or RF off) no client logged on	turn on clients
	Flashing Red	Flashing Red/Green	<i>camin</i> ready (wireless mode), no client logged on	turn on clients
	Off	Green	<i>camin</i> ready, client logged on in cable mode	OK
	Green	Green	<i>camin</i> ready, client logged on in wireless mode	OK
	Red	Flashing Red/Green	During Start-Up: <i>camin</i> is booting up Selected channel already in use by another <i>camin</i> Channel is currently being changed Hardware fault	turn off <i>camin</i> and change radio channel If that does not work, please contact cmotion.
	Green Flashing	Flashing Red	Software incompatible between <i>camin</i> and clients	update all components
	Red	Flashing Red	Low battery <i>camin</i> will not work	change Power Supply
Motor LED	Flashing Red		Motor Error	check motor cable If no reason can be found, please contact cmotion
	Green		Motor ready	
	Green/ Flashing Red		System is calibrating motor cannot reach its position	check if lens torque is too high and lens damage check lens calibration
	Off		No motor connected	check motor cable check if <i>camin</i> is turned on
TC LED	Off		No time code input	check TC cable check if TC generator is powered on and set up correctly
	Green		Time code signal present and device in sync	
	Flashing Green		Time code running out of sync (40 minutes warning before sync is lost)	Reconnect TC generator and re-sync within 40 minutes
	Red, followed by Green		Syncing with TC signal	Do not disconnect the TC in cable
	Flashing Red, Red		TC out of sync	Re-sync with TC generator

1.4. *evolution camin* wireless systems

evolution systems are available in 2 wireless versions. The first, and “standard RF at time of writing”, is ARRI White. This is identified with either a white dot or white disc on the antenna module of each *evolution* hand unit. A white antenna port is used to identify the white RF module in all *evolution camin*.

The white system offers integration into ARRI’s Wireless Lens Control System (WLCS) and is fully compatible to the ALEXA Plus and other WLCS cameras.

- Selectable RF channels: 0-7
- Max Active users: 3
- *camin* software releases: 3.11.x
- The *cdisplay II* and the *czoom II* can only be used in cable mode.

The black system is the legacy *evolution* system. Most important technical specs are:

- Selectable RF channels: 1-9
- Max Active users: 4
- Selectable RF power.
- *camin* software releases: 3.11.x
- The *czoom II* can only be used in cable mode.

1.5. *evolution hand unit*

The *evolution hand unit* is the modular hand-held control unit of the *evolution* Lens Control System. The base unit can be expanded with several modules for controlling lens and/or rig motors. The construction is light-weight and ergonomic with a user friendly and intuitive



interface.



evolution hand unit (without **slider** and **knob**)

evolution hand unit (with **slider**, **knob**, **zoom** and **cdisplay II**)

1.5.1. Connectors and Buttons on the *volution hand unit*

Buttons

ON button	Turn <i>hand unit</i> on or off
CAL button	Calibrate motors. Refer to section 4.4 on page 49
LENS button (KNOB)	Set lens limits When pressed while holding CAL only the motor associated with <i>knob</i> is calibrated In the menu, LENS is context sensitive and serves several purposes, as indicated on the display.
KNOB button	Set <i>knob</i> limits. In the menu, KNOB is context sensitive and serves several purposes, as indicated on the display.
RUN (GREEN button)	User configurable: REC (start/stop the camera) RET Trigger (Return function when using an ARRI Alexa camera and a RVI cable) UB 1, UB 2, UB 3 (triggers assignable camera user button functions) MARK (used in conjunction with <i>cfinder</i> , <i>cdisplay</i>) QSYN (used for quick sync) RECM (start/stop recording meta data, with <i>camin</i> 8M-TC only) LASER (activates the laser pointer of <i>cfinder</i> III) Off
RUN (RED button)	User configurable: REC (start/stop the camera) RET Trigger (Return function when using an ARRI Alexa camera and a RVI cable) UB 1, UB 2, UB 3 (triggers assignable camera user button functions) MARK (used in conjunction with <i>cfinder</i> , <i>cdisplay</i>) QSYN (used for quick sync) RECM (start/stop recording meta data, with <i>camin</i> 8M-TC only) LASER (activates the laser pointer of <i>cfinder</i> III) Off
MENU SELECT WHEEL	Enter menu by pressing twice Scroll in menu In SYNC menu: move slave motor

Connectors

CBUS port	The <i>volution hand unit</i> has a CBUS port on the top side. This allows mounting the <i>zoom module</i> as well as connection to the <i>camin</i> via <i>cbus</i> cable. It can also be used for software updates.
Antenna connector	Connector for RF antenna. External antenna <i>hand unit</i> only.

Battery port	Insert the cmotion battery in the battery port to power the <i>hand unit</i> . Note: For cable operation, a battery is not necessary.
---------------------	--

1.5.2. LED Status *evolution hand unit*

	LED Status	<i>hand unit</i> Status	Solution
READY LED	OFF	<i>hand unit</i> off	Turn on system
	GREEN	<i>hand unit</i> on	
	RED Blinking	Battery low	Change battery
	RED	at startup: <i>hand unit</i> not ready while online: power to <i>camin</i> lost unexpectedly	
RUN LED	OFF	No run signal from camera Camera in standby	Check cable Check if RUN SIMUL is ON
	GREEN	Camera running	OK
	RED	Camera error Camera changing speed	
Slider LED	OFF	System idle	
	GREEN	Lens limits have been set	Remove lens limits by pressing the „LENS“ button
	RED	<i>Slider</i> does not have control of assigned motor	Connect motor to appropriate port on <i>camin</i> Change <i>slider</i> configuration to different motor
	Blinking RED/GREEN	Calibrating	Wait for calibration to finish
	Blinking GREEN	Calibration armed	Release “CAL” button to calibrate
KNOB LEDs (advanced knob only and only when used with <i>cdisplay II</i> and <i>cfocas</i>)	OFF	System idle	
	MIDDLE LED GREEN	Manual focus matches <i>cfocas</i> range finder value	
	RED LED BAR	Shows necessary focus correction	

1.5.3. Technical Specifications *evolution hand unit*

General

- Wireless communication: 2.4Ghz RF
- Temperature range: -20 °C to + 50 °C
- Power Supply: 7 -35 V
- Power Supply Battery: 7,2 V
- Weight: *hand unit* only: 350 g (approx. 12 oz), 1,15 kg (approx. 40 oz) with *knob, slider, zoom* and battery

1.6. evolution basic knob

The *evolution hand unit* can be configured with a *basic knob* or an *advanced knob*. Both *knobs* can be mounted for left or right hand use.



evolution basic knob

1.7. evolution advanced knob

The **advanced knob** features mechanical limits, a locking mechanism, torque adjustment, back lit marker ring illumination and auto focus reference LEDs.



evolution advanced knob

1.8. evolution slider

The *evolution slider* is an extension module for the *evolution hand unit*. Up to three *sliders* can be attached to the main unit. *sliders* are commonly used to control iris, interaxial or convergence motors.



evolution slider

The *sliders* feature a locking mechanism and a user swappable marker strip.

1.8.1. LEDs and Buttons of the *slider*

Refer to sections 1.5.1 on page 14 and 1.5.2 on page 16 for information on the *sliders* LED and button.

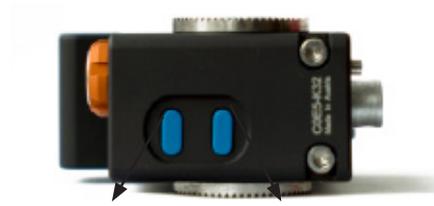
1.9. evolution zoom

The *evolution zoom* is an extension module of the *evolution* Lens Control System and is designed to control the zoom motor(s) with a pressure sensitive joystick. Most commonly, the *evolution zoom* can be attached directly to the *evolution hand unit* for wireless operation. However, it can also be attached to its own handle and hard wired to a *camin* using a CBUS cable. The *zoom* control can then either be hand held, or mounted to the pan bar using a *cfast-czoom* bracket.

evolution zoom module front view (display, zoom controller, buttons) & back view

evolution zoom module top and bottom view

Note: There are two versions of the *zoom* unit. The layout of the older version differs only slightly and is not pictured here. The pan-bar zoom unit has two user buttons only, whereas all other zoom units serve 4 buttons for individual user assignment.



LENS / USER BUTTON 1 LENS / USER BUTTON 2



1.9.1. Connectors, Buttons and Display of the evolution zoom

Connectors

CBUS	The <i>zoom module</i> has one male and one female CBUS connector. This allows the <i>zoom</i> unit to be mounted to the <i>hand unit</i> and/or cabled to the <i>camion</i> .
------	--

Buttons

ZOOM MENU BUTTON	Menu – access menu/select
ZOOM MENU BUTTON UP	User button, to be assigned as ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN, (and navigate through menu)
ZOOM MENU BUTTON DOWN	User button, to be assigned as ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN (and navigate through menu)
LENS / USER BUTTON 1 (for latest revision units from 2015)	User button, to be assigned as ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN
LENS / USER BUTTON 2 (for latest revision units from 2015)	User button, to be assigned as ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN

Display

Bar graph (middle)	Shows zoom position
Zoom speed read out (right)	Shows zoom speed
Data (top center)	Zoom value, Distance and lens data
USER BUTTON 1 (left / top)	Shows user button 1 configuration
USER BUTTON 2 (left/bottom)	Shows user button 2 configuration

Note: The *zoom* display is independent from the *hand units* display and menu.

1.9.2. Technical Specifications evolution zoom

General

- Temperature range: -20 °C to +50 °C
- Power Supply: 9-35 V
- Weight: 163 g (5 3/4 oz)
- 180 g (6.35 oz) (for revision units before 2015)
- 145g (5.11 oz) (pan-bar zoom with clamp)
- 143 g (5 oz) (steady zoom with clamp)

1.10. cvolution knob solo

The *cvolution knob solo* is a light-weight, ergonomic and easy-to-use single axis controller. Using the cmotion locking disc, it can be mounted to lens support rods, pan bars or specially adapted supports for use in OB trucks and studios. The *knob solo* has a direction switch and axis selector for control over focus iris or zoom and a LENS button to set LENS limits. Using the CBUS connector, *cvolution knob solo* can be connected to any *cvolution camin*, *cforce* motor, ENG adapter or ARRI ALEXA Plus. Like the advanced *knob*, the *knob solo* advanced features LED scale illumination.



1.10.1. Connectors, Buttons and LEDs of the evolution knob solo

Connectors

CBUS	The <i>knob solo</i> features a CBUS connector. The <i>knob solo</i> can be connected directly to a <i>evolution camin</i> or an ARRI ALEXA PLUS.
------	---

Buttons/Switches

F/I/Z Switch	Select Focus/Iris/Zoom scale.
L/R Switch	Select <i>knob</i> direction.
LENS	Set lens limits

LEDs

OFF	System idle
MIDDLE LED GREEN	Manual focus matches cfocas range finder value
RED LED BAR	Shows necessary focus correction

1.10.2. Technical Specifications evolution knob solo

General

- Temperature range: -20 °C to +50 °C
- Power Supply: 9-35 V
- Weight: *knob solo* basic 350 g (approx. 12 oz) *knob solo adv* 400 g (approx. 14 oz)

1.11. cforce

cforce is a motor with built-in smart electronics that runs as fast as any top end motor but produces less than 20 dB when high speed mode is disabled. It was developed in collaboration with ARRI and offers 3 different mounting options: rod-to-rod, Hill bracket locking disc and the “standard” rod bracket mounting with 2 different clamp versions, sporting unparalleled mounting flexibility. *cforce* motors are connected in a daisy chain fashion. I.e. a cable from the first motor is connected to the second, another cable runs to the third motor and the last is cabled to the *camlin*, thus achieving a less cluttered and expedited setup.

cforce motors can also be used with the compact LCS, knob solo, ENG-adapters and broadcast *camlin*



Status LED

Red	Voltage below 10 Volts, motor won't function
Flashing Red	No LBUS data, i.e. no camlin or no other LBUS device present
Flashing Red/Green	No controller assigned to motor
Flashing Yellow/Green	Motor Calibration Request
Flashing Yellow	Motor Calibration underway
Flashing Green	Motor in manual mode, i.e. for manual calibration
Green	Everything normal

1.12. *cforce mini*

cmotion has partnered up with our friends at ARRI to develop the new intelligent, compact and lightweight *cforce mini* motor. Weighing in at 6 ounces, *cforce mini* provides precision and power in any situation where size and weight are critical. Equipped with the same twin LBUS connectors as its big brother, up to 3 *cforce mini* motors can be integrated with any compact LCS *camin*, *evolution* LCS *camin* or broadcast solution. And, with the new ARRI ALEXA Mini also using the same LBUS connector and protocol, these motors offer even greater flexibility.

The *cforce mini* also provides a lighter option for all existing stand-alone cmotion solutions including pan-bar zoom, *evolution knob* solo and broadcast ENG-adapters.



Status LED

Red	Voltage below 10 Volts, motor won't function
Flashing Red	No LBUS data, i.e. no camin or no other LBUS device present
Flashing Red/Green	No controller assigned to motor
Flashing Yellow/Green	Motor Calibration Request
Flashing Yellow	Motor Calibration underway
Yellow	Motor is in calibration timeout state
Flashing Green	Motor in manual mode, i.e. for manual calibration
Green	Motor is ready and calibrated, no warnings

2. cvolution system Accessories

2.1. Battery



Battery 2.400mAh 7.2V for all cmotion controllers and the *cdisplay II*.

2.2. Battery Charger



Battery charger for cmotion batteries. Worldwide socket adapters available optionally.

2.3. cvolution CBUS splitter



The CBUS splitter allows connection of more CBUS devices to the *cam* or *hand unit*, such as a *cfinder* or *cdisplay II*.

2.4. *cvolution* handle



The *cvolution handle* is the handgrip unit for the *cvolution zoom*. It enables an independent operator to control the *zoom* motor(s).

2.5. *cstrap*



The *cstrap* allows the *hand unit* to be carried around the neck or over a shoulder between takes. The locking mechanism allows the unit to turn freely without the risk of coming loose.

2.6. *clamp II*



The *clamp II* allows the *cdisplay II* to be mounted directly to the *cvolution hand unit*.

2.7. cfastener



The cfastener is a universal clamp for secure attachment to rods 15-28mm (e.g. support rods or pan bar). The clamp has two 1/4 inch screw threads for mounting optional fastening tools.

2.8. cfast-czoom



Attaches various *evolution* system components to the pan bar, support rods or any other 15-28 mm rods.

2.9. cfast-vlock



The cfast-vlock provides a fast and secure mounting solution for *evolution camin 2M/4M/8M/8-TC* (plus *camin 3M* when using cfast-vlock rosette adapter) on cameras, 3D rigs and any 15-28mm rods. The cfast-vlock consist of a v-shaped plate that can be screwed to the back of a *camin*, plus the respective v-lock bracket which can be securely mounted on the optional cfastener.

2.10. cfast-artemis



Secures the *camin* to the Sachtler Artemis camera stabilization system.

2.11. Additional Fastening Tools

There is a wide variety of fastening tools available for the *volution* system. For more information check www.cmotion.eu.



2.12. Antenna



Flexible swivel antenna, straight or right angle. Length 10cm. +1dBi, 2.4Ghz. For *evolution camin* and external antenna *hand unit*.

2.13. Marker Ring



Marker ring for *evolution* focus knobs.

2.14. Pre-marked Marker Rings



cmotion offers three imperial and three metric pre-marked rings for both right and left handed operators. Each ring is engraved with scale from infinity to one of three close focus values. These can be used with a wide range of lenses from wide angle to telephoto. They are available for both right and left-handed operation. For more information refer to section 4.16 on page 66

NOTE: If you bought your *evolution* system before 20th December 2013, your *evolution knob* will need to be calibrated at cmotion before it can be used accurately with pre-marked rings. For more info contact cmotion support.

2.15. Marker Strip



User swappable marker strip for the *cvolution slider* module.

3. System Setup

This section will guide you through the *cvolution* system setup. Starting with the **camin** then proceeding to *cvolution* **hand unit** and *cvolution* **zoom** unit.

3.1. camin 3M/8M

3.1.1. Attaching camin to the Camera

Mount the Lens Motors and **camin** securely. The *camin* can be attached to the camera using various fastening tools. The most popular are the *cfast* rod connector and the *cfast-vlock*; which can be used with or without a *cfastener*.



Illustration shows *camin* 2M mounted with *cfast-vlock* and *cfaster*.

3.1.2. Attaching *cfast-vlock*

- Use a No.2 Philipps screwdriver and the 4 supplied screws to attach the v-shaped insert piece to the *camin*.
- If applicable: attach the *cfastener* to any rod 15-28 mm. Fasten securely!
- Gently slide the insert piece into the interlocking mechanism until you hear it click and lock into place.

3.1.3. Releasing *cfast-vlock*

- Push and hold the release button.
- Slide the *camin* upwards.

3.1.4. Mounting the Antenna

- Locate the antenna port on the Motor side of *camin 2M*, *4M* and *8M* and the top side of *camin 3M*.
- Insert the threaded end of the antenna and attach by turning it clockwise.
- Tighten securely.

3.2. Powering the camin and Connecting Motors

Use the cable RRS-1 or RRS-8 (Fi 3p, Fi 3p, for ARRI style power outlets) to connect the *camin* to the camera. If you are using a *camin* 2M, use connector RS-1. If you are using *camin* 4M or 8M, use connector RS-2 for the primary power source. A *camin* 3M only has 1 RS connector on the CBUS side.

Note: RRS cables are used for various ARRI cameras. See the cmotion cable guide or contact us for more info on camera cables.

3.2.1. Connecting Motors to the camin 3M/8M



The ARRI CLM-4 will be used in this example showing how to connect motors to the **camin**. Use a CLM-4 cable for a Fi connector *camin* or a CAM-4 for Le motor ports.

- Carefully align the internal locating pin on the Bi 8pin connector with the reference groove positioned on the far side of the motor connector (turn reference pin away from you). Push into position and secure by tightening the thread connector.
- Align the Fi or Le connector with the corresponding motor port on the *camin* and push firmly to secure.

Note: The ARRI CLM-5 motor has an integrated cable. Just connect this to the desired motor port.

Note: Other motors like the Heden M21VE are connected in a similar manner. Refer to the current cmotion cable guide for the correct cables: www.cmotion.eu.

3.2.2. Changing CLM-4 gears



Most motors have user-exchangeable gears for different lenses. With the CLM-4 you can change the gears by follow these steps:

- Use a coin or flat blade screwdriver to loosen the screw.
- Choose the gear with the correct gear pitch.
- Choose the side on which you would like to gear ring to be placed.
- Align the gear shaft with the gear mount and gently push the gear into the mount until it clicks into place.
- Tighten the screw securely before use

3.2.3. Mounting Motors to Camera Support Rods



- Loosen the thumbscrew and gently slide the motor onto the rod.
- When the motor is in the correct position on the rod, adjust the motor height by sliding the motor up or down in the clamp if necessary.
- Press the gear firmly against the lens or rig gear and fasten the thumbscrew securely.

Warning: Make sure cables are not at risk of becoming caught or tangled during operation or handling.

3.3. evolution hand unit

The *evolution hand unit* is the primary control unit of the *evolution* system. Please follow the instructions for a complete set-up.

Note: *evolution hand unit* set-up is to be done after *camin* set-up.

Note: If the *sliders* or the advanced *knob* do not move, loosen their respective locking screws.



Note: You can use the *evolution* system in cable or wireless mode. For cabled use you can connect the *hand unit* and the *camin* using a CBUS cable (Le 8p, Le 8p). As soon as the CBUS cable is connected the systems RF module will turn off automatically.

Note: Please be aware that CBUS cables are available in different lengths and with different connectors. Plugs with orange sleeves match the 8 pin Lemo connector of the *evolution camin* and newer *cdisplay II* units. Plugs with blue sleeves match the CBUS Fi 7p found on *cfinder*, *cfinder II* and *coperate* LCS units.

3.3.1. Battery

Insert a fully charged battery. Press until it snaps into place with an audible click.



Note: A battery is not required for cable operation.

To release the battery, hold the *hand unit* with the battery compartment downwards. Slide the battery release lever down until the battery is released and can be removed.

3.3.2. Mounting the cstrap

The cstrap is a carry-strap that can be attached to the base of the *evolution hand unit*. The strap can be worn around the neck to prevent the operator from dropping the unit, or worn over the shoulder between shots. The fastener is designed to enable the units to rotate freely without the risk of unscrewing.



- Hold the wide part of the pin between your index and middle finger. Insert the tip of the locking pin into the hole located next to the CAL button on your *hand unit*. Now apply pressure to the other end of the pin and push it all the way into the hole.
- Ensure the fastener is secure before letting go of the *evolution hand unit*.

3.3.3. Mounting and Removing knobs

The basic or advanced *knob* can be mounted to and removed from the *hand unit* following a few easy steps.

- Unscrew the two 4 mm hex screws at the back of the *knob*.
- Carefully lift the upper part of the *knob*, making sure you do not damage any cables.
- Unscrew the two internal hex screws and remove the rear disc of the *knob*.
- To attach a basic or advanced *knob* to a *hand unit*, follow the previous steps in reverse order.

Note: You may notice the threaded holes in the lower part of the *knob* once it has been removed. These holes allow you to mount the *knob* in different orientations if needed.

3.3.4. Marker Rings

The marker ring for the *knob* can be used to mark scale values and can be exchanged easily. A locating pin ensures the ring does not rotate out of position once attached.

3.3.5. Mounting and Removing sliders

You can attach up to three sliders to the *hand unit*. Follow the steps above to remove the knob if required

- Carefully align the connector on the back of the *slider* with the socket on the *hand unit* or lower *slider* and press the *slider* into place.
- Secure the *slider* with the two hex screws using a 4mm Allen wrench.

Note: The *sliders* can be mounted for left or right hand operation.

Note: If the *hand unit* is only equipped with a knob, you will need to remove the spacer block known as the bridge adapter before mounting a slider.

3.3.6. Marker Strips

The marker strip can be used to mark scale values on the *slider*. It is kept in place by a magnet and can be exchanged easily.

3.4. evolution zoom and evolution handle

The *evolution zoom* is the *zoom* control unit of the *evolution* lens control system. There are two ways to integrate the *evolution zoom* into the *evolution* lens control system.

3.4.1. Attaching the zoom unit on the hand unit

You will find the CBUS connector at the top of the *evolution hand unit*.

- Attach the *evolution zoom* to the CBUS connector on the *evolution hand unit*.



- Securely fasten the screw located on top of the *evolution zoom* using a 4mm Allen key.



3.4.2. Attaching the zoom to the evolution handle



- Gently slide the *evolution zoom* on the *evolution handle*.
- Using a 4mm Allen key, securely fasten the screw located on top of the *evolution zoom* to the hand grip.
- Using a CBUS cable (Le 8p, Le 8p), connect the *evolution zoom* to the *camin*.

Note: Ensure the motor is correctly configured for zoom control through the hand unit MOTOR menu.

Note: The zoom unit with *evolution handle* can also be cabled to the *hand unit* using a CBUS cable. This allows for wireless zoom control by a second operator without the need for a separate *evolution main unit*.

3.4.3. Using evolution zoom on the hand unit in Cable Mode

With the *evolution zoom* attached to the *evolution hand unit*, a CBUS cable can be used to connect the *hand unit* and the *evolution zoom* to the *camin* for cable operation.

3.4.4. Attach evolution zoom and handle to the Pan Bar

Using the *cfast-czoom* the *zoom* can be attached to the pan bar for comfortable control by the operator. The *cfast-czoom* is composed of an arm, two locking discs and a *cfastener*. It can be attached to any rod or bar 15-28 mm in diameter. The angle of the *evolution zoom* to the pan-bar can also be adjusted with the *cfast-czoom*, providing optimal comfort to the user.

Note: The arm of the *cfast-czoom* has two locking discs. One locking disc is attached to the *cfastener* and the other is attached to the *evolution zoom*. The locking disc that holds the *cfastener* can be attached to both ends of the arm to mount the *zoom* to both sides of the pan bar.

- Attach the *evolution zoom* to the *cfast-czoom* using the locking discs. Fasten securely.
- Attach the *cfastener* to the pan bar (or any other rod 15-28 mm). Fasten securely.

Note: You can adjust the angle of the *evolution zoom* to the pan-bar to ensure maximum comfort.

- Loosen the tightening lever slightly.
- Rotate the *evolution zoom* to your desired angle.
- Once you have established your desired position, tighten the lever again.

3.4.5. Using the evolution pan-bar zoom

The pan-bar zoom clamp allows you to place the zoom unit onto the pan bar and a rod of a steadycam or gimbal application accordingly.

Using the LBUS connector you can connect the pan-bar zoom to the camin or directly to a cforce motor.

- Attach the clamp to any rod or pan bar of 15-28 mm in diameter and fasten securely
- Connect the pan-bar zoom to your compatible device via LCB cable

Note: The pan-bar zoom features 2 user buttons only. It is compatible with the following cmotion and 3rd party devices: cforce motors, evolution camin 3M, ARRI Alexa Plus, Alexa Mini, UMC-4, AMC-1, SMC-1 and EMC-1.

3.4.6. Using the evolution steady zoom

The steady zoom clamp allows you to place the zoom unit next to the pan bar and a rod of a steadycam or gimbal application accordingly.

Using the LBUS connector you can connect the steady zoom to the camin or directly to a cforce motor.

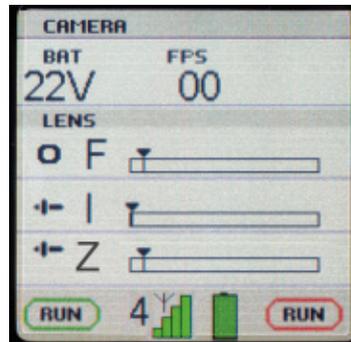
- Attach the clamp to any rod or pan bar of 15-28 mm in diameter and fasten securely
- Adjust the steady zoom unit's position, height and distance from the rod as needed (Allen key, size 2,5 mm required)
- Connect the steady zoom to your compatible device via LCB cable

Note: The steady zoom is compatible with the following cmotion and 3rd party devices: cforce motors, evolution camin 3M, ARRI Alexa Plus, Alexa Mini, UMC-4, AMC-1, SMC-1 and EMC-1.

4. Basic System Operation

This chapter deals with the basic functions of the system. Please complete the following steps to start working with the system.

4.1. hand unit Status Display



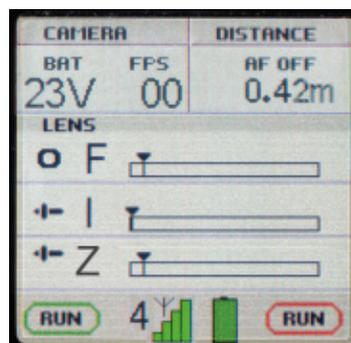
The display of the *evolution hand unit* shows real time lens, camera and system status information.

On the top line, the supply voltage to the *cam* and the camera speed in FPS (Frames per Second) are displayed (where supported).

Below, you see the status and positions of the *slider* and *knob*. The capital letters behind the respective controller icon is the axis the controller is configured for (I=Iris, F=Focus, Z=Zoom, IA=Interaxial, C=Convergence, T=Tilt, M=Mirror, R=Rotation, H.I.T. = Horizontal Image Translation).

At the bottom, the configuration of the red and green button is shown, as well as the RF reception and the *hand unit* battery status.

When a *finder* or other range finder is connected to the *cam* the measurement value will be shown in the top right corner of the display..



4.2. hand unit Menu

The *cvolution hand unit* and the *camin* can be easily configured using the internal menu.



- To enter the menu, press the MENU SELECT WHEEL twice.
- The MENU SELECT WHEEL, LENS or KNOB buttons are context sensitive and serve different functions depending on the menu page.
- Generally, rotating the MENU SELECT wheel cycles through options. Pressing the MENU SELECT wheel selects or confirms. Pressing the LENS button goes back one step in the menu and the KNOB button exits the menu.
- For details on menu functions, please refer to the Menu Guide at the end of this document.

4.2.1. RF Channel Selection

Make sure that all *cvolution* units that you wish to operate in wireless mode are set to the same channel.

Note: *cvolution* lens control systems are fitted with one of two wireless RF modules; Black and White. Not all options given in this section might apply to your system. For more details refer to section 1.4 on page 12.

4.2.2. *camin*

- The channel selector (rotary switch) is located on the Motor side of *camin 2M, 4M, 8M* and *8M-TC*. On the *camin 3M* this is located on the top.
- Using your fingernail or a coin, rotate the channel selector to your desired channel.
- Note: The channel selector will light up for a moment when *camin* is powered on and when the channel is being changed.

4.2.3. hand unit

The channel selection is done in the menu.

- Press the “SELECT” button twice to enter the menu.
- Select MAIN, “Rf Channel” and select the appropriate channel, according to your *camin* settings.



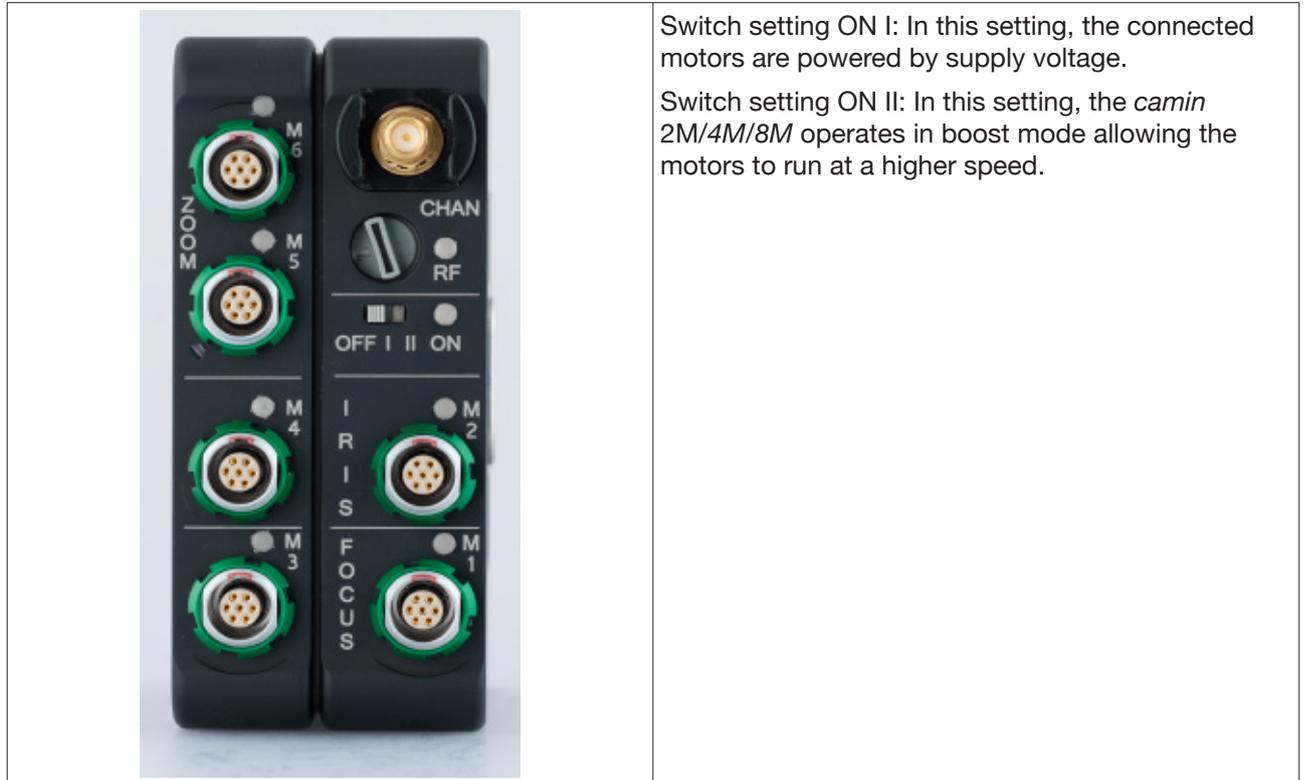
Note: The *cvolution hand unit* can also be used in cable mode. It can be connected to the *camin* by means of a CBUS cable (Le 8p, Le 8p). As soon as the CBUS cable is connected, the system’s RF module will turn off automatically.

Note: Please be aware that CBUS cables are available in different lengths and with different connectors. Plugs with orange sleeves match the 8 pin Lemo connector of the *cvolution camin* and newer *cdisplay II* units. Plugs with blue sleeves match the CBUS Fi 7p found on *cfinder*, *cfinder II* and *coperate* LCS units.

4.3. System Power Up

4.3.1. camin

camin 2M, 4M, 8M and 8M-TC have a three way ON switch located on the Motor side. The *camin* 3M has a two way switch located on the top.



Note: Depending on the supply voltage, the *camin* 2M/4M/8M in boost mode (ON = II) has a higher current requirement. Not all cameras are capable of providing the required current. For these cameras, a separate power supply for the *camin* 2M/4M/8M is necessary (e.g. a battery).

Note: Boost mode for *camin* 3M is activated through *hand unit* menu: Main > Boost > ON

Typical power requirements with one motor are as follows:

Supply voltage	ON=I	ON = II/Boost Mode
24V	0.5A	0.6A
12V	0.5A	1.1A

Before switching the *camin* on please check the following:

Warning! Make sure all motors are securely fastened to their support, e.g. support rods.

Warning! Make sure that the rods are securely fastened.

4.3.2. hand unit

The *evolution hand unit*, “ON” button is a blue button, located at the bottom of the *hand unit*.

- Hold down the “ON” button for half a second.



Note: In RF mode, if the *cam* is set to a different channel than the *hand unit* or there is no *cam* present, the *hand unit* will shut itself down after 6 seconds. To prevent this, simply enter the menu by pressing the MENU SELECT WHEEL twice.

It is good practice to take a look at the *cam* LEDs for status information. Refer to 8.3.3 on page 106 for more information on *cam* LED status.

4.3.3. Controller Priority

The *evolution* system enables setting a controller priority. It might be advisable, for example, to always give focus priority to a *knob* solo mounted to the camera and connected by cable to set a quick focus for the operator even when the 1st AC is getting equipment from the truck or otherwise occupied.

To set controller priority proceed as follows:

- Press the MENU SELECT WHEEL twice to enter the Menu.
- Select MAIN, “Priority” and select “Startup”, “RF” or “Cable”. “Startup” gives priority to the first controller present in the system when starting up. “Cable” gives priority to a controller connected via cable and “RF” give priority to wireless controllers.

4.4. Motor Calibration

Motors must be calibrated each time a motor is attached or if the lens motor has been moved/adjusted manually.

You can either calibrate all attached motors simultaneously, individually or perform special calibration options from the CAL menu. The CAL button is located at the bottom of the *cvolution* hand unit.



Note: When working directly with ARRI Alexa Plus and Alexa Mini cameras, the motor calibration process is different. Please refer to section 5 on page 79 for more information.

Note: Lens motors will not calibrate if the system receives information that camera is recording or the 'Record Simulation' feature has been used to trigger the camera.

4.4.1. Single Motor Calibration

- Push and hold the CAL button and press the respective controller LENS Button that is assigned to the motor you wish to calibrate.

4.4.2. Multiple Motor Calibration

- Hold down the yellow CAL button for three seconds and release.

4.4.3. Calibration Menu

The calibration menu offers advanced calibration options.

- Press and release the CAL button to enter the CAL menu.
- Use the MENU SELECT WHEEL to select your option and press to execute.
- All, Lens and Rig calibrates all axes or all lens/rig axes respectively.

Quick Check is used to check scale calibration after a break in shooting. The *camin* checks one end limit on all axis. If no valid value is returned, a full calibration of that axis is activated.

Manual calibration enables calibration of lenses with no mechanical scale stops, such as photo style lenses. To manually calibrate these lenses follow these steps:

- Use the MENU SELECT WHEEL to select Manual and press Enter to select.
- Select the motor controlling the axis you want to calibrate.
- Use the MENU SELECT WHEEL to move the motor to the minimum value. The WHEEL acts like a jog shuttle on a VCR. Turn clockwise to go forward and increase speed, turn counter-clockwise to go backward or decrease speed. Press “Set” when finished.
- Repeat the process for the maximum value.
- Check if calibration is correct by moving the axis controller all the way to both limits.

4.5. Motor Settings

4.5.1. Motor Direction

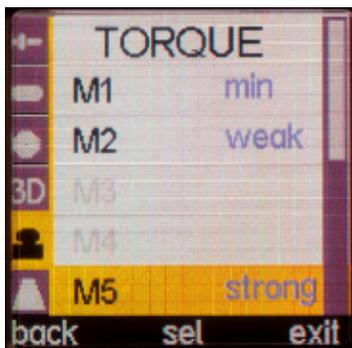


You can change the direction for every motor in the menu DIRECTION.

- Press the “SELECT” button twice to enter the menu.
- Using the MENU SELECT WHEEL, scroll to “DIRECTION”, select motor and change motor direction as needed.

Note: Only motors that are connected can be configured.

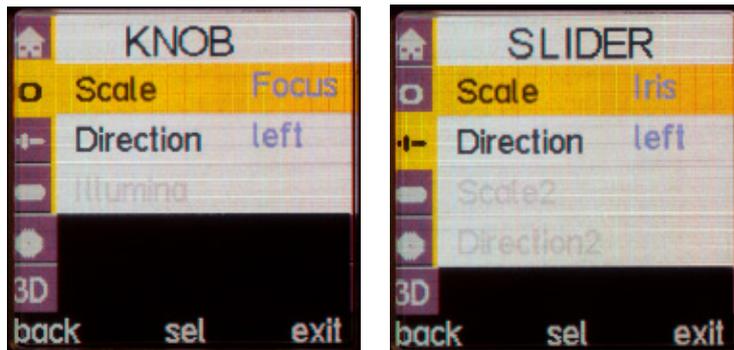
4.5.2. Motor Torque



To adjust the motor torque for each motor, go to menu TORQUE and select the desired motor. Set the torque as needed.

Note: To prevent the lens from being damaged, adjust the torque to the lens barrels friction (high friction = more torque and vice versa).

4.5.3. Motor Control



Any motor can be controlled by the *knob* or *slider*. However, the Knob is most commonly used to control focus. To change this, go to menu KNOB (*Slider* respectively), choose “Scale” and set the scale to your desired function (Focus, Iris, Zoom, Interaxial, Convergence, Tilt, Roll, Height and H.I.T.).

Note: When you set the *knob* or a *slider* to control H.I.T. This scale will NOT control a motor. For more information refer to section 6.6 on page 94.

To move the focus (or iris) motor: rotate/slide the *knob/slider* in the direction you wish to move the motor. The faster you rotate/slide, the faster the motor will move.

Note: The maximum speed of the motors depends on the motor itself and the power supply of the *cam*. The higher the voltage, the higher the speed. If you’re running on 12V try using the boost mode for more motor speed.

Note: If you want to change the direction of the KNOB or *Slider*, go to the menu KNOB (*Slider*), choose “Direction” and change the direction as needed.

4.6. Working with *cforce* mini or plus motors

cforce and *cforce mini* motors can be connected to any *cvolution camin* 2M, 4M, 8M and 8M-TC through the CBUS port using cable LCB-7. The *cvolution camin* 3M (and broadcast *camin*) however are also equipped with an LBUS connector where all regular LCB cables can be used. Up to 3 *cforce* and *cforce mini* motors can be connected in daisy-chain to any *cvolution camin* and are identified in the *hand unit* menu by their serial number. Although all motor settings can be changed through the *cvolution hand unit*, unlike passive motors, *cforce* save these settings internally.

Note: The *camin*'s internal power booster has no effect on *cforce* motors.

cforce motor Assignment

Press the SETUP button to assign the scale of the *cforce mini* motor to focus, iris or zoom. Make sure that the assignment matches the lens scale the motor is engaged with.

- Press the SETUP button to indicate the current motor assignment. The F (Focus), I (Iris) or Z (Zoom) indicator underneath the SETUP button will light up for three seconds.
- Press the SETUP button repeatedly within 3 seconds to cycle through the motor assignment options.

cforce motor Calibration

- Press and hold the SETUP button for three seconds to start calibration.
- Press the SETEUP button during calibration to interrupt the process.

4.7. Camera Run

4.7.1. Camera Run Button



The Camera Run Button is located on the front or back side of the *cvolution hand unit*, depending on your *hand unit*'s configuration.

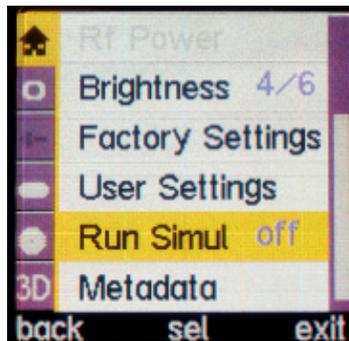
- The function of each button can be configured in the menu **BUTTONS**.
- To start/stop the camera, push the red or green Button, whichever is assigned to **REC**.

RUN LED	OFF	No RUN signal received from camera or Camera in standby mode
	GREEN	Camera running
	RED	Camera error or camera is changing speed

Note: You cannot start the camera when motors are calibrating.

4.7.2. Camera Run Simulation Function

The RUN LED indicates the recording status of the camera. Once the run button has been pressed, a pulse signal is sent from the camera to indicate the camera status. However, not all cameras relay this information. In this case, you can use the “Run Simul” mode. This feature will simply indicate when you have pressed the RUN button.



Note: When using Run Simul, make sure that the camera is recording when indicated on the *hand unit*.

4.8. Setting Limits

4.8.1. Setting Knob Limits

Knob Limits can be set to control the entire lens scale using a user defined portion of the knob rotation. This can be used, e.g. for extremely fast focus racks.

- Turn the knob to the position you want to start the control range with
- Press and hold the KNOB Button on the front of the *hand unit* and move the knob to to the end of the range.
- Release the KNOB Button to confirm the limits.

Note: Limits will remain programmed until they have been erased intentionally by user, the motor is calibrated, or a factory reset is performed.

- Press the KNOB button to remove the lens limit.

4.8.2. Setting Mechanical Knob Limits

Mechanical limits allow you to define the rotation of the lens controlled by the same proportion of the focus *knob*.

- Turn the lens to your first desired position.
- Move the first mechanical stop and secure against the *knob's* position indicator.
- Turn the lens to the end position.
- Move the second mechanical stop and secure against the *knob's* position indicator.

Note: Mechanical Limits are only available on the advanced *knob*.

4.8.3. Setting Lens Limits

Lens Limits can be set for the *knob*, *slider* and *zoom* unit. They allow you to define how much of the lens scales will be controlled by the entire range of the controller.

- Using the focus *knob*, turn the lens to one of the two desired limits.
- Press and hold the LENS Button on the front of the *hand unit* and move the lens to the other desired value.
- Release the LENS Button to confirm the limits.

Note: The displayed scale will flash while the lens limits are being set.

Note: Each limited scale will be displayed on the *hand unit*.

- Press the LENS button to remove the lens limit

4.8.4. Setting Lens Limits in Combination with Knob Limits

Lens and Knob limits can be used in combination. This allows a defined range of the lens scale to be controlled by a defined rotation of the *knob*. This feature is particularly useful when requiring quick and precise focus racks for macro or close up work.

Note: Limits will remain programmed until they have been erased intentionally by user, the motor is calibrated, or a factory reset is performed.

- Set a motor limit as described above.
- Set a *knob* limit as described above.

Note: As long as a Knob Limit is set the letter K will be visible on the display.

- To erase Limits, press both the LENS Button and the KNOB Button.

4.8.5. Setting *slider* Limits

The *slider* lens limit allows you to control a defined range on the lens using the full *slider* range.

Note: Limits will remain programmed until they have been erased intentionally by user, the motor is calibrated, or a factory reset is performed.

- Using the *slider*, move the motor to one of the two desired limit values.
- Push and hold the *slider* LENS Button, move the motor to the other desired value.
- Release the LENS Button.

Note: The *slider* LENS LED on the *cvolution* main unit will blink green

Note: As long as there is a limit currently set the LENS LED will illuminate green. The limits will be shown on the *hand unit* display.

- To erase the limits press the *slider* LENS Button.

4.9. Locking Controllers

4.9.1. Locking the knob

Note: The locking mechanism is available on the advanced *knob* only.

You can use the *knob* lock to lock a position for both the *knob* and its respective motor.

- Tighten the *knob* lock thumbscrew to lock the *knob*.

4.9.2. Locking the *slider*

You can use the *slider* lock to lock a position for both the *slider* and its respective motor.

- Tighten the *slider* lock thumbscrew.

4.10. Adjust advanced knob Torque

- To adjust the torque of the *knob*, push the button in the middle of the *knob* and slightly turn the *knob* until you feel it engage.
- Hold the button down and turn *knob* clockwise to increase friction, counterclockwise to decrease friction.
- When you are satisfied with the torque of the *knob*, release the button.

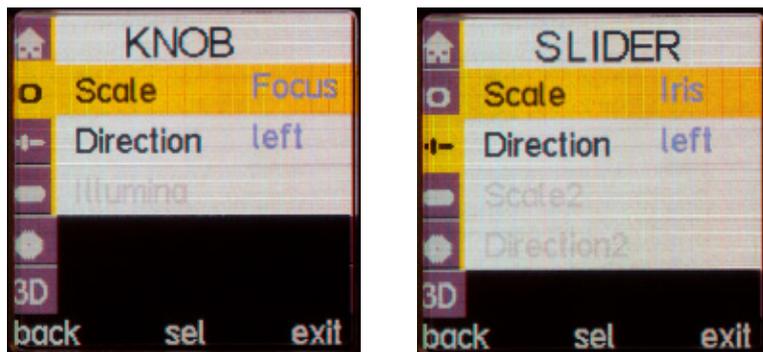
Note: When you reach the end of the *knob* rotation while adjusting torque, release the button, turn the *knob* to the opposite end and continue adjusting as described above.



4.11. advanced knob Illumination

- Press the Select button to enter the menu.
- Scroll to “KNOB”, select “Illumina”, and select desired brightness.
- Press the MENU SELECT WHEEL to confirm.

4.12. Assigning Controllers



You can assign any motor to any scale and any controller in the menu. First go to menu KNOB or *Slider* and select the scale you want to control (e.g. Knob to Focus).

Then go to menu MOTOR, select desired motor and assign the desired function (e.g. M1 to Focus). You can assign as many motors as you want to one control. Motors and controllers which are grayed out are currently not connected and cannot be configured.

4.13. zoom Functions

The *cvolution zoom* can be configured using the buttons on the *zoom* module and the *zoom* menu.

4.13.1. zoom Menu



— BUTTON UP, to be assigned as ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN

— Menu – access menu/select

— BUTTON UP, to be assigned as ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN



LENS / USER BUTTON 1 (for latest revision units from 2015)

ZAP / USER BUTTON 2 (for latest revision units from 2015)

Cal Mot

Calibrate the motor assigned to the zoom's controlled scale.

Joystick

to change all relevant Joystick functions like Scale, Dircetion, Speed and Sensitivity

Scale

Select the scale to be controlled by the zoom unit. "Focus", "Iris" and "Zoom" are available.

Direction

Set the direction of the scale motor to "left or "right".

Speed

Set the speed of the zoom axis to a value between 0-99

Sensitivity

Set the touch sensitivity of the joystick to "MIN", "MID" or "MAX".

Bright

Set the zoom display brightness to “MIN”, “MID” or “MAX”.

View

Select the data to be visualized on the zoom display.

“Scale” shows a graphical representation of the current scale and current controller position only.

“Distance” displays the current distance value from the cfinder or another range finder if present in the system.

“ABS/SCA” displays the current absolute controller position in metric or imperial scale units.

“ABS ALL” displays all available lens data.

Motors

To assign motor functions (scale, ramp, torque or direction) if no camin is used and the zoom unit is connected to the cforce motor daisy chain directly.

Select the motor to be configured.

“Scale” allows you to assign the motor axis to “FOCUS“ “IRIS“ or “ZOOM“

“Ramp“ allows you to set a motor ramp to “MIN”, “SHORT”, “LONG” or “MAX”

“Torque“ allows you to adjust motor torque to “WEAK“, “STRONG“ or “MAX“

“Dir X” allows you to change motor direction from “LEFT” to “RIGHT”

Buttons

Assign a user button function (ZAP, LENS, REC, RET, MARKER, SPD UP, SPD DOWN) to one of the buttons (BUTTON 1, BUTTON 2, BUTTON UP, BUTTON DOWN).

4.13.2. Zooming

The *zoom* controller (joystick) is sensitive to pressure (sensitivity can be adjusted in the joystick menu individually). To move the *zoom* motor, apply pressure to the *zoom* controller in the direction you want to move the motor. The more pressure you apply, the faster the motor will move. The *zoom* motor position will be shown in a bar graph in the *zoom* menu.

4.13.3. Zoom Speed

If you want to adjust zoom speed more often, assign BUTTON UP to SPD UP and BUTTON DOWN to SPD DOWN. Now you just need to press the BUTTON UP or DOWN to change zoom speed.

The zoom speed value is shown in the display of the zoom controller as a percentage value and a bar graph.

If BUTTON UP or BOTTON DOWN is assigned to another function than SPD UP and SPD DOWN, you can change the speed in the joystick menu.

4.13.4. zoom Buttons

On the back of the zoom module are two blue user buttons.

LENS / USER BUTTON 1 (for latest revision units from 2015) and ZAP / USER BUTTON 2 (for latest revision units from 2015).

Buttons can be configured freely to ZAP, LENS, REC, RET, MARKER, SPD UP or SPD DOWN.

ZAP

The ZAP function allows you to override the zoom speed setting and to drive the motor at maximum speed while maximum pressure is applied to the zoom controller.

LENS

The LENS function serves the same purpose as the LENS buttons on the slider and the hand unit. I.e. single motor calibration / setting a lens limit.

Note: When a button is assigned to LENS and pressed while holding CAL only the motor associated with the corresponding axis is calibrated.

REC

The REC function triggers the camera and is used to start and stop the camera

RET

The RET function replays the last clip from the camera

MARKER

The MARKER function allows you to set markers on the zoom scale and to jump between those

markers quickly

In order to set a marker:

- assign a user button to MARKER
- move the zoom axis to the desired position using the joystick
- press and hold the MARKER button until a small arrow shows up on the display's bar graph
- move the zoom axis to the next desired position using the joystick
- press and hold the MARKER button until a small arrow shows up on the display's bar graph

you can set up to 3 markers

In order to jump from one set marker to another:

- press the MARKER button and the zoom moves to the first marked position quickly
- press the MARKER button again to move to the next marked position

Note: Once you reach the highest marked position and press the MARKER button, the zoom will move to the lowest marked position again

In order to erase the markers

- press the MARKER button until you have reached the desired marker position to be erased
- press and hold the MARKER button until the small arrow disappears from the display's bar graph
- press the MARKER button again until you have reached the next desired marker position to be erased

SPD UP

The SPD UP function allows you to increase the zoom speed

SPD DOWN

The SPD DOWN function allows you to decrease the zoom speed

4.13.5. Setting Zoom Limits

Setting a *zoom* limit works in the same way as setting a limit on the *knob* and *slider*:

- Assign one of the user buttons to “LENS”
- Move the *zoom* motor to your desired starting position.
- Now hold the LENS button while zooming to your desired end position.
- Release the LENS button. On the *evolution zoom* display, the limits will be shown in the bar graph.

4.13.6. Changing Zoom Motor Direction

Direction can be changed through the zoom units menu.

- Go to the menu “MOTORS” select the appropriate motor, then select the menu “DIR X” and set the direction as needed.

4.14. Using the knob solo

4.14.1. Assigning Scales

The *knob* solo can be used to control focus, iris or zoom. This can be selected using the FIZ switch on the back of the *knob*.

Note: Currently, the *knob* solo cannot control a Zoom axis when directly connected to the ARRI ALEXA PLUS.

4.14.2. Setting Direction

The direction of the motor can be changed using the L/R switch on the back of the *knob*.

4.14.3. Calibration

To calibrate the selected scale on the *knob* solo:

- Press and hold the LENS button for 3-5 seconds and release.

4.14.4. Lens Limits

You can set LENS limits on the knob solo in the same manner as on your hand unit. Refer to section 4.8.3 on page 55. Just use the knob solo LENS button instead.

4.14.5. Knob Limits

- To set a knob limit, go to the first position, press the LENS button 2 times and then press and hold the lens button while turning the knob to position nr. 2.
- Release the lens button.
- To delete the knob limit, simply press the lens button twice.

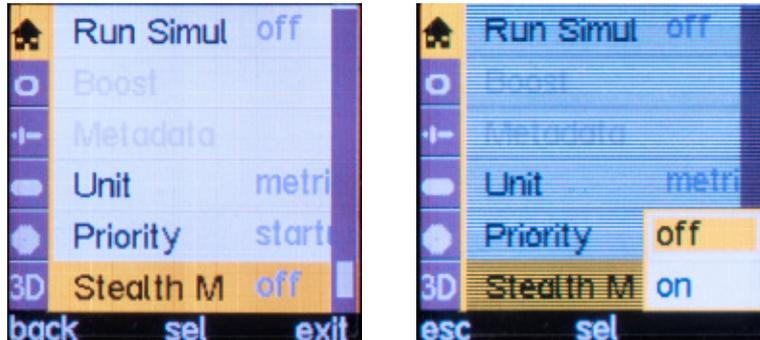
4.14.6. Advanced knob solo Illumination

As with the *cvolution* advanced knob, the advanced knob solo also features backlit LED illumination. Follow these instructions to switch illumination on / off and to adjust the brightness:

- Press and hold the LENS button.
- Toggle the direction switch.
- When the blue reference LED is illuminated, turn the focus *knob* to increase or decrease the brightness of the marker ring illumination.
- Press the LENS button to confirm preferred illumination brightness.

4.15. Stealth Mode

Stealth Mode is used in dark environments when LEDs cast unwanted light into a scene or are seen as reflections on camera. To enable Stealth mode:



- Press the MENU SELECT WHEEL twice to enter the Menu.
- Select MAIN, “Stealth Mode” and press “sel”. Select “on” and press “sel” again.

Note: Stealth Mode disables all *camin* and *cforce* LEDs except for the USB and TC LEDs on the *camin 8M* and *8M-TC*.

Note: Stealth Mode will be deactivated if the *camin* is power cycled.

4.16. Creating / Editing a lens file using the evolution hand unit

“Create lens” is a cvolution feature that allows you to quickly and accurately create and save up to 24 imperial or metric focus scales for use with regular or pre-engraved marker rings. These created lens files can be named and saved within the internal memory of the cvolution hand unit.

“Edit lens” allows you to change preset parameters on a lens file stored on the hand unit. Editing a lens file follows the same procedure as “create lens” described below.

In order to edit a lens file, please also refer to section 4.18.8. on page 75 of this manual.

NOTE: The lens file needs to be unloaded from the camin before it can be edited. Only lens files created on the hand unit can be edited.

In order to create a lens file using the cvolution hand unit proceed as follows:

Press the MENU SELECT WHEEL twice to enter the Menu

Select “Create lens” within the LENS menu



Scroll through the alphanumerical characters using the MENU SELECT WHEEL to create a name for each lens.



- Press “sel” using the MENU SELECT WHEEL if you want to edit the next digit
- Press “done” once finished

Select the unit type of the lens (imperial or metric)

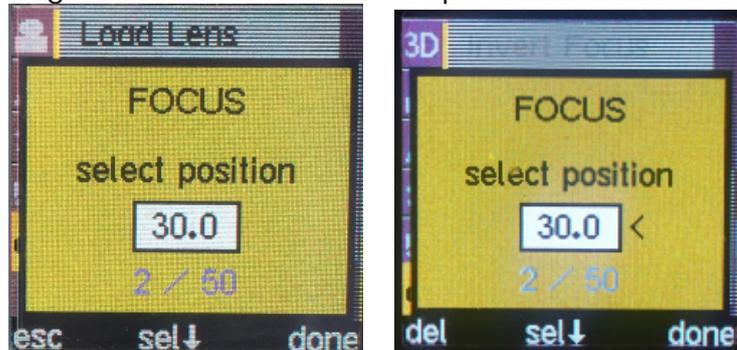


4.16.1. Focus scale

In order to create a focus scale, move the scale controller to the infinity position. Press the MENU SELECT WHEEL to set the value.



The next value increment will be displayed automatically. Move the lens to match this value. If the next suggested value does not exist on your lens, scroll through the values using the MENU SELECT WHEEL until you find a value which is also on your lens. Align the lens to this value and press "sel" to confirm.



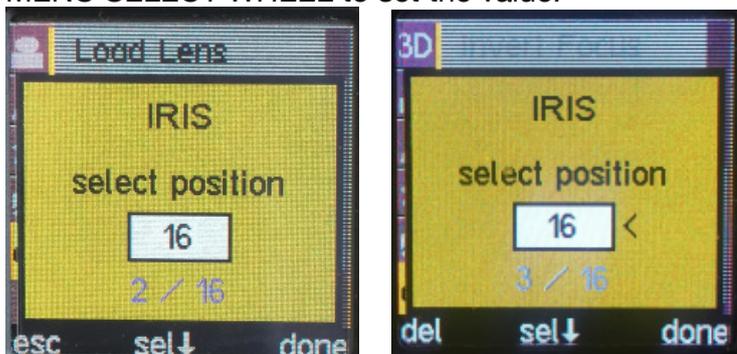
Continue with all focus values on your lens scale. Once finished with the nearest focus value, press "done".

Note: Upto 50 motor positions per lens can be stored for the focus scale. By scrolling left or right using the select wheel, each set motor position will be marked with a small arrow. In order to delete or change the motor position, scroll to the value to be edited and press "del" in order to delete the motor position or simply overwriting the old one by pressing "sel".

4.16.2. Iris scale

In order to create an iris scale, move the scale controller to the closed iris position.

Press the MENU SELECT WHEEL to set the value.



If the closed iris value does not exist on your lens, scroll through the values using the MENU SELECT WHEEL until you find a value which is also on your lens. Align the lens to this value and press “sel” to confirm.

The next iris value increment will be displayed automatically. Move the lens to match this value.

Align the lens to this value and press “sel” to confirm.

Continue with all iris values on your lens scale. Once finished with the last iris value, press “done”.

Note: Upto 16 motor positions per lens can be stored for the iris scale. By scrolling left or right using the select wheel, each set motor position will be marked with a small arrow. In order to delete or change the motor position, scroll to the value to be edited and press “del” in order to delete the motor position or simply overwriting the old one by pressing “sel”.

4.16.3. T-stop

If the correct open iris value of your lens is not suggested in the previous IRIS MENU, you are able to select it individually within the t-stop selection.

In order to enter an open iris value, move the scale controller to the open iris position.

Use the MENU SELECT WHEEL to enter your open iris value.

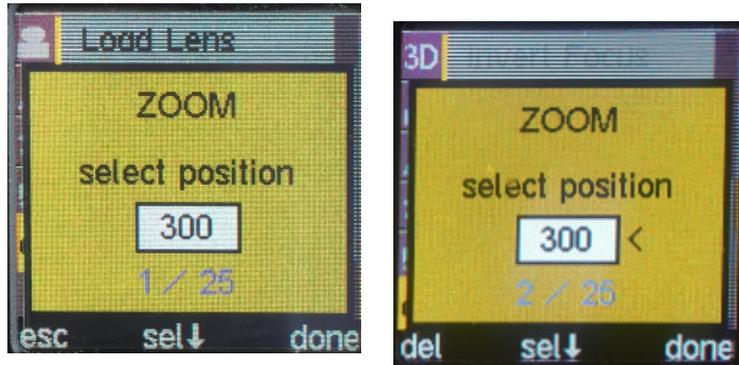
Press the MENU SELECT WHEEL to set the value.

If you have already set your open iris value within the previous menu, press “skip” to continue.



4.16.4. Zoom scale

In order to create a zoom scale, move the scale controller to the longest zoom position. Press the MENU SELECT WHEEL to set the value.



If the suggested zoom value does not exist on your lens, scroll through the values using the MENU SELECT WHEEL until you find a value which is also on your lens. Align the lens to this value and press “sel” to confirm.

The next zoom value increment will be displayed automatically. Move the lens to match this value.

Align the lens to this value and press “sel” to confirm.

Continue with all zoom values on your lens scale. Once finished with the shortest zoom value, press “done” to save the lens file.

Note: Upto 25 motor positions per lens can be stored for the zoom scale. By scrolling left or right using the select wheel, each set motor position will be marked with a small arrow. In order to delete or change the motor position, scroll to the value to be edited and press “del” in order to delete the motor position or simply overwriting the old one by pressing “sel”.

Note: If using a prime lenses, scroll through the values using the MENU SELECT WHEEL until you find a value matching the focal length of your lens respectively. Press “sel” to confirm. Press “done” to save the lens file.

Note: You can store up to 20 lens files within the hand unit’s memory. When a factory reset is performed you will be asked if you want to clear all lensdata. Press “No” if you want to keep all lens files created and saved on the hand unit.

4.17. Working with Pre-Marked Marker Rings

To save time marking your focus marker rings for each lens, cmotion have introduced 3 imperial and 3 metric pre-engraved marker rings for your cvolution system. With engraved scales from infinity to 3 close focus values, they are available for left and right handed operators and can be used with a range of both wide and telephoto lenses. Before a pre-engraved marker ring can be used, a lens file needs to be created using cvolution’s internal ‘create lens’ feature, a cdisplay II or a cworld. For further information, please refer to ‘Creating a lens file using the cvolution

hand unit' in section 4.16., the *cdisplay II* User Guide and the *cworld* User Guide respectively.

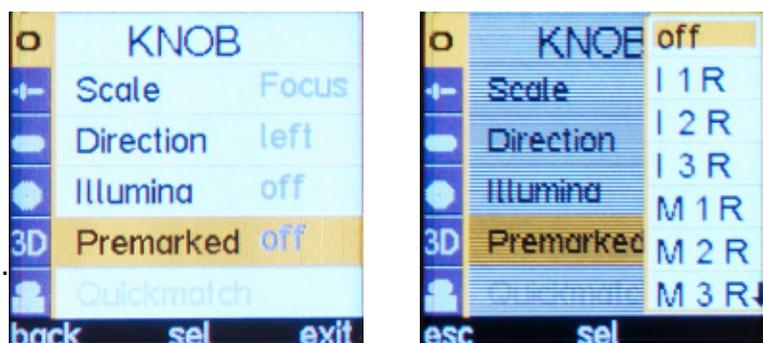
In order to use a premarked ring proceed as follows:

Calibrate the lens (please refer to section 4.4. "Motor Calibration")

Load a lens file from the *cvolution* hand unit, from *cdisplay II*, from *cworld*, or from the *cvolution camin 3M*'s internal memory

Choose the right pre-marked ring from your selection to match the close focus value of the lens.

- Press the MENU SELECT WHEEL twice to enter the Menu.



- Select KNOB, "Premarked" and select the appropriate marker ring from the list.

NOTE: "I" denotes Imperial units, "M" metric. "R" and "L" denote left and right hand operation respectively.

NOTE: If you purchased your *cvolution* system before 20th December 2013, your *cvolution knob* will need to be calibrated at *cmotion* before it can be used accurately with pre-marked rings. For more info contact *cmotion* support.

4.18. Working with Lens Data

Lens data can be created for virtually any lens using either a compact or *cvolution* hand unit, *cdisplay II* and *cworld*. This process allows you to pair the digital position of each connected motor to 'recommended' or manually input lens values. Both *cdisplay II* and *cworld* are capable of storing up to 1,000 lens files in easy to manage lens databases. Each saved lens will be recognized automatically after a full motor calibration and will be loaded onto the connected *cvolution camin*. Lens data including focus, iris, zoom, depth of field and Hyperfocal will be displayed as an animated depiction on any *cdisplay II* or any connected smart device (e.g. phone or tablet) when paired with *cworld*. Values and the relative motor position for focus and iris are also displayed on the *hand unit*'s main display while zoom information is displayed on the *zoom* unit display (when set to 'ABS/SCA').

Note: Only 1 lens file can be uploaded at any one time from either *cdisplay II* or *cworld* when using *camin 2M*, *4M*, *8M* and *8M-TC*.

Note: Up to 20 lens files can be stored and uploaded using the *cvolution* hand unit as described in section 4.16 and 4.17.2.

Note: Up to 14 lens files can be uploaded from *cworld* and saved

internally on any *cam* 3M as explained below in 4.17.1.

Note: Lens data can be output through a serial interface from any *evolution cam*. However, at time of writing, only the *cam 8M-TC* can record time coded lens data onto a USB drive.

Note: Systems connected wireless or cabled with ARRI Alexa Plus, Alexa Mini and UMC-4 will display ARRI LDS on the *hand unit's* main display.

4.18.1. Loading a lens file from the evolution hand unit

Press the MENU SELECT WHEEL twice to enter the Menu.

Select LENS, “Load Lens”.

Use the MENU SELECT WHEEL to highlight the desired lens and press ‘Yes’ to confirm and load the lens file.

4.18.2. Using lens data saved internally on a *cam* 3M

Up to 14 lens files can be transferred from any cworld database during prep and saved on the internal memory of a *cam* 3M. This allows you to select and display accurate lens data for up to 14 different lenses during your shoot without cworld being connected.

How to transfer a lens file:

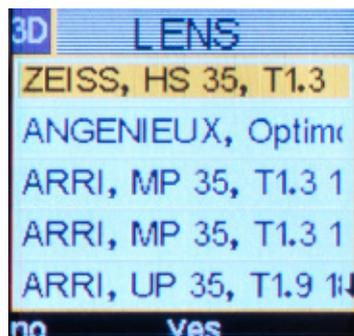
- Using cworld, select ‘clensdatabase’
- Select required lens (e.g. Cooke S4/i T2.0 32)
- Select Send > LBUS Devices > *evolution cam*3m (No. xxx)

After transferring Lens Data into the system via the cworld you can select the desired lens from the Lens Menu.

- Press the MENU SELECT WHEEL twice to enter the Menu.



- Select LENS, “Load Lens”.
- Use the MENU SELECT WHEEL to highlight the desired lens and press ‘Yes’ to confirm and load the lens data.

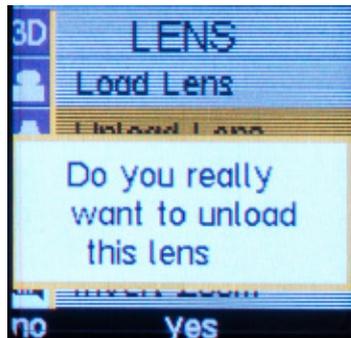


4.18.3. Loading a Lens when using a *camin 8M*

When using a *camin 2M*, *4M* or *8M*, multiple lens files cannot be stored within the system. Each lens will need to be loaded individually via the *cworld* or *cdisplay II*. For more information refer to the *cworld* online documentation.

4.18.4. Unload Lens

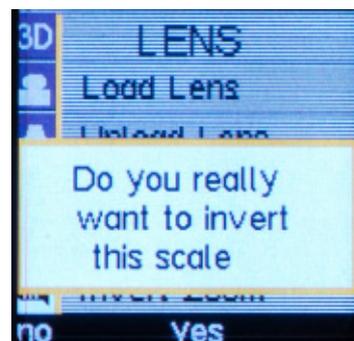
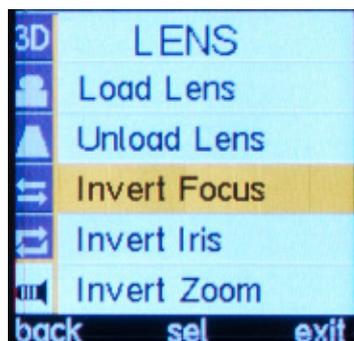
- Press the MENU SELECT WHEEL twice to enter the Menu.
- Select LENS, “Unload Lens”.
- Confirm by pressing “yes”.



4.18.5. Invert Focus/Iris/Zoom

If the lens and lens data show opposite values, the lens data can be inverted following these simple steps:

- Press the MENU SELECT WHEEL twice to enter the Menu.
- Select LENS, “Invert Focus” or “Invert Zoom” or “Invert Iris” respectively.
- Confirm by pressing “yes”.



4.18.6. Delete Lens

In order to delete a single lens file from the evolution hand unit's memory, proceed as follows:

- Press the MENU SELECT WHEEL twice to enter the Menu
- Select LENS, "Delete Lens"
- Select the lens file to be deleted and confirm twice by pressing "yes"
- Select "No" to cancel the procedure

4.18.7. Create lens

In order to create a lens file on the evolution hand unit, please proceed as follows:

- Press the MENU SELECT WHEEL twice to enter the Menu
- Select LENS, "Create Lens"

For a detailed description on how to create a lens file, please refer to section 4.16 on page 66 of this manual.

4.18.8. Edit Lens

In order to edit a lens file on the evolution hand unit, please proceed as follows:

- Press the MENU SELECT WHEEL twice to enter the Menu
- Select LENS, "Edit Lens"
- Select the lens file to be edited and confirm by pressing "yes"
- Select "No" to cancel the procedure

For a detailed description on how to create a lens file, please refer to section 4.16 on page 66 of this manual.

NOTE: A lens file which is loaded to the camin can not be edited and needs to be unloaded before selecting the "Edit lens" function.

Only lens files created on the hand unit can be edited.

In order to unload a lens file, please refer to section 4.18.4. on page 72 of this manual.

4.19. Working with a range finder

4.19.1. Autofocus

In order to use autofocus with an ARRI UDM-1, a Cinematography electronics Cine Tape Measure or a cmotion cfinder III, a lens file needs to be loaded in the camin, a lens motor needs to be connected, engaged with the lens and assigned to focus. For further information on how to create, load and manage lens data, please refer to section 4.16. and 4.18. in this manual or to the cworld user guide.

Within the RANGE FINDER MENU/AutoFocus on the cvolution hand unit there are various autofocus trigger options:

off: turns autofocus permanently off

M pre: "MARK press" activates autofocus as long as the user button is being pressed (one of the user buttons needs to be assigned to MARK). After releasing the user button, the focus will move to the preset knob position.

M tog: "MARK toggle" activates autofocus by the press of an user button and deactivates it by another press (one of the user buttons needs to be assigned to MARK). After deactivating the autofocus, the focus will move to the preset knob position.

M pin: "MARK pin" allows to take a single reading from the range finder. After releasing the user button the focus will STAY at this distance (one of the user buttons needs to be assigned to MARK). If pressed permanently the autofocus is activated as long as the user button is being pressed. Turning the knob over the fixed focus position assigns the control to the knob automatically.

on: turns autofocus permanently on

Note: Autofocus status (AF on / AF off) will be displayed in the distance information on the cvolution hand unit

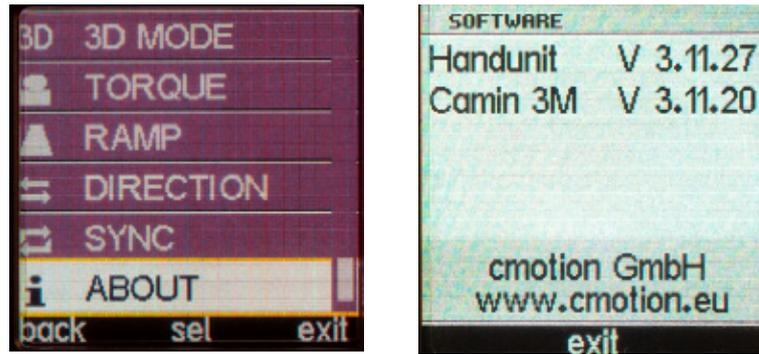
4.19.2. Laser pointer

The RANGE FINDER MENU/laser pointer allows you to turn on cfinder III's red reference/alignment laser through the cvolution hand unit for 30 seconds. Assigning a user button within the BUTTONS menu to LASER, allows you to activate the laser pointer as long as the user button is being pressed.

Warning: Always avoid direct eye contact with the beam of the red alignment laser.

Note: For further information on how to work with cfinder III, please refer to the cfinder III user guide.

4.20. Software Version



If you want to find out which software version your *cvolution* system components are running, select “ABOUT” from the *hand unit* main menu.

If you contact the cmotion support team with any technical enquiries, you will be asked to confirm which software your system is running.

5. Working with ARRI ALEXA Cameras

cvolution hand units fitted with the ARRI White RF module are compatible with both ARRI Alexa Plus/Mini cameras and ARRI motor control units including UMC-4, AMC-1, SMC-1 and EMC-1. In these configurations, the *cvolution camin* is not required and the motors are either connected directly to the camera or the ARRI motor control unit.

Note: Not all *cvolution* features are available when working with ARRI cameras or motor control units.

5.1. Working with an ALEXA Plus

5.1.1. Connecting the *hand unit* and the camera

To use your *hand unit* wireless with the camera, follow these simple steps:

Camera:

- Press the “WRS” button on the camera.
- Select “Radio” (top left button).
- Set “Radio Power” to ‘ON’ using the menu wheel to select and confirm.
- Select an available RF Channel by pressing “WRS Radio Channel”. Use the menu wheel to select and confirm.

Hand unit:

- Press the “SELECT” button twice to enter the Menu.
- Select “MAIN” followed by “RF Channel”.
- Turn the “SELECT” wheel to highlight the same RF channel as the camera and press “SELECT” to confirm.

5.1.2. Motor Assignment

The motor ports on all ARRI Alexa Plus cameras are assigned and labeled as Focus, Iris and Zoom. It is not possible to change motor assignment of these motor ports through the *cvolution* “MOTORS” menu.

5.1.3. Motor Calibration

Each time the camera is powered ON; the scales displayed on the *hand unit* will flash yellow and both the camera and *hand unit* will ask if you want to recalibrate the motors. It will not be possible to control the motors until you have confirmed one of two options through either the camera or the *hand unit*:

On the camera:

- Select “Skip” to use the previous calibration range.
- Select “ALL” to recalibrate the motors.

On the *hand unit*:

- Press the yellow ‘CAL’ button to access the calibration menu.
- Turning the “SELECT” wheel to select ‘Skip’ or ‘All’ as above.
- Press the “SELECT” button to confirm.

5.1.4. Features Not Available with ARRI ALEXA Plus

Please be advised that not all *cvolution* features are currently available when working wireless with an ARRI Alexa Plus camera. These features are not available and will be greyed out in the *hand unit* menu: Motor, Ramp, 3D Mode.

NOTE: User profiles are stored in the internal memory of the *cam* 3M or saved to a removable USB drive when using *cam* 2M, 4M, 8M and 8M-TC. Therefore, it is not possible to save or load user profiles when working with an Alexa Plus.

NOTE: Factory settings can only be reset when a *hand unit* is paired with a *cvolution cam*.

NOTE: At time of writing, only ARRI CLM-x motors can be connected directly to ARRI Alexa Plus cameras.

5.2. Working with an ALEXA Mini

cvolution hand units fitted with the ARRI White RF module are compatible with ARRI Alexa Mini cameras. In this configuration, the *cvolution camin* is not required and up to 3 *cforce/cforce mini* motors can be daisy-chained from the 4pin LBUS port located on the lens mount.

To use your *cvolution hand unit* wireless with the Alexa Mini camera, follow these simple steps:

Camera:

- Press the MENU “jog wheel” on the camera’s viewfinder to enter the main menu.
- Turn the MENU “jog wheel” to highlight “SYSTEMS” and press to select.
- Select “ Wireless Remote System”.
- Set “Radio Power” to ‘ON’. This will be indicated by a check mark in the box on the right of the display.
- Set an available RF Channel by using the MENU “jog wheel” to select and confirm.

Hand unit:

- Press the “SELECT” button twice to enter the Menu.
- Select “MAIN” followed by “RF Channel”.
- Turn the “SELECT” wheel to highlight the same RF channel as on the camera and press “SELECT” to confirm.

5.2.1. Assigning cforce mini / cforce plus Motors

- Press the Setup button to identify the axis that the motor is currently assigned to.
- Press the Setup button again repeatedly within 2 seconds to cycle through F, I and Z.

Note: Regular *cforce* motors can only be assigned to F, I and Z when connected to a *cvolution camin*, *cworld* or compact LCS *hand unit*.

5.2.2. Motor Calibration

Each time the camera is powered ON; the scales displayed on the *hand unit* will flash yellow and both the camera and *hand unit* will ask if you want to recalibrate the motors. Both units can select “Calibrate All” or “Skip”. It will not be possible to control the motors until you have confirmed one of two options through either the camera or the *hand unit*:

Camera:

- Select “Skip” to use the previous calibration range.
- Select “ALL” to recalibrate the motors.

Hand unit:

- Press the yellow ‘CAL’ button to access the calibration menu.
- Turning the “SELECT” wheel to select ‘Skip’ or ‘All’ as above.
- Press the “SELECT” button to confirm.

NOTE: It is possible to set the torque for each individual motor through either the Alexa Mini viewfinder menu or the *cvolution hand unit* menu.

NOTE: It is possible to change the direction of each motor through either the Alexa Mini viewfinder menu or the *cvolution hand unit* menu.

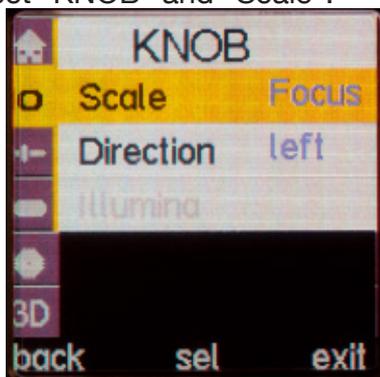
6. 3D System Operation

6.1. Working With a Lens Pair

All *evolution* systems are capable of controlling paired / synchronized lenses and 3D production rigs. The *camin 8M* and *8M-TC* can control up to 8 passive motors together with up to 3 active motors including *cforce* and *cforce mini*. This full configuration can provide precision control for synchronized focus, iris and zoom, plus rig control for up to 5 individual motorized axis.

6.1.1. Assigning Controllers for a Lens Pair

- Press the “SELECT” button twice to enter the Menu.
- Select “KNOB” and “Scale”.



- Turn the “SELECT” wheel to highlight ‘Lens’ (Focus, Iris or Zoom) or ‘Rig’ and assign the *knob* to your chosen scale.

6.1.2. Assigning Motors for a Lens Pair

Each motor needs to be assigned to the scale it will be controlling. Although the *camin 8M* and *8M-TC* have pre-assigned paired motor ports (2 x focus, 2 x iris, 2 x zoom, 1 x IA and 1 x Conv), each motor port can be re-assigned through the *hand unit's* menu:



- Press the “SELECT” button twice to enter the Menu.
- Select “MOTOR”.
- Select any ‘passive’ motor by the corresponding motor port number (M1 – M8) or ‘active’ motor by its serial number.
- Once the necessary motor is highlighted, press the “SELECT” button and assign the motor to the desired scale (Focus, Iris, Zoom, Interaxial, Convergence).

- Repeat this process to configure all other connected motors to meet your setup needs.

Note: The default motor assignment on the *camin 8M* and *8M-TC* is as follows:

M1 / M3 = Focus

M2 / M4 = Iris

M5 / M6 = Zoom

M7 = Interaxial

M8 = Convergence

Depending on your setup, the focus puller's *hand unit* should now be configured with two focus motors controlled by the *knob*, two iris motors controlled by the *slider* and two zoom motors controlled by the zoom unit. The Stereograher's *hand unit* can be configured to control IA and Convergence, PLUS "Mirror, Tilt and Rotation" when using 8 passive motor PLUS 3 active motors connected through the CBUS port.

Note: If you want to assign more than two motors to a single scale (e.g. Panoramic/Virtual Reality setups), simply assign the corresponding motors to the required scale.

6.1.3. Synchronizing Scales

Because lenses are generally not manufactured in pairs, it is often necessary to create an offset or synchronize the scales on both lenses to achieve the same aperture, focal distance and focus length for shooting 3D. *cvolution* offers both a Quick Sync (one point) offset feature for focus and an advanced scale synchronization feature for focus, iris and zoom.

Quick Sync

Make sure one of the RUN/MARK buttons is configured for QSYN. Per default, both buttons are configured for REC, so you might need to change this in menu **BUTTONS**.



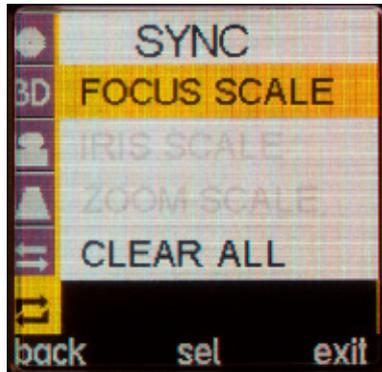
- Press the “SELECT” button twice to enter the Menu.
- Select “BUTTONS” and assign either the Green or Red button to “QSYN”.
 - Note:** Two motors must be assigned to ‘Focus’ before you begin. This is usually motor port M1 and M3 when using *camin 8M* and *8M-TC*.
- Once you have assigned one of the buttons to QSYN, move the lens pair so that the slave lens is in the position where you want to create the offset.
- Press and hold the QSYN button.
- The controller will now only turn the master lens allowing you to create the desired offset.
- Release the QSYN button.
- You have now set a Quick Sync offset. This offset will remain active until the *camin* is power cycled or the “QSYN” button is pressed again.

Note: The Master motor is the one connected to the motor port with the lowest number. E.g. M1 = Master / M3 = Slave.

Scale Sync

The more advanced lens synchronization feature identified as “SYNC” in the *hand unit* menu allows you to create up to 32 precise offset positions for each paired lens axis. This feature is particularly useful for optically matching zoom scales.

Note: Two motors must be assigned to the lens axis/scale you want to synchronise before you begin. If only one motor is assigned to a particular scale, that scale will appear grey in the “SYNC” menu.

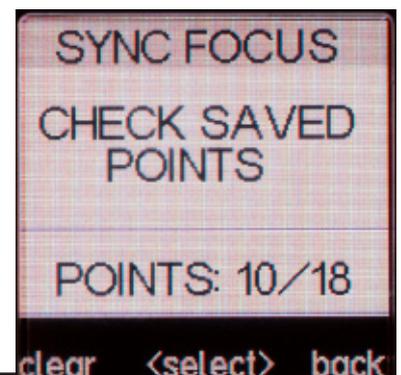


This example shows how to sync Focus on a pair of lenses.

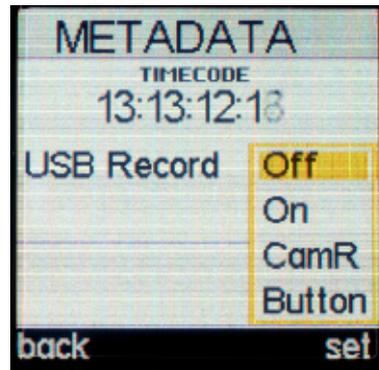
- Press the “SELECT” button twice to enter the Menu.
- Select “SYNC” followed by the scale you want to synchronize, e.g. “FOCUS SCALE”.



- The SYNC FOCUS screen will open and the “Master” focus motor position will be displayed.
- Turn the *knob* so that the ‘Master’ focus scale is set to its closest focal distance.
- Turn the “SELECT” wheel to independently adjust the “Slave” focus motor to the same value.
- Press the LENS (“save”) button to store this synchronization point. POINTS 1/32 will be displayed.
- Repeat this process until you have created an offset for each ‘Slave’ value that does not match the ‘Master’ value.

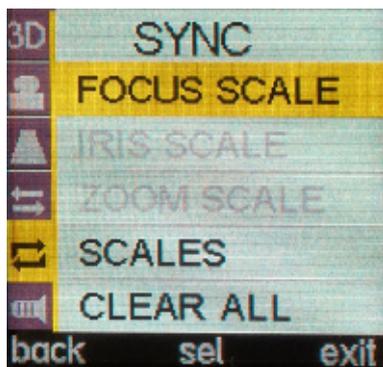


- Press the “SELECT” button to check offsets.
- Turn the “SELECT” wheel to scroll through each synchronization point. Both motors will turn to their new synchronized positions.
- You can delete any individual synchronization point by pressing the LENS (‘clear’)



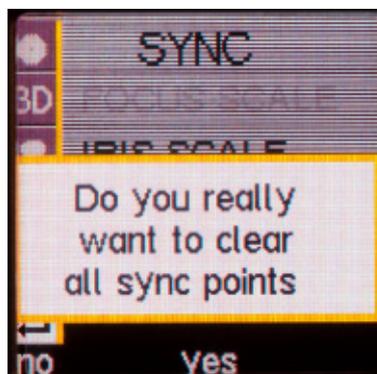
button.

- Press the KNOB (‘back’) button to return to the pervious screen.
- From the initial “SYNC” menu page, select the next scale to be synchronized and repeat as above.



Note: It is also possible to synchronize ‘ANY’ scales using the “SCALES” option in the “SYNC” menu. This allows you to synchronize rig control or even focal length with focal distance.

Note: All synchronization points can be deleted by selecting CLEAR ALL and confirming [yes].



Note: If you reset the *camin* to factory defaults, you will also be asked whether you want to clear all sync points.

6.2. Save/Load User Settings

With every *cvolution* system, it is possible to save up to 7 user profiles. Each profile includes: Motor Assignment, Direction, Torque, Ramp and Scale Sync/Scale Link. These individual profiles are saved internally when using the *camin 3M* but can be written to a USB when stick when working with *cvolution camin 2M, 4M, 8M* and *8M-TC*.

NOTE: Saving multiple Scale Sync profiles is particularly useful when regularly changing paired/synchronized lenses in a 3D production.

To save a user profile:

- Press the “SELECT” button twice to enter the Menu.
- Select “User Settings”.
- Select “save” and press “next”.
- Select one of the slots, e.g. “User1” and press “Select”.
- Wait for “Data successfully written internally / written to USB” and press “exit”..

To save a pair of synchronized lenses to a user profile:

- First synchronize the pair of lenses as described in section 6.1.3 on page 86.
- Save your settings to a slot as described above.
- Clear ALL synchronized scales from the “SYNC” menu.
- Synchronize the second pair of lenses.
- Save the settings to another slot.

To load settings:

- Press the “SELECT” button twice to enter the Menu.
- Select “User Settings”.
- Select “load” and press “next”.
- Select one of the slots, e.g. “User1” and press “Select”.
- Wait for “Data successfully loaded / loaded from USB” and press “exit”.

NOTE: You cannot load empty settings.

6.3. *volution* System Setup for Mirror Rigs

The following instructions show you how to set up your *volution* system for use with your choice of mirror rig. After successful setup, your *hand unit* display will directly read out correct Interaxial and Convergence/Screen Plane distance values.

Note: Starting from software version 3.9.15 on the *hand unit* and 3.9.19 on the *camin* it is possible to control the following 3D rig axes: Interaxial, Convergence, Mirror, Tilt and Rotation. The availability of these axes depends on the manufacturer and type of your 3D rig.

6.3.1. *camin* Setup

- Connect the motors driving the rig to your *camin*.
- Make sure no cables are under strain.
- Connect the motor for Interaxial and Convergence to the desired motor ports. M7 for Conv and M8 for Interaxial are standard on a *camin 8M/8M-TC*.

Note: On advanced 3D rigs you can control more 3D axes, such as Mirror or Tilt. These do not have dedicated motor ports on the *camin*. Connect these to any available motor ports and assign accordingly via the *hand unit* Motor menu.

6.3.2. stereographer hand unit Setup

To assign Convergence to the *hand units knob* and Interaxial to the *slider* follow these steps:

- Enter the MAIN MENU by pressing „Select“ twice.
- Scroll down to „KNOB“ and press „Select“. Set the *knob* to Convergence and the direction as needed.
- Scroll to “Slider” and press „Select“. Set the *Slider* Scale to Interaxial and the direction to right.
- Return to the MAIN MENU and enter “DIRECTION” and make sure M7 and M8 direction is set to right, or depending on the motor mount, left.
- Return to the MAIN MENU by selecting „Exit“. Calibrate Interaxial and Convergence motors by pressing the „CAL“ button, rotating the SELECT button to highlight “RIG” and pressing ‘SELECT’.

NOTE: To move from minimum to maximum by a clockwise *knob* rotation set Knob direction to left. To move in a counter-clockwise rotation set the direction to right.

6.3.3. Setting the Zero Point

To configure your rig properly, ensure that both cameras line up perfectly on your rig.

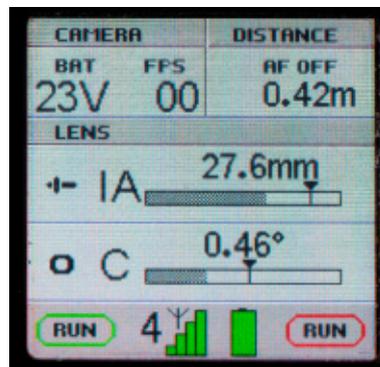
- Line up both cameras on your rig. Make sure they both show precisely the same 2D picture.
- Enter the MAIN MENU by pressing “Select” twice.
- Scroll to and enter “3D MODE” by pressing “Select”.
- Select “Zero Point” and press “Select”.
- Confirm by pressing “Yes”.

6.3.4. Blocking Negative Values

When you have properly defined the zero point, you might want to keep the rig from reaching negative Convergence and Interaxial values.

- Enter the MAIN MENU by pressing “Select” twice.
- Scroll to and enter “3D MODE” by pressing “Select”.
- Select “BlockNeg” and press “Select”.
- Select “on” or “off”
- Confirm by pressing “sel”.

The main display will now show the negative scale areas grayed out and you will not be able to move the motors into negative values.



6.3.5. Setting Convergence/Interaxial Scaling

Note: Depending on the rig you work with, some of the following instructions might not apply. Contact us or your 3D manufacturer for more information on the best calibration method for your rig.

Setting Convergence/Interaxial Scaling by Calibration Range

Note: Make sure your Convergence/Interaxial axes are properly calibrated.

- Scroll to „3D MODE“ and press „Select“.
- Scroll to „Conv Scaling“ or „Interax Scaling“ respectively and enter.
- Select „Cal Ran“ and press „Next“. Enter the Interaxial Distance Range in mm or the Convergence Angulation Range in degrees. Press „save“.

Setting Convergence/Interaxial Scaling by Factor

Note: Make sure your Convergence/Interaxial axes are properly calibrated.

- Scroll to „3D MODE“ and press „Select“.
- Scroll to „Conv Scaling“ or „Interax Scaling“ respectively and enter. Select „Factor“ and press „Next“.
- Enter the scale factor for your 3D rig (to obtain this factor please contact your rig manufacturer). Press „save“.

Setting Convergence Scaling by Target

- Enter the MAIN MENU. Scroll to „3D MODE“ and press „Select“.
- Scroll to „Conv Scaling“ and press „Select“. Select „Target“ and press „Next“.
- Looking through the stationary camera place a object dead center in your viewfinder. Now set Interaxial to its maximum.
- Looking through the second camera adjust Convergence until the object is also centered in this cameras viewfinder.
- Now measure the distance to the object and enter the value. Press “Save”.

NOTE: For best results use a distance of at least 5m/15ft.

6.3.6. Setting Plane Limits via Plane Scaling

You can directly set the limits for Near, Far and Screen Planes via the Plane Scaling Menu.

- Enter the MAIN MENU, scroll to “3D MODE” and press “select”.
- Scroll to “Scaling“ and press “select”.
- Select the desired plane and press “select”.
- Set the desired maximum using the MENU SELECT WHEEL. When done press the wheel to switch to setting the minimum.
- Set the desired minimum and press “done” to save and exit.

6.4. Automatic Convergence

In some stereoscopic shooting situations you might want to set the screen plane distance directly instead of the Convergence Angle. To do so, follow these steps:

- Enter the MAIN MENU, scroll to “3D MODE” and press “select”.
- Scroll to “Mode” and select “AutoC”.
- Now set the screen plane distance directly instead of the Convergence Angle using your Convergence axis controller.

6.5. Linking Scales

Depending on job demands it might sometimes be advisable to link 3D rig axes to Focus and concentrate solely on pulling Focus. In another scenario when using Zoom lenses, Mirror, Rotation and Tilt axes can be synchronized to match two lenses exactly and correct their nodal point off-set and other differences. To link one or more slave axes to your choice of master axis complete the steps below.

- Enter the MAIN MENU, scroll to “Sync”. Enter and select “SCALES”.
- Now select the scale (master) you want to synchronize other scales (slaves) to.
- Press “next”. Select the slaves by scrolling and pressing “select”. The selected scales will turn green. Press “next”.
- Set the first sync point on your master and slaves axes. Press “save”.
- Set the next sync point on your axes and press “save” again.
- Repeat for up to 32 sync points.
- Check your saved sync points by pressing “select” and cycle through your saved sync points using the wheel.
- To unlink linked scales and clear sync points enter “Sync” and select “Clear All”, press “Select” and confirm by pressing yes.

6.6. Controlling H.I.T

You can assign the *knob* or a *slider* to control H.I.T. (Horizontal Image Translation) directly. Unlike all other controllable axis on a *cvolution* system, this will not control a motor directly but will output a pixel value via the CBUS cable and record this value along with all other meta data to a USB device when being recorded by a *camin 8M-TC*.

To assign H.I.T control:

- Enter the MAIN MENU, scroll to “KNOB” or “Slider”.
- Press the MENU SELECT WHEEL to enter.
- Select “H.I.T.” from the Scale Menu and press “sel” to confirm.

6.7. Troubleshooting

If you experience an difficulties, please follow these step:

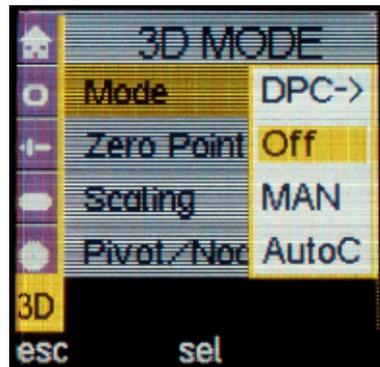
- AutoConv: If you can set the screen plane, but the angle does not change accordingly, make sure you have properly set the zero point.
- Interaxial/Convergence: If the display shows an inverted value, try changing the Motor Direction for that axis.

If the problem persists, reset you system to Factory Preset and re-setup as per instructions. To reset the system:

- Enter the MAIN MENU, scroll to “MAIN”.
- Enter and select “Factory Settings”. Press “select” and confirm by pressing “select” again
- Contact cmotion if any of these instructions fail to solve your problem. Have your system components’ serial numbers and software versions at hand when contacting us.

6.8. Screen Plane

The *volution* lens control system is also capable of controlling Screen Plane, P+S technik and other custom 3D rigs with the *cdisplay II* and the *cscreenplane* software.



Please refer to the Screen Plane User Guide for documentation on Screen Plane 3D functions.

7. Time Code and Meta Data

7.1. Setup

7.1.1. Connecting the Time Code Generator

The *camín 8M-TC* features a standard SMPTE LTC LEf5p time code connector. Any device capable of putting out a SMPTE LTC signal can be used as a time code generator for the *camín*. These include, but are not limited to, film and digital cameras, time code slates and similar devices.

To setup TC sync operation follow these steps:

- Connect the time code generator's TC cable to the *camín 8M-TC*'s TC connector.

NOTE: Time code will be kept in sync for at least 6 hours when the *camín* remains powered on. When power is lost, the *camín* will keep TC sync for at least 90 minutes.

NOTE: The *camín 8M-TC* currently supports frame rates of 24, 25, 30 fps and 23,976 or 29,97 fps respectively.

7.1.2. Preparing the USB Memory Stick

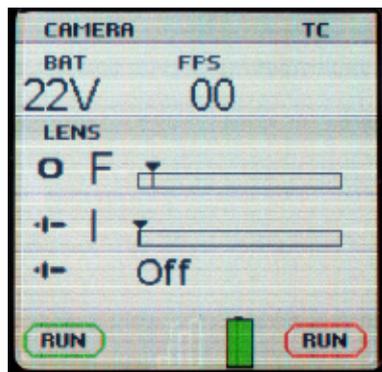
- Insert the USB stick into the *camín*'s USB port.
- The USB LED will start flashing. Wait for the USB device to be initialized and the LED to turn off.

NOTE: USB sticks up to 16GB capacity can be used. When using larger devices problems may occur. Proper operation cannot be guaranteed.

NOTE: USB sticks with large directory/file trees will have longer initialization times. For best results use empty USB sticks reserved for meta data recording.

7.1.3. *hand unit* Setup

- Press the MENU SELECT WHEEL twice to enter the Menu.
- Select MAIN, “Metadata” and enter.
- Select the meta data recording mode. „Off“ disables recording, „On“ records all the time while the *camin* is online, „camrun“ records only when the camera is running. „button“ enables to start/stop meta data recording via the *hand units* red/green buttons. For information on assigning buttons refer to page 101. When a time code signal is present “TC” will be visible on the *hand unit* display.



7.2. Time Code Operation

Time code operation properly set up is not something that requires much thought while shooting. Please bear the following in mind:

- According to your settings in the METADATA menu on the *hand unit* your system will be recording as long as a time code signal is present, whenever the camera is running or when you start the recording by pressing an assigned button. In any case, wait a couple of seconds for the recording to be started. Normally, the time for the camera to run up to speed should be sufficient.
- When the recording has started a red symbol will start flashing in the top of the *hand unit* display.
- The *camcin* will save a file for every clip to the USB device. The naming convention for these files is as follows: DxxTxxxx.dat

The two digits following the letter D indicate the recording's day of the month. The four digits after the letter T indicate the time in hours and minutes. So a clip recorded on the 14th at 13:42 would be named D14T1342.dat.

NOTE: When two clips are started during the same minute, the system will continue writing to the first file. Keep that in mind when shooting very short takes.

Use the supplied file conversion tool for conversion to .cvs files. These files can be read with most standard spreadsheet editors.

NOTE: Alternatively, the *camcin 8M-TC*'s meta data stream is output serially via CBUS. This data can be used for motion control and external recording. For more information on data stream, please contact the cmotion support team.

8. Reference Section

8.1. Using the evolution hand unit Menu

- The *evolution hand unit* and the *camin* can be easily configured using the evolution` hand unit`s menu
- To navigate in the menu, use the MENU SELECT WHEEL (“select”).
- The MENU SELECT WHEEL, LENS or KNOB buttons are context sensitive and serve different functions, depending on the menu.
- Generally, pressing the MENU SELECT WHEEL selects or confirms, pressing the LENS button goes back one step in the menu and KNOB exits the menu.
- To enter the menu, press the MENU SELECT WHEEL twice.

Note: In this menu guide, the factory default settings will be underlined.

Menu	Menu Entry	Options
MAIN	RF Channel	0-7 (White RF), 1-9 (Black RF) Select RF channel according to <i>camin</i> settings
	RF Power (Black RF only!)	Max, ½, ¼, 1/8 Select RF power. If you experience RF reception problems in close range, try reducing RF power.
	Brightness	1,2,3,4,5,6 Sets LCD brightness. While navigating through the menu, brightness is set to default.
	Factory Settings	Resets the <i>camin</i> to factory settings. Confirm by pressing „Select“. Must be connected to <i>camin</i> when performing factory reset.
	User settings	
	Metadata (<i>camin</i> 8M-TC only!)	Off, On, CamR, Button Controls metadata recording to USB device. On is recording all the time, CamR is synchronised with camera run trigger; button enables user control via the GREEN/RED handunit buttons.
	Unit	Imperial, Metric Selects measurement unit to be used and displayed on <i>hand unit</i> .
	Priority	Cable, RF, Startup Sets controller priority. Startup is the default, first controller to be switched on in the system gains priority.
	Run Simul	ON , OFF Run Simulation: When ON, provides optical feedback via the RUN-LED and LCD for cameras that do not send a camera run signal. Please verify if camera is actually running.
	Stealth Mode	ON , OFF Stealth mode is used in dark environments when LEDs cast unwanted light into a scene or are seen as reflections on camera.
Boost	<i>CamIn</i> 3M only: the boost function is activated here instead of the switch on the <i>camin</i> 2M, 4M and 8M(+TC)	
KNOB	Scale	Focus, Iris, Zoom, Conv, Interax, Mirror, Tilt, Rotation, Off Assign the <i>knob</i> to the desired scale.
	Direction	left, right Sets the <i>knob</i> direction. This setting is independent from the motor direction setting, allowing to have motors move in opposite directions while turning the <i>knob</i> . See DIRECTION menu for details.
	Illumina	OFF, ON, 4 brightness levels Controls <i>knob</i> illumination. (Only <i>knob</i> advanced)
	Premarked	OFF, ON, MET 1,2,3 IMP 1,2,3 Select premarked focus ring. Available for right or left handed configurations
Slider	Scale	Focus, Iris, Zoom, Conv, Interax, Mirror, Tilt, Rotation, Off Select for which function the <i>slider</i> is used.

Menu	Menu Entry	Options
	Direction	left, right Sets the <i>slider</i> direction. This setting is independent from the motor direction setting, allowing to have motors move in opposite directions while using the <i>slider</i> . See DIRECTION menu for details.
	Scale2 (With two or more <i>sliders</i> on <i>hand unit</i> ONLY)	Focus, Iris, Zoom, Conv, Interax, Mirror, Tilt, Rotation, Off Select for which function the <i>slider</i> is used.
	Direction2 (With two or more <i>sliders</i> on hand unit ONLY)	<u>left</u> , right Sets the <i>slider</i> direction. This setting is independent from the motor direction setting, allowing to have motors move in opposite directions while using the <i>slider</i> . See DIRECTION menu for details.
	Scale3 (With three <i>sliders</i> on <i>hand unit</i> ONLY)	Focus, Iris, Zoom, Conv, Interax, Mirror, Tilt, Rotation, Off Select for which function the <i>slider</i> is used.
	Direction3 (With three <i>sliders</i> on <i>hand unit</i> ONLY)	<u>left</u> , right Sets the <i>slider</i> direction. This setting is independent from the motor direction setting, allowing to have motors move in opposite directions while using the <i>slider</i> . See DIRECTION menu for details.
BUTTONS	Green	REC, RET, UB 1, UB 2, UB 3, MARK, QSYN, RECM, LASER, OFF REC starts/stops the camera. RET Trigger Return function when using an ARRI Alexa camera and a RVI cable. UB 1, UB 2, UB 3, triggers a camera function assigned to a user button 1-3 on ARRI Alexa, Amira, Alexa Mini and RED Weapon, Helium, Scarlett (in order to assign user buttons on the camera, please refer to the corresponding camera manual). MARK is used for focus marks when used with cdisplay and for auto focus with a cfinder. QSYN is used for quick sync. Please refer to to section 6.1.3 on page 83 for details. RECM is used for meta data recording (camin 8M-TC only). Please refer to section 7 on page 93. LASER activates the laser pointer of cfinder III as long as the button is being pressed. (WARNING: Do not point at eyes while the laser pointer is activated!) OFF disables the button.

Menu	Menu Entry	Options
	Red	<p>REC, RET, UB 1, UB 2, UB 3, MARK, QSYN, RECM, LASER, OFF</p> <p>REC starts/stops the camera.</p> <p>RET Trigger Return function when using an ARRI Alexa camera and a RVI cable.</p> <p>UB 1, UB 2, UB 3, triggers a camera function assigned to a user button 1-3 on ARRI Alexa, Amira, Alexa Mini and RED Weapon, Helium, Scarlett (in order to assign user buttons on the camera, please refer to the corresponding camera manual).</p> <p>MARK is used for focus marks when used with cdisplay and for auto focus with a cfinder.</p> <p>QSYN is used for quick sync. Please refer to section 6.1.3 on page 83 for details.</p> <p>RECM is used for meta data recording (camin 8M-TC only). Please refer to section 7 on page 93.</p> <p>LASER activates the laser pointer of cfinder III as long as the button is being pressed. (WARNING: Do not point at eyes while the laser pointer is activated!)</p> <p>OFF disables the button.</p>
MOTOR	M1 – M8, <i>cforcexxx</i> Note: motors that are not connected cannot be configured.	Focus, Iris, Zoom, Conv, Interaxial, Mirror, Tilt, Rotation Select motor function. Default is dependent on <i>camin</i> version. Each motor can be set to any function.
3D MODE		These functions are used with Screen Plane and other 3D rigs. Please refer to section 6 on page 84 for more information.
TORQUE	M1 – M8, <i>cforcexxx</i> Note: motors that are not connected cannot be configured.	min, weak, strong, max Select motor torque for each motor. Please note that using high motor torque on lenses with low drag can result in motor jitter.
RAMP	M1 – M8, <i>cforcexxx</i> Note: motors that are not connected cannot be configured.	min, short, long, max Select motor ramp for each motor. Use short ramps for fast acceleration (e.g. on lenses) and long ramps for smooth acceleration (e.g. on 3D rigs)
DIRECTION	M1 – M8, <i>cforcexxx</i> Note: motors that are not connected cannot be configured.	left, right Sets the motor direction for each motor. This setting is independent from the <i>knob</i> or <i>slider</i> direction, allowing to move motors in opposite direction while using <i>knob</i> or <i>slider</i> (for example on 3D rigs).
SYNC	FOCUS, IRIS, ZOOM Scales, CLEAR ALL	This setting allows to save up to 32 sync points to match lenses for 3D/Panoramic operation. Refer to section 6.1 on page 84 for more information.

Menu	Menu Entry	Options
LENS	Load Lens	Loads a lens into the system from internal memory. Note: This feature is only available on the <i>camin 3M</i> . Other <i>camin</i> need the cworld or cdisplay .
	Unload Lens	Unload the loaded lens. Confirm by pressing "yes".
	Invert Focus	Inverts the selected scale, Confirm by pressing "yes".
	Invert Iris	Inverts the selected scale, Confirm by pressing "yes".
	Invert Zoom	Inverts the selected scale, Confirm by pressing "yes".
	Create Lens	Allows you to create a lens file using the evolution hand unit (please refer to section 4.16.)
	Delete Lens	Allows you to delete a single lens file from the evolution hand unit (please refer to section 4.18.6.)
Range finder	AutoFocus	Allows you to choose between off, M pre, M tog, M pin, on off: turns autofocus permanently off M pre: "MARK press" activates autofocus as long as the user button is being pressed (one of the user buttons needs to be assigned to MARK). After releasing the user button, the focus will move to the preset knob position. M tog: "MARK toggle" activates autofocus by the press of an user button and deactivates it by another press (one of the user buttons needs to be assigned to MARK). After deactivating the autofocus, the focus will move to the preset knob position. M pin: "MARK pin" allows to take a single reading from the range finder. After releasing the user button the focus will STAY at this distance (one of the user buttons needs to be assigned to MARK). If pressed permanently the autofocus is activated as long as the user button is being pressed. Turning the knob over the fixed focus position assigns the control to the knob automatically. on: turns autofocus permanently on
	laser pointer	activates the red reference/alignment laser of a cfinder III for 30 seconds Warning: Always avoid direct eye contact with the beam of the red alignment laser.
ABOUT		Displays current software versions of all connected components.

8.2. Connectors and Controls on the camin 3M

8.2.1. Connectors and Controls, Top Side

ON-Switch	Turn <i>camin</i> on or off. Note: The voltage boost on the <i>camin 3M</i> is activated via the <i>hand unit</i> menu.
Channel Dial	Set the desired RF channel. Channel 1-9 for Black RF Channels 0-7 for ARRI White RF
Antenna port	Connect the supplied antenna to this port. To achieve optimum wireless range the antenna is required.

8.2.2. Connectors and Controls, Motor Side

LBUS port	You can connect up to 3 <i>cforce/cforce mini</i> motors to the LBUS port in a daisy chain fashion. Assign these motors to axis via the <i>hand unit</i> menu.
Motor ports	The <i>camin 3M</i> offers three Fi or Le motor ports. The standard axis assignment on these is as follows: M1 Focus, M2 Iris, M3 Zoom but can be changed via the <i>hand unit</i> menu.

8.2.3. Connectors, CBUS Side

RS	9-35 V power connector with standard ARRI pinout.
ANA	To control motors using traditional broadcast controllers. Optional CEN-1 / CEN-2 cables required.
CBUS	The CBUS port allows accessories like the <i>cfinder</i> to connect to the <i>camin</i> . It is also used for cable operation and software updates.
EXT	Camera /3rd party interface. If your camera is capable of communicating with the <i>camin</i> , it can be connected to the EXT port for camera control. You can also connect two cameras to EXT via split cable.

8.3. Connectors and Controls on the camin 2M/4M/8M and 8M-TC

8.3.1. Connectors and Controls, Motor Side

ON-Switch	Turn <i>camin</i> on or off		
	In position I the motor voltage equals the input voltage.		
	In position II the motor voltage is boosted internally to 26V but draws a higher current. If using position II, make sure your camera or power supply is capable of providing sufficient Amps.		
	Typical current requirements per motor connected are:		
	Supply voltage	24V	12V
	ON=I	0.5A	0.5A
	ON = II	0.6A	1.1A
Channel Dial	Set the desired RF channel. Channel 1-9 for Black RF Channels 0-7 for ARRI White RF		
Antenna port	Connect the supplied antenna to this port. To achieve optimum wireless range the antenna is required.		
Motor ports	Depending on your camin model there are up to 8 passive motor ports on this side of the <i>camin</i> . Connectors are either Fi 12p or Le 7p connectors.		

8.3.2. Connectors, CBUS Side

USB connector	The USB port is used for import/export of User Settings and recording of meta data (<i>camin 8M-TC</i> only)
RS-1	9-35 V power connector with standard ARRI pinout. This is the primary power connector for <i>camin 8M-TC</i>
RS-2	9-35 V power connector with standard ARRI pinout. This is the primary power connector for <i>camin 4M</i> and <i>8M</i> Note: When using more than 4 motors, it is highly recommended that you use both RS jacks to power the <i>camin</i> .
CBUS ports	The CBUS port allows accessories like the <i>cfinder</i> to connect to the <i>camin</i> . It is also used for cable operation and software updates. Please note: Second CBUS port available on <i>camin 8M-TC</i> only. CBUS 2 is also used for serial meta data output.
EXT-1, EXT-2	Camera and 3rd party interface. Up to two cameras can be controlled through EXT-1 via a split cable. The <i>camin</i> can be powered through the EXT ports, preferably EXT-2..
Motor ports	On the <i>camin 8M</i> , motor ports 7 and 8 are found on this side of the <i>camin</i> .
TC	SMPTE LTC Time Code In. Use this port to input time code from any time code generator capable of putting out SMPTE TC (camera, TC slate etc). Please note: TC port available on <i>camin 8M-TC</i> only.

8.3.3. LED Status camin 2M/4M/8M

	RF LED	ON LED	camin Status	Solution
RF LED/ON LED (Operation Status)	Off	Off	<i>camin</i> off	check <i>camin</i> ON/OFF switch check power supply voltage (9 V minimum) check for cable damage
	Off	Flashing Red/Green	<i>camin</i> ready, (cable mode, channel selector set at 0 or RF off) no client logged on	turn on clients
	Flashing Red	Flashing Red/Green	<i>camin</i> ready (wireless mode), no client logged on	turn on clients
	Off	Green	<i>camin</i> ready, client logged on in cable mode	OK
	Green	Green	<i>camin</i> ready, client logged on in wireless mode	OK
	Red	Flashing Red/Green	During Start-Up: <i>camin</i> is booting up Selected channel already in use by another <i>camin</i> Channel is currently being changed Hardware fault	turn off <i>camin</i> and change radio channel If that does not work, please contact cmotion.
	Green Flashing	Flashing Red	Software incompatible between <i>camin</i> and clients	update all components
	Red	Flashing Red	Low battery <i>camin</i> will not work	change Power Supply
Motor LED	Flashing Red		Motor Error	check motor cable If no reason can be found, please contact cmotion
	Green		Motor ready	
	Green/ Flashing Red		System is calibrating motor cannot reach its position	check if lens torque is too high and lens damage check lens calibration
	Off		No motor connected	check motor cable check if <i>camin</i> is turned on
TC LED	Off		No time code input	check TC cable check if TC generator is powered on and set up correctly
	Green		Time code signal present and device in sync	
	Flashing Green		Time code running out of sync (40 minutes warning before sync is lost)	Reconnect TC generator and re-sync within 40 minutes
	Red, followed by Green		Syncing with TC signal	Do not disconnect the TC in cable
	Flashing Red, Red		TC out of sync	Re-sync with TC generator

8.4. LEDs, Connectors and Buttons on the evolution hand unit

8.4.1. Buttons

ON button	Turn <i>hand unit</i> on or off
CAL button	Calibrate motors. Press to enter CAL Menu, hold button for 3 sec to calibrate all motors.
LENS button (KNOB)	Set lens limits When pressed while holding CAL only the motor associated with <i>knob</i> is calibrated When menu is active LENS is context sensitive and serves several purposes, shown in the menu.
KNOB button	Set <i>knob</i> limits.
RUN (GREEN button)	User configurable: REC (start/stop the camera) RET Trigger (Return function when using an ARRI Alexa camera and a RVI cable) UB 1, UB 2, UB 3 (triggers assignable camera user button functions) MARK (used in conjunction with cfinder, cdisplay) QSYN (used for quick sync) RECM (start/stop recording meta data, with camin 8M-TC only) LASER (activates the laser pointer of cfinder III) Off
RUN (RED button)	User configurable: REC (start/stop the camera) RET Trigger (Return function when using an ARRI Alexa camera and a RVI cable) UB 1, UB 2, UB 3 (triggers assignable camera user button functions) MARK (used in conjunction with cfinder, cdisplay) QSYN (used for quick sync) RECM (start/stop recording meta data, with camin 8M-TC only) LASER (activates the laser pointer of cfinder III) Off
MENU SELECT WHEEL (select)	Enter menu by pressing twice. Scroll in menu and select items. This button is context sensitive, the current function will be indicated on the display. In SYNC menu: move slave motor

8.4.2. Connectors

CBUS port	The <i>evolution hand unit</i> has a CBUS port on the top side. This allows mounting the <i>zoom</i> module as well as connection to the <i>camin</i> via cbus cable. It can also be used for software updates.
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Antenna port	Depending on your <i>hand unit</i> model, there is an antenna port, allowing to attach an external antenna to the <i>hand unit</i> for wireless operation.
Battery port	Insert the cmotion battery in the battery port to power the <i>hand unit</i> . For cable operation, a battery is not necessary.

8.5. LED Status evolution hand unit

	LED Status	hand unit Status	Solution
READY LED	OFF	<i>hand unit</i> off	Turn on system
	GREEN	<i>hand unit</i> on	
	RED Blinking	Battery low	Change battery
	RED	at startup: <i>hand unit</i> not ready	
RUN LED	OFF	No run signal from camera Camera in standby	Check cable Check if RUN SIMUL is ON
	GREEN	Camera running	OK
	RED	Camera error Camera changing speed	
Slider LED(s)	OFF	System idle	
	GREEN	Lens limits have been set	Remove lens limits by pressing „LENS“ button
	RED	Motor controlled by <i>slider</i> is missing or is being controlled by another module	Connect motor to appropriate jack on <i>camin</i> Change <i>slider</i> configuration to different motor
	Blinking RED/GREEN	Calibrating	Wait for calibration to finish
	Blinking GREEN	Calibration armed	Release “CAL” button to calibrate
KNOB LEDs	OFF	System idle	
	MIDDLE LED GREEN	Manual focus matches cfocas range finder value	
	RED LED BAR	Indicates focus correction is necessary	

9. Troubleshooting

General problems	Problem	Solution
	Zoom does not work properly	Repower <i>cvolution hand unit</i> . Make sure not to touch the <i>zoom</i> controller while calibrating.
	Calibration does not work	Make sure camera is not running.
	Camera RUN does not work	Make sure <i>camin</i> is not calibrating.
	Any strange behavior	Reset „Factory Settings“
RF problems	Bad reception	Check antenna. Adjust RF Power.
	No reception	Check is selected RF channel is correct for your RF version. Make sure RF modules of <i>camin</i> and <i>cvolution hand unit</i> match.
Motor problems	Motor LED red Motor does not move	<i>camin 4M/8M</i> only: use RS-2 to power <i>camin</i> .
	Motor has problems moving the lens/rig	Increase torque, decrease ramp speed. <i>camin 3M</i> : Check Boost setting in the main Menu. <i>camin 4M/8M</i> only: Check if <i>camin</i> power switch is set to ON 2.
	Motors can't be synchronized	Motors must be paired to be synchronized.
	Motor moves too slow	Increase supply voltage. <i>camin 3M</i> : Check Boost setting in the main Menu. <i>camin 4M/8M</i> only: Check if <i>camin</i> power switch is set to ON 2.
	Zoom axis does not move	Check <i>zoom</i> unit speed setting.

10. Version History

- V 1.0, initial release: April, 27th 2011.
- V 1.01, updated release for *cam* software 3.9.21, May 16th 2011.
- V 1.03 updated for software release package 2011_03, November 29th, 2011.
- V 1.04 updated for software release package 2012_01, March 29th, 2012.
- V 1.05 updated for software release package 2012_02, June 11th, 2012. Added instructions for *knob solo*.
- V 1.08 updated software release package 2015_03, January 11th, 2016.
- V 1.09 updated software release package 2017_01, January 12th, 2017
- V 1.10 updated software release package 2018_01, January 9th, 2018

