

ramona

MCAM® Safety Manual

(EN, FR, DE)

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Durham, NC.



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DISCLAIMER

The Ramona Optics Multi-Camera Array Microscope (MCAM®) is a Gigapixel Microscope that is provided as a beta-unit for use by the user "AS-IS" and any express or implied warranties, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed.

CONTACT

Ramona Optics, Inc.
1000 West Main Street, Suite #2A
Durham, NC 27701

Phone: (919) 797-9975
General Email: info@ramonaoptics.com
Support Email: help@ramonaoptics.com
Website: ramonaoptics.com

SYSTEM RATINGS

Main Supply: 100-240 VAC, 50/60Hz, 10A
Indoor use only
Altitudes up to 2000m
Operating temperatures 15-28C, storage temperatures 5-40C
Maximum relative humidity: 80% up to 31C, decreasing linearly to 50% at 40C
OVERVOLTAGE CATEGORY II (EN 61010-1 2010)
POLLUTION DEGREE II (EN 61010-1 2010)

SYSTEM SPECIFICATIONS

The MCAM technology is sold in two products, the Kestrel™ (designed for small model organism imaging) and the Vireo™ (designed for live-cell imaging).

Kestrel Dimensions: 360 x 360 x 460 mm (Depth x Width x Height)
Kestrel Mass (weight): 30 kg (68 lbs)

Vireo Dimensions: 529 x 469 x 600 mm (Depth x Width x Height)
Vireo Mass (weight): 91 kg (200 lbs)



Safety Warnings and Precautions

The MCAM system ("MCAM") should always be used in accordance with the guidelines of this manual to avoid risk of personal injury and/or damage to the instrument. **If the MCAM is used in a manner not consistent with the manner specified by Ramona Optics, Inc. in this manual, protection provided by the equipment may be impaired.**

Note the following safety warnings:

	The MCAM is heavy (Kestrel: ~30 kg/68 lbs; Vireo: ~91 kg/200 lbs). Use caution when lifting. Use your legs and core muscles to lift the equipment, not your back. Keep the load close to your body during the lift. Maintain a firm grip on the load with both hands.
	Given the weight of the MCAM, for stability, position all hardware on a stable surface prior to use.
	Prior to moving, cleaning, or performing maintenance on the MCAM, always power off and disconnect power from hardware and disconnect the MCAM and MCAM Workstation.
	The MCAM is an electronic system. Do not touch any MCAM hardware with wet hands.
	Ventilation is required for proper function of the MCAM. Make sure to leave a minimum of two inches or 5 cm of space around all sides of the MCAM as well as the MCAM Workstation.
	The MCAM's X, Y, and Z stages can move quickly, causing pinch hazards. To avoid pinch hazard, ensure hands are outside the MCAM imaging chamber before operating the moving MCAM stages using the provided software.
	The LEDs on the MCAM Reflection Illumination Module can become very hot after use. Do NOT touch any part of MCAM Reflection Illumination Module except for Quick Release Handles (see MCAM User Manual).
	The MCAM is an electronic device. Disconnect power prior to moving, cleaning, or performing maintenance.

Avertissements de sécurité et précautions

Le système MCAM doit toujours être utilisé conformément aux directives de ce manuel afin d'éviter tout risque de blessure personnelle et/ou de dommage à l'appareil. **Si le système MCAM est utilisé d'une manière non conforme aux indications spécifiées par Ramona Optics, Inc. dans ce manuel, la protection offerte par l'équipement peut être compromise.**

Prenez note des avertissements de sécurité suivants :

	Le MCAM est lourd (Kestrel: ~30 kg/68 livres; Vireo: ~91 kg/200 livres). Faites attention lorsque vous le soulevez. Utilisez vos jambes et les muscles de votre tronc pour soulever l'équipement, pas votre dos. Gardez la charge près de votre corps pendant le soulèvement. Maintenez une prise ferme sur la charge avec vos deux mains.
	Le MCAM est lourd. Pour une meilleure stabilité, placez tout le matériel du système sur une surface stable avant son utilisation.
	Avant de déplacer, nettoyer ou effectuer la maintenance du MCAM, éteignez toujours et débranchez l'alimentation du matériel et déconnectez le MCAM et la station de travail MCAM.
	Le MCAM est un système électronique. Ne touchez à aucun composant matériel du système MCAM avec vos mains mouillées.
	Une ventilation est nécessaire pour le bon fonctionnement du MCAM. Assurez-vous de laisser un espace minimal de 5 cm autour de chaque côté du MCAM ainsi que de la station de travail MCAM.
	Les plateaux X, Y et Z du MCAM peuvent présenter des risques de pincement car ils peuvent se déplacer rapidement. Pour éviter ceci, assurez-vous que vos mains sont à l'extérieur de la chambre d'imagerie MCAM avant d'opérer les déplacements des plateaux MCAM à l'aide du logiciel fourni.
	Les LED du module d'éclairage par réflexion MCAM peuvent devenir très chaudes après l'utilisation de l'appareil. Ne touchez à AUCUNE partie du module d'éclairage par réflexion MCAM à l'exception des poignées de dégagement rapide (voir le manuel d'utilisation MCAM).
	Le MCAM est un dispositif électronique. Déconnectez l'alimentation avant de le déplacer, de le nettoyer ou d'effectuer sa maintenance.

Sicherheitswarnungen und Vorsichtsmaßnahmen

Das MCAM-System sollte immer gemäß den Richtlinien dieses Handbuchs verwendet werden, um das Risiko von persönlichen Verletzungen und/oder Schäden am Gerät zu vermeiden. **Wird das MCAM auf eine Art und Weise verwendet, die nicht mit den von Ramona Optics, Inc. in diesem Handbuch angegebenen Verfahren übereinstimmt, kann der durch die Ausrüstung gebotene Schutz beeinträchtigt werden.**

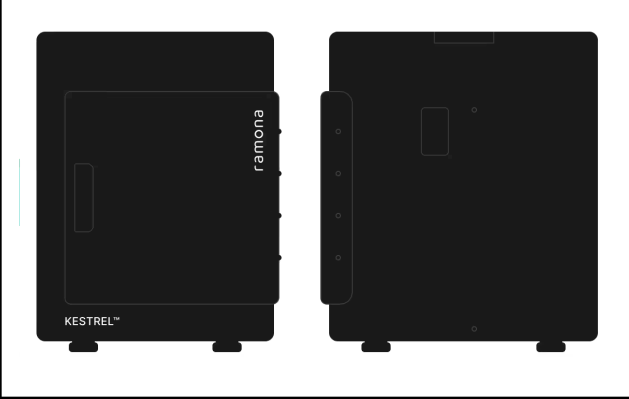
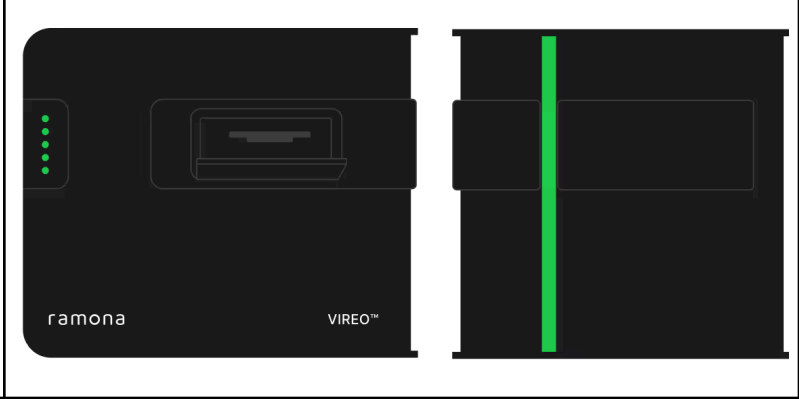
Beachten Sie die folgenden Sicherheitswarnungen:

	Das MCAM ist schwer (Kestrel: ~30 kg/68 livres; Vireo: ~91 kg/200 livres). Seien Sie vorsichtig beim Heben. Benutzen Sie Ihre Bein- und Rumpfmuskulatur zum Heben der Ausrüstung, nicht Ihren Rücken. Halten Sie die Last während des Hebens nah am Körper. Behalten Sie einen festen Griff an der Last mit beiden Händen.
	Das MCAM ist schwer. Für die Stabilität positionieren Sie die gesamte Systemhardware vor der Verwendung auf einer stabilen Oberfläche.
	Bevor Sie das MCAM bewegen, reinigen oder Wartungsarbeiten daran durchführen, schalten Sie das System immer zuerst aus, trennen Sie die Stromversorgung von der Hardware und trennen Sie die Verbindung zwischen dem MCAM und der MCAM-Workstation.
	Das MCAM ist ein elektronisches System. Berühren Sie keine Hardware des MCAM mit nassen Händen.
	Eine Belüftung ist für die ordnungsgemäße Funktion des MCAMs erforderlich. Stellen Sie sicher, dass auf allen Seiten des MCAMs sowie der MCAM-Workstation mindestens zwei Zoll oder 5 cm Platz gelassen werden.
	Die X-, Y- und Z-Achsen des MCAMs können sich schnell bewegen und so Quetschgefahren für Benutzer verursachen. Um Quetschgefahren zu vermeiden, stellen Sie sicher, dass Ihre Hände außerhalb der Bildgebungskammer des MCAMs sind, bevor Sie die beweglichen MCAM-Stufen mit der bereitgestellten Software betreiben.
	Die LEDs am MCAM-Reflexionsbeleuchtungsmodul können nach Gebrauch sehr heiß werden. Berühren Sie KEINEN Teil des MCAM-Reflexionsbeleuchtungsmoduls außer den Schnellverschlussgriffen (siehe MCAM-Benutzerhandbuch).
	Das MCAM ist ein elektronisches Gerät. Trennen Sie vor dem Bewegen, Reinigen oder Durchführen von Wartungsarbeiten den Strom.



Getting Started

Begin by identifying your MCAM model, referring to the table below:

Kestrel	Vireo
	

Overview

The Multi-Camera Array Microscope (MCAM) is a form of Gigapixel Microscope. This new class of high-throughput imaging system enables Gigapixel Microscopy and consists of 6 main components: data acquisition electronics, image forming optics, an illumination unit, a motion control unit, the graphical user interface (GUI), and MCAM software (including machine learning analysis and the software development kit).

Ramona offers two products that leverage its MCAM technology, the Kestrel and the Vireo:

- The **Kestrel** consists of 48x video microscopes and is the ultimate imaging system for small model organisms. It transforms small model organism research with high-throughput behavioral, morphological, and fluorescence analysis of entire plates at video rates.
- The **Vireo** consists of 24x video microscopes and is the world's fastest live-cell imaging system. It revolutionizes 4D live-cell imaging, delivering unparalleled speed, precision, and multi-channel fluorescence for studying cells and organoids. It is compatible with laboratory scheduling software, enabling seamless integration into automated workflows.

The software and firmware coordinate these optical sensors so that they operate in the desired configuration. The illumination unit enables one to control both the spectral and the angular profile of the illumination. The GUI is provided to give users a quick way to navigate many of the functions of the MCAM. The software development kit (SDK) provides finer grained control over the MCAM's functionality, enabling more advanced acquisition through Python®.



Included Hardware

Item	Quantity
Multi-Camera Array Microscope (MCAM) Kestrel may include MCAM Reflection Illumination Module (Qty: 1).	1
Universal Power Cable (3-prong IEC, rated for 100-240VAC, 10A-5A, 47-63Hz) <i>Note: Universal Power Cables (3-prong IEC, rated for 100-240VAC, 10A-5A, 47-63Hz) are rated for MCAM and MCAM Workstation power supplies. Do not connect other cable types to the MCAM.</i> <i>Note: To ensure proper grounding, only Universal Power Cables (3-prong NEMA, rated for 100-240VAC, 10A-5A, 47-63Hz) can be used with the MCAM. Do not use other cable types with the MCAM.</i>	3
USB Cable (USB-A to USB-B)	1
Kestrel Only: Mini SAS Cables (SF-8766) The provided quantity depends in part on the purchased performance.	2 or 4
Kestrel Only: Transmission Illumination Diffuser	1
Kestrel Only: Universal Stage Insert	1
Vireo Only: Thunderbolt Cable	1
MCAM Workstation: MCAM Desktop Workstation Computer Monitor Mouse Keyboard	1



Included Software

Item	Description
MCAM User Interface	User interface for controlling the MCAM unit and capturing data.
MCAM Viewer	Viewing software for data captured on the MCAM. For optimal performance, it is recommended the MCAM Viewer be run on a workstations with the following specs: • Ubuntu 24.04 or Windows 10 • A modern Intel i7, Xeon processor, or Ryzen (from the last 3 years) • 16 GB of RAM (64 GB recommended) • An internal solid state drive for data storage • A dedicated graphics card Using an external hard drive can significantly reduce data transfer rates and system performance.

Technical Support

For technical and/or service issues please contact the manufacturer at help@ramonaoptics.com.

To resolve any questions not addressed within this manual or to request additional material regarding the MCAM, contact the manufacturer.

Installation

Installation procedure is as follows:

1	The MCAM is heavy (Kestrel: 30kg, Vireo 91kg). Always have at least 2 people present when removing the MCAM or MCAM Workstation from its packaging.
2	Place the MCAM packaging container next to the table where the MCAM will be installed. Open the MCAM packaging container. As a team of 2 people, lift the MCAM (Kestrel or Vireo) out of its packaging and place it on the table.
3	Position the MCAM, MCAM Workstation, Computer Monitor, Keyboard, and Mouse on a stable surface with minimal vibration.



	Do not position MCAM system components in a manner that makes power buttons difficult to access. Make sure to leave a minimum of six inches of space for ventilation around all sides of the MCAM as well as the workstation computer. Vireo: Make sure to leave a minimum of six inches of space in front of the MCAM to allow for full extension of the sample tray outside the device enclosure.
4	Confirm that the power button at the back of the MCAM unit is in the OFF position (0).
5	If the MCAM Workstation is equipped with a power button next to the IEC power inlet, ensure it is in the OFF position (0). Confirm that the MCAM Workstation IEC power cable is disconnected from both the wall and the workstation.
6	Plug the MCAM, MCAM Workstation, and Computer Monitor into standard 100-240V wall power outlets using the IEC C13 to wall outlet power cable. (3-prong cable , rated for 100-240VAC, 10A-5A, 47-63Hz). The cable appropriate to the country of shipment will be provided to you. For North America, this is a NEMA 5-15 cable will be provided. <i>Note: Universal Power Cables (3-prong NEMA, rated for 100-240VAC, 10A-5A, 47-63Hz) are rated for MCAM and MCAM Workstation power supplies. Do not connect other cable types to the MCAM.</i> <i>Note: To ensure proper grounding, only Universal Power Cables (3-prong NEMA, rated for 100-240VAC, 10A-5A, 47-63Hz) can be used with the MCAM. Do not use other cable types with the MCAM.</i>
7	Connect MCAM and MCAM Workstation with one (1) USB Cable (USB-A to USB-B).
8	Connect MCAM Workstation and Computer Monitor with Display Cable (HDMI or DisplayPort).
9	Kestrel only: Connect MCAM and MCAM Workstation with Mini-SAS Cables. Note that the terminals of each cable are labeled with a number that corresponds to a numbered port on the MCAM as well as a numbered port on the MCAM Workstation. Only connect cable terminals to ports that are numbered correspondingly. Vireo only: Connect MCAM and MCAM Workstation with one (1) Thunderbolt Cable.
10	Vireo only: If the Vireo is equipped with the stagetop incubator option, ensure that the following connections are made: 1. CO₂ inlet (if option installed) CO₂ must be available at 1.4 barg (20.3 psig), with a connector for 6mm OD rigid silicon tube. Gas source must be Standard Purity CO₂ (coded as 4.5 that means 99.995 % of CO₂) and humidity-free gas. 2. N₂ inlet (if option installed) N₂ must be available at 1.4 barg, with a connector for 6mm OD rigid silicon tube. Gas source must be Standard Purity N₂ (coded as 4.5 that means 99.995 % of N₂) and humidity-free gas.



	3. The water reservoir is filled with de-ionized water and sealed tight.
11	Connect keyboard and mouse to thy MCAM Workstation By using the USB ports on the back of the workstation.
12	Consult the MCAM User Manual to ensure the system is tuned for your application.
13	Kestrel only: Ensure there is adequate room around the door for it to be fully opened and closed. Vireo only: Ensure there is at least 20 cm (8 inches) of space in front of the unit to allow for the retractable nest to open.
14	Power on the System in the following order: 1. Turn on the computer monitor. A power bottom should be pressed in the lower right hand corner and a small indicator light will turn on. 2. Power on the MCAM with by setting the switch on the back of the system next to the IEC inlet to the ON position (1). 3. Power on the MCAM Workstation by ensuring that the switch next to the IEC inlet is in the ON position (1) and then pressing the power button on the front of the workstation. The MCAM workstation may take up to 5 minutes to start. Once the MCAM Workstation is powered up, the MCAM may be operated using the provided Ramona Optics MCAM Graphical user interface. It may be started by clicking on the white ramona logo on the left hand side of the user interface. 

Equipment Operation

Operating controls and their use in all operating modes for the **Kestrel** and **Vireo** is described in detail in the **MCAM User Manual and MCAM Workflows Manual**.

Other specialized operating modes can be found on the online documentation available at docs.ramonaoptics.com
The instructions in this document are limited to the safe operation and cleaning of the instruction.

Users control the MCAM with the MCAM Workstation to change operating modes and capture data using pre-installed MCAM User Interface software. Modifying settings within the MCAM User Interface enables the user to change illumination wavelength and direction, sample position, and image sensor position, among other capabilities. The MCAM User Interface also enables the user to capture image, timelapse, and video data at selected resolution, intervals, and frame rates over a user-defined duration of time.

Data captured using the MCAM User Interface can be viewed using pre-installed MCAM Viewer software.



Vireo and Kestrel Power Connection

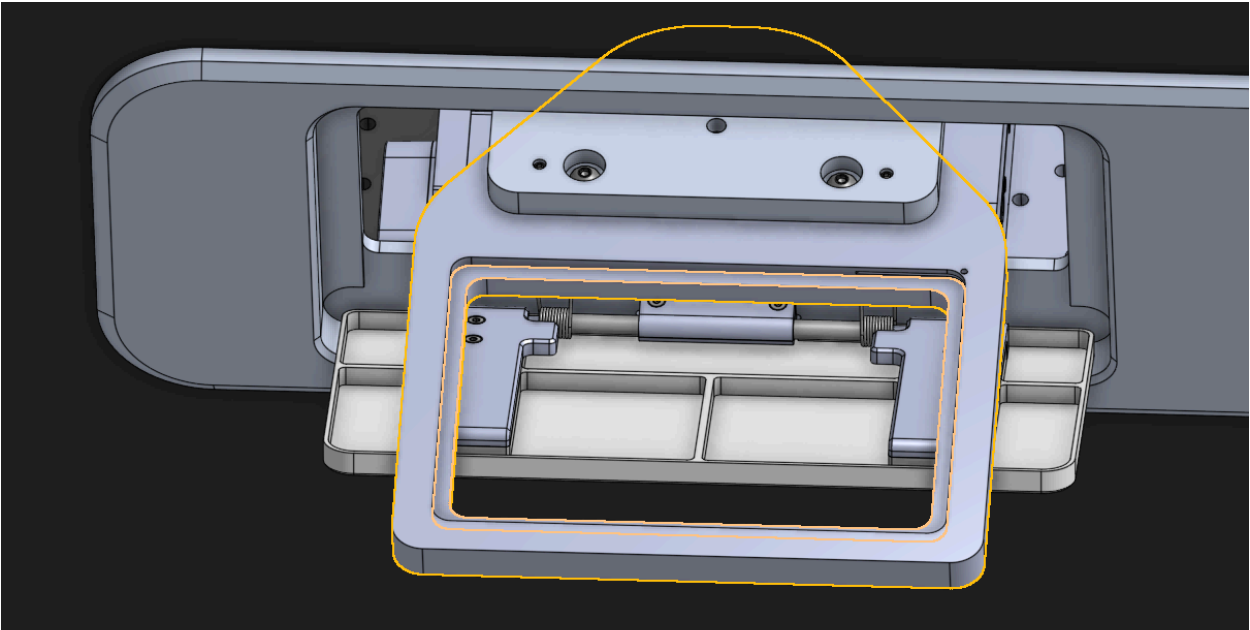
Connect only to an earthed mains outlet of the rated voltage (100-240 VAC, 50/60Hz, 10A). The equipment includes a built-in AC power supply and may include a rear-panel power switch.

Important: The rear-panel switch, if present, does not isolate the equipment from the mains. The mains plug is the means of disconnecting the equipment from the AC supply. Ensure the mains plug is readily accessible so that the equipment can be fully disconnected in an emergency or during servicing. Before cleaning, maintenance, or connecting/disconnecting cables, unplug the mains cord.

Vireo: Changing the sample insert

For Vireo systems equipped without an incubator, users may choose to interchange the Vireo's sample insert to accommodate different sample holders in the highlighted region.

1	Power on the MCAM and MCAM Workstation.
2	Using the MCAM software, eject the sample nest. Wait until the nest has stopped moving.
3	Pop out the previous sample holder by physically pulling it up with your hands.
4	Insert the desired sample insert into the nest holder. Ensure it is fully seated into the sample holder.
5	Insert the nest using the MCAM interface.





Vireo: Incubator Water Reservoir Refill

To refill the water reservoir for the Vireo system, always do so by removing the reservoir from the unit. To do so please follow the instructions below.

1	Using the MCAM software interface, insert the plate nest.
2	Close the MCAM software.
3	Power off the Vireo using the switch next to the IEC inlet on the back of the system and disconnect the AC power cable.
4	The cap on the top of the bottle may be hot. Let the system cool down for 5 minutes.
5	After the cooldown period, unfasten the cap on the top of the bottle.
6	Remove the glass reservoir by lifting it upward and tilting it away from the Vireo.
7	Refill it with 150 mL of de-ionized water.
8	Insert it back into the Vireo and tighten the cap.
9	Power on the Vireo by connecting the AC power cable and flipping the switch at the back of the unit. Then start the MCAM software.

Kestrel: MCAM Fluorescence and Reflection Illumination Module

The **MCAM Fluorescence and Reflection Illumination Module** allows the user to illuminate samples from above and enables utilization of a subset of MCAM User Interface illumination modes. To connect/disconnect the **MCAM Fluorescence and Reflection Illumination Module** to the MCAM, refer to the below instructions:

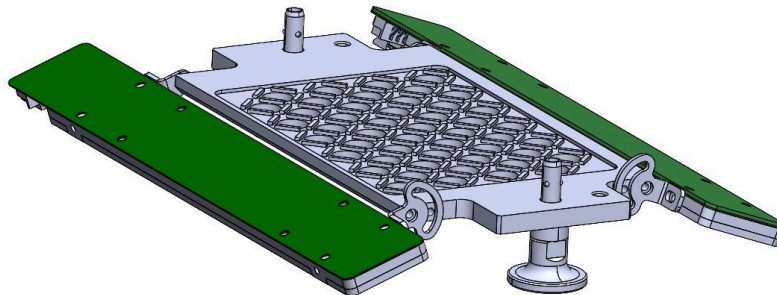


Figure 1: MCAM Fluorescence and Reflection Illumination Module

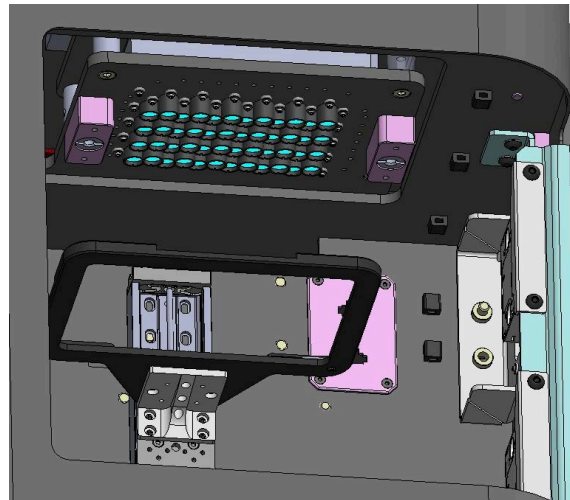


Figure 2: MCAM Kestrel imaging chamber upper surface

1	Remove the MCAM Fluorescence and Reflection Illumination Module from its packaging, taking care to only touch it by the quick release handles on either end of the module. Note: To protect the hardware of the MCAM Fluorescence and Reflection Illumination Module, never touch any part of the module except the quick release handles. Note: Surfaces of MCAM Fluorescence and Reflection Illumination Module can become hot after use. To avoid risk of burns, use caution when touching the module. Do not touch any part of module except for quick release handles.
2	Simultaneously pressing both of the MCAM Fluorescence and Reflection Illumination Module's quick release handle buttons, insert the module's pins into the sockets on either side of the MCAM lens block (on the MCAM imaging chamber upper surface). Insert the MCAM Fluorescence and Reflection Illumination Module so cabling is closest to the MCAM Fluorescence and Reflection Illumination Module Ports on the right hand side of the MCAM imaging chamber interior.



3	Release the MCAM Fluorescence and Reflection Illumination Module quick release handle buttons. Connect back rail module cable to upper MCAM Fluorescence and Reflection Illumination Module Port . Connect front rail module cable to lower MCAM Fluorescence and Reflection Illumination Module Port .
4	To disconnect MCAM Fluorescence and Reflection Illumination Module from MCAM , unplug module cables and disengage quick release connection by simultaneously pressing down on quick release handle buttons.

Equipment Maintenance and Service

Servicing the MCAM

Do not attempt to get into the MCAM with a tool. There are no user-serviceable parts inside the MCAM. Users should not attempt to service their MCAMs.

To prevent damage to the MCAM and avoid risk of hazard exposure to users, only Ramona technicians should service the MCAM.

Technicians servicing MCAM may use tools to dismantle system enclosures and access interior circuitry. To avoid risk of shock or burns, as well as damage to equipment, Ramona service technicians should confirm that both the MCAM and the MCAM workstation are powered off before servicing. Additionally, technicians should not replace any of the 3 Universal Power Cords in the MCAM with power cords not adequately rated for equipment or for mains supply.

To verify the safe state of the equipment after servicing, Ramona service technicians should successfully complete functionality testing, exercising MCAM components as a user would. Functionality testing will include the exercising of any system stages and illumination components, and capturing data from all image sensors in the array.

Equipment Integration

Additional hazards may result from integration of the MCAM into a larger system. The safety of any larger system incorporating an MCAM is the responsibility of the assembler of the larger incorporating system.

Cleaning and Decontamination

Instructions for surface cleaning and decontamination (can be performed by any users of the MCAM) are as follows.

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1	Confirm that the power button at the back of the unit is in the OFF position (0) .
2	Confirm that the MCAM Workstation is powered off.
3	Prepare a fresh 70% ethanol disinfectant solution and pour it into a spray bottle.
4	Do not spray the MCAM directly. Spray soft cloth with ethanol disinfectant solution and wipe down all exterior surfaces, including handles, of MCAM.
5	Let disinfectant sit on surfaces for 10 minutes. Contact time may vary depending on the product used, please refer to the instruction for your particular disinfecting product
6	After waiting for 10 minutes, use paper towels to wipe down all disinfected surfaces and discard towels as biohazard waste.

Cleaning and decontamination of the MCAM interior should only be performed by a Ramona technician. If equipment requires interior cleaning or decontamination, please contact Ramona Optics, Inc.