BACK-BONE

Modulus Sensor Housing Installation

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v1.2

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Contents

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Getting Started

Parts Included with Your Kit:

Item	Description	Quantity
1	Modulus Faceplate	1
2	Modulus Back Plate - A	1
3	Modulus Back Plate - B	1
4	12" Hero4 Image Sensor Jumper	1
5	M12 ring	1
6	CS-Mount Ring	1
7	C-Mount Ring	1
8	Extended M12 Ring (Metal)	1
9	Extended M12 Ring (Plastic)	1
10	IR-Cut Filter	1
11	Plastic C/CS cap	1
12	Plastic Camera Body Cap	1
13	13mm Rubber O-Ring	1
14	15mm Rubber O-Ring	1
15	L-Bracket (Tripod Mount)	1
16	#1-72 x ¼" screw	2
17	#1-72 x 3/16" screw	2
18	#2-56 x ½" screw	2
19	#2-56 x 3/16" Screw	2
20	#0-80 x 3/16" screw	5
21	#0-80 x Philips Sensor Screw	4
22	#2-56 Nylon Tip Set Screw	3
23	#0-80 x 1/8" screw	2
24	L-key 0.050" Hex	1
25	L-key 0.035" Hex	1
26	L-key 0.0625" Hex (1/16)	1
27	L-Key 0.078" Hex (5/64)	1

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Figure: A

Generic M12 lens

2X #1-72 x 1/4" (LONG SCREWS)

2X #1-72 x 3/16" (SHORT SCREWS)

2X #2-56 x 1/2"

#2-56 Nylon tip set screw

Extended M12-Ring

L-Bracket

5X #0-80 x 3/16"

15mm O-Ring

Filter

Modulus face plate

CMOS sensor/ board

4X #0-80 Sensor screws

12" Extended jumper

Modulus back plate

Modulus Sensor Housing Installation

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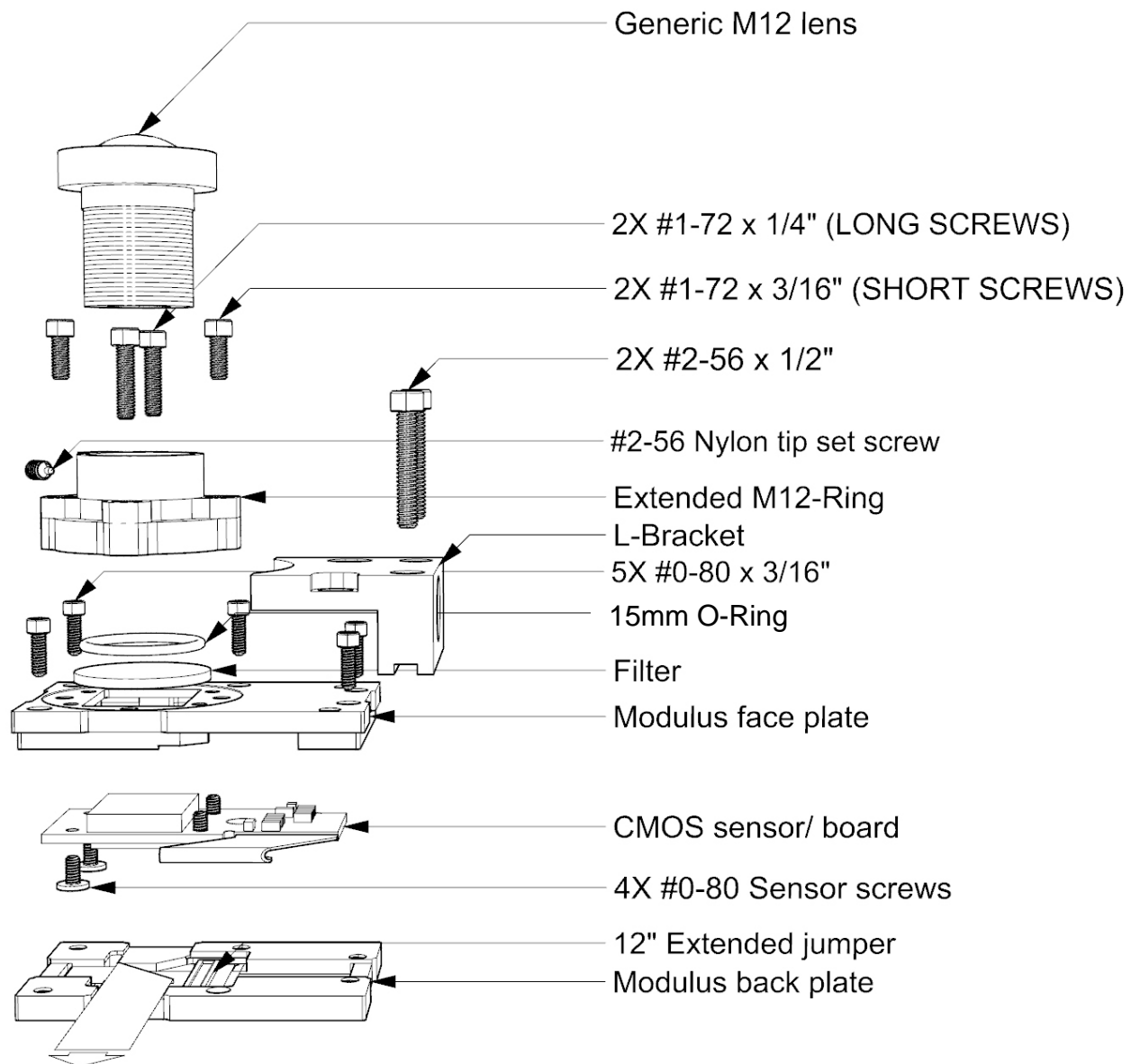
Important Notes:

1. Please read all our documentation thoroughly before beginning your installation
2. This kit is for the Hero4 Black and Hero4 Silver only. No other models are supported.
3. NEVER force or exert force on any components. IF YOU FEEL THE NEED TO USE FORCE THAN YOU'RE DOING SOMETHING WRONG.
4. This kit consists of machined parts and fine threaded through holes. NEVER FORCE any screws as this can strip the fine threads on the through holes. Instead check your assembly and registration and try again. All parts are highly accurate and DO NOT require force to assemble.
5. Ensure your work area is clean, well-lit and free from dust.
6. We recommend inspecting and removing any dust or debris from the parts before you begin.
7. By applying this or any modifications to your GoPro devices you will void any warranties
8. Back-Bone takes no responsibility in your ability to use this modification
9. Disclaimer: Ribcage and Modulus are products of Back-Bone Gear Inc., and are not manufactured, distributed or endorsed by GoPro Inc.

Tools Required

- L-Keys included in kit
- Philips #000 screwdriver
- Lens / CCD Cleaner, Puffer & Lens Cloth (Optional but recommended)
- Scissors
- Electric tape
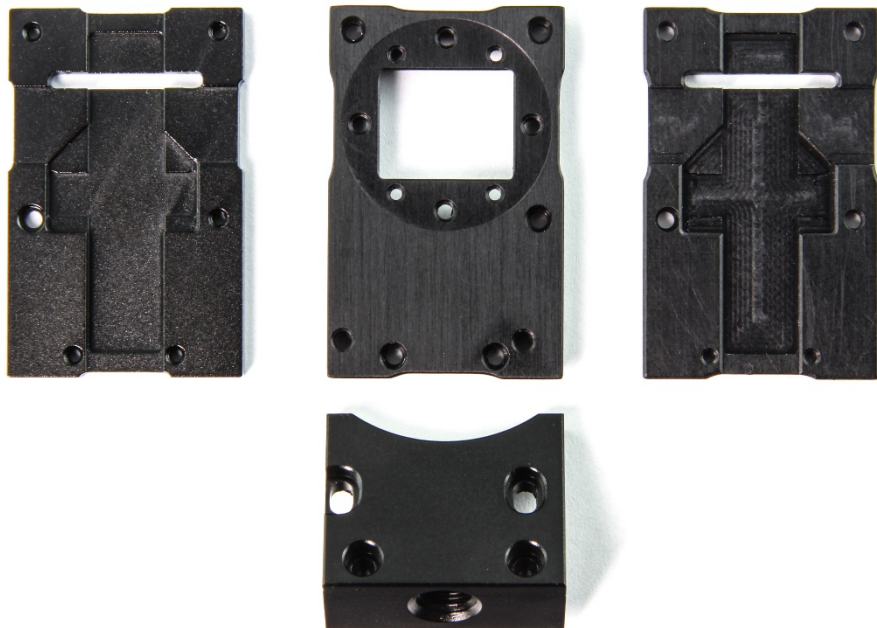
Section 1: Modulus Sensor Housing Assembly

1-1 First Steps

These instructions assume that you have already performed the teardown of your Hero4 camera and have removed the image sensor. For detailed instructions on the disassembly of your Hero4 camera please refer to the first half of this video and PDF file:

Hero4 Black:

http://www.back-bone.ca/PDF/Hero4_Black_Guide.pdf

http://www.back-bone.ca/support/ribcage-air-h4b/

Hero4 Silver:

https://www.youtube.com/watch?v=YFaRxhGzyf4

Once your camera disassembly is complete we recommend that you proceed with the Ribcage Mod Kit installation *AFTER* completing your Modulus Sensor Housing assembly. The Extended Sensor Ribbon will be connected to the camera part way through the Mod Kit installation.
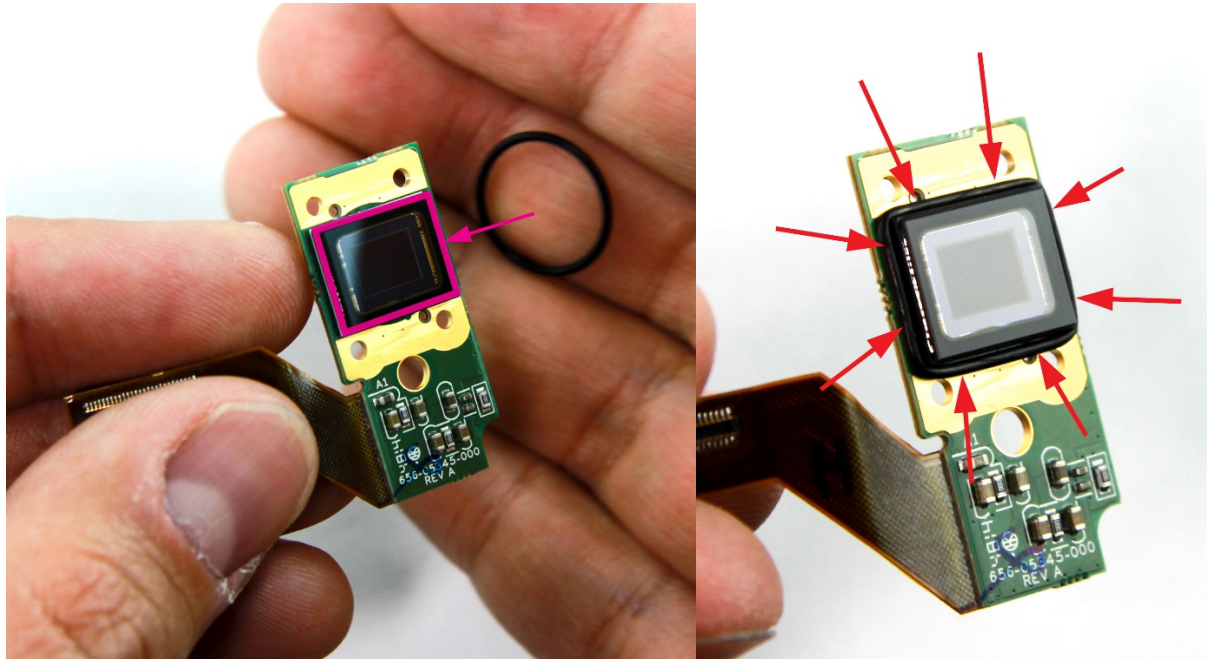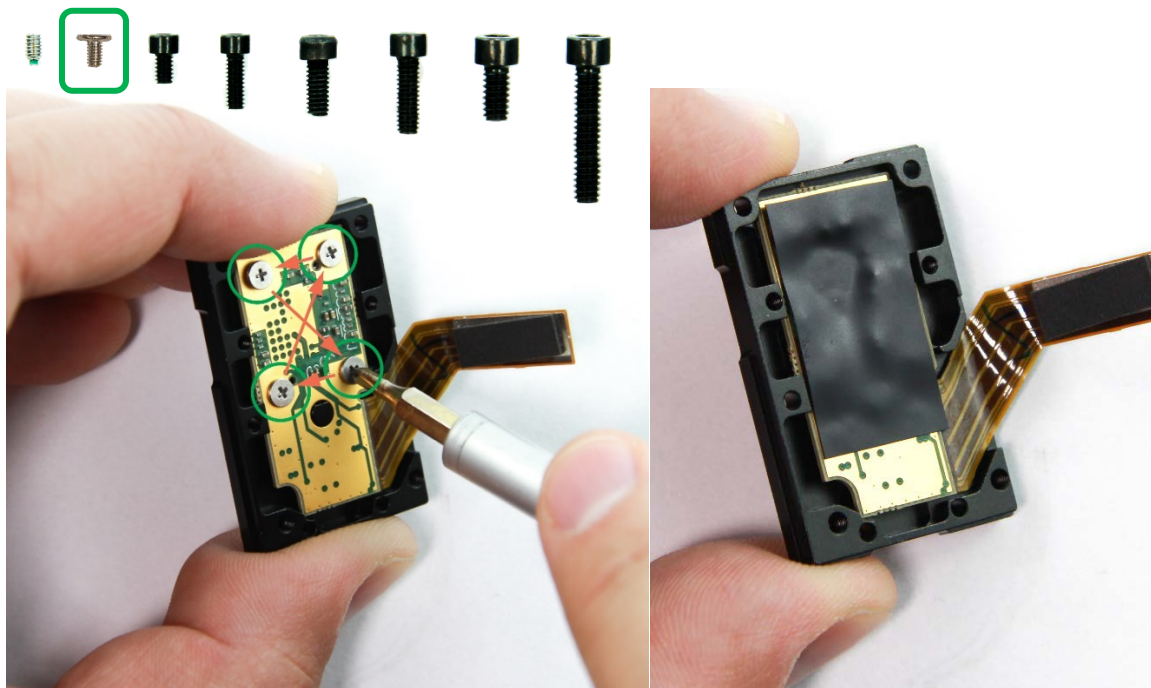
1-2 Mount the Image Sensor

First locate the 13mm rubber O-ring and place it around the outside of the image sensor glass. This will close any light leaks present on the sides of the unit.


Now insert the Hero4 image sensor into the faceplate as pictured. Loosely fit the 4 silver #0-80 flat-top screws into position using a Philips #000 screwdriver. Tighten them in a diagonal pattern until snug. Do not overtighten. Cut a small piece of electrical tape and place it on the back of the image sensor.

Modulus Sensor Housing Installation

1-3 Connect the 12" Sensor Ribbon

Now that you have your ribbon prepared it's time to attach it to the image sensor. Connect the end of the jumper to the image sensor as pictured. Don't force the connection. The parts should click together easily when properly aligned.
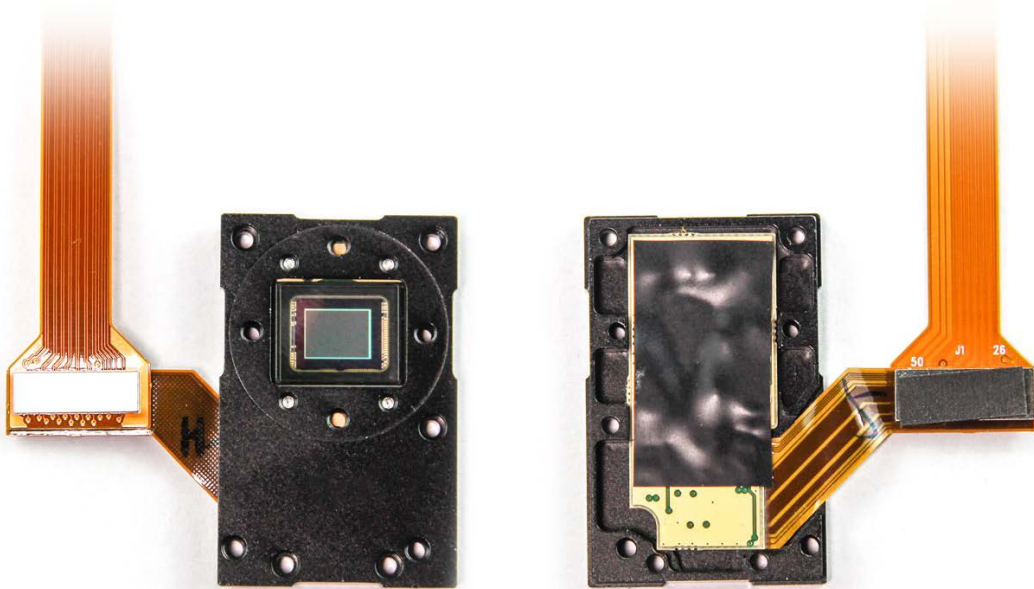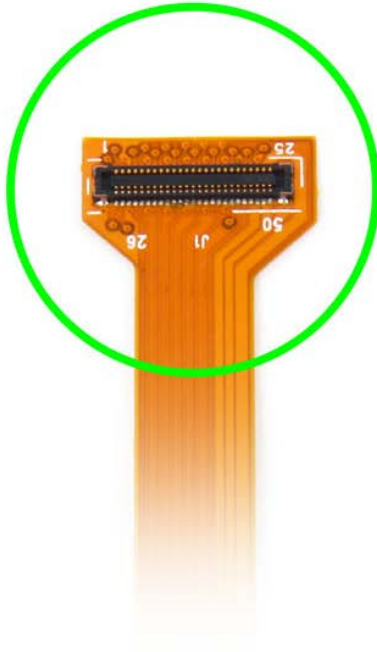
If you want the sensor ribbon connection protected inside the housing fold it behind the board as pictured.
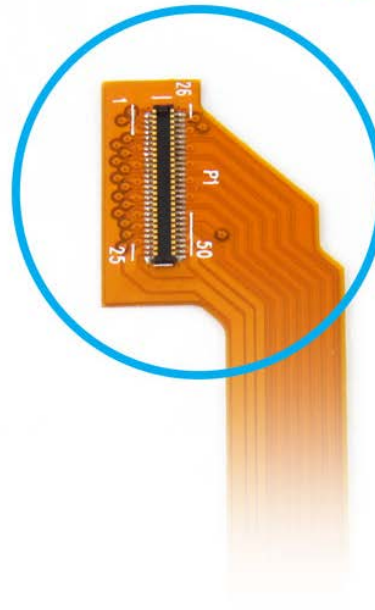
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**1-4 Ribbon Placement**

Connect to Sensor

Connect to Camera

Depending on your application you might need the ribbon to exit the sensor housing on the back, top, bottom, left or right. The following diagrams illustrate how to fold your ribbon for your chosen configuration.
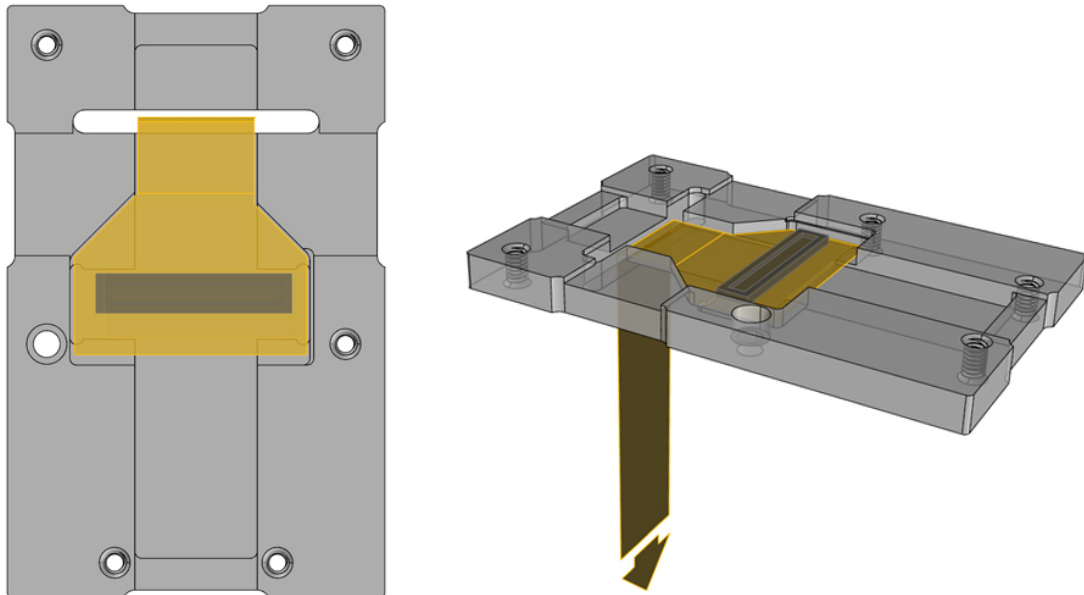
Option A (external)

In this case the sensor board's attached ribbon can protrude from the housing for easy reconnection or custom applications. If you would prefer that the connection be protected inside the housing, please use one of the following options.
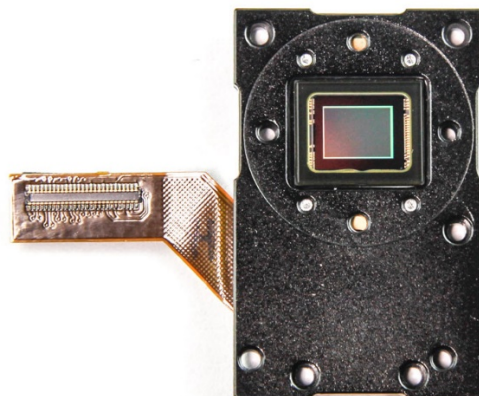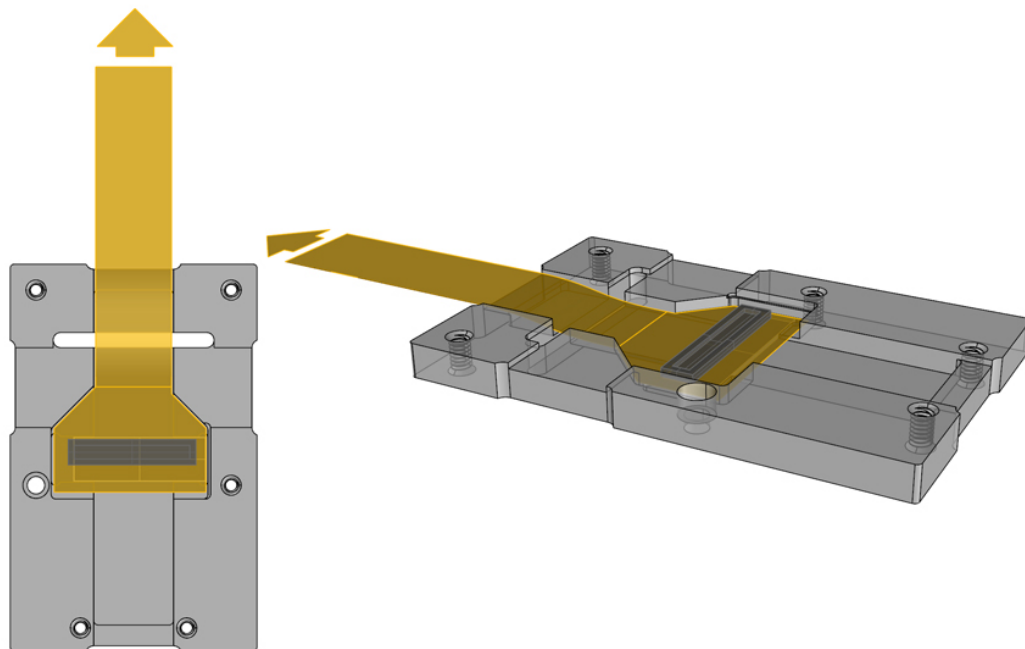
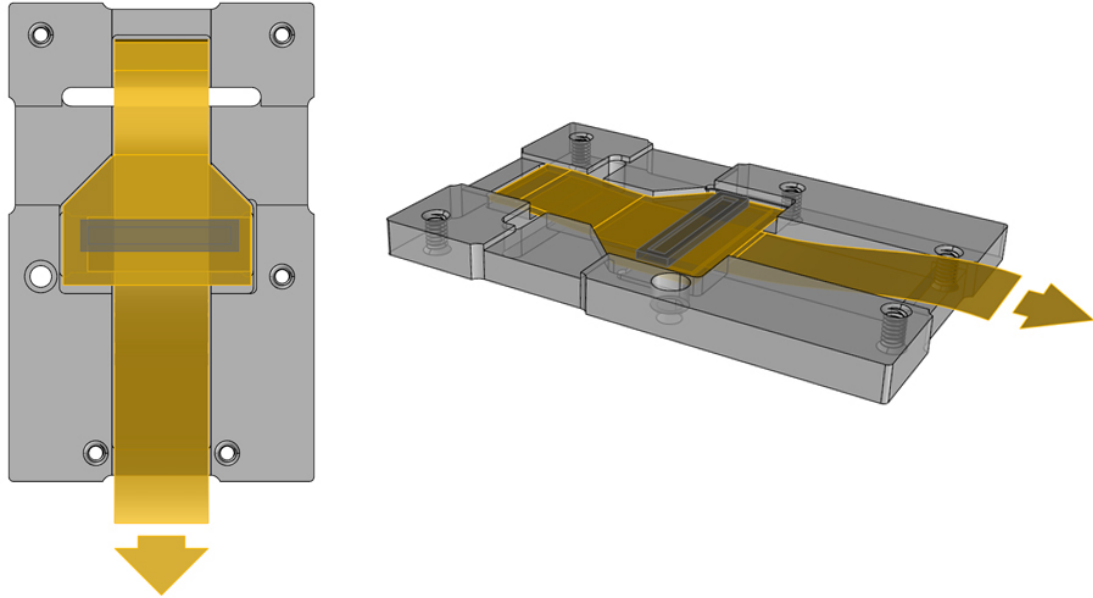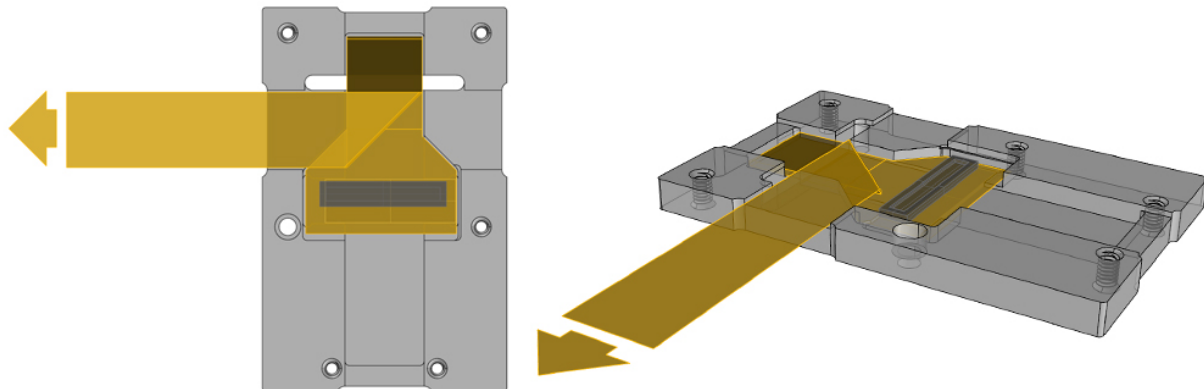# Modulus Sensor Housing Installation

Option B (Back)

Option C (Top)

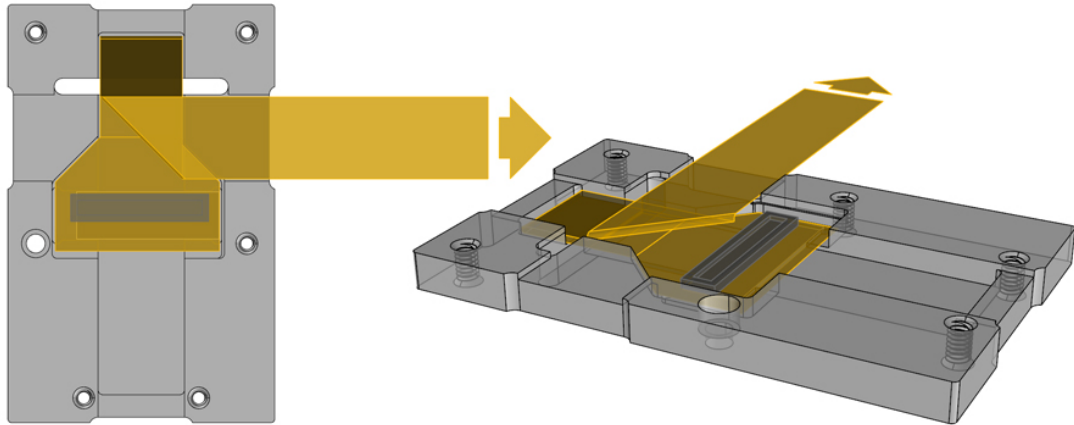# Modulus Sensor Housing Installation

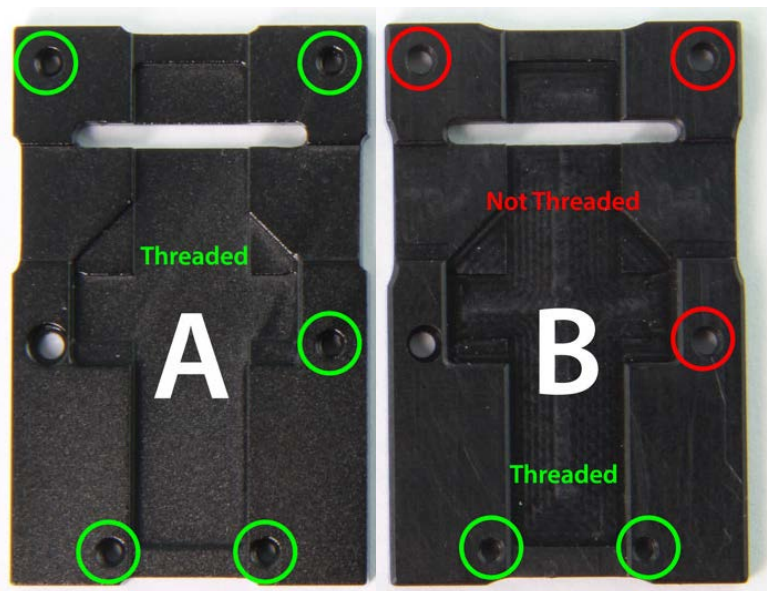**Option D (Bottom)**

Option E (Left)

Option F (Right)

1-5 Choosing the Rear Cover

Now it's time to attach the rear cover. Your kit comes with two different rear plates. Choosing the right one is important depending on your application. Back Plate 'A' features three threaded holes on the top and right and Back Plate 'B' has unthreaded through holes instead.

Back Plate 'A'

Use for standalone applications where the image sensor will be used alone or attached only via the tripod mount. Also used when connecting two sensor housings back-to-back.
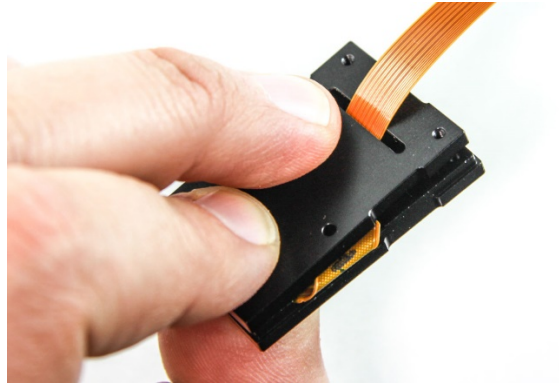
Back Plate 'B'

Use when connecting the sensor housing to the Ribcage 3x Mount or your own custom parts. This is to allow the screws to pass through the plates and into the threaded holes in the part behind.

1-6 Attaching the Rear Cover

Note: If connecting two sensor housings together back-to-back please skip ahead to 1-7.

Align your folded ribbon to the channels in the rear cover. Put the cover in place making sure that the ribbon is properly aligned with the exit channel you are using. If you want your ribbon to exit from the back, make sure to thread the ribbon through the hole first (shown).

If using threaded **Back Plate 'A'** use the 5 included #0-80 3/16″ screws through the faceplate in the positions indicated to fasten the cover in place. Before tighten all the way ensure your sensor ribbon is properly aligned with its exit channel.

If using **Back Plate 'B'** use only 2 of the #0-80 3/16" screws on the bottom as indicated.
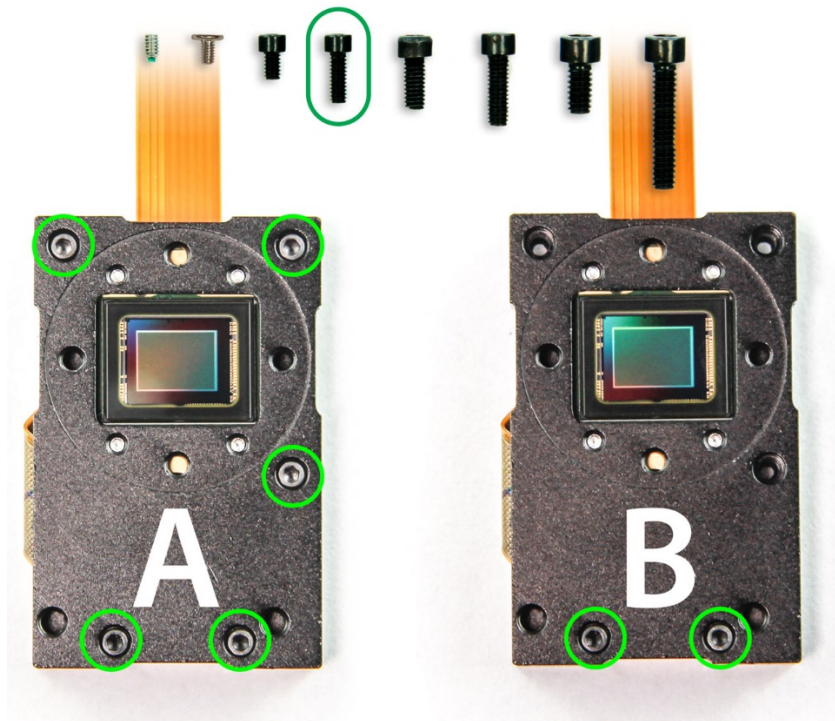
1-7 Back-to-Back Housing Configuration

This section assumes you would like to connect two housing kits together back-to-back. If using the housing alone or on a Ribcage 3x Mount please skip ahead to 1-8.

Two sensor housings can be connected directly back-to-back in the same orientation or at a 90 degree offset. For this example we will show how to connect them at 90 degrees. This has the added advantage of being able to use the 16:9 shooting modes of the GoPro camera while still getting a complete 360 view with certain super wide angle lenses.

Take **Back Plate 'A'** from each housing kit. Place them back-to-back in your preferred orientation so that the screw holes are aligned. Place one short #0-80 1/8" screw into the socket indicated and tighten it into the plate behind. **Repeat from the other side.** Both plates should now be securely attached to one another from both sides.
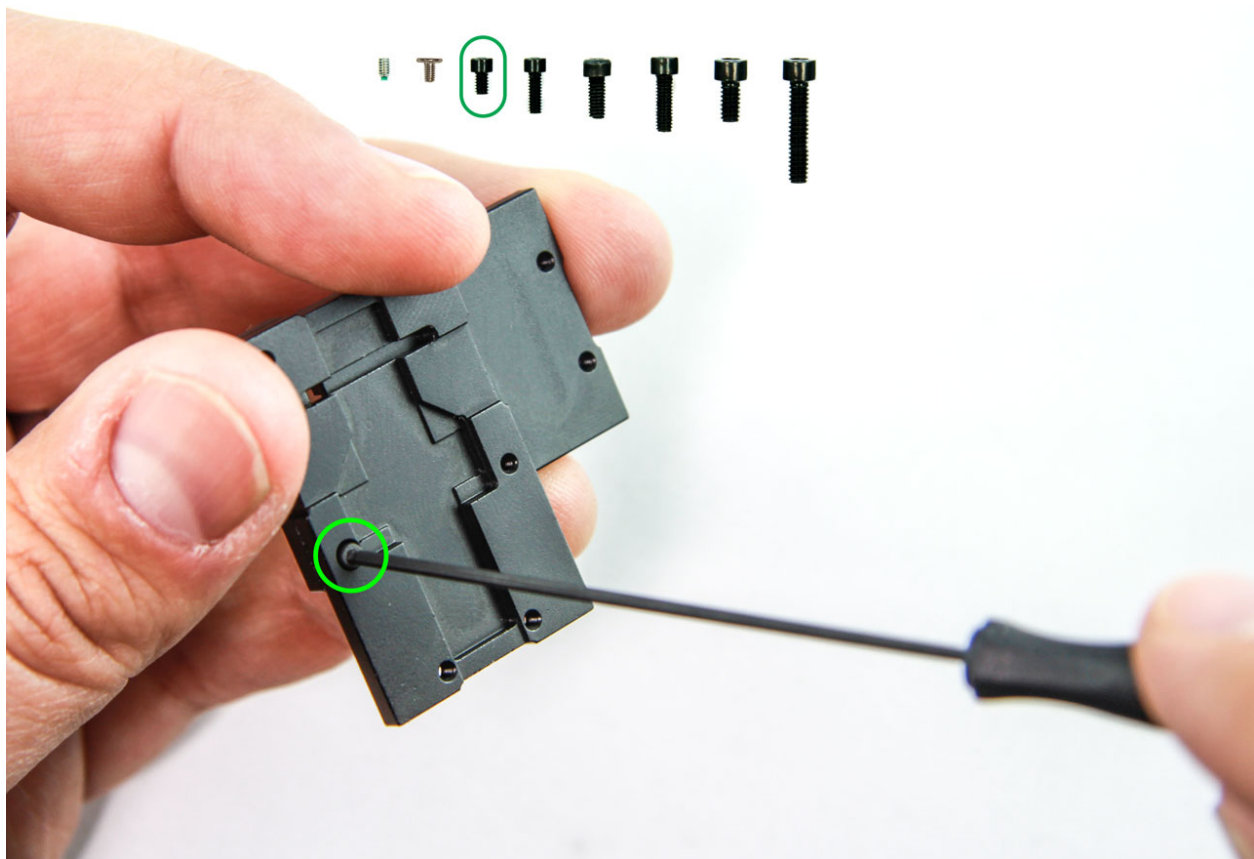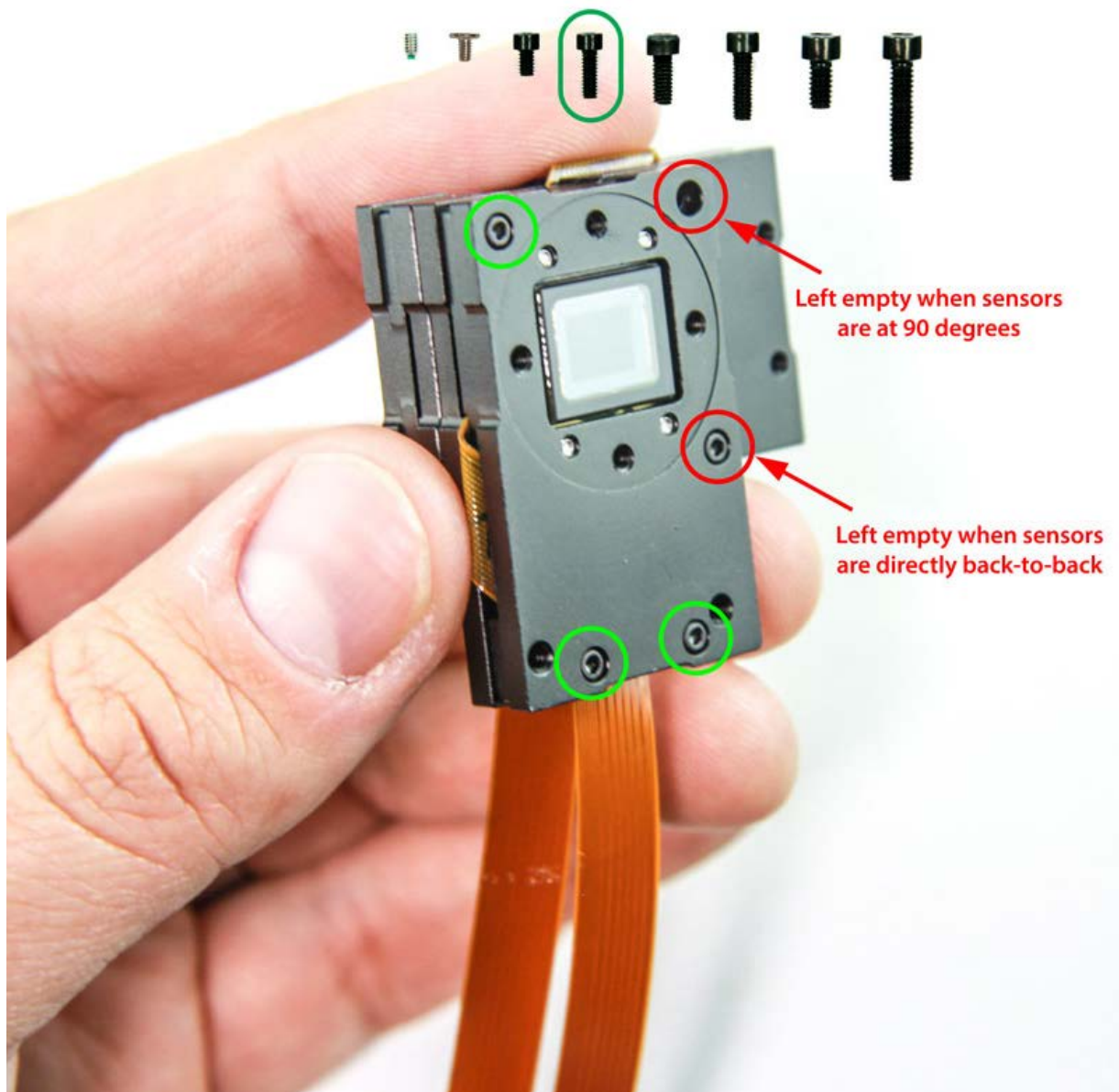
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Take your two cover plate assemblies one at a time. Align your folded ribbon to the channels in the rear cover. We suggest positioning your ribbons so that they both come out of the same side (pictured) for easier cable management. In this case ribbon options D & F where used.

Put the cover in place making sure that the ribbons are properly aligned with the exit channels you're using. Use 4 of the #0-80 3/16" screws to securely attach each faceplate taking care to ensure the ribbons are properly aligned before tightening. Please note that one of the screw sockets will be left empty because of the small screws that were used inside the assembly from the opposite side.

Left empty when sensors are at 90 degrees

Left empty when sensors are directly back-to-back

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1-8 Attaching the L-Bracket

Now that the sensor housing has been assembled you can add the optional 'L-Bracket' tripod mount. Align the holes in the L-Bracket (tripod mount) with the holes in the faceplate. Use two #2-56 x 3/16" screws to connect the plate. If your ribbon exits the housing under the tripod mount the mounting holes are elongated to allow the L-Bracket to be moved down to allow room for the ribbon if needed. The L-Bracket also features two holes for connecting to compatible Back-Bone mounts and accessories.

1-9 Choosing a Lens Mount

Depending on your needs the housing comes with the parts you need to connect M12, CS and C-Mount lenses.

Extended (Deep Socket) M12 Mount

If you plan on using <u>only</u> M12 lenses, it's best to use the included Extended M12 mounts for maximum compatibility. Use the metal version for plastic lenses or the plastic version with metal lenses.

Standard M12 Mount

To use CS, C-Mount lenses, or Entaniya Fisheye lenses we recommend connecting the standard M12 mount with the outer threading and adding the other mounting rings as needed. Some M12 lenses are compatible with this configuration but not all. The mount is easily changed if needed.

1-10 Attaching the Lens Mount

The following steps show the mounting rings being attached to a Ribcage Modified Hero4 camera. The mounting points and steps are identical to the Ribcage Sensor Housing. The process for installing the Extended M12 Mount is also the same. A video of the process can be viewed here:

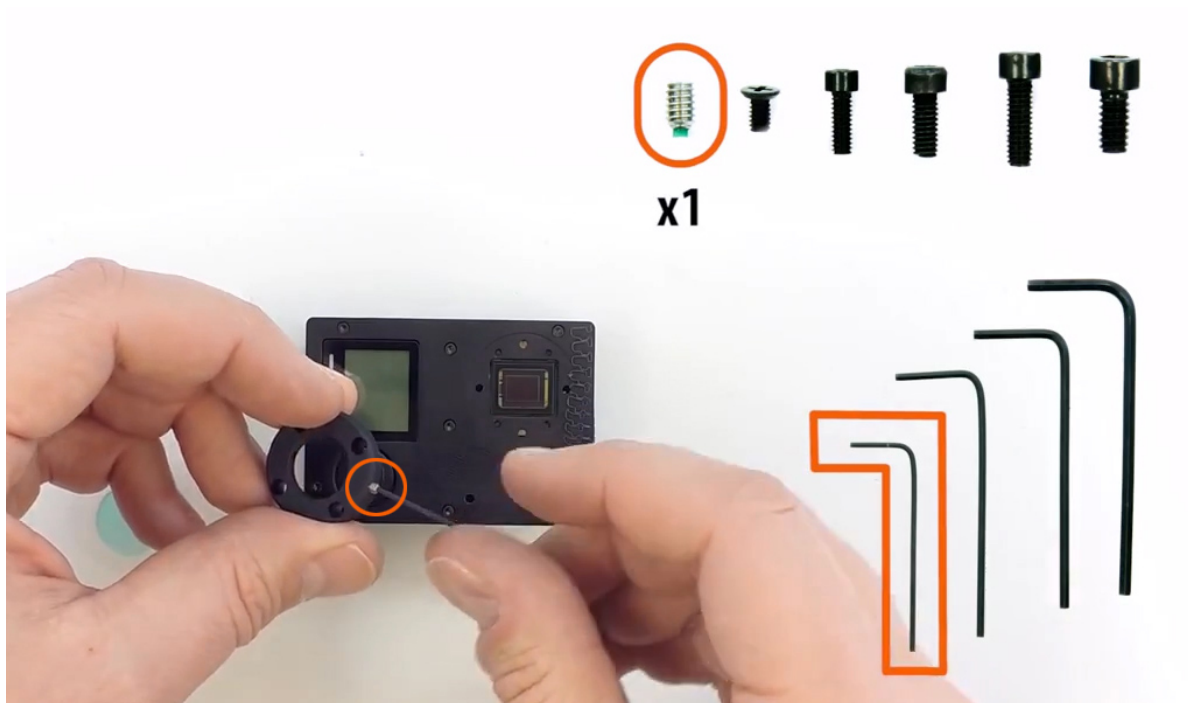https://youtu.be/4YZgo6IrBRk?t=24m6s

As well as the process for switching mounts if required:

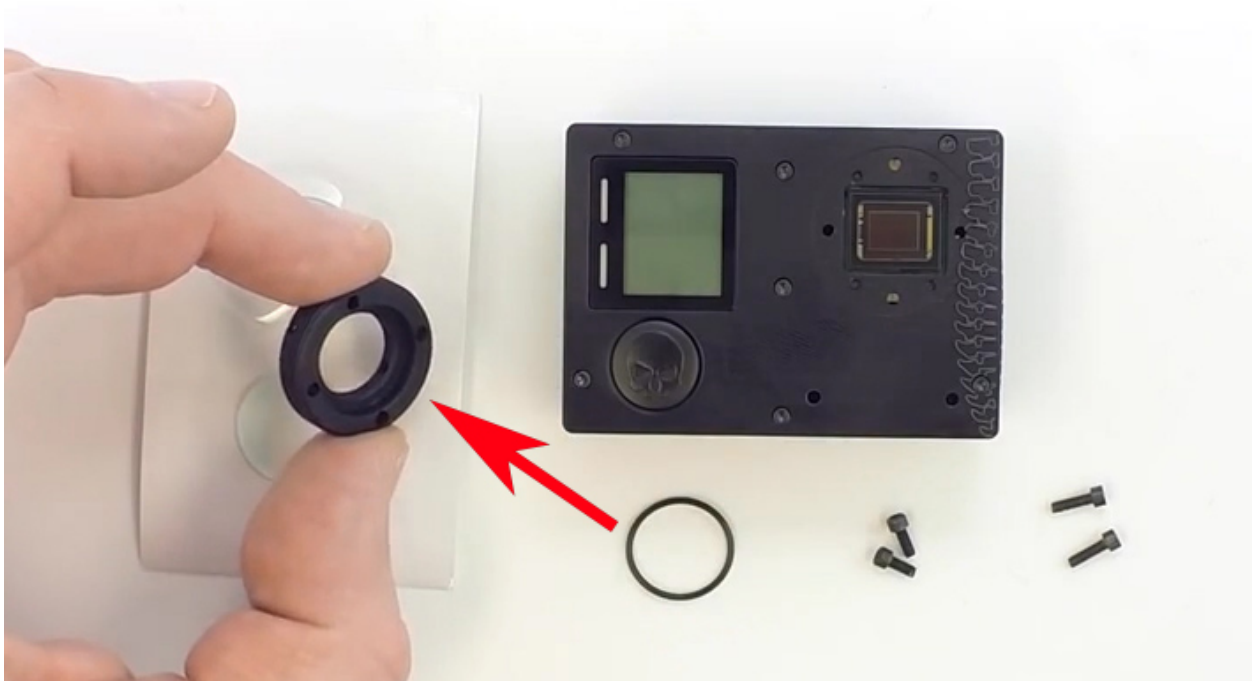https://www.youtube.com/watch?v=q0vfjiV_zfU

Unscrew the M12 ring from inside the CS-Mounting ring.

Add a steel set screw to the M12 ring using the smallest L-key.

Now we'll install the IR-cut filter. Optionally If you want to use the camera for night vision, or if you plan to use M12 lenses with built in IR cut filters you can leave the filter out.

Take the rubber O-Ring and drop it into the socket on the back of the M12 ring.

Next take one of the filters from the kit and place it on top. Take care to keep the filter clean by handling it by the edges.
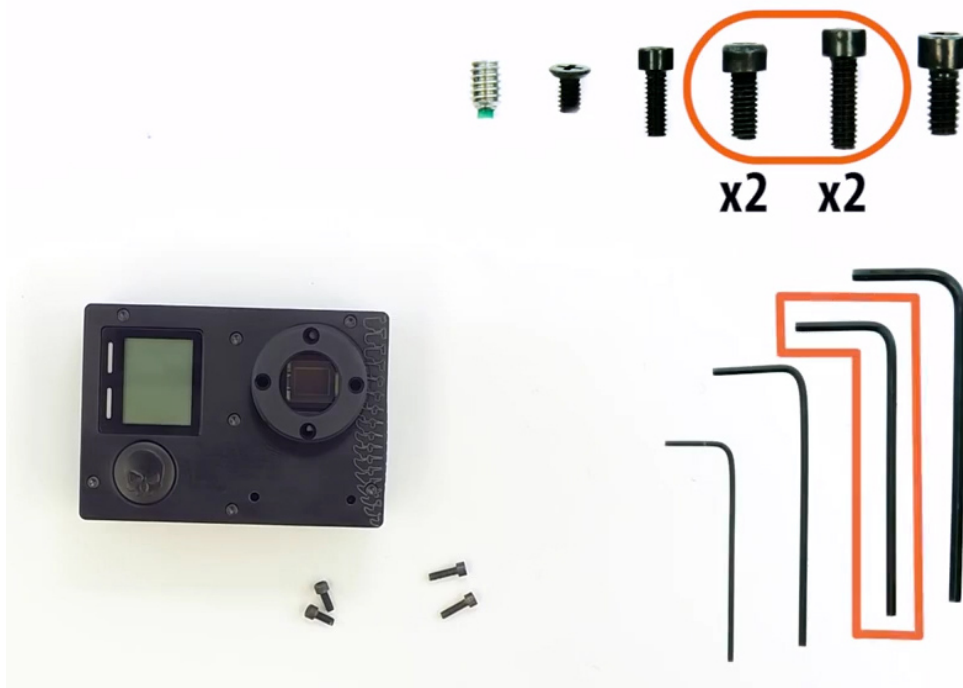
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![BACK-BONE logo]

Align the ring and filter to the holes on the front of the camera, making sure that the set screw is located on the upper right.
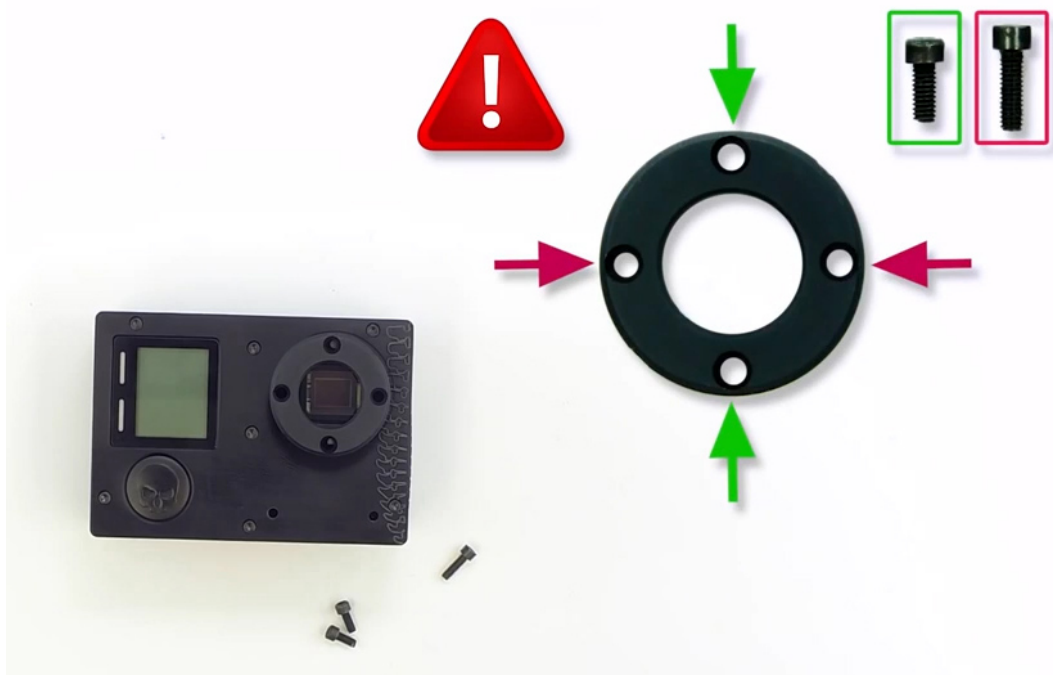
Take the four medium sized socket screws from your kit. The short screws should be fitted to the top and bottom and the longer ones on the left and right.

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Take care **<u>not</u>** to use the long screws on the top and bottom as they can potentially cause damage!

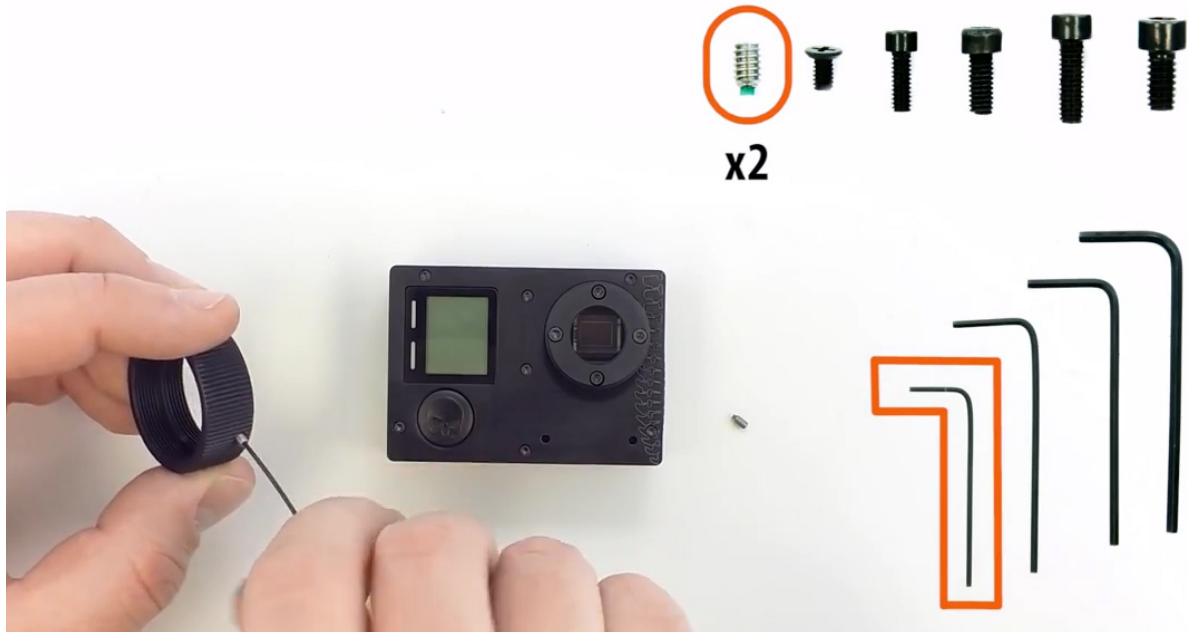Tighten the screws until the ring sits snug and flat on the surface.

1-11 Attach the CS & C-Mount Rings

Add the two remaining set screws to the CS-Mounting ring.

Thread the CS-ring onto the camera.

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To Connect C-Mount lenses simply attach the included 5mm C-Mount spacer ring. A plastic cap is also included to protect the image sensor when no lens is attached.

Section 2: Connecting to a Ribcage Kit

This section is meant to be a brief companion to the full Ribcage Mod Kit Installation instructions. The only real differences when using the extended jumper are that the image sensor doesn't need to be mounted to the faceplate and you already completed setting up your lens mounts in the previous section. Each video step will reference the sections of Ribcage AIR installation video that you need to complete along with a YouTube link.

2-1 Ribcage Install Video Section 1

https://youtu.be/4YZgo6IrBRk?t=10m7s

Watch until 13:10

2-2 Feed Ribbon Through Faceplate and Plastic Cap

Before connecting your extended ribbon to the main board be sure to feed it through both the plastic cap and the faceplate as pictured:
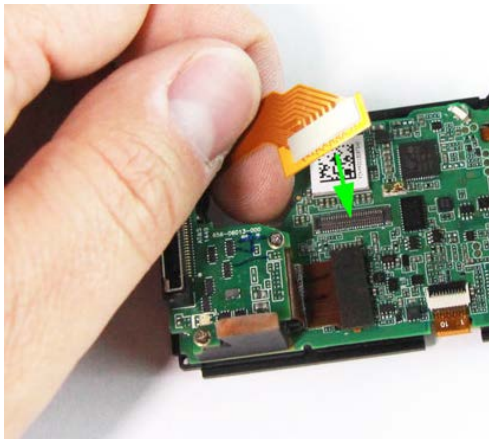
2-3 Connect Your Ribbon to the PCB Board

Feed the end of the ribbon through the gap in the PCB board from the front

Turn the unit over. Align the connector on the ribbon with the socket on the board as pictured. The connectors should click together easily when properly aligned. Do not force the connector together or you may damage the pins.


Cut a small piece of electrical tape to cover the stiffener plate on the back of the connector. Make sure the small pin highlighted in the picture is left uncovered.

2-4 Ribcage Install Video Section 2

https://youtu.be/4YZgo6IrBRk?t=13m39s

**Watch until 18:21** Keep in mind that you will follow exactly the same steps only with the extension ribbon coming out of the front of the camera. Be mindful not to disconnect it when flipping the unit over.
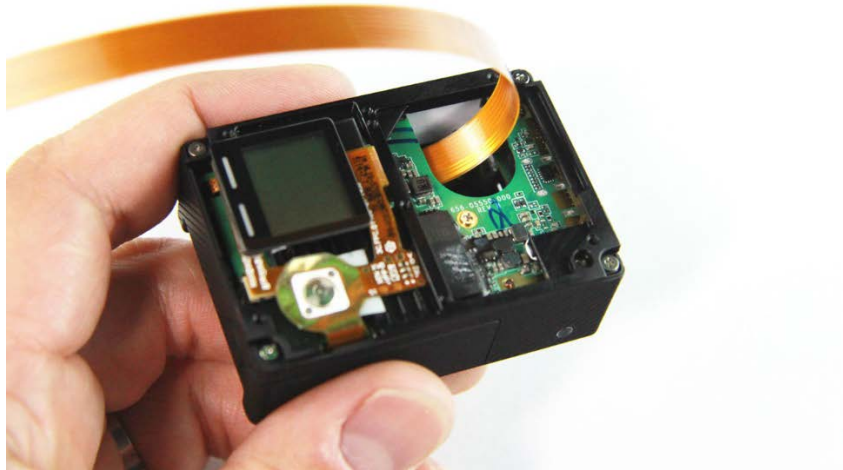

2-5 Connect the Faceplate

Slide the faceplate down over the jumper extension and place it on the front of the camera.

Turn the unit over and insert the button as pictured. Fit the faceplate back into place and turn the unit over. Use one of the #0-80 x 3/16" screws to secure it in place in the center.

2-6 Functionality Test

Now is a good time to test your connections and make sure all the elements of the camera are working correctly. Put your battery into the camera and power it up. Check to make sure all the buttons on the exterior of the camera are working. If a button doesn't work or if the camera freezes during mode changes, double check your ribbon connections and try again. If the camera fails to power up the small white tipped connector is likely not properly connected.
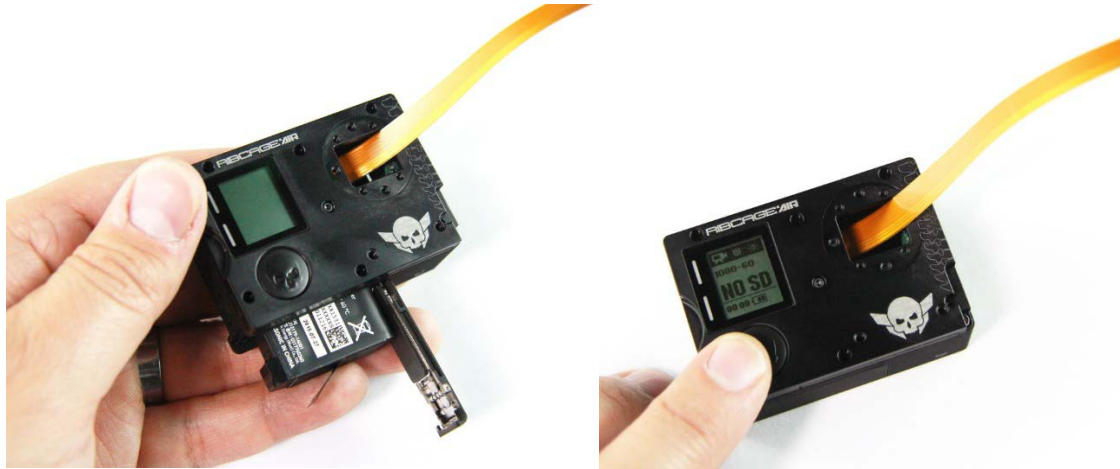
2-7 Complete the Installation

Insert the remaining faceplate screws. The screws should be snug only, don't overtighten.

Slide the plastic cap down over the ribbon to the faceplate. Align it to the hole in the plate and press to click it into place. Optionally you can add a small piece of tape to stick the base of the ribbon to the backside of the plastic cap for added security against tugging.

Your mod is now complete! You can connect the tripod mounting plate if desired. See Video:

https://youtu.be/4YZgo6IrBRk?t=30m40s