

BACK-BONE Ribcage v2.0 Installation

Part 2 - Assembly

Back-Bone
V2.0

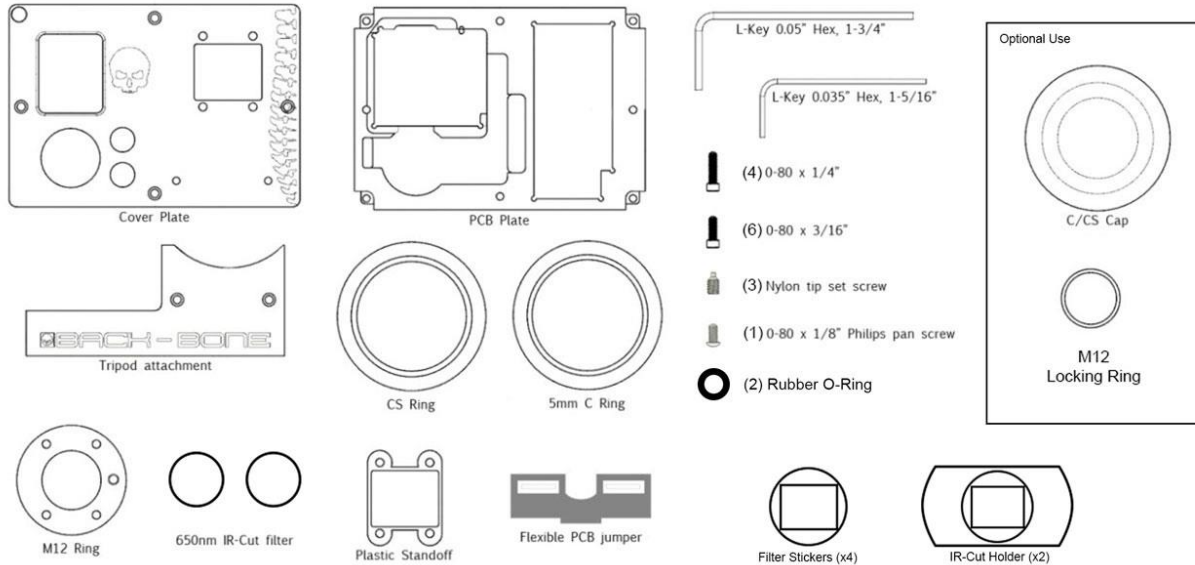


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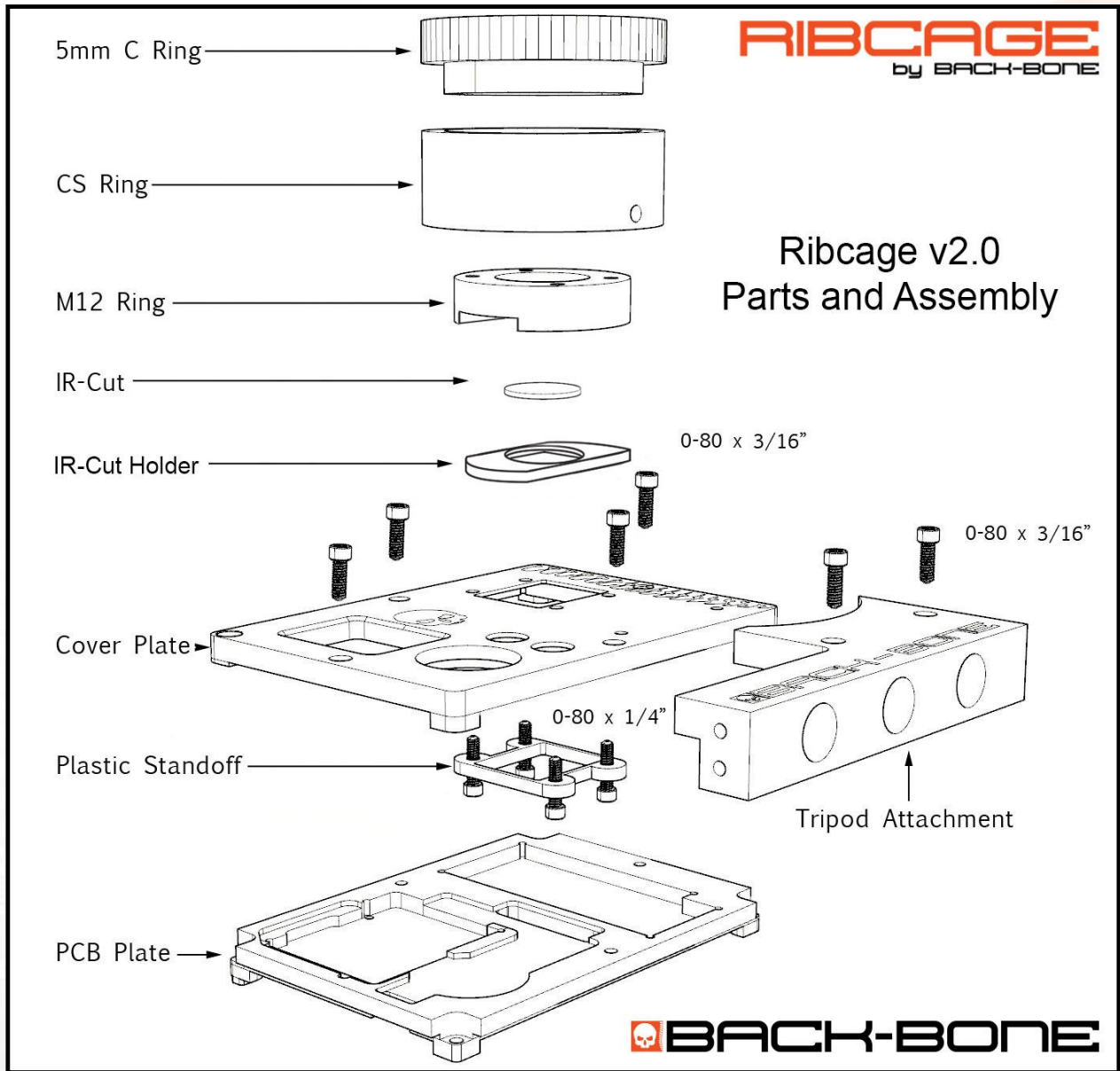
Section 1 – Before You Get Started

Included With Your Kit:



<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
1.	Cover plate	1
2.	PCB plate	1
3.	Tripod attachment	1
4.	650nm IR-cut filter	2
5.	M12 ring	1
6.	CS ring	1
7.	C ring	1
8.	Plastic standoff	1
9.	Flexible PCB jumper	1
10.	M12 Lens Locking Ring	1
11.	IR-Cut Holder	2
12.	Filter Stickers	4
13.	Plastic C/CS cap	1
14.	L-key 0.050" Hex	1
15.	L-key 0.035" Hex	1
16.	0-80 x 1/4" Philips screw	4
17.	0-80 x 3/16" Hex socket screw	6
18.	Nylon tip set screw	3
19.	0-80 x 1/8" Philips pan screw	1
20.	Rubber O-Ring	2

Figure: A



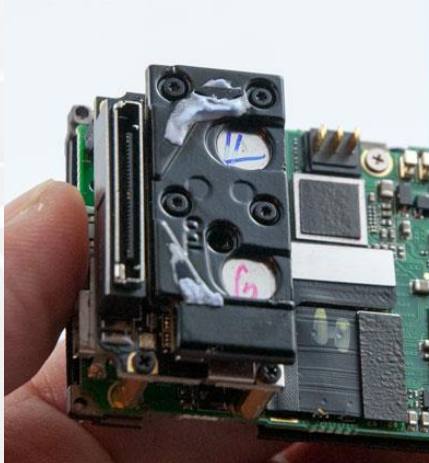
CAUTION!

1. Read all our documentation thoroughly before beginning your installation
2. This kit is for the Hero3 Black and Hero3+ Black only. No other models are supported.
3. Make sure to charge your battery before beginning the installation.
4. NEVER force or exert force on any components. IF YOU FEEL THE NEED TO USE FORCE THAN YOU'RE DOING SOMETHING WRONG.
5. The Ribcage DIY kit consists of highly 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.
6. Ensure your work area is clean, well lit and free from dust.
7. We recommend inspecting and removing any dust or debris from the parts before you begin.
8. Never over tighten any of the small screws, especially on the faceplate and tripod mount. Excessive force or over tightening can result in stripped threads on the aluminum parts. Always loosely fit all screws in place before screwing them in until seated. Additional tightening is not required.
9. By applying this or any modifications to your GoPro devices you will **VOID** any warranties
10. Back-Bone takes no responsibility in your ability to use this modification
11. The Ribcage DIY kit is provide "as is" and without warranty
12. Disclaimer: Ribcage is a product of Back-Bone, and is not manufactured, distributed or endorsed by Woodman Labs, Inc the maker of GoPro and Hero Products.

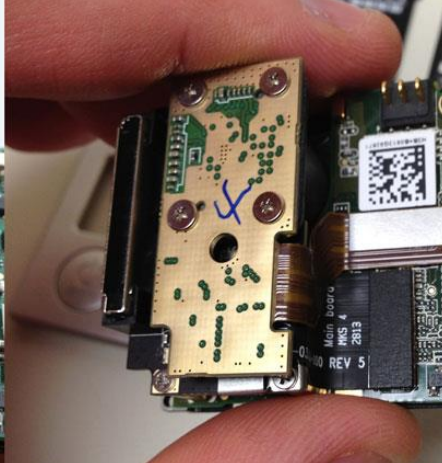
Note:

We should point out that the teardown was performed on the Hero3 Black, and the assembly was performed on the Hero3+ Black, so there are some slight visual differences. Most notably the Hero3 has a much different looking image sensor board than the Hero3+. It has a thick dark backing attached. It is not necessary to remove this backing as the Ribcage was designed with enough room for it to fit.

Hero3 Black



Hero3+ Black



Tools Required

Before you begin you will need to gather the following tools:

- A Torx T4 screw driver (not required for Hero3+)
- A set of small precision screw drivers with a Phillips #0
- Lens / CCD Cleaner, Puffer & Lens Cloth (Optional but recommended)
- A utility knife
- A roll of electric tape
- 3M Double Sided Tape (Optional) *Note: don't use thick mounting tape – use only thin double sided tape or the parts may not fit correctly.*
- A small file, or nail file (For Hero3+)



Section 2: Ribcage Assembly

2-1 Your Ribcage Kit

Video: <http://youtu.be/l1kAaRuEa3o?t=7m52s>

Let's start by opening the kit and removing the various parts. For a complete list of parts and hardware please refer to pages 2 and 3 of this guide. Remove the two screws holding on the tripod mount and the cover plate. You can use your own tools or the L-keys provided.



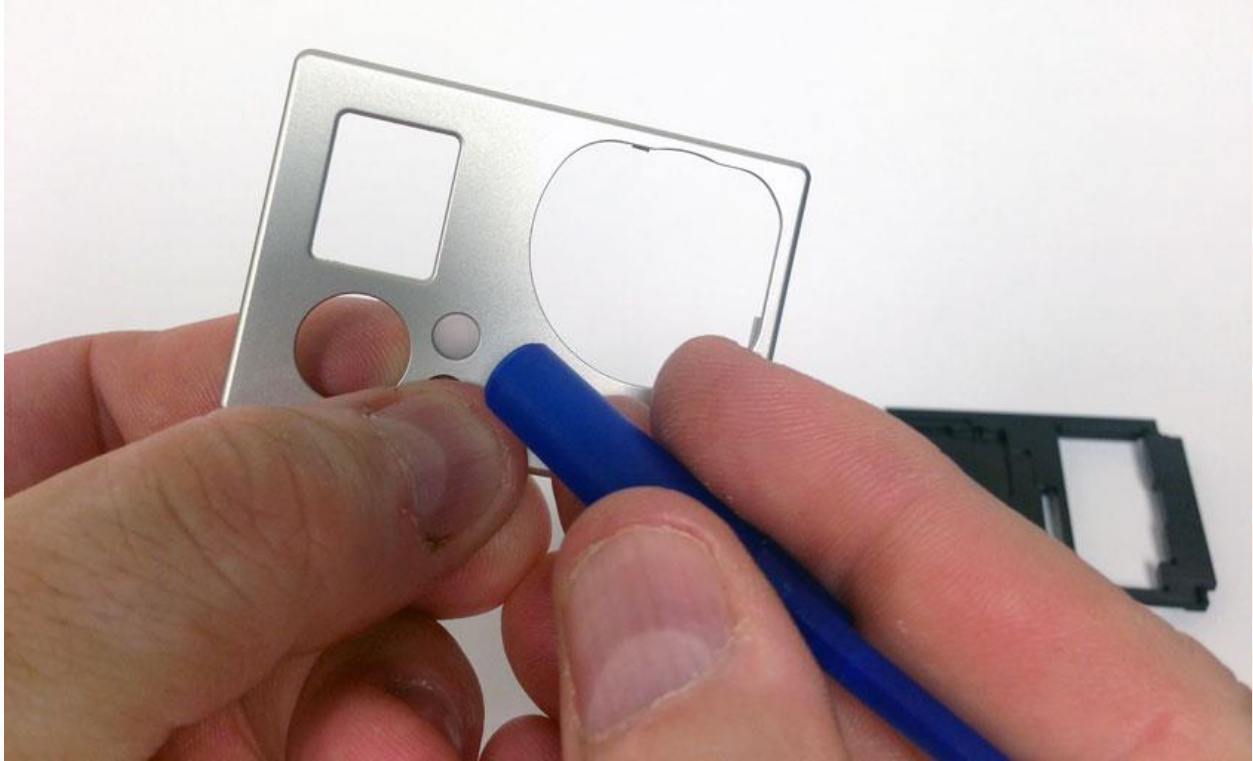
Ribcage Installation: Part 2 - Assembly



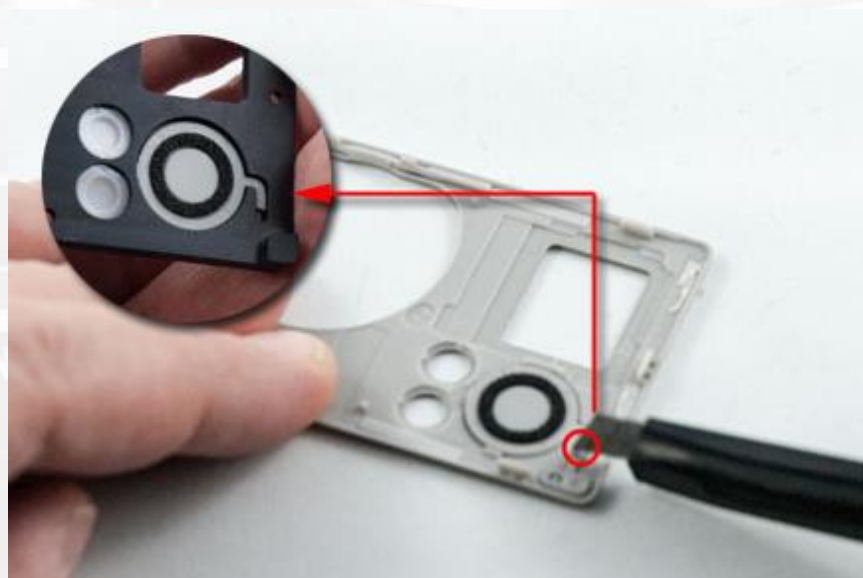
2-2 Transfer the LED and power buttons

Video: <http://youtu.be/l1kAaRuEa3o?t=8m58s>

Next we'll remove the LED covers from the original faceplate. Take a blunt, non-metallic tool such as the end of a pen and apply pressure to the edges until they come free.



Turn the faceplate over and use a utility knife to cut the tab connecting the power button as pictured.



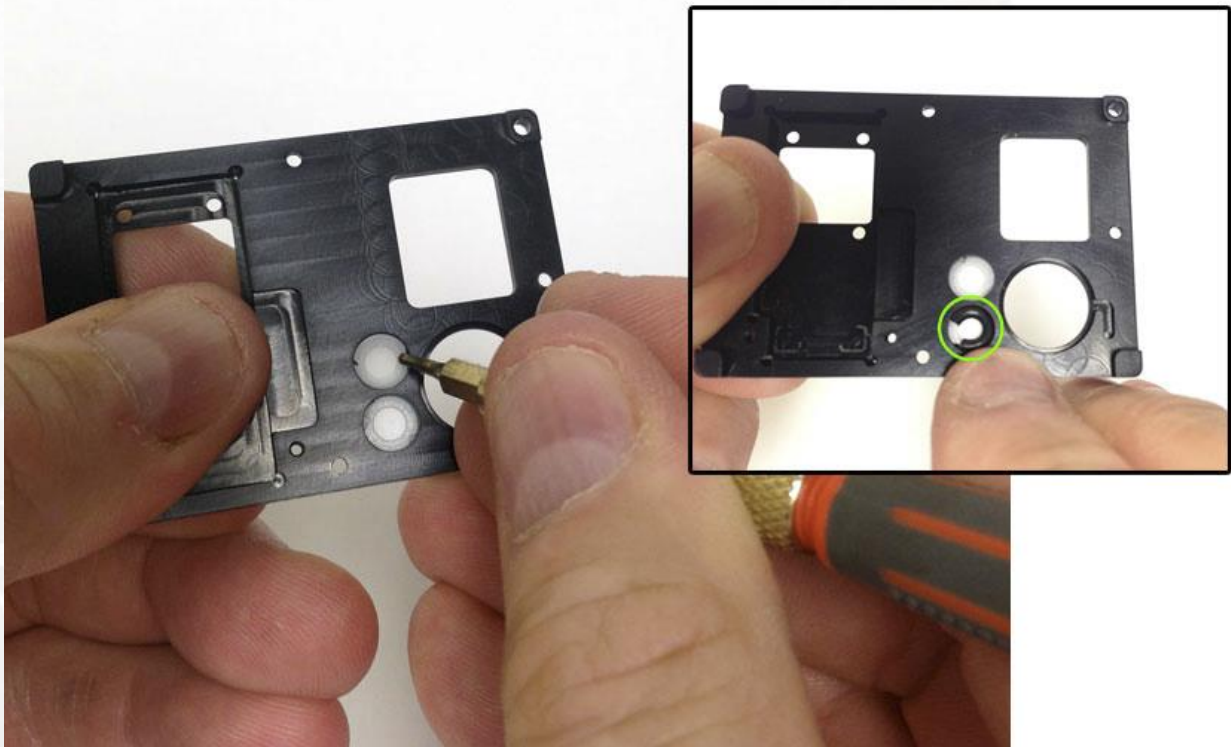
Ribcage Installation: Part 2 - Assembly



Next, take the supplied rubber O-ring and cut it in half with a pair of scissors or a utility knife. These will prevent the LED covers from being accidentally pushed back into the camera after assembly.



Place the parts into the Ribcage faceplate. Use a screwdriver to push in the LED covers by applying pressure to the edges. Work them in until seated correctly. Place each half of the O-ring behind the LED covers in the faceplate.



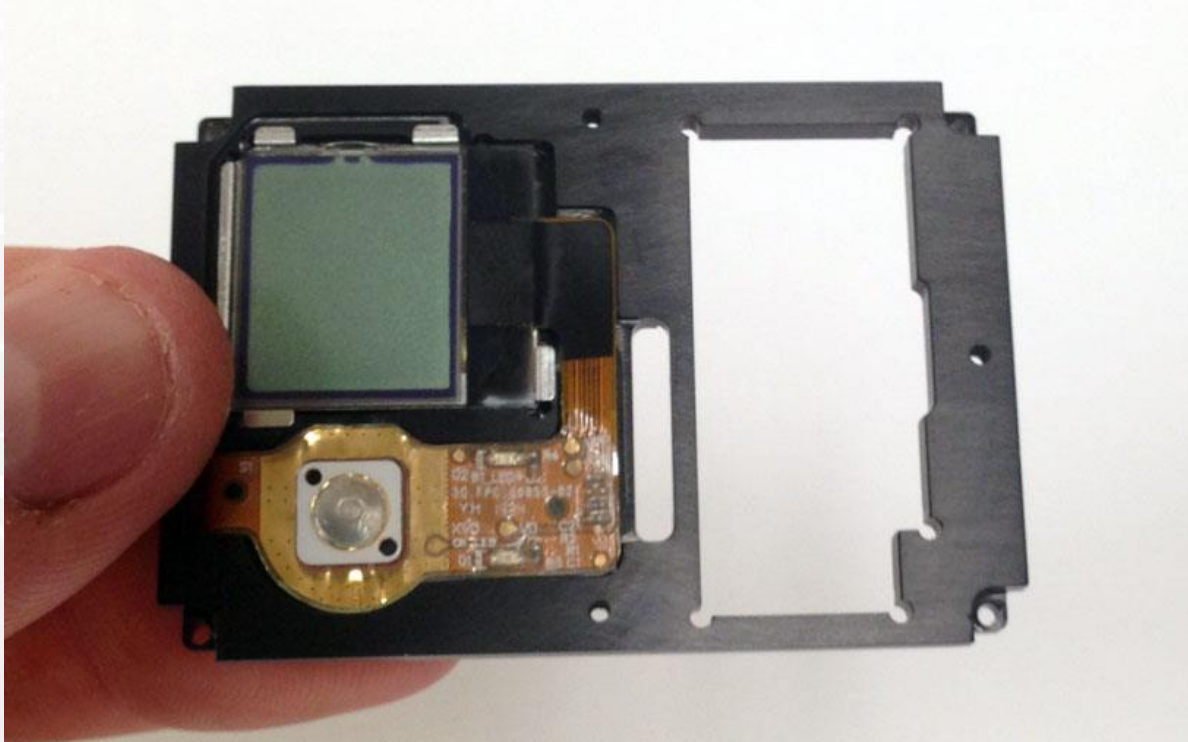
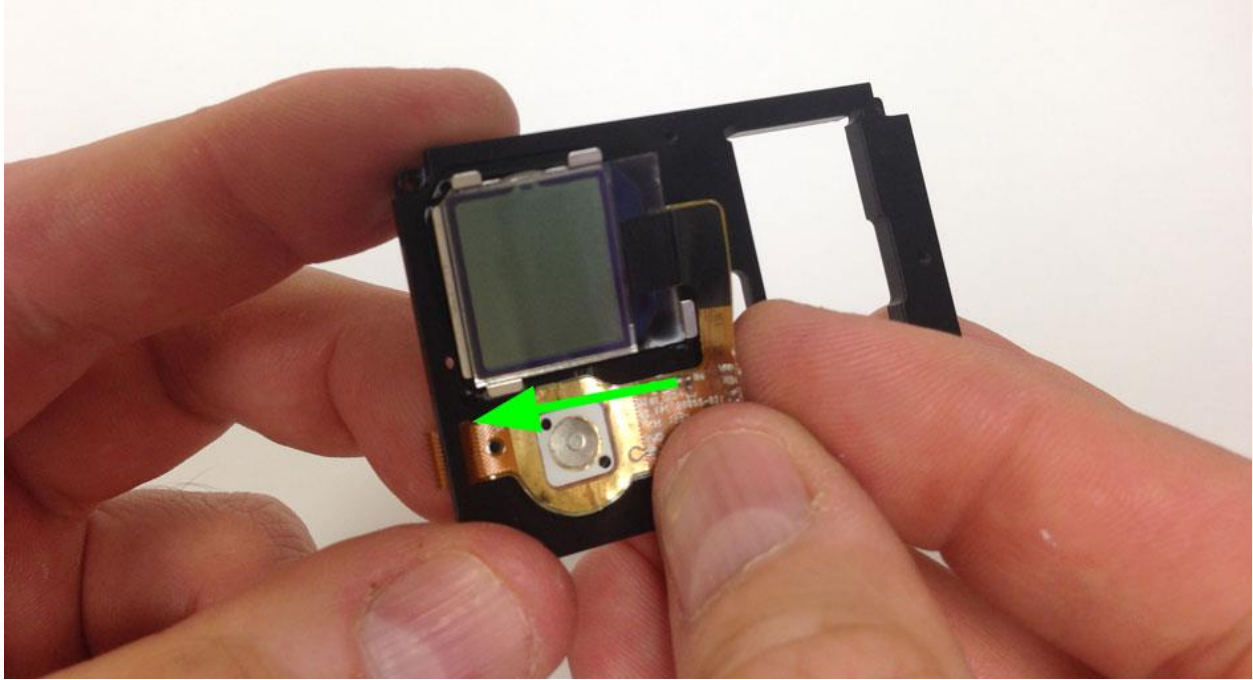
Ribcage Installation: Part 2 - Assembly



2-3 Attach LCD/Button Strip

Video: <http://youtu.be/l1kAaRuEa3o?t=10m18s>

Next, Insert the LCD/ power button strip into the PCB plate. Be sure to align the button and ribbon as closely as possible to the channel in the plate to ensure a tight fit later on, and to ensure the connector extends out far enough to be reconnected.

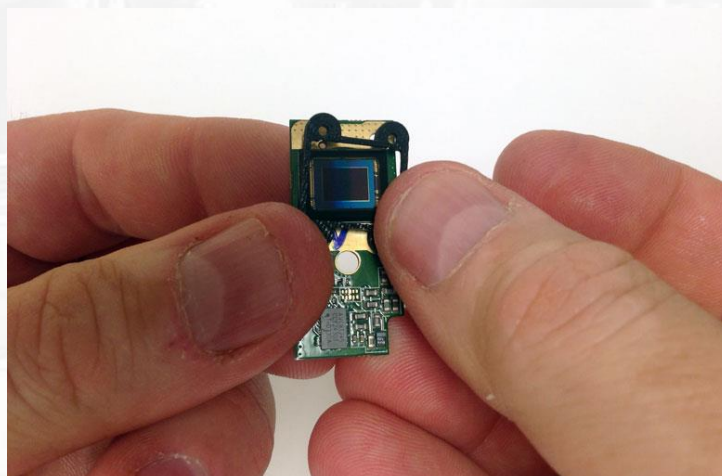
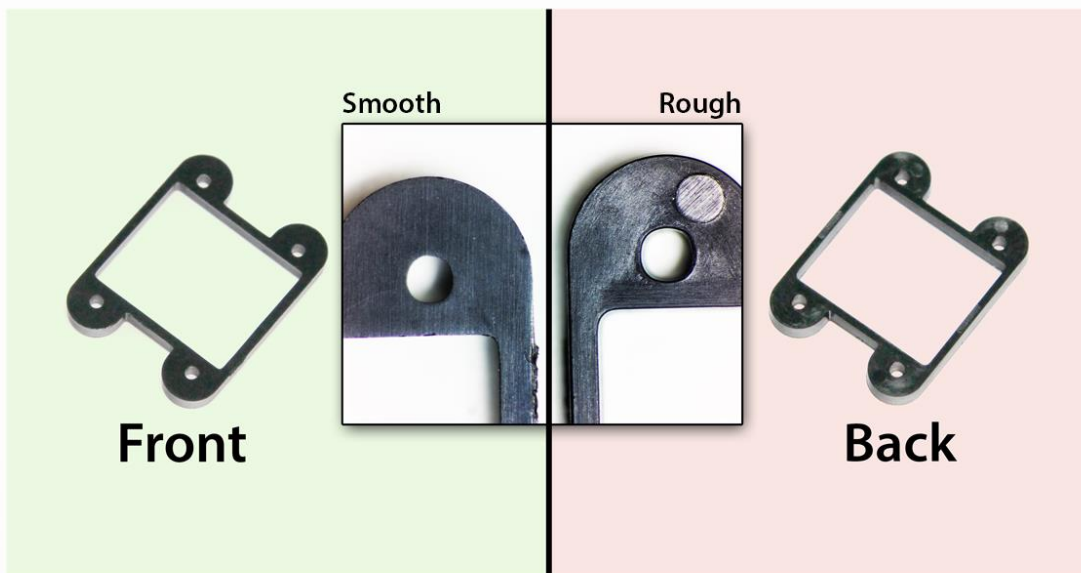


2-4 Attach CMOS Sensor to Cover Plate

Video: <http://youtu.be/l1kAaRuEa3o?t=10m41s>

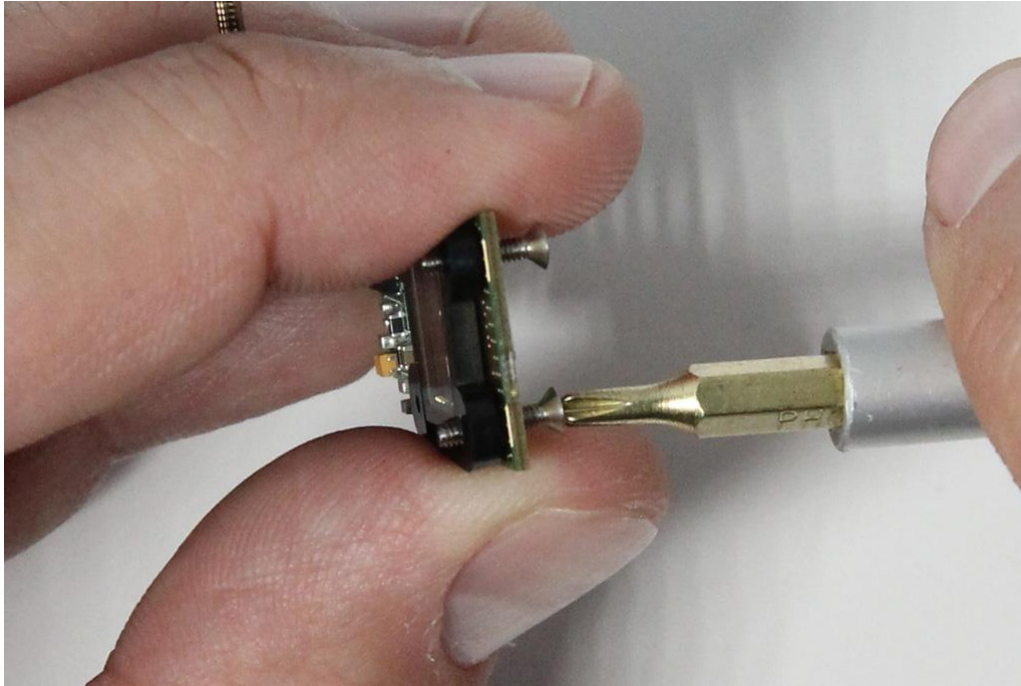
(PLEASE READ THIS ENTIRE SECTION BEFORE PROCEEDING)

You will now need the tools and screws provided in the kit. Place the plastic standoff over the image sensor. If you look closely, you will notice that one side of the plastic standoff is smoother than the other. The smooth side should face forward when placed over the sensor. If you find threading the screws difficult, flip the plastic standoff over and try again. You can also thread the screws through the standoff first and then remove them to make this step easier. Take care not to touch the image sensor during the following steps, but if you do it can be cleaned later.

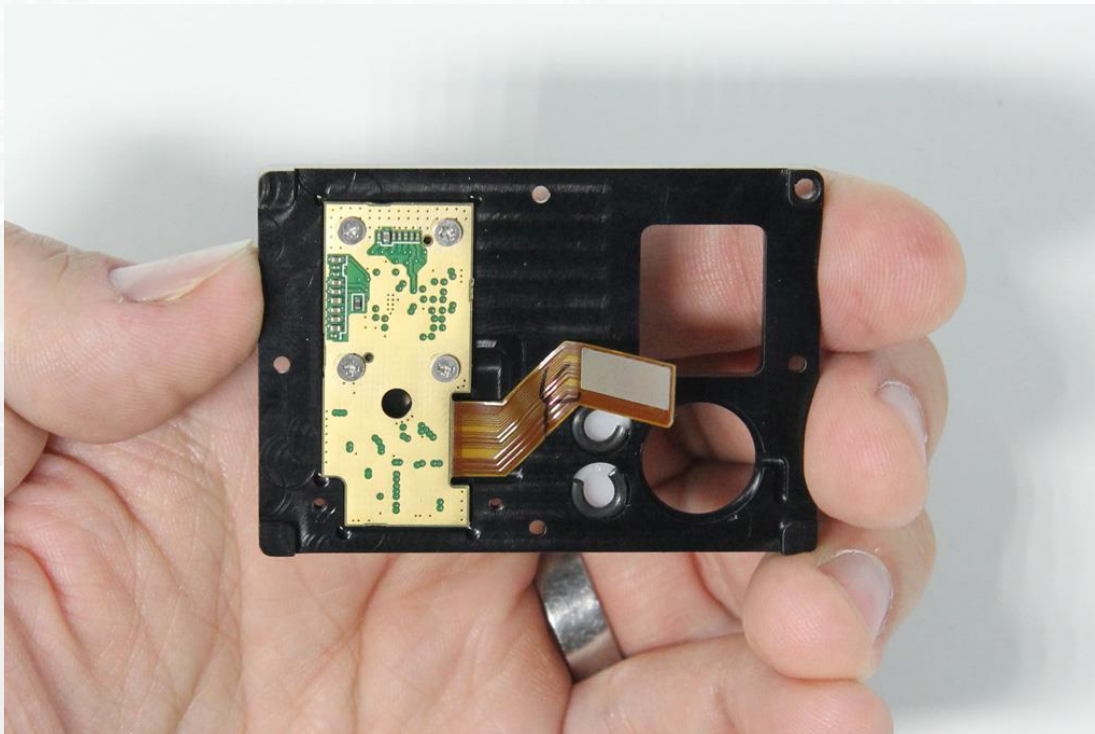


Ribcage Installation: Part 2 - Assembly

Screw in four of the long silver screws provided through the holes in the back of the image sensor board and through the standoff.



Insert the image sensor with the plastic standoff into the Ribcage cover plate so that the four holes line up correctly.



Ribcage Installation: Part 2 - Assembly



Ensure that three of the four screws are flush with the front of the cover plate. The fourth screw should extend beyond the cover plate slightly for attaching the M12 ring.



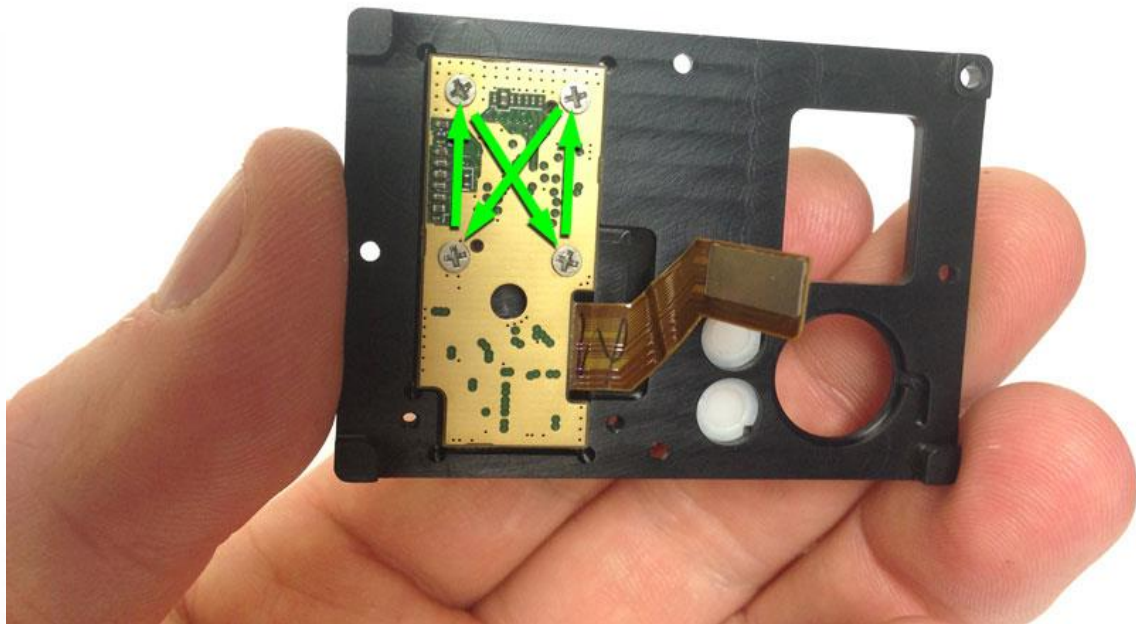
Position the M12-ring with its set screw hole towards the top. Screw the first socket screw into the M12-ring, but do not tighten it. **It's important that the ring is flat against the plate as you engage the screws to ensure that no gap is present behind the ring when complete.** With the first screw loosely in position, turn the M-12 ring to align the remaining three holes with the holes in the cover plate.



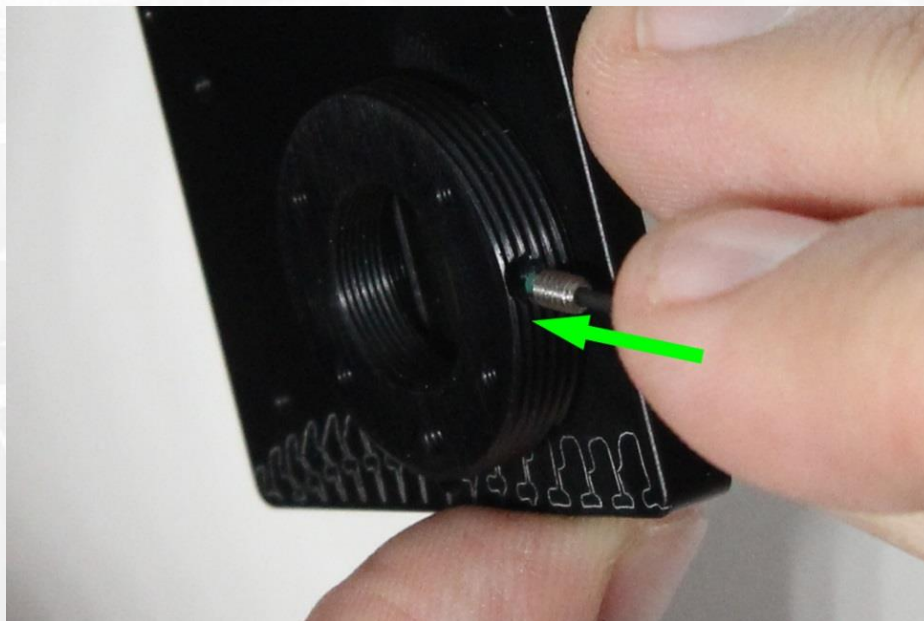
Ribcage Installation: Part 2 - Assembly



Lastly, we will gently in a repeating crisscross fashion tighten all 4 screws until the M-12 ring lays flush with the cover plate and the 4 screws are snug **ONLY** i.e. tighten only to the point of contact. **Before continuing make sure there are no gaps behind the ring and it sits perfectly flat on the surface**



If you plan to use M12 lenses similar to the original GoPro lens, insert one of the tiny set screws into the top of the M12 ring using the small L-key provided.



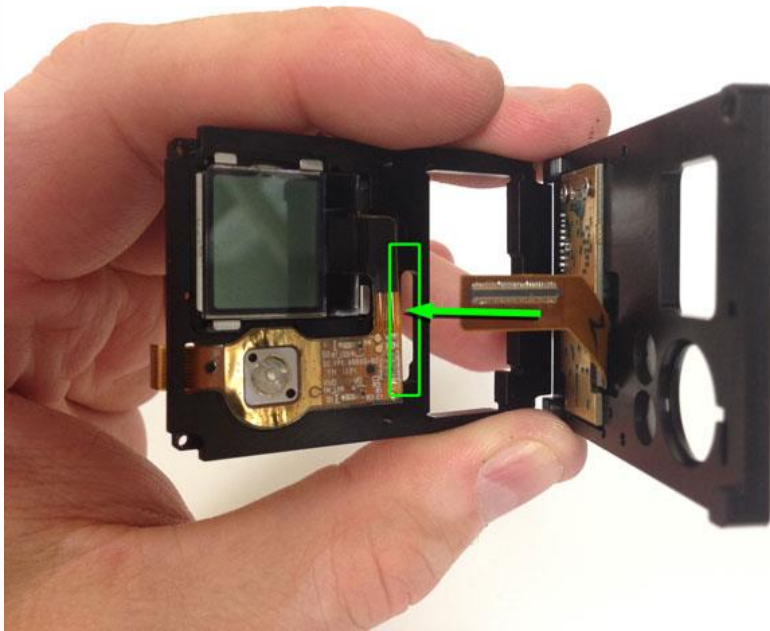
Ribcage Installation: Part 2 - Assembly



2-5 Attach the Cover Plate to the PCB Plate.

Video: <http://youtu.be/l1kAaRuEa3o?t=13m17s>

Attach the cover plate to the PCB plate. Carefully thread the flexible connector through the opening in the PCB plate.



Once together connect them with one of the black screws provided. *Note: when all the pieces are properly aligned the assembly fits together easily. Never force any of the components, instead check that they are seated properly and try again.*



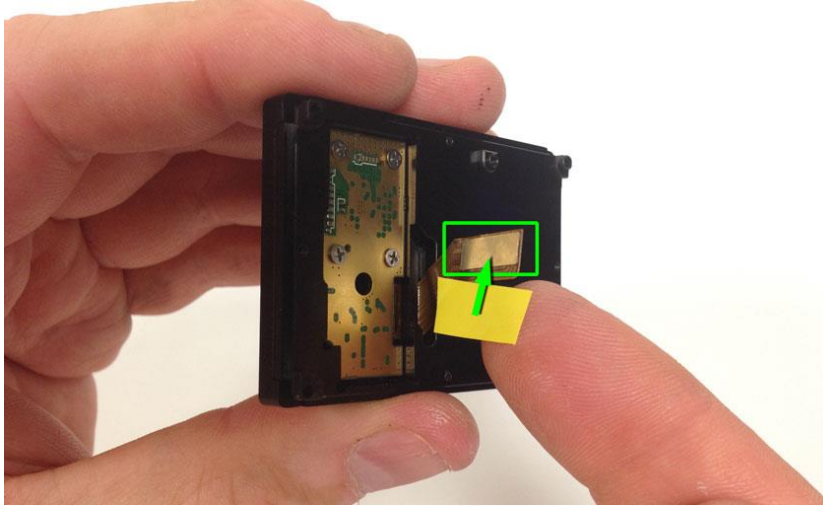
Ribcage Installation: Part 2 - Assembly



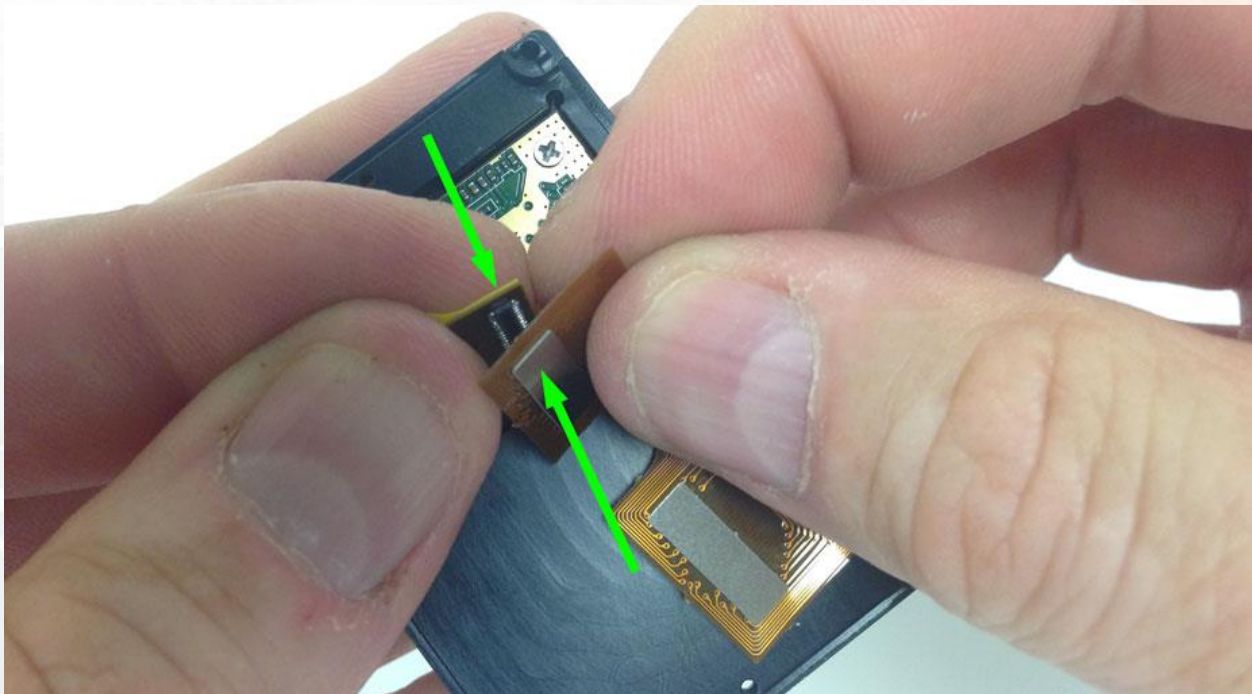
2-6 Connect flexible PCB jumper to PCB plate.

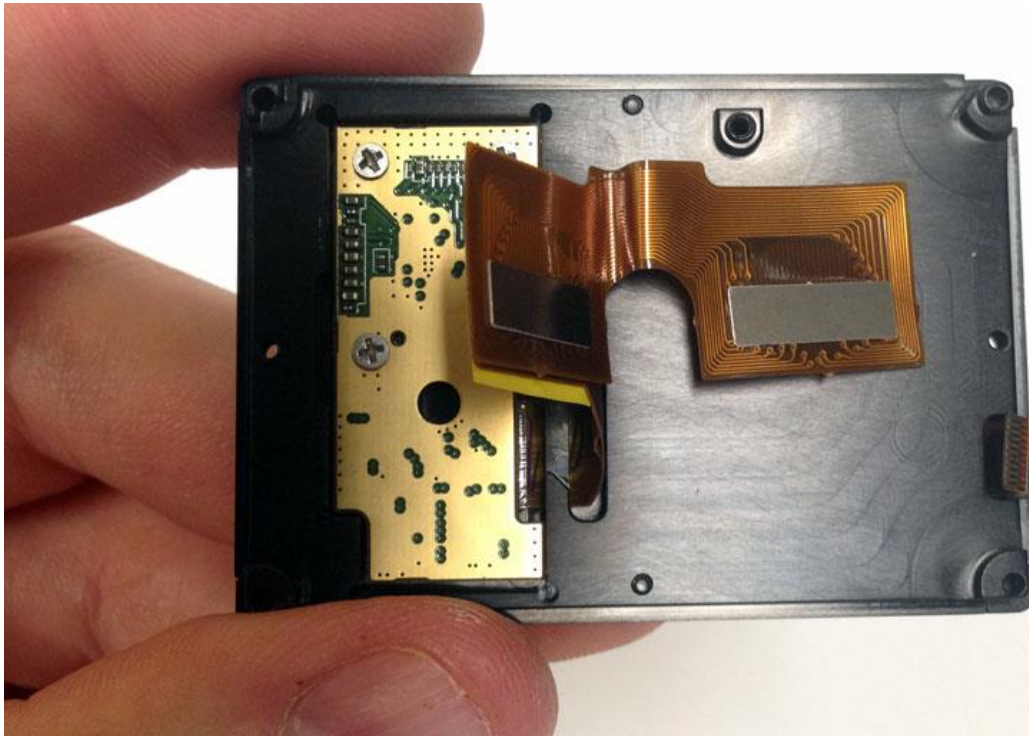
Video: <http://youtu.be/l1kAaRuEa3o?t=13m51s>

Optional - If you wish you can choose to place a small piece of electrical tape on the back of the flexible 50 pin connector.

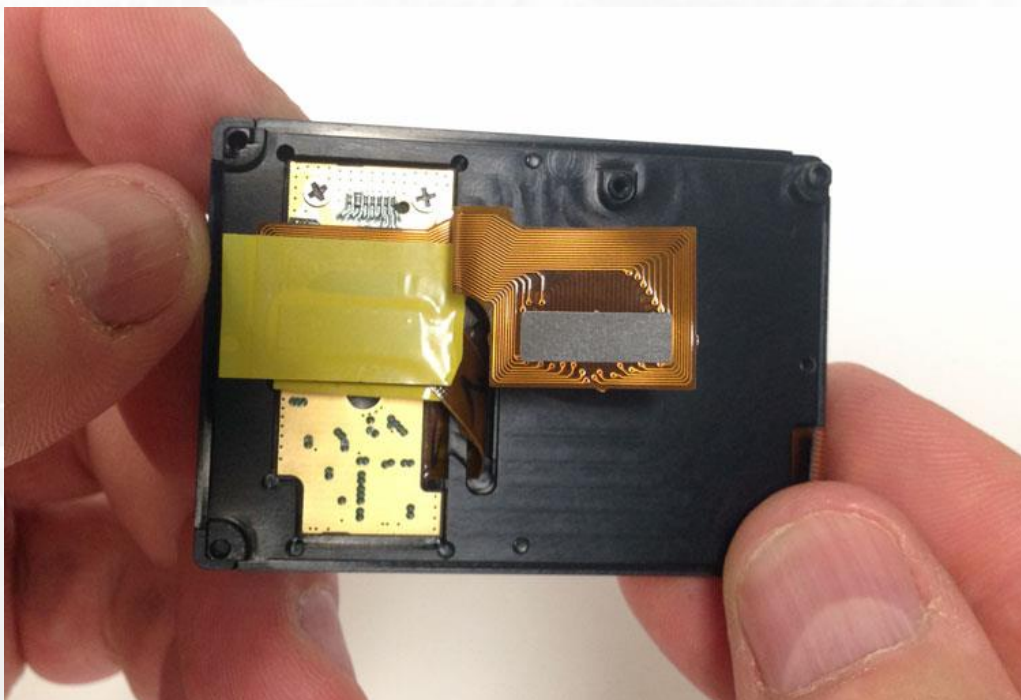


Next we'll connect the flexible jumper. Be very careful to align the tiny 50 pin connectors together before exerting a small amount of pressure. **FORCING THE CONNECTORS TOGETHER WILL DAMAGE THEM ESPECIALLY IF THEY ARE NOT PROPERLY SEATED.**





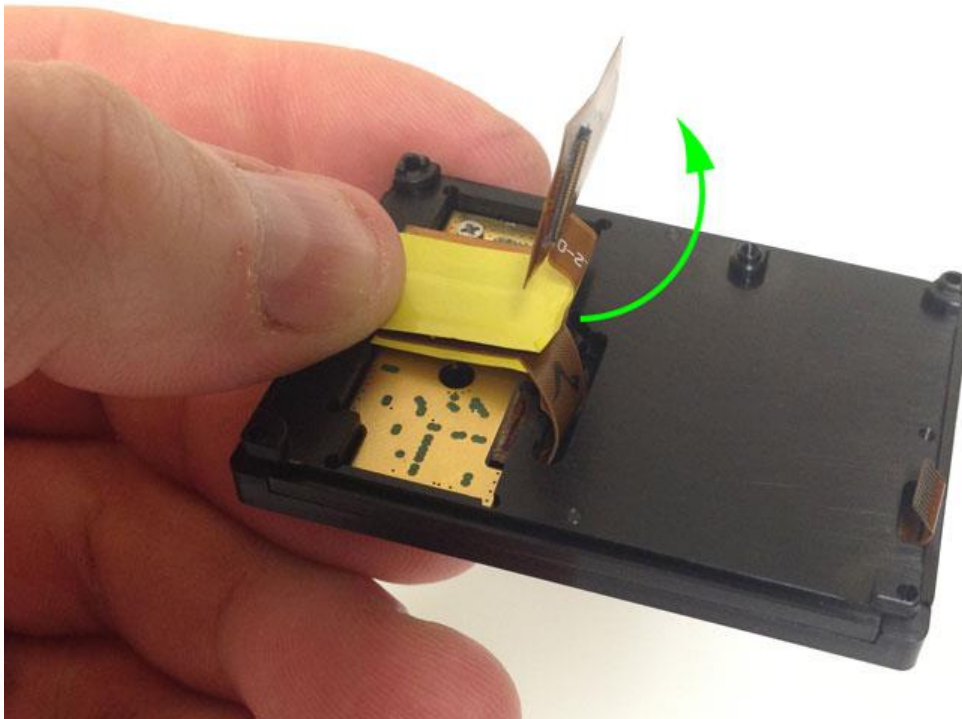
Place a small piece of electrical tape over top the metal stiffener on the flexible PCB. The tape will help isolate the metal stiffener from the bottom side of the PCB board that we will be attaching next. Be sure to align the ribbon as closely as possible to the channel in the PCB plate. The tape pictured is yellow but regular black electric tape is also a great choice.



Ribcage Installation: Part 2 - Assembly

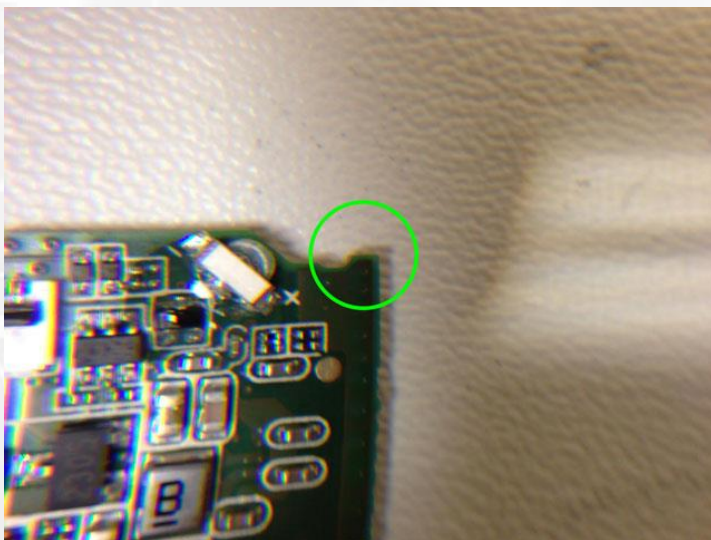


Bend the flexible PCB 90 degrees. This will make attaching the PCB board in the next step easier. *Note: we recommend bending the ribbon between the 'M' and the 'L' printed on the surface.*



A Note for Hero3+ Installations:

For Hero 3+ users there's a small variation in the main boards of the Hero3+ which now have a small tab in the upper right corner.



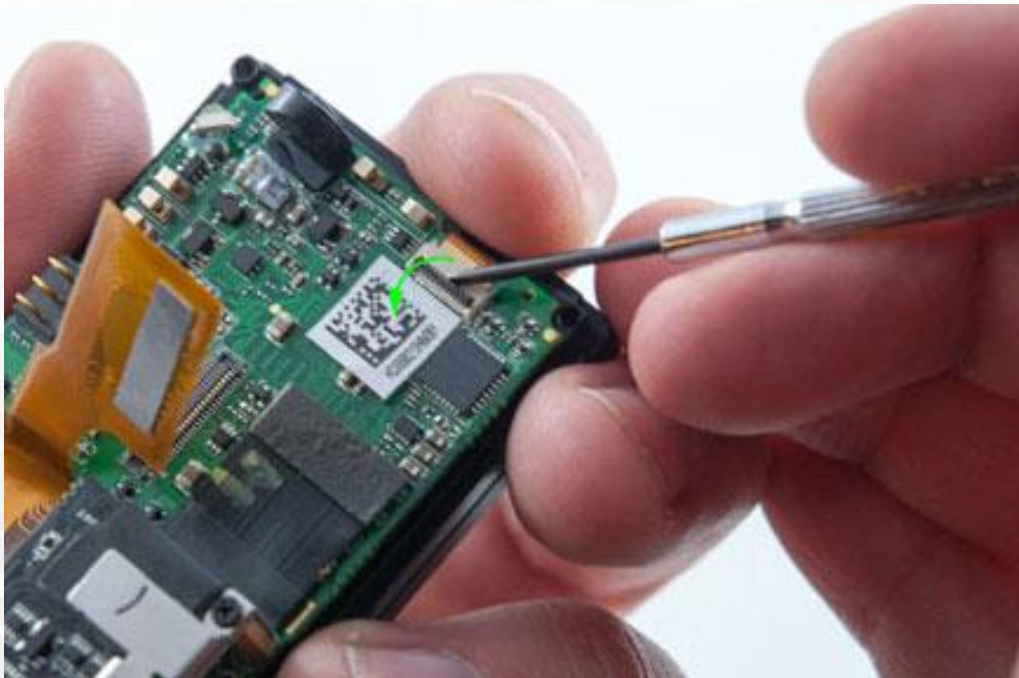
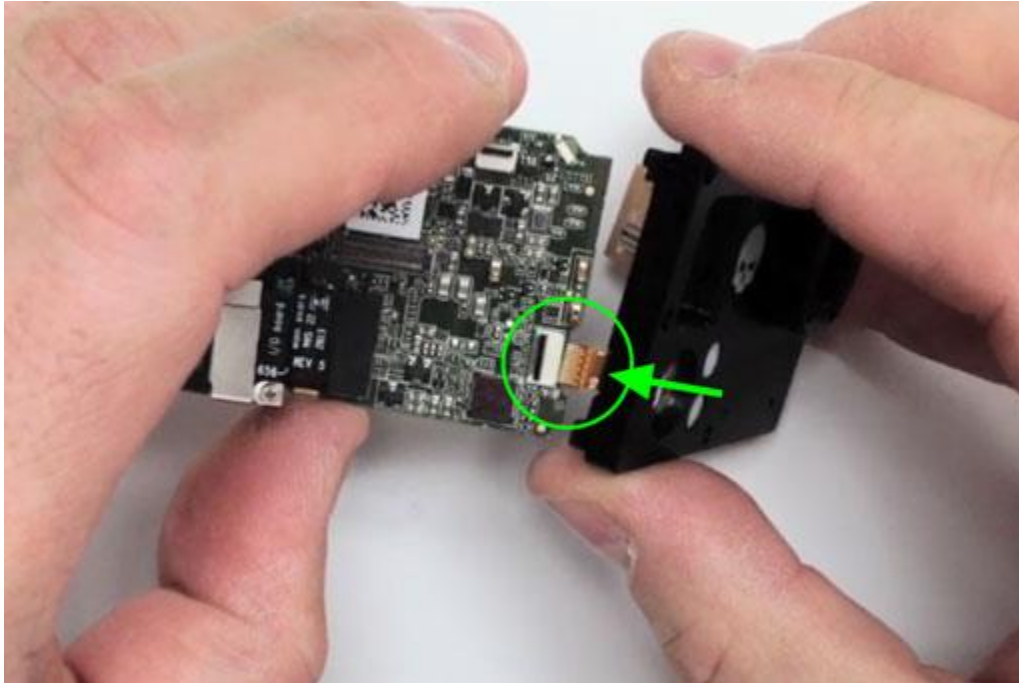
We recommend taking a small file and shaving off about 0.5mm from the tab.



This will insure that the main board sits correctly in the bracket. This step is not required for users of the Hero3.

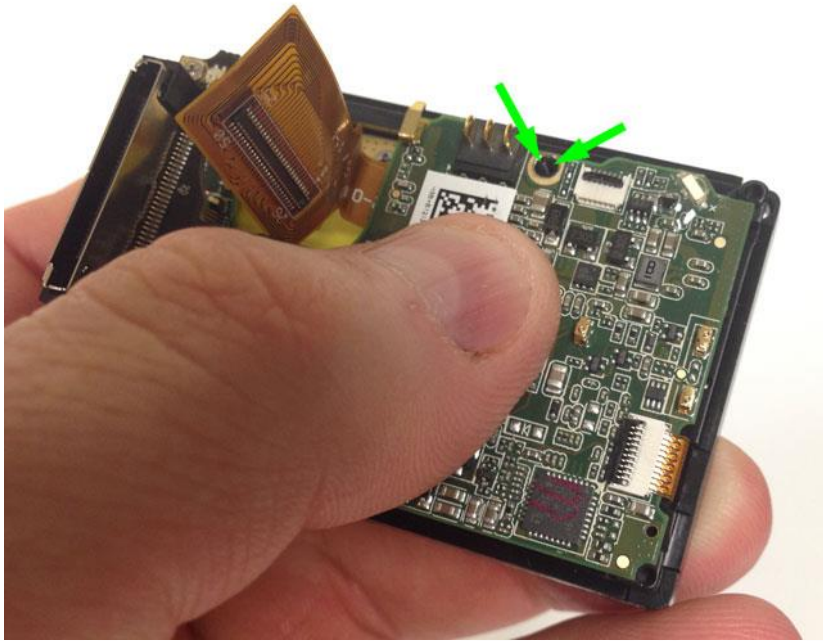
Ribcage Installation: Part 2 - Assembly

Attach the small ribbon connector and flip down the black plastic locking mechanism to hold the LCD connector in place.



Carefully move the flexible PCB jumper into the empty area where the wide angle lens assembly resided and match the through hole of the PCB board with the mount on the PCB plate.

Ribcage Installation: Part 2 - Assembly



Attach the board with the small metallic 1/8" Philips screw provided.



Ribcage Installation: Part 2 - Assembly

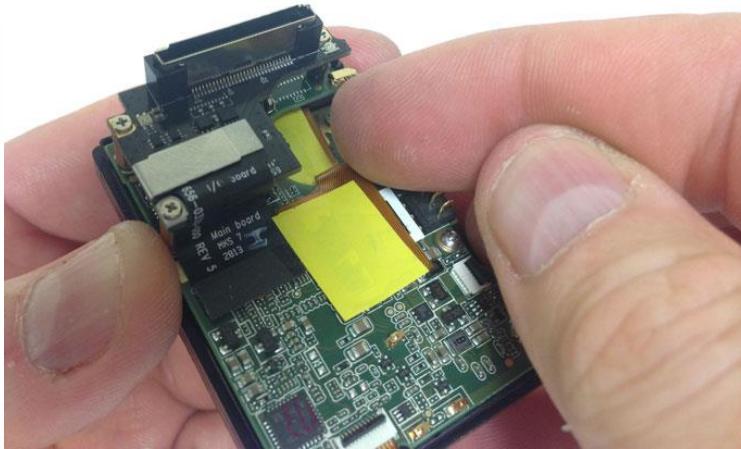
Connect the flexible PCB jumper to the PCB board taking care to align the connectors prior to exerting any pressure to seat them together. They should click together easily when properly aligned.



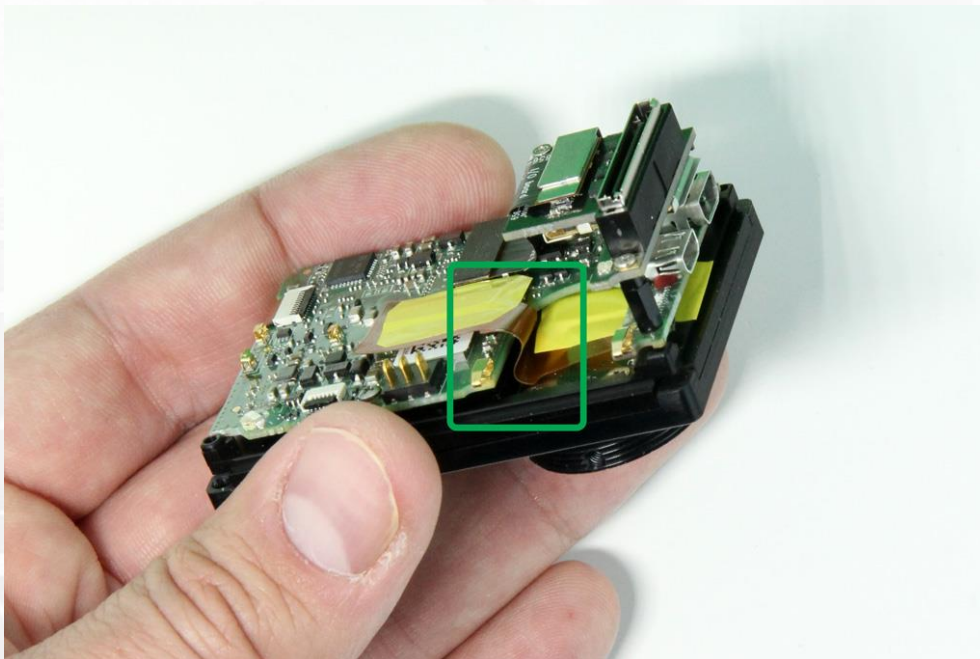
Ribcage Installation: Part 2 - Assembly



Add a small piece of electrical tape to the upper side of the flexible PCB jumper to help isolate the jumper from the housing. *Note: the tape shown here is yellow but standard black electrical tape is also recommended.*



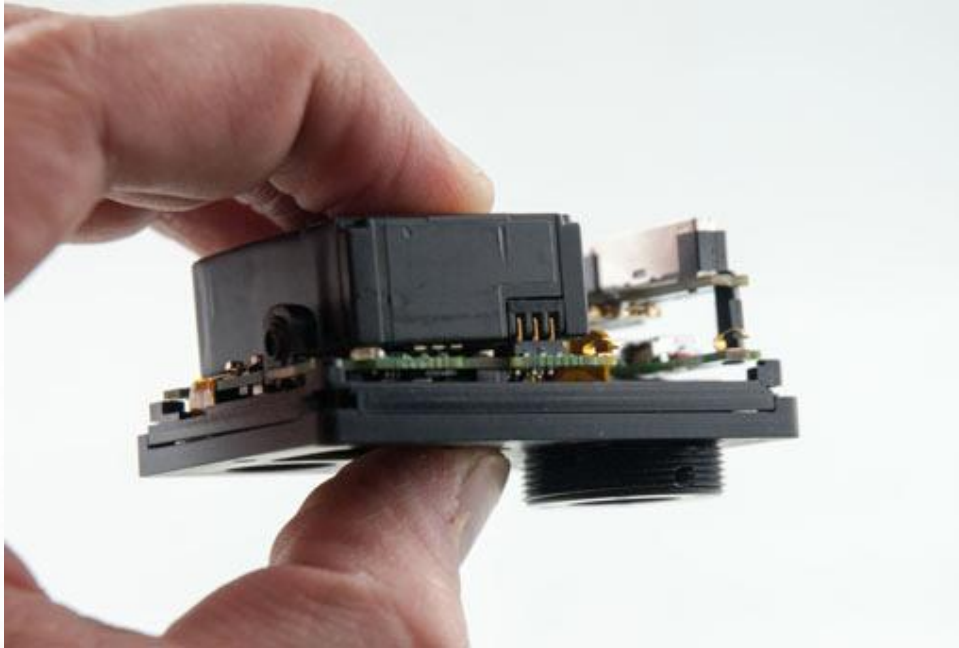
Part of the ribbon should remain tucked under the board slightly and bent over to form an 'S' shape as pictured.



2-7 Functionality Test

Video: <http://youtu.be/l1kAaRuEa3o?t=17m1s>

Now it's time for a quick test. Take the GoPro battery and slide it onto the contacts located on the back of the camera. Hold the battery in place and press the power button. If the camera powers on and you are able to switch modes everything is good! If the camera doesn't power on, or you can't change modes ensure your battery is charged, double check your connections and try again.



Ribcage Installation: Part 2 - Assembly



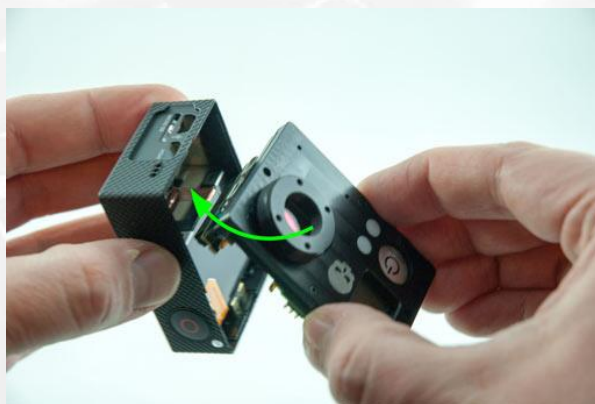
2-8 Put Ribcage Assembly Back Into Housing

Video: <http://youtu.be/l1kAaRuEa3o?t=17m25s>

Now we'll place the assembly back into the housing. If you have a Hero3+ make sure you re-attach the small ribbon connected to the housing. Re-insert the ribbon into the connection socket as pictured and click down the black locking mechanism to hold it in place. This is not required for Hero3.



Take the Ribcage assembly and angle it back into the housing ensuring the HDMI and USB ports properly mate with their openings and the assembly is fully inserted.



Ribcage Installation: Part 2 - Assembly



2-9 Release Cover Plate Screws

Video: <http://youtu.be/l1kAaRuEa3o?t=17m55s>

Release the screw holding on the new cover plate.



Separate the plate slightly and rotate it about ten degrees to reveal the four screw holes located in the corners.



Ribcage Installation: Part 2 - Assembly



2-10 Insert Original Corner Screws

Video: <http://youtu.be/l1kAaRuEa3o?t=18m17s>

Insert the original four corner fastening screws. Tighten them until snug.



Ribcage Installation: Part 2 - Assembly



2-11 Screw on Cover Plate

Video: <http://youtu.be/l1kAaRuEa3o?t=18m56s>

Next turn the unit over and place the power button in position within the cover plate.



Guide it in with your screw driver if necessary. Click the cover plate back into place.



Ribcage Installation: Part 2 - Assembly



Now fasten the faceplate with four of the black screws provided. Loosely fit all four screws before tightening all the way. Do not over tighten. A snug fit is all that's required.



Note: In some cases debris may have worked its way into the threads. Use your puffer to clear it out if threading the screw is difficult

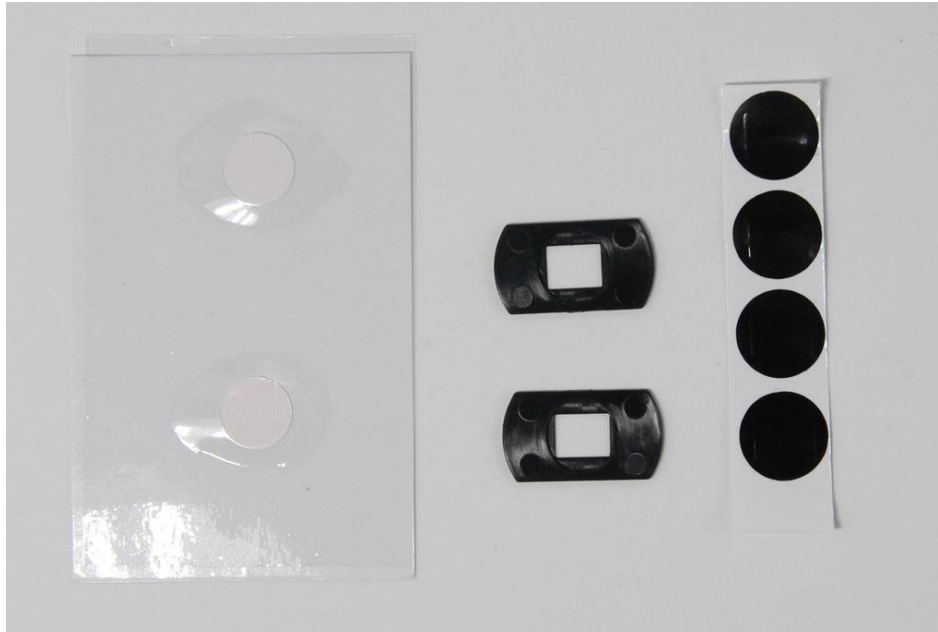
Ribcage Installation: Part 2 - Assembly



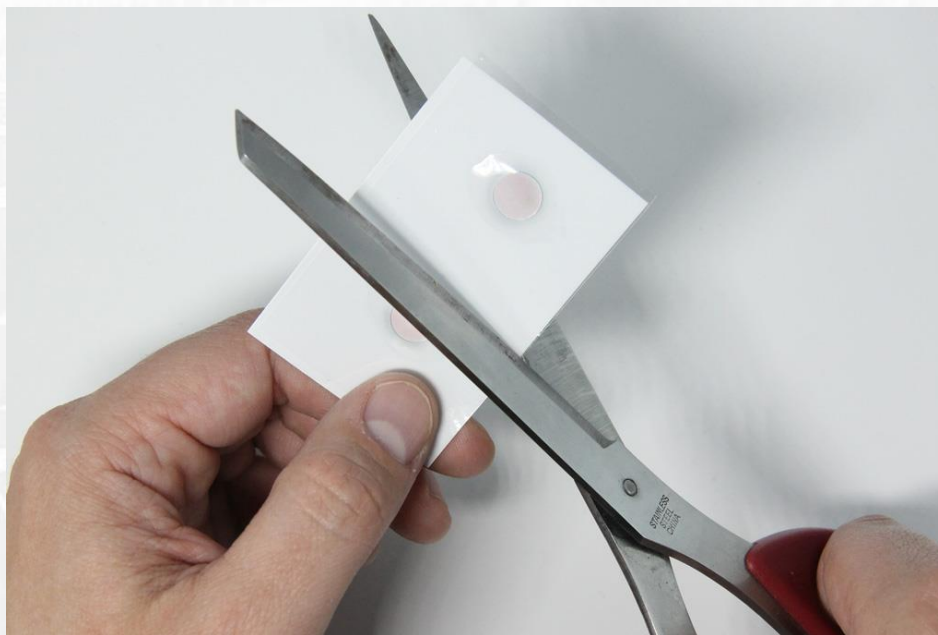
2-12 Install the IR-Cut Filter

Video: <http://youtu.be/l1kAaRuEa3o?t=19m52s>

Now we'll prepare the IR-cut filter. You will need the filters, filter holders and circular black stickers from your kit.



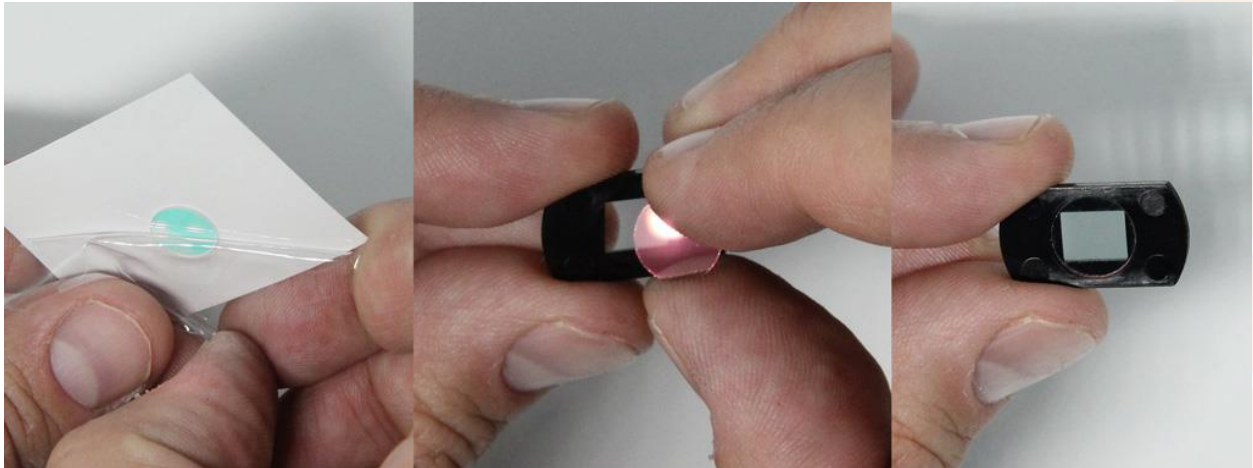
Cut the filter pack in half with a pair of scissors or a utility knife.



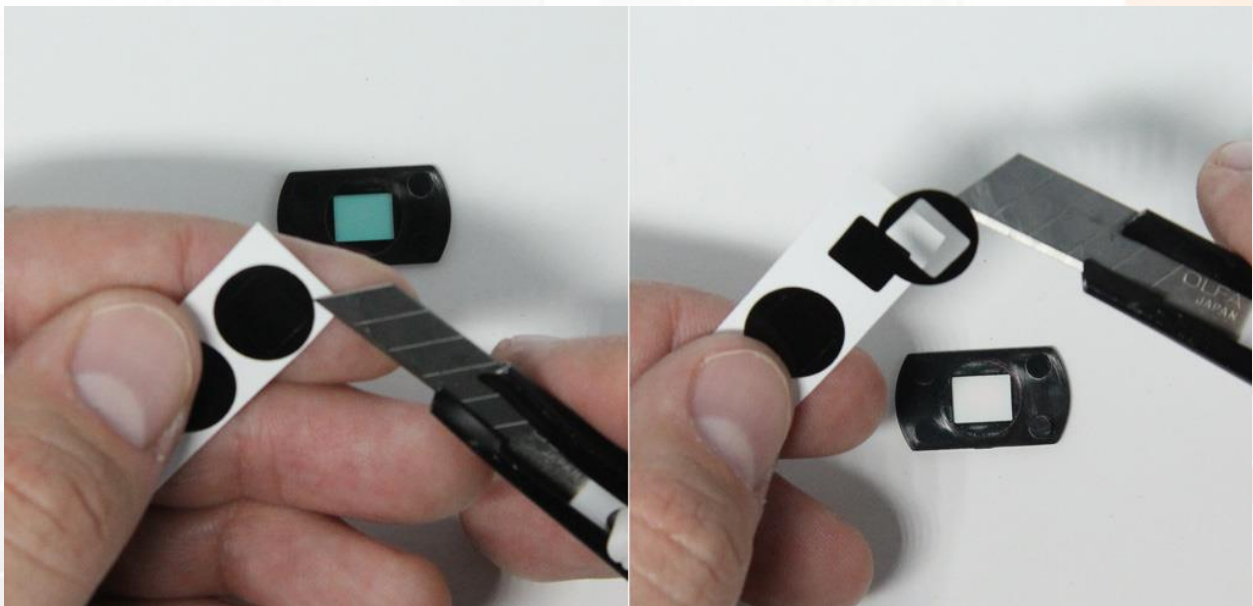
Ribcage Installation: Part 2 - Assembly



Next, peel away the plastic film from one of the filters. Pop in into the socket in one of the filter holders. *Note: It's best to handle the filter by the edges to avoid adding smudges.* Set aside the backing paper for use in a moment.

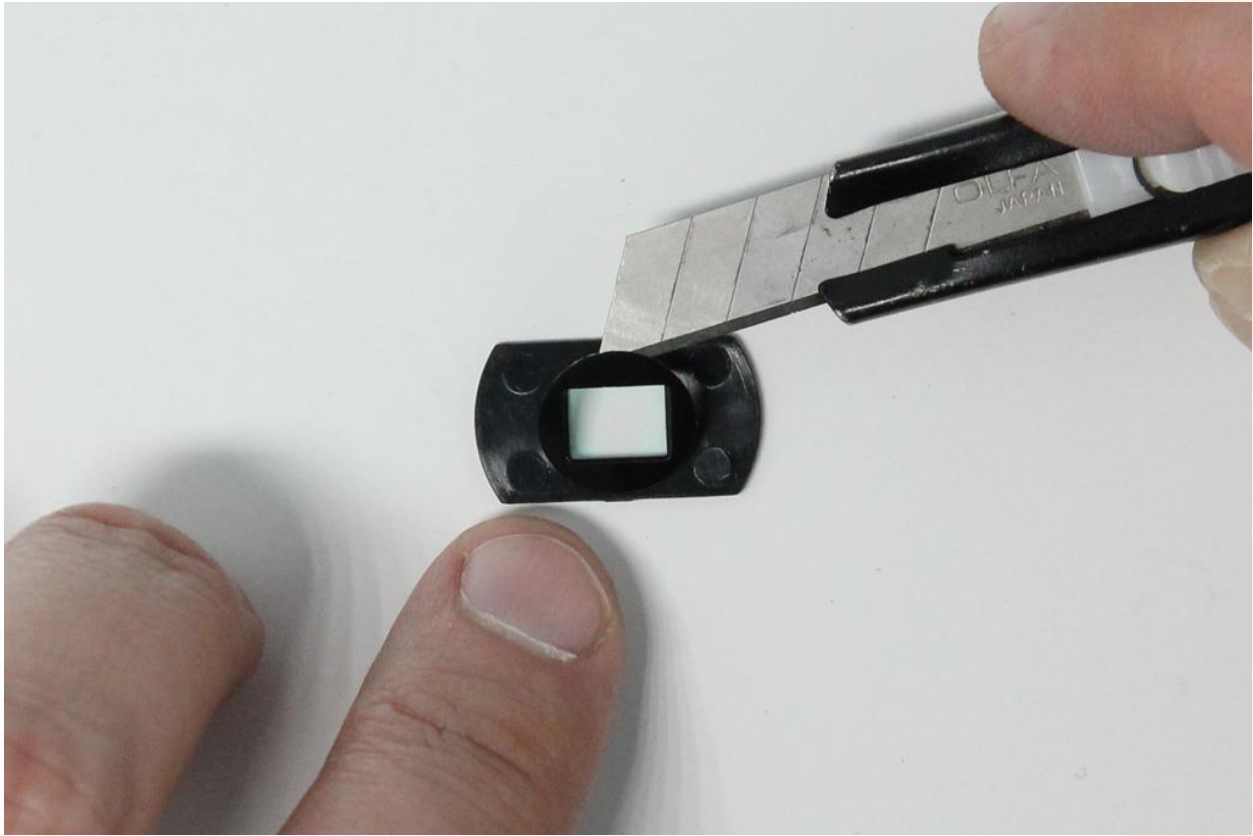


Now take a utility knife and remove one of the stickers from the backing.

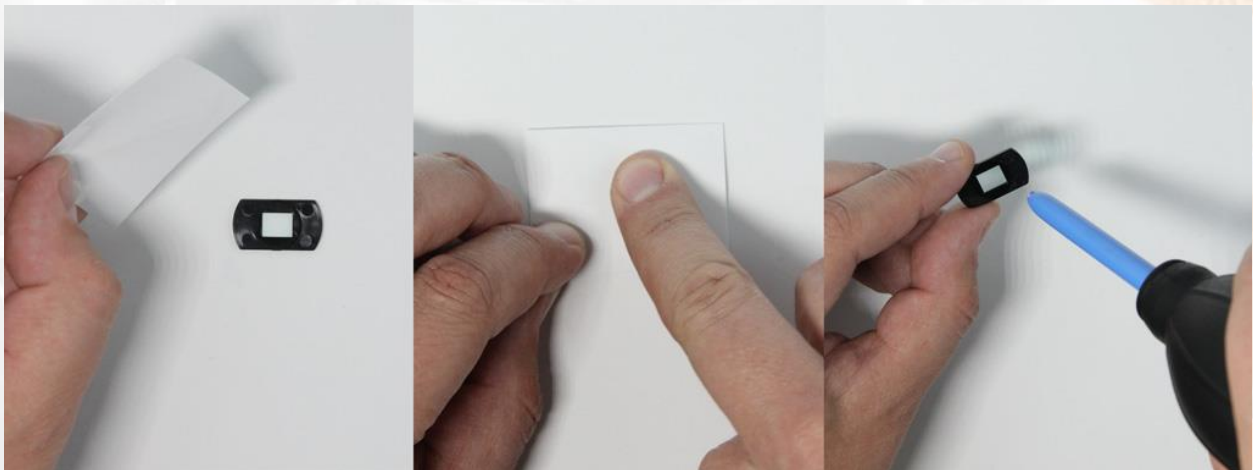


Ribcage Installation: Part 2 - Assembly

Carefully place it over the filter to keep it in position.



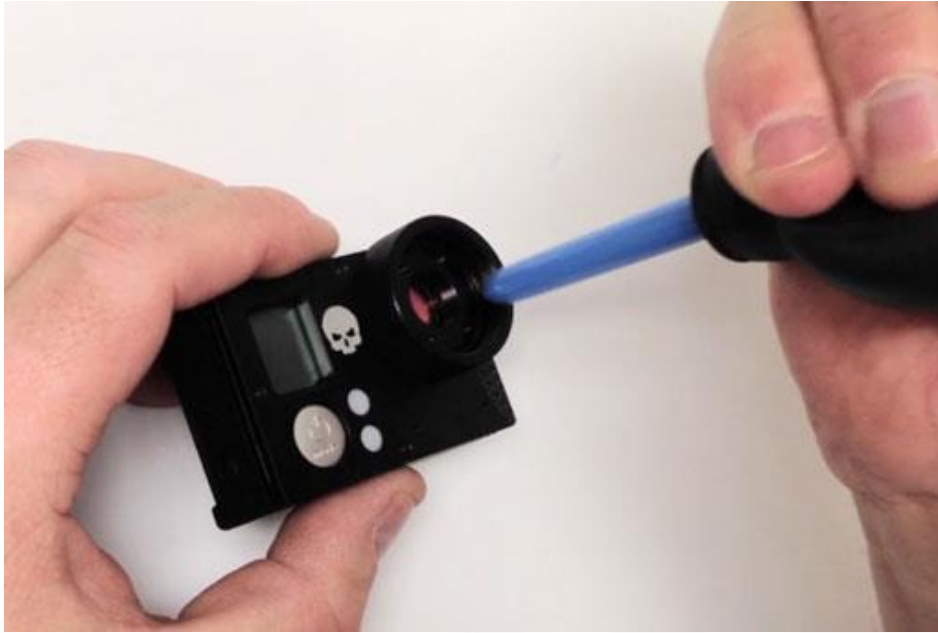
Take the filter backing paper, find the shiny side and place it over the filter and sticker. Gently press down to fix the sticker in place. Now is a good time to clean the filter if required. **Note: Make sure the sticker is perfectly flat with no lifted edges and trim any excess that hangs over the side. An incorrectly applied sticker may make inserting and removing the filter tray more difficult. Spare stickers are provided in case you need to re-apply.**



Ribcage Installation: Part 2 - Assembly



Use a puffer to make sure there is no debris inside the assembly or on the image sensor. If needed use some lens cleaner, or your favorite sensor cleaning tools to make sure it's crystal clear.



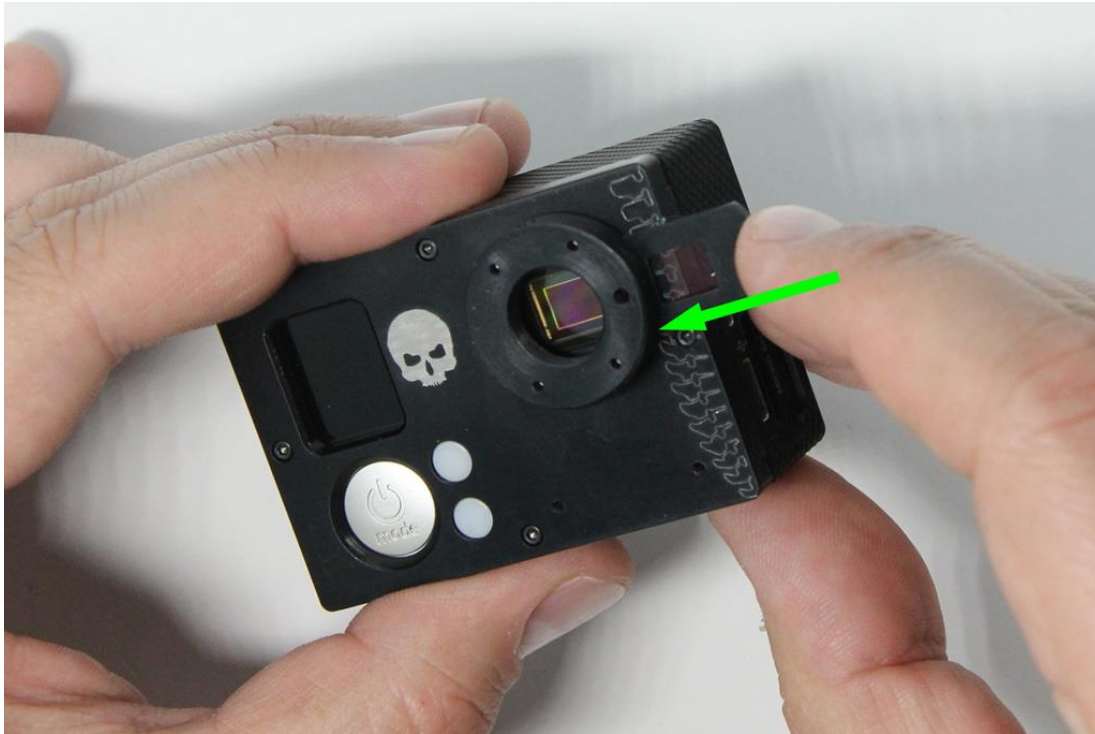
Next we'll add the IR-cut filter. We recommend that you position the IR-cut cartridge with the square opening facing forward. This will protect the filter and sensor in case you happen to screw in an M12 lens too far.



Ribcage Installation: Part 2 - Assembly



Take one of the two filter cartridges provided and slide it into the slot at the base of the M12 ring.



Use your screw driver to move it into place so that it's centered over the image sensor.



Ribcage Installation: Part 2 - Assembly



Insert a tiny set screw into the empty hole on the front of the M12 ring. Tighten it until snug to keep the IR filter in place. *Note: use the smallest L-key provided*



If you ever want to remove the filter for night vision, the best method is to loosen the set screw and push it out with the spare filter cartridge. *Note: we don't recommend pushing it out with any tools as there is a chance they can make contact with the sensor.*



Ribcage Installation: Part 2 - Assembly



2-13 Attach the Mounting Rings

Video: <http://youtu.be/l1kAaRuEa3o?t=22m18s>

Screw the CS-Mount ring into place over the M12 ring.



Insert the remaining tiny set screw into the CS ring and tighten until snug using the provided Allen key.



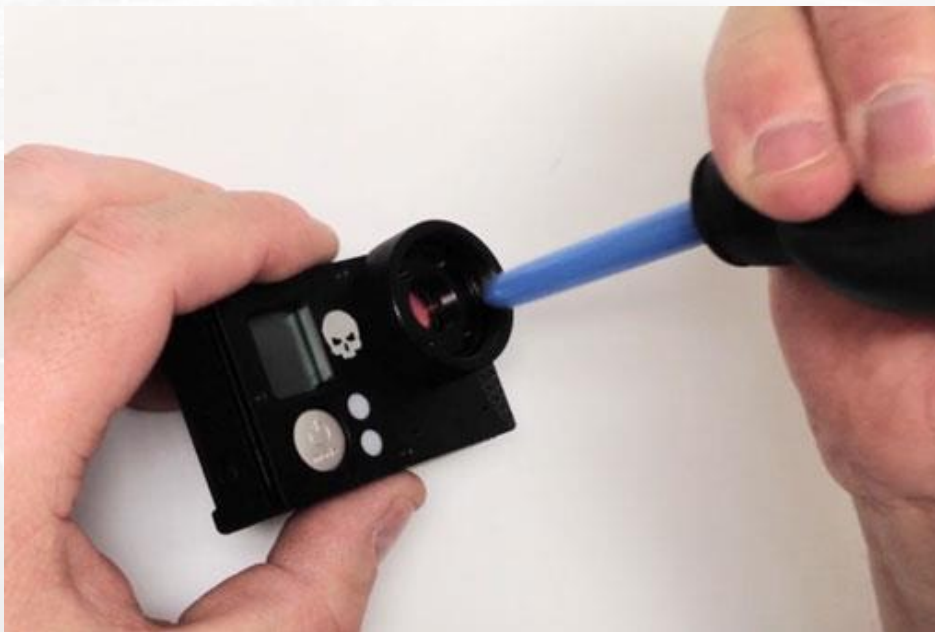
Ribcage Installation: Part 2 - Assembly



In order to attach C-Mount lenses attach the 5mm C-Mount spacer ring.



Use a puffer to remove any debris from the assembly.



Ribcage Installation: Part 2 - Assembly



It's recommended that you use the protective cap when no lens is attached.



Ribcage Installation: Part 2 - Assembly



2-14 Re-attach Battery and Accessories

Video: <http://youtu.be/l1kAaRuEa3o?t=23m19s>

Re-attach the battery and accessories.



Ribcage Installation: Part 2 - Assembly



2-15 Attach Tripod Mount

Video: <http://youtu.be/l1kAaRuEa3o?t=23m51s>

Attach the tripod plate using the two remaining black screws. If the screw requires any force to put in, it is best to back it off and try again. The screws will go in easily when properly aligned. Loosely fit both screws before tightening all the way. Do not over tighten. If the screws feel tight, back them off slightly and make sure the threads are properly aligned.



Ribcage Installation: Part 2 - Assembly



2-16 Done!

Video: <http://youtu.be/l1kAaRuEa3o?t=24m21s>

Now we're all done! Go out and enjoy your new camera and have fun experimenting with different lenses!

