BACK-BONE

Ribcage v1.1 Installation

Part 2 - Assembly

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V1.1

Contents

Ribcage Installation: Part 2 - Assembly

Section 1 – Before You Get Started

Included With Your Kit:

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

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Figure: A

5mm C Ring

CS Ring

M12 Ring

0-80 x 3/16"

IR-Cut

0-80 x 3/16"

Cover Plate
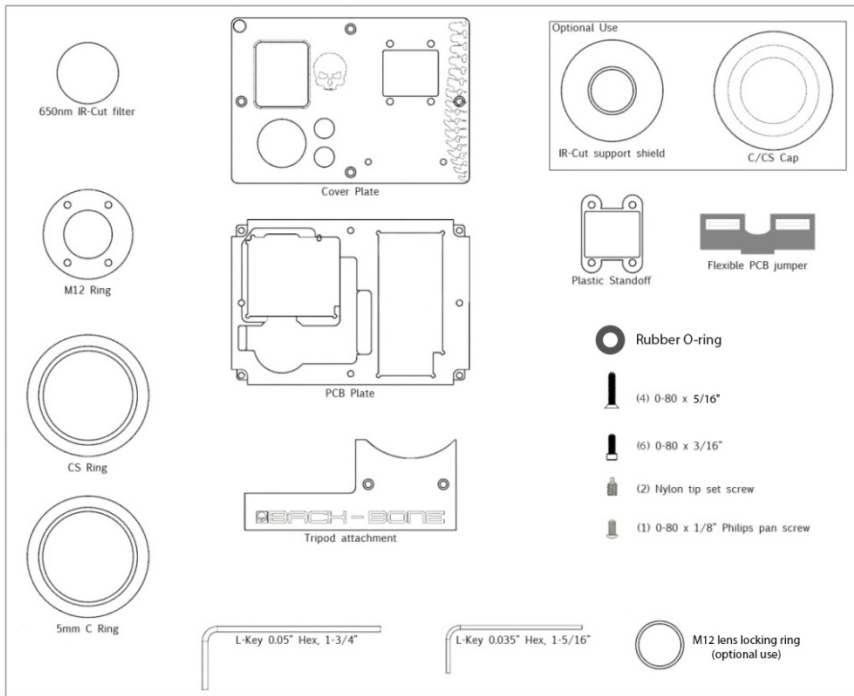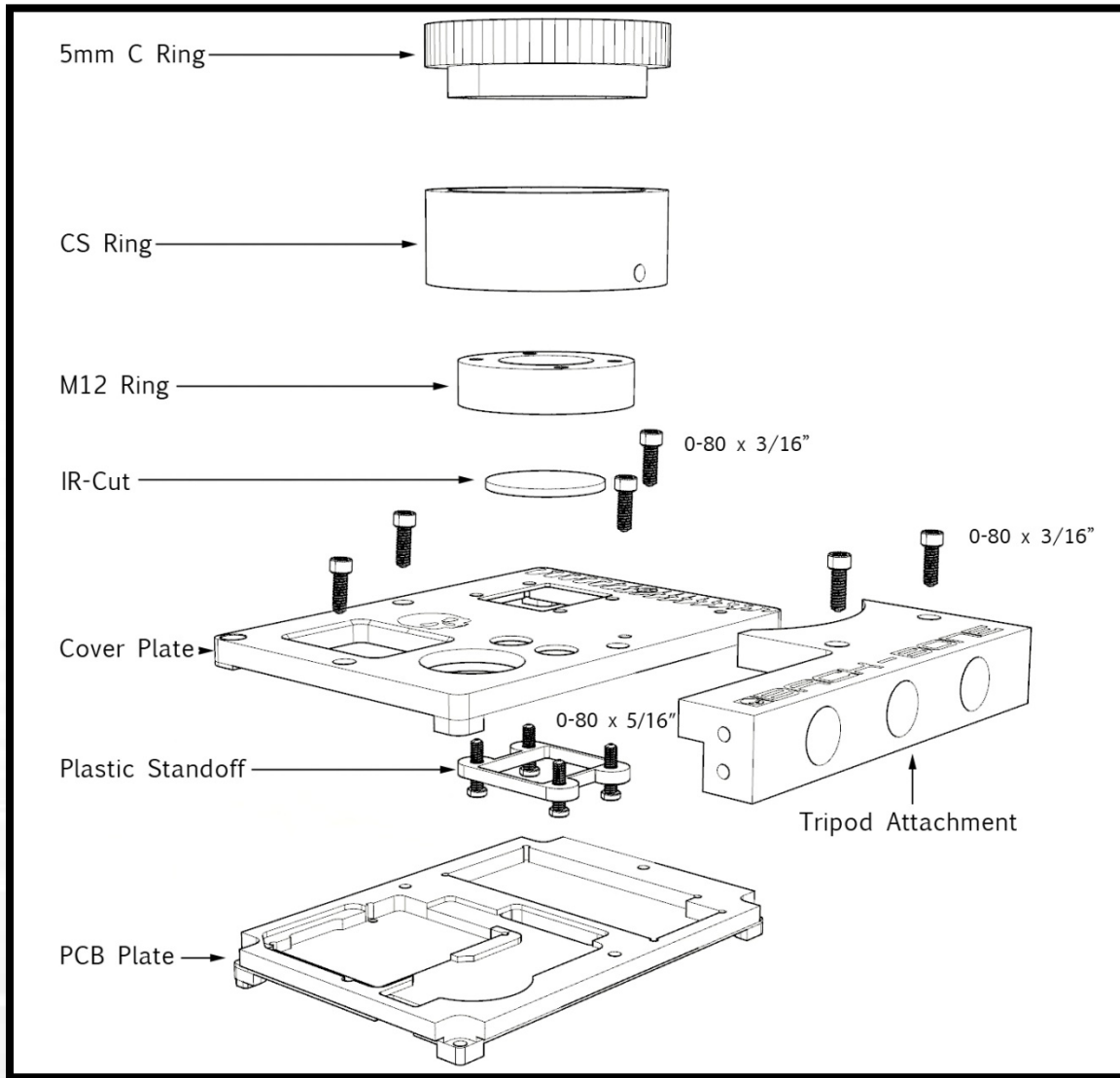
0-80 x 5/16"

Plastic Standoff

Tripod Attachment

PCB Plate

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 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
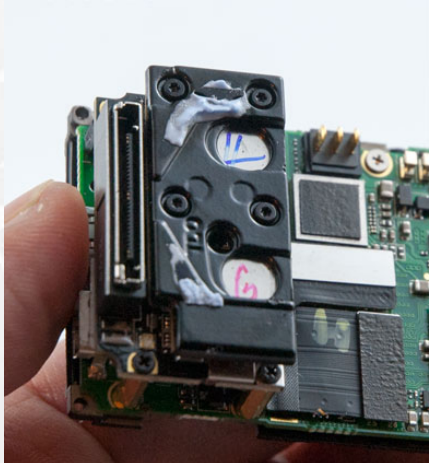
Hero3+ Black
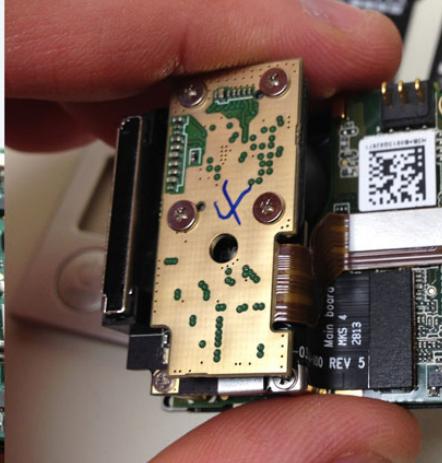
Tools Required

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 Philips #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+)

Ribcage Installation: Part 2 - Assembly

Section 2: Ribcage Assembly

2-1 Your Ribcage Kit

Video: http://youtu.be/83UAabt3hxc?t=7m42s

Remove the two screws holding on the tripod mount and the cover plate. You can use your own tools or the L-keys provided. The IR-Cut filter is stored inside.

For a complete list of parts and hardware please refer to pages 2 and 3 of this guide.
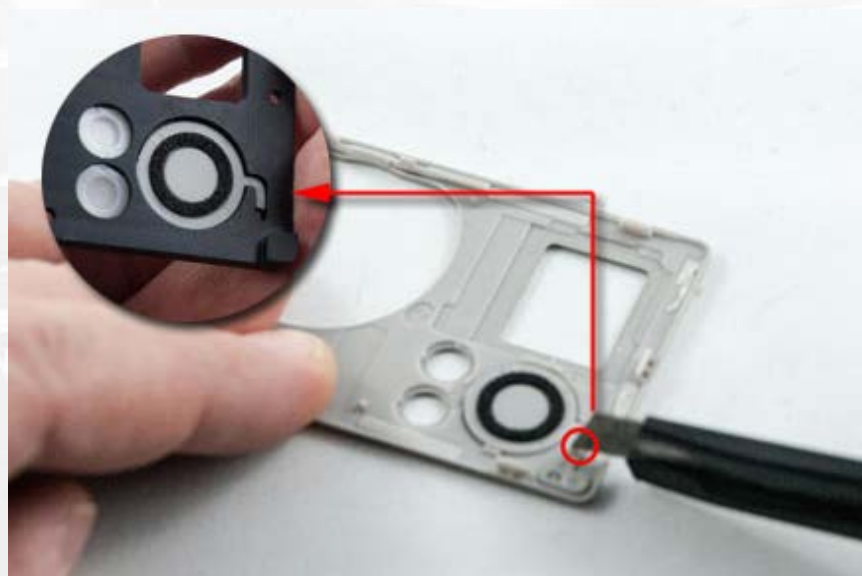
Ribcage Installation: Part 2 - Assembly

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2-2 Transfer the LED and power buttons

Video: http://youtu.be/83UAabt3hxc?t=8m52s

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.
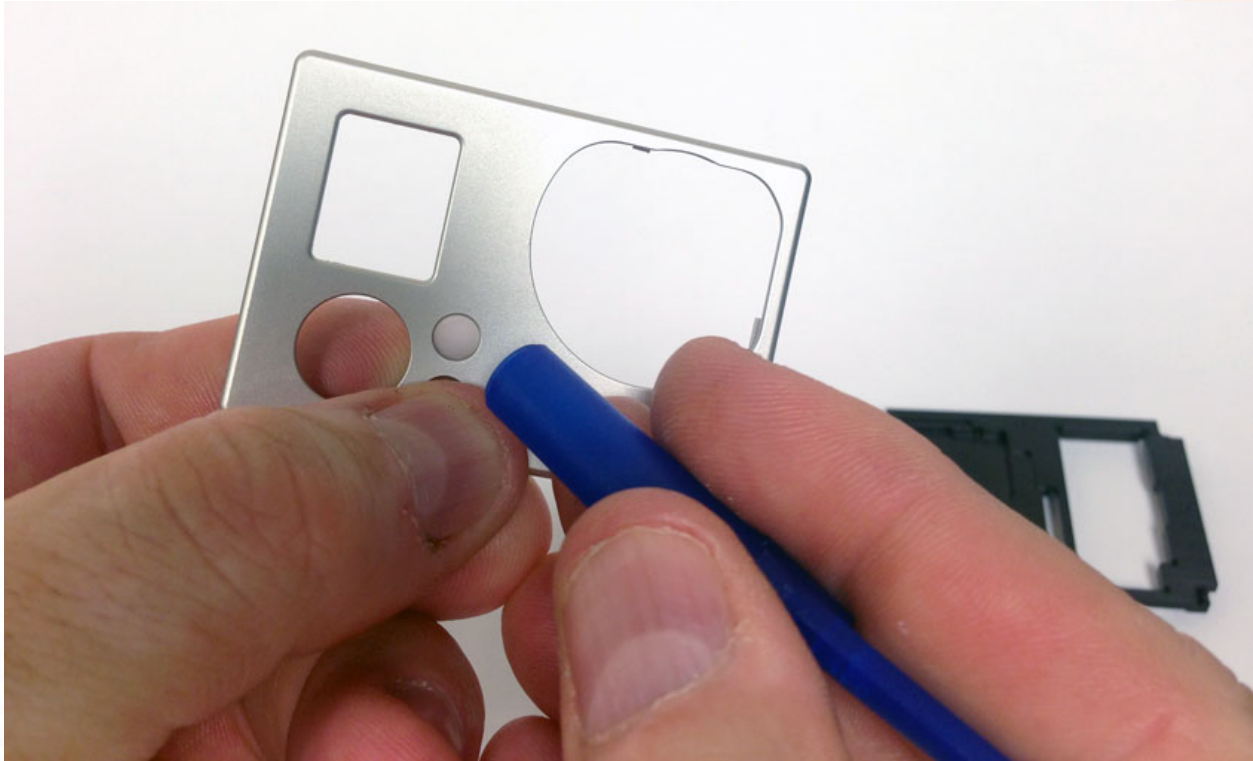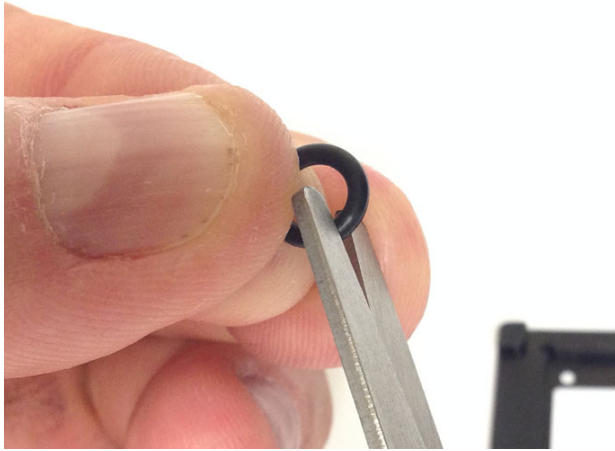
Turn the faceplate over and use a utility knife to cut the tab connecting the power button as pictured.
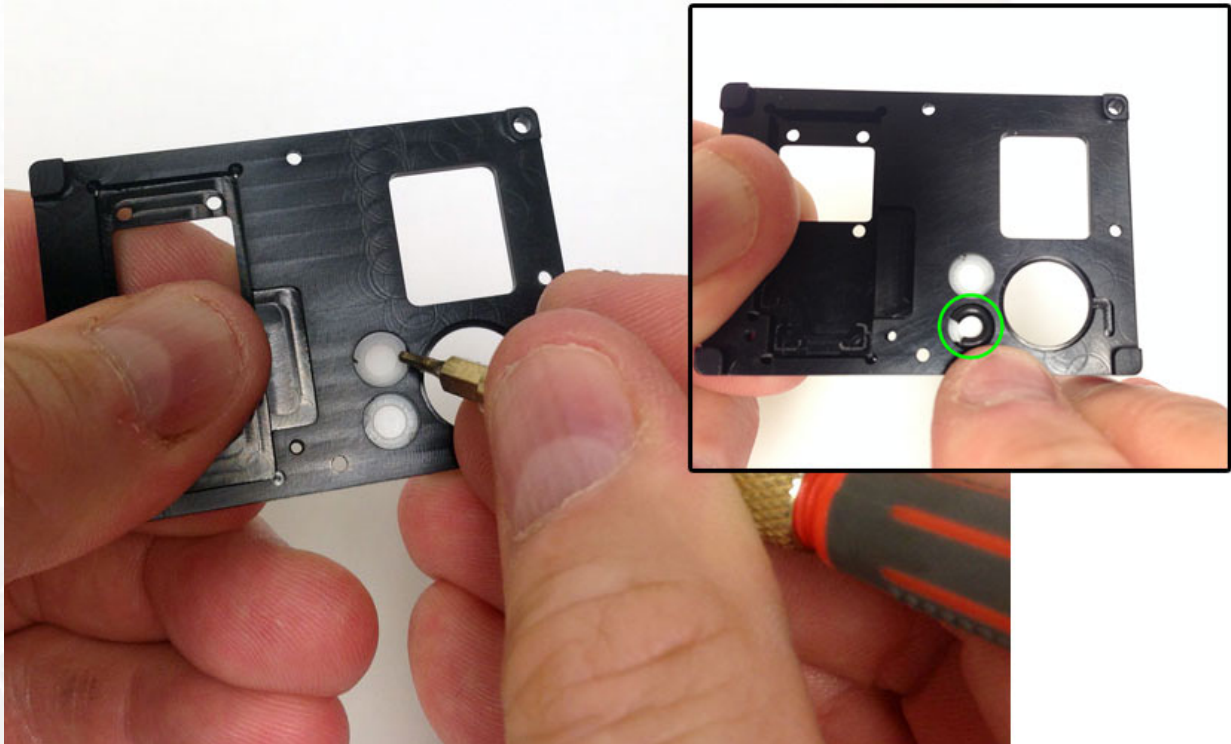
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Next, take the supplied rubber O-ring and cut it in half with a pair of scissors or a utility knife.

Place the parts into the Ribcage faceplate. Use a screwdriver to push in the LED covers. Work them in until seated correctly by applying pressure to the edges. Place each half of the O-ring behind the LED covers in the faceplate. These will prevent the covers from being accidentally pushed back into the camera after assembly.
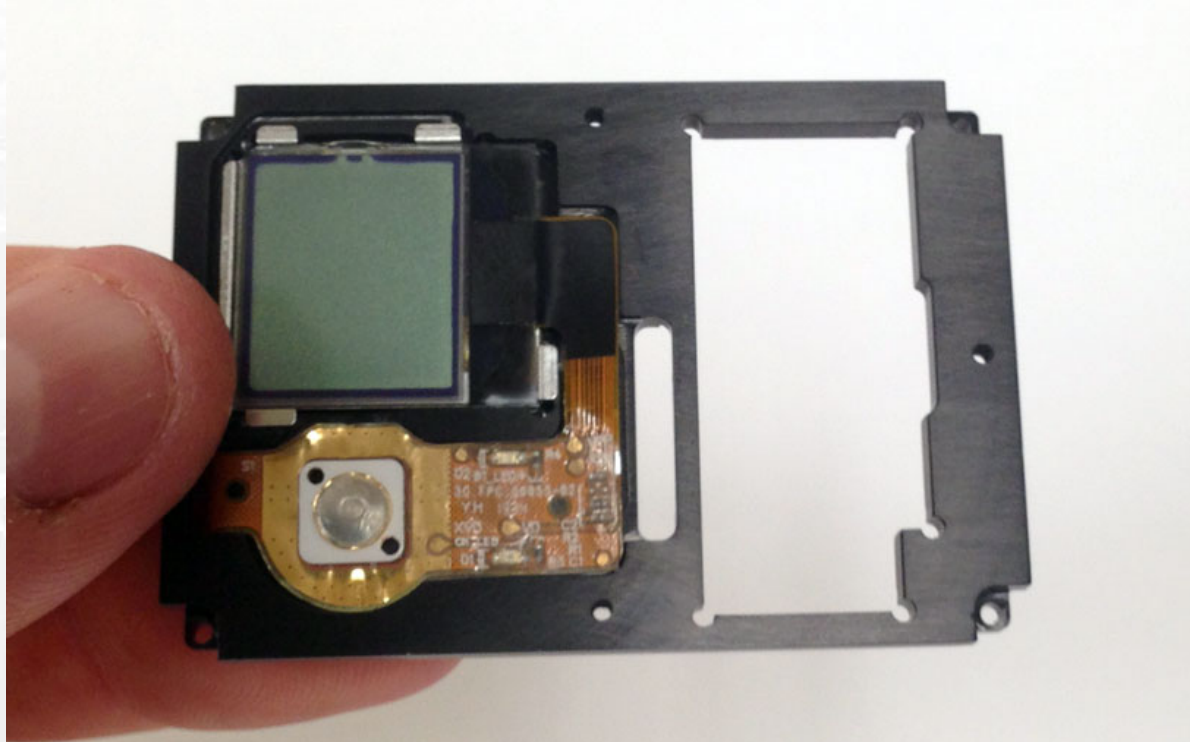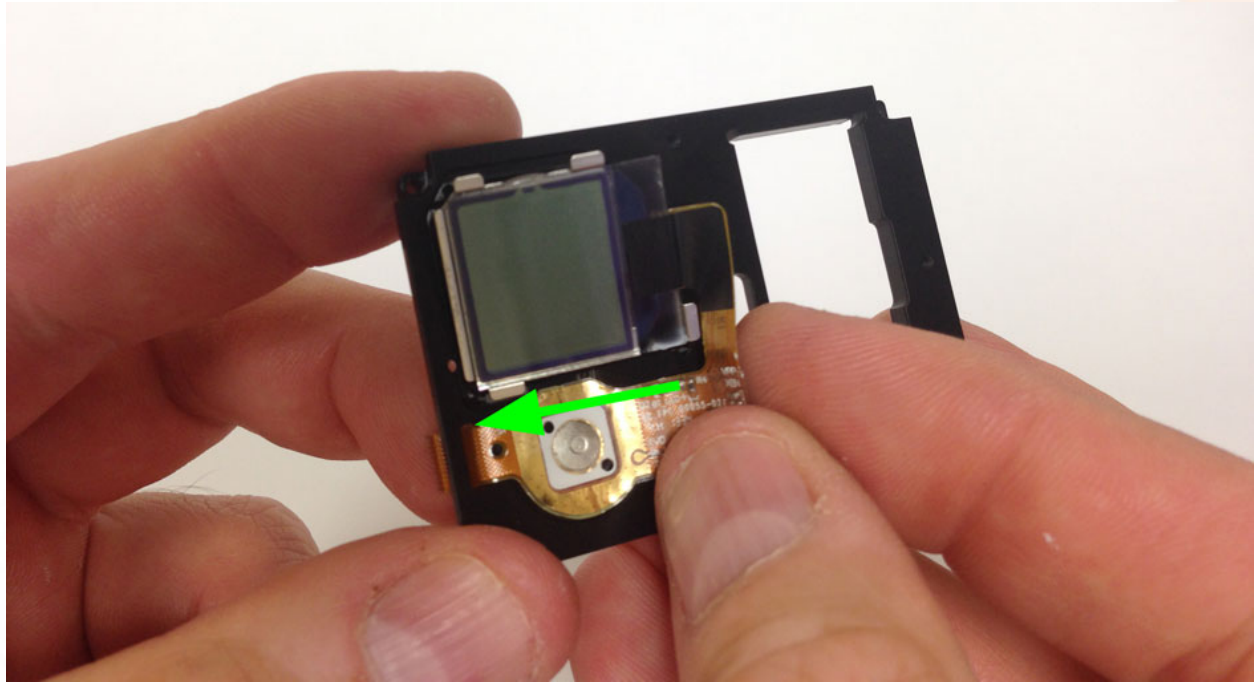
2-3 Attach LCD/Button Strip

Video: http://youtu.be/83UAabt3hxc?t=10m12s

Insert the LCD/ 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.

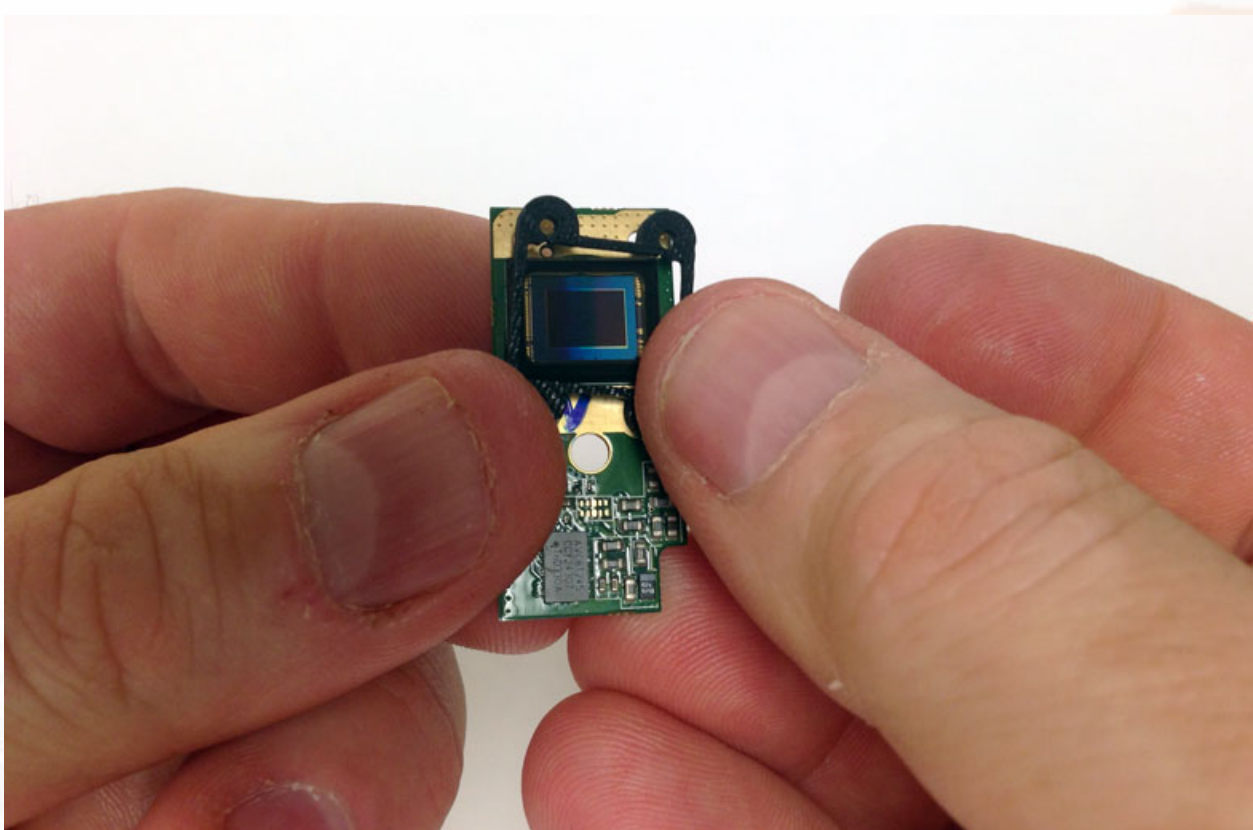## Ribcage Installation: Part 2 - Assembly

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2-4 Attach CMOS Sensor to Cover Plate
Video: http://youtu.be/83UAabt3hxc?t=10m39s

**(PLEASE READ THIS ENTIRE SECTION BEFORE PROCEEDING)**

You will now need the tools and screws provided in the kit. Take care not to touch the image sensor during the following steps, but if you do it can be cleaned later. Place the plastic standoff over the image sensor.

Screw in four of the long silver 5/16" screws provided through the holes in the back of the image sensor board and through the standoff.
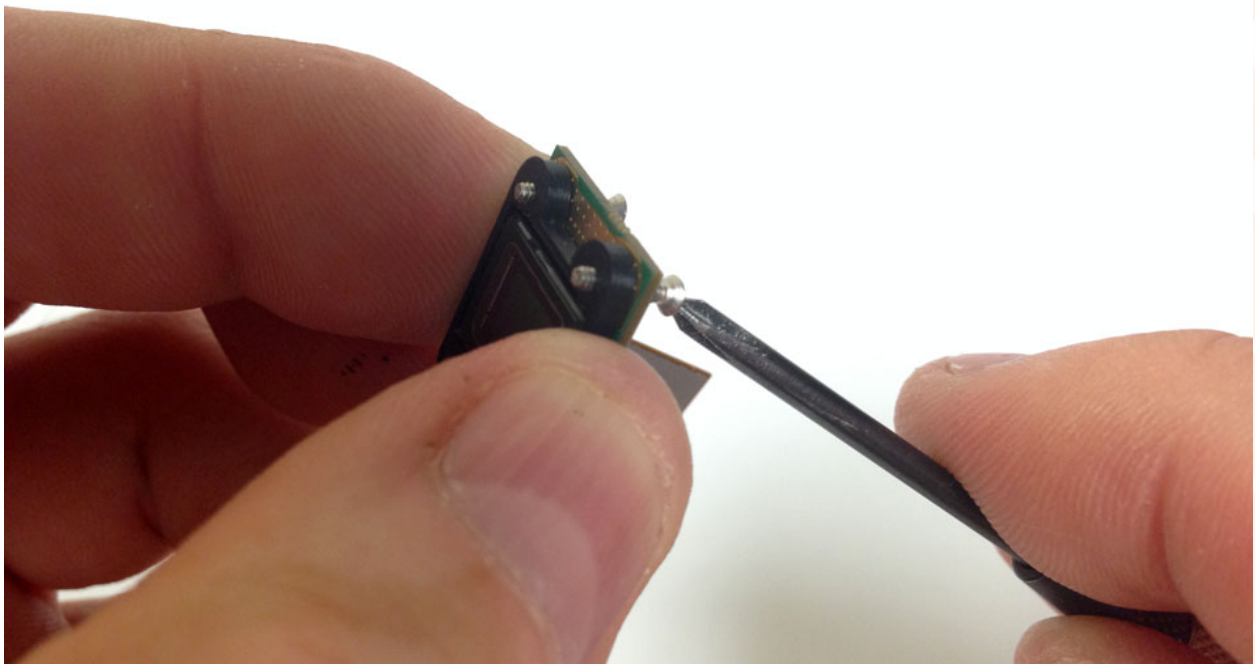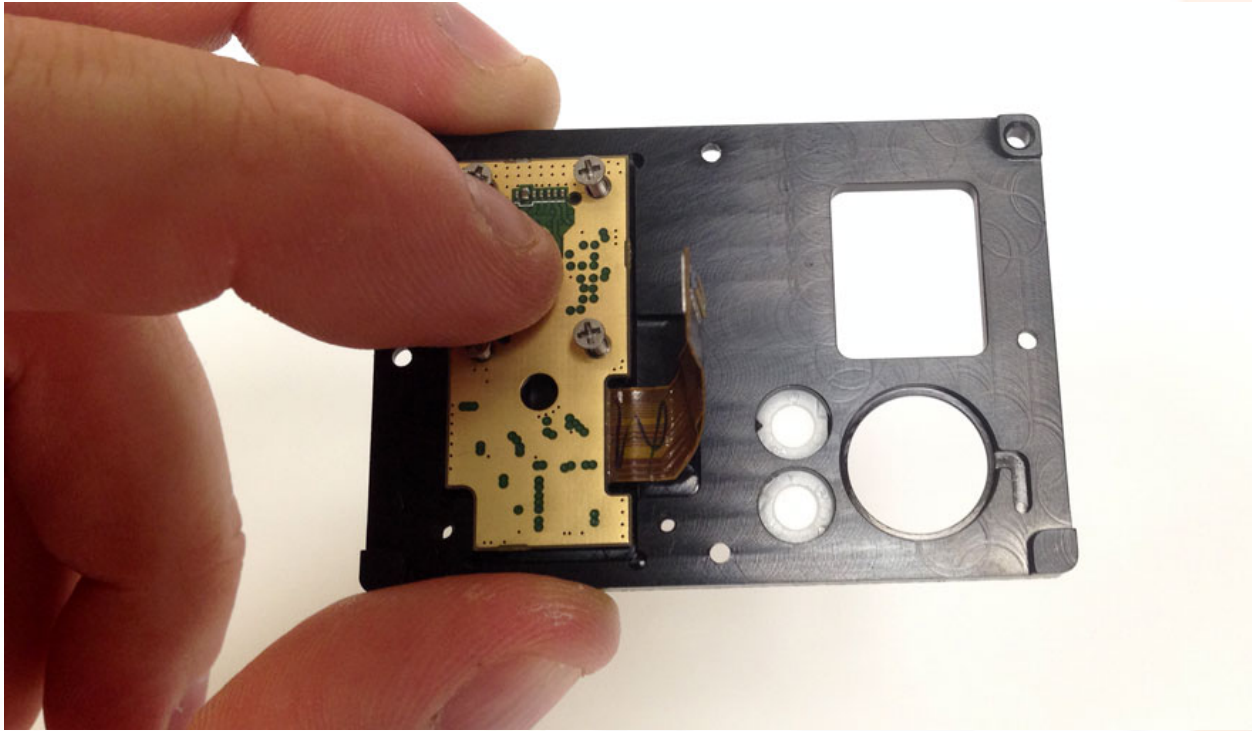
If you wish to permanently install your IR-Cut filter, place it into the back of the M12 ring now before you connect it to the faceplate – again taking care not to add smudges or debris. Make sure the set screw hole is aligned to the top of the camera.
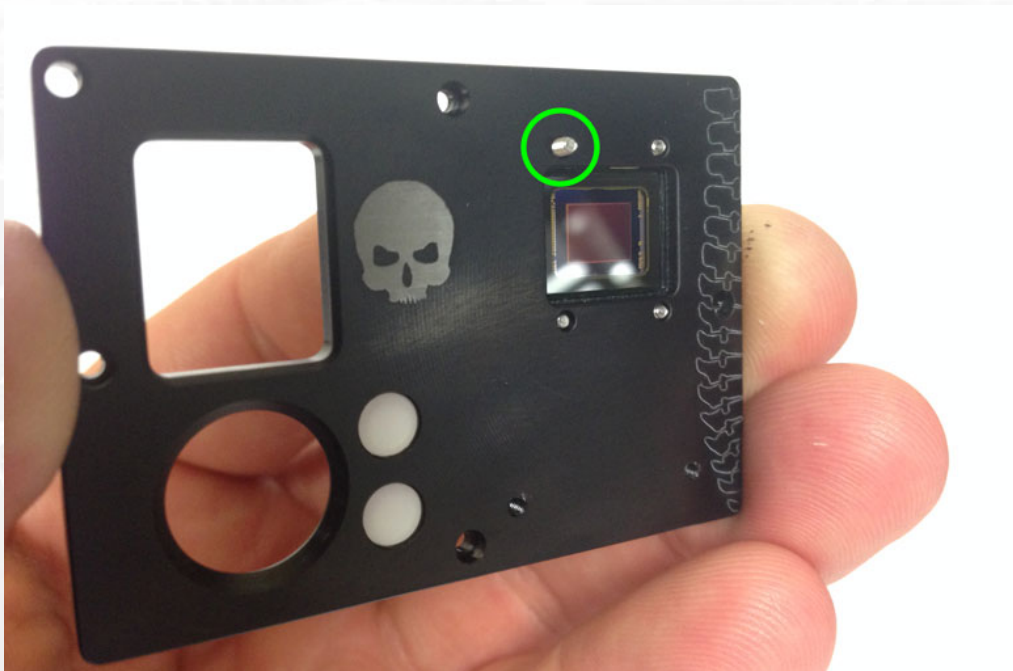
Insert the image sensor with the plastic standoff into the Ribcage cover plate so that the four holes line up correctly.

Insure 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.

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You may now choose to permanently install your IR cut filter. At this point make sure clean your CMOS sensor if any debris or smudges are visible. Inspect both the IR-Cut filter and sensor carefully to make sure they are crystal clear before permanently installing. Cleaning the sensor after permanently installing the IR-Cut will mean having to partially disassemble your camera.

There are two ways to install the IR-cut filter in your camera:

Permanent IR-Cut Placement (Fig. A)
This method will cover the sensor permanently. This configuration is recommended if you plan to use M12 lenses without built in IR-Cut filters. The filter is placed in the M12 ring filter socket and then installed directly over the sensor (Fig.A). Once installed, if the sensor requires cleaning you will have to partially disassemble the unit to do so.


Fig.A
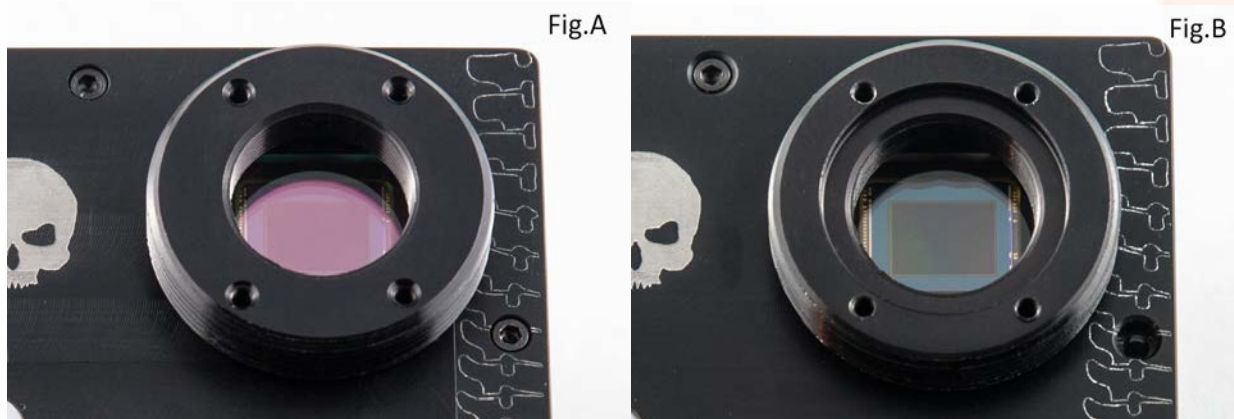
Fig.B

Removable IR-Cut Placement (Fig. B)
If you want the IR-cut filter to be removable for night vision, turn the ring over so that the filter socket faces forward (Fig. B). The advantages to this method are flexibility and easy access to the sensor for cleaning. The disadvantage is that the filter must be removed to access the M12 socket underneath. If your M12 lens doesn't have a built in IR-cut filter you won't get accurate color, but it will still be perfect for night vision.

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. 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.
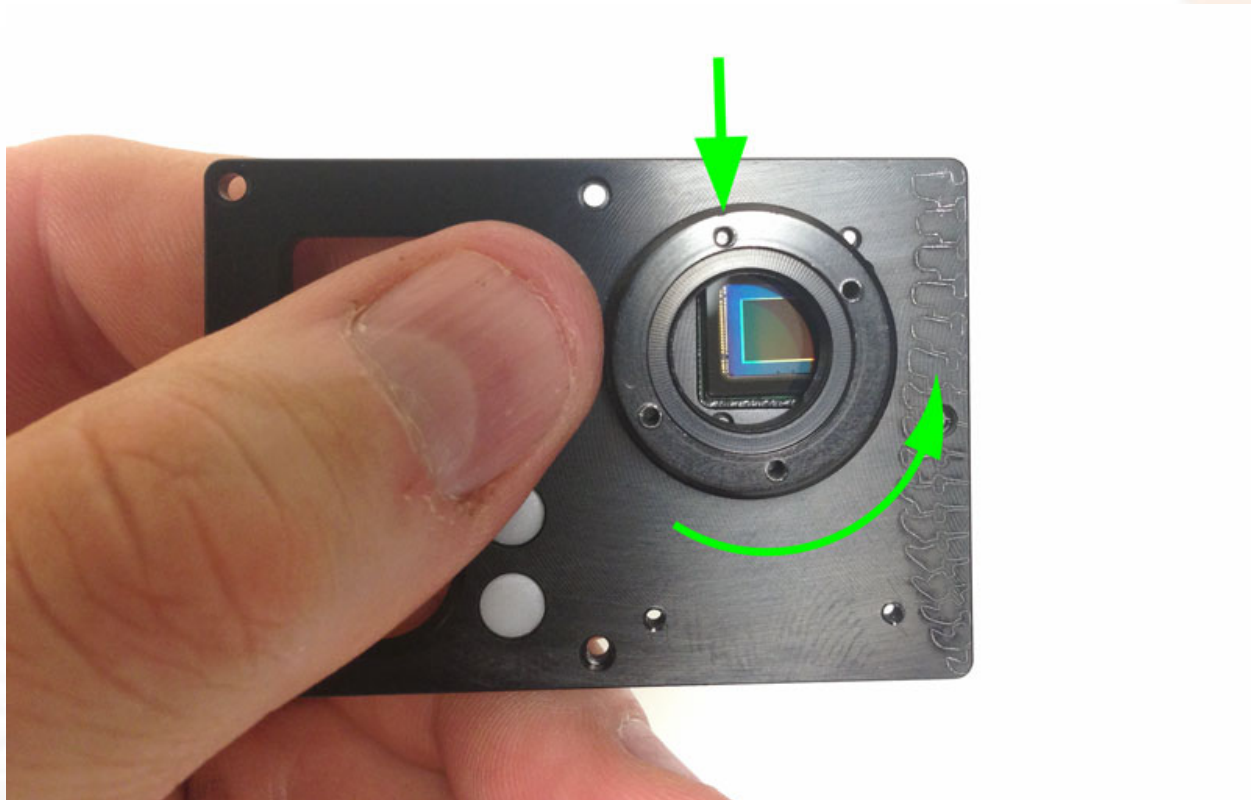
Lastly, we will gently in a repeating crisscross fashion tighten all 4 screws until the M-12 ring lays flush with the cover plate and the 4 screws are <u>SNUG ONLY</u> i.e. tighten only to the point of contact.
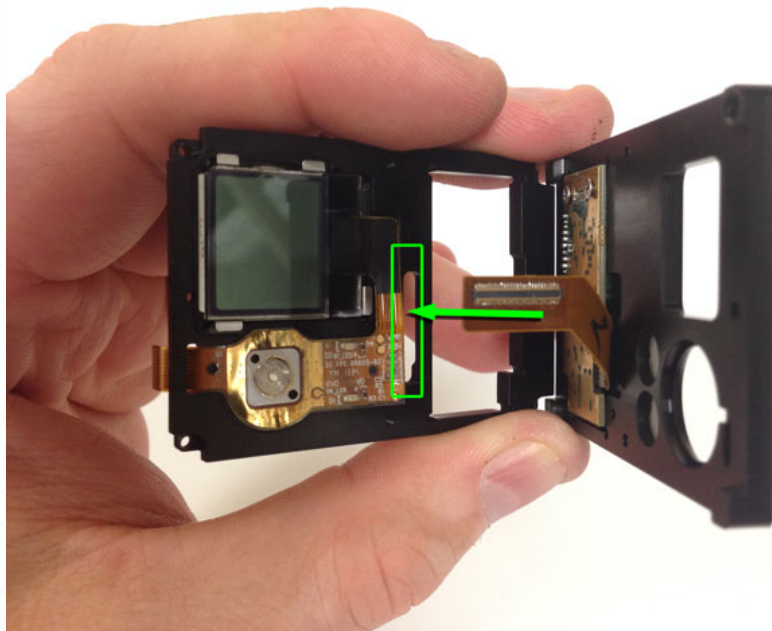
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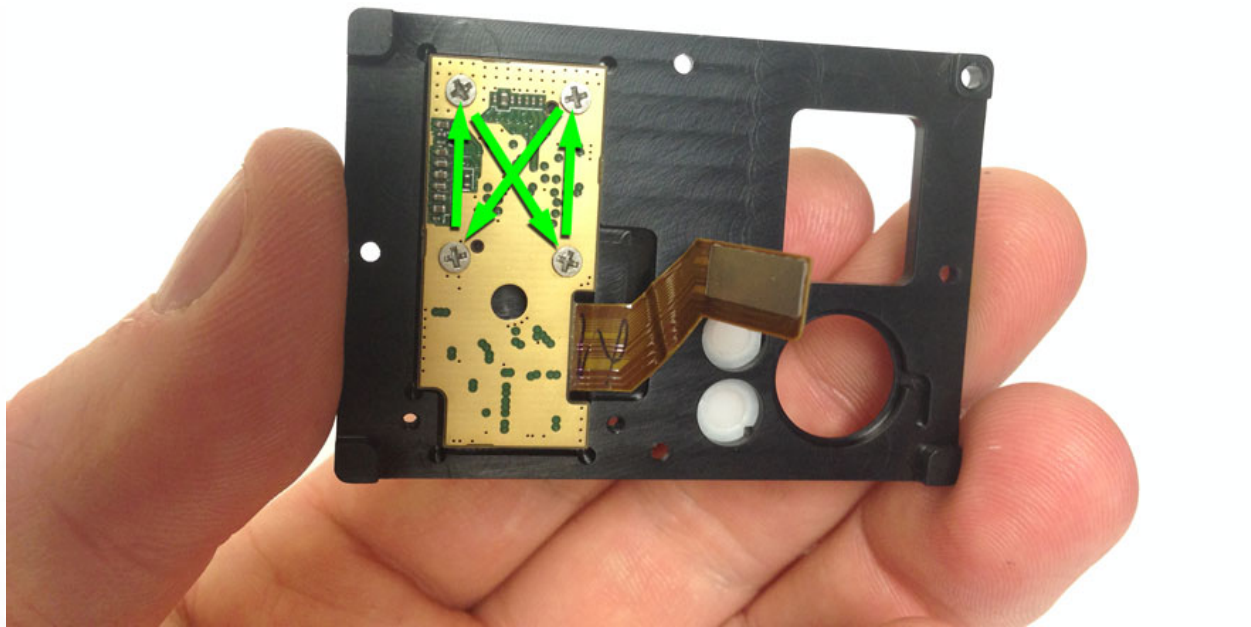
2-5 Attach the Cover Plate to the PCB Plate.
Video: http://youtu.be/83UAabt3hxc?t=13m44s

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 or two of the black 3/16" 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.*
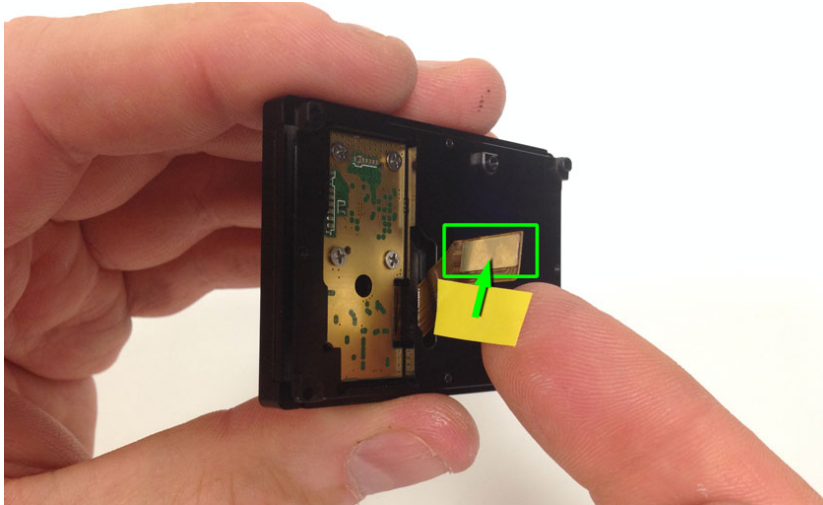
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2-6 Connect flexible PCB jumper to PCB plate.

Video: http://youtu.be/83UAabt3hxc?t=14m20s

Optional - If you wish you can choose to place a small piece of double-sided tape on the back of the flexible 50 pin connector and then tape it down after joining the connectors. **Be sure to use only thin tape, not any kind that has a thickness made of rubber or foam.**


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.
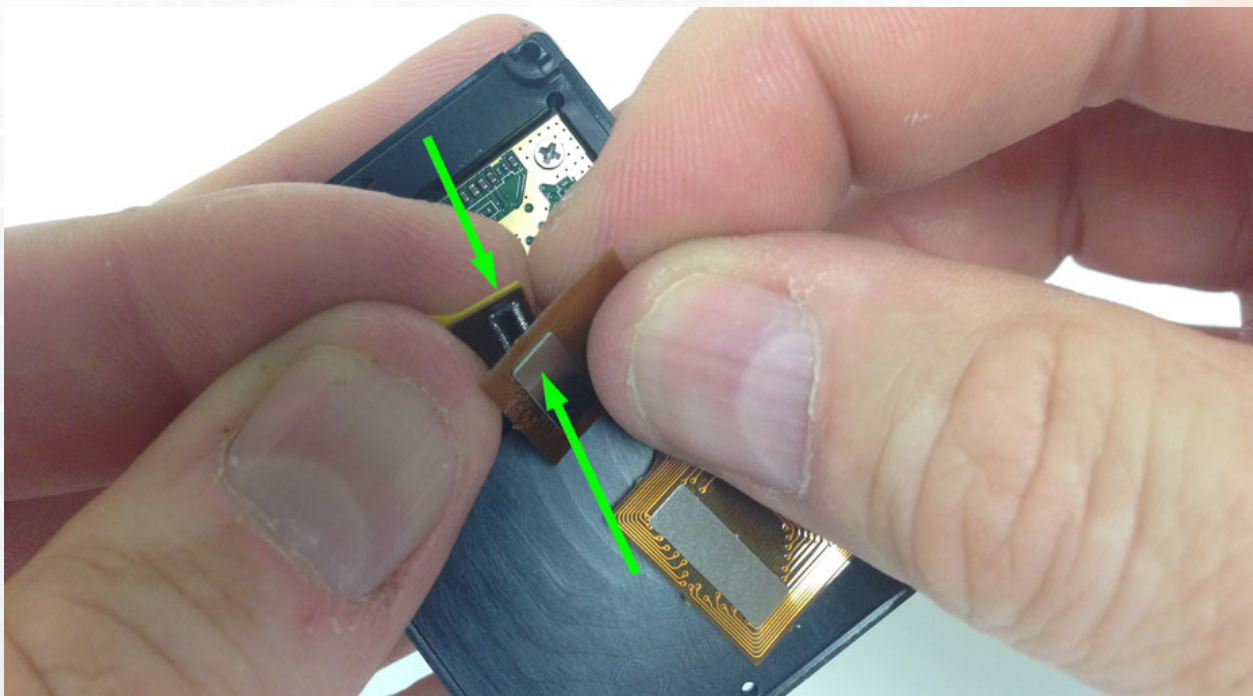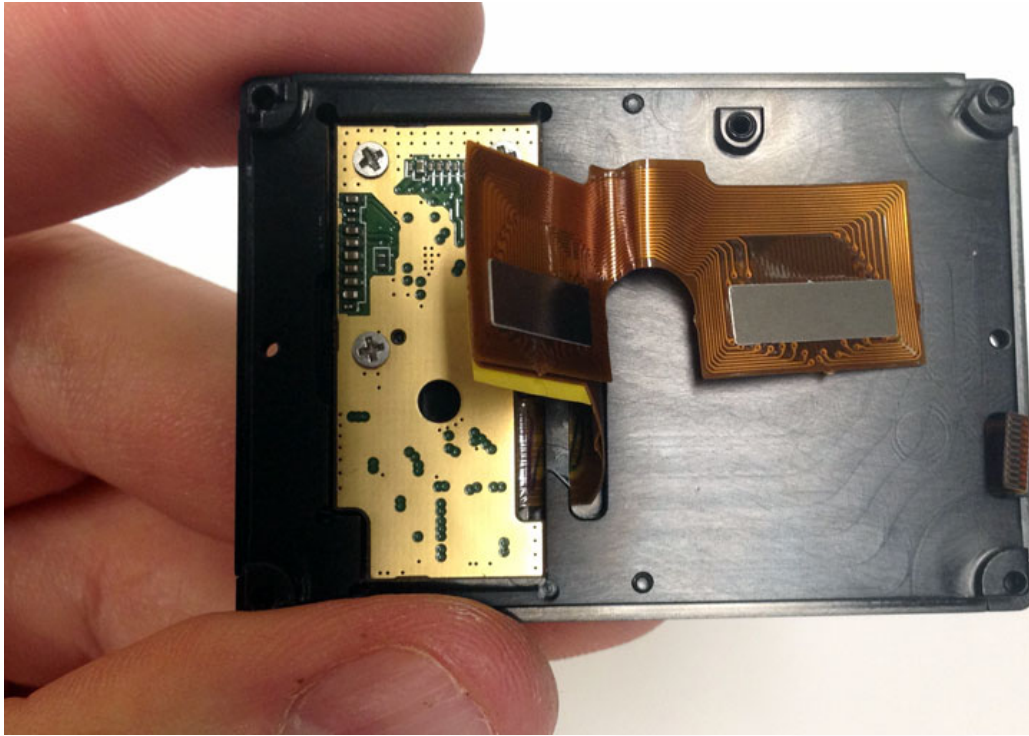
Place a small piece of electrical tape over top the metal stiffener on the flexible PCB. The tape will help isolate the metal stiffener from the bottom side of the PCB board that we will be attaching next. *Note: the electrical tape pictured is yellow but regular black electrical tape is also a great choice.*
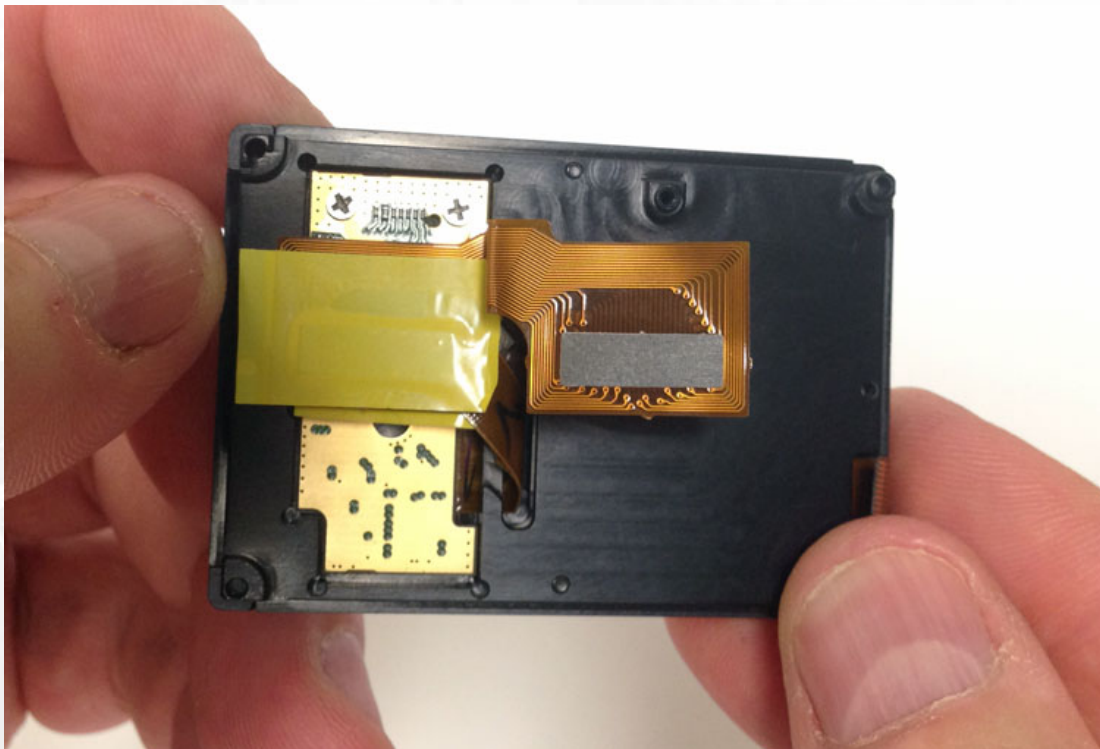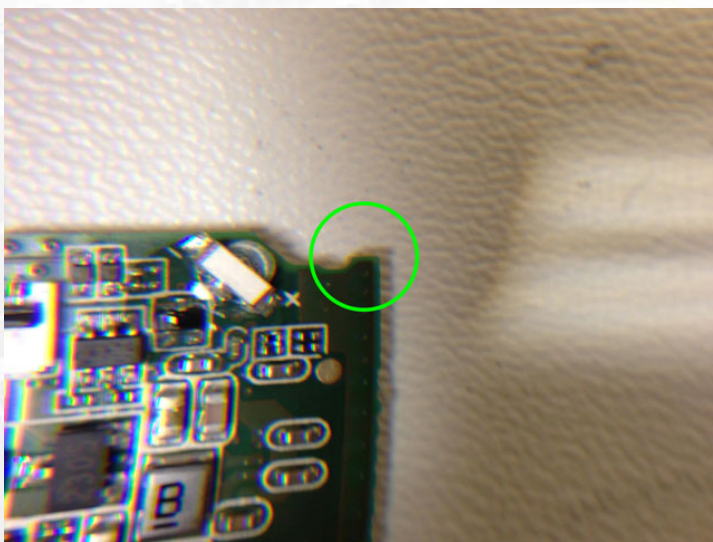
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Bend the flexible PCB 90 degrees. This will make attaching the PCB board in the next step easier.
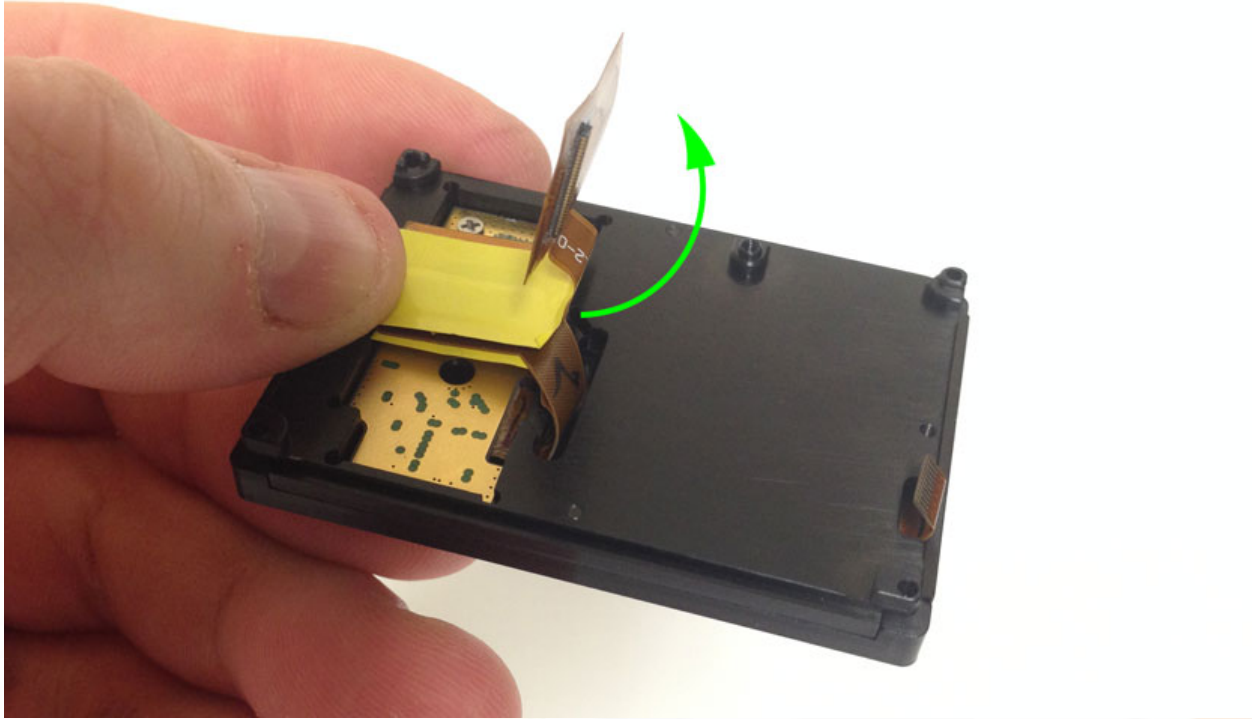
A Note for Hero3+ Installations:

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.

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

Attach the small ribbon connector and then carefully lay the PCB board on the PCB plate making sure to align the mounting hole.

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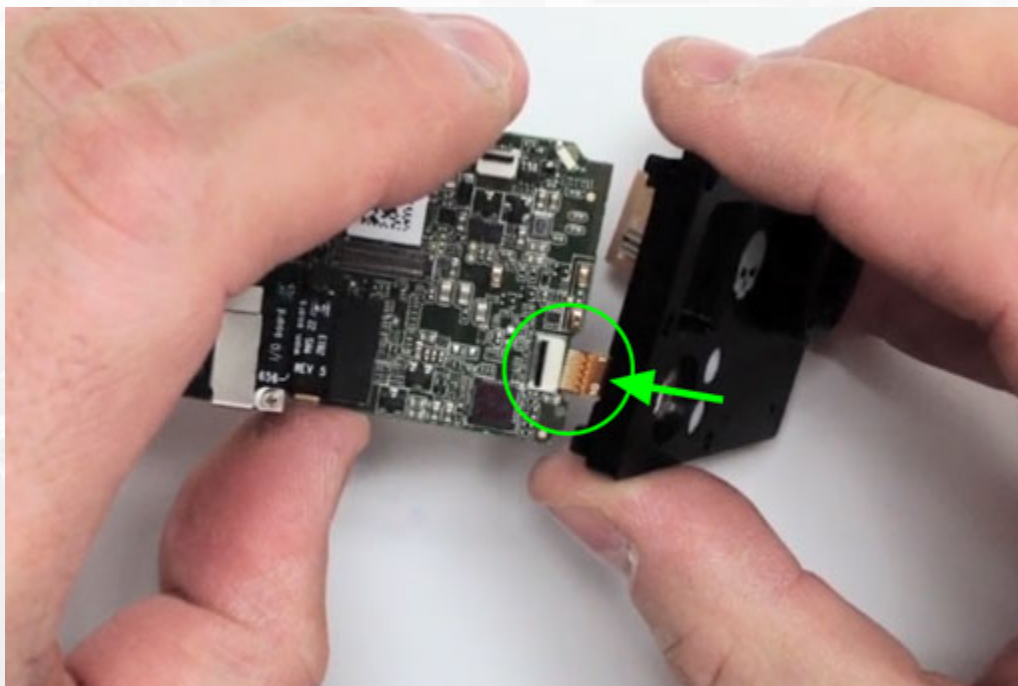
Flip down the black plastic locking mechanism to hold the LCD connector in place.
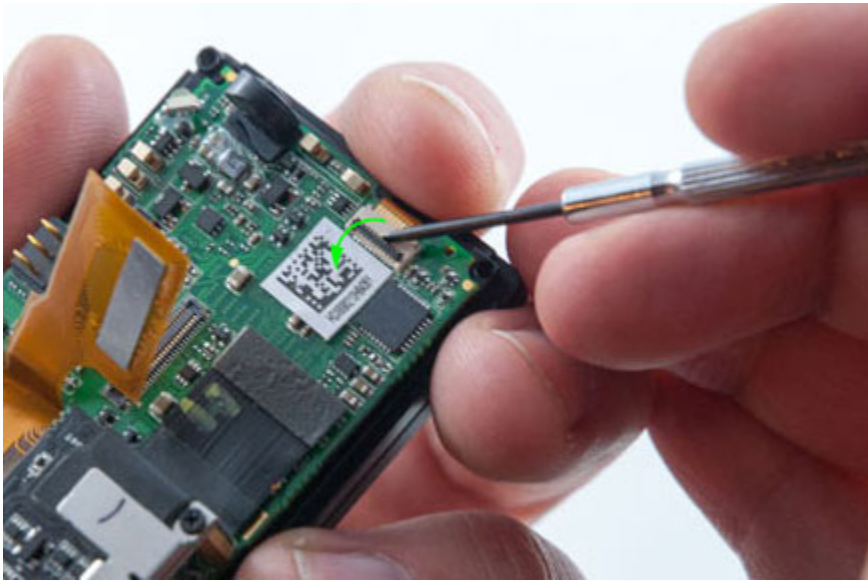
Carefully move the flexible PCB jumper into the empty area where the original lens assembly resided and match the through hole of the PCB board with the mount on the PCB plate. *Note: part of the flexible connector should remain tucked under the board slightly to form an 'S' shaped bend – do not try to pull it out and over as this can cause tearing or damage.*

Attach the board with the small metallic 1/8" Philips screw provided with the kit. *Note: the original screw will <u>not</u> work for this step.*
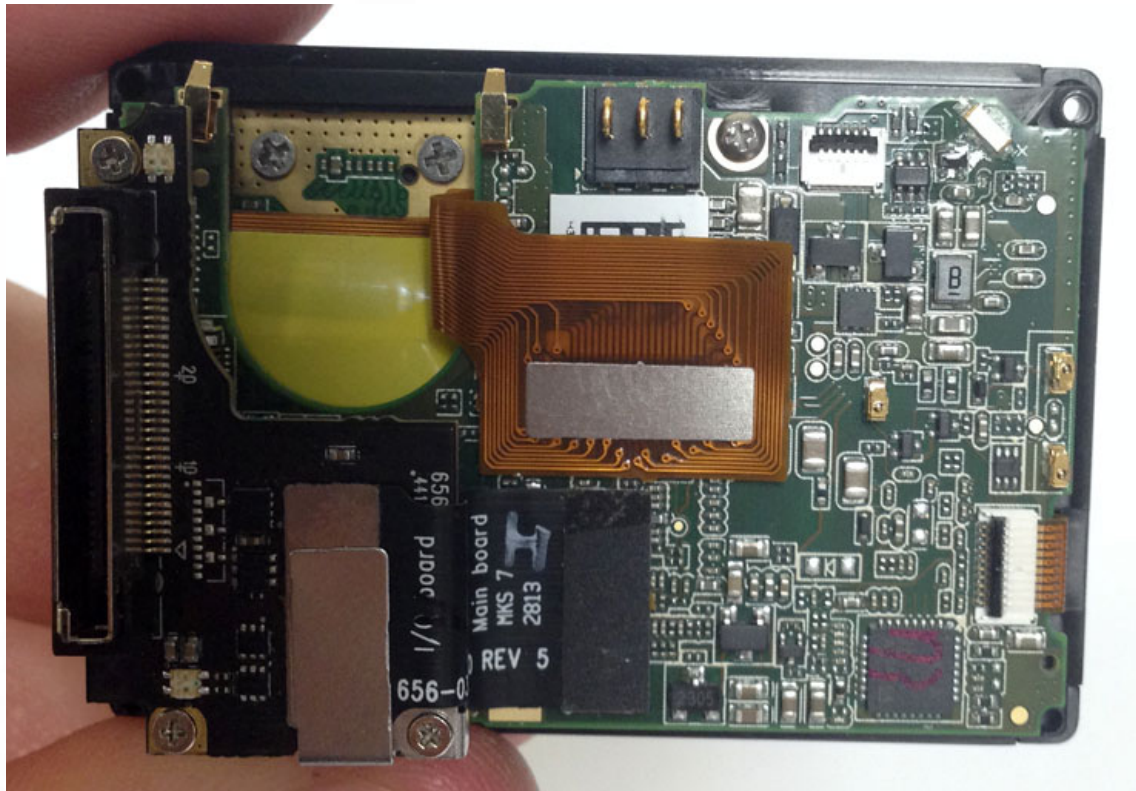

Connect the flexible PCB jumper to the PCM board taking care to align the connectors prior to exerting any pressure to seat them together. They should click together easily when properly aligned.
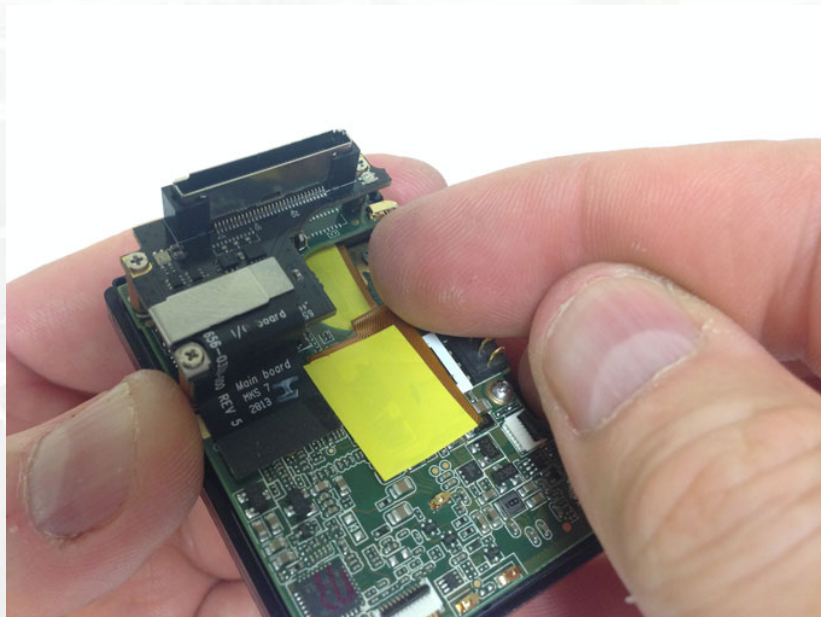
Ribcage Installation: Part 2 - Assembly

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

Add a small piece of electrical tape to the upper side of the flexible PCB jumper to help isolate the jumper from the housing.

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2-7 Functionality Test

Video: http://youtu.be/83UAabt3hxc?t=17m23s

Now it's time for a quick test. Take the 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.

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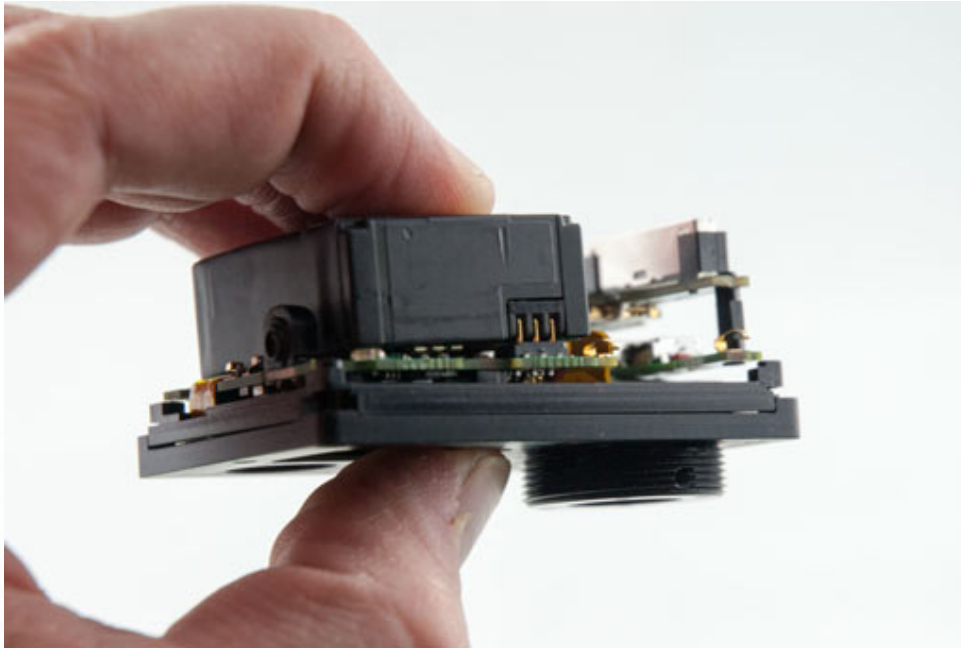
2-8 Put Ribcage Assembly Back Into Housing
Video: http://youtu.be/83UAabt3hxc?t=17m47s

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.
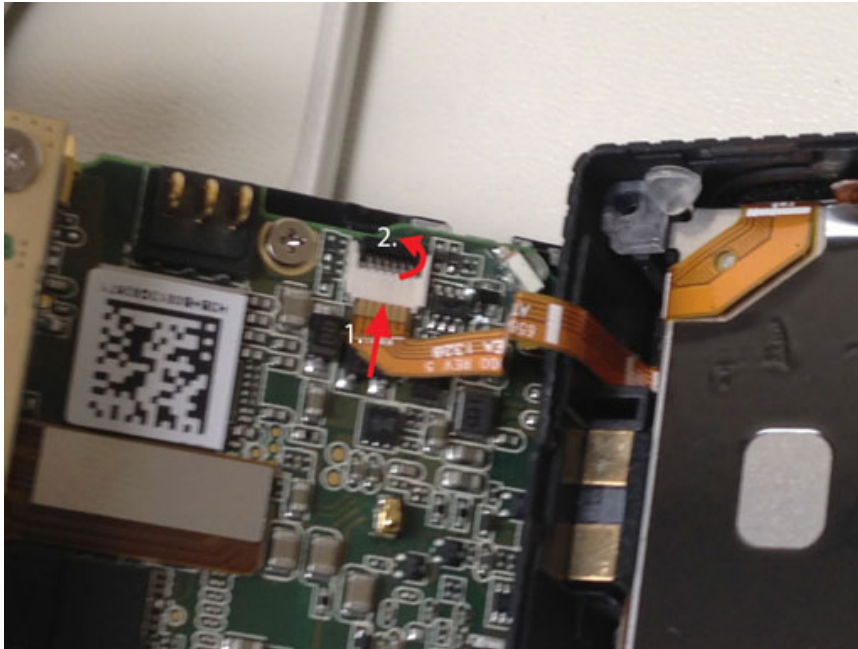
Take the Ribcage assembly and angle it back into the housing ensuring the HDMI and USB ports properly mate with their openings and the assembly is fully inserted.
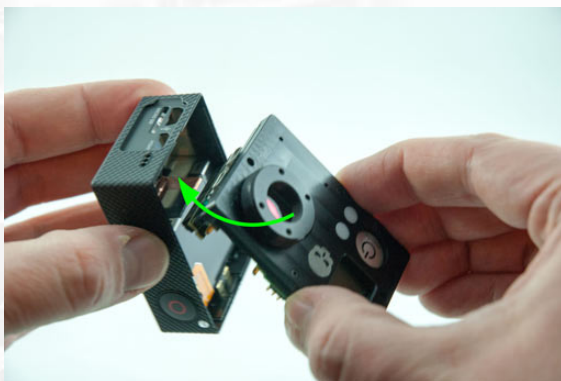
2-9 Release Cover Plate Screws

Video: http://youtu.be/83UAabt3hxc?t=18m20s
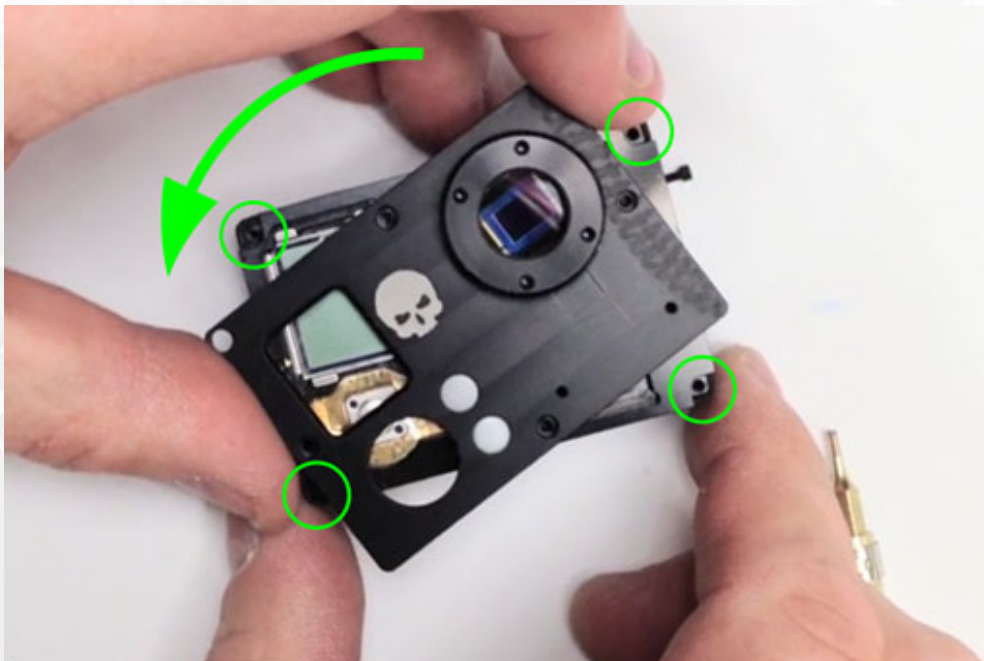
Release any screws holding on the new cover plate.

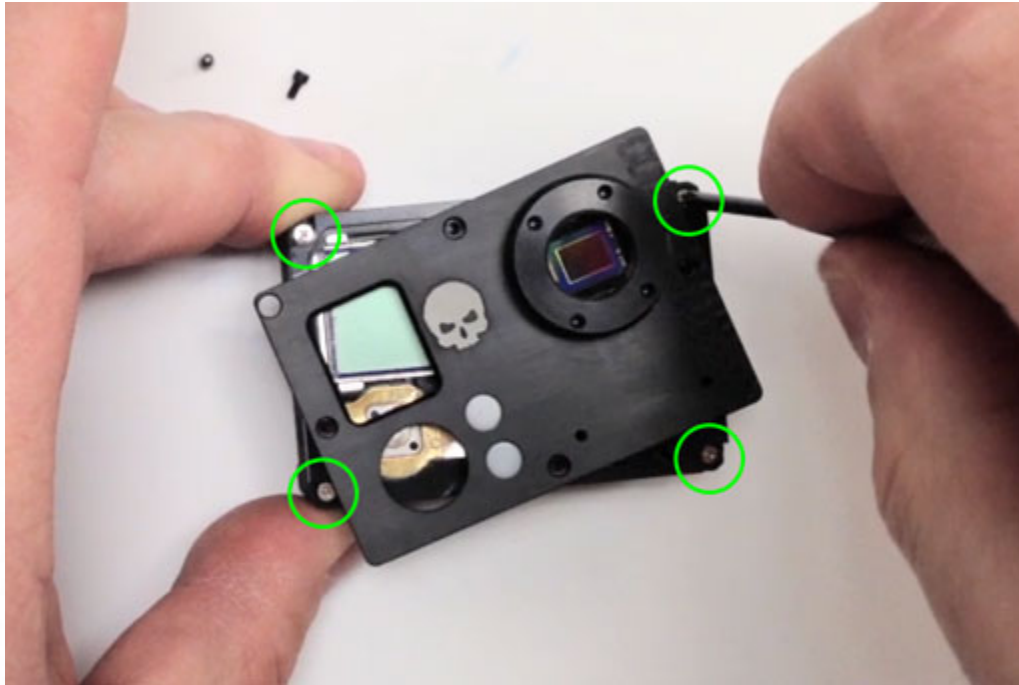Separate the plate slightly and rotate it about ten degrees to reveal the four screw holes located in the corners.

2-10 Insert Original Corner Screws

Video: http://youtu.be/83UAabt3hxc?t=18m33s

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

![BACK-BONE logo]

2-11 Screw on Cover Plate
Video: http://youtu.be/83UAabt3hxc?t=19m12s

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

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

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.

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2-12 Insert Set Screw Into M12 Ring
Video: http://youtu.be/83UAabt3hxc?t=20m22s

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.

2-13 Attach CS-Mount Ring

Video: http://youtu.be/83UAabt3hxc?t=20m52s

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.

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Use a puffer to remove any debris from the assembly.
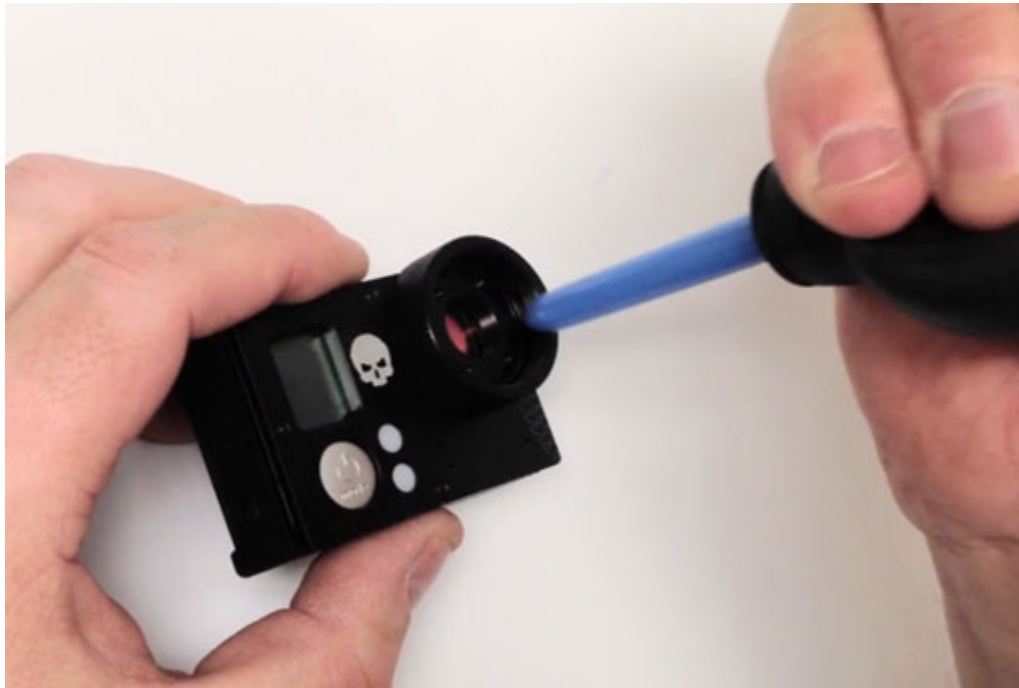
2-14 Re-attach Battery and Accessories

Video: http://youtu.be/83UAabt3hxc?t=21m53s

Re-attach the battery and accessories.

2-15 Install IR Cut Filter and Holder

Video: http://youtu.be/83UAabt3hxc?t=22m25s

If you've chosen to have a removable IR-cut filter, remove the CS-Mount ring and thread the plastic IR-cut holder into the front until it drops into place at the bottom. The plastic holder is designed to have a snug fit, so please take your time and don't force the part.

Drop the IR cut filter into the front of the M12 ring and screw the CS-Mount ring back into position on top.

2-16 Attach C-Mount Ring

Video: http://youtu.be/83UAabt3hxc?t=23m12s

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

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2-17 Attach Tripod Mount
Video: http://youtu.be/83UAabt3hxc?t=23m28s

Attach the Ribcage tripod plate using two black 3/16" screws provided. 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.

2-19 Done!
Video: http://youtu.be/83UAabt3hxc?t=24m9s

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