

Instructions v1.0

An updated version is available from our resources page: <http://naturebytes.org/wildlife-cam-kit-resources>



Naturebytes Wildlife Cam Kit

Assembly Instructions v1 (Kickstarter Edition)

An updated version is available from our resources page:
<http://naturebytes.org/wildlife-cam-kit-resources>



About your kit and this Guide



This guide will take you through the assembly process and all you need to know to get started with your Naturebytes Wildlife Cam Kit. Use the images and read the description carefully to help you through each step. Let's go!



Watch out for the caution symbol. It helps you identify areas where you need to pay particular attention, or where you may need to check that you have connected a cable correctly for example.

What is the Naturebytes Wildlife Cam Kit?

The Naturebytes Wildlife Cam Kit is a wildlife camera that anyone can build to take stealthy, high definition images of wildlife.

Beginner, expert, wildlife enthusiast or hacker, the Raspberry Pi powered kit is a fun way to develop your digital making skills and an exciting new insight into the natural world.



Who are these instructions for?

These instructions are for anyone with a Raspberry Pi A+ Wildlife Cam Kit, or for a school using the original Raspberry Pi 1. The guide includes instructions to assemble both kits.



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2. Make It
3. Test it
4. Set it up
5. Viewing your photos
6. Support



What's in the Wildlife Cam Kit?

1

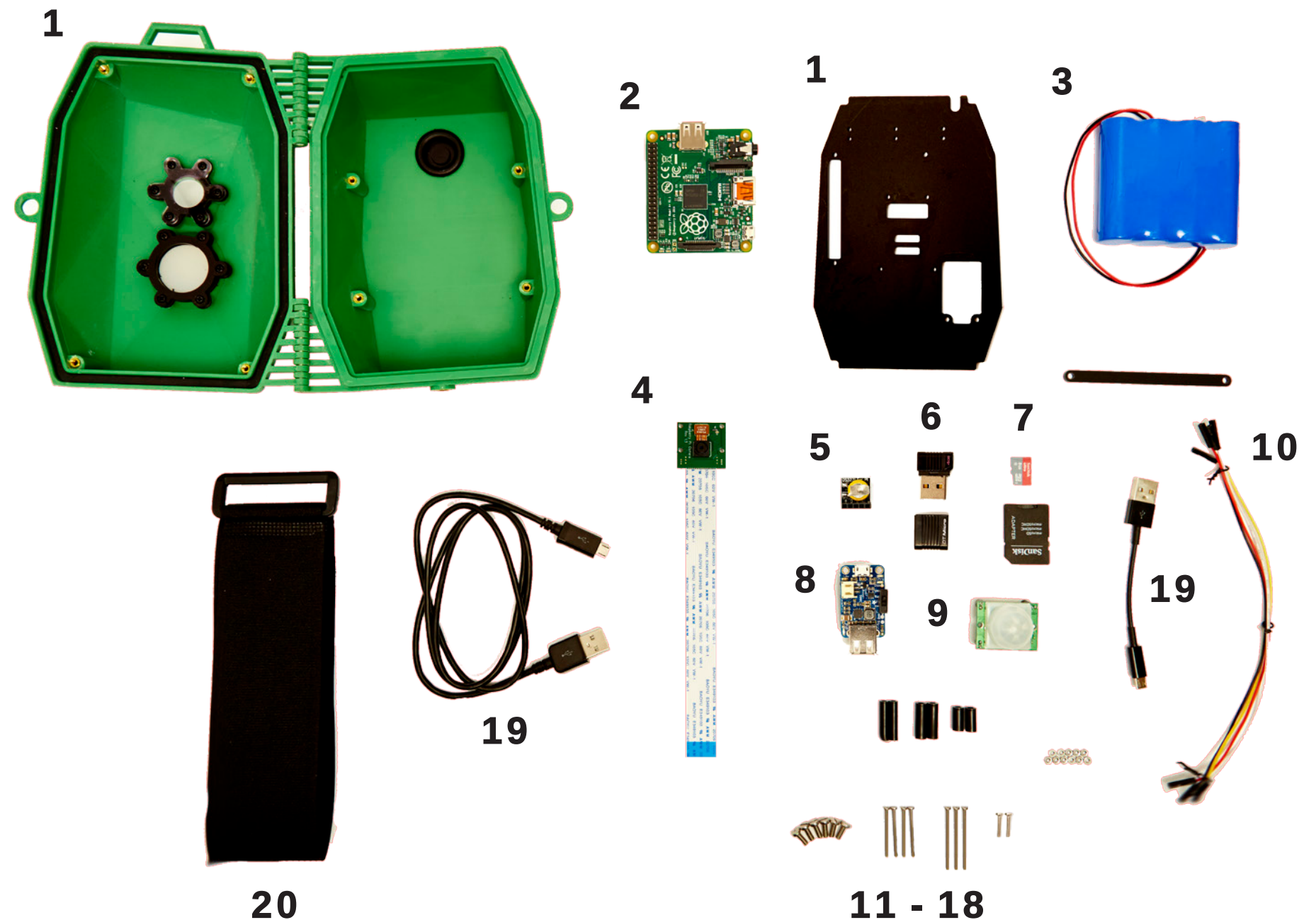
TASK 1

Open your box and check that you have each of the components displayed.

We also recommend using a 1mm flathead screwdriver to help you screw in the smaller screws in your pack.



1. Waterproof case & insert
2. Raspberry Pi
3. Li-ion battery
4. Pi camera
5. Real time clock
6. USB flash drive
7. SD card
8. Powerboost 500 charger
9. PIR sensor
10. Jumper cables
11. Inserts (3 x 20 mm)
12. Inserts (2 x 18 mm)
13. Inserts (2 x 12 mm)
14. Nuts (9 x M2)
15. Screws (3 x M3 8mm)
16. Screws (4 x M2 25mm)
17. Screws (2 x M2 30mm)
18. Screws (2 x M2 8mm)
19. USB (micro) cables
20. Nylon strap



What's in the Computer Kit?

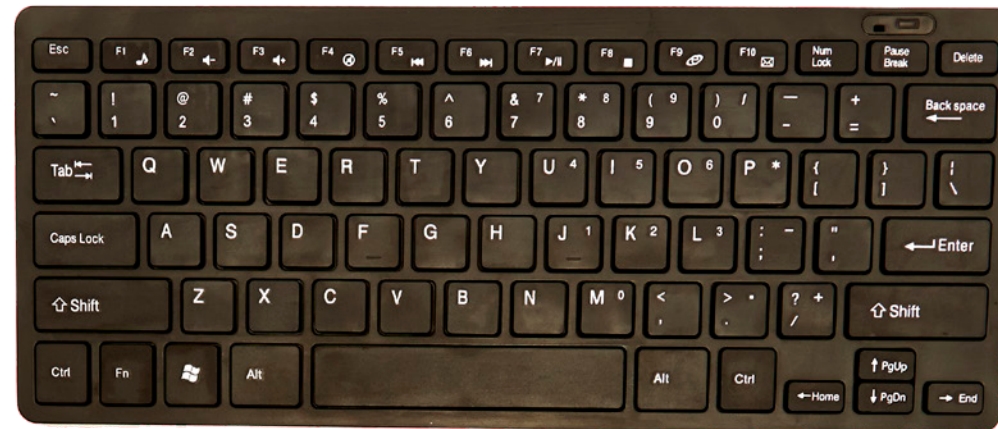
1

Computer Kit Checklist

Open your box and check that you have each of the components displayed.

1. Keyboard
2. HDMI wire
3. USB splitter
4. WiFi dongle
5. Mouse
6. USB power wire
7. Plug

1



What's in the Birdfeeder Arm Extension?

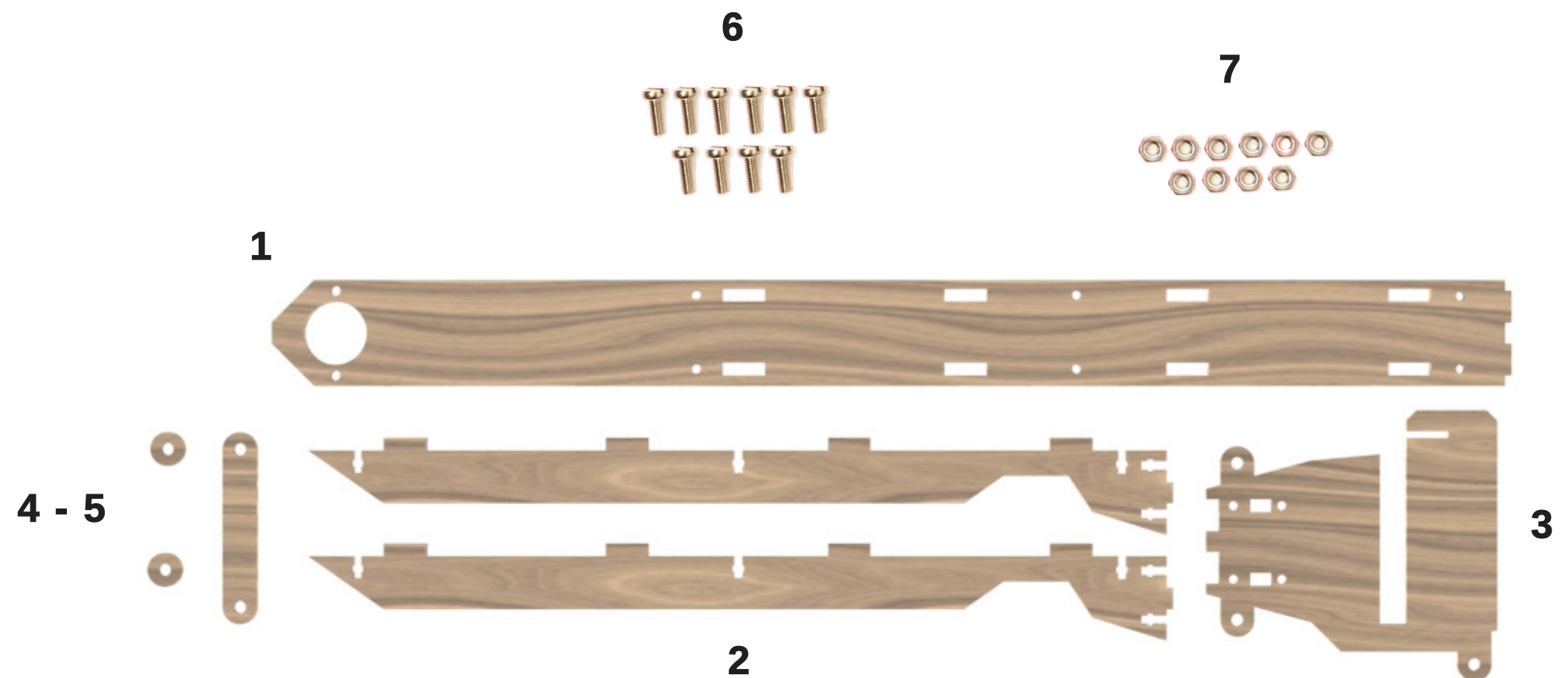
1

Birdfeeder Arm Checklist

Open your box and check that you have each of the components displayed.

Note - the standard kit doesn't come with a birdfeeder arm by default, it's an optional extra.

1. Top
2. Support x 2
3. Back
4. Spacer 1
5. Spacer 2
6. Screws
7. Nuts 10 x M3

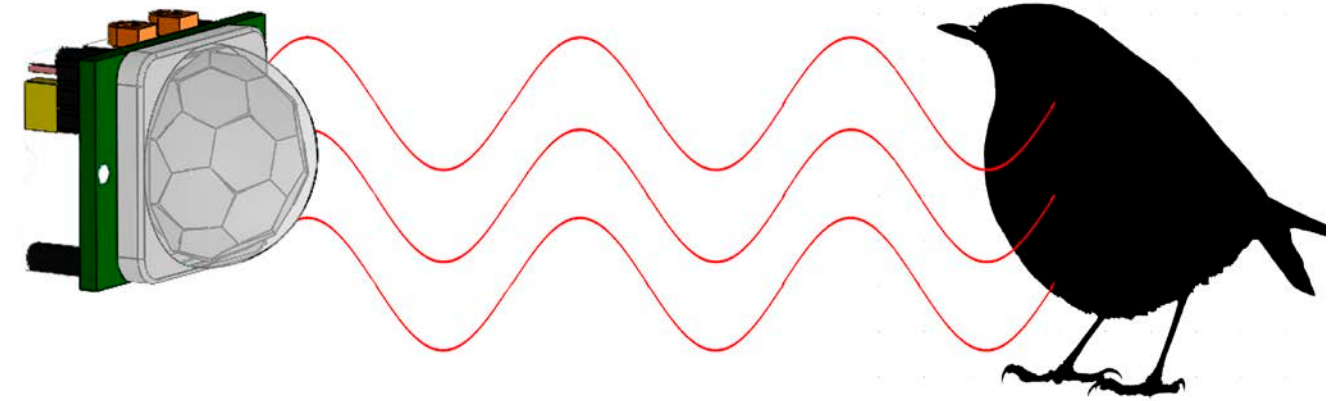


The PIR Sensor

1

What is the PIR Sensor?

The PIR (Passive InfraRed) sensor is a really clever part of your kit. The sensor can detect body heat from warm blooded animals (birds, foxes, dogs and even you). Body heat is given off in the form of invisible Infrared energy, so when a warm blooded animal walks past it will trigger the camera to take a photo!



Front



Back



The Pi Camera

1

About the camera

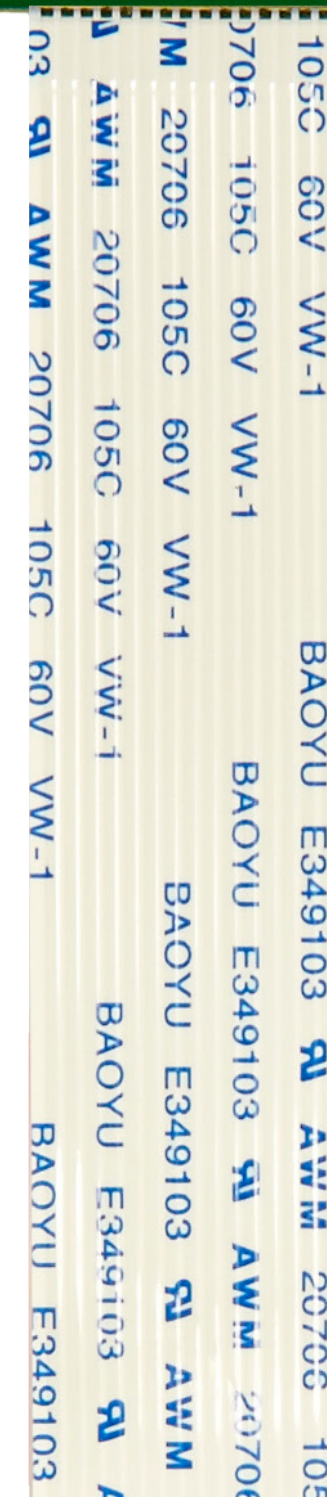
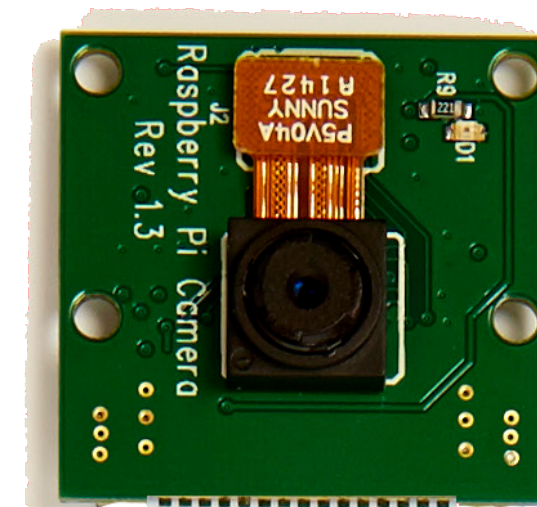
The Raspberry Pi camera module can be used to take high-definition photos, as well as 30 frames per second video.

It's a 5.0 megapixel camera, which means that when it takes a photo it saves 5 million pixels (tiny dots) of information. The maximum resolution is 2592×1944, but we have set it to take 1920 x 1440 photos as they are large enough and take up less space on the USB drive.

Specification:

Size : 25 mm x 24 mm x 9 mm

Fixed focus : 1 meter

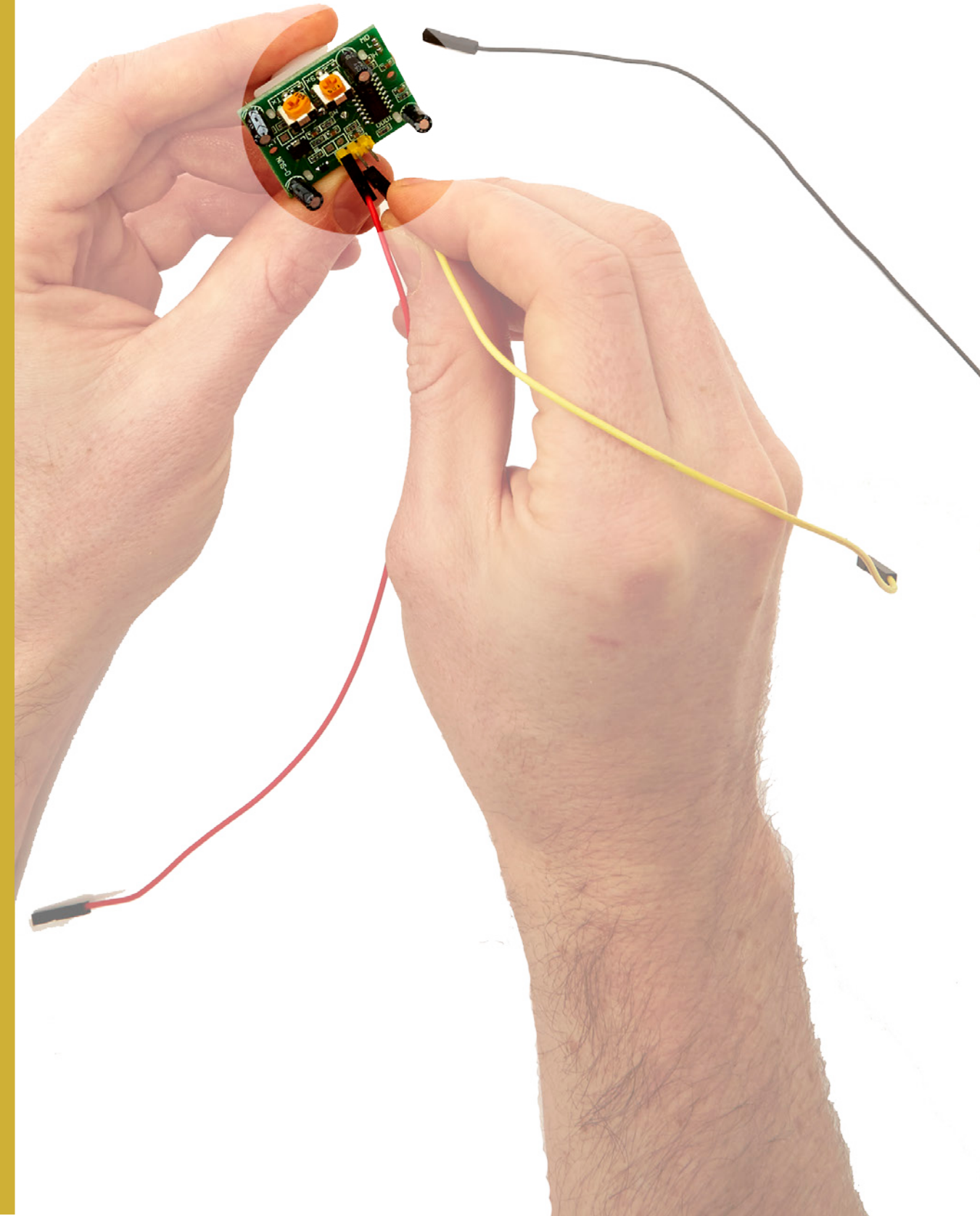


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Make it | The PIR Sensor

2

Task 1 - Connect the jumper cables to the PIR

We're going to attach the cables to the PIR sensor.

There are three PINs labelled VCC, OUT and GND.

Make sure the the correct colour cable is connected to the correct Pin as follows:

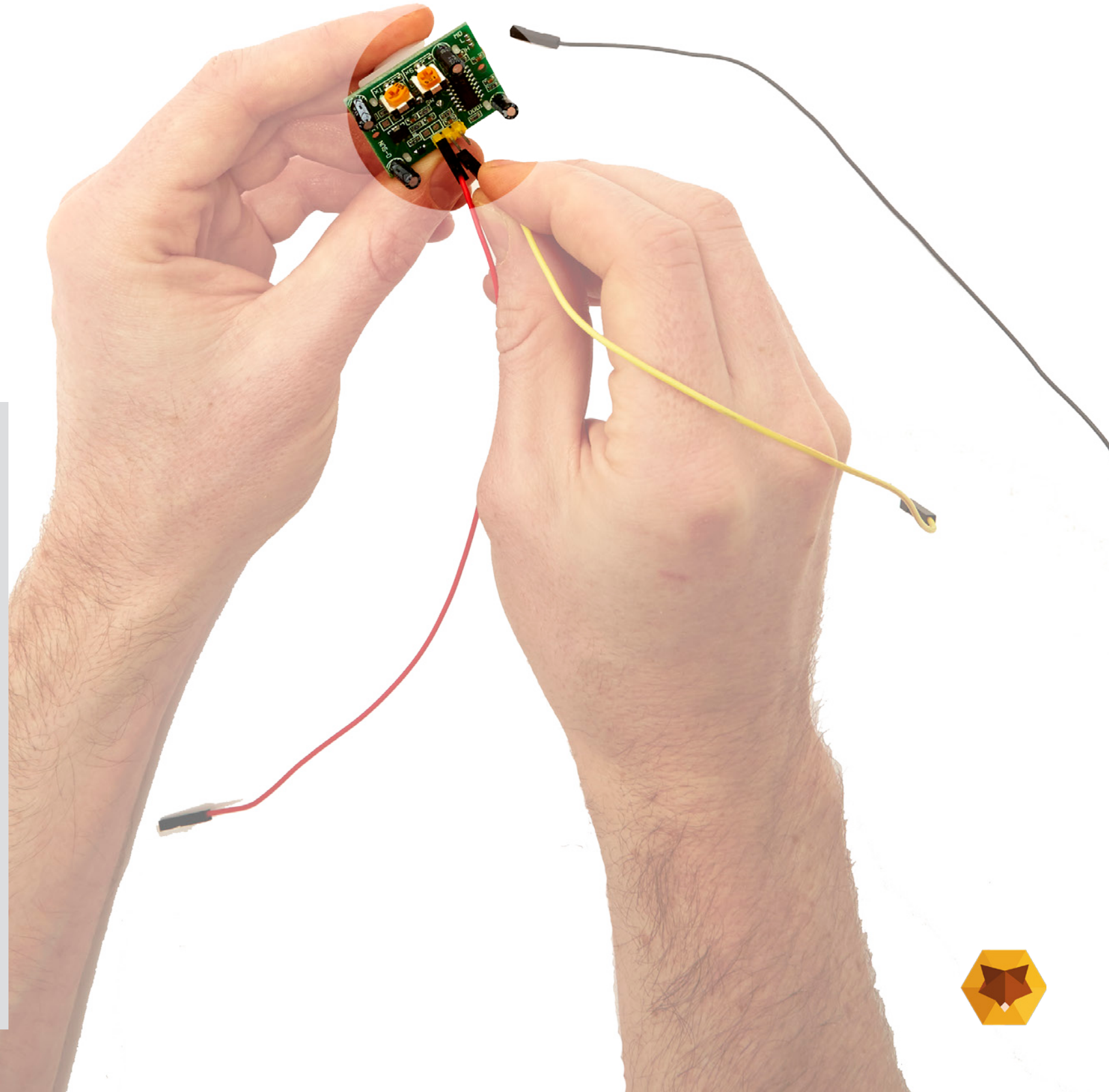
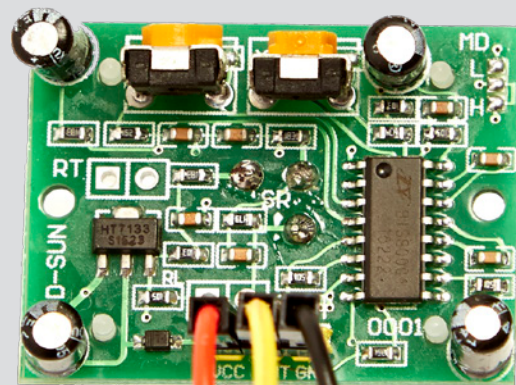
Red Cable - VCC

Yellow Cable - OUT

Black Cable - GND

Attach the cables like so

VCC = Red
OUT = Yellow
GND = Black



Make it | Feeding the wire through the insert

2

Task 2 - Feeding the cable wire through

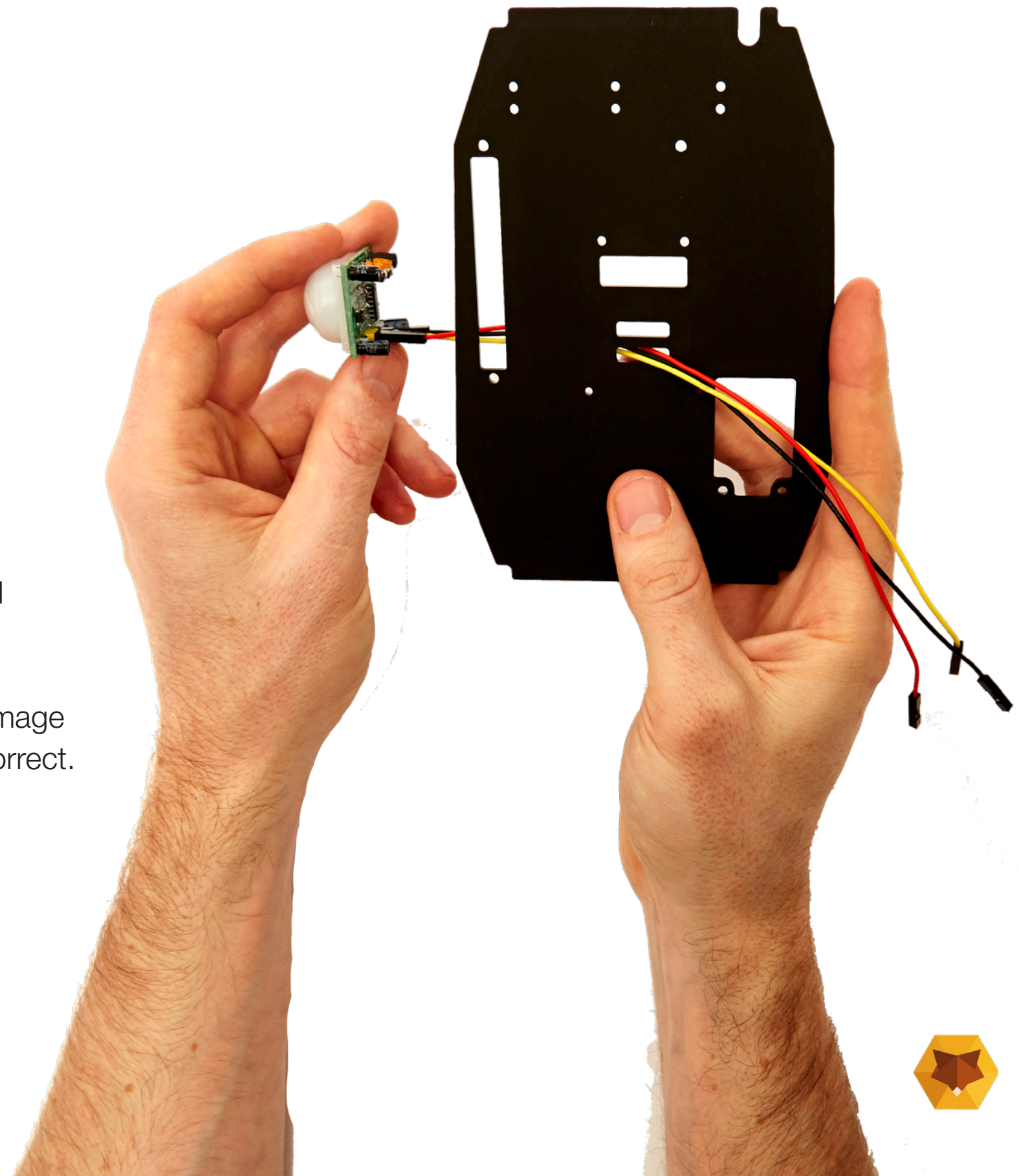
Pass the jumper cable wires through the lower hole as seen in the image below. You need to make sure that the PIR is being fed through the correct side.

You will need the PIR assembly that you just made and the black insert.



Make sure the wires are fed through the slot highlighted.

Hold your insert up to the image on the right to check it is correct.



Make it | Securing the PIR & cables

2

Task 3 - Securing the PIR

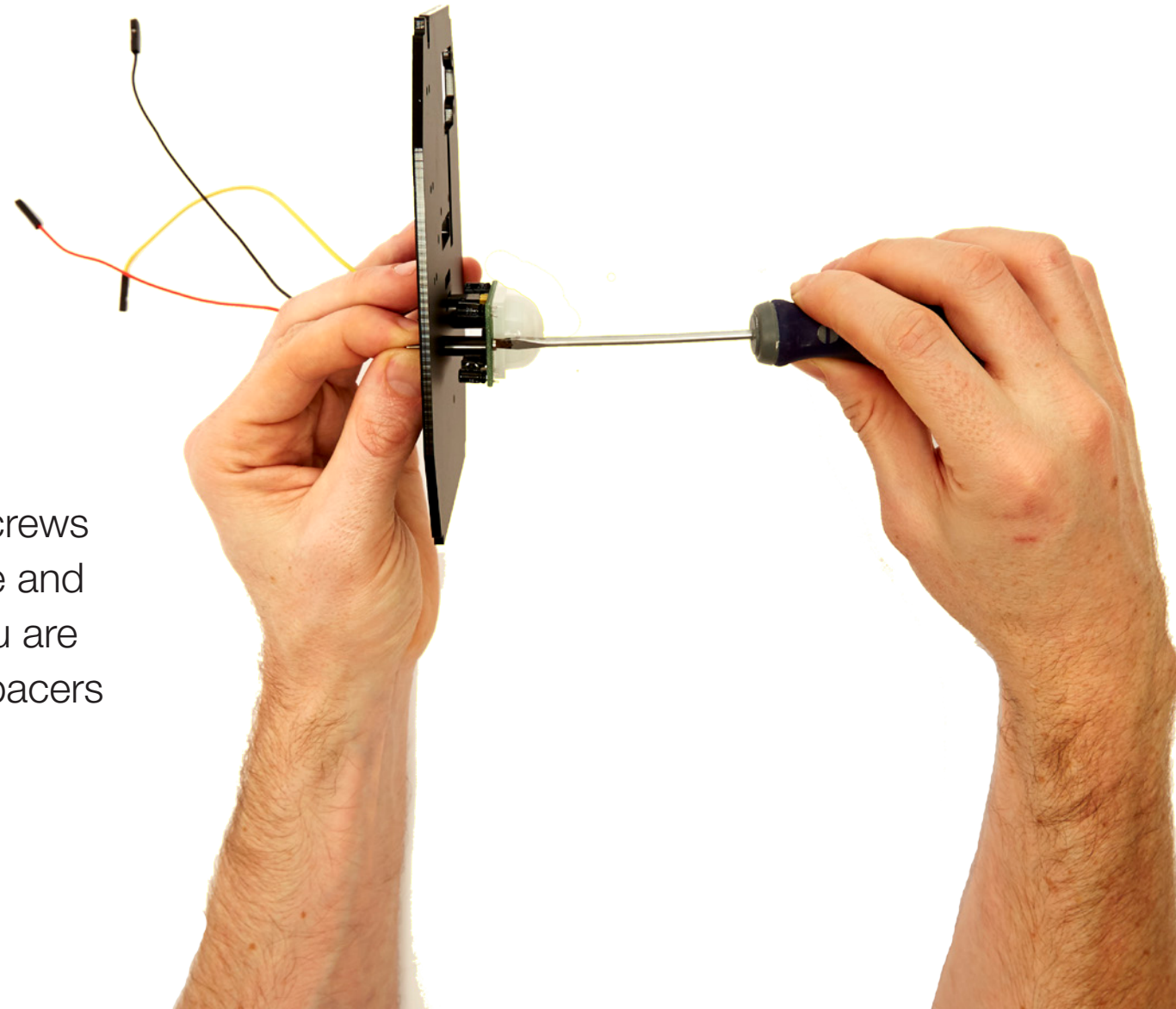
Screw the PIR onto the insert making sure that the spacers go between the two. See the diagram to the right.

You will need:

3 x Screws (M2, 25mm - the middle sized ones)

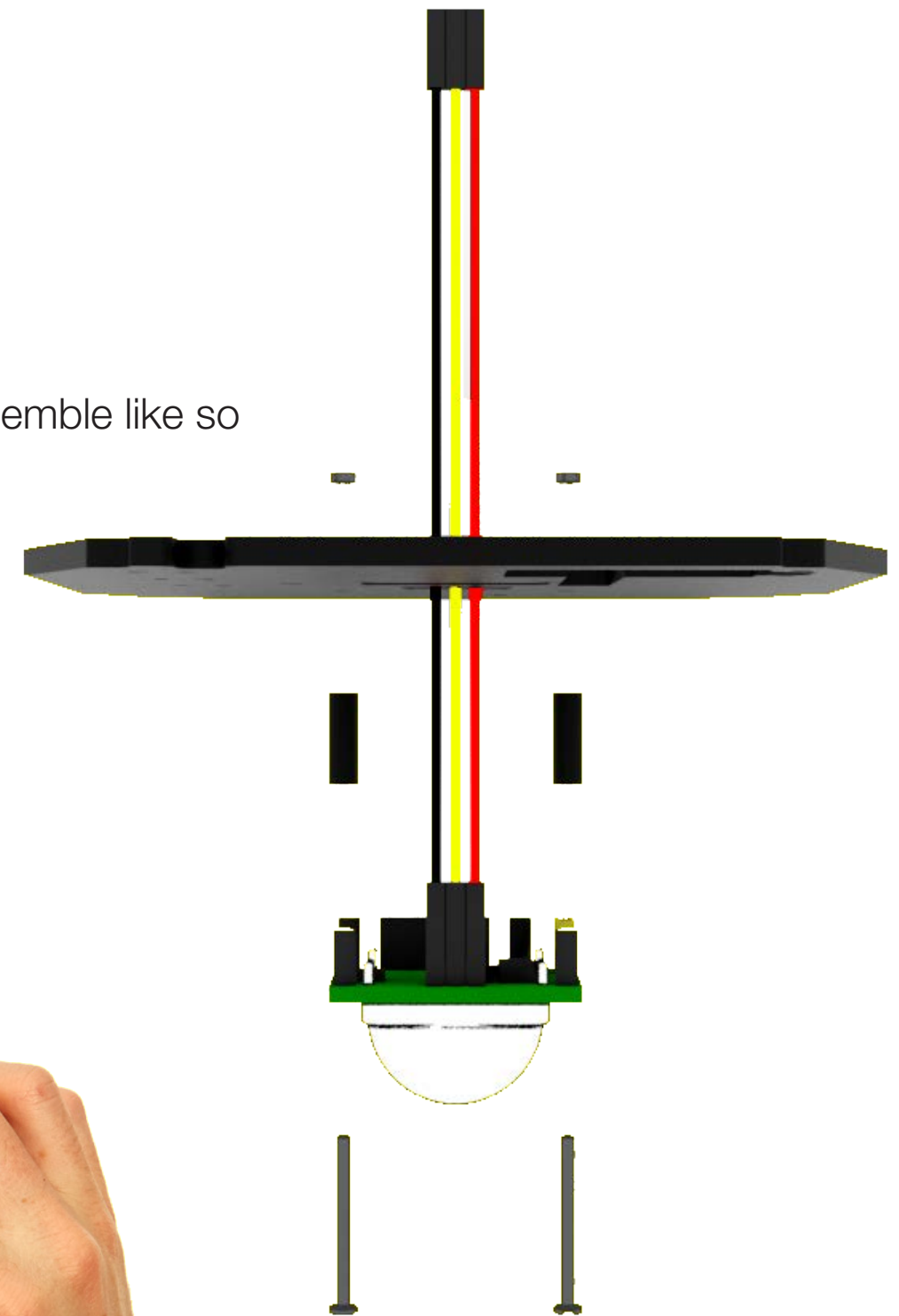
2 x Nuts (M2)

2 x Spacers (12 mm) - the smallest ones



Make sure the screws and nuts are nice and tight and that you are using the right spacers and screws.

Assemble like so



Make it | Feeding the wires back through

2

Task 4 - Feeding the wires back through

Feed the wires through the insert from Side B to A, as shown in the diagram.



Make it | Adding the camera

2

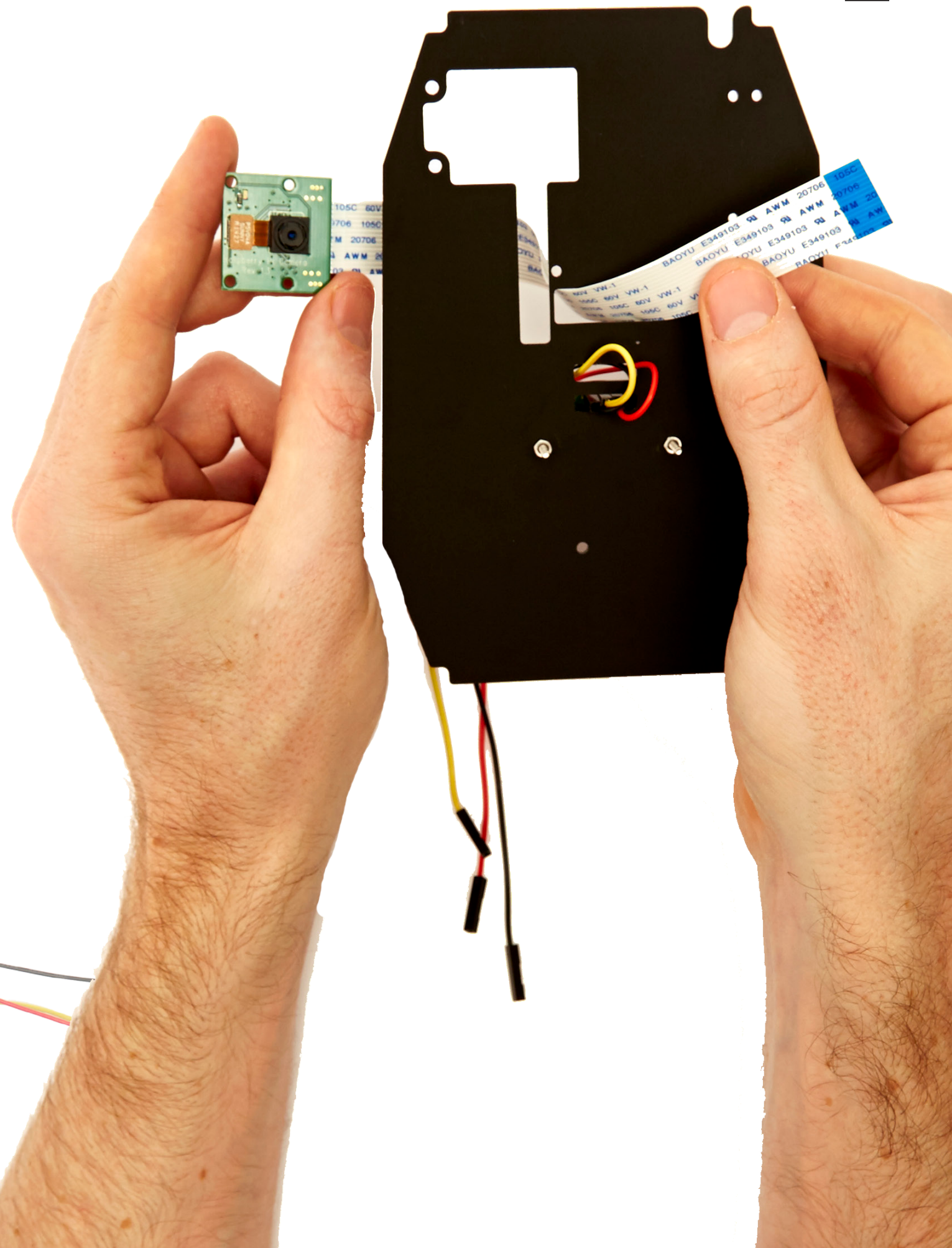
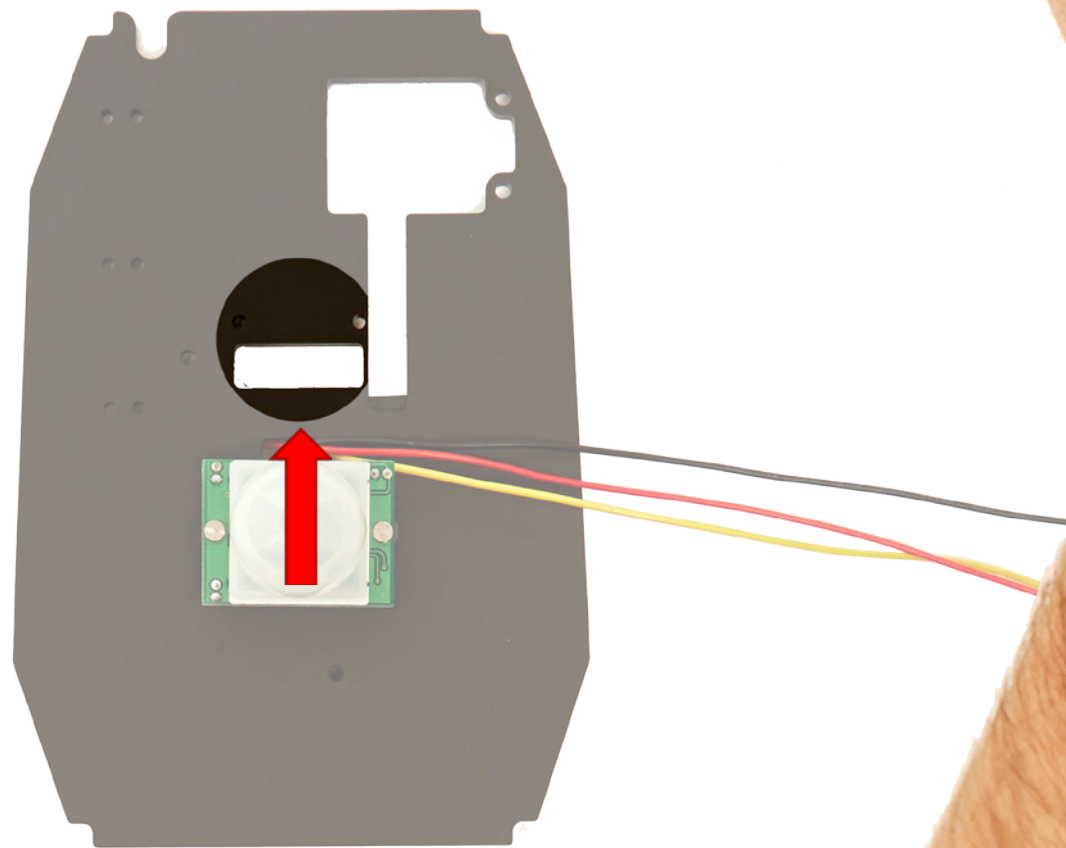
Task 5 - Feed the camera through the insert

Next, we need to feed the ribbon through from side A to B. Feed the camera ribbon through the hole highlighted below.



Position the insert as seen to the right and then feed the camera ribbon through the upper-middle slot.

Hold your insert up to the image on the right to check it is correct. The camera should be on the same side as the PIR sensor.



Making it | Securing the camera

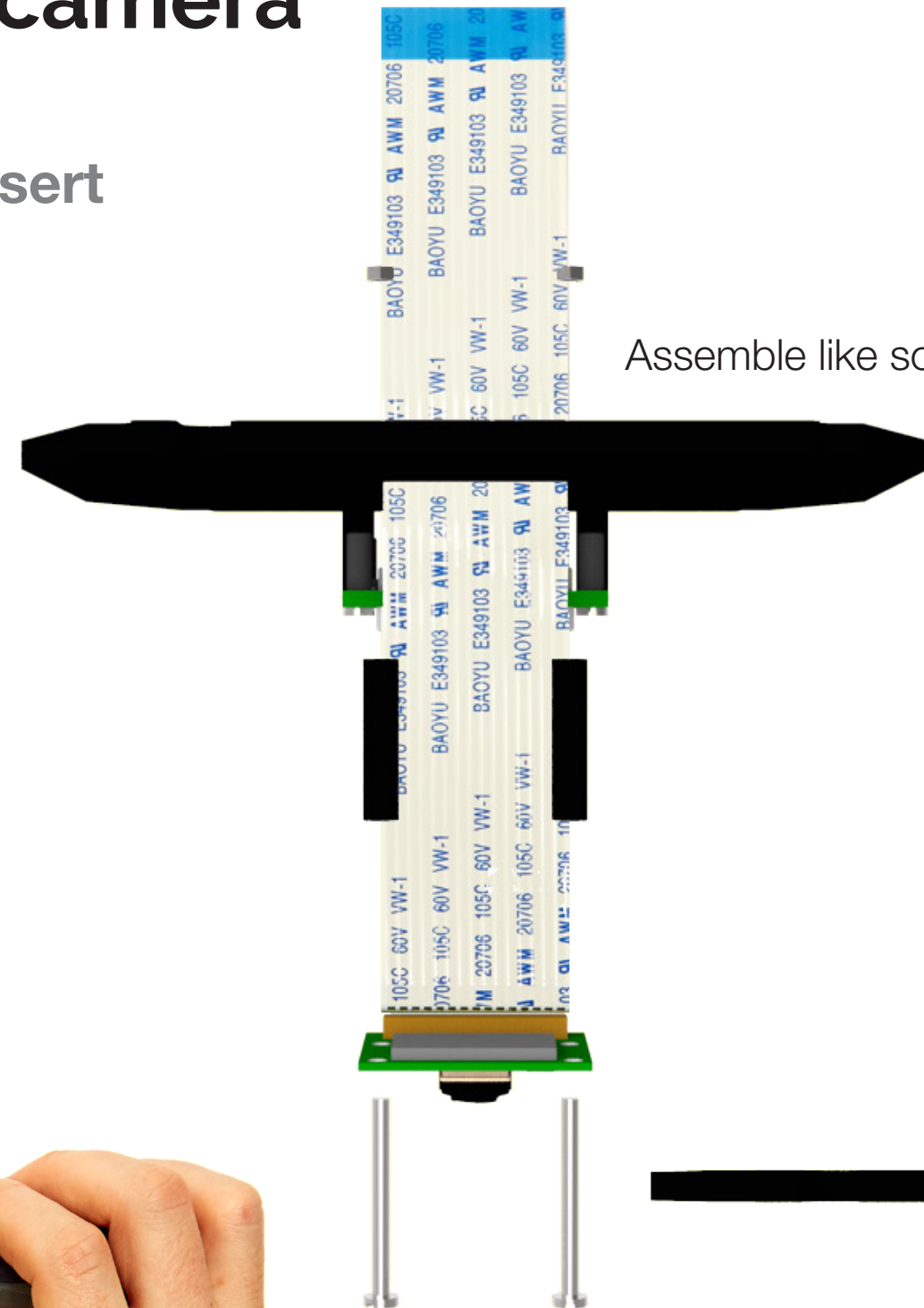
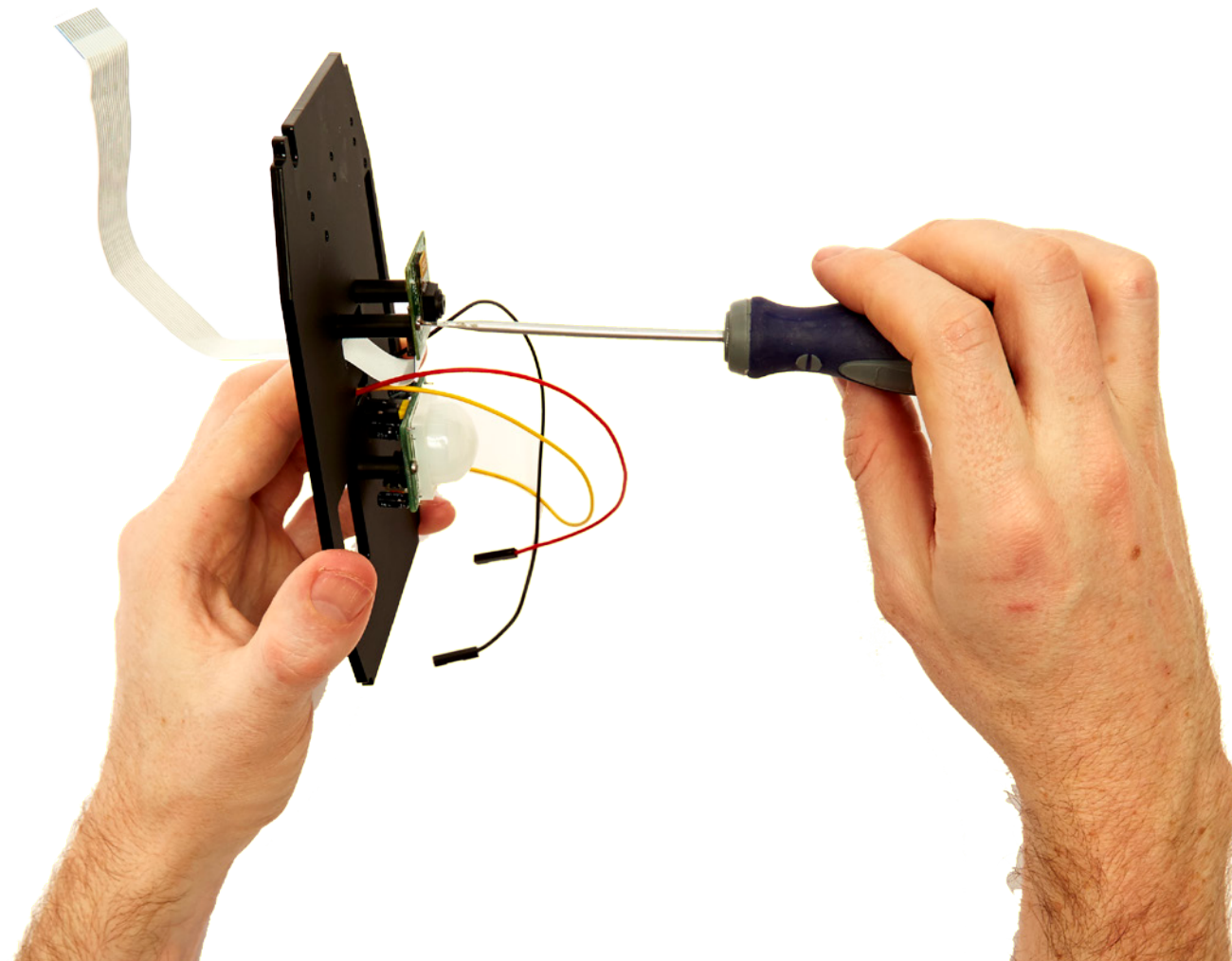
2

Task 6 - Secure the camera to the insert

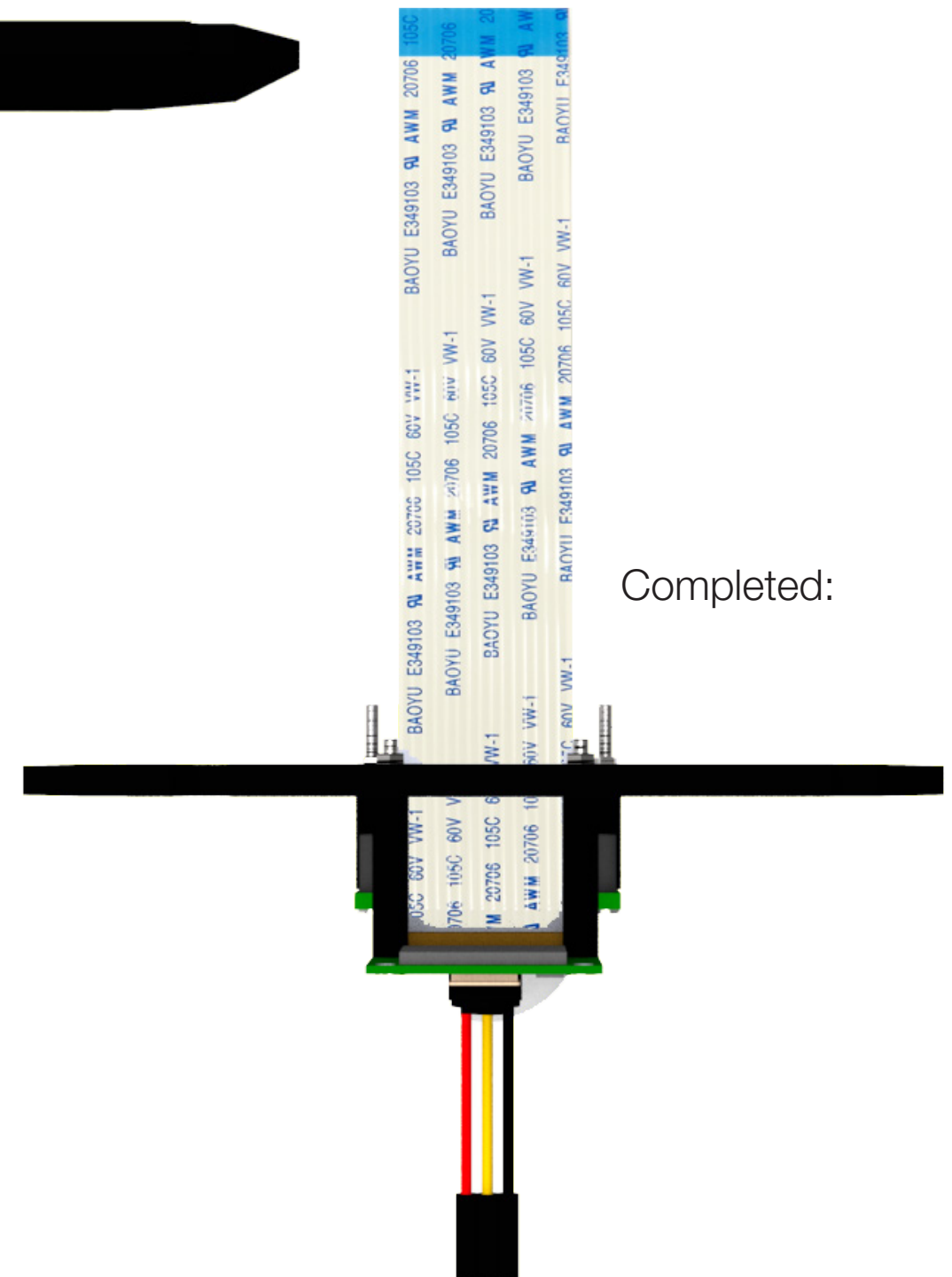
Now attach the camera to the insert assembly.

You will need:

- 3 x Screws (M2, 25mm - the middle sized ones)
- 2 x Nuts (M2)
- 2 x Spacers (18 mm)



Assemble like so:



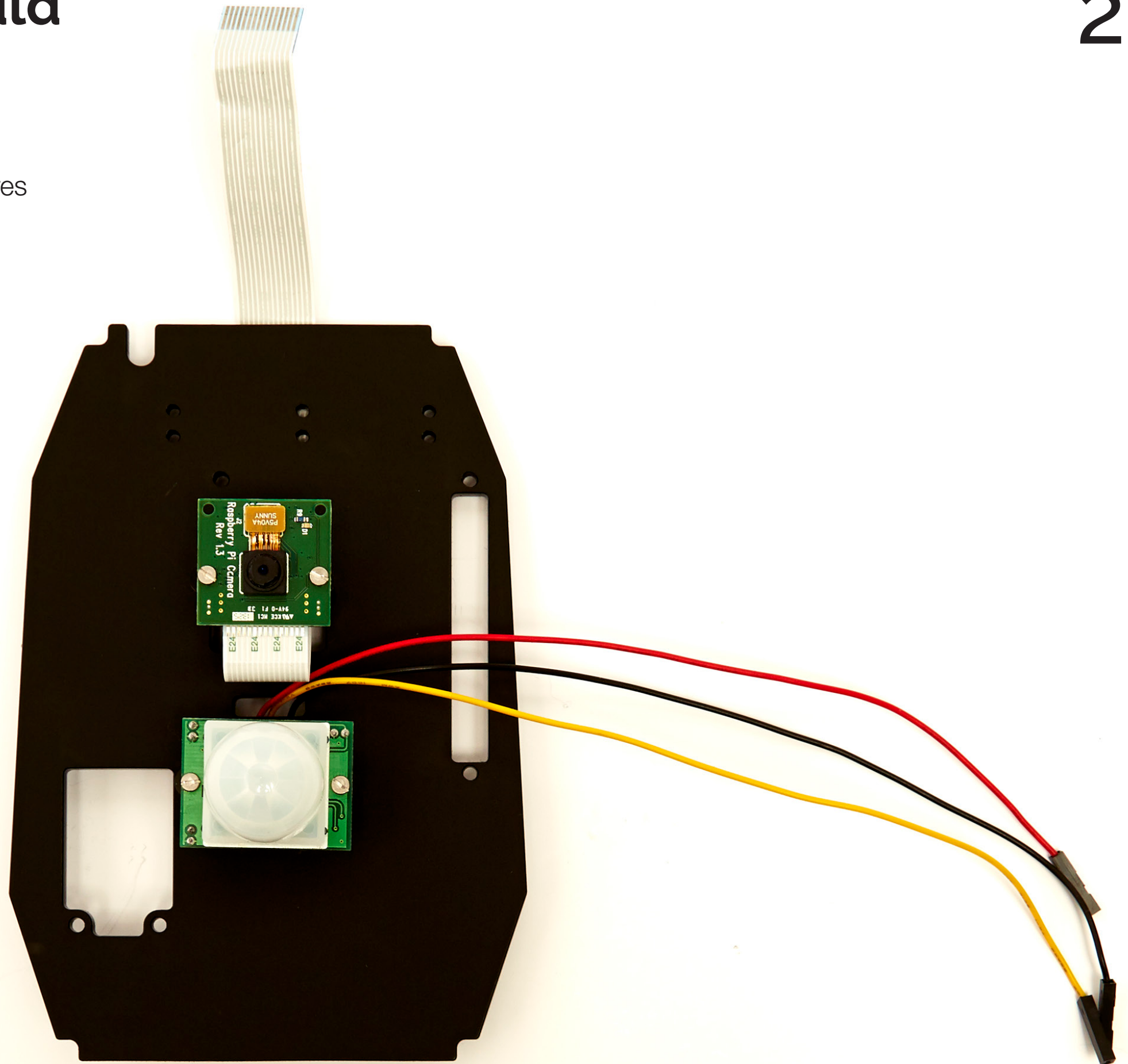
Completed:

Your assembly should look like this

2

Take a moment and check that all of the wires are in the correct place and exit through the correct holes.

If in doubt, re-visit the earlier construction pages and double check your assembly.



Make it | Attaching the Real Time Clock

2

Task 7 - Connect the Real Time Clock to the Raspberry Pi

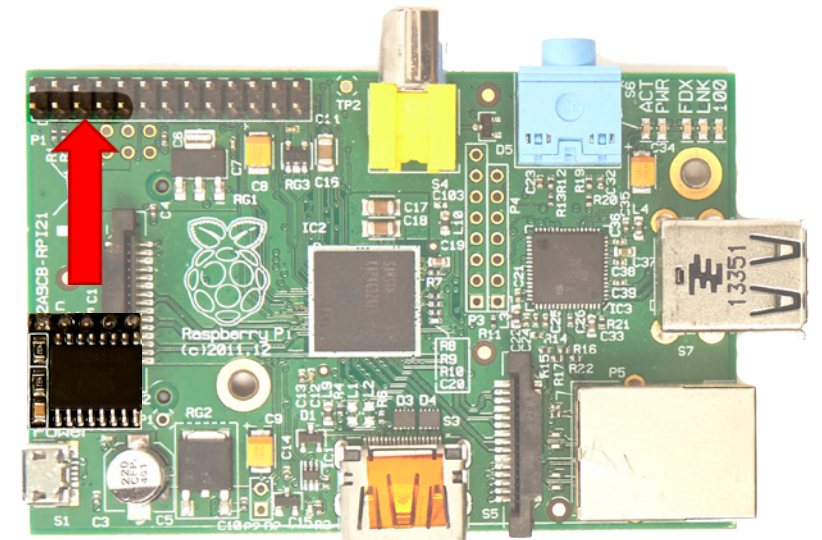
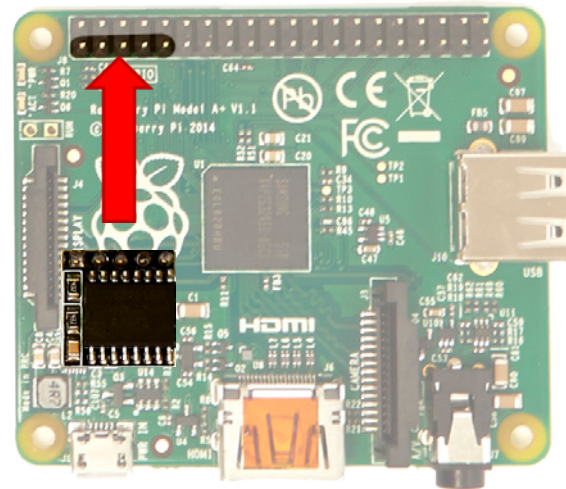
Attach the Real Time Clock to the Raspberry Pi by positioning it on the pins shown to the right.

You will need:

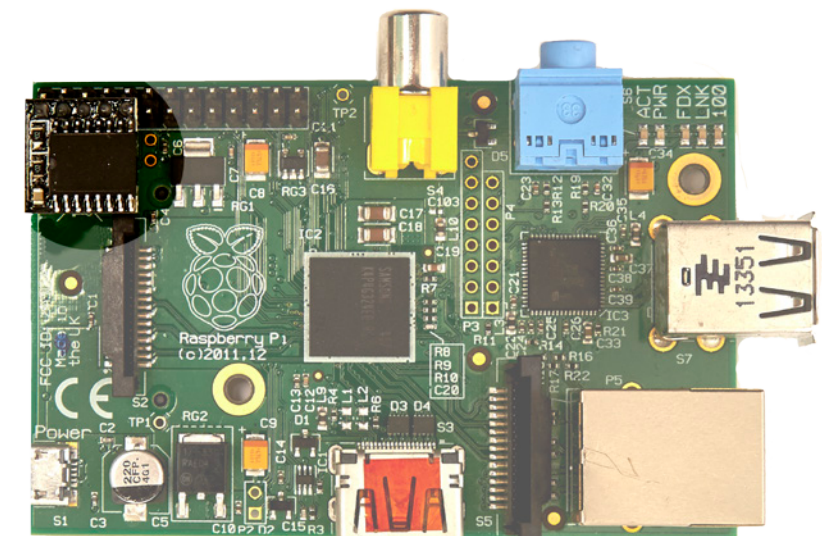
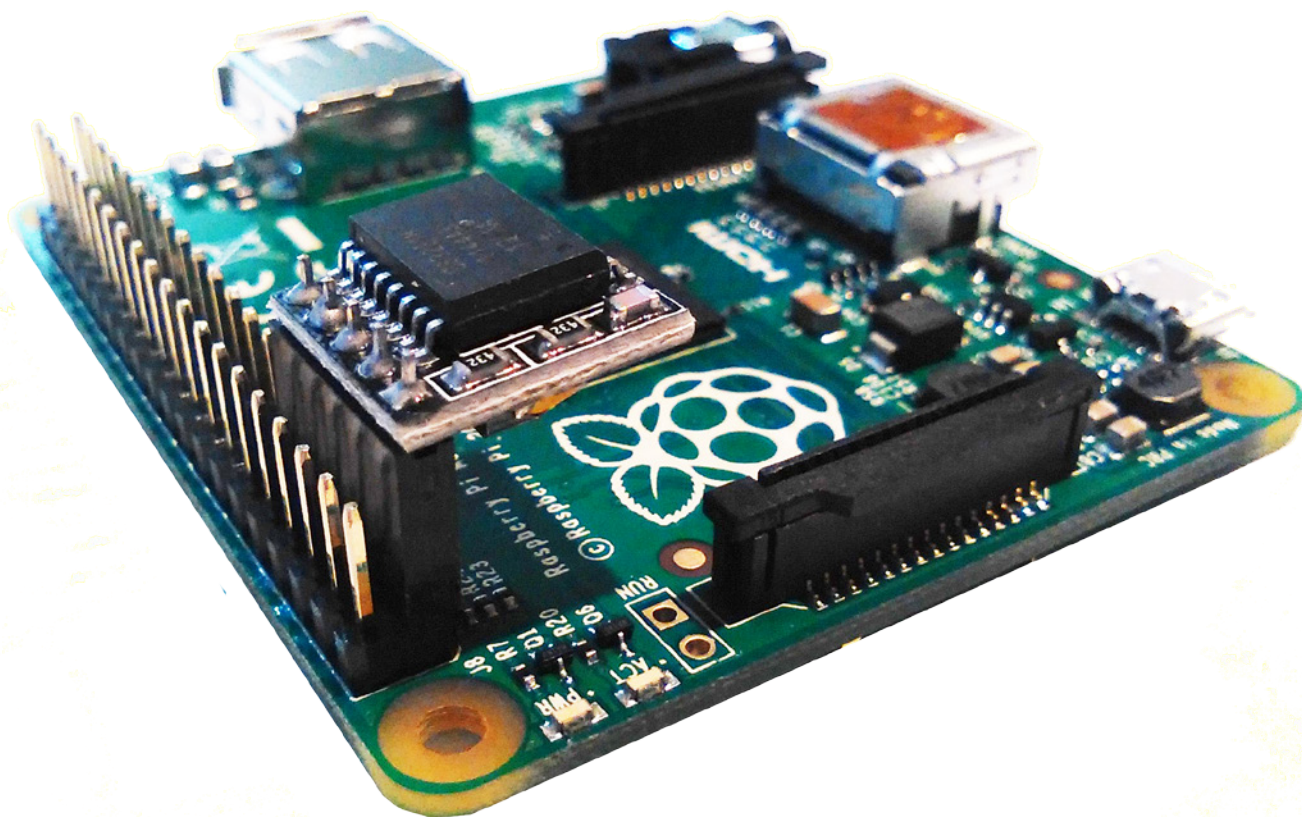
- Your Raspberry Pi
- Real Time Clock

This is where the clock should be placed.
See the instructions to the right for the exact placement.

Place the Real Time Clock on the following 5 pins:



The clock will point inwards over the PCB as seen below. Make sure the Real Time Clock is positioned the right way around. Compare your Raspberry Pi with the image on the left and below to confirm it's seated correctly.

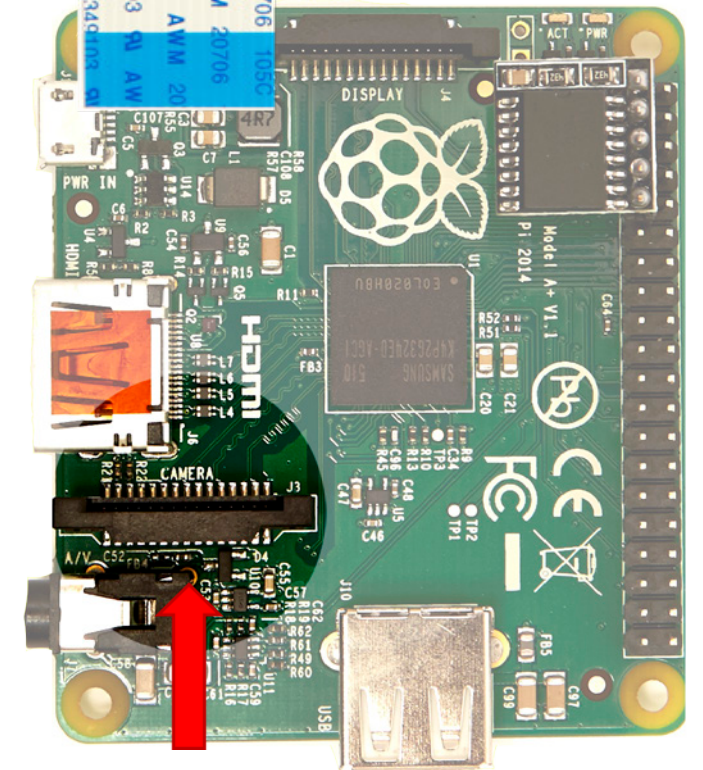
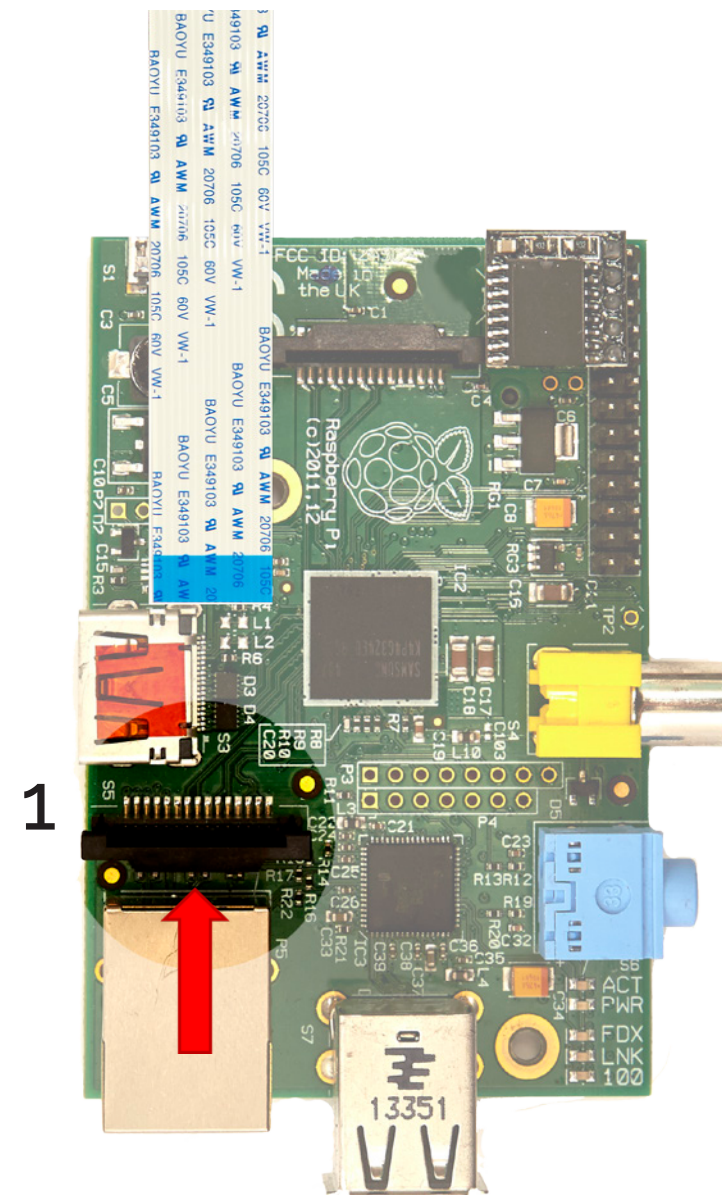
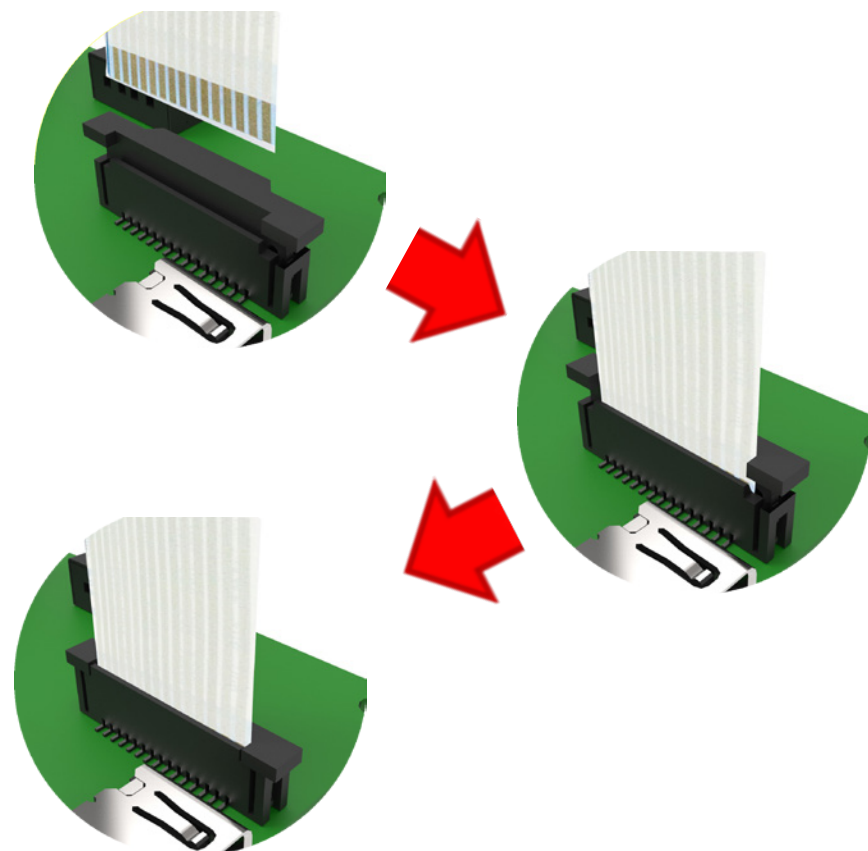


Make it | Attaching the Pi Camera

2

Task 8 - Connect the camera to the Raspberry Pi

- 1) Take the Raspberry Pi and gently lift the clasp on the camera port highlighted by the number 1.
- 2) Insert the camera ribbon into the port making sure that the blue tab on the camera ribbon is facing away from the HDMI port.
- 3) Secure the ribbon by holding the ribbon in the port and gently pushing the clasp on the camera port down. Make sure the ribbon is pushed down evenly and not at an angle and that it is firmly seated. Also ensure that the clasp is locked.



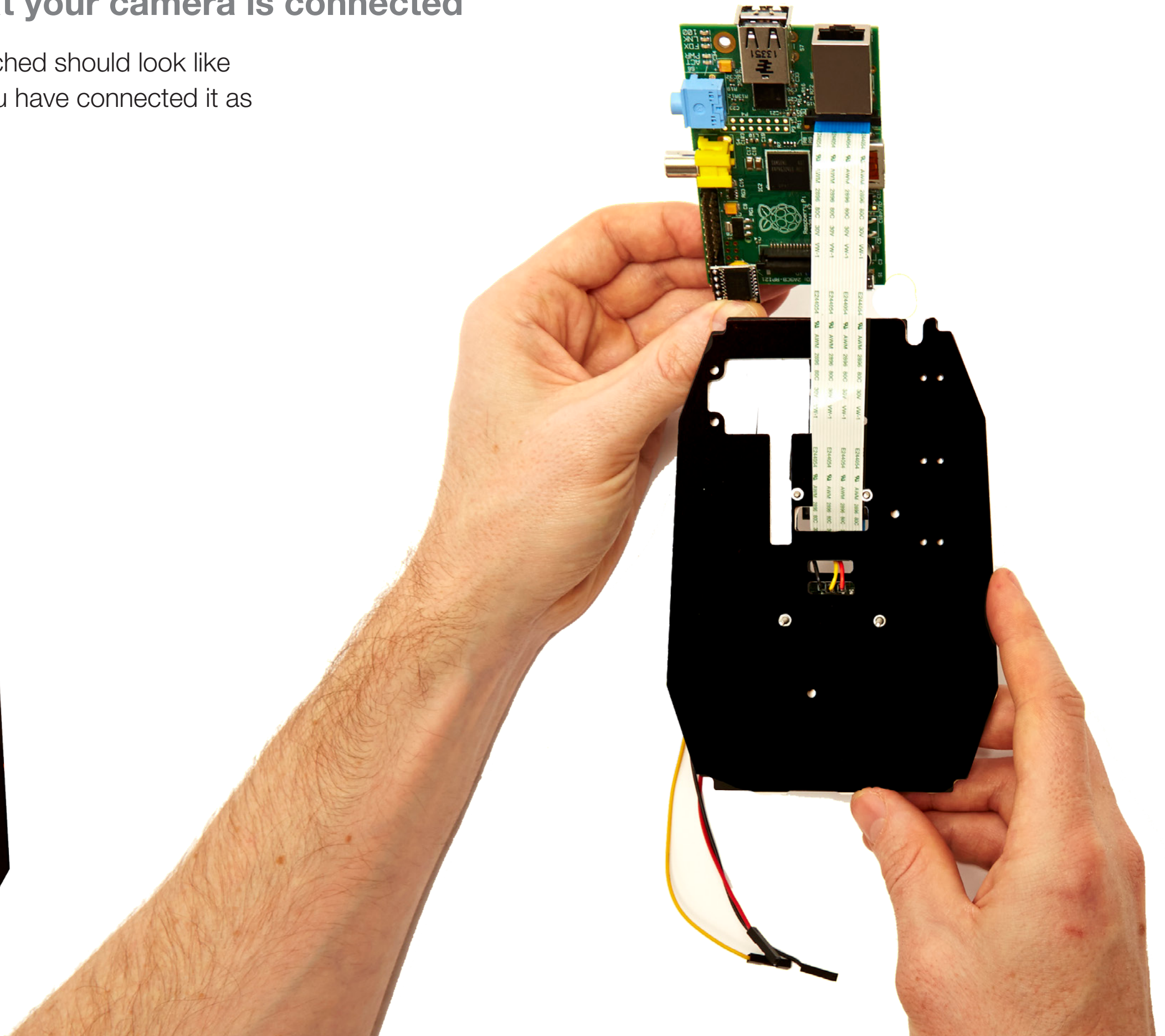
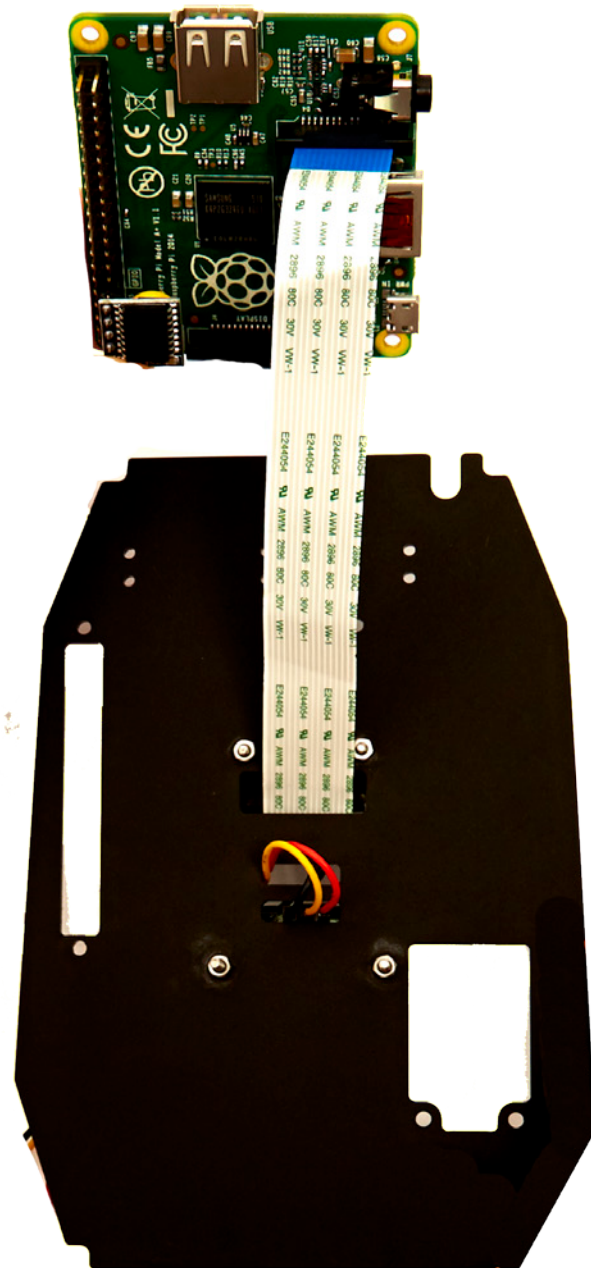
Make sure the camera ribbon
Is located the right way around.

Make it | Attaching the Pi Camera

2

Task 8 - Confirm that your camera is connected

Your camera cable when attached should look like this. Check to confirm that you have connected it as seen below and to the right.



Make it | Attaching the Raspberry Pi (A+)

2

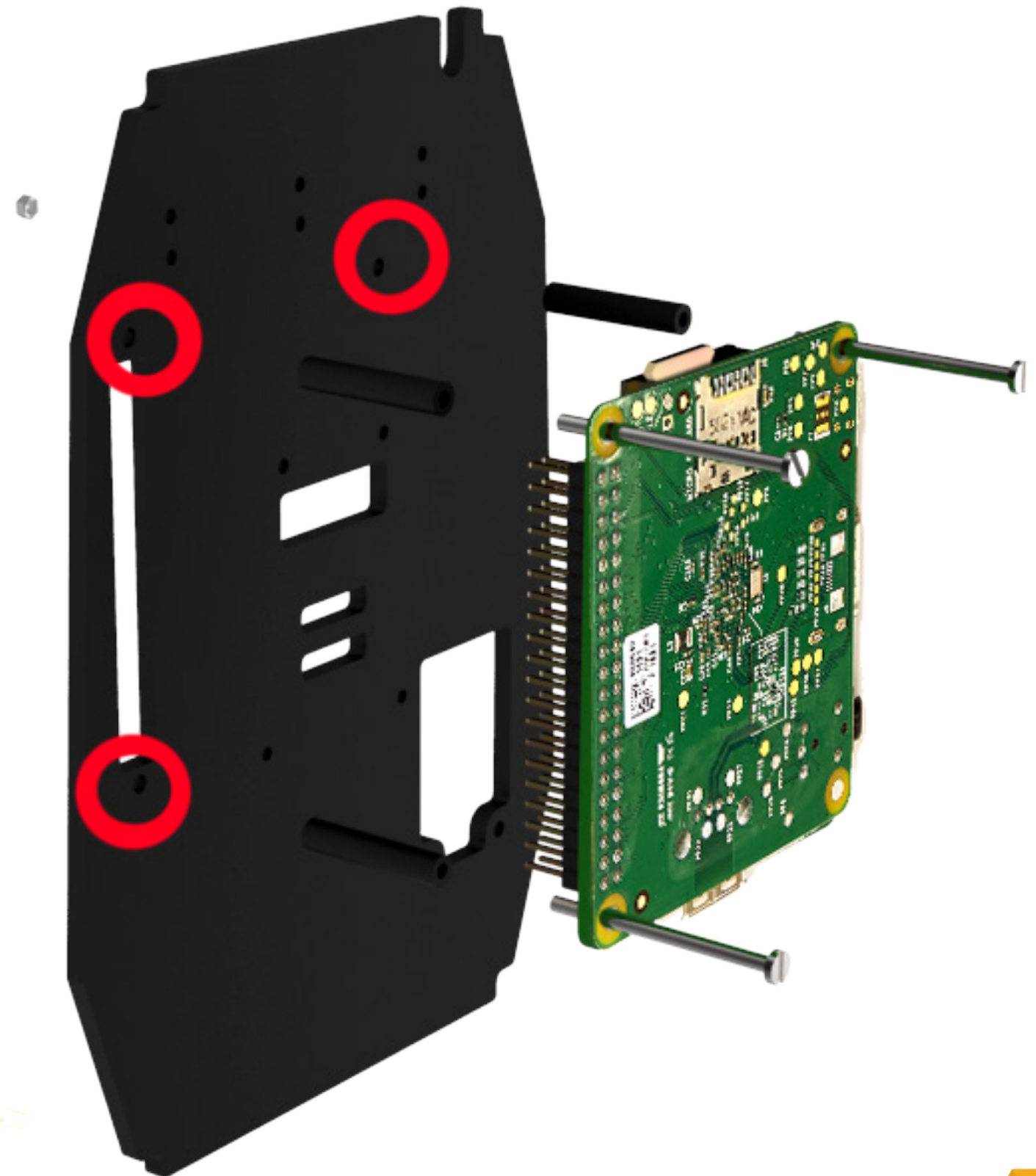
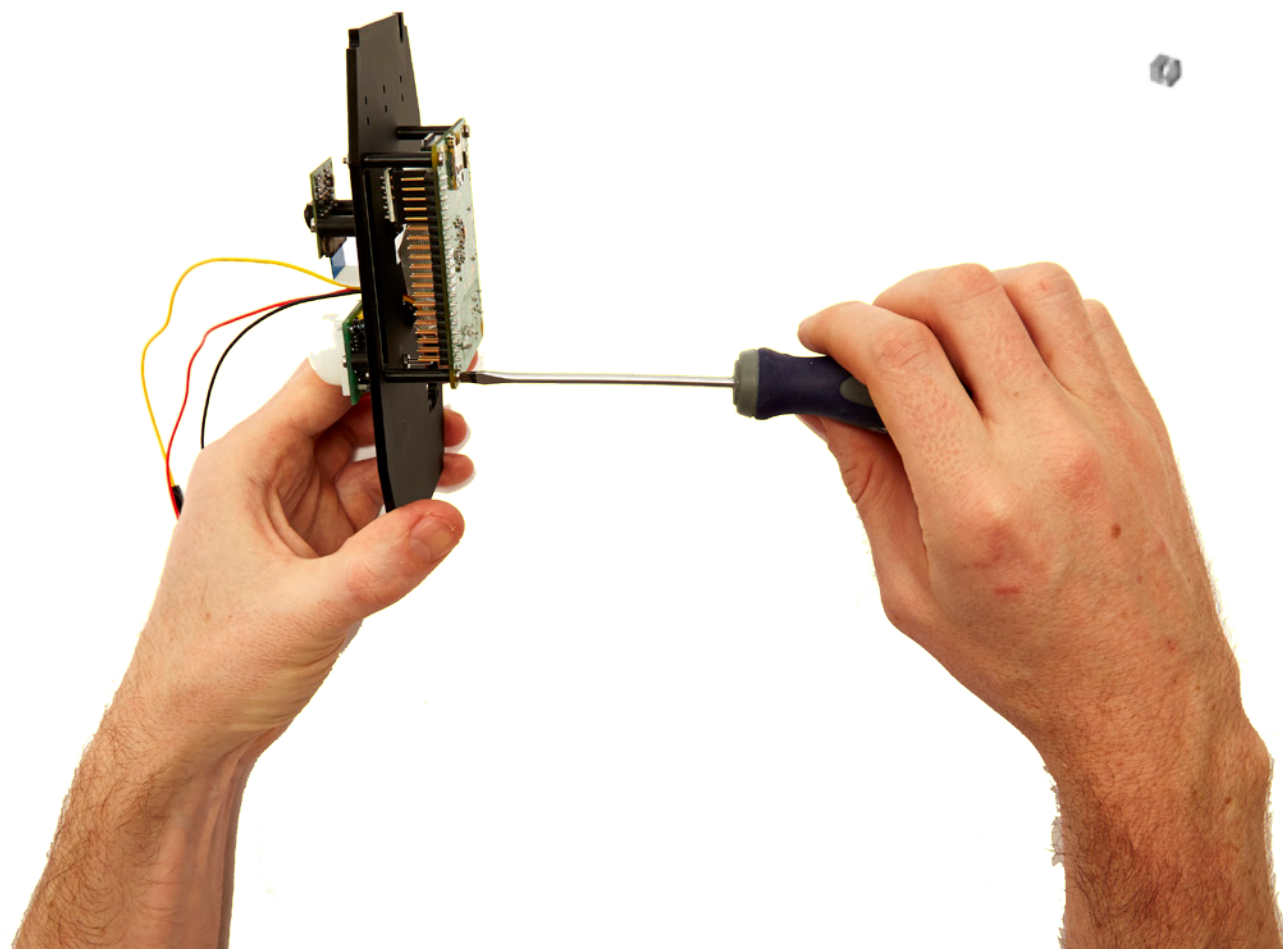
Task 9 - Secure the Raspberry Pi

Attach the A+ Raspberry Pi to the insert using the screws, nuts and bolts provided.

You will need:

- Screws (M2 3 x 30mm - the largest sized)
- Nuts (M2 x 2)
- Spacers (2 x 20mm - the largest sized)
- Your Raspberry Pi and the main insert

If you don't have an A+ Raspberry Pi please continue to see additional instructions.



Making it | Attaching the Raspberry Pi 1

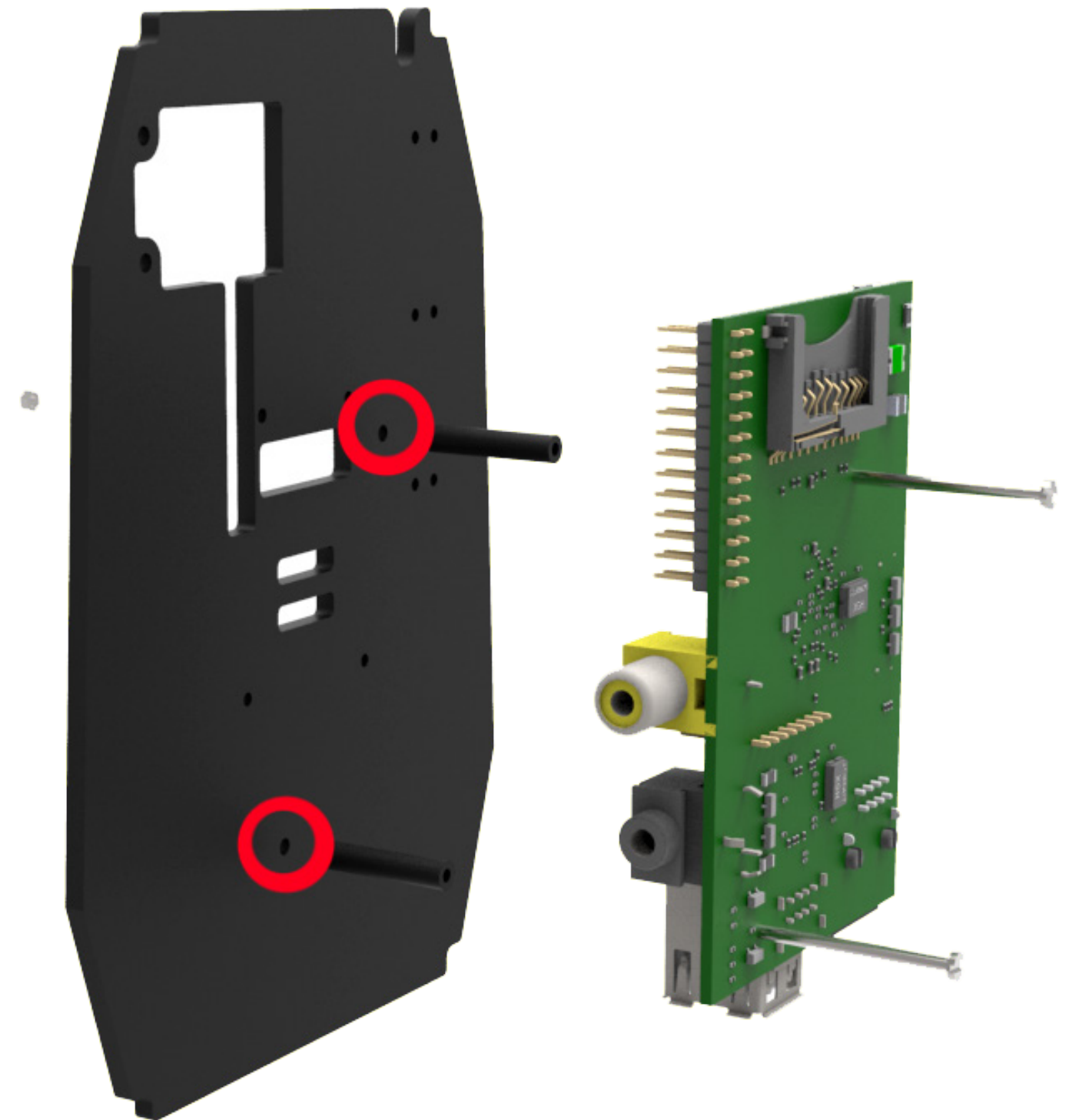
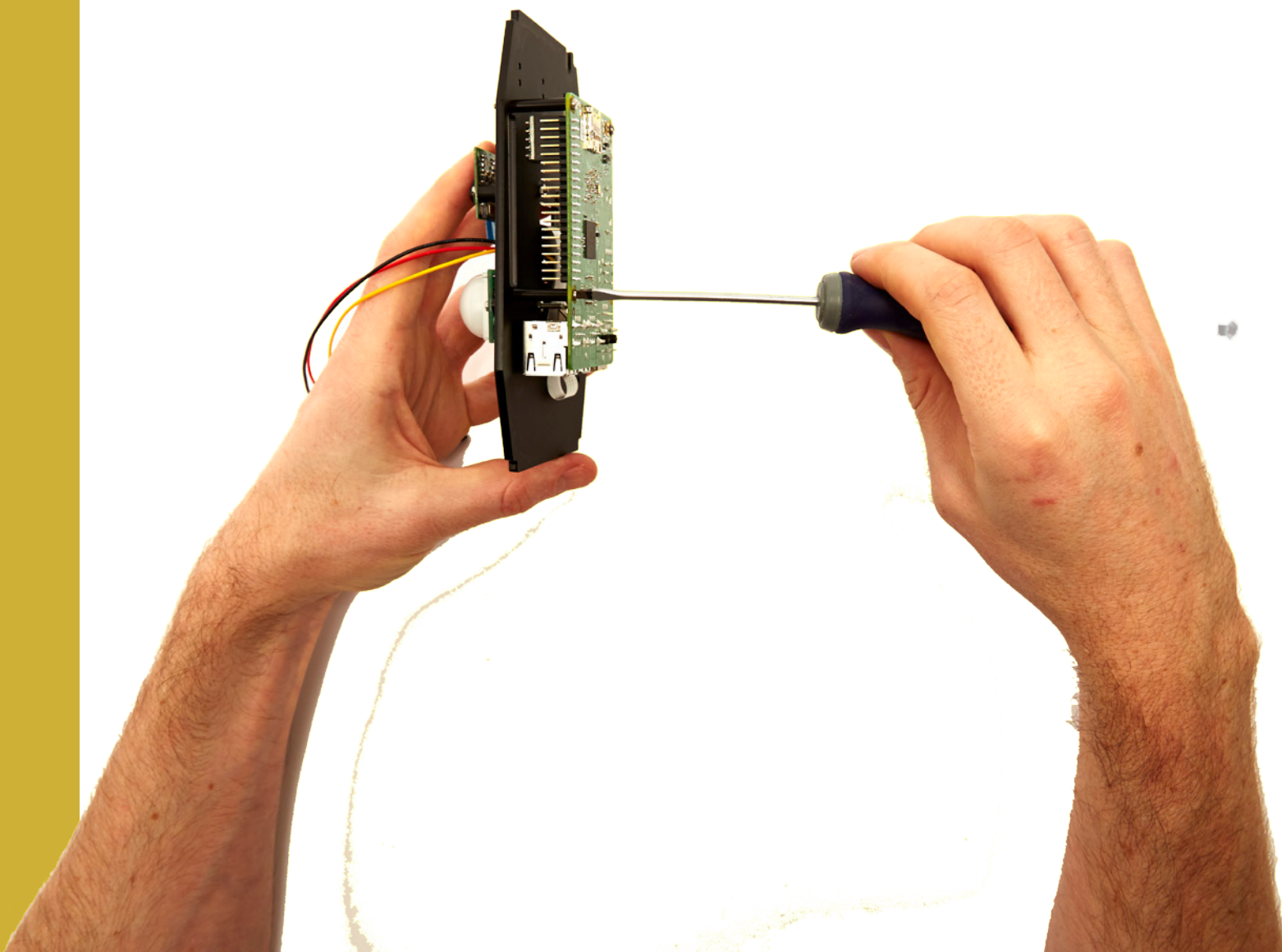
2

Task 8 - Secure the Raspberry Pi

Attach the Raspberry Pi 1 to the insert using the screws, nuts and bolts provided.

You will need:

- Screws (M2 3 x 30mm - the largest sized)
- Nuts (M2 x 2)
- Spacers (2 x 20mm - the largest sized)
- Your Raspberry Pi and the main insert



Make it | Attaching the PIR's jumper cables

2

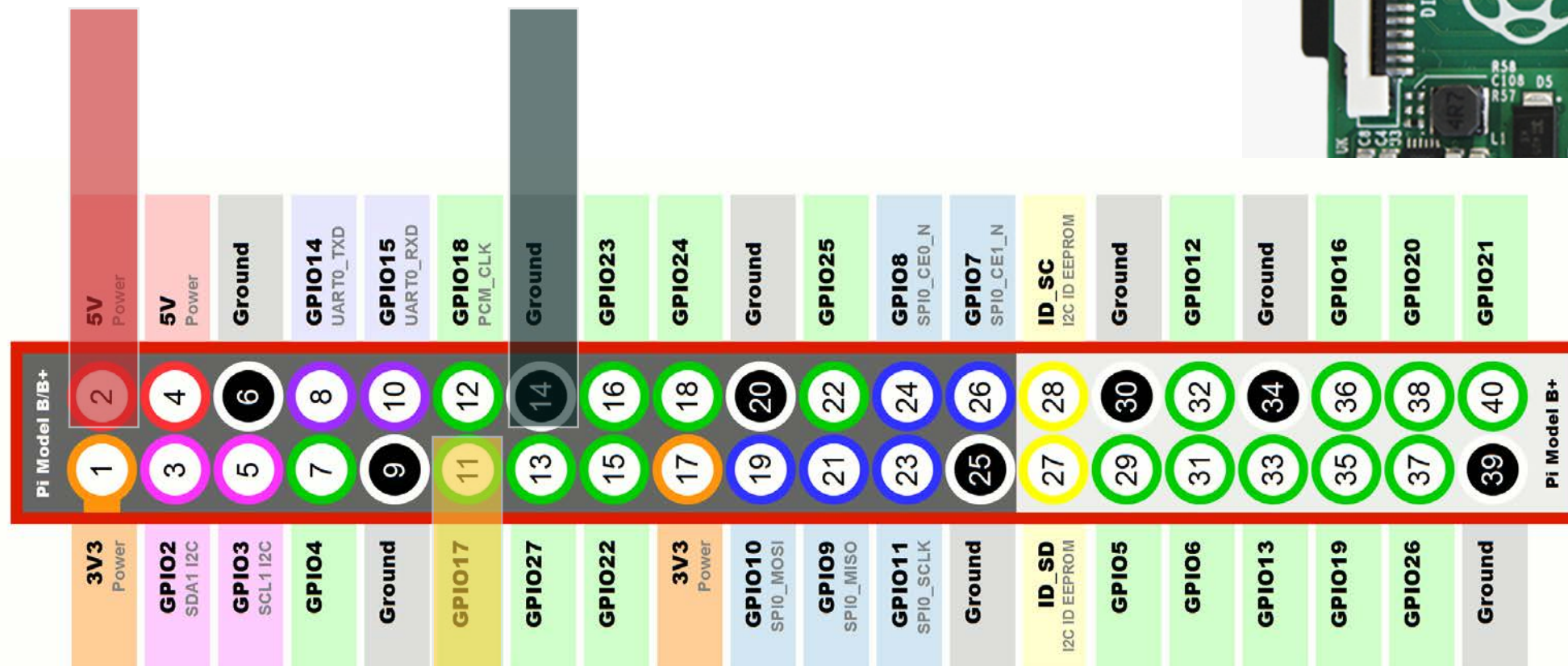
Task 10 - Attaching the jumper cables from the PIR to the Raspberry Pi (A+)

Attach the three jumper cables from the PIR to the correct pins on the Raspberry Pi as shown in the diagram.

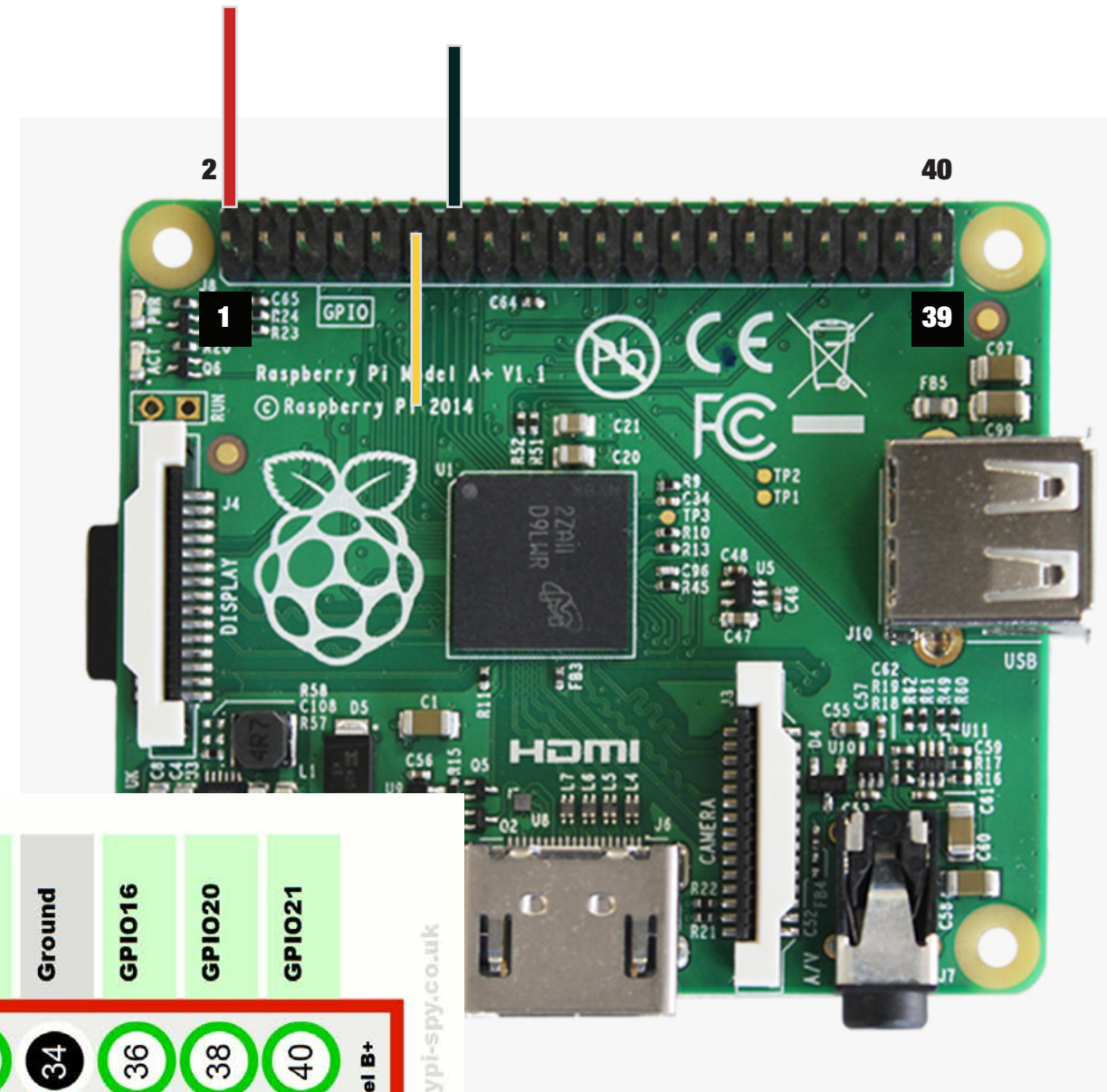
Ensure the wires go around the camera and terminate to the correct GPIO (General Purpose Input Output) pins on the Raspberry Pi. It's often easy to count across to make sure you have the correct pin. See the diagram to the right to place the A+ Raspberry Pi the correct way around.

Red jumper cable goes to 2

Black jumper cable goes to 14



Yellow jumper cable goes to 11



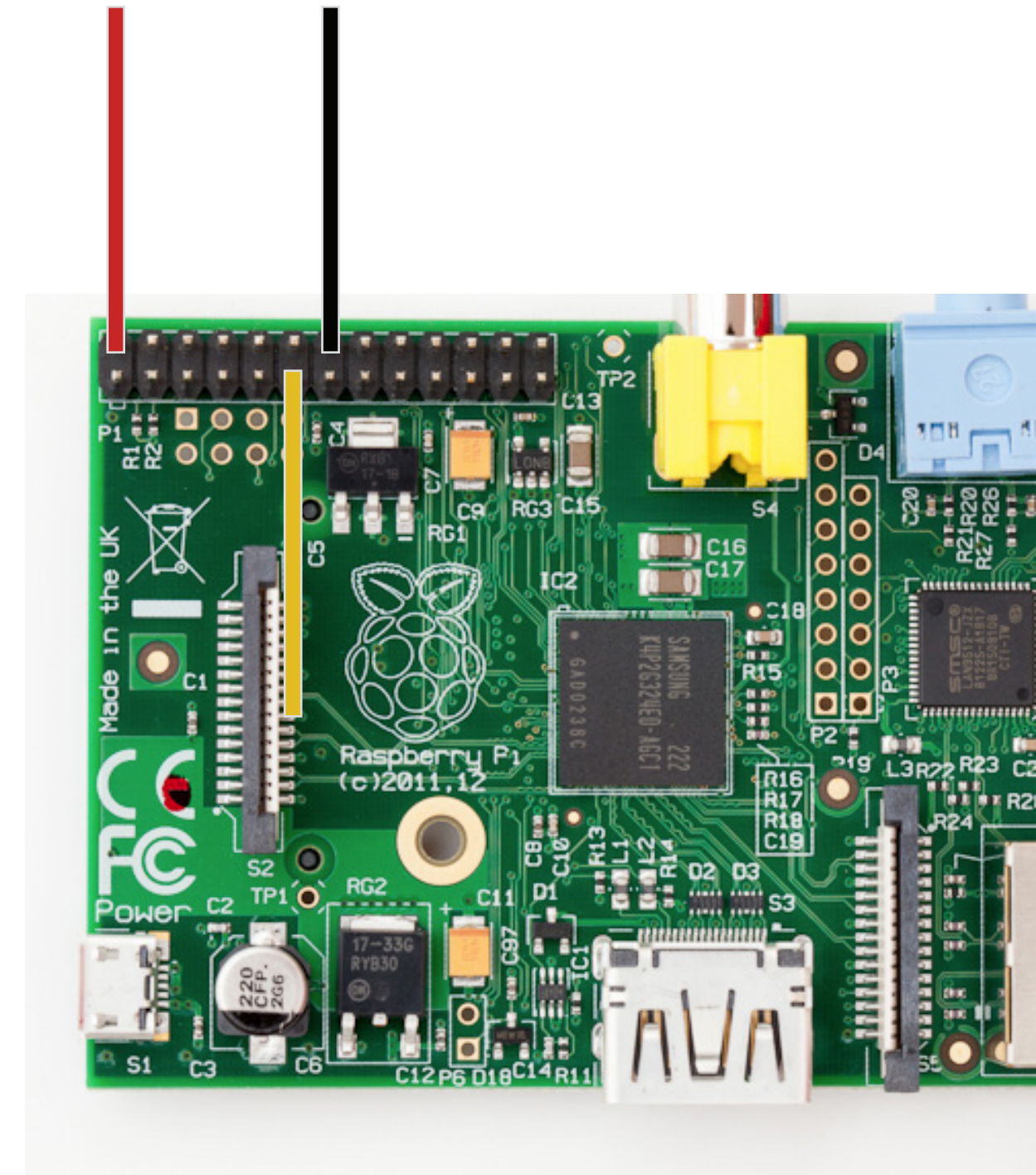
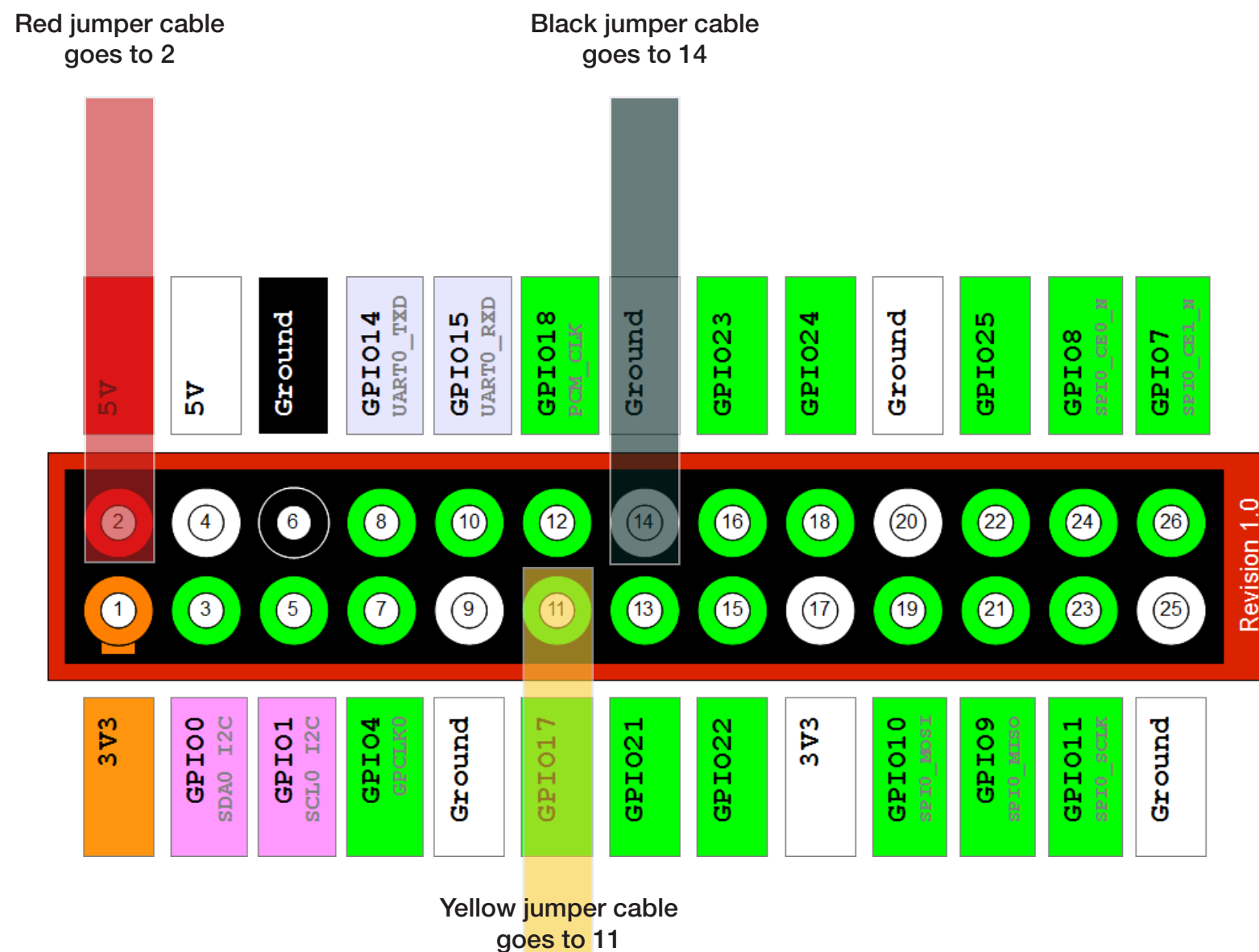
Make it | Attaching the PIR's jumper cables

2

Task 10 - Attaching the jumper cables from the PIR to the Raspberry Pi 1

Attach the three jumper cables from the PIR to the correct pins on the Raspberry Pi 1 as shown in the diagram.

Ensure the wires go around the camera and terminate to the correct GPIO (General Purpose Input Output) pins on the Raspberry Pi 1. It's often easy to count across to make sure you have the correct pin. See the diagram to the right to place the Raspberry Pi 1 the correct way around.



Make it | Attaching the Powerboost 500 C

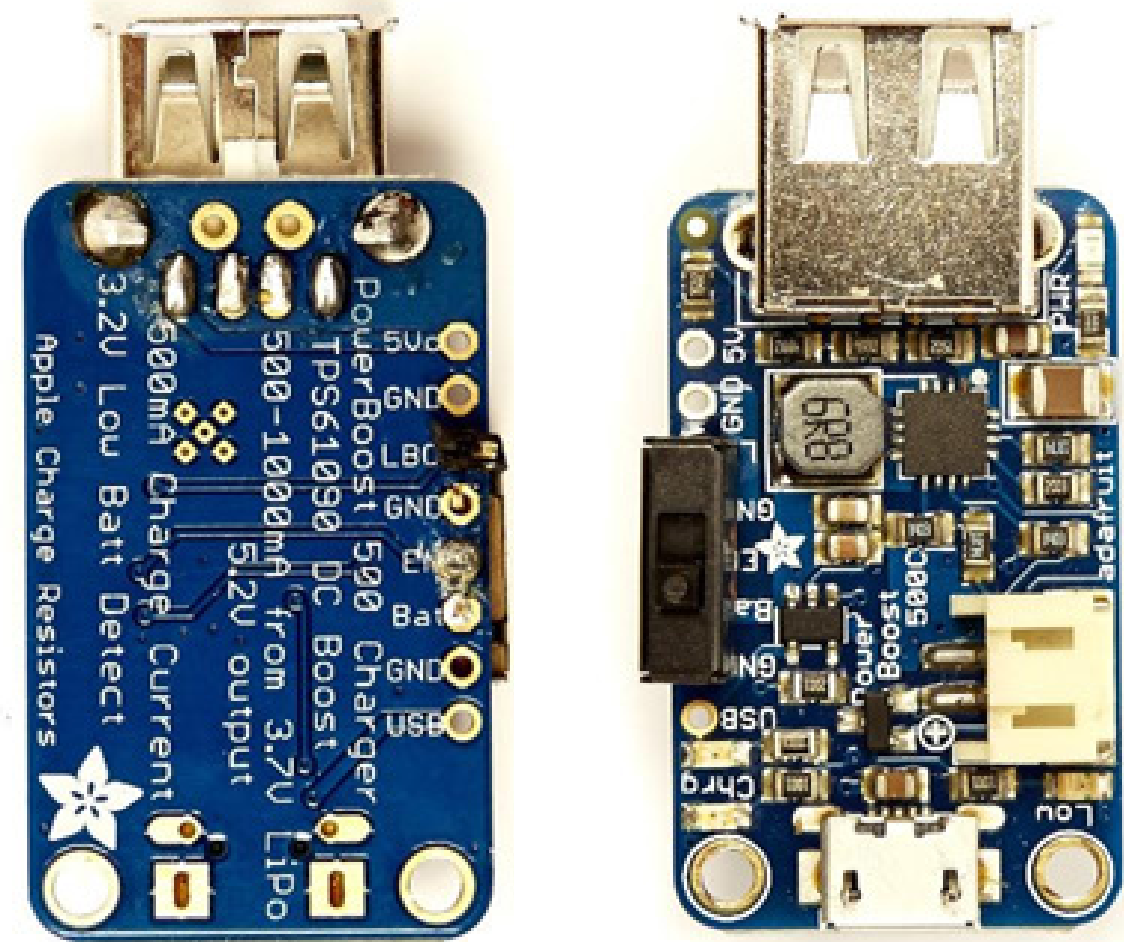
2

Task 11 - Attaching the Powerboost

The Adafruit Powerboost 500 C enables the 3.7v Li-ion battery included in your kit to be boosted to 5.2v and so power the Raspberry Pi and the associated components.

It provides 500mAh when charging, so will charge the included 8800mAh battery in 17.6 hours from empty.

We've added a power switch to make it easier for you to turn on / off the camera when outdoors. For those of you wishing to shutdown the camera automatically when the battery is low, we have soldered a pin to the LB out which will be HIGH if the battery is above 3.2v, but drops to 0v LOW if the battery is under 3.2v - however, **you can't directly connect a jumper cable to the Raspberry Pi's GPIO pins** as the voltage from the LB pin is 4.2v. You will need a diode to limit the voltage. We have commented out the code in the kit's Python script to help beginners explore this additional task, but we won't cover that in these instructions - instead, you can add this feature by visiting the Naturebytes website for advanced guides and instructions.



Make it | Attaching the Powerboost 500 C (A+)

2

Task 11 - Attaching the Powerboost

Attach the Powerboost to the insert using the nuts and bolts. The Powerboost should be attached to the side that the Raspberry Pi is positioned on.

Note - these instructions assume you are attaching an A+ Raspberry Pi. Continue to the next page if not.

What you will need:

- Screws (M2 10mm)
- Nuts (M2)



Make it | Attaching the Powerboost 500 C (Pi 1)

2

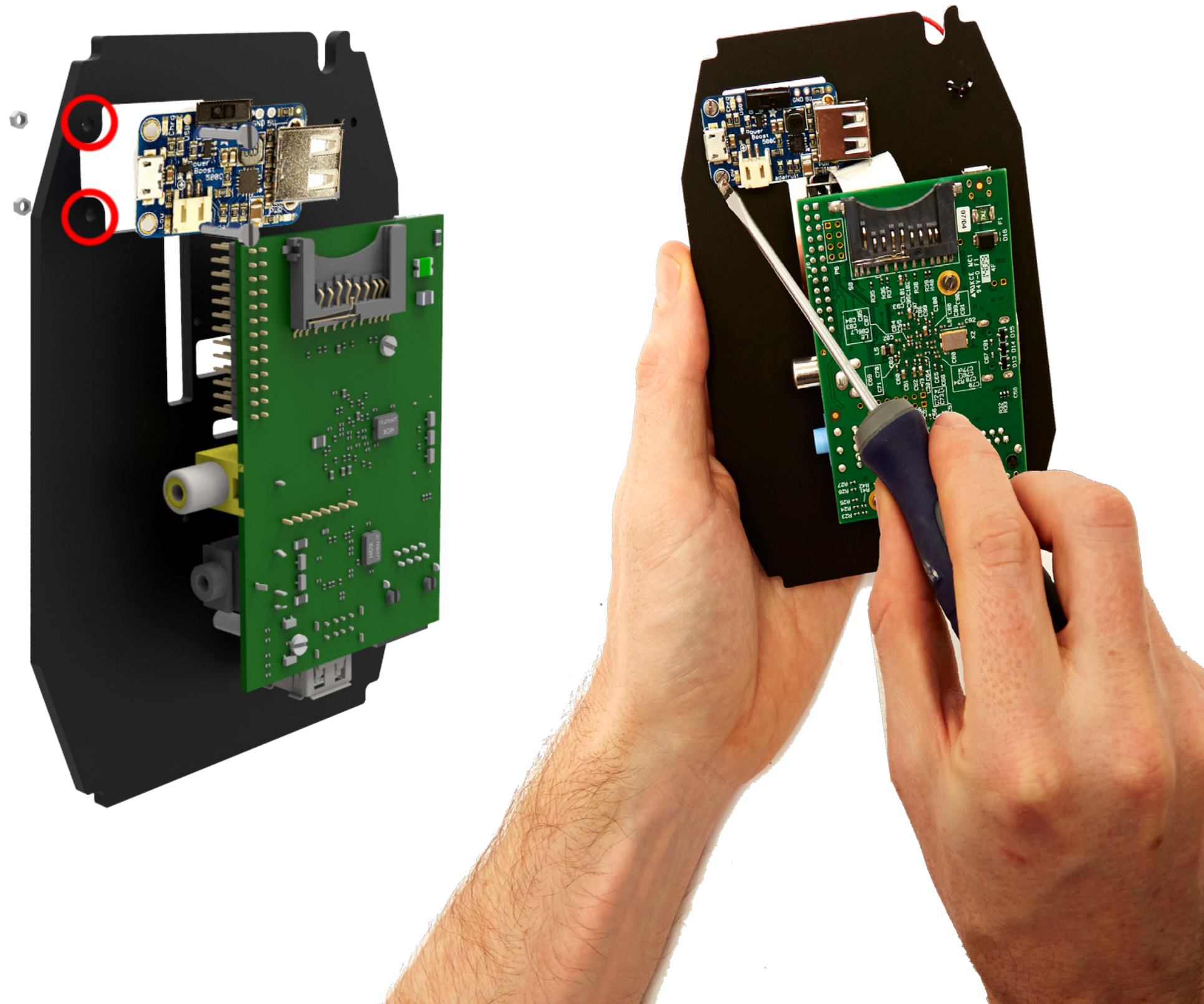
Task 11 - Attaching the Powerboost

Attach the Powerboost to the insert using the nuts and bolts. The Powerboost should be attached to the side that the Raspberry Pi is positioned on.

Note - these instructions assume you are attaching a Raspberry Pi 1

What you will need:

- Screws (M2 10mm)
- Nuts (M2)



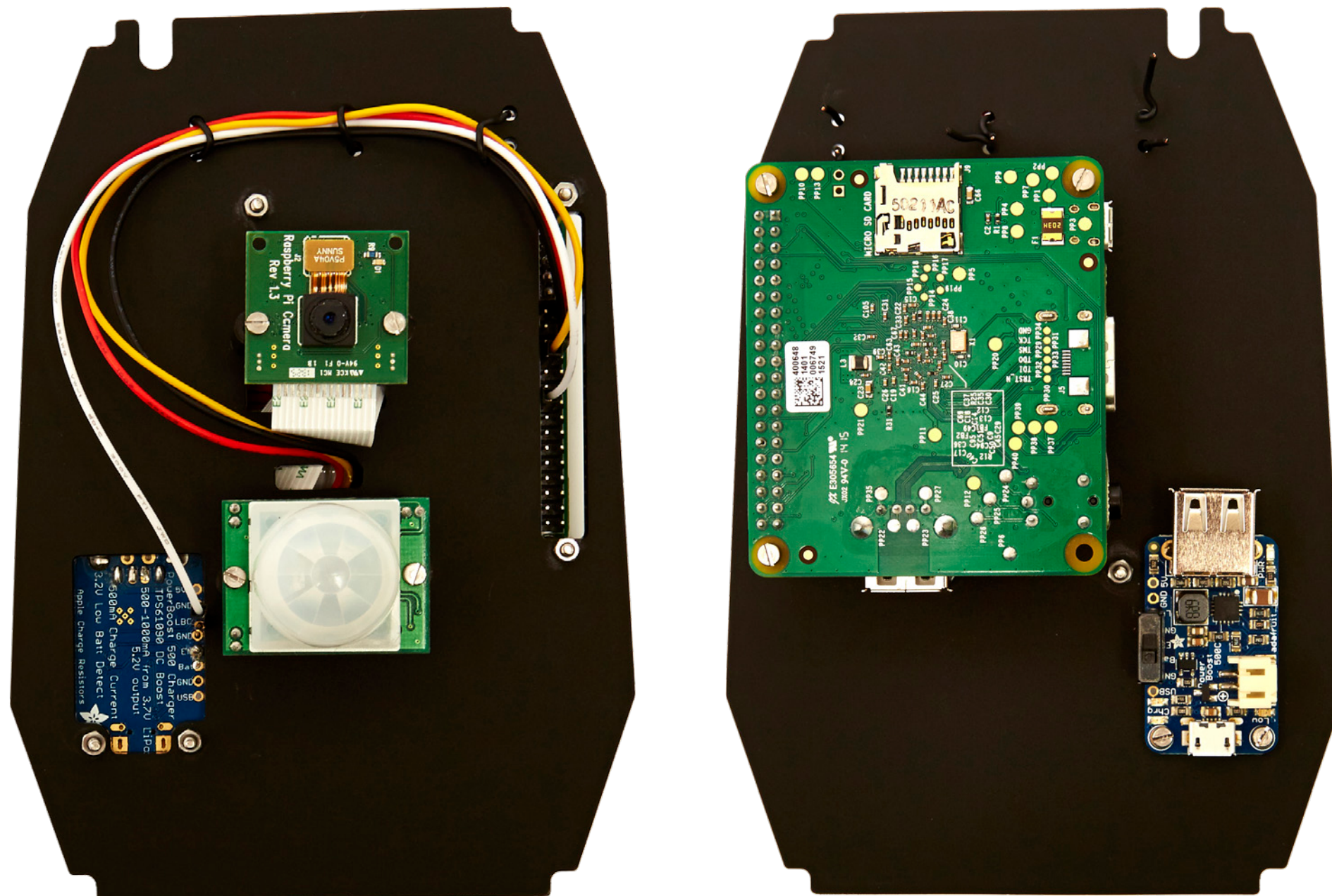
Make it | Assessing your assembly

2

Task 12 - Confirm that everything has been connected correctly

Your unit should now look a little like this if using a Raspberry Pi A+. The pin placement in this image is not correct, so don't worry if they look different compared to your placement. This photo was just taken as an example.

Note - the white jumper cable attached to the Powerboost is also for illustration only, you **should not do this** as it may damage your Pi.



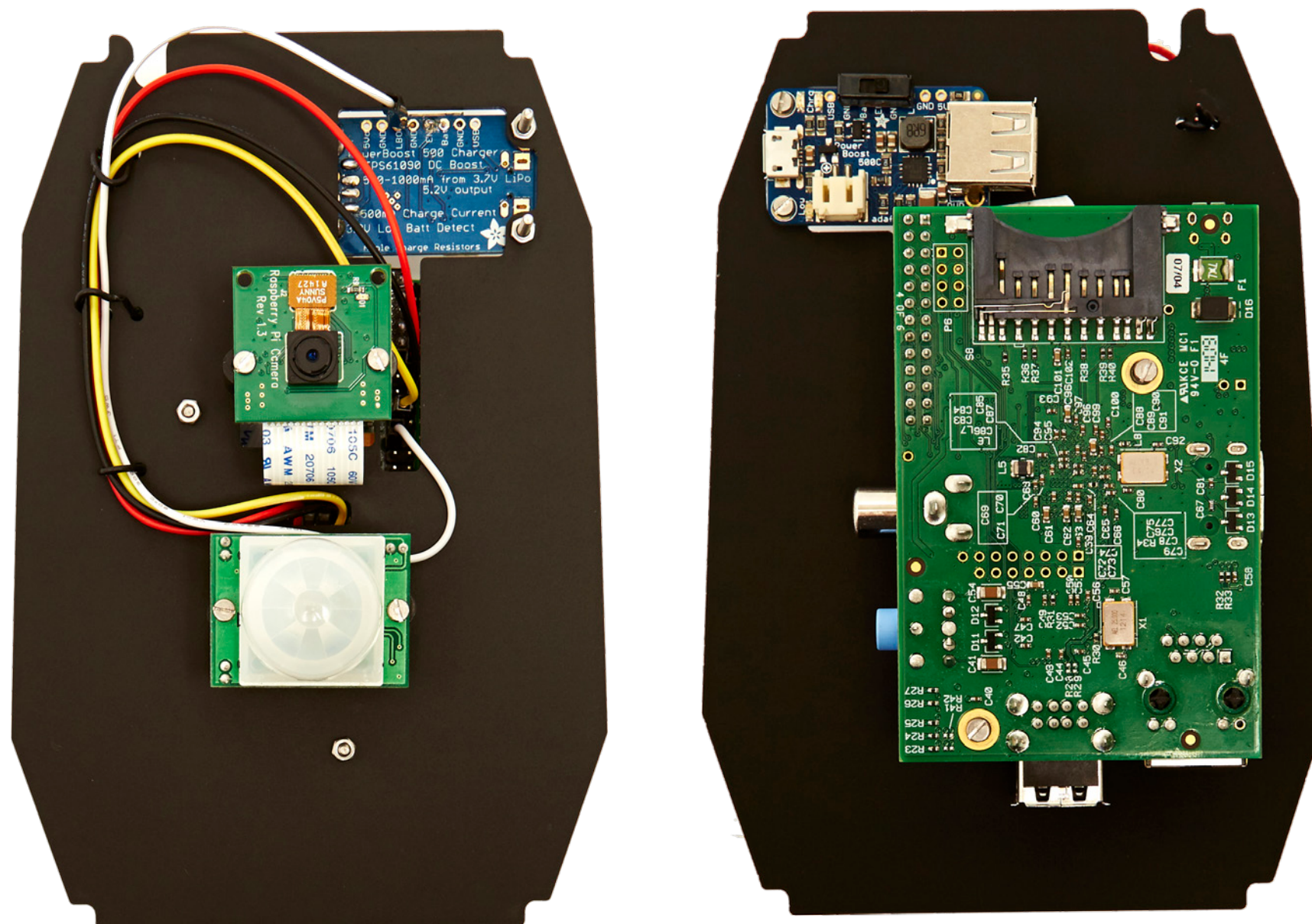
Make it | Assessing your assembly

2

Task 11 - Confirm that everything has been connected correctly

Your unit should now look a little like this if using a Raspberry Pi 1. The pin placement in this image is not correct, so don't worry if they look different compared to your placement. This photo was just taken as an example.

Note - the white jumper cable attached to the Powerboost is also for illustration only, you **should not do this** at will damage your Pi.



Make it | Using your weatherproof case

2

Your Naturebytes case is weatherproof, protecting all of the electronic components inside from the elements.

The case has passed an independent ingress test and gained an IP rating of 55.

It has also been designed to fit all of the available Raspberry Pi computers in the current Pi family by using custom inserts.

The rear of the case has a neoprene bung which can be removed to allow an external power cable or ethernet cable to access the internal chamber. Note - if this is your intention, you'll need to waterproof the hole using Sugru or another suitable bung.



Make it | Assembling the case

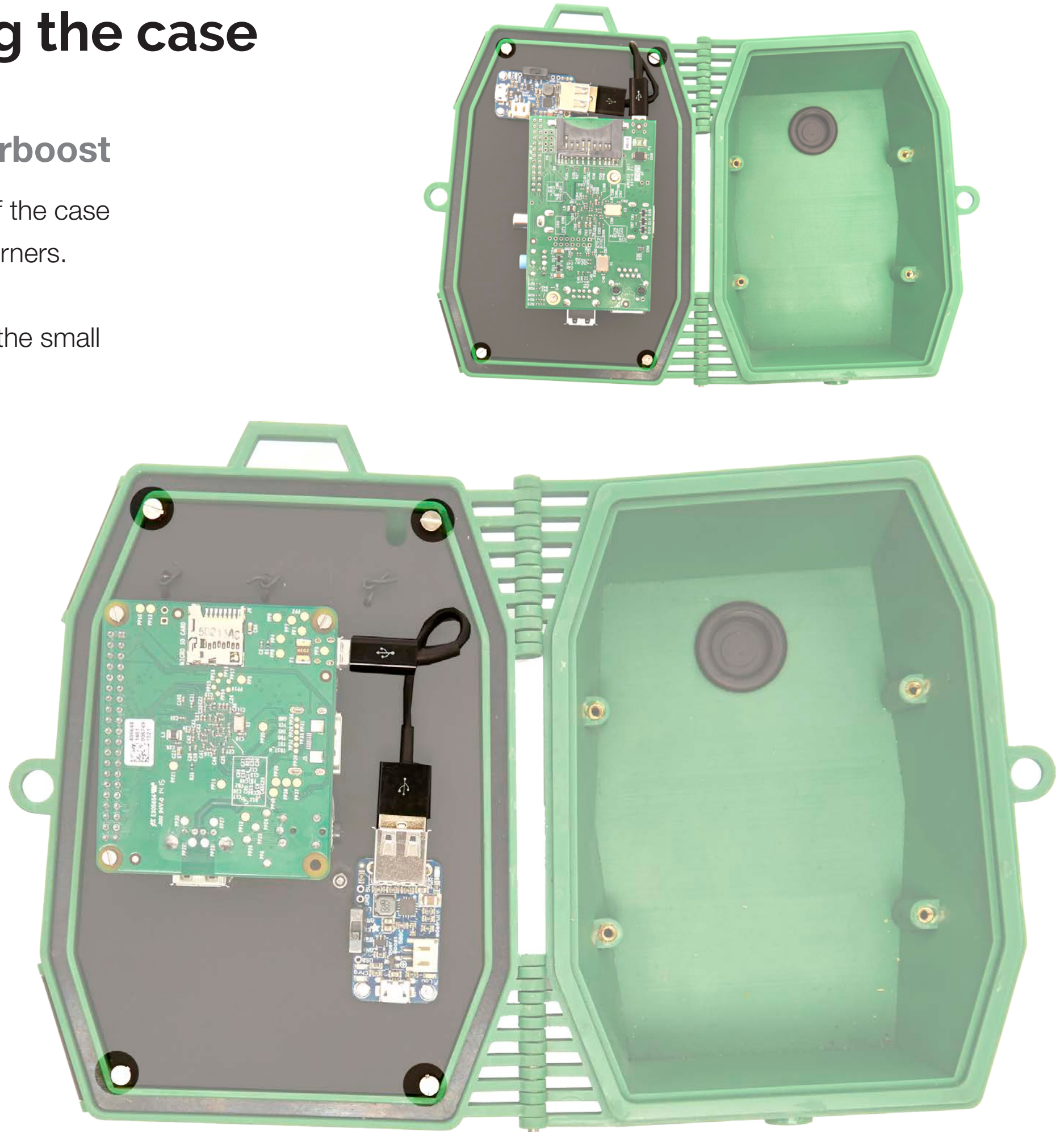
2

Task 13 - Attaching the Powerboost

- 1) Place the insert assembly into the front of the case and secure it by screwing it in at the four corners.
- 2) Connect the Powerboost to the Pi using the small USB cable.

What you will need:

- Screws (4 x M3 8mm)



Make it | Adding the Li-ion battery pack

2

Task 14 - Attach and connect the battery pack

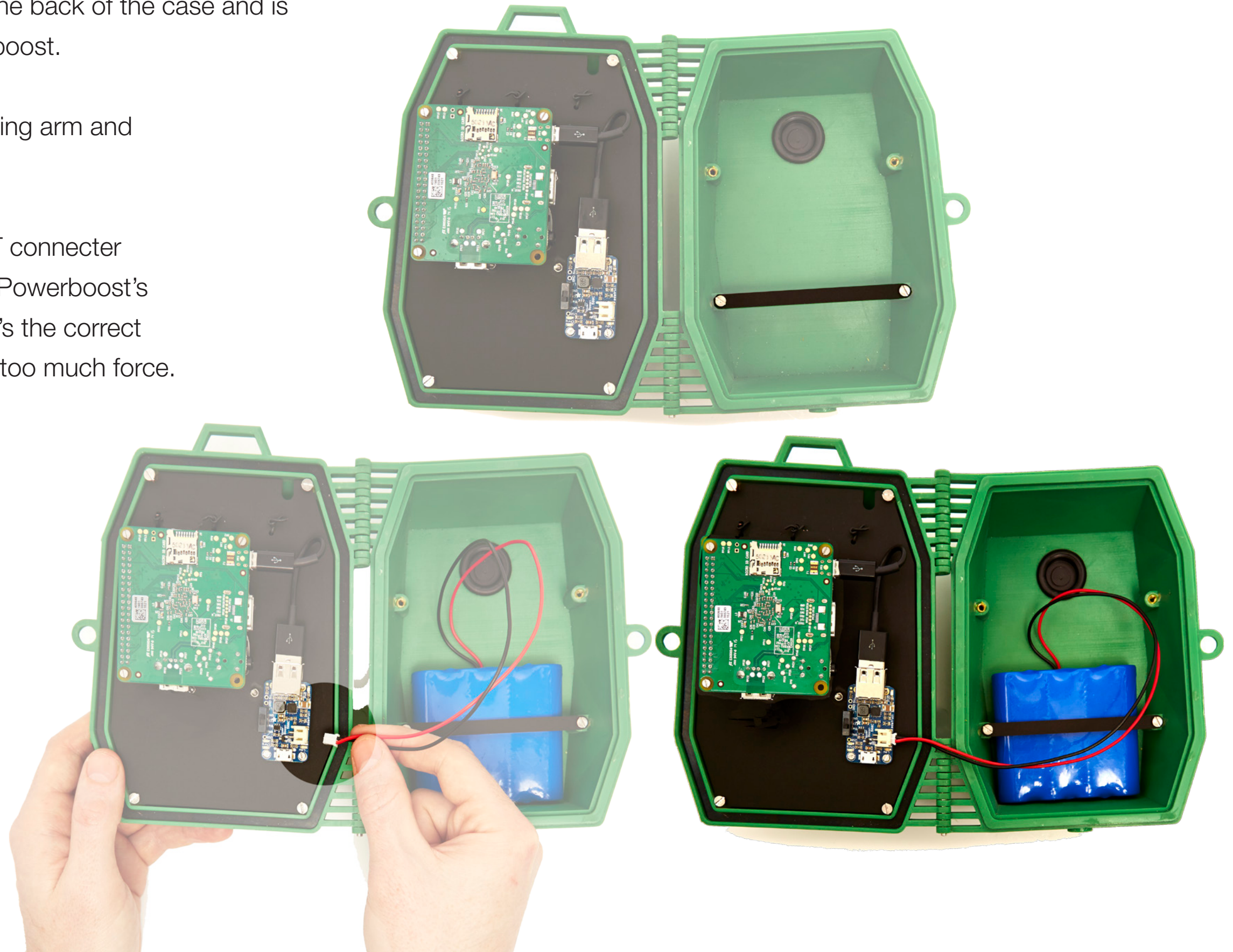
The battery pack sits in the back of the case and is connected to the Powerboost.

Screw in the battery holding arm and then connect the battery.

Next, push the white JST connector from the battery into the Powerboost's JST socket. Make sure it's the correct way up and don't exert too much force.

What you will need:

- Screws (4 x M3 8mm)
- Battery holder

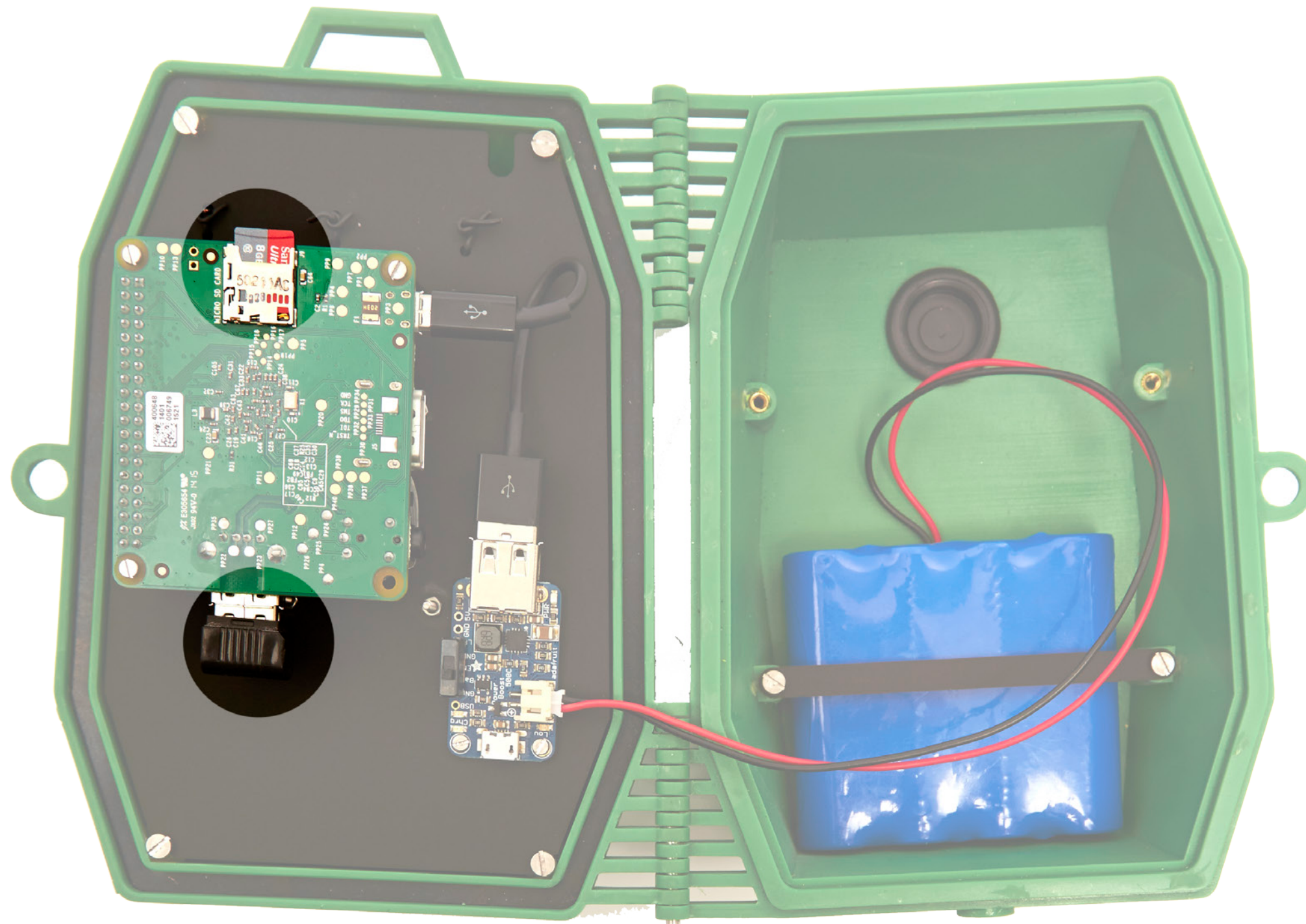


Make it | Inserting the SD card and USB drive

2

Task 15 - Inserting the SD card and USB

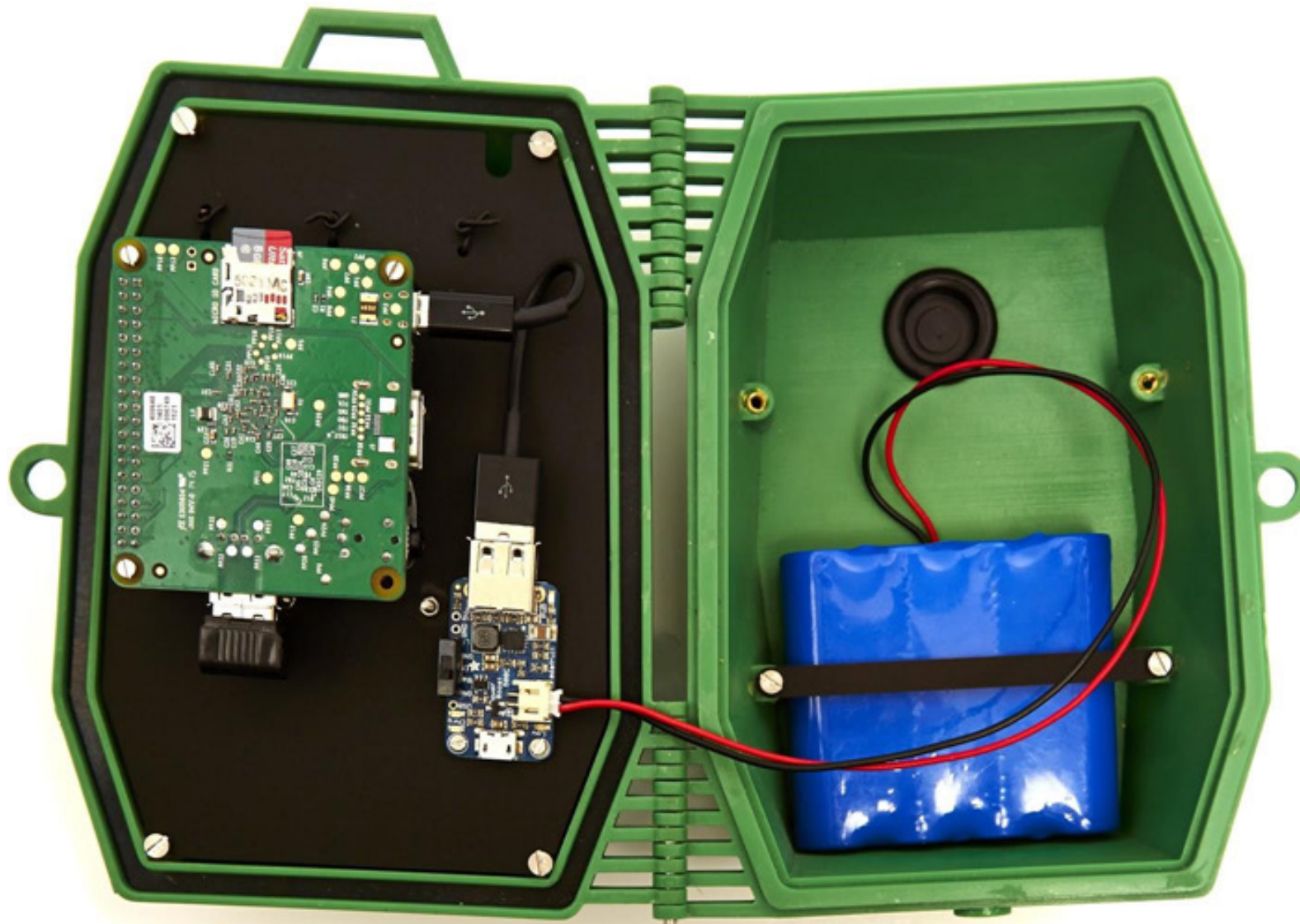
Finally, insert the SD card as seen in the diagram and plug your USB drive into to the Raspberry Pi's USB socket.



Make it | Assembly complete

2

The assembly is now complete. Your kit should look like this.

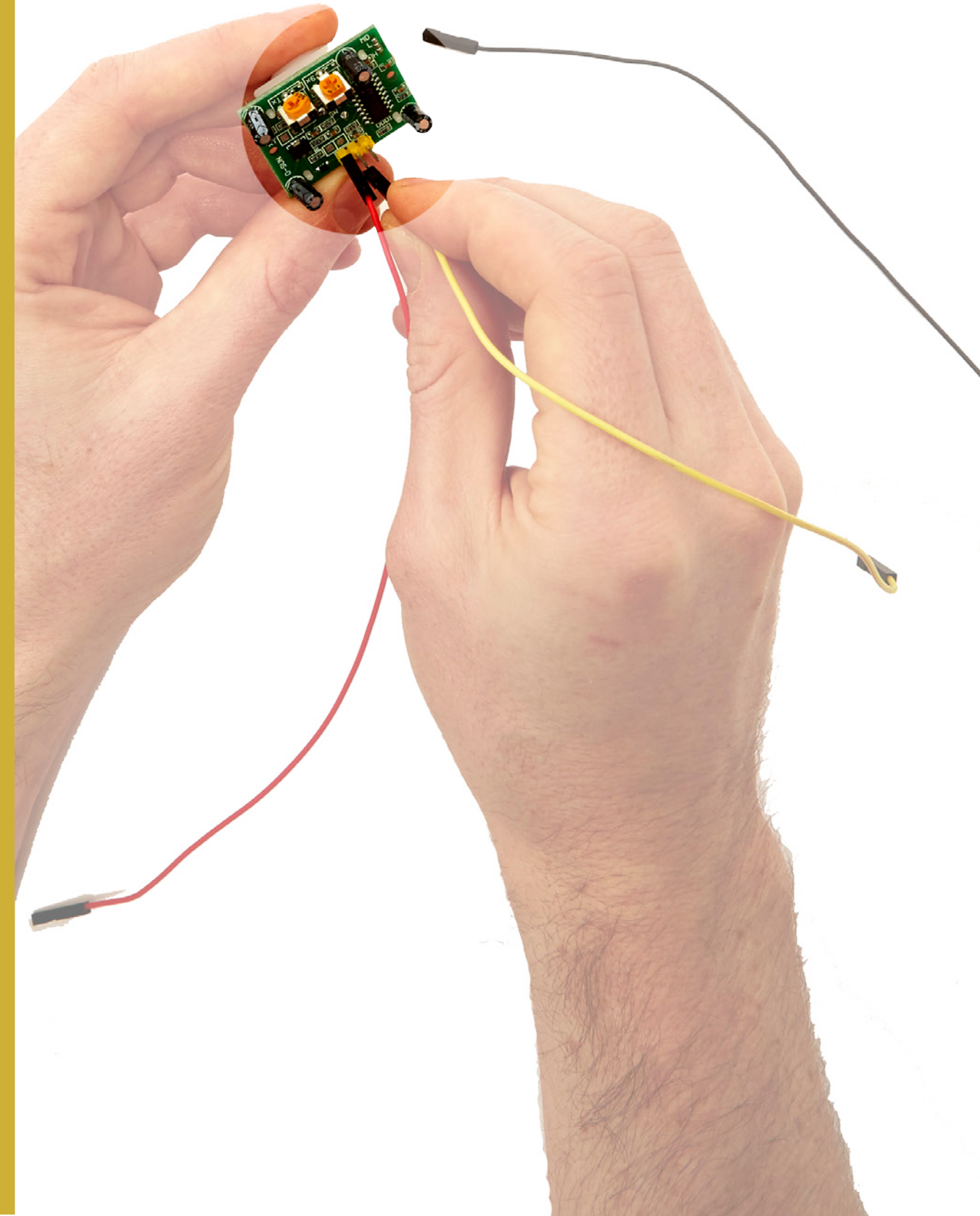


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Test it | Preparing to test

3

Task 1 - Charging your battery

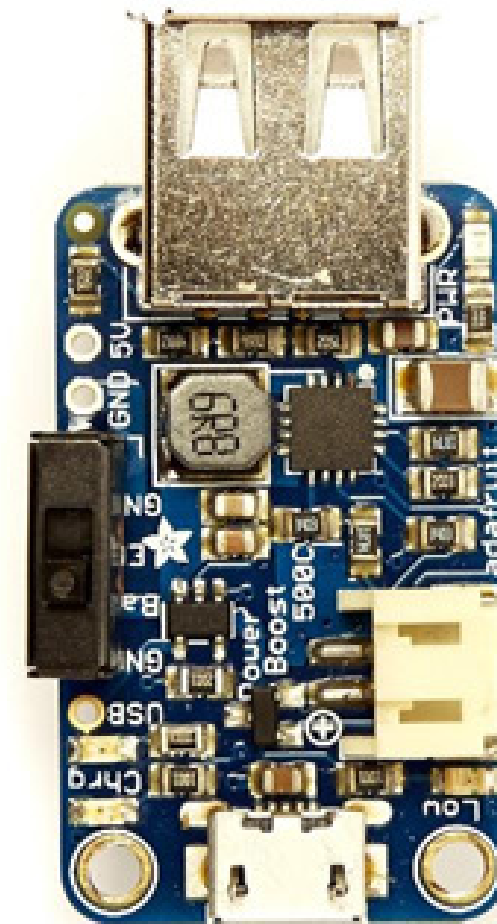
Before we can test your kit and start to take photos we need to charge the battery. You can do this by plugging in the micro USB cable into the Powerboost and then plugging that into your computer's USB socket or a suitable USB phone charger.

The powerboost has a number of LEDs that you can monitor to check its status. When you plug the USB cable in to charge the unit the orange charging LED should light up.

Once the battery is fully charged, the orange LED will turn off and a green LED will light up instead. This tells you that your battery is fully charged and you're ready to go.

Charge your battery up to full. Whilst charging we can test your kit, as you can power on the kit at the same time.

Note - the red LED informs you that the battery is low. You can open your case when outdoors and quickly see if the battery is low in this way.





You're ready to start testing

Plug a HDMI cable (from your TV or computer) into the kit and turn the camera on using the switch on the powerboost.

The Naturebytes desktop will load on your screen. Now we can start to test your kit.

Continue at **naturebytes.org/wildlife-cam-kit** where a video will guide you.



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Set it up | Finding a location to place your Cam Kit

4

Task 1 - Think about a suitable location

There are many different ways in which you can place your camera - where, when and how you place it will determine which animals you are likely to photograph, but to make sure you get off to a good start follow the tips (seen to the right) and have a good think about;

- 1) Looking for wildlife corridors and signs of activity such as paths, fences and where you've seen animals before.
- 2) Height and direction - would you prefer a wider view looking down at a bird table to capture multiple birds, or are you focusing on individuals close up?

What to watch out for

Changes in heat will trigger your camera, so try to place it where it's protected from the glaze of the morning and afternoon sun to prevent false triggers.

You can adjust the sensitivity of your PIR sensor (see online for details) if you find that the camera is taking too few or too many photos, regardless of placement.

You'll want to open the case and removed the USB drive to check how your camera is doing, so leave enough space to do this without having to take it down each time.

Set it up | Changing the date and time

4

Task 1 - Accessing the Raspberry Pi

Your Wildlife Cam Kit has a Real Time Clock which will remember the data and time even if you power off the kit. Because your Real Time Clock is brand new from the factory, it doesn't yet know the date and time.

We'll need to tell it what day it is by connecting to the Raspberry Pi and entering the data via the command line terminal. This may sound a little scary if you're a beginner, but it's actually quite easy (and interesting) as you'll get to see what the Raspberry Pi can do and soon realise that's a fully working computer.

To access the Raspberry Pi see the video "Testing your Wildlife Cam Kit" on the Naturebytes website.

Changing the date

Once you have accessed the Raspberry Pi, click on the Terminal icon seen on the bottom left of the screen.

You'll be presented with a command line in which you can type commands.

Type the following command and press enter. Change the date and time to the correct values.

`sudo date -s "01 MAR 2015 13:24:00"`

You have now told the Raspberry Pi what day it is, but we now need to save the time to the actual Real Time Clock. After you have entered the command above enter the following to do so:

`sudo hwclock -w`

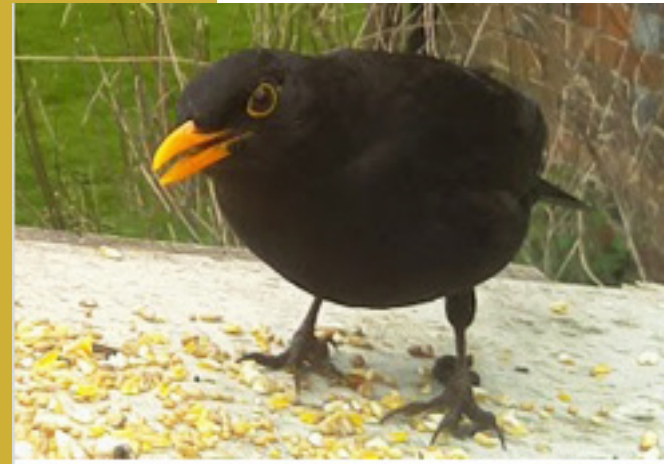
To read the time of your Real Time Clock enter:

`sudo hwclock -r`

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Viewing your photos

Check your USB Flash Drive

If everything was connected correctly your camera should be taking photos right now!

Point the camera away from you and wave your hand in front of it to activate the PIR sensor - this will trigger a photo to be taken. The photo will be saved automatically to the USB Flash Drive that is plugged into the USB socket on the Raspberry Pi inside the case. You can remove this drive and place it in your normal computer to view the photos - they can be viewed on both Windows based PCs and Apple Mac computers.

Pop the USB drive back into the kit and it will automatically detect it and start to save new photos to it without you having to remove it from its position. Note, however, that you should try to not turn it off or take the USB drive out when it is writing a photo (taking a photo) and should wait for 30 seconds after opening the case to make sure it has finished taking a photo (i.e detecting you) and saving it before turning it off if possible.

Using the kit itself to view your photos

Your Cam Kit has a Raspberry Pi inside, which is computer. By plugging in a HDMI cable and powering up the kit you will be presented with a Raspbian operating system and a collection of Naturebytes applications and scripts on your TV or computer screen.

Take a look at the “Testing your Wildlife Cam Kit” video on the Naturebytes website for an indepth look at these features and to explore this environment.

You can see photos being taken in real time when connected to the Raspberry Pi as a preview window will appear in the top left corner of the screen showing you the photos that have been captured.

Feel free to explore the code, tweak it, and experiment, as you can always download a fresh copy of the operating system from the Naturebytes website and start again.

Click on the “Image library” icon to view the photos on your USB Flash Drive directly.

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We're all here to help

We're building an online community where Wildlife Cam Kit users can post their photos, comment on sightings and discuss customisations and tweaks to the kit.

Beginner, expert, wildlife enthusiast or hacker - join our online community if you're looking for a fun way to develop your digital making skills, share your code or post an exciting new insight into the natural world.

You'll also find the latest scripts, instructions, help and advice. If you also find that you need help constructing the kit, don't be afraid to post a question on our support page or get in touch at info@naturebytes.org directly for assistance.

Visit <http://naturebytes.org/wildlife-cam-kit/> for more information.

Direct support

If you would like to contact Naturebytes directly to report a problem with your Kit, or perhaps a missing component, then please contact us at:

info@naturebytes.org