Replacing your Line-us arm

1. You will need the following items:

- Replacement arm
- Philips PH0 screwdriver
- Pry tool to remove the back
- Labels - just write on some masking tape: Top, Bot, T, M and B

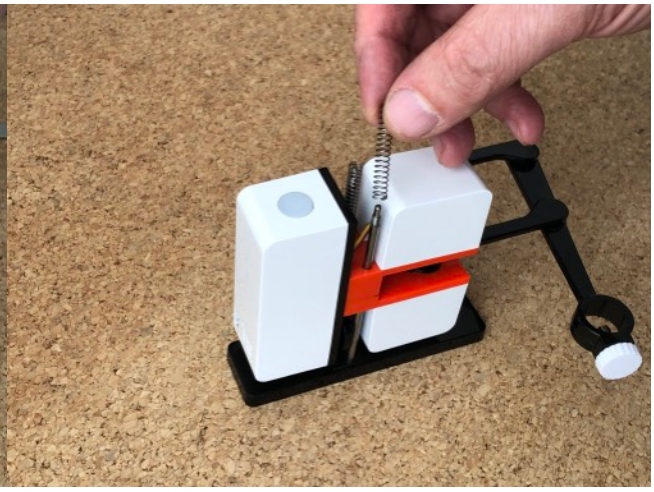
The repair should take about30 minutes and is fairly straightforward. If you have problems get in touch at help@line-us.com - if you get completely stuck you can always send your Line-us to us and we'll finish the repair for you so we encourage you to give it a try!

2. Clear the arm calibration in the Line-us App. Run the App and connect to your Line-us. In the Settings tab click the **Clear** button. You will probably see the arm move a little, but this doesn't always happen. If you're not sure there's no harm clicking **Clear** more than once. Close the App and unplug your Line-us form the power so that you can get to work.

It is **very important** that you don't move the arms on your Line-us between now and step 14, so you will have to be careful doing the next few steps. Its' worth taking a picture of your Line-us from above so you have a record of the positions to check against if you think you might have moved them.

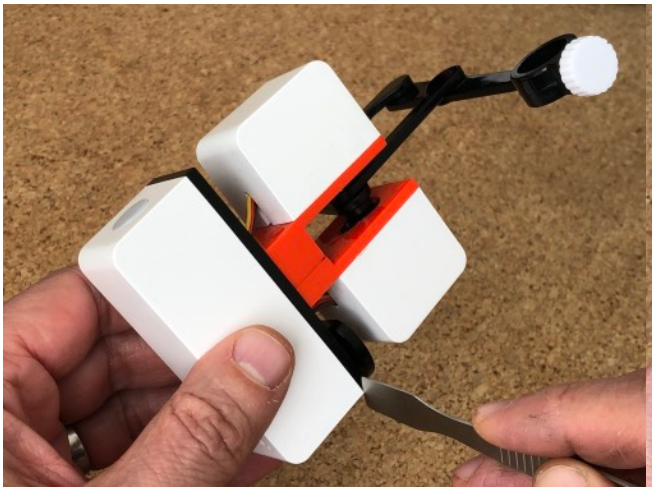
2. Label your Line-us so that you know which part is which. You can use some masking tape to make the labels.

3. Unscrew the two metal caps and remove the springs.

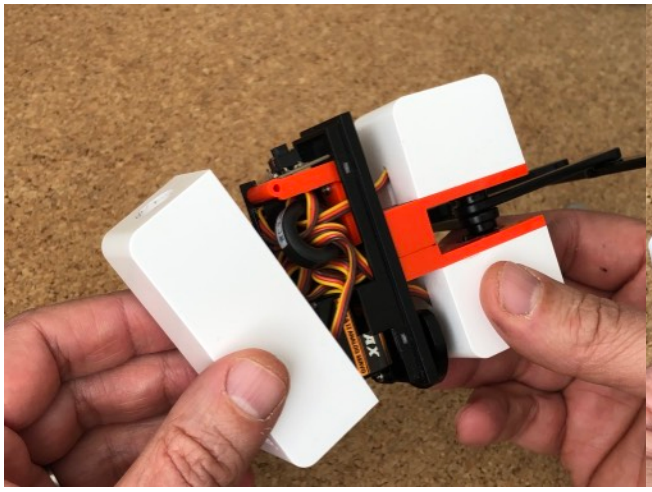
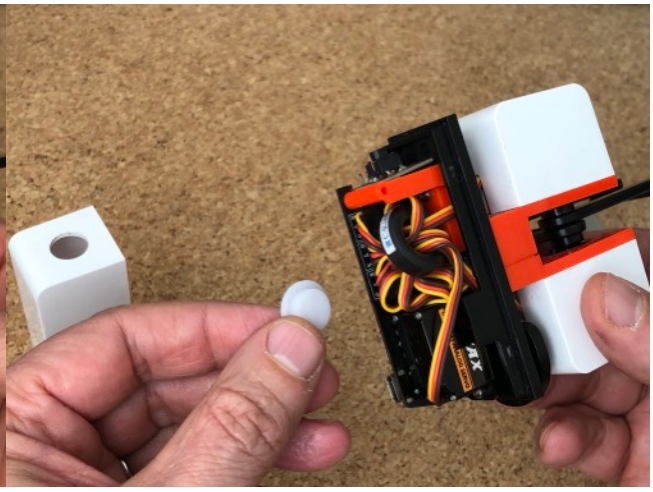


4. Remove the Line-us body from the base and put the base somewhere safe as you won't be needing it until you re-assemble your Line-us.

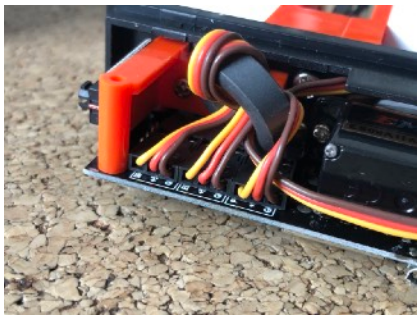
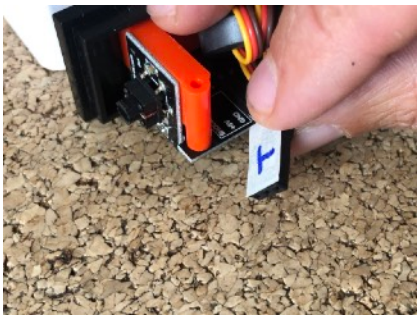
5. You now need to remove the back from your Line-us. You'll need a pry tool - it's not a good idea to use anything sharp in case you slip. It doesn't require much force if you get the technique right. Start at the bottom, on the arm side, insert the pry tool between the white and black parts right on the corner and lever away the back. You should hear a click. Then insert the tool at the top back corner and you should hear another click.



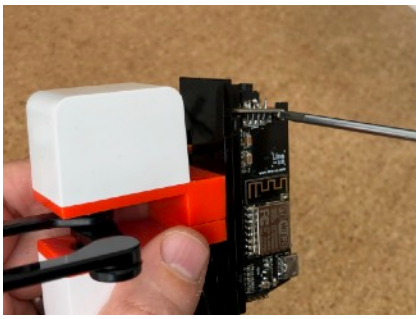
6. you should now be able to pull the back carefully off. One thing to be aware of is that the button will come loose as you remove the back and it's possible that to could get caught somewhere. If it feels like something is stopping the back from coming off it's probably the button. Try turning Line-us upside-down or gently shaking it to free things up. The picture below on the right shows what the button looks like.

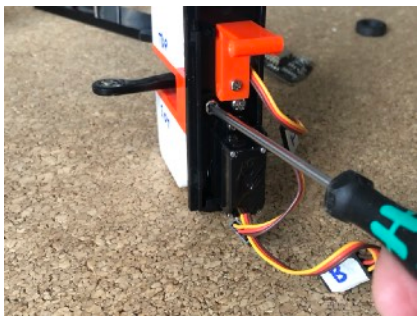



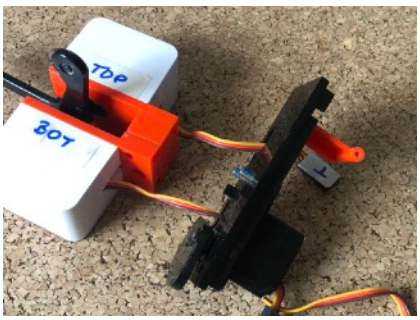
8. You'll now need to unplug the servo connections, but make sure to label them as you remove them; top, middle and bottom. The cables go through the thing that looks like a donut; the top and middle loop round it but the bottom one just goes through the hole. It's a bit tight, but the plugs will go through and it's easiest to start with the bottom one. You might be wondering why Line-us has a donut - it's actually a ferrite ring that absorbs radio signals and it's there to stop the servo cables acting as antennas and causing interference.

9. Now you're inside your Line-us you'll see the PCB which controls your Line-us! The bit in the middle with the metal cover and the wiggly gold line is the WiFi chip that is its brain. Remove the screw at the top that holds the PCB in place. It can be a bit fiddly to free the PCB but keep wiggling it and it will come out eventually

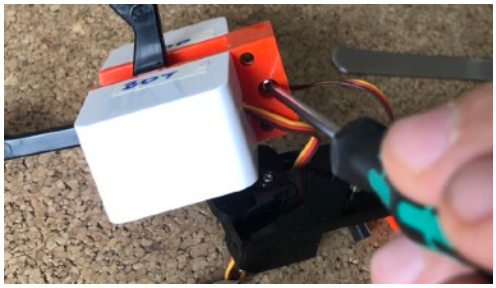


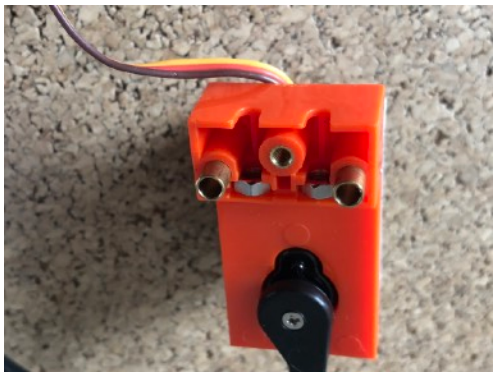




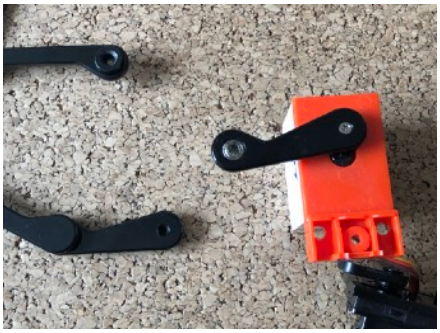
10. Now remove the back plate from the orange U section. Just unscrew the two screws - there's no need to take them right out.

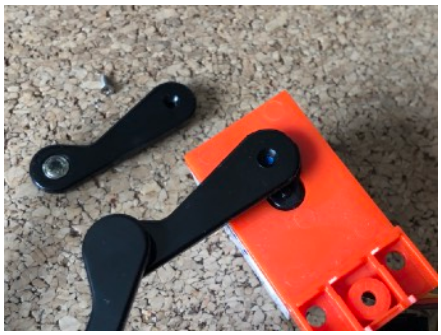
11. We're getting close to being able to replace the arm now - the next step is to remove the screw that hold the two parts of the orange U section together. You can leave the cables going through the slots in the back part or if you find it easier you can gently push the plugs through so you have one less part to worry about. Now is a good time to check that the arms haven't moved while you were taking Line-us apart - check against the photo you took earlier. If you think they may have moved skip to the end of the document to find out what to do. If all is OK, then once you've removed the screw (it's quite a long screw so you might be unscrewing for a while) your Line-us should look like the picture on the left. Depending on what the problem is with your arm the two halves may not be completely separate, but if a part has broken off you'll be able to separate them. There are two small nuts in the top part of the U - one or both might fall out. If they do put them somewhere safe as they are important.



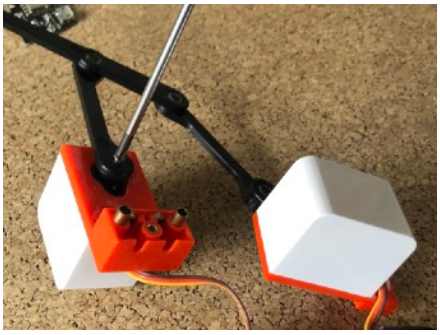


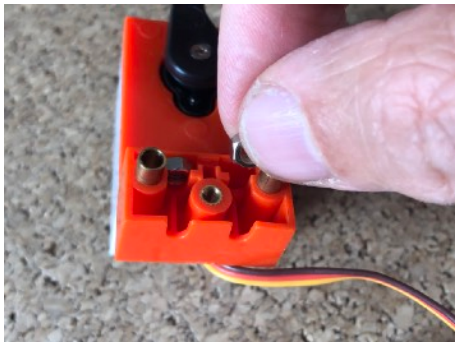
12. Now you're ready to remove the arm from the bottom part of the U. Make a mental note of how the arm looks, or maybe take a photo. You'll need to hold the arm while undoing the screw so it doesn't move. Once the screw is removed pull up the arm, or use the pry tool if it's stiff. The put the short arm of the replacement on so that the position is the same. It might not go on in exactly the same place as sometimes the arm mouldings are a little different, and as the shaft has 'splines' it will only go on in certain positions. Pick the position where the bottom edge is as close to horizontal as possible. In the picture above you can see the the arm is quite close to horizontal. Then replace the screw.





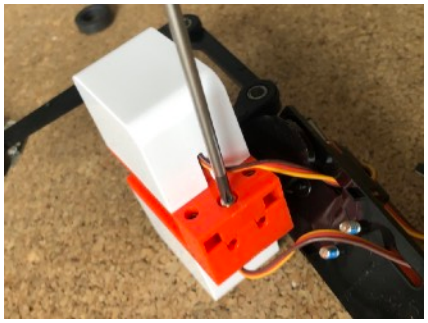
13. Now turn over the part you've just been working on and lay it in the table. Take the top part of the U which has the longer arm still attached and put it next to the bottom part as in the picture on the right. Now remove the screw holding the old arm on, again holding the arm so it doesn't move and put the new arm on so that it's as close to straight as possible and replace the screw.

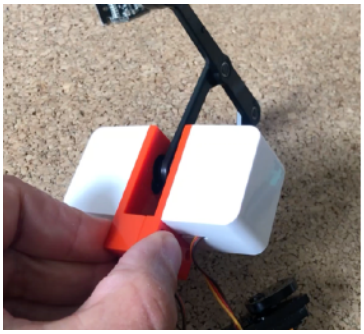




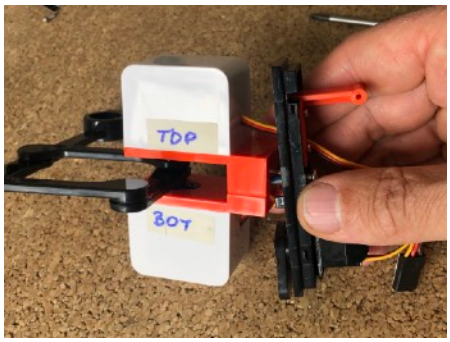
14. There are two shiny nuts in the top part of the U that may have fallen out. Check they are both there and and put them back if necessary.

15. Now you need to carefully put the two parts of the U together, making sure the two nuts don't fall out. It would help to have three hands, but if you're not a three handed alien than just take it slowly and you'll get there. You can then put the long screw back in and tighten it.

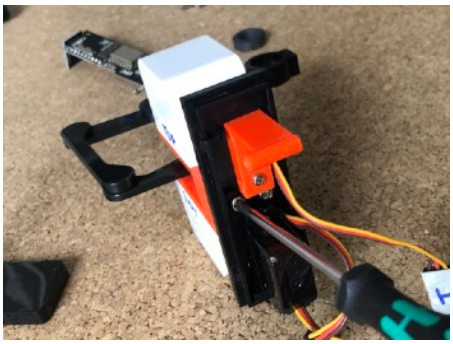


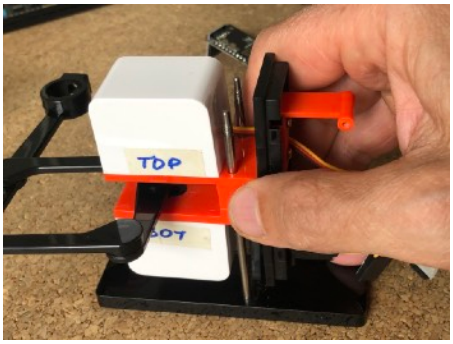


16. Phew, that's the tricky part done and your Line-us should look like this. The arm should point to the right and be more or less square to the Line-us body. Now we'll start the re-assembly.



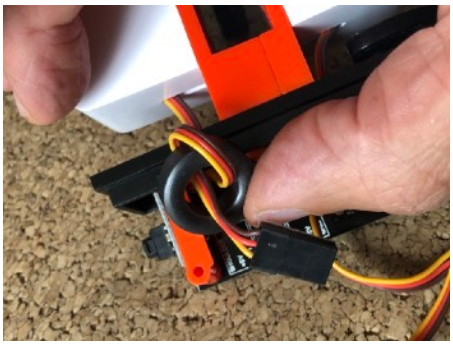
17. Re-fit the back to the U section, making sure that it's the right way up. The servo and cam should be a the bottom. If you unthreaded the cables you should push the plugs back through the slots in the back before refitting the back. There are two lugs on the back that fit into holes in the U section that will guide it into place. Gently tighten the two screws in the back. If they don't tighten no matter how much you screw them in then one of the nuts from step 14 is missing. just gently tighten these screws - enough so they won't come undone. We'll check that they aren't too tight in the next step.



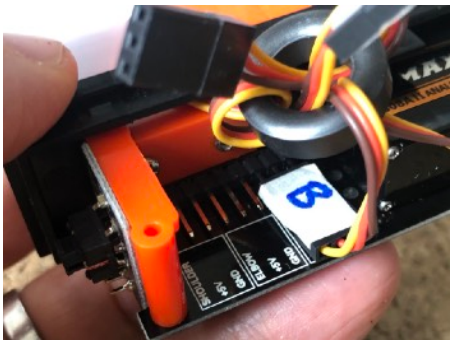


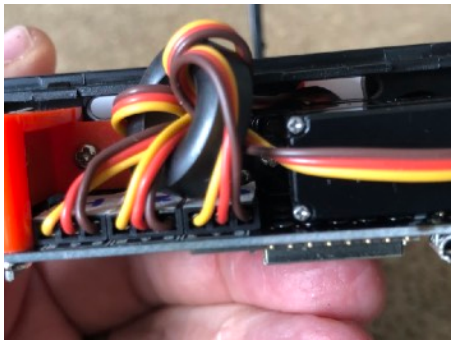
18. Now slide the Line-us body back onto the base to check that it moves freely. There should be no resistance - if there is then loosen both of the screws you just fitted a tiny bit until the resistance has gone. If you're worried that they are too loose tighten then a bit and make sure it still moves freely.

19. Now thread the servo cables back through the donut and plug them back in to the PCB. The top and middle loop around the donut once and the bottom one just feeds through. It's a bit fiddly - the donut is there to so that we comply with the interference regulations and so if you don't get the threading quite right it won't stop Line-us from working.



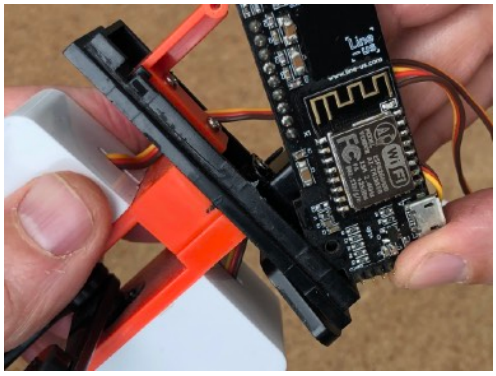
20. Once you've done that plug the three plugs back into the circuit board. You do this before or after you screw the circuit board in. It's very important that the plugs go back in in the right places (the one marked **shoulder** on the circuit board is the top). Make sure that the the plug is fitted with the brown wire at the bottom as in the picture on the right. It's also important that all three pins on the PCB go into the plug. If you find your Line-us doesn't lift after the repair it's most likely to be a problems here - so double check before moving on! When you're finished it should look like the picture on the left.

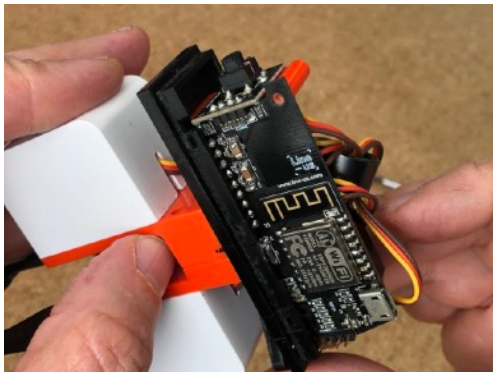


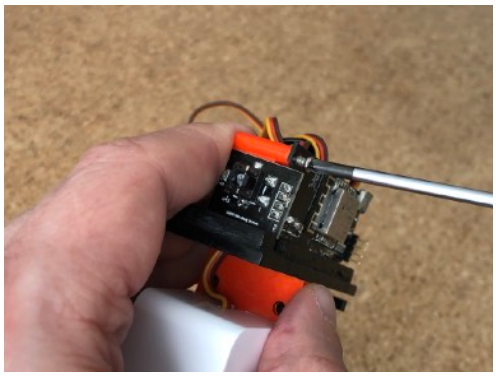


14. Now you'll need to power up your Line-us so that the lift servo goes to the home position. Plug it in and wait for the arm to wave. Fit the cam as in the picture below - so that the top part is as close to horizontal as possible. It's OK if it's a little off, as it will only go in certain positions but pick the one that is closest to horizontal. Be careful not to turn the servo when doing this. If you think you may have, unplug your Line-us and plug it in again to re-set the position.

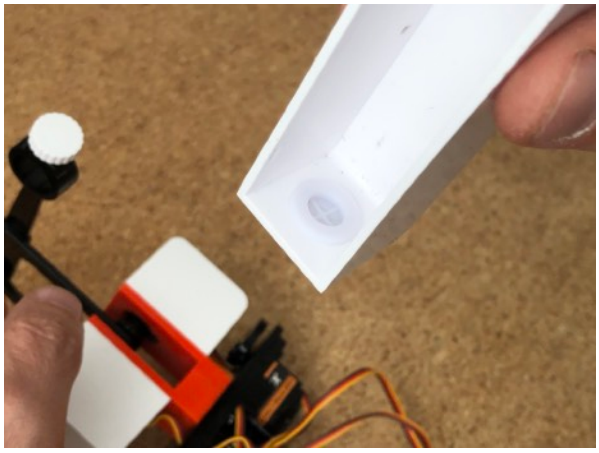
17. You're now ready to re-fit the PCB. The bottom goes in first and it might take a bit of wiggling to get the top part in as it's a tight fit between the orange bracket and the top plug. Keep trying!
18. You can now screw the PCB to the bracket. Again, not too tight.

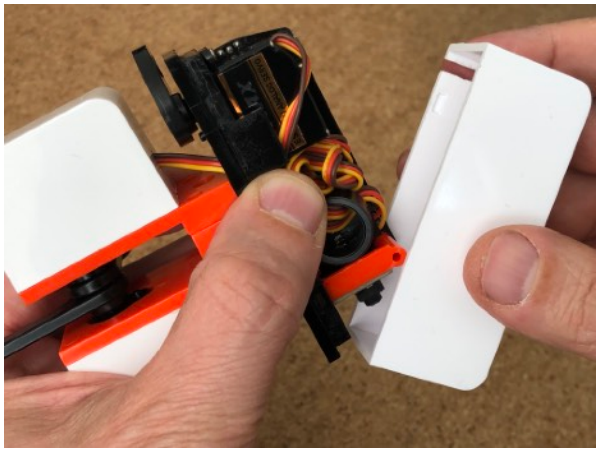




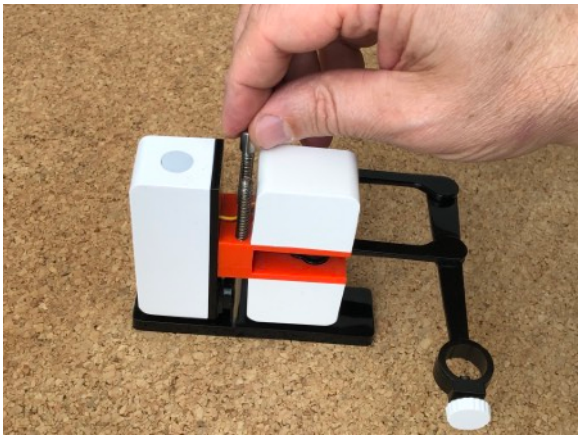


19. Nearly there! You need to re-fit the back with Line-us upside-down. Place the button in the hole in the back and fit the back to Line-us staring at the button end. You'll need to make sure all of the cables are tucked in neatly. If everything is in place you'll be able to click the back back on. Just check that there are no cables hanging out and that the button is in place before clicking.

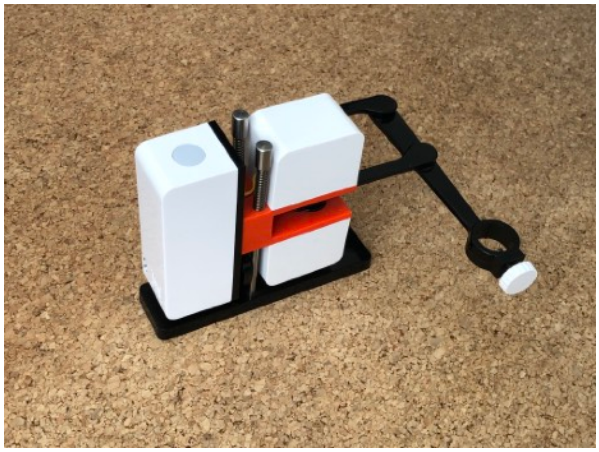


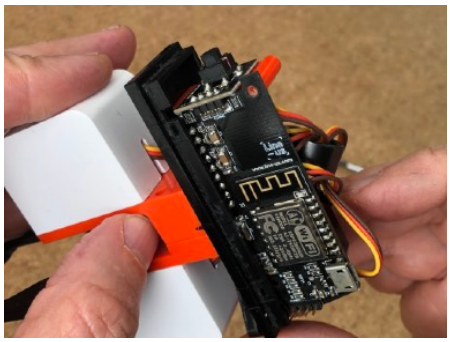
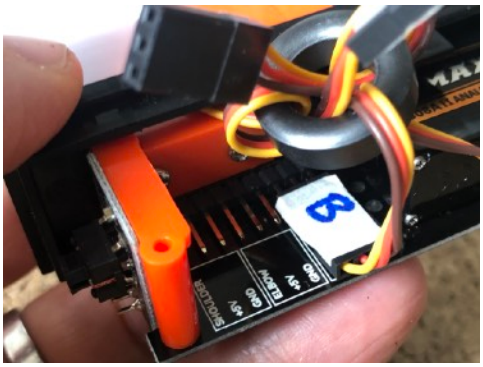


20. Re-fit the Line-us to the base, put the springs back on and screw on the caps.



21. Well done! You've now completed the repair.You'll need to re-calibrate your Line-us. There are instructions at: https://www.line-us.com/help.html#11 and then you'll be ready to draw!



Appendix I - Help! I think the arm moved

DON'T PANIC! actually it's not too tricky to fix. Plug the two cables marked **T** and **M** back into the circuit board. **T** goes to the **shoulder** position and **M** goes to **elbow.** You can leave B unplugged. Then plug a USB cable into the circuit board - the socket it the grey thing at the bottom of the board that you can see below. The arms will move and then move back to the correct position. You can then remove the USB and unplug the **T** and **M** plugs.