

## Ptosis crutch open source instructions

The ptosis crutch device has been made available as an open source file for your (the users) convenience. The ptosis crutch can be downloaded and easily assembled using the step-by-step instructions outlined below.

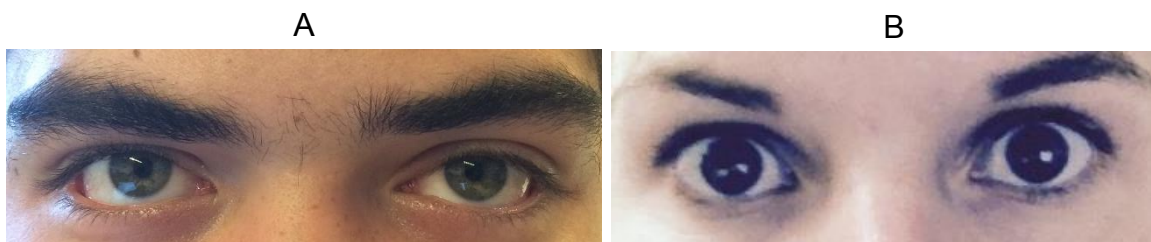
### Instructions

1. Download the STL and SLDWRKS files within this folder.
2. Locate your closest 3-D printing facility (it is often easiest to find the closest 3D printing institution using a Google search).
3. Measure the height and width of the superior border of your spectacle frame [Figure 1].



*Figure 1: Illustration of the height [A] and the width [B] measurements.*

4. If you have got access to the SolidWorks software, alter the dimensions of the attachment component to 0.1mm larger than the dimensions of your spectacle frame, that were measured in step 3.
5. If you do not have access to the SolidWorks software, ask an assistant at the 3D printing institution to alter the dimensions of the attachment component to 0.1mm larger than the dimensions of your spectacle frame, that were measured in step 3.
6. Determine whether the aperture of the eye is upward or downward sloping [Figure 2].



*Figure 2: Downward [A] and upward [B] sloping eye aperture.*

7. Select the crutch bar for the ptotic eye with the suitable slant for the user's aperture [Figure 3].

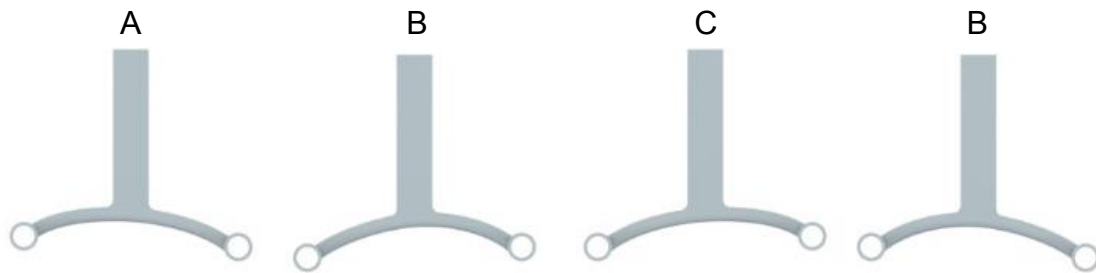


Figure 3: Models of the crutch bar for the left and the right eyes. A] Left eye upward sloping aperture, B] Left eye downward sloping aperture, C] Right eye upward sloping aperture, D] Right eye downward sloping aperture.

8. You are now ready to 3D print the three components of the ptosis crutch. Print the components using ABS as the chosen material.
9. Sand down the 3D printed component to remove the roughly printed edges
10. Place the 3D printed components in an acetone chamber with 45 ml of acetone [Figure 4]. The control and the crutch bar should be placed in the chamber for 20 minutes while the attachment component should only be inserted for 10 minutes. The acetone vapour based smoothing provides the ABS with a smooth and glossy finish.
11. Mould a piece of 1.5mm galvanized wire to a curved shape [Figure 4] with the dimensions given below:
- RoC: 12.7mm
- Height of curve: 4.87mm
- Width: 24mm

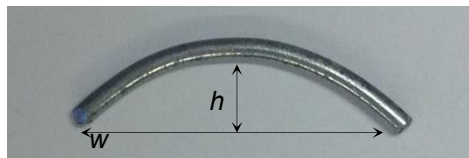


Figure 4: Curved shape of the galvanized wire.

12. Cut a 5cm length of PVC tubing with a bore of 2mm.
13. Thread the curved wire through the PVC tubing [Figure 5].



*Figure 5: Curved galvanized wire being threaded through the PVC tubing.*

14. Thread the PVC tubing, containing the wire bar, through the cylindrical openings in the crutch bar housing unit [*Figure 6*].



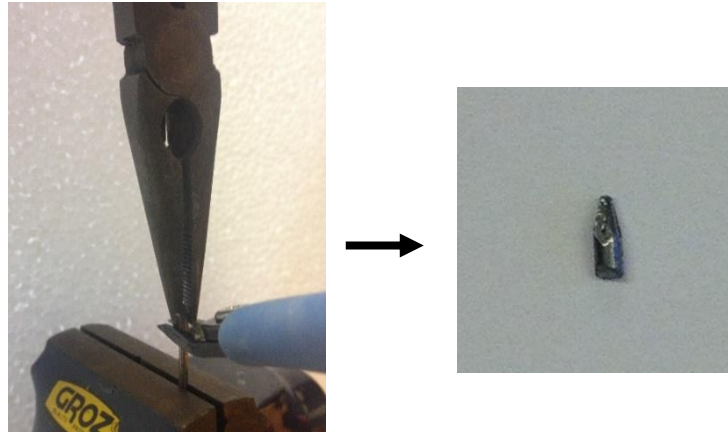
*Figure 6: PVC tubing inserted into the ABS crutch bar.*

15. Snip the PVC tubing at the edge of the crutch bar housing unit [*Figure 7*].



*Figure 7: PVC tubing being cut to size, when threaded through the cylindrical openings in the ABS crutch bar.*

16. Remove the 2mm tip of a stainless steel nail (2mm diameter), using wire cutters [*Figure 8*].



*Figure 8: Tip of a 2mm nail being removed, using a clamp to secure the nail and pliers to remove the tip of nail.*

17. Insert the nail tips into the PVC tube opening and push them into the bore of the tube [Figure 9]. The purpose of the nail tips is to secure the PVC tubing within the housing unit.



*Figure 9: Nail tips inserted into the PVC tubing to secure the tubing in place.*

18. Clip the attachment component onto the superior border of the spectacle frame.  
The component should fit securely on the spectacle frame.
19. Insert the control component into the slot on the attachment.
20. Insert the crutch bar into the slot on the control
21. Fit the spectacles to the nasal bridge.
22. Adjust the crutch bar along the y axis to comfortably fit on the upper eyelid.
23. Elevate the eyelid to clear the visual axis using the vertical lever.