

N-BCAM Assembly Manual

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This manual describes how to assemble an N-BCAM out of a loaded circuit board and the necessary mechanical and optical components.

The parts required for assembly are listed below:

- A208301A/B loaded flex board
- 1 of ICX-424 CCD
- 1 of RJ-45-RST Inverted
- 1 of 48mm lens (Edmund Optics)
- 1 of 5mm length brass lens holder
- Black/blue anodized N-BCAM base
- Black/blue anodized N-BCAM face plate
- Black/blue anodized N-BCAM cover
- 2 of pan head, M2.5, 10mm length screws
- 2 of pan head, M2.5, 12mm length screws
- 2 of pan head, M2.5, 5mm length screws
- 4 of pan head, M2.5, 8mm length screws
- 4 of socket head, M2.5, 8mm length screws
- 2 of aluminum standoffs, 8mm length
- 2 of aluminum standoffs, 5mm length
- 1 bar code sticker and 1 reflective number sticker

The tools required for assembly are listed below:

- Phillips head screwdriver
- 2mm Allen key
- Tweezers
- DP460 epoxy
- DP270 black epoxy
- Petri dish
- Wooden applicator
- Aluminum bar lens inserter
- L-shaped 0.7mm G10 shim

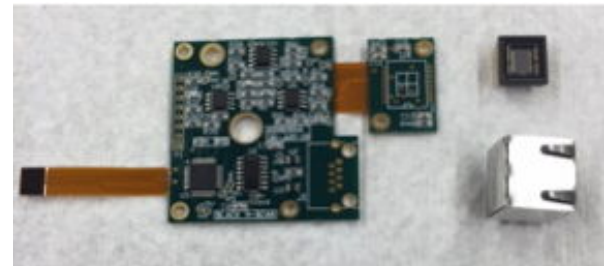


Figure 1: N-BCAM Flex Board (left), ICX-424 (top right), RJ-45 (bottom right)

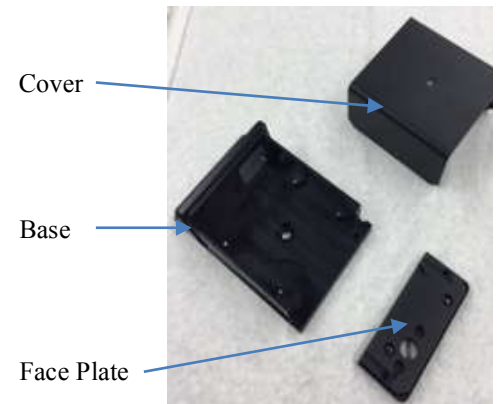


Figure 2: N-BCAM Body



Figure 3: Lens Inserter

The assembly process for the optics involved are as follows:

Step 1: Clean off the lens holder by spraying it with dry air. Mix DP270 black epoxy (1:1 ratio) in petri dish using wooden applicator and apply thin ring of epoxy around the outside of the ledge of the clean brass lens holder. (You may want to use gloves when performing this.)

Step 2: Next, as you prepare to glue in the lens, you must determine its proper orientation. The lens has a flat side and a convex side. Hold the lens under a light fixture. When we have the lens convex-side-down, if looked at closely, it will show a small coherent sized reflection of the light fixture and a reflection of an immensely magnified light fixture. The flat-side-down orientation will have a larger coherent reflection and a smaller, in comparison to the flat surface, magnified reflection of the image. We want the lens oriented in the lens holder flat-side-down.

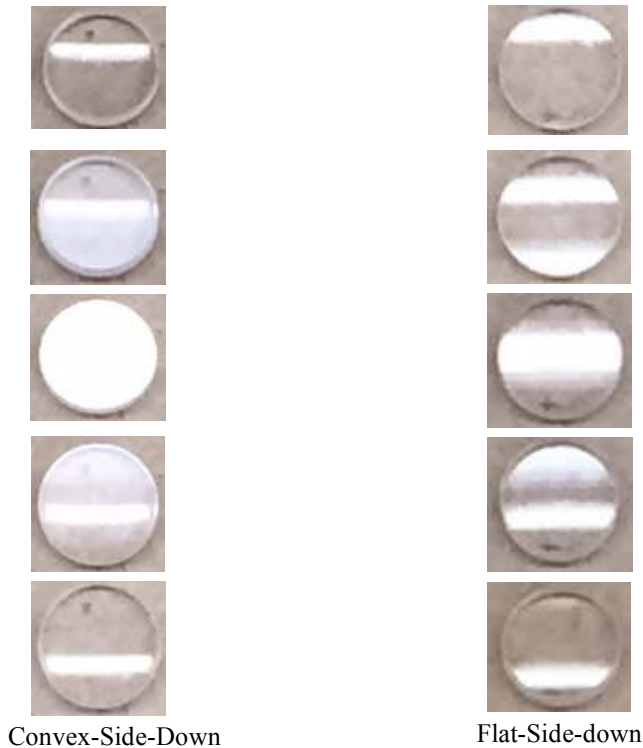


Figure 4: The two columns above show what one would see when looking down at a lens under a light fixture with the convex-side-down (left) and the flat-side-down (right).

Notice how with the convex-side-down, the reflection of the light fixture is much larger than that of the flat-side-down lens, with this reflection taking up the whole lens in the middle photo on the left. Also notice how on the right (flat-side-down) the two reflections appear more distinct from each other, whereas on the left (convex-side-down) there appears to be the distinct streak from the coherent reflection and then the other reflection looks more like a faint sheet of light.

Gently place the lens flat-side-down onto the ledge in the lens holder, making sure it lies flat and evenly (can use clean part of applicator to gently tamp the lens down around perimeter). If you notice epoxy seeping out toward the center of the lens, remove the lens, clean the ledge, and try again. Once lens is settled properly, allow it to cure for 24 hours.

If you notice that there is dirt or epoxy that seeped in towards the center of the lens during curing, you may use a dental pick to try to scrape off the epoxy and ethanol to clean off the lens, then blow dry with nitrogen.

Bottom of lens holder.

Notice that the hole on this side is flat (no chamfer).



Top of lens holder.

Notice that the hole has a 45 degree chamfer.

Apply thin ring of epoxy and then place lens flat-side-down onto this ledge.

Figure 5: Lens Holder

Step 3: Take the already-assembled laser head and screw it into the face plate using the two 5mm standoffs and the two 10mm pan head screws, ensuring that the laser diodes lay flat on the face plate. For full laser head assembly instructions, see

http://alignment.hep.brandeis.edu/Electronics/A2074/NBCAM_Laser_Assembly.pdf

Step 4: Using mixing nozzle, mix DP460 epoxy (using 2:1 cartridge) in petri dish using wooden applicator and apply a thin ring of epoxy around the inner surface of the designated lens holder slot in the face plate. (You may want to use gloves when performing this.)

Step 5: Using the aluminum bar lens inserter on the front of the face plate, insert the lens holder into the front of the face plate such that the lens side of the holder is facing outside of the NBCAM. If any epoxy seeps into the lens holder during this process, clean it off with a cotton-tip applicator. Additionally, clean off the ledge of the inserter to ensure no epoxy remains on it. Allow lens holder to cure in the face plate for 24 hours.

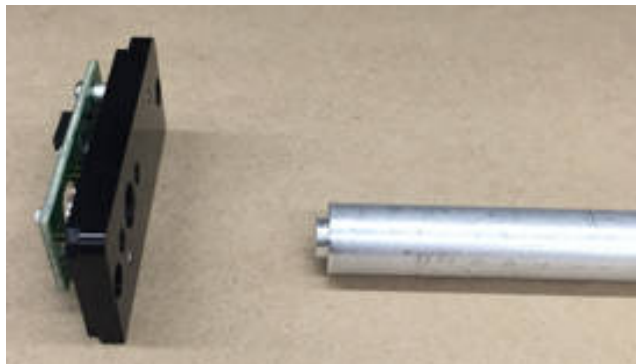


Figure 6: Proper justification of face plate and lens inserter to epoxy lens holder

The assembly procedure for the N-BCAM board and chassis is as follows:

Step 1: With the aid of water-soluble flux and the L-shaped G10 shim, solder the ICX-424 onto the A208301A/B flex board such that the widest pin (Pin 1) goes through the designated square hole (make sure to push the CCD all the way in such that it lays flush with the shim). Clip the pins of the of the ICX-424.

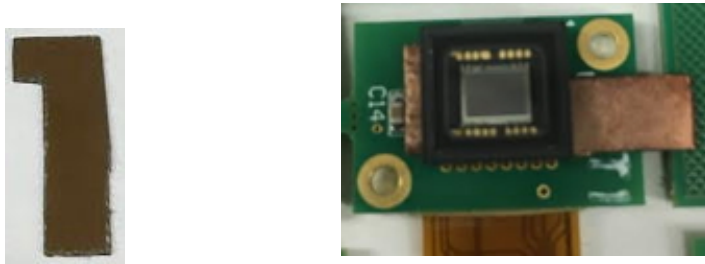


Figure 7: The left image shows a G10 shim to be used for soldering the CCD. Slide the shim in such that it is sitting between the board and the CCD as shown in the right image and then solder the pins of the CCD (using flux) while pushing the CCD against a flat surface, ensuring the shim is being pushed against the board evenly throughout, thus avoiding any skewing or rotation of the CCD.

Step 2: Solder the RJ-45 RST Inverted connector onto the A208301A/B flex board. Clip the shield tabs of the RJ-45 to ensure they do not short with the chassis.

Step 3: Wash the flex board using warm water with a brush as well as squirting water under the image sensor with a thin jet nozzle and then blow dry, allowing the plastic cover on the image sensor to blow off during drying. (**See note at end of manual for instructions on cleaning the CCD if it appears dirty before calibration**)

Step 4: Program the logic chip on the now fully-loaded board using the P2083A02 .JED file in Lattice. Test the board by making sure it takes pictures and flashes lasers.

Step 5: Clean the chassis by spraying it with nitrogen, and then place flex board into the N-BCAM anodized base at a slight angle and then push down so that the RJ-45 is properly sitting in its designated slot in the wall of the base, as shown in Figure 8.



Figure 8: Make sure RJ-45 sits properly in the base as shown.

Step 6: Using the four 8mm pan head screws, screw the flex board into the bottom surface of the base with the Phillips head screwdriver.

Step 7: Using tweezers or small plyers, hold one of the 8mm standoffs in place in the lower hole of the wall of the anodized base with the CCD. Use your other hand to partly screw in one of the 12mm screws through the CCD board and standoff. Be careful not to damage capacitor C16 on the main board while doing this.

Step 8: Do the same with the higher-placed standoff, slightly tightening it. Then, tighten both screws a second time a bit harder. Finally, tighten both screws a third time such that they are very tight and the CCD is justified properly.

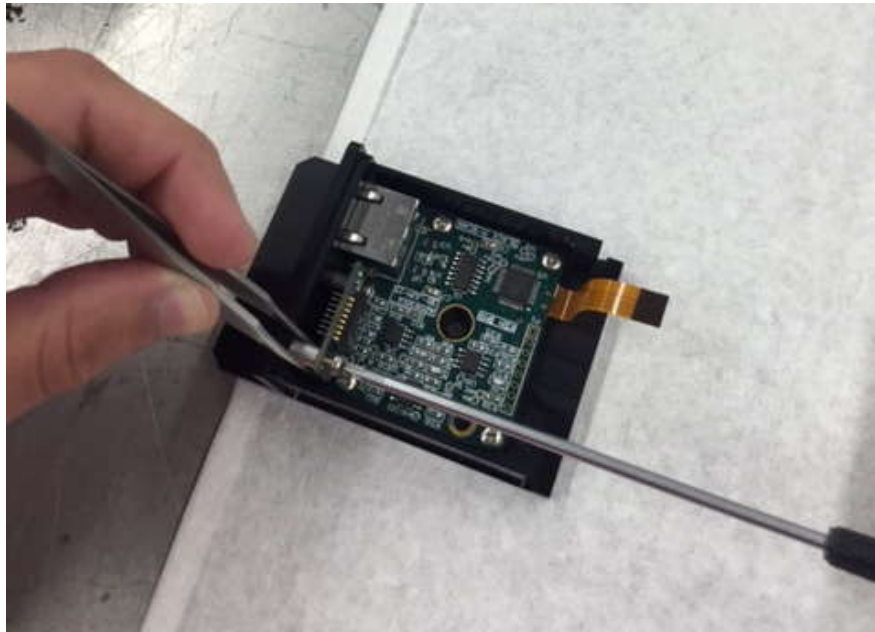


Figure 9: Recommended technique for screwing CCD board into the wall of the base through the standoffs

Step 9: Plug the flex cable of the main board into the connector on the laser board of the face plate.

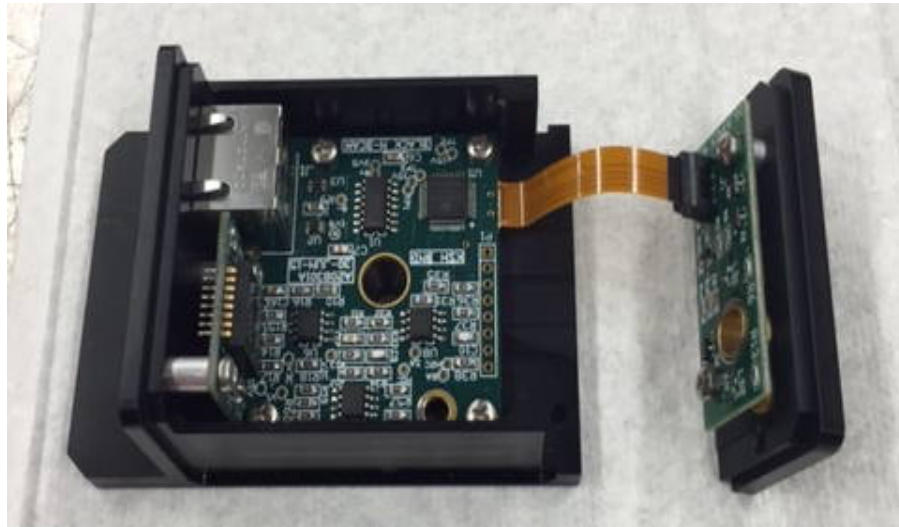


Figure 10: Assembled base attached to face plate through flex cable

Step 10: Using the 2mm Allen key, screw the four socket head 8mm screws into the face plate to connect the face plate to the base using the following technique: **(1)** Finger-tighten the two screws connecting the face plate to the bottom surface of the chassis, **(2)** Finger-tighten the two screws connecting the face plate to the front end of the chassis, **(3)** Firmly tighten the two screws connecting the face plate to the bottom surface, **(4)** Firmly tighten the two screws connecting the face plate to the front end.

Step 11: Place the anodized cover on the chassis and screw it in on the sides using the two 5mm pan head screws.

Step 12: Place a bar code sticker on the top of the cover and the corresponding reflective number sticker on the front face plate.



Figure 11: Fully-assembled N-BCAM with stickers on chassis.

****Cleaning instructions if CCD appears dirty right before calibrating****

If the CCD appears to be dirty when taking a test image right before calibration, we use the following procedure to clean it such that we do not push against the CCD with enough force to skew it at all and thus affect the N-BCAM's calibration.

Step 1: Take a lint-free wipe and fold it as shown in the figure below.



Figure 12: Folded wipe to be used to clean the CCD.

Step 2: Hold one end of the folded wipe and soak the other end in ethanol.

Step 3: Rub the side with ethanol across the face of the CCD, ensuring that you are not directly pushing your finger against the CCD at all.

Step 4: Blow the CCD with nitrogen to dry the surface.