LKB Knifebreaker. A. G. Moss lab

The knifebreaker is located in lab room 155A, i.e. next to the ultracut, immediately adjacent to the sink. Not a great location. We'll try to move it as space is rearranged.

This is a very standard piece of equipment; nearly anywhere you go, you will see this device. It's used for breaking glass knives used for both semithick and thin sections.

Glass is a fluid! Therefore once broken (or pulled, as with a micropipette puller) the ultrafine blade or tip will become blunt. It only takes a few hours for a freshly broken knife to lose its capability to perform thin section; but you can do high quality final trimming and facing with an old knife; even one many months old.

The glass used for this process comes from the manufacturer/distributor as long blanks, typically ¼ inch thick, and one inch (25 mm) wide. We'll assume that's what we are using for all steps described here.

With all step, exercise due caution! You are handling glass, which, when broken, literally makes the sharpest edge that can be produced. It is so sharp that you might not even feel a dangerously deep cut until it is too late, so handle the glass carefully.

NEVER USE FORCE! ONLY PINCH-TIGHT; NEVER 'CRANKED DOWN'! IF SOMETHING DOESN'T MOVE FREELY, CONTACT DR. MOSS!

Procedures
Making the half-length glass blank:
1. Glass is held in a long box; pieces are 2 feet long; the glass must be cut in half to be manageable. Frequently it is almost ludicrously dirty. Wash the glass 'blank' in a dilute Alconox solution (~0.1 %), and rinse it at least 5 times with ultrapure water. I would recommend you use gloves, but lab gloves are a joke; they would never stop a glass cut, so use heavy dishwashing gloves or something designated for this purpose. Other than protecting you from a cut, there is actually no reason to wear gloves; bacterial or other contamination from your hands will not matter unless it gets on a sharp edge. Allow to dry complete and check that there are no water marks; if so re-rinse. It's very important that the glas be clean. From this point on, handle the glass by its broad sides! This reduces the chances of being cut, and also keeps your fingers off the critical regions that will become the cutting surface.

2. Open up the diamond-holding jaws (look like two mini tuning forks with nylon plastic end bits to hold the glass) by rotating the leftmost knob on the side of the instrument (it's on the left side of the box), and gently pull it out. It will lock in the out position. The knife breaker knob is on the front right of the box; rotate it fully to the counterclockwise direction. Do not make ANY other knob adjustments. Do not make any adjustments to the white plastic fence, or the fine angle adjustments to the diamond holders.

3. Make sure that the cutter slider is all the way in; pushed forward. It has a white plastic knob that freely rotates – rotation does nothing. However, there is a marker on it that shows either a railroad track appearing picture, or the diamond image. Also, there is a setting for '25' (mm) or 38 (again, mm). This relates to the glass thickness, set it to 25.

4. Inspect a full-length glass blank. On one side the glass edges will be exceptionally clean and sharp; the other will look a little scored on the edges; slightly jagged. Place the edge side down in the holder. Place the piece so that it spans over the entire instrument, depressing the two small stainless pegs just to the left of the cutter. Pull the glass gently back against the white plastic fence. Make sure that the piece is in line with the end of the instrument to the left; once you've done all this the piece is positioned to be cut in half.

5. While holding the glass blank gently against the fence, gently lower the cutter head down on the glass. Make sure the glass is properly seated against the fence with your right hand, then lift the head up a little with your left hand on the lever, and transfer your right hand to the top of the head. As you lower the head, steady it with your hand; before you clamp it allow your arm to 'get heavy' and put some pressure down on the glass. Only a pound or so; not much; you are stabilizing the head and holding everything stable.

6. In one smooth motion, pull the scoring arm toward you. You will hear a distinctive quiet scratching sound as the carbide roller cutter scores the glass surface. Quickly and smoothly rotate the right-hand 'breaker' knob (located on the front) about ¼ to 1/3 of a turn; the glass should cleanly break as the two black rods rise up to press on the glass. Return the breaker knob by rotating it counter clockwise all the way.

7. Raise the head, supporting it as it comes up. Push the sliding cutter in all the way. Pick up the two newly-cut pieces of glass.

Making the 'diamond shape' and cutting it to produce a useable knife.

8. Select a clean half-length blank. Place it with scored surface down in the knifebreaker and stabilize it against the plastic white fence. Place the tuning-fork like lifter under the glass, and around the stainless stops. Push the glass to the left so that it runs into the stainless pins to the left of the cutter slider. Ensure that the cutter is pushed all the way in. Lower the head as before (see above); cut as before (this is the same process as before, but instead you are making a 1 inch piece of glass. After cutting return the knobs to their startng positions.

9. Lift the head as before; remove the remaining long piece to the right. Lift up the 1 inch square to the left, and carefully rotate it 22.5 degrees counterclockwise so that the lower left corner faces you. Place the square so that the lower left is directly positioned into the square blank holders/stabilizers. Rotate the LEFT most knob so that the square is positioned and clamped between the two stainless supports. The plastic (nylon) feet should hold it stably. Reverse the knob and retighten it by several times quickly. Place the lifter under the square diamond piece. Rotate the cutter slider knob so that the

diamond symbol appears. Lower the head as before, and then cut as previously. Raise the head and then use the lifter to pull the two pieces apart; and then entirely remove the newly cut pieces; be critically careful not to touch the newly cut edges together.

Place the new knives in a box with tacky wax or clay strips on the bottom to hold the knives in place in the manner you were shown.

Making the water trough

10. Cut a 2 inch strip of ¼ inch wide mylar tape.

11. Carefully wrap the tape around the knife, being sure that the tape is at the very edge of the knife edge (be carefuly NOT to cut your fingers!).

12. Pull the tape around the side of the knife and smooth it out; be careful to ensure that the tape is parallel to the base of the knife.

13. Continue wrapping around the diagonal region of the knife, and over the remaining side of the knife. Smooth it down again.

14. Use a razor to cut off the excess tape; start at the bottom of the knife and carefully slice upwards toward the edge.

15. Seal the back of the trough with sealing wax or paraffin wax as you were shown.

All done!