ULTIMAT
MANUAL
INTRODUCTION
Thank you for choosing a Keencut ULTIMAT. Every effort has been made to bring you a superbly built product with the promise of many years of good service. Please read these instructions carefully in order to obtain maximum benefit from your machine and remember, in case of difficulties ask your distributor or Keencut Limited for assistance.

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N.B! Please fold out the front flap when reading the instruction manual.

IDENTIFICATION

B = The aluminium base
Ba = Clip in board supports (optional extra)
Rb = Bevel blade [see fig 10]
Bbh = Bevel blade holder [see fig 8]
Brs = Slide adjustment screws for Ch [see fig 19]
Bdh = Bevel depth adjustment knob [see fig 13]
C = M6 nuts on Ma [see fig 20]
Cb = Combined rail and clamp on which Ch moves
Ch = Complete sliding block including both blade holders
Cs = Slip mat
Cpx = Cutter bar Ch pivot X
Cpy = Cutter bar CB pivot Y
E = End of cut limit stop mounted on CB
Es = Adjustable measuring scale for E
F & R = Front & Rear stops for unequal margins [optional] [see fig 6]
Fp = Oval slot in LH for attachment of foot pedal (optional extra)
G = Pivot screw on Vbh [see fig 32]
H = Full length handle for lifting the cutter bar Ch
He = Black hexagonal knob for locking Vbh up or down [see fig 5]
Lb = Raiser mechanism for lifting the cutter bar Ch
Lhb = Fixing bolt for lif & hold mechanism
M = Border width setting controlled by Mg
Mak = Mounting bracket for Ma
Mak = Limit stop for pre-setting mat sizes on Ma
Mas = Adjustable measuring scale for Ma
Mg = Long T-bar mechanism parallel to CB
Mgb = Margin guide bar set parallel to CB
Mgl = Margin guide running track [see fig 6]
Mgy = Locking bracket for Mg [see fig 6]
Mhx = Main hinge screw at X
Mgs = Adjustable measuring scale for Mg
Mhy = Main hinge screw at Y

Rhs = Plastic levelling screw for Ma, Mg and Ba [see fig 1]
RhHe = READ HERE on Mak
RhM = READ HERE on E
RhS = READ HERE on S
Rhkm = READ HERE on Mg
S = Start of cut limit stop mounted on Ch [see fig 11]
Stf = Shaft for S [see fig 28]
Sa = Adjustable measuring scale for S
Sqa = Squaring screw for XEp
Sx = Finger lever for S
Tb = Thumb screw for Vbh [see fig 5]
Vbh = Vertical blade holder [see fig 5]
Vbc = Vertical blade clamp [see fig 5]
Vgs = V-groove limit stop
X = End from which machine is operated
XEp = End plate at X
Y = Opposite end of machine to X
Mak = Bevel cut aperture Mount
Failure = Piece that is cut from the centre of a mat
Sizing = Cutting to size with the vertical blade Vb
PRECAUTIONS Please remember the blades are very sharp take care and dispose of them safely.
- Do not lift or carry the machine by the long handle H.
- Do not use oil.
- Do not put hand pressure on the handle H when matcutting.
- Do not assume that new sheets of matboard are square.
- Use the recommended matcutting blades.

USEFUL NOTES
- The elimination of over and undercuts at the mat corners should be the aim of every framer.
- The Keencut ULTIMAT is designed to cut without overcutting or undercutting. Please read the instructions.
- Always use a new blade for V-grooves, museum and black core matboard.
- Routinely check and adjust S, E and Mg scales with an accurate rule.
- Do not use discarded blades from the bevel cutter in the vertical cutter because Keencut 080 or regular utility blades are more rigid.
- Mats are always cut face [coloured side] down
- The end plate XEp adjusts for square with just one socket screw Sq.
- The ideal BENCH for the ULTIMAT will be very rigid, flat and 88cm [35"] high for most operators. Low benches cause operator discomfort.
A 30mm recess in the bench would set the ULTIMAT base and the bench top at the same level making large board handling simpler with no sag - but remember to make provision for the measuring arm Ma.
ULTIMAT does have base extension arms available for the same purpose.
- Adjusting the level of Base fitting components and accessories [Fig 1].
It is better for the function of the machine and particularly Mg if the Margin guide track Mg1 and other components that fit into the edge of the base are set level with the top of the base B. The plastic screw Pls and lock nut fitted to the appropriate components provides the means to adjust the level.

FITTING MEASURING ARM [Ma]
- Fit the MEASURING ARM Ma for cutting Matboard to size [Fig 2].
  a. Hold Ma at 45° approximately 15cm [6"] from XEp.
  b. Present the mounting bracket Mab to the slot in the edge of the base.
     Engage Mab upwards into the base slot and lower Ma to horizontal.
     Lift Ma and slide it towards X until it stops.

NOTE Lifting of Ma [see fig.c] will ensure that Mab drops into proper engagement
- To remove MEASURING ARM Ma
  c. Lift Ma a little and raise Mab in the base slot until it stops.
     Slide Mab 15cm [6"] towards Y to let Ma clear the end of XEp.
  b. Swing Ma up to 45°.
  a. Keep Ma at 45° and drop Mab down and away to clear the base slot.
- The OPERATOR POSITION is at X.

PREPARATION OF SLIP MAT [Cs]
- A SLIP MAT Cs provides a cutting surface of matboard on which mats should be cut to ensure crisp clean cutting.
  Cs can be up to 15cm [6"] wide and the cutting length of the ULTIMAT.
  Cut on the reverse [white side] of Cs.
  Replace Cs when the surface damage is obvious.
PREPARATION

LIFT AND HOLD
The Lh roller mechanism is separate for safe transit and must be fitted to the XEp section by Lhb.
— Raise Cb to its vertical rest position.
— Place Lh in position and fit Lhb to threaded hole.
— Use a 5mm hexagon wrench to tighten Lhb.
— The oval hole in Lh engages the footpedal cord Fp.

T-BAR MARGIN GUIDE assembly [Mg].
— Clips into the base edge from 45° and holds rigidly with no fixing.
— Slide Mg so the end of Mgb is near to XEp.
— For sizing matboards Mg may be unlocked and removed from its track Mgt.

For larger margins two kits are available each featuring a longer Mg track Mgt and two base extensions Ba. The options enable the Mgb to operate up to 50cm [20"] or 75cm [30"] respectively away from Cb.

NOTE
At regular intervals check all points on the ULTIMAT. Check and tighten the socket screws attaching H using a 5mm hexagon wrench. To do this it is necessary to fold back the plastic covers.

CALIBRATION & ADJUSTMENTS

The blade Vb is loaded from the front or back of the blade holder Vbh and held by pressure from the thumb screw Ts applied to the blade clamp Vbc. Cutting effort will be reduced if the penetration of Vb through the matboard is kept to a minimum.

VERTICAL BLADE [Vb] DEPTH ADJUSTMENT

METHOD 1
— Raise H to park Cb in a vertical position.
— Twist Cb to place Vbh uppermost.
— Rotate Vbh and lock it in the down [operating] position by twisting He.
— Unlock Ts and using a thickness of board as a gauge move Vb and lock Ts when tip of Vb extends sufficiently to pass through the board.

METHOD 2 [Not illustrated]
— Place two thicknesses of matboard under Cb with the slip mat in place [Adjusting for thick board use one thick and one regular matboard].
— Rotate Vbh and lock it in the down [operating] position by twisting He.
— Slide Ch until it is near the two spacing matboards but not above them.
— Slide the blade Vb through Vbh until the tip contacts the slip mat.
— Tighten Ts to lock the blade Vb.

USING [Optional] UNEQUAL MARGIN STOPS F & R
— To preset margins of say 4 and 5.
— Move Mg to fit into the track Mgt on the inside of Mgy.
— Slide R into Mgt on the other side.
— Set Mg to 4 and lock it.
— Slide F up to contact the inside of Mg and lock using the 3mm hexagon wrench through the slot Fs.
— Set Mg to 5 and lock it.
— Slide R in Mgt track to make contact with the back of Mg and lock using the thumb screw Rs.

Mg will now move backwards and forwards between the two set stops for repeat cutting of un equal borders. Remove F & R for convenience when not needed.
MEASURING ARM SCALE [Mas] - Adjusting for accuracy.
— Take a square piece of matboard, say 20 x 30 [not a bevelled fallout]. Lock Mak at say 15.
— Place the matboard under Cb positioned against Mak as normal for cutting to size.
— Score a line on the matboard with Vb. DO NOT MOVE Mak.
— Measure from the cut line to the matboard edge [A]. (just for this example say the distance is 14.75).
— Move Mas to 14.75 at RHk.
— Mak may now be set to any required size.

NOTE
The friction on all scales may be increased to lock them firmly [see Maintenance]

BEVEL BLADE [Bb] - Information.
The bevel blade Bb in the ULTIMAT loads from the back to the front to maintain the tip position when blades are changed.
To achieve optimum mat cutting results the blade depth is critical. Too deep and hooking [curving] will occur at the start, too shallow and the cut will not penetrate or meet at the corners.
Adjustment of the depth is necessary when the thickness of matboard is changed and sometimes when the texture of the surface changes.

BEVEL BLADE [Bb] DEPTH
— Place a sized matboard in the machine as for normal cutting.
— Slide Ch towards the edge of the matboard.
— Depress the blade Bb fully to penetrate into the slip mat at a point close to the edge of the matboard.
— Look to check the blade penetration into the slip mat.
— If it is correct at approx. 0.8mm [1/32"] try a test mat. If not - ADJUST THE BLADE DEPTH as follows:
   — Slacken the locking screw BTs.
   — Turn Bda clockwise to reduce the blade depth, anti-clockwise to increase it. Press the blade Bb forward against the ejector stop, tighten BTs and check the depth setting.
LIMIT [PRODUCTION] STOPS

Start S, End E and Margin Mg Limit [production] Stops are fitted to provide control of the cut position to enable mats to be cut accurately without overcuts or undercuts and without special skill.

Limit stops are often called production stops but it is a feature of the Cenecut system that when correctly set they will save much time and add certainty to cutting all mats from the most simple to very complex multiplices and even title openings.

The ULTIMAT uses measurement scales that can be moved to adjust the stops because the method is faster, more positive and tools are not needed.

The limit stops need to be adjusted because the point at which the matcutter blade tip penetrates through the underside face of a matboard is different when a thicker or different textured board is cut.

NOTE

If the adjustments are to be made owing to a different thickness of board adjust the blade depth first.

ADJUSTING THE LIMIT Stops

- The entire adjustment procedure should take less than 60 seconds.
- Use an accurate rule preferably steel with zero at the end.
- For the following examples the discrepancies are exaggerated.
- It is very important that Ch is held firmly in place by the thumb pressure on Sx until the blade has fully penetrated through the mat. Any sliding movement will spoil the cutting and the adjustments.

The adjustable limit stops:

S Connects with the matboard edge to arrest Ch and determine the exact point for the blade tip to cut through the mat at the start of the cut.
E Clamps to Ch and arrests the moving Ch and blade tip at the exact set distance from XEp for the end of the cut.
Mg Controls the placement of the mat under Cb and ensures that the cut is made parallel and at the correct distance from the mat edge.

CALIBRATION & ADJUSTMENTS

- a. Take an accurate squared matboard and check Bb depth.
- b. Set S, E & M at say 10cm or 4" for example.
- c. Using the stops make one precise bevel cut.
- T. Turn the mat over.

NOTE

Do not move stops S, E or M until the scales are adjusted.

- e. Check and adjust S. On the coloured face measure from the mat edge to the start point of the cut.
- f. For this example we will say that Ss is not adjusted and measures 10.3cm or 4 1/8”.
- g. Move the scale Ss so that it reads 10.3cm or 4 1/8” or RHs. [fig 13]
- h. Check and adjust E. On the coloured face measure from the mat edge to the end of the cut.
- i. For this example we will say that Es is not adjusted and reads 10.1cm or 4 1/16”.
- j. Move the scale Es so that it reads 10.1cm or 4 1/16” at RHs. [fig 14]
- k. Check and adjust Mg. On the coloured face measure the margin from the parallel mat edge to the cut in the coloured face. Exclude the bevel. [fig 15]
- l. For this example we will say Mgs is not adjusted and measures 9.7cm or 3 7/8”.
- m. Move the scale Mgs until it reads 9.7cm or 3 7/8” at RHm. [fig 16]
- n. Check the adjustments by setting S, E & M to a smaller margin say 9cm or 3 1/2” and cut an aperture in the same matboard. The corners should all be cut without over or undercuts. If they are not use a rule to identify the stop which is not correct and re-adjust.

The limit stops will now be accurate and with square matboard the ULTIMAT will cut the full range of sizes without over or undercuts.
MAINTENANCE

The ULTIMAT has been designed to enable the framer to carry out all servicing and adjustments. For spare parts contact your distributor or Keencut Ltd.

MEASUREMENT SCALES - Adjustment for tightness.
- Set the appropriate stop to zero at [READ HERE]
- Remove the scale by sliding it from its groove.
- Grip the scale with the hands about 10cm apart.
- Turn the hands in opposite directions and twist the scale enough to lightly distort the stainless steel strip.
- Try the scale in the groove and adjust the twist accordingly.
- Replace the scale to zero at [READ HERE]

Ch runs on opposing tapered bearings for smooth straight running. After a little use the bearings will settle in and become smooth and silent. If side movement occurs ADJUST THE BEARINGS as follows: [fig 18]
- Remove the slip mat and lower Ch flat on B.
- The shaped grip Bg on Bbh has two holes in the top.
- Place the 3mm hexagon wrench in either of the holes and it will engage with one of the bearing adjustment screws Bas.
- Turn each Bas alternately clockwise no more than 1/16th of a turn at a time to adjust Ch on Cb. Adjust evenly until the sideways movement has been removed but Ch can move easily and smoothly on Cb.

IMPORTANT
In only very exceptional circumstances and probably never will it be necessary to remove Ch from Cb. Do not remove Ch to clean the machine because the sliding bearings will remain smooth and only need adjusting occasionally as they settle down with use.

CLEANING
Clean the ULTIMAT regularly. Dirt will spoil the machine performance and the mats cut upon it. Use a dry or damp [not wet] cloth. Solvents will remove the silicone from Cb.

LUBRICATION - Use Silicone on Cb preferably applied with a pad or a spray applied to a cloth first. Wipe off any surplus liquid with a clean cloth. Special dry lubricant applied by spray is also suitable. Follow the Health Instructions on spray cans. [If no special lubricants are available - use a hand cream applied with a sleeve]. Do not use Oil, Grease or Multi-purpose Penetrating Oil on Cb. Oil or grease may be used lightly on Lbh, hinges Mhx and Mhy and pivots Cpx and Cpy.

SQUARENESS - Adjusting the squareness of the machine by adjusting XEp.
- Remove Ma, Mg and the slip mat.
- Take a matboard at least 65 x 65cm [25 x 25"] in size.
- Clamp it under Cb in close contact with XEp with approx. 2.5cm [1"] protruding from the right Z of Cb.
- Cut the matboard with the vertical blade Vb.
- Cut the same amount off the other three sides rotating the matboard clockwise to place the previous cut precisely against XEp each time.
- Rotate the matboard 90° clockwise once more but this time place the two edges in precise contact with the back [Z] edge of Cb and XEp.
- If there is a gap at either edge it represents the error multiplied by four and XEp will need to be adjusted using screw Sq as follows:
  - Keep the matboard in position against Cb and XEp as in steps + and * described above.
  - Use a 5mm hexagon wrench to turn the screw and reduce the gap by 25%.
  - Repeat test and adjust as necessary.

MEASURING ARM [Ma] - Adjusting for square.
- Use a steel straight edge placed across B, under Cb and against the squaring edge of XEp and Ma.
- Slacken both M6 nuts C holding Ma to Mab using a 10mm spanner.
- Move Ma to position it exactly against the - straight-edge in line with XEp and tighten M6 nuts C.
MAINTENANCE

MARGIN GUIDE [Mg]
Checking the MARGIN GUIDE [Mg] for parallel to Cb.
--- Place a long matboard in the machine against Mg.
--- Cut a strip from the matboard using Vb.
--- Double the strip over and compare the width of the ends against one another. They should be the same. If not proceed as follows:-

MARGIN GUIDE [Mg] adjustment.
--- Place a slip mat under Cb but not over the slot in B.
--- Move Ch to Y.
--- Note the Vgs position on its scale then move it by loosening the screw Vs with 3mm hexagon wrench.
--- Loosen one of the socket screws [A1,2,3,4] with 3mm hexagon wrench.
--- Move Mg up to touch Cb and lock Mg.
--- Manipulate Mg until it is parallel to Cb. Loosen another screw if more adjustment is needed.
--- Firmly re-lock the socket screws [A1,2,3,4].
--- Replace Vgs to original position.

BLADE TYPES
- Bevel cutting - The ULTIMAT has been designed to use Keencut high performance Tech-d .012 blades but regular rectangular mat cutter blades may be used. For cutting extra thick board fit 080 type blades to give extra rigidity and tip length - without depth stop adjustment.
- Matcutter blades are also available in .015 thickness for heavy duty cutting in tough boards.
- Chisel edge or single sided blades can be filed without any modification and will have some different cutting qualities.
- Vertical cutting - The .012 blades can distort and Keencut 080 trapezium blades or .017 utility blades should be used.

ADJUSTING THE PIVOT G for the Vertical blade holder [Vbh] [fig 22]
The Vbh pivot G is adjustable to eliminate any side play as follows:
--- Remove socket screw [A] with a 3mm hexagon wrench.
--- Insert 2mm hexagon wrench into the vacant hole to locate and loosen the hidden socket grub screw at the bottom.
--- Use a coin or broad screwdriver to adjust G by turning until all play is eliminated but Vbh can still rotate easily under its spring pressure.
--- Hold G in position and lock the grub screw.
--- Replace [A].

ADJUSTING THE PIVOT for the Bevel blade holder [Bbh] [fig 23]
Bbh rotates on two ball bearings, one of which is adjustable as follows:
--- Remove Bm from the Bbh spindle with the fingers.
--- Unscrew with the fingers or pierce the round nut cover K on the spindle.
--- Using a 10mm spanner tighten the hexagon nut by very small increments.
--- Eliminate all play ensuring Bbh is free to rotate with only its spring pressure.

REMOVING THE LIMIT STOP S complete with shaft [Sft] [fig 24] & [fig 25]
--- Set Vbh in the down position.
--- Place a 3mm hexagon wrench in the screw [A] and loosen it.
--- Set Vbh in the up position.
--- Place the wrench through the hole [B] to loosen the other screw.
--- Remove the shaft from the Y end of Ch.
--- If the machine is to be used without S for any reason adjust the screws inwards to ensure they do not interfere with Vbh.

IMPERIAL or METRIC ? - Changing over.
All scales have dual calibration except S6 which has centimetres on one face and inches on the reverse. Change over as follows:-
--- Set S to zero at Rhs.
--- Slide out the scale, turn it over and slide it back.
--- Move the scale until the zero is against Rhs.
The machine is now ready to use.
FAULT FINDING

<table>
<thead>
<tr>
<th>FAULT</th>
<th>Causes and Suggestions</th>
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| Frayed mount surface | Change blade Bb  
Replace slipmat Cs |
| Over or undercuts in some corners only | Matboard out of square  
Apply even hand pressure on cutter head |
| Machine starts to undercut without apparent changes | Matboard not the same texture  
Worn slip mat  
Change the blade Bb  
Check under Ch for tape or offcuts  
Adjust for any adhesive tape thickness on the mat |
| Distortions at start of cut | Blade Bb set too deep  
Change blade Bb  
Avoid any hand pressure on handle H  
Sidplay in cutter head Ch - adjust  
Do not release the lever Sx until the blade has fully penetrated |
| Blade will not | Push the blade forward and try again |

IMPORTANT At the first sign of any cutting defect change the blade. Do not adjust blade depth before changing the blade.

MOUNT CUTTING TECHNIQUES

ULTIMAT CUTTING TECHNIQUE - See contents for more details.

a. Put a good slip mat Cs in position.
b. Lock the limit stops S, E and Mg at a chosen margin width.

Lift Ch with either Lh or H.

d. Place a squared matboard coloured face down on slip mat Cs.
e. Ensure that two mat edges are aligned against both Mg and XEp.
f. Lower Ch to clamp the matboard in precise contact with Mg and XEp.
g. Move Ch beyond the far edge of the matboard. Depress Sx with the thumb of the left hand until it touches the surface of Cs.
h. Pull Ch until Sx connects with edge of the matboard and stops.
i. Hold Sx down and fully insert the blade Bb with a firm downward pressure on Bbh.
j. Release Sx.
k. Make the cut by pulling Ch until it is stopped by E.
l. Release Bbh.
m. Repeat 3 more times turning the mat anti-clockwise each time.

NOTE
Use downward pressure on Sx at the start to prevent Ch from moving at all until the Bb is fully penetrated through the matboard or a curve will occur at the start of the cut.

CUTTING A BEVEL MAT - with equal borders 5 wide.

a. Be sure that Bb is sharp and is O.K. for depth.
b. Move Mek clear of the working area.
c. Set S to 5.
d. Set E to 5.
e. Set M to 5.

NOTE
Dimensions are mentioned for example only and could be either centimetres or inches.

- Cut precisely as described from item [c.] in cutting techniques.
UNEQUAL MARGINS - Cutting a mat with UNEQUAL MARGINS, for example 3,3,3,4

1. Place the mat on the machine with 4 nearest to X.
   a. Set S to 3.
   b. Set E to 4.
   c. Set Mg to 3.
   d. Place the matboard for cutting and make a cut in the normal way.

2. Turn the mat 90° anti-clockwise.
   a. Now the nearest number to E is now 3, so move E to 3.
   b. S and Mg remain the same - 3.
   c. Make the second cut.

3. Turn the mat 90° anti-clockwise.
   a. The mark nearest S is now 4, so move S to 4.
   b. E and Mg remain the same - 3.
   c. Make the third cut.

4. Turn the mat 90° anti-clockwise.
   a. The mark nearest S is now 3, so move S to 3.
   b. E remains the same - 3.
   c. The mark nearest Mg is now 4, so move Mg to 4.
   d. Make the forth cut.

CUTTING A V-GROOVE

a. Lightly mark the back of the matboard with a pencil and then cut a mat.
   b. Remove the mat and fallout and retain both.
   c. Move slip mat Cs.
   d. Set Mg forward as far as Vs permits.
   e. Place the fallout (coloured face up) under Cb against Mgb.
   f. Fully depress the blade Bb at the edge of the fallout and draw it through the card.
   g. Take care to remove the trimming.
   h. Repeat on the remaining three edges of the fallout.
   i. Place the fallout face down and position the mat on it using the light pencil mark to place pieces back the same way around.
   j. Tape the mount and the fallout together along the cut lines.

CHANGING THE V-GROOVE WIDTH

To widen and deepen the V-groove move Mg slightly away from Cb. Moving Mg closer to Cb will make the groove thinner and less deep. Too deep and the cut will fray and discolor in the centre and so part of the original bevel must remain on the fallout [fig A]

- Undo the dome socket screw Vs to release Vgs.
- Using scrap fallbacks, experiment with different settings of Mg until a new width of cut has been selected.
- Without moving Mg place Vgs firmly against the base and lock Vs.
OFFSET CORNER MATS
a. Set Mg to 6.
b. Set S to 3.
c. Set E to 3.
d. Cut all four sides as for normal mat.
e. Set Mg to 3.
f. Set S to 6.
g. Set E to 6.
h. Cut all four sides as for a normal mat taking care to remove all small
   offcuts from under Cb as they occur.

DOUBLE OFFSET CORNER MATS
1. Set Mg to 3.5.
a. Set S to 3.5.
b. Set E to 3.5.
c. Cut all four sides as for normal mat and check for good corners.

2. Set Mg to 3.
a. Set S to 6.
b. Set E to 6.
c. Cut all four sides.

3. Set Mg to 6.
a. Set S to 3.
b. Set E to 3.
c. Cut all four sides taking care to remove all small offcuts under Cb as
   they occur.

NOTE
Whilst making cuts 1 and 3 the blade may be lifted to pass the centre of the
mat and reinserted. The fallout will remain in one piece and the cutting
accuracy improved [c].

CUTTING MULTIPLE OPENINGS AND TITLE BOXES
The limit stop S can be used to great advantage after just a little
practice to accurately cut multiple openings and openings so far from
the mat edges to be beyond the normal scope of the stops.

First mark the back of the matboard with the required layout and
place a cross in each intended aperture or use other identifying
marks to ensure that the correct lines are cut and the bevel is cut the
correct way.

a. Place the matboard under Cb so the blade Bb will cut along the
   pencil line.
b. Set S to slightly less than zero.
c. Depress Sx and move Ch until the tip of Sx reaches the horizontal
   line at the beginning of a marked aperture.
d. Insert Bb fully.
e. Cut until the depressed tip of Sx reaches the horizontal line at the
   end of the marked aperture.
f. Repeat until all the apertures are complete.