

INSTRUCTIONAL MANUAL

CAT. 5100mz & 5100mz Plus Vibrating Blade Tissue Slicer



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Introduction

The new 5100mz series Vibrating Microtomes share the user interface with the premium 7000smz-2, placing a wide range of adjustable parameters at the user's fingertips. Use in fully manual or the semi-automated "slice window" mode which automatically remembers the start and finish position of the slice.

With most vibrating microtomes, large amplitudes and/or high oscillation frequencies can lead to excessive vibration and unstable tissue fluid. The 5100mz Series instruments greatly reduce these effects since they are built on a sturdy, rigid cast base that shields against secondary vibration transmission.

5100mz-Plus

The 5100-Plus is perfect for those who need to keep slices viable for longer, e.g. for electrophysiological field recordings. The user can calibrate the Z-axis deflection of the blade to 2 μm with the adjustable blade holder and "optical" calibration device. Minimal Z-axis deflection reduces the "chatter" and minimizes damage to the slice surface, leading to greater viability of the cells on the slice surface.

5100mz

The 5100mz is a very competitively priced, high precision, vibrating microtome which shares many features with the top of the range 7000smz series, such as the vibrating mechanism, the inner and outer tissue baths and the easy to use control system.

This new entry level microtome is perfect for techniques such as histology, organotype slice culture and low resolution imaging with a fixed blade holder and a mechanism Z-axis error rate of 5-8 μm .

Special NOTES:

- Be sure to keep all packing material, should the instrument ever need to be serviced off-site.
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- Be aware that in order to achieve maximum usability and expertise with the 5100mz series, one must read and understand the information set forth in this manual. Only capable, competent personnel should attempt use the instrument.

Description of Instrument



The Microscope

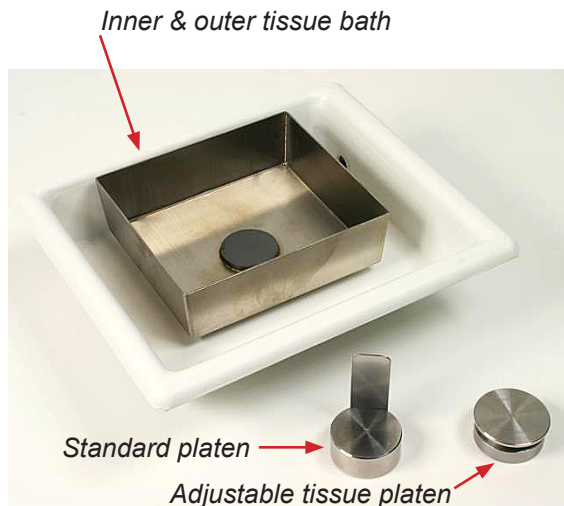
The 5100mz instrument greatly reduces z-axis deflections and motion errors since it has a removable blade holder that is mounted on a deep section parallel leaf spring assembly.

Blade motion is by non-contact magnetic attraction which gives a high degree of immunity from out-of-plane forces while still allowing variable oscillation rates and amplitudes.

The blade is advanced under motor control via a rotary control knob on the remote keypad. This allows for continuous adjustment of speed, which is extremely useful when dealing with different areas of tissue that need to be cut at various speeds. To avoid the possibility of damage to the tissue by the blade dragging across any uncut tissue, the blade retracts quickly only after the tissue has been lowered.

Other features include:

- Vibration amplitude is controlled with feedback on the oscillation axis. Also, positional feedback on the advance axis allows the instrument to remember the slice start and stop position.
- More control over section thickness, since the tissue rises up into the path of the advancing blade. A sprung-loaded dovetail arrangement for mounting the tissue bath gives a positive location of the bath yet still allows for quick and easy removal.
- Instrument control parameter settings such as section thickness, blade frequency, etc., are achieved with a remote membrane keypad with LCD display.
- A ceramic magnet in the tissue bath allows for locating and retaining the specimen platen. A fixed specimen platen with removable specimen support is supplied as standard. The rotational position of the specimen platen can be adjusted using the tool provided. **NOTE:** an adjustable specimen platen is available as an optional extra.
- The outer bath has magnets that locate and hold in place the tissue bath.



Tissue Bath

Standard

The instrument comes with a tissue bath that has a ceramic magnet to locate and retain the specimen plate. Also supplied, is a fixed specimen platen with removable tissue support.

Optional, Catalog #7000-3-1A

An adjustable tissue platen, also which also uses a magnet for retaining placement, is available as optional equipment.

5100mz Slicer with Illuminated Magnifier
Optional, Catalog # 5100-1-3



For enhanced observation of the tissue cutting process, a magnifying glass with integral cold light source is available as an optional extra and has:

- A magnification factor of 1.5X
- A circular array of variable power white LEDs (cold illumination)
- The power cord plugs directly into the slicer and requires no other source of power

The Opti-Cal non-contact metrology device from the 7000smz slicer is available as an option. This monitors the blade edge travel profile and can indicate blade alignment error. **NOTE:** if used together with the optional align-able blade holder from the 7000smz slicer it will allow the blade to be adjusted relative to the lateral motion axis, minimizing the out-of-alignment error of the blade edge and therefore resulting in a potentially cleaner slice.

Microtome Blades

Normal razor blades and carbon steel blades are not recommended for tissue sectioning. Normal razor blades are likely to flex when clamped into a blade holder and carbon steel will rust. With that said, the 5100mz Series instrument is supplied with fixed angle titanium blade holders suitable for the 7550-1-SS stainless steel and 7550-1-C ceramic blades. One of each blade type is included:

Catalog #7550-1-SS Stainless Steel Blades

- Made from surgical quality stainless steel
- Double beveled on both faces, honed to an acute cutting edge

NOTE: Because of the relative softness of stainless steel, it is recommended these blades be used once only or, at a maximum, changed every day.

Catalog #7550-1-C Ceramic Blades

- Made from ultra-hard zirconium, this is a material that creates a precise cutting edge with a rigid blade body, while maintaining a straight cutting edge. The resultant slice quality is especially fine for the most difficult tissues such as young brain, where structures are yet to be formed, or very old brain with build up of extracellular proteins and added structures.
- The ultra hard cutting edge, gives the blade a much longer usable life, plus it does not corrode.
- Ceramic blades are best for studies where the deposition of metal into the slice would have undesirable effects. The initial higher cost of the ceramic blade is more than offset by its longevity.

NOTE: To a special blade holder tool is provided to ensure proper fitting of the narrow blades. This helps to correct blade alignment and reduces the risk of personal injury when fitting the blade.

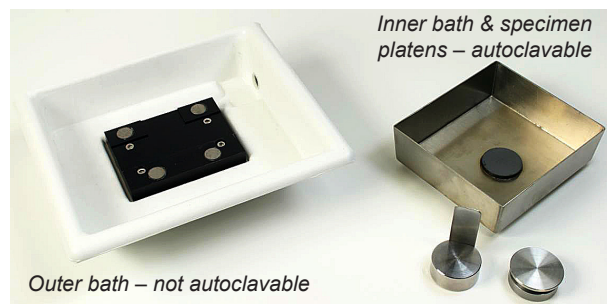
NOTE: The align-able blade holder from the 7000smz slicer can be fitted to the 5100mz slicer and is available as an option; in this case the optional Opti-Cal unit (again from the 7000smz slicer) should be used so that blade edge alignment can be optimized. **NOTE:** With the adjustable blade holder fitted, optimum blade accuracy will be in the region of 0.003 – 0.005 mm.

Cleaning, Sterilizing and Autoclaving

Cleaning, Sterilizing & Autoclaving Table		
Part	Autoclavable?	Comment
Blade Holder (titanium)	Yes	Blade holder can be fitted to or removed from the vibrating head using the included Pozidriv screwdriver.
Specimen platen (magnetic stainless steel)		
The inner bath (magnetic stainless steel)		
Outer bath and its associated parts	NO	They should NOT be dismantled

NOTES:

- Replacement blade holders are available as spares should the original items be lost or damaged.
- The stainless steel inner bath and specimen platens are made magnetic stainless steel; which is not completely immune from the effects of a.c.s.f. and needs to be rinsed thoroughly with clean water on a regular basis.
- The specimen holder is located by a circular magnet in the inner bath. To separate, simply pull the two items apart. The inner bath is also located in the outer bath by magnets.
- Additional or replacement baths parts and specimen platens are available.



Installation

Place unit on a sturdy bench. Even though the unit has a very high static-mass-to-vibrating-mass ratio and absorbent rubber feet, a rigid support bench will better guard against secondary vibration transmission.

The remote keypad and display should be connected to the appropriate socket on the rear panel of the instrument.

Make sure to read and follow the directions for installing any accessories that you may have ordered, such as microscope/magnifier attachment or light source.

Be sure unit is set for your particular voltage before connecting the unit to a mains supply 88-264VAC 47- 63Hz. The electrical inlet molding accepts a standard IEC socket. Where possible a standard mains lead – IEC socket/mains plug – suitable for your mains outlet will have been supplied with the instrument. The instrument must not be operated unless it is connected to a suitably earthed (grounded) mains supply.

The inlet molding accepts a standard IEC socket. Where possible, a standard mains lead – IEC socket/mains plug – suitable for your mains outlet will have been supplied with the instrument. **The instrument must not be operated unless it is connected to a suitably earthed (grounded) mains supply.**



Opti-Cal connection

Hand controller
connection

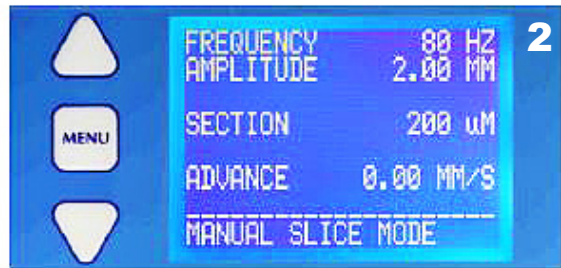
Light source
connection

Electrical inlet

On/Off switch

Operation

Edit an existing user name or register a new user name



When the instrument is switched on the display will be as shown, showing any personalized user slots. This screen can also be accessed from the main menu.

1. Use the Δ or ∇ keys to scroll to the desired user name or to an unused position.
2. Press the MENU key to go to the display shown. This is the normal operating display.
3. Press the MENU key again and the display will change to that shown. Use the Δ or ∇ keys to scroll to the line SETTINGS
4. Then scroll to the line EDIT USER NAME and select.
5. Use the Δ or ∇ keys to scroll to the line (in the example shown) USER 2. Pressing MENU again will cause the 1st letter of the name to be highlighted. The rotary knob can now be used to scroll through the alphabet to select a new letter or symbol. Press the MENU to confirm and move to the next letter position; use the rotary knob to select a new letter. (Selects the previous position). Continue until the new user name is acceptable.
6. Press the MENU key - this will highlight the new name.
7. Use the Δ or ∇ keys to scroll to the line CHANGE.
8. Press MENU to confirm the change. Any changes to the oscillating frequency, amplitude and section thickness will be remembered under that user name so that when that user comes back to the instrument and selects that user name those settings will also be selected for immediate use.
9. An existing user name can be deleted by scrolling to the line CLEAR NAME and pressing MENU.
10. Press MENU again to revert to the normal operating display.

6 - 10



Change the Operating Parameters: Frequency, Amplitude and Section Thickness



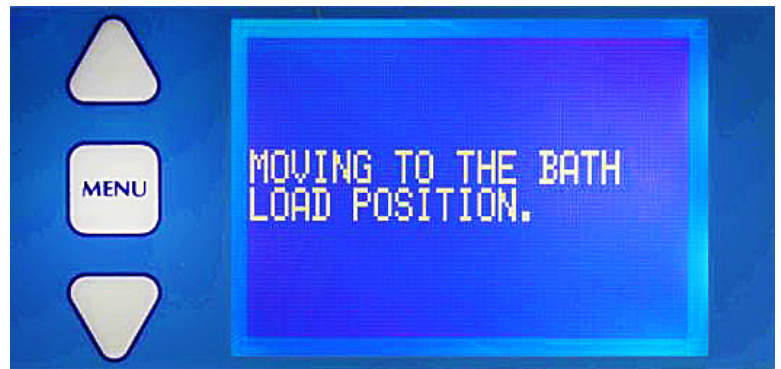
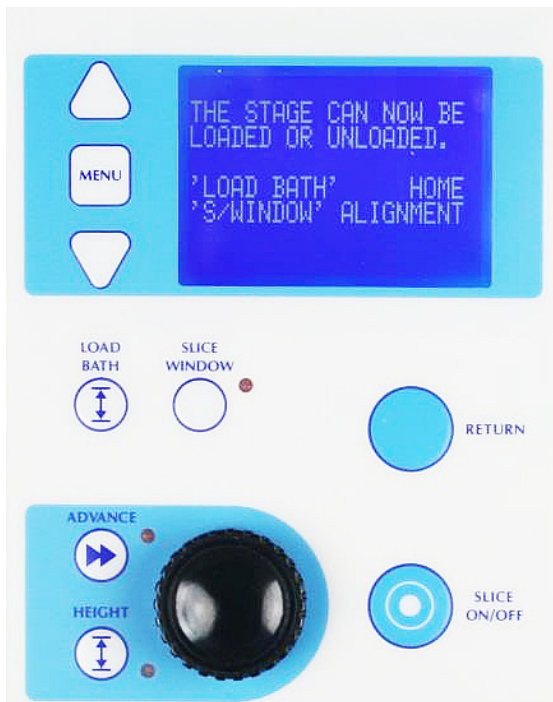
Press the MENU key to display the basic menu screen as shown:

1. Use the Δ or ∇ keys to scroll to the desired parameter: Frequency – amplitude - section.
2. Press the MENU key to select that parameter and highlight the value. The Δ or ∇ keys can now be used to change the parameter's value.
3. Press the MENU key to confirm and store the change.



Load or Unload the Specimen Bath

1. Press the LOAD BATH key (and hold for 2 seconds) and the display will change to that shown. The bath table will be moved to its lowest position to allow a specimen bath to be loaded (or an existing one removed).



2. Once the table has reached its lowest position the display will be as shown. The specimen bath is located on the rising table in a sprung loaded dovetail mount.
3. To remove the bath, move the clamp lever to the left and pull the bath away from the instrument.



NOTE:

- Pressing LOAD BATH key will cause the table to rise to a preset (nominal) position.
- The display will then revert to the 'home' display.
- Pressing SLICE WINDOW key will enter the blade alignment routine. 'Alignment of the blade with the axis of oscillation' for detailed guidance on the use of the 'Opti-Cal' alignment calibrator. **NOTE:** The 'Opti-Cal' is only supplied as standard with the 5100mz Plus instrument.

Manual Operation



1. With the instrument on, scroll to the desired user name and press MENU. All cutting parameters associated with that user will be recalled.
2. Make any changes as described on page 8 and scroll to the EXIT MENU line and press the MENU key. If necessary load a bath to the table and press the LOAD BATH key. The table will raise the bath to a nominal position and the operating screen will change to that shown in the image to the left.



Bringing the Blade to the Start Height

3. Press the HEIGHT key.
4. Press the LOAD BATH key to quickly raise the table. Press again to stop.
5. Press the ADVANCE key to quickly lower the table. Press again to stop.
6. Set a movement amount using the rotary knob. Press the RETURN key to raise the table by this amount. Press the SLICE key to lower the table by this amount.
7. Press the SLICE WINDOW key to reset the height datum.
8. Press the HEIGHT key once more to exit.

Bringing the Specimen to the Start Position

1. Press the ADVANCE key and using the rotary knob to control the advance speed. Press the SLICE key to switch the movement on or off.
2. Bring the cutting blade into a suitable position for commencement of cut. When the blade is in a suitable position, press the ADVANCE key again to exit. **NOTE:** This selects the start position such that when the RETURN key is pressed [see next page] this is the position the blade will return to.

Cutting a Slice

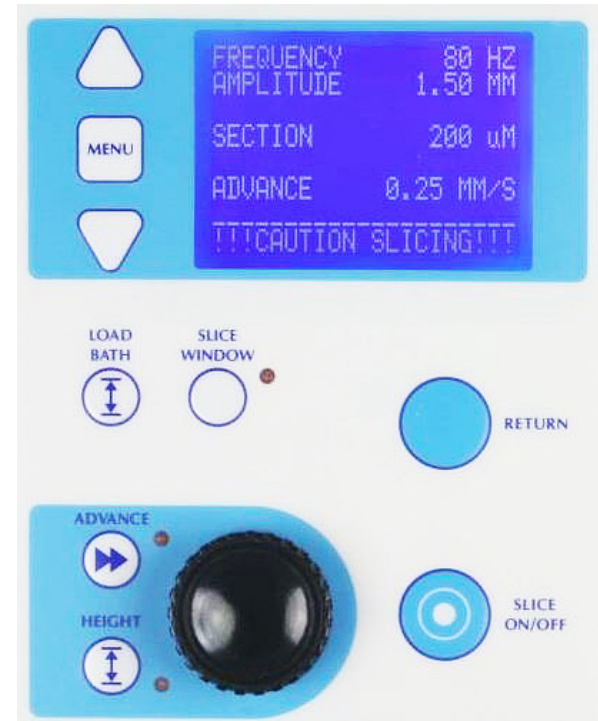
3. Press the SLICE ON/OFF key to commence the cut. The bottom line of the display will show a flashing warning:

!!!CAUTION SLICING!!!

4. Use the rotary knob to control the advance speed as the blade moves through the tissue.

NOTE: The advance speed can be reduced past zero and the cutting head moved in reverse.

5. When the cut has been completed, press the SLICE ON/OFF key to halt the process.
6. The RETURN key may now be used to retract the head to the position you had selected as the start position above. Before the head retracts the bath will be lowered so that the blade does not drag across the surface of the specimen. After the head has been retracted the bath will be raised to its previous position and then raised once more by the thickness of the section in readiness for another cut
7. When the cutting head has been retracted to the start position, the section thickness will be highlighted on the display. If required, the section thickness may be changed by pressing the height button and making any adjustment required via the rotary control knob. Note that this will change the section thickness for this slice only. If you want to change the repeat thickness this should be done by changing the general operating parameters – see the section on page 8 – Change the Operating Parameters: Frequency, Amplitude and Section Thickness.
8. The cut may now be repeated.



Slice Window Mode

Once a cut has been taken as described in the manual slice procedure, the start point and end point of that slice operation is stored in memory. In slice window mode the user can slice between these points and the unit will automatically stop at the end point. The user can select if the slice operation finishes at the end point or automatically retracts to the start point ready for the next slice (see Settings section).

It is not possible to enter the slice window mode unless you have previously defined a slice window.

When a satisfactory cut window has been made, press the SLICE WINDOW key once and the slice window screen will be displayed. The led adjacent to that key will be illuminated in red as a warning.

- Using the rotary knob set a suitable advance speed for cutting. You only need to do this the first time you take a slice. Successive slices will be taken at this speed.
- Pressing the RETURN button will take the slicer to the start point and increment the section thickness for the next slice.
- Press the SLICE ON/OFF key to commence cutting or to stop cutting.
- The unit will automatically stop cutting at the stop point.



Blade Fitting and Adjustment

Fitting blades with the blade fitting tool

The fixed angle blade holder, which is not adjustable for horizontal alignment, accepts only 7550-1-SS Stainless Steel Blades and 7550-1-C Ceramic Blades.

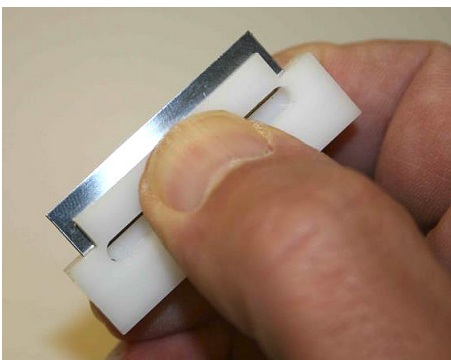
Fit the blade holder to the instrument face plate:

1. Align with the face plate
2. Fit the two securing screws
3. Before tightening the screws, push the blade holder upwards so that the protruding lugs on its rear locate with the lower edge of the face plate
4. Tighten the screws

The blade can now be fitted ...



WARNING! Blades are extremely sharp! Take care when fitting or removing blades. **Always use the blade holding tool supplied.** The blade tool is designed so that the blade may be safely handled without damaging the cutting length of the blade or injuring the operator. Fit the blade by ...



1. Carefully unwrap the blade.
2. Place it, sharp edge first, into the slot of the blade tool. The blade tool can then be squeezed using the thumb and forefinger – see photo to the left. The blade is now safely gripped with its cutting edge protected from damage and can be safely handled during the fitting operation with minimal risk of personal injury.

- Fit the blade by loosening the two screws on the arms of the holder and sliding the blade under each washer and pushing it firmly back against the rear stops. The screws should not be over-tightened. See *photo at immediate right*.

NOTE: The left hand screw has a left hand thread and should be turned counter-clockwise to tighten it. The right hand screw has a normal right hand thread.



- A blade guard is included with the instrument. This guard uses a magnet and can simply be fitted over the blade with the magnet holding it in position. See *photo above, right*. **NOTE:** This will provide some protection to the user and reduce the possibility of accidental damage to the blade edge. We recommend that it is used whenever the instrument is not actually in use.
- Once the blade has been fitted it should be aligned to the axis of oscillation in order to reduce Z axis (vertical) errors to a minimum and achieve optimum performance.
- See 'Alignment of the blade with the axis of oscillation' for detailed guidance on the use of the 'Opti-Cal' alignment calibrator on the next page.

Settings

- From the basic menu screen, use the Δ or ∇ keys to scroll to the line SETTINGS and press the MENU key. The display screen may be adjusted for brightness and contrast to suit local conditions.
- Use the Δ or ∇ keys to scroll to line required and press the MENU key. The feature value will be highlighted and may be adjusted by using the Δ or ∇ keys.
- Press the MENU key to confirm the change.
- Use the Δ or ∇ keys to scroll to line EXIT MENU and press the MENU key to get back to the basic menu display.
- When in SLICE WINDOW mode, the park position for the slicer can be set as either at the end of the slice just taken or at the beginning of the next slice.
- Use the Δ or ∇ keys to scroll to the AUTOSTOP line. Press the MENU key to toggle between AUTOSTOP AT END or AUTOSTOP AT START. Use the Δ or ∇ keys to scroll to line EXIT MENU and press the MENU key to get back to the basic menu display.



Options – Opti-Cal Alignment

Opti-Cal Aligning Blade with the Axis of Oscillation

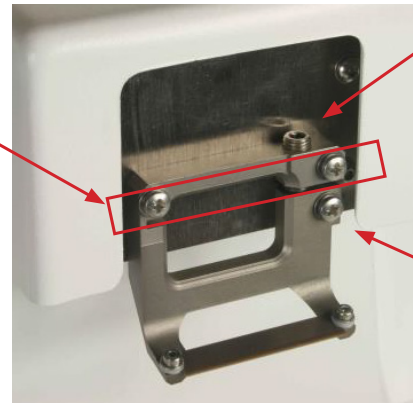
NOTE: the 'Opti-Cal' and adjustable blade holder are only supplied as standard with the 5100mz Plus instrument.

The mechanism of the slicer controls the lateral oscillation of the blade within very fine tolerances. Since there are many different tolerances and variables in blade manufacturing, the edge of the blade should be aligned with the lateral motion in order to ensure the best possible cut with least damage to the tissue.

The 7000smz blade holder is secured by two screws to the oscillating faceplate. A third screw



Securing
screws



Adjusting screw

Locking screw

locks the blade holder in position once the alignment procedure has been completed.

Fit the blade holder as shown and tighten the two upper securing screws - (tightening torque = 30-40cN.m). *Do not over-tighten the screws.* The lower locking screw should be tightened sufficiently to just grip the lower portion of the blade holder.

The instrument uses a demountable calibration device to facilitate alignment of the blade with the axis of travel, thereby minimizing the z axis deflections.

Important Note

If you have the optional light source/magnifier fitted and are using an early Opti-Cal from a previously purchased 7000smz slicer (i.e. an Opti-Cal with serial number prior to CI.7000-6-1A-161) the connecting cable may be only just long enough. In this instance the cable must be routed between the vibrating head enclosure and the magnifier base before plugging it into the rear of the instrument – see photo at right.

Opti-Cal Cable Routing



When the 'Opti-Cal' calibration device is plugged into the instrument it will be automatically be detected and thus take control of the amplitude and frequency settings, adjusting them to a magnitude that allows best adjustment of the blade alignment error. The alignment process also automatically moves the blade so that the cutting edge is in its optimal position relative to the calibration device for best alignment evaluation.

To enter the alignment routine

1. Press the LOAD BATH key (and hold for 2 seconds). The bath table will be moved to its lowest position to allow the Opti-Cal to be loaded. Press AUTO REPEAT to begin the blade alignment routine.

NOTE: The alignment routine can also be accessed from the main menu.

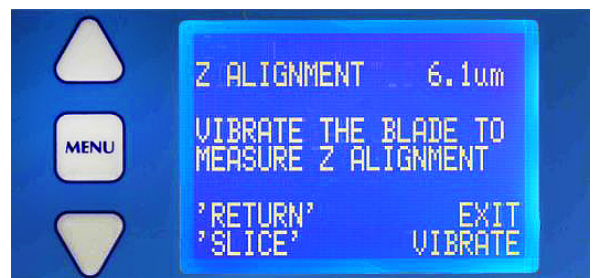
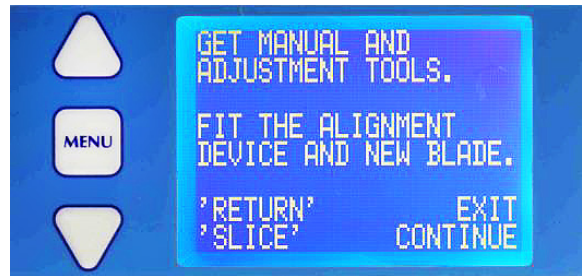
2. When the unit has been connected, the instrument will detect the connection and the display will change as shown.
3. Install the alignment device and new blade.
4. Press SLICE to continue. Choose which type of blade you want to calibrate. Scroll to the appropriate blade using the or keys and press MENU to select.
5. Press SLICE to continue. The instrument will now re-position the blade with respect to the alignment device ready for adjustment.
6. The display will now change to that shown on the left. **NOTE:** the uppermost line shows the current Z axis (vertical) deflection. At this point it indicates zero because the blade is not moving.
7. Press SLICE as instructed and when the blade is vibrating note the Z axis deflection reading.
8. Press SLICE again to stop the blade vibration.
9. Loosen the lower locking screw just sufficiently tight to retain its grip on the blade holder but without locking it in place.

NOTE: The blade holder can be tilted in either a clockwise or counterclockwise direction by turning the adjusting screw accordingly. Use the supplied hexagonal driver to tighten the lower screw.

Adjust screw by small amount. **NOTE:** If the adjusting screw is turned clockwise, then the lower portion of the blade holder will be tilted in a clockwise direction. If the adjusting screw is turned counterclockwise, then the lower portion of the blade holder will be tilted in a counterclockwise direction

Press SLICE to set the blade vibrating again and note the Z axis deflection. Stop the blade vibrating. If the error has increased you should repeat the adjustment but in the opposite direction.

Continue the above process until the Z axis deflection has been reduced to acceptable limits. Once the blade is within acceptable limits the lower locking screw may be tightened to a torque of 30-40 cN.m. **Do not over-tighten the screw.** Recheck the blade alignment. Repeat the adjustment procedure if required.



When you have completed the alignment procedure press the RETURN key and follow the removal instructions as shown on the display.

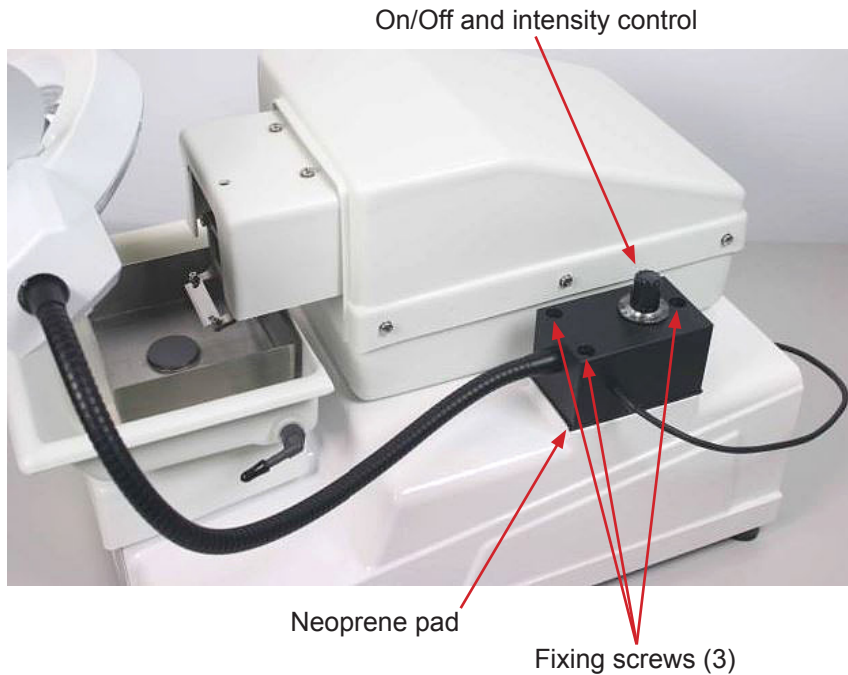
In certain circumstances, for example if a steel blade is fitted and you have specified a ceramic blade, the control system may position the blade incorrectly and not detect the blade edge. In these instances the display will show the following message: Correct any problems and press SLICE to retry.

Options – Magnifier & Cold Light Source

The instrument may be (optionally) supplied with a magnifier mounted on a flexible arm. The magnifier housing incorporates a LED cold light source. The base should be fixed to plinth on the right hand side of the instrument.

How to Attach the Magnifier and Cold Light Source

1. Place the neoprene cushioning pad between the instrument and the magnifier base body.
2. Fit and tighten with the three fixing screws. **Do not over-tighten the screws.**



The power cable plugs directly into the appropriate outlet on the rear of the 5100mz slicer (see illustration on page 6, Installation). **NOTE: This outlet must not be used for any other purpose.**

The rotary knob controls both the On/Off and the intensity of the light (where the flexible arm is mounted).

Turn the knob clockwise to switch the light on. Turn the knob clockwise to increase the light intensity. To turn the light source off, turn the knob counter clockwise until a click is felt.

Adjust the position of the magnifier as required.

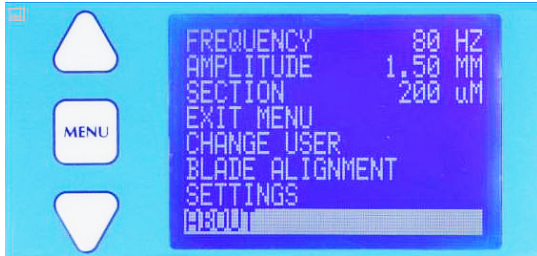
NOTE: Do not clean the magnifying lens or the LED cover with any kind of solvent or alcohol because they are made from acrylic materials and may be irreparably damaged. Use only a non-abrasive tissue or cloth which has been dampened with a mild detergent mixed with water to clean.

Recording Technical Information About the Instrument

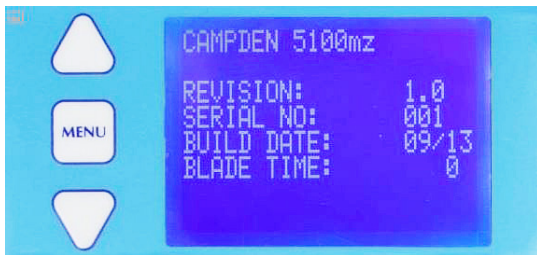
If you experience any problems with this instrument, please have the following information ready before you contact Technical Support.

- Instrument model number
- Instrument serial number
- Build date
- Blade run time
- Software revision code
- Any error codes that you may have witnessed

This information may be readily accessed from the basic menu screen as follows.



1. Use the \triangle or ∇ keys to scroll to the line ABOUT and press the MENU key.



2. The screen will now display the parameters required to contact Technical Support.
3. Pressing the MENU key once more will exit this screen

Error Codes

Notes:

- If an error code occurs the instrument will stop. The instrument must be restarted by recycling the power.
- If the error occurs repeatedly during normal use, please contact **Technical Support at 1-800-523-5874**.

Code #	Type of Error	Descriptor/Action to Take
1	Internal communications error	Restart the instrument. If the problem persists contact Technical Support for advice.
2	Internal communications error	Restart the instrument. If the problem persists contact Technical Support for advice.
3	Advance limit switch fault	If the error occurs repeatedly during normal use contact Technical Support for advice.
4	Table limit switch fault	Both limit switches flagged. Contact Technical Support for advice.
5	Oscillating head fault	If motion of the vibrating head has been obstructed, restart the instrument and carefully drive the blade away from the obstruction. If the problem persists contact Technical Support for advice.
10	Alignment tool communications error	If the alignment tool has been unplugged during the blade alignment procedure, restart the instrument.

Maintenance and Service

The 5100mz and the 5100mz Plus have been designed to give reliable, trouble-free service. It is advisable to have only qualified service personnel to service the instrument. Call Customer Service at 1-800-523-5874, if you have any questions.

Spare Parts and Accessories List

Spare Parts and Accessories	
Catalog #	Description
7610-A	Standard Temp controlled tissue bath & controller
5100-1-45	Upgrade Kit for 5100mz
5100-1-3	Integrally Mounted Cold Light Source and Magnifying Glass for 5100mz-Plus and 5100mz
7000-3-1A	Tissue Bath Mount (additional price only - this mount comes standard with purchase of 7000smz-2, 5100mz-Plus or 5100mz)
7000-3-2	Stainless steel inner specimen bath
7000-4-1	Specimen Mount Only
7000-4-2	Tilting Tissue Mount
7000-5-3	Blade holder - special angle, includes right and left hand clamp screws, single-axis adjustment screw
7000-6-1	'Opti-Cal' Z-axis measurement, traceable to national standards
7000-7-1	Blade handling tool
7000-50-1	Tool kit - hexagonal drivers
7000-60-1	Transit crate, includes packaging expansion bags
7550-1-SS	Stainless steel blades - narrow, ultrasonically cleaned
7550-1-C	Ceramic blades

Specifications for the 5100mz and 5100mz Plus Vibrating Blade Tissue Slicer

Specifications for the CAT. 5100mz/5100mz Plus Vibrating Blade Tissue Slicer	
Section thickness step size	0.001 mm
Bath table rise & fall speed	1.0 mm/sec maximum
Maximum (vertical) travel of bath table	19 mm
Tissue bath size	80 x 90 x 25 mm (nominal)
Tissue bath volume (with specimen platen)	160 ml (nominal)
Cutting head advance speed	
Minimum forward speed	0.1 mm/sec
Maximum forward speed	+2.0 mm/sec (1 mm/sec while cutting)
Maximum reverse speed	- 2.0 mm/sec (-1 mm/sec whilst cutting)
Cutting head retraction speed	2.0 mm/sec
Maximum travel of cutting head	36 mm (nominal)
Blade oscillation frequencies	50 to 80 Hz (nominal) in 5Hz steps
Blade oscillation amplitudes	0.5/1.0/1.5 mm (nominal)
Mechanism Z axis error	0.008 mm max
Power requirements	88-264 VAC 47-63 Hz
Power rating	36W
Fuse rating – 115V or 230V	T2A 250VAC
Bench space requirement (mm) (Excludes Keypad/control unit)	270 Width x 400 Depth x 260 Height
Keypad/control unit (mm)	135 W x 200 D x 60 H
Weight	15Kg
Boxed shipping weight	19Kg
Shipping box size (mm)	550 (W) x 470 (D) x 370 (H)

For any questions or for ordering information,
please contact Customer Service at

1-800-523-5874

Thank you for choosing

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