CAMPDEN INSTRUMENTS LIMITED

INSTRUCTION MANUAL

FOR

INTEGRASLICE 7550PSDS

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Contents

Introduction

The Integraslice by Campden Instruments is an oscillating blade microtome and is the culmination of 20 years experience in the manufacture of tissue slicers. The Integraslice 7550 PSDS is a programmable unit that allows the instrument to 'learn' a cutting cycle input by the operator and then repeat that cycle a desired number of times. The cycle may have a varying speed and distance profile so that particular areas of tissue can be sliced at particular speeds.
A further major feature of the instrument is that the size of oscillation of the blade dynamically variable. A number of researchers have found that certain combinations of oscillation frequency, oscillation amplitude and tissue advance can give superior slice quality. The Integraslice 7550 PSDS allows these combinations to be developed solely by input from the keypad without the need for dismantling the instrument to effect the adjustment. For machine stability and long life the amplitude of cut is related to the maximum frequency of oscillation – the larger the amplitude, the lower the maximum frequency available and vice versa.
Experienced users of oscillating microtomes will no doubt be aware that high amplitudes and/or high oscillation frequencies lead to excessive vibration and unstable tissue fluid. The Integraslice benefits in this area by being built on a rigid, cast aluminium base giving exceptional immunity to secondary vibration transmission.

The purpose of this manual is to allow the user to quickly achieve expertise in the use of the Integraslice and to give the maintenance technician the insight into maintaining the instrument in peak operating condition.
Please read and understand the information contained in this manual before using the instrument. Only competent and capable personnel should use the instrument.

This document should be retained for future reference as it contains the name and address of the manufacturer within the EC

PACKAGING
Please retain the original packaging for future use.
Instruments will not be accepted for service or repair unless the unit has been adequately and properly packaged. Additionally instruments will not be accepted without prior authorisation and have been certified as being uncontaminated with any material that may be hazardous to the health of service personnel. Returns Authorisation and Decontamination Certificate blanks can be obtained by contacting Campden Instruments.

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EC DECLARATION OF CONFORMITY

CE

Name and address of Manufacturer:

Campden Instruments Limited
PO BOX 8148
Loughborough LE12 7XT
UK

Description of Instrument:

OSCILLATING MICROTOME

Model Type/Number:

INTEGRASLICE PSDS

Serial Number:

7550PSDS-…….

The instrument specified above complies with the relevant health and safety requirements of the following:

1. EC Directive(s):
   - The Machinery Directive 89/392/EEC as amended by
     - Directive 91/368/EEC
     - Directive 93/44/EEC
   - Electromagnetic Compatibility Directive 89/336/EEC
   - The Low Voltage Directive 73/23/EEC
2. UK Regulations:
   - The Supply of Machinery (Safety) Regulations 1992 (SI 1992/3073)
   - Electricity at Work Regulations 1989
3. European Standards
   - EN 50081-1: 1992 Electromagnetic compatibility generic emissions standard part 1
   - EN 50082-1: 1992 Electromagnetic compatibility generic immunity standard part 1

Additionally, the health and safety requirements of the following British and harmonised European Standards have been incorporated in the design of the above instrument:

- BS 2771:part 1:1986 (EN 60 204:part1:1985)
- BS 5304:1988

Description of the Integraslice

The Integraslice features a removable (autoclavable) cutting head mounted on a deep section parallel leaf spring assembly. A positive mechanical drive action and accurate manufacture ensures the uniformity of blade motion. A feature of the parallel spring motion is that the blade travels in an arcuate path. The arcuate path withdraws the cutting edge of the blade from the advancing tissue at the points of oscillation reversal and does not re-engage the tissue until motion in the opposite direction is established. This prevents a static blade trying to cut through delicate specimen to the detriment of the tissue.
Blade motion is by motor drive and cam giving positive control over the motion at all times whilst allowing variable oscillation rates. A unique motor driven mechanism allows amplitude to be varied dynamically from the keypad.

The blade is advanced into the tissue under motor control at speeds between –1.0 mm/sec and to 3.0 mm/sec in steps of 0.01 mm/sec. (The negative value means that the blade can be reversed during the 'advance' motion). A rotary control on the front of the instrument gives instantaneous adjustment of speed. This is particularly useful when different areas of tissue need to be cut at different speeds. Blade retraction is carried out at maximum speed (4.4 mm/sec). It should be noted that blade retraction is only carried out after the uncut tissue sample has been lowered away from the blade, obviating the possibility of a blade dragging back across the uncut tissue and causing damage.
Dynamic feedback on the oscillation and blade advance axes maintain accurate control over speed and (in the case of the advance axis) distance travelled.

Raising the tissue up into the path of the advancing blade controls section thickness. This movement, against gravity, reduces lost motion and uncertainty to a minimum allowing section thickness to be controlled accurately. The thickness can be incremented in steps of 1 micron (0.001mm). A built-in speed profile of the table movement gives initial sensitivity of control, ramping up to a maximum speed of 0.85 mm/sec. Total vertical travel is 32 mm allowing plenty of room to incorporate different heights of tissue bath and Peltier cooled baths.

A sealed LCD display and membrane keypad allows the user to control the instrument and set the parameters governing blade frequency, section thickness, etc. Rotary controls on the front of the instrument allow control over blade advance speed and light intensity (if fitted). As the unit can be operated under fully automatic control an emergency stop facility is also provided.
The entire instrument is enclosed in a moulded enclosure sealing against liquid ingress from spillage and is tolerant of most commonly used solutions. The rear section of the cover is removable to allow easy access for adjusting the LCD screen contrast and to change the light source bulb and drive belts.

An integral cold light source and a stereoscopic zoom microscope attachment are available as optional extras. If the light source was not fitted during manufacture, the instrument must be returned to the factory (or service agent) if it is subsequently required; retrofitting by the end user is not possible.
The cold light source with flexible fibre optic light guides allows concentrated illumination to be directed specifically at the specimen being processed.
The stereoscopic microscope, with magnification factors of between 10x and 40x allows close observation of the cutting procedure.

Blades

Whatever features and control an oscillating microtome possesses, the quality of the slice can be enhanced by good blades and degraded by poor blades.
The average razorblade consists of a triple bevel on both faces on a thin foil of either carbon or stainless steel. The triple bevel terminates in a relatively non-acute angle and is designed for cutting when being drawn across a surface perpendicular to the edge of the blade. The very thin foil will almost certainly flex when clamped into a blade holder. For these reasons razorblades are not recommended for tissue slicers.
Carbon steel is relatively hard compared to stainless steel and thus will keep its cutting edge longer however it also has the inherent disadvantage in that it will rust quickly when exposed to moist air. To prevent rusting in storage, all carbon steel blades have a film of oil that first needs to be removed, before the blade can be used. The corrosion process is, of course, accelerated significantly in a.c.s.f. saline.
For these reasons normal razor blades and carbon steel are not recommended for precision tissue sectioning.

Campden Instruments supplies two types of blade for all its oscillating microtome models. These are as follows:

Model 7550/1/SS Stainless Steel Blades. Made from surgical quality stainless steel these are double bevelled on both faces, honed to an acute cutting edge. Because of the relative softness of stainless steel, for optimum performance, it is recommended that these blades should be used once only or at maximum changed every day.

Model 7550/1/C Ceramic Blades. Made from ultra hard zirconium, this is a material that can be honed to the finest of edges, the body of the blade can also be thinner than a metal blade whilst still remaining rigid and hence maintaining a straight cutting edge. The result, definitively, is that slice quality is substantially improved with prolonged slice life especially in the most difficult of 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. Additionally, the blade has a much longer life due to the ultra hard cutting edge not losing its sharpness and being impervious to corrosion.
For studies where the deposition of metal into the slice would have undesirable effects the benefit of ceramic blades is obvious.
The initial higher cost of the ceramic blade is more than offset by its longevity.

The Integraslice instrument is supplied with a blade holder suitable for both standard stainless steel blades and also our advanced ceramic blades. Sample blades of both types are included.

Sterilizing and Autoclaving

The Integraslice features an autoclavable blade holder and nosepiece. The standard components are autoclavable at 121^{o} Celsius. Special components, autoclavable at 140 ^{o} Celsius, are available at extra cost.
The nosepiece and blade holder can be removed from the unit by advancing the head as far forward as possible and removing two stainless steel socket cap head screws using the hexagonal wrench supplied. The nosepiece can then be gently eased upwards to lever it off its locating tenon.
It should be borne in mind that autoclaving will eventually degrade these components, especially the plastic ones. All the parts that make up the nosepiece and blade holder are available as spares, should the original items be lost or damaged.

When refitting the nosepiece, the securing screws should not be over-tightened.

The tissue bath supplied as standard is not autoclavable. Versions that will withstand autoclaving are available at extra cost.

Autoclaving specifications:

Standard autoclavable items:

20 minutes at 121^{o}C

Enhanced items:

30 minutes at 140^{o}C

Installation

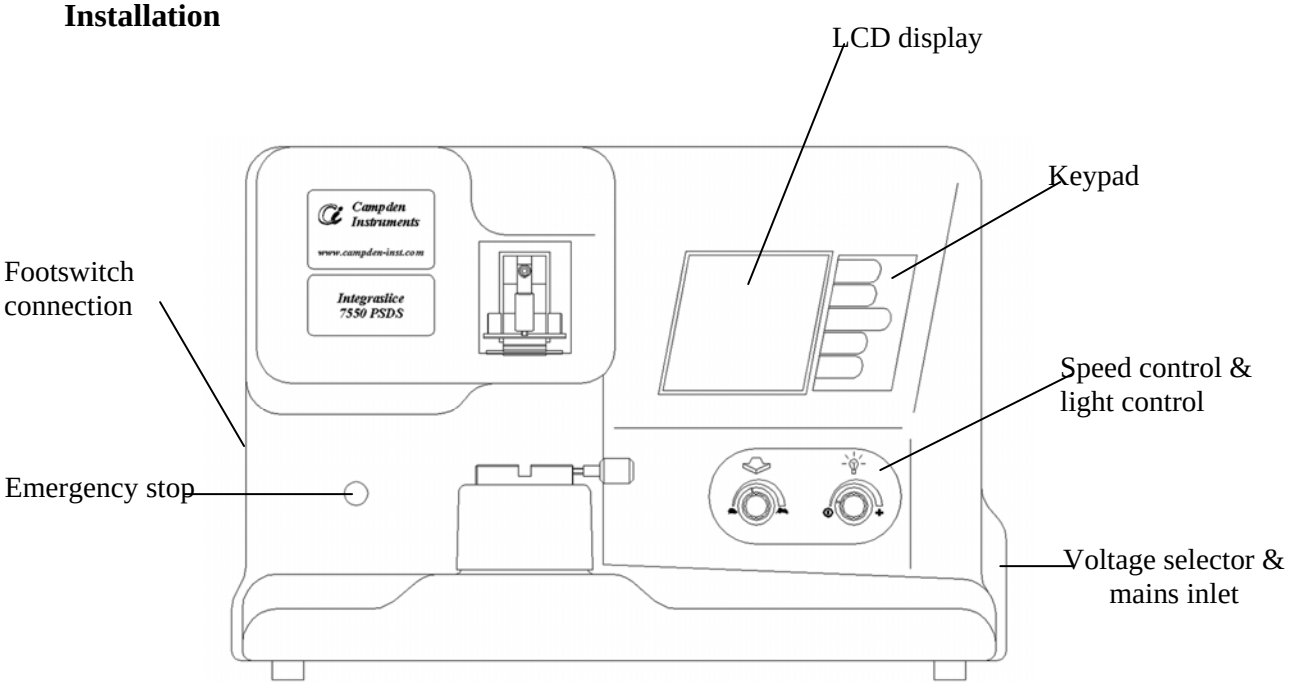

Figure 1 Front view of the Integraslice

The unit should be placed on a sturdy bench. Although the unit has a good vibrating mass to static mass ratio and absorbent rubber feet, a rigid support bench will enhance immunity from secondary vibration transmission.
If a microscope attachment has been supplied with the instrument, reference should be made to the additional documentation supplied for the fitting and setting up procedure.
Figure 1 shows a front view of the instrument and the main controls.
Figure 2 shows a rear view of the instrument.

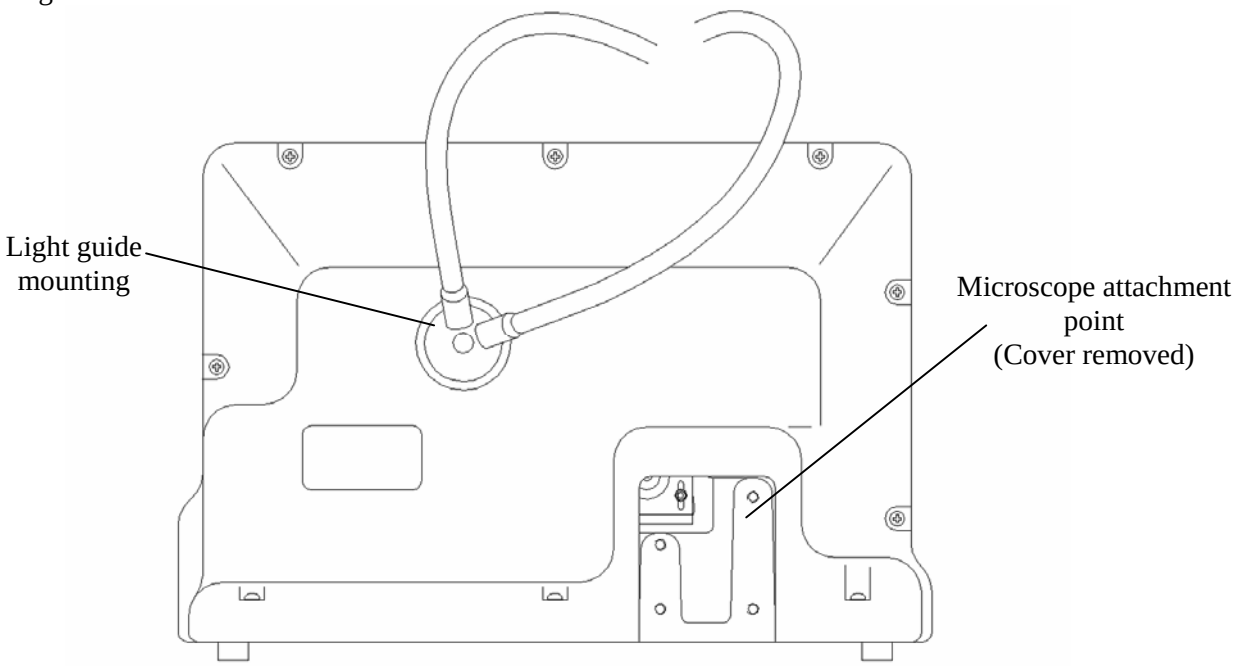

Figure 2 Rear view of the Integraslice

Before connecting the unit to a mains supply, the unit must be set for your particular voltage supply.
The voltage is set by prising out the fuse holder drawer and re-inserting it such that the voltage legend for your supply is aligned with the mark on the inlet moulding. See Figure 3.

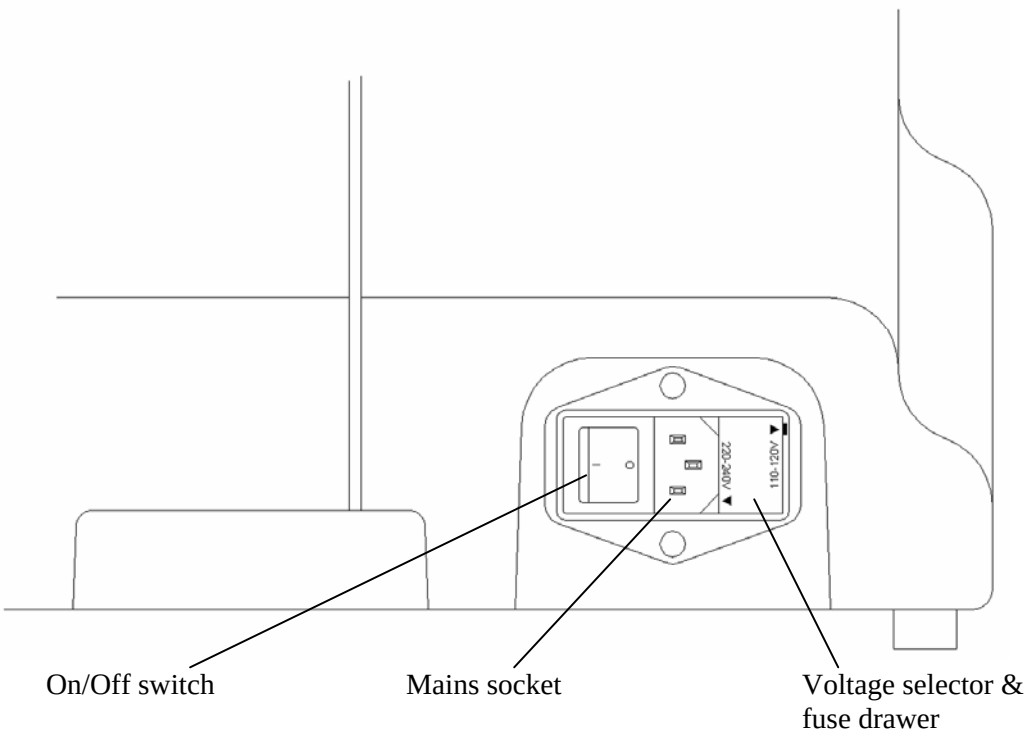

Figure 3 Voltage supply selector (example shown is set to 110-120V)

The inlet moulding 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
If a light source has been supplied with the instrument, the fibre optic light guides should be plugged into the outlet on the rear of the instrument (see figure 2). Note that the light guide and outlet are keyed to prevent rotation during use. The keyway in the outlet is angled to give best orientation and reach of the light guides over the Integraslice.

The footswitch should be plugged into its connecting socket on the left hand side of the instrument.

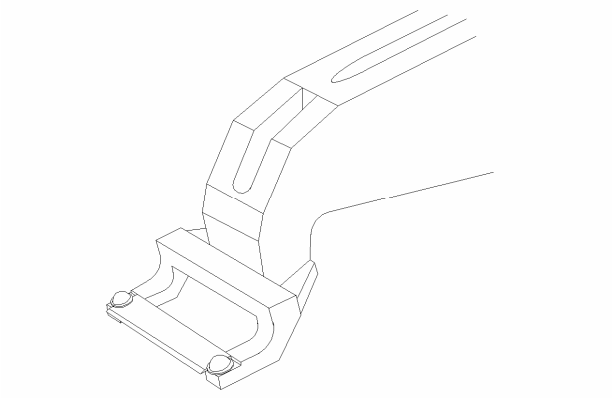

Figure 4 (note: blade visor not shown)

When fitting blades, care must be taken as the blades supplied by Campden Instruments are very sharp.

The blade should be fitted by loosening the two screws on the arms of the holder and sliding the blade under each washer. The screws should not be over-tightened. See figure 4 above

The blade holder may be fitted with a transparent plastic ‘Clearview’ visor. This performs two functions. It will reduce the possibility of accidental cuts to the operator. The visor also performs a secondary function when the head is vibrating; if the visor is in contact with the bath solution, it will maintain a ripple-free surface allowing distortion-free viewing of the sectioning process. This is a particular advantage when the microscope attachment is being used. When slicing the blade should be positioned at the correct height for the desired slice and the level of a.c.s.f in the tissue bath adjusted so that it ‘sticks’ to the underside of the visor by capillary action maintaining a clear and undistorted view of the specimen and vibrating blade during the slicing operation. This is illustrated in figure 5. The part number for the Clearview visor is listed in the Spare Parts and Accessories section at the end of this manual.

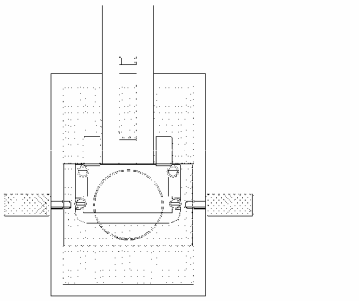

Figure 5 Use of the ‘Clearview’ visor

Please note that figure 5 also shows an adjustable blade holder. The standard blade holder presents the blade at an angle that has been optimised over many years of experience, some researchers may, however, wish to set the blade at some other angle. Campden Instruments can supply an adjustable blade holder. With this attachment the user can set the blade at any angle between horizontal and vertical. A protractor is also supplied to allow the angle to be gauged. Due to the extra mass of the adjustable blade holder and nosepiece configuration a slight reduction in cutting performance may be experienced when they are used. This can generally be overcome by using a

lower oscillation frequency. Part numbers for this option are listed in the Spare Parts and Accessories section at the end of this manual.

Operation

Language selection

When the instrument is first switched on, the display will be as shown in Figure 6. This display is timed; after 5 seconds the display will change to that shown in Figure 8.
Whilst the display is as shown in Figure 6, the operating language may be changed by pressing the key pad ‘SET’, this will bring up the display shown in Figure 7.

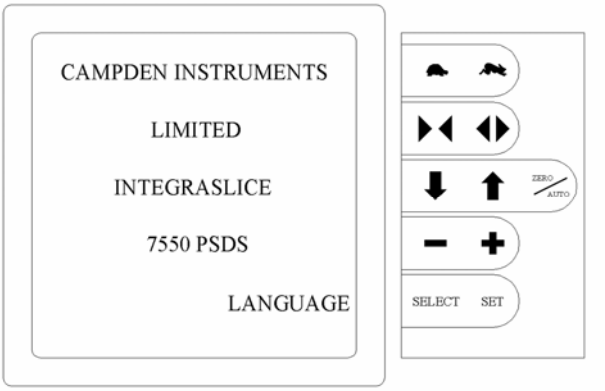

Figure 6 Initial screen display

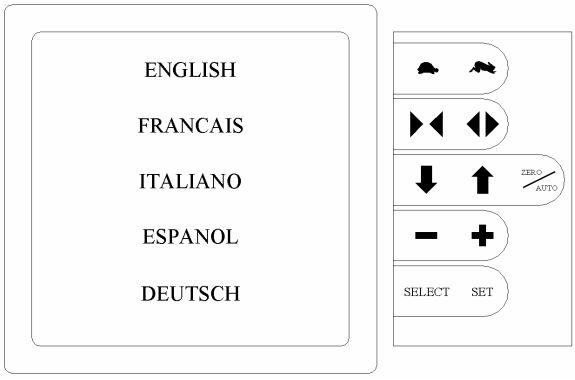

Figure 7 Language select display

The desired language may now be selected by pressing the keypad adjacent to the language required, e.g. for Italian, press the ‘down arrow’ for Italiano. The display will always operate in the selected language until the language select procedure is repeated.
As soon as a language is selected, the display will change to the normal operating display in the selected language. The instrument is now ready for use.

Operation of Emergency Stop

The red emergency stop button on the front of the instrument may be used at any time to bring all motions to a halt. Actuation of the emergency stop will also disable all controls and prevent any further use of the instrument until it has been reset. After the emergency stop is released the instrument must be switched off and on again before any controls are operable. Note that the emergency stop button should be released before the instrument is switched on again or the controls will remain disabled.

Manual Control

(Note that all illustrations show typical values only)

After the language selection screen has timed out or a language has been selected the display will change to the basic manual operating mode display, as shown in Figure 8.

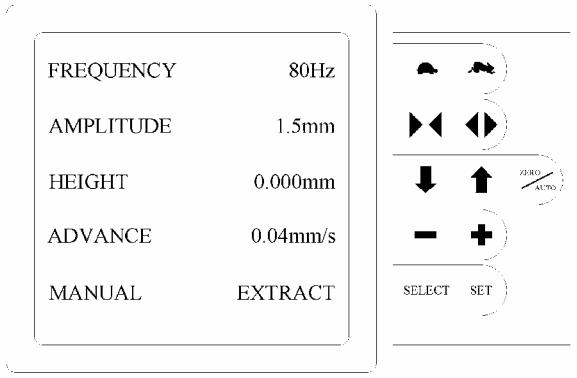

Figure 8 Manual mode display

An explanation of the terms used:

Frequency – this is the frequency of cutting cycle in Hertz. Pressing the keypad (tortoise or hare symbols) will cause the frequency to decrease or increase respectively in steps of 1 Hz. The minimum frequency is restricted to 20Hz. The maximum frequency available will depend upon the amplitude of cut selected. There is an inverse linear relationship between frequency and amplitude:
At 0.5mm amplitude the maximum frequency is 115 Hz, as the amplitude is increased to 1.5mm the maximum frequency reduces to 80 Hz.
When the allowable limits are reached the display ceases to change.

Amplitude – this is the amplitude of sideways travel of the blade. It is adjustable in steps of 0.1mm between 0.5 mm and 1.5 mm (nominal values). Pressing the inward facing arrows keypad reduces amplitude; the outward facing arrows keypad increases amplitude. When the allowable limits are reached the display ceases to change. The maximum amplitude available will depend upon the frequency selected. Note that the oscillation amplitude will not actually change until the instrument is operated, i.e. the footswitch is depressed – see below. The amplitude value will flash until the amplitude has changed to the selected value.

Height – when the unit is switched on, the display will show a height of zero. Pressing either the up or down arrow keypads will move the table in the appropriate direction. Speed of movement is proportional to the length of time the keypad is kept pressed. Initial movement is slow, enabling fine increments to be set, ramping up to a maximum speed of 0.85 mm/sec.
There are upper and lower limit of travel switches inside the unit to prevent damage through over-travel. If the table is driven such that either the upper or lower limits are reached, the numerical display will change to display 'LIMIT'. Releasing the key switch will cause the display to revert to a numerical value.
The display shows the distance moved away from the zero point. Pressing the zero/auto keypad for a short period will reset the display to zero. If the zero/auto keypad is kept depressed the display will change to read SECTION as shown in figure 9. Changing to 'section' mode will also reset the height datum to zero; if the zero/auto keypad is pressed for a brief period whilst still in section mode, the word SECTION will change to TOTAL and the display will indicate the total movement away from the new datum, e.g. after 3 repeats at 0.400mm the brief display will indicate 1.200mm (i.e. 3 x 0.400mm = 1.200mm).

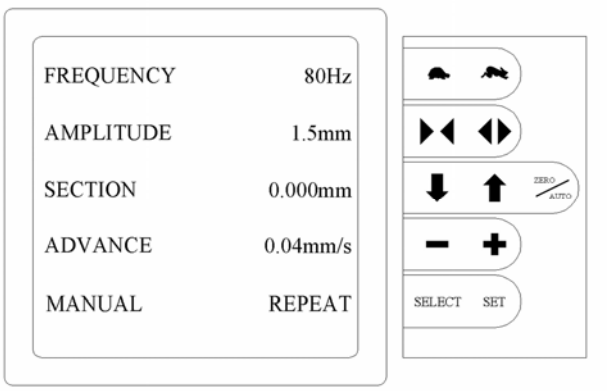

Figure 9

When the display is showing SECTION, pressing the up or down keypads will allow the user to preset the desired section thickness without moving the table. When the table is in this mode the display will also show the legend REPEAT. Pressing the 'set' keypad will then raise the table by the amount shown against SECTION each time the keypad is pressed. After a cut has been taken in this mode and the blade has been retracted, the REPEAT legend will flash as a reminder that the height has not yet been incremented (by the section thickness). When the 'set' keypad has been pressed in order to repeat the section, the display will cease to flash. Note that pressing the 'set' keypad once will increment the table position by the section thickness (and the legend will cease to flash), repeated pressing of the 'set' keypad will increment the table by the number of times the keypad is pressed.

Advance – this shows the rate at which the cutting head will move. The speed is adjustable by turning the potentiometer situated below the display panel, see figure 10. Pressing the – keypad will retract the cutting head inwards (at the built-in speed of 4.4 mm/sec). Pressing the + keypad will advance the cutting head at the preset speed. The advance speed may be adjusted in increments of 0.01 mm/sec whilst the cutting head is being advanced. Note that the + keypad will cause the head to advance without the head vibrating. The head will only advance and vibrate when the footswitch is pressed to its second stop position (see below).

Manual – this denotes that the instrument is in simple manual operation mode. In this mode the user can control all functions and take slices by direct interaction with the keypad and footswitch.

The footswitch causes the cut to be taken: The cut is taken by first pressing the footswitch to its first stop – this will set the blade in motion, pressing the footswitch to its second stop will start the blade advance.
Limit switches inside the instrument prevent damage being caused by over-travel of the cutting head in either direction. If the head is driven such that either the inner or outer limits are reached, the display will cease to display the advance speed value and display 'LIMIT'. Releasing the foot switch (or the key switch) will cause the display to revert to a numerical value.
If the amplitude setting has been changed, the control system will initiate the dynamic amplitude change sequence when the footswitch is depressed to its first stop.

Thus, in manual mode, there are two options:

1. Set the frequency, amplitude, blade advance speed and height of the table. Then take a cut by pressing the footswitch to its second stop. The cut is stopped either by the footswitch being released or by the blade head reaching its limit of travel. Retract the blade. The next cut is taken by raising the table the desired amount and taking another cut as above.
2. Set the frequency, amplitude, blade advance speed and section thickness. Then take a cut by pressing the footswitch to its second stop. The cut is stopped either by the footswitch being released or by the blade head reaching its limit of travel. Retract the blade. The next cut is taken pressing the REPEAT keypad to raise the table by the specified amount and taking another cut as above.

Note that in order to prevent the cutting blade dragging across the uncut specimen as it is retracted after taking a cut, the table will automatically lower itself by .25mm when the blade retract keypad is pressed and will raise itself by the same amount when the keypad is released.

Extract - When the display is as shown in figure 8, i.e. Manual mode and height mode, the legend 'EXTRACT' will be shown in the bottom right hand corner of the display. If the 'set' keypad is pressed and held down briefly the table will be lowered automatically to its lower limit allowing the tissue bath to be easily removed without having to tilt the bath to clear the cutting head and blade. If the 'set' keypad is pressed at any time whilst the table is being lowered the downward motion of the table will be halted.

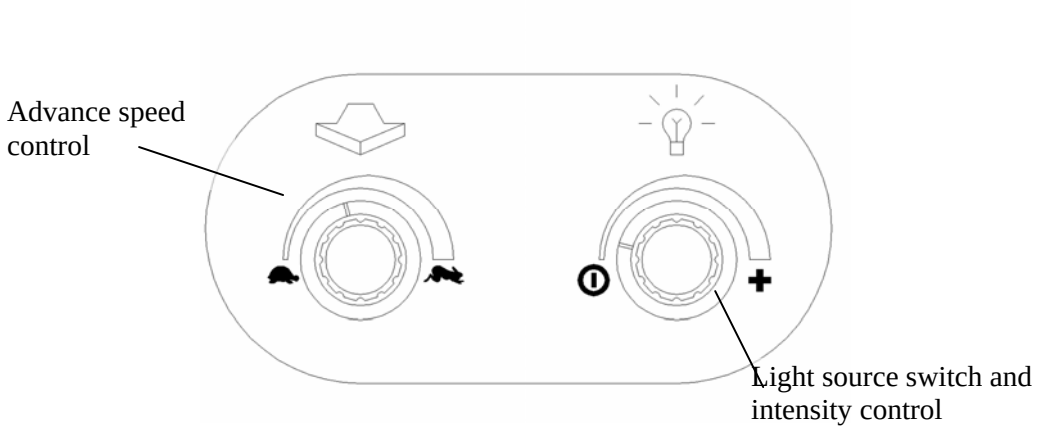

Figure 10

Programmed Control

The programmed operation feature allows the user to teach the instrument a cutting profile, i.e. a start point for the cut, a blade advance speed profile and an end point. The blade advance speed/distance profile can include fast speeds for rapid cuts through certain areas of tissue and slow cuts through other areas. The user can also programme in the section thickness and number of cuts to be taken for that profile
Pressing the SELECT keypad whilst the instrument is in manual mode (as shown by the display) will initiate the programmed mode and the display will change to that shown in Figure 11.
Note that the recording phase will only record the blade advance profile. Settings for blade oscillation frequency and blade amplitude (including any changes made to the frequency or amplitude during recording) are not recorded.

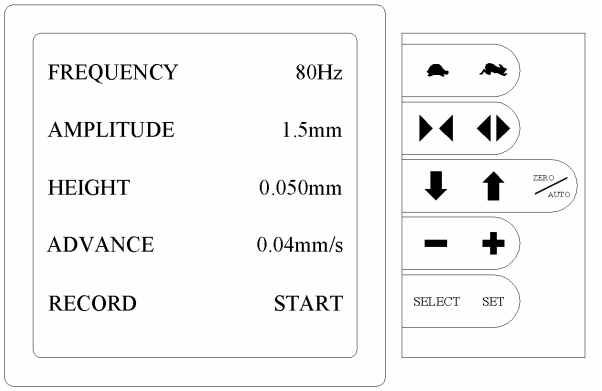

Figure 11

In order for the instrument to cut slices automatically it must, first, learn the cutting profile. This is accomplished by setting up the parameters required and moving the head to the desired start point. Pressing the start keypad (SET) will change the display to that shown in Figure 12a. You now have the option to begin recording or to abort the operation. N indicates that ‘No’ you wish to abort and Y indicates that ‘Yes’ you wish to record. Press the SELECT keypad to abort or press SET to begin recording. Take a cut as described above under manual operation. As the learning cut progresses, its parameters are monitored and stored in memory. As recording takes place the display will change to that shown in figure 12b.
Note that if the blade head reaches its front (or rear) limit of travel, recording will continue even though the head advance will have been stopped by the over-riding safety routines within the instrument’s operating program.

If you wish to abort the cut, press the abort keypad (SELECT) and the screen will revert to that shown in Figure 11. You may then restart the learn procedure.

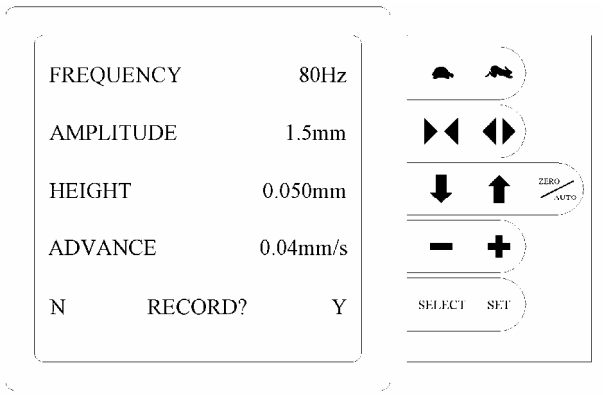

Figure 12a

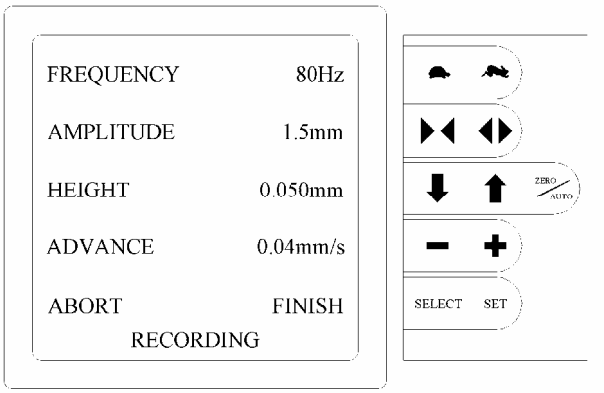

Figure 12b

When the cut profile is satisfactory, press the finish keypad (SET) to complete the programming sequence and store the profile. The display will change to that shown in Figure 13, allowing section thickness and number of cuts to be specified.

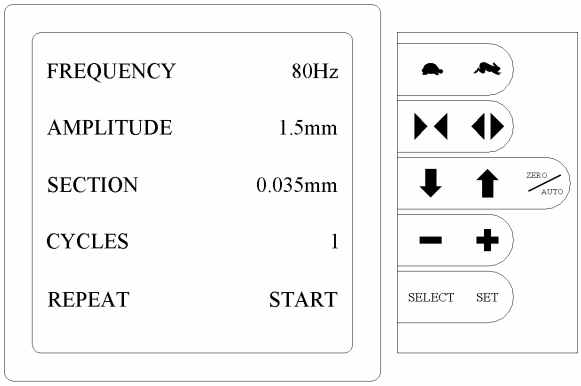

Figure 13

If the display shows HEIGHT as in figure 14, only one cycle will be allowed when the start keypad (SET) is pressed, after which a new height must be set.

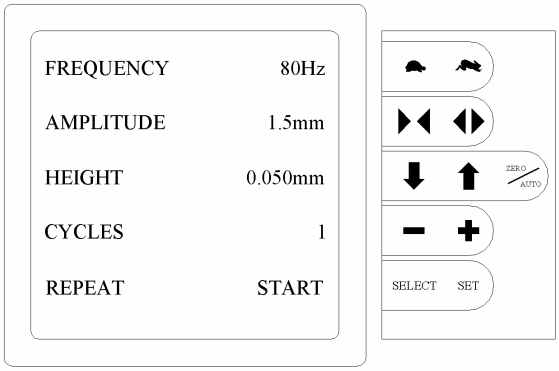

Figure 14

If the Zero/Auto keypad is pressed for about 3 seconds the display will change to read SECTION. In this mode the required section thickness can be keyed in and the required number of cycles (up to a maximum of 25) can be set using the -/+ keypad. Pressing the start keypad (SET) will initiate the cutting sequence. As soon as the cutting sequence is initiated the CYCLES display will change to show both the number of the cut being taken and the total number required, this will be displayed as a fractional value, e.g. 2/4 indicates that the second cut of four is being taken. To halt the sequence at any time, press the abort keypad (SELECT). See Figure 15.
When the cutting sequence is initiated an extra line at the bottom of the display will show 'WARNING!! SLICING' as an indication that the instrument is operating automatically.

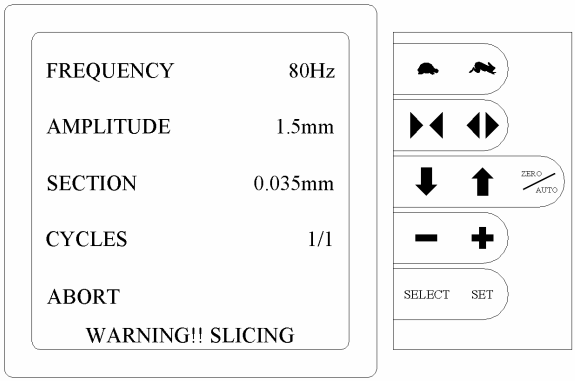

Figure 15

Light Source Operation (if fitted)

The Integraslice may be (optionally) fitted with a fibre optic cold light source. The light source is located within the main covers of the instrument and the fibre optic light guide is plugged into the source through an aperture in the rear cover. This is illustrated in figure 2. The light guide is a push fit in its socket and is angled slightly to allow both guides to reach over the instrument on either side of the cutting head.
The light source is switched on and the intensity is controlled via a combined rotary switch/potentiometer on the front of the instrument below the LCD screen – see Figure 10.
Should the bulb fail, instructions for replacing it are given later in this manual.

Maintenance and Service

The 7550 Integraslice has been designed to give reliable, trouble-free service. Maintenance requirements are limited to adjusting or changing drive belts and the occasional lubrication of moving parts. Service intervals will depend on the amount of use the instrument is subjected to.
When the equipment has been in service for a number of years it may be advisable to have a more comprehensive service, Campden Instruments or its local agents will be pleased to advise on this and we operate a fast turn around on equipment returned for service or repair.

The following section outlines how to perform minor service tasks such as lubrication and drive belt adjustment.

Important notes

Maintenance operations may involve operating or adjusting the instrument under electrical power whilst protective guards and covers have been removed. Great care must be taken to avoid electric shock to personnel. All maintenance/service instructions are given in good faith and are to the best of our knowledge correct. Campden Instruments Limited accepts no liability whatsoever for damage/loss due to errors in this manual or for errors/damage/loss made by personnel carrying out the operations outlined herein.

Please note that a number of the drives in the Integraslice use toothed ‘timing’ belts; timing belts work by positive meshing of the belt teeth with the teeth on the pulley, not by belt tension. Excessive belt tension will not improve drive efficiency but merely lead to premature failure of the belt and the bearings supporting the pulleys in the drive train. Belt tension will be sufficient when the belt cannot jump over the pulley teeth and backlash is at a minimum. In a static situation (i.e. no driving force is being applied) there is no need for any significant tension in the belt.

Some of the operations listed below require the rear cover of the instrument to be removed; this will be sufficient to expose the mechanism of the instrument for all normal purposes. It is unnecessary to remove the front cover and no attempt should be made to remove it.

Adjusting and changing the rising table drive belt.

Refer to Fig. 16
From underneath the instrument, loosen and remove ten countersunk head screws securing the mechanism cover plate (the rectangular cover with ventilation slots) and remove the cover.
Loosen (but do not remove) four M3 socket cap head screws securing the motor to the drive base.
The belt tension may be adjusted by sliding the motor towards or away from the larger pulley.

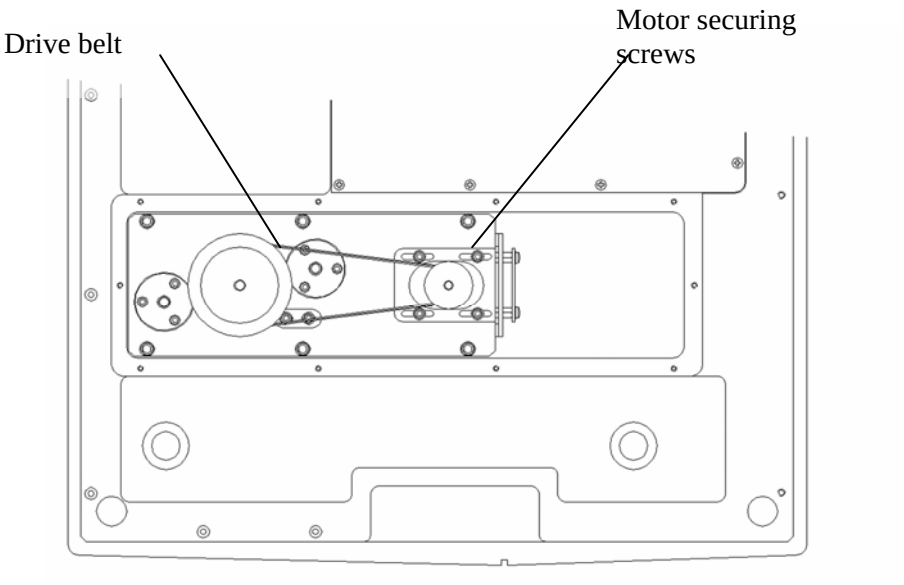

Figure 16

If it is necessary to change the belt, slide the motor towards the large pulley as far as the mounting slots will allow. The belt can now be removed and a replacement fitted.
To tension the belt, slide the motor away from the larger pulley until the belt is tensioned correctly (see notes at the beginning of this section) and tighten the four motor securing screws.
Refit the cover plate; note that the ventilation slots should be to the rear of the instrument.

Adjusting and changing the blade advance drive belt

Refer to Fig. 17
Disconnect the instrument from the electrical supply before proceeding.
Remove the microscope assembly and fibre-optic light guide (if fitted).
Loosen and remove nine M4 screws securing the rear cover. Slide the rear cover backwards and then upwards to remove it.
Loosen (but do not remove) four M3 socket cap head screws securing the motor to the drive base.
The belt tension may be adjusted by sliding the motor towards or away from the lead screw pulley.
If it is necessary to change the belt, slide the motor towards the lead screw pulley as far as the mounting slots will allow. The belt can now be removed and a replacement fitted.
To tension the belt, slide the motor away from the lead screw pulley until the belt is tensioned correctly (see note above) and tighten the four motor securing screws.
Refit the rear cover and microscope assembly.

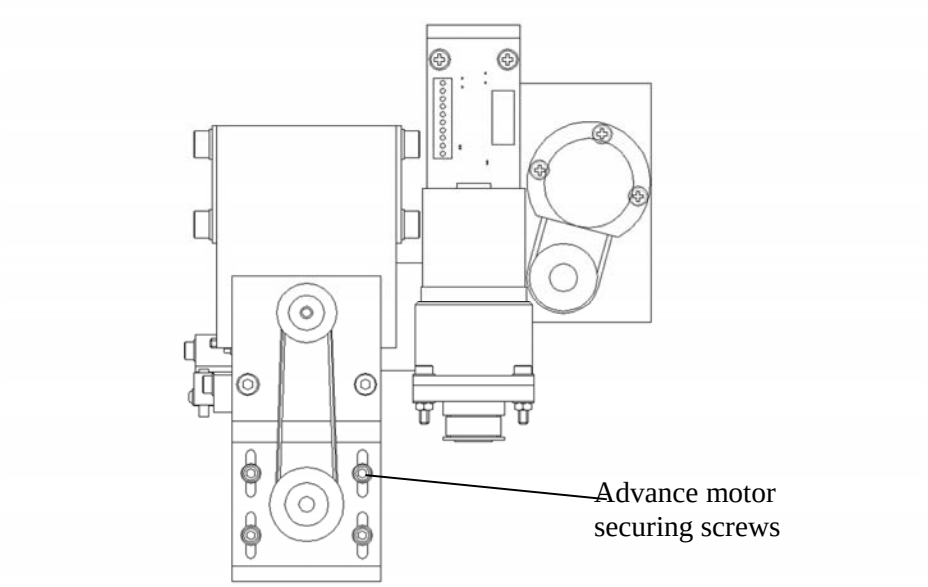

Figure 17

Adjusting and changing the amplitude adjustment drive belt

Refer to Fig. 18
Power up the instrument and retract the nosepiece as far as possible into the instrument.
Disconnect the instrument from the electrical supply before proceeding.
Remove the microscope assembly and fibre-optic light guide (if fitted).
Loosen and remove nine M4 screws securing the rear cover. Slide the rear cover backwards and then upwards to remove it.
Loosen (but do not remove) four M3 socket cap head screws and nuts securing the motor to the drive base.
The belt tension may be adjusted by sliding the motor towards or away from the lead screw pulley.

If it is necessary to change the belt, slide the motor towards the lead screw pulley as far as the mounting slots will allow. The belt can now be removed and a replacement fitted.
To tension the belt, slide the motor away from the lead screw pulley until the belt is tensioned correctly (see note above) and tighten the four motor securing screws.
Refit the rear cover and microscope assembly.

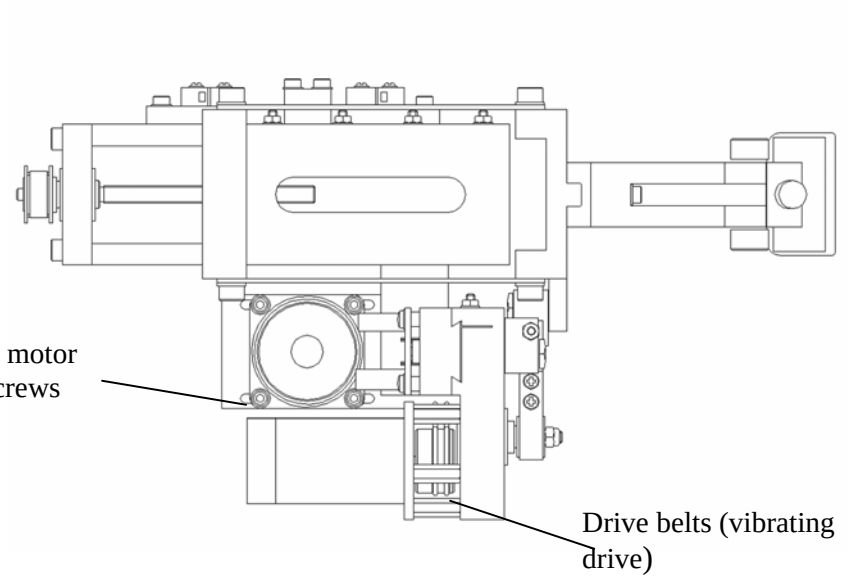

Figure 18

Changing the blade motion drive belt(s)

Refer to Fig. 18
Power up the instrument and retract the nosepiece as far as possible into the instrument.
Disconnect the instrument from the electrical supply before proceeding.
Remove the microscope assembly and fibre-optic light guide (if fitted).
Loosen and remove nine M4 screws securing the rear cover. Slide the rear cover backwards and then upwards to remove it.
The two (red) drive belts will be visible on the left hand side of the exposed mechanism just clear of the front cover, see Fig 17.
Remove the old drive belts (using tweezers or a similar instrument) and fit the replacements.
Refit the rear cover and microscope assembly.

Changing the light source bulb

Refer to Fig. 19
Disconnect the instrument from the electrical supply before proceeding.
Remove the microscope assembly and fibre-optic light guide (if fitted).
Loosen and remove nine M4 screws securing the rear cover. Slide the rear cover backwards and then upwards to remove it.

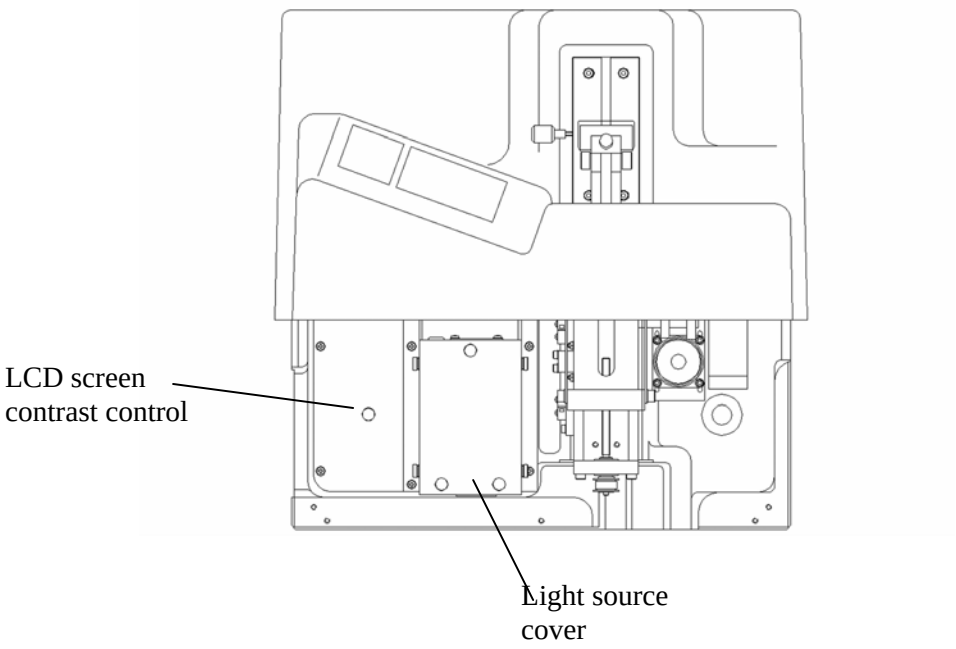

Figure 19

Identify seven screws with black knurled knobs securing the light source cover Remove the three screws on the top of the cover and loosen the two screws on each side. Lift off the cover to expose the bulb. Remove the old bulb and insert the replacement.
Note that the replacement bulb should not be touched directly or moisture from the fingers will lead to premature failure. If the bulb is inadvertently touched it should be wiped clean with a suitable solvent.
Replace the light source cover and instrument rear cover.
Refit the microscope assembly and fibre optic light guide.

LCD screen contrast adjustment

Refer to Fig. 19
Remove the microscope assembly and fibre-optic light guide (if fitted).
Loosen and remove nine M4 screws securing the rear cover. Slide the rear cover backwards and then upwards to remove it.
Locate the contrast adjustment control as shown in figure 19.
Adjust the contrast of the display as required: the characters should be clear and easy to read whilst the background should be unaffected.
Replace the instrument rear cover.
Refit the microscope assembly and fibre optic light guide.

Lubrication

All moving parts were lubricated, where necessary, during assembly of the instrument. During the design of the instrument due regard was taken to ensure that moving parts would not be exposed to 'lubricant washout' by fluids that may be used during normal use of the instrument. Nevertheless occasional re-lubrication is advisable. An annual lubrication regime is recommended although heavy use may demand more frequent attention. Unexpected noises such as squeaking or metallic rubbing should be investigated immediately or more severe damage may occur.

Recommended lubricants
During manufacture high quality grease with a molybdenum disulphide (MoS_2) additive was used. MoS_2 gives exceptional lubrication under high or vibrating load conditions and Campden recommends its continued use in the Integraslice.

Lubricating procedure.

Retract the blade assembly as far into the Integraslice as it will go.
Remove the microscope assembly and fibre-optic light guide (if fitted).
Loosen and remove nine M4 screws securing the rear cover. Slide the rear cover backwards and then upwards to remove it.

1. Amplitude drive
Smear good quality grease with MoS_2 additive onto the amplitude drive lead screw. The lead screw is accessible from the side and front of the carriage.
The amplitude dovetail slide should be lubricated by smearing good quality grease with MoS_2 additive onto the sliding surfaces and then operating the drive to move the carriage up and down a few times. This will entail operating the instrument without the rear cover being fitted. Note that in order to move this carriage up and down the blade drive must also be engaged: Select a low frequency for the blade speed - less than 50 Hz - on the front panel. Select maximum amplitude and engage the blade drive by operating the foot switch to its first position. This will drive the carriage to its highest position. Select minimum amplitude and re-engage the footswitch – this will drive the carriage to its lowest position. Repeat this procedure until the lubricant is evenly distributed.
At the very front of this mechanism (just inside the front cover, if the blade advance has been fully retracted) there is a vertical steel rod that oscillates when the blade drive is actuated: Apply a few drops of clean oil (with MoS_2 additive) to the upper section of the rod and allow the oil to drain down the rod. Wipe off any excess. Repeat the procedure described above to move the amplitude carriage up and down a few times.

2. Blade advance drive
Smear good quality grease with a molybdenum disulphide additive onto the lead screw.
The dovetail slide should be lubricated by smearing good quality grease with MoS_2 additive onto the sliding surfaces and then operating the drive to move the carriage forwards and backwards a few times.

Replace the rear cover.

3. Rising table assembly
From the front of the instrument:
Remove the autoclavable blade carrier and nose.
Drive the rising table to its lowest position.
Loosen and remove four stainless steel socket cap head screws from the tabletop and carefully lift off the tabletop and plastic skirt to reveal the table mechanism. Note that the plastic skirt

has been bonded to tabletop with sealant – try not to break the seal (but see below for the resealing procedure).
Drive the table to its uppermost position and smear a good quality grease on the two exposed bearing rods.
Smear grease on the central vertical lead screw.
Drive the table up and down a few times.
Finally drive the table to its lowest position.
Smear grease on the tabletop retaining screws and refit the tabletop and skirt ensuring that the skirt does not touch the main cover.

If the seal between the table top and skirt has been broken it must be resealed to prevent liquid ingress to the rising table mechanism. Remove the tabletop and skirt from the instrument and thoroughly clean both components. Take care that any solvents used do not attack the painted finish of the skirt.
With the rising table at its lowest position, loosely position the skirt on the table assembly and centralise it so that it is not in contact with the 'turret' moulding of the instrument main cover.
Smear silicon sealant around the underside edges of the tabletop and place it on the skirt.
Secure the tabletop and skirt to the table assembly with the four M4 x 16 stainless steel socket cap head screws.
Before tightening the screws check that the skirt has not moved.
Wipe of any excess sealant and drive the table up and down to check that the skirt does not come into contact with the turret.
Allow the sealant to dry before putting the instrument back into service.

Packing List

Integraslice 7550PSDS	1 off
Footswitch	1 off
Blade holder for ceramic blades	1 off
Mains lead	1 off
Tissue bath (including mirror & perfusion tube)	1 off
Specimen holder	1 off
Adjustable specimen holder	1 off
Stainless steel blades	10 off
Ceramic blades	2 off
Hexagonal wrench	2 off
Operator's handbook	1 off
Spare light source bulb	1 off (if light source fitted)

Spare Parts and Accessories

When ordering, please order by part number and description.

Stereoscopic zoom microscope	7550/IM
Magnifying glass	7550/MG
Tissue bath	752/2B
Autoclavable bath (121^{o} Celsius)	752/2AC
Autoclavable bath (140^{o} Celsius)	752/2UHT
Bath mirror	752/2BM
Bath perfusion tube	752/2BPT
Specimen holder	752/2A
Adjustable specimen holder	752/2A/A
Nosepiece (standard)	7550/7
Nosepiece (140^{o} Celsius)	7550/7UHT
Nosepiece (adjustable) inc. screws	7550/7A
Blade holder (standard)	7550/9
Blade holder (adjustable)	7550/9A
Stainless steel blades (pack of 50)	7550/1/SS
Ceramic blades (pack of 5)	7550/1/C
Blade visor (standard) (pack of 5)	7550/6
Blade visor (adjustable) (pack of 5)	7550/6A
Blade angle protractor (pack of 5)	752/69
Hexagonal wrench (pack of 2)	7550/HW
Light source bulb	7550/LSB
Blade head drive belts (pack of 4)	752/5

Specifications

Section thickness step size	0.001 mm
Total travel of Bath table	32 mm
Bath table rise & fall speed	0.85 mm/sec maximum
Cutting head advance speed	Minimum: -1.00 mm/sec Maximum: +3.00 mm/sec
Cutting head retraction speed	4.4 mm/sec
Blade oscillation frequency	Minimum: 20 Hz Maximum: 115 Hz (amplitude dependent)
Frequency step size	1 Hz
Blade oscillation amplitude	Minimum: 0.5 mm (nominal) Maximum: 1.5 mm (nominal)
Blade oscillation step size:	0.1 mm (nominal)
Power requirements (Selectable)	115VAC 60Hz 230VAC 50Hz
Power rating	100W (without light source) 140W (with light source)
Fuse rating (115V) (230V)	T2A 250VAC T2A 250VAC
Weight	21Kg (excluding microscope)
Shipping weight	25Kg (excluding microscope)