



Instruction Manual
for the
'Oxford' Retro-Illumination Camera
for
Cataract Recording

(film using camera)

Issued with Camera System Ser. No. 2X1030

Issue 9
June 1993

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Oxford Retro-Illumination Camera -- User Manual

C O N T E N T S

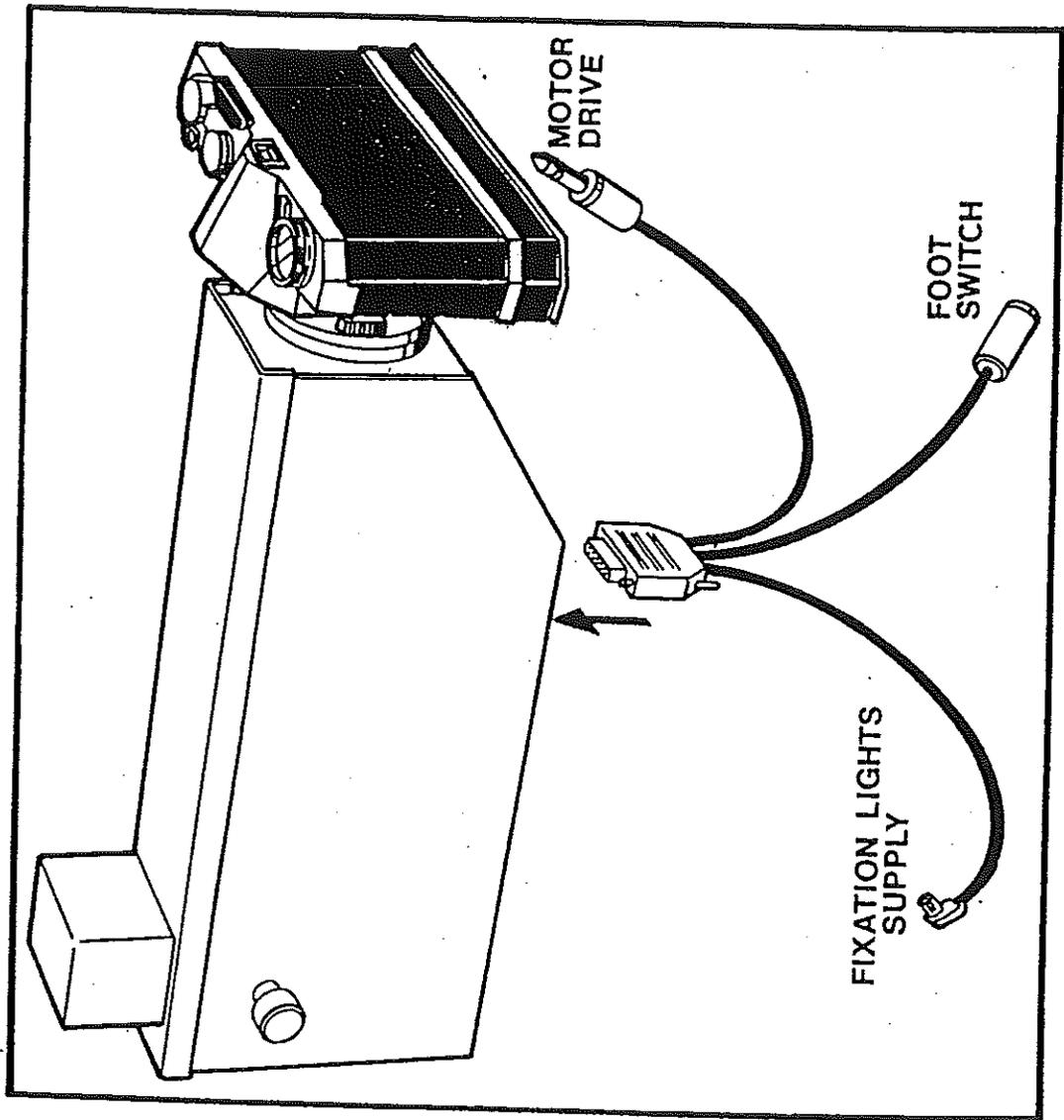
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ADDENDUM

Throughout this manual, any reference to Haag-Streit Slit lamps may be taken to include others with similar construction (e.g. Topcon), unless the sense dictates otherwise.

1. UNPACKING AND INSTALLATION

When unpacking the equipment, and before installation, open the 'Oxford' camera Power Pack, and check that all components are correctly positioned, and in particular that the grey Timer/Relay is plugged firmly into its socket. **THE SYSTEM WILL NOT WORK UNLESS THIS RELAY IS PRESENT.**

2. Motor Winder and Footswitch Connection

Since this Manual was illustrated, there has been a change in the way that the Motor Winder and Footswitch are connected.

- a) Supplied with the equipment is a circular plug, with three separate leads:-
 - (i) A 2.5mm Jack plug, for the Motor Winder
 - (ii) A 3.5mm jack socket for the Footswitch
 - (iii) A flash synch type connector for the 12 volt supply.
- b) Fit the circular connector into the socket on the under side of the 'Oxford' camera body.
- c) Connect the three leads as described in (a) above. See the Manual, Page 8 and Figure 6 for connection of the 12 volt supply.

3. Trouble-Shooting

If the camera does not work, or the flash fails to fire, first please check the following :-

- (a) Are all connections made correctly, and secure ?
- (b) Is the 'Oxford' Power Pack switched ON ?
- (c) Is the Green 'READY' light on the Power Pack flashing ?
- (d) Is the 'Oxford' viewing light ON ?
- (e) Is the Olympus Motor Winder switched to 'Single' shots ?
- (f) Are the batteries in the Motor Winder OK ?
- (g) Are the batteries in the OM-4 camera OK ?

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W A R N I N G

ELECTRIC SHOCK HAZARD

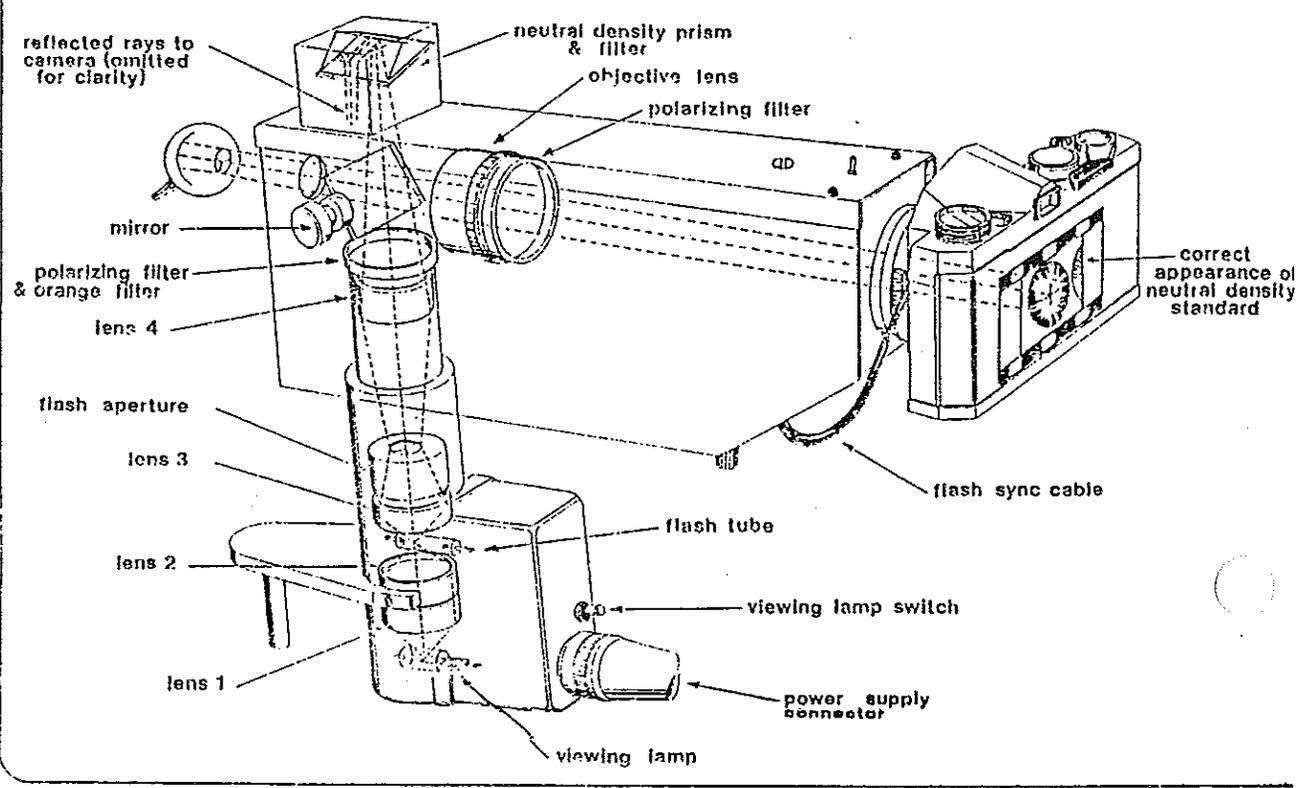
Both the Flash Unit and the Power Pack operate at 650 Volts DC.

Servicing must be done by qualified personnel.

Disconnect from the MAINS before removing covers.

ELECTRIC SHOCK HAZARD

Oxford Retro-Illumination Camera



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INTRODUCTION

The Oxford Retro-Illumination Camera is designed for the recording of cataracts in the lens of the eye. The source illumination is projected along the optical axis of the camera, into the patient's eye, where it is reflected by the fundus and returns through the patient's lens (and cataract), into the lens of the camera. The image recorded is a twice life-size frontal view of the patient's lens, and the camera may be focussed to record, separately, both anterior and posterior cataract.

The camera will fit directly onto the flash projector of a Zeiss Photo Slit-lamp. Alternatively, a separate Flash Unit is available to enable the camera to be mounted on a Haag-Streit (or similar) Slit-lamp.

The camera is completed by mounting a 35mm camera body to the rear. The camera chosen should have an inter-changeable viewing screen, and be fitted with a screen suitable for photo-micrography. (e.g. Olympus screen Type 12) Mounts are available for the following 35mm bodies :- Canon; Minolta; Nikon; Olympus; Pentax K (bayonet). An Olympus mount is supplied as standard, others must be specified at the time of ordering. A suitable camera body will be supplied if required. (EXTRA)

Other features include :-

Camera

- * Flashing Fixation Lights for Patient positioning, with repeater lamps for operator convenience.
- * Separate brightness control for fixation and repeater lamps.
- * Colour and polarising filtration to remove unwanted corneal reflections.
- * Standard Density indicator.

Flash Unit

- * On/Off switch for viewing lamp.
- * Central stop for elimination of Corneal reflex
- * Flash re-cycling time less than 5 seconds.

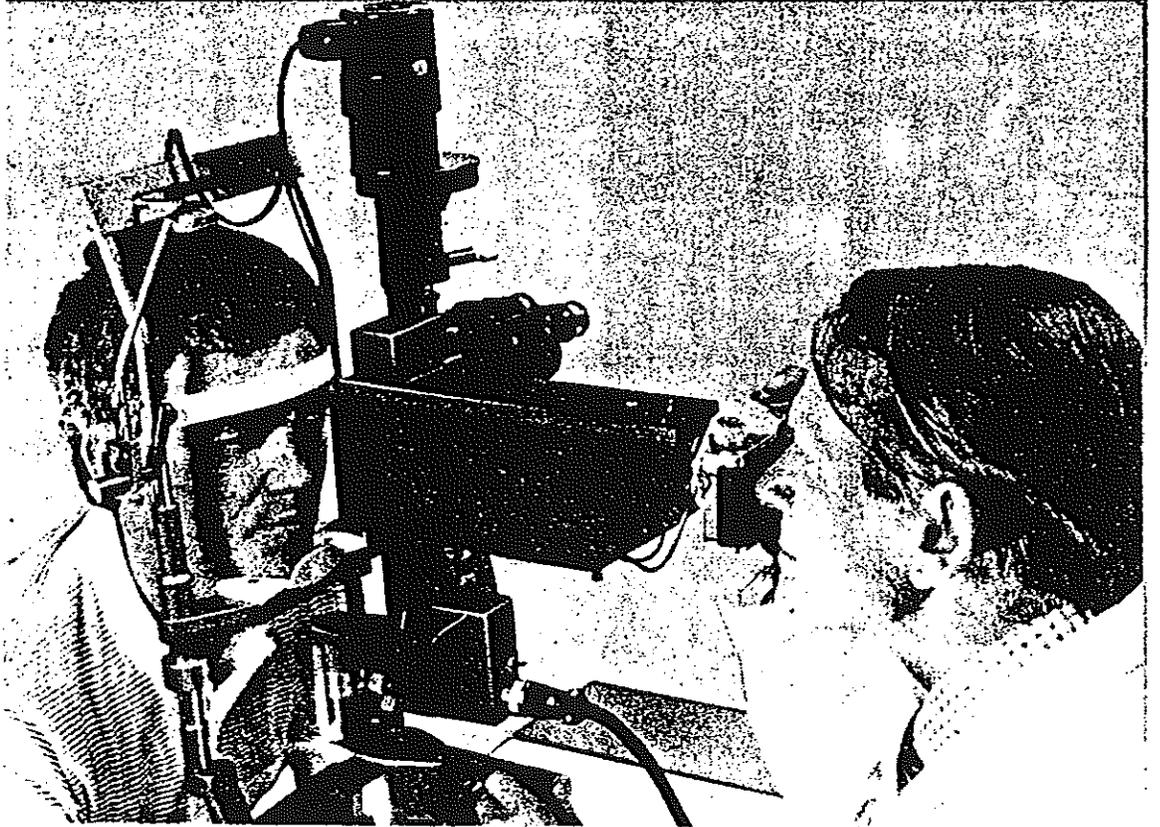


Fig. 1

Section I

WORKING WITH THE PATIENT

1. FIXATION LIGHTS

- (a) The fixation light is controlled by the small switch at the rear of the camera lid. To photograph the patient's right eye, the switch is moved to the patient's right. This will illuminate a green repeater LED beside the switch and a flashing green LED in front of the patient. (Nasal to the eye being photographed).
- (b) When the left eye is to be photographed the switch is moved towards the patient's left, switching on red LEDs.
- (c) Many patients find the flashing fixation light easier to see. On the under side of the camera is a control for the flash rate which may be adjusted with a small screw-driver.
- (d) When used with Motor Wind, the fixation lights are extinguished at the moment of exposure.

2. VIEWING LIGHT

- (a) On the Zeiss photo-slit lamp it is advisable to have the filament illumination, controlled by the rheostat knob at the rear right of the table, at less than full brightness. The patient is then better able to see the fixation light LED.
- (b) When using the Oxford Flash Module (with Haag-Streit or similar slit lamp), the viewing lamp may be switched on or off by the small switch on the rear of the Flash Unit. There is no provision for brightness control.

3. POSITIONING THE PATIENT, FOCUSING and EXPOSING

- (a) The patient is instructed to fixate the appropriate fixation LED with the eye being photographed. The operator observes the cross hairs in the camera viewfinder and takes up precise visual fixation on these. The operator should use his own distance visual correction, preferably in the form of an eye piece correction lens mounted on the rear of the camera view-finder. (The recommended Olympus OM-4Ti has a built in adjustable corrector).
- (b) The camera is advanced towards the patient until the cataract comes into focus in the plane of the cross hairs. The cross hairs are centred in relation to the pupil.
- (c) Correct patient fixation is necessary to ensure maximum reflection of light from the fundus. When the patient is fixating correctly, a weak reflection of the fixation light can be seen close to the centre of the view-finder. The precise position of this reflex will depend on patient anatomy. If the patient loses fixation, the reflex will move disproportionately in the same direction as the patient's eye. In cases where the patient has difficulty in fixating, the positioning of the fixation lamp reflex may be used to assist the operator in judging when fixation is correct.
- (d) An exposure is first made of anteriorly situated cataract. When posterior (subcapsular) cataract is present, a second frame may be exposed with the camera focussed on that cataract.
- (e) It is advisable to make all exposures in pairs so that the results may be averaged, and to avoid loss of information due to errors, such as blink by the patient.
- (f) Repeat for the other eye, changing the fixation light appropriately.
- (g) After exposure, the Power Pack will recharge in approximately five seconds, when the green 'Ready' light will come on and continue to blink until the flash is fired again.

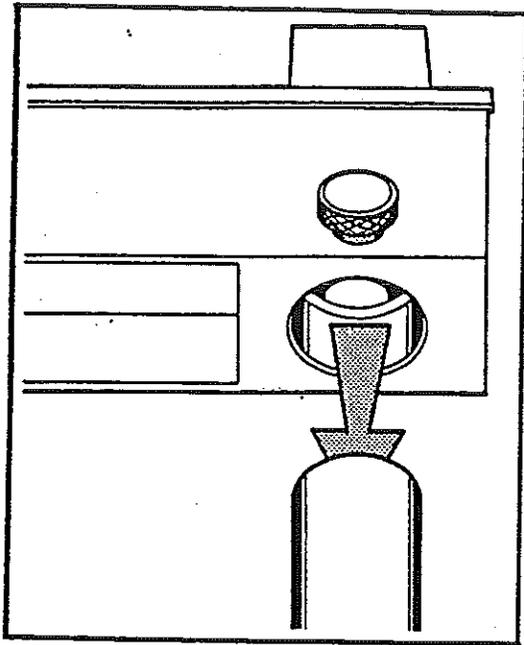


Fig. 2

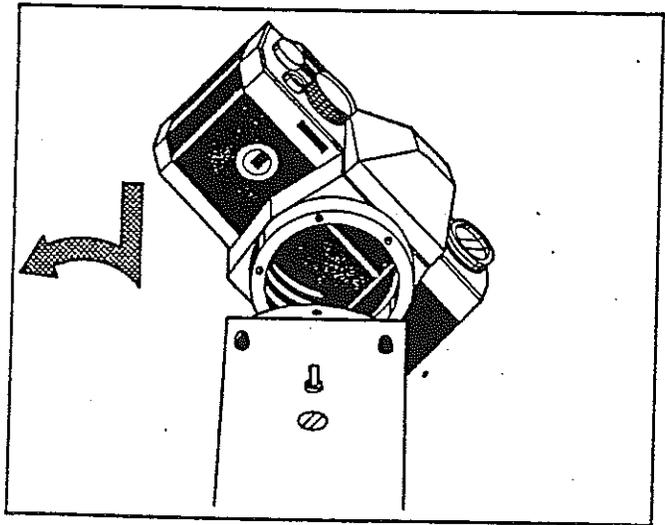


Fig. 3

Section II

MOUNTING THE CAMERA

1. MOUNTING ON THE ZEISS PHOTO SLIT-LAMP

The Camera mounts directly on the Zeiss Photo Slit-lamp, and uses the built in viewing and flash lamps. Proceed as follows:-

- (a) Remove the prism from the slit flash projector. This simply lifts off.
- (b) Slide the camera onto the slit flash projector (Fig. 2). Secure locking knob (moderate pressure) on front right of camera.
- (c) Unlock the rear leg of the camera, and adjust its height until the camera is supported by the Zeiss lamp housing. Re-clamp the leg.
- (d) Set the controls on the Zeiss slit projector to project a round circle of light of the maximum diameter (9.5 mm).
- (e) Either (i) Connect the 3 mm coaxial lead from the under side of the camera to the 3 mm coaxial socket on the head frame of the Zeiss Photo-slit lamp. (Thereby disconnecting the Zeiss fixation light) This connection powers the fixation lights in the Oxford camera.

Or (ii) Where there is no plug and socket connector on the head frame of the Zeiss, extend the lead from the camera using the Oxford 12 Volt extension lead and plug it into the 12 volt outlet socket on the right side of the Zeiss table.
- (f) Mount a 35 mm SLR camera in place at the rear (Fig. 3). Connect the 3 mm coaxial flash lead from the Zeiss photo-slit lamp to the camera body. Set shutter for flash (i.e. 1/60th sec exposure and 'X' synchronisation).

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1. MOUNTING ON THE ZEISS PHOTO SLIT-LAMP (cont'd)

(g) If using a Motor wind with provision for electric release:-

- (i) Plug the 2.5mm jack plug into the Motor Wind.
- (ii) Plug the Foot-Switch lead onto the 3.5mm in-line socket.

N.B.1 Both plug and socket are on flying leads from a circular connector which is normally supplied fitted into the base of the camera.

RELEASE THE CONNECTOR BY GENTLY PULLING THE KNURLED RING AWAY FROM THE CAMERA BODY. DO NOT TWIST THE CONNECTOR.

N.B.2 Some Motor Winds have no means of electric release. Others may have a different connector. Seek advice from your regular camera supplier.

(h) Set the control on the Flash Power Pack to 480 ws. (Setting III) Exposure is usually correct for fast black and white film, (e.g. Ilford XPl, Kodak Tri-X), with the camera lens at f11. See paragraph 3 below.

(j) Select the slit-lamp flash only (Set rotary switch on the right of the Zeiss table to 'I')

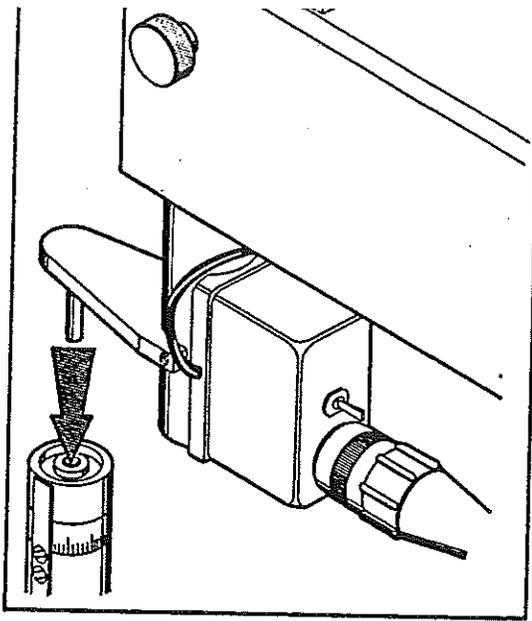


Fig. 4

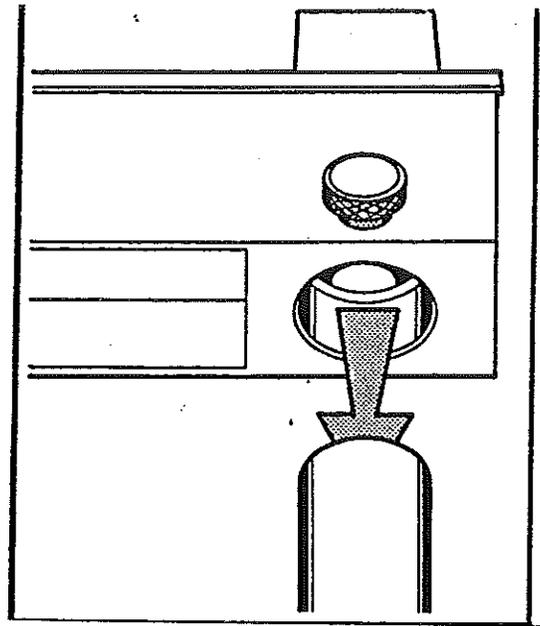


Fig. 5

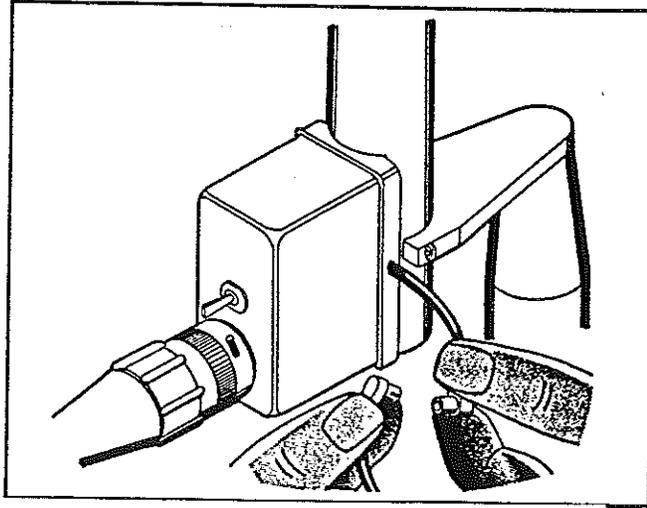


Fig. 6

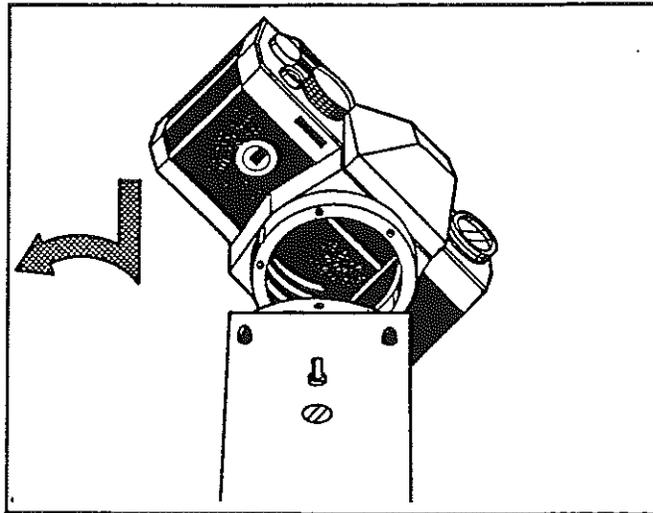


Fig. 7

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2. MOUNTING ON THE HAAG-STREIT (or similar) SLIT-LAMP

The Camera may be mounted on the Haag-Streit Slit-lamp by using the optional Flash Unit adaptor to provide both viewing and flash lamps and a low voltage power supply for the fixation lamps. Proceed as follows:-

- (a) Remove the applanation mounting shoe to reveal 8 mm socket.
- (b) Place the 8 mm shaft of the Flash Unit into the socket (Fig. 4).
- (c) Slide the camera onto the Flash Unit. Secure locking knob (moderate pressure) on front right of camera (Fig. 5).
- (d) Connect the coaxial lead from the connector on the under-side of the camera to the shorter 3 mm coaxial lead on the right of the Flash Unit (Fig. 6). (This connection powers the fixation lights).
- (e) Mount a 35 mm SLR camera in place at the rear (Fig. 7). Connect the longer 3 mm coaxial flash lead from the Flash Unit to the camera. Set shutter for Flash. (i.e. 1/60th sec exposure and 'X' synchronisation)
- (f) The Flash Unit normally provides correct exposure for fast black and white film (Ilford XP1, Kodak Tri-X) with the camera lens at f11.
- (g) If using a Motor wind with provision for electric release:-
 - (i) Plug the 2.5mm jack plug into the Motor Wind.
 - (ii) Plug the Foot-Switch lead onto the 3.5mm in-line socket.

N.B.1 Both plug and socket are on flying leads from a circular connector which is normally supplied fitted into the base of the camera.
RELEASE THE CONNECTOR BY GENTLY PULLING THE KNURLED RING AWAY FROM THE CAMERA BODY. DO NOT TWIST THE CONNECTOR.

N.B.2 Some Motor Winds have no means of electric release. Others may have a different connector. Seek advice from your regular camera supplier.

3. EXPOSURE TESTING

- (a) The Zeiss photo-slit-lamp and the Oxford Flash Unit normally ensure correct exposure for ISO 400 Black and White film (Ilford XP1, Kodak Tri-X) with the camera lens at f11. However, since the output of individual flash tubes may vary, it is recommended that test exposures be made, and the working aperture adjusted if necessary before starting patient studies.
- (b) for slower films, the lens may be used up to its maximum aperture of f/4, but with reduction of depth of field. For some applications this may be an advantage, because it permits better differential focussing between anterior and posterior cataract.
- (c) The film should be processed to 'Gamma = 1' to obtain satisfactory contrast. If prints are required, paper of grade 4 (Hard) is recommended.

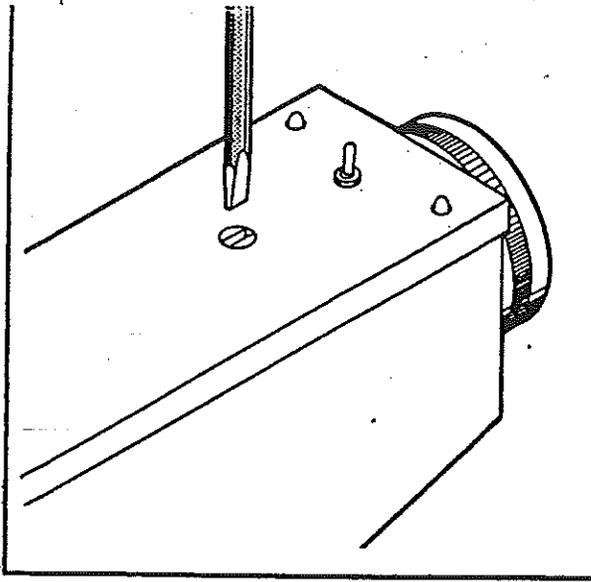


Fig. 8

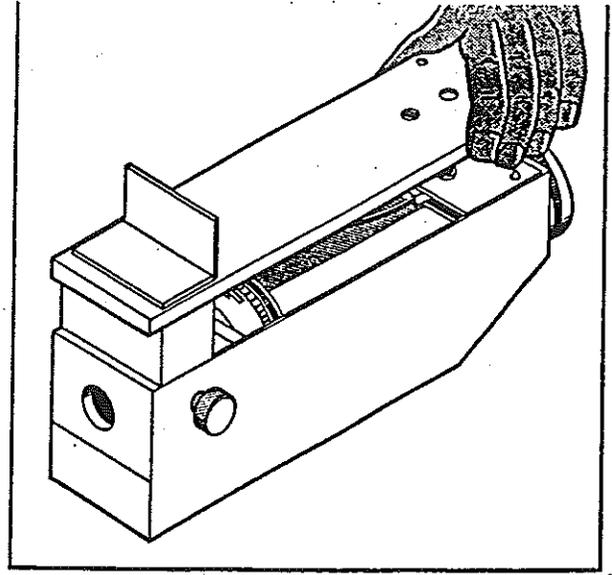


Fig. 9

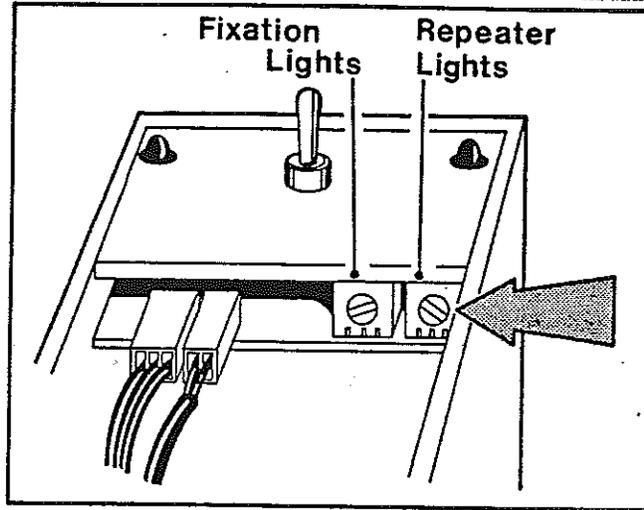


Fig. 10

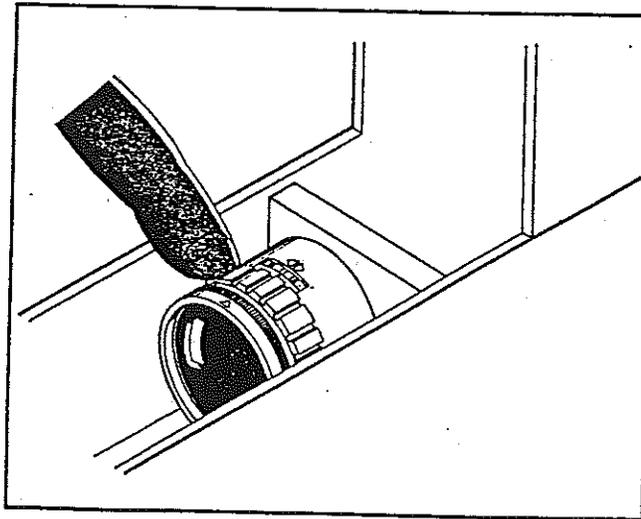


Fig. 11

Section III

Service Adjustments -- Camera

1. ADJUSTMENT OF FIXATION LIGHTS

The brightness of the fixation lights and the repeaters on the top of the camera may be adjusted separately to suit patient and operator requirements. Proceed as follows:-

- (a) Unlock the camera lid by anti-clockwise rotation of the large recessed screw (found on the top of the lid towards the rear) (Fig. 8). Lift off the lid by careful vertical movement (Fig. 9).
- (b) The variable resistors controlling lamp brightness are located on the circuit board under the switch at the rear of the camera. The resistors themselves are small blue square components with a central screw head (Fig. 10).
- (c) Fixation light brightness is controlled by the left hand resistor. Rotate the screw head clockwise to increase brightness, anti-clockwise to reduce.
- (d) The brightness of the repeater lights is controlled by the right hand resistor, adjust as above.
- (e) If no further adjustments are required, replace and secure the lid.

Fixation light flash rate may be adjusted by rotation of a pre-set resistor, on the under-side of the camera body, with a small screw-driver.

2. ADJUSTMENT OF LENS APERTURE

The 80mm f/4 Rodagon lens is normally used at f/11, and is mounted in the camera correctly pre-set. The lens may be opened up by rotating the knurled ring (Fig. 11) clockwise, and closed down again to working aperture by anti-clockwise rotation. (Directions of rotation as seen from rear of camera). Avoid rotation of the polarizing filter mounted to the rear of the lens.

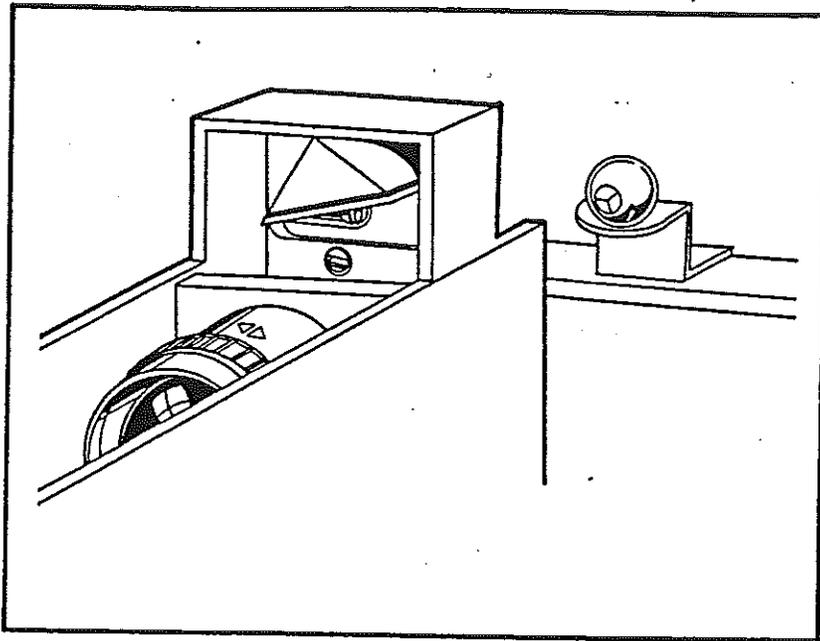


Fig. 12

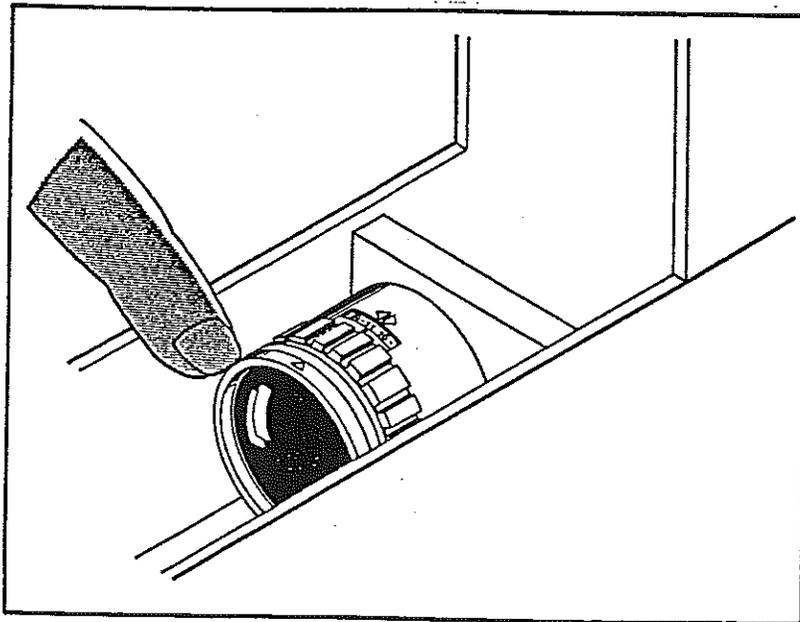


Fig. 13

3. ADJUSTMENT OF POLARIZING FILTER

The polarizing filters are pre-set to be optically crossed. Should the polarizing filter on the camera lens ('PF2') be accidentally moved, proceed as follows:-

- (a) Switch on viewing light
- (b) Direct the camera towards a spherical reflecting surface (Fig. 12); an artificial eye (prosthesis) serves perfectly, or alternatively, a ball bearing of 1.5 - 2 cm diameter may be used.
- (c) Unlock the camera lid by anti-clockwise rotation of the large recessed screw (found on top of the lid towards the rear). Lift off the lid by careful vertical movement.
- (d) The polarizing filter is situated on the rear of the 80 mm f/4 Rodagon lens. Focus the camera upon the artificial eye and centre this subject in the viewfinder. Rotate the polarizing filter to obtain maximum extinction of the central reflex image (Fig. 13).
- (e) Note that as extinction approaches, a dark vertical bar moves horizontally across the field of view. If this bar moves obliquely, the first polarizing filter may also require adjustment. (See Section V, para 4)

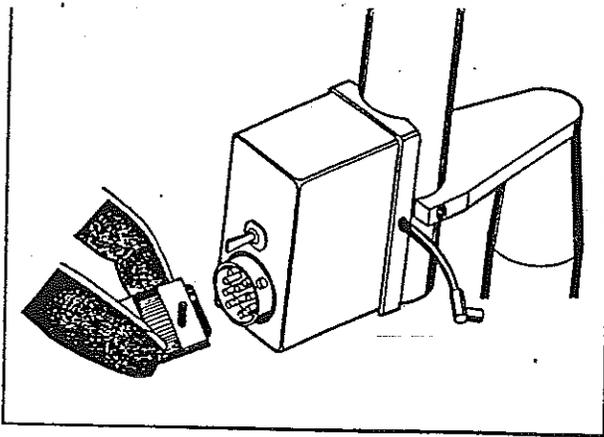


Fig. 14

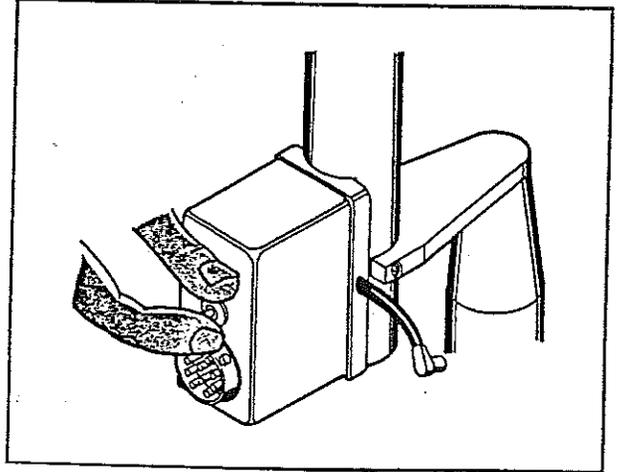


Fig. 15

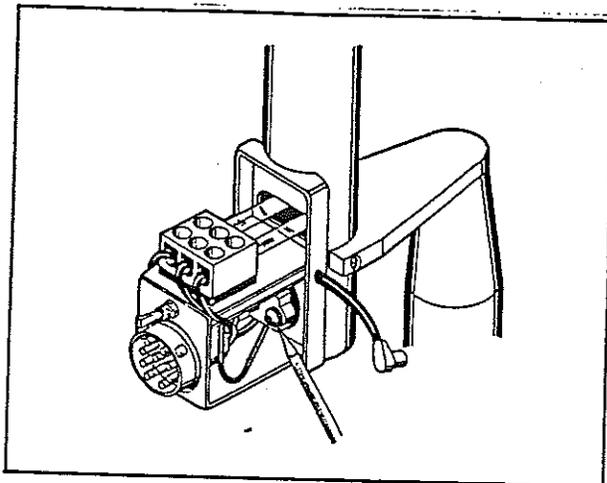


Fig. 16

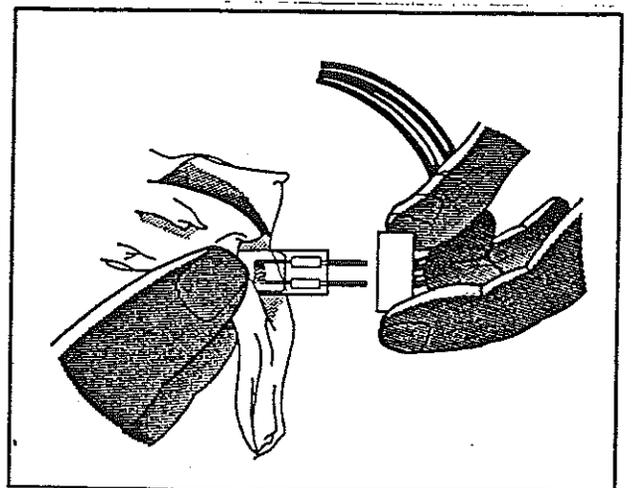


Fig. 17

Section IV

Service Adjustments -- Flash Unit

The Flash Unit is robustly constructed, and if treated with reasonable care will require no other operator attention than occasional replacement of the filament lamp. Should the flash tube fail, call a service technician

When the Flash Head is removed from the Slit-lamp, ensure that the dust cover is replaced on the top.

1. REPLACEMENT OF FILAMENT LAMP

The 20W bi-pin filament lamp is designed for long life, but will eventually age and fail. It may also fail prematurely if the Flash Head is severely jarred while the lamp is alight or still hot. To replace the lamp, proceed as follows:-

- (a) Switch off the Flash Power Supply Unit, and remove the Camera.
- (b) Allow a few minutes for the Flash Head to cool.
- (c) Disconnect the power cord from the Flash Head (rotate the bright knurled ring anti-clockwise) (Fig. 14).
- (d) Unscrew the bezel surrounding the lamp On/Off Switch, (Fig. 15) and withdraw the cover box carefully.
- (e) The ceramic lamp base is secured on studs by two knurled nuts (Fig. 16). Remove both nuts, and withdraw the lamp base.
- (f) Pull the lamp out of the base, and dispose of it safely.
- (g) Insert a new lamp into the base, making sure it is pushed fully home (Fig. 17). Handle the new lamp with a clean cloth or tissue. DO NOT touch the glass directly with the hands. Such contact is NOT dangerous, but the natural oils deposited on the glass will impair lamp life. If the lamp is inadvertently touched by hand, clean it with methylated spirits before continuing.

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1. REPLACEMENT OF FILAMENT LAMP (cont'd)

- (h) Replace the components in the reverse order.
- (j) The lamp may be tested before re-fitting the cover box by briefly re-connecting the power cord . Ensure that the Power Pack is switched OFF when connecting and disconnecting the power cord

2. INTERMITTENT FLASH OPERATION

Intermittent flash failure is either due to a poor contact somewhere, or, particularly if it has started after a period of satisfactory operation, some fault in the Flash Tube (See (f) below)

- (a) Check the connection between the sync lead and the camera. Ensure that there is a good contact on both the outer shell and the inner pin.

Ensure that the Power Pack is switched OFF and UNPLUGGED when making the continuity and resistance tests described below

- (b) Check the contacts in the Flash Module, (BEWARE! 650 Volts, be sure to have switched off and unplugged the Power Supply Unit) where the POWER and trigger leads go to the flash tube. Make sure they are screwed down tightly. Check also that the trigger wire is adequately insulated from the other two wires, and that there is no danger of sparking over (particularly to the Right (black wire) side. (This wire is Violet on 110 Volt models after June 1993)

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- (c) Open the PSU. (BEWARE! 650 Volts, be sure to have switched off and unplugged the Power Supply Unit) On the right of the main PCB is a three-way connector that goes to the umbilical, and these are the flash trigger connectors. (Short the centre and right leads to fire). Check that the connector is properly seated. Check for continuity (and low resistance) from those pins, all the way through the umbilical to the Flash Module PCB.

The wire from the LEFT pin is pink, and goes to the blue lead of the Flash Coil in the flash module. The Centre wire is orange, and goes to the Flash Sync lead (only). The Right wire is violet, and goes to the RED lead of the flash coil AND to the other terminal of the Sync Lead. (The right wire is Green/yellow and goes to Earth on models after June 1993).

- (d) You can test for flash operation by poking a small screwdriver into the end of the flash sync lead. However, this method is unreliable over a number of flashes, probably because the contacts get dirty. Therefore use a small momentary switch (with gold plated contacts) wired to the opposite gender sync lead contact, which plugs into the sync lead. This produces reliable firing, and acts as a cross-check of the sync lead and camera contacts.
- (e) VERY occasionally the flash coil will fail, but that is unlikely with intermittent firing. Check resistance on the Flash Coil Leads, Red to Blue about 0.3 Ohms, Red (or Blue) to Orange about 168 Ohms (+/- 2) (BEWARE! 650 Volts, be sure to have switched off and unplugged the Power Supply Unit)

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- (f) Occasionally there may be a faulty flash tube, where low gas pressure can lead to intermittence after some 200-500 flashes, which will become steadily worse until it does not fire at all. There is no non-destructive test, except to try it out in a camera over time. Marcher Enterprises can only consider supplying replacement tubes free of charge if suspect tubes are returned UNBROKEN for passing back to the manufacturer.

Please estimate how many flashes it did before :-

- (a) starting to be intermittent,
- (b) failing altogether.

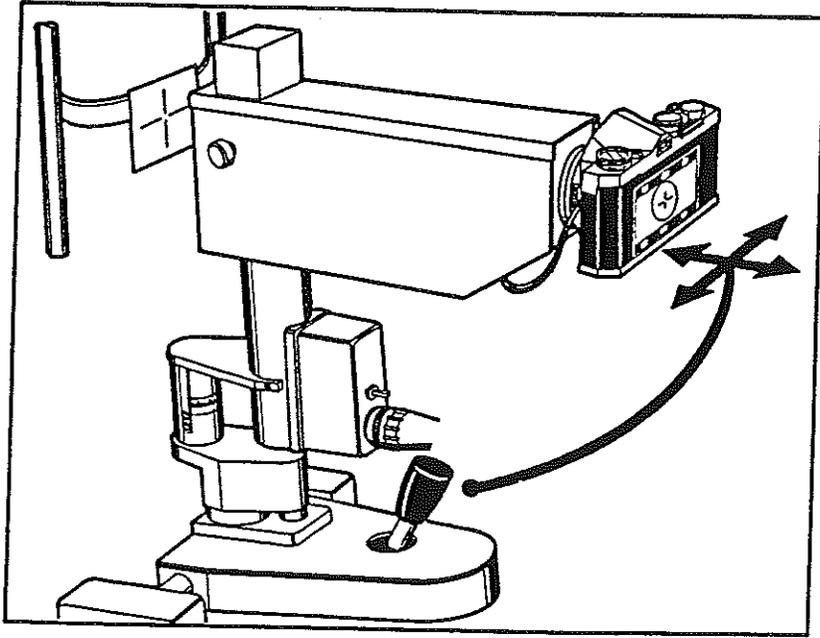


Fig. 18

Section V

INSTALLING THE CAMERA

N.B. If using a Haag-Streit Slit-lamp (or similar), first install the Flash Unit, see Section VI.

1. PRELIMINARY PROCEDURE

The Camera is calibrated as part of the final inspection procedure before despatch from the factory, but some mis-alignment may be expected to occur during shipment. Re-calibration is straight-forward. Proceed as follows:-

- (a) Mount the Camera on the Slit-lamp (see Section II, Mounting the Camera), and switch on the viewing lamp.
- (b) Mark a cross '+' on a piece of card, and mount it on the head-rest as a target (Fig. 18).
- (c) In normal room lighting, look through the view-finder, and align and focus the camera on the target, using the joystick. (If severe mis-alignment has occurred, it may be necessary to make some of the adjustments below, before the camera can be aligned.)
- (d) Check the following alignments, following the instructions below in each case:-
 - (i) Adjustment of 45° Mirror.
 - (ii) Alignment of both polarizing filters.
 - (iii) Alignment of Standard Density indicator.

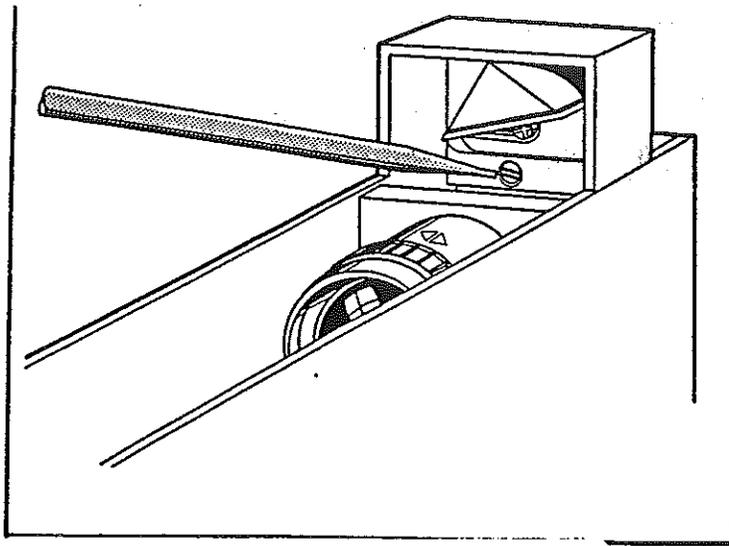


Fig. 19

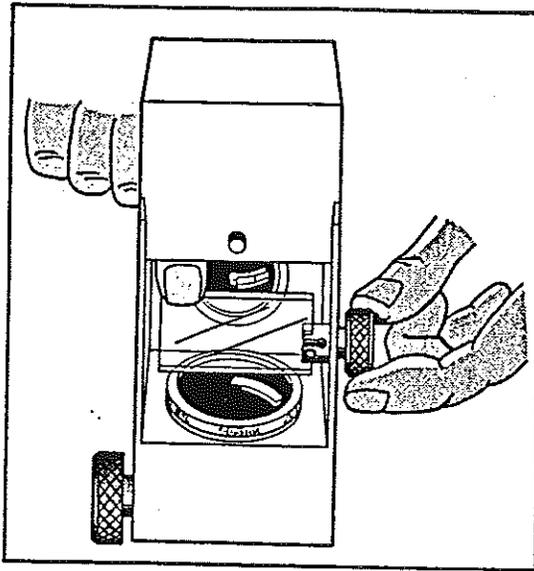


Fig. 20

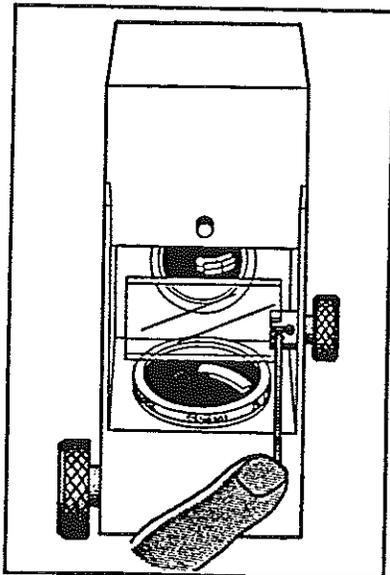


Fig. 21

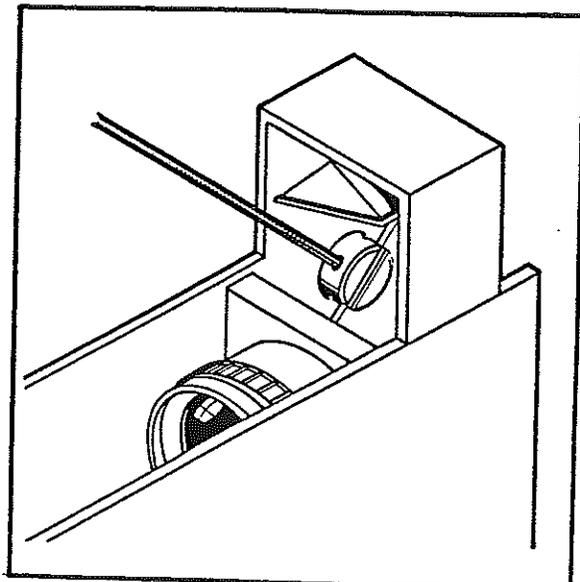


Fig. 22

2. ADJUSTMENT OF 45° MIRROR

The 45° mirror will require to be adjusted accurately when the camera is first installed. Thereafter it will not normally need adjustment unless it is accidentally dislodged. Primary adjustment, about the transverse horizontal axis, will raise or lower the image in the viewfinder. The secondary adjustment rotates the mirror about its longitudinal centre-line, and will move the viewfinder image left and right. This secondary adjustment may have some minor effect upon the primary adjustment, and therefore the latter should be re-checked.

The procedure is as follows:-

- (a) Unlock the camera lid by anti-clockwise rotation of the large recessed screw (found on the top of the lid towards the rear). Lift off the lid by careful vertical movement.
- (b) Locate the electric cable leading to the fixation lights, and unplug it from the circuit board at the rear of the camera (it is the 3-pin connector closest to the side wall).
- (c) Remove the camera front panel by first removing the securing screw at the bottom of the prism housing, (Fig. 19) then lifting the panel up about 6 mm and withdrawing forwards.
- (d) Slacken the mirror locking knob which is on the left hand side of the camera body (Fig. 20).
- (e) Check that the camera is aligned with the Target, as in 1 (c) above.
- (f) Looking through the camera viewfinder, adjust the mirror inclination with the fingertip until the spot of light is correctly aligned with the target on the vertical axis.
- (g) Using the allen key provided, carefully adjust the grub screws in the top and bottom of the mirror mounting boss until the spot of light is correctly aligned on the horizontal axis (Figs. 21 & 22).

2. ADJUSTMENT OF 45°MIRROR (cont'd)

- (h) Recheck that vertical alignment is still correct, and adjust if necessary.
- (i) When both alignments are satisfactory, clamp the mirror in position by retightening the locking screw on the left hand side of the camera body.
- (j) Replace the front panel, and ensure that the fixation light connector is plugged into the circuit board at the back of the camera.
- (k) Check the alignment of the Standard Density Indicator in the viewfinder. There should be a quarter segment of a circle on the left of the viewfinder image, within which two density steps may be seen. If it requires adjustment proceed to the next paragraph. If no further adjustments are required replace and secure the camera lid.

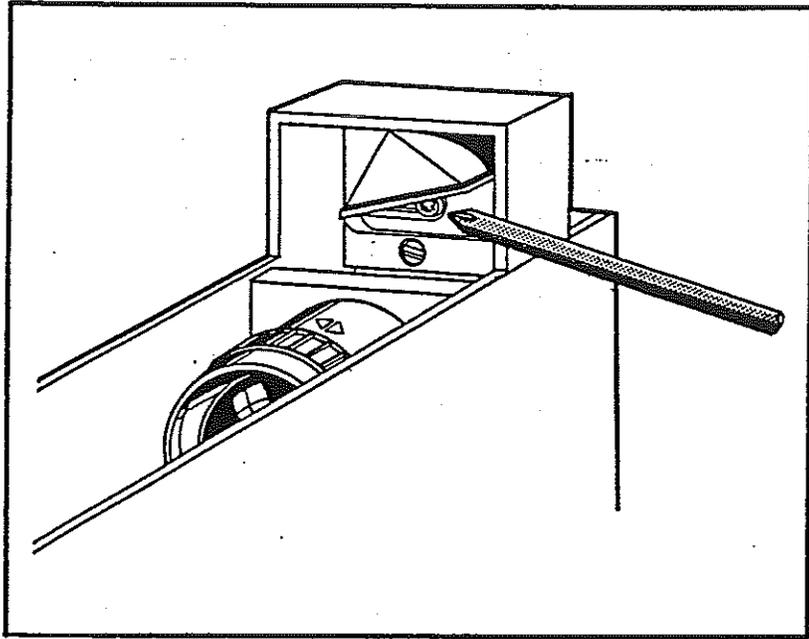


Fig. 23

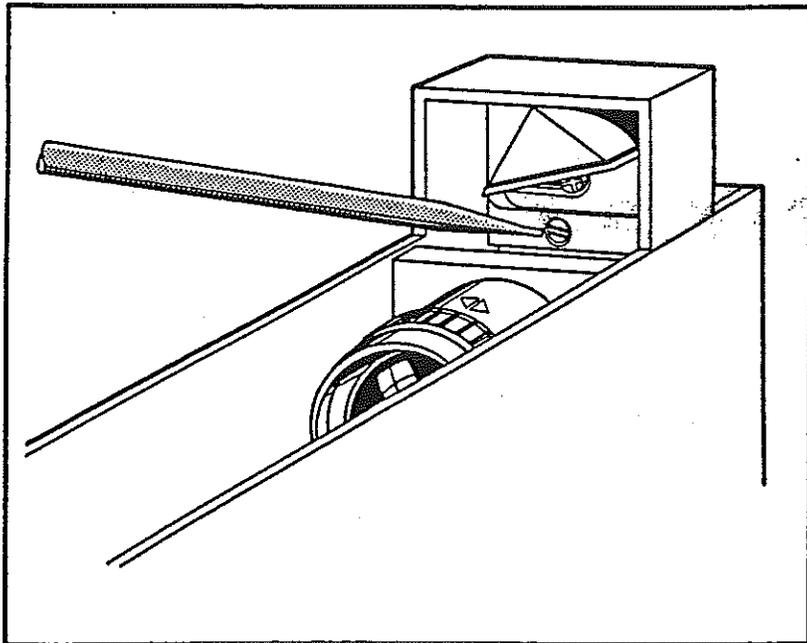


Fig. 24

3. ALIGNMENT of STANDARD DENSITY INDICATOR

The horizontal alignment of the Standard Density Indicator is controlled by sideways movement of the Standard Density Prism. To make an adjustment proceed as follows:-

- (a) Unlock the camera lid by anti-clockwise rotation of the large recessed screw (found on the top of the lid towards the rear). Lift off the lid by careful vertical movement.
- (b) The screw securing the prism mounting bracket may be seen when looking from the rear of the camera, beneath the prism (Fig. 23). Loosen this screw, and while looking through the viewfinder, slide the bracket to left or right as required, until the two standard density steps are clearly seen on the left of the view-finder image, contained in a quarter segment of a circle, which must be separate from the image of the projected disc.
- (c) When the position of the Standard Density Indicator is satisfactory, retighten the standard density prism bracket locking screw.
- (d) If no further adjustments are required replace and secure the lid.

4. ADJUSTMENT OF BOTH POLARIZING FILTERS

To adjust both polarizing filters, proceed as follows:-

- (a) Unlock the camera lid by anti-clockwise rotation of the large recessed screw (found on the top of the lid towards the rear). Lift off the lid by careful vertical movement.
- (b) Locate the electric cable leading to the fixation lights, and unplug it from the circuit board at the rear of the camera (it is the 3-pin connector closest to the side wall).
- (c) Remove the camera front panel by first removing the securing screw at the bottom of the prism housing, (Fig. 24) then lifting the panel up about 6 mm and withdrawing forwards.

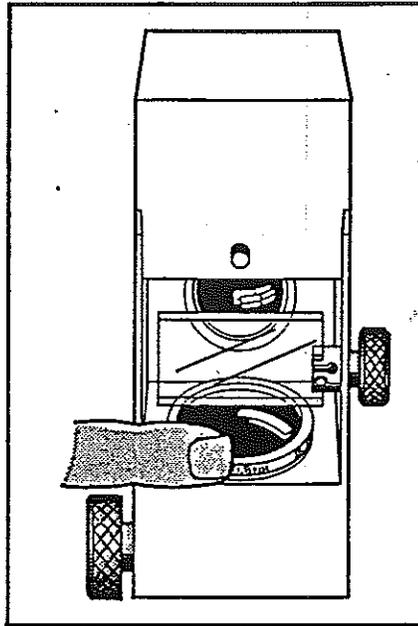


Fig. 25

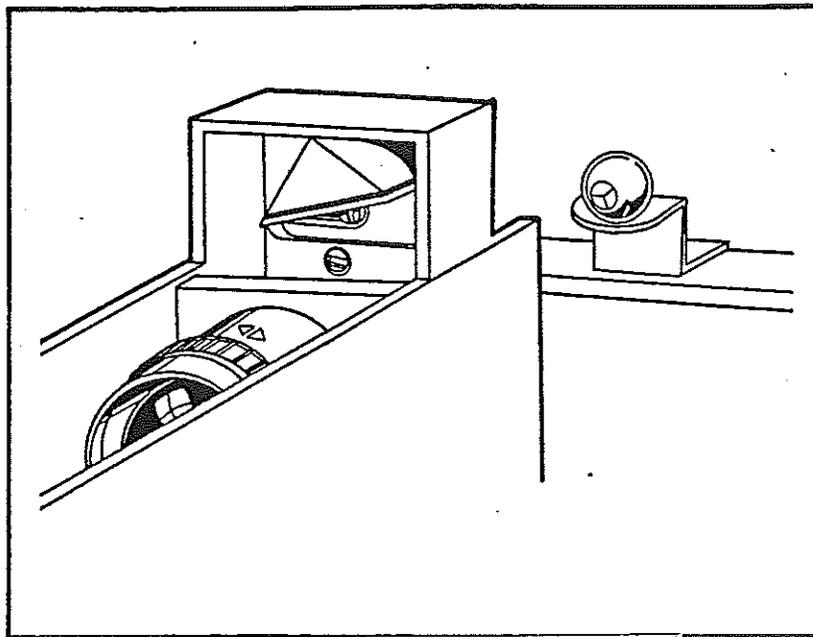


Fig. 26

4. ADJUSTMENT OF BOTH POLARIZING FILTERS (cont'd)

- (h) Set a white card in front of the camera and focus the projected disc of light.
- (i) The first polarizing filter ('PF1') is located below the 45° mirror; rotate it carefully until the projected disc is at maximum brightness (Fig. 25). (The maximum is imprecise, a more accurate result may be obtained by rotating the filter to give minimum illumination, and then rotating a further 90°.)
- (j) Remove the white card, and substitute the artificial eye, or ball bearing (Fig. 26).
- (k) The polarizing filter PF2 is located on the rear of the 80 mm f/4 Rodagon lens. Focus the camera upon the artificial eye and centre this subject in the viewfinder. Rotate the polarizing filter to obtain maximum extinction of the central reflex image (Fig. 27).
- (l) Note that as extinction approaches, a dark bar moves across the central reflex. When the polarizing filters are correctly adjusted, the bar is vertical, and moves horizontally. If the bar is oblique, make a small adjustment to PF1, then move PF2 to obtain extinction.
- (i) If the vertical bar is still oblique, make a further small adjustment to PF1, (rotate in the opposite direction if obliquity is worse) and re-check. Repeat until the bar is vertical, and moves horizontally

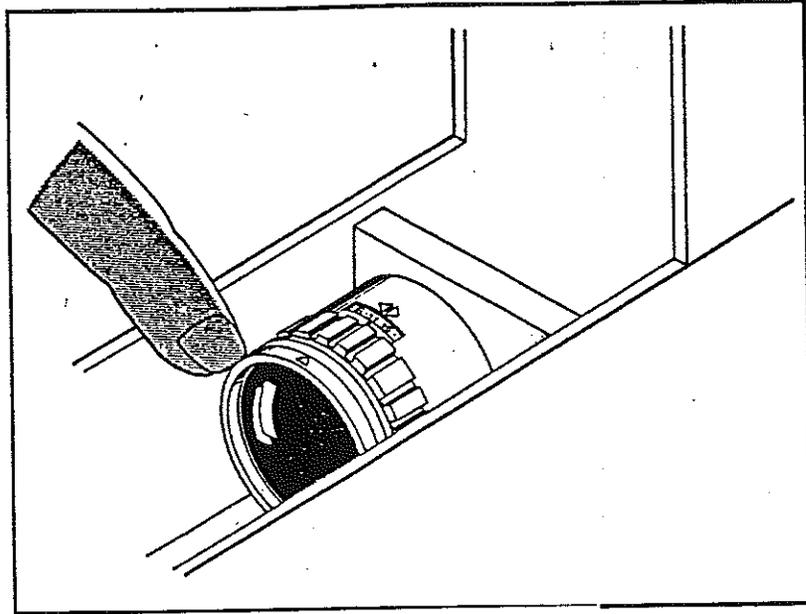


Fig. 27

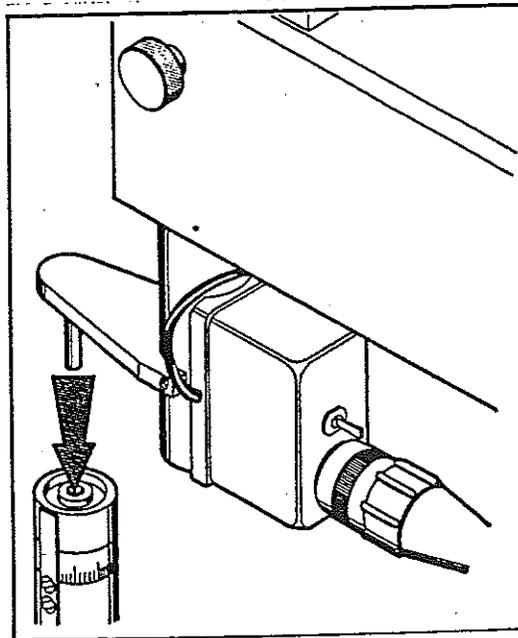


Fig. 28

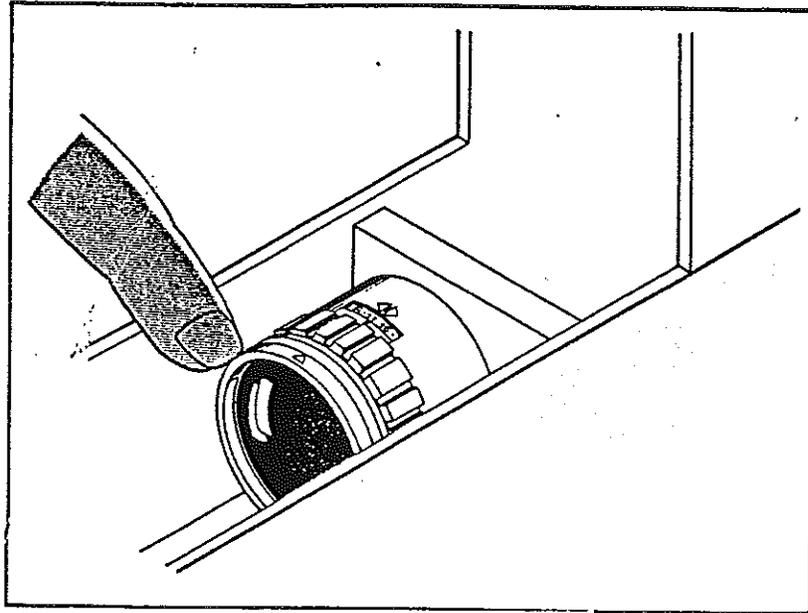


Fig. 27

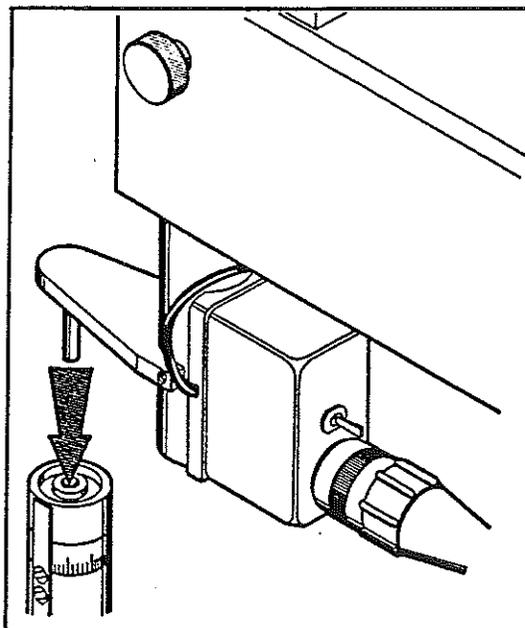


Fig. 28

Section VI

INSTALLING THE FLASH UNIT (Haag-Streit only)

1. PRELIMINARY

- (a) The Flash Unit consists of five parts:-
 - (i) The Flash Head
 - (ii) Power Pack
 - (iii) Flash power lead, (0.75 metre) with multiway plug and socket
 - (iv) Mains input lead (2½ metres)
 - (v) Mounting Brackets (optional)
- (b) The Power Pack should preferably be mounted on the left of the Haag-Streit table. Most tables are supplied with suitable mounting holes and screws, which the Power Pack is designed to fit.
- (c) Swing the Haag Streit lamp housing and binocular to one side
- (d) Remove the applanation mounting shoe to reveal 8mm socket.
- (e) Insert the 8mm shaft of the Flash Head into the socket (Fig. 28). Ensure that the offset Yoke is seated on the top surface of the socket, and that the Flash Head is free to swing.

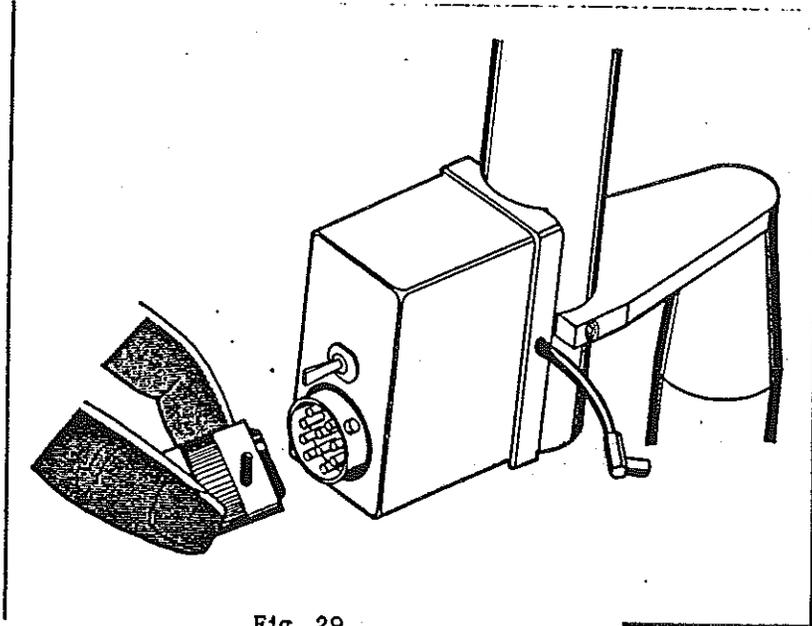


Fig. 29

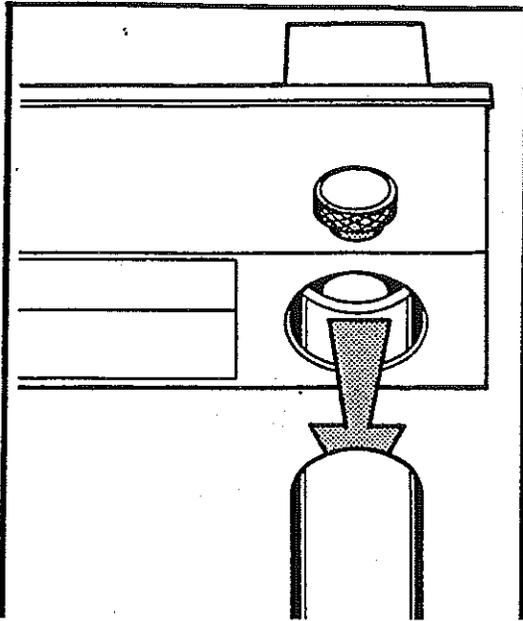


Fig. 30

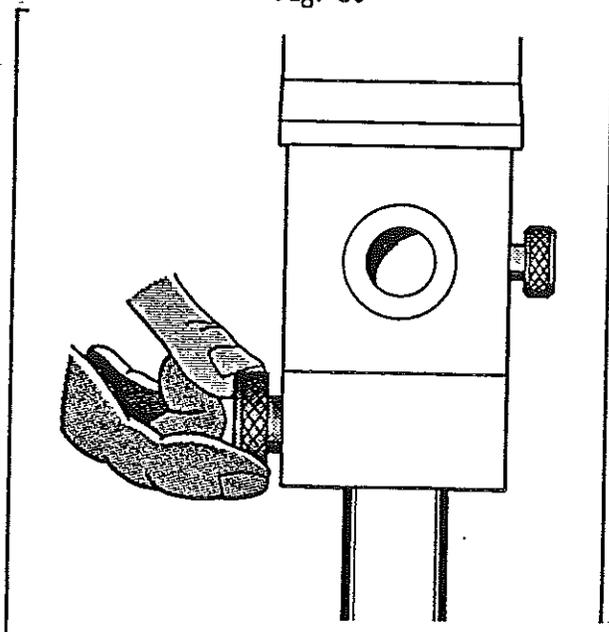


Fig. 31

2. CONNECTION AND TESTING

- (a) Connect the socket end of the Flash Power Lead (Fig. 29) to the multiway connector on the rear of the Flash Head, and the other (pin) end to the Power Pack. Ensure that the knurled rings are fully clockwise, but do not apply undue force.
- (b) Connect the Power Pack to the mains electricity supply, and switch on. Watch the two indicator lamps on the Power Pack :-
 - (i) Amber lamp on immediately. (Initial slow charging of power capacitors) NB. In 110 Volt models after January 1993, the Amber light does NOT illuminate at this stage.
 - (ii) After about 20 seconds, Amber lamp off, Green flashing lamp ON. (Flash Ready).
- (c) Switch on the viewing lamp with the switch on the rear of the Flash Head (above the Power Socket). Check for viewing lamp operation by holding a reflector above the Flash Head. (The lamp light should focus as a 10mm disk about 116.5mm above the top of the Flash Head, but it is not necessary to check these dimensions.)
- (d) Switch off the Flash Unit at the Power Pack and/or Mains supply.
- (e) Slide the Camera onto the Flash Head (Fig. 30). Secure locking knob (moderate pressure) on front right of camera (Fig. 31).
- (f) Connect the coaxial lead from the connector on the underside of the Camera to the short 3 mm coaxial lead on the right hand side of the Flash Head (Fig. 32) (This connection powers the Fixation Lights).
- (g) Mount the 35 mm SLR camera in place at the rear (Fig. 33). Connect the longer 3 mm coaxial flash lead from the Flash Head to the 35mm camera flash synchronisation socket. Set shutter for Flash. (i.e. 1/60th sec exposure and 'X' synchronisation)

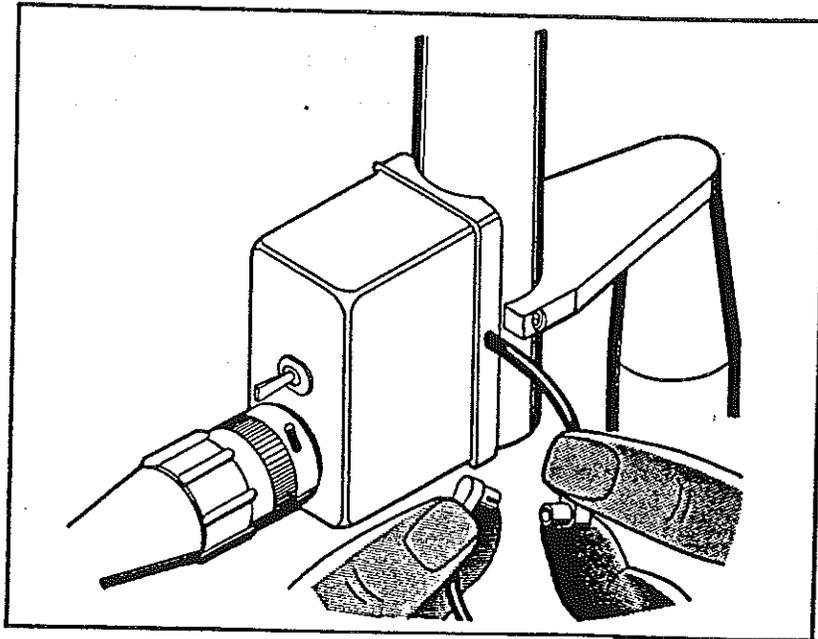


Fig. 32

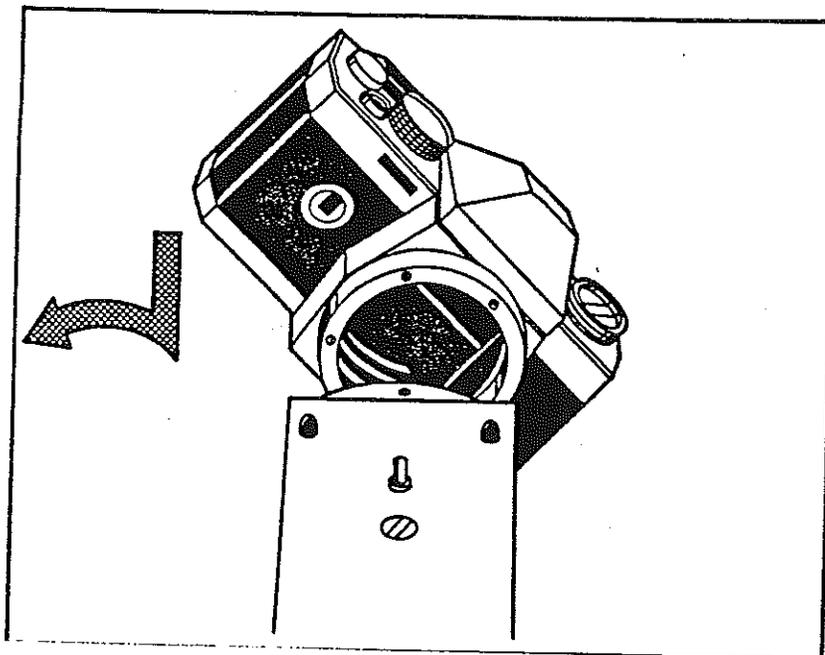


Fig. 33

2. CONNECTION AND TESTING (cont'd)

(h) If using a Motor wind with provision for electric release:-

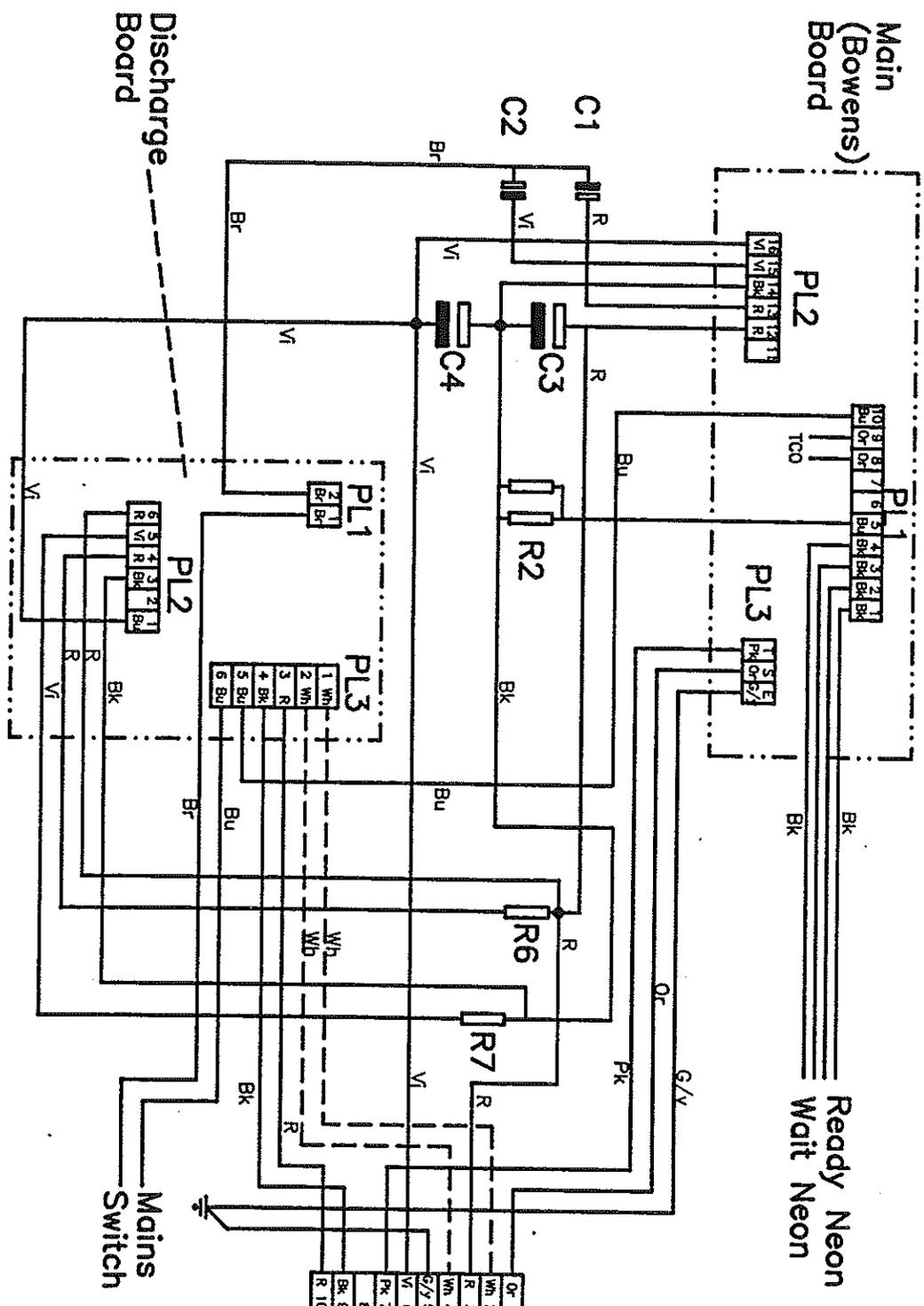
- (i) Plug the 2.5mm jack plug into the Motor Wind.
- (ii) Plug the Foot-Switch lead onto the 3.5mm in-line socket.

N.B.1 Both plug and socket are on flying leads from a circular connector which is normally supplied fitted into the base of the camera.

RELEASE THE CONNECTOR BY GENTLY PULLING THE KNURLED RING AWAY FROM THE CAMERA BODY. DO NOT TWIST THE CONNECTOR

N.B.2 Some Motor Winds have no means of electric release. Others may have a different connector. Seek advice from your regular camera supplier.

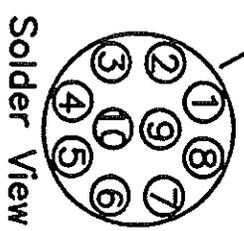
- (i) Switch on the Flash Unit. Test for correct operation (preferably by making an exposure, but otherwise by shorting the flash synchronisation lead).
- (j) Swing the Haag-Streit lamp housing and binocular as close to the camera as is convenient, so that they do not touch the head-rest when the camera is advanced towards the patient.
- (k) The Flash Unit is now ready for operation. If the Retro-Illumination Camera has not been used before, refer now to Section V, 'Installing the Camera'.



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Connection Diagram for Oxford PSU 110 Volts
 Version 2 (July 1993)
 Components positioned approximately as arranged in PSU

Drg No: OXPSU-1
 Drawn by: T.R.H. Dawson
 Date: 24 July 1993



Circular Connector to Flash
 Solder View

Oxford Retro-illumination Camera Power Supply MkII

Description of Circuit

Basic principle (see Drawing OxPSU-06)

The capacitors C3 & C4 are charged to a high voltage (650 VDC), which is permanently applied across the anode and cathode of the Flash Tube. When the camera is fired, the Trigger Coil applies a momentary high voltage (1.5kV) to the fine wire surrounding the Flash Tube, which ionises the gas inside the tube. The ionised gas discharges the capacitors through the Flash Tube, resulting in a brief powerful flash of light.

Method of Operation

The PCB in the Power Pack (PSU) contains four circuit elements:-

- a) Timer Circuit
- b) Charging Circuit
- c) Trigger Circuit
- d) Discharge Circuit

Switching ON.

Drawing No OxPSU-06 shows all contacts in their 'normal' condition, with no power applied. Note that RLB1 is open, therefore when the PSU is first switched on no charging of capacitors occurs. Amber 'WAIT' neon N1 is lit via RLD1 and R31 & R32. The transformer TFR1 provides 12VAC to the rectifier BR1, which charges capacitor C12. Relay RLF activates, enabling the 555 timer IC1, which is set to approximately 10 seconds by R30 & C14. At the end of this period, relay RLB is activated, allowing the capacitor charging process to start through RLB1.

Charging.

Capacitors C3 & C4 are charged through RLC1 and voltage doubler Diodes D1 & D4 respectively, their central common connection going to neutral via R33 (220 Ohms). (See below for an explanation of the differences in the 110 Volt version) Charging continues to completion, but when the voltage across C3 & C4 reaches a value preset by VR1, FET TR1 activates RLE, and RLE1 enables the trigger circuit. At the same time, RLD1 switches over, the 'WAIT' neon goes out, and resistors R31 & R32 are brought into the charging circuit to enable faster subsequent charging.

Trigger Circuit

When the trigger circuit is enabled, the reservoir capacitor C7 is charged. The resistor chain R18 & R19 charge capacitor C8, and when this reaches about 90 volts, 'READY' neon N2 conducts, discharging C8, which then starts to charge up again. Thus N2 flashes on and off when the unit is ready to fire.

Resistors R21-R24 are isolating resistors (1 MOhm each), R25 and R26 form a voltage divider to produce about 40 volts at the camera synchronisation socket. When the camera shutter is fired, capacitor C9 is discharged into the gate of Triac T1. This Triac turns hard on, and discharges C10 into the trigger Coil primary, generating a high voltage spike in the secondary, which causes the gas in the tube to conduct, producing the flash.

Recharging

As soon as the voltage across C3 & C4 begins to fall, TR1 is turned OFF, and RLE1 opens, disabling the trigger circuit. To avoid 'after-burn' the PSU is prevented from recharging while it is firing by the discharge of C5 through RLC, which briefly opens the contacts RLC1. RLD however, is held ON by capacitor C6 through the thermal safety cut-out TCO, so that charging recommences through R31 & R32 (and R33). The unit is ready to fire again in 2-3 seconds.

The charging/firing cycle may be continued indefinitely at short intervals. However, if the interval becomes too short, the safety cut-out TCO will activate (at 70°C). RLD will deactivate, and the fast charge resistors R31 & R32 will be excluded from the circuit. The 'WAIT' neon NI will come on. The PSU will then charge only at the slower rate, until it has cooled down. It is most unlikely that this limit will be exceeded during normal clinical use.

Switching OFF.

When the PSU is switched off, the main capacitors C3 & C4 are rapidly and safely discharged through R34 & R35 respectively. During use, RLB2 is OPEN, so RLA is inactivated. Likewise, RLB3 & RLB4 are also OPEN. There are two discharge circuits, one for each main capacitor. The circuit for C3 is described here, the one for C4 behaves identically. On switch-off, RLB2 closes, activating RLA, RLB3 closes, completing the circuit from thyristor TH1 to neutral. RLA1 closes, triggering TH1, and C3 discharges through R34 and TH1. When the voltage across C3 has fallen, RLA is de-energised, and RLA1 opens. However TH1 remains on while there is still sufficient voltage across C3. Resistors R3 & R4 (220kOhms) ensure total discharge of the capacitors when the PSU is left switched off for some time.

If the PSU is switched on during the discharge process, timer IC1 is reset by RLF1, which prevents charging from starting again for ten seconds, which is sufficient for discharge to complete.

Safety Switch

The safety switch (see Drawing OxPSU-3) is held ON by the PSU cover. Thus if the cover is removed while the PSU is ON, it will immediately discharge safely. For testing the PSU with the cover off, the safety switch may be switched ON by pulling the actuating rod out. Replacing the cover automatically resets the safety switch. The cover is secured by a large central knob, which must be screwed fully clockwise to retain the safety switch in the ON position.

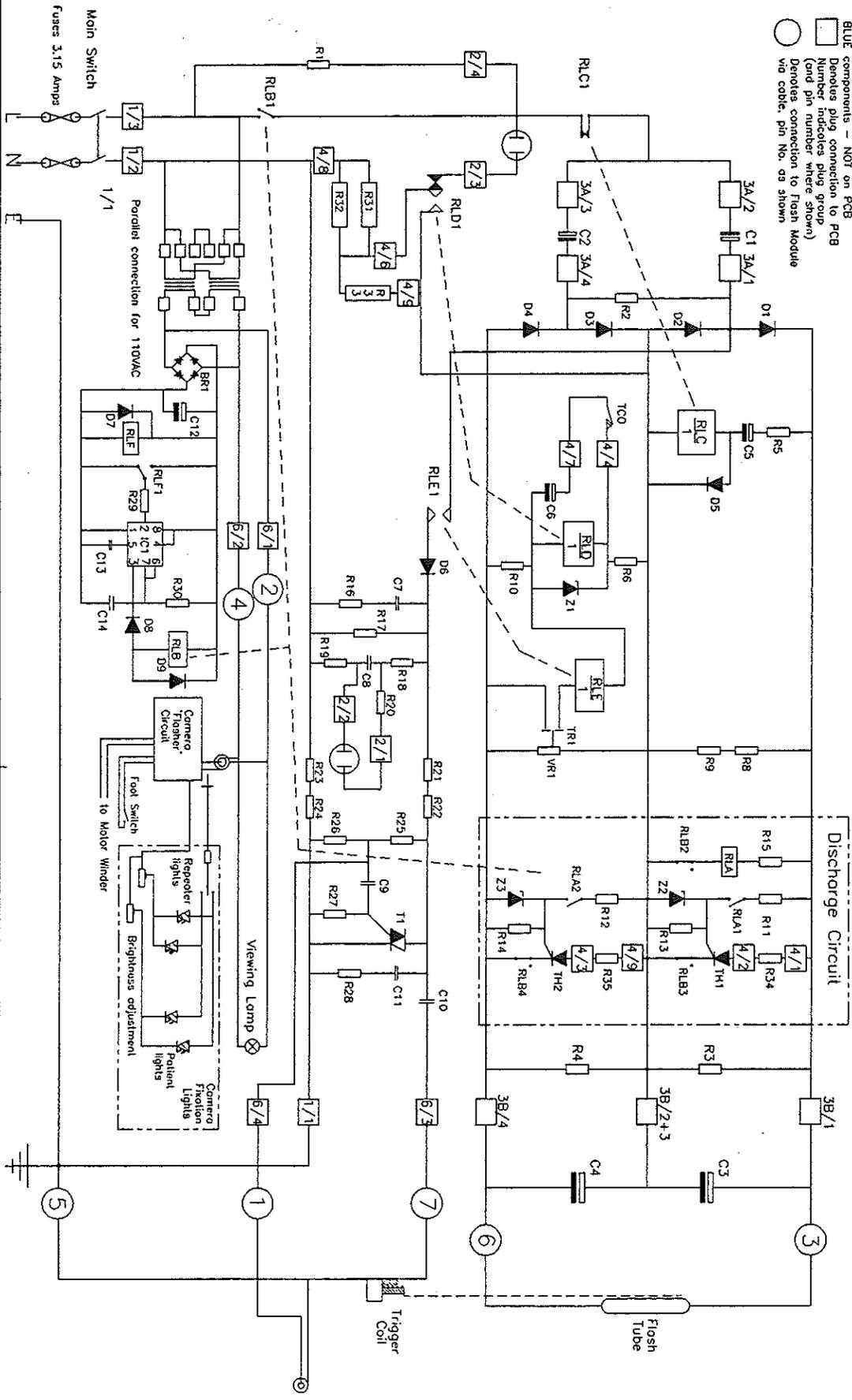
BEWARE OF HIGH VOLTAGES WHEN TESTING THE PSU WITH THE COVER OFF

110 Volt Version (Differences)

Additional voltage doubler capacitors C1 & C2 are used, with additional diodes D2 & D3, to raise the AC voltage to the required 650 Volts DC. Resistor R2 (220K) ensures full discharge of C1 & C2 after switch-off.

The primary windings of transformer TFR1 are connected in parallel.

RED connections - 110V only
 BLUE components - NOT on PCB
 Denotes plug connection to PCB
 Number indicates plug group
 (and pin number where shown)
 Denotes connection to Flash Module
 via cable, pin No. as shown



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'Oxford' Retro-Illumination Camera
 General Schematic with MKII PSU Dual Voltage version
 110 Volt Connections Shown

Drq No: Ox240-06
 Drawn by : T.R.H. Dawson
 Date : 2nd Nov. 1993

Oxford Retro-illumination Camera PSU Parts List

No.	Value	Description	Location	Part No.	Qty/Unit
BR1	50V 1.5A	Bridge Rectifier	PCB	W005G	1
C1 & C2	150uF	200 VDC Electrolytic (110V)	Panel 2	Bowens 'L'	2
C3 & C4	1000uF	350 VDC Electrolytic	Base	Bowens 'S'	2
C5	4.7	450 VDC Electrolytic	PCB	228-965	1
C6	47	63 VDC Electrolytic	PCB	148-868	1
C7	0.22	400 V	PCB	148-905	1
C8	0.22	250 V Polyester	PCB	368 45224	1
C9	0.1	250 V Polyester	PCB	368 45104	1
C10 & C11	0.1	400 V	PCB	148-903	2
C12	47	25 VDC Electrolytic	PCB	286-369	1
C13	0.01	100 V Polyester Film	PCB	143-691	1
C14	3.3	100 V	PCB	108-798	1
D1 & D4	600V 3A	Diode	PCB	1N5406	2
D2 & D3	600V 3A	Diode (110V Version only)	PCB	1N5406	2
D5 & D6	600V 1A	Diode	PCB	1N4005	2
D7-9	50V 1A	Diode	PCB	1N4001	3
IC1		555 Timer	PCB	TLC555CP	1
PL1	3	0.2" Square Pin Headers	PCB	143-188	1
PL2, 3A, 6	4	0.2" Square Pin Headers	PCB	143-189	3
PL3B	4	Amp Mate'n'lok	PCB	285-328	1
PL4	9	Amp Mate'n'lok	PCB	285-353	1
PL7	10	0.2" Square Pin Headers	PCB	143-192	1
Crimps1		Molex 0.2" crimp skt	PCB	143-193	25
Crimps2		Amp Mate'n'lok crimp skt	PCB	285-419	13
R1 & R2	220K	0.25 Watt HS Carbon Film	PCB	229-957	2
R3, 4, 8, 9, 17	220K	1 Watt HS Carbon Film	PCB	272-450	5
R5	10K	0.5 Watt HS Carbon Film	PCB	261-944	1
R6	22K	7 Watt	PCB	104-294	1
R10	33K	0.5 Watt HS Carbon Film	PCB	262-006	1
R11 & R12	2K2	2.5 Watt Vitreous Enamel	PCB	W21 2K2	2
R13 & R14	470R	0.5 Watt HS Carbon Film	PCB	261-786	2
R15	6K8	2.5 Watt Vitreous Enamel	PCB	W21 6K8	1
R16	100R	0.25 Watt HS Carbon Film	PCB	229-556	2
R18 & R19	3M9	0.5 Watt HS Carbon Film	PCB	262-250	2
R20	6K8	0.25 Watt HS Carbon Film	PCB	229-775	1
R21-R24	1M	0.25 Watt HS Carbon Film	PCB	230-030	4
R25	10M	0.5 Watt HS Carbon Film	PCB	262-304	1
R26	2M2	0.25 Watt HS Carbon Film		230-078	1
R27	6R8	0.25 Watt HS Carbon Film		229-416	1
R29	10K	0.25 Watt HS Carbon Film		229-799	1
R30	3M3	0.5 Watt Metal Film	PCB	MRS25 3M3	1
R31 & R32	68R	50W Alum. Clad	Res Bd	WH50 68	2
R33	220R	50W Alum. Clad	Res Bd	WH50 220	1
R34 & R35	220R	25W Alum. Clad	Res Bd	WH25 220	2
RLA & RLF		DPCO 12VDC 2A	PCB	179-351	2

No.	Value	Description	Location	Part No.	Qty/Unit
RLB		4PCO 12VDC 5A	PCB	170-906	1
RLC		SPCO 48VDC 16A	PCB	179-331	1
RLD & RLE		SPCO 48VDC 10A	PCB	179-327	2
TCO	70 deg	Thermal Cut out	Res Bd	151-646	1
TH1 & TH2	400V 20A	Thyristor	PCB	BT152-600R	2
TFR1	0-6, 0-6 2.5A	Toroidal Transformer	Base	177-951	1
TR1	400V 1.5A	MOSFET (TO-220)	PCB	IRF710-IR	1
VR1	4K7	Preset Horizontal Min.	PCB	OMP10H-4K7	1
Z1	56V 1.3W	Zener Diode	PCB	BZV85C58	1
Z2 & Z3	20V	Zener Diode	PCB	BZX85C20	2
		Mains Inlet	Base	BU BZ04104	1
SW2		Interlock switch	Panel 2	RS 330-676	1
SW1		Mains Switch	Panel 1	Arcoelectric	1
N1	Amber	Miniature Neon Indicator	Panel 1	140-001	1
N2	Green	Without Resistor	Panel 1	147-422	1
T1		Sensitive Gate Triac	PCB	TLC386A	1