

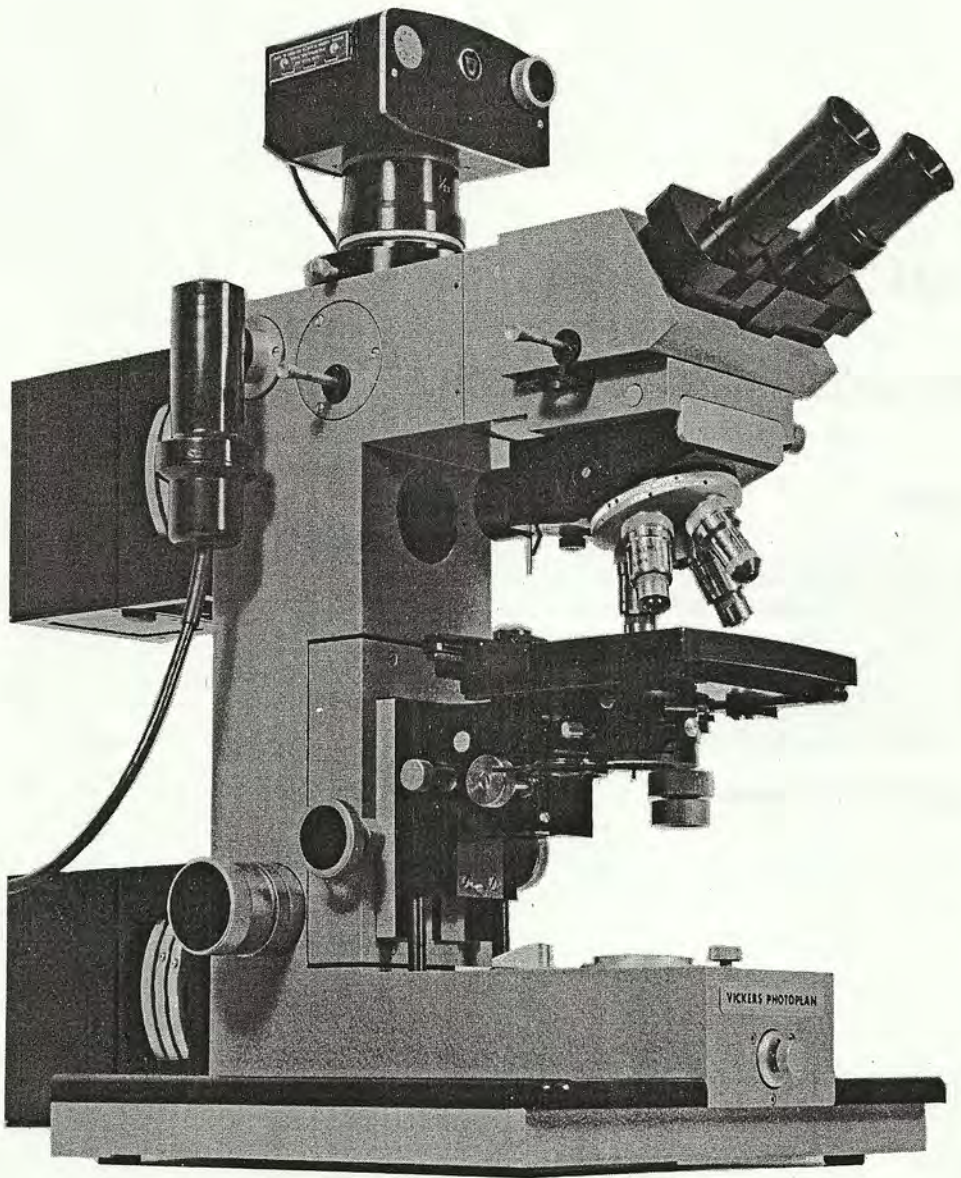
**M41 PHOTOPLAN
MICROSCOPE
BASIC INSTRUCTIONS**

VICKERS LTD.
VICKERS INSTRUMENTS

M41 PHOTOPLAN

SECTION 1 — MICROSCOPE

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The M41 Photoplan is designed on a modular basis allowing the use of a large number of accessory components covering most widely used microscope techniques. Comprehensive camera facilities cover all the photographic requirements of the routine or research laboratory.

SECTION 1 MICROSCOPE

IMPORTANT

In transit the stage block will be secured firmly to the microscope limb by a red-painted metal plate. A thin rubber strip is inserted under slight compression in the space above the block.

To remove:

1. Remove the two screws and lift the plate clear.
2. Lower the stage block with the fine motion spindle.
3. Remove the thin rubber strip from between the top of the block and the limb.
4. Plug the two holes in the limb and block with the cap screws provided.

If on subsequent re-packing the rubber strip and clamp plate are not replaced, Vickers Instruments can take no responsibility for possible transit damage to the focusing unit.

Two thin shims are provided to protect the paint finish. These must be placed between the red plate and the paint surface.

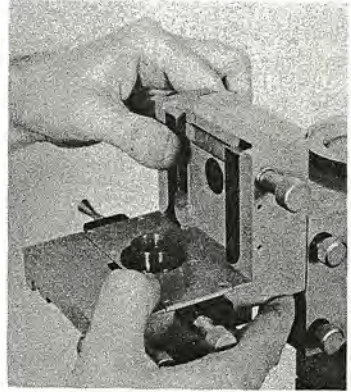
UNPACKING

The M41 Photoplan will arrive packed in a wooden crate. If an accessory container is supplied all appropriate accessories will be packed within it. Care should be taken to ensure that any items packed separately within the crate are not discarded with the packing materials. Instrument packing pieces and transit covers and wrappings should be removed before assembly. For electrical connection please refer to the instructions covering the individual power supply and control units.

A. ASSEMBLY

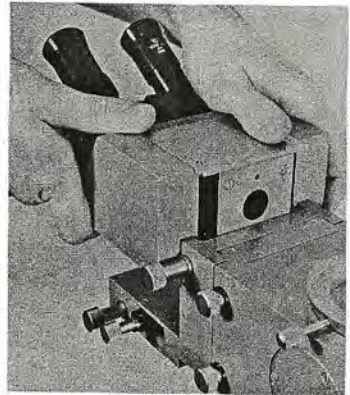
Attachment of the head carrier bracket

Release the two top right hand clamping screws on the stand head. Insert the bracket dovetail, into the corresponding slide on the head. Slide down to the stop and reclamp the screws.



Attachment of the binocular viewing head

Release the right hand clamp screw on the head bracket. Insert the dovetail on the viewing head into the slide on the bracket. Slide down to the stop and reclamp the screw.



Attachment of the condenser carrier

Where the condenser carrier is detachable; engage the right hand edge of the carrier slide with the substage dovetail mount. Keeping it engaged swing the carrier to the left so as to contact the mount. Raise the carrier on the slide to the top of its run and clamp securely with the side-mounted screw.

Fitting the stage

Raise the stage carrier with the coarse movement and fully lower the condenser carrier with the condenser focusing control. Engage the left hand edge of the stage dovetail mount with the left hand edge of the carrier slide. Keeping it engaged lower the right hand edge into contact with the carrier slide. Push the stage fully to the rear and clamp firmly in place with the left hand screw.



Fitting the condenser

With Akehurst fitting condensers, first insert the condenser dovetail square to the carrier slide. Slide the condenser back to the stop and tighten the left hand clamping screw.

All standard condensers should first be fitted into an Akehurst slide before they can be attached to the microscope as described. Care must be taken to ensure that the condenser is fully home and that the controls face the operator.



Attachment of the transmitted light nosepiece

Insert the transmitted light carrier dovetail from the front onto the slide beneath the head carrier bracket. Slide it backwards to the stop and clamp the right hand screw. Slide the transmitted light nosepiece from the rear onto the transmitted light carrier and clamp in place.

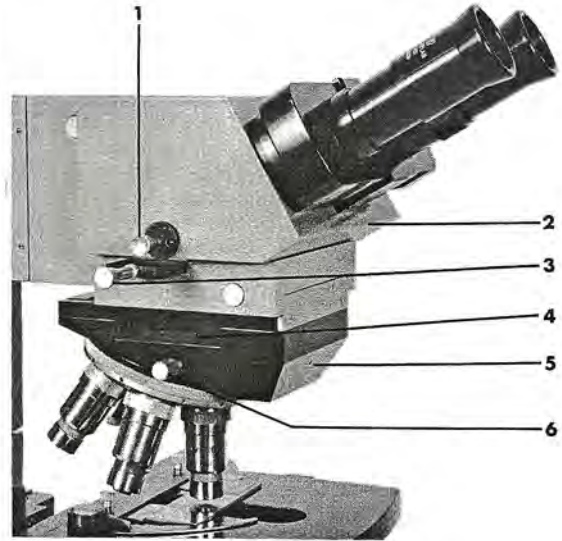


Attachment of the incident light illuminator

Insert the incident light illuminator from the front onto the slide beneath the head carrier bracket. Slide it backwards to the stop and clamp with the right hand screw. Slide the incident light nosepiece from the front onto the illuminator and clamp in place.

B. MICROSCOPE HEAD COMPONENTS

All the basic microscope head optical components are attached on dovetail slides to an "L" shaped carrier bracket, which is itself clamped to the stand upper limb. The viewing head contains the beam splitters required to direct the light to the eyepieces and to the camera optics contained within the limb.

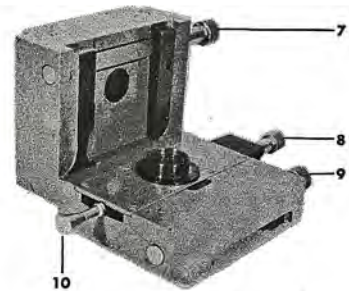


1. Viewing head beam splitter slide
2. Viewing head
3. Filter or Bertrand lens slide
4. Filter aperture
5. Transmitted carrier
6. Nosepiece clamp screw

Head Carrier bracket with Bertrand lens

A broad dovetail slide beneath the bracket accepts either the transmitted light carrier or the incident light illuminator.

The Bertrand lens is inserted into the light path on a slider. The slider knob is pulled fully to the left to insert the Bertrand lens and is pushed fully to the right to remove it. The Bertrand lens is focused with the control mounted at the right hand end of the slider.



7. Viewing head clamp
8. Bertrand lens focusing control
9. Objective carrier clamp
10. Bertrand lens shift knob

Head Carrier bracket without Bertrand lens

A broad dovetail slide beneath the bracket accepts either the transmitted light carrier or the incident light illuminator.

A slot is provided for the insertion of filter carrier sliders. The filter slide is inserted from the right hand side and is located accurately in place by catches. When the filter slot is not in use a blanking plate containing a compensation disc is inserted.



11. Filter slide

Transmitted light Carrier

A filter slot similar to that on the head carrier bracket is provided.

Binocular viewing head

Alteration of the interocular setting on the binocular head causes the eyepiece tubes to move correspondingly in or out, thus retaining a set 160 mm. tube length. This device not only makes for comfortable use but also ensures that the image seen in the eyepieces remain parfocal with the camera plane enabling the head to be used for photographic focusing and adjustment.

The beamsplitter system serves to alter the ratios between the light sent to the eyepieces and that sent to the camera system. With the rod fully out 100% of the light is transmitted to the binocular viewing head. In the central position 20% of the light is sent to the viewing head and 80% to the camera optics. This is the usual photographic position. With the rod fully in 100% of the light passes to the camera optics contained within the limb. The binocular head has a visual magnification factor of 1.25x.

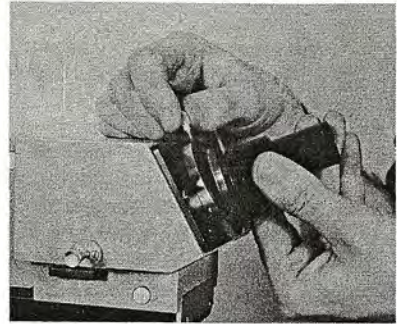
For details of the camera system see Section 2.



- 12. Interpupillary setting
- 13. Focusing eyepiece setting
- 14. Beam splitter slide

Monocular viewing head

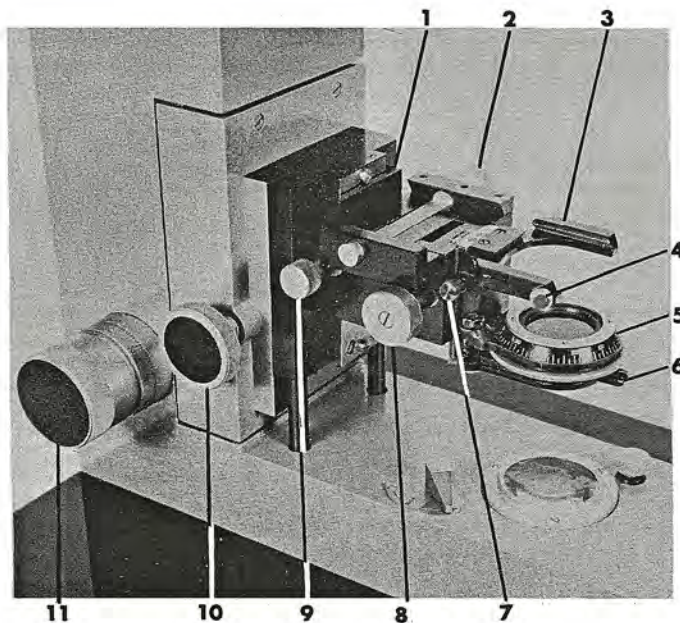
The monocular head is also fitted with a beam splitter system. The eyepiece tubes, one for normal tubes (23.2 mm) eyepieces and one for wide tube (29.2 mm) eyepieces, are interchangeable on a clamping cone fitting.



C. STAGE AND SUBSTAGE SYSTEMS

Focusing Movements

The coarse and fine movements are operated by separate low mounted controls. The fine movement which runs on crossed rollers and is mounted behind and lower than the coarse movement, is so designed that the slightest pressure forward or back on the controls will operate it very freely. Despite this free movement the system is highly stable and is not susceptible to vibration or drift. The knurled control spindle is engraved with a scale enabling stage movement to be measured. One scale division is equal to one micron. The coarse control, mounted in front of the fine motion is spring counterbalanced so that very little effort is required to raise or lower the stage. A lever clamp enables the coarse motion to be clamped in position. The coarse movement tension may be altered by contra rotation of the two bushes fitted between the coarse motion knobs and the stand; one to each side.



- | | |
|---|-----------------------------|
| 1. Coarse focusing lever clamp | 7. Substage carrier clamp |
| 2. Stage carrier clamp | 8. Condenser focusing |
| 3. Small Akhurst slide | 9. "Stage drop" clamp |
| 4. Condenser clamp | 10. Coarse focusing control |
| 5. Polarizer (if fitted) | 11. Fine focusing spindle |
| 6. Auxiliary lens (and/or filter carrier) | |

Stage Carrier and Stages

The stage carrier is provided with a horizontal slide and clamp facilitating the ready interchange of a number of stages.

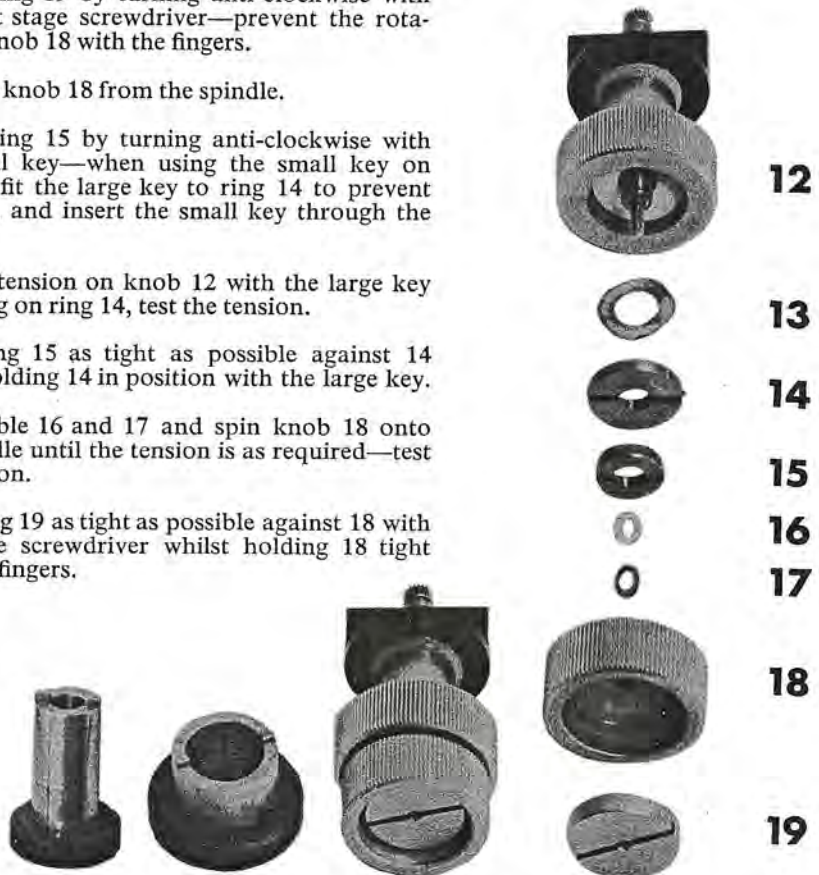
The stage carrier can be freed on its dovetail slide and can then be slid down and reclamped so as to accommodate incident light specimens up to 2.50" in height.

(1) The Square Mechanical Stage has a very large working surface and is fitted for either left or right handed use. The stage verniers have a cross movement of 50 × 75 mm. the slide carrier itself being removable. The two small knurled screws should be loosened whereupon the carrier can be lifted free. The tension of the drop vernier control knobs can be adjusted with the two keys provided.

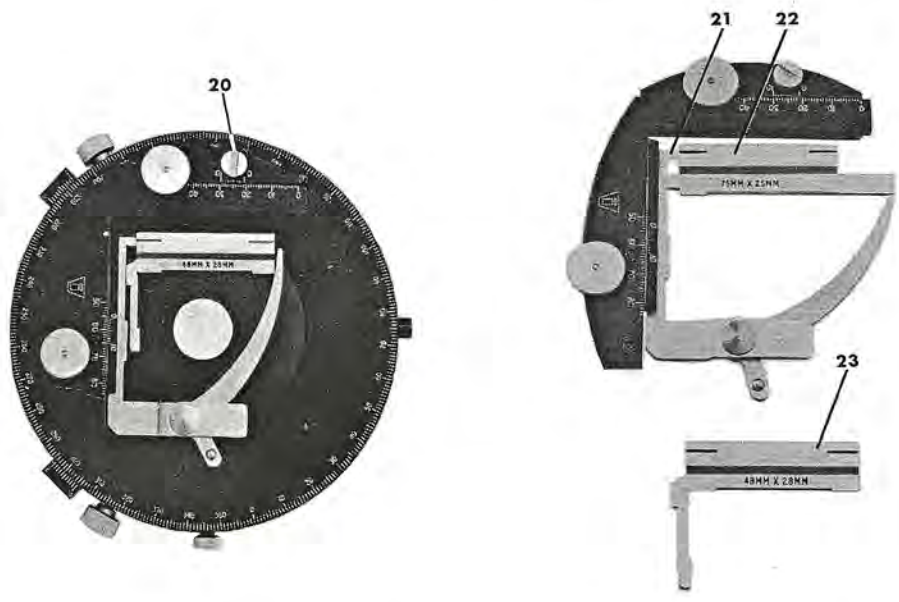


The diagram shows an exploded view of the traverse control assembly. The tension on the north south traverse can be altered on adjusting ring 14 after removing components 15 to 19.

1. Remove ring 19 by turning anti-clockwise with the short stage screwdriver—prevent the rotation of knob 18 with the fingers.
2. Unthread knob 18 from the spindle.
3. Remove ring 15 by turning anti-clockwise with the small key—when using the small key on ring 15, fit the large key to ring 14 to prevent rotation, and insert the small key through the centre.
4. Alter the tension on knob 12 with the large key operating on ring 14, test the tension.
5. Clamp ring 15 as tight as possible against 14 whilst holding 14 in position with the large key.
6. Re-assemble 16 and 17 and spin knob 18 onto the spindle until the tension is as required—test the tension.
7. Clamp ring 19 as tight as possible against 18 with the stage screwdriver whilst holding 18 tight with the fingers.



(2) The 150 mm diameter precision rotatable ball-bearing stage has a peripheral angular scale read from two verniers to 6' of arc. A pair of hand screws enable the stage to be centred in rotation to the objective. An attachable mechanical stage with 40 mm. × 25 mm. vernier movements can be simply fitted to the main stage by tightening the holding screw after locating the pin underneath into the hole provided. Adaptors to take either 74 mm. × 25 mm. or 48 mm. × 28 mm. slides can be pushed on to the fixed slide carrier arm behind the specimen clip when required.



20. Attachable stage fixing screw
 21. Fixed slide carrier
 22. Slide adaptor in situ
 23. Slide adaptor 48 × 28 mm.

A small clamp may be operated to fix the rotational movement. Stage clips may be screwed on to the stage top plate.

(3) The small plain metallurgical stage is fitted with 38 mm. × 38 mm. traverses operated by concentric low mounted controls.



Substage

The condenser carrier is adjusted in height by the control placed beneath the stage carrier which operates a rack and pinion.

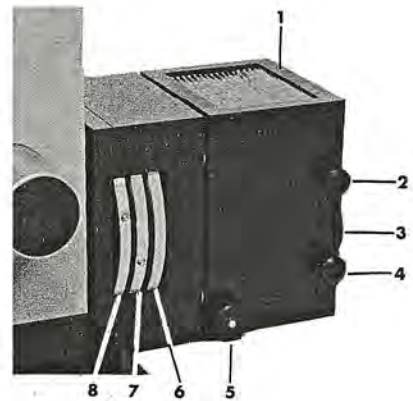
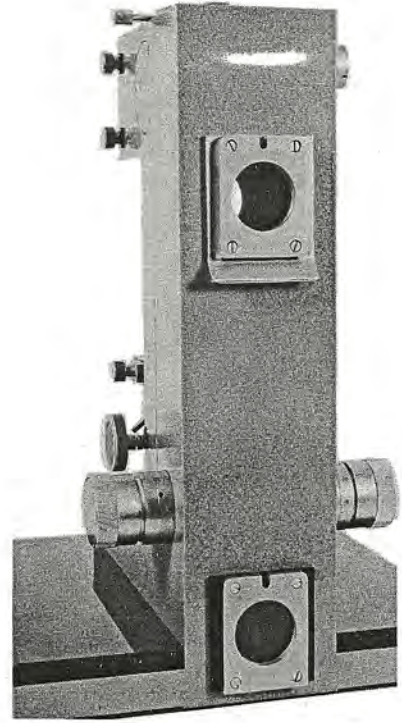
D. ILLUMINATION

The microscope stand is provided with dovetail mounts to carry the lamp housings for transmitted and incident light illumination. No clamping is necessary. The housings are simply slid onto the instrument dovetail mounts and lowered to the stop.

Lamphousings

The lamps are centred within the housing by operation of the two rear right hand knobs. A small wheel between these allows a diffuser to be inserted in the light path with the tungsten halogen housing.

The lamp condenser is focused by a control to the right of the housing and just behind the filter housing. The back mounted lamp-holder may be removed from the small housing together with the housing lid by gripping the lid edges and pulling it vertically away from the housing after removing the two rear cheese headed red screws.

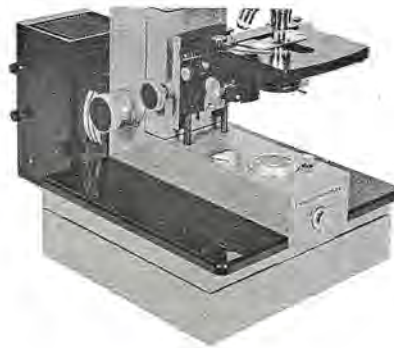


1. Lamp back
2. Lamp centring
3. Diffuser control
4. Lamp centring

5. Lamp condenser focusing
6. Field iris control
7. Filter wheel 1
8. Filter wheel 2

The large lamphousing may only be used for transmitted light with the fluorescence mirror housing or if the instrument is raised above the bench on a special base.

The back mounted lamp holder may be removed from the large housing by gripping the back plate and pulling it vertically away from the housing after freeing the two upper side mounted screws from the keyhole slots.



Note: Should the field iris image be colour fringed on the top and bottom edges, the iris image should be shifted by operating the substage mirror controls until it appears free from aberration. If the image is now off centre it must be re-centred using the condenser centring controls.

Filter housing

The filter housing is attached to the lamp housing by heat insulating fastening. The rear disc controls the field iris and the two forward discs contain standard filter sets. The filters are correctly located by click stops. The discs may be operated in either direction.

Disc 1. Nearest Lamp	0. Clear 1. Heat Absorbing 2. Dark Green 3. Daylight Blue	HA3 or KG1 OGR1 or VG9 OB8 or BG 34	A heat absorbing filter is mounted permanently in place.
Disc 2.	0. Clear 1. Heat Absorbing 2. Neutral 3. Light Red	HA3 or KG1 ON10 or NG9 OR2 or RG1	

Fig. 1. Standard filters for the tungsten halogen lamp.

When using a polarizer both heat filters must be used together to avoid bleaching.

Disc 1. Nearest Lamp	0. Clear 1. UG 2 2. BG 12 3. BG 12	1 mm thick 1 mm thick 3 mm thick	A red minus BG 38 filter is mounted permanently in place.
Disc. 2	0. Clear 1. UG 2 2. BG 12 3. BG 12	2 mm thick 2 mm thick 3 mm thick	

Fig. 2. Fluorescence filters for the tungsten halogen lamp, and mercury vapour lamps 50 watt, HBO 200.

TUNGSTEN HALOGEN LAMP 12 VOLT 100 WATT

Power Supply Unit.

Connect the mains lead to a suitable three pin earthed plug.

The mains lead is colour coded as follows:

Red: Live
Black or Blue: Neutral
Green: Earth

Connect the plug from the lamp to the 6 pin socket at the rear of the unit.



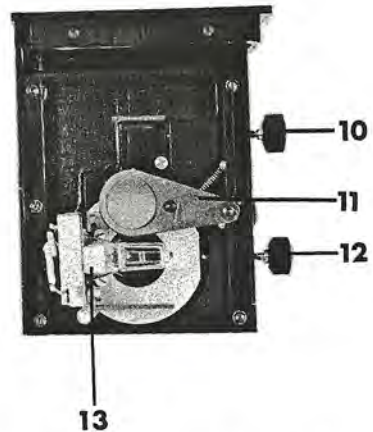
The rheostat control knob also operates an on/off switch. A red pilot lamp indicates that the unit is switched on. The fuse is contained within the unit on a simple clip mount. Access is gained on removing the right hand side panel after releasing the three fixing screws (fused with Anti-surge R.S. 1.5 amp. cartridge 32 mm x 6 mm dia.).

No damage can result from plugging a tungsten lamp into a mercury vapour power unit and vice versa, the supply pins used being different in each case.

Tungsten Halogen Lamp

The lamp is contained in the small lamp housing.

The lamp should be pressed firmly into its socket so that no gap shows between the ceramic base and the holder.



9. Lamp condenser focusing knob
10. Lamp vertical centring
11. Diffuser disc "out"
12. Lamp horizontal centring
13. Tungsten halogen lamp in holder

The lamp envelope is made of quartz and should not be contaminated by handling with bare fingers. A clean handkerchief is best used to grip the lamp. Any fingermarks should promptly be cleaned off with alcohol on a lint free cloth and allowed to dry.

Removal of the lamp after use should not be undertaken until it has cooled completely. When hot the lamp retains a pinkish glare which clears on cooling.

The lamp has a mean life of about 400 hours at 9 volts dropping to about 50 hours at 12 volts. Care should therefore be taken to keep the voltage as low as is consistent with the work in hand. (See notes on colour photography and chart of operating characteristics in Section 2.) The lamp contact pins should be checked for oxidation from time to time and scraped clean when dirty.

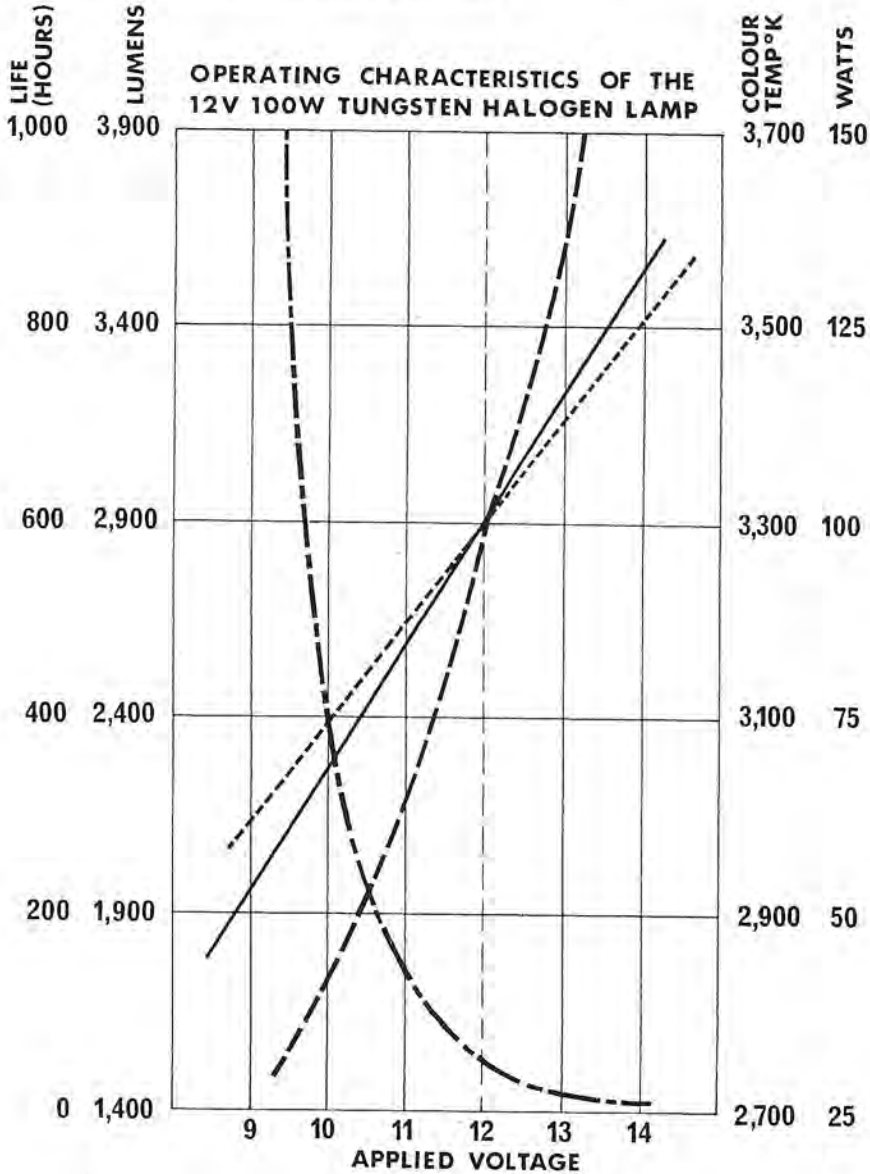


Fig. 3.

KEY TO GRAPH
 - - - - - WATTS
 - · - · - LUMENS
 ——— COLOUR TEMP
 ——— LIFE
 - - - - - RATED VOLTAGE

MERCURY VAPOUR LAMP 50 WATTS

Power Supply Unit.

Connect the mains unit to a suitable three pin earthed plug. The mains lead is colour coded as follows:—

Brown : Live

Black : Neutral

Green and Yellow : Earth

The unit is provided with a rocker on/off switch (left) and a spring biased starter switch (right) marked 10 secs. max. The red pilot light indicates the unit is switched on. After switching on, the starter switch should be depressed for ten seconds during which time the lamp should ignite. If after 10 seconds it fails to do so release the switch and start again. Do not attempt to operate the starter switch until at least two minutes have elapsed. The green pilot light indicates that the lamp is running. A digital counter records the number of operating hours. A fuse is contained within the unit on a simple clip mount. Access is gained on removing the left hand side panel after releasing the five fixing screws.

No damage can result from plugging a tungsten lamp into a mercury vapour power unit and vice versa the supply pins used being different in each case.

The lamp ignition must not be left on longer than the stipulated 10 seconds. Full intensity is achieved after a short warm-up period. Re-ignition is only possible after the lamp has cooled.

A life of between 250 and 300 hours can be expected only if the minimum burning period is kept to at least 30 minutes.

The lamp should be left running as long as is consistent with the work in hand.

PLEASE NOTE

Under no circumstances should the lamphousing be opened without first switching off the unit and unplugging the lamp completely from the power unit as the lamp is operated at a high voltage.

Mercury Vapour Lamp 50 Watt.

The lamp is contained in the small lamp housing.

The lamp is inserted large diameter down, into the split holder and is fixed in place by the side screw. The cap collar is fitted to the upper terminal and the side screw fastened. In case of doubt the larger diameter anode may be recognized by a coating of mercury on the electrode within the envelope.

The quartz envelope should not be touched by hand and should be cleaned before insertion with an alcohol damped lint free cloth.

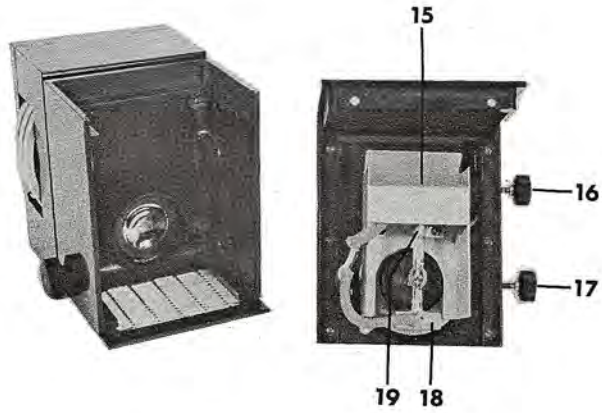
The lamp is automatically ignited by a high voltage imposed across the electrodes on switching on. The voltage is automatically removed on ignition. Full intensity is achieved after a short warm-up period. Re-ignition is only possible after the lamp has cooled.

A 200 hour life can be expected but cannot be guaranteed if the lamp is continually switched on and off.

The lamp should be left running as long as is consistent with the work in hand.



14. Rocker switches



- 15. Removable lamp baffle
- 16. Lamp vertical centring
- 17. Lamp horizontal centring
- 18. Lamp cathode terminal
- 19. Lamp anode terminal

Lamp Adjustment

A concave reflector behind the lamp envelope allows two images of the mercury arc to be laid alongside one another for maximum field coverage at the lower powers. This adjustment is effected by the lamp centring screws.

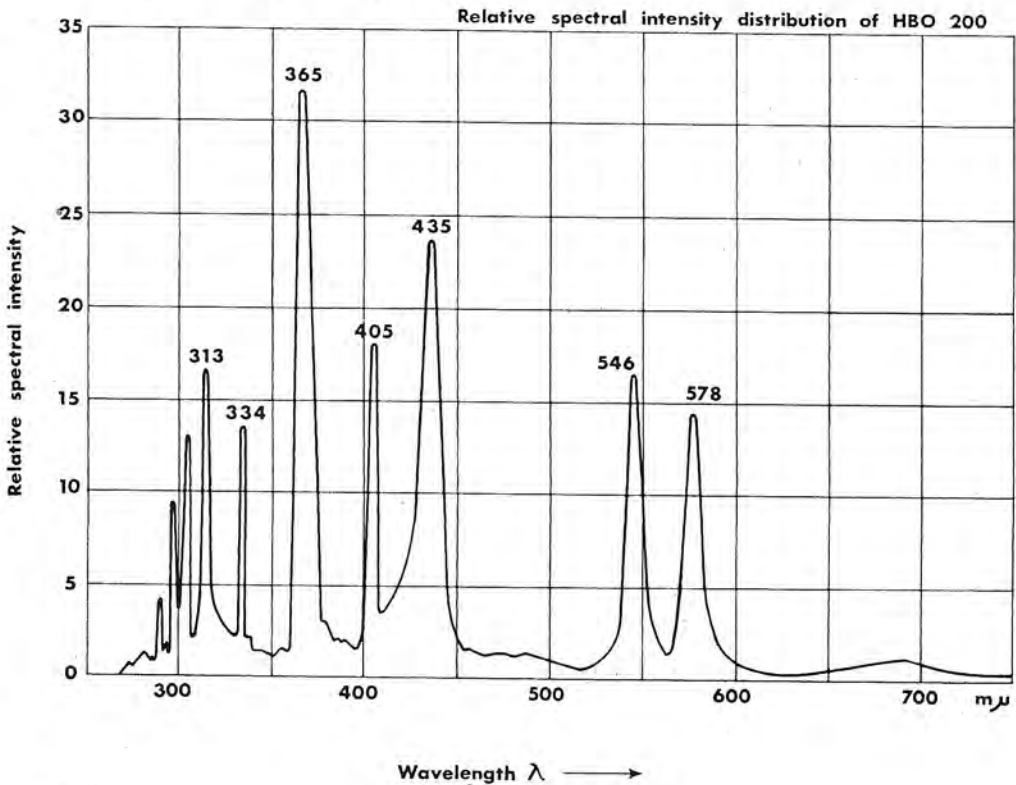


Fig. 4.

MERCURY VAPOUR LAMP HBO 200

Power Supply Unit

Connect the mains unit to a suitable three pin earthed plug. The mains lead is colour coded as follows:—

Brown	:	Live
Black	:	Neutral
Green and Yellow	:	Earth

The unit is provided with a rocker on/off switch (left) and a spring biased starter switch (right) marked 10 secs. max. The red pilot light indicates the unit is switched on. After switching on, the starter switch should be depressed for ten seconds during which time the lamp should ignite. If after 10 seconds it fails to do so release the switch and start again. Do not attempt to operate the starter switch until at least two minutes have elapsed. The green pilot light indicates that the lamp is running. A digital counter records the number of operating hours. A fuse is contained within the unit on a simple clip mount. Access is gained on removing the left hand side panel after releasing the five fixing screws.

No damage can result from plugging a tungsten lamp into a mercury vapour power unit and vice versa the supply pins used being different in each case.

Mercury Vapour Lamp HBO 200

The lamp is contained in the large lamphousing.

Insert the lamp positive end down into the lower terminal (terminal next to cable entry). The positive electrode may be recognized by the engraved markings (+ etc) and the coating of metallic mercury on the electrode within the envelope. Clamp the lamp to the lower terminal with the screw provided and with the lamp side electrode facing right.

DO NOT HANDLE THE ENVELOPE EXCEPT WITH A CLOTH.

Place the heat sink over the top electrode with the fins uppermost, being careful to avoid straining the bulb. Press the sprung terminal onto the upper lamp electrode and fasten with the elongated knurled screw. Fit the ceramic insulated terminal over the side electrode and fasten in place.

To fit the light baffle first engage the lower slots in the lower standing posts, sliding the baffle back under the lamp. It may be necessary to put a little pressure on the baffle to pass the upper sprung terminal. Pass the upper standing posts through the key holes, locate the post slots with the baffle edge and push the baffle fully down.

DO NOT CHANGE LAMPS UNTIL THE ENVELOPE HAS COOLED.

When hot the envelope is under considerable internal pressure and may well explode if mishandled.

The quartz envelope should not be touched by hand and should be cleaned before insertion with an alcohol damped lint free cloth.

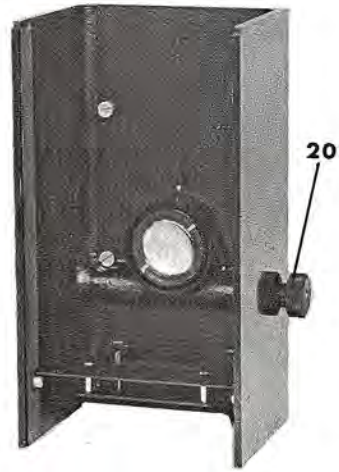
The lamp ignition must not be left on longer than the stipulated 10 seconds. Full intensity is achieved after a short warm-up period. Re-ignition is only possible after the lamp has cooled.

A life of between 250 and 300 hours can be expected only if the minimum burning period is kept to at least 30 minutes.

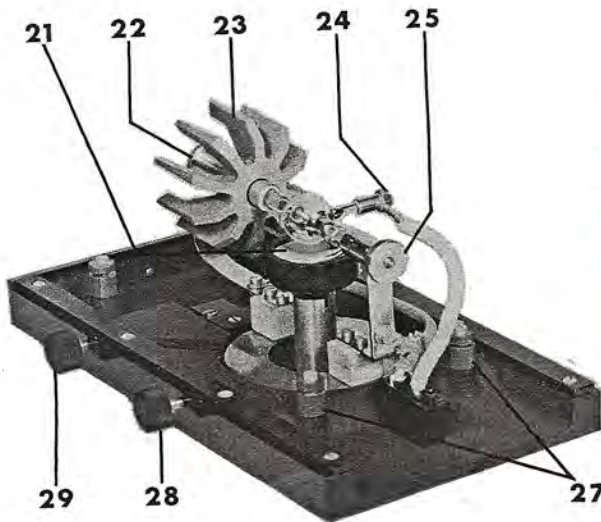
The lamp should be left running as long as is consistent with the work in hand.

PLEASE NOTE

Under no circumstances should the lamphousing be opened without first switching off the unit and unplugging the lamp completely from the power unit as the lamp is operated at a high voltage.



20. Lamp condenser focusing



- 21. Back concave reflector
- 22. Anode terminal
- 23. Heat sink fins
- 24. Igniter side-arm terminal
- 25. Cathode terminal screw

- 26. Removable lamp baffle
- 27. 2 of 4 baffle standing posts
- 28. Lamp horizontal centring
- 29. Lamp vertical centring

Lamp Adjustment

A concave reflector behind the lamp envelope allows two images of the mercury arc to be laid alongside one another for maximum field coverage at the lower powers. This adjustment is effected by the lamp centring screws.

E.1. TRANSMITTED LIGHT WORK

The standard achromatic bright field condenser is so designed as to allow the back aperture of oil immersion systems to be fully illuminated whilst being able to fill the field of even the lowest power scanning objectives. A single lever on the stand base operates two field lenses switching from low power to high power illumination conditions.

The objectives are factory precentered to the nosepiece. A black dot is marked on one aperture to indicate the position for the lowest power objective. The other objectives are mounted clockwise from this position in ascending power. A pair of Allen keys are provided for centring purposes. These are inserted into the two holes relating to each aperture on the knurled edge of the nosepiece.

If more than one nosepiece is provided for either incident or transmitted light work then the second nosepiece will be marked with a red dot. The objectives belonging to this nosepiece will be indicated and should only be employed in this nosepiece in the order specified.

Should the user wish to alter either the objective order on the nosepiece then the objectives will have to be recentred.



1. Nosepiece dovetail carrier
2. Objective aperture centring screws



3. Two position field lens lever

Power	Base Lever	Auxiliary lens	Diffuser
2.5	Low	in	in
4	Low	in	in
5	Low	out	
10	Low	out	
20	High	out	
40	High	out	
100	High	out	

Fig. 5. Auxiliary lenses with standard achromatic condenser.

Bright Field

Rack the condenser as high as possible. Fully open the aperture diaphragm and open the field iris. Ensure that any movable items such as filter changers do not obstruct the light path.

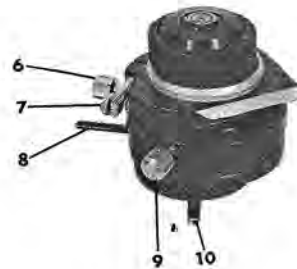
1. Switch on the illumination.
2. Pull out the viewing head beam splitter slide rod to the stop. All the available light will now be transmitted to the viewing head.
3. Adjust the interocular distance on the viewing head. The tube length compensator will automatically maintain a standard 160 mm. tube length.
4. Observe the specimen with a lower power objective (10x) through the binocular head and focus it with the stage focusing controls. The fixed left hand tube should be used at this stage—with the left eye!
5. Turn the right hand draw tube to focus both eyes equally.
6. Close the field iris and focus it in the field of view with the condenser focusing control.
7. Centre the field iris image in the field of view with the condenser centring controls and open the iris to fill the field of view.
8. Insert the Bertrand lens or auxiliary telescope, close the aperture diaphragm and focus it in the back focal plane with the Bertrand lens focusing control. Open the aperture diaphragm to fill 7/10 of the back focal plane by area.
9. Swing out the lamp diffuser disc. With the filament centring and focusing knobs, centre and focus the filament image conjugate with the diaphragm image.

Revert to normal viewing.

The aperture size filling 7/10 of the back focal plane by area is chosen so as to give the best compromise between resolution and contrast. Reducing the aperture too much will reduce the high objective correction. Opening the aperture iris wider than the objective aperture will possibly introduce scattered light. Judicious use of the aperture iris will give useful control over the image contrast.

If any filament image is visible in the field of view this may be removed by inserting the diffuser screen or by defocusing the lamp condenser.

10. On selection of the desired objective optimum performance is ensured by repeating steps 6 to 10. The condenser should be oiled for use with high power objectives. See chart for details of field lenses and other variables.



- | | |
|----------------------------|-----------------------|
| 6. Condenser centring | 9. Condenser centring |
| 7. Condenser/carrier clamp | 10. Auxiliary lens |
| 8. Aperture iris lever | |

Phase contrast

The phase contrast condenser for the M41 may be used with a full range of both negative and positive contrast objectives. The objectives will be clearly marked with a + positive or — negative sign depending on their contrast type.

Adjust the illumination as for bright field up to and including Step 10.

11. Turn the condenser selector drum until the number corresponding to the phase number marked on the objective is visible at the front of the condenser. The drum locates accurately into click stops.



- | | |
|------------------------|-------------------------|
| 11. Condenser centring | 14. Aperture iris lever |
| 12. Annuli disc | 15. Auxiliary lens |
| 13. Condenser centring | 16. Annulus centring |

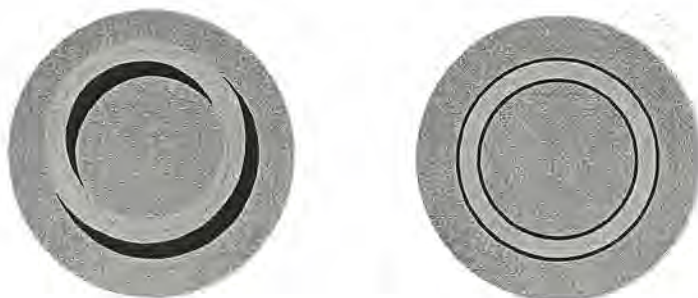
12. Either insert a phase telescope in place of one eyepiece or insert the carrier bracket Bertrand lens (if fitted). Focus the annulus and phase ring now visible with the Bertrand lens.

(To insert the Bertrand lens pull the slider to the left and turn the knob at the right hand end of the slider to focus)

13. Push in the two phase adjustment pins on the condenser and rotate them until the annulus and phase ring are in exact coincidence. Release the pins which will then be removed from the ring carrier under spring pressure. The pins are captive.
14. Change to normal viewing. The phase image will now be in correct adjustment. The use of a green filter will help to enhance the contrast.

Position 0 may be used for bright field work with the aperture diaphragm.

Position 4 which is also centrable is kept clear for further accessories.



Dark Ground

Well adjusted dark ground illumination can be achieved using the oil immersion condenser with slide thickness adjustment.



17. Slide thickness adjustment

Employing the tungsten halogen lamp in bright field white light with 10x objective and bright field condenser. Align the tungsten halogen lamp.

1. Turn up the lamp and open the field iris.
2. Oil the top of the condenser with a fairly large drop of ALP1 oil and rack into contact with the specimen slide.
3. Looking down the microscope, focus the specimen.
4. Turn the centring screws of the condenser until they are roughly in the middle of their run.
5. Looking down the microscope again, use the condenser slide thickness adjustment until a small bright spot is obtained (only the edge of it may be visible in the field).
6. Now centre this spot accurately using the condenser centring screws.
7. Select low power on the field lens lever. With the 10x objective only about 1/10th of the field will be seen to be illuminated.
8. Swing the desired objective into position.

All oil immersion objectives for use with the dark ground condenser should either be of the type fitted with an iris diaphragm or a funnel stop should be inserted to reduce the aperture to below 1.0. With an iris fitted the collar should be adjusted to give maximum contrast.

Funnel stop for Achromat Objectives

Screw out the back coma stop from the objective and screw the funnel stop into its place in the objective mount.

Funnel stop for achromat Objectives

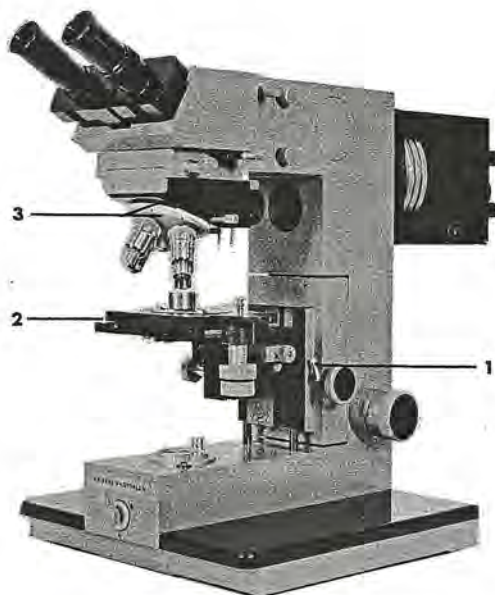
Drop the funnel stop directly into the back of the objective mount. With a funnel stop the aperture is reduced to about 0.95 N.A.

A condenser height stop adjustment screw is positioned just beneath the stage on the left hand side of the substage unit. It may be necessary to alter the stop to focus the dark ground condenser. After releasing the small side mounted clamp grub screw the vertical height screw may be adjusted. Set the screw so that the condenser just contacts the slide when the condenser focusing is racked to the stop.

E2 REFLECTED LIGHT WORK

The illuminator for reflected light work is designed to be used with both dark ground and bright field illumination. The illuminator is inserted from the front of the carrier bracket on a dovetail and clamped in place. The objectives are carried on a detachable revolving nosepiece which is inserted from the front of the illuminator, slid fully back and clamped. The illuminator is fitted with a mirror reflector, a dark ground slide, a field iris and an aperture iris.

The detachable lamphousing should be mounted on the upper carrier at the rear of the stand. If it is fitted with a field iris this should be kept wide open. If desired the stage carrier may be slackened on its dovetail slide and dropped down to accommodate larger specimens up to 2.50" in height.



1. Stage coarse motion clamp
2. Simple metallurgical stage
3. Incident illuminator with bright field nosepiece

Bright Field Illumination

The objectives are factory precentred to the nosepiece. A black dot is marked on one aperture to indicate the position for the lowest power objective. The other objectives are mounted clockwise from this position in ascending power. A pair of Allen keys are provided for centring purposes. These are inserted into the two holes related to each aperture on the knurled edge of the nosepiece. (also see page 22)

1. Adjust as for transmitted light from 1 up to and including 5.
2. The field diaphragm if closed a little will be very nearly in focus in the field of view. The diaphragm should also be well centred. Final sharp focus of the diaphragm is achieved by sliding the focusing control. Open the diaphragm to fill the field of view.
3. View the back focal plane of the objective with an auxiliary telescope or the focusable Bertrand lens and open the aperture iris to fill 7/10th of the back focal plane. Centration of the lamp filament may also be checked at this point.
4. Change to normal viewing position.

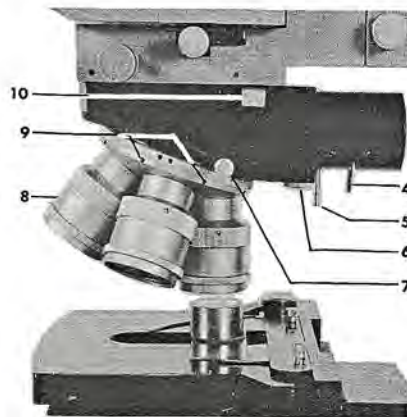
All objectives from microplan 4× through to the oil immersion lenses may be employed. Use of a substage system will allow combined incident and transmitted light illumination.

Dark ground illumination

The three dark ground objectives fitted with catoptric condensers are fitted par-central on a quadruple revolving nosepiece. The achromatically corrected objectives having powers of $10\times$, $20\times$ and $40\times$ are equally suitable for dark ground and bright field illumination.

1. Swing in the appropriate objective fitted with a catoptric condenser and insert the dark ground slide.
2. Open the aperture diaphragm and close the field iris until a well contrasted image results.

Return to bright field is effected by pulling out the dark ground stop.



- | | |
|-------------------------|--------------------------------|
| 4. Aperture iris | 8. Dark ground objectives |
| 5. Field iris | 9. Objective aperture centring |
| 6. Illuminator focusing | 10. Dark ground slider |
| 7. Nosepiece clamp | |

F. OPTICS FOR INCIDENT AND TRANSMITTED LIGHT

Each objective is engraved with the type, power, numerical aperture and where applicable, the permitted cover slip thickness. A black ring on the objective mount in addition to the engraved markings indicates a fluorite, and a white ring an apochromat. A colour ring on the objective mount denotes the power of the objective.

All objectives are corrected for a tube length of 160 mm. and where necessary a standardised 0.18 mm. cover slip thickness; corresponding approximately to size 1.5.

The objectives should always be used under the range of conditions for which they were designed. The maximum overall microscope magnification should lie between 500 and 1,000 times the objective numerical aperture. Any magnification over this range supplies no additional information about the microscope image and is therefore referred to as empty magnification. Careful attention to eyepiece and instrument magnification factors and to objective powers will help to avoid this common error. Where necessary because of short working distances the higher power objectives are provided with spring mounts to avoid collision damage either to the specimen or to the objective front components.

Because of their complex construction the incident light dark ground objectives are not fitted with spring mounts.

Cleaning the Optics

It is essential that the optical surfaces of the microscope are kept scrupulously clean. Dust should be removed with a clean camel hair brush. Smearred surfaces should have dust particles removed in the same manner before wiping with a suitable material, such as Goddards Lens Cloth, well washed fine linen or lens tissues, lightly moistened with industrial alcohol.

While the use of industrial alcohol is recommended for cleaning Vickers Instruments optics, it may not be suitable for use with other manufacturers equipment.

Cleaning the Paint Surfaces

The paint surfaces can be cleaned with a soft cloth lightly moistened with industrial alcohol and afterwards polished with a dry cloth. The microscope is finished with an epoxy resin paint which is extremely durable, but any injurious chemicals which may accidentally come into contact with it should be removed as quickly as possible.

Servicing

The mechanical movements have been lubricated before leaving the factory and should only require attention after prolonged use. If servicing is necessary, the user should contact Vickers Instruments or their agents.

M41 PHOTOPLAN

SECTION 2 — PHOTOGRAPHY

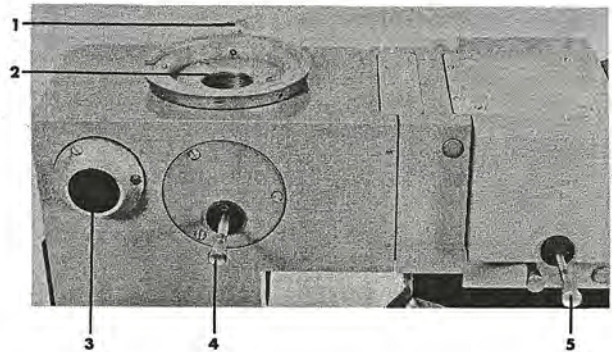
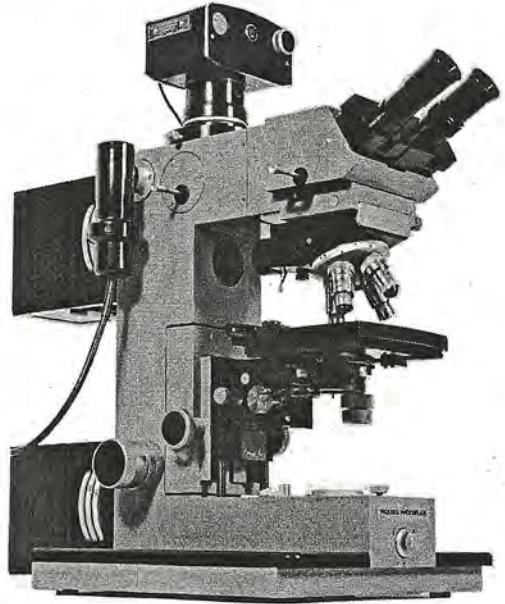
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A. CAMERA OPTICAL SYSTEM

Brief description

When the binocular viewing head beam splitter set is in the full-in or half-in position 100% and 80% of the available illumination respectively is transmitted to the stand camera optics. When little light is available the 100% photographic position is employed after setting up is accomplished using the 100% visual position. With the 80% position, sufficient light is sent to the eyepieces to allow image monitoring throughout the exposure.



1. Magnification cone clamp
2. Camera aperture
3. J35 photomultiplier aperture
4. Camera beam splitter slide
5. Viewing head beam splitter slide

Two apertures are provided on the stand head for the attachment of light measuring photomultipliers. The left-hand aperture is intended for the J35, automatic exposure unit photomultiplier. The right hand aperture accommodates the J37 high sensitivity photometer photomultiplier with its associated partial field device. A cone fitting is provided at the top rear of the stand for the reception of camera bodies.

Binocular viewing head

Alteration of the interocular setting on the binocular head causes the eyepiece tubes to move correspondingly in or out, thus retaining a set 160 mm tube length. This device not only makes for comfortable use but also ensures that the image seen in the eye pieces remains parfocal with the camera plane enabling the head to be used for photographic focusing and adjustment.

The beam splitter system serve to alter the ratios between the light sent to the eyepieces and that sent to the camera system. With the rod fully out 100% of the light is transmitted to the binocular viewing head. In the central position 20% of the light is sent to the viewing head and 80% to the camera optics. This is the usual photographic position. With the rod fully in 100% of the light passes to the camera optics contained within the limb. A framing graticule within the left hand eye piece is provided for camera focusing.

POSITION	I	II	III
Mode	Observation	Observation and Photography	Photography
Ratio	100% to head	20% to head 80% to camera optics	100% to camera optics

Stand Beamsplitting Slide

A beamsplitter slide controlled by a rod at the stand left side serves to direct the available light in one of three ways.

POSITION	I	II	III
Mode	J37 multiplier	Camera and J35 multiplier	Camera
Ratio	100% to J37	80% to camera 20% to J35	100% to camera

In the central position 20% of the available light passes to the J35 photomultiplier and 80% passes to the camera. In this position and with the viewing head in the central position the specimen image may be automatically exposed and visually monitored simultaneously. With the rod fully out 100% of the available light is collected by the J37 photomultiplier for photoelectric exposure assessment prior to pushing the rod fully in when 100% of the light passes to the camera for exposure.

Alternatively, the instrument may be fitted with single purpose optical systems.

Combinations of Beamsplitter slides for Photography

Observation 100% to Head		Observation 20% to Head		Automatic Photography & Visual		Automatic Photography		High Sensitivity Photometer	
Head Slide	Stand Slide	Head Slide	Stand Slide	Head Slide	Stand Slide	Head Slide	Stand Slide	Head Slide	Stand Slide
I		II		II	II	I		I	
						III	II	III	I
								III	III

S E Q U E N C E ↓

Graticule focusing

Camera focusing and framing is accomplished using a graticule contained in a 18 mm field kellner eyepiece in the fixed left-hand eyepiece tube. Eyepiece graticules are provided for the two basic eyepiece sizes, 23.2 mm normal tube (0.75" graticule) and 29.2 mm wide tube (1" graticule). The wide tube eyepieces are intended for use with the wide tube monocular. Graticules are available for 4" × 5" with 35 mm and 3¼" × 4¼" with 35 mm.

Each graticule consists of four frames, two for the larger format in each case and two for the smaller. The two inner frames in each case are for 35 mm.

In each pair of frames the inner is for use with the 1.25× camera cone and the outer is for use with the 1× camera cone.

The graticule types will be found engraved on the eyepiece body.

B. CAMERA MAGNIFICATION (A.S.T.M. Series)

One of two interchangeable magnification factor inserts must be clamped into position between the stand and camera body so as to provide the A.S.T.M. range of preferred magnifications on the M.P.P. camera formats. The first insert has a factor which together with the camera projection optics has an overall value of $10\times$. The second insert provides an overall factor of $12.5\times$. The chart lists the A.S.T.M. factors available for a given range of objective powers. The values indicated apply to the universal holder formats, 9×12 cm. quarter plate, etc. With a 35 mm back the values should be halved.

After fitting the insert is clamped in place by the right hand screw before the camera body and shutter is placed in position and secured.

	OBJECTIVE POWER	10x FACTOR (1x insert)	12.5x FACTOR (1.25x insert)
MICROPLAN	2.5	25	31.25
MICROPLAN	4	40	50
ACHROMAT	5	50	62.5
MICROPLAN	10	100	125
MICROPLAN	20	200	250
MICROPLAN	40	400	500
ACHROMAT	80	800	1000
MICROPLAN	100	1000	1250



C. AUTOMATIC PHOTOGRAPHY

J35 Automatic exposure unit

The J35 exposure unit enables exposures of between 1/50 second and 15 minutes to be made automatically with 35 mm and 1/20 second to 15 minutes with the large format back. The current from a photomultiplier is used to feed a resistance capacitance charging circuit. The shutter is opened and the timing sequence started when the exposure button is pressed. The shutter is closed automatically when the charge on the capacitor reaches a predetermined value. The time interval required for the capacitor to acquire this charge being proportional to the amount of light falling on the photomultiplier.



1. Expose indicator
2. Photometer scale
3. Expose button
4. Film type control
5. Film speed control

The film speed indicator is scaled from 5 to 3, 200 A.S.A. The "magic eye" tube gives an indication of the progress of the exposure. The two luminous blinds draw apart at a rate proportional to the exposure time. The output from the photomultiplier, from which the exposure time may be determined is displayed on the microammeter on the unit front panel. The sensitivity switch alters the sensitivity of the unit to allow for the different exposure requirements of negative and reversal materials. Broadly speaking most colour films are of the reversal type producing colour transparencies whilst all black and white films are of the negative type. The upper and lower indicator lights, respectively, indicate the switch position and that the unit is switched on.

(N.B. All Polaroid film should be treated as of the reversal type for best results).

Three positions are provided on the photometer scale switch to control the photomultiplier sensitivity in steps of ten, thus increasing the effective range of the unit and enabling a wide variation of light intensities to be accommodated. The "T" position is used when manual shutter control is required.

Electrical Connections

Ensure that the mains selector, which is accessible at the rear of the unit, is set to the correct mains supply voltage.

Connect the mains lead to a suitable three pin earthed plug. The mains lead is colour coded as follows:

RED:	LIVE
BLACK OR BLUE:	NEUTRAL
GREEN:	EARTH

Connect the plug from the photomultiplier housing to the four pin socket marked socket 2 at the rear of the exposure unit, and insert the photomultiplier into the left hand aperture at the rear of the microscope stand. Connect the plug from the camera shutter to the eight pin socket marked socket 1 at the rear of the exposure unit.

A fuse rated at 2 amperes is fitted to protect the unit. If the fuse requires replacing, first remove the instrument power plug from the mains supply. A spare fuse is supplied with the instrument.

Operation

Fit one of the magnification cones into the stand camera aperture. Clamp the camera body east west over the aperture on the top rear of the microscope stand. The body is clamped by the left hand screw. Turn the photometer scale switch from the "off" position to X100 and allow 2-3 minutes for the unit to warm up.

Set the film speed indicator to the A.S.A. rating of the film to be used. The white indicator line on the knob is for use with the 35mm camera bodies and the blue indicator line is for use with the large format camera.

Set the film type switch to negative or reversal.

With the viewing head beam splitter in a visual position, fully out or in mid position, and with the framing graticule in the left hand eyetube focus the graticule eyepiece scroll to render the frame sharp. Bring the microscope specimen image into coincident focus with the graticule and adjust the illumination correctly. If it is wished to monitor the specimen during the exposure set the beam splitter prism in the central position. With the beam splitter fully in 100% of the light is sent to the camera optics. Set the photographic beam splitter into the central position. The needle should now move over the scale.

If the needle is in the red portion of the scale, rotate the photometer scale switch to X10. If it is still in the red portion rotate to the X1 position. When the needle is on scale, depress the expose button to make an exposure. When using colour reversal film a correction may be necessary to cope with reciprocity failure—see Fig. 1.

	Kodachrome II Type A Manufacturer's rating 40 A.S.A.	High Speed Ektachrome Type B Manufacturer's rating 125 A.S.A.	Ansochrome T.100 Manufacturer's rating 100 A.S.A.	Agfa CK.20 Manufacturer's rating 80 A.S.A.
Meter reading	5000 – 1000 μ A.	5000 – 500 μ A.	5000 – 250 μ A.	5000 – 500 μ A.
Film speed to be set on J.35	40 A.S.A.	125 A.S.A.	100 A.S.A.	80 A.S.A.
	—	—	—	
Meter reading	1000 – 250 μ A.	500 – 250 μ A.	250 – 50 μ A.	500 – 250 μ A.
Film speed to be set on J.35	32 A.S.A.	100 A.S.A.	80 A.S.A.	64 A.S.A.
Colour compensating filters	10 R	05 G	20 R	
Meter reading	250 – 125 μ A.	250 – 50 μ A.	50 – 25 μ A.	250 – 125 μ A.
Film speed to be set on J.35	25 A.S.A.	80 A.S.A.	64 A.S.A.	50 A.S.A.
Colour compensating filters	Wratten CC 20 R	10 G	Wratten CC 20 R	
Meter reading	125 – 50 μ A.	50 – 25 μ A.	25 – 15 μ A.	125 – 25 μ A.
Film speed to be set on J.35	20 A.S.A.	64 A.S.A.	50 A.S.A.	40 A.S.A.
Colour compensating filters	Wratten CC 20 R	10 G	Wratten CC 20 R	
	50 – 5 μ A. 16 A.S.A. Wratten CC 25 R	25 – 5 μ A. 50 A.S.A. 10 G	15 – 5 μ A. 40 A.S.A. Wratten CC 20 R	25 – 5 μ A. 32 A.S.A.

Fig. 1

Guide to exposure times (seconds) against meter readings (μ A) and film speeds (A.S.A.)

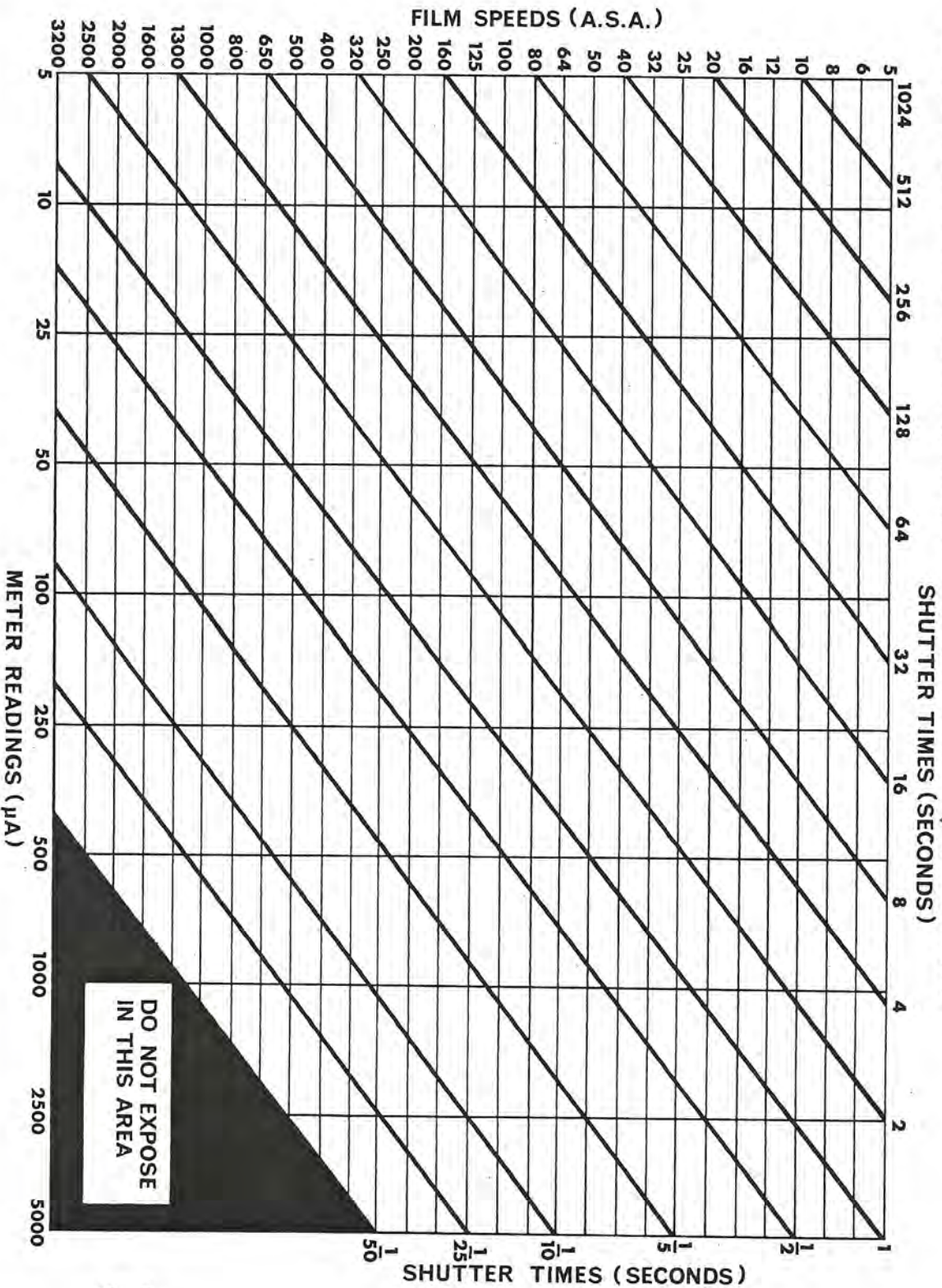


Fig. 2.

The filters listed are from the Kodak Wrattan Series and are used to correct colour balance.

If the level of illumination is insufficient to deflect the needle beyond the red portion of the scale when the photometer scale switch is turned to the X1 position, manual exposure of the film is necessary. This situation may perhaps be remedied by increasing the illumination intensity. To open the shutter manually, turn the photometer switch to "T" and depress the expose button. The "magic eye" is illuminated when the shutter is open. To close the shutter press the expose button once more. Interpolation of the exposure guide table will help to indicate the correct exposure. This facility will also be of use when it is required to examine the image in the film plane, particularly with formats larger than 35 mm.

If the needle is off scale, the level of illumination reaching the film will have to be reduced. This can be achieved by the use of suitable neutral density filters, or, in some instances, by reducing the brightness of the light source. Care must be taken to ensure that the lamp colour temperature does not alter from the set standard when using colour film. The maximum usable speed of the electro-magnetic shutter, 1/50 second or 1/20 second will also restrict the illumination intensity which may be used. To assess the required exposure first locate the meter reading along the bottom horizontal. Do not forget the factor which will be on the photometer scale switch. Locate the intersection of this vertical line with the horizontal line corresponding to the correct film speed. Follow the nearest diagonal line to the upper right where the corresponding exposure time will be found. The instrument will not operate satisfactorily at speeds above 1/50 of a second (or 1/20 with the plate back). Frame vignetting will indicate this error. The chart meter readings include the scale switch factor.

The correction table indicates some of the more commonly employed colour films together with the speeds which will need to be set on the J35 film speed indicator so as to counteract reciprocity failure. The filters indicated are from the Kodak Wrattan Series and are required for colour balance correction. Fig. 1.

POSITIONS OF BEAMSPLITTER SLIDES

S E Q U E N C E ↓	Automatic Photography & Visual		Automatic Photography	
	Head Slide	Stand Slide	Head Slide	Stand Slide
	II	II	I	
		III	II	

D. HIGH SENSITIVITY AND PARTIAL FIELD PHOTOMETRY J37 HIGH SENSITIVITY PHOTOMETER TIMER

with associated partial field optics

The J37 high sensitivity photometer with its associated partial field device attached to the right hand stand photometer aperture allows accurately timed photomicrography to be undertaken on even the faintest dark ground fluorescence images. Individual parts of a microscope specimen area may be photometrically determined and an accurate exposure made for just that part of the field.

The photometer will be employed with the microscope set in three consecutive configurations.

1. All the light passes to the viewing head containing a framing graticule for camera focusing and three concentric rings for photometer centration.
2. All the light may pass to the photomultiplier. A drum containing three accurately centred stops limiting the measured field to 1/10, 1/100, or 1/500 of the whole field by area, passes the appropriate fraction to the photomultiplier. A concentric ring graticule is contained with the framing mask in the viewing head eyepiece and is adjusted so that the rings are accurately superimposed upon the corresponding areas seen by the photometer.
3. All the light passes to the camera for full utilization.

Having focused and centred the specimen a photometer reading is made. The calibrated time corresponding to the photometer reading and the film speed is then set on the exposure control. (A special slide rule is provided for this purpose). A button is depressed, the exposure electronically timed, taken, and the film automatically wound on.

Electrical Connection

Ensure that the mains selector, which is accessible at the rear of the unit, is set to the correct mains supply voltage. Connect the mains lead to a suitable three pin earthed plug. The mains lead is colour coded as follows:

RED:	LIVE
BLACK OR BLUE:	NEUTRAL
GREEN:	EARTH

Connect the plug from the camera shutter to the eight pin socket at the rear of the instrument. The photomultiplier is permanently connected to the instrument.

A fuse rated at 2 amperes is fitted to protect the unit. If the fuse requires replacing, first remove the instrument power plug from the mains supply. A spare fuse is supplied with the instrument.



1. On/off
2. Expose button
3. Timer control
4. Photometer scale

Operation

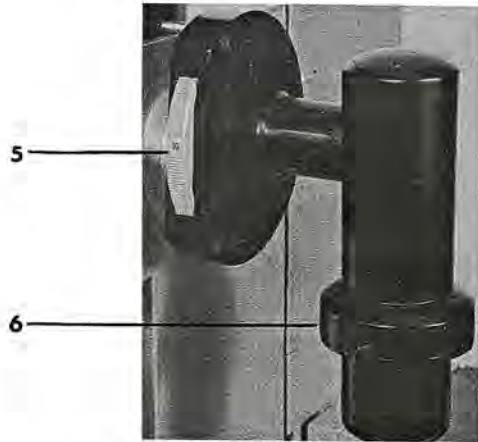
Fit one of the magnification cones into the stand camera aperture. Clamp the camera body east west over the aperture at the top rear of the microscope stand. Insert the Photomultiplier into the right hand stand aperture. The camera is clamped by the left hand screw.

Insert the eyepiece containing the framing graticule and photometer rings into the left hand non-focusing eyepiece tube. Do not initially focus the specimen but with a clear background turn the eyepiece scroll threaded sleeve to bring the graticule clearly into focus for the left eye. Focus the specimen for the left eye with the stage focusing and while still observing with the left eye, turn the right hand eyepiece tube sleeve to bring the specimen into focus for the right eye.

Provided that this operation has been carried out correctly, the specimen will now be in focus at the film plane. The rectangular frame in the left hand eyepiece indicates the specimen area covered by the camera format. The three concentric rings in the eyepiece indicate the area of the field from which the specimen light will be integrated when using the appropriate stops in the framing revolver.

1. Select the ring which most nearly fills that part of the specimen area which is to be taken as the criterion for correct exposure. The specimen must of course be centred in the field of view and be completely covering the selected ring.
2. Turn the aperture revolver until the appropriate symbol, 1/10, 1/100 or 1/500 faces the front. If the whole area is to be integrated then the symbol 1 should be selected.

The smallest graticule circle corresponds to 1/500 and so on.



5. Partial field stop unit
6. J37 photomultiplier

Reading

The binocular viewing head beam splitter slide should be pushed fully in to send all the available light to the camera optics. Pull the camera prism slide fully out to send all the light to the J37 photomultiplier.

1. Rotate the J37 range switch fully anti-clockwise to read 10^5
2. Push the "on" button once.
3. Should no reading appear on the meter turn the range switch clockwise one step at a time until the needle falls within the meter scale.
4. Take the meter reading and note it by the symbol now given on the range switch. If whilst using the full aperture stop 1 on the aperture revolver, the needle is off scale when the range switch is fully anti-clockwise, rotate the aperture disc to position N (containing a 10% neutral density filter). The reading is now multiplied by 10^6 instead of 10^5 . If the reading is still off scale a further neutral density filter must be put into the illuminating path.

Reading Interpretation

Refer to the calculating slide supplied with the instrument. Set the upper slider so that the film speed appears against the appropriate arrow. Negative or reversal. Set the lower slider so that the partial field symbol 1, 10, 100, 500 appears against the index arrow. Refer to the slider common face. The correct exposure corresponding to the photometer reading on the bottom scale is shown along the time scale on the upper slider. The readings above $\frac{1}{4}$ hour duration must be manually timed using the position marked "T" on the instrument timer control.

Exposure

1. Set the timer control on the J37 to the required exposure time accurate to the nearest $\frac{1}{2}$ stop.
2. Push the camera beam splitter fully in to deflect all the light to the camera.
3. Depress the expose button. The green light will now come on.

The equipment should now be left strictly alone until the green light goes out indicating completion of the exposure. If the Autowind 35 mm camera is supplied the film will then automatically wind on.

High Sensitivity
Photometer

S E Q U E N C E ↓	Head Slide	Stand Slide	
	I		Setting
	III	I	Measuring
	III	III	Exposing

Checking Adjustment

A 6 × eyepiece is supplied with the partial field stop unit for checking purposes.

1. Focus and centre to the smallest circle, a suitable point specimen (an isolated particle or stage micrometer crossline is ideal).
2. Set the beam splitters to the measurement position and insert the 6x eyepiece in place of the J37 photomultiplier.
3. Select the smallest stop. The crossline or particle should appear centred to it when viewed with the 6x eyepiece.
4. Should the reference point not be centred to the stop this can be corrected by operating the 3 centring screws fixing the stop unit to the stand. Do not allow the stop unit to fall.

Any point centred to the eyepiece ring graticule should now be coincident with the appropriate partial field stop. This adjustment should only be carried out when it proves necessary although it is wise to check the system from time to time.

E. 35 mm CAMERA BODIES

There are three basic 35 mm bodies.

Manual wind on camera with a speeded shutter which cannot be used with the J35, 36 or 37.

Semi automatic camera with an electromagnetic shutter but a manual wind on mechanism. May be used with J35, 36 or 37 but not without.

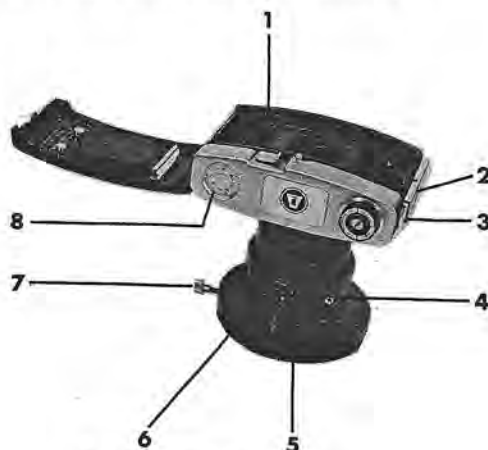
Autowind Camera with an electromagnetic shutter and mobilized wind on mechanism. May be used with J35, 36 or 37 but not without.

The electrical cables should also be decoupled with the electromagnetic shutter bodies. All 35 mm bodies have a $\frac{1}{2} \times$ camera factor.

Take care to remove the dark slide before commencing photography. The dark slide pulls out to a stop and serves to prevent film fogging when removing the shutter.

Loading the manual wind-on Cameras

Unlock the camera by depressing the button and slightly withdraw the locking arm. The back can now be opened.



- | | |
|-------------------------|------------------|
| 1. Wind-on lever | 5. Shutter timer |
| 2. Catch release button | 6. Flash contact |
| 3. Back catch | 7. Camera clamp |
| 4. Cable release entry | 8. Frame counter |

Depress the film rewind knob with the thumb and rotate anti-clockwise. This will cause the knob to spring out approximately $\frac{1}{4}$ " from the casing. This is the normal position of the rewind knob when the film is to be wound back into the cassette.

Pull the rewind knob out a further $\frac{1}{2}$ " and place the cassette with the projecting end of its spool away from the rewind knob, in the camera. Push in the rewind knob, rotating until the fork engages in the spool. Insert the cutaway leader of the film into the slot in the take up spool so that one of the film perforations is engaged on the projecting pin. Rotate the take up spool to ensure that the film is firmly attached and that the sprocket teeth are projecting through the perforations in the film.

Rotate the rewind knob in the direction indicated by the arrow on the camera back to take up any slack on the film in its cassette.

Depress the rewind knob with the thumb and rotate clockwise to lock in position, flush with the camera casing.

To close the camera back, hold it tightly shut and push the locking arm back home.

Loading the autowind 35 mm Camera

Unlock the camera by depressing the catch release button while at the same time slightly withdrawing the locking arm. The back can now be opened. Pull out the rewind knob and place the cassette in the camera with the projecting end of the spool away from the rewind knob. Push in the rewind knob, rotating until the fork engages in the spool.



Insert the cutaway film leader into the slot in the take up spool so that one of the film perforations is engaged on the projecting pin. Rotate the take up spool to ensure that the film is firmly attached and that the sprocket teeth are projecting through the film perforations.

Rotate the rewind knob in the direction indicated by the arrow on the camera back to take up any slack on the film in the cassette.

To close the camera back, hold it firmly shut and push the locking arm back home.

Rotate the film counter dial in the direction indicated by the arrow on the dial until the black diamond is adjacent to the index mark.

There are two positions, one for 36 exposure and one for 20 exposure films. Press the expose button on the photometer three times to clear the fogged leader film. Check that the film is being transported by observing the anti-clockwise rotation of the rewind knob after pressing the expose button.

The film counter will now be set at 36 or 20. When the film has been exposed, rewind it into the cassette in the following manner;

Press in the rewind button in the bottom of the camera and, keeping it pressed in, rotate the rewind knob clockwise until a sudden release of resistance indicates that the film has been detached from the take up spool.

Open the camera back, withdraw the rewind knob and remove the cassette.

F. LARGE FORMAT CAMERA ASSEMBLY

The camera assembly accommodates all formats other than 35 mm employed with the M41: There are two basic assemblies.

Camera assembly with speeded shutter cannot be used with exposure units J35, 36 or 37.

Camera assembly with electromagnetic shutter may be used with J35, 36 or 37 but not without.

The shutter unit may be removed from each body after releasing a side screw.

The universal camera assembly has a 1 × camera factor (See 2B).

The camera assembly is fitted directly over the stand camera aperture and is clamped by the left hand screw.

One of the magnification factor inserts must first be fitted into the camera aperture.

Universal Holder for plate and cut film adapters

The Universal Holder is clamped firmly into place on the camera assembly with the sliding slide clips.

The Holder is fitted with a ground glass screen which can be used for focusing checks. The screen can be removed completely from the holder by pressing simultaneously on the two spring clamps and easing the screen forwards.

Plate or cut film holders of 4" × 5" dimensions are inserted from the front on lifting the screen front slightly against the springs. The holder is then pushed firmly back against the stop. Small formats are accommodated by the use of insets fitting within the plate-holders.



1. Slide clamp
2. Shutter timer
3. Cable release
4. Camera body clamp



5. Slide clips
6. Camera/shutter separation clamp



7. Press down sprung holder
8. M.P.P. camera adaptor

Polaroid 4" × 5" LAND back, 500

The 500 back is fitted under the viewing screen in a similar manner to plate and cut film holders. It is then held in place by a pair of side mounted sliding clips.

For loading see manufacturers instructions.



9. Polaroid 4" × 5" inserted under sprung holder

Loading the CB 100 Polaroid Camera

Open the camera by moving the clamp lever anti clockwise. Insert the film pack and close the camera ensuring that the black paper tab is protruding.

Pull out the black tab until a white one appears. The camera is now ready for use.

After making the exposure, pull the white tab out completely. This will cause a yellow tab (marked "PULL") to appear through the slit. Immediately pull out this yellow tab, which has the picture attached to it.

Allow the time for development, as stated in the film manufacturers' instructions, before separating the picture from the brown mask and negative. Note that this separation should be started from the end nearest the yellow tab.

The CB 100 camera is clamped directly to the camera assembly by the side mounted clips. The universal holder must first be removed.



10. Back clamp lever

Loading the J66 Polaroid Camera

Open the camera by pulling the release lever downwards. Open the film packet and insert the film into the camera.

Close the camera.

After making the exposure, flick the top switch over and pull out the film until it stops. Allow the time for development, as stated in the film manufacturers instructions, then open the lid and remove the print.

G. NOTES ON THE USE OF COLOUR REVERSAL FILM WITH THE M41 PHOTOPLAN

The film selected should be balanced for a colour temperature as close as possible to that of the light source being used.

“Daylight” type films are not to be recommended for use with tungsten light sources. Mercury vapour lamps are not colour balanced and should only be used with colour film when they act as a source of exciting radiation for fluorescence work. The colour values will otherwise be grossly distorted. The J37 is the most suitable unit for fluorescence work. The faster films are generally to be preferred, so that the shortest possible exposure times can be given, since the range over which colour films follow the reciprocity law, (Schwarzschild effect) is limited. Increasingly long exposure times result in increased under exposure and incorrect colour balance. A chart on Page 35 indicates speed corrections which should be made with the J35 unit to counteract reciprocity failure. Films which have good contrast, such as Agfa CK, have proved to be particularly suitable for photomicrography.

Film Speed

Whilst film manufacturers make every effort to ensure uniformity, small variations in film speed and colour balance can occur with different batches of film.

Therefore, for best results, it is advisable to purchase films from the same batch and to expose a test strip to determine any departures from the nominal film speed, colour balance and reciprocity characteristics. For details advice refer to:

Agfacolor Reversal Film—A guide to its Use and
Kodakdata sheet CL11—The critical use of colour films.

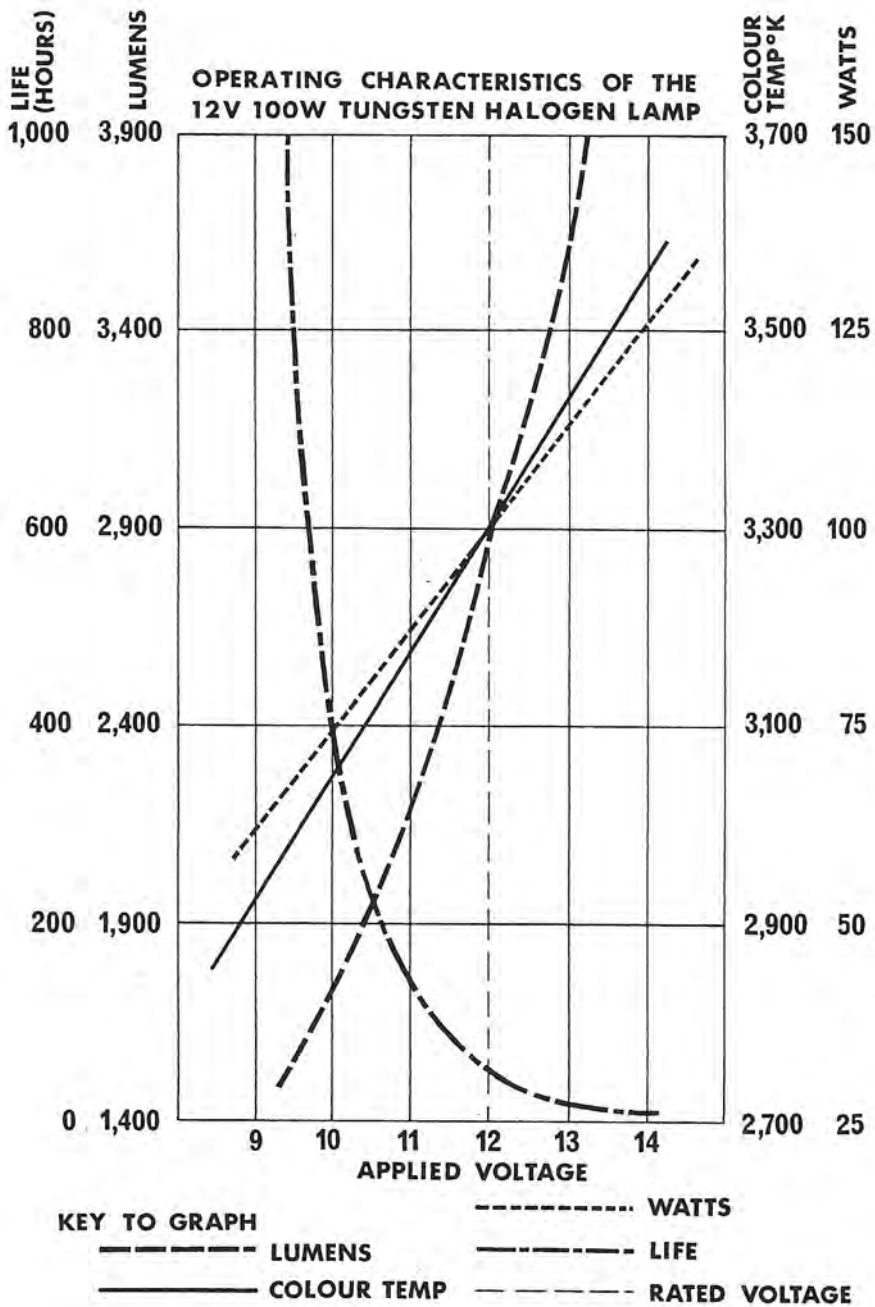
Colour Temperatures

The colour temperature of the light source should closely match that for which the film is rated. If this cannot be achieved to within 100°K , then colour temperature correction filters must be used. Since the colour temperature of a tungsten light source varies with the lamp voltage, care must be taken to maintain the correct rheostat settings, using if possible a voltmeter for this purpose.

If the colour temperature of the light source is too high (lamp voltage too high) the transparency will have an overall blue cast, if too low (lamp voltage too low) it will be pink.

Because of differences in transformers and lamps, any recommended rheostat settings and correction filters required to achieve a given colour temperature can only be considered as approximate.

At 11.5 volts the tungsten halogen lamp has a colour temperature approximating 3200°K and no filters are therefore necessary when used with 3200°K corrected films.



Substage condensers

The use of an achromatic substage condenser is to be recommended. When a less perfectly corrected condenser is used care must be taken to ensure that it is correctly focused, i.e. a sharp image of the lamp iris is obtained in the plane of the object. If the condenser is focused below the object plane a bluish colour cast will result, and if set above a pinkish colour cast will appear.

Reducing the Light Source Intensity

Where it is necessary to reduce the illumination intensity neutral density filters will be required. These should be of gelatin with a perfectly neutral absorption curve. Such filters are manufactured by Messrs. Ilford and Kodak. The great majority of glass filters are unsuitable as they tend to produce greenish colour casts.

Some causes of poor results

The utmost care must be taken to ensure the correct adjustment of the microscope. Unless this is done, faults which would be hardly noticeable under visual observation will be very apparent in the colour transparency. Faint images of the lamp filament in the field of view are a common example of this fault.

Where ever possible, Köhler illumination should be employed to minimise the effects of glare which otherwise will produce marked colour desaturation and lack of contrast in the transparency. The field iris should be opened so that its image is only slightly larger than the field of the viewing eyepiece. All optical components, including the object slide, must be as clean as possible, smeared surfaces will greatly reduce the image contrast. Apochromatic, fluorite and high numerical aperture achromatic objectives should always be used with compensating eyepieces, and low power achromatic objectives with Huygen's eyepieces. Unless this is done the resulting chromatic difference of magnification will cause small particles, particularly those at the edges of the field to be reproduced with coloured flares. Only object slides and mounting media entirely free from colour should be used. This point should not be forgotten when looking for causes of unwanted colour casts. The built-in camera projection system is compensated.

At high magnifications one must expect results with less saturated colours, even when using brightly stained objects, than those obtainable at lower magnifications.

H. NOTES ON THE USE OF BLACK AND WHITE NEGATIVE FILM

The slow films are to be preferred because of their finer grain and high actuanee. Kodak panatomic X, Ilford Pan F and Adox KB 14 are examples of such films.

Developers

Where a gain in contrast is required, increase the rated film speed and increase the development time, using a fine grain MQ developer such as Agfa Final or Kodak D 76. A test strip will indicate just how much contrast can be increased without blotting out detail.

Films, such as Kodak "Micro-File" which develop to a very high gamma, are not generally suitable for photomicrography of normal biological material because of their limited tonal range.

For maximum detail and sharpness, high definition developers, such as Agfa Rodinal and Kodak High definition, are to be preferred.

Filters

A wide range of filters may be used to control contrast when placed in the illuminating light path. Also see chart on page 15, section 1.

Light Red	RG1	M001774
Orange	OG3	M001776
Yellow	OG4	M001782
Dark Green	OGR1	M001780
Daylight Blue	OB8	M001380
Blue	OB2	M001783
Mercury Green (Gelatin)		M505785

The filters are inserted in the head filter slide.

All filters available affect the sensitivity of the photomultiplier to a greater or lesser degree such that calibration should be effected for these filters if it is intended to use the J35 or J37 photometers. The mercury green filter, which is largely used for phase contrast work or for improvement of achromatic performance has little effect on the sensitivity and so can safely be used with the standard J35 or J37 calibration.

I. POLAROID EXPOSURE GUIDE

A guide to reciprocity law failure corrections for Polapan 200 (Type 42)

Meter reading (uA)	5000 – 1000	1000 – 500	500 – 250	250 – 100	100 – 50	50 – 5
Film speed setting (A.S.A.)	200	160	125	100	80	64

A guide to reciprocity law failure corrections for Polaroid 3000 (Type 107)

Meter reading (uA)	500 – 200	200 – 100	100 – 50	50 – 5
Film speed setting (A.S.A.)	3200	2500	2000	1600

J. PROJECTION HEAD

The projection head is mounted directly over the microscope stand rear camera aperture and is clamped firmly in place by a side mounted screw.

The projection head is used without the camera magnification cones.

The head gives an overall screen magnification of $10\times$ the objective power.

