LAMP FOR THE EXTERNAL SUPPLY ADAPTOR
(Photometer Lamp)

The external supply adaptor and lamp (Figs. 8 and 9) take the place of the normal battery container and lamp used for exposure estimation. The adaptor consists of a machined metal barrel, closed at its upper end by a disc fitted with an aperture carrying a diffusing screen. Its lower end is threaded to carry the photometer lamp holder which in turn is mounted in an auxiliary base ring to fit the body of the photometer itself. This auxiliary base ring screws into the position on the photometer body normally taken by the 'operating ring' when the photometer is used for exposure estimation, and indeed the operating ring, with its push button switch screws into an outer cavity of the auxiliary base ring in which are situated the insulated contact and other terminal for the lamp circuit.

The leads to the lamp are brought in from two plugs through a hole in the auxiliary base ring, the lamp being operated by the push-button switch in the normal way.

The plugs for the photometer lamp circuit are used to connect the lamp and button switch with a two socket connector on the top of the transformer box. The sockets are themselves connected inside the transformer with the 6-volt output terminals of the transformer.

THE ILLUMINATOR LAMP AND ITS MOUNTING

The illuminator lamp is carried on a swivelling arm inside the illuminator. Its purpose is to illuminate the opal window in the top of the illuminator which is used as the platform of the densitometer. A lead screw terminating in a knob on the upper side of the transformer box, enables the distance of the densitometer lamp from the opal window to be adjusted so that the brightness of the opal window can be fixed at a convenient level and so that the zero of the relative density scale can be made to correspond with absolute zero density. The illuminator lamp is connected in parallel with the external supply adaptor (photometer) lamp. A switch on the top of the illuminator enables this lamp to be switched off.

The lamps employed are 6-volt, 6-watt, two-pole motor car side lamp bulbs with small bayonet cap fittings, Osram Reference No. 80.

Calibration

The S.E.I. exposure photometer is sufficiently accurate for most ordinary densitometry. If, however, density values are required to be compared with those obtained on different instruments to an accuracy of better than ± 0.04, the instrument should be calibrated against densities of known values. Strips of film carrying about 15 measured densities between 0 and 4 may be purchased from Ilford Limited.

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S.E.I.

Photometer

accessories for densitometry

Contents

S.E.I. Photometer accessories for densitometry

The S.E.I. Exposure Photometer is described fully in the Instruction Book supplied with the instrument. The present book describes accessories which provide a means for conveniently using the S.E.I. Photometer as a densitometer for transparencies and reflection images. Negatives and prints from miniature size upwards may be accommodated.

The Densitometer Accessories comprise :—

1. Densitometer Supplementary Lens Attachment, to focus the photometer on to the negative.
2. Densitometer Illuminator, containing transformer, 6-volt lamp, opal diffuser and cradle to support the photometer.

   WARNING : This apparatus must be used only with A.C. Main Electric Supply.
3. External Supply Adaptor, to convert the photometer to mains operation.

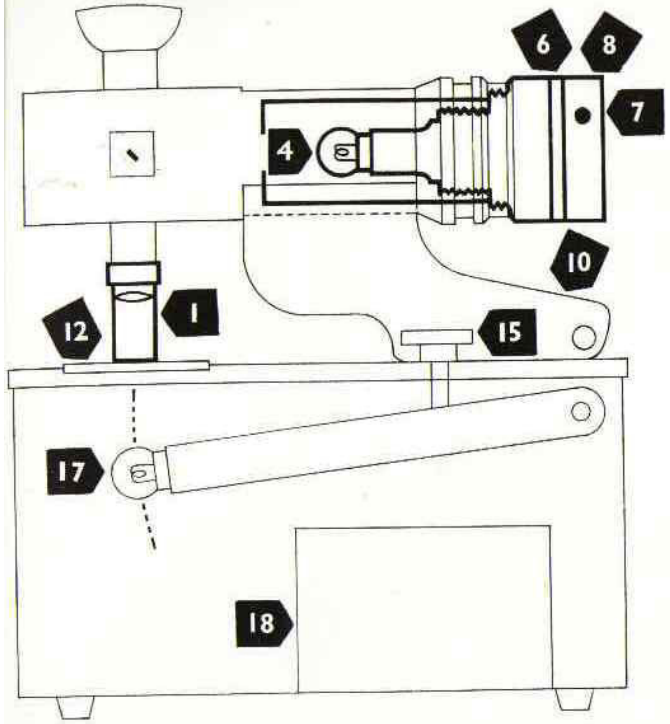
General arrangement

The general arrangement of the photometer and accessories is shown diagrammatically in Fig. 1, and their actual appearance in Fig. 2.

The photometer is mounted in a cradle on the *Illuminator* so that its telescope points at a white diffuser which forms a window in the top of the illuminator box. The diffuser is illuminated from inside the box by a small lamp whose distance from the diffuser can be varied ; thus the brightness of the diffuser can be adjusted. The telescope of the photometer is provided with a *Supplementary Lens Attachment* (Fig. 7) which carries a lens of such a power that the upper side of the diffuser can be focused in the eyepiece. This lens is mounted in the upper part of a small extension tube, blackened on the inside and provided at its lower end with a diaphragm having a small circular opening through which the diffuser is viewed. The tube of the supplementary attachment is provided at its lower end with a cut-away window for use in making density measurements of reflection images (see page 7). This window is provided with a sleeve by which it can be closed.

The *External Supply Adaptor* (Fig. 8) takes the place of the normal battery container and lamp used for exposure estimation. It consists of a tube to fit inside the body of the photometer and carries a lamp to illuminate the comparison 'spot' of the photometer.

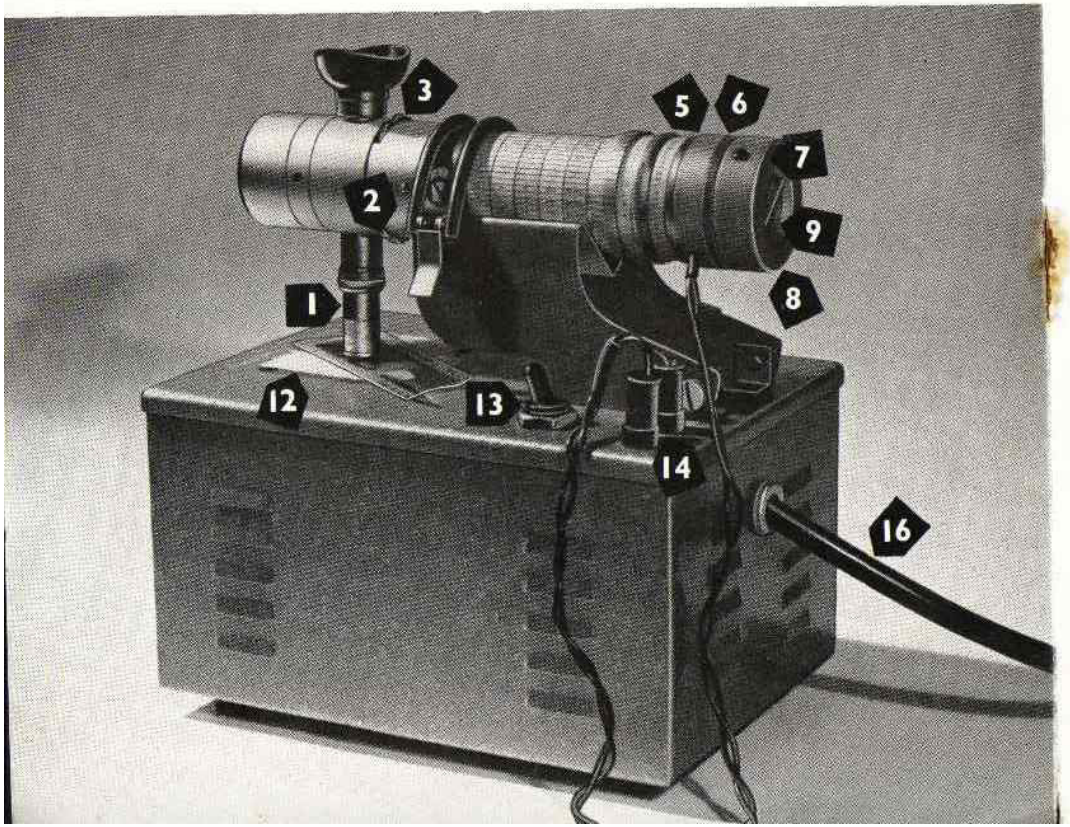
The two lamps are of the same type and wattage, 6-volt 6-watt. They are fed on parallel circuits from a small transformer which is mounted in



Figs. 1 and 2. *General arrangement*

Key to numbers :

1. *Supplementary lens attachment*
2. *Range shift disc*
3. *Colour matching disc*
4. *External supply adaptor*
5. *Base ring of external supply adaptor*
6. *Locking ring*
7. *Button switch*
8. *Operating ring*
9. *Rheostat control*
10. *Cradle*
12. *Diffuser*
13. *Switch for illuminator lamp*
14. *Plugs for photometer lamp supply*
15. *Zero adjusting screw*
16. *Mains lead*
17. *Illuminator lamp*
18. *Transformer*



the base of the illuminator. Any variations in mains voltage thus produce equal relative variations of output from the lamps; it is thus unnecessary to read and adjust the galvanometer in the photometer during the progress of densitometric work.

To set up the S.E.I. Photometer to measure densities of transparencies

1. Make sure that your electricity supply is A.C. 50 cycles/sec. Find out the nominal mains voltage. If the mains voltage is not 240 volts the connections to the illuminator transformer should be altered as described on page 9.

2. Mount and clamp the S.E.I. Photometer in the cradle of the illuminator so that the telescope points vertically downwards at about the centre of the diffuser. In this position the cradle should just occupy the scale space between the rotating end and the metal housing at the other end of the Photometer (Figs. 2 and 3).

3. Slip the supplementary lens attachment over the telescope. Note that the telescope lens itself should be pushed in as far as it will go and, for measuring the density of a transparency, the aperture in the side of the attachment must be closed by the sleeve provided (Fig. 2).

4. Set the knurled cradle stop screw so that the end of the supplementary attachment cannot accidently break the negative or diffuser window (Fig. 5).

5. Unscrew the operating ring at the end of the photometer (Fig. 2) and withdraw the battery container and lamp.

6. Insert the external supply adaptor to take the place of the battery container which you have just removed, and screw this adaptor into place (Fig. 6).

7. Screw the operating ring into the end of the adaptor, locking it with the ring provided (Fig. 2) so that the switch button is in a comfortable operating position.

8. Connect the two plugs from the adaptor to the sockets provided on the illuminator platform (Fig. 2).

9. Connect the illuminator mains lead (Fig. 2) to the supply point via a suitable earthing type (3-pin) plug.

The instrument is now ready for adjusting the zero.

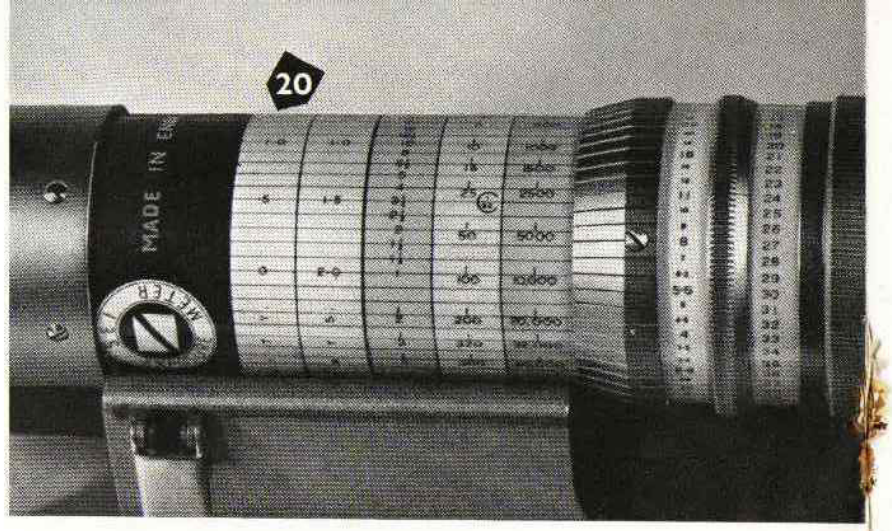
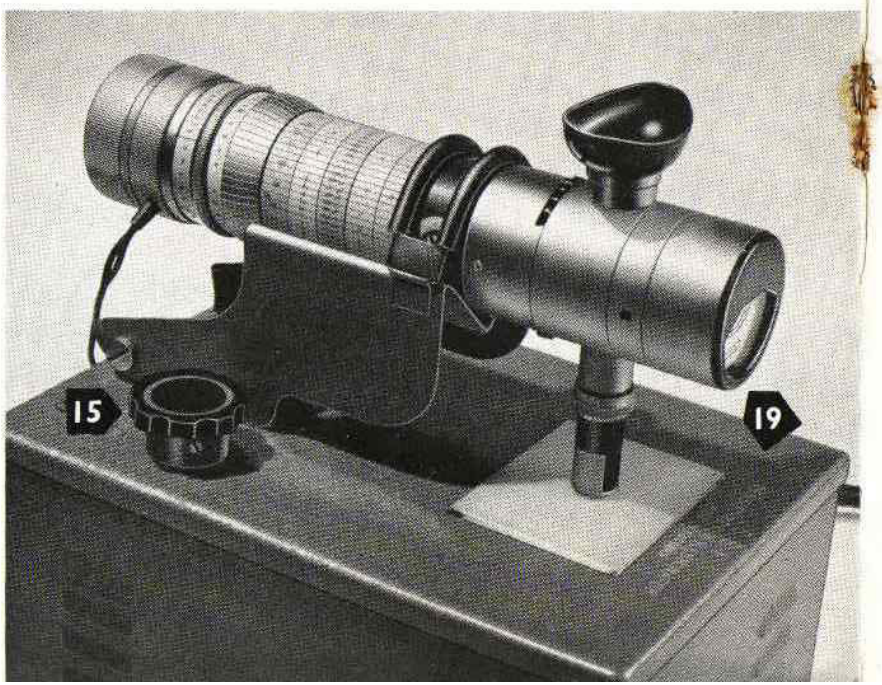


Fig. 3. *View of the Scales showing Relative Density Scale and reference mark screw. The instrument is shown recording a density value of* 0.23. *Arrow* (20) *points to Relative Density Scale*

Fig. 4. *View showing Zero Adjusting Screw* (15)



TO ADJUST THE ZERO

To enable the relative density scale of the photometer to be used as an absolute scale it is necessary to adjust the brightness of the illuminator. The procedure is as follows:—

10. Turn the operating ring of the photometer until the screw head in the graduated tapered ring corresponds with the zero of the relative density scale. This screw appears opposite 27° on the film speed scale and is in line with the reference mark of the photometer (Fig. 3).

11. Focus the eyepiece on the photometric spot.

12. Set the brightness range selector to the white index mark for densities between 0 and 2.0 (for higher densities, see 17 below), the colour-of-light corrector to the yellow index mark and the photometer rheostat control (Fig. 2) to about its mid position.

13. Look into the eyepiece, press the button switch in the operating ring and turn the densitometer zero adjusting screw (Fig. 3) until photometric balance is obtained.

Note: If the spot is yellower or whiter than the surrounding field, turn the rheostat control until colour balance has been restored. This must be done before the final zero brightness adjustment is made and should, as implied in 12 above, normally be obtained with the rheostat control at about its mid position. The needle of the photometer galvanometer (19, Fig. 4) should not be allowed to go over the end of the scale, but there is no need to use the red 'standard brightness' mark for this work.

TO MEASURE TRANSMISSION DENSITIES

14. Place the transparency, emulsion upwards, on the diffuser and arrange the part to be measured exactly under the aperture of the supplementary attachment (Fig. 2).

15. Look into the eyepiece and make any slight adjustment of the position of the negative which may be necessary to bring the image of the part to be studied over the photometric spot. The cradle stop screw may be used to assist in focusing the image of the negative, but it may sometimes be an advantage not to focus too sharply. Then press the switch button and rotate the operating ring until photometric balance is obtained.

16. Read the density from the relative density scale, using the line adjoining the screw mentioned in paragraph 10 as the reference mark.

17. For densities above 2.0, change to the 'red' range selector and proceed as above but adding 2.0 to the scale values then obtained.

Precautions to be taken in measuring transmission densities

The S.E.I. densitometer is intended to measure 'totally-diffuse densities'; that is to say, the density value should be that obtained when the image

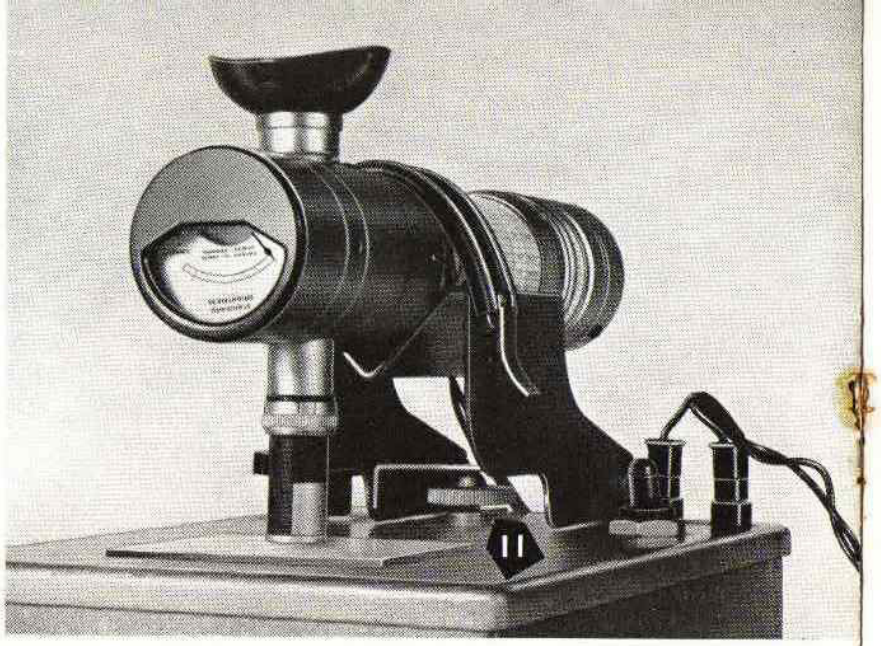
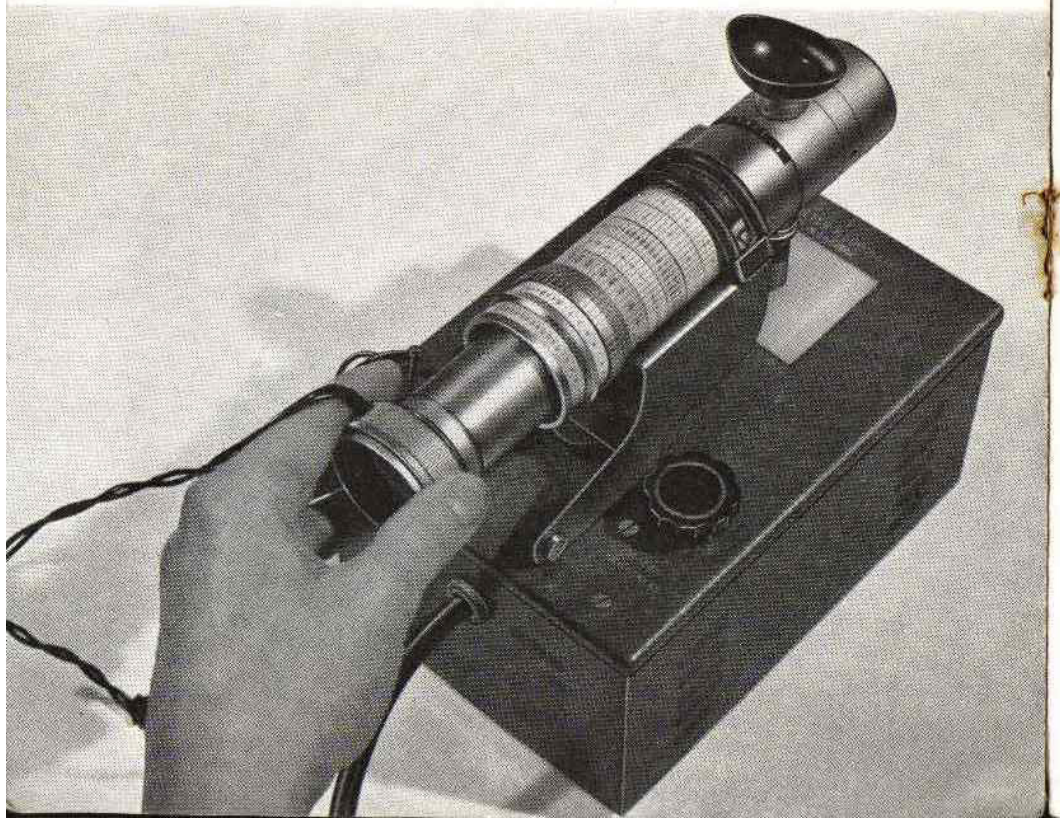


Fig. 5. *View showing Cradle Stop Screw* (11)

Fig. 6. *Inserting the External Supply Adaptor*



side of the negative is in contact with the diffusing window. If the instrument is used in a dimly lighted room and the diffuser window is masked down to a small aperture by means of a thin black mask placed under the negative and the negative itself is placed face downwards on the platform, these conditions are fulfilled. The aperture in the mask should be only sufficiently larger than the image of the photometer spot to ensure exclusion of any brighter surrounding area of negative. It has been found, however, that by placing the negative *face upwards* on the platform and the aperture of the supplementary attachment in contact with the negative, correct readings are obtained without masking provided the area to be measured covers the aperture. When these conditions are fulfilled, there is also no need to work in an inconveniently darkened room. It is for this reason that in paragraph 14 of the instructions it is advised that the negative be placed 'face upwards'.

For measuring densities which will not permit contact either with the diffuser or with the aperture, e.g. lantern slides with cover glasses, the diffuser must be masked and the room should be only dimly lighted.

The values of density obtained with this instrument from negatives which are neutral grey in colour will be directly applicable to contact printing. They will not, without further experiment, give correct printing values for negatives which are to be used for projection printing.

Measurement of reflection density

For measuring reflection densities of prints the lamp within the illuminator is switched off and the paper print to be measured is placed face up under the aperture of the supplementary attachment. The illumination must now be provided by means of an external lamp arranged so that it can shine at an angle of about 45° to the surface of the paper through the side aperture of the supplementary attachment (Fig. 7). This aperture is uncovered by turning the sleeve provided.

Although it is possible to adjust the position of the external lamp so that the white of the fixed out paper gives photometric balance when the relative density scale reads zero, it is more convenient to fix the position of the lamp relative to the photometer and obtain balance by turning the operating ring of the photometer. The photometer reading obtained with the instrument so set must be taken as the zero position and all subsequent readings must be measured from this point.

To obtain the best out of the apparatus for reflection density work, it is best to use a lamp like that used in the adaptor (6-volt 6-watt). This must be fed by a parallel circuit tapped from the same plugs as used for the adaptor.

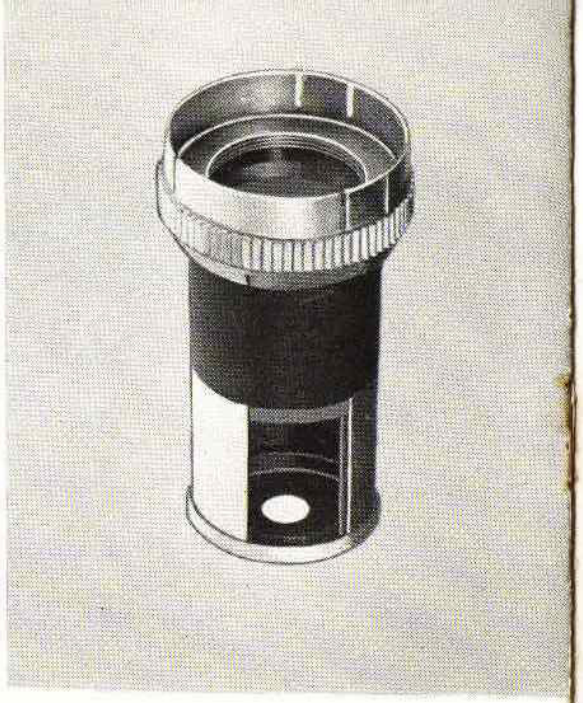
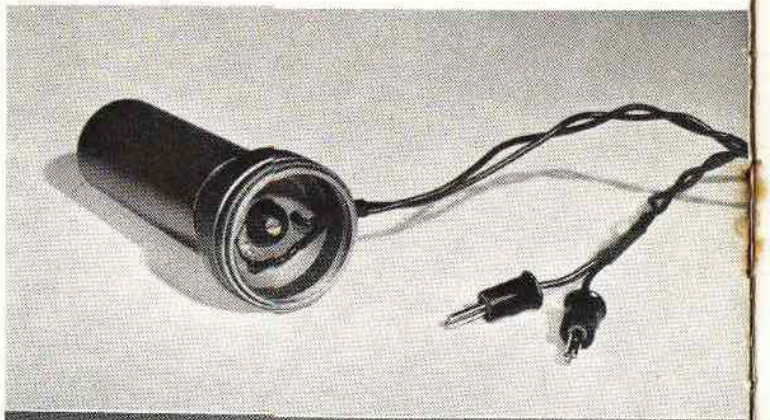


Fig. 7. *Supplementary Lens Attachment, about twice actual size, showing side window open as it would be for reflection density work*

Fig. 8. *External Supply Adaptor*

Fig. 9. *Barrel of External Supply Adaptor removed to show lamp*



Electrical connections and maintenance

Connection to A.C. mains is provided by a length of 3-core flex carrying the usual earthing wire. This flex is led through one end of the illuminator and held by a rubber fairlead ring (Fig. 2). The instrument is sent out connected for a 240 volt A.C. 50 cycle circuit. If the available voltage is other than this, the red and black wires must be moved and soldered to the appropriate connectors on the transformer panel.

TRANSFORMER PANEL

To get at the transformer panel, give a half turn anticlockwise to the slot-headed fastening clamp on the bottom of the box and lift off the top of the box. It will be necessary to push the main supply lead inwards in order to lift the lid of the box far enough to get at the transformer panel.

The instrument as supplied is wired for 240V A.C. as shown in Fig. 10.

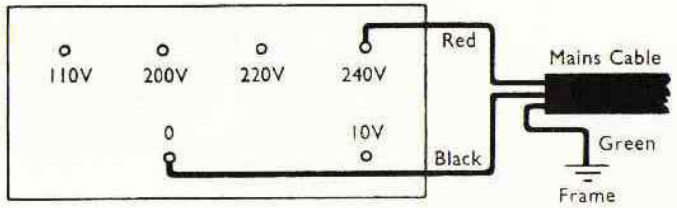


Fig. 10. Transformer panel wired for 240V A.C.

Before using the instrument on other A.C. voltages the connections of the mains lead on the panel must be altered. The connections in each case should be as shown in the following table.

A.C. supply voltage	Terminals for mains lead connections		
	Red	Black	Green
110V	110V	0V	Frame
120V	110V	10V	Frame
200V	200V	0V	Frame
210V	200V	10V	Frame
220V	220V	0V	Frame
230V	220V	10V	Frame
240V	240V	0V	Frame
250V	240V	10V	Frame

S.E.I. PHOTOMETER REPAIRS

1. Calibration must be checked even if the photometer has only had minor servicing, e.g. cleaning.

2. If more complex work be carried out, e.g. fitting new photocell, meter, wedges, or filters, then the Standard Brightness setting will definitely not coincide with that already marked on the dial of the microammeter.

3. Faults most likely to occur:-

(1)	Battery leakage(affecting battery tube, inner case, Rheostat Base and Scales).	10%
(2)	Photocell unserviceable	10%
(3)	Microammeter faulty	10%
(4)	Rheostat Base unserviceable	60%
(5)	Wedges and/or filters damaged due to age, corrosion, etc.,	30%
(6)	Scales and scale covers damaged	50%
(7)	Telescopic ring tube damaged	10%
(8)	Action of lower body siezed up	10%
(9)	Clean and recalibrate only	10%

This survey was conducted on 100 photometers serviced during the latter half of 1963. From this it will be seen that battery leakage and loss in photocell sensitivity caused most of the repairs to be necessary. Battery leakage is the main contributor to rheostat base failure, bloomed wedges and filters, and scale damage.

4. From this it will be seen that the spare parts which will be needed most are:-

(1) Photocells
(2) Scales
(3) Scale covers
(4) Battery tubes
(5) Wedges
(6) Filters
(7) All components of Rheostat Bases
(8) Complete Rheostat Bases

5. In addition to these important spares, it would be advisable to also stock:-

(1) Microammeters
(2) Tele-ring tubes
(3) Eyepiece mouldings
(4) Bulb assemblies
(5) Lenses
(6) Photocell assy.
(7) Photocell clamp
(8) Photocell contact plate
(9) Diffusing screen
(10) Filter discs
(11) Cursor ring
(12) Ratchet sleeve
(13) Lens aperture ring
(14) Speed degree ring
(15) Contact assy. 36392
(16) Battery insulator